A future for nuclear sites beyond their service life

Nuclear Site Value Development

AREVA
PURE ENERGY

A new life cycle for nuclear

As the nuclear industry moves into a new development phase, many facilities built in the fifties and sixties are reaching the end of their service life. Dismantling them and rehabilitating the sites on which they stand is a major industrial challenge which will give rise to a number of new projects. AREVA has more than 20 years' experience in these highly technical fields.

A societal issue

By dismantling and developing the value of disused facilities, nuclear can be shown to be reversible: like all industrial activities, a nuclear site has a limited lifetime. After it has been redeveloped, it can be used again for new activities, not necessarily nuclear.

A technical challenge

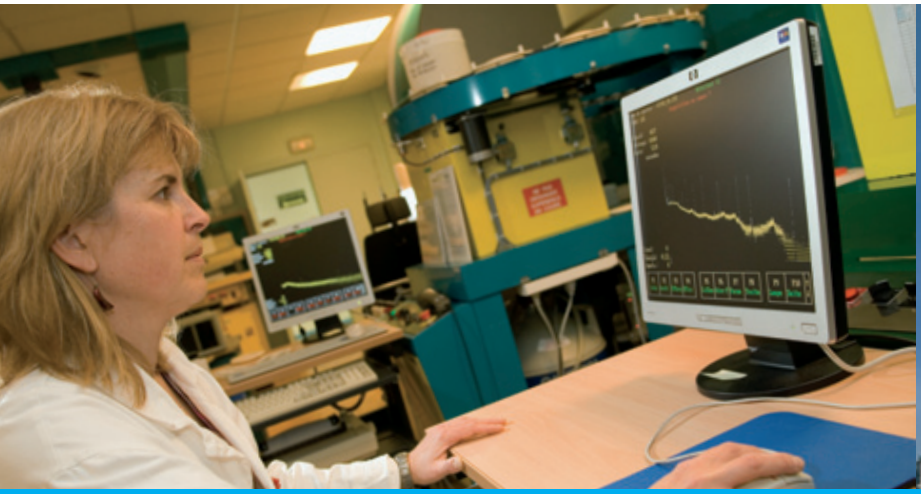
An enormous amount of work is involved, given the size and complexity of the facilities to be decontaminated and dismantled; large quantities of concrete, steel, copper and other materials have to be handled in difficult conditions. Today's tried-and-tested procedures and techniques are the result of many years of development work. The feasibility of the operations has been demonstrated throughout the world for the last fifteen years or so.

An economic challenge

Hundreds of millions of euros will be invested in site value development. Dismantling lasts for years once the facilities have been shut down and provides work for several thousand people until new industrial projects are set up. It continues to contribute to the local economy.

An activity with a future

More than one-fifth of the world's 500 nuclear power plants are nearing the end of their service life, as are dozens of research units and fuel fabrication and recycling plants. Developing the value of these shutdown sites is set to become a major industrial activity that will be part of a facility's life cycle: design, construction, operation, shutdown and value development.



facilities

A NEW INDUSTRIAL ACTIVITY

As more and more sites reach the end of their service life, AREVA considers nuclear site value development as a fully-fledged industrial activity. The group's competencies in this field have been grouped together to form a dedicated entity: the Nuclear Site Value Development Business Unit, created in 2008.

Unique expertise

AREVA has been cleaning up and dismantling its own sites for over 20 years and is currently working on four major value development projects that are set to become worldwide references.

An industrial logic

Within AREVA, the role of the Nuclear Site Value Development BU is to:

- steer **project progress** (control of deadlines, costs, etc.),
- develop a **new business line**: dismantling,
- bring together and make known **the group's expertise** in dismantling,
- promote economies of scale by **standardizing methods** and techniques,
- assert itself as a **major stakeholder** at a time when new projects are set to be launched.

Project management and steering

The BU is the owner of all AREVA projects. It acts as both operator and project leader to improve performance. The BU is also the prime contractor for a number of projects launched by the French Atomic Energy Commission (CEA). In this case, it steers the work and coordinates all the partners and subcontractors, ensuring that the projects stay on course and remain within budget.

BU Valorisation des sites nucléaires

- 1,400 employees working on 6 sites.
- 4 major projects underway.
- 400 million euros in revenues.

Large-scale projects

Several billion euros are invested in site value development projects which are far-reaching and complex, and often last for several decades. Long before work actually begins, lengthy studies and preparations are required to schedule operations, select the techniques to be used and optimize costs and deadlines. The Nuclear Site Value Development BU is currently working on four major projects involving its own facilities and those of the CEA.

La Hague

DISMANTLING OF THE FIRST GENERATION OF USED FUEL RECYCLING FACILITIES

Between 1966 and 1998, almost 5,000 tons of used fuel from graphite-moderated gas-cooled reactors, 4,500 tons of light water reactor fuel, as well as fuel from fast reactors and research reactors, were treated at UP2 400, the very first industrial recycling plant on the La Hague site.

UP2 400 was shut down in 2003 and replaced by two new plants. Dismantling involves cleaning up all the facilities and packaging waste for which no disposal solution existed at the time it was generated. The necessary permits have still to be granted for this vast program which is due to begin in 2009 and run until 2032.

