About ABB

ABB is a technology leader that is driving the digital transformation of industries. With a history of innovation spanning more than 130 years, ABB has four, customer-focused, globally leading Businesses: Electrification, Industrial Automation, Motion, and Robotics & Discrete Automation, supported by the ABB Ability™ digital platform. We plan to divest 80.1 percent of ABB's Power Grids business to Hitachi in 2020. ABB has approximately 144,000 employees.

History of the ABB Group

The ABB Group was formed in 1988 through a merger between Asea AB and BBC Brown Boveri AG. Initially founded in 1883, Asea AB was a major participant in the introduction of electricity into Swedish homes and businesses and in the development of Sweden's railway network. In the 1940s and 1950s, Asea AB expanded into the power, mining and steel industries. Brown Boveri and Cie. (later renamed BBC Brown Boveri AG) was formed in Switzerland in 1891 and initially specialized in power generation and turbines. In the early to mid-1900s, it expanded its operations throughout Europe and broadened its business operations to include a wide range of electrical engineering activities.

In January 1988, Asea AB and BBC Brown Boveri AG each contributed almost all of their businesses to the newly formed ABB Asea Brown Boveri Ltd, of which they each owned 50 percent. In 1996, Asea AB was renamed ABB AB and BBC Brown Boveri AG was renamed ABB AG. In February 1999, the ABB Group announced a group reconfiguration designed to establish a single parent holding company and a single class of shares. ABB Ltd was incorporated on March 5, 1999, under the laws of Switzerland. In June 1999, ABB Ltd became the holding company for the entire ABB Group. This was accomplished by having ABB Ltd issue shares to the shareholders of ABB AG and ABB AB, the two companies that formerly owned the ABB Group. The ABB Ltd shares were exchanged for the shares of those two companies, which, as a result of the share exchange and certain related transactions, became wholly-owned subsidiaries of ABB Ltd. ABB Ltd shares are currently listed on the SIX Swiss Exchange, the NASDAQ OMX Stockholm Exchange and the New York Stock Exchange (in the form of American Depositary Shares).

Organizational structure

Our business is international in scope and we generate revenues in numerous currencies. We operate in approximately 100 countries across three regions: Europe, the Americas, and Asia, Middle East and Africa (AMEA). We are headquartered in Zurich, Switzerland.

We manage our company through our four Businesses. For a breakdown of our consolidated revenues (i) by Business (ii) by geographic region (iii) by end-customer markets and (iv) by product type, see "Item 5. Operating and Financial Review and Prospects – Analysis of Results of Operations – Revenues" and "Note 23 – Operating segment and geographic data". We also operate our Power Grids business, which is reported as discontinued operations in the Consolidated Financial Statements (see "Discontinued operations" section below).

Our principal corporate offices are located at Affolternstrasse 44, CH-8050 Zurich, Switzerland, telephone number +41 43 317 71 11. Our agent for U.S. federal securities law purposes is ABB Holdings Inc., located at 305 Gregson Drive, Cary, North Carolina 27511. Our internet address is www.abb.com. The United States Securities and Exchange Commission (SEC) maintains a website at www.sec.gov which contains in electronic form each of the reports and other information that we have filed electronically with the SEC.

Employees

A breakdown of our employees by geographic region is as follows:

December 31,	2019	2018	2017
Europe	68,400	68,300	63,000
The Americas	35,200	35,600	28,800
Asia, Middle East and Africa	40,800	42,700	43,000
Total	**144,400**	**146,600**	**134,800**

The proportion of our employees that are represented by labor unions or are subject to collective bargaining agreements varies based on the labor practices of each country in which we operate.

Our markets

ABB is a technology leader that is driving the digital transformation of industries, combining electrification, automation and robotics and digitalization solutions for industrial customers. We operate in attractive, growing markets with a focus on fast-growth segments including software and digital solutions, data centers, EV charging, robotics and machine and factory automation. We believe that our portfolio is well positioned to benefit from secular growth drivers, including urbanization, aging populations, the electrification of transport, the Internet of Things and other data and digitalization trends.

Approximately 40 percent of our orders are for digitally enabled products and services (including ABB Ability™ solutions, software and related services, digitally enabled products). As the end-markets we serve are still at an early stage of digitalization, including food and beverage, rail, buildings, oil and gas, chemicals, marine, utilities, and other discrete markets, we expect the demand for digitally enabled solutions from our customers to grow significantly in the coming years.

ABB Ability™ is our unified, cross-industry digital portfolio, extending from device to edge to cloud on an open architecture platform. ABB Ability™ provides over 160 solutions (excluding the Power Grids business) utilizing the latest software technologies, including artificial intelligence and machine learning, to improve productivity and efficiency, security, safety and reliability, ultimately unlocking value for customers. ABB Ability™ solutions cover the entire life-cycle of assets, from planning and building to performance management. ABB Ability™ is a globally recognized market leader for control systems for process industries and for utility- and mining-related asset management software. We also have a leading offering in connected services, for example remote monitoring services for robots, motors and machinery and remote control solutions for buildings, EV charging networks and offshore platforms. Some of the more specialized offerings address energy management for data centers and navigation optimization and automation for maritime shipping fleets.

Utilities Market

Following the agreement to divest the Power Grids business to Hitachi, which we announced on December 17, 2018, the exposure to utility customers for our continuing operations has decreased significantly. In 2019, ABB was focused on delivering solutions in the distribution and renewables segments within the sector, even while continuing to service conventional power generation customers with our control and automation solutions. Our continuing operations are not active in the high-voltage transmission segment. As a proportion of revenues, utility customers accounted for 15 percent in 2019.

Conventional power generation markets were challenged in 2019, with select investments focused in service activities as utilities looked to prolong asset-lives. Renewables investments grew, while capital expenditure in the distribution segment also increased owing to the increased scale of output from renewables assets.

Industry Market

We serve production facilities and factories all around the world from process to discrete industries with a comprehensive automation portfolio including robotics. Automation and digitalized solutions that achieve improved safety, uptime, energy efficiency and productivity are the intended hallmarks of our offerings in this customer segment. As a proportion of revenues, industrial customers accounted for 56 percent in 2019.

Investments in 2019 in robotics and machinery automation solutions were challenged by weak consumer demand for traditional automotive vehicles, a subdued consumer electronics market, and a tough machine builders market. Demand for new EV manufacturing lines and in service areas such as intra-logistics was not able to offset the headwinds from the aforementioned markets. Process industries, including pulp and paper, oil and gas and mining invested more in 2019 than in the prior year, investing predominantly in service and productivity improvements.

Transport & Infrastructure Market
Our expertise provides efficient, reliable and sustainable solutions for transport & infrastructure customers. We believe our offerings are key to customers that are focused on energy efficiency and reduced operating costs. Other major growth drivers for this customer segment are urbanization, the move to electrify transportation, and growth in data centers and smart buildings. As a proportion of revenues, transport & infrastructure customers accounted for 29 percent in 2019.

Demand in transport & infrastructure markets was solid in 2019. Demand for building automation solutions and from data center customers was strong over the year, with ABB successful in offering bundled solutions to hyperscale and co-location customers in particular. Buildings demand was robust. Activity in rail for electrification and traction solutions grew well, while activity in specialty vessels, particularly cruise ships, was healthy.

EV charging markets accelerated sharply during 2019. We received multiple orders from customers for EV charging infrastructure, including for our high-voltage direct-current (DC) fast-charging station, the Terra HP. As of December 31, 2019, we have more than 11,000 installed fast-chargers in 76 countries.

Since April 1, 2019, we reorganized the compositions of our businesses and commenced serving our customers through four Businesses. Developments in these Businesses are discussed in more detail below. Revenue figures presented in this Business section are before intersegment eliminations.

Businesses

Electrification Business

Overview
The Electrification Business provides products, services and connected solutions throughout the electrical value chain from the substation to the point of consumption across the world. The innovations from this business enable safer and more reliable electricity flow, with a full range of low- and medium-voltage products and solutions for intelligent protection and connection as well as pre-engineered packaged services and solutions tailored to customers' needs. The portfolio includes modular substation packages, distribution automation products, switchgear, circuit breakers, measuring and sensing devices, control products, solar power solutions, EV charging infrastructure, wiring accessories, and enclosures and cabling systems, including KNX systems (the recognized global standard for home and building control) and data communication networks.

The Business delivers products to customers through a global network of channel partners and end-customers. Most of the Business's revenue is derived from sales through distributors, original equipment manufacturers (OEMs), engineering, procurement, construction (EPC) contracting companies, system integrators, utilities and panel builders, with some direct sales to end-users (utilities, customers in industries, transport & infrastructure segments) and to other ABB businesses.

The Electrification Business had approximately 53,000 employees on December 31, 2019, and generated $12.7 billion of revenues in 2019.

Customers
The Electrification Business serves a wide range of customers, including buildings, data centers, rail, wind and solar, distribution utilities, food and beverage, marine, oil and gas, and e-mobility.

Products and Services
The Smart Power business offers low-voltage system orientated products that protect, control and connect people, plants and systems. ABB offers solutions to restore power rapidly in case of a fault and helps provide optimum protection for people and electrical installations. The product

offering includes molded-case and air-circuit breakers, safety switches used for power distribution in factories and buildings, switchgear systems for short circuit and overload protection as well as cabling and connection components. It also offers power protection solutions such as uninterruptible power supply (UPS) solutions, status transfer switches and power distribution units. In addition, the business offers a range of contactors, proximity sensors, safety products for industrial protection, limit switches, along with electronic relays and overload relays.

The Smart Buildings business provides low-voltage smart home and intelligent building control systems, including voice activated KNX systems to optimize efficiency, safety and comfort through the automated management of lighting, shutters and security. In addition, the business supplies conventional wiring accessories, industrial plugs and sockets, DIN-rail products, and enclosures ideal for single family homes, multiple dwellings, commercial buildings, infrastructure and industrial applications, including electric vehicle charging infrastructure from AC wall boxes through to DC fast charging stations and on-demand electric bus charging systems.

The Installation Products business offers products for low-voltage wire and cable management, making the task of fastening, protecting, insulating and connecting wires easier and quicker for industrial applications, construction, communications, utility and OEM professionals, as well as do-it-yourself specialists. The business offers emergency lighting and lighting for explosive environments, as well as lightning protection and earth grounding apparatus.

The Distribution Solutions business helps utility, industry and transport & infrastructure customers to improve power quality and control, reduce outage time and enhance operational reliability and efficiency. The business offers products and services that largely serve the power distribution sector, often providing the requisite medium-voltage link between high-voltage transmission systems and low-voltage users. Its comprehensive offering includes medium-voltage equipment (1 to 66 kilovolts), indoor and outdoor circuit breakers, reclosers, fuses, contactors, relays, instrument transformers, sensors, motor control centers, ring main units for primary and secondary distribution, as well as a range of air- and gas-insulated switchgear. It also produces indoor and outdoor modular systems and other solutions to facilitate efficient and reliable power distribution, adding value through design, engineering, project management and service. The service offering spans the entire value chain, from the moment a customer makes the first inquiry to disposal and recycling of the product. Throughout the value chain, ABB provides training, technical support and customized contracts. All of this is supported by an extensive global sales and service network.

The Solar business offers an extensive range of solar inverters for residential, commercial and utility applications designed to optimize the performance, reliability and return on investment of any solar installation. It also offers solar packages with integrated energy storage solutions, utility-scale turnkey solutions and microgrid solutions. During 2019, we reached an agreement to sell our solar inverters business to FIMER S.p.A. and the completion of the sale is expected to be in the first quarter of 2020. The Electrification Business remains fully committed to supporting the renewables industry with its leading energy protection, control and integration products and solutions.

The Industrial Solutions business includes the acquired GEIS business and offers product solutions, such as switchboards, panelboards, UPS and arc prevention technologies and engineered solutions, such as modular, cost-saving medium-voltage switchgear, motor control centers, vacuum circuit breakers, arc-resistant switchgear for industrial applications and industry leading telecom DC power.

Sales and Marketing

Sales are primarily made through indirect sales channels such as distributors to end-customers including installers and system integrators. Direct customers range from electrical installers to large utilities, industrial end-users, customers in the transport & infrastructure sector, as well as other ABB businesses. The proportion of direct sales compared to channel partner sales varies among the different industries, product technologies and geographic markets. The business is focused on creating demand to support its channel sales, with a range of promotional activities and support services including configuration and digital solutions.

Competition

The Electrification Business's principal competitors vary by product group and include Eaton, Legrand, Schneider Electric, Siemens, Hubbell, Rittal and Chint.

Capital Expenditures

The Electrification Business's capital expenditures for property, plant and equipment totaled $279 million in 2019, compared to $244 million and $218 million in 2018 and 2017, respectively. Investments in 2019 were primarily related to footprint changes, equipment replacement and upgrades. Geographically, in 2019, Europe represented 49 percent of the capital expenditures, followed by the Americas (36 percent) and Asia, Middle East and Africa (15 percent).

Industrial Automation Business

Overview

The Industrial Automation Business offers customers in process and hybrid industries a broad range of industry-specific integrated automation, electrification and digital solutions that are designed to optimize the productivity, energy efficiency and safety of their industrial processes and operations, based on deep domain knowledge and expertise of each end market. The solutions include turnkey engineering, control technologies, software and lifecycle services, measurement and analytics products, marine and turbocharging offerings, Human Machine Interfaces (HMI) and integrated safety technology. The systems can link various process and information flows allowing customers to manage and control their entire manufacturing and business process based on real-time facility or plant information. Additionally, the systems and solutions enable customers to increase production efficiency, optimize their assets and reduce environmental impact.

The Industrial Automation Business's offerings are available as separately sold products or as part of a total automation, electrification and/or instrumentation solution. For overall solutions, Industrial Automation integrates products and solutions from the Electrification, Motion, and Robotics & Discrete Automation Businesses as well as our Power Grids business. The Business's offering is sold primarily through its direct sales force as well as third-party channels.

The Business had approximately 22,300 employees as of December 31, 2019, and generated revenues of $6.3 billion in 2019.

Customers

The Industrial Automation Business's end customers include companies in the oil and gas, minerals and mining, metals, pulp and paper, chemicals, plastics, pharmaceuticals, food and beverage, power generation and maritime industries. These customers are looking for automation, electrification, instrumentation and digitalization offerings that deliver value mainly through lower capital costs, increased plant availability, lower life-cycle costs and lower project risks.

Products and Services

Oil, gas and chemicals solutions cover the entire hydrocarbon value chain, from exploration and production to supply, transport and distribution, as well as refining, chemicals and petrochemicals. ABB specializes in mastering the control loop and transforming client operations through actionable insights that optimize performance in real time. From the well head to the refinery, ABB Ability™ solutions aim to connect people with data to optimize performance, improve reliability, enhance efficiency and minimize environmental impact from project start-up throughout the entire plant life cycle.

Other process industry markets served include mining, minerals processing, metals, pharmaceuticals and pulp and paper as well as their associated service industries. The Business's added value is deep industry expertise coupled with the ability to integrate both automation and electrical, resulting in faster start-up times, increased facility productivity and reduced overall capital and operating costs for customers. For mining, metals and cement industries, solutions include specialized products and services, as well as total production systems. The Business designs, plans, engineers, supplies, erects and commissions integrated electric equipment, drives, motors, high power rectifiers and equipment for automation and supervisory control within a variety of areas including mineral handling, mining operations, aluminum smelting, hot and cold steel applications and cement production. In the pharmaceuticals and fine chemicals areas, the Business offers applications to support manufacturing, packaging, quality control and compliance with regulatory agencies. The offering for the pulp and paper industries includes control systems, quality control systems, drive systems, on-line sensors, actuators and field instruments.

The Business serves the power generation market with leading automation solutions for all types of power generation. With an offering that includes instrumentation, excitation and control systems, our technologies are designed to help optimize performance, improve reliability, enhance efficiency and minimize environmental impact throughout the plant life cycle. The Business also serves the water industry, including applications such as pumping stations and desalination plants.

The Business serves the marine and ports industry through its leading solutions for specialty vessels, as well as container and bulk cargo handling. For the shipping industry, the Business offers an extensive portfolio of integrated marine systems and solutions that improve the flexibility, reliability and energy efficiency of vessels. By coupling power, automation and marine software, proven fuel-efficient technologies and services that ensure maximum vessel uptime, ABB is well positioned to help improve the profitability of a customer's business throughout the entire life cycle of a fleet. The Business designs, engineers, builds, supplies and commissions automation and electrical systems for marine power generation, power distribution and electric propulsion, as well as turbochargers to improve efficiency. With ABB Ability™'s Collaborative Operations Centers around the world and marine software solutions, owners and operators can run their fleets at lower fuel and maintenance cost, while improving crew, passenger, and cargo safety and overall productivity of their operations. In addition, the Business delivers automation and electrical systems for container and bulk cargo handling, from ship to gate. These systems and services help terminal operators meet the challenge of larger ships, taller cranes and bigger volumes per call, and make terminal operations safer, greener and more productive.

The Business serves the hybrid and discrete market, focusing primarily on plastics, food and beverage, packaging and data centers. The Business combines state-of-the-art technology with advanced engineering to provide a wide range of customers with complete solutions for machine and factory automation, motion control, HMI and integrated safety technology. ABB is one of the largest providers focused on product- and software-based, open-architecture solutions for machine and factory automation worldwide.

The Business offers an extensive portfolio of products and software from stand-alone basic control to integrated collaborative systems for complex or critical processes. Solutions such as Distributed Control System (DCS) 800xA, provides a scalable extended automation system for process and production control, safety, and production monitoring. Freelance, another solution, is a full-fledged, easy-to-use DCS for small to medium size applications. The Programmable Logic Controller (PLC) automation portfolio offers a scalable range for small, middle and high-end applications. Components for basic automation solutions, process and safety controllers, field interfaces, panels, process recorders and HMI are available through our Compact Product Suite offering. The product portfolio is complemented by services such as Automation Sentinel, a subscription-based life-cycle management program that provides services to maintain and continually advance and enhance ABB Ability™ control systems (e.g. cyber security patches) and thus allows it to manage a customer's life-cycle costs. The ABB Ability™ Advanced Services offering portfolio provides individual software-based services to continuously improve automation and processes. The Business also offers Manufacturing Execution Systems that enable agility and transparency for production processes by synchronizing and orchestrating a flow across individual automation islands.

The measurement and analytics business portfolio is designed to measure product properties, such as weight, thickness, color, brightness, moisture content and additive content and includes a full line of instrumentation and analytical products to analyze, measure and record industrial and power processes. Actuators allow the customer to make automatic adjustments during the production process to improve the quality and consistency of the product. Field instruments measure properties of the process, such as flow rate, chemical content and temperature.

The Business manufactures and maintains turbochargers for diesel and gas engines having power levels ranging from 500 kilowatts to over 80 megawatts. The Business provides engine builders and application operators with advanced turbocharging solutions for efficient and flexible application operations and in compliance with the most stringent environmental requirements.

Sales and Marketing

The Industrial Automation Business primarily uses its direct sales force as well as third-party channel partners, such as distributors, system integrators and OEMs. The majority of revenues are derived through the Business's own direct sales channels.

Competition

The Industrial Automation Business's principal competitors vary by industry or product group. Competitors include: Emerson, Honeywell, Valmet, Rockwell Automation, Beckhoff, Schneider Electric, Siemens, Voith, and Yokogawa Electric Corporation.

Capital Expenditures

The Industrial Automation Business's capital expenditures for property, plant and equipment totaled $64 million in 2019, compared to $58 million and $54 million in 2018 and 2017, respectively. Principal investments in 2019 were in Turbocharging and the Measurement and Analytics business lines. Geographically, in 2019, Europe represented 70 percent of the capital expenditures, followed by the Americas (19 percent) and Asia, Middle East and Africa (11 percent).

Motion Business

Overview

The Motion Business provides pioneering technology, products, solutions and related services to industrial customers to increase energy efficiency, improve safety and reliability, and maintain precise control over processes. The portfolio includes motors, generators and drives for a wide range of applications in all industrial sectors.

The Motion Business had approximately 20,400 employees as of December 31, 2019, and generated around $6.5 billion of revenue in 2019.

Products and Services

The Motors and Generators business line supplies a comprehensive range of electrical motors, generators, and mechanical power transmission products. The range of electrical motors includes high efficiency motors that conform to leading environmental and Minimum Energy Performance Standards (MEPS). Efficiency is an important selection criterion for customers, because electric motors account for nearly two-thirds of the electricity consumed by industrial plants. The business line manufactures synchronous motors for the most demanding applications and a full range of low- and high-voltage induction motors, for both IEC (International Electrotechnical Commission) and NEMA (National Electrical Manufacturers Association) standards. The business line offers digitalized asset management solutions that monitor motor performance and provide vital intelligence on key operating parameters. These products and solutions are designed to help customers improve uptime, extend motor lifetimes, and increase productivity while becoming or remaining digitally connected.

