

All over the world, AREVA provides its customers with solutions for carbon-free power generation and electricity transmission. With its knowledge and expertise in these fields, the group has a leading role to play in meeting the world's energy needs.

Ranked first in the global nuclear power industry, AREVA's unique integrated offering covers every stage of the fuel cycle, reactor design and construction, and related services. In addition, the group is developing a portfolio of operations in renewable energies. AREVA is also a world leader in electricity transmission and distribution and offers its customers a complete range of solutions for greater grid stability and energy efficiency.

Sustainable development is a core component of the group's industrial strategy. Its 75,000 employees work every day to make AREVA a responsible industrial player that is helping to supply ever cleaner, safer and more economical energy to the greatest number of people.

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Heavy Components Manufacturing

Chalon/Saint-Marcel

Energy is our future, don't waste it!

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» A factory in the forefront of nuclear technology

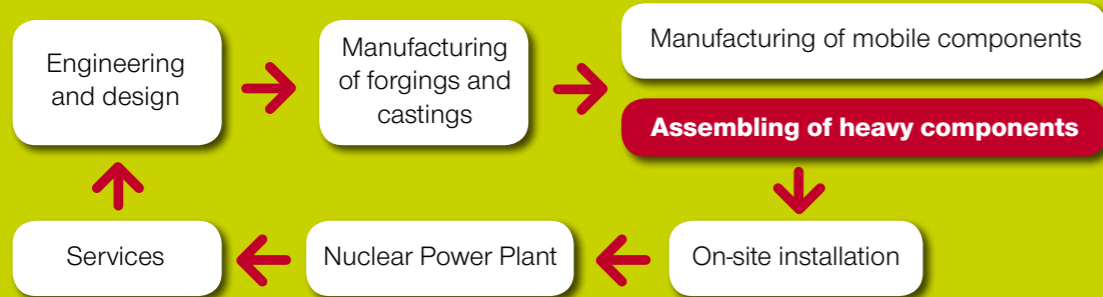
AREVA, the world leader in nuclear energy, has a strong foothold in all industrial activities of the sector, mostly, in the design and construction of nuclear power plants.

The AREVA Chalons/Saint-Marcel plant is the world leader in manufacturing nuclear power plant components. Thanks to our know-how, capacity for innovation and quality requirements, we are capable of developing such products as to fully satisfy our customers' needs.

» Products at the heart of AREVA integrated strategy

The Chalons/Saint-Marcel plant is one of the industrial sites of AREVA devoted to the design and manufacture of the NSSS heavy components and mobile components.

AREVA integrated offer (Nuclear Steam Supply System)



» We manufacture the key components of the nuclear reactor

At the heart of the reactor: the primary loop

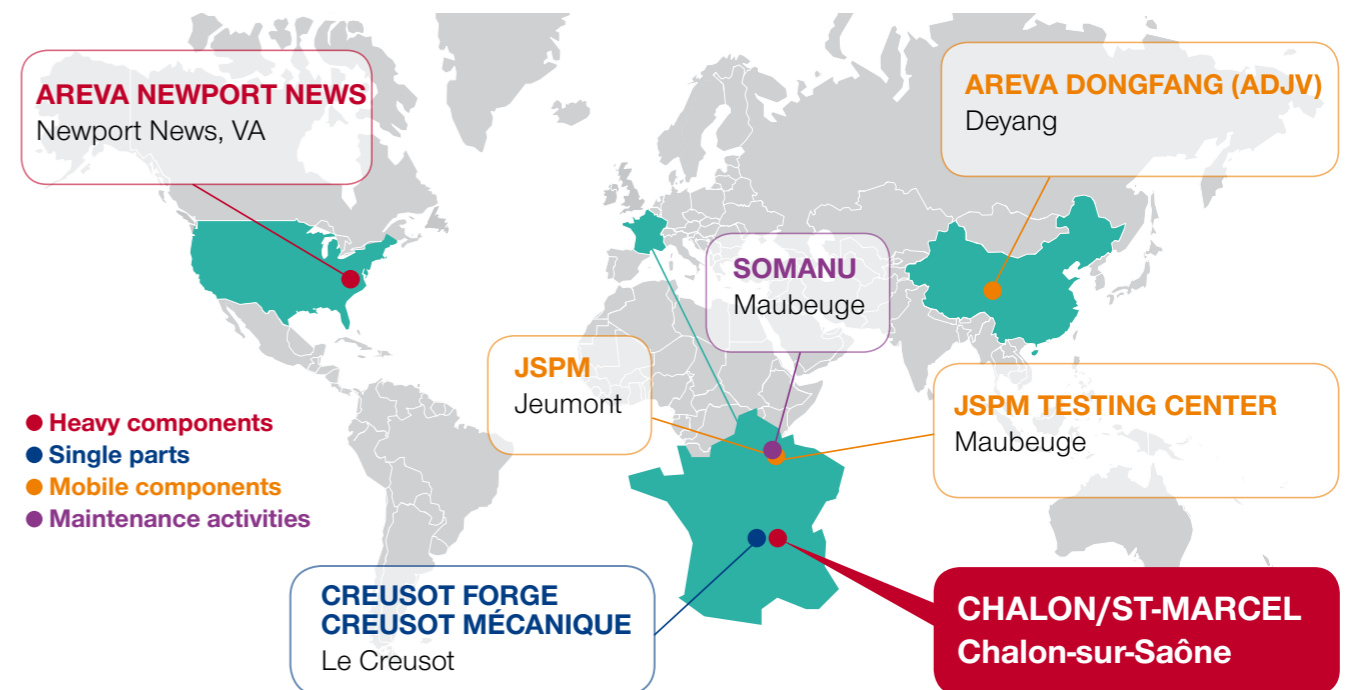
- 1 **Reactor pressure vessel and vessel internals:** impenetrable thick metal wall in steel enclosing the heart of the reactor and containing the fuel assemblies.
- 2 **Steam Generators (SG):** provide heat transfer from the water of the primary circuit to the water of the secondary circuit. The water is converted into steam, which drives a turbine which is linked to an alternator producing electricity.
- 3 **Reactor Coolant Pumps (RCP):** force the primary water through the reactor and steam generators, and ensure the safety of the system by cooling the core.
- 4 **Pressurizer:** maintains the pressure in the primary cooling circuit at a specified level (around 150 bars) to prevent the water boiling.
- 5 **Primary piping:** provides the transfer of water between the reactor pressure vessel and the steam generators.



