



AUTOMATION AND CONTROL SOLUTIONS

Hydro
Wind
Geothermal
Solar
Ocean
Biomass
Nuclear
Coal
Gas
Oil

Air Quality Control Systems

Power Automation and Controls

Lifecycle Management

CO2 Solutions

POWER

We are shaping the future

ALSTOM

Welcome to **Alstom Power**

25 percent of the world's power production capacity depends on Alstom technology

52,000 employees around the world in 70 countries

100 years of industry leading expertise

Alstom is a global leader in power generation with a portfolio of products covering all fuel types. From fossil and biomass to nuclear and renewables, 25% of the world's power production capacity depends on Alstom technology or services.

Whether in design, manufacture, procurement or servicing, Alstom is setting the benchmark for innovative technologies that provide clean and efficient power solutions. Alstom can supply anything from single components to complete turnkey power plants. Our Plant Integrator™ approach and power automation and control solutions ensure the optimisation of all elements to derive the maximum lifetime value from all our customer's investments.

Alstom has more than 100 years of experience in the engineering, procurement and construction (EPC) of new power plants. Our engineers are also experts in retrofitting, modernising and servicing existing plants. With operations in 70 countries, Alstom is close to customers all over the world, ensuring rapid responses and service excellence at all times.

Provider of the cleanest
integrated power



The brain behind the power

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Efficient power plant operation, solutions for a higher level of power plant level excellence and best power fleet management, a comprehensive portfolio for operation and services – all focused on long-term value.	
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Our flagship platform ALSPA, its dedicated solutions for fuels and isolated phase busducts - an entire range built for your operations.	
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Over the last decades, Alstom has completed thousands of projects all over the world. Reference list and case studies.	

Access to reliable and affordable power is the key to an improved standard of living for everyone. However, it is essential that this power be produced without negative environmental side effects. Alstom’s Plant Integrator™ solutions maximise performance, while our extensive range of environmental products enable us to supply the cleanest power plants in the industry.

Alstom’s Clean Power Today™ strategy recognises the need to improve the environmental balance of legacy plants, while increasing the adoption of new clean energy solutions. Its three pillars are:

- 1. Focussing on production efficiency and energy management
- 2. Implementing carbon capture and storage
- 3. Balancing the energy portfolio by increasing the share of renewable technologies.

Smart power

Flexible generation for

CLEAN POWER TODAY!™

Alstom is setting the benchmark for innovative and environmentally-friendly power generation technologies. The objective is to build the cleanest integrated power solutions for customers. Alstom's commitment to address the climate change challenge is a long-standing one. We are ready to provide the solutions that will meet the world's increasing demand for power, with a range of technologies that ensure higher efficiency and lower emissions, today!

PLANT INTEGRATOR™

Building a power plant control system is an extremely complex undertaking, combining the needs for safety, reliability, availability and efficiency. Leveraging years of experience in power plants and other power generation technologies, Alstom has developed its Plant Integrator™ concept to provide integrated solutions that optimise customer investments, shorten delivery times, raise efficiency, safety and availability, and lower operating and maintenance costs.

LIFECYCLE MANAGEMENT

Alstom is committed to supporting its customers throughout the lifetime of their power plant projects, with the objective of maximising their return on investment. Benefiting from a large heritage, Alstom delivers effective solutions to maintain, upgrade, retrofit and repair its own installed base as well as components and systems from third-party suppliers.

highest efficiency

Alstom provides power generation utilities with integrated information, automation and control solutions that are fully embedded in the design and processes of power plants of all fuel types, be it thermal, nuclear, hydro, wind or solar, in order to guarantee flexible, efficient and safe power generation.

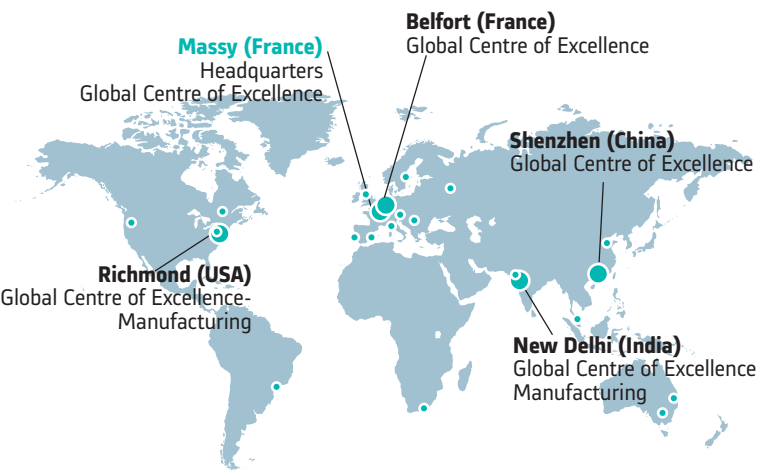
18 times more real-time information needs to be managed today than 20 years ago