The Drives business line provides low-voltage and medium-voltage drives and systems for industrial, commercial and residential applications. Drives provide speed, torque and motion control for equipment such as fans, pumps, compressors, conveyors, centrifuges, mixers, hoists, cranes, extruders, and printing and textile machines. They are used in industries such as building automation, marine, power, transportation, food and beverage, metals, mining, and oil and gas. The business line also supplies traction converters (propulsion converters and auxiliary converters) for the transportation industry and wind converters.

The Motion Business offers services that complement its products and solutions, including design and project management, engineering, installation, training and life cycle care, energy efficiency appraisals, preventive maintenance and digital services such as remote monitoring and software tools.

Customers

The Motion Business serves a wide range of customers, including OEMs, process industries such as pulp and paper, oil and gas, and metals and mining companies, hybrid and batch manufacturers such as food and beverage companies, transportation equipment manufacturers, discrete manufacturing companies, logistics, utilities as well as customers in the automotive industry.

Sales and Marketing

Sales are made both through direct sales forces and through channel partners, such as distributors and wholesalers, as well as installers, machine builders and OEMs, and system integrators. The proportion of direct sales compared to channel partner sales varies among the different industries, product technologies and geographic markets.

Competition

The principal competitors of the Motion Business include Siemens, Toshiba, WEG Industries, SEW-EURODRIVE and Danfoss.

Capital Expenditures

Capital expenditures in the Motion Business for property, plant and equipment totaled $110 million in 2019, compared to $93 million and $89 million in 2018 and 2017, respectively. Principal investments in 2019 were primarily related to equipment replacement, footprint adjustments and automation upgrades. Geographically, in 2019, Europe represented 44 percent of the capital expenditures, followed by the Americas (36 percent) and Asia, Middle East and Africa (20 percent).

Robotics & Discrete Automation Business

Overview

The Robotics & Discrete Automation Business provides robotics, and machine and factory automation from single products to complete systems including services.

Revenues are generated both from direct sales to end users as well as from indirect sales mainly through system integrators and machine builders.

The Robotics & Discrete Automation Business had approximately 10,100 employees as of December 31, 2019, and generated $3.3 billion of revenues in 2019.

Products and Services

The Robotics business offers a wide range of products, solutions and services such as industrial robots, software, application solutions, engineered solutions and related services. This offering provides flexibility and productivity for operations to meet the challenge of making smaller lots of a larger number of specific products in shorter cycles for today's dynamic global markets, while also improving quality, productivity and reliability. Robots are also used in activities or environments which may be hazardous to employee health and safety, such as repetitive or strenuous lifting, dusty, hot or cold rooms, or painting booths. In the automotive industry, robot products and systems are used in areas such as press shop, body shop, paint shop, power train assembly, trim and final assembly. Robotics solutions are used in a wide range of segments from metal fabrication, foundry, plastics, food and beverage, chemicals and pharmaceuticals, electronics and warehouse/logistics center automation. Typical robotic applications in general industry include welding, material handling, machine tending, painting, picking, packing, palletizing and small parts assembly automation.

The Machine and Factory Automation business offers automation products and solutions such as programmable logical controllers, industrial PCs, servo motion control systems and track systems. The range of solutions are mainly used by machine builders for various types of series machines, e.g. for plastics, metals, printing and packaging.

Customers
Robotics & Discrete Automation serves a wide range of customers. The main customers are active in industries such as automotive, machine building, metalworking, electronics, food and beverage and logistics. They include end-users such as manufacturers, system integrators and machine builders.

Sales and Marketing
Sales are made both through direct sales forces as well as through third-party channel partners, such as system integrators and machine builders. The proportion of direct sales compared to channel partner sales varies among the different industries, product technologies and geographic markets.

Competition
The principal competitors of the Robotics & Discrete Automation Business vary by offering and include companies such as Fanuc, Kuka, Yaskawa, Kawasaki, Dürr, Stäubli, Universal Robots, Rockwell Automation and Siemens.

Capital Expenditures
The Robotics & Discrete Automation Business's capital expenditures for property, plant and equipment totaled $59 million in 2019, compared to $74 million and $43 million in 2018 and 2017, respectively. Principal investments in 2019 were primarily related to production capacity, upgrades and equipment replacement. Geographically, in 2019, Europe represented 78 percent of the capital expenditures, followed by Asia, Middle East and Africa (17 percent) and the Americas (5 percent).

Corporate and Other

Corporate and Other includes headquarters, central research and development, real estate activities, Corporate Treasury Operations, Global Business Services (GBS) and other minor business activities. The remaining activities of certain EPC projects which we are completing and are in a wind-down phase are also reported in Corporate and Other. In addition, we have classified the historical business activities of significant divested businesses in Corporate and Other. These include the high-voltage cables business, the EPC business for turnkey electrical AC substations and certain EPC contracts relating to the oil and gas industry.

Corporate headquarters and stewardship activities include the operations of our corporate headquarters in Zurich, Switzerland, as well as corporate-related activities in various countries. These activities cover staff functions with group-wide responsibilities, such as accounting and financial reporting, corporate finance and taxes, planning and controlling, internal audit, legal and integrity, compliance, risk management and insurance, corporate communications, information systems, investor relations and human resources.

Corporate research and development primarily covers our research activities, as our development activities are organized under our Businesses. We have two global research laboratories, one focused on power technologies and the other focused on automation technologies, which both work on technologies relevant to the future of our business. Each laboratory works on new and emerging technologies and collaborates with universities and other external partners to support our Businesses in advancing relevant technologies and in developing cross-business technology platforms. We have corporate research centers in seven countries (China, India, Germany, Poland, Sweden, Switzerland and the U.S.).

GBS operates shared service centers globally through a network of five hubs and consists of both expert and transactional services in the areas of human resources, finance, information services, legal, real estate, procurement and logistics, customer contact centers, global travel services and other ancillary activities. GBS also staffs and maintains front offices in most countries.

A significant portion of the costs for GBS and other shared corporate overhead costs are allocated to the operating businesses. Overhead and other management costs, including GBS costs, which would have been allocated to our Power Grids business, and which are not directly attributable to this business, are not allocated to the discontinued operation and are included in Corporate and Other and are considered “stranded costs”.

Corporate and Other had approximately 4,200 employees at December 31, 2019.

Discontinued operations

In December 2018, the Company announced an agreement to divest 80.1 percent of its Power Grids business to Hitachi valuing the business at $11 billion. As a result, the Power Grids business is reported as discontinued operations in the Consolidated Financial Statements for all years presented. See “Note 3 – Basis of presentation and assets held for sale” to our Consolidated Financial Statements.

Power Grids business

The Power Grids business is a global leader and aspires to be the partner of choice for enabling a stronger, smarter and greener grid. The Power Grids business provides product, systems, software and service solutions across the power value chain that are designed to help meet growing demand for electricity with minimum environmental impact. These solutions support utility, industry and transport & infrastructure customers to plan, build, operate and maintain their power infrastructure. They are designed to facilitate the safe, reliable and efficient integration, transmission and distribution of bulk and distributed energy generated from conventional and renewable sources.

The Power Grids business has a worldwide customer base, with a balanced geographic spread of revenues across the Americas, Europe, and Asia, Middle East and Africa. The business also has a globally diversified manufacturing, engineering, and research and development footprint to serve customers in the most efficient manner. Direct sales account for the majority of total revenues generated by the business while external channel partners such as EPCs, wholesalers, distributors and OEMs account for the rest.

Products and Services

The Grid Automation operation is at the forefront of digitalizing and automating the power grid. It supplies substation automation products, systems and services. It also provides Supervisory Control and Data Acquisition (SCADA) systems for transmission and distribution networks as well as a range of wireless, fiber optic and powerline carrier-based telecommunication technologies for mission-critical applications. The operation offers grid-edge and microgrid solutions that are being increasingly deployed for remote and partially grid-connected applications. Its comprehensive enterprise software portfolio provides solutions for managing and optimizing assets, operations, logistics, financials and HR, reducing operating costs and improving productivity for customers.

The Grid Integration operation is among the world’s leading providers of integration and transmission solutions such as High Voltage Direct Current (HVDC), a technology pioneered by ABB and now playing a key role around the world in integrating renewables and transmitting electricity efficiently and reliably over ever-increasing distances with minimal losses. Another key part of the portfolio is the Flexible Alternating Current Transmission Systems (FACTS) business, which comprises Static Var Compensation (SVC) and static compensator (STATCOM) technologies to address stability and power quality issues. The Grid Integration operation’s portfolio also includes a range of high-power semiconductors, a core technology for power electronics deployed in HVDC, FACTS and rail applications. The Grid Integration operation is also among the world’s leading providers of transmission and distribution substations and associated life-cycle services. These substations are used in utility and non-utility applications including rail, data centers and various industries. Battery energy storage solutions and shore-to-ship power supply are also part of the customer offering.

The High Voltage products operation is a global leader in high voltage switchgear up to 1200 kV AC and 1100 kV DC with a portfolio spanning air-insulated, gas-insulated and hybrid technologies. It manufactures generator circuit breakers, a key product for integrating large power plants into the grid. The portfolio also includes a broad range of capacitors and filters that facilitate power quality, instrument transformers and other substation components.

The Transformers operation supplies transformers that are an integral component found across the power value chain, enabling the reliable, efficient and safe conversion of voltages levels. The product range includes dry- and liquid-distribution transformers, traction transformers for rail applications and special application transformers plus related components, for example, insulation kits, bushings and other transformer accessories. The business is also leading the way in digitalization of its transformer portfolio, equipping them with sensor-based technologies to facilitate asset optimization and enable smarter grids.

The Power Grids business also has an extensive portfolio of service offerings across the value chain. This is a growing focus area, leveraging the significant installed base. The portfolio includes spare parts, condition monitoring and maintenance services, on- and off-site repairs as well as retrofits and upgrades. Advanced software-based monitoring and advisory services further enhance the portfolio and support the increasing digitalization of grids.

Simplification of business model and structure

In December 2018, as part of our ABB-OS program, we announced our intention to simplify our organizational structure through the discontinuation of the legacy matrix, country and regional structures, including regional Executive Committee roles. These changes were completed by January 1, 2020, and, effective January 1, 2020, the Executive Committee has been streamlined to reflect this new structure.

In addition, effective April 1, 2019, we changed the composition and operating model of our operating Businesses. Our new organization provides each Business with full operational ownership of products, support functions, research and development, and geographic territories. The Businesses are the single interface to customers, maximizing proximity and speed. Corporate activities will focus on Group strategy, portfolio and performance management, capital allocation, core technologies and the ABB Ability™ platform, providing a common framework across the group.

In line with the simplification, as of April 1, 2019, we operate four customer-focused, entrepreneurial Businesses: Electrification, Industrial Automation, Motion and Robotics & Discrete Automation.

Capital expenditures

Total capital expenditures for property, plant and equipment and intangible assets (excluding intangibles acquired through business combinations) amounted to $762 million, $772 million and $752 million in 2019, 2018 and 2017, respectively. In 2019, 2018 and 2017, capital expenditures were 21 percent, 16 percent and 10 percent lower, respectively, than depreciation and amortization. Excluding acquisition-related amortization, capital expenditures were 9 percent, 20 percent and 24 percent higher, respectively, than depreciation and amortization.

Capital expenditures in 2019 remained at a significant level in mature markets, reflecting the geographic distribution of our existing production facilities. Capital expenditures in Europe and North America in 2019 were driven primarily by upgrades and maintenance of existing production facilities, mainly in the U.S., Switzerland, Germany, Italy, Finland, Sweden and Austria. Expenditures in Austria included amounts for a state-of-the-art innovation and training campus, which is planned to become one of our largest research and development centers. Capital expenditures in emerging markets were highest in China, India and Poland. Capital expenditures in emerging markets were made primarily to increase production capacity by investing in new or expanded facilities. We started construction of an advanced, automated and flexible robotics factory in China, which is designed to combine our connected digital technologies, state-of-the-art collaborative robotics and innovative artificial intelligence research. The share of emerging markets capital expenditures as a percentage of total capital expenditures in 2019, 2018 and 2017 was 27 percent, 31 percent and 28 percent, respectively.

At December 31, 2019, construction in progress for property, plant and equipment was $500 million, mainly in the U.S., Switzerland, Finland, Germany, Austria and Sweden. At December 31, 2018, construction in progress for property, plant and equipment was $464 million, mainly in the U.S., China, Sweden, Finland and Germany while at December 31, 2017, construction in progress for property, plant and equipment was $511 million, mainly in China, the U.S., Switzerland, Sweden and Germany.

Our capital expenditures relate primarily to property, plant and equipment. For 2020, we estimate the expenditures for property, plant and equipment will be lower than our annual depreciation and amortization charge, excluding acquisition-related amortization.

Supplies and raw materials

We purchase a variety of supplies and products which contain raw materials for use in our production and project execution processes. The primary materials used in our products, by weight, are copper, aluminum, steel, mineral oil and various plastics. We also purchase a wide variety of fabricated products, electronic components and systems. We operate a worldwide supply chain management network with employees dedicated to this function in our Businesses and key countries. Our supply chain management network consists of a number of teams, each focusing on different product categories. These category teams take advantage of opportunities to leverage the scale of ABB on a global, business and/or business line level, as appropriate, to optimize the efficiency of our supply networks in a sustainable manner.

Our supply chain management organization's activities and objectives include:

- pool and leverage procurement of materials and services,
- provide transparency of ABB's global spending through a comprehensive performance and reporting system linked to our enterprise resource planning (ERP) systems,
- strengthen ABB's supply chain network by implementing an effective product category management structure and extensive competency-based training, and
- monitor and develop our supply base to ensure sustainability, both in terms of materials and processes used.

We buy many categories of products which contain steel, copper, aluminum, crude oil and other commodities. Continuing global economic growth in many emerging economies, coupled with the volatility in foreign currency exchange rates, has led to significant fluctuations in these raw material costs over the last few years. While we expect global commodity prices to remain highly volatile, we expect to offset some market volatility through the use of long-term contracts and global sourcing.

We seek to mitigate the majority of our exposure to commodity price risk by entering into hedges. For example, we manage copper, silver and aluminum price risk using principally swap contracts based on prices for these commodities quoted on leading exchanges. ABB's hedging policy is designed to safeguard margins by minimizing price volatility and providing a stable cost base during order execution. In addition to using hedging to reduce our exposure to fluctuations in raw materials prices, in some cases we can reduce this risk by incorporating changes in raw materials prices into the prices of our end products (through price escalation clauses).

Overall, during 2019 supply chain management personnel in our businesses, and in the countries in which we operate, along with the category teams, continued to focus on value chain optimization efforts in all areas, while maintaining and improving quality and delivery performance.

In August 2012, the SEC issued its final rules regarding "Conflict Minerals", as required by section 1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act. We initiated conflict minerals processes in 2013 and have continuously aimed at improving and tailoring the processes to our value chain. We continue to work with our suppliers and customers, to enable us to comply with the rules and disclosure obligations. Further information on ABB's Conflict Minerals policy and supplier requirements can be found under "Material Compliance" at new.abb.com/about/supplying.

Patents and trademarks

While we are not materially dependent on any one of our intellectual properties, as a technology-driven company, we believe that intellectual property rights are crucial to protect the assets of our business. Over the past ten years, we have continued to substantially add new applications to our existing first patent filings, and we intend to continue our aggressive approach to seeking patent protection. As of December 31, 2019, we have approximately 33,500 patent applications and registrations, of which approximately 8,500 are pending applications. These patents include more than 3,800 utility model and design applications and registrations, of which approximately 400 are pending applications. In 2019, we filed more than 1,400 patent, utility model and design applications for more than 1,500 new inventions. Based on our existing intellectual property strategy, we believe that we have adequate control over our core technologies. The "ABB" trademarks and logo are protected in all of the countries in which we operate. We aggressively defend our intellectual property rights to safeguard the reputation associated with the ABB technology and brand. While these intellectual property rights are fundamental to all of our businesses, there is no dependency of the business on any single patent, utility model or design application.

Management overview

The combined impact of the Energy and Fourth Industrial Revolution is profoundly influencing how we power the world, produce goods, work, live in cities and move in a sustainable way.

On December 17, 2018, we announced an agreed sale of our Power Grids business, expanding our existing partnership with Hitachi Ltd (Hitachi). We also announced our new strategy, with ABB proposing fundamental actions to focus, simplify and lead the digital transformation of industries, for enhanced customer value and shareholder returns. To deliver on our ambitions, we are introducing a new operating model, ABB Operating System (ABB-OS). ABB-OS provides a common framework across the Group, governing management processes, such as market validation, budgeting and portfolio management, in order to facilitate clear decision making and a balanced approach to value creation. Our new, simplified, operating model also positions the Businesses to be the single interface to customers, maximizing proximity and speed. Each Business is intended to have full entrepreneurial ownership of operations, functions, research and development, and territories. Significant amounts of company resources and management effort were dedicated to both of these areas in 2019.

We plan to demonstrate improved commercial quality of business and enhance exposure to faster growing markets with a greater emphasis on high value-add solutions, lower risk, less large-order volatility and more recurring revenue streams through digital solutions, software and services.

Our investment proposition is reflected in a new medium-term target framework for the Group:

- 3 to 6 percent annual comparable revenue growth, based on current economic outlook,
- Operational EBITA margin of 13 to 16 percent,
- Return on Capital Employed (ROCE) of 15 to 20 percent,
- Cash conversion to net income of approximately 100 percent, and
- Basic EPS growth above revenue growth.

In 2019, we successfully began implementing our new strategy.

Power Grids separation

Significant work was undertaken during 2019 to separate the Power Grids business from ABB. By

December 31, 2019, the new Power Grids legal structure was substantially complete, allowing the business to commence operations within a stand-alone consolidated business. In addition, the transfer of resources from ABB to the Power Grids business progressed significantly. Overall, the separation of the Power Grids business is proceeding as planned and the divestment is on schedule with closing expected at the end of the second quarter of 2020.

New operating model, ABB-OS

Since April 1, 2019, we have been operating through four customer-focused Businesses: Electrification, Industrial Automation, Motion, and Robotics & Discrete Automation. In particular, ABB has integrated group sales and the vast majority of other centrally managed functional activities into the Businesses, transferred country resources to the Businesses and worked to streamline the corporate center. At the end of 2019, regional structures were dismantled and the new operating model was fully effective as of January 1, 2020.

We reached the run-rate savings targeted for 2019 and continue to target annualized net savings of approximately $500 million in the medium term from our new operating model. ABB continuing operations headcount was 113,900 at the beginning of the year and 110,000 at the end of 2019, partly also reflecting stranded cost elimination. Continuous improvement plans are now in place within each Business and fully integrated into the annual planning process to support delivery of this objective.

Business progress

During 2019, the Group performed with resilience in the context of a tougher market environment, slightly improving revenues and gross margin while undertaking an extensive transformation.

Orders and revenues were higher in the Electrification and Motion Businesses while they decreased in the Industrial Automation and Robotics & Discrete Automation Businesses. These developments reflect some easing in global economic growth in 2019, while more substantial headwinds in discrete markets, particularly automotive and machine builders, resulted in larger declines in orders and revenues in the Robotics & Discrete Automation Business. During 2019, the order backlog increased 2 percent.

The performance of our Businesses was mixed during 2019 with increases in segment profit (Operational EBITA) in both the Electrification and Motion Businesses and decreases in the other two Businesses. Group profitability was supported by solid execution in the Motion Business, lower losses in non-core businesses and reductions in costs in Corporate, including $72 million of stranded corporate costs, and some realized savings from the ABB-OS simplification program. Group profitability was hampered by some specific headwinds in other businesses. In the Electrification Business, this included dilutive impact of including a full year of the GEIS business, which was acquired in June 2018 as well as a large loss recorded in connection with the planned divestment of the solar inverters business. In the Industrial Automation Business, the segment profit was impacted specifically by operational challenges in the Kusile power generation project in South Africa as well as adverse mix. The segment profit of the Robotics & Discrete Automation Business was impacted by lower volumes and adverse mix stemming from the downturn in its key end-markets.

Within the Electrification Business, the integration of GEIS progressed well. ABB aims to deliver approximately $200 million of annual cost synergies by 2022, of which approximately 80 percent is anticipated to come from product and technology portfolio harmonization and footprint optimization. To support this transformation, we plan to expend approximately $480 million for the GEIS business through 2022. By the end of 2019, the 13,000 employees from GEIS had been transitioned into ABB, while product substitutions were proceeding ahead of plan with 100 new products planned for commercial launch in 2020. In North America, 13 facilities have been designated for closure while 4 facilities have been identified for expansion.