Here, in the Chalons/Saint-Marcel factory, the EPR™ is being manufactured

Chalons/Saint-Marcel Plant

» Manufacturing of heavy and mobile components: industrial locations



CHALONS/SAINT-MARCEL PLANT

In 1973, it was decided to build the factory in a region of long history of metalworking and mechanical activities. The elected site, in the town of Saint-Marcel, in the vicinity of Chalons-sur-Saône, offered two advantages: easy waterway transportation of heavy components from the Saône river, and proximity of other sites of the group. Since its completion in 1975, the factory had manufactured all heavy components of the domestic pressurized water reactors. The Chalons/Saint-Marcel site was awarded a lot of export contracts, making AREVA the world leader. Today, it is the first industrial site manufacturing Generation III+ reactor components, of the EPR™ type.

» Unequaled component manufacturing in the world

An annual production capacity of at least 12 large-scale components (approximately 5500 metric tons).



Heavy component bay

The AREVA Chalon/Saint-Marcel factory is the only factory in the world manufacturing nuclear components for EPR™ type Generation III+ power plants.

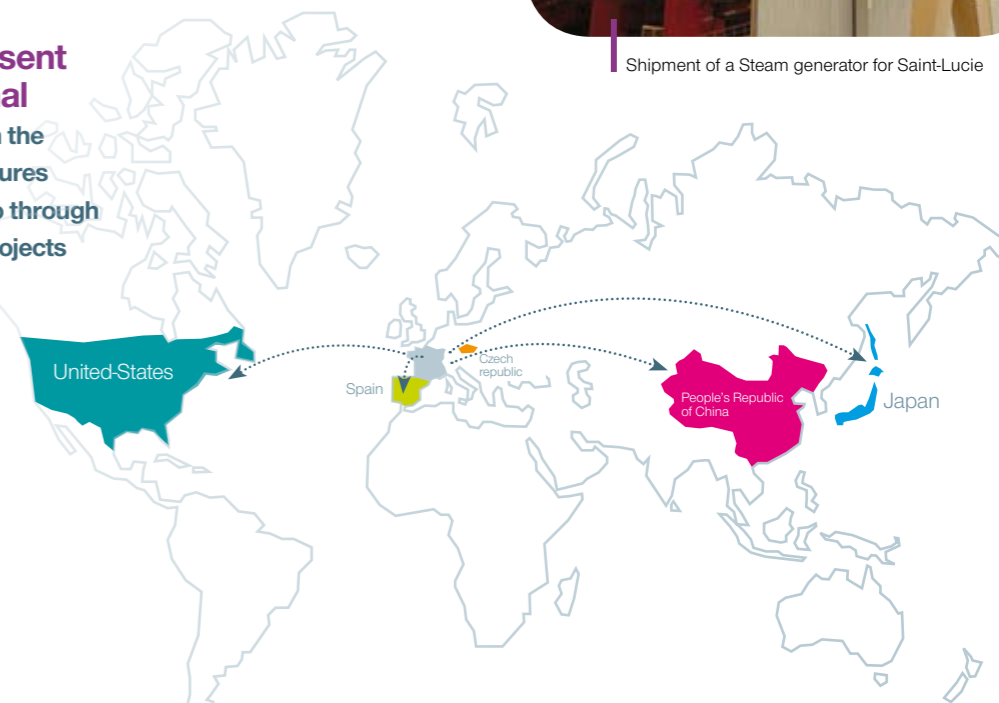
The Chalon/Saint-Marcel plant is a world leader because of its ability to :

