SERVICES FOR
THERMAL
POWER PLANTS
Services for thermal power plants

At Alstom we are committed to being a reliable and flexible partner for power plant owners and operators. Our industry faces a rapidly evolving regulatory and market environment, so a long-term global perspective supported by a strong local presence is essential.

With over 100 years of experience building and maintaining power plants, Alstom has the presence, technology and solutions to meet your power generation challenges as an efficient partner.

The Alstom lifecycle management approach redefines the concept of after sales support: we team up with our customers to improve the return on their assets while minimising the lifetime environmental footprint of each process and the whole plant.

As we work to create affordable, sustainable and secure energy solutions for society and our customers, we are expanding the scope of our service portfolio to embrace new technologies and equipment made by other manufacturers.

Welcome to Alstom Thermal Services – your partner for lifecycle management.
Alstom’s technologies and solutions help power plant owners and operators adapt to the challenges of dynamic markets, changing energy sources, different fuel qualities and evolving technologies. In a changing competitive and regulatory environment, we offer forward-looking solutions to reduce maintenance costs while boosting flexibility and performance. We align our goals with those of our customers and always ensure the safe availability and environmental compatibility of their equipment.
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 (SOx, NOx, PM, mercury)
- CO₂ 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
- Lifetime extension and power uplift
- Designs and service for improved availability and reliability
- Climate packages
- Energy storage
ENERGY SUSTAINABILITY: A GLOBAL CHALLENGE

1 in 5 people globally lacks electricity.

A 5% increase in coal plant efficiency would decrease global CO₂ emissions by 8%.

Only 20% of renewable energies in global electricity generation.
Alstom thermal services

Capability pillars

**Presence**
Alstom Thermal Services is present at more than 200 locations in 60 countries. Having local offices and execution centres allows us to quickly respond to the needs of customers. And it helps us to take into account local conditions, regulations and technology norms.

**Technology**
We respond to customer and market needs by leveraging our technological leadership. Based on our fleet management, plant systems, factory and R&D capabilities, we are able to offer a unique portfolio of products and services for the lifecycle management of Alstom and other OEM equipment.

**Solutions**
Alstom offers forward-looking solutions to improve efficiency and flexibility while enhancing reliability and increasing performance. We also develop asset management strategies to optimise your whole plant. Our mission is to be a reliable longterm partner throughout the entire plant lifecycle.
Alstom Thermal Services is the division of Alstom Power responsible for thermal power plant lifecycle management. Building on more than 100 years of manufacturing experience and with Alstom equipment installed in around 25% of the world’s power plants, Thermal Services integrates proprietary technologies with feedback from operational experience to deliver superior solutions.
PRESENCE
Alstom’s global reach and local presence allows us to understand the precise needs of our all customers and respond more effectively.
Global and local reach

Top technology
local reach
adapted to the needs of different regions

Thermal Services Locations

Alstom’s global organisation and local reach allows us to cultivate world-class technology while adapting to the needs of customers in different regions.

5 Reconditioning Workshops
17 Fixed and Mobile Workshops
200 Offices
Service factory network

15,000 staff including
• 4,000 field service experts
• 1,400 engineers
• 300 R&D engineers
SOLUTIONS
Alstom solutions combine cutting-edge proven technology with services that efficiently address your business challenges.
Based on our global fleet experience and comprehensive knowledge of equipment and component integration, we advise customers on choosing the right solutions and provide expert operational support to help you maximise your lifetime return on assets.

Besides selection and operational support, Alstom offers performance and lifetime assessments. Our technical expertise and support is always concrete and practical: we have techniques for outage compression, Emergency Response Planning (ERP), as well as, monitoring and diagnostics methods.

With Alstom, you can outsource risks and management challenges through our service contracts covering specific components, systems or even whole plants.

Our portfolio of easily customised contracts ensures win-win agreements that are perfectly aligned with your needs, capabilities and skills strategy.

- Long Term Service Agreements (LTSA) for scheduled maintenance of turbines, boilers, generators and air quality control equipment.
- Operation & Maintenance contracts (O&M) for planned and unplanned maintenance with performance guarantees.

Both LTSA and O&M agreements can be extended with a Plant Service Center™ (PSC) option for the highest level of round the clock analysis and support.
Our portfolio of products and services addresses all your needs:

- Reliability and availability
- Health and safety
- Operations and maintenance costs
- Outage time
- Emissions reductions
- Efficiency
- Output/MW
- Flexibility

Performance improvements are necessary to save fuel and stay competitive, especially as the electrical burden of clean air measures increases. Alstom Thermal Services offers modernisation, upgrades and retrofits that enhance the performance of individual components or whole systems.

