

Nuclear energy in France

Nuclear energy outlook

NUCLEAR energy is the cornerstone of French energy policy. In the '70s France chose to develop nuclear as its base load electricity source as a response to the oil crisis and assure its energy independence.

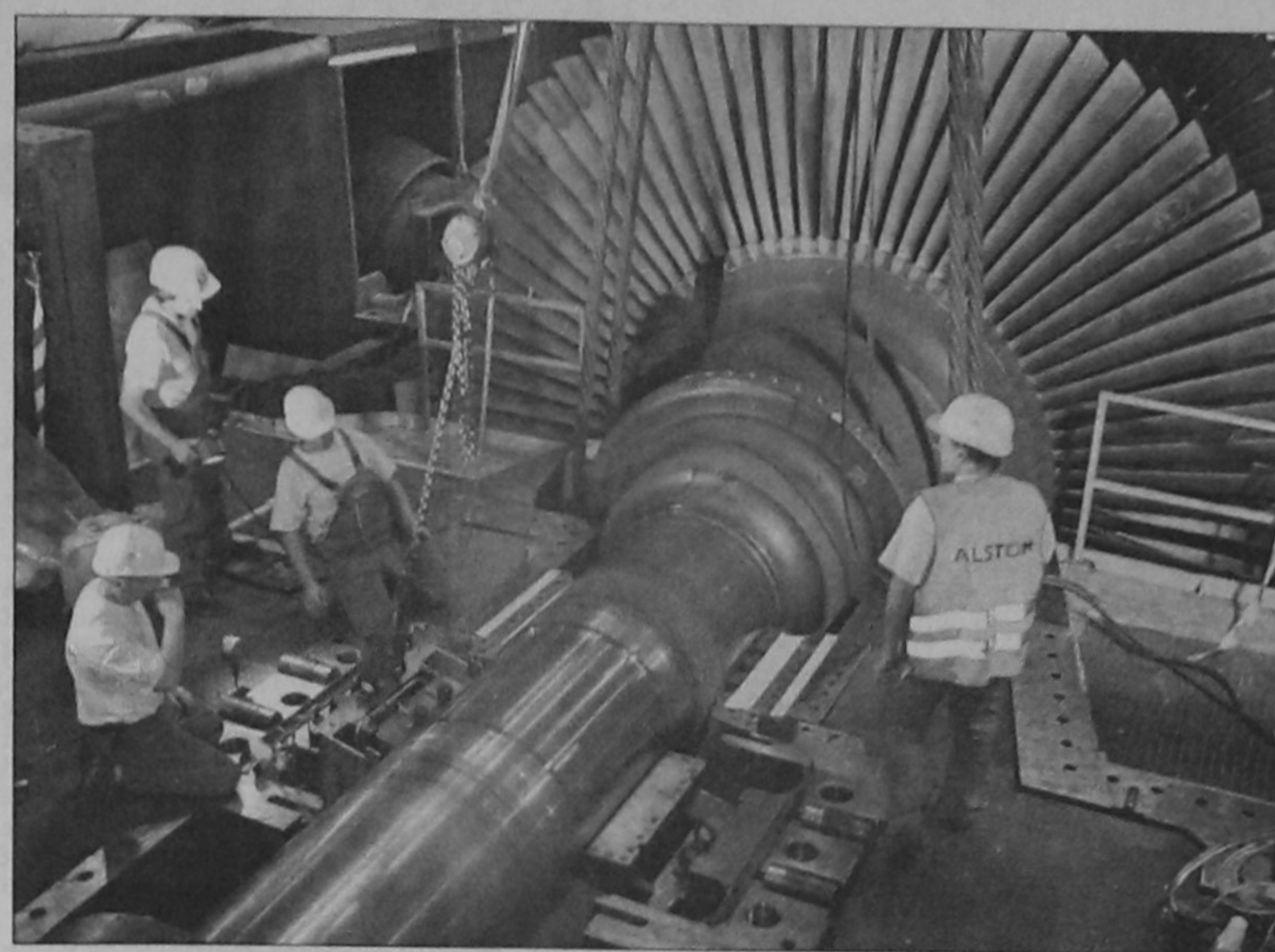
Nuclear electricity production: France currently counts 58 commercial nuclear reactors in operation responsible for producing 80% of French domestic electricity. As a comparison, the 104 US reactors produces 20% of US electricity. Despite scarce natural

resources, France has reached an energy independence of 50% thanks to its strategic choice for nuclear energy.

