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02

Low-carbon society

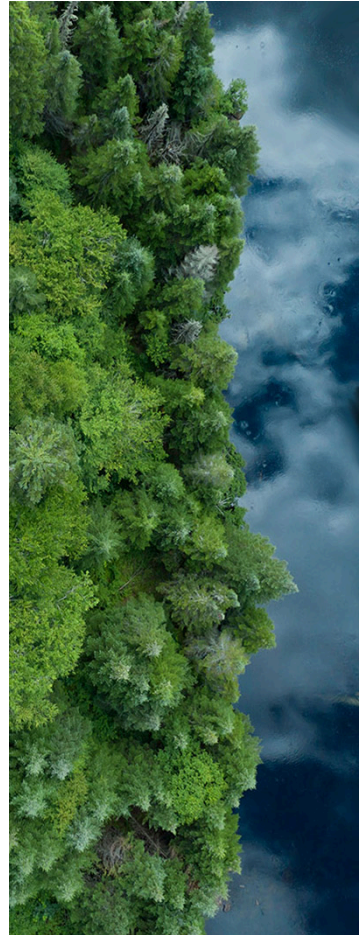
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PILLAR OVERVIEW

We enable a low-carbon society

To support the transition to a low-carbon society, we aim to move toward carbon neutrality in our own operations by 2030 and are actively helping to reduce greenhouse gas (GHG) emissions in our suppliers' and customers' operations. Our technologies serve industry, buildings, power and transport – sectors that together account for three-quarters of global energy consumption.

To increase our accountability, in 2022 we developed 2025 mid-term targets to reduce emissions in our own operations and our suppliers' emissions. These mid-term targets were developed in close collaboration with our businesses and approved by the ABB Executive Committee and the ABB Board of Directors. Going forward, the Board of Directors will continuously evaluate the ambition of and progress toward our sustainability targets. We aim to achieve our targets ahead of schedule and will continue to refine them if we believe further adjustments will enable us to intensify our efforts.



We will continuously provide our stakeholders with transparent information about our performance and progress against our targets.

Targets 2030 ¹	Mid-term targets 2025	2019 baseline ²	2022 status
Achieve carbon neutrality in our own operations by 2030; reduce own scope 1 and 2 emissions by at least 80% ³	Reduce own scope 1 and 2 emissions by at least 70%	639 kilotons CO ₂ e (adjusted for portfolio changes)	65% since baseline and 43% in 2022 alone
Work with main tier-one suppliers ⁴ to reduce their scope 1 and 2 CO ₂ e emissions by 50%	Work with main tier-one suppliers ⁴ to reduce their scope 1 and 2 CO ₂ e emissions by 20%	Measurement in process	Measurement in process

1 As we intend to have our targets validated against the Science Based Targets initiative's new Net-Zero Standard, we are no longer focusing on a limited amount of cases linked to the 100 megatons emissions' avoidance but rather on our complete portfolio of offerings.

2 Where a baseline applies.

3 Carbon offsets for remaining 20% CO₂e emissions as a last resort.

4 Suppliers covering 70% of our annual procurement spend.

ABB's 2030 GHG emissions targets for our own operations have been approved by the Science Based Targets Initiative (SBTi), providing external confirmation that they are in line with the 1.5 degrees Celsius target adopted by the Paris Agreement. Our sustainability reporting follows the GRI Standards, and our emissions accounting conforms to the globally accepted GHG Protocol.

In 2023, we will continue to reduce GHG emissions from our own operations by making greater use of certified green energy sources and self-generated solar electricity. We are continually improving the energy performance of ABB sites that possess significant footprints by means of energy management systems and energy efficiency measures; to this end, we use ABB's products and solutions whenever possible. In 2023, we will also focus on eliminating hard-to-abate emissions from natural gas by implementing energy efficiency measures and shifting to renewable fuels or electricity. Additionally, we will continue to cut our SF₆ emissions and coolant-related emissions from HVAC systems, and we will continue to transition to a fully electric vehicle fleet.

Emissions in own operations

Target 2030: Reduce emissions by at least 80 percent and achieve carbon neutrality in our own operations

As part of our drive to make ABB carbon-neutral, we have committed to three initiatives of the [Climate Group](#) of global companies. By 2030, we will completely electrify our vehicle fleet (EV100 initiative), source 100 percent of our electricity from renewable energy sources (RE100 initiative), and improve energy efficiency and productivity across our operations (EP100 initiative). These actions will help us to reduce our scope 1 and 2 GHG emissions by at least 80 percent by 2030. We are exploring additional solutions to eliminate the remaining 20 percent, with carbon offsets serving as a last resort.

