FACTS
Solutions to optimise network performance
Our worldwide presence:
Better solutions for your network all around the world

Our field of expertise

- Evaluation to installation
- Feasibility studies
- System design and execution of turnkey FACTS solutions (SVC, STATCOM, FSC and TCSC)
- Studies and project management
- Line commutated converter valves, using thyristors of up to 125 mm/8.5 kV
- Voltage-source converters using IGBTs
- Fully digital control based on high performance processor units
- Installation, commissioning and testing
- Training and maintenance
- Service of 24/7 on-line monitoring.
Alstom Grid offers customers a solution to save energy and to improve power quality by reactive power compensation and harmonic filtering

Improved power quality, increased capacity and controllability of an existing network can be provided through the application of innovative technologies.

Power electronics-based equipment, including Flexible AC Transmission Systems (FACTS), provide proven, dynamic and cost-effective solutions to address these new operating challenges.

More and more, the installation of FACTS equipment is widely recognised by network suppliers and industrial energy managers. Grid operators can gain accurate control of reactive power in the network, maximise power flow along existing lines and improve steady-state and dynamic stability within the system.

FACTS solutions installed in an industrial power supply give the energy manager control over stability and manage acceptable voltage fluctuations created by rapidly varying reactive power demands. The results are increased productivity, reduced utility charges and improved equipment life.

FACTS technologies provide the customer with a flexible solution that has minimal infrastructure investment, low environmental impact, and rapid implementation time.

A pioneer in series compensation development

**FSC main components**

- Capacitors
- Spark gap
- Damping reactors
- By-pass breaker
- Control

**FACTS environmental benefits**

- Reduce need for new transmission line or new generation
- Reduce losses on network and increase use of power generated
- Reduce footprint with installation on existing substations
Innovative products

As one of the world’s leading providers of grid solutions and a global leader in power electronics, Alstom Grid has developed a range of cost-effective solutions to ensure optimal power quality and security. Power quality optimisation means asset utilisation maximisation, enhanced service quality and reduced operating costs. Our comprehensive portfolio of FACTS devices is dedicated to enhancing the power quality and performance of our customers’ AC transmission systems around the world.

Alstom Grid FACTS solutions include:

**Fixed and Relocatable SVCs** (Static VAr Compensators): dynamically variable sources of reactive power to stabilise the network voltage, damp system instabilities and reduce flicker for both transmission and industrial applications.
**SVC MaxSine STATCOM**: Very fast voltage source converter-based compensators which, compared to SVCs, offer improved range of operational voltage, a faster response and a smaller site area.

**FSC** (Fixed Series Capacitors): switchable banks of capacitors inserted in series with a line to compensate for the inductive voltage drop in the line, effectively allowing power transmission over greater lengths of line.

**TCSC** (Thyristor Controlled Series Capacitors): similar to FSCs but provide dynamic controllability of power flow and can mitigate the effects of sub-synchronous resonance.
With FACTS, gain greater flexibility in network operation with the ability to deliver optimum power

Reactive power compensation
Electricity suppliers charge for all the power they deliver – not only the active power needed to drive motors, but also the reactive power needed, for example, to maintain the magnetic fields of motors.

Only part of the reactive power is included in the price for electricity. If the reactive power is generated by a power plant, the distribution system and all the equipment have to be dimensioned to cope.

The capacity has to be much higher than is actually needed. It is therefore sensible to generate the reactive power where it is needed. The benefits are:

- Correct dimensioning of distribution system and equipment brings savings at source
- No need for reinforcement of transmission or distribution systems
- Cheaper electricity rates, no reactive power charges.

Harmonic filtering
In connection with reactive power compensation, power quality should also be considered. Harmonic filtering reduces the risk of technical faults and disturbances. Voltage distortion resulting from harmonic currents is caused by inverters, DC drives, fluorescent lighting, converters, arc furnaces, etc. In practice, harmonic currents are everywhere. Harmonic filtering brings a number of bonuses:

- Minimised disturbances in telecommunications and data transmission
- Electronics, control systems, converters, motors and generators operate without interruption
- No resonance, no measurement errors, less transmission losses
- No risk of overloading cables, nuisance tripping of relays or fuses

Poor power quality may remain unnoticed for a long time. Quality deficiency may easily bring extra costs in the form of high electricity bills and an oversized power system.

High voltage equipment
High voltage power capacitor units include a wide range of one and three-phase all-film dielectric power and surge protection capacitor units.

Featuring the most modern technology, they are produced to meet the requirements of different climatic and operating conditions. The capacitor banks can be open rack or enclosed, high or low power, fixed or automatically controlled, integrated or for use with individual motors. Harmonic filters are an economical method of compensating and reducing harmonic currents caused by non-linear loads.

Harmonic filters are individually designed to meet the customer’s specific requirements.

Air-Core Reactors (ACR)
Air-core, air-cooled, dry-insulated reactors are manufactured for different applications. The range includes series, damping, filter, discharge, shunt and SVC reactors. The advanced production technology ensures excellent mechanical and electrical properties even under extreme weather conditions.

Series capacitors
Series capacitors are used for a more efficient use of transmission lines. The diversification of generation, transmission and distribution in addition to long transmission distances and large generating power plants result in increased demand for economical and reliable operation of the transmission system. Demand for increasing power transfer means either new parallel
transmission lines or compensating the existing ones. Series compensation is an economical method of improving the power transmission capability of the lines. Series capacitors increase power transfer capability, improve system stability, reduce system losses, improve the voltage profile of lines, and optimise current sharing between parallel lines. The cost of a series capacitor bank is typically only about 10% of the cost of a new transmission line. Thus the payback time for the series capacitor bank investment is typically only a few years.

**Static VAR Compensators**

Disturbances in the normal operation of transmission lines and industrial distribution systems may be caused by line switching, line faults, non-linear components such as thyristor controls and rapidly varying active or reactive loads. Problems caused by harmonics, need for additional reactive power, voltage fluctuation, flicker phenomena, unbalanced loads and rapid changes in reactive power can be solved by a Static VAR Compensator (SVC). The SVC is designed to give an individual solution, based on standard components, to meet each customer’s needs.

**SVC MaxSine STATCOM**

SVC MaxSine is the fastest high power compensation equipment in the market. It is a modular compensation system based on proven power electronic units (PEU). Due to the modular design, the size of the compensation system can easily be adjusted to the customer’s needs. SVC MaxSine can compensate fundamental reactive power, control voltage and eliminate harmonic current depending on the selected operation mode with a high dynamic performance, with the aim of stabilizing the grid voltage and minimizing any transient disturbances.

With more than 300 Static VAR Compensators (SVC) and over 100 Fixed Series Capacitors (FSC) delivered throughout the world over the past 50 years, we are recognised as a technology leader. Our solutions increase your network reliability and efficiency.