STEAM POWER SOLUTIONS

Hydro
Wind
Geothermal
Solar
Tidal
Biomass
Nuclear
Coal
Gas
Oil
Air Quality Control Systems
Power Automation and Controls
Lifecycle Management
CO₂ Solutions

ALSTOM
Shaping the future
Welcome to Alstom Power

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, close to 25% of the world’s power production capacity depends on Alstom technology or services.

Whether in design, manufacture, procurement or servicing, we are setting the benchmark for innovative technologies that provide clean and efficient power solutions. We 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.

We have more than 100 years of experience in engineering, procurement and construction (EPC) of new power plants. But our engineers are also experts in retrofitting, modernising and servicing existing plants. We have operations in 70 countries around the world. So we are able to respond quickly and provide you with the highest quality service at all times.
Steam: an integral part of energy production – now and for years to come

Clean Power, Clear solutions ................................................................. page 04
How Alstom is helping you meet the challenges of energy sustainability

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What we offer our customers

A choice of product types .................................................................... page 08
A tailored approach – matching our offering to customer needs

Innovative technologies State-of-the-art components ......................... page 12
Highly efficient products that help to maximise energy production for all steam cycles

From maintenance to performance Dedicated expert support ............... page 22
Our service and retrofit offering throughout the lifetime of your plant

Standing the test of time Our references ............................................. page 24
A selection of major Alstom projects that help provide the world with energy
Our Power generation offering is based on a deep understanding of power markets and our customers’ needs. It is organised around three levers to maximise the return of assets over their entire lifecycle.

**REDUCING COST OF ELECTRICITY**

It takes competitive assets to keep electricity affordable. We enable power companies to compete successfully in the marketplace and provide affordable electricity to consumers. We help you reduce the cost of electricity through:

- Efficiency improvements
- CAPEX reduction/scaling up
- Capacity Factor increase (renewable)
- Lead time reduction
- Competitive O&M
- Competitive financing

**LOWERING ENVIRONMENTAL FOOTPRINT**

Clean generation is one way of demonstrating environmental responsibility. Another is lowering resource usage, visual impact and noise pollution. In both cases, we can help you meet or exceed regulations and environmental standards. That is why Alstom innovates in the following areas:

- Renewable portfolio
- Natural resource optimisation
- Pollutants control (SO\(_x\), NO\(_x\), PM, mercury)
- CO\(_2\) emission reduction & CCS
- Land use, visual impact and noise
- Water intensity reduction & recyclability

**INCREASING FLEXIBILITY & RELIABILITY**

Intermittent power generation is a growing challenge of energy security, as is maintaining an aging installed base and adapting it to changing market conditions. We help you tackle both issues so that you can enjoy dependable operations with:

- Maintainability and outage time reduction
- Operational and fuel flexibility
- Designs and service for improved availability and reliability
- Climate packages
- Energy storage
Clear Solutions meet the challenges of energy sustainability

ENERGY SUSTAINABILITY: A GLOBAL CHALLENGE

- 1 in 5 people globally lack electricity.
- A 20% rise of the global energy-related carbon dioxide emissions could happen by 2035.
- Only 20% of renewable energies in global electricity generation.
World leading experience

We have the expertise and resources to meet customer requirements anywhere in the world. We draw upon a history of outstanding product innovation to deliver reliable, technologically advanced products using the unique Plant Integrator™ approach to optimise the value chain and provide the best solutions for the plant owner. For all these reasons, we are a global OEM: a leading provider of equipment packages and turnkey thermal power plants.
advantage
our customers

Whether it’s coal, oil, biomass or gas, Alstom offers a wide range of state-of-the-art technologies for all steam applications. We employ the expertise of over 700 engineers and project and R&D specialists who have delivered major components for more than 835 GW of steam power plants worldwide.

World class product portfolio

Alstom delivers fully integrated and optimised power solutions that are designed and manufactured in-house. Our portfolio includes steam turbines, turbogenerators and boilers, as well as balance of plant components. Our comprehensive knowledge of all types of equipment and technologies allows us to service both original and third-party components. We offer air quality control equipment that complies with the strictest international standards, power automation control systems which optimise plant performance plus power/steam for district heating, waste-to-energy and desalination.

Worldwide manufacturing

Alstom manufactures components in engineering centres across Europe, North America and Asia and we have R&D facilities and resources in strategic locations around the globe. We maintain the same, consistent high level of quality, regardless of location.