In 2022, we made considerable progress toward our 2030 goal of carbon neutrality. We reduced our total energy consumption by 15 percent compared to a 2019 baseline. At the end of 2022, 52 percent of our energy was sourced from renewables. Since 2019, we have reduced our GHG emissions by 65 percent. A number of measures we have taken have made these results possible. We have increased the share of certified green and self-generated solar electricity we use from 24 percent to 81 percent. At the same time, we continually improve the energy efficiency of ABB sites by conducting energy audits, implementing energy management and monitoring systems, and making changes to buildings and production processes. Additionally, we remain focused on cutting our SF₆ emissions, which we have reduced by 79 percent since 2019.

2022 climate action initiatives

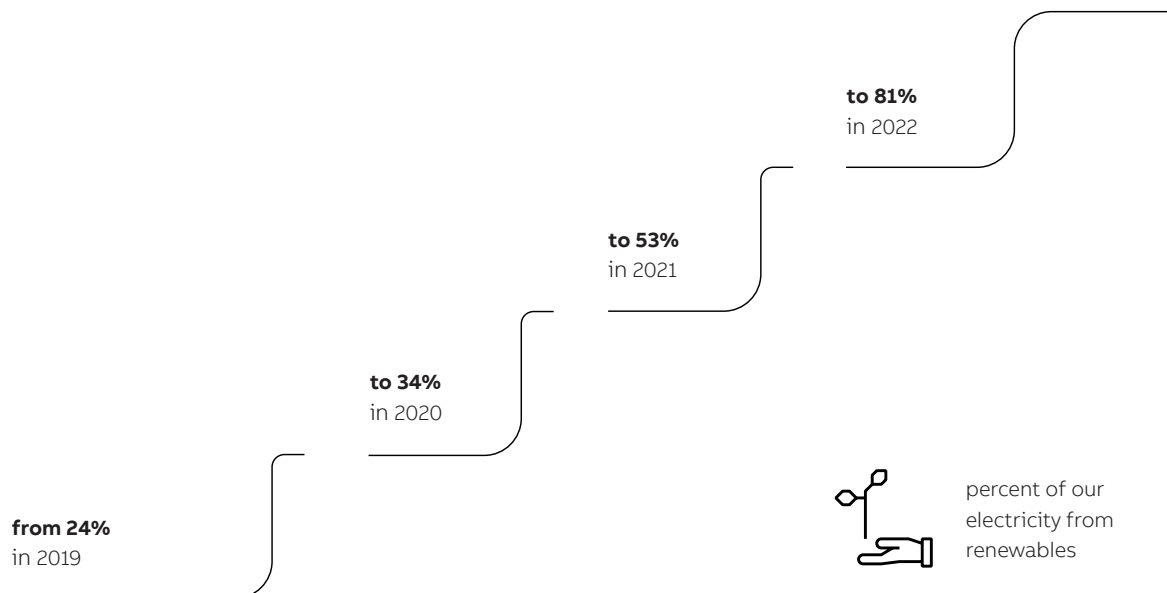
In 2022, we undertook a wide range of actions to reduce ABB's energy use and emissions.

In keeping with our EP100 commitments, we implemented more than 90 energy-efficiency projects across the company. These projects varied widely, from measures such as installing automatic lights and HVAC temperature controls at our factory in Cheonan, South Korea, to larger projects such as implementing a heat recovery system at our Large Motors and Generators factory in Helsinki. Our energy/distribution components factory in Ede in the Netherlands has saved 215,600 kWh of power per year using smart building management and LED lighting. From next year, the Ede site will reuse the heat generated in the production process, offsetting further carbon emissions.

In addition to these types of initiatives, which are undertaken at the site, division or business area level, the ABB Real Estate function runs a Group-level energy savings program. As of 2022, this program had achieved savings totaling 92.5 GWh per year and \$11.6 million between 2018 and 2022. The savings were derived from 336 completed and ongoing energy-saving projects at ABB sites around the world.