35% reduction in CO₂ emissions can be obtained through efficient control and capture solutions

Financial performance In view of today's volatile electricity spot markets, cost-effective power generation has never been more important. Alstom's automation and control solutions provide operators with the tools necessary to achieve a cost-effective energy system at every level of the plant.

Critical asset safety Safety is key for the availability of a power plant and its main equipment. Safety requirements are based on international standards that automation and control solutions need to be compliant with. Alstom's automation and control solutions are adopted to applicable standards, such as IEC 61508, to achieve Safety Integrity Level up to SIL 3, depending on country regulations, type of plant and process, from small generating units to the most complex power plant.

Renewables integration Climate change and energy policies are pushing for energy efficiency and a higher proportion of renewables in the electricity generation. The integration of renewables into the electricity grid, however, challenges the grid management system and increases the pressure on operators to assess new tools to guarantee network stability. Alstom's solutions enable real-time scheduling of various generation units that help master these new challenges.



Specialist production sites embedded in the global Alstom network

We are where our customers are

The Alstom Power Automation and Controls business is led from Massy, France. Our Global Centres of Excellence are located in Massy (France – the lead centre), New Delhi (India), Richmond (USA) and Shenzhen (China). Further front offices and support centres are spread around the world. Using common platforms for product development across all facilities promotes effective international collaboration. With the additional support of local service centres in 70 countries, Alstom can deliver timely and efficient power solutions and services all over the world.



Alstom offers a complete portfolio of power generation equipment and services for all fuel types. By 2030 the world will have seen **a significant change in the power generation mix**, with an increased share of CO₂-free and renewable power. Alstom will continue to play a strong role in this booming market.



Automation and IT



Plant operations

Our solutions are adapted to each plant and ensure the safe operation of the power generating unit. Our extensive know-how ensures high electrical quality and improves the efficiency of operation. Thanks to Alstom's plant process and design knowledge, operators are sure to reap the maximum benefits from their power plants. Site security solutions secure the plant from physical and logical intrusion.

We procure the following hard- and software solutions for your project:

- **Distributed control systems**
- **Machine controllers**
- **Excitation systems**
- **Instrumentation**
- **Security**
- **Electrical**

Plant optimisation

In order to achieve best performance, highest availability and maximum reliability, Alstom provides solutions that help analyse the increasing amount of information provided by power plant operations and its environmental control solutions. Advanced simulation tools enable forecast planning to be ready whenever generation activities need to be adapted to demand from the grid, allowing for flexible generation.

We engineer reliable solutions for the optimisation of:

- **Product lifecycle management**
- **Advanced power stabiliser systems**
- **Maintenance and management**
- **Simulation**
- **Monitoring and diagnostics**

We help you to maximise power output and efficiency – from distributed control systems to asset management and from installation to maintenance.

PLANT INTEGRATOR™

solutions

For flexible power generation



Fleet management

When the performance of an entire fleet needs to be enhanced, Alstom provides power generation fleet managers with advanced decision-making solutions for fleet performance management, fleet scheduling, fleet asset management and power generation risk management and trading to help in finding the best use of customers' power generation assets.

We construct optimised solutions covering:

- **Scheduling**
- **Performance management**
- **Risks and trading**
- **Asset management**
- **Power Cloud**

Service and maintenance

Alstom offers a full range of products and services adapted to your needs for the installation, operation, and maintenance of your automation and controls solutions, ensuring maximum efficiency throughout the whole lifecycle of your power plant.