Performance improvement

Plant assessments

Our Plant Assessment packages are designed to identify cost-effective measures to improve the performance of the parts or systems in question. Packages are tailored to fit the plant’s operating conditions, configuration, history and the customer’s improvement objectives.

A total plant assessment enables owners to align plant improvements with their business strategies and to identify and achieve synergies that would be missed by using traditional component-based assessments.

Our portfolio of products and services addresses all your needs:
In tight economies, plant owners need inventive, reliable and proven reconditioning solutions to optimise and enhance their return on assets without compromising reliability.

Extending the operating life of hot gas path components and boosting performance is Alstom’s speciality. Our quality-certified reconditioning service covers the full range of noble parts. And with our part lifetime management solutions, reconditioning is a viable and secure alternative to replacement.

- Advanced assessment and diagnostics
- Sophisticated stripping, cleaning and brazing processes
- Manual and automated welding, machining and grinding
- Laser metal forming and re-opening
- Advanced surface and coating technologies
By combining global expertise and local resources, Alstom can respond with unmatched confidence and speed, to reduce outage times.

Our field service network comprises around 5,000 employees with the all skills and experience necessary to keep your plant operations in line with your strategy. This market presence, allows us to deliver consistent results taking into account the relevant local regulations and constraints.

- Installation, construction and commissioning
- Inspections and performance tests
- Operations
- Maintenance

FULL PLANT SCOPE SOLUTIONS FOR EVERY NEED

The power of collaboration
We work together with the customer to simplify planning, reduce risks and environmental impact and optimise every stage of the process and plant lifecycle.

The power of integration
Alstom offers a whole plant perspective developed over decades of building and servicing gas, steam, nuclear and industrial plants. Switching effortlessly between the component/system view and the whole plant perspective, our engineers are able to identify the opportunities for efficiencies and synergies that are only possible with an integrated approach.

For example, we optimise the relationships and interactions between the boiler and air quality control systems to reduce cost of electricity and optimise performance at low load or peak load. We also have solutions that combine renewable energy with conventional plant systems.

Field service

of products & services and range
Expertise on Experience through 100 years of acquisition expertise on non-alstom equipment
Experience through 100 years of acquisition

Concentrated know how
Alstom’s universal portfolio for power plant owners is the result of one hundred years expanding our brand by integrating established manufacturers and acquiring on-going technological expertise. Today, we can offer our customers various solutions for optimising the plant performance – from turbine to generator, and from the boiler to the AQCS units. Our other OEM services are supervised by our specialist competence centres and delivered through our global field service network.

Inclusive scope
Mastering both Alstom and other OEM equipment, we are able to optimise performance, reliability and availability throughout the lifecycle of any type of power plant with major components made by almost any major manufacturer: For boiler and AQCS we cover all makes of equipment while for gas and steam turbines, and generators we cover many other OEM.

Besides routine operations and maintenance work, we also offer other OEM repairs, reconditioning and parts for considerable performance and /or lifetime extension benefits.

Our other OEM track record
Gas turbines
- Our wholly-owned subsidiary, PSM Power Systems Manufacturing, based in the USA, provides technologically-advanced aftermarket gas turbine components, parts reconditioning services and Long Term Agreements (LTAs) to power generation customers all over the world.

Steam turbines
- Only Alstom offers both reaction and impulse technology.
- Since 1993, Alstom has retrofitted over 390 steam turbines made by other manufacturers.
- We have also completed over 170 outages on other OEM steam turbines.

Generator
- 33 other OEM units have been retrofitted with Alstom technology and over 160 outages completed.

Industrial
- We have a special team dedicated to industrial steam turbine service solutions covering all major OEM shaftlines.
TECHNOLOGY
With a large dedicated R&D programme for the installed base, customers of thermal services also benefit from Alstom OEM new equipment R&D
Benefit from proprietary systems and integration experience

The fleet management advantage
The Alstom global installed base totals 700 GW of power generation equipment and we are responsible for the operations and maintenance of over 70 plants, 147 gas turbines and 42 GW of production. This experience enables Thermal Services to identify best practices and develop solutions that resolve customer’s operational challenges.

Alstom evaluates operating conditions and applies the feedback from operations and field service and to pro-actively support customers addressing fleet specific challenges. By combining test rig results with real performance data, we develop predictive models, which help us to significantly increase reliability and availability and reduce maintenance costs.