Worldwide local service

Our international sales and service network delivers high quality, cost-effective equipment and related services to customers around the world. And with local service centres in 70 countries, our customers are assured that we can deliver effective solutions and services anytime, anywhere in the world. Using consistent processes in execution, engineering and manufacturing, we provide the highest level of product excellence in each of our locations. Our local expertise is what helps to strengthen our global presence.

Alstom excellence means cutting edge designed equipment engineered to the highest standards and proven international competitiveness.
Alstom offers the broadest component portfolio for all steam applications ranging from 5–1,200 MW. We are experienced leaders in manufacturing, delivering, installing and servicing boilers, steam turbines and turbogenerators, as well as balance of plant components. Our dedicated strategic sourcing organisation scans global markets for suppliers that are state-of-the-art in terms of their processes, their manufacturing facilities and their ability to deliver products to the highest standards. Alstom engineers reliable products covering:

- Steam turbines
- Boilers
- Turbogenerators
- Air quality control systems
- Automation and controls

We help you to maximise power output and profitability – from initial design to plant configuration and from construction to maintenance.

Alstom’s Integrated Power Package supplies customers with our world-class boilers, turbines and generators. All have been entirely designed and produced internally and developed to operate as one unit – allowing us to guarantee maximised performance and power output. The Integrated Power Package is very flexible and provides customers with optional add-ons like our innovative Air Quality Control Systems. All options include overall performance guarantees – ensuring the products chosen are fully optimised to their maximum efficiencies.

- Boiler core parts
- Steam turbine and generator sets
- Basic engineering & functional specifications for the power block
- AQCS (optional)
- Additional equipment (optional)
Optimising the value chain

The Plant Integrator™ approach creates real value for our customers by optimising the entire value chain and 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 to achieve their business objectives and consequently, better serve their markets.

Power Block

The Power Block is the heart of the power plant and includes the engineering, procurement and construction (EPC) of all the main equipment in the power generation. Our power block solutions benefit from over 100 years of experience in the power generation industry which allows us to deliver world leading equipment specifically designed for maximum efficiency and reliability.

Our power block offering comprises the following:

- Turbine island
- Boiler island
- A combination of the above including Balance of Plant
- Services: cooling water, compressed air, HVAC, fire fighting
- Electrical building & transformers

Full Turnkey

Alstom offers world-class project management and engineering, procurement and construction (EPC) capabilities, including power plant concept, design, manufacturing and construction. As a result, we have become the industry benchmark for proven availability, reliability, and overall plant efficiency. As an EPC provider, we have installed almost 580 GW in steam turbine generator sets and 835 GW of boilers worldwide. We provide turnkey solutions for the following types of plant:

- Pulverised coal (PC) steam power plants up to 1,200 MW
- Gas or oil-fired steam power plants
- Circulating fluidized bed (CFB) steam power plants up to 660 MW
- Biomass-fired steam power plants that can use: Wood and wood wastes, Paper and cardboard, Agricultural wastes and crops expressly produced for use as biofuels, Bio-derived fuels including municipal solid waste or refuse derived fuel, sewage sludge, animal waste

product types

– matching our offering to customer needs
We offer the **broader component portfolio for all steam applications** ranging from 5-1,200 MW and have long experience of manufacturing, installing and servicing boilers, steam turbines and turbogenerators, as well as balance of plant components.
Utility boilers

Alstom drives technology improvements to increase efficiency and reliability while reducing all emissions including NOx, SO2, particulates and greenhouse gases. Our product portfolio includes suspension-fired boilers for firing pulverised coal, oil and gas plus fluidised bed boilers for firing coal, waste coal and biomass.

Firing systems

We supply firing systems for utility boilers. For suspension firing, we offer the tangential firing system and for fluidised bed firing, the circulating fluidised bed (CFB). Both of these firing systems have been proven to offer the lowest emission levels with high combustion efficiency handling a wide range of fuels.

Pulverised coal (PC) boilers (up to 1,200 MW)

Pulverised coal-fired boilers comprise both tower and two pass configurations. The selection of boiler configuration is project-specific, with considerations given to the fuel moisture content, ash characteristics, site restrictions and customer preference. In a tower boiler, all heating surfaces are located above the furnace, resulting in a taller structure with a small footprint.