Agreements for a number of divestments and acquisitions were secured in 2019 to strengthen our portfolio. Of note, the Electrification Business announced in July 2019 an agreement to divest the solar inverters business to FIMER S.p.A (Italy). The transaction will enable the Electrification Business to focus its business portfolio on other growth markets. In December 2019, the Electrification Business completed the divestment of two Shanghai-based joint ventures, acquired in 2018 as part of the GEIS transaction, reducing the complexity of the Electrification Business in China. In October 2019, we also announced the planned acquisition of a majority stake in Shanghai Chargedot New Energy Technology Co., Ltd, a leading Chinese e-mobility solution provider. The acquisition will extend our relationships with leading Chinese EV manufacturers and broaden our e-mobility portfolio with hardware and software developed specifically for local requirements.

We also continued to make organic growth investments in a disciplined manner, prioritizing research and development and sales expenditure while reducing administrative costs. Total non-order related research and development was $1.2 billion in 2019, or approximately 4 percent of revenues. Organic investment highlights from 2019 include the opening of the Robotics business's first dedicated healthcare research center at the Texas Medical Center in Houston, United States. This laboratory will focus on developing non-surgical medical robotics systems. The Motion Business unveiled a semi-autonomous production plant in Baden, Switzerland, that makes energy storage systems for railways, e-buses/trolleybuses and e-trucks, incorporating latest battery technologies that allow diesel engines to be efficiently converted to hybrid.

ABB continued to expand its digital ecosystem, announcing several important partnerships over the year, including entering a global software partnership with Dassault Systèmes, a world-leading provider of 3D and digital twin software, and the establishment of a global alliance with Ericsson, the Swedish networking and telecommunications company, focused on exploring future 5G technologies. We also partnered with Huawei, the Chinese information and communication technology provider, for the industrial cloud in China. Partnerships help ensure ABB Ability™ solutions consistently utilize latest high-tech developments, maximizing the value proposition of digital solutions for our customers.

Capital allocation

The Board of Directors is proposing a dividend of 0.80 Swiss francs per share at the 2020 Annual General Meeting.

Our sustained capital allocation priorities are unchanged:

- funding organic growth, research and development, and capital expenditures at attractive returns,
- paying a rising, sustainable dividend,
- investing in value-creating acquisitions, and
- returning additional cash to shareholders.

Following the expected completion of the sale of 80.1 percent of our Power Grids business to Hitachi at the end of the second quarter of 2020, valuing the business at $11 billion, we intend to commence a share buyback program returning to shareholders approximately $7.6–7.8 billion of proceeds from the divestment. We intend to maintain the level of dividend per share after the divestment and aim to maintain our "single A" credit rating long term.

Short-term outlook

Macroeconomic indicators suggest weaker growth in Europe and the U.S., while China's stabilizing trend might be impacted by the novel coronavirus outbreak. The global economy remains affected by geopolitical uncertainties.

The end-markets we operate in are showing resilience, with headwinds in some markets, particularly the automotive, machine builders, and conventional power generation sectors. Foreign exchange translation effects are expected to continue to influence our results.

Application of critical accounting policies

General

We prepare our Consolidated Financial Statements in accordance with U.S. GAAP and present these in U.S. dollars unless otherwise stated.

The preparation of our financial statements requires us to make assumptions and estimates that affect the reported amounts of assets, liabilities, revenues and expenses and the related disclosure of contingent assets and liabilities. We evaluate our estimates on an ongoing basis, including, but not limited to, those related to: fair value of assets and liabilities assumed in business combinations; determination of corporate costs directly attributable to discontinued operations;

loss contingencies associated with litigation or threatened litigation and other claims and inquiries, environmental damages, product warranties, self-insurance reserves, regulatory and other proceedings; calculation of pension and postretirement benefits and the fair value of pension plan assets; valuation allowances for deferred tax assets and amounts recorded for uncertain tax positions; assumptions used to determine impairment of long-lived assets and in testing goodwill for impairment; inventory obsolescence and net realizable value; the allowance for doubtful accounts; and the percentage-of-completion of projects as well as the amount of variable consideration the Company expects to be entitled to. Where appropriate, we base our estimates on historical experience and on various other assumptions that we believe to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from our estimates and assumptions.

We deem an accounting policy to be critical if it requires an accounting estimate to be made based on assumptions about matters that are highly uncertain at the time the estimate is made and if different estimates that reasonably could have been used, or if changes in the accounting estimates that are reasonably likely to occur periodically, could materially impact our Consolidated Financial Statements. We also deem an accounting policy to be critical when the application of such policy is essential to our ongoing operations. We believe the following critical accounting policies require us to make difficult and subjective judgments, often as a result of the need to make estimates regarding matters that are inherently uncertain. These policies should be considered when reading our Consolidated Financial Statements.

Revenue recognition

A customer contract exists if collectability under the contract is considered probable, the contract has commercial substance, contains payment terms, the rights and commitments of both parties, and has been approved. By analyzing the type, terms and conditions of each contract or arrangement with a customer, we determine which revenue recognition method applies.

We offer arrangements with multiple performance obligations to meet our customers' needs. These arrangements may involve the delivery of multiple products and/or performance of services (such as installation, training and maintenance) and the delivery and/or performance may occur at different points in time or over different periods of time. Goods and services under such arrangements are evaluated to determine whether they form distinct performance obligations and should be accounted for as separate revenue transactions. We allocate the sales price to each distinct performance obligation based on the stand-alone selling price of each product or service of the arrangement.

We recognize revenues when control of goods or services is transferred to customers in an amount that reflects the consideration we expect to be entitled to in exchange for these goods or services. Control is transferred when the customer has the ability to direct the use and obtain the benefits from the goods or services.

Control transfer for non-customized products is not considered to have occurred, and therefore no revenues are recognized, until the customer has taken title to the products and assumed the risks and rewards of ownership of the products specified in the purchase order or sales agreement. Generally, the transfer of title and risks and rewards of ownership are governed by the contractually defined shipping terms. We use various International Commercial shipping terms (as promulgated by the International Chamber of Commerce) in our sales of products to third party customers, such as Ex Works (EXW), Free Carrier (FCA) and Delivered Duty Paid (DDP).

We generally recognize revenues for the sale of customized products, including integrated automation and electrification systems and solutions, on an over time basis using the percentage-of-completion method of accounting. These systems are generally accounted for as a single performance obligation as we are required to integrate equipment and services into one deliverable for the customer. Revenues are recognized as the systems are customized during the manufacturing or integration process and as control is transferred to the customer as evidenced by our right to payment for work performed or by the customer's ownership of the work in process. We use the cost-to-cost method to measure progress towards completion on contracts. Under this method, progress of contracts is measured by actual costs incurred in relation to management's best estimate of total estimated costs, which are reviewed and updated routinely for contracts in progress. The cumulative effect of any change in estimate is recorded in the period in which the change in estimate is determined.

The percentage-of-completion method of accounting involves the use of assumptions and projections, principally relating to future material, labor, subcontractor and project-related overhead costs as well as estimates of the amount of variable consideration to which we expect to be entitled. As a consequence, there is a risk that total contract costs or the amount of variable consideration will either exceed or be lower than, respectively, those we originally estimated (based on all information reasonably available to us) and the margin will decrease or the contract may become unprofitable. This risk increases if the duration of a contract increases because there is a higher probability that the circumstances upon which we originally developed our estimates will change, resulting in increased costs that we may not recover. Factors that could cause costs to increase include:

- unanticipated technical problems with equipment supplied or developed by us which may require us to incur additional costs to remedy,
- changes in the cost of components, materials or labor,
- difficulties in obtaining required governmental permits or approvals,
- project modifications creating unanticipated costs,
- suppliers' or subcontractors' failure to perform, and
- delays caused by unexpected conditions or events.

Changes in our initial assumptions, which we review on a regular basis between balance sheet dates, may result in revisions to estimated costs, current earnings and anticipated earnings. We recognize these changes in the period in which the changes in estimates are determined. By recognizing changes in estimates cumulatively, recorded revenue and costs to date reflect the current estimates of the stage of completion of each project. Additionally, losses on such contracts are recognized in the period when they are identified and are based upon the anticipated excess of contract costs over the related contract revenues.

Revenues from service transactions are recognized as services are performed. For long-term service contracts, revenues are recognized on a straight-line basis over the term of the contract or, if the performance pattern is other than straight-line, as the services are provided. Service revenues reflect revenues earned from our activities in providing services to customers primarily subsequent to the sale and delivery of a product or complete system. Such revenues consist of maintenance-type contracts, field service activities that include personnel and accompanying spare parts, training and installation and commissioning of products as a stand-alone service or as part of a service contract.

Revenues are reported net of customer rebates, early settlement discounts, and similar incentives. Rebates are estimated based on sales terms, historical experience and trend analysis. The most common incentives relate to amounts paid or credited to customers for achieving defined volume levels.

Taxes assessed by a governmental authority that are directly imposed on revenue-producing transactions between us and our customers, such as sales, use, value-added and some excise taxes, are excluded from revenues.

As a result of the above policies, judgment in the selection and application of revenue recognition methods must be made.

Contingencies

As more fully described in "Item 8. Financial Information – Legal Proceedings" and in "Note 15 – Commitments and contingencies" to our Consolidated Financial Statements, we are subject to proceedings, litigation or threatened litigation and other claims and inquiries related to environmental, labor, product, regulatory, tax (other than income tax) and other matters. We are required to assess the likelihood of any adverse judgments or outcomes to these matters, as well as potential ranges of probable losses. A determination of the provision required, if any, for these contingencies is made after analysis of each individual issue, often with assistance from both internal and external legal counsel and technical experts. The required amount of a provision for a contingency of any type may change in the future due to new developments in the particular matter, including changes in the approach to its resolution.

We record provisions for our contingent obligations when it is probable that a loss will be incurred and the amount can be reasonably estimated. Any such provision is generally recognized on an undiscounted basis using our best estimate of the amount of loss or at the lower end of an estimated range when a single best estimate is not determinable. In some cases, we may be able to recover a portion of the costs relating to these obligations from insurers or other third parties; however, we record such amounts only when it is probable that they will be collected.

Pension and other postretirement benefits

As more fully described in "Note 17 – Employee benefits" to our Consolidated Financial

Statements, we have a number of defined benefit pension and other postretirement plans and recognize an asset for a plan's overfunded status or a liability for a plan's underfunded status in our Consolidated Balance Sheets. We measure such a plan's assets and obligations that determine its funded status as of the end of the year.

Significant differences between assumptions and actual experience, or significant changes in assumptions, may materially affect the pension obligations. The effects of actual results differing from assumptions and the changing of assumptions are included in net actuarial loss within "Accumulated other comprehensive loss".

We recognize actuarial gains and losses gradually over time. Any cumulative unrecognized actuarial gain or loss that exceeds 10 percent of the greater of the present value of the projected benefit obligation (PBO) and the fair value of plan assets is recognized in earnings over the expected average remaining working lives of the employees participating in the plan, or the expected average remaining lifetime of the inactive plan participants if the plan is comprised of all or almost all inactive participants. Otherwise, the actuarial gain or loss is not recognized in the Consolidated Income Statements.

We use actuarial valuations to determine our pension and postretirement benefit costs and credits. The amounts calculated depend on a variety of key assumptions, including discount rates, mortality rates and expected return on plan assets. Under U.S. GAAP, we are required to consider current market conditions in making these assumptions. In particular, the discount rates are reviewed annually based on changes in long-term, highly-rated corporate bond yields. Decreases in the discount rates result in an increase in the PBO and in pension costs. Conversely, an increase in the discount rates results in a decrease in the PBO and in pension costs. The mortality assumptions are reviewed annually by management. Decreases in mortality rates result in an increase in the PBO and in pension costs. Conversely, an increase in mortality rates results in a decrease in the PBO and in pension costs.

Holding all other assumptions constant, a 0.25 percentage point decrease in the discount rate would have increased the PBO related to our defined benefit pension plans by $419 million while a 0.25 percentage point increase in the discount rate would have decreased the PBO related to our defined benefit pension plans by $414 million.

The expected return on plan assets is reviewed regularly and considered for adjustment annually based upon the target asset allocations and represents the long-term return expected to be achieved. Decreases in the expected return on plan assets result in an increase to pension costs. Holding all other assumptions constant, an increase or decrease of 0.25 percentage points in the expected long-term rate of asset return would have decreased or increased, respectively, the net periodic benefit cost in 2019 by $24 million.

The funded status, which can increase or decrease based on the performance of the financial markets or changes in our assumptions, does not represent a mandatory short-term cash obligation. Instead, the funded status of a defined benefit pension plan is the difference between the PBO and the fair value of the plan assets. At December 31, 2019, our defined benefit pension plans (in both continuing and discontinued operations) were $1,751 million underfunded compared to an underfunding of $1,677 million at December 31, 2018. Our other postretirement plans were underfunded by $110 million and $120 million at December 31, 2019 and 2018, respectively.

We have multiple non-pension postretirement benefit plans. Our health care plans are generally contributory with participants' contributions adjusted annually. For purposes of estimating our health care costs, we have assumed health care cost increases to be 6.3 percent per annum for 2020, gradually declining to 5.0 percent per annum by 2028 and to remain at that level thereafter.

Income taxes

In preparing our Consolidated Financial Statements, we are required to estimate income taxes in each of the jurisdictions in which we operate. Tax expense from continuing operations is reconciled from the weighted-average global tax rate (rather than from the Swiss domestic statutory tax rate). As the parent company of the ABB Group, ABB Ltd, is domiciled in Switzerland, income which has been generated in jurisdictions outside of Switzerland (hereafter "foreign jurisdictions") and has already been subject to corporate income tax in those foreign jurisdictions is, to a large extent, tax exempt in Switzerland. Therefore, generally no or only limited Swiss income tax has to be provided for on the repatriated earnings of foreign subsidiaries. There is no requirement in Switzerland for a parent company of a group to file a tax return of the group determining domestic and foreign pre-tax income and as our consolidated income from continuing operations is predominantly earned outside of Switzerland, corporate income tax in foreign jurisdictions largely determines our global weighted-average tax rate.

We account for deferred taxes by using the asset and liability method. Under this method, we determine deferred tax assets and liabilities based on temporary differences between the financial reporting and the tax bases of assets and liabilities. Deferred tax assets and liabilities are measured using the enacted tax rates and laws that are expected to be in effect when the differences are expected to reverse. We recognize a deferred tax asset when it is more likely than not that the asset will be realized. We regularly review our deferred tax assets for recoverability and establish a valuation allowance based upon historical losses, projected future taxable income and the expected timing of the reversals of existing temporary differences. To the extent we increase or decrease this allowance in a period, we recognize the change in the allowance within “Provision for taxes” in the Consolidated Income Statements unless the change relates to discontinued operations, in which case the change is recorded in “Income from discontinued operations, net of tax”. Unforeseen changes in tax rates and tax laws, as well as differences in the projected taxable income as compared to the actual taxable income, may affect these estimates.

Certain countries levy withholding taxes, dividend distribution taxes or additional corporate income taxes (hereafter “withholding taxes”) on dividend distributions. Such taxes cannot always be fully reclaimed by the shareholder, although they have to be declared and withheld by the subsidiary. Switzerland has concluded double taxation treaties with many countries in which we operate. These treaties either eliminate or reduce such withholding taxes on dividend distributions. It is our policy to distribute retained earnings of subsidiaries, insofar as such earnings are not permanently reinvested or no other reasons exist that would prevent the subsidiary from distributing them. No deferred tax liability is set up, if retained earnings are considered as indefinitely reinvested, and used for financing current operations as well as business growth through working capital and capital expenditure in those countries.

We operate in numerous tax jurisdictions and, as a result, are regularly subject to audit by tax authorities. We provide for tax contingencies whenever it is deemed more likely than not that a tax asset has been impaired or a tax liability has been incurred for events such as tax claims or changes in tax laws. Contingency provisions are recorded based on the technical merits of our filing position, considering the applicable tax laws and OECD guidelines and are based on our evaluations of the facts and circumstances as of the end of each reporting period. Changes in the facts and circumstances could result in a material change to the tax accruals. Although we believe that our tax estimates are reasonable and that appropriate tax reserves have been made, the final determination of tax audits and any related litigation could be different than that which is reflected in our income tax provisions and accruals.

An estimated loss from a tax contingency must be accrued as a charge to income if it is more likely than not that a tax asset has been impaired or a tax liability has been incurred and the amount of the loss can be reasonably estimated. We apply a two-step approach to recognize and measure uncertainty in income taxes. The first step is to evaluate the tax position for recognition by determining if the weight of available evidence indicates that it is more likely than not that the position will be sustained on audit, including resolution of related appeals or litigation processes, if any. The second step is to measure the tax benefit as the largest amount which is more than 50 percent likely of being realized upon ultimate settlement. The required amount of provisions for contingencies of any type may change in the future due to new developments.

Business combinations

The amount of goodwill initially recognized in a business combination is based on the excess of the purchase price of the acquired company over the fair value of the assets acquired and liabilities assumed. The determination of these fair values requires us to make significant estimates and assumptions. For instance, when assumptions with respect to the timing and amount of future revenues and expenses associated with an asset are used to determine its fair value, but the actual timing and amount differ materially, the asset could become impaired. In some cases, particularly for large acquisitions, we may engage independent third-party appraisal firms to assist in determining the fair values.

Critical estimates in valuing certain intangible assets include but are not limited to: future expected cash flows of the acquired business, brand awareness, customer retention, technology obsolescence and discount rates.

In addition, uncertain tax positions and tax-related valuation allowances assumed in connection with a business combination are initially estimated at the acquisition date. We re-evaluate these items quarterly, based upon facts and circumstances that existed at the acquisition date with any adjustments to our preliminary estimates being recorded to goodwill provided that we are within the twelve-month measurement period. Subsequent to the measurement period or our final determination of the tax allowance’s or contingency's estimated value, whichever comes first, changes to these uncertain tax positions and tax-related valuation allowances will affect our provision for income taxes in our Consolidated Income Statements and could have a material impact on our results of operations and financial position. The fair values assigned to the intangible assets acquired are described in "Note 4 – Acquisitions and business divestments" as well as "Note 11 – Goodwill and other intangibles assets", to our Consolidated Financial Statements.

Goodwill and other intangible assets

We review goodwill for impairment annually as of October 1, or more frequently if events or circumstances indicate the carrying value may not be recoverable.

We use either a qualitative or quantitative assessment method for each reporting unit. The qualitative assessment involves determining, based on an evaluation of qualitative factors, whether it is more likely than not that the fair value of a reporting unit is less than its carrying amount. If, based on this qualitative assessment, it is determined to be more likely than not that the reporting unit's fair value is less than its carrying value, then a quantitative impairment test is performed. If we elect not to perform the qualitative assessment for a reporting unit, then we perform the quantitative impairment test.

Our reporting units are the same as our Businesses for the Electrification, Motion and Robotics & Discrete Automation Businesses. For the Industrial Automation Business, we determined the reporting units to be one level below the Business, as the different products produced or services provided by this business do not share sufficiently similar economic characteristics to aggregate into a single reporting unit.

When performing the qualitative assessment, we first determine, for a reporting unit, factors which would affect the fair value of the reporting unit including: (i) macroeconomic conditions related to the business, (ii) industry and market trends and (iii) the overall future financial performance and future opportunities in the markets in which the business operates. We then consider how these factors would impact the most recent quantitative analysis of the reporting unit's fair value. Key assumptions in determining the fair value of the reporting unit include the projected level of business operations, the weighted-average cost of capital, the income tax rate and the terminal growth rate.

If, after performing the qualitative assessment, we conclude that events or circumstances have occurred which would indicate that it is more likely than not that the fair value of the reporting unit is less than its carrying value, or if we have elected not to perform a qualitative assessment, then a quantitative impairment test is performed. First, we calculate the fair value of the reporting unit using an income approach based on the present value of future cash flows, applying a discount rate that represents our weighted-average cost of capital, and compare it to the reporting unit's carrying value. Where the fair value of the reporting unit exceeds the carrying value of the net assets assigned to that unit, goodwill is not impaired and no further testing is performed. However, if the carrying value of the net assets assigned to the reporting unit exceeds the reporting unit's fair value, we would record an impairment loss equal to the difference, up to the full amount of goodwill. Any goodwill impairment losses would be recorded as a separate line item in the income statement in continuing operations, unless related to a discontinued operation, in which case the losses would be recorded in "Income from discontinued operations, net of tax".

In 2019, we performed a qualitative assessment and determined that it was not more likely than not that the fair value for each of these reporting units was below the carrying value. As a result, we concluded that it was not necessary to perform the quantitative impairment test.

In 2018, we performed a quantitative impairment test for all of the reporting units applicable at that time. The test reflected assumptions and forecasts resulting from our strategic plan for the period from 2019 to 2023. We concluded that the estimated fair values for each of our reporting units exceeded their respective carrying values and that none of the reporting units were impaired.