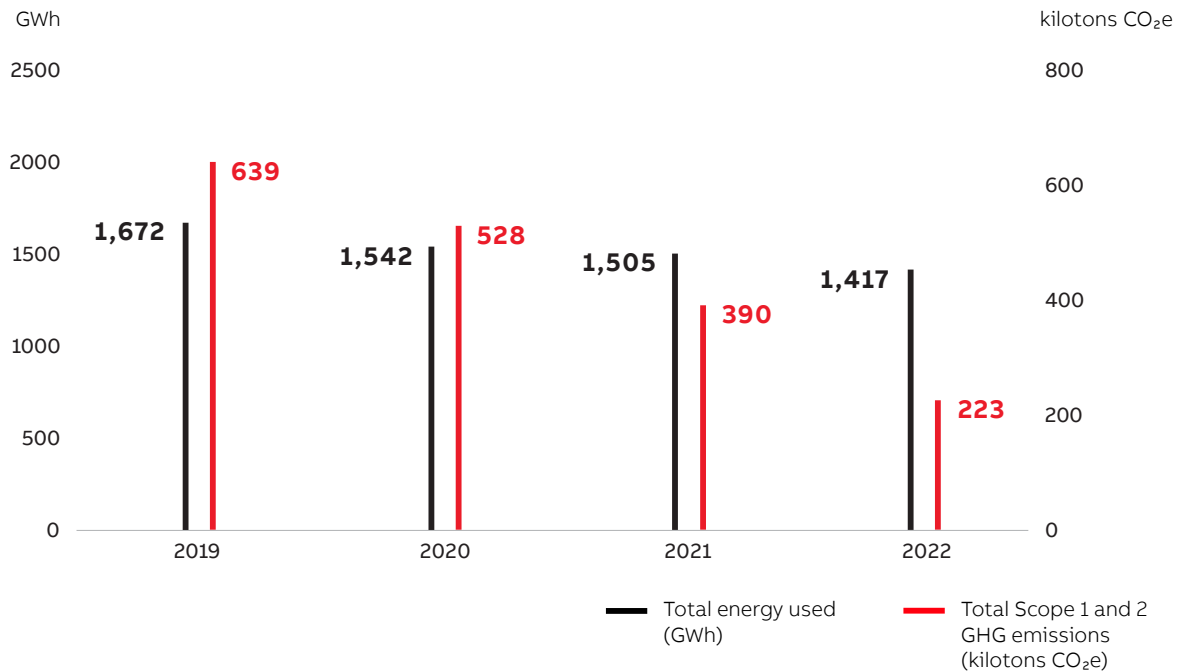
In alignment with our RE100 commitments, we continued to source renewable energy for our sites and/or equip them with on-site renewable power generation capabilities. In the past year, we installed on-site solar power at the ABB campus in Aleksandrów Łódzki, Poland, our technology campus in Jüri, Estonia, and the ABB factory in Cheonan, South Korea, among others.

Share of renewable electricity



Figures are adjusted for portfolio changes.

Total energy used and total scope 1 and 2 GHG emissions



Figures are adjusted for portfolio changes.

Our e-mobility research center in Delft in the Netherlands is already carbon neutral and generates 75,000 kWh of power from solar panels and geothermal sources. The site also feeds excess power into the local grid. Thanks to its use of renewable energy, the facility avoided 27,825 kg of GHG emissions over a 12-month period. And at our new innovation and training campus that opened at B&R's Eggelsberg headquarters in Austria, we installed one of the largest self-consumption photovoltaic systems in the country. Elsewhere, we have continued to contract with renewable energy suppliers to serve our facilities, most notably in the United States, where a large number of sites were shifted to 100 percent green energy in 2022.

In addition, we remained on track to electrify ABB's fleet of more than 10,000 vehicles by 2030, as per our EV100 commitments. In 2022, 50 percent of our global new vehicle orders were for either EVs or plug-in hybrid vehicles (PHEVs). Among other actions, in Spain and Portugal, ABB Motion chose to accelerate the transition of its fleet to EVs by 2024 (while retaining some hybrids for service uses). It intends to achieve a 90 percent conversion rate by the end of 2023. Lastly, ABB's E-mobility division has committed to converting its entire fleet to battery-electric vehicles (BEVs) by 2026.

By 2030, our goal is to achieve carbon-neutral operations. By demonstrating our leadership in the field of operational decarbonization, we want to inspire our customers and show them that the energy transition can be achieved now by deploying existing energy-transparency, efficiency, electrification and resiliency solutions that serve communities.

