AGILE DIGITAL SUBSTATIONS
Releasing the potential of digital technologies
After more than 15 years of advanced research and projects around the world, Alstom Grid’s digital substations now deliver the great potential of this technology: interoperability, ease of configuration, maximised reliability and availability, real-time performance, Smart Grid communications capabilities and reduced cost of ownership.

Solution continuity from conventional through to non-conventional substations is ensured, thanks to IEC 61850 compliance.
An investment with many rewards

Alstom Grid agile digital substations
- Based on the IEC 61850 unifying communication standard for complete information sharing and interoperability allowing future modernisation and the integration of new systems
- Digital Control Systems connected with the primary bays via a process bus built on redundant Ethernet architectures. Merging and control units collect and translate measurements, indications and commands (I/O) from the primary equipment into sampled values and GOOSE messages and vice-versa
- Digital instrument transformers and HMI (Human Machine Interface)- integrated condition monitoring systems for the primary equipment can be added, providing superior substation situational awareness locally and remotely

Optimise your operational costs
Asset managers now have a critical tool that, with less wiring and fewer commissioning tests, optimises preventive maintenance and can extend the lifetime of the entire substation, including third party plant items.

Alstom Grid’s digital solutions:
- Maximise the reliability of your substation
- Operate assets more efficiently and safely close to the limits of the system
- Optimise maintenance, repair and retrofit of equipment with minimal outages

Complete and adaptable solutions
Alstom Grid’s digital substation solutions are available for:
- Retrofit and extension schemes, as they reinforce conventional tools and systems
- New substations

The particular solution and architecture can be adjusted to meet your operational needs according to how critical your asset and substation is to the network.

Extensions and modifications are easier, as the substation functions via software, not hardware.

Michel Augonnet,
Senior Vice-President, Alstom Grid Commercial Solutions

Extended communication for more accurate substation awareness...

Digital technologies have brought many benefits to the strategic field of transmission networks and specifically in substations. Digital technology at station bus level is widespread today and has also extended to process busses at the primary equipment level. As a company committed to research and a key player in the industry, Alstom Grid has worked with the utility and industry community towards greater standardisation and use of the common standard IEC 61850 since 1995.

Following years of extensive laboratory research, rigorous test platform acceptance programmes and more than 3,000 digital control systems installed worldwide, Alstom Grid digital substation solutions are now ready for use in an integrated architecture combining cutting-edge hardware, software and communication with technology engineering to IEC 61850 specification standards.

As a global leader in electrical grids, offering a complete range of digital hardware and software, Alstom Grid is uniquely placed to deliver tested, interoperable solutions based on optical fibre and digital communications that will remain sustainable over time and thus provide the significant benefits systems operators are entitled to expect.

Throughout these pages, I invite you to discover the principles and main benefits of Alstom Grid’s agile digital substations, how the architecture is built and how we can tailor our technology to your needs.
Driving digital substations

Alstom Grid’s digital substation - the benefits

Increased reliability and availability

The extensive self-diagnostic capabilities of digital devices ensure the maximised availability of the substation, as well as its full suite of functionalities: any degradation in the performance of an asset is pinpointed in real-time.

The inherent redundancy built into the system can be employed to self-heal maloperation, and permits troubleshooting without the need for primary system outage.

Optimised operation of assets

The intelligence within digital substation schemes allows close monitoring of the load capacity of plant equipment, based on their design ratings. This dynamic load analysis means that lines, cables, transformers and other grid equipment can operate closer to their limits.

Improved safety

- Removal of wired cross-site CT (Current Transformer) circuits reduces the risk of fatal injury due to inadvertent opening of the circuit by personnel
- Absence of oil in transformers reduces explosion risks
- Advanced self-monitoring of substation assets ensures that they are operating within safe limits

Reduced maintenance costs

The digital substation closely monitors all substation assets in terms of operational conditions, effective load capacity and asset health indicators. Intelligent systems analyse the data and provide recommendations on maintenance and repair actions. This allows a shift to predictive maintenance, avoiding unplanned outages and emergency repair costs.

Investment optimisation

The capital cost of investment projects is reduced on many fronts:
- Savings on the time needed to engineer and install substations
- Reduced real-estate needs
- Copper cabling is cut by up to 80% through the use of optical fibre
- Asset optimisation tools allow faster targeting of weak areas which need to be reinforced, allowing for reduced operational costs

Easier renovation and extension of existing substations

Interoperable solutions and the use of optical fibres instead of copper wires reduce the duration and costs of unavailability of substations during the refurbishment phase of secondary equipment. This also applies to extension works.