In a two pass boiler, the heating surface is located both above the furnace and adjacent to the furnace, resulting in a shorter structure with a larger footprint.

Circulating fluidised bed (CFB) boilers (up to 660 MW)

We have been continually developing our CFB technology since the 1980s and now lead the power industry in scaling-up utility-class CFB boilers up to 660 MW supercritical steam cycles. With unparalleled fuel flexibility, CFB boilers have the capability to burn a wide variety of low-grade opportunity fuels in an environmentally friendly manner, with intrinsically low emissions and within a reduced footprint.

Oil and gas-fired boilers (up to 1,000 MW)

We provide advanced oil and natural gas-fired boilers, featuring high reliability, efficiency and unsurpassed environmental performance. We have supplied 228 GW of subcritical and supercritical oil and gas-fired boilers, directly and through global licenses.

We design and supply utility-scale boilers that combust an extensive range of fossil fuels for steam power generation.
Boiler products

Power mills
For over 90 years, we have maintained our position as the leading supplier and innovator of mills for utility and industrial boilers. Consequently, we have extensive experience in grinding technology and have supplied systems for a wide range of fossil fuels like coal, petcoke and lignite.

Our products are designed to suit boilers up to 1,200 MW, complying with the highest environmental regulations. A major advantage of all Alstom products is their modular design which allows them to be customized and tailored to the specific needs of each customer, leading to significantly reduced costs and faster erection times.

Boiler range

<table>
<thead>
<tr>
<th>Type</th>
<th>Power Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC boiler</td>
<td>400 – 1,200 MW</td>
</tr>
<tr>
<td>Oil/gas-fired boiler</td>
<td>300 – 1,000 MW</td>
</tr>
<tr>
<td>CFB boiler</td>
<td>100 – 660 MW</td>
</tr>
</tbody>
</table>

HP Mill

SM Mill
Steam turbines

Large steam turbines

Steam turbine power plants
In fossil-fired steam plants, Alstom steam turbines drive efficiency improvements, because they can cope with the highest ultra-supercritical steam parameters that today’s materials can deliver:

- STF100 – from 700 to 1,200 MW
- STF60 – from 500 to 900 MW
- STF40 – from 250 to 700 MW
- STF25 – from 100 to 350 MW

Cogeneration
In cogeneration power plants, Alstom steam turbines enable highly flexible operation between power and heat demand and efficiently accommodate wide variations in process steam flows:

- COMAX – from 100 to 400 MW

Combined cycle power plants
In combined cycle power plants with advanced gas turbines, the flexible thermal design of Alstom steam turbine generator sets results in a highly efficient heat recovery cycle and excellent operational flexibility:

- STF30C – from 150 to 400 MW
- STF15C – from 100 to 250 MW

We are a global leader in steam turbine technology with over 100 years experience in manufacturing, delivering, installing and servicing steam turbine generator sets with outputs up to 1,200 MW for a wide range of applications.
For more than 100 years, Alstom has been a leading force in hydropower having installed more than 450 GW of turbines and generators – around 25% of the total global hydro power capacity. Leveraging our experience and global network, we offer unique solutions based on proven state-of-the-art technology and project-specific research and development (R&D).

Industrial steam turbines

We have delivered 1,000 industrial steam turbines of below 100 MW totalling 17 GW in installed capacity worldwide. Our industrial steam turbines are designed to reduce plant capital costs through their modularity, exhaust configurations and compact packaging concept. With highly efficient components and customisable to maximise overall plant efficiency and flexibility in operation, Alstom industrial steam turbines are built to suit a wide variety of applications.

GRT – from 5 to 65 MW

- Renewable applications (biomass, waste-to-energy, CSP)
- Cogeneration for industrial applications
- Utility and independent power production

With high reliability and proven technologies, the GRT steam turbine provides optimised solutions for efficient and flexible power and steam production. It features a highly flexible modular concept that comes in a plug-and-play package to reduce installation and commissioning time and costs.

MT – from 50 to 100+ MW

- Utility and independent power production
- Biomass
- Waste-to-energy
- Cogeneration for industrial applications

The advanced MT steam turbine comprises a highly flexible modular concept, proven technology and high efficiency. Thanks to the flexibility of its design, the MT is available in reheat and non-reheat configurations with axial and downward exhaust options allowing it to be integrated into any plant configuration.

Steam tail (add-on)

We also offer fully integrated steam tail, which encompasses a heat recovery steam generator, a steam turbine and a turbogenerator. This add-on is compatible with all conventional class or advanced class gas turbines from any OEM. As a result, our customers benefit from the highest possible power plant output and efficiency, a fully-aligned start-up and operation procedure and one overall performance guarantee for the complete package.
We provide a full range of leading technology turbogenerators

**GIGATOP 2-pole**
Our hydrogen and water-cooled GIGATOP 2-pole turbogenerator delivers the power you need. With output ranges of 400 MW to 1,400 MW at 50 Hz and 340 MW to 1,100 MW at 60 Hz, it is ready to support the largest steam turbine power plants. The GIGATOP 2-pole is powerful; it is also modular and flexible in design, so that each machine fits your MW needs precisely – and at optimum efficiency.

**TOPGAS**
The TOPGAS hydrogen-cooled turbogenerator leads the field in reliability and efficiency, thanks to the proven design elements and the consistent application of operations experience. TOPGAS covers an output range from 300–710 MW in 50 Hz markets and 250–450 MW in 60 Hz markets.

**TOPAIR**
As the world leader in air-cooled technology, Alstom has set the trend with TOPAIR by designing a simple and robust air-cooled turbogenerator. With a range of 150–400 MW (50 Hz) or 90–311 MW (60 Hz), the TOPAIR can be used where a hydrogen-cooled turbogenerator was used previously.

**TOPACK**
The TOPACK air-cooled turbogenerator is an all-in-one easy to maintain solution that can be simply integrated into your power plant. And with over 2,000 units already installed worldwide, TOPACK is also proven in the field. It has a range of 40–165 MW at 50 Hz and 40–110 MW at 60 Hz, so has the versatility to suit all kinds of applications and climates and to fill any turbine.

**Turbogenerator range for steam applications**

- **GIGATOP 2-pole**
  - H/H2 cooled
  - 340–1400 MW
- **TOPGAS**
  - H cooled
  - 250–710 MW
- **TOPAIR**
  - Air cooled
  - 90–400 MW
- **TOPACK**
  - Air cooled
  - 40–110 MW

MW given for power factor 1
We are a global supplier of heat exchange equipment and services

**Condensers**
As an essential element of any power plant, the surface condenser, which acts as an interface between the water steam cycle and the environment, is a heat exchanger fed with steam from the low-pressure exhaust of the turbine and cooled by water available near the site. In the field of condensers, we cover the whole supply, from design to commissioning. Options include either church window design for optimal performance or daisy design for compactness and space optimisation.

**Feedwater heaters**
Feedwater heaters are used in a regenerative water-steam cycle to improve thermodynamic efficiency, resulting in a reduction of fuel consumption and thermal pollution. The boiler feedwater is heated up by steam extracted from suitable turbine ranges. We have exceeded electrical outputs of over 1,500 MW.

**Low pressure feedwater heaters**
The feedwater heaters placed between the main condensate pumps and the boiler feedwater pumps are called low pressure (LP) feedwater heaters. These are U-tube bundle heat exchangers, which are mounted in a tube sheet and surrounded by a steam shell.

**High pressure feedwater heaters**
The feedwater heaters placed between the boiler feedwater pump and the boiler are called high pressure (HP) feedwater heaters. Alstom can supply either tube-sheet or header type HP heaters, depending on the application and the customer’s preference.

**District heaters**
In locations with residential and/or industrial heating needs, using district heaters renders the maximum degree of fuel utilisation. Since 1955, we have supplied more than 50 district heaters and built over 500 heat exchangers.

**Deaerator storage tanks**
For efficient operation, thermal power plant boilers need feedwater that has been reheated and contains very small quantities of oxygen. Benefits include deaeration over the entire load range, as well as very low heat losses through venting.

**Water / water coolers**
The intermediate cooling water system is filled with clean, fully desalinated and inhibited water, which helps customers avoid power plant fouling and corrosion. At the same time, our unique tube and shell design allows for a large optimisation range.
Our tailor-made pumps are known worldwide for their reliability, efficiency and cost-effectiveness

**Vertical turbine pumps (VTP)**
Our vertical turbine pumps are highly efficient at condenser cooling, petrochemical plant cooling, addition of urban and industrial water, liquefied natural gas seawater desalination plants, harbour and river installations as well as drainage. Our SATURNE range of VTPs includes over 80 different models covering a wide range of suction heads and outputs. In addition, our tailor-made pull-out design for specific projects adds value while improving efficiency.

**Concrete volute pumps (CVP)**
Our concrete volute pumps offer exceptional efficiency — often in excess of 90% — maintained over the machine’s life. They are particularly suitable for sites where large volumes of fresh water or seawater can be pumped. We have references in nuclear and fossil power projects, drainage and irrigation, as well as marine works for ports and harbours.

**Condensate extraction pumps**
Our condensate extraction pumps are specifically designed for the severe operating conditions of conventional and nuclear power plants. These pumps incorporate cutting edge technology which is tailored to your plant’s individual needs and specially designed to provide maximum efficiency, performance and cost effectiveness throughout the lifetime of the equipment. Our pumps are specially designed and manufactured to optimise the steam and water loop on the turbine island using the very latest Alstom turbine generator technology.

**Vacuum pumps**
Our vacuum pumps are recognised for their outstanding reliability and performance. They are offered in three key technologies:

- Liquid ring vacuum pumps and compressors, which can be either with central or lateral distribution
- Water blade vacuum pumps that can be associated to other specific devices

In addition to power plants, the vacuum pumps are also used in the industrial field, particularly at sugar and paper mills, and also in the chemical, oil and gas and mining industries.
We are the global leader in air quality control systems, with a full portfolio of emissions control technologies

**NO\textsubscript{x} reduction**
Our selective catalytic reduction (SCR) systems utilise specialised catalysts together with newly designed ammonia injection and mixing systems to chemically reduce the NO\textsubscript{x}, achieving removal efficiency of 95% or more. Our systems can be precisely adapted to site conditions to achieve superior flow dynamics and constructability.

**Addressing SO\textsubscript{x}**
Our wide portfolio of flue gas desulphurisation (FGD) products covers all types of fuels with wet lime/limestone, seawater and dry lime processes.

<table>
<thead>
<tr>
<th><strong>WET</strong></th>
<th><strong>FLOWPAC™ ABSORBER</strong></th>
<th><strong>SEAWATER</strong></th>
<th><strong>DRY</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPEN SPRAY TOWER</strong></td>
<td></td>
<td>SEAWATER FGD</td>
<td><strong>NID™ ABSORBER</strong></td>
</tr>
<tr>
<td>• SO\textsubscript{2} removal efficiency: &gt;99%</td>
<td>• SO\textsubscript{2} removal efficiency: approaching 100%</td>
<td>• SO\textsubscript{2} removal efficiency &gt; 98%</td>
<td>• SO\textsubscript{2} removal efficiency &gt; 98%</td>
</tr>
<tr>
<td>• Unit size: Up to 1,300 MW</td>
<td>• Unit size: Up to 360 MW</td>
<td>• Lowest power consumption</td>
<td>• Small footprint with modular design &amp; multi-pollutant control</td>
</tr>
</tbody>
</table>

**Particulate matter**
We have over 80 years experience in particulate matter removal systems and lead the industry in designing and manufacturing innovative products with unique performance features.

**Dry electrostatic precipitators (ESP)**
- Removal efficiency: >99.95%. Emissions: < 10 mg/Nm\textsuperscript{3}
- Extensive experience with low sulphur, high resistivity ash coals

**Wet electrostatic precipitators (ESP)**
- Meet the most stringent standards for emissions control
- Effective gaseous acid pollutants control

**Fabric filters (FF)**
- Removal efficiency: > 99.97%. Emissions: < 5 mg/Nm\textsuperscript{3}
- Mega FF: Compact and flexible design with up to 12m bags

**Mercury control**
Mercury emissions are a growing area of concern for the power industry. Alstom has effective process solutions for retrofits or new plants, achieving over 90% removal efficiency.

- **Mer-Cure™** – Our propriety sorbent, designed for high removal efficiencies across a wider temperature range.
- **Filsorption™** – Our powdered activated carbon process.
Fossil fuels will in the future still account for approximately 60% of the installed base. The development and implementation of carbon capture and storage technologies (CCS) continues to be an essential component of power generation. In global partnership with Schlumberger, our strategy is to deliver to utilities companies a comprehensive carbon capture solution which includes integrated CO₂ capture, transportation and storage systems, all designed to conform to your plant’s operating requirements. We offer a ‘CCS Ready’ plant concept, which has the advantage of limiting plant outage time and unnecessary expense as well as easing the integration at the time of installation of the CO₂ capture plant.

We are currently developing the two most promising types of CO₂ capture technologies: **Oxy-combustion and post-combustion capture**. We believe that these technologies will be the most economically viable and sustainable solutions for our customers and, importantly, can also be retrofitted to the installed base – a critical factor in meeting future emissions targets. **Oxy-combustion** burns the fuel in a mixture of oxygen and re-circulated flue gas. The absence of nitrogen means the resulting flue gas is enriched in CO₂ which is then concentrated and purified further following the oxy-combustion process. **Post-combustion technologies**, for example the Advanced Amine Process or the Chilled Ammonia Process, are the most advanced carbon capture solutions available today and can be applied to both coal-fired and combined cycle, gas-fired power plants. They involve the separation of the CO₂ from exhaust gases using a solvent (either amine or chilled ammonia).

**These methods have the potential to remove more than 90% of the CO₂ produced by fossil plants.** The recovered CO₂ is then compressed and pumped into selected deep geological formations such as porous sandstone or limestone saline aquifers. A cap of impermeable rock ensures that the CO₂ remains underground. Working closely with our partners, we are now in the process of validating these technologies at a number of pilot and demonstration projects in different parts of the world with the aim of being ready for full-scale commercialisation by 2015.
Solutions for optimised power generation

ALSPA®, is our flagship power automation and controls platform. It encompasses all the necessary software applications, IT control layers, equipment and services that power providers and service operators require to run their plant or fleet efficiently. Our knowledge of the steam process and plant design enables us to integrate all the key processes (from control, security, asset condition monitoring to fleet management) into one system – guaranteeing a high level of availability.

The platform’s unique interface is based on Microsoft Net technology and its flexible, modular, open real-time architecture (based on Ethernet Power Link) makes it a truly open system which means it not only fully supports Alstom hardware and software products but can also seamlessly integrate with existing power plant equipment.

The ALSPA® product line is a comprehensive one that extends across the entire function of the plant. It includes machine control solutions like steam turbine governing and generator excitation, as well as instrumentation and electrical balance of plant equipment designed to help operators get the best performance from their plant. It can be used with small to large complex systems in power plant or industrial applications to control, optimise and protect all types of steam power plant and their turbines.

Because ALSPA® is designed to efficiently help optimise overall plant cycle performance, it is an ideal solution for power producers looking to increase plant flexibility in response to changing load demand.

We offer a large range of automation, control and protection solutions that helps energy producers exposed to the challenges of a new and demanding energy environment optimise their power generation assets.
Full and dedicated support for the whole power plant

Our wide range of experience enables us to ensure that steam power generators stay competitive with changing market requirements over the lifetime of their assets. We support customers with tailored solutions that ensure maximum efficiency, emissions reduction and flexibility.

We provide comprehensive services for boilers, steam turbines, generators, air quality control systems, balance of plant and instrumentation & controls at all stages of the plant lifecycle:

- Parts
- Repairs
- Field service
- Advice and operational support
- Performance improvements
- Service contracts
- Services on other original equipment manufacturers

Expertise in components and systems interaction: the Plant Integrator™ solution

Our in-depth plant knowledge and expertise in product and component integration enables us to offer comprehensive solutions. From operational and fuel flexibility to total plant optimisation with life extension and performance requirements, we will help you to meet your business and plant operation needs.

Experience on other OEM’s equipment

Through a series of acquisitions and mergers over the last century, we have developed a broad technical product portfolio and project expertise. We have extensive experience in interfacing and integrating Alstom and other suppliers’ equipment and are able to service, upgrade or retrofit the widest range of third party components and systems – regardless of the original technology and unit configuration.
Performance improvements:
retrofit expertise for the full plant

**Boilers**
With more than 1,400 retrofits performed worldwide on boiler islands (more than 40% being third party equipment), we are the leading global supplier of performance optimisation solutions. We also have more than 35,000 MW of fuel switching experience.

**Steam turbines**
We have the capabilities to perform steam turbine retrofits on both reaction turbine blading (RTB) and impulse turbine blading (ITB) technologies, irrespective of the original blading technology.

**Generators**
We have accumulated and developed a broad technical product portfolio, enabling our customers to benefit from upgrades and rewind solutions either on Alstom or third-party fleet.

**Air quality control systems**
We offer a complete range of solutions, including electrostatic precipitators, fabric filters, flue gas desulphurisation and selective catalytic reduction for most components associated with the flue gas line.

**Integrated retrofits**
By combining our component retrofit solutions, O&M experience and plant integration expertise, we can offer one-stop solutions. These are optimised for cost, performance and efficiency, depending on your requirements and come with global performance guarantees.

Our worldwide presence ensures we have strong technology and engineering capabilities and you have immediate local access to Alstom experts.
We have provided equipment or turnkey solutions for many of the world’s largest steam projects. The length of our reference list, the range of our product and service portfolio and the reach of our global organisation means that we have the capability to lead projects of any size and application.
Project highlights

CHINA – Pingwei 3
2 x 1,000 MW steam turbines installed

ESTONIA – Narva
1 x 300 MW oil-shale-fired CFB steam power plant

GERMANY – Karlsruhe RDK8
1 x 912 MW turnkey ultra-supercritical pulverised coal steam power plant

GERMANY – Lippendorf
2 x 934 MW steam turbines installed

GERMANY – Neurath
2 x 1,100 MW ultra-supercritical PC steam power plant, erection and commissioning of two steam turbine islands including condensers and delivery of two lignite-fired boilers

INDIA – Barh II
1 x 660 MW supercritical two pass boiler

MALAYSIA – Manjung 4
1 x 1,000 MW turnkey ultra-supercritical PC steam power plant including two pass boilers, SWFGD and fabric filters

NETHERLANDS – Maasvlakte
1 x 1,100 MW steam turbine generator set, boiler feedwater pump turbine and condensers

POLAND – Belchatow
1 x 858 MW supercritical PC steam power plant with a STF 100 steam turbine, once-through tower boiler, GIGATOP 2-pole turbogenerator, cooling tower, ALSPA® automation and control systems

POLAND – Opole 5 & 6
2 x 900 MW ultra-supercritical, coal-fired power plant. Includes PC tower boiler, STF100, GIGATOP 2-pole turbogenerator, FGD & ESP.

PORTUGAL – EDP Sines
Selective Catalyst Reduction (SCR) system installed at the coal-fired power plant

SAUDI ARABIA – Shoaiba III
3 x 400 MW full EPC turnkey plant including a boiler, steam turbine generator sets, distributed control system, complete water steam cycle, I&C, electrical equipment, balance of plant, desalination and FGD option

SOUTH AFRICA – Kusile
6 x 800 MW supercritical full turbine island, including air-cooled condensers

USA – AEP Mountaineer
58 MW chilled ammonia post-combustion system installed

USA – Comanche 3
1 x 750 MW supercritical two pass boiler

USA – Duke Cliffside 6
Spray dryer absorber, fabric filter and wet flue gas desulphurisation

USA – Spurlock
Alstom supplied a 305 MW sub-critical CFB boiler and a comprehensive range of AQCS components including Fabric Filter (FF), NID, Selective Catalyst Reduction (SCR), Wet Flue Gas Desulphurisation (WFGD), Wet Electrostatic Precipitator (WESP) and Electrostatic Precipitator (ESP).
All new plants offered by Alstom today provide significant improvements on yesterday’s technology. We are now working on cutting edge innovations that aim to achieve the goal of 50%+ plant efficiency for steam plants — meeting customer demand for greater economic and environmental efficiencies well into the future.
Alstom

Alstom is a global leader in the world of power generation, power transmission and rail infrastructure and sets the benchmark for innovative and environmentally friendly technologies.

Alstom builds the fastest train and the highest capacity automated metro in the world, provides turnkey integrated power plant solutions and associated services for a wide variety of energy sources, including hydro, nuclear, gas, coal, wind, solar thermal, geothermal and ocean energies. Alstom offers a wide range of solutions for power transmission, with a focus on smart grids.

Power generation

Alstom Power offers solutions which allow their customers to generate reliable, competitive and eco-friendly power.

Alstom has the industry’s most comprehensive portfolio of thermal technologies – coal, gas, oil and nuclear – and holds leading positions in turnkey power plants, power generation services and air quality control systems. It is also a pioneer in carbon capture technologies.

Alstom offers the most comprehensive range of renewable power generation solutions today: hydro power, wind power, geothermal, biomass and solar. With ocean energies, we are developing solutions for tomorrow. Alstom is one of the world leaders in hydro power, the largest source of renewable energy on the planet.