CASE STUDY

Leading the way toward carbon-neutral operations



As one of the largest companies operating in Estonia, we feel a particular responsibility to lead the way in more sustainable production techniques. In 2022, ABB Large Motors and Generators opened a solar park at the center of its Jüri, Estonia, technology campus to help show how we can sustainably achieve carbon-neutral operations. Expected to cut the plant's GHG emissions by an estimated 180 tons per year, the facility will also reduce its dependency on the external grid and protect it from energy price fluctuations.

To help ABB meet its commitment to achieving carbon-neutral operations by 2030, the solar park's six stations and 820 panels generate 360 kW of electricity, supplying nearly 6 percent of the factory's electric needs. The work done on the campus manufacturing components for our most efficient motors and generators also plays a role in innovating for a more energy-efficient, regenerative, adaptive world. Moreover, the campus is also helping ABB meet its RE100 commitment to purchase 100 percent renewable electricity for the operation of its factories.

In addition to helping protect the environment, cut emissions and reduce our natural resource consumption, the new solar park in Jüri simply makes good business sense. Amid increasing energy prices, we expect to cover the investment in the solar park within the next 4 to 5 years, rather than the 10 years originally envisaged.

Emissions of sulfur hexafluoride

In addition to the projects described above, we have implemented a global program to reduce our direct emissions of SF₆ from losses associated with either handling or production processes. Over the past year, the program reduced ABB's direct emissions of SF₆ by 61 percent. In 2022, we emitted 861 kg of SF₆, down from 2.21 metric tons in 2021.

Supplier emissions

Target 2030: Work with our most impactful suppliers – which account for 70 percent of our supply spending – to achieve a 50 percent reduction in their emissions

In 2022, ABB announced a new emissions target for its supply chain. The company will work with its main tier-one suppliers with the aim of helping them achieve a 50 percent reduction in their scope 1 and 2 GHG emissions by 2030. The program is focused on our most impactful tier-one material and service suppliers, accounting for 70 percent of ABB's annual procurement spending. The new target has implications for our business, as it requires us to scrutinize the sustainability of our suppliers with greater care. At the same time, the project will contribute significantly to ABB's goal of enabling a low-carbon society because many of our suppliers have larger emissions footprints than ABB itself.

In 2022, ABB's four business areas began to engage with suppliers on the subject of emissions. For example, in India, ABB conducted its first Sustainable Supplier Summit. Held at ABB's award-winning Nelamangala facility in cooperation with the Confederation of Indian Industry, the summit focused on approaches to mitigating climate change and showcased the best practices being applied at the ABB plant. In addition to engaging with suppliers, ABB's business areas continued to form dedicated teams, formalize supplier sustainability frameworks and designate full-time supply chain sustainability managers. ABB also continued to strengthen its internal capacity to conduct life cycle assessments (LCAs). LCAs have proven themselves as effective tools for prioritizing interventions with suppliers, as they quantify the contributions of raw material sourcing to the full emissions footprints of our products.

Overall, we have reduced emissions in our supply chain by incorporating more recycled materials into our products, shifting to lower-carbon primary materials and using lower-carbon transport between tiers of suppliers.

For more information about ABB's comprehensive approach to supplier engagement, please refer to the chapter [“Responsible sourcing.”](#)

Customer emissions

Our leading electrification and automation technologies help our customers reduce and avoid GHG emissions

Our greatest contribution to a low-carbon society comes from our energy-saving and emissions-reducing technologies. Among our many impactful offerings are energy-efficient motors and drives, which are in use across industry, buildings and infrastructure, and electric vehicle (EV) charging systems, which enable the shift from combustion cars to EVs. Further contributions are made by our automation technologies, which increase the energy efficiency of industrial operations and facilitate the reliable integration of renewable energy sources into the energy mix, among other purposes. Digital solutions from ABB help customers design and deploy such integrated, energy-efficient systems in a cost-effective manner. In this section, we highlight some of the ways in which we are helping our customers reduce and avoid emissions in sectors that account for the majority of global energy consumption.

Energy savings enabled by ABB motors and drives

Significant energy savings are enabled by our variable-speed drives for electric motors. They regulate the amount of power that is fed into a motor to match the load it must perform, thus avoiding excess use of energy. By adding a drive to an existing motor system (retrofit), energy savings of up to 25 percent are possible. Upgrading a drive to a newer model can deliver single-digit percentage energy savings, while replacing a motor and drive system with a newer model typically enables energy savings of around 1 percent.