Standardisation and interoperability

IEC 61850 compliant, Alstom Grid digital solutions and substations are designed to be interoperable with other vendors’ equipment, with a strong degree of standardisation at the interface level of secondary equipment systems.

Improved communication capabilities

Data exchange between intelligent devices, in situ and inter-substation, is optimised through Ethernet communications. Smart local and wide area control units allow data exchanges between voltage levels within substations and between substations.

IEC 61850: a crucial technology enabler

Modern sensors and other Intelligent Electronic Devices (IEDs) must be connected to communicate within the substation and over the greater grid system. In the past, there were many different protocols requiring much effort to make them communicate with each other. Insufficient standardisation, fear of degraded reliability and lack of return on investment slowed down the emergence of the fully digital substation. But today, the IEC 61850 standard makes it possible to facilitate interoperability between different equipment and suppliers.

Introduced in 2004, the IEC 61850 standard is increasingly accepted across the world, as its main objective is to ensure interoperability between equipment coming from various suppliers. IEC 61850 continues to evolve and encompass the needs identified by the industry’s user group (UCA UG), ensuring that it caters to all substation needs. IEC 61850 is rapidly being enriched as new application areas are continually added, most notably IEC 61850-8-1 and IEC 61850-9-2.

IEC 61850-9-2

IEC 61850 is the international standard for Ethernet-based communication in substations. It is more than just a protocol, it is a comprehensive standard designed for utilities, to deliver functionalities that are not supported in legacy communication protocols.

IEC 61850 defines a domain specific data model (data and services) supporting all functions required in substations. These unique characteristics can significantly reduce costs associated with designing, installing, commissioning and operating power systems.

IEC 61850 is designed for interoperability and longevity, removing the dependence on one supplier and one generation of IEDs.

IEC 61850-8-1

IEC 61850-8-1 is the relevant standard for the station bus. It defines the means to generate and present reports which may be subscribed to by other devices and HMIs (Human Machine Interfaces) as well as the way to communicate peer-to-peer. The latter is achieved by the exchange of GOOSE messages between devices on the LAN (Local Area Network).

IEC 61850-9-2

IEC 61850-9-2 is the part of the standard that brings non-conventional instrument transformer technology into play, breaking the constraints of conventional CTs and VTs. It is particularly important for the process bus, as it describes how analog signals such as phase currents and voltages can be exchanged as sampled values.

Denis Chatrefou, Alstom Grid Research & Development, Digital Substation Coordination

“As a driving force in the development of the standard, Alstom Grid is proactive in the support, maintenance and development of IEC 61850 and its components. We have developed an integration platform for interoperability tests of digital systems in their real configuration before installation in the field. We will continue to work to make sure that this standard delivers its significant potential benefits to transmission and distribution system operators. We will also endeavour to develop technologies and solutions that are instantly interoperable with other vendors’ equipment and compatible with future generations of software and hardware.”
The architecture of Alstom Grid digital substations

Alstom Grid’s digital substations rely on the newest DS Agile digital control system that provides the complete architecture, connecting all the components, together with the operator interface, through an IEC 61850 Ethernet network.

DS Agile digital substation solutions are highly scalable in terms of equipment, functions, architecture and services.

The digital substation architecture can be divided into three levels

1. The process level

A digital substation is based on a communicating architecture, where real-time operational measurements and other data are polled from the primary system by sensors embedded within the primary system. This data is communicated to devices which must act on those measurements (pressure or temperatures in GIS switchgear, current and voltage measurements) via a “process bus”.

Most important is that smart devices and systems within the substation, (protection relays, recorders, phasor measurement units, bay controllers, wide area controllers) can immediately process this data. By subscribing as clients to this data flow over an Ethernet process bus, the information from the “eyes and ears” of the power system is distributed and communicated much more efficiently to the bay level than in conventional hardwired schemes.

The process bus is also the link by which the primary equipment information from out in the yard travels back to the substation control room.

In a fully digital architecture, control commands are also routed to the primary devices via the process bus.

The process bus, therefore, enables time-critical services.

2. The protection and control level

Between the process bus and the station bus are devices identified as “secondary equipment”.

