GT24/GT26
GAS TURBINE
Clean / High performance / Flexible
Utilities, independent power producers and merchant power generators face unprecedented change - deregulation and tougher competition, shifting consumption trends and more stringent emissions legislation. They also need to ensure reliability of supply yet reduce the cost per kilowatt hour of producing electricity. Raising efficiency remains a constant challenge. And finally the flexibility to fuel gas composition needs to be addressed in times of global transport of fuel gas.

Alstom has addressed all these issues. The result is the compact GT24 (60 Hz) and GT26 (50 Hz) sequential combustion gas turbines, a solution that lowers the kilowatt hour cost without reducing availability by raising the efficiency close to 60% in combined-cycle operation. Their unusually low environmental emissions are achieved thanks to Alstom’s unique, sequential combustion technology burning the fuel in two dry low NOx combustors. And it can do all this with low firing temperatures and with burners which are robust enough to cope with wide fuel gas compositions that are seen in the market today. In addition, while efficiency levels and power density increase, operational flexibility of the GT24/GT26 engines is significantly improved. Their turn down capability is unique in the market today. Meaning that, with the GT24/GT26 you get a gas turbine eminently suited to today’s market.

The GT24 and GT26 represent a uniquely successful approach to heavy-duty gas turbine technology – many of their major components and subsystems have performed outstandingly for years in a number of applications. They can operate in a new or existing power plant design or as part of a turnkey power plant. Applications cover electrical power generation in base load, intermediate or peak duty. It can be used in industrial applications such as paper mills, district heating or desalination plants.

Right technology, right products

Alstom’s gas turbines stand out for their high cost efficiency, availability and flexibility. The range covers a wide spectrum of products, including machines for both the 50 Hz and 60 Hz markets. They can operate either in simple cycle or combined cycle and are fuelled by natural gas, medium or low calorific gases or light oil; with on-line fuel switch over capability eliminating dependency on any one fuel.
GT24/GT26 sequential combustion: the benefits

**Competitive kilowatt hour**
In combined-cycle applications, the GT24/GT26 is capable of net plant efficiencies of close to 60% using already proven gas turbine technology.

**High reliability/availability**
Low turbine inlet temperatures, a uniform annular temperature profile, a maintenance free, welded rotor and a simple and robust EV burner all help to reduce maintenance needs and therefore improve availability.

**High Power density**
High power density design leads to smaller components. Compared to Alstom’s conventional gas turbines, the GT24/GT26 provide up to 60% more output for the same footprint.

**Operational flexibility**
Sequential combustion means unrivalled operational flexibility which includes the ability to handle wide fluctuations in gas compositions. An operating range, down to 40% part load and below while keeping low NOx emissions, allows the plant to meet all power demands.

**Clean Power**
Sequential combustion technology is the industry’s most innovative platform for clean power generation, giving gas turbines with low emissions and high efficiency.

**Long-term payback**
In combined-cycle applications, the GT24/GT26 can deliver a significantly higher internal rate of return compared to conventional turbine technology.
Performance with a unique track record

The success of the GT24/GT26 is the result of time-tested design principles, thorough validation and manufacturing processes conforming to the highest standards.

Pioneering the technology
No-one knows sequential combustion turbines better than Alstom. Not only did we invent them, we have been designing, manufacturing and installing them for over 50 years. In fact, Alstom is the only manufacturer in the world to have chosen the sequential combustion path, leading to high gas turbine efficiency, low emissions and wide part load operating range. Our first sequential combustion turbine went live in Switzerland in 1948. With the advent of metallurgically superior hot-gas materials and advanced blade-cooling technology in the 1970s, we were able to leverage the outstanding potential of our sequential combustion technology. 1978 saw the next generation, a single rotor sequential combustion gas turbine.

Highly-efficient compressor
The development of the GT24/GT26 compressor is the result of an evolutionary process with a gradual increase in the pressure ratio to over 30 bar. The GT24 and GT26 employ controlled diffusion airfoil (CDA) blading, where each compressor stage is individually optimised according to specific requirements and boundary layer conditions. This leads to higher overall compressor efficiency while retaining a high surge margin. In addition, three rows of variable guide vanes are used to optimise the operation concept at every load.

