DOW CHEMICAL CO /DE/
Form 10-K
February 11, 2019
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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

þ ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the fiscal year ended December 31, 2018
or
¨ TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the transition period from _____to_____
Commission file number: 1-3433
THE DOW CHEMICAL COMPANY
(Exact name of registrant as specified in its charter)

Delaware	38-1285128
State or other jurisdiction of incorporation or organization	(I.R.S. Employer Identification No.)

2211 H.H. DOW WAY, MIDLAND, MICHIGAN 48674
(Address of principal executive offices) (Zip Code)
Registrant's telephone number, including area code: 989-636-1000
Securities registered pursuant to Section 12(b) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. ¨ Yes þ No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. ¨ Yes þ No

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. þ Yes ¨ No
Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). þ Yes ¨ No
Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405 of this chapter) is not contained herein, and will not be contained, to the best of the registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. þ
Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	¨	Accelerated filer	¨
Non-accelerated filer	þ	Smaller reporting company	¨
		Emerging growth company	¨

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ¨

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). ¨ Yes þ No

At February 11, 2019, 100 shares of common stock were outstanding, all of which were held by the registrant's parent, DowDuPont Inc.

The registrant meets the conditions set forth in General Instruction I(l)(a) and (b) for Form 10-K and is therefore filing this form with a reduced disclosure format.

DOCUMENTS INCORPORATED BY REFERENCE

None

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The Dow Chemical Company and Subsidiaries

Throughout this Annual Report on Form 10-K, except as otherwise noted by the context, the terms "Company" or "Dow" as used herein mean The Dow Chemical Company and its consolidated subsidiaries.

FORWARD-LOOKING STATEMENTS

Certain statements in this report, other than purely historical information, including estimates, projections, statements relating to business plans, objectives and expected operating results, and the assumptions upon which those statements are based, are “forward-looking statements” within the meaning of the Private Securities Litigation Reform Act of 1995, Section 27A of the Securities Act of 1933, as amended and Section 21E of the Securities Exchange Act of 1934, as amended. Forward-looking statements may appear throughout this report including, without limitation, the sections: “Item 1. Business,” “Management's Discussion and Analysis” and “Risk Factors.” These forward-looking statements often address expected future business and financial performance and financial condition, and often contain words such as “anticipate,” “believe,” “estimate,” “expect,” “future,” “intend,” “may,” “opportunity,” “outlook,” “plan,” “project,” “see,” “se “strategy,” “target,” “will,” “would,” “will be,” “will continue,” “will likely result” and similar expressions and variations or negatives of these words. Forward-looking statements are based on current expectations and assumptions that are subject to risks and uncertainties which may cause actual results to differ materially from the forward-looking statements.

On December 11, 2015, Dow and E. I. du Pont de Nemours and Company ("DuPont") entered into an Agreement and Plan of Merger, as amended on March 31, 2017 (the "Merger Agreement"), under which the companies would combine in an all-stock merger of equals transaction (the "Merger"). Effective August 31, 2017, the Merger was completed and each of Dow and DuPont became subsidiaries of DowDuPont Inc. ("DowDuPont"). Forward-looking statements by their nature address matters that are, to varying degrees, uncertain, including important risks associated with the Merger and the intended separation, subject to approval of the Company's Board of Directors and customary closing conditions of DowDuPont’s materials science business under the Dow brand as well as the intended separation of DowDuPont’s agriculture and specialty products businesses in one or more tax- efficient transactions on anticipated terms (the “Intended Business Separations”). Forward-looking statements are not guarantees of future performance and are based on certain assumptions and expectations of future events which may not be realized. Forward-looking statements also involve risks and uncertainties, many of which are beyond Dow's control. Some of the important factors that could cause Dow’s actual results to differ materially from those projected in any such forward-looking statements include, but are not limited to: (i) costs to achieve and achieving the successful integration of the respective agriculture, materials science and specialty products businesses of Dow and DuPont, anticipated tax treatment, unforeseen liabilities, future capital expenditures, revenues, expenses, earnings, productivity actions, economic performance, indebtedness, financial condition, losses, future prospects, business and management strategies for the management, expansion and growth of the combined operations; (ii) costs to achieve and achievement of the anticipated synergies by the combined agriculture, materials science and specialty products businesses; (iii) risks associated with the Intended Business Separations, associated costs, disruptions in the financial markets or other potential barriers; (iv) disruptions or business uncertainty, including from the Intended Business Separations, could adversely impact Dow’s business (either directly or indirectly in connection with disruptions to DowDuPont or DuPont); (v) Dow's ability to retain and hire key personnel; (vi) uncertainty as to the long-term value of DowDuPont common stock; and (vii) risks to DowDuPont's, Dow's and DuPont's business, operations and results of operations from: the availability of and fluctuations in the cost of feedstocks and energy; balance of supply and demand and the impact of balance on prices; failure to develop and market new products and optimally manage product life cycles; ability, cost and impact on business operations, including the supply chain, of responding to changes in market acceptance, rules, regulations and policies and failure to respond to such changes; outcome of significant litigation, environmental matters and other commitments and contingencies; failure to appropriately manage process safety and product stewardship issues; global economic and capital market conditions, including the continued availability of

capital and financing, as well as inflation, interest and currency exchange rates; changes in political conditions, including trade disputes and retaliatory actions; business or supply disruptions; security threats, such as acts of sabotage, terrorism or war, natural disasters and weather events and patterns which could result in a significant operational event for the Company or adversely impact demand or production; ability to discover, develop and protect new technologies and to protect and enforce the Company's intellectual property rights; failure to effectively manage acquisitions, divestitures, alliances, joint ventures and other portfolio changes; unpredictability and severity of catastrophic events, including, but not limited to, acts of terrorism or outbreak of war or hostilities, as well as management's response to any of the aforementioned factors. These risks are and will be more fully discussed in the current, quarterly and annual reports filed with the U.S. Securities and Exchange Commission by DowDuPont; as well as, the preliminary registration statements on Form 10, in each case as amended from time-to-time, of each of Dow Holdings Inc. and Corteva, Inc. While the list of factors presented here is considered representative, no such list should be considered to be a complete statement of all potential risks and uncertainties. Unlisted factors may present significant additional obstacles to the realization of forward-looking statements.

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Consequences of material differences in results as compared with those anticipated in the forward-looking statements could include, among other things, business disruption, operational problems, financial loss, legal liability to third parties and similar risks, any of which could have a material adverse effect on Dow's consolidated financial condition, results of operations, credit rating or liquidity. Neither Dow nor DowDuPont assumes any obligation to publicly provide revisions or updates to any forward-looking statements whether as a result of new information, future developments or otherwise, should circumstances change, except as otherwise required by securities and other applicable laws.

A detailed discussion of principal risks and uncertainties which may cause actual results and events to differ materially from such forward-looking statements is included in the section titled "Risk Factors" and as set forth in the preliminary registration statements on Form 10 in each case as amended from time-to-time, of each of Dow Holdings Inc. and Corteva, Inc. Dow undertakes no obligation to update or revise publicly any forward-looking statements whether because of new information, future events, or otherwise, except as required by securities and other applicable laws.

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The Dow Chemical Company and Subsidiaries
PART I

ITEM 1. BUSINESS

THE COMPANY
The Dow Chemical Company was incorporated in 1947 under Delaware law and is the successor to a Michigan corporation, of the same name, organized in 1897. The Company's principal executive offices are located at 2211 H.H. Dow Way, Midland, Michigan 48674. Throughout this Annual Report on Form 10-K, except as otherwise indicated by the context, the terms “Company” or “Dow” as used herein mean The Dow Chemical Company and its consolidated subsidiaries.

Merger with DuPont
Effective August 31, 2017, pursuant to the merger of equals transaction contemplated by the Agreement and Plan of Merger, dated as of December 11, 2015, as amended on March 31, 2017, Dow and E. I. du Pont de Nemours and Company ("DuPont") each merged with subsidiaries of DowDuPont Inc. ("DowDuPont") and, as a result, Dow and DuPont became subsidiaries of DowDuPont (the "Merger"). Following the Merger, Dow and DuPont intend to pursue, subject to certain customary conditions, including, among others, the effectiveness of registration statements filed with the U.S. Securities and Exchange Commission ("SEC") and approval by the board of directors of DowDuPont, the separation of the combined company's agriculture, materials science and specialty products businesses through one or more tax-efficient transactions ("Intended Business Separations").

Effective with the Merger, Dow’s business activities are components of its parent company’s business operations. Dow’s business activities, including the assessment of performance and allocation of resources, ultimately are reviewed and managed by DowDuPont. Information used by the chief operating decision maker of Dow relates to the Company in its entirety. Accordingly, there are no separate reportable business segments for the Company under Accounting Standards Codification Topic 280 “Segment Reporting” and the Company’s business results are reported in this Form 10-K as a single operating segment.

