ALL ABOUT ELECTRICAL GRID SERVICES
Asset reliability and performance are key to attaining your business objectives and return-on-investment.

You need to ensure that your assets operate optimally throughout their lifetimes - and you need a responsive partner with comprehensive and high quality services to support you in your challenges.
A complete range of solutions

Turn your asset management challenges into eco-efficient solutions

Alstom proposes a full range of services tailored to your needs and managed by experts in the field.

Our technical specialists take care of your assets: networks, transformers, protection, information and control equipment, power electronics equipment and entire air-insulated or gas-insulated substations. They also make sure that all quality and safety regulations are respected and met.

Alstom offers complete, innovative, high quality services to optimise your electrical infrastructure, improve your return-on-investment and extend the lifetime of your assets. Our local technical experts provide comprehensive solutions to get the most out of your assets during their lifecycle:

- From network consulting and planning to operational implementation
- From asset diagnostics to condition-based maintenance
- From emergency support to full operations and maintenance
- From technical training to customised competence development programmes

Make your equipment smarter and more sustainable thanks to field-proven expertise

At Alstom, our mission is to ensure your electrical assets are reliable, efficient and environmentally-friendly.

We leverage the technical know-how of our equipment design and manufacturing engineers into customised service solutions.

Alstom provides innovative technology solutions to keep your high voltage substations and equipment up-to-date, safe, reliable and efficient. Our asset management solutions optimise your infrastructure performance, while keeping your operating costs under control.

Alstom local service sites around the world are managed by strict quality management systems - including our own. They fulfill the requirements of ISO 9001 and environmental standards ISO 14001 and OHSAS 18001.
Transmission assets constitute an important capital investment and are critical to the successful operation of your electrical power systems. Taking care of your equipment components is essential to keeping your assets safe and reliable. Based on our manufacturing and field experience, Alstom proposes efficient and customised solutions to improve the life of your equipment.

Get the most from your assets at all stages of their lifecycle

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**ASSET MANAGEMENT**
- Site inspection and diagnostics
- Continuous online condition-monitoring systems
- Communications and integration solutions
- Analytics for Health Index management
- Integration in the utility business process

**NETWORK CONSULTING**
- Power systems analysis and engineering
- Infrastructure audit and optimisation
- Network expansion, reinforcement or integration studies
- Stability and security analysis (post incident, reliability, availability and maintainability)

**TECHNICAL TRAINING**
- Tutored e-learning
- Modular training
- Software training
- Competence development programmes
- Education partnership
Global expertise delivered locally

Alstom aims to deliver continuous field operational excellence via our broad service experts network. We focus on the quality of our services and the competence development of our technicians and supervisors. Their competencies, qualification levels and certifications are checked regularly. As a result, wherever you are, Alstom Grid provides you with the best field experts to ensure your satisfaction.

As close to our customers as any local company - with the expertise and long-term sustainability of a global company
Although some parts mainly play a supporting role, they are vital for optimal operations. Alstom proposes strategic spare parts management to avoid risks on main and critical components. It is an effective solution to cope with urgent corrective maintenance and to control replacement lead times and costs. Several options are proposed: stock at an Alstom facility, within your facility or use shared stock.

### ERECTION AND COMMISSIONING

Our local teams ensure that the asset is erected, tested and commissioned according to our own state-of-the-art standards. Our certification process, based on “on-the-job coaching” guarantees the same high levels of quality - anywhere the asset is installed.

### MAINTENANCE AND REPAIR

Alstom recommends regular maintenance on your equipment. Maintenance plans must be carried out by a qualified field services supervisor with the prerequisite technical levels. Maintenance levels 3 to 5 (Excelec referential) must be conducted by the manufacturer. Our local teams can support you in emergency repairs, time-based, predictive and corrective maintenance.

### OIL ANALYSIS

With over 25 years of experience, our laboratories perform reliable fluid tests in order to provide you with an expert assessment of the overall condition of your transformers. Based on analysis and diagnostics, you can anticipate any dysfunctions and limit losses. Necessary maintenance and repairs can be conducted while avoiding any outages or induced production downtimes. A dedicated Alstom team can ensure diagnosis within 8 days and emergency requests within 8 hours.

### DECOMMISSIONING

During decommissioning, Alstom is committed to handle equipment correctly and responsibly, with recyclers and collectors governed by regulations and directives with a special focus on preserving the environment. Alstom objectives are to reuse a maximum number of parts, thus using less raw materials and meeting other customers’ needs for obsolete equipment still in service.