Environment: As well as providing safe and reliable energy, nuclear helps to reduce French greenhouse gas emissions by avoiding the release of 31 billions tonnes of carbon dioxide (contrary to coal or gas generation) and making France the less carbon emitting country within the OECD. As a leader in nuclear energy, France has developed clean technology for radioactive waste disposal.

Reprocessing currently allows France to recover valuable elements from spent fuels and permit a significant reduction of high level waste and lead to safer and optimized containment, for final radioactive waste disposition. French nuclear power plants produces only 10 g/year/inhabitant of highly radioactive waste.

International cooperation and research: France is one of the forerunner in nuclear research and participates in numerous international cooperation pro-



Nuclear turbine

grams alongside the United States such as the development of the next generation of nuclear power plants (Gen IV) and the International Thermonuclear Experimental Reactor (ITER) that will be built in Cadarache, South of France.

The principal public actors of the nuclear sphere in France

The French Atomic Energy Commission (CEA)

The French Atomic Energy Commission is a public body established in October 1945 by General de Gaulle. It constitutes a power of expertise and proposition for the authorities. A leader in research, development and innovation, the CEA is involved in three main fields:

Energy:

It develops and acquires the technological building blocks necessary to the development of the nuclear reactors of the future (Contribution to Generation IV and GNEP research).

- It contributes to reducing greenhouse gas emission with its research on hydrogen, fuel cells, biomass, energy storage....
- It supports the nuclear utilities in France by optimizing the nuclear power plants of the French nuclear fleet and by optimizing the fuel cycle.
- It offers safe and economically viable technical solutions for managing nuclear waste.
- It conducts fundamental research in climate and environmental sciences, high energy physics, astrophysics, fusion, nanosciences...

Information and Health technologies:

- It tackles micro and nanotechnologies for telecommunication and nuclear medicine for radiotherapy and medical imaging.
- It researches programs on biotechnology, molecular labelling, biomolecular engineering and structural biology.
- It shares its knowledge and know-how through education and training through the National Institute for Nuclear Sciences and Technologies (INSTN).
- It manages over 300 priority patents and is active in the creation of clusters.

Defense and National Security:

- It conceives, builds, maintains then dismantles the nuclear warhead of the French deterrence force.
- It helps to fight against nuclear, biological and chemical weapons (NRBC program).

The French Nuclear Safety Authority (ASN)

Created in 2006, from the former DSIN (Directorate for the Safety of Nuclear Facilities), the French Nuclear Safety Authority is an independent administrative authority which is tasked with regulating nuclear safety and radiation protection in order to protect workers, patients, the public and the environment from the risks involved in nuclear activities. It also contributes to informing the public. Like the Nuclear Regulatory Commission in the United States, it carries out inspections and may pronounce sanctions, up to and including suspension of operation of an installation.

French Institute for Radioprotection and Nuclear Safety (IRSN)
Created in 2001 by merging the Protection and Nuclear Safety

Institute (IPSN) and the Ionizing radiations Protection Office (OPRI), the Institute for Radioprotection and Nuclear Safety is a public establishment of an industrial and commercial nature placed under the joint authority of the Ministries of the Environment, Health, Industry, Research and Defense. It is the expert in safety research and specialized assessments into nuclear and radiological risk serving public authorities whose work is complementary to the ASN.

Its scope of activities includes:

- environment and response,
- human radiological protection,
- research on the prevention of major accidents,
- power reactor safety,
- fuel cycle facility safety,
- research installation safety,
- transport safety
- waste management safety,
- nuclear defense expertise.

National radioactive Waste Management Agency (ANDRA)

Created in 1991, the French National Agency for Radioactive Waste Management is a public

industrial and commercial organization that operates independently of waste producers. It is responsible for the long-term management of radioactive waste produced in France under the supervision of the French Ministries for Energy, Research and the Environment. It can be compared to a certain extent to the Office for Nuclear Waste of the Department of Energy in the United States.

Andra also pursues industrial, research, and information activities as it designs and implements disposal solutions suited to each category of radioactive waste:

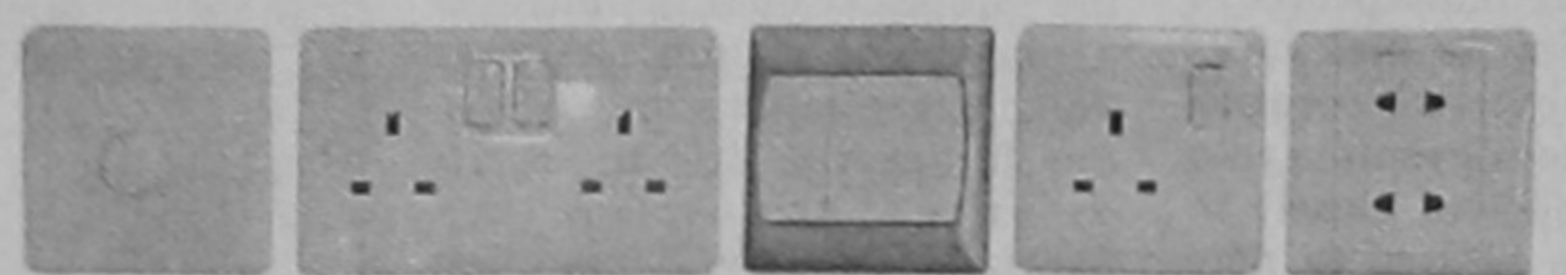
- the collection, conditioning, disposal of radioactive waste from small producers (hospitals, research centers, industry),
- specification of waste packages for disposal,
- disposal in suited sites,
- Monitoring of closed disposal facilities,
- research programs for long-lived and high level activity waste, especially through the operation of an underground research laboratory in a deep clay formation...

General Directorate for Energy and Raw Materials (DGEMP)

The General Directorate for Energy and Raw Materials represents the government and is part of the Office of the Department for Ecology and Sustainable Development. It defines the French nuclear policy. The DGEMP takes care of the energy supply, the security of supply, oil refining and logistics, nuclear industry, and coal and mines. Consequently, its activities include:

- the design and implement energy and raw material supply policy,
- to ensure opening of electricity and gas markets,
- track key energy and raw material sectors,
- to oversee enterprises and public institutions in energy sector,
- to ensure compliance with rules and regulations governing energy sector,
- to participate in European and international energy projects and working groups,
- to provide economic, environmental, and fiscal expertise on energy matters.

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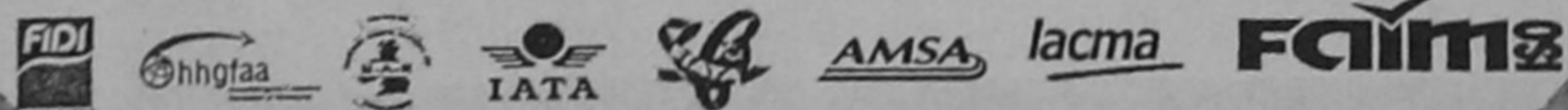
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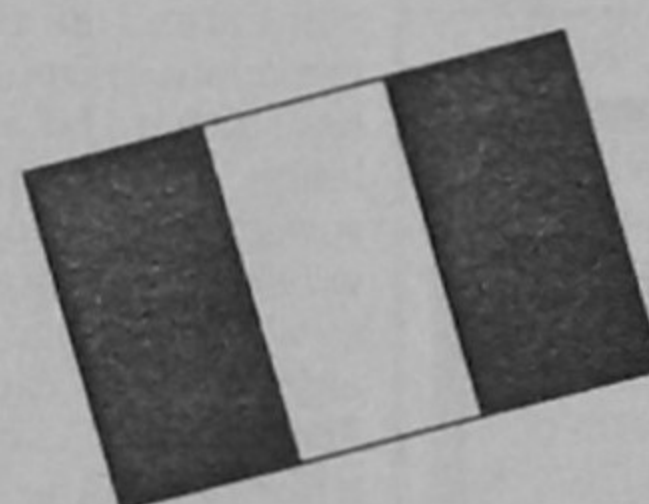
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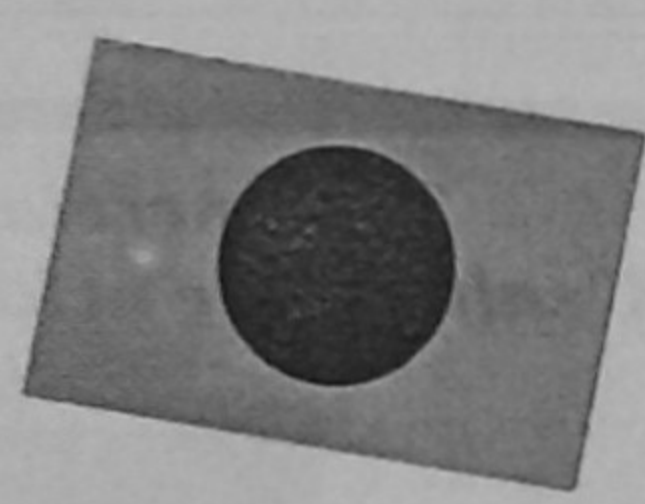
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