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PIONEERING TECHNOLOGY

Products, solutions and services for eco-efficiency

ABB enables its customers in the utilities, industry, and transport & infrastructure sectors to conserve resources and become more sustainable and efficient

ABB has a history of innovation going back more than 130 years, and it takes pride in its track record of developing pioneering technologies that contribute to global eco-efficiency while stimulating economic growth and improving people's lives.

ABB's considerable portfolio of eco-efficient products, solutions and services delivers tangible benefits in three critical areas: energy efficiency, renewable energy and resource efficiency. These benefits are vital to the ongoing effort to achieve the goal of the 2015 Paris Agreement.



57 percent

revenue from eco-efficiency portfolio

Meeting this goal will depend on transitioning to a decarbonized energy system that is connected, digital, smart and distributed. This evolution will directly impact stakeholders of every kind, both individually and at the level of enterprises and governments. It will be disruptive to certain business models and lifestyles, but will also open the door to new models and drive the further development of new technologies.

It must be emphasized that, with continuing urbanization, population growth and economic

growth, demand for energy will continue to rise. At the same time, we must work hard to reduce emissions of greenhouse gases. The generation of more power has an important role to play in achieving the Sustainable Development Goals (SDGs) adopted by the United Nations in 2015. SDG 7 seeks to ensure access to affordable, reliable, sustainable and modern energy for all.

Since 2014, ABB has established one clear, central target for our products, solutions and services: for our eco-efficiency portfolio to account for 60 percent of ABB's total revenue by 2020. Over the past year, we performed well against this target; our eco-efficiency portfolio grew steadily and accounted for 57 percent of ABB's revenue in 2018.

ABB reviews all of its products, systems and services according to a robust methodology that determines which offerings should be included or excluded from its eco-efficiency portfolio. Consequently, the energy efficiency portion of this portfolio includes variable frequency drives, energy-efficient motors (IE3 or higher), and flexible alternating current transmission systems; the renewable energy portion includes solar inverters, microgrids, long-distance power transmission systems and asset performance and resource management solutions; and the resource efficiency portion includes industrial robotic solutions, sustainable transportation solutions, control systems for water, power and other facilities,



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SF₆-free gas-insulated switchgear, and transformers with biodegradable insulating fluids. Applications that have potential short- and long-term environmental impacts, such as oil extraction, nuclear power generation and military uses, have been excluded.

ABB Ability™, our Group's comprehensive digital offering, is a central component of our eco-efficiency portfolio. ABB Ability connects the world's largest installed base of industrial devices – more than 70 million of them – to industry-leading digital solutions in sectors as diverse as marine shipping, mining, paper milling, printing and food and beverage processing.

Energy efficiency

ABB is committed to realizing the vision that underlies SDG 7 – which is to ensure access to affordable, reliable, sustainable and modern energy for all – and SDG 12 – calling for responsible consumption and production. ABB provides much of the technology that will be needed to make these goals a reality.

In particular, SDG 7 sets five targets for 2030. These include ensuring universal access to affordable, reliable, modern energy services; increasing the share of renewable energy in the global energy mix; doubling the global rate of improvement in energy efficiency; enhancing international cooperation to facilitate access

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to clean energy research and technologies and promoting investment in energy infrastructure and clean energy technologies; and expanding infrastructure and upgrading technology for modern, sustainable energy services for all in developing countries.

Advanced engineering helps improve sustainable solutions

Sheri Straw – Duke Energy Corporation
[ABB Stakeholder Panel](#)

With respect to SDG 7's third target, SDG 7.3 – improving energy efficiency – ABB's high-efficiency motors, generators and drives are among the solutions offered by ABB with this purpose in mind. They are designed to be flexible, making it possible to optimize all processes and controls, and they are built to be reliable, so as to reduce downtime. Most of all, they are extremely efficient, offering significant reductions in power consumption. Electric motors account for roughly 28 percent of the world's electricity consumption. They are often larger than necessary and are run at full speed, even when it is not needed. Fitting every inefficient motor with an ABB variable-speed drive would result in energy savings equivalent to the output of 286 power plants. ABB offers a comprehensive range of reliable and high-efficiency motors, drives and generators for all applications.

Sustainable engineering from ABB can also be found in the high-performance turbochargers we manufacture for use in ships, power stations, generator sets, diesel locomotives and other large vehicles. ABB is a leader in the manufacture and maintenance of turbochargers for large diesel and gasoline engines. The latest

turbocharger designs can reduce exhaust gas temperatures, enable an increase in boost pressure and reduce fuel consumption.

Another technology from ABB, flexible alternating current transmission systems, or FACTS, is playing an important role in integrating renewable energy and distributed generation sources into mainstream power grids. FACTS covers a range of power-electronics-based technologies that radically increase the capacity of transmission networks – by up to 50 percent – while maintaining or improving voltage stability and grid reliability. They are vital to the development of modern smart grids and can be implemented with minimal infrastructure and environmental impacts. ABB pioneered early solutions in this field in the 1950s and continues to push the boundaries of what can be accomplished with power electronics in the field of transmission.



up to 50 percent
increase in capacity of
transmission networks

ABB Ability interacts with these solutions and many others to track and analyze operational data and then make adjustments in real time to ensure optimal energy efficiency.

Renewable energy

In addition to supporting the clean energy mandate specified by SDG 7.2 – increasing the share of renewables – ABB is committed to enabling the ideals enshrined in SDG 11, which calls for sustainable cities and communities. These goals cannot be achieved without the successful,

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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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wastewater treatment**

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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 (O₂, N₂, CO₂) and fluoroketones. The AirPlus solutions avoid using SF₆, a greenhouse gas that requires careful handling. Replacing SF₆ with AirPlus reduces the global warming potential by almost 100 percent compared to that of SF₆, 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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