The projected future cash flows used in the 2018 fair value calculation for all reporting units, except for the Machine and Factory Automation business within the Industrial Automation Business, were based on approved business plans for the reporting units which covered a period of five years plus a calculated terminal value. The after-tax weighted-average cost of capital of 8 percent was based on variables such as the risk-free rate derived from the yield of 10-year U.S. treasury bonds as well as an ABB-specific risk premium. The terminal value growth rate was assumed to be 1 percent. The mid-term tax rate used in the test was 27 percent.

For Machine and Factory Automation, which includes the acquisition in 2017 of B&R, the projected future cash flows used in the 2018 fair value calculation were based on an approved business plan which covered a period of eight years plus a calculated terminal value. The business plan covered a longer projected period due to a higher growth trajectory as well as a longer term view for the business which was available following the acquisition process. The terminal value growth rate was assumed to be 3 percent and the after tax weighted-average cost of capital was 9.4 percent. The mid-term tax rate used in the test was 25 percent which is based on tax rates in countries where the business is primarily operating.

Determining the projected future cash flows required significant judgments and estimates involving variables such as future sales volumes, sales prices, awards of large orders, production and other operating costs, capital expenditures, net working capital requirements and other economic factors.

We based our fair value estimates on assumptions we believed to be reasonable, but which were inherently uncertain. Consequently, actual future results may differ from those estimates.

We assessed the reasonableness of the fair value calculations of our reporting units by reconciling the sum of the fair values for all our reporting units to our total market capitalization. Through the use of sensitivity analysis, the assumptions used in the fair value calculation were stressed to determine the impact on the fair value of the reporting units. Our sensitivity analysis in 2018 showed that, holding all other assumptions constant, a 1 percentage point increase in the discount rate would have reduced the calculated fair value by approximately 13.0 percent, while a 1 percentage point decrease in the terminal value growth rate would have reduced the calculated fair value by approximately 9.3 percent.

Intangible assets are reviewed for recoverability upon the occurrence of certain triggering events (such as a decision to divest a business or projected losses of an entity) or whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. We record impairment charges in “Other income (expense), net”, in our Consolidated Income Statements, unless they relate to a discontinued operation, in which case the charges are recorded in “Income from discontinued operations, net of tax”.

New accounting pronouncements

For a description of accounting changes and recent accounting pronouncements, including the expected dates of adoption and estimated effects, if any, on our Consolidated Financial Statements, see “Note 2 – Significant accounting policies” to our Consolidated Financial Statements.

Research and development

Each year, we invest significantly in research and development. Our research and development focuses on developing and commercializing the technologies, products and solutions of our businesses that are of strategic importance to our future growth. In 2019, we invested $1,198 million, or approximately 4.3 percent of our 2019 consolidated revenues, on research and development activities in our continuing operations. We also had expenditures of $50 million, or approximately 0.2 percent of our 2019 consolidated revenues, on order-related development activities. These are customer- and project-specific development efforts that we undertake to develop or adapt equipment and systems to the unique needs of our customers in connection with specific orders or projects.

In addition to continuous product development, and order-related engineering work, we develop platforms for technology applications in our businesses in our research and development laboratories, which operate on a global basis, such as our ABB Ability™ platform. Through active management of our investment in research and development, we seek to maintain a balance between short-term and long-term research and development programs and optimize our return on investment.

Universities are incubators of future technology, and a central task of our research and development team is to transform university research into industry-ready technology platforms. We collaborate with multiple universities and research institutions to build research networks and foster new technologies. We believe these collaborations shorten the amount of time required to turn basic ideas into viable products, and they additionally help us to recruit and train new personnel. We have built numerous university collaborations in the U.S., Europe and Asia, including long-term, strategic relationships with Carnegie Mellon University, North Carolina State University, Virginia Polytechnic Institute and State University, Massachusetts Institute of Technology, Imperial College London, ETH Zurich, Royal Institute of Technology (KTH) Stockholm, Cambridge University, Dresden University of Technology, Huazhong University of Science & Technology (HUST), Zhejiang University and Xi'an Jiaotong University (XJTU).

We are further leveraging our ecosystem to enhance our innovation efforts and gain speed with strategic partners by investing and collaborating with start-ups worldwide via our corporate venture arm ABB Technology Ventures and our start-up collaboration arm SynerLeap.

Our collaborative research and development projects include research on artificial intelligence, materials, sensors, micro-engineered mechanical systems, robotics, controls, manufacturing, distributed power and communication. Common platforms for power and automation technologies are developed around advanced materials, efficient manufacturing, information technology and data communication, as well as sensor and actuator technology.

Common applications of basic power and automation technologies can also be found in power electronics, electrical insulation, and control and optimization. Our power technologies, including our insulation technologies, current interruption and limitation devices, power electronics, flow control and power protection processes, apply as much to large, reliable, blackout-free transmission systems as they do to everyday household needs. Our automation technologies, including our control and optimization processes, power electronics, sensors and microelectronics, mechatronics, wireless communication processes as well as advanced artificial intelligence solutions are designed to improve efficiency in plants and factories around the world, including our own.

Acquisitions and divestments

Acquisitions

There were no acquisitions in 2019. During 2018 and 2017, ABB paid $2,638 million and $1,992 million to purchase three and four businesses, respectively. The amounts exclude increases in investments made in cost- and equity-accounted companies.

The principal acquisition in 2018 was GE Industrial Solutions (GEIS), GE's global electrification solutions business, which was acquired in June. GEIS, headquartered in the U.S., provides technologies that distribute and control electricity and support the commercial, data center, health care, mining, renewable energy, oil and gas, water and telecommunications sectors. At the time of the acquisition, GEIS had approximately 13,500 employees.

The principal acquisition in 2017 was Bernecker + Rainer Industrie-Elektronik GmbH (B&R), a worldwide provider of product- and software-based, open-architecture solutions for machine and factory automation. At the time of the acquisition, B&R employed more than 3,000 people, including about 1,000 research and development, and application engineers, and operated across 70 countries in the machine and factory automation market segment.

Divestments

In 2019, we recorded net gains (including transaction costs) of $55 million, primarily due to the divestment of two businesses in China. There were no significant divestments in 2018.

On March 1, 2017, we divested our high-voltage cable system business. Total cash proceeds from all business divestments during 2017 amounted to $605 million, net of transaction costs and cash disposed.

Planned divestment of Power Grids
In December 2018, ABB announced an agreement to divest 80.1 percent of its Power Grids business to Hitachi, valuing the business at $11 billion. The business also includes certain real estate properties which were previously reported within Corporate and Other. The divestment is expected to be completed at the end of the second quarter of 2020, following the receipt of customary regulatory approvals. As this divestment represents a strategic shift that will have a major effect on the Company's operations and financial results, the results of operations for this business have been presented as discontinued operations and the assets and liabilities are reflected as held-for-sale for all periods presented. For more information on our discontinued operations, see "Note 3 – Basis of presentation and assets held for sale" to our Consolidated Financial Statements.

Planned divestment of solar inverters business
During 2019, ABB reached an agreement to sell its solar inverters business to FIMER S.p.A. (Italy) for no consideration. Under the agreement ABB is obligated to transfer cash on the closing date and make additional cash payments to the purchaser through to 2025. As a result, in 2019, we recorded a loss, of $421 million in "Other income (expense), net", representing the excess of the carrying value over the estimated fair value of this business. The carrying value at December 31, 2019, includes a loss arising from the cumulative translation adjustment of $99 million. The assets and liabilities of this business are included within assets and liabilities held for sale in our Consolidated Balance Sheet as at December 31, 2019. For more information on assets held for sale, see "Note 3 – Basis of presentation and assets held for sale" to our Consolidated Financial Statements.

Exchange rates

We report our financial results in U.S. dollars. Due to our global operations, a significant amount of our revenues, expenses, assets and liabilities are denominated in other currencies. As a consequence, movements in exchange rates between currencies may affect: (i) our profitability, (ii) the comparability of our results between periods and (iii) the reported carrying value of our assets and liabilities.

We translate non-USD denominated results of operations, assets and liabilities to USD in our Consolidated Financial Statements. Balance sheet items are translated to USD using year-end currency exchange rates. Income statement and cash flow items are translated to USD using the relevant monthly average currency exchange rate.

Increases and decreases in the value of the USD against other currencies will affect the reported results of operations in our Consolidated Income Statements and the value of certain of our assets and liabilities in our Consolidated Balance Sheets, even if our results of operations or the value of those assets and liabilities have not changed in their original currency. As foreign exchange rates impact our reported results of operations and the reported value of our assets and liabilities, changes in foreign exchange rates could significantly affect the comparability of our reported results of operations between periods and result in significant changes to the reported value of our assets, liabilities and stockholders' equity.

While we operate globally and report our financial results in USD, exchange rate movements between the USD and both the EUR and the CHF are of particular importance to us due to (i) the location of our significant operations and (ii) our corporate headquarters being in Switzerland.

The exchange rates between the USD and the EUR and the USD and the CHF at December 31, 2019, 2018 and 2017, were as follows:

Exchange rates into $	2019	2018	2017
EUR 1.00	1.12	1.15	1.20
CHF 1.00	1.03	1.02	1.02

The average exchange rates between the USD and the EUR and the USD and the CHF for the years ended December 31, 2019, 2018 and 2017, were as follows:

Exchange rates into $	2019	2018	2017
EUR 1.00	1.12	1.18	1.13
CHF 1.00	1.01	1.02	1.02

When we incur expenses that are not denominated in the same currency as the related revenues, foreign exchange rate fluctuations could affect our profitability. To mitigate the impact of exchange rate movements on our profitability, it is our policy to enter into forward foreign exchange contracts to manage the foreign exchange transaction risk of our operations.

In 2019, approximately 74 percent of our consolidated revenues were reported in currencies other than the USD. The following percentages of consolidated revenues were reported in the following currencies:

- Euro, approximately 23 percent, and
- Chinese renminbi, approximately 14 percent.

In 2019, approximately 72 percent of our cost of sales and selling, general and administrative expenses were reported in currencies other than the USD. The following percentages of consolidated cost of sales and selling, general and administrative expenses were reported in the following currencies:

- Euro, approximately 21 percent, and
- Chinese renminbi, approximately 12 percent.

We also incur expenses other than cost of sales and selling, general and administrative expenses in various currencies.

The results of operations and financial position of our subsidiaries outside of the United States are generally accounted for in the currencies of the countries in which those subsidiaries are located. We refer to these currencies as "local currencies". Local currency financial information is then translated into USD at applicable exchange rates for inclusion in our Consolidated Financial Statements.

The discussion of our results of operations below provides certain information with respect to orders, revenues, income from operations and other measures as reported in USD (as well as in local currencies). We measure period-to-period variations in local currency results by using a constant foreign exchange rate for all periods under comparison. Differences in our results of operations in local currencies as compared to our results of operations in USD are caused exclusively by changes in currency exchange rates.

While we consider our results of operations as measured in local currencies to be a significant indicator of business performance, local currency information should not be relied upon to the exclusion of U.S. GAAP financial measures. Instead, local currencies reflect an additional measure of comparability and provide a means of viewing aspects of our operations that, when viewed together with the U.S. GAAP results, provide a more complete understanding of factors and trends affecting the business. As local currency information is not standardized, it may not be possible to compare our local currency information to other companies' financial measures that have the same or a similar title. We encourage investors to review our financial statements and publicly filed reports in their entirety and not to rely on any single financial measure.

Orders

Our policy is to book and report an order when a binding contractual agreement has been concluded with a customer covering, at a minimum, the price and scope of products or services to be supplied, the delivery schedule and the payment terms. The reported value of an order corresponds to the undiscounted value of revenues that we expect to recognize following delivery of the goods or services subject to the order, less any trade discounts and excluding any value added or sales tax. The value of orders received during a given period of time represents the sum of the value of all orders received during the period, adjusted to reflect the aggregate value of any changes to the value of orders received during the period and orders existing at the beginning of the period. These adjustments, which may in the aggregate increase or decrease the orders reported during the period, may include changes in the estimated order price up to the date of contractual performance, changes in the scope of products or services ordered and cancellations of orders. The undiscounted value of future revenues we expect to generate from our orders at any point in time is represented by our order backlog.

The level of orders fluctuates from year to year. Portions of our business involve orders for long-term projects that can take months or years to complete and many larger orders result in revenues in periods after the order is booked. Consequently, the level of orders generally cannot be used to accurately predict future revenues or operating performance. Orders that have been placed can often be cancelled, delayed or modified by the customer. These actions can reduce or delay any future revenues from the order or may result in the elimination of the order.

Transactions with affiliates and associates

In the normal course of our business, we purchase products from, sell products to and engage in other transactions with entities in which we hold an equity interest. The amounts involved in these transactions are not material to ABB Ltd. Also, in the normal course of our business, we engage in transactions with businesses that we have divested. We believe that the terms of the transactions we conduct with these companies are negotiated on an arm's length basis.

Performance measures

We evaluate the performance of our Businesses based on orders received, revenues and Operational EBITA.

Operational EBITA represents income from operations excluding:

- amortization expense on intangibles arising upon acquisitions (acquisition-related amortization),
- restructuring, related and implementation costs,
- changes in the amount recorded for obligations related to divested businesses occurring after the divestment date (changes in obligations related to divested businesses),
- changes in estimates relating to opening balance sheets of acquired businesses (changes in pre-acquisition estimates),
- gains and losses from sale of businesses (including fair value adjustment on assets and liabilities held for sale),
- acquisition- and divestment-related expenses and integration costs,
- certain other non-operational items, as well as
- foreign exchange/commodity timing differences in income from operations consisting of: (a) unrealized gains and losses on derivatives (foreign exchange, commodities, embedded derivatives), (b) realized gains and losses on derivatives where the underlying hedged transaction has not yet been realized, and (c) unrealized foreign exchange movements on receivables/payables (and related assets/ liabilities).

Certain other non-operational items generally includes: certain regulatory, compliance and legal costs, costs for planned divestment of the Power Grids business, certain asset write downs/impairments, non-operational gains, as well as other items which are determined by management on a case-by-case basis.

See "Note 23 – Operating segment and geographic data" to our Consolidated Financial Statements for a reconciliation of the total Operational EBITA to income from continuing operations before taxes.

Analysis of results of operations

Orders and order backlog were as follows:

Orders and order backlog:

($ in millions)	2019	2018	2017
Orders	28,588	28,590	25,034
Order backlog at December 31,	13,324	13,084	12,491

Our consolidated results from operations were as follows:

Income statement data:

($ in millions, except per share data in $)	2019	2018	2017
Revenues	27,978	27,662	25,196
Cost of sales	(19,072)	(19,118)	(17,350)
Gross profit	**8,906**	**8,544**	**7,846**
Selling, general and administrative expenses	(5,447)	(5,295)	(4,765)
Non-order related research and development expenses	(1,198)	(1,147)	(1,013)
Other income (expense), net	(323)	124	162
Income from operations	**1,938**	**2,226**	**2,230**
Net interest and other finance expense	(148)	(190)	(161)
Non-operational pension (cost) credit	72	83	33
Provision for taxes	(772)	(544)	(583)
Income from continuing operations, net of tax	**1,090**	**1,575**	**1,519**
Income from discontinued operations, net of tax	438	723	846
Net income	**1,528**	**2,298**	**2,365**
Net income attributable to noncontrolling interests	(89)	(125)	(152)
Net income attributable to ABB	**1,439**	**2,173**	**2,213**
Amounts attributable to ABB shareholders:			
Income from continuing operations, net of tax	1,043	1,514	1,441
Income from discontinued operations, net of tax	396	659	772
Net income	1,439	2,173	2,213
Basic earnings per share attributable to ABB shareholders:			
Income from continuing operations, net of tax	0.49	0.71	0.67
Income from discontinued operations, net of tax	0.19	0.31	0.36
Net income	0.67	1.02	1.04
Diluted earnings per share attributable to ABB shareholders:			
Income from continuing operations, net of tax	0.49	0.71	0.67
Income from discontinued operations, net of tax	0.19	0.31	0.36
Net income	0.67	1.02	1.03

A more detailed discussion of the orders, revenues, income from operations and Operational EBITA for our Businesses follows in the sections of "Business analysis" below entitled "Electrification", "Industrial Automation", "Motion", "Robotics & Discrete Automation", and "Corporate and Other". Orders and revenues of our businesses include intersegment transactions which are eliminated in the "Corporate and Other" line in the tables below.

Orders

				% Change	
($ in millions)	2019	2018	2017	2019	2018
Electrification	13,050	11,867	10,143	10%	17%
Industrial Automation	6,432	6,697	6,113	(4)%	10%
Motion	6,782	6,725	5,966	1%	13%
Robotics & Discrete Automation	3,260	3,808	2,977	(14)%	28%
Operating Businesses	**29,524**	**29,097**	**25,199**	**1%**	**15%**
Corporate and Other					
Non-core and divested businesses	(91)	364	643	n.a.	(43)%
Intersegment eliminations and other	(845)	(871)	(808)	n.a.	n.a.
Total	**28,588**	**28,590**	**25,034**	**0%**	**14%**

In 2019, total orders remained stable compared to 2018 (increased 4 percent in local currencies). Total orders reflects the moderate organic growth in the Electrification and Motion Businesses, dampened by lower orders in the Industrial Automation and Robotics & Discrete Automation Businesses. Order declines were most significant in the Robotics & Discrete Automation Business as several of its primary industry sectors reduced order levels. Changes in the business portfolio, mainly from the inclusion of GEIS for a full year in 2019, positively impacted total orders by approximately 3 percent. For additional information about Business order performance in all periods, refer to the relevant sections of "Business analysis" below.

In 2018, total orders increased 14 percent (14 percent in local currencies). Orders grew organically in all Businesses with the most significant growth in the Motion Business, while the Industrial Automation Business also received strong order levels in the Marine & Ports business line. Orders increased approximately 6 percent due to changes in the business portfolio including GEIS, acquired at end June 2018 and a full year of contribution from B&R, acquired in July 2017.

We determine the geographic distribution of our orders based on the location of the ultimate destination of the products' end use, if known, or the location of the customer. The geographic distribution of our consolidated orders was as follows:

				% Change	
($ in millions)	**2019**	**2018**	**2017**	**2019**	**2018**
Europe	10,509	10,725	9,202	(2)%	17%
The Americas	9,057	8,243	7,006	10%	18%
Asia, Middle East and Africa	9,022	9,622	8,826	(6)%	9%
Total	**28,588**	**28,590**	**25,034**	**0%**	**14%**

Orders in 2019 grew in the Americas but decreased in Asia, Middle East and Africa and in Europe. In the Americas orders increased 10 percent (11 percent in local currencies). Orders increased in Chile, Brazil, Argentina, Canada, Mexico, Peru and the United States. In Asia, Middle East and Africa orders declined 6 percent (4 percent in local currencies), negatively impacted by the Motion and Robotics & Discrete Automation Businesses. Orders were higher in Qatar, Singapore, Japan, Australia and South Korea while they declined in China, India, Saudi Arabia, the United Arab Emirates and South Africa. In Europe orders declined 2 percent (increased 4 percent in local currencies). Orders in local currencies increased in the Industrial Automation and Motion Businesses. Orders declined in Norway, the United Kingdom, Switzerland, Finland, Italy and Sweden. Orders remained flat in Switzerland while they increased in France, Denmark, Germany, the Netherlands, Russia and Spain. Growth in the Americas included a 10 percent increase due to changes in the business portfolio, primarily due to the inclusion of GEIS for a full year. In Europe, these changes had a positive impact of 2 percent while these changes had a negative impact of 3 percent in Asia, Middle East and Africa.

Orders in 2018 increased in all regions. In Europe orders grew 17 percent (14 percent in local currencies) and grew in all of the Businesses. In local currencies, orders increased in Finland, Switzerland, Germany, Sweden and Italy while they decreased in the United Kingdom. In the Americas orders increased 18 percent (19 percent in local currencies). In local currencies, orders increased in the U.S., Brazil, Mexico and Argentina while orders decreased in Canada, Chile and Panama. In Asia, Middle East and Africa orders grew 9 percent (8 percent in local currencies), driven by the Robotics & Discrete Automation Business. Orders were higher in China, Japan, Egypt, Malaysia and India while they declined in Saudi Arabia, South Korea and South Africa. Growth in the Americas included a 12 percent impact due to acquisitions, including GEIS and B&R. In Europe, these acquisitions had a positive impact of 4 percent while the impact in Asia, Middle East and Africa was 2 percent.