LA HAGUE: 4 billion euros over 25 years / a workforce of 500 at the height of operations /

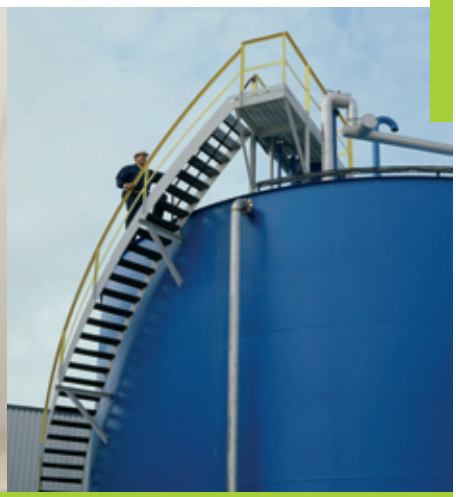
LONG-TERM OPERATIONS

1 / Assessment

Site value development has to be prepared several years in advance. Studies are carried out to determine the resources required, cost the operations, draw up a detailed schedule and describe each stage of the project in detail. Each individual stage is validated by the safety authorities which issue the corresponding permit. This lengthy administrative process guarantees that nuclear and occupational safety considerations are taken into account.

2 / Clean-up

Work begins with the recovery and removal of all radioactive material remaining in the facility; complex techniques are used and many, such as pipe flushing, scraping down of walls, etc. are carried out remotely.



Marcoule

FIRST-TIME DISMANTLING OF A RECYCLING PLANT

1,000 rooms to be cleaned up, 30,000 tons of waste to be treated, 30 years of work.

Dismantling of plant UP1 at the Marcoule Nuclear Research Center is a project like no other and will be a unique reference for the group. From 1958 to 1997, a total of 18,600 tons of fuel for the defense industry and then for the graphite-moderated gas-cooled reactor series were treated at UP1. Dismantling work was started by AREVA ten years ago and is set to last for another twenty years. Since 2005, AREVA has been acting as prime contractor for the CEA which plans to use the site for new research activities. Numerous chemical decontamination and remote cutting techniques have been specially developed for the project. The waste generated (rubble, scrap metal, bitumen drums, etc.) are treated and packaged on-site in a dedicated facility. Ninety-eight percent of the dismantling waste generated at Marcoule is put into surface storage.

MARCOULE: 5.6 billion euros over 30 years / more than 250 people working on the site /

3 / Dismantling

The next step is to take the facilities apart: pipes are cut up and the equipment and certain buildings are disassembled. Here again, a number of operations can be carried out using manipulator arms and robots. Large amounts of waste are generated during this phase; it must be carefully packaged before it can be sent for disposal.

4 / Site Release

After a final clean-up, the facilities can be released. The buildings can either be demolished or used again for new industrial activities, not necessarily nuclear. This marks the end of the site value development program.

Cadarache

FIRST-TIME DISMANTLING OF A MOX FUEL FABRICATION PLANT

The Cadarache plant was commissioned in 1962 to fabricate fuel for fast reactors; this was followed by MOX fuel for light water reactors, an activity which continued until the plant was shut down in 2003.

Clean-up began in 2007 after a 4-year preparatory phase to select the clean-up and disassembly techniques, plan out the various stages, draw up the schedule and obtain the necessary permits. AREVA opted to carry out the operations with the facility operating personnel. Six hundred thousand hours of work will be required to dismantle the 432 glove boxes and 44 tanks before the facilities are cleaned up and handed over to the owner, the CEA, in 2013.

CARADACHE: 120 million euros over 6 years / a workforce of 225 at the height of operations (AREVA and its partners) /

Annecy and Veurey

GIVING A NEW LEASE OF LIFE TO FORMER INDUSTRIAL SITES IN BUILT-UP AREAS

AREVA is currently working on a site value development program on two industrial sites in Annecy and Veurey, near Grenoble. Dating back to 1955 and 1957, the sites were created for the manufacture and precision machining of uranium metal.

The industrial park in which the Annecy plant is located is now in a built-up area due to successive construction programs. Even though this dismantling project is technically quite simple – the radioactivity levels are low and the equipment is disassembled, the buildings are cleaned up and the resulting waste is sent to the appropriate waste disposal streams – the major challenge is to prepare the site for new non-nuclear activities. A partnership is being set up between the local stakeholders and the authorities to attract new industries and continue to provide employment on the site, which will be released in 2010. An industrial or tertiary activity cluster coordinated by the Economic Agency of the Haute-Savoie department is due to be built on the site in 2011.

ANNECY / VEUREY: 60 million euros over 5 years / a workforce of 100 /

An activity with a future

The number of clean-up and dismantling projects is set to rise steadily in the years ahead and site value development will unquestionably become a **new nuclear activity in its own right**.

AREVA is developing the corresponding competencies and expertise: **new professions** are springing up (value development project manager, scenario and feedback manager, operational dismantling methods manager, flushing operator, etc.) and a dedicated theoretical and practical training program is being put together.

Once a nuclear site has been shut down, the long-term dismantling and value development operations make a **considerable contribution to the local economy**.

Site rehabilitation is an **environmental necessity** and improves nuclear's image in the eyes of the public.

As new nuclear projects get off the ground, developing the value of disused sites will **free up space for future projects** and make a valuable contribution to the nuclear revival.

With manufacturing facilities in 43 countries and a sales network in more than 100, AREVA offers customers reliable technological solutions for CO2-free power generation and electricity transmission and distribution. We are the world leader in nuclear power and the only company to cover all industrial activities in this field.

Our 71,000 employees are committed to continuous improvement on a daily basis, making sustainable development the focal point of the group's industrial strategy.

AREVA's businesses help meet the 21st century's greatest challenges: making energy available to all, protecting the planet, and acting responsibly towards future generations.

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