### STRATEGIC SPARE PARTS MANAGEMENT

Although some parts mainly play a supporting role, they are vital for optimal operations. Alstom proposes strategic spare parts management to avoid risks on main and critical components. It is an effective solution to cope with urgent corrective maintenance and to control replacement lead times and costs. Several options are proposed: stock at an Alstom facility, within your facility or use shared stock.
Services
at all stages of their lifecycle

Operations & maintenance
Optimise asset performance over the long term

Whether for a specific critical product range within your electrical infrastructure or over the entire network, Alstom can provide you with lifetime support for Alstom, Alstom-legacy or third-party equipment, including full lifetime operations and maintenance management.

Our experts provide complete and comprehensive services to ensure substation stability, security, reliability and performance (asset management, preventive maintenance, strategic spare parts, technical training...).

The combination of services to complement your resources and competencies can include:
- Responsibility for controlling and operating electrical networks on any original manufacturer’s equipment
- Asset management: usage planning, operations, condition-based maintenance, repair and replacement
- Dedicated experts with prompt response times and 24/7 emergency support capability on all fault rectification related issues
- Condition assessment with periodic onsite visits
- Strategic spare parts management
- Technical training and competence development

Asset upgrades
Give your substation a second life

When facing performance improvement or obsolescence issues, Alstom experts perform an assessment of your equipment in order to make the best decisions based on site diagnostics. Our solutions offer lower implementation costs, higher return-on-investment and shorter lead-times than replacement.

RENOVATION
- Expand the life of ageing equipment, replace worn circuit-breakers, switches, control and protection equipment, process transformer oil
- Conduct power transformer life extension, circuit-breaker mid-life overhaul and substation refurbishment to ensure equipment safety, reliability and performance

MODERNISATION
- Adapt new designs and technology to equipment in operation to avoid obsolescence
- Conduct substation modernisation by adding condition monitoring systems or disconnector motorisation
- Retrofit or upgrade certain key components such as cooling systems or breakers and add condition-monitoring

EXTENSION
- To face evolving power demands, increase electrical ratings such as nominal current, short-circuit current, etc
- Install additional bays/poles to an existing substation (Alstom or third party) to answer network evolution needs
Any manufacturer's equipment and third party condition-monitoring devices can also be integrated to meet specific objectives.

By early detection of incipient failures, you can reduce your failure rates by up to 70%, while reducing your maintenance costs by up to 30%. The devices are usable on 08 09 pieces of equipment.

Asset management

Make efficient and proactive decisions on your assets

Alstom offers a comprehensive business solution to maximise the value of your assets by optimising maintenance and asset replacement strategies. It takes into account the condition of your assets, your budget constraints and the criticality of each piece of equipment.

To optimise your infrastructure, Alstom proposes integrated solutions to manage assets efficiently. Based on site inspections and asset condition assessments, our experts analyse data to define the ‘Asset Health Index’ of your equipment and provide recommendations on asset usage planning, operations, repair and replacement, so you get the most from your infrastructure.

Our asset management solutions include:

- Site inspection and diagnostics
- Continuous online condition-monitoring systems*
- Communications and integration solutions
- Analytics for Health Index management
- Integration in the utility business process

Whether you own transmission, generation, distribution or industry and infrastructure electrical assets, Alstom can provide you with the adequate models and tools to meet your company objectives in terms of:

- **Reliability** - reduction of outages, assessment and mitigation of operational risks
- **Cost efficiency** - maximise asset life while optimising maintenance costs and hedging risk costs, with particular care taken for ageing infrastructures
- **Strategy** - get the information you need to establish your corporate asset investment plans and performance objectives with your regulator or shareholders
- **Organisation** - capitalise on electrical know-how in the context of an ageing work force and align your departments with consistent goals for increased efficiency

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For **power transformers**, Alstom offers options ranging from data collection by dissolved gas analysis (DGA) sensors up to the comprehensive monitoring of all transformer components: active parts, bushings, onload tap changers, cooling system and conservator.

For **gas-insulated switchgear**, Alstom has developed innovative digital gas sensors and advanced processing techniques. These can monitor and forecast gas density, localise internal arcs, monitor circuit-breaker conditions and analyse UHF partial discharge events.