Dry low NOx EV burner
EV (EnVironmental) burner technology, operating successfully for millions of hours throughout the Alstom gas turbine fleet, gives long burner life, no maintenance between hot gas path inspections and low emissions.
The EV burner gives the benefit of dry low NOx combustion for operation with different natural gases, with the option to run with liquid fuel as an alternative.

The burner is shaped like two half-cones slightly offset laterally to form two inlet slots of constant width running the component’s full length. Combustion air enters the cone through these slots and fuel is injected through a series of fine holes in their edges. With this arrangement, fuel and air spiral into a vortex form and are intensively mixed.

**Annular combustion**

Two, fully annular combustion chambers distribute the circumferential temperature evenly while avoiding problem zones such as cross-firing tubes or transition pieces. In addition the annular combustion systems of Alstom do not need a so called “Combustor Inspection” as for can-annular systems which reduces the amount of maintenance leading to higher availability.

**Turbine**

The sequential combustion concept results in a gas turbine exhibiting extremely high power density resulting in the smaller blade dimensions of the GT24/GT26 machines. The five rows of turbine blades are anchored in fir tree slots. Air from the compressor cools the high-pressure turbine stage and the first three low-pressure turbine stages utilising a combination of film and convection cooling techniques.

**Secondary air system**

The cooling air for the hot gas path components is taken from four extraction points along the compressor. Air from two of these secondary airflows is used directly, while the two other streams are cooled by heat exchangers (Once Through Coolers) before entering the hot gas path components. The heat rejected is recovered in the water-steam cycle, which maximises the performance of the GT24/GT26 in combined cycle applications. In simple cycle applications, the cooling is achieved by quenching water, which is introduced directly into the secondary air stream.
The industry has always sought to develop a gas turbine with higher efficiency. The traditional solution is to raise the firing temperature at the turbine inlet. However, this has drawbacks. It will increase emissions into the atmosphere and subject the entire gas turbine system to higher temperatures. The likely result is more frequent maintenance and reduced availability – defeating the initial objective. For decades conventional wisdom has decreed that efficiency cannot be increased in any other way.
But there is another way. By injecting fuel into two combustion systems in series, it is possible to increase output and cycle efficiency without significantly increasing the emissions at full and part load as the firing temperature in the first combustor can be kept relatively low and the second combustor does not contribute substantially to the engine NOx emissions. This is called sequential combustion.

For more than 50 years, Alstom has been a pioneer in sequential combustion technology. Over the years, we have made major system and component innovations, introduced incrementally, with successive gas turbine models. These include our industry leading EV burners, annular combustion design and solid welded rotor. In so doing, we have succeeded in uncoupling emissions and efficiency through an inventive yet basic application of elementary thermodynamics.
Sequential combustion provides an alternative approach to optimising the gas turbine cycle. The thermodynamic benefits of this innovative cycle are illustrated by the enthalpy-entropy relationship.

The enthalpy-entropy diagram of the Brayton cycle graphic represents the thermodynamic processes (compression, combustion and expansion) and states (temperature and pressure) that fuel and air undergo in the gas turbine cycle. Enthalpy is a measure of the energy density, while entropy reflects the efficiency of the compression and expansion processes as well as heat transfer to the gas during the combustion process.

Conventional gas turbines all operate on the same principle. The compressor increases the pressure of the inlet air from ambient conditions to the compressor discharge state. In the combustor, energy of the fuel is released into the combustion air, which increases its specific energy (enthalpy) and raises its temperature to peak level. The hot gases expand through the turbine, producing the work to drive the compressor and the electric generator. To achieve more work and higher efficiency in a conventional gas turbine, turbine inlet temperature has to be increased.