Order backlog

	December 31,			% Change	
($ in millions)	**2019**	**2018**	**2017**	**2019**	**2018**
Electrification	4,488	4,113	3,098	9%	33%
Industrial Automation	5,077	4,986	5,171	2%	(4)%
Motion	2,967	2,740	2,674	8%	2%
Robotics & Discrete Automation	1,356	1,438	1,279	(6)%	12%
Operating Businesses	**13,888**	**13,277**	**12,222**	**5%**	**9%**
Corporate and Other					
Non-core and divested businesses	192	555	1,055	(65)%	(47)%
Intersegment eliminations	(756)	(748)	(786)	n.a.	n.a.
Total	**13,324**	**13,084**	**12,491**	**2%**	**5%**

Consolidated order backlog increased 2 percent (2 percent in local currencies) from December 31, 2018, to December 31, 2019. Order backlog increased in the Electrification Business, supported by order growth in all regions, especially in Asia, Middle East and Africa as well as in Europe. Order backlog also increased in the Motion Business driven by higher order intake in Europe mainly from Germany, Spain, Russia, Finland and France. Order backlog in the Industrial Automation Business increased slightly due to the order intake in the system business and in Turbocharging. Order backlog declined in the Robotics & Discrete Automation Business as a result of the weak order intake in the Robotics business.

Consolidated order backlog increased 5 percent (10 percent in local currencies) from December 31, 2017, to December 31, 2018. Order backlog increased in the Electrification Business due to the acquisition of GEIS in June 2018 and in the Motion and Robotics & Discrete Automation Businesses. In the Industrial Automation Business, the order backlog decreased compared to the end of 2017 due to high levels of execution that could not be fully compensated with new orders. The net impact on order backlog from divestments and acquisitions was an increase of 4 percent.

Revenues

				% Change	
($ in millions)	**2019**	**2018**	**2017**	**2019**	**2018**
Electrification	12,728	11,686	10,094	9%	16%
Industrial Automation	6,273	6,500	6,472	(3)%	0%
Motion	6,533	6,463	5,877	1%	10%
Robotics & Discrete Automation	3,314	3,611	2,957	(8)%	22%
Operating Businesses	**28,848**	**28,260**	**25,400**	**2%**	**11%**
Corporate and Other					
Non-core and divested businesses	37	273	661	(86)%	(59)%
Intersegment eliminations and other	(907)	(871)	(865)	n.a.	n.a.
Total	**27,978**	**27,662**	**25,196**	**1%**	**10%**

In 2019, revenues increased 1 percent (5 percent in local currencies). Revenues were higher in the Electrification and Motion Businesses while revenues decreased in the Industrial Automation and Robotics & Discrete Automation Businesses. In the Electrification Business, higher revenues were mainly attributable to the inclusion of a full year of revenues from GEIS. The revenue decrease in the Robotics & Discrete Automation Business was due to weakness in automotive-related sectors and weak book-and-bill business. For additional information about the Business revenues performance in all periods, please refer to “Business analysis” below.

Revenues in 2018 increased 10 percent (9 percent in local currencies) with growth in all Businesses except Industrial Automation, reflecting the trend in orders during 2018. In Electrification, the increase in revenues was mainly attributable to the acquisition of GEIS in June 2018. The increase in revenues in the Robotics & Discrete Automation Business was mainly attributable to the inclusion of a full year of revenues for B&R which was acquired in July 2017.

We determine the geographic distribution of our revenues based on the location of the ultimate destination of the products’ end use, if known, or the location of the customer. The geographic distribution of our consolidated revenues was as follows:

				% Change	
($ in millions)	**2019**	**2018**	**2017**	**2019**	**2018**
Europe	10,097	10,129	9,142	0%	11%
The Americas	8,955	8,042	6,870	11%	17%
Asia, Middle East and Africa	8,926	9,491	9,184	(6)%	3%
Total	**27,978**	**27,662**	**25,196**	**1%**	**10%**

In 2019, revenue growth was mixed across the regions. In Europe, revenues remained flat (increased 6 percent in local currencies) with higher local currency revenues in the Electrification, Motion and Robotics & Discrete Automation Businesses and lower revenues in the Industrial Automation Business. Revenues increased in the Netherlands, Spain, Poland, Switzerland and Belgium, while they were lower in Finland, Turkey, Italy, Germany and Sweden. Revenues in the Americas increased 11 percent (13 percent in local currencies) largely due to the impact of including GEIS for a full year. Revenues were higher in the U.S., Mexico, Canada, Peru and Chile. In Asia, Middle East and Africa, revenues decreased 6 percent (3 percent in local currencies) due to lower revenues in the Robotics and Energy Industries business lines. Revenues declined in Saudi Arabia, South Korea, South Africa, India and China but increased in Australia, Japan and Singapore.

In 2018, revenues increased in all regions. In Europe, revenues increased 11 percent (9 percent in local currencies) reflecting growth in the Motion Business as well as the Electrification Business, which benefited from the acquisition of GEIS. Revenues grew in the Robotics & Discrete Automation Business which benefited from the inclusion of a full year of revenues from B&R. In local currencies, revenues declined in Sweden, Norway and the United Kingdom, while revenues increased in Switzerland, Spain and Poland. Revenues in the Americas increased 17 percent (19 percent in local currencies), mainly driven by the acquisition of GEIS. In local currencies, revenues were higher in the U.S., Canada, Brazil, Mexico and Argentina. In Asia, Middle East and Africa, revenues increased 3 percent (3 percent in local currencies). In local currencies, revenues declined in Saudi Arabia, Qatar and South Korea while revenues increased in China, India, and Australia.

Cost of sales

Cost of sales consists primarily of labor, raw materials and component costs but also includes indirect production costs, expenses for warranties, contract and project charges, as well as order-related development expenses incurred in connection with projects for which corresponding revenues have been recognized.

In 2019, cost of sales was steady (increased 3 percent in local currencies) at $19,072 million and the gross margin improved by 0.9 percent as cost of sales as a percentage of revenues decreased from 69.1 percent in 2018 to 68.2 percent in 2019. Gross margins improved in the Electrification Business, despite the dilutive impacts of the GEIS business and were also higher in the Motion Business.

Margins were lower in the Industrial Automation and Robotics & Discrete Automation Businesses. Lower losses in Non-core businesses also reduced cost of sales. Continued price-erosion was lower than in 2018 and we had some positive impacts from changes in commodity prices. We also benefited from the results of supply chain and operational excellence initiatives.

In 2018, cost of sales increased 10 percent (10 percent in local currencies) to $19,118 million, a similar increase as Revenues. Growth was due to the acquisition of GEIS, a full year of inclusion of B&R and growth in the Motion Business. Cost of sales as a percentage of revenues increased slightly from 68.9 percent in 2017 to 69.1 percent in 2018, due to the impact of the lower gross margin business in the acquired GEIS business, the impact of higher commodity prices and certain project-related charges in the non-core EPC business. Cost of sales benefited from continued efforts to generate savings from supply chain and operational excellence programs.

Selling, general and administrative expenses

The components of selling, general and administrative expenses were as follows:

($ in millions, unless otherwise stated)	**2019**	**2018**	**2017**
Selling expenses	3,383	3,228	2,864
Selling expenses as a percentage of orders received	11.8%	11.3%	11.4%
General and administrative expenses	2,064	2,067	1,901
General and administrative expenses as a percentage of revenues	7.4%	7.5%	7.5%
Total selling, general and administrative expenses	**5,447**	**5,295**	**4,765**
Total selling, general and administrative expenses as a percentage of revenues	19.5%	19.1%	18.9%
Total selling, general and administrative expenses as a percentage of the average of orders received and revenues	19.3%	18.8%	19.0%

In 2019, general and administrative expenses remained at the same level as in 2018 (increased 3 percent in local currencies). As a percentage of revenues, general and administrative expenses decreased to 7.4 percent from 7.5 percent in 2018. General and administrative expenses were impacted by approximately $240 million of restructuring and implementation expenses for the OS program and additional general and administrative expenses from the integration of the acquired GEIS business. General and administrative expenses were also impacted by the costs associated with the planned divestment of the Power Grids business. General and administrative expenses in 2019 benefited from a $72 million reduction of stranded corporate costs compared to 2018. Stranded costs are overhead and other management costs which could previously be allocated to the Power Grids business.

In 2018, general and administrative expenses increased 9 percent compared to 2017 (8 percent in local currencies). As a percentage of revenues, general and administrative expenses remained at 7.5 percent. Despite a significant reduction in restructuring and restructuring-related expenses for the White Collar Productivity program of $131 million compared to 2017, general and administrative expenses increased driven by the continuation of a series of strategic initiatives and additional general and administrative expenses from the acquired B&R and GEIS businesses. General and administrative expenses in 2018 includes $297 million of stranded corporate costs compared with $286 million in 2017.

In 2019, selling expenses increased 5 percent compared to 2018 (8 percent in local currencies) and includes $27 million of restructuring and implementation expenses for the OS program. We also increased investments in sales efforts in selective businesses including Machine and Factory Automation, Process Industries, Installation Products, Measurement & Analytics and Drives and also had higher selling expenses from the impact of including a full year of the acquired GEIS business. These factors resulted in increasing selling expenses as a percentage of orders received from 11.3 percent to 11.8 percent.

In 2018, selling expenses increased 13 percent compared to 2017 (12 percent in local currencies) primarily driven by extended sales activities in selective businesses like Robotics, Drives and Motors & Generators and additional selling expenses from the acquired B&R and GEIS businesses. Selling expenses as a percentage of orders received decreased from 11.4 percent to 11.3 percent on higher orders received.

In 2019, selling, general and administrative expenses increased 3 percent compared to 2018 (6 percent in local currencies) and as a percentage of the average of orders and revenues, selling, general and administrative expenses increased from 18.8 percent to 19.3 percent mainly from the impact of the higher selling expenses described above.

In 2018, selling, general and administrative expenses increased 11 percent compared to 2017 (10 percent in local currencies) and as a percentage of the average of orders and revenues, selling, general and administrative expenses decreased from 19.0 percent to 18.8 percent mainly from the impact of the higher average orders and revenues.

Non-order related research and development expenses

In 2019, non-order related research and development expenses increased 4 percent (9 percent in local currencies) compared to 2018 driven by a continued focus on investments in promising key technologies.

In 2018, non-order related research and development expenses increased 13 percent (11 percent in local currencies) compared to 2017 due to expanded investment in specific future growth areas.

Non-order related research and development expenses as a percentage of revenues increased in 2019 to 4.3 percent, after increasing to 4.1 percent in 2018 from 4.0 percent in 2017.

Other income (expense), net

($ in millions)	2019	2018	2017
Restructuring and restructuring-related expenses[1]	(69)	(37)	(35)
Net gain from sale of property, plant and equipment	51	57	37
Asset impairments	(61)	(36)	(27)
Fair value adjustment on assets and liabilities held for sale	(421)	—	—
Favorable resolution of an uncertain purchase price adjustment	92	—	—
Net gain (loss) from sale of businesses	55	57	252
Gain on liquidation of foreign subsidiary	—	31	—
Income from equity-accounted companies and other income (expense), net	30	52	(65)
Total	**(323)**	**124**	**162**

(1) Excluding asset impairments

"Other income (expense), net" primarily includes certain restructuring and restructuring-related expenses, gains and losses from sale of businesses and sale of property, plant and equipment, recognized asset impairments, our share of income or loss from equity-accounted companies as well as other losses.

In 2019, "Other income (expense), net" was a loss of $323 million, while it was a gain of $124 million in 2018. In 2019, the amount includes the impact of recording a loss of $421 million for a fair value adjustment to the net assets of the solar inverters business which was classified as held for sale in June 2019. See "Note 3 – Basis of presentation and assets held for sale" to our Consolidated Financial Statements for additional information. Partially offsetting this was a gain of $92 million due to a favorable resolution of an uncertain purchase price adjustment relating to the acquisition of GEIS. See "Note 4 – Acquisitions and business divestments" to our Consolidated Financial Statements for additional information.

In 2018, "Other income (expense), net" was an income of $124 million, lower than in 2017. The primary reason was that 2017 included a significant gain on sale of the Cables business. Partially offsetting this was that 2018 included lower costs for legal claims (recorded within other expense) and a currency-related gain on a substantial liquidation of a foreign subsidiary.

Income from operations

				% Change	
($ in millions)	2019	2018	2017	2019	2018
Electrification	1,049	1,290	1,352	(19)%	(5)%
Industrial Automation	700	853	829	(18)%	3%
Motion	1,009	924	707	9%	31%
Robotics & Discrete Automation	298	456	387	(35)%	18%
Operating Businesses	**3,056**	**3,523**	**3,276**	**(13)%**	**8%**
Corporate and Other	(1,113)	(1,302)	(1,052)	n.a.	n.a.
Intersegment elimination	(5)	5	6	n.a.	n.a.
Total	**1,938**	**2,226**	**2,230**	**(13)%**	**0%**

In 2019 and 2018, changes in income from operations were a result of the factors discussed above and in the divisional analysis below.

Net interest and other finance expense

Net interest and other finance expense consists of "Interest and dividend income" offset by "Interest and other finance expense".

"Interest and other finance expense" includes interest expense on our debt, the amortization of upfront transaction costs associated with long-term debt and committed credit facilities, commitment fees on credit facilities, foreign exchange gains and losses on financial items and gains and losses on marketable securities. In addition, interest accrued relating to uncertain tax positions is included within interest expense. "Interest and other finance expense" excludes interest expense which has been allocated to discontinued operations.

($ in millions)	2019	2018	2017
Interest and dividend income	67	72	73
Interest and other finance expense	(215)	(262)	(234)
Net interest and other finance expense	(148)	(190)	(161)

In 2019, "Interest and other finance expense" decreased compared to 2018 primarily due to lower foreign exchange losses compared to 2018 as well as lower effective interest rates on outstanding long-term debt.

In 2018, "Interest and other finance expense" increased compared to 2017 primarily due to an increase in average outstanding commercial paper borrowings and the interest expense associated with the bonds issued in 2018.

Non-operational pension (cost) credit

The Non-operational pension credit of $72 million in 2019 was lower than the $83 million recorded in 2018 primarily due to a smaller pension asset base used in the computation of the expected return on assets and in increase in the settlement charges, partially offset by the change in approach used to calculate the interest cost as described in "Note 17 – Employee benefits" to our Consolidated Financial Statements.

The Non-operational pension credit of $83 million in 2018 was higher than the $33 million recorded in 2017 primarily due to a reduction in 2018 of the discount rate applicable to the computation of the defined benefit pension obligation and a larger pension asset base used in the computation of the expected return on plan assets.

Provision for taxes

($ in millions)	2019	2018	2017
Income from continuing operations before taxes	1,862	2,119	2,102
Provision for taxes	(772)	(544)	(583)
Effective tax rate for the year	41.5%	25.7%	27.7%

In 2019, the effective tax rate increased from 25.7 percent to 41.5 percent. The distribution of income within the group resulted in a lower weighted-average global tax rate, including the impact of recording a loss for the planned sale of the solar inverters business which reduced the weighted-average global tax rate by approximately 2 percent. In connection with this loss, we also recorded a change in a valuation allowance which increased the effective tax rate by approximately 6 percent. During 2019, the effective tax rate also increased further due to impacts relating to the planned divestment of the Power Grids business, primarily including non-deductible expenses, taxes payable due to the reorganization of the business in connection with the planned sale, changes to valuation allowances and additional taxes for unremitted earnings. Additionally, the effective tax rate also increased due to changes in valuation allowances and changes in taxes due to interpretation of tax law and double tax treaty agreements by competent tax authorities. See "Note 3 – Basis of presentation and assets held for sale" to our Consolidated Financial Statements for additional information.

In 2018, the effective tax rate decreased from 27.7 percent to 25.7 percent. The distribution of income within the group resulted in a lower weighted-average global tax rate. In addition, the impact from changes in interpretation of law and double tax treaty agreements by competent tax authorities decreased the effective tax rate. These impacts were partially offset by a negative impact from changes in valuation allowance and a lower positive impact compared to 2017 from non-taxable amounts for net gains from sale of businesses.

Income from continuing operations, net of tax

As a result of the factors discussed above, income from continuing operations, net of tax, decreased by $485 million to $1,090 million in 2019 compared to 2018, and increased by $56 million to $1,575 million in 2018 compared to 2017.

Income from discontinued operations, net of tax

Income from discontinued operations, net of tax, was $438 million, $723 million and $846 million for 2019, 2018 and 2017, respectively.

In December 2018, we announced an agreement to divest 80.1 percent of our Power Grids business to Hitachi. The business also includes certain real estate properties which were previously reported within Corporate and Other. The divestment is expected to be completed at the end of the second quarter of 2020, following the receipt of customary regulatory approvals. As this divestment represents a strategic shift that will have a major effect on our operations and financial results, the results of operations for this business have been presented as discontinued operations for all periods presented. In addition, consistent with the presentation of the business as discontinued operations, during 2019, we have not recorded depreciation or amortization on the property, plant and equipment, and intangible assets reported as discontinued operations. In 2018 and 2017, respectively, a total of $258 million and $265 million of depreciation and amortization expense was recorded for such assets.

Income from discontinued operations excludes certain costs which were previously allocated to the Power Grids business as these costs were not directly attributable to the business. As a result, $225 million, $297 million and $286 million, for 2019, 2018 and 2017, respectively, of allocated overhead and other management costs (stranded corporate costs), which were previously able to be included in the measure of segment profit for the Power Grids business are now reported as part of Corporate and Other. In 2019 and 2018, income from discontinued operations, before taxes, included $28 million and $18 million, respectively, for costs incurred to execute the transaction.

Income from discontinued operations for 2019, 2018 and 2017 included income from operations of $605 million, $951 million and $1,119 million, respectively. In addition, in 2019, 2018 and 2017 we recorded $167 million, $228 million and $273 million, respectively, as provision for taxes within discontinued operations.

For additional information on the planned divestment and discontinued operations see “Note 3 – Basis of presentation and assets held for sale” to our Consolidated Financial Statements.

Net income attributable to ABB

As a result of the factors discussed above, net income attributable to ABB decreased by $734 million to $1,439 million in 2019 compared to 2018, and decreased by $40 million to $2,173 million in 2018 compared to 2017.

Earnings per share attributable to ABB shareholders

(in $)	2019	2018	2017
Basic earnings per share attributable to ABB shareholders:			
Income from continuing operations, net of tax	0.49	0.71	0.67
Income from discontinued operations, net of tax	0.19	0.31	0.36
Net income	0.67	1.02	1.04
Diluted earnings per share attributable to ABB shareholders:			
Income from continuing operations, net of tax	0.49	0.71	0.67
Income from discontinued operations, net of tax	0.19	0.31	0.36
Net income	0.67	1.02	1.03

Basic earnings per share is calculated by dividing income by the weighted-average number of shares outstanding during the year. Diluted earnings per share is calculated by dividing income by the weighted-average number of shares outstanding during the year, assuming that all potentially dilutive securities were exercised, if dilutive. Potentially dilutive securities comprise: outstanding written call options and outstanding options and shares granted subject to certain conditions under our share-based payment arrangements. See “Note 20 – Earnings per share” to our Consolidated Financial Statements.

Business analysis

Electrification Business

The financial results of our Electrification Business, including the operations of GEIS which was acquired in June 2018, were as follows:

				% Change	
($ in millions)	2019	2018	2017	2019	2018
Orders	13,050	11,867	10,143	10%	17%
Order backlog at December 31,	4,488	4,113	3,098	9%	33%
Revenues	12,728	11,686	10,094	9%	16%
Income from operations	1,049	1,290	1,352	(19)%	(5)%
Operational EBITA	1,688	1,626	1,510	4%	8%

Orders

Approximately two-thirds of the Business's orders are for products with short delivery times; orders are usually recorded and delivered within a three-month period and thus are generally considered as short-cycle. The remainder of orders is comprised of smaller projects that require longer lead times, as well as larger solutions requiring engineering and installation. Approximately half of the Business's orders are received via third-party distributors; as a consequence, end-customer market data is based partially on management estimates.

In 2019, orders increased 10 percent (14 percent in local currencies) with broad-based growth across regions and business lines. The increase in orders was mostly due to acquisitions, primarily as GEIS was included in 2019 for a full year. The order growth was driven mainly by systems and long-cycle businesses, with utilities, oil and gas, renewables, electric vehicle infrastructure and data centers demand contributing strongly to the order intake. Construction demand overall remained positive with signs of easing in some key markets, particularly in terms of residential developments. Demand from transport & infrastructure remained positive with strong demand for electric vehicle infrastructure and continued investment in rail infrastructure. Data centers continued to be an attractive market with key investments in hyperscale and co-location developments. The oil and gas and distribution utilities sectors showed signs of recovery with large project orders in the second half of the year.

In 2018, orders increased 17 percent (16 percent in local currencies) with growth across business lines and regions. The increase in orders was positively impacted by 12 percent due to acquisitions, primarily GEIS. Orders for products grew stronger than the orders for systems. Construction demand was robust, driven by continued investment in residential and commercial buildings. Transport & infrastructure demand was positive with continued investment in rail infrastructure and strong demand for electric vehicles infrastructure. Demand for data centers was also strong and resulted in the award of a few significant orders. From an industry perspective, stronger oil prices earlier in the year contributed to a return to investment in oil and gas projects. Solar orders improved slightly from the low levels recorded in 2017.

The geographic distribution of orders for our Electrification Business was as follows:

(in %)	2019	2018	2017
Europe	33	35	37
The Americas	36	32	27
Asia, Middle East and Africa	31	33	36
Total	**100**	**100**	**100**

In 2019, orders grew in all regions. The relative share of orders from the Americas increased due to strong order growth in the United States driven mainly by the impact of including GEIS for a full year, which has a significant portion of its operations in the United States. Although the share of orders from Europe decreased compared with the previous year, orders in Europe developed positively with order growth led by Germany, Netherlands and Finland. The relative share of orders from Asia, Middle East and Africa decreased slightly compared with 2018, despite an order increase in the region supported by sustained growth in China and India.

In 2018, orders grew in all regions. The relative share of orders from the Americas increased due to strong order growth in the United States following the acquisition of GEIS. Although the share of orders from Europe decreased slightly compared with the previous year, orders in Europe developed positively with order growth in key markets such as Germany and Italy compensating for lower order volumes in Turkey. Order growth in Asia, Middle East and Africa was supported by growth in China, Taiwan and Egypt, whereas orders from Saudi Arabia and Qatar were significantly lower than in 2017.

Order backlog

In 2019, the order backlog increased 9 percent (9 percent in local currencies) mainly reflecting growth for long-cycle businesses in the Distribution Solutions business. The majority of this order backlog is planned to be converted to revenues during 2020.

In 2018, the order backlog increased 33 percent (39 percent in local currencies). The acquisition of the GEIS business contributed 36 percentage points to the growth of the order backlog. The remaining order backlog increase in local currencies reflected the receipt of orders for electric vehicle charging infrastructure with deliveries scheduled to occur after 2018.

Revenues

In 2019, revenues increased 9 percent (12 percent in local currencies). The inclusion of GEIS for a full year contributed 10 percentage points of the revenue growth. Revenues in local currencies grew across all business lines, with long-cycle businesses such as the electric vehicle charging infrastructure business and Solar growing at a higher pace than our short-cycle product businesses. Revenues developed positively in most end-customer sectors, with strong growth in e-mobility, renewables and data centers. Growth in the transportation sectors was driven particularly by investments in urban transport. Revenues also grew in industries such as oil and gas, whereas the construction sector benefited from continued public investments in hospitals and education facilities.

In 2018, revenues increased by 16 percent (16 percent in local currencies). The acquisition of the GEIS business contributed 13 percentage points of the revenue growth. Revenues grew in the short-cycle low-voltage product businesses, with growth broad-based across end-customer markets including construction, specifically non-residential construction, and industries such as oil and gas. Revenue growth from the distributor channel was strong. There was significant revenue growth in our electric vehicle charging infrastructure business, although the business remains a small portion of total revenues. Revenues from the medium-voltage systems business decreased, negatively impacted by longer lead times for the conversion of orders into revenues. Revenues decreased in Solar, reflecting a lower opening order backlog and the impact of continued price pressure across the Solar business.

The geographic distribution of revenues for our Electrification Business was as follows:

(in %)	2019	2018	2017
Europe	33	35	37
The Americas	37	32	27
Asia, Middle East and Africa	30	33	36
Total	**100**	**100**	**100**

In 2019, the relative share of revenues from the Americas increased primarily due to the impact of the inclusion of GEIS for a full year, which has a significant portion of its operations in the United States. Although the share of revenues from Europe decreased compared with the previous year, orders in Europe developed positively supported by growth in the Netherlands, Switzerland and Germany. Revenues from Asia, Middle East and Africa decreased compared with 2018 reflecting a lower level of revenues particularly from South Korea.

In 2018, the relative share of revenues from the Americas increased primarily due to the impact of the acquisition of GEIS. Although the relative share of revenues from Europe decreased, revenues were higher as growth in multiple markets such as Germany, Switzerland and Netherlands helped offset a lower revenue level from Turkey. Although the share of revenues from Asia, Middle East and Africa decreased, revenues for this region were steady as a positive revenue development in China and Egypt offset lower revenue volumes from Saudi Arabia and Qatar.

Income from operations

In 2019, income from operations decreased 19 percent, mainly reflecting a loss of $421 million recognized to record the solar inverters business at fair value. During 2019, we announced an agreement to sell the solar inverters business to FIMER S.p.A. At December 31, 2019, this business is presented as held-for-sale and completion of the sale is expected in the first quarter of 2020. The loss from this sale was partly offset by gains from sales of businesses of $42 million. We also recognized a gain of $92 million relating to the receipt of cash from General Electric for a favorable resolution of an uncertainty with respect to the price paid to acquire GEIS. In 2019, we had $49 million lower acquisition-related expenses and post-acquisition integration costs compared to 2018, whereas restructuring and related expenses were $14 million higher than the previous year. Pricing actions across the product businesses and the benefits from savings from ongoing restructuring and cost savings programs had a positive impact on the operating margin. In addition, the Business recorded lower warranty costs in the solar inverters business than in 2018, and also benefited from slightly lower commodity prices. These positives were partly offset by pricing pressures in the Distribution Solutions and Solar businesses. Changes in foreign currencies, including the impacts from FX/commodity timing differences summarized in the table below, negatively affected income from operations by 1 percent.

In 2018, income from operations decreased 5 percent, mainly reflecting a $145 million increase of acquisition-related expenses and post-acquisition integration costs compared with 2017, due to the acquisition of GEIS. Pricing actions across the product businesses and the benefits from savings from ongoing restructuring and cost savings programs had a positive impact on the operating margin. The Business realized a gain of $81 million on the sale of a business. These benefits were offset by the negative impact of higher commodity prices and pricing pressures for distribution solutions and Solar. The Business also recorded significant warranty costs for certain solar inverters. In addition, restructuring, related and implementation costs in 2018 of $98 million were $70 million higher than in 2017, reflecting manufacturing footprint changes as well as organizational simplification. Acquisition-related amortization was 8 percent higher than in 2017, mainly due to the GEIS acquisition. Changes in foreign currencies, including the impacts from FX/commodity timing differences summarized in the table below, negatively affected income from operations by 2 percent.

Operational EBITA

The reconciliation of Income from operations to Operational EBITA for the Electrification Business was as follows:

($ in millions)	2019	2018	2017
Income from operations	**1,049**	**1,290**	**1,352**
Acquisition-related amortization	115	106	98
Restructuring, related and implementation costs(1)	112	98	28
Changes in pre-acquisition estimates	22	19	8
Gains and losses from sale of businesses	(42)	(81)	—
Fair value adjustment on assets and liabilities held for sale	421	—	—
Favorable resolution of an uncertain purchase price adjustment	(92)	—	—
Acquisition- and divestment-related expenses and integration costs	119	168	23
Certain other non-operational items	3	(2)	21
FX/commodity timing differences in income from operations	(19)	28	(20)
Operational EBITA	**1,688**	**1,626**	**1,510**

(1) Amount in 2017 also includes the incremental implementation costs in relation to the White Collar Productivity program.

In 2019, Operational EBITA increased 4 percent (8 percent excluding the impacts from changes in foreign currencies) compared to 2018, primarily due to the reasons described under "Income from operations", excluding the explanations related to the reconciling items in the table above.

In 2018, Operational EBITA increased 8 percent (6 percent excluding the impacts from changes in foreign currencies) compared to 2017, primarily due to the reasons described under "Income from operations", excluding the explanations related to the reconciling items in the table above.

Industrial Automation Business

The financial results of our Industrial Automation Business were as follows:

				% Change	
($ in millions)	2019	2018	2017	2019	2018
Orders	6,432	6,697	6,113	(4)%	10%
Order backlog at December 31,	5,077	4,986	5,171	2%	(4)%
Revenues	6,273	6,500	6,472	(3)%	0%
Income from operations	700	853	829	(18)%	3%
Operational EBITA	732	914	902	(20)%	1%

Orders

Orders in 2019 decreased 4 percent (flat in local currencies) primarily reflecting the impact of selective large capital expenditure projects in oil and gas, and mining which continued to be at low levels. The underlying base business continued to be strong as investment in maintenance activities, digitalization upgrades and other discretionary projects improved, in particular for oil and gas, chemical and process industry customers. Orders were steady in almost all industries with the exception of conventional power generation which was depressed as seen in the order levels for Energy Industries and Turbocharging.

Orders in 2018 increased 10 percent (8 percent in local currencies) and was supported by selective demand for cruise ships and specialty vessels. Large capital expenditure projects in some end-markets like oil and gas, and mining continued to be selective and at low levels. In 2018, demand for Measurement and Analytics products was quite strong. Demand for ABB Ability™ solutions and services contributed to positive order momentum.

The geographic distribution of orders for our Industrial Automation Business was as follows:

(in %)	2019	2018	2017
Europe	40	42	40
The Americas	25	23	24
Asia, Middle East and Africa	35	35	36
Total	**100**	**100**	**100**

In 2019, orders decreased slightly in Europe reflecting the larger orders in 2018 from the cruise ship sector and resulted in a reduction in the share of orders in Europe. The share of orders in the Americas increased slightly, supported by positive development in Marine and Ports business in the U.S., as well as the Process Industries business in South America. In Asia, Middle East and Africa, the share of orders remained stable as a result of large capital expenditures for specialty vessels and strong demand in China.

In 2018, orders from all regions increased. In Europe, the share of orders increased due to strong demand for cruise and specialty vessels. Orders in the Americas grew but the share of orders decreased as Europe had significant increases. In Asia, Middle East and Africa, growth was steady but lower than the other regions, thus reducing this region's share.

Order backlog

The order backlog at the end of 2019 was 2 percent higher (2 percent higher in local currencies) than at the end of 2018. The backlog continued to benefit from orders for specialty vessels which are executed over multiple years. In addition, the Business continued to see recovery in demand for oil and gas, chemical and the Process Industries as well as strong demand for shorter cycle products. Demand for conventional power generation was depressed putting negative pressure on the positive order backlog development.

The order backlog at the end of 2018 was 4 percent lower (1 percent higher in local currencies) than at the end of 2017. The local currency increase reflects the benefit from orders for cruise and specialty vessels which are executed over multiple years.

Revenues
In 2019, revenues decreased 3 percent (flat in local currencies). Process Industries realized high revenue levels benefiting from strong book-and-bill business and good execution of the order backlog. This was offset by lower revenues across other businesses predominantly in Energy Industries and Turbocharging driven by weaknesses in the conventional power generation market. Energy Industries were also impacted by the project-related challenges in the Kusile power generation project in South Africa.

In 2018, revenues were steady (steady in local currencies). The majority of the business lines recorded higher revenues, especially the Process Industries, Measurement and Analytics and Turbocharging business lines. Revenues were lower in the Energy Industries business line. During the year, the Business realized higher revenues from book-and-bill business and good execution of the backlog. Notwithstanding, the lower order backlog at the beginning of 2018 dampened revenue growth.

The geographic distribution of revenues for our Industrial Automation Business was as follows:

(in %)	2019	2018	2017
Europe	40	39	39
The Americas	25	23	21
Asia, Middle East and Africa	35	38	40
Total	**100**	**100**	**100**

In 2019, revenues were higher in the Americas, slightly weaker in Europe and grew strongly in Asia, Middle East and Africa. Despite revenue declines in Europe across most business lines, the share of revenues in Europe increased slightly. In the Americas, the share of revenues grew benefiting from strong book-and-bill business and higher execution from the order backlog compared to a year ago. Revenues in the U.S. grew primarily on strong development in Process Industries and Marine and Ports. In Asia, Middle East and Africa, weaker revenues were impacted by slower growth in Energy Industries and Turbocharging. The Process Industries business was lower in China and South Korea while the Marine and Ports business declined in the United Arab Emirates. Revenues in the Energy Industries business were negatively impacted by project-related challenges in the Kusile power generation project in South Africa.

In 2018, revenues improved in the Americas, benefiting from a selective market recovery in Process Industries. The share of revenues from Europe was steady. The Americas increased their share of revenues benefiting from an upturn in mining as well as continued demand for Measurement and Analytics and Turbocharging products. The share of revenues from Asia, Middle East and Africa was lower as the region recorded lower revenue growth compared to the other regions, impacted by the lower opening backlog and lower book-and-bill orders.

Income from operations
In 2019, income from operations decreased 18 percent compared to 2018 on weaker sales volumes in the Turbocharging business and losses resulting from project-related challenges in the Kusile power generation project in South Africa. Income from operations was also impacted by legal costs relating to challenges in certain projects, unfavorable business mix as well as investments in growth. These impacts could not be offset by the positive results of ongoing business rationalization efforts and other cost saving measures. The impact from changes in foreign currencies, including the impact from changes in the FX/commodity timing differences summarized in the table below, negatively impacted income from operations by 2 percent.

In 2018, income from operations increased 3 percent compared to 2017, benefiting from an improved revenue mix, ongoing progress in the Business's rationalization efforts and benefits realized from cost savings measures, productivity improvements and solid project execution. Income from operations was also higher due to a reduction of restructuring and restructuring-related expenses compared to 2017. The impact from changes in foreign currencies, including the impacts from changes in FX/commodity timing differences summarized in the table below, negatively impacted income from operations by 4 percent.

Operational EBITA

The reconciliation of Income from operations to Operational EBITA for the Industrial Automation Business was as follows:

($ in millions)	2019	2018	2017
Income from operations	**700**	**853**	**829**
Acquisition-related amortization	4	6	7
Restructuring, related and implementation costs(1)	21	35	85
Gains and losses from sale of businesses	—	3	(2)
Acquisition- and divestment-related expenses and integration costs	—	4	9
Certain other non-operational items	2	3	—
FX/commodity timing differences in income from operations	5	10	(26)
Operational EBITA	**732**	**914**	**902**

(1) Amount in 2017 also includes the incremental implementation costs in relation to the White Collar Productivity program.

In 2019, Operational EBITA decreased 20 percent (18 percent excluding the impacts from changes in foreign currencies) compared to 2018. The change is due to the reasons described under "Income from operations", excluding the explanations related to the reconciling items in the table above.

In 2018, Operational EBITA increased 1 percent (1 percent excluding the impacts from changes in foreign currencies) compared to 2017. The change is due to the reasons described under "Income from operations", excluding the explanations related to the reconciling items in the table above.

Motion Business

The financial results of our Motion Business were as follows:

				% Change	
($ in millions)	**2019**	**2018**	**2017**	**2019**	**2018**
Orders	6,782	6,725	5,966	1%	13%
Order backlog at December 31,	2,967	2,740	2,674	8%	2%
Revenues	6,533	6,463	5,877	1%	10%
Income from operations	1,009	924	707	9%	31%
Operational EBITA	1,082	1,023	838	6%	22%

Orders

In 2019, orders increased 1 percent (4 percent in local currencies). Order growth was driven by increased demand from process industries such as oil, gas and chemicals as well as rising demand from transport & infrastructure sectors with rail, water and waste water, and wind growing strongly. The Business experienced a slightly slower demand from traditional heavy industries such as mining and metals, minerals, and pulp and paper.

In 2018, orders increased 13 percent (12 percent in local currencies). Order growth was driven by demand from process industries such as oil, gas, mining and metals as well as demand from discrete industries such as food and beverage. The Business noted rising demand from light industries for smaller-sized drives and motor solutions as well as solid significant order intake for traction solutions from the rail industry.

The geographic distribution of orders for our Motion Business was as follows:

(in %)	2019	2018	2017
Europe	35	34	33
The Americas	36	37	39
Asia, Middle East and Africa	29	29	28
Total	**100**	**100**	**100**

In 2019, Europe increased its relative share of orders on growth across the main countries including Germany, Italy and Spain. The Asia, Middle East and Africa share remained stable with good performance in China which was partly offset by other markets. The Americas share of orders declined as a result of slight decrease of the orders in the United States.

In 2018, orders grew in all regions. The relative share of orders from Asia, Middle East and Africa increased on double-digit growth in China and India. The European market performed well with order growth across the majority of countries including Germany, Italy and Switzerland. The relative share of orders from the Americas declined despite solid growth in the United States.

Order backlog

The order backlog in 2019 increased 8 percent (9 percent in local currencies) compared to 2018. The order backlog increased in all business lines, reflecting strong long-cycle order growth in 2019.

The order backlog in 2018 increased 2 percent (7 percent in local currencies) compared to 2017. The backlog improved in all business lines on strong order growth in 2018.

Revenues

In 2019, revenues grew 1 percent (4 percent in local currencies) compared to 2018. Revenue growth was driven by Drives while revenues in Motors & Generators decreased slightly. The revenue increase was driven by strong execution of the order backlog as well as book-and-bill business. Service revenues continued to improve as the Business continued to leverage its installed base and increased customer demand for ABB Ability™ solutions.

In 2018, revenues increased 10 percent (10 percent in local currencies) compared to 2017. Revenues grew in all business lines driven by steady execution of the order backlog as well as book-and-bill business. Service revenues improved as the Business leveraged its installed base with increased customer demand for ABB Ability™ solutions.

The geographic distribution of revenues for our Motion Business was as follows:

(in %)	2019	2018	2017
Europe	33	33	33
The Americas	36	38	39
Asia, Middle East and Africa	31	29	28
Total	**100**	**100**	**100**

In 2019, revenue growth in Asia, Middle East and Africa is reflected in the increase in the relative share of revenues from this region as revenues grew in China, India and Japan. The share of revenues from Europe remained stable despite revenue growth across many countries including Germany and France. Revenues from the Americas declined as revenues were lower in the U.S., lowering the relative market share of the region compared to 2018.

In 2018, revenues were higher in all regions. The relative share of revenues from Asia, Middle East and Africa increased on double-digit revenue growth in China and India. The share of revenues from Europe remained steady despite revenue growth across the majority of countries including Germany, Italy and Switzerland. The relative share of revenues from the Americas declined despite generating higher revenues including moderate growth in the U.S.

Income from operations

In 2019, income from operations increased 9 percent compared to 2018 driven by higher sales volumes, continued cost discipline and operational performance. In 2019, the Business also benefited from lower restructuring and restructuring-related expenses. Changes in foreign currencies, including the impacts from FX/commodity timing differences summarized in the table below, negatively impacted income from operations by 3 percent.

In 2018, income from operations increased 31 percent compared to 2017, driven by positive volumes and continued cost discipline. Restructuring and restructuring-related expenses were lower in 2018 than in 2017, positively impacting income from operations. Acquisition-related amortization was slightly lower as certain acquired intangible assets were fully amortized in early 2018. These positive effects were partly offset by the effects of higher commodity prices and pricing pressures. Changes in foreign currencies, including the impacts from FX/commodity timing differences summarized in the table below, positively impacted income from operations by 2 percent.

Operational EBITA

The reconciliation of Income from operations to Operational EBITA for the Motion Business was as follows:

($ in millions)	2019	2018	2017
Income from operations	**1,009**	**924**	**707**
Acquisition-related amortization	53	61	64
Restructuring, related and implementation costs(1)	12	17	63
Gains and losses from sale of businesses	—	4	—
Acquisition- and divestment-related expenses and integration costs	—	2	—
Certain other non-operational items	14	10	—
FX/commodity timing differences in income from operations	(6)	5	4
Operational EBITA	**1,082**	**1,023**	**838**

(1) Amount in 2017 also includes the incremental implementation costs in relation to the White Collar Productivity program.

In 2019, Operational EBITA increased 6 percent (9 percent excluding the impact from changes in foreign currency exchange rates) primarily due to the reasons described under "Income from operations", excluding the explanations related to the reconciling items in the table above.

In 2018, Operational EBITA increased 22 percent (21 percent excluding the impact from changes in foreign currency exchange rates) primarily due to the reasons described under "Income from operations", excluding the explanations related to the reconciling items in the table above.

Robotics & Discrete Automation Business

The financial results of our Robotics & Discrete Automation Business were as follows:

				% Change	
($ in millions)	**2019**	**2018**	**2017**	**2019**	**2018**
Orders	3,260	3,808	2,977	(14)%	28%
Order backlog at December 31,	1,356	1,438	1,279	(6)%	12%
Revenues	3,314	3,611	2,957	(8)%	22%
Income from operations	298	456	387	(35)%	18%
Operational EBITA	393	528	473	(26)%	12%

Orders
In 2019, orders decreased 14 percent (11 percent in local currencies). Demand was weakened by headwinds in traditional automotive and automotive-related sectors as well as in the machine builders and electronics markets. Demand for warehouse automation was strong in 2019. The Business continued to benefit from a large order intake for robot systems from certain parts of the automotive sector, including for new electric vehicle manufacturing lines, although on lower levels than in 2018.

In 2018, orders grew 28 percent (25 percent in local currencies), primarily due to the impact of including B&R for a full year in 2018 which contributed 15 percent to order growth. Order growth was also driven by demand from discrete industries such as automotive and food and beverage as well as machine builders. The Business also benefited from solid order intake for robot systems from the automotive sector.

The geographic distribution of orders for our Robotics & Discrete Automation Business was as follows:

(in %)	2019	2018	2017
Europe	53	49	45
The Americas	14	13	16
Asia, Middle East and Africa	33	38	39
Total	**100**	**100**	**100**

In 2019, orders decreased in all regions. The relative share of orders from Asia, Middle East and Africa decreased due to weak demand in China which then resulted in an increase in the relative share of orders from both the Americas and Europe.

In 2018, orders grew in all regions. The relative share of orders from Europe increased, reflecting the impact of including B&R for a full year in 2018. The relative share of orders from Asia, Middle East and Africa remained steady due to strong growth in China. The relative share of orders from the Americas decreased.

Order backlog
The order backlog in 2019 decreased 6 percent (5 percent in local currencies) compared to 2018. The backlog decrease reflected the reduced order intake in all businesses due to a decline in market demand in 2019.

The order backlog in 2018 increased 12 percent (18 percent in local currencies) compared to 2017. The backlog improved in all businesses on strong order growth in 2018.

Revenues
In 2019, revenues decreased 8 percent (4 percent in local currencies) compared to 2018. Revenues decreased in all businesses due to lower volumes from book-and-bill business, partially offset by steady execution of the order backlog. Service revenues decreased, driven by weak demand from automotive and automotive-related sectors.

In 2018, revenues increased 22 percent (20 percent in local currencies) compared to 2017, partially due to the impact of including B&R for a full year in 2018 which contributed 14 percent to the revenue increase. Revenues grew in all businesses driven by steady execution of the order backlog as well as book-and-bill business. Service revenues continued to improve as the Business leveraged its installed based and increased customer demand for ABB Ability™ solutions.

The geographic distribution of revenues for our Robotics & Discrete Automation Business was as follows:

(in %)	2019	2018	2017
Europe	51	49	43
The Americas	14	13	18
Asia, Middle East and Africa	35	38	39
Total	**100**	**100**	**100**

In 2019, revenues decreased in all regions. The relative share of revenues from Asia, Middle East and Africa decreased due to weak demand in China which resulted in a shift in the relative share of revenues to both the Americas and Europe.

In 2018, revenues were higher in all regions. The relative share of revenues from Europe increased, reflecting the impact of including B&R for a full year in 2018. The relative share of revenues from Asia, Middle East and Africa remained steady following strong growth in China. The relative share of revenues from the Americas decreased.

Income from operations
In 2019, income from operations decreased 35 percent compared to 2018, driven by lower sales volumes, an adverse change in the revenue mix, partially offset by benefits of cost reduction measures. Acquisition-related amortization was slightly lower than 2018. Changes in foreign currencies, including the impacts from FX/commodity timing differences summarized in the table below, negatively impacted income from operations by 4 percent.

In 2018, income from operations increased 18 percent compared to 2017. Of this increase, B&R contributed approximately 17 percent which included both the inclusion of the operations for a full year as well as the negative comparative impact in 2017 of purchase price adjustments (primarily for inventories) which reduced income in 2017. Restructuring and restructuring-related expenses were slightly higher in 2018 than in 2017, negatively impacting income from operations. Acquisition-related amortization was higher as certain acquired intangible assets were fully amortized in 2017. There was no significant impact on income from operations due to changes in foreign currencies.

Operational EBITA

The reconciliation of Income from operations to Operational EBITA for the Robotics & Discrete Automation Business was as follows:

($ in millions)	2019	2018	2017
Income from operations	**298**	**456**	**387**
Acquisition-related amortization	77	82	42
Restructuring, related and implementation costs(1)	12	4	1
Changes in pre-acquisition estimates	—	(11)	—
Acquisition- and divestment-related expenses and integration costs	1	—	45
Certain other non-operational items	4	1	1
FX/commodity timing differences in income from operations	1	(4)	(3)
Operational EBITA	**393**	**528**	**473**

(1) Amount in 2017 also includes the incremental implementation costs in relation to the White Collar Productivity program.

In 2019, Operational EBITA decreased 26 percent (22 percent excluding the impact from changes in foreign currency exchange rates) primarily due to the reasons described under “Income from operations”, excluding the explanations related to the reconciling items in the table above.

In 2018, Operational EBITA increased 12 percent (10 percent excluding the impact from changes in foreign currency exchange rates) primarily due to the reasons described under “Income from operations”, excluding the explanations related to the reconciling items in the table above. The acquisition of B&R increased Operational EBITA by 5 percent after consideration of the related adjustments in the table above relating to that business.

Corporate and Other

Net loss from operations for Corporate and Other was as follows:

($ in millions)	2019	2018	2017
Corporate headquarters and stewardship	(407)	(496)	(430)
Stranded corporate costs	(225)	(297)	(286)
Corporate research and development	(155)	(170)	(128)
Costs for planned divestment of Power Grids	(141)	—	—
OS program costs	(83)	(11)	—
Corporate real estate	60	75	45
Net gain (loss) from sale of businesses	13	(17)	250
White Collar Productivity program costs	—	—	(107)
Other corporate costs	(11)	(70)	(92)
Divested businesses and other non-core activities	(164)	(316)	(304)
Total Corporate and Other	**(1,113)**	**(1,302)**	**(1,052)**

In 2019, the net loss from operations within Corporate and Other decreased by $189 million to $1,113 million. This reflected corporate cost decreases offset by costs for current strategic projects while the losses incurred within the non-core businesses decreased significantly. Costs were lower for corporate headquarters and stewardship costs and corporate research and development expenses while the amount recorded for stranded corporate costs also decreased. In 2019, we incurred restructuring and implementation costs for the OS program and also incurred costs relating to the planned divestment of the Power Grids business.

In 2018, the net loss from operations within Corporate and Other was $1,302 million compared to $1,052 million in 2017. The primary reason for the increase was that 2017 included a significant net gain on sales of businesses, primarily a gain of $338 million for the sale of the high-voltage cables business. In addition, lower White Collar Productivity costs were offset by an increase in corporate headquarters and stewardship costs.

In 2019, corporate headquarters and stewardship costs declined by $89 million to $407 million from $496 million, benefiting from savings generated from results of the OS restructuring program efforts. Costs were lower for communications and information technology and also reflected the benefits of a reduction in country-level general management costs. In 2018, corporate headquarters and stewardship costs were $496 million, an increase of $66 million from 2017. Higher costs were due to higher costs relating to ABB Digital and the sponsorship of the ABB FIA Formula E Championship.

Stranded corporate costs includes the amount of allocated general and administrative and other overhead costs previously included in the measure of segment profit (Operational EBITA) for the Power Grids business which is presented as discontinued operations. These allocated costs do not qualify for being reported as costs within the discontinued operation. During 2019, we reduced the amount of stranded corporate costs by eliminating certain costs and transferring certain previously centralized functions directly to the Power Grids business.

At the end of 2018, we announced the OS program and the implementation of the program in 2019 resulted in higher costs than were incurred in 2018. As of December 31, 2017, we had incurred substantially all costs related to the White Collar Productivity program which we executed from 2015 through 2017. In 2017, costs incurred in connection with this program amounted to $107 million, including program implementation costs. The program costs relate mainly to employee severance and both external and internal costs relating to the execution of the program. For further information on the OS Program and the White Collar Productivity program see "Restructuring and other cost savings initiatives" below.

Corporate real estate primarily includes income from property rentals and gains from the sale of real estate properties. In 2019, 2018 and 2017, income from operations in Corporate real estate included gains from the sale of real estate properties of $48 million, $49 million and $28 million, respectively.

Other corporate costs consist of operational costs of our Corporate Treasury Operations and certain other charges such as costs and penalties associated with legal cases, environmental expenses and impairment charges related to investments.

Divested businesses and other non-core activities

The results of operations for certain divested businesses and other non-core activities are presented in Corporate and Other. Divested businesses include the high-voltage cables business, which was divested in March 2017. Also, certain EPC contracts relating to the oil and gas industry were divested to an unconsolidated joint venture at the end of 2017. In addition, in 2018 and 2019, we transferred certain projects in our EPC business for turnkey electrical AC substations to a new unconsolidated joint venture, Linxon, which is controlled by the SNC-Lavalin Group. Other non-core activities includes amounts relating to the execution and wind-down of certain legacy EPC and other contracts.

In 2019, Divested businesses and other non-core activities reflects challenges in winding down several legacy projects as well as charges for certain retained liabilities of divested businesses. In 2019, we recorded additional losses for legacy substations, plant electrification EPC contracts and the full train retrofit business, which were driven by additional project cost overruns. We also incurred certain customer credit-related losses and a contract termination loss resulting from an unfavorable legal decision.

In 2018, the amount primarily reflects losses incurred in legacy substations and plant electrification EPC contracts and were driven by project cost overruns and contractual costs relating to delayed project completion. The amount in 2018 also reflects project cost overruns in the full train retrofit business.

In 2017, the loss includes charges of $94 million recorded for certain retained liabilities associated with the divested cables businesses and losses for project cost overruns in the full train retrofit business. In 2017, the amount also includes losses incurred in legacy substations and plant electrification EPC contracts driven by cost overruns, credit losses and contractual costs for delayed project completion.

At December 31, 2019, our remaining non-core activities primarily include the completion of the remaining EPC contracts for substations and plant electrification and the completion of the remaining obligations for the full train retrofit business.

Restructuring and other cost savings initiatives

OS program

In December 2018, ABB announced a two-year restructuring program with the objective of simplifying its business model and structure through the implementation of a new organizational structure driven by its Businesses. The program includes the elimination of the country and regional structures within the current matrix organization, including the elimination of the three regional Executive Committee roles. The Businesses will each be responsible for both their customer-facing activities and business support functions, while the remaining Group-level corporate activities will primarily focus on Group strategy, portfolio and performance management, capital allocation, core technologies and the ABB Ability™ platform.

Over the course of the program, we will execute a number of restructuring activities across all operating segments and functions. The following table outlines the cumulative amount of costs incurred to date and the total amount of costs expected under the program:

($ in millions)	Costs incurred in[(1)] 2019	Costs incurred in[(1)] 2018	Cumulative costs incurred up to December 31, 2019[(1)]	Total expected costs[(1)]
Electrification	18	32	50	80
Industrial Automation	3	21	24	40
Motion	6	1	7	50
Robotics & Discrete Automation	8	—	8	20
Corporate and Other	54	11	65	160
Total	**89**	**65**	**154**	**350**

(1) Amounts in the table above have been recast to reflect the reorganization of the Company's operating segments in 2019. See "Note 23 – Operating segment and geographic data" to our Consolidated Financial Statements.

By the completion of the program, we estimate that we will achieve a run-rate cost savings of approximately $500 million, impacting all Businesses and Corporate and Other. These cost savings are expected to mainly impact cost of sales, selling, general and administrative expenses, and non-order related research and development expenses, and are planned to be achieved during 2021. In 2019, we achieved cost savings of approximately $160 million in line with the target set for the program.

For details of the nature of the costs incurred and the impact on the Consolidated Financial Statements, see "Note 22 – Restructuring and related expenses" to our Consolidated Financial Statements.

The majority of the remaining cash payments, primarily for employee severance benefits, are expected to occur in 2020 and 2021. We expect that our cash provided by operating activities will be sufficient to cover any expenditures for this restructuring program.

White Collar Productivity program

From September 2015 to December 2017, we executed a restructuring program to make ABB leaner, faster and more customer-focused. The program involved the rapid expansion and use of regional shared service centers as well as a streamlining of global operations and head office functions, with business units moving closer to their respective key markets. The program involved various restructuring initiatives across all operating segments and regions.

The restructuring program resulted in total annual cost savings of $1.2 billion in continuing operations. The savings were realized as reductions in cost of sales, selling, general and administrative expenses and non-order related research and development expenses.

As of December 31, 2017, we had incurred substantially all costs related to the White Collar Productivity program.

The following table outlines the costs incurred in 2017 as well as the cumulative amount of costs incurred under the program:

($ in millions)	Net costs incurred in 2017[(1)]	Cumulative costs incurred up to December 31, 2017[(1)]
Electrification	(17)	72
Industrial Automation	(23)	106
Motion	(10)	42
Robotics & Discrete Automation	(4)	14
Corporate and Other	(32)	91
Total	**(86)**	**325**

(1) Amounts in the table above have been recast to reflect the reorganization of our operating segments as outlined in "Note 23 – Operating segment and geographic data" to our Consolidated Financial Statements.

During the course of the restructuring program, total expected costs were reduced mainly due to the realization of significantly higher than originally expected attrition and internal redeployment rates. The reductions were made across all operating Businesses as well as for corporate functions.

In 2017, a change in estimate of $118 million was recorded to adjust the amount of our estimated liability for restructuring which was recorded in 2016 and 2015. This change in estimate resulted in a reduction primarily in cost of sales of $53 million and in selling, general and administrative expenses of $55 million in the year.

For details of the nature of the costs incurred and their impact on the Consolidated Financial Statements, see ''Note 22 – Restructuring and related expenses'' to our Consolidated Financial Statements.

Other restructuring-related activities and cost savings initiatives

In 2019, 2018 and 2017, we also executed other restructuring-related and cost savings measures to sustainably reduce our costs and protect our profitability. Costs associated with these other measures amounted to $114 million, $116 million and $181 million in 2019, 2018 and 2017, respectively.

Liquidity and capital resources

Principal sources of funding

We meet our liquidity needs principally using cash from operations, proceeds from the issuance of debt instruments (bonds and commercial paper), and short-term bank borrowings.

During 2019, 2018 and 2017, our financial position benefited from positive cash flow from operating activities (both from continuing and discontinued operations) of $2,325 million, $2,924 million and $3,799 million, respectively.

Our net debt is shown in the table below:

	December 31,	
($ in millions)	**2019**	**2018**
Short-term debt and current maturities of long-term debt	2,287	2,031
Long-term debt	6,772	6,587
Cash and equivalents	(3,544)	(3,445)
Marketable securities and short-term investments	(566)	(712)
Net debt (defined as the sum of the above lines)	**4,949**	**4,461**

Net debt at December 31, 2019, increased $488 million compared to December 31, 2018, as cash flows from operating activities during 2019 of $2,325 million was more than offset by cash outflows for the dividend payment to our shareholders ($1,675 million) and net purchases of property, plant and equipment and intangible assets ($839 million for both continuing and discontinued operations). We also made payments of dividends to noncontrolling shareholders totaling $90 million. In addition, net debt decreased by $32 million due to movements in foreign exchange rates. See “Financial position”, “Investing activities” and “Financing activities” for further details.

Our Corporate Treasury Operations is responsible for providing a range of treasury management services to our group companies, including investing cash in excess of current business requirements. At December 31, 2019 and 2018, the proportion of our aggregate “Cash and equivalents” and “Marketable securities and short-term investments” managed by our Corporate Treasury Operations amounted to approximately 34 percent and 38 percent, respectively.

Throughout 2019 and 2018, the investment strategy for cash (in excess of current business requirements) has generally been to invest in short-term time deposits with maturities of less than 3 months, supplemented at times by investments in corporate commercial paper, money market funds, and in some cases, government securities. During 2018 and the first quarter of 2019, we also continued to place limited funds in connection with reverse repurchase agreements. We actively monitor credit risk in our investment portfolio and derivative portfolio. Credit risk exposures are controlled in accordance with policies approved by our senior management to identify, measure, monitor and control credit risks. We have minimum rating requirements for our counterparts and closely monitor developments in the credit markets making appropriate changes to our investment policy as deemed necessary. In addition to minimum rating criteria, we have strict investment parameters and specific approved instruments as well as restrictions on the types of investments we make. These parameters are closely monitored on an ongoing basis and amended as we consider necessary.

Our cash is held in various currencies around the world. Approximately 22 percent of our cash and cash equivalents held at December 31, 2019, was in U.S. dollars, while other significant amounts were held in Chinese renminbi (24 percent), euro (15 percent) and Indian rupee (8 percent).

We believe the cash flows generated from our business, supplemented, when necessary, through access to the capital markets (including short-term commercial paper) and our credit facilities are sufficient to support business operations, capital expenditures, business acquisitions, the payment of dividends to shareholders and contributions to pension plans. Consequently, we believe that our ability to obtain funding from these sources will continue to provide the cash flows necessary to satisfy our working capital and capital expenditure requirements, as well as meet our debt repayments and other financial commitments for the next 12 months. See “Disclosures about contractual obligations and commitments”.

Due to the nature of our operations, including the timing of annual incentive payments to employees, our cash flow from operations generally tends to be weaker in the first half of the year than in the second half of the year.

Debt and interest rates

Total outstanding debt was as follows:

	December 31,	
($ in millions)	**2019**	**2018**
Short-term debt and current maturities of long-term debt	2,287	2,031
Long-term debt:		
Bonds	6,587	6,411
Other long-term debt	185	176
Total debt	**9,059**	**8,618**

The increase in short-term debt in 2019 was due to the reclassification to short-term of the USD 300 million 2.8% Notes, the issuance of EUR 1,000 million floating rate notes, an increase in outstanding commercial paper of $244 million mostly offset by the repayment at maturity of the EUR 1,250 million 2.625% instruments. Commercial paper outstanding was $706 million at December 31, 2019, compared to $464 million outstanding at December 31, 2018.

At December 31, 2019, Long-term debt increased $185 million compared to the end of 2018 due primarily to the issuance in 2019 of two new long-term notes with net proceeds totaling $449 million partially offset by the reclassification to short-term debt of the USD 300 million notes discussed above.

Our debt has been obtained in a range of currencies and maturities and with various interest rate terms. For certain of our debt obligations, we use derivatives to manage the fixed interest rate exposure. For example, we use interest rate swaps to effectively convert fixed rate debt into floating rate liabilities. After considering the effects of interest rate swaps, at December 31, 2019, the effective average interest rate on our floating rate long-term debt (including current maturities) of $2,221 million and our fixed rate long-term debt (including current maturities) of $6,000 million was 1.1 percent and 2.4 percent, respectively. This compares with an effective rate of 1.1 percent for floating rate long-term debt of $3,106 million and 3.6 percent for fixed rate long-term debt of $4,951 million at December 31, 2018.

For a discussion of our use of derivatives to modify the interest characteristics of certain of our individual bond issuances, see "Note 12 – Debt" to our Consolidated Financial Statements.

Credit facility

In December 2019, we replaced our $2 billion multicurrency revolving credit facility, maturing in 2021, with a new $2 billion multicurrency revolving credit facility, maturing in 2024. In 2020 and 2021, we have the option to extend the maturity of the new facility to 2025 and 2026, respectively.

No amount was drawn under either of the committed credit facilities at December 31, 2019 and 2018. The replacement facility is for general corporate purposes and contains cross-default clauses whereby an event of default would occur if we were to default on indebtedness, as defined in the facility, at or above a specified threshold.

The credit facility does not contain financial covenants that would restrict our ability to pay dividends or raise additional funds in the capital markets. For further details of the credit facility, see "Note 12 – Debt" to our Consolidated Financial Statements.

Commercial paper

At December 31, 2019, we had two commercial paper programs in place:

- a $2 billion commercial paper program for the private placement of U.S. dollar denominated commercial paper in the United States, and
- a $2 billion Euro-commercial paper program for the issuance of commercial paper in a variety of currencies.

At December 31, 2019, $706 million was outstanding under the $2 billion program in the United States, compared to $292 million outstanding at December 31, 2018.

At December 31, 2019, no amount was outstanding under the $2 billion Euro-commercial paper program compared to $172 million outstanding at December 31, 2018.

European program for the issuance of debt

The European program for the issuance of debt allows the issuance of up to the equivalent of $8 billion in certain debt instruments. The terms of the program do not obligate any third party to extend credit to us and the terms and possibility of issuing any debt under the program are determined with respect to, and as of the date of issuance of, each debt instrument. During 2017, we issued EUR 750 million 0.75% Notes, due 2024. At December 31, 2019, two bonds (principal amount of EUR 700 million, due in 2023 and principal amount of EUR 750 million, due in 2024) having a combined carrying amount of $1,658 million, were outstanding under the program. At December 31, 2018, in addition to these two bonds, one additional bond (principal amount of EUR 1,250 million due in 2019) was outstanding and the combined carrying amount of the three bonds was $3,100 million.

Credit ratings

Credit ratings are assessments by the rating agencies of the credit risk associated with ABB and are based on information provided by us or other sources that the rating agencies consider reliable. Higher ratings generally result in lower borrowing costs and increased access to capital markets. Our ratings are of "investment grade" which is defined as Baa3 (or above) from Moody's and BBB− (or above) from Standard & Poor's.

At both December 31, 2019 and 2018, our long-term debt was rated A2 by Moody's and A by Standard & Poor's.