- meet the expectations of a market where competition operates worldwide,
- supply products that match the criteria for increasing the service life of power plants (from 40 → 60 years),
- manufacture under tighter deadlines (from 7 → 5 years),
- comply with Sustainable Development criteria (environmental, economic and labor).

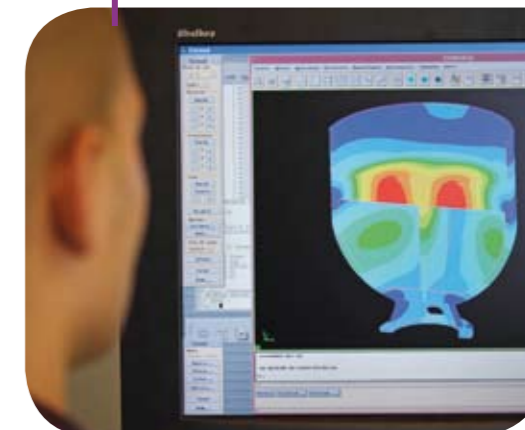
Leading scientific and technical support provided by :

- the **Calculations Department** that provides the most advanced finite element capabilities and expertise (static and dynamic, including thermal transients, etc.), fatigue analysis, and fracture mechanics,
- the **Technical Center laboratories** (located in Saint-Marcel, Le Creusot and in Germany) which are recognized worldwide for providing the best welding, chemical corrosion, mechanical, hydraulic and non-destructive testing techniques.

The factory is present on the international stage not only through the components it manufactures or subcontracts, but also through industrial deployment projects



The Catia software used in the Calculations Division



Shipment of a Steam generator for Saint-Lucie

» Mastery of heavy component manufacturing



The plant at Chalon/Saint-Marcel is at the heart of the manufacturing chain for nuclear steam supply systems (NSSS) supplied by AREVA.

Two steam generators in Fos-sur-Mer for sea transportation to the Saint-Lucie site.



Insertion of a tube support plate into a steam generator



The Ling Ao reactor vessel arriving in the nuclear power plant in People's Republic of China



One of the steam generator shells of the workshop

On the basis of the engineering data from the nuclear power plant, the factory manufactures reactor vessels and internals, steam generators and pressurizers. It also manufactures related components and EPR™ new generation components, in collaboration with the teams from other AREVA sites who are in charge of the component installation in the reactor buildings.

The plant is also involved :

- upstream by adapting the design input from engineering to the production constraints and quality control requirements,
- and downstream by producing stress reports proving the component resistance to the specified in-service conditions.



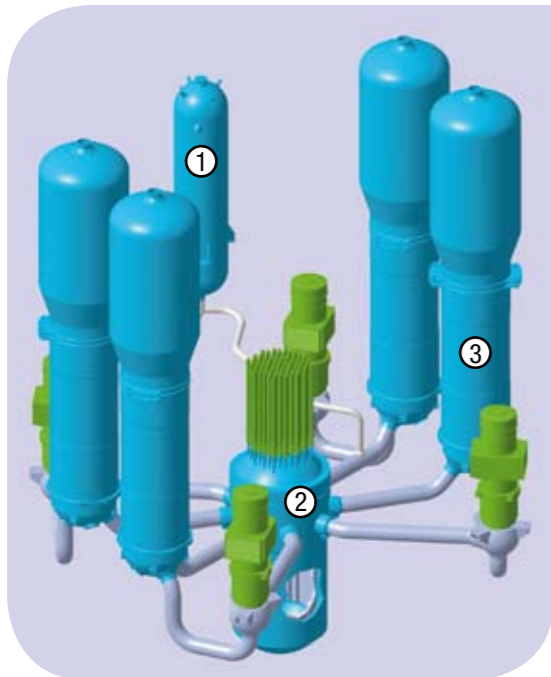
Shipment of Salem steam generators



Transportation of a steam generator manufactured in Chalon/Saint-Marcel to the nuclear power plant of Chinon