The GT24/GT26 achieve low NOx emission levels, not only at full load, but also down to part loads of 40% and below. This is due to the operation concept that maintains the EV combustor temperature at a nearly constant level. Further the SEV combustor produces only little additional NOx.
Sequential combustion how it works

Sequential combustion breaks the link between higher efficiency and higher inlet temperature. In sequential combustion, the process is characterised by splitting the combustion process into two stages, separated by an expansion to an intermediate pressure level. In this so-called “reheat” process, energy is added part way through the expansion process, resulting in high gas turbine efficiency and high power density. The sequential combustion principle has been successfully applied to the large, heavy duty, GT24 and GT26 gas turbine models. These units possess several important features that distinguish them from conventional machines.

1] Compressed air is fed into the EV burner, creating a homogeneous, lean fuel/air mixture. The vortex flow, induced by the shape of the burner, breaks down at the EV burner exit into the combustion zone, forming a central recirculation zone.

2] The mixture ignites into a single, low temperature flame ring. The inner recirculation zone stabilises the flame in free space within the combustion zone, avoiding contact with the burner wall.

3] The hot exhaust gas, low in oxygen content, exits the first combustor and moves through the high pressure turbine stage before entering the SEV burner.

4] Vortex generators in the SEV burner enhance the mixing process, while carrier air, injected with the fuel at the SEV fuel lance, delays spontaneous ignition until the mixture enters the annular SEV combustion chamber.

5] Ignition occurs when the fuel reaches self-ignition temperature in the free space of the SEV combustor. The hot gas then continues its path into the low-pressure turbine.
Its beauty is in its simplicity

Like all the best ideas, sequential combustion is based on a simple concept: the reheat principle.

Sequential combustion can be visualised as a gas turbine comprising two combustor-turbines in series, where the exhaust gases from the first turbine feed the combustor of the second.

An efficient 22-stage subsonic compressor feeds combustion air into the first combustor. There fuel is mixed with the high-pressure air and burns in the first combustor – the annular EV combustor. The hot gases drive a first turbine, the single-stage high-pressure turbine.

Unlike conventional turbines, fuel is now injected into a second burner set and ignites spontaneously in the following annular combustion zone, the SEV (Sequential EV) combustor, thereby reheating the air and expanding it further through four low pressure turbine stages.

EV combustion

The EV combustor has an annular burner arrangement. The GT26 is fitted with 24 retractable EV burners, while the GT24 is fitted with 20 retractable EV burners. Each operates over the whole load range. Compared to other combustor arrangements, the annular combustor distributes the hot gas, circumferentially, at a much more uniform temperature.

Radial temperature uniformity is accomplished by pre-mixing virtually all incoming compressor air with the fuel in the EV burner, and by the absence of film cooling in the convection-cooled combustor walls. This produces a single, uniform flame ring in the free space of the EV combustion zone.

A key benefit is that the flame has no contact with the walls of the burner. These design features distinguish the EV combustor significantly from other combustion systems.
SEV combustion
In the annular SEV combustor, the combustion process is repeated as in the EV: vortex generation, fuel injection, pre-mixing and flame stabilisation in a vortex. The SEV combustor consists of 24 burners distributed in a ring, followed by an annular combustion zone surrounded by convection-cooled walls. Exhaust gas from the high-pressure turbine enters the SEV combustor through the diffuser area. Combustion temperature uniformity in the SEV, as in the EV, is achieved by the uniform premixing of fuel with air in a vortical flow with high mixing intensity. Each SEV burner contains four delta-shaped vortex generators on each burner wall in order to form four pairs of vortices in the combustion air.

Fuel is then injected through an air-cooled fuel lance, distributing with four jets into the vortex pairs such that it forms a perfect fuel/air mixture prior to combustion. The fuel jet is surrounded by cool carrier-air that delays spontaneous ignition until the fuel air mixture has reached the combustion zone.

There, the mixture ignites spontaneously and, as in the EV, combustion occurs in a single, stable flame ring, operating across its entire load range.