To calculate the energy savings that ABB motors and drives enable for our customers, we considered the most impactful applications for these offerings and compared them with a typical or “base” scenario that represents the energy that would be consumed in the absence of the ABB offering. The most impactful applications are pumps, fans and compressors, which account for 45 and 80 percent respectively of all ABB low- and medium- voltage drives sold. As a rule, the larger the motor, the more energy the drives save.

Technologies for industry

Industry consumes more energy than any other sector and emits 24 percent of global GHG emissions¹. The bulk of electricity used in industry is consumed by industrial electric powertrains, which typically consist of a motor, a variable-speed drive and an application, such as a pump, fan or compressor.

In Brazil, ABB drives, motors and smart sensors enabled water and wastewater company Saneago to reduce its electricity consumption by roughly 25 percent in 2022. Our process automation and control systems continue to deliver energy savings for customers in industries that address a wide range of essential needs – from supplying power, water and other basics to manufacturing goods and transporting them to market. The intelligent power solution we supplied to the Kangsheng Data Center in Beijing will support its goal of becoming a “low-carbon and green data center,” putting it on track to save up to 20 percent in utility costs and 30 percent in operational costs.

CASE STUDY

Eliminating 14,000 tons of annual GHG emissions at a pulp plant in Norway



Drying wood pulp is an energy-intensive process. At its factory in Kragerø, Norway, Vafos produces 80,000 tons of pulp a year to be processed into cardboard. Until now, the plant has been burning oil to generate the necessary heat. But Norway is committed to reducing carbon emissions and already has one of the cleanest power grids in the world, relying almost exclusively on renewable resources.

In 2022, Vafos replaced elements of the plant’s heating system with an electric one equipped with 10 of ABB’s DCT880 power controllers. These controllers will ensure that the system is as efficient as possible, reducing peak loads and managing each heating element to minimize total power consumption without reducing output.

1 IPCC Climate Change 2022: Impacts, Adaptation and Vulnerability; Working Group II Contribution to the Sixth Assessment Report, p. 88 of pdf

The new system has the potential to impact carbon emissions equivalent to taking 7,000 conventional automobiles off the road. The project demonstrates how industry can support Norway's goal of cutting carbon emissions in half by 2030. The new power controllers allow for more precise control of the drying process, and the system eliminates the need to store large quantities of fuel oil on site. The DCT880 units incorporate a power optimization feature that keeps load requirements stable, thereby limiting the plant's potential impact on the local power grid.

The solution represents one of the ways ABB Motion is helping customers save energy and enabling the low-carbon future with digitally enabled drives, motors and services.

In 2022, we provided our industrial customers with a range of digital solutions that help them monitor and optimize their energy consumption and emissions footprints. Fiorentini, a major Italian snack manufacturer, is using ABB Ability™ Energy Manager to monitor almost 100 intelligent devices and control the electrical power distribution in its new 56,000-square-meter production facility in Trofarello. This solution will help Fiorentini make better-informed performance and energy consumption decisions, in keeping with its commitment to reduce its use of electricity by 400,000 kWh per year. Digital solutions such as the ABB Ability Digital Powertrain are also being used by CERN, Europe's foremost nuclear research center, as part of a project intended to improve the energy efficiency of its cooling and ventilation infrastructure by up to 15 percent.

Looking ahead, we have expanded our partnership with Hydrogen Optimized to advance the deployment of economical, large-scale, green hydrogen production systems. We expect such systems to play a vital role in the decarbonization of essential but hard-to-abate industries such as utilities, metals, cement, ammonia and fertilizers, as well as to provide clean fuels for aircraft, ships, trucks and railway engines.

CASE STUDY

Accelerating industrial decarbonization and CO₂ removals



ABB's automation, electrical and digital solutions are playing a key role in the creation of the world's first open-source CO₂ transport and storage infrastructure, Norway's Northern Lights project.

Part of a growing movement to actively manage the carbon cycle and get it back in balance, Northern Lights is a joint venture between Equinor, Shell and TotalEnergies. Designed for safe and permanent carbon capture and storage, the project was set up to help industrial emitters prevent carbon from ever reaching the atmosphere. Its first phase, expected to be completed by mid-2024, will have the capacity to permanently store up to 1.5 million tons of CO₂ per year. The project's second development phase will work to expand that to more than five million tons stored per year.

