

widespread integration of renewable energy into our systems of transport and production.

Among ABB's many activities in the field of renewable energy, the company is one of the leading global manufacturers of solar inverters, which convert the direct current (DC) power generated by photovoltaic systems into alternating current (AC) power to be fed into the grid. ABB solar inverters draw on more than 40 years of experience and the latest advances in inverter and power converter technology. Among many other projects in 2018, ABB provided its TRIO-50 string inverters for two large solar farms in Chile, where the high average solar irradiance has made photovoltaic power plants an increasingly important part of the country's energy mix.

Another ABB technology that is playing an important role in integrating renewable energy into mainstream power grids is high-voltage direct current, or HVDC. By converting AC power into DC power for transmission, then back to AC power for consumption, we can transmit power with minimal losses over long distances. That makes it possible to connect remotely located energy sources to major consumption centers, such as cities. HVDC systems are now delivering electricity generated by hydro, wind and solar plants to millions of consumers every day. Many of the best renewable generation sites are in remote locations – mountaintops, deserts and seas – so the electricity produced must cross vast distances to get where it is needed. HVDC is the most reliable and efficient way to ensure that renewable energy reaches consumers, and it plays an important part in a stronger, smarter and greener grid.

Another ABB solution for renewables is the microgrid – a small-scale electric grid that can run largely on renewables such as wind or solar, reducing or even eliminating the need for diesel generators in places that lack reliable grid connections. This technology is ideal for remote locations, such as Kodiak Island in Alaska, where an ABB microgrid that relies heavily on wind power and flywheel energy storage has improved the community's power supply and dramatically reduced the use of fossil-fueled generators.

Among activities such as these, the company is leveraging ABB Ability on multiple fronts to ensure that renewable energy can be successfully integrated into the global energy mix on a large scale, while maintaining and even improving reliability and cost efficiency. For instance, our ABB Ability Ellipse APM (asset performance management) software ensures that the high-voltage switchgear and transformers necessary for long-distance transmission of renewable power can be counted on to serve the needs of the grid – even at times of peak demand. ABB Ability DERMS is a resource management solution for distributed energy resources. As a module of our network management platform, it aids grid operators in integrating power from sources such as rooftop solar installations and battery storage systems.

## Resource conservation

In the realm of resource conservation, ABB offers a range of solutions that support SDGs 6 (clean water), 12 (responsible consumption and production), 13 (climate action), 14 (life below water) and 15 (life on land). Each of these goals calls on society to minimize waste and the dispersion of pollutants into the environment.



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For example, a target associated with SDG 6 aims to improve water quality by reducing pollution and substantially increasing water-use efficiency by 2030. SDG 12 has a target focused on the sustainable management and efficient use of natural resources and the environmentally sound management of chemicals. SDG 13 targets mechanisms to raise capacity for effective climate change-related planning and management in the least developed countries, among others. A target associated with SDG 14 aims to secure a reduction in marine pollution of all kinds and the sustainable management of marine and coastal ecosystems. SDG 15 has a target focused on the conservation and sustainable use of terrestrial and inland freshwater ecosystems, the sustainable management of forests and the halt of desertification.

As an example of how we are contributing to these goals, ABB is a global leader in industrial robotic solutions that can be used to reduce waste in production processes. The proper application of robotics in a factory setting improves quality control, reduces the number of units produced that are faulty or unusable, and limits the amount of waste material generated by production. For example, the IRB 340 FlexPicker – a robot designed for high-speed pick-and-place tasks, capable of 150 picks per minute – can be used to dramatically reduce the breakage of food items being packed for shipping. Paint robots like the IRB 5500 save paint as well as time, by spraying surfaces with near-perfect uniformity. The use of these machines also requires less factory space than previous painting processes.

Sustainable transportation solutions make up an important part of ABB's extensive portfolio of clean, resource-efficient technologies. We have worked particularly hard in recent years to expand our

position as the world's leading provider of EV fast-charging stations, with more than 8,500 chargers installed in 69 countries. For example, ABB's charging systems are being deployed in a growing network of stations along Germany's motorways. The company's car chargers can now be found in networks across Europe, Russia, the United States, Canada, Iceland, and beyond. The most powerful ABB chargers are capable of adding 200 kilometers of range to a vehicle in just eight minutes.

ABB has special expertise in the field of water conservation, particularly in terms of helping water service providers achieve high levels of

reliability and sustainable management. We help water companies achieve their targets for SDG 6 through our solutions for optimizing processes and minimizing leaks and water losses in distribution networks and transmission systems. We also provide flood-protection and smart-sewerage solutions that prevent wastewater from becoming a sanitation problem during heavy rains and floods. These solutions incorporate process expertise, integrated electrical and automation systems and life cycle services, enabling us to optimize water processes and reduce energy consumption while monitoring water quality and minimizing leaks.

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Many of these solutions are built around a control system architecture known as supervisory control and data acquisition, or SCADA. ABB SCADA solutions can be applied to a range of automated systems, including water processing systems and power plants. ABB incorporates SCADA into its ABB Ability Symphony Plus automation solution, providing users with a comprehensive view of their plants by integrating data from all areas and systems, including remote SCADA systems. The control system's open architecture can seamlessly consolidate and rationalize plant data and enhance operator responses to changing conditions, improving both plant safety and uptime. ABB also offers the MicroSCADA Pro solution for application at the station level and a distributed generation solution to integrate and manage renewables, like photovoltaic and wind installations. ABB was recognized by the ARC Advisory Group, a technology advisory firm, as the global leader in large-scale SCADA projects.

 **more than 10,000**  
chargers installed in  
73 countries

ABB Ability Symphony Plus is one of the most widely used DCS and SCADA systems in water applications worldwide. Symphony Plus maximizes efficiency and reliability through automation, integration and optimization of an entire plant, network or facility. Symphony Plus is part of the ABB Ability portfolio of unified, cross-industry digital solutions that enable businesses to harness the power of the industrial internet. Since its launch in 2011, ABB Ability Symphony Plus has been implemented in more than 6,800 new installations, on top of the thousands of plants that have chosen to upgrade to it.

ABB additionally contributes to resource efficiency with sustainable solutions related to power management and distribution. These include a comprehensive range of high-voltage circuit breakers and switchgear with AirPlus™, a family of eco-efficient gases consisting of components of air (O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>) and fluoroketones. The AirPlus solutions avoid using SF<sub>6</sub>, a greenhouse gas that requires careful handling. Replacing SF<sub>6</sub> with AirPlus reduces the global warming potential by almost 100 percent compared to that of SF<sub>6</sub>, significantly lowering environmental impacts.

In a similar development, ABB has emerged as a leader in the design and production of dry-type transformers. In contrast to oil-insulated transformers, which contain thousands of liters of flammable oil, dry transformers are insulated with air and non-flammable solid insulation material, eliminating oil leaks and dramatically reducing the risk of fire. Dry transformers also provide an alternative to gas-insulated transformers and are safer to maintain and operate. One of ABB's recent innovations is the world's first digital dry-type transformer. The ABB Ability TXpert Dry is a smart transformer equipped with sensors that collect data and subject them to powerful analytics, enabling key functionality such as power quality monitoring, self-supervision and lifecycle assessment. Due to its dry-type design, digitalization and little or zero maintenance, these new transformers offer enhanced safety and data security, increased uptime and optimized operations.

These represent just a few examples of ABB technologies that are enabling an advanced approach to eco-efficiency on the part of utilities, industry, and transport and infrastructure operators around the globe.



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