Neither the EV nor SEV combustor contains any moving parts. No so-called “Combustor Inspection” is needed – neither for the EV nor SEV combustor. This mechanical simplicity determines the high reliability and availability of the GT24/GT26 design.

Uncoupling emissions and performance
NOx formation depends on the temperature, pressure and residence time in high temperature regions inside the combustion area. In both the EV and SEV combustors, the combustion temperatures are relatively low due to the lean premixing of fuel with air. Due to the efficient vortex stabilisation of the flame the residence time at high temperature is shorter than in conventional combustors. In addition, when comparing conventional and reheat gas turbines, the Brayton cycle demonstrates thermodynamically that conventional machines need a higher combustion exit temperature to achieve an equivalent specific output.

Given the importance of the relationship between NOx production and flame temperature, it is also notable that the temperature profiles in both the EV and the SEV combustors are much more uniform than in conventional combustors. This effectively prevents temperature peaks and resultant NOx formation. NOx emissions for the GT24/GT26 units are well below 25 vppm, this across a wide load range.

The design of the SEV combustor provides additional advantages. In the SEV burner, where incoming hot gas has a considerably lower O2 content than normal air, less oxygen is available for NOx formation.

Furthermore, because the SEV incoming air is at a considerably higher temperature than conventional combustion air, it requires less heating to reach flame temperature. Both of these NOx mitigating phenomena are known from other combustion technologies that employ exhaust gas recirculation.

Although a large amount of the total unit fuel is burned in the SEV combustor, there is very little additional NOx (at 15% O2) formed in the SEV combustor, mainly due to the low oxygen content of the incoming air.
The Alstom Power Train

Power Train Arrangements
Alstom has extensive experience with both single and multi shaft power train arrangements, in all types of operating regimes from base load to daily start and stop.

Steam Turbine
Alstom steam turbines offer:
- HP turbine shrink ring design for sustained efficiency and fast start-up
- welded rotor design for fast start-up and low maintenance
- single bearing designs for compact arrangement
- single lateral exhaust designs also available for lower foundations and lower first costs.

Turbogenerator
Alstom turbogenerators demonstrate high efficiency, reliability and availability with low maintenance requirements. According to plant size and arrangement, both TOPAIR and TOPGAS generators are available.

TOPAIR
- multi-chamber Totally Enclosed Water to Air Cooled (TEWAC) system for high efficiency
- self retightening stator end windings for low maintenance
- proven reliability in various applications and shaft arrangements.

TOPGAS
- for higher output levels, primarily in GT26 single shaft arrangements
- maximum efficiency through hydrogen cooling
- efficient seals for low hydrogen consumption levels
- self retightening stator end windings for low maintenance.

Gas Turbine
Alstom gas turbines - the core of any combined cycle plant.

Heat Recovery Steam Generator (HRSG)
Alstom’s range of HRSGs provide:
- drum type of once-through technology
- optimised hot and cold end performance for maximised combined cycle efficiency
- high thermal flexibility for fast start up
- highly modularised design for fast site erection
Shoreham / UK
A GT26 merchant power plant application
Scottish Power Ltd selected the KA26-1 standard single-shaft design to build a combined-cycle power plant at Shoreham Harbour in the United Kingdom. The plant was completed in December 2000 and is managed on a merchant plant basis. It has operated at both base load and intermediate duties.

Island Cogen / CANADA
A GT24 in cogeneration application
Island Cogen is a 250 MW gas-fired combined-cycle cogeneration power plant at Campbell River in British Columbia, Canada. The plant is owned by Calpine and delivers steam to an adjacent paper mill.

Taranaki / NEW ZEALAND
The first GT26 single–shaft power plant
Contact Energy in New Zealand is the owner of an Alstom turnkey 360 MW combined-cycle power plant, featuring the GT26 sequential combustion gas turbine. Taranaki is arranged in a single-shaft configuration and represents the first standardised reference plant solution with the GT26. This triple pressure reheat combined-cycle plant has been in continuous base load operation since July 1998.