We offer comprehensive operation and maintenance services including:

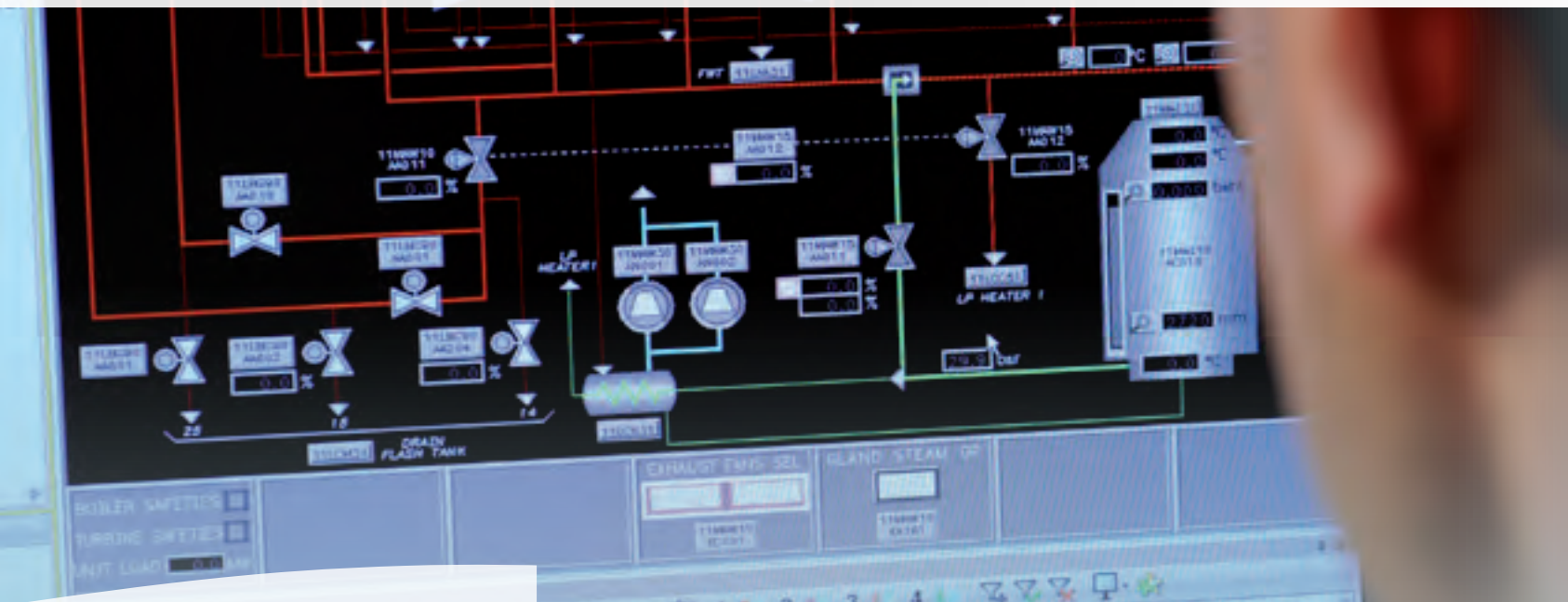
- **Engineering**
- **Manufacturing**
- **Integration and tests**
- **Training**
- **Retrofit**
- **Lifecycle extension**

Optimising the value chain

The Plant Integrator™ approach creates real value for our customers by optimising the entire value chain and the overall plant performance. This approach goes beyond the typical product compilation simply aimed at reducing costs. As an OEM, EPC and O&M provider, Alstom has a unique perspective that allows the analysis of the whole plant and the full lifecycle as an integrated system. Using proven models and established benchmarks, specific investment costs can be understood in their true context. Customers benefit from a greater range of options to determine the solutions that are best-suited to their needs. These help them achieve their business objectives and consequently, better serve their markets.

ALSPA –

Comprehensive tools for



One platform: ALSPA

Taking advantage of their in-depth knowledge of power plant processes, Alstom has developed a comprehensive control and instrumentation system. Alstom's flagship platform ALSPA extends across the entire plant, from the control room with plant management and optimisation tools, through plant and machine automation to asset management and remote diagnostic systems. The ALSPA Series 6 product line provides consistent technology from low-level controls to high-level asset management. It ensures data consistency and is an ideal platform for power operators requiring remote feature centralisation.

Instrumentation

All sensors collecting real-time data (pressure, temperature, flow, ...) from the power block and balance of plant (BoP) equipment, as well as actuators (motors, drives) are optimised for best asset operation.