Purpose-built ships using ABB [shaft generator systems](#) with permanent magnet technology will transport captured and liquefied CO₂ from emitters to the Northern Lights Øygarden Terminal in western Norway. This process will be remotely operated from a central control room at Equinor's facilities in Sture, seven kilometers away. To enable the remote operations, ABB will build a state-of-the-art Extended Operator Workstation at the terminal that will communicate with the control room to minimize response times and support 24/7 operations. ABB Ability™ System 800xA will be the distributed control system for the terminal, analyzing real-time and historical data and instantly providing plant metrics and KPIs. This solution will enable operators to make more accurate and informed decisions and review options for optimizing performance of assets and processes.

Technologies for the buildings sector

Buildings account for 5.6 percent of global GHG emissions.² ABB is supporting the effort to reduce the emissions of this sector with technologies that can increase the energy efficiency of existing structures and radically reduce the emissions footprint of new structures that are purposely designed to conserve energy.

In 2022, ABB and Caverion, a northern and central European-based company specializing in smart and sustainable built environments, entered an agreement to accelerate the development of carbon-neutral buildings by combining the two companies' solutions, integration capabilities and expertise. This collaboration is directly linked to ABB's Mission to Zero™ program, which seeks to help customers achieve carbon neutrality by leveraging energy management solutions associated with electrification, distributed energy and renewable energy. Also in 2022, ABB Electrification and Samsung Electronics forged a global partnership to supply jointly developed technologies for energy savings, energy management and the Internet of Things (IoT) for use in residential and commercial buildings.

CASE STUDY

BREEAM green building certification: designing more sustainable buildings



BREEAM (Building Research Establishment Environmental Assessment Method) is considered the world's leading method for assessing sustainability in the construction sector. In Europe alone, the European Commission estimates that around 75 percent of building stock, representing some 220 million buildings, is energy-inefficient. Since it has been estimated by the World Economic Forum that buildings use 40 percent of the energy that humans consume, BREEAM represents an important way to assess and promote society's efforts to achieve greater sustainability.

² IPCC Climate Change 2022: Impacts, Adaptation and Vulnerability; Working Group II Contribution to the Sixth Assessment Report, p. 88 of pdf

In 2022, independent consulting agency Encon assessed several of ABB Electrification's efficiency solutions and found that they contributed measurably to developers' efforts to earn higher BREEAM certifications than could be achieved with conventional building systems. Encon is qualified in sustainability assessment methodologies, including BREEAM.

The solutions assessed under the BREEAM standard include ABB Ability Energy Manager and ABB Smart Buildings solutions. ABB Ability Energy Manager is a digital solution that provides a clear and comprehensive way to monitor and optimize a building's energy consumption and carbon footprint. ABB Smart Buildings solutions include a complete portfolio of automated and intelligent controls for lighting, air conditioning, heating and motion detection.

Under the BREEAM standard, it was determined that ABB Ability Energy Manager can help a new building earn up to 42 credits in 10 different sustainability categories addressed by the standard. ABB Smart Buildings solutions can make it possible to earn up to 21 credits across seven categories. As an internationally recognized emblem of quality, BREEAM certification serves as a helpful guide for businesses seeking to reduce the environmental impacts associated with refurbishing existing buildings or erecting new ones.

Technologies for the power sector

The power sector is responsible for 23 percent of global GHG emissions.³ To help reduce its emissions, ABB has developed solutions that not only support the transition to renewable energy, but also maximize the efficiency and reliability of power facilities through the automation, integration and optimization of the entire plant.

One of the most significant GHGs associated with the power sector is sulfur hexafluoride (SF₆), a commonly used insulating gas that is 23,500 times more potent than CO₂. ABB's ecoGIS™ range of products is enabling customers like Enel and UK Power Networks to reduce their emissions by phasing out switchgear that uses SF₆. To support customers' energy transition, ABB also supplies innovative solutions for the integration of renewable energy. For example, ABB Ability™ Electrification Monitoring and Control, ZEE600 software and ABB Ability™ Smart Substation Control and Protection for SSC600 electrical systems can handle the intermittency associated with renewable energy resources. That is why they were installed in 2022 at a substation near India's Anabaru windfarm. In Italy, Enel Green Power upgraded its 60 MW geothermal plant in Farinello – part of the oldest geothermal complex in the world – with ABB's state-of-the-art medium-voltage VD4G generator circuit breakers, reducing outages. These circuit breakers provide full protection for this major source of renewable energy relied upon by the residents of Tuscany. In India, we supported the efforts of THINK Gas, which is working to shift India's energy sector from coal, oil and firewood to gas; we supplied the company with our

³ IPCC Climate Change 2022: Impacts, Adaptation and Vulnerability; Working Group II Contribution to the Sixth Assessment Report, p. 88 of pdf

SCADAventure™ and ABB Ability™ Genix Industrial Analytics and AI suite to increase the efficiency, availability and reliability of its city gas distribution network.