Gilbert / USA
The first ever GT24/GT26 engine
The first GT24 ever to go into operation was installed in the simple-cycle power plant at Gilbert Station, on the Delaware River in New Jersey. The addition of the GT24 simple cycle, coupled with the retirement of two older steam units, resulted in a net increase of 96 MW, with higher efficiency and lower emissions. The unit is owned by Reliant Energy.

Midlothian / USA
One of the largest GT24 combined cycle power plants
International Power, formerly a subsidiary of Britain’s National Power PLC, selected Alstom to build a large gas-fired combined-cycle power plant designed around six GT24 single-shaft power trains. Midlothian is one of the largest combined-cycle merchant power plant facilities in the US.

Cartagena / SPAIN
A GT26 fast-track project in Spain
The Cartagena project, a 1200 MW combined-cycle power plant consisting of three independent blocks equipped with dual-fuel GT26 gas turbines, was awarded to Alstom in December 2003 with a very aggressive timetable. The first unit was finished within 25 months, with the other units following at one-month interval. This is a repeat order for Gas Natural, which already owns and operates two other GT26 combined-cycle power plants in Spain.
Sequential combustion applications

Combined-cycle
A combined-cycle power plant is an efficient and environmentally sound way to generate electrical power. The reheat process in sequential combustion provides optimum exhaust temperatures for combined-cycle use. This is the main application for which the GT24 and GT26 have been developed for.

The two combustors in the GT24/GT26 sustain high efficiency and low emissions at part load operation through control of the inlet air flow by three rows of variable guide vanes. The vanes reduce air mass flow to 60% of the full load level while maintaining the exhaust temperature of the gas turbine at nominal level. This ensures that the thermodynamic quality of the sequential combustion combined-cycle remains nearly constant, maintaining its high live steam temperatures. As a result, GT24/GT26 combined cycle efficiency at 50% load, for example, is approximately 12% better than a conventional class gas turbine combined-cycle power plant.

This maximises the long-term value of GT24/GT26 power plants by significantly broadening their operating flexibility – a key success factor for today’s competitive power generation market.

Single-shaft solutions
The single-shaft combined-cycle system consists of one gas turbine, one steam turbine, and one heat recovery steam generator (HRSG), with the gas turbine and steam turbine coupled to either side of a single turbogenerator to form a single shaft line.

The key advantage of the single-shaft arrangement is its operating simplicity, which raises reliability – as much as 1% above multi-shaft blocks. Operational flexibility comes from the fact that a steam turbine can be disconnected, using a self-synchronizing clutch, during start-up or for simple cycle operation of the gas turbine.

In terms of overall investment, the initial cost of the single-shaft is lower than the multi-shaft arrangement. Single-shaft plants achieve savings in both power-island and balance of plant costs. Power-island costs are saved by reducing electrical equipment: only one generator, one bus duct and one step-up transformer are required. Balance of plant savings come from lower civil and structural costs due to a compact arrangement compared to multi-shaft layouts.
Multi-shaft solutions
The multi-shaft combined-cycle system consists typically of two or more gas turbines, each with its own dedicated turbogenerator and HRSG feeding steam to a single steam turbine also with its own turbogenerator.

The key advantage of the multi-shaft arrangement is higher overall plant output and efficiency due to the larger steam turbine and optimised water-steam cycle.

This advantage is maintained down to about 50% plant load. Below this figure, the efficiency of two single-shaft power trains is better, as one shaft line can be shut down.

Repowering with sequential combustion gas turbines
Alstom has developed a hybrid plant concept combining conventional steam plants with the GT24/GT26.

This concept responds to the most critical requirements of modern power generation systems – low generating cost, fuel mix capabilities, operational flexibility and minimum environmental impact. The concept exhibits extraordinary design flexibility by integrating high performance sequential combustion gas turbine technology with a wide range of existing or new conventional steam power plants.

These plants combine an operating and dispatching flexibility with continuous fuel optimisation, low O&M costs and moderate capital investment.