Limitations on transfers of funds

Currency and other local regulatory limitations related to the transfer of funds exist in a number of countries where we operate, including: China, Egypt, India, Malaysia, Russian Federation, South Africa, South Korea, Taiwan (Chinese Taipei), Thailand, Turkey and Viet Nam. Funds, other than regular dividends, fees or loan repayments, cannot be readily transferred offshore from these countries and are therefore deposited and used for working capital needs in those countries. In addition, there are certain countries where, for tax reasons, it is not considered optimal to transfer the cash offshore. As a consequence, these funds are not available within our Corporate Treasury Operations to meet short-term cash obligations outside the relevant country. The above described funds are reported as cash in our Consolidated Balance Sheets, but we do not consider these funds immediately available for the repayment of debt outside the respective countries where the cash is situated, including those described above. At December 31, 2019 and 2018, the balance of "Cash and equivalents" and "Marketable securities and other short-term investments" under such limitations (either regulatory or sub-optimal from a tax perspective) totaled approximately $1,843 million and $1,796 million, respectively.

During 2019, we continued to direct our subsidiaries in countries with restrictions to place such cash with our core banks or investment grade banks, in order to minimize credit risk on such cash positions. We continue to closely monitor the situation to ensure bank counterparty risks are minimized.

Financial position

Balance sheets

	December 31,		
($ in millions)	**2019**	**2018**	**% Change**
Current assets			
Cash and equivalents	3,544	3,445	3%
Marketable securities and short-term investments	566	712	(21)%
Receivables, net	6,434	6,386	1%
Contract assets	1,025	1,082	(5)%
Inventories, net	4,184	4,284	(2)%
Prepaid expenses	191	176	9%
Other current assets	674	616	9%
Assets held for sale and in discontinued operations	9,840	5,164	91%
Total current assets	**26,458**	**21,865**	**21%**

For a discussion on Cash and equivalents, see sections "Liquidity and Capital Resources – Principal sources of funding" and "Cash flows" for further details.

Marketable securities and short-term investments decreased in 2019. The reduction primarily reflects lower amounts placed in reverse repurchase agreements (see "Note 5 – Cash and equivalents, marketable securities and short-term investments" to our Consolidated Financial Statements).

Contract assets decreased 5 percent (4 percent in local currencies). The decrease reflects lower amounts in the non-core businesses and the Robotics & Discrete Automation Business. This was partially offset by higher levels in the Industrial Automation Business.

Inventories, net, decreased 2 percent (1 percent in local currencies). The decrease primarily reflects the impact of the reclassification to held for sale of the inventory in the solar inverters business which decreased inventory by 3 percent.

Current assets held for sale and in discontinued operations increased to $9,840 million from $5,164 million due to the reclassification from non-current assets to current assets of the non-current assets in the Power Grids business, which is reported as discontinued operations. This reclassification reflects that this business is expected to be divested within the next 12 months. For the details of the assets of the Power Grids business see "Note 3 – Basis of presentation and assets held for sale" to our Consolidated Financial Statements.

	December 31,		
($ in millions)	**2019**	**2018**	**% Change**
Current liabilities			
Accounts payable, trade	4,353	4,424	(2)%
Contract liabilities	1,719	1,707	1%
Short-term debt and current maturities of long-term debt	2,287	2,031	13%
Current operating leases	305	—	n.a.
Provisions for warranties	816	948	(14)%
Other provisions	1,375	1,372	0%
Other current liabilities	3,761	3,780	(1)%
Liabilities held for sale and in discontinued operations	5,650	4,185	35%
Total current liabilities	**20,266**	**18,447**	**10%**

Accounts payable, trade, decreased 2 percent (1 percent in local currencies) primarily reflecting the impact of reclassifying payables of the solar inverters business to liabilities held for sale, which decreased Accounts payable, trade, by 2 percent.

The increase in Short-term debt and current maturities of long-term debt was primarily due a net increase in the balance for the U.S. and Euro commercial paper programs of $242 million, the amount outstanding for the newly-issued EUR 1,000 million floating-rate notes of $1,122 million and the reclassification to short-term debt and current maturities of long-term debt of the USD 300 million Notes. This was mostly offset by the repayment in 2019 of the EUR 1,250 million Instruments ($1,431 million at December 31, 2018).

Current operating leases includes the portion of the operating lease liabilities that are due to be paid in the next 12 months. The amount in 2019 reflects the adoption of a new accounting standard on leases. For a description of the adoption of the new accounting standard and summary of operating lease liabilities, see "Note 2 – Significant accounting policies" and "Note 14 – Leases" to our Consolidated Financial Statements.

Provisions for warranties decreased 14 percent (13 percent in local currencies). The decrease was mainly due to the reclassification of the solar inverters business to held for sale which resulted in a decrease of 11 percent. The remaining decrease was due to cash payments for warranties exceeding the expense recognized in the period. For details on the change in the Provision for warranties, see "Note 15 – Commitments and contingencies" to our Consolidated Financial Statements.

Current liabilities held for sale and in discontinued operations increased to $5,650 million from $4,185 million due to the reclassification from non-current liabilities to current liabilities of the non-current liabilities in the Power Grids business, which is reported as discontinued operations. For the details of the liabilities of the Power Grids business see "Note 3 – Basis of presentation and assets held for sale" to our Consolidated Financial Statements.

	December 31,		
($ in millions)	**2019**	**2018**	**% Change**
Non-current assets			
Property, plant and equipment, net	3,972	4,133	(4)%
Operating lease right-of-use assets	994	—	n.a.
Goodwill	10,825	10,764	1%
Other intangible assets, net	2,252	2,607	(14)%
Prepaid pension and other employee benefits	133	83	60%
Investments in equity-accounted companies	33	87	(62)%
Deferred taxes	910	1,006	(10)%
Other non-current assets	531	469	13%
Assets held for sale and in discontinued operations	—	3,427	n.a.
Total non-current assets	**19,650**	**22,576**	**(13)%**

In 2019, Property, plant and equipment, net decreased 4 percent (3 percent in local currencies) partly due to the reclassification of the assets of the solar inverters business to held for sale.

In 2019, Goodwill increased 1 percent (1 percent in local currencies). The local increase was due to adjustments recorded to the purchase price of GEIS before the end of the measurement period.

Other intangible assets, net decreased 14 percent (14 percent in local currencies) due to the amortization recorded during the year. For additional information on goodwill and other intangible assets see "Note 11 – Goodwill and other intangibles assets" to our Consolidated Financial Statements.

In 2019, Deferred taxes, decreased 10 percent (7 percent in local currencies). For details on deferred tax assets (see "Note 16 – Income taxes" to our Consolidated Financial Statements).

	December 31,		
($ in millions)	2019	2018	% Change
Non-current liabilities			
Long-term debt	6,772	6,587	3%
Non-current operating leases	717	—	n.a.
Pension and other employee benefits	1,793	1,828	(2)%
Deferred taxes	911	927	(2)%
Other non-current liabilities	1,669	1,689	(1)%
Liabilities held for sale and in discontinued operations	—	429	n.a.
Total non-current liabilities	**11,862**	**11,460**	**4%**

Long-term debt increased 3 percent. During 2019, we issued two CHF-denominated bonds having a value of $463 million at December 31, 2019. This was mostly offset by the reclassification to Short-term debt and current maturities of long-term debt of the USD 300 million Notes. There were no significant impacts from changes in foreign currency rates on Long-term debt. For additional information on Long-term debt, see "Liquidity and Capital Resources – Debt and interest rates".

Non-current operating leases includes the portion of the operating lease liabilities that are due to be paid in more than 12 months. The amount in 2019 reflects the adoption of a new accounting standard on leases as described above.

For a breakdown of Other non-current liabilities, see "Note 13 – Other provisions, other current liabilities and other non-current liabilities" to our Consolidated Financial Statements.

Cash flows

The Consolidated Statements of Cash Flows are shown on a continuing operations basis, with the effects of discontinued operations shown in aggregate for each major cash flow activity.

The Consolidated Statements of Cash Flows can be summarized as follows:

($ in millions)	2019	2018	2017
Net cash provided by operating activities	2,325	2,924	3,799
Net cash used in investing activities	(815)	(3,085)	(1,450)
Net cash used in financing activities	(1,383)	(789)	(1,735)
Effects of exchange rate changes on cash and equivalents	(28)	(131)	268
Net change in cash and equivalents	**99**	**(1,081)**	**882**

Operating activities

($ in millions)	2019	2018	2017
Net income	1,528	2,298	2,365
Less: Income from discontinued operations, net of tax	(438)	(723)	(846)
Depreciation and amortization	961	916	836
Total adjustments to reconcile net income to net cash provided by operating activities (excluding depreciation and amortization)	220	(189)	(406)
Total changes in operating assets and liabilities	(372)	50	639
Net cash provided by operating activities – continuing operations	**1,899**	**2,352**	**2,588**
Net cash provided by operating activities – discontinued operations	**426**	**572**	**1,211**

Cash flows from operating activities of continuing operations in 2019 provided net cash of $1,899 million, a decrease of 19 percent from 2018 mainly due to a lower cash effective net income (net income adjusted for depreciation, amortization and other non-cash items) which includes the impacts of the costs associated with the planned divestment of the Power Grids business as well as the OS restructuring program. The amount in 2019 also includes the impacts of net cash outflows for an increase in working capital. The higher amount in 2018 also reflected the impacts from extending payment terms with suppliers and the changes in our supplier payment process, which resulted in an increase in trade payables and this impact was not repeated in 2019. The cash flows from operating activities in 2019 was also lower due to the timing of cash payments for accrued liabilities. This was partially offset by more favorable timing of income tax payments which negatively impacted cash flows from operating activities in 2018.

Cash flows from operating activities of continuing operations in 2018 provided net cash of $2,352 million, a decrease of 9 percent from 2017 as higher cash effective net income was offset by a lower improvement in working capital. Cash flow impacts from changes in working capital showed the impact of extending payment terms with suppliers and the changes in our supplier payment process. Payables and inventory also increased due to higher inventories to support growth. In addition, the timing of tax payments, including income taxes and value-added taxes, negatively impacted cash provided by operating activities.

Cash flows from operating activities of discontinued operations in 2019 decreased to $426 million from $572 million in 2018. The primary reason was lower net income from discontinued operations in 2019, mostly offset by more favorable changes in working capital in 2019 compared to 2018, including the impacts in 2018 of the timing of cash collections on large projects and other receivables. Cash flows from operating activities of discontinued operations in 2018 decreased to $572 million from $1,211 million in 2017. The primary reason was lower net income from discontinued operations as well as negative impacts from the timing of cash collections on large projects and other receivables. The amount reported for cash flows from operating activities of discontinued operations benefits directly from the allocation of stranded costs to continuing operations.

Investing activities

($ in millions)	2019	2018	2017
Purchases of investments	(748)	(322)	(666)
Purchases of property, plant and equipment and intangible assets	(762)	(772)	(752)
Acquisition of businesses (net of cash acquired) and increases in cost- and equity-accounted companies	(22)	(2,664)	(2,011)
Proceeds from sales of investments	749	567	1,443
Proceeds from maturity of investments	80	160	100
Proceeds from sales of property, plant and equipment	82	72	61
Proceeds from sales of businesses (net of transaction costs and cash disposed) and cost- and equity-accounted companies	69	113	607
Net cash from settlement of foreign currency derivatives	(76)	(30)	63
Other investing activities	(23)	(32)	37
Net cash used in investing activities – continuing operations	**(651)**	**(2,908)**	**(1,118)**
Net cash used in investing activities – discontinued operations	**(164)**	**(177)**	**(332)**

Net cash used in investing activities for continuing operations in 2019 was $651 million, compared to $2,908 million in 2018. The decrease in 2019 was due to the higher amounts for acquisitions of businesses in 2018 (primarily GEIS). This was offset partially by lower net sales of marketable securities and short-term investments and slightly lower purchases of property, plant and equipment in 2019 compared to 2018.

Net cash used in investing activities for continuing operations in 2018 was $2,908 million, compared to $1,118 million in 2017. The amount in 2018 reflects the higher amounts used to fund acquisitions of businesses. In addition, cash used in investing activities was higher in 2018 as 2017 included the positive cash flows resulting from reducing investments in marketable securities and short-term investments. Purchases of property, plant and equipment and intangible assets were slightly higher in 2018 with higher spending on information technology as well as large investments in the U.S. and China. We also had higher capital expenditures in Austria with large investments in the B&R business. In addition, changes in the impacts from derivative cash flows classified as investing activities increased cash used in investing activities by $93 million. These cash flows primarily result from the maturity and settlement of derivatives that are in place to hedge foreign currency exposures on internal subsidiary funding and the amount of the settlement results from movements in foreign currency exchange rates throughout the year.

The following presents purchases of property, plant and equipment and intangibles by significant asset category:

($ in millions)	2019	2018	2017
Construction in progress	536	523	520
Purchase of machinery and equipment	156	152	125
Purchase of land and buildings	26	28	32
Purchase of intangible assets	44	69	75
Purchases of property, plant and equipment and intangible assets	**762**	**772**	**752**

In 2019, we reduced the level of our excess liquidity invested in marketable securities and short-term investments with net cash inflows of $81 million. In 2018 and 2017, we decreased the amount of our excess liquidity invested in marketable securities and short-term investments as funds were needed for acquisitions of businesses. In 2018 and 2017, the net decrease in investments during the year resulted in inflows of $405 million and $877 million, respectively. Marketable securities and short-term investments at December 31, 2019 and 2018, consisted primarily of money market funds, and U.S. Government and other corporate bonds. The balance at December 31, 2018, also included amounts placed in reverse repurchase agreements.

In 2019, there were no significant business acquisitions or divestments while in 2018, acquisitions of businesses primarily represents the purchase of GEIS, which was acquired in June. In 2017, acquisitions of businesses primarily represents the purchase of B&R, which was acquired in July, while proceeds from sales of businesses primarily represents the divestment of the high-voltage cables and cable accessories businesses.

Cash used in investing activities from discontinued operations primarily represents net purchases of property, plant and equipment. The higher amount in 2017 was due to cash paid for acquisition of a business.

Financing activities

($ in millions)	2019	2018	2017
Net changes in debt with maturities of 90 days or less	164	221	204
Increase in debt	2,406	1,914	920
Repayment of debt	(2,156)	(830)	(1,000)
Delivery of shares	10	42	163
Purchase of treasury stock	—	(250)	(251)
Dividends paid	(1,675)	(1,717)	(1,635)
Dividends paid to noncontrolling shareholders	(90)	(86)	(83)
Other financing activities	13	(35)	(6)
Net cash used in financing activities – continuing operations	**(1,328)**	**(741)**	**(1,688)**
Net cash used in financing activities – discontinued operations	**(55)**	**(48)**	**(47)**

Our financing cash flow activities primarily include debt transactions (both from the issuance of debt securities and borrowings directly from banks), share transactions and payments of distributions to controlling and noncontrolling shareholders. Net cash used in financing activities for discontinued operations represents primarily distributions paid to noncontrolling shareholders of certain subsidiaries classified in discontinued operations.

In 2019, 2018 and 2017, the net inflow for debt with maturities of 90 days or less related primarily to net increases of commercial paper borrowings.

In 2019, the increase in debt was due primarily to the issuance of the following: CHF 280 million 0.3% Notes due 2024, CHF 170 million 1.0% Notes due 2029 and EUR 1,000 million floating rate notes due 2020. In 2018, the increase in debt was due primarily to the issuance of the following: USD 300 million 2.8% Notes due 2020, USD 450 million 3.375% Notes due 2023 and USD 750 million 3.8% Notes due 2028. In 2019 and 2018, the increase also included $774 million and $316 million, respectively, for commercial paper borrowings having an original maturity of more than 90 days. In 2017, the increase in debt was due primarily to the issuance of our EUR 750 million 0.75% Notes due 2024.

During 2019, $2,156 million of debt was repaid, reflecting primarily the repayment at maturity of the EUR 1,250 million 2.625% Instruments as well as repayments at maturity of $606 million in commercial paper borrowings having an original maturity of more than 90 days. During 2018, the CHF 350 million 1.50% bonds (equivalent to $350 million on the date of repayment) were repaid as well as repayments at maturity of $316 million in commercial paper borrowings. During 2017, $1,000 million of debt was repaid, reflecting primarily the repayment at maturity of both the USD 500 million 1.625% Notes and the AUD 400 million 4.25% Notes (in total equivalent to $803 million at dates of repayment).

In 2018 and 2017, “Purchase of treasury stock” reflects the cash paid to purchase 10 million of our own shares on the open market in each period.

Disclosures about contractual obligations and commitments

The contractual obligations presented in the table below represent our estimates of future payments under fixed contractual obligations and commitments. These amounts may differ from those reported in our Consolidated Balance Sheet at December 31, 2019. Changes in our business needs, cancellation provisions and changes in interest rates, as well as actions by third parties and other factors, may cause these estimates to change. Therefore, our actual payments in future periods may vary from those presented below. The following table summarizes certain of our contractual obligations and principal and interest payments under our debt instruments, leases and purchase obligations at December 31, 2019:

($ in millions)	Total	Less than 1 year	1–3 years	3–5 years	More than 5 years
Payments due by period					
Long-term debt obligations	8,019	1,433	2,532	2,373	1,681
Interest payments related to long-term debt obligations	1,952	179	343	199	1,231
Operating lease obligations(1)	1,125	308	377	209	231
Finance lease obligations(1)	233	37	66	46	84
Purchase obligations	2,380	2,043	332	5	—
Total	**13,709**	**4,000**	**3,650**	**2,832**	**3,227**

(1) Lease obligations represent total cash payments to be made in the future, and include an implied interest expense, being the difference between undiscounted cash flows and discounted cash flows, of $103 million and $61 million, for operating and finance leases, respectively, as well as including executory costs of $1 million for finance leases. See “Note 14 – Leases” to our Consolidated Financial Statements.

In the table above, the long-term debt obligations reflect the cash amounts to be repaid upon maturity of those debt obligations. The cash obligations above will differ from the long-term debt balance reflected in “Note 12 – Debt” to our Consolidated Financial Statements due to the impacts of fair value hedge accounting adjustments and premiums or discounts on certain debt. In addition, finance lease obligations are shown separately in the table above while they are combined with long-term debt amounts in our Consolidated Balance Sheets.

We have determined the interest payments related to long-term debt obligations by reference to the payments due under the terms of our debt obligations at the time such obligations were incurred. However, we use interest rate swaps to modify the interest characteristics of certain of our debt obligations. The net effect of these swaps may be to increase or decrease the actual amount of our cash interest payment obligations, which may differ from those stated in the above table. For further details on our debt obligations and the related hedges, see “Note 12 – Debt” to our Consolidated Financial Statements.

Of the total of $1,294 million unrecognized tax benefits (net of deferred tax assets) at December 31, 2019, it is expected that $76 million will be paid within less than a year. However, we cannot make a reasonably reliable estimate as to the related future payments for the remaining amount.

Off-balance sheet arrangements

Commercial commitments
We disclose the maximum potential exposure of certain guarantees, as well as possible recourse provisions that may allow us to recover from third parties amounts paid out under such guarantees. The maximum potential exposure does not allow any discounting of our assessment of actual exposure under the guarantees. The information below reflects our maximum potential exposure under the guarantees, which is higher than our assessment of the expected exposure.

Guarantees
The following table provides quantitative data regarding our third-party guarantees. The maximum potential payments represent a worst-case scenario, and do not reflect our expected outcomes.

	Maximum potential payments(1)	
December 31, ($ in millions)	**2019**	**2018**
Performance guarantees	1,860	1,584
Financial guarantees	10	10
Indemnification guarantees	64	64
Total	**1,934**	**1,658**

(1) Maximum potential payments include amounts in both continuing and discontinued operations

The carrying amounts of liabilities recorded in the Consolidated Balance Sheets in respect of the above guarantees were not significant at December 31, 2019 and 2018, and reflect our best estimate of future payments, which we may incur as part of fulfilling our guarantee obligations.

In addition, in the normal course of bidding for and executing certain projects, we have entered into standby letters of credit, bid/performance bonds and surety bonds (collectively “performance bonds”) with various financial institutions. Customers can draw on such performance bonds in the event that ABB does not fulfill its contractual obligations. ABB would then have an obligation to reimburse the financial institution for amounts paid under the performance bonds. At December 31, 2019 and 2018, the total outstanding performance bonds aggregated to $6.8 billion and $7.4 billion, respectively, of which $3.7 billion and $4.3 billion, respectively, relate to discontinued operations. There have been no significant amounts reimbursed to financial institutions under these types of arrangements in 2019, 2018 and 2017.

For additional descriptions of our performance, financial and indemnification guarantees see “Note 15 – Commitments and contingencies” to our Consolidated Financial Statements.

Consolidated Financial Statements of ABB Group