Technologies for the transport sector

Transport accounts for 15 percent of global GHG emissions.⁴ To help decarbonize this vital sector, ABB is supporting the transition to electric mobility. In addition to providing charging solutions for vehicles such as passenger cars and buses, we also offer solutions to electrify the powertrains of trains and marine vessels.

In 2022, we continued to support the adoption of EVs around the world, having now sold more than 840,000 electric vehicle chargers in more than 85 markets. Our work included signing a new global framework agreement with Shell to supply our full portfolio of charging solutions. As part of this agreement, we announced the launch of Germany's first nationwide charging network, using ABB Terra 360 chargers. The Terra 360, recognized by Time magazine as one of the best inventions of 2022, is not only one of the fastest electric car chargers in the world but also the most flexible one. It is capable of fully charging an electric car in 15 minutes and can charge up to four vehicles simultaneously, making it ideal for fleet operators. We also partnered with PACCAR, a designer and manufacturer of premium trucks, to provide advanced charging solutions for its fleet operations in North America and Europe. And in line with our commitment to facilitate progress in this sector, we worked with CharIN and other organizations to promote the adoption of heavy-duty all-electric vehicles by jointly developing a standard for the Megawatt Charging System, which is expected to debut in 2024.

In the rail sector, we are supplying a 25 kV power solution for Lithuanian Railways that will be used to electrify 730 kilometers of a fully carbon-neutral rail line. And in Australia, we are providing the Adelaide Metro with a lithium-ion-based energy storage system that will make better use of energy from regenerative braking systems; the solution is expected to reduce electricity consumption by up to 16 percent.

In the marine transportation segment, we have continued to drive the decarbonization of ships with our electric, digital and automation solutions. Among our many projects in this sector, we will supply and integrate advanced power, automation, control and energy-storage systems for two next-generation installation vessels ordered by Eneti, a company specializing in offshore wind turbine construction. In the port of Toulon, we are leading a turnkey project to build the largest ship-to-shore solution in France, which will cut emissions and noise pollution for ferries and cruise ships during port stays.

4 IPCC Climate Change 2022: Impacts, Adaptation and Vulnerability; Working Group II Contribution to the Sixth Assessment Report, p. 88 of pdf

CASE STUDY

Robots that assemble battery packs for heavy electric vehicles



Scania AB, the Swedish truck and bus manufacturer, is one of ABB's longest-standing clients. The companies have worked together for more than four decades. Today, Scania is seeking to maintain its place at the cutting edge of its sector by investing heavily in the production of electric vehicles. As part of that push, it is investing more than \$100 million in an advanced new factory for battery assembly adjacent to its main assembly site in Södertälje, Sweden. ABB has signed on to provide a range of industrial robots for use in the state-of-the-art, 18,000-square-meter facility.

The automotive industry has always been an early adopter of robotics and other automated production technologies. But with the shift to electric vehicles, it is making some major changes in its manufacturing processes. ABB is helping Scania adapt to these changes by supplying robotics solutions, some of which are being deployed in completely new ways. For instance, this is the first time the IRB 390 robot will be used in a battery production facility. Originally designed for packing applications, the units will be used by Scania to mount contact plates in batteries. They can execute the task at the rate of one plate per second, operating 24 hours a day.

Other ABB robots involved in the assembly process will include the IRB 4600 and IRB 6700. ABB will also provide a variety of solutions to support the plant's operations. Among these is ABB's RobotStudio® simulation and programming software, which makes it possible to test and debug the production line prior to final deployment. The software serves to shorten lead times and improve process quality.

The facility will assemble its modules from battery cells supplied by Northvolt. The Northvolt facility in Sweden, the largest of its kind in Europe, was also developed in partnership with ABB. Once the packs are completed, they will be transferred directly to Scania's vehicle assembly hall next door. The battery assembly factory will play a major part in keeping Scania at the forefront of industrial digitalization and automation, while enabling the shift to electric vehicles. The plant is expected to be fully operational in 2023.