![Chart showing relative CC Gross Efficiency]

**Relative CC Gross Efficiency**

**Superior Part Load Performance**

Relative KA26 Efficiency vs CC Load

![Diagram showing GT Power Plant and Existing Conventional ST Power Plant]
Alstom offers extensive service experience in power generation. It has a complete range of services from traditional spare parts supply and field service specialists to the full operation and maintenance of gas turbine and combined-cycle power plants. As the Original Equipment Manufacturer (OEM) we are ideally placed to provide continuous plant improvement packages, e.g. performance upgrades, lifetime extensions or emission reduction packages to meet changing market requirements during a plant’s operational lifetime.

With over 100 years experience and an installed fleet of more than 650 GW, Alstom’s 200 Local Service Centers (LSCs), located in 70 countries, are there to provide local facilities and expertise directly to our customers, keeping your plant competitive.

### Long-term service contracts

Alstom’s long-term service contracts are flexible in scope of services and equipment covered as well as contract duration in order to meet your unique business requirements. Their modular scope allows tailor made packages to be assembled based on the level of risk mitigation and guarantees required, enabling you to choose the correct contract model that fits your strategy in terms of operating and maintaining your power generation assets. With traditional purchase order contracts, customers can purchase spare parts according to their needs. Service agreements can add guaranteed availability and fixed prices for parts, services and consulting. With our Operations and Maintenance contracts, customers can have Alstom employees operating and/or maintaining their plants.

Our experience covers over 30 plants and 45 gas turbines of the GT24/GT26 type with long term service contracts. Such contracts with the OEM benefit from the extensive first-hand experience gained from site operations and make full use of the knowledge gained from the complete installed fleet.

With our service contracts, our partners obtain significantly more value to ensure key requirements (depending upon scope of supply) are met:

- Predictable operation & maintenance costs
- Reliability and availability
- Heat rate and power output
- Environmentally sound products
- 24 hour / 7 day plant support
- Broad OEM experience
Plant Support Centre
Alstom’s Plant Support Centre (PSC) located in Baden, Switzerland, offers remote, fast and comprehensive technical support for the whole power plant around the clock. In addition to trouble shooting, the PSC provides data monitoring services including early warnings and Monitoring & Diagnostic Reports, assessment of health parameters and consulting regarding performance and RAM (reliability, availability, maintainability) optimization. The PSC reduces operational risks through its focus on pro-active monitoring, which provides early warning of emerging equipment problems through advanced diagnostic programs.

Plant Integrator™ – creating customer value

Plant Integrator™ is Alstom’s solution methodology designed to create added value for customers. Plant Integrator™’s starting point is the customers’ viewpoint. It then systematically analyses, measures and optimises the specific customer benefits desired, technically, economically and ecologically. As a result, Plant Integrator™ matches customer needs and priorities with products and services, delivering a thoroughly tailored solution and maximising customer value. This then becomes the benchmark for future fine-tuning and upgrades.

The unrivalled Plant Integrator™ offering from Alstom covers the full palette, from single component packages and control systems to power islands and complete plants, operation and maintenance services, as well as retrofit solutions.

Plant Integrator™ benefits to customers:
- Improve cash flow – by achieving lowest costs
- Generate more power
- Increase installation efficiency
- Burn less fuel
- Improve operational flexibility
Alstom Power R&D

Alstom Power R&D is decidedly market and customer oriented and focuses on creating innovative technologies to apply at all stages of our products’ life cycles.

We aim for the best utilisation of the Customers’ investment, the earth’s materials and the fuel used, through efficiency, availability and cost reduction. The increased environmental concern means that we place a focus on minimising CO₂ emissions through the development of mitigation and renewable technologies for application in new and retrofit installations.

The engineering and R&D workforce totals 5,500 people, of which 4,000 are in engineering and 1,500 in R&D in 22 R&D centres. There are 13 laboratories with dedicated infrastructure, equipment and testing facilities.

Alstom Power R&D policy takes a global approach which has several benefits. First, it puts the work where the expertise is located. Secondly, it helps to nurture close contacts with universities and design institutes that can complement our in-house efforts. Thirdly, it enables us to stay in touch with global customers’ expectations, anticipate their needs and lead the technology trends.

Alstom Power works with more than 30 universities worldwide. We establish close, long-term links with institutions and professors who are experts in fields which are important to us, for example, with MIT and Stanford Research Institute on CO₂, Grenoble and Lausanne universities on hydro turbines, Cologne’s DLR on combustion, Oxford University on heat transfer as well as with engineering institutes in China, India and Russia.

In the field of international collaboration, Alstom Power has played a leading role in establishing the European technology platform for zero emission fossil fuel power generation (ZEP).

The Gas Turbine Test Power Plant

The Gas Turbine Test Power Plant located in Birr, Switzerland, provides a unique environment for maintaining Alstom’s competitive advantage through product improvement, all within the proximity of Alstom’s R&D facility, the gas turbine development department and the manufacturing facility. The facility is equipped with a dual fuel GT26 and a dual fuel GT8C2 gas turbine, both operating in simple cycle mode dispatching to the Swiss electrical grid. As it is an Alstom facility, there are no restrictions on testing (loads, limits or duration) which can be done under real conditions without any commercial time constraints.

The shortened feedback loop (in terms of time and distance) of field experience helps in speeding up design validation and implementation in Alstom’s gas turbine fleet. The Gas Turbine Test Power Plant, in combination with the Product Support organization and the GT development department puts Alstom in a position to insure seamless implementation of evolutionary product improvements based on the GT24/GT26 fleet experience.
A world leader in clean power generation

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

The company designs, manufactures and delivers state-of-the-art products and systems to the power generation (gas, coal, and hydro power plants) and industrial markets. In addition, Alstom provides the conventional equipment for nuclear power plants.

Our objective is to build the cleanest integrated power solutions for our customers. We supply and integrate all components of a clean power system, from boilers to air quality control and energy recovery systems. We also have extensive experience in retrofitting, upgrading and modernising existing power plant equipment. We can also boast unrivalled expertise in project management for all types and sizes of power generation systems – small to large as well as single equipment to complete turnkey solutions.

Alstom’s unique offering brings real value to our customers. With our innovative plant integration concept, we help operators to maximise their plant performance, while fully complying with environmental regulations and obligations.

Expertise in clean power solutions
Plant operators today face multiple challenges in their efforts to make their plants more competitive, while complying with the different environmental regulations.

Alstom is delivering clean power solutions now. As the uncontested leader in clean power generation technologies, we provide the cleanest integrated power solutions on the market. They cover all plants (both existing and new ones), all energy sources (from fossil fuels to hydro and nuclear), and all emissions (NOx, SOx, Mercury, particulate matter).

Alstom offers the complete range of products designed to help power plants to either reduce pollutant and CO₂ emissions, or to produce clean electricity from the outset.

A world leader
Alstom supplies major equipment for 25% of the world’s installed base, making us:

N°1 in turnkey power plants
N°1 in air quality control systems
N°1 in hydro turbines and generators
N°1 in the number of installed boilers worldwide
N°1 in installed turbines and generators for nuclear power plants
N°1 in steam turbine retrofit and integrated retrofit projects

For example, we deliver new coal-fired power plants with an advanced supercritical design using proven clean combustion solutions that are integrated with state-of-the-art emission controls. Similarly, we improve the thermal and environmental efficiency of existing power plants by retrofitting plant components or upgrading the whole system. The GT24 and GT26 sequential combustion gas turbines are prime examples of Alstom’s ability to curtail emissions and deliver cleaner power.

Investing in the future of clean power
Alstom is uniquely placed as a plant integrator and full-service provider to design and manufacture all the components of a clean power plant, from turbines such as the GT24/GT26 to generators, boilers and air quality control systems.

Alstom also invests substantially in the research and development of new environmentally friendly power solutions. Together with partners, universities and customers in Europe and the United States, we are working on collaborative projects to develop solutions for pre and post-combustion CO₂ capture and oxy-firing.