For **circuit-breakers**, Alstom devices can monitor active parts, mechanisms and auxiliaries and provide advanced analysis such as: electrical wear calculation, arcing time, travel curve analysis, SF6 gas monitoring of density and leakage detection.
Network consulting

Anticipate tomorrow’s challenges for sustainable network reliability

Alstom proposes a range of power systems analysis and engineering solutions to get the most out of your assets - whether for new installations or to improve the efficiency and performance of existing infrastructures. Network consulting experts will support you at every step of your project:

- **Upstream** - feasibility, design, planning
- **Midstream** - performance testing and upgrade, component optimisation, transient stability analysis, dynamic interaction assessments and reliability studies
- **Downstream** - extension and evolution definition, post incident analysis

Reliability analysis tools offer electrical system managers effective ways to monitor performance and ensure supply quality for complex power systems. Beyond the standard power flow or short circuit calculations, these studies provide the information required to improve network reliability in a cost-effective and sustainable manner.

Our range of tested, tailor-made solutions for upgrading, expanding or even reducing your network, ensures that your system will operate reliably and safely.

As a leading industry system integrator, we have the global experience and expertise to analyse, specify and design network systems to meet your exact requirements.

Technical training

Power up your knowledge. Let the Grid experts train you!

Alstom Grid Technical Institutes offer a full range of training in electrical grid safety, operations and maintenance, protection, control and network management solutions - all near your location. These value-adding courses encompass all aspects of electricity from fundamentals to in-depth equipment knowledge. Trainees benefit from trainers’ field experience and expertise in modern techniques.

When considering operational performance, theoretical study is necessary, but not sufficient to optimise site personnel competence. What makes a real difference is the experience gained through practice.

At our Technical Institutes, training combines theory with practical hands-on experience on real equipment or in ‘sand boxes’ for software courses.

You can choose from a large range of training methods: tutored e-learning, classroom courses, hands-on, set curriculums, 3D modules and competence development programmes.

Alstom Grid Technical Institutes continuously improve existing training modules and develop new ones according to local regulations and new technologies, products and solutions.

Check out our interactive catalogue at: www.alstom.com/grid/solutions/technical-training
Air-insulated substations (AIS)

Alstom offers complete services for all current and legacy products, from circuit-breakers ranging from 66 kV up to 1200 kV, to disconnectors and instrument transformers:

- Strategic spare parts: hydraulic rams, interrupting chambers, supporting columns, spring mechanisms...
- Monitoring: stress assessment analysis for SF₆ circuit-breakers with spring mechanisms, synchronisation relays, SF₆ monitoring, continuous online monitoring...
- SF₆ management: leak detection and repair, gas quality & pressure checks...
- Renovation, modernisation, extension: turnkey generator circuit-breaker (GCB) retrofit, GCB mid-life overhaul, complete AIS component overhaul after 20 years of operation, disconnector motorisation, additional AIS bays.

Gas-insulated substations (GIS)

Alstom supports you in managing your GIS and extending their lifetimes, especially those installed in complex environments (populated areas, mountains, small areas...). A full range of services can be provided on GIS from 72.5 kV up to 800 kV:

- Strategic spare parts: gaskets, arcing contacts, closing and tripping springs, valves, compressors...
- SF₆ management: leak detection and repair, gas quality & pressure checks...
- Monitoring: SF₆ monitoring, partial discharge, UHF electromagnetic waves, continuous online condition solution...
- Renovation, modernisation, extension: overhauling after 25 years of operation, switchgear retrofits, minor or major modernisation, additional bay installation on all asset brands.
comprehensive services

Power electronics systems (PES)

To ensure the performance of your power electronics equipment (HVDC, FACTS, high current rectifiers and reactors, capacitor installations...), Alstom provides comprehensive service solutions, even in remote areas:
- Strategic spare parts: for DC and AC plants, management of obsolescence and emergency return to service
- Preventive and corrective maintenance in support of reliability, availability, maintainability (RAM) requirements
- Asset management with continuous online condition-monitoring and 24/7 support
- Renovation, modernisation, extension: overhaul after 20 years of operation, valve retrofits, upgrade from analog to digital control, electrical equipment modernisation with the latest technologies.

Power transformers (PTR)

Power transformers are critical for ensuring a sustainable supply of power with no outages. With the loss of insulation being irrecoverable, transformer failure risk can be minimised only if: oil quality is maintained, moisture is controlled, temperatures managed, incipient faults are detected and corrected and an overhaul is conducted at midlife. Our services include:
- Strategic spare parts such as bushings, tapchanger, fan motor, pumps
- Condition assessment with oil analysis and continuous online monitoring system
- Renovation, modernisation, extension: mid-life overhaul after 20 years in operation, oil processing and preservation upgrade, cooling upgrade for lifetime or power increase, ratio and voltage regulation adjustments to new needs, thermal upgrade with Nomex winding insulation, retrofit of Alstom and Third Party equipment.
A worldwide manufacturer with Alstom delivers continuous

Infrastructure | Traction transformer renovation
For a European transport company, Alstom conducts the complete half-life refurbishment services on more than 20 traction transformers operating for over 20 years.

Power generation | PTR fleet management
An American power generation company awarded Alstom a long-term contract to operate and maintain its entire transformer fleet, comprising of more than 650 transformers from different brands.

Industry | Voltage Source Converter upgrade
An American carbon and steel producer improved the reliability of its substation by having Alstom experts replacing control and valves plus adding continuous online monitoring system.

Power generation | Post incident analysis
Following a substation incident, Alstom investigated and then proposed a curative and preventive solution which avoided a country-wide blackout.

Industry | AIS spare parts management
A Brazilian mining company bought strategic spare parts stocks (245-300 kV circuit-breakers, instrument transformers, disconnectors) for its AIS substations to avoid disruption risks - and lowered its overall costs.

Utility | GIS renovation & monitoring retrofit
Alstom overhauled a Brazilian substation after 20 years of operations and modernised it by installing a Bwatch continuous online condition-monitoring system.

Utility | AIS and GIS long term maintenance
In 1996, a partnership was established with a Middle Eastern utility. Recently, Alstom was awarded a five-year maintenance programme on its 51 substations.

Oil & Gas | AIS competence development
Following the renovation of an AIS substation, Alstom trained 100 technicians to ensure the efficient and safe operations of the substation.
Alstom delivers continuous Utility | Offshore operations & maintenance

A utility entrusted Alstom to conduct operations and maintenance on its offshore 400 kV DC substation. The contract is over 3 years and includes training.

Oil & Gas | Transformer renovation

In the Middle East, a petrochemical company entrusted Alstom with its transformer renovation and modernisation project. This included the refurbishment of six rectifier transformers with Nomex® insulation.

Utility | AIS and GIS long term maintenance

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Power generation | AIS spare parts

A power generation company in China set up strategic spare parts stocks and an emergency support contract with Alstom to limit disruption risks.

Industry | Transformer refurbishment

A European aluminium company selected Alstom for the refurbishment of two transformers built in the 1970’s. One was a legacy product of Alstom, the other was from another OEM.

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Power generation | GCB retrofit & PTR overhaul

A leading Australian power generator awarded Alstom with the contract for a generator circuit breaker (GCB) retrofit on third party equipment and the overhaul of 112 transformers over 3 years.

Utility | HVDC operations & maintenance

Alstom conducts a three-year operations and maintenance contract on a 400 kV interconnection and 1800 MW HVDC back-to-back installation in the Middle East.

Industry | AIS spare parts management

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Utility | Asset management

Alstom conducted the full condition assessment of 10,000+ distribution substations for a Middle Eastern utility. This included inspection data integration and analytics via our eterra AssetCare software.

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Infrastructure | GIS operations & maintenance

Alstom supports two Indian airports in operating and maintaining their 110 kV substations. The contract includes emergency support, service level agreement (SLA) and training for 5 years.

Utility | GIS extension

An Asian utility, with the support of Alstom, conducted several extensions on Alstom and third party 245 kV and 300 kV GIS substations.

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Alstom

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

Alstom builds the fastest trains 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 and wind, and it offers a wide range of solutions for power transmission, with a focus on smart grids.

Grid

Alstom Grid has one clear mission: to develop innovative solutions for a flexible, reliable, affordable and sustainable electrical grid throughout the world.

Active in power transmission and distribution, Alstom Grid designs, manufactures and services the products and systems that empower the planet’s low carbon economy. It ranks among the top three players in the electrical transmission sector, with an annual sales turnover of €3.5 billion.

With over 130 years’ experience, Alstom Grid has become a trusted partner for all of its energy customers, from the source to the smart city.