» Heavy components of the nuclear steam supply system

Sketch of an EPR™ NSSS

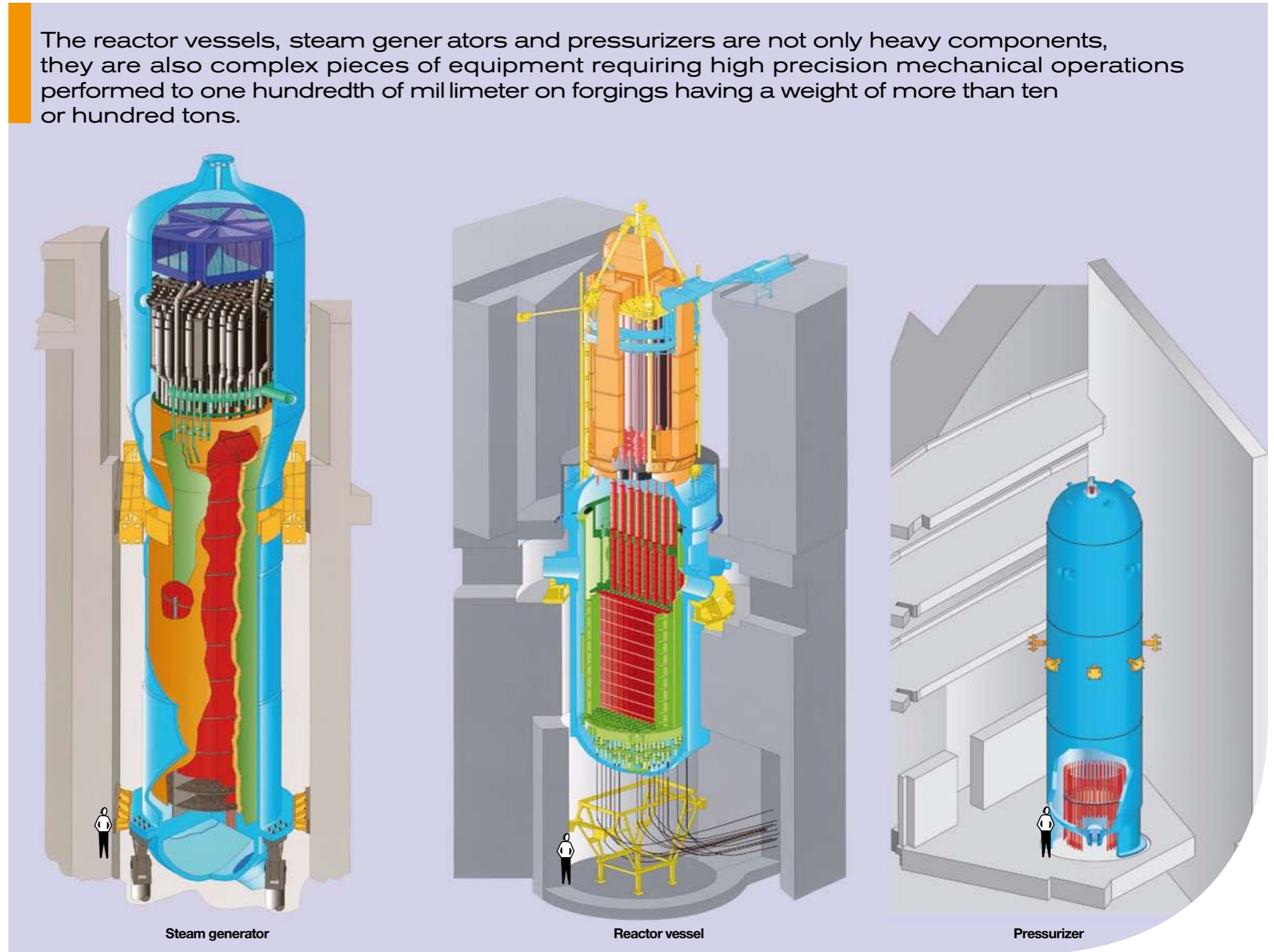


- ① Pressurizer
- ② Reactor vessel
- ③ Steam generator

Some typical characteristics of a «heavy component»:

- **Weight up to 500 metric tons:**
EPR™ steam generator or EOTSP, Once Through Steam Generator.
- **Height of 24 m (26.2 yards):** EPR™ steam generator.
- **Diameter of almost 7 m (7.7 yards):** EPR™ vessel.
- **Welding thickness greater than 300 mm (11" 8):**
1450 MW or EPR™ vessel.
- **Drilling of 18,000 holes** into Saint-Lucie steam generators.
- **140 km (87 miles) of tubing** on a single EPR™ steam generator.

The reactor vessels, steam generators and pressurizers are not only heavy components, they are also complex pieces of equipment requiring high precision mechanical operations performed to one hundredth of millimeter on forgings having a weight of more than ten or hundred tons.



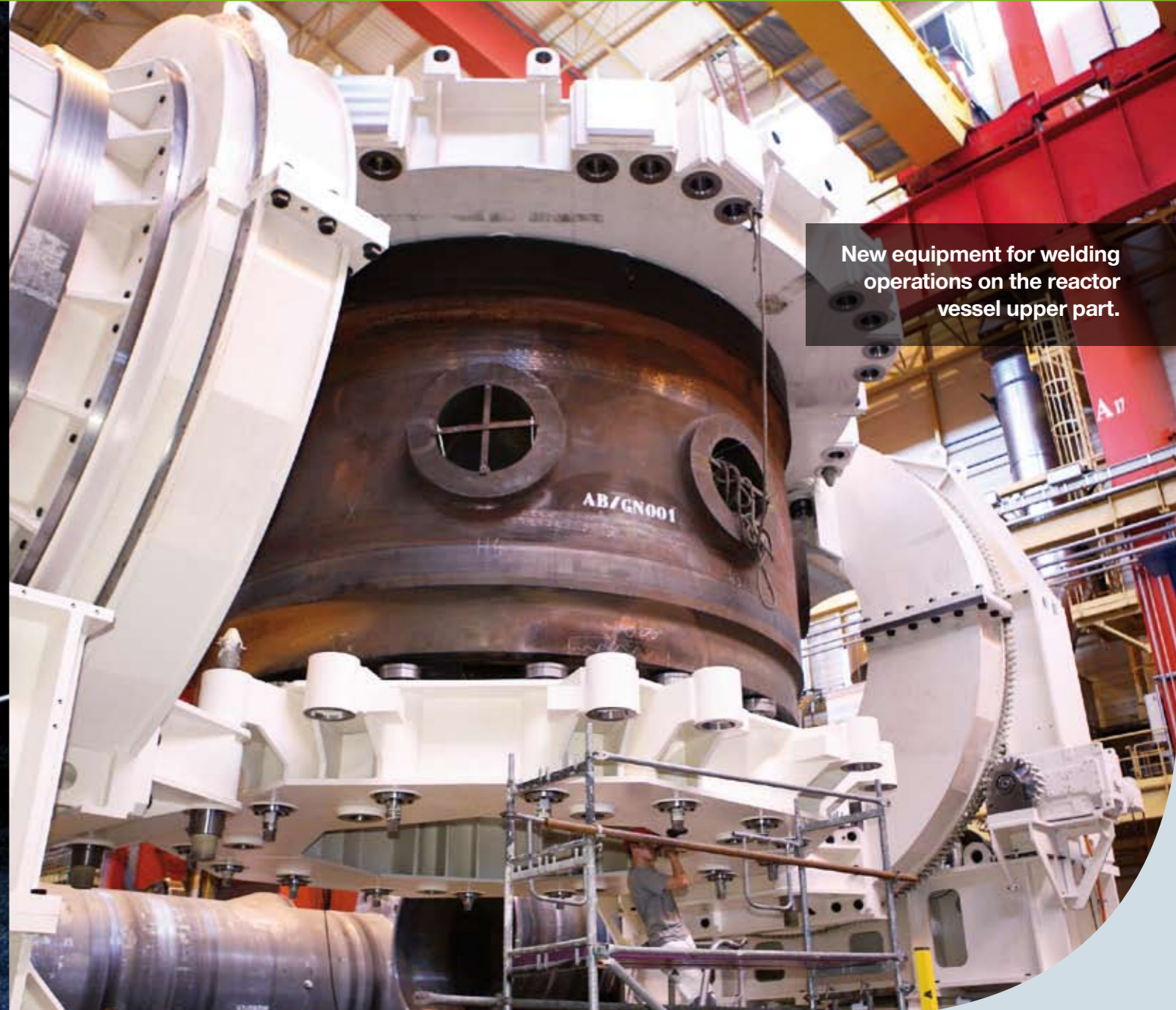
Cutaway views of the Pressurized Water Reactor components (Except EPR™)

» High level techniques, controlled skills...

The core business of the factory is metalworking and heavy mechanics. These activities are carried out by qualified personnel, in compliance with the applicable nuclear safety requirements.



Welder



New equipment for welding operations on the reactor vessel upper part.

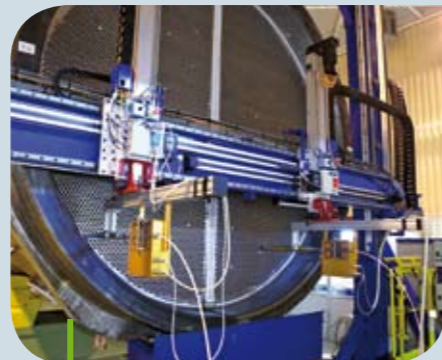
Welding and cladding

Fully automated large welding gantries and manipulators, stainless alloy cladding machines, etc.



Welder

Eddy current testing after hydraulic expansion



Hydraulic expansion

Placing a film for radio graphic testing



Machining of holes into a reactor vessel flange



Machining

High capacity vertical lathes and boring and milling machines.

Heat treatment of a steam generator channel head



Heat treatment

Furnaces of 600 t and 150 t are equipped with automatic controls to ensure high quality manufacturing.

... High precision techniques in constant evolution



Brushing robot



Tubes

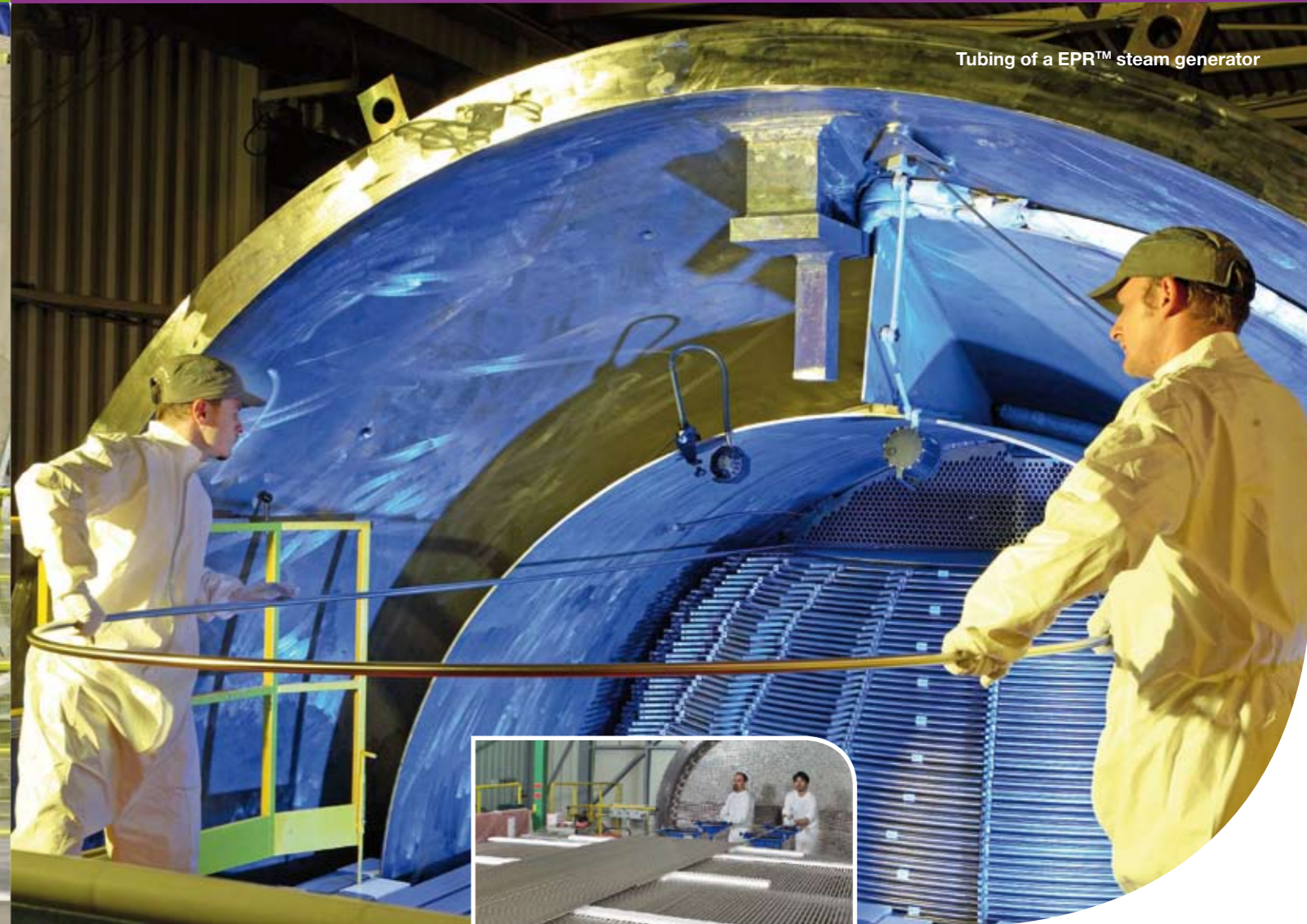


12-spindle drilling machine for tube support plates

The Chalon/Saint-Marcel factory is equipped with exceptional resources, specially adapted to manufacturing steam generators with over 15,000 tubes:

- deep drilling machines for tubesheets of up to 1000 mm thick,
- twelve-spindle drilling machines for drilling tube support plates,
- completely automated broaching machines for manufacturing the various tube support plate models,
- fully automated equipment for tube support plate finishing.

Clean and reliable techniques



Tubing of a EPR™ steam generator



Tubing of a EPR™ steam generator



Broaching machines for tube support plates

Controlled access cleanrooms

The tube installation process (tubing, welding, hydraulic expansion, etc) for steam generator manufacturing is performed in pressurized cleanrooms.

Inspection during and after manufacturing

Forming an essential link in the safety chain, all inspections are based on a complete range of inspection techniques: linear accelerator, gamma radiographic sources, ultrasonic testing, eddy current, etc.

» Men, women and skills

New welding center inaugurated in April 2008

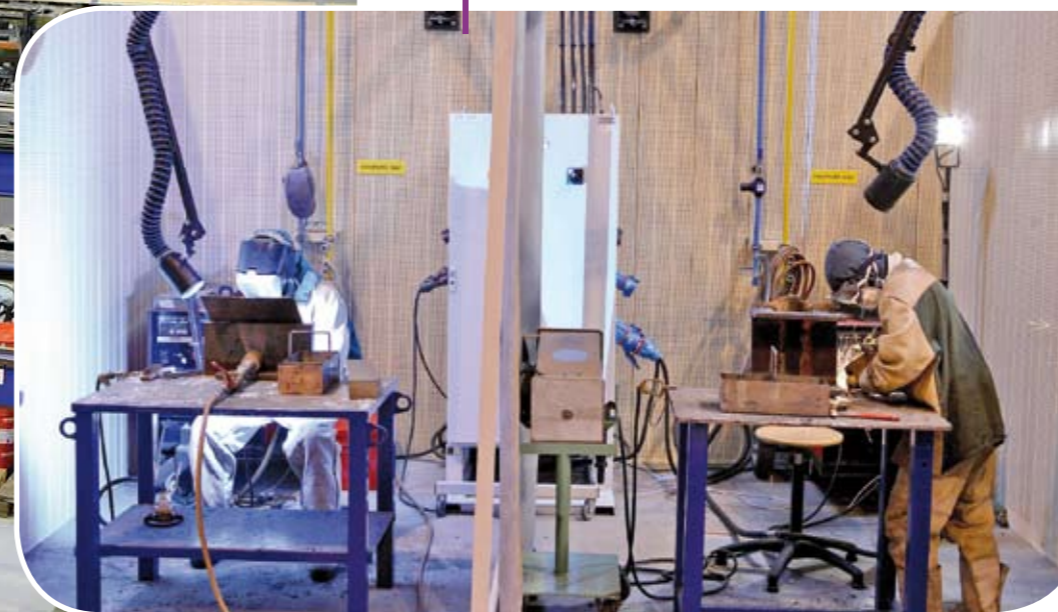


Safety

The main concerns of the factory are the health and safety of its own personnel and of those of outside companies.



Young trainees in the welding center



Training

Training underpins the company's strong development and accompanies the renewal of its skills base. We are involved in bringing young people into the workplace through an important training policy, including apprenticeships, short-term contracts for young people and university internships.

Visual management

The personnel are involved in the continuous improvement of manufacturing processes and work conditions.



Sustainable development

AREVA incorporates the sustainable development into its management practices through a continuous progress policy broken down into ten commitments

		RESPECT FOR THE ENVIRONMENT	
		ENVIRONMENTAL PROTECTION Limit our environmental impacts by reducing our consumption of natural resources, controlling our releases and optimizing our waste management.	
	FINANCIAL PERFORMANCE Ensure the group's sustainability through long-term profitable growth.	INNOVATION Develop and harness best-in-breed technologies to anticipate customer needs and increase our cost-competitiveness while complying with nuclear safety, occupational safety and environmental protection requirements.	
	CUSTOMER SATISFACTION Listen to our customers, anticipate their needs, support their growth, and increase and measure their satisfaction.	GOVERNANCE Manage our operations responsibly in accordance with the group's values, and assess and truthfully report on our performance to shareholders and all stakeholders.	CONTINUOUS IMPROVEMENT Implement a continuous improvement initiative based on practices shared throughout the group.
ECONOMIC DEVELOPMENT			RISK MANAGEMENT AND PREVENTION Establish and maintain the highest level of nuclear and occupational safety in all of the group's operations to preserve public and worker health, and to protect the environment.
		COMMUNITY INVOLVEMENT Participate in the economic and social development of the communities in which the group operates.	DIALOGUE AND CONSENSUS BUILDING Establish stakeholder relations based on trust.
			COMMITMENT TO EMPLOYEES Promote our employees' professional development and provide good working conditions.
			SOCIAL/SOCIETAL EXPECTATIONS

AREVA Way is the underlying theme that turns sustainable development into reality



To GO

To be aware of our commitments and define how they will be implemented



To ACT

To structure and break down our actions



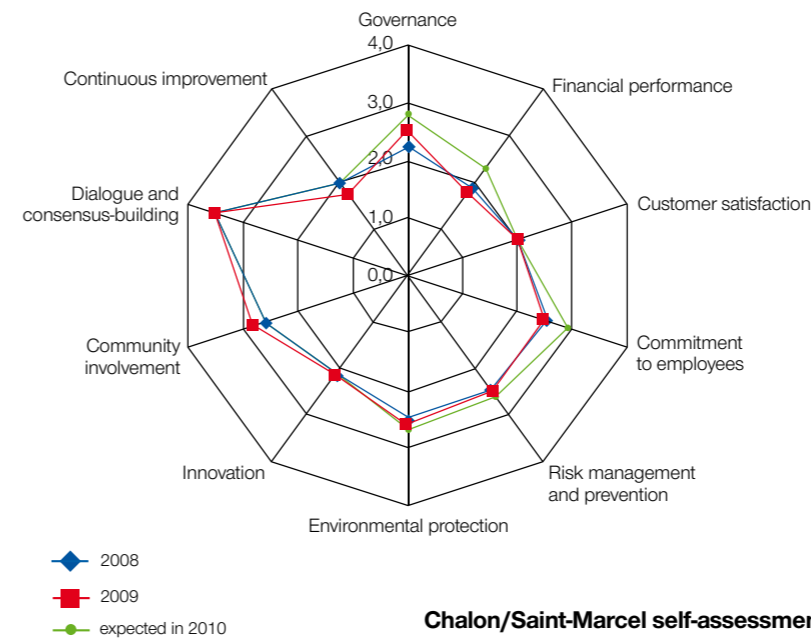
To BE

So that sustainable development is taken into account in our behaviour every day



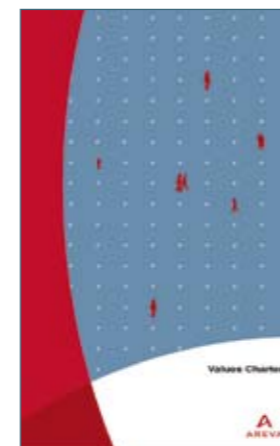
"to go" : our commitments

To ensure that we meet our objectives, the group has put together ten Sustainable Development commitments. These commitments are broken down into lines of progress which all group units and functional departments must use, taking the self-assessment as a starting point.



"to act" : continuous improvement

The group has selected continuous progress as a means of meeting its sustainable development objectives. The continuous improvement process is integrated into two major group management processes: the Strategic Action Plan (SAP) and the Budget. As a result, sustainable development actions are integrated into our regular activities.



"to be" : an attitude – the Values Charter

Our values:

- integrity
- excellence
- sincerity
- partnership
- profitability
- responsibility

We also need to:

- have a long-term vision which is essential for sustainability
- have an overall reasoning to be able to make fair decisions
- be able to listen and be open in order to understand what stakeholders expect
- base ourselves on facts rather than statements as this is the only way to be truly credible

» Certifications to satisfy the requirements of the safety authorities worldwide

The integrated Quality-Health-Safety-Environment system ensures that all products comply with applicable codes and standards:

- » **ASME** (American Society of Mechanical Engineers) section III, when the client specifies that American standards be applied requiring N and NPT certification.
- » **ISO 9001**
- » **ISO 14001 (Environment Management)**
- » **OHSAS 18001 (Safety Management)**

- » **RCC-M:** (design and construction rules for mechanical components of PWR nuclear islands) defined by the AFCEN (French association for the design and construction of nuclear power plant materials)
- » **French regulations on pressurized water reactors** monitored by the French nuclear safety authorities represented by the DEP (Pressure Equipment Department)
- » **NPT certification (for support structures)**