Distributed control and monitoring systems

Distributed control systems (DCS) control the entire plant including balance of plant equipment and machine controllers and provide added services to operate and maintain the plant.

Excitation systems

Whatever your fuel type or generator, we have the expertise you need for efficient, reliable excitation solutions. Our comprehensive range of excitation and voltage control solutions include advanced power system stabilisers (APSS), automatic voltage regulators, or excitation for emergency diesel generators.

Machine controllers

Machine controllers collect information from all major equipment of any power plant, such as turbines, boilers and generators.

Power applications and information systems

We provide analysing software applications for plant optimisation, plant performance monitoring, plant and fleet production scheduling and asset management, as well as reporting services for operation, maintenance and environmental emissions.

- Performance plant monitoring to support decision making on plant operation and to help the transition towards predictive maintenance
- Plant data lifecycle and lifetime for managing all data generated by the operation of the plant to help optimise its maintenance
- Plant scheduling and economic dispatch
- Simulator

the integrated solution

a flexible generation



Dedicated solutions

ControPlant – Our comprehensive solution covering all fuels and integrating dedicated controllers for critical components. Thanks to its flexible concept, it fully integrates with the power plant's machine control products.

ControGas – Our gas turbine controller adapts to any type of gas power plant, be it single cycle or combined cycle.

ControSteam – From small industrial steam turbines to large nuclear steam turbines our dedicated steam turbine controller covers the whole range.

ControFlame – A dedicated controller for all types of boilers, ALSPA ControFlame includes BMS/BPS systems for highest reliability.

ControGen – ALSPA ControGen is the latest excitation system designed to manage all types of power generators from small units to large production machines requiring complex control.

ControBOP – Gain control of the electrical balance of plant thanks to our tailored solutions for all kinds of power generating or industrial plants.



ALSPA Care

ALSPA Care offers solutions for continuous monitoring and diagnostics of all equipment aiming at providing a clear picture of the condition of the machines.

Predictive maintenance

The continuous assessment of the equipment helps optimise maintenance decisions in order to generate power at best efficiency. This continuous assessment provides the necessary information to help turn forced outages into planned outages.

Commercial availability

There is only one goal that really counts: power needs to be available at the right time and in the right amount. Optimise maintenance outages by having the right information on your equipment at hand to be able to schedule operation and maintenance.

Risk mitigation support

Assessment and limitation of risks to reduce uncertainty: early detection of degradation in component performance, timely prediction of breakdown and risk assessment support, making sure you keep your plant up and running at all time.

An integrated Value-adding



Site security systems

In today's world, industrial facilities such as power plants and oil and gas sites are facing potential security challenges and threats. Alstom solutions protect and secure your assets in order to reduce the risks and ensure reliable operation.

Our access control solutions range from standard control functions to specific needs such as biometric systems. Video surveillance and perimeter protection complete the offering. All these modules need to be seamlessly integrated into a plant's workflow in order to guarantee the desired degree of protection.

Alstom provides an integrated and centrally managed system that ensures all components of the solution work together. To achieve maximum security we provide standardised solutions for small sites as well as tailor-made systems for the largest plants of all fuel types, be it a nuclear, gas, steam or a renewables power plants, an industrial site or transportation infrastructure.

Our solutions cover the entire scope of the project, from supervision and management of the security project to engineering services or system development; from technical support, documentation and training, to quality control and commissioning.

Isolated phase busducts

Alstom's Enerbus isolated busbars have been designed to feature any power plant requirements, whether for short circuit withstand or demanding seismic constraints.

By connecting the generator to the main transformer, Enerbus is the global solution for quality and performance:

- nominal current up to 52,000 A (world record)
- power plant capability up to 1600 MW
- short-circuit withstand current up to 1,200,000 A
- easy access to insulators for maintenance

Alstom Enerbus incorporates all critical components required to evacuate energy from generators, complete with connections, joints and insulating supports, each contained in earthed metal enclosures and used to connect to unit transformers. It also includes all the necessary steel supporting structures as well as optional predesigned circuit breaker and transformer components.

approach

services and support



ALSPA Trusted Services customer support

When you choose Alstom as your OEM, EPC or O&M provider, you are tapping into a huge reservoir of power generation know-how and experience. Our operating fleet provides a large amount of data that we use to establish benchmarks and best practices. This makes a real difference to the longterm efficiency and profitability of a plant.

The performance potential of a power plant control system is only partially determined at the manufacturing and construction stages. The best design and construction would be of little benefit if operation and maintenance were not fully optimised. That is why Alstom operates a global network of local service centres that offer a

full range of packages and services: O&M contracts, consulting & support, spare parts, and field services.

Our O&M goals are to maximise plant availability, improve energy efficiency and optimise component and system lifetimes through planned maintenance and suitable upgrades and retrofits. In accordance with our clean power strategy, commercial goals are never allowed to outweigh concerns about the environment and the health and safety of employees and local communities.

As service and maintenance do not depend on the origin of the components, all our solutions are offered for Alstom and non-Alstom equipment.

References

plants that stand the



Control and automation systems for highest reliability

Alstom is a key contributor or lead OEM for many of the world's largest power projects. The length of our reference list, the range or our product and service portfolio and the reach of our global organisation means there is no project too big or too small for us to handle. If you want a case study on or reference for a particular type, design or technology, do not hesitate to contact your local Alstom representative.

Sunrise USA

Retrofit upgrade of a 545 MW natural gas-fired power station

The collaboration of Alstom's cross-functional team ensured the project for the engineering, installation and commissioning of an ALSPA Series 6 machine control system at the Edison Mission/Chevron was executed within the aggressive timeline.

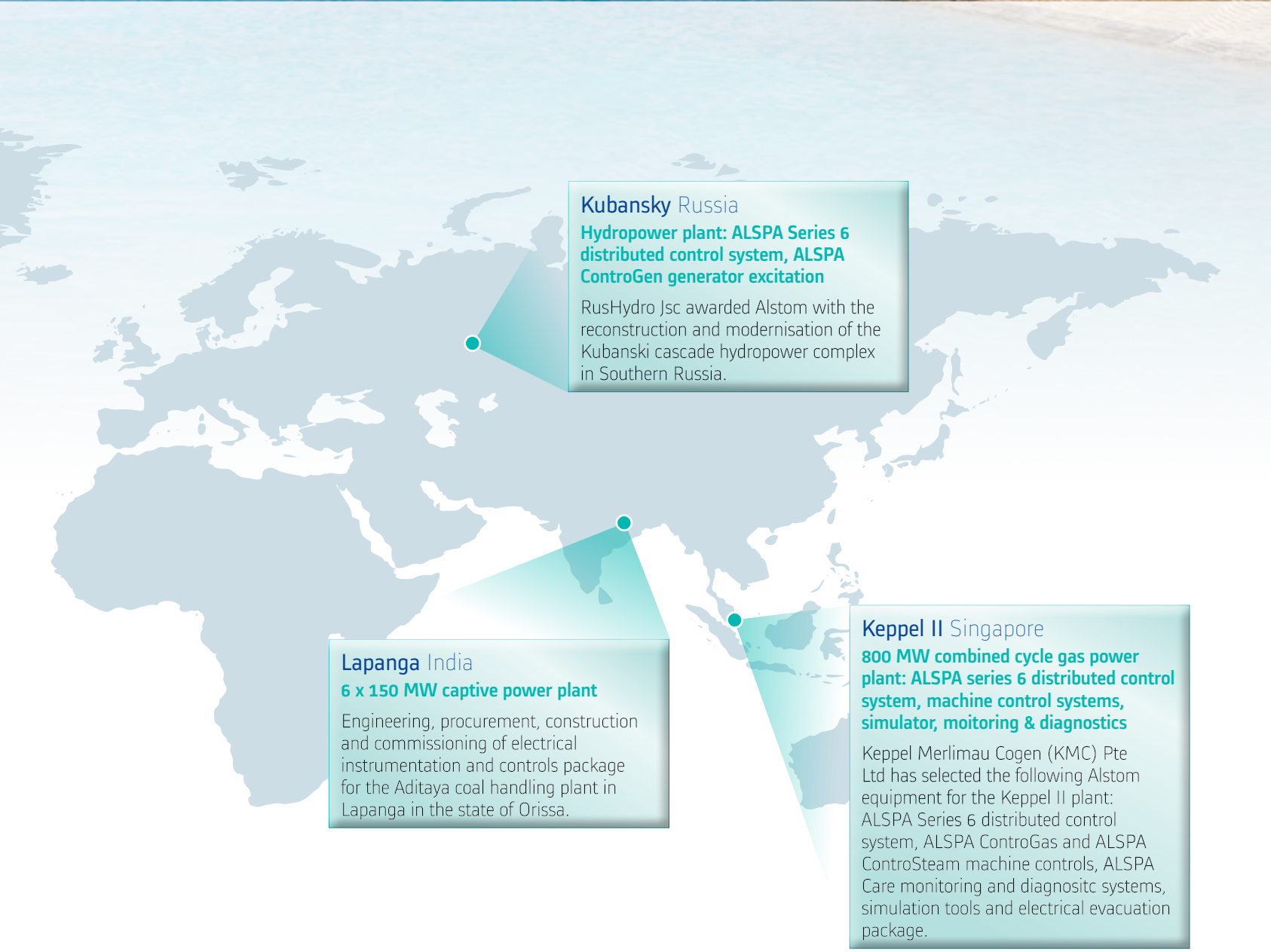
Los Humeros Mexico

Geothermal: 25 MW turnkey plant, ALSPA Series 6 DCS, ALSPA ControSteam turbine control, ALSPA ControGen generator excitation.

Managed by the Federal Electricity Commission (CFE), the Los Humeros II plant will have a capacity of 25 MW. The turnkey power plant will use steam located some 2 to 3 km beneath the earth. When completed in October 2011, the plant will supply electricity to the Puebla state.

* Status September 2011

test of time





The largest coal-based power plant ever, in Africa.

Medupi/Kusile

South Africa



The Medupi coal-fired power plant will be the biggest dry-cooled power station in the world. Medupi’s sister plant Kusile will provide 4790 MW. Each plant will represent approximately 12% of South Africa’s future generating capacity.

Facing the risk of critical power shortages in 2009-2012, South Africa is investing heavily in its energy infrastructure. Eskom is rising to the challenge of meeting South Africa’s growing power needs as the country continues to industrialise while simultaneously meeting the energy security challenges of the 21st century.

Alstom’s flexible yet highly reliable control system will help Eskom maximise its fleet’s efficiency and stabilise the system through the integration of all systems of the plant for optimised performance and real-time information exchange between power plants.

Customer	Eskom
Scope of supply	ALSPA Series 6 control system, including ControSteam turbine controller, ControGen generator excitation, ControBOP electrical balance of plant control, plant information system, advanced alarm system, smart instrumentation, ControFlame boiler protection
Commercial operation	2012



The world’s biggest
European Pressurised
Reactor (EPR) nuclear
power plant.

Flamanville

France



Alstom will provide the engineering, manufacturing and procurement, construction and commissioning of the steam turbine, turbogenerator, condensers, moisture separator reheaters (MSR s), feedwater heaters and deaerator, circulating water and condensate extraction pumps, and auxiliary equipment such as the vacuum system, turbine bypass, compressed air distribution, busbars, etc

EDF is the world’s major nuclear power generation company with 58 units in service, all of which use Alstom technology in the turbine island. This order, won against international competition, reflects EDF’s confidence in both Alstom’s technology and engineering know-how.

Alstom’s control solutions adapt seamlessly to every project size. The Flamanville machine controllers will help meet EDF’s efficiency targets while ensuring safe operation of the new generation nuclear power plant at all times.

Customer	Electricité de France (EDF)
Scope of supply	ALSPA Series 6 control system, including ControSteam turbine controller, plant information system, advanced alarm system, ControBOP electrical balance of plant control
Commercial operation	2012



The largest **supercritical coal-fired** power plant in Poland.



Belchatow

Poland

The Belchatow extension will be the largest generating unit ever built in Poland and also the most efficient lignite plant. Alstom is supplying the plant under a full turnkey EPC (engineering, procurement, construction and commissioning) contract. At around 41%, the new plant will have the highest efficiency level of any plant in Poland, and meet the highest European standards of performance in terms of reduced emissions of Sulphur Dioxide (SO₂) and Nitrous Oxides (NO_x).

This project is part of the Polish electric system’s programme of modernisation. BOT Elektrownia wanted to replace two old and polluting units with a modern plant, which would increase the efficiency of the electricity production in full compliance with the European environmental regulations.

Customer	BOT Elektrownia
Scope of supply.....	ALSPA Series 6 plant control system including: ControFlame FDG burner management system, ControGen generator control, asset management system for field instrumentation
Commercial operation	2010



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