Power generation and renewables
With Relion® 670 and 650 series.
Power of one solution
For protection and control.

Electricity is traditionally produced on a large scale, with centralized thermal (such as nuclear, coal, biomass or natural gas) or hydroelectric power generation plants. This form of power generation still dominates, but huge strides in power technology and environmental pressure are pushing renewable generation sources like wind and solar into the energy mix.

ABB grid automation delivers automation, high-voltage protection, control and monitoring solutions for today’s power networks and generation stations, ensuring they are ready for tomorrow’s challenges.

ABB’s portfolio of reliable, innovative products is based on more than a century of practical, real-world experience in the electricity sector. Our solutions for digital substations and smart grids capture real value, and make ABB the ideal partner for power sector customers around the world.
**Relion® the power of one solution**

For power generation and renewables.

We deliver secure power generation solutions by continuously adapting to the active system situation, guaranteeing reliability and performance.

**Thermal power plants**

Burning natural gas, coal, diesel oil, biomass or using nuclear fission to create steam, which in turn drives turbines and generators is how most electrical power on earth is presently produced, and thermal power generation will remain an integral part of the energy mix for a very long time. As the grid and the machinery connected to it become ever larger and more complex, reliable sources of quality power are crucial for its stability.

**Hydroelectric power plants**

Moving water is the oldest green technology, which has produced energy for mankind for thousands of years, and electricity for more than a century. Hydro generation continues to play a significant role in modern power networks as a load balancer and as a source of cheap, renewable energy. Although in many regions many of the most accessible hydro locations have been developed, pumped storage upgrade solutions are breathing new life and interest in existing installations. In regions with untapped renewable generation potential, hydro helps to integrate other renewable sources such as wind and solar power into the network, by providing stability and storage capacity.

**Renewable generation**

Sustainable power, such as solar photovoltaic, large and small hydroelectric and wind turbines deployed either onshore or offshore are part of the power generation future. Their deployment in our electrical networks is steeply on the rise and only expected to increase in the future, but this is not always an easy process.

Utility-scale renewable generation is typically situated in remote, difficult to access locations, such as far out to sea, in a desert or on a mountaintop, which means they require advanced protection and control equipment to ensure a reliable connection to the grid.

**Generator**

A generator is one of the most complex and essential pieces of electrical equipment in a power station. Without it no electricity will be produced, so unnecessary outages and undue stress on the generator are to be avoided at all cost.

**Transformer**

Step-up and auxiliary transformers are high value, difficult to replace assets that are as much a part of a generator protection solution as the generator protection device itself. Step-up transformers can potentially be exposed to a much larger frequency range than conventional transformers, and may also face very different conditions during fault and through fault incidents because of their proximity to the generator.

A protection solution for every component

ABB’s Relion family of IEDs delivers control, protection and monitoring solutions that protect these vital generating assets. With its proven reliability, high accuracy and high performance operation, the Relion series can be used for the most demanding applications.

Advanced control capabilities and system modeling, such as given by IEC 61850 will give you new ways to design and dynamically operate your network or power plant. And in the smart grid, information is of vital importance, so advanced and accurate PMU (phasor measurement unit) functionality will present you with the information you need to make your smart grid truly smart.

Technology may change, but safety, quality and reliability remain the top requirements of any power generation source. Whether the generation solution is large or small, centralized or distributed. In the end, every minute not spent producing energy has tremendous financial and social consequences.

ABB is at the forefront of the digitalization that is sweeping over the power generation space. Our digital substation portfolio enables customers to build for the future - today, while still enjoying the long-term ABB know-how and support of the existing market.
Renewables, protection and control
Relion® REG670

Relion REG670 Intelligent Electronic Device (IED) is a protection and monitoring solution for generators, prime movers and step-up transformers in hydro, pumped storage, gas fired, combined cycle, steam, and cogeneration power plants. It delivers excellent, flexible and scalable generator protection performance in new installations and refurbishment projects around the world.

Supported by ABB’s extensive experience in generator protection solutions, REG670 achieves a new level of performance with up to 24 analog inputs, and the availability of IEC61850-9-2 process bus technology. Main and back-up protection can be integrated into one IED, and additional components like transformers can be included in the scope of protection. This reduces the number of IEDs needed to protect the generating station. It also increases availability, simplifies installation and reduces lifecycle costs relating to commissioning, maintenance and spare parts.

Using an advanced and innovative filtering technique, REG670 can provide integrated sub synchronous resonance protection for turbo generators.

A REG670 generator protection scheme delivers maximum dependability and availability, featuring extremely fast detection criteria (typically 15 milliseconds) for generator differential protection, while maintaining a high level of security with DC offset functionality. Among the REG670’s many functions, is injection-based 100 percent stator and rotor earth fault protection, as well as third harmonic-based 100 percent stator earth fault protection. These solutions optimize the protection system’s cost-performance ratio in relation to the importance or size of the generating station. ABB’s innovative solution enables injection via a neutral point VT, or even an open-delta VT located at the generator terminals. No changes are necessary in the primary circuit or grounding resistor, so the design, installation and commissioning of the protection system is simple and fast. The third harmonic-based 100 percent stator earth fault protection utilizes the differential principle, providing high sensitivity and security to ensure proper operation even in low load conditions.

REG670 comes in 3 different pre-configured variants, as well as a completely customizable solution:
- REG670-A20 offers a solution for a typical generator protection application with generator differential and back-up protection including 12 analog inputs transformers in a half 19" case size
- REG670-B30 offers enhanced generator protection application with generator differential and back-up protection, including 24 analog inputs in a full 19" case size. Optionally, pole slip protection, 100% stator earth fault protection and overall block differential protection can be added
- REG670-C30 offers complete unit protection, including generator and generator transformer protection with 24 analog inputs in a full 19" case size. Optionally pole slip protection and 100% stator earth fault protection can be added

<table>
<thead>
<tr>
<th>Variant</th>
<th>Generator differential protection</th>
<th>Generator differential, and (transformer) backup protection</th>
<th>Generator and block transformer protection</th>
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<tr>
<td>REG670-C30</td>
<td></td>
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- Two winding transformer differential protection
- Three winding transformer/block differential protection
- Backup protection
- Extensive function selection included, and additional functionality available
- IEEE 1344/C37.118(PMU)
- IEC 61850-9-2

- Optional
Renewables, protection and control

Relion® RET670 and RET650

Relion RET670 or RET650 intelligent electronic devices provide fast, reliable protection, monitoring and control solutions for all types of transformers. In addition, RET670 offers state-of-the-art protection for autotransformers, phase-shifting transformers and shunt reactors. These IEDs provide extremely fast differential protection with automatic CT ratio matching and vector group compensation, and are ideal solutions for the most demanding transformer protection applications.

RET670 and RET650 protect step-up transformers by dynamically adjusting to a wide frequency range, ensuring speed and accuracy even during generator run-up conditions. RET650 delivers complete protection for two- or three-winding transformers, while RET670 can also provide control for up to 30 switching objects. One RET670 IED can be extended to contain two differential protection functions to protect the most advanced system configurations, providing increased functional integration and more cost-effective protection and control solutions.

Differential protection for phase-shifting transformer (PST)

ABB’s RET670 brings to you a unique functionality for protection of PSTs. This crucial, complex and cost intensive transformer equipment previously required a number of differential protection functions / devices to protect. With the state of the art protection technology adapted in this device, the RET670 is a globally unique protection device for PSTs. In terms of this IED’s application, the complete PST is seen as a unit and only external CTs and VTs are required for protection. What this means is, with the RET670, the internal embedded CTs in the PST are not used. The IED is extremely self adaptive to the phase angle and voltage ratio making it extremely simple to configure, set and deploy.

Customer benefits of the differential protection functionality for PSTs are that this new age device eliminates the requirement of internal embedded CTs in the PSTs. Correspondingly, this optimizes the requirements on primary equipment - by enabling reduction in size and cost of not only the required PST but also of the equipment transport from factory to site.

RET670 and RET650 both include voltage regulation and tap changer control for a single transformer, while RET670 can also be configured for voltage regulation and tap changer control of up to 8 parallel transformers.

RET670 comes in 4 pre-configured variants, as well as a completely customizable solution

• RET670-A10 is intended as a back-up protection solution. It doesn’t offer differential protection such as the B30 and B40 configurations do, but includes all possible back-up protection, making it ideal as a complementing product.
• RET670-A25 is a dedicated voltage regulator solution, with the possibility to include some back-up protection functionality.
• RET670-B30 and B40 are intended for respectively two winding or three winding transformers. They include transformer differential and restricted earth fault protection, and offer a selection of standard and optional back-up protection functionality.

RET650 comes in 2 pre-configured variants

• RET650-A01 is intended for 2 winding transformers and RET650-A05 for three winding transformers. Both devices are 6U ½ 19" devices, offering a list of functionality in a small package.

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<table>
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<tr>
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Relion® the power of one solution
For protection and control.

The Relion series of protection, control and measurement devices cover your complete power generation and renewables application.

Advanced control capabilities and system modeling, such as given by IEC 61850 will give you new ways to design and dynamically operate your network. And in the smart grid, information is of vital importance, so advanced and accurate PMU (phasor measurement unit) functionality will present you with the information you need to make your smart grid truly smart. With its proven reliability, high accuracy and high performance operation, the Relion series of power generation and renewable devices can be used for the most demanding applications.