As a result of the Merger, DowDuPont owns all of the common stock of Dow. Pursuant to General Instruction I(1)(a) and (b) of Form 10-K “Omission of Information by Certain Wholly-Owned Subsidiaries,” the Company is filing this Form 10-K with a reduced disclosure format. See Note 3 to the Consolidated Financial Statements for additional information on the Merger.

Intended Business Separations
In furtherance of the Intended Business Separations, Dow and DuPont are engaged in a series of internal reorganization and realignment steps (the “Internal Reorganization”) to realign their businesses into three subgroups: agriculture, materials science and specialty products. DowDuPont has also formed two wholly owned subsidiaries: Dow Holdings Inc. (“DHI”), to serve as a holding company for its materials science business, and Corteva, Inc. (“Corteva”), to serve as a holding company for its agriculture business. Following the separation and distribution of DHI, which is targeted to occur by April 1, 2019, DowDuPont, as the remaining company, which is referred to herein as “New DuPont,” will continue to hold the agriculture and specialty products businesses. New DuPont is then targeted to complete the separation and distribution of Corteva on June 1, 2019, resulting in New DuPont holding the specialty products businesses of DowDuPont. Following the distributions, DowDuPont will be known as DuPont.

As part of the Internal Reorganization, 1) the assets and liabilities of the materials science business will be transferred or conveyed to legal entities that then will be aligned under DHI, 2) the assets and liabilities of the agriculture business will be transferred or conveyed to legal entities that then will be aligned under Corteva, and 3) the assets and

liabilities of the specialty products business will be transferred or conveyed to legal entities that then will be aligned with New DuPont. Following the Internal Reorganization, DowDuPont expects to distribute DHI and Corteva through separate, pro rata U.S. federal tax-free spin-offs in which DowDuPont stockholders, at such time, would receive shares of common stock of DHI and of Corteva.

Additional information is included in the Form 10 registration statements for the separation of DowDuPont's materials science business (filed as Dow Holdings Inc.) filed with the SEC on September 7, 2018, as amended on October 19, 2018 and November 19, 2018, and the agriculture business (filed as Corteva, Inc.) filed with the SEC on October 18, 2018, as amended on December 19, 2018.

Available Information

The Company's annual reports on Form 10-K, quarterly reports on Form 10-Q and current reports on Form 8-K, and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Securities Exchange Act of 1934, are available free of charge at www.dow-dupont.com/investors, as soon as reasonably practicable after the reports are electronically filed or furnished

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with the SEC. The SEC maintains a website that contains these reports as well as proxy statements and other information regarding issuers that file electronically. The SEC's website is at www.sec.gov. The DowDuPont website and its content is not deemed incorporated by reference into this report.

Principal Product Groups

Dow combines science and technology to develop innovative solutions that are essential to human progress. Dow has one of the strongest and broadest toolkits in the industry, with robust technology, asset integration, scale and competitive capabilities that enable it to address complex global issues. Dow’s market-driven, industry-leading portfolio of advanced materials, industrial intermediates and plastics deliver a broad range of differentiated technology-based products and solutions to customers in 175 countries in high-growth markets such as packaging, infrastructure and consumer care. The Company's products are manufactured at 164 sites in 35 countries across the globe. In 2018, Dow had annual sales of approximately $60 billion. The following is a description of the Company’s principal product groups:

Principal Product Groups Aligned with the Materials Science Business

Coatings & Performance Monomers

Coatings & Performance Monomers makes critical ingredients and additives that help advance the performance of paints and coatings. The product grouping offers innovative and sustainable products to accelerate paint and coatings performance across diverse market segments, including architectural paints and coatings, as well as industrial coatings applications used in maintenance and protective industries, wood, metal packaging, traffic markings, thermal paper and leather. These products enhance coatings by improving hiding and coverage characteristics, enhancing durability against nature and the elements, reducing volatile organic compounds (“VOC”) content, reducing maintenance and improving ease of application. Coatings & Performance Monomers also manufactures critical building blocks based on acrylics needed for the production of coatings, textiles, and home and personal care products.

Consumer Solutions

Consumer Solutions uses innovative, versatile silicone-based technology to provide ingredients and solutions to customers in high performance building, consumer goods, elastomeric applications and the pressure sensitive adhesives industry that help them meet modern consumer preferences in attributes such as texture, feel, scent, durability and consistency; provides a wide array of silicone-based products and solutions that enable Dow’s customers to increase the appeal of their products, extend shelf life, improve performance of products under a wider range of conditions and provide a more sustainable offering; provides standalone silicone materials that are used as intermediates in a wide range of applications including adhesion promoters, coupling agents, crosslinking agents, dispersing agents and surface modifiers; and collaborates closely with global and regional brand owners to deliver innovative solutions for creating new and unrivaled consumer benefits and experiences in cleaning, laundry and skin and hair care applications, among others.

Hydrocarbons & Energy

Hydrocarbons & Energy is the largest global producer of ethylene, an internal feedstock, and a leading producer of propylene and aromatics products that are used to manufacture materials that consumers use every day. It also produces and procures the power and feedstocks used by the Company's manufacturing sites.

Industrial Solutions

Industrial Solutions is the world’s largest producer of purified ethylene oxide. It provides a broad portfolio of solutions that address world needs by enabling and improving the manufacture of consumer and industrial goods and services, including products and innovations that minimize friction and heat in mechanical processes, manage the oil and water interface, deliver ingredients for maximum effectiveness, facilitate dissolvability, enable product identification and provide the foundational building blocks for the development of chemical technologies. Industrial Solutions supports

manufacturers associated with a large variety of end-markets, notably better crop protection offerings in agriculture, coatings, detergents and cleaners, solvents for electronics processing, inks and textiles.

Packaging and Specialty Plastics

Packaging and Specialty Plastics serves growing, high-value sectors using world-class technology, broad existing product lines and a rich product pipeline that creates competitive advantages for the entire packaging value chain. Dow is also a leader in polyolefin elastomers and ethylene propylene diene monomer ("EPDM") rubber serving automotive, consumer, wire and cable and construction markets. Market growth is expected to be driven by major shifts in population demographics; improving socioeconomic status in emerging geographies; consumer and brand owner demand for increased functionality; global efforts to reduce food waste; growth in telecommunications networks; global development of electrical transmission and distribution infrastructure; and renewable energy applications.

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Polyurethanes & CAV
Polyurethanes & Chlor-Alkali & Vinyl ("CAV") is the world's largest producer of propylene oxide, propylene glycol and polyether polyols, and a leading producer of aromatic isocyanates and fully formulated polyurethane systems for rigid, semi-rigid and flexible foams, and coatings, adhesives, sealants, elastomers and composites that serve energy efficiency, consumer comfort, industrial and enhanced mobility market sectors. Polyurethanes & CAV provides cost advantaged chlorine and caustic soda supply and markets caustic soda, a valuable co-product of the chlor-alkali manufacturing process, and ethylene dichloride and vinyl chloride monomer. The product grouping also provides cellulose ethers, redispersible latex powders, silicones and acrylic emulsions used as key building blocks for differentiated building and construction materials across many market segments and applications ranging from roofing and flooring to gypsum-, cement-, concrete- or dispersion-based building materials.

Corporate
Corporate includes certain enterprise and governance activities (including insurance operations, environmental operations, etc.); non-business aligned joint ventures; gains and losses on sales of financial assets; non-business aligned litigation expenses; discontinued or non-aligned businesses; and foreign exchange gains (losses).

Principal Product Groups Aligned with the Agriculture Business
Crop Protection
Crop Protection serves the global production agriculture industry with crop protection products for field crops such as wheat, corn, soybean and rice, and specialty crops such as trees, fruits and vegetables. Principal crop protection products are weed control, disease control and insect control offerings for foliar or soil application or as a seed treatment.

Seed
Seed provides seed/plant biotechnology products and technologies to improve the productivity and profitability of its customers. Seed develops, produces and markets canola, cereals, corn, cotton, rice, soybean and sunflower seeds.

Principal Product Groups Aligned with the Specialty Products Business
Electronics & Imaging
Electronics & Imaging is a leading global supplier of differentiated materials and systems for a broad range of consumer electronics including mobile devices, television monitors, personal computers and electronics used in a variety of industries. Dow offers a broad portfolio of semiconductor and advanced packaging materials including chemical mechanical planarization ("CMP") pads and slurries, photoresists and advanced coatings for lithography, metallization solutions for back-end-of-line advanced chip packaging, and silicones for light emitting diode ("LED") packaging and semiconductor applications. This product line also includes innovative metallization processes for metal finishing, decorative and industrial applications and cutting-edge materials for the manufacturing of rigid and flexible displays for liquid crystal displays and quantum dot applications.

Industrial Biosciences
Industrial Biosciences is an innovator that works with customers to improve the performance, productivity and sustainability of their products and processes through advanced microbial control technologies such as advanced diagnostics and biosensors, ozone delivery technology and biological microbial control.