R&D
As an original equipment manufacturer Alstom Power has been pursuing power and performance for over 100 years with a strong commitment to research and development. Today, Alstom Thermal Services has around 300 R&D engineers focused on improving lifecycle extension and management technologies and solutions.

Alstom also collaborates with universities to encourage market-driven scientific research, which enables our customers to benefit from best-in-class technologies and inventive solutions that address the major challenges plant owners are facing.

As an OEM customer also benefits from Alstom new equipment R&D solutions which offer can be applied or retrofitted into the existing installed base.
Gas turbine
Alstom’s proven gas turbines are top choices for availability, flexibility and efficiency. Leveraging modern combustion technology and materials advances, we offer performance upgrades, so Plant Operators and Owners can produce more power with less fuel while reducing emissions.

Steam turbine
With an installed base of 2,900 steam turbines contributing to producing >480 GW in >80 countries, Alstom Thermal Services, is the unchallenged leader in steam energy. Our portfolio of steam turbine technologies cover industrial, steam, combined cycle and nuclear plants. In nuclear, our Arabelle nuclear turbines set benchmarks for performance, reliability and availability.

Boiler
Alstom has been the world leader in steam generation for over a century: we have supplied more than 3200 boilers contributing to >470 GW of coal and gas fired boilers, direct to clients and through licensed technologies.
Alstom Thermal Services offers maintenance services, innovative and high performance upgrade solutions for Alstom and other OEM boiler subsystems, including mills /pulverisers, firing systems / ignitors, pressure parts and scanners as well as bottom and ash handling systems. Reduced emissions, improved operational flexibility, fuel changes and improved performance are just a few of the areas we can address.

Heat Recovery Steam Generator (HRSG)
In a market increasingly driven by flexibility requirements, Alstom Heat Recovery Steam Generators (HRSG) are designed to cost-effectively handle the thermal stresses of frequent cycling and strict environmental controls. From operations and maintenance support, to new installations, retrofits and upgrades, Alstom Thermal Services can help you meet your HRSG challenges.
We can support with lifetime extension and performance improvement solutions. For example, by improving the turbine path efficiency and optimising the cold end (LP exhaust and condenser), we can boost the overall performance of the thermal cycle. We also offer upgrades and retrofits to optimise the operational flexibility and performance of your plant in today’s changing environment.

Integrated solutions
Alstom offers a range of integrated service solutions; from whole plant or more targeted assessments, to product selection, customisation and execution, we are a reliable one-stop partner. By taking a holistic approach to understanding and addressing your plant and market requirements, we can help find the most cost-effective solutions and uncover hidden potential. We capture operational and implementation synergies that are normally missed when approaching the plant with a strict component perspective.

Generator
Around 20% of the global turbogenerator fleet is based on Alstom technology. From 10 MW air-cooled to 1,700 MW hydrogen-water-cooled generators, our portfolio covers all fuel types and includes more than 18 different technologies for rotors, stators and auxiliary systems.
We harness the latest winding technologies to increase per-unit output, reliability and availability and as the global leader in fast rewind solutions, our time-to-restart after an outage is excellent.

Air Quality Control System (AQCS)
Alstom AQCS solutions help customers reduce their environmental footprint and comply with the relevant regulations: As the number one global supplier of air quality control systems (AQCS) with a dedicated clean air research centre and a global field service network, Alstom Thermal Services offers dedicated support for environmental systems with a focus on cost-effective solutions for upgrading and extending the life of environmental systems. Our environmental services cover: electrostatic precipitators, fabric filters, flue gas desulphurisation, and a range of NOx removals systems.

Balance of Plant (BoP)
Alstom’s plant system approach means we also support your balance of plant requirements. Our BoP solutions covers as an example condenser, heat exchangers and pump. For example, optimising the relationship between the LP exhaust, last stage blades and condenser in steam plants, we deliver significant efficiency gains.
Reducing cost of electricity

Speedy C-inspection for greater availability and lower costs
PLANT: Kuala Langat, Malaysia, 1 x KA13E2-3 670 MW
Thanks to an Alstom O&M contract, Genting is able to outsource full operations and maintenance responsibilities to Alstom and benefit from great gains in availability and reliability and lower costs.

BENEFITS: Being involved in the hands-on operation of the plant allows Alstom to optimise planning and execution of routine operations and major outages. Thus, in 2011, Alstom conducted a C-inspection on the turbine and the generator in only 21 days.

Boosting power output at two PWRs sites
PLANT: North Anna and Surry
PWR nuclear power plants
OEM: Westinghouse
Alstom retrofitted two 810 MW units at North Anna and two 920 MW units at Surry. The Westinghouse units received 1 new HP turbine and 2 new LP turbines, condenser modifications and new turbine bearings.

BENEFITS: Alstom increased availability for reduced loss of income. While the customer expected the installations to take 35 to 45 days each, the average time for the four installations was 26.5 days. The average power output increase after the Alstom retrofit was 76 MW per station, which reduced cost of electricity through economies of scale.

Stator rewind improves generator core performance
PLANT: Ratcliffe-on-Soar, UK, coal-fired 4 x 500 MW
OEM: Siemens
The plant’s Siemens generators were facing water chemistry related technical issues on the magnetic core. Alstom’s innovative and proven stainless steel design stator bars successfully addressed problems experienced with the copper bar design. Alstom is the only OEM applying this technology today.

BENEFITS: Alstom delivered efficiency gains with an 8% stator output increase from 588 to 635 MVA. This technology, also improves availability and reliability to minimise profit loss through downtime.

Service for other OEM equipment
PLANT: Narva Estonia 5, 6 & 12, 200 MW oil shale steam power plant
OEM: LMZ
With a full high tech portfolio covering the whole plant, strong field service experience and local presence for rapid responses, Alstom has been Eesti’s partner of choice since 2000. A Long Term Service Agreement covering the steam turbine and boiler was renewed for the third time in 2009.

BENEFITS: Eesti Energia can focus on their core business of energy trading, while Alstom experts focus on reducing operational costs and increasing the availability and reliability the plant.
Lowering the environmental footprint

Massive decrease in NOx emissions
PLANT: Altura Cogen Energy Center, USA
Combined Cycle & Cogeneration
600 MW
OEM: GE
Alstom installed a LEC III® low emission combustor system in five GE Frame 7E gas turbines over a one year period. The customer’s goal was to cut NOx emissions by 90%.

BENEFITS: The Alstom technology exceeded the customer’s expectations to deliver a 93% reduction in NOx emissions. All five units are now emitting less than 4 ppm. Further benefits include better heat distribution & less thermal stress, more effective & controlled cooling and a pilot-free secondary fuel nozzle design for optimised mixing.

Halving emissions in Portugal
PLANT: Sines power plant, 4 x 314 MW coal-fired
Alstom completed a combined electrical and mechanical upgrade of the Electrostatic Precipitators (ESP) of two units including internal replacement, new Alstom SIR high frequency power supplies and EPIC control system.

BENEFITS: Emissions were cut from 80 mg/Nm³ to 40 mg/Nm³, nearly 10 mg/Nm³ below the official emission limits. Operations and maintenance costs were simultaneously reduced and the reliability of the unit increased.

Minimising Mercury and cutting sorbent costs
PLANT: Colstrip Power Station, USA
2 x 330 MW & 2 x 800 MW
Alstom supplied four Mer-Cure™ mercury removal systems. These advanced activated carbon injection systems have a higher removal efficiency of >90% compared to traditional ACI systems (40-50%).

BENEFITS: Alstom’s system delivers MT compliant mercury removal (0.9 lbs Hg per trillion btu) along with massive savings in sorbent costs estimated at USD 5 million in the first year of operation thanks to lower sorbent usage and supplier flexibility.

Combined mechanical and electrical upgrade for particulate reductions
PLANT: Baoshan Steel 1 & 2, Shanghai, China
OEM: MHI Lurgi
New Chinese environmental legislation led Baoshan Iron & Steel Co., Ltd, one of the top three global steel producers, to approach Alstom for assistance with upgrading their MHI Lurgi ESP units. Alstom designed, supplied and advised on the installation and commissioning of the ESP upgrades and also supplied Switched Integrated Rectifiers (SIR) which optimise the energisation and performance of the ESPs.

BENEFITS: The Alstom products and services resulted in a 75% particulate emission reduction from over 400 down to 100 mg/Nm³.

Boiler solutions for low NOx and multi-fuel
PLANT: Elektrenai unit 7&8, Lithuania, 4 x 150 MW boilers
To meet the customer objectives of reducing emissions and enhancing fuel flexibility, Alstom provided a full fuel system modification and a new burner management system for oil, Orimulsion™ & gas firing. The burners were completely upgraded with an Over Fire Air (OFA) system and new soot blowers.

BENEFITS: The overall impact of the combined measures was to reduce NOx emissions to 400 mg/Nm³ on heavy fuel oil and 200 mg/ Nm³ on natural gas. The CO output was cut to below 170 mg/Nm³ for all fuels.
Increasing reliability and availability

Outstanding starting reliability
PLANT: Hai Fu combined cycle power plant, Taiwan, 2 x Alstom KA24-2 960 MW
EverPower IPP signed an O&M contract with Alstom to reduce risk and establish predictable operations and maintenance costs at this peak load plant with a daily start-stop regime.

BENEFITS: The agreement provides performance and availability guarantees. Since initial operation, Alstom was responsible for 11’287 starts and achieved a starting reliability of 98.5%.

Excellent performance and availability guaranteed
PLANT: Monterrey III, Mexico
4 x Alstom KA24-1 1000 MW
An O&M contract with Alstom allows for reduced risks and establishes predictable operations and maintenance costs for the customer at this base load plant.

BENEFITS: Thanks to the effective collaboration between Alstom and the customer within the framework of this O&M agreement, availability was 99.10%, reliability 99.91% and the service factor 98.14%.

Casteljon (GT26) new
PLANT: Castejon 1, Spain1 x 400 MW
Alstom KA26
Under an O&M contract, an upgrade of the LP turbine was finalised at this gas-fired plant in 2009. As a result, output rose by 13.5 MW and efficiency by 0.7%. The upgrade also allowed maintenance intervals to be extended by 8000 operation hours.

BENEFITS: Besides the efficiency gain which reduces cost of electricity the plant now has higher availability and lower maintenance costs: reliability was 99.02%, availability was 96.76%.

Successful integrated plant retrofit
PLANT: Belchatow 6, Poland 370 MW
Alstom was charged with a full scope retrofit of unit 6 with the goals of lifetime extension, emissions reduction, performance optimisation and availability improvements. The contract covered the boiler, steam turbine and generator.

BENEFITS: Thanks to the Alstom retrofit, the unit lifetime was extended by 25 years, while efficiency was increased to 41% and output to 394 MW. CO₂ and NOx were cut to < 200 mg/Nm³. There was also a general increase in reliability, availability and maintainability.
Increasing reliability and availability

Successful emergency on-line cleaning
PLANT: South Texas Project, USA Nuclear
2800 MW
OEM: Siemens Westinghouse
Copper oxidation was diminishing the efficiency of a generator stator cooling water system. To bring temperatures back to normal, Alstom’s CUPROPLEX® online cleaning service was carefully employed avoiding tripping and damage to the generator.
BENEFITS: Thanks to the Alstom online gentle yet efficient cleaning process, full availability of the plant was maintained throughout. The targeted removal of copper oxides was conducted while the generator was at full output. Temperatures were normalised within 48 hours thus mitigating the outage risk.

Reliable compressor operations
PLANT: Corpus Christi Energy Center, TX, USA 2 x 7FA+e, Combined Cycle, 500 MW
OEM: GE
Having wrestled with reliability issues due to material distress, Calpine decided to replace the crack prone row zero with an Alstom compressor upgrade.
BENEFITS: The Alstom solution eliminated the reliability issues and the associated operational restrictions of the original OEM design. Online Water Wash (OLWW) and fogging practices are now possible and the solution has been successfully operating for more than 16’000 hours.

Co-firing upgrade for large CO₂ savings
PLANT: Drax, N. Yorkshire, UK
4000 MW, 4 x 150 MWe boilers
Drax, the largest coal-fired plant in Western Europe, engaged Alstom to aggressively increase the biomass co-firing capabilities to 10% MCR. Alstom designed and implemented the necessary modifications to the plant that produces over 7% of UK energy requirements.
BENEFITS: Processing 40 tonnes of biomass and 230 tonnes of coal per hour, Drax is consistently delivering its rated output. Thanks to the co-firing with agricultural and forestry residues, Drax can now save 2 million tonnes of CO₂ annually.

Rapid rotor rewind on OOEM generator
PLANT: Sherer, Georgia USA, 880 MW, coal-fired
Rotor rewind at the largest coal-fired plant in the USA.
BENEFITS: Alstom reverse-engineered the necessary parts and carefully planned the supply-chain and work schedule. This enabled the rotor rewind job to be completed on-site during a regular C-inspection outage. The job was done in only 19 days contributing to a quick return to full availability.

Fortaleza (GT11N2)
PLANT: Fortaleza, Brazil 2 x 311 MW Alstom KA11N2
Under an Alstom o&m contract since 2004, Alstom has been securing safe operation, reliable service and high availability the customer’s fullest satisfaction.
BENEFITS: In recognition of the added value delivered by Alstom’s Brazilian O&M team, Endesa nominated Alstom best service provider in 2010.
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.