In the digital substation, these devices are IEDs (intelligent electronic devices), interacting with: the field via the process bus; with other peer devices in the bay; with other bays, and with the digital control system via the station bus. They are designed to provide the Smart Grid applications demanded by utilities via real-time and secure equipment. They provide interoperable solutions, stability applications, wide area protection & control plans, and more generally, substation situation awareness.

Key components are: the protection relays, bay controllers, switches and Ethernet network, measurement and recording devices, substation proxy, the operator user interface within the substation control room, time synchronisation units, security applications and the panels where all this equipment is commissioned and energised. IEC 61850 communications enable complete integration between devices. It ensures optimal use of the information for the continuity and reliability of electrical grid operations in secured access situations.

3. The station control area

The digital substation station bus is much more than a traditional SCADA bus, as it permits multiple clients to exchange data, supports peer-to-peer device communication and links to gateways for inter-substation wide-area communication.

The IEDs perform their time critical functions such as protection, point-on-wave switching supervision and other tasks via direct interaction with the process bus.

Additionally, other clients in the substation may require information-sharing of some or all of this data. For example, protection and control schemes may be distributed amongst multiple IEDs.

There is also the need to distribute the information to local or remotely-stationed control operators so they can visualise the operational status of the substation in real-time. This requires substation HMIs, proxy server links to remote HMIs and control servers. One or more workstations can apply the instructions assigned by regional dispatchers, or can be used as an engineering workstation for IED configuration, or for local concentration and archiving of power system data. On-line condition monitoring may have specific workstations for alerts and to manage the database history of each primary device.

A typical Alstom Grid digital substation solution incorporates many components, all designed for optimal inter-operability, data retrieval, protection and control capability and remote settings. Its architecture is organised on three levels:

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Digital instrument transformers

Decades of extensive research by Alstom Grid has delivered proven non-conventional instrument transformers, designed to be accurate, intelligent, safe, cost-effective – and very importantly – core-less.

The root of many of the limitations of conventional instrument transformers is their reliance on an iron core. The core is a source of inaccuracy, due to the need to magnetise it, but not to overflux it. In the case of conventional CTs, achieving the low-level accuracy and dynamic range to satisfy both measurement and protection duties is a challenge. Conventional VTs may experience ferroresonance phenomena resulting in thermal overstressing.

Instead of an iron core, the translation from primary to secondary measurement uses optical, Rogowski or capacitive technology, with the optimal choice for AIS (air-insulated substation) and GIS (Gas-Insulated Substation) equipment driven by the size of the respective digital device, which allows size optimisation for the switchgear.

A wide array of sensors monitor conditions in real-time thanks to multiple applications: diagnostic analysis, asset management and condition-based maintenance.

- Optical sensors use the Faraday effect. A fibre optic loop sensor carrying a polarised light beam encircles the power conductor. This light will experience an angular deflection due to the magnetic field, generated by the primary current flow. The sensor’s intelligence is to accurately determine the primary current based on the real-time optical measurement.

- Rogowski sensors dispense with the conventional CT core and instead implement windings as tracks on a multi-layer printed circuit board. Four quadrants of the board are clamped together to form a toroid around the primary conductor. The sensor output becomes a low-level voltage measurement, which can be accurately correlated to the primary current.

- Capacitive dividers dispense with the conventional VT core. Capacitors are built from slimline film stacks for AIS sensors or printed circuit board electrodes laid on the interior of the enclosure for GIS sensors.

Alstom Grid’s offer...

Measure

Alstom Grid COSI (COmpact Sensor Intelligence) solutions:

<table>
<thead>
<tr>
<th>Device Description</th>
<th>AIS</th>
<th>GIS</th>
<th>AC</th>
<th>DC</th>
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<tbody>
<tr>
<td>Optical Sensor</td>
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<tr>
<td>Faraday optical technology devices:</td>
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<tr>
<td>COSI-CT: Composite optical CT</td>
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<tr>
<td>COSI-CT F3: Flexible, portable optical current sensor</td>
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<tr>
<td>Rogowski Sensor CT</td>
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<tr>
<td>COSI-RECT: Rogowski coil for current measurement</td>
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<tr>
<td>COSI-Rogoflex: Flexible Rogowski current sensor</td>
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<td>Capacitive Sensor VT</td>
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<tr>
<td>COSI-VF: AIS voltage transformers</td>
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<tr>
<td>COSI-CEVT: GIS voltage transformers</td>
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</tbody>
</table>

Customer benefits

- Enhanced safety: no risk of explosion, no wired CT secondary circuit running cross-site
- Measurement precision coupled with protection dynamic range
- No saturation, ferroresonance or unwanted transients.
- Long-term accuracy
- Outstanding seismic resilience
- Unparalleled reliability and availability with full self-diagnostics
- Lightweight, compact and flexible
- Minimal inventory, near-zero maintenance
- Harmonic monitoring
- Online condition monitoring
Alstom Grid’s offer...

Converters
Alstom Grid digital substations optimise the amount of electronics residing in potentially harsh outdoor environments.

The primary converters convert analog signals from the primary equipment into digital signals. Primary converters can be installed either directly in primary plant hardware or in cubicles.

Digital controllers (switch control units) are the fast, real-time interface to switchgear, mounted close to the plant which they command. They replace the hardwiring of inputs and outputs with an Ethernet interface to the yard.

Merging units
Merging units perform all the digital data processing necessary to produce a precise, time-aligned output data stream of sampled values according to the IEC 61850-9-2 standard. This processing includes tasks such as sampling, analog to digital conversion, scaling, precise real-time referencing and message formatting.

The design may vary with the applied technology of the instrument transformers (eg: optical, Rogowski, voltage dividers, or conventional wound instrument transformers), the switchgear type, mounting space available and also with the preferred substation communication architecture.

<table>
<thead>
<tr>
<th>Device</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS Agile SCU</td>
<td>Switchgear controller unit: Processes the I/O signals from/to the primary switchgear as IEC 61850-8-1 GOOSE messages</td>
</tr>
<tr>
<td>MU Agile AMU</td>
<td>Standalone compact merging unit: Digitising of conventional 4A/5A and 100/120V analog secondary circuits</td>
</tr>
<tr>
<td>MU Agile XMU800</td>
<td>Modular digital merging unit: Interfaces with multiple primary converters in the field</td>
</tr>
<tr>
<td>MU Agile XMU820</td>
<td>Modular merging unit: Interfaces with digital and conventional instrument transformers</td>
</tr>
<tr>
<td>MU Agile NXMU</td>
<td>Modular merging unit: Interfaces with COSI optical CTs and conventional VTs</td>
</tr>
</tbody>
</table>

Customer benefits
- Interfaces with all types of power system current and voltage sensors, whether digital instrument transformers (DIT) or conventional CT/VT
- Ensures accuracy of protection applications up to highest fault currents and X/R ratios
- Ensures measurement accuracy

Digital pioneers in the field
With multiple reference sites in different countries, Alstom Grid has been involved in the development of the various components of the digital substation for many years. We have gained precious experience in our IEC 61850 pilot projects that puts us in a strong position to meet the demands of utilities for instantaneous operability and backward compatibility of multi-vendor equipment.

Focus on 3 projects
- **Federal Grid Company of Unified Energy System (Russia), Nadezhda** - 110 kV double-bus and 220 kV breaker and a half substation
  Supply of process bus protection relays and bay controllers, digital control systems, CCS panels, merging units and engineering.

- **RTE (France), Saumade** - 245 kV GIS substation with hybrid sensors, MU and distance protection
  DIT based on Rogowski coils and capacitors, connected to the merging unit and interfacing digitally with distance protection relays provided by Alstom Grid and a third party.

- **GETCO (India), Jambua AIS Substation**
  243 kV COSI-CT based on optical sensor technology (Faraday effect), connected to the merging unit and interfaced digitally with Alstom Grid distance protection by IEC 61850-9-2 process bus.
Alstom MiCOM is a complete range of IEDs designed for digital substation architectures. The full range of transmission protection is included, from the simplest back-up device, to subcycle tripping main protection schemes. In a fully-digital architecture, the relays receive currents and voltages as IEC 61850-9-2 sampled values and issue trip or alarm signals using IEC 61850-8-1 GOOSE. The flexibility of MiCOM allows you to adopt new technology tailored to match your pace of change – from initial station bus digital integration, up to full station and process bus schemes. The following table indicates the typical relays selected, and their main functions:

<table>
<thead>
<tr>
<th>Device</th>
<th>Principal Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>MiCOM Alstom P446</td>
<td>Subcycle distance protection with integral teleprotection and one or two breaker reclosing</td>
</tr>
<tr>
<td>MiCOM Alstom P546</td>
<td>Line differential for 2 or 3 terminal lines with subcycle distance and one or two breaker reclosing</td>
</tr>
<tr>
<td>MiCOM Alstom P645</td>
<td>Transformer differential for up to 5 ends with advanced loss-of-life thermal monitoring</td>
</tr>
<tr>
<td>MiCOM Alstom P746</td>
<td>Digital busbar protection for centralised smaller schemes up to large decentralised bus configurations</td>
</tr>
<tr>
<td>MiCOM Alstom P841</td>
<td>Transmission line terminal IED for backup, reclose and breaker fail management</td>
</tr>
<tr>
<td>MiCOM Alstom C264P</td>
<td>One-box solution feeder protection with control and bay mimic diagram</td>
</tr>
</tbody>
</table>

Also available, the MiCOM P847 phasor measurement unit offers industry-leading accuracy and dynamic response to frequency excursions.

The MiCOM P594 provides the precision clock source reference for merging units and phasor measurement units in the substation.

Alstom MiCOM IEDs extend their supervision facilities to address and check the plausibility of the incoming sampled values from the process bus. This addresses the fact that the traditional task of current and voltage sampling is now external to the device, and is connected via Ethernet. The supervision compensates for any latency or mismatch in the network, provides ride-through intelligent compensation in the event of several missing samples or jitter, and blocks/alarms if the quality of incoming data compromises the secure and reliable operation of the IED.

Customer benefits

- Proven algorithms of conventional applications remain unchanged, no need for reapproval
- Time-critical performance is maintained irrespective of the architecture, number of functions enabled, or extent of logic programmed
- Safer test and maintenance operations for technicians – no wired CT secondary circuit exists
- Accurate measurement capabilities – as accurate as the incoming -9-2 data itself
- Station bus communication redundancy available: PRP (Parallel Redundancy Protocol) and RSTP (Rapid Spanning Tree Protocol)
Control and Monitor

Redundant architectures

DS Agile architectures can be set up as a self-healing ring (HSR protocol) or dual-homing star (PRP protocol); both of which are fully redundant, eliminating outages.

Fibre optical networks link all the system’s components together and with the operator interface (HMI), via a full range of Ethernet switches that provide full reliability and interoperability.

Substation automation

<table>
<thead>
<tr>
<th>Devices</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS Agile bay controllers (C-series)</td>
<td>Alstom’s IEC 61850-compliant bay controllers, like the C264, provide embedded or programmable fast automation (automatic voltage regulation, synch-check, auto-recloser, busbar transfer, etc.), backup feeder protection, data concentrator, events and waveform recorder, hot standby redundancy etc.</td>
</tr>
<tr>
<td>DS Agile OI</td>
<td>Real-time, user-friendly Operator Interface (OI) for complete substation automation</td>
</tr>
</tbody>
</table>

Substation/grid control room communications

The digital substation benefits from a wide-area network interface, receiving and responding to the data from its extensive array of sensors and IEDs. It can be integrated as part of the grid operator’s wide area control systems and defence plans, as the data from Phasor Measurement Units (PMUs) is concentrated and relayed from the substation to the control centre and analysed by online stability solutions to track current oscillations and anticipate incidents.

Cyber security

The digital substation brings increased cyber security capabilities, as intrusion protection and protection against virus attacks are integrated in switches and IEDs. Cyber security provides protection against unauthorised access to equipment and unauthorised transfer, modification or destruction of data – whether deliberate or accidental.

Customer benefits

- Reduced unscheduled outages and repair times
- Reduced routine maintenance costs
- Increased equipment life expectancy
- Frees-up skilled personnel for remote diagnostics and operation centres

Alstom’s digital substation sensors and control systems work seamlessly with its software platforms for grid operator control rooms, allowing a real-time data exchange both at the substation operational data level and at the asset management data level. This substation / control room communication introduces smart grid capabilities to the network, bringing complete synergy between field equipment operations and network management systems.

The networks can be local to the substation or they can interconnect several dispersed substations, and all are linked to the grid control room through gateway solutions.

Inter-substation or inter-voltage level automation exchanges GOOSE messages for:
- Logic selectivity
- Auto-reclose and fault location
- Automatic setting of the relays

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The digital substation brings increased cyber security capabilities, as intrusion protection and protection against virus attacks are integrated in switches and IEDs. Cyber security provides protection against unauthorised access to equipment and unauthorised transfer, modification or destruction of data – whether deliberate or accidental.

Customer benefits

- Reduced unscheduled outages and repair times
- Reduced routine maintenance costs
- Increased equipment life expectancy
- Frees-up skilled personnel for remote diagnostics and operation centres

Alstom’s digital substation sensors and control systems work seamlessly with its software platforms for grid operator control rooms, allowing a real-time data exchange both at the substation operational data level and at the asset management data level. This substation / control room communication introduces smart grid capabilities to the network, bringing complete synergy between field equipment operations and network management systems.

The networks can be local to the substation or they can interconnect several dispersed substations, and all are linked to the grid control room through gateway solutions.

Inter-substation or inter-voltage level automation exchanges GOOSE messages for:
- Logic selectivity
- Auto-reclose and fault location
- Automatic setting of the relays

Cyber security

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Control and Monitor

On line condition monitoring and asset management

On line condition monitoring functions are essential for power transformers, circuit-breakers, disconnectors and gas-insulated switchgear.

Physical parameters are continuously monitored and real-time measurements are combined and compared to models in order to generate specific recommendations for operations and maintenance, as well as alarms when necessary.

Expert software providing additional advance warnings, automatic diagnostics and maintenance suggestions will boost the efficiency of asset management. An interface with an asset management system yields additional features such as remaining lifetime or dynamic rating capabilities.

This architecture gives operational and maintenance teams an overview of the condition of all substations in real-time, so they can make appropriate strategic asset management decisions.

<table>
<thead>
<tr>
<th>Device</th>
<th>Principal applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTWatch M53000</td>
<td>Power transformer condition monitoring; expert system for data management throughout the life-span of the power transformer, with scalable range of sensors and modules for on line continuous monitoring of all major components of the transformer (active parts, bushings, tap-changer and cooling system)</td>
</tr>
<tr>
<td>BWatch</td>
<td>GIS bay condition monitoring; interactive diagnostics, acquisition of pressure and temperature, threshold management, leakage, density and liquefaction calculation, internal arc location, enclosure overheating detection</td>
</tr>
<tr>
<td>PDWatch</td>
<td>Partial discharge condition monitoring for GIS</td>
</tr>
<tr>
<td>GISWatch</td>
<td>Integrated bay &amp; partial discharge condition monitoring for GIS</td>
</tr>
<tr>
<td>CBWatch</td>
<td>Circuit-breaker condition monitoring: moving part timings and travelling curves; main contact wear; drive energy and auxiliary parts are continuously monitored</td>
</tr>
<tr>
<td>DWatch</td>
<td>Disconnector condition monitoring</td>
</tr>
</tbody>
</table>

Services and technical training for agile digital substations

Alstom Grid is committed to bringing you the support you need throughout the lifespan of your substation. Armed with the accurate information received from our installed monitoring modules and supported by 100 years of manufacturing experience, we can provide a full assessment to evaluate your equipment in real time. This assessment allows us to define the scope of maintenance operations and plan actions for future execution (planning, operations, repairs, network improvement, extension, replacement) to ensure the reliability of your electrical system. To maximise your asset performance and investment, Alstom Grid offers long-term operations and maintenance agreements, including 24/7 service centre assistance.

Alstom Grid provides technical training on digital substations to develop the in-house technical knowledge and skills required to operate and maintain a digital substation at peak performance. By gaining hands-on experience and enhancing their technical skills in one of our Technical Institute centres, your teams can improve their performance and efficiency in their daily work.

All around the world, the Technical Institute offers a full range of comprehensive training in: electrical safety, operations & maintenance, protection & control and network management solutions.

Digital retrofitting and extension of substations

Alstom Grid’s engineering teams can interface with any system, whatever its age or generation. We provide stage-by-stage extensions, whilst keeping the remaining circuits safely in service.

Alstom Grid has developed simple tools that enable operators to manage their substations easily and safely while identifying problems quickly. We provide a fully documented solution with clear instructions on interconnecting, testing and commissioning. Moreover, extension and retrofit solutions in the future will not require the original manufacturer to be involved, as everything is designed for interoperability.

Alstom’s agile digital substation offers unprecedented performance using intelligent primary systems and tailored automation solutions.