Nutrition & Health
Nutrition & Health uses cellulosics and other technologies to improve the functionality and delivery of food and the safety and performance of pharmaceutical products.

Safety & Construction

Safety & Construction unites market-driven science with the strength of highly regarded brands such as STYROFOAM™ brand insulation products, GREAT STUFF™ insulating foam sealants and adhesives, and DOW FILMTEC™ reverse osmosis and nanofiltration elements to deliver products to a broad array of markets including industrial, building and construction, consumer and water processing. Safety & Construction is a leader in the construction space, delivering insulation, air sealing and weatherization systems to improve energy efficiency, reduce energy costs and provide more sustainable buildings. Safety & Construction is also a leading provider of purification and separation technologies including reverse osmosis membranes and ion exchange resins to help customers with a broad array of separation and purification needs such as reusing waste water streams and making more potable drinking water.

Transportation & Advanced Polymers
Transportation & Advanced Polymers provides high-performance adhesives, lubricants and fluids to engineers and designers in the transportation, electronics and consumer end-markets. Key products include MOLYKOTE® lubricants, DOW

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CORNING® silicone solutions for healthcare, MULTIBASE™ TPSiV™ silicones for thermoplastics and BETASEAL™, BETAMATE™ and BETAFORCE™ structural and elastic adhesives.

Current and Future Investments

In 2017, the Company announced the startup of its new integrated world-scale ethylene production facility and its new ELITE™ Enhanced Polyethylene production facility, both located in Freeport, Texas. In 2018, the Company also started up its new Low Density Polyethylene ("LDPE") production facility and its new NORDEL™ Metallocene EPDM production facility, both located in Plaquemine, Louisiana. These key milestones enable Dow to capture benefits from increasing supplies of U.S. shale gas to deliver differentiated downstream solutions in its core market verticals. The Company also completed debottlenecking of an existing bi-modal gas phase polyethylene production facility in St. Charles, Louisiana, and started up a new High Melt Index ("HMI") AFFINITY™ polymer production facility, in Freeport, Texas, in the fourth quarter of 2018.

Additionally, the Company has announced investments over the next five years that are expected to enhance Dow’s competitiveness following the Intended Business Separations. These include:

- Expansion of the capacity of the Company’s new ethylene production facility, bringing the facility’s total ethylene capacity to 2,000 kilotonnes per annum (“KTA”) and making it the largest ethylene facility in the world.

- Incremental debottleneck projects across its global asset network that will deliver approximately 350 KTA of additional polyethylene, the majority of which will be in North America.

- Construction of a 600 KTA polyethylene unit on the U.S. Gulf Coast based on Dow’s proprietary solution process technology, to meet consumer-driven demand in specialty packaging, health and hygiene, and industrial and consumer packaging applications.

- Construction of a 450 KTA polyolefins facility in Europe to maximize the value of the Company’s ethylene integration in the region and serve growing demand for high-performance pressure pipes and fittings, as well as caps and closures applications.

- A new catalyst production business for key catalysts licensed by Univation Technologies, LLC, a wholly-owned subsidiary of Dow.

- Low capital intensity, high return investments in the Company's silicones franchise, including: a series of incremental siloxane debottleneck and efficiency improvement projects around the world; a new hydroxyl functional siloxane polymer plant in the U.S.; and a new specialty resin plant in China.

PRINCIPAL PRODUCT GROUP AND GEOGRAPHIC REGION RESULTS

See Note 25 to the Consolidated Financial Statements for information regarding sales by principal product group as well as sales and long-lived assets by geographic region.

RAW MATERIALS

The Company operates in an integrated manufacturing environment. Basic raw materials are processed through many stages to produce a number of products that are sold as finished goods at various points in those processes. The major raw material stream that feeds the production of the Company’s finished goods is hydrocarbon-based raw materials. The Company purchases hydrocarbon raw materials including ethane, propane, butane, naphtha and condensate as feedstocks. These raw materials are used in the production of both saleable products and energy. The Company also purchases certain monomers, primarily ethylene and propylene, to supplement internal production. The Company

purchases natural gas, primarily to generate electricity, and purchases electric power to supplement internal generation. The Company also produces a portion of its electricity needs in Louisiana and Texas; Alberta, Canada; the Netherlands; and Germany.

Key raw materials purchased for use in the manufacturing process include: acetone, benzene, butane, condensate, electric power, ethane, hexene, methanol, methyl methacrylate, naphtha, natural gas, propane, pygas, silica, styrene and wood pulp. Key raw materials that are produced internally and procured from external sources for internal consumption include aniline, aqueous hydrochloric acid, butyl acrylate, chlorine, ethylene, octene, propylene and silicon metal. Hydrogen peroxide is produced internally and procured through a consolidated variable interest entity and a joint venture. The Company had adequate supplies of raw materials in 2018, and expects to continue to have adequate supplies of raw materials in 2019.

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PATENTS, LICENSES AND TRADEMARKS

The Company continually applies for and obtains U.S. and foreign patents and has a substantial number of pending patent applications throughout the world. At December 31, 2018, the Company owned approximately 6,500 active U.S. patents and 32,200 active foreign patents as follows:

Remaining Life of Patents Owned at Dec 31, 2018	United States	Foreign
Within 5 years	1,400	5,600
6 to 10 years	1,500	10,200
11 to 15 years	3,000	15,300
16 to 20 years	600	1,100
Total	6,500	32,200

Dow's primary purpose in obtaining patents is to protect the results of its research for use in operations and licensing. Dow is party to a substantial number of patent licenses and other technology agreements. Dow also has a substantial number of trademarks and trademark registrations in the United States and in other countries, including the "Dow in Diamond" trademark. Although the Company considers that its patents, licenses and trademarks in the aggregate constitute a valuable asset, it does not regard its business as being materially dependent on any single or group of related patents, licenses or trademarks.

PRINCIPAL PARTLY OWNED COMPANIES

Dow's principal nonconsolidated affiliates at December 31, 2018, including direct or indirect ownership interest for each, are listed below:

Principal Nonconsolidated Affiliate	Country	Ownership Interest	Business Description
EQUATE Petrochemical Company K.S.C.C.	Kuwait	42.50 %	Manufactures ethylene, polyethylene and ethylene glycol, and manufactures and markets monoethylene glycol, diethylene glycol and polyethylene terephthalate resins
The HSC Group:			
DC HSC Holdings LLC [1]	United States	50.00 %	Manufactures polycrystalline silicon products
Hemlock Semiconductor L.L.C.	United States	50.10 %	Sells polycrystalline silicon products
The Kuwait Olefins Company K.S.C.C.	Kuwait	42.50 %	Manufactures ethylene and ethylene glycol
The Kuwait Styrene Company K.S.C.C.	Kuwait	42.50 %	Manufactures styrene monomer
Map Ta Phut Olefins Company Limited [2]	Thailand	32.77 %	Manufactures propylene and ethylene
Sadara Chemical Company [3]	Saudi Arabia	35.00 %	Manufactures chlorine, ethylene, propylene and aromatics for internal consumption and manufactures and sells polyethylene, ethylene oxide and propylene oxide derivative products and isocyanates
The SCG-Dow Group:			
Siam Polyethylene Company Limited	Thailand	50.00 %	Manufactures polyethylene
Siam Polystyrene Company Limited	Thailand	50.00 %	Manufactures polystyrene
	Thailand	50.00 %	Manufactures styrene

Siam Styrene Monomer Co., Ltd.				
Siam Synthetic Latex Company Limited	Thailand	50.00	%	Manufactures latex and specialty elastomers

1. DC HSC Holdings LLC holds an 80.5 percent indirect ownership interest in Hemlock Semiconductor Operations LLC.
2. The Company's effective ownership of Map Ta Phut Olefins Company Limited is 32.77 percent, of which the Company directly owns 20.27 percent and indirectly owns 12.5 percent through its equity interest in Siam Polyethylene Company Limited.
3. Dow is responsible for marketing the majority of Sadara products outside of the Middle East zone through the Company's established sales channels. Under this arrangement, the Company purchases and sells Sadara products for a marketing fee.

See Note 12 to the Consolidated Financial Statements for additional information regarding nonconsolidated affiliates.

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PROTECTION OF THE ENVIRONMENT
Matters pertaining to the environment are discussed in Part I, Item 1A. Risk Factors; Part II, Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations; and Notes 1 and 16 to the Consolidated Financial Statements. In addition, detailed information on Dow's performance regarding environmental matters and goals can be found online on Dow's Science & Sustainability webpage at www.dow.com. The Company's website and its content are not deemed incorporated by reference into this report.

EMPLOYEES
At December 31, 2018, the Company permanently employed approximately 54,000 people on a full-time basis.

OTHER ACTIVITIES
Dow engages in the property and casualty insurance and reinsurance business primarily through its Liana Limited subsidiaries.

ITEM 1A. RISK FACTORS
The factors described below represent the Company's principal risks.

Global Economic Considerations: The Company operates in a global, competitive environment which gives rise to operating and market risk exposure.
The Company sells its broad range of products and services in a competitive, global environment, and competes worldwide for sales on the basis of product quality, price, technology and customer service. Increased levels of competition could result in lower prices or lower sales volume, which could have a negative impact on the Company’s results of operations. Sales of Dow’s products are also subject to extensive federal, state, local and foreign laws and regulations, trade agreements, import and export controls and duties and tariffs. The imposition of additional regulations, controls and duties and tariffs or changes to bilateral and regional trade agreements could result in lower sales volume, which could negatively impact the Company’s results of operations.

Economic conditions around the world, and in certain industries in which the Company does business, also impact sales price and volume. As a result, market uncertainty or an economic downturn in the geographic regions or industries in which Dow sells its products could reduce demand for these products and result in decreased sales volume, which could have a negative impact on the Company’s results of operations.

In addition, volatility and disruption of financial markets could limit customers’ ability to obtain adequate financing to maintain operations, which could result in a decrease in sales volume and have a negative impact on the Company’s results of operations. Dow’s global business operations also give rise to market risk exposure related to changes in foreign exchange rates, interest rates, commodity prices and other market factors such as equity prices. To manage such risks, Dow enters into hedging transactions pursuant to established guidelines and policies. If Dow fails to effectively manage such risks, it could have a negative impact on the Company’s results of operations.

Financial Commitments and Credit Markets: Market conditions could reduce the Company's flexibility to respond to changing business conditions or fund capital needs.
Adverse economic conditions could reduce the Company’s flexibility to respond to changing business and economic conditions or to fund capital expenditures or working capital needs. The economic environment could result in a contraction in the availability of credit in the marketplace and reduce sources of liquidity for the Company. This could result in higher borrowing costs.
Raw Materials: Availability of purchased feedstock and energy, and the volatility of these costs, impact Dow’s operating costs and add variability to earnings.

Purchased feedstock and energy costs account for a substantial portion of the Company's total production costs and operating expenses. The Company purchases hydrocarbon raw materials including ethane, propane, butane, naphtha and condensate as feedstocks and also purchases certain monomers, primarily ethylene and propylene, to supplement internal production, as well as other raw materials. The Company also purchases natural gas, primarily to generate electricity, and purchases electric power to supplement internal generation.

Feedstock and energy costs generally follow price trends in crude oil and natural gas, which are sometimes volatile. While the Company uses its feedstock flexibility and financial and physical hedging programs to help mitigate feedstock cost increases, the Company is not always able to immediately raise selling prices. Ultimately, the ability to pass on underlying cost increases is dependent on market conditions. Conversely, when feedstock and energy costs decline, selling prices generally decline as well. As a result, volatility in these costs could impact the Company's results of operations.

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The Company has a number of investments on the U.S. Gulf Coast to take advantage of increasing supplies of low-cost natural gas and natural gas liquids (“NGLs”) derived from shale gas including: the restart of the St. Charles Operations (SCO-2) ethylene production facility in December 2012; construction of a new on-purpose propylene production facility, which commenced operations in December 2015; completion of a major maintenance turnaround in December 2016 at an ethylene production facility in Plaquemine, Louisiana, which included expanding the facility’s ethylene production capacity and modifications to enable full ethane cracking flexibility; completion of a new integrated world-scale ethylene production facility and a new ELITE™ Enhanced Polyethylene production facility, both located in Freeport, Texas, in 2017, and a capacity expansion project which will bring the facility’s total ethylene capacity to 2,000 kilotonnes per annum (“KTA”) by 2020; and, the Company commenced operations in 2018 on its new Low Density Polyethylene ("LDPE") production facility and its new NORDEL™ Metallocene EPDM production facility, both located in Plaquemine, Louisiana. As a result of these investments, the Company’s exposure to purchased ethylene and propylene is expected to decline, offset by increased exposure to ethane- and propane-based feedstocks.

While the Company expects abundant and cost-advantaged supplies of NGLs in the United States to persist for the foreseeable future, if NGLs become significantly less advantaged than crude oil-based feedstocks, it could have a negative impact on the Company’s results of operations and future investments. Also, if the Company’s key suppliers of feedstocks and energy are unable to provide the raw materials required for production, it could have a negative impact on the Company’s results of operations.

Supply/Demand Balance: Earnings generated by the Company's products vary based in part on the balance of supply relative to demand within the industry.
The balance of supply relative to demand within the industry may be significantly impacted by the addition of new capacity, especially for basic commodities where capacity is generally added in large increments as world-scale facilities are built. This may disrupt industry balances and result in downward pressure on prices due to the increase in supply, which could negatively impact the Company’s results of operations.

Litigation: The Company is party to a number of claims and lawsuits arising out of the normal course of business with respect to product liability, patent infringement, employment matters, governmental tax and regulation disputes, contract and commercial litigation, and other actions.
Certain of the claims and lawsuits facing the Company purport to be class actions and seek damages in very large amounts. All such claims are contested. With the exception of the possible effect of the asbestos-related liability of Union Carbide Corporation (“Union Carbide”) and Chapter 11 related matters of Dow Silicones Corporation (“Dow Silicones,” formerly known as Dow Corning Corporation, which changed its name effective as of February 1, 2018) as described below, it is the opinion of the Company’s management that the possibility is remote that the aggregate of all such claims and lawsuits will have a material adverse impact on the Company’s consolidated financial statements.

Union Carbide is and has been involved in a large number of asbestos-related suits filed primarily in state courts during the past four decades. At December 31, 2018, Union Carbide's total asbestos-related liability, including future defense and processing costs, was $1,260 million ($1,369 million at December 31, 2017).

In 1995, Dow Silicones, a former 50:50 joint venture, voluntarily filed for protection under Chapter 11 of the U.S. Bankruptcy Code in order to resolve breast implant liabilities and related matters (the “Chapter 11 Proceeding”). Dow Silicones emerged from the Chapter 11 Proceeding on June 1, 2004, and is implementing the Joint Plan of Reorganization (the “Plan”). The Plan provides funding for the resolution of breast implant and other product liability litigation covered by the Chapter 11 Proceeding and provides a process for the satisfaction of commercial creditor claims in the Chapter 11 Proceeding. Dow Silicones’ liability for breast implant and other product liability claims was $263 million at December 31, 2018 ($263 million at December 31, 2017) and the liability related to commercial creditor claims was $82 million ($78 million at December 31, 2017).

See Note 16 to the Consolidated Financial Statements for additional information on these matters.

Environmental Compliance: The costs of complying with evolving regulatory requirements could negatively impact the Company's financial results. Actual or alleged violations of environmental laws or permit requirements could result in restrictions or prohibitions on plant operations, substantial civil or criminal sanctions, as well as the assessment of strict liability and/or joint and several liability.
The Company is subject to extensive federal, state, local and foreign laws, regulations, rules and ordinances relating to pollution, protection of the environment, greenhouse gas emissions, and the generation, storage, handling, transportation, treatment, disposal and remediation of hazardous substances and waste materials. In addition, the Company may have costs related to environmental remediation and restoration obligations associated with past and current sites as well as related to the Company’s past or current waste disposal practices or other hazardous materials handling. Although management will estimate and accrue liabilities for these obligations, it is reasonably possible that the Company’s ultimate cost with respect to these matters could be significantly higher, which could negatively impact the Company’s financial condition and results of operations. Costs and capital expenditures relating

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to environmental, health or safety matters are subject to evolving regulatory requirements and depend on the timing of the promulgation and enforcement of specific standards which impose the requirements. Moreover, changes in environmental regulations could inhibit or interrupt the Company’s operations, or require modifications to its facilities. Accordingly, environmental, health or safety regulatory matters could result in significant unanticipated costs or liabilities.

Health and Safety: Increased concerns regarding the safe use of chemicals and plastics in commerce and their potential impact on the environment as well as perceived impacts of plant biotechnology on health and the environment have resulted in more restrictive regulations and could lead to new regulations.
Concerns regarding the safe use of chemicals and plastics in commerce and their potential impact on health and the environment and the perceived impacts of plant biotechnology on health and the environment reflect a growing trend in societal demands for increasing levels of product safety and environmental protection. These concerns could manifest themselves in stockholder proposals, preferred purchasing, delays or failures in obtaining or retaining regulatory approvals, delayed product launches, lack of market acceptance and continued pressure for more stringent regulatory intervention and litigation. These concerns could also influence public perceptions, the viability or continued sales of certain of the Company's products, the Company's reputation and the cost to comply with regulations. In addition, terrorist attacks and natural disasters have increased concerns about the security and safety of chemical production and distribution. These concerns could have a negative impact on the Company's results of operations.

Local, state, federal and foreign governments continue to propose new regulations related to the security of chemical plant locations and the transportation of hazardous chemicals, which could result in higher operating costs.

Operational Event: A significant operational event could negatively impact the Company's results of operations.
As a diversified chemical manufacturing company, the Company's operations, the transportation of products, cyber-attacks, or severe weather conditions and other natural phenomena (such as freezing, drought, hurricanes, earthquakes, tsunamis, floods, etc.) could result in an unplanned event that could be significant in scale and could negatively impact operations, neighbors or the public at large, which could have a negative impact on the Company's results of operations.

Major hurricanes have caused significant disruption in Dow's operations on the U.S. Gulf Coast, logistics across the region, and the supply of certain raw materials, which had an adverse impact on volume and cost for some of Dow's products. Due to the Company's substantial presence on the U.S. Gulf Coast, similar severe weather conditions or other natural phenomena in the future could negatively impact the Company's results of operations.

Cyber Threat: The risk of loss of the Company’s intellectual property, trade secrets or other sensitive business information or disruption of operations could negatively impact the Company’s financial results.
Cyber-attacks or security breaches could compromise confidential, business critical information, cause a disruption in the Company’s operations or harm the Company's reputation. The Company has attractive information assets, including intellectual property, trade secrets and other sensitive, business critical information. While the Company has a comprehensive cyber-security program that is continuously reviewed, maintained and upgraded, a significant cyber-attack could result in the loss of critical business information and/or could negatively impact operations, which could have a negative impact on the Company’s financial results.

Company Strategy: Implementing certain elements of the Company's strategy could negatively impact the Company's financial results.
The Company currently has manufacturing operations, sales and marketing activities, and joint ventures in emerging geographies. Activities in these geographic regions are accompanied by uncertainty and risks including: navigating

different government regulatory environments; relationships with new, local partners; project funding commitments and guarantees; expropriation, military actions, war, terrorism and political instability; sabotage; uninsurable risks; suppliers not performing as expected resulting in increased risk of extended project timelines; and determining raw material supply and other details regarding product movement. If the manufacturing operations, sales and marketing activities, and/or implementation of these projects is not successful, it could adversely affect the Company’s financial condition, cash flows and results of operations.

Goodwill: An impairment of goodwill could negatively impact Dow’s financial results.
At least annually, the Company assesses goodwill for impairment. If testing indicates that goodwill is impaired, the carrying value is written down based on fair value with a charge against earnings. Where the Company utilizes a discounted cash flow methodology in determining fair value, continued weak demand for a specific product line or business could result in an impairment. Accordingly, any determination requiring the write-off of a significant portion of goodwill could negatively impact the Company's results of operations. See Note 13 to the Consolidated Financial Statements for additional information regarding the Company's goodwill impairment testing.

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Pension and Other Postretirement Benefits: Increased obligations and expenses related to the Company's defined benefit pension plans and other postretirement benefit plans could negatively impact Dow's financial condition and results of operations.

The Company has defined benefit pension plans and other postretirement benefit plans (the “plans”) in the United States and a number of other countries. The assets of the Company's funded plans are primarily invested in fixed income securities, equity securities of U.S. and foreign issuers and alternative investments, including investments in real estate, private market securities and absolute return strategies. Changes in the market value of plan assets, investment returns, discount rates, mortality rates, regulations and the rate of increase in compensation levels may affect the funded status of the Company's plans and could cause volatility in the net periodic benefit cost, future funding requirements of the plans and the funded status of the plans. A significant increase in the Company's obligations or future funding requirements could have a negative impact on the Company's results of operations and cash flows for a particular period and on the Company's financial condition.

DowDuPont Merger: Failure to successfully integrate the new combined operations of DowDuPont and execute the intended separation of the agriculture business, materials science business and specialty products business could result in business disruption, operational problems, financial loss and similar risk, any of which could have a material adverse effect on Dow’s consolidated financial condition, results of operations, credit rating or liquidity.

On August 31, 2017, Dow and E. I. du Pont de Nemours and Company ("DuPont") completed the previously announced merger of equals transaction and each merged with subsidiaries of DowDuPont Inc. ("DowDuPont") and, as a result, Dow and DuPont became subsidiaries of DowDuPont (the "Merger"). Following the Merger, Dow and DuPont intend to pursue, subject to certain customary conditions, including, among others, the effectiveness of registration statements filed with the U.S. Securities and Exchange Commission and approval by the board of directors of DowDuPont, the separation of the combined company's agriculture, materials science and specialty products businesses through one or more tax-efficient transactions ("Intended Business Separations"). Many factors could impact the combined company, its subsidiaries, Dow and DuPont, as well as the Intended Business Separations including: (i) costs to achieve and achieving successful integration of the respective agriculture, specialty products and materials science businesses of Dow and DuPont, anticipated tax treatment, unforeseen liabilities, future capital expenditures, revenues, expenses, earnings, productivity actions, economic performance, indebtedness, financial condition, losses, future prospects, business and management strategies for the management and expansion and growth of the new combined company’s operations, (ii) costs to achieve and achievement of anticipated synergies, risks and costs and pursuit and/or implementation of the potential Intended Business Separations, including anticipated timing, and any changes to the configuration of businesses included in the potential separation if implemented, (iii) potential litigation relating to the Merger and proposed Intended Business Separations that could be instituted against Dow, DuPont or their respective directors, (iv) the risk that disruptions from the Merger and proposed Intended Business Separations will harm Dow’s or DuPont’s business, including current plans and operations, (v) the ability of Dow or DuPont to retain and hire key personnel, (vi) potential adverse reactions or changes to business relationships resulting from the Merger, (vii) uncertainty as to the long-term value of DowDuPont common stock, (viii) continued availability of capital and financing and rating agency actions, (ix) legislative, regulatory and economic developments, (x) potential business uncertainty during the pendency of the Merger that could affect Dow’s and/or DuPont’s economic performance, (xi) certain contractual restrictions that could be imposed on Dow and/or DuPont during the pendency of the Merger that might impact Dow’s or DuPont’s ability to pursue certain business opportunities or strategic transactions and (xii) unpredictability and severity of catastrophic events, including, but not limited to, acts of terrorism or outbreak of war or hostilities, as well as management’s response to any of the aforementioned factors.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

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ITEM 2. PROPERTIES

The Company's corporate headquarters are located in Midland, Michigan. The Company's manufacturing, processing, marketing and research and development facilities, as well as regional purchasing offices and distribution centers are located throughout the world. The Company has investments in property, plant and equipment related to global manufacturing operations. Collectively, the Company operates 164 manufacturing sites in 35 countries. The following table includes the number of manufacturing sites by geographic region, including consolidated variable interest entities:

Number of Manufacturing Sites at Dec 31, 2018

Geographic Region	Number of Sites
U.S. & Canada	57
EMEA [1]	44
Asia Pacific	42
Latin America	21
Total	164

1. Europe, Middle East and Africa.

Properties of Dow include facilities which, in the opinion of management, are suitable and adequate for their use and have sufficient capacity for the Company's current needs and expected near-term growth. All of the Company's plants are owned or leased, subject to certain easements of other persons which, in the opinion of management, do not substantially interfere with the continued use of such properties or materially affect their value. No title examination of the properties has been made for the purpose of this report. Additional information with respect to the Company's property, plant and equipment and leases is contained in Notes 11, 15 and 16 to the Consolidated Financial Statements.

ITEM 3. LEGAL PROCEEDINGS

Asbestos-Related Matters of Union Carbide Corporation

Union Carbide Corporation (“Union Carbide”), a wholly owned subsidiary of the Company, is and has been involved in a large number of asbestos-related suits filed primarily in state courts during the past four decades. These suits principally allege personal injury resulting from exposure to asbestos-containing products and frequently seek both actual and punitive damages. The alleged claims primarily relate to products that Union Carbide sold in the past, alleged exposure to asbestos-containing products located on Union Carbide’s premises, and Union Carbide’s responsibility for asbestos suits filed against a former Union Carbide subsidiary, Amchem Products, Inc.

For additional information, see Part II, Item 7. Other Matters, Asbestos-Related Matters of Union Carbide Corporation in Management’s Discussion and Analysis of Financial Condition and Results of Operations, and Notes 1 and 16 to the Consolidated Financial Statements.

Environmental Matters

In April 2012 and May 2015, Dow Silicones Corporation ("Dow Silicones"), a wholly owned subsidiary of the Company, received the following notifications from the U.S. Environmental Protection Agency ("EPA"), Region 5 related to Dow Silicones' Midland, Michigan, manufacturing facility (the “Facility”): 1) a Notice of Violation and Finding of Violation which alleges a number of violations in connection with the detection, monitoring and control of certain organic hazardous air pollutants at the Facility and various recordkeeping and reporting violations under the Clean Air Act and 2) a Notice of Violation alleging a number of violations relating to the management of hazardous

wastes at the Facility pursuant to the Resource Conservation and Recovery Act. Discussions between the EPA, the U.S. Department of Justice ("DOJ") and Dow Silicones are ongoing.

On March 14, 2017, FilmTec Corporation ("FilmTec"), a wholly owned subsidiary of the Company, received notifications from the EPA, Region 5 and the DOJ of a proposed penalty for alleged violations of the Clean Air Act at FilmTec's Edina, Minnesota, manufacturing facility. Discussion between the EPA, DOJ and FilmTec are ongoing.

On July 5, 2018, the Company received a draft consent decree from the EPA, the DOJ and the Louisiana Department of Environmental Quality (“DEQ”), relating to the operation of steam-assisted flares at Dow’s olefins manufacturing facilities in Freeport, Texas; Plaquemine, Louisiana; and St. Charles, Louisiana. Discussions between the EPA, the DOJ and the DEQ are ongoing.

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On July 7, 2018, the Company received an informal notice that the EPA, Region 6 was contemplating filing a Notice of Violation with a proposed penalty for alleged violations uncovered during a prior inspection related to the management of hazardous wastes at the Company's Freeport, Texas, manufacturing facility, pursuant to the Risk Management Plan requirements of the Clean Air Act. Discussions between the EPA and the Company are ongoing.

On July 26, 2018, DC Alabama, Inc. (“DCA”), a wholly owned subsidiary of the Company, received a draft consent order (“Order”) from the Alabama Department of Environmental Management (“ADEM”) relating to alleged unpermitted discharges of industrial process water and certain water quality and equipment violations at DCA’s silicon metal production facility located in Mt. Meigs, Alabama. DCA and the ADEM negotiated the terms of and executed a final Order that contains a civil penalty of $250,000 and certain additional requirements. Discussions between DCA and the ADEM are ongoing.

On November 27, 2018, Union Carbide signed a consent decree with the DOJ on behalf of the EPA, Region 2 relating to alleged disposal of mercury by a third party which Union Carbide contracted with at the Port Refinery site in Rye Brook, New York. The consent decree contains a payment of $120,198 and certain additional requirements. The final consent decree is subject to a public comment period.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

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The Dow Chemical Company and Subsidiaries
PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

On December 11, 2015, Dow and E. I. du Pont de Nemours and Company ("DuPont") entered into an Agreement and Plan of Merger, as amended on March 31, 2017 (the "Merger Agreement") to effect an all-stock, merger of equals strategic combination resulting in a newly formed corporation named DowDuPont Inc. ("DowDuPont"). On August 31, 2017, pursuant to the terms of the Merger Agreement, Dow and DuPont each merged with subsidiaries of DowDuPont (the "Mergers") and, as a result of the Mergers, became subsidiaries of DowDuPont (collectively, the "Merger"). See Note 3 to the Consolidated Financial Statements for additional information on the Merger.

Prior to the Merger, the principal market for the Company's common stock was the New York Stock Exchange, traded under the symbol "DOW." Effective with the Merger, there is no longer a public trading market for the Company's common stock, as the Company became a wholly owned subsidiary of DowDuPont.

Quarterly market price of common stock and dividend information related to periods prior to the Merger can be found in Note 26 to the Consolidated Financial Statements.

In connection with the Merger, on August 31, 2017, all outstanding Dow stock options and deferred stock awards were converted into stock options and deferred stock awards with respect to DowDuPont common stock. The stock options and deferred stock awards have the same terms and conditions under the applicable plans and award agreements prior to the Merger. All outstanding and nonvested performance deferred stock awards were converted into deferred stock awards with respect to DowDuPont common stock at the greater of the applicable performance target or the actual performance as of the effective time of the Merger. Dow and DuPont did not merge their stock-based compensation plans as a result of the Merger. The Dow and DuPont stock-based compensation plans were assumed by DowDuPont and continue in place with the ability to grant and issue DowDuPont common stock.

ITEM 6. SELECTED FINANCIAL DATA

Omitted pursuant to General Instruction I of Form10-K.

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ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

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ABOUT DOW

Dow combines science and technology to develop innovative solutions that are essential to human progress. Dow has one of the strongest and broadest toolkits in the industry, with robust technology, asset integration, scale and competitive capabilities that enable it to address complex global issues. Dow’s market-driven, industry-leading portfolio of advanced materials, industrial intermediates and plastics deliver a broad range of differentiated technology-based products and solutions to customers in 175 countries in high-growth markets such as packaging, infrastructure and consumer care. The Company's products are manufactured at 164 sites in 35 countries across the globe. In 2018, Dow had annual sales of approximately $60 billion.

In 2018, 36 percent of the Company’s sales were to customers in U.S. & Canada; 30 percent were in Europe, Middle East and Africa ("EMEA"); while the remaining 34 percent were to customers in Asia Pacific and Latin America.

In 2018, the Company and its consolidated subsidiaries did not operate in countries subject to U.S. economic sanctions and export controls as imposed by the U.S. State Department or in countries designated by the U.S. State Department as state sponsors of terrorism, including Iran, the Democratic People's Republic of Korea (North Korea), Sudan and Syria. The Company has policies and procedures in place designed to ensure that it and its consolidated subsidiaries remain in compliance with applicable U.S. laws and regulations.

Except as otherwise indicated by the context, the term "Union Carbide" means Union Carbide Corporation, a wholly owned subsidiary of Dow, and "Dow Silicones" means Dow Silicones Corporation (formerly known as Dow Corning Corporation, which changed its name effective as of February 1, 2018), a wholly owned subsidiary of Dow.

OVERVIEW

Effective August 31, 2017, pursuant to the merger of equals transaction contemplated by the Agreement and Plan of Merger, dated as of December 11, 2015, as amended on March 31, 2017, Dow and E. I. du Pont de Nemours and Company ("DuPont") each merged with subsidiaries of DowDuPont Inc. ("DowDuPont") and, as a result, Dow and DuPont became subsidiaries of DowDuPont (the "Merger"). Following the Merger, Dow and DuPont intend to pursue, subject to certain customary conditions, including, among others, the effectiveness of registration statements filed with the U.S. Securities and Exchange Commission ("SEC") and approval by the board of directors of DowDuPont, the separation of the combined company's agriculture, materials science and specialty products businesses through one or more tax-efficient transactions ("Intended Business Separations"). See Note 3 to the Consolidated Financial Statements for additional information on the Merger.

Effective with the Merger, Dow's business activities are components of its parent company's business operations. Dow's business activities, including the assessment of performance and allocation of resources, ultimately are reviewed and managed by DowDuPont. Information used by the chief operating decision maker of Dow relates to the Company in its entirety. Accordingly, there are no separate reportable business segments for the Company under Accounting Standards Codification Topic 280 "Segment Reporting" and the Company's business results are reported in this Form 10-K as a single operating segment.

As a result of the Merger, DowDuPont owns all of the common stock of Dow. Pursuant to General Instruction I(1)(a) and (b) of Form 10-K "Omission of Information by Certain Wholly-Owned Subsidiaries," the Company is filing this Form 10-K with a reduced disclosure format.

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Intended Business Separations

In furtherance of the Intended Business Separations, Dow and DuPont are engaged in a series of internal reorganization and realignment steps (the “Internal Reorganization”) to realign their businesses into three subgroups: agriculture, materials science and specialty products. DowDuPont has also formed two wholly owned subsidiaries: Dow Holdings Inc. (“DHI”), to serve as a holding company for its materials science business, and Corteva, Inc. (“Corteva”), to serve as a holding company for its agriculture business. Following the separation and distribution of DHI, which is targeted to occur by April 1, 2019, DowDuPont, as the remaining company, which is referred to herein as “New DuPont,” will continue to hold the agriculture and specialty products businesses. New DuPont is then targeted to complete the separation and distribution of Corteva on June 1, 2019, resulting in New DuPont holding the specialty products businesses of DowDuPont. Following the distributions, DowDuPont will be known as DuPont.

As part of the Internal Reorganization, 1) the assets and liabilities of the materials science business will be transferred or conveyed to legal entities that then will be aligned under DHI, 2) the assets and liabilities of the agriculture business will be transferred or conveyed to legal entities that then will be aligned under Corteva, and 3) the assets and liabilities of the specialty products business will be transferred or conveyed to legal entities that then will be aligned with New DuPont. Following the Internal Reorganization, DowDuPont expects to distribute DHI and Corteva through separate, pro rata U.S. federal tax-free spin-offs in which DowDuPont stockholders, at such time, would receive shares of common stock of DHI and of Corteva.

Additional information is included in the Form 10 registration statements for the separation of DowDuPont's materials science business (filed as Dow Holdings Inc.) filed with the SEC on September 7, 2018, as amended on October 19, 2018 and November 19, 2018, and the agriculture business (filed as Corteva, Inc.) filed with the SEC on October 18, 2018, as amended on December 19, 2018.

Impact From Recently Enacted Tariffs

Certain countries where the Company’s products are manufactured, distributed or sold have recently enacted tariffs on certain products. The Company has analyzed the direct impact from the enacted tariffs and does not expect them to have a material impact on results of operations in 2019. The Company is taking actions to mitigate the impact by leveraging its global asset base to adjust its product and raw material flows.

PRINCIPAL PRODUCT GROUPS

The Company's principal product groups aligned with the materials science business include: Coatings & Performance Monomers, Consumer Solutions, Hydrocarbons & Energy, Industrial Solutions, Packaging and Specialty Plastics, Polyurethanes & CAV and Corporate. The principal product groups aligned with the agriculture business include: Crop Protection and Seed; and those aligned with the specialty products business include: Electronics & Imaging, Industrial Biosciences, Nutrition & Health, Safety & Construction and Transportation & Advanced Polymers.

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RESULTS OF OPERATIONS

Net Sales

The following table summarizes sales variances by geographic region from the prior year:

Sales Variances by Geographic Region Percentage change from prior year	Local Price & Product Mix	Currency	Volume	Portfolio & Other	Total
2018					
U.S. & Canada	3 %	— %	1 %	— %	4 %
EMEA	4	4	3	—	11
Asia Pacific	2	1	15	(1)	17
Latin America	3	—	3	(3)	3
Total	4 %	1 %	5 %	(1)%	9 %
2017					
U.S. & Canada	6 %	— %	5 %	4 %	15 %
EMEA	10	1	6	3	20
Asia Pacific	4	—	7	7	18
Latin America	2	—	(1)	—	1
Total	6 %	— %	5 %	4 %	15 %
2016					
U.S. & Canada	(7)%	— %	3 %	2 %	(2)%
EMEA	(6)	(1)	4	(1)	(4)
Asia Pacific	(6)	—	6	9	9
Latin America	(6)	—	—	(1)	(7)
Total	(6)%	— %	3 %	2 %	(1)%

Net sales for 2018 were $60.3 billion, up 9 percent from $55.5 billion in 2017, driven by higher sales volume, reflecting additional capacity from U.S. Gulf Coast growth projects and increased supply from Sadara Chemical Company ("Sadara"), increased local price and the favorable impact of currency. Sales increased in all geographic regions with double-digit gains in Asia Pacific (up 17 percent) and EMEA (up 11 percent). Volume increased 5 percent as increases in Polyurethanes & CAV, Packaging and Specialty Plastics, Industrial Solutions, Hydrocarbons & Energy, Electronics & Imaging, Nutrition & Health and Safety & Construction more than offset declines in Seed, Consumer Solutions, Coatings & Performance Monomers, Industrial Biosciences and Transportation & Advanced Polymers. Volume was flat in Crop Protection. Volume increased in all geographic regions, including a double-digit increase in Asia Pacific (up 15 percent). Local price increased 4 percent, primarily in response to higher feedstock and raw material costs and pricing initiatives. Local price increased in all geographic regions and across all principal product groups, except Packaging and Specialty Plastics and Electronics & Imaging which were flat, with the most notable increases in Consumer Solutions, Polyurethanes & CAV, Hydrocarbons & Energy, Coatings & Performance Monomers and Industrial Solutions. Portfolio & Other decreased sales 1 percent, reflecting the divestiture of the global Ethylene Acrylic Acid copolymers and ionomers business ("EAA Business"), a portion of Dow AgroSciences' corn seed business in Brazil ("DAS Divested Ag Business") and the divestiture of SKC Haas Display Films group of companies. Currency increased sales by 1 percent, driven primarily by EMEA (up 4 percent).

Net sales for 2017 were $55.5 billion, up 15 percent from $48.2 billion in 2016, primarily reflecting increased local price, higher sales volume and the addition of the Dow Silicones business. Sales increased in all geographic regions

with double-digit increases in EMEA (up 20 percent), Asia Pacific (up 18 percent) and U.S. & Canada (up 15 percent). Local price increased 6 percent, with increases in all geographic regions, including a double-digit increase in EMEA (up 10 percent), driven by broad-based pricing actions as well as higher feedstock and raw material prices. Local price increased across most principal product groups with the most notable increases in Hydrocarbons & Energy, Polyurethanes & CAV, Coatings & Performance Monomers, Packaging and Specialty Plastics, Industrial Solutions and Consumer Solutions. Local price was flat in Safety & Construction and Transportation & Advanced Polymers and declined in Crop Protection, Electronics & Imaging and Industrial Biosciences. Volume increased 5 percent, with increases across all principal product groups, except Seed, with notable increases reported in Hydrocarbons & Energy, Polyurethanes & CAV, Packaging and Specialty Plastics, Electronics & Imaging and Industrial Solutions. Volume was flat in Crop Protection. Volume increased in all geographic regions, except Latin America (down 1 percent). Portfolio & Other increased

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sales 4 percent, primarily reflecting the addition of the Dow Silicones business, partially offset by divestitures, including the SKC Haas Display Films group of companies, the EAA Business and the DAS Divested Ag Business.

Cost of Sales

Cost of sales ("COS") was $47.7 billion in 2018, up $4.1 billion from $43.6 billion in 2017. COS increased in 2018 primarily due to increased sales volume, which reflected additional capacity from U.S. Gulf Coast growth projects and increased supply from Sadara, higher feedstock and other raw material costs and increased planned maintenance turnaround costs which more than offset lower commissioning expenses related to U.S. Gulf Coast growth projects and cost synergies. COS as a percentage of sales was 79.1 percent in 2018 compared with 78.6 percent in 2017.

COS was $43.6 billion in 2017, up $5.9 billion from $37.7 billion in 2016, primarily due to increased sales volume, higher feedstock, energy and other raw material costs, higher commissioning expenses related to U.S. Gulf Coast growth projects, and the addition of the Dow Silicones business. COS as a percentage of sales was 78.6 percent in 2017 compared with 78.2 percent in 2016. See Note 5 to the Consolidated Financial Statements for additional information on the Dow Silicones ownership restructure.

Personnel Count

The Company permanently employed approximately 54,000 people at December 31, 2018 and 2017, down from approximately 56,000 people at December 31, 2016, primarily due to the Company's restructuring programs.

Research and Development Expenses

Research and development (“R&D”) expenses were $1,536 million in 2018, compared with $1,648 million in 2017 and $1,593 million in 2016. In 2018, R&D expenses decreased primarily due to cost synergies and lower performance-based compensation costs. In 2017, R&D expenses increased primarily due to the addition of the Dow Silicones business.

Selling, General and Administrative Expenses

Selling, general and administrative (“SG&A”) expenses were $2,846 million in 2018, compared with $2,920 million in 2017 and $2,953 million in 2016. In 2018, SG&A expenses decreased primarily due to cost synergies and lower performance-based compensation costs. In 2017, SG&A expenses decreased as cost reduction initiatives and reduced litigation expenses, as a result of the favorable impact from the recovery of costs related to the Nova Chemicals Corporation ("Nova") patent infringement award, more than offset higher spending from the addition of the Dow Silicones business. See Note 16 to the Consolidated Financial Statements for additional information on the Nova award.

Amortization of Intangibles

Amortization of intangibles was $622 million in 2018, essentially flat compared with $624 million in 2017. Amortization of intangibles in 2017 increased from $544 million in 2016, primarily due to the addition of the Dow Silicones business. See Note 13 to the Consolidated Financial Statements for additional information on intangible assets.

Restructuring, Goodwill Impairment and Asset Related Charges - Net

DowDuPont Agriculture Division Restructuring Program

During the fourth quarter of 2018 and in connection with the ongoing integration activities, DowDuPont approved restructuring actions to simplify and optimize certain organizational structures within the Agriculture division in preparation for its intended separation as a standalone company ("Agriculture Division Program"). As a result of these actions, the Company expects to record total pretax restructuring charges of $31 million, comprised of $28 million of severance and related benefit costs and $3 million of asset write-downs and write-offs. For the year ended December

31, 2018, the Company recorded pretax restructuring charges of $25 million, consisting of severance and related benefit costs of $24 million and asset write-downs and write-offs of $1 million. The Company expects actions related to the Agriculture Division Program to be substantially complete by mid 2019.

DowDuPont Cost Synergy Program

In September and November 2017, DowDuPont approved post-merger restructuring actions under the DowDuPont Cost Synergy Program (the "Synergy Program") which is designed to integrate and optimize the organization following the Merger and in preparation for the Intended Business Separations. The Company expects to record total pretax restructuring charges of approximately $1.3 billion, which included initial estimates of approximately $525 million to $575 million of severance and related benefit costs; $400 million to $440 million of asset write-downs and write-offs, and $290 million to $310 million of costs associated with exit and disposal activities.

As a result of the Synergy Program, the Company recorded pretax restructuring charges of $687 million in 2017, consisting of severance and related benefit costs of $357 million, asset write-downs and write-offs of $287 million and costs associated with exit and disposal activities of $43 million. For the year ended December 31, 2018, the Company recorded pretax restructuring charges of $551 million, consisting of severance and related benefit costs of $204 million, asset write-downs and write-offs of

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$226 million and costs associated with exit and disposal activities of $121 million. The Company expects to record additional restructuring charges during 2019 and substantially complete the Synergy Program by the end of 2019.

2016 Restructuring
On June 27, 2016, Dow's Board of Directors approved a restructuring plan that incorporated actions related to the ownership restructure of Dow Silicones. These actions, aligned with Dow’s value growth and synergy targets, resulted in a global workforce reduction of approximately 2,500 positions, with most of these positions resulting from synergies related to the ownership restructure of Dow Silicones. As a result of these actions, the Company recorded pretax restructuring charges of $449 million in the second quarter of 2016, consisting of severance and related benefit costs of $268 million, asset write-downs and write-offs of $153 million and costs associated with exit and disposal activities of $28 million.

In 2017, the Company recorded a favorable adjustment to the 2016 restructuring charge related to costs associated with exit and disposal activities of $7 million.

In 2018, the Company recorded a favorable adjustment to the 2016 restructuring charge related to severance and related benefit costs of $8 million and an unfavorable adjustment to costs associated with exit and disposal activities of $14 million. The 2016 restructuring activities were substantially complete at June 30, 2018, with remaining liabilities for severance and related benefit costs and costs associated with exit and disposal activities to be settled over time. See Note 7 to the Consolidated Financial Statements for details on the Company's restructuring activities.

Goodwill Impairment
Upon completion of the goodwill impairment testing in the fourth quarter of 2017, the Company determined the fair value of the Coatings & Performance Monomers reporting unit was lower than its carrying amount. As a result, the Company recorded an impairment charge of $1,491 million in the fourth quarter of 2017. There were no impairment charges in 2016 or 2018. See Note 13 to the Consolidated Financial Statements for additional information on the impairment charge.

Asset Related Charges
2018 Charges
In 2018, the Company recognized an additional pretax impairment charge of $34 million related primarily to capital additions made to the biopolymers manufacturing facility in Santa Vitoria, Minas Gerais, Brazil, which was impaired in 2017.

2017 Charges
In 2017, the Company recognized a $622 million pretax impairment charge related to a biopolymers manufacturing facility in Santa Vitoria, Minas Gerais, Brazil. The Company determined it would not pursue an expansion of the facility’s ethanol mill into downstream derivative products, primarily as a result of cheaper ethane-based production as well as the Company’s new assets coming online on the U.S. Gulf Coast which can be used to meet growing market demands in Brazil. As a result of this decision, cash flow analysis indicated the carrying amount of the impacted assets was not recoverable.

The Company also recognized other pretax impairment charges of $317 million in the fourth quarter of 2017, including charges related to manufacturing assets of $230 million, an equity method investment of $81 million and other assets of $6 million.

2016 Charges

In 2016, the Company recognized a $143 million pretax impairment charge related to its equity interest in AgroFresh Solutions, Inc. (“AFSI”) due to a decline in the market value of AFSI. See Notes 7, 12, 22 and 23 to the Consolidated Financial Statements for additional information on asset related charges.

Integration and Separation Costs

Integration and separation costs, which reflect costs related to the Merger and the ownership restructure of Dow Silicones (through May 31, 2018), as well as post-Merger integration and Intended Business Separation activities, were $1,044 million in 2018, $786 million in 2017 and $349 million in 2016. In 2018, integration and separation costs ramped up as a result of post-merger integration and Intended Business Separation activities.

Asbestos-Related Charge

In 2016, the Company and Union Carbide, a wholly owned subsidiary, elected to change the method of accounting for asbestos-related defense and processing costs from expensing as incurred to estimating and accruing a liability. As a result of this accounting policy change, the Company recorded a pretax charge of $1,009 million for asbestos-related defense costs through the terminal year of 2049. The Company also recorded a pretax charge of $104 million to increase the asbestos-related liability for pending and future claims through the terminal year of 2049. There was no adjustment to the asbestos-related liability for pending and

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future claims and defense and processing costs in 2017 or 2018. See Notes 1 and 16 to the Consolidated Financial Statements for additional information on asbestos-related matters.

Equity in Earnings of Nonconsolidated Affiliates

Dow's share of the earnings of nonconsolidated affiliates in 2018 was $950 million, compared with $762 million in 2017 and $442 million in 2016. In 2018, equity earnings increased as higher earnings from the Kuwait joint ventures, lower equity losses from Sadara and higher earnings from the HSC Group, which included settlements with a customer related to long-term polysilicon sales agreements, were partially offset by lower equity earnings from the Thai joint ventures.

In 2017, equity earnings increased as lower equity losses from Sadara and higher equity earnings from the Kuwait joint ventures and the HSC Group, which included settlements with a customer related to long-term polysilicon sales agreements, were partially offset by the impact of the Dow Silicones ownership restructure and lower equity earnings from the Thai joint ventures.

Sundry Income (Expense) - Net

Sundry income (expense) – net includes a variety of income and expense items such as foreign currency exchange gains and losses, interest income, dividends from investments, gains and losses on sales of investments and assets, non-operating pension and other postretirement benefit plan credits or costs, and certain litigation matters. Sundry income (expense) - net for 2018 was income of $181 million, compared with income of $195 million in 2017 and income of $1,486 million in 2016.

In 2018, sundry income (expense) - net included non-operating pension and other postretirement benefit plan credits, interest income and gains on sales of assets and investments which more than offset foreign currency exchange losses, a loss of $54 million on the early extinguishment of debt and a loss of $47 million for post-closing adjustments related to the Dow Silicones ownership restructure. See Notes 8 and 15 to the Consolidated Financial Statements for additional information.

In 2017, sundry income (expense) - net included a $635 million gain on the divestiture of the DAS Divested Ag Business, a $227 million gain on the divestiture of the EAA Business, a $137 million gain related to the Nova patent infringement matter, interest income and gains on sales of assets and investments. These gains more than offset $682 million of non-operating pension and other postretirement benefit costs, primarily related to a settlement charge for a U.S. non-qualified pension plan, a $469 million loss related to the Bayer CropScience arbitration matter and foreign currency exchange losses. See Notes 1, 2, 6, 8, 16 and 19 to the Consolidated Financial Statements for additional information.

In 2016, sundry income (expense) - net included a $2,445 million gain related to the Dow Silicones ownership restructure, a $27 million favorable adjustment related to a decrease in Dow Silicone's implant liability, interest income and gains on sales of assets and investments. These gains more than offset a $1,235 million loss related to the Company's settlement of the urethane matters class action lawsuit and the opt-out cases litigation, $41 million of costs associated with transactions and productivity actions, $26 million of charges for post-closing adjustments related to divestitures and foreign currency exchange losses. See Notes 5, 8 and 16 to the Consolidated Financial Statements for additional information.

Interest Expense and Amortization of Debt Discount

Interest expense and amortization of debt discount was $1,118 million in 2018, up from $976 million in 2017, primarily reflecting the effect of lower capitalized interest as a result of decreased capital spending. Interest expense and amortization of debt discount in 2017 was up from $858 million in 2016, primarily reflecting the effect of the

long-term debt assumed in the Dow Silicones ownership restructure. See Liquidity and Capital Resources in Management's Discussion and Analysis of Financial Condition and Results of Operations and Notes 11 and 15 to the Consolidated Financial Statements for additional information related to debt financing activity.

Provision for Income Taxes

The Company's effective tax rate fluctuates based on, among other factors, where income is earned, the level of income relative to tax attributes and the level of equity earnings, since most earnings from the Company's equity method investments are taxed at the joint venture level. The underlying factors affecting the Company's overall tax rate are summarized in Note 9 to the Consolidated Financial Statements.

On December 22, 2017, the Tax Cuts and Jobs Act (“The Act”) was enacted. The Act reduces the U.S. federal corporate income tax rate from 35 percent to 21 percent, requires companies to pay a one-time transition tax on earnings of certain foreign subsidiaries that were previously deferred, creates new provisions related to foreign sourced earnings, eliminates the domestic manufacturing deduction and moves to a hybrid territorial system. At December 31, 2017, the Company had not completed its accounting for the tax effects of The Act; however, the Company made a reasonable estimate of the effects on its existing deferred tax balances and the one-time transition tax. In accordance with Staff Accounting Bulletin 118 ("SAB 118"), income tax effects of The Act were

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refined upon obtaining, preparing, and analyzing additional information during the measurement period. At December 31, 2018, the Company had completed its accounting for the tax effects of The Act.

The provision for income taxes was $1,285 million in 2018, compared with $2,204 million in 2017 and $9 million in 2016. The effective tax rate for 2018 was favorably impacted by the reduced U.S. federal corporate income tax rate as a result of The Act and benefits related to the issuance of stock-based compensation and unfavorably impacted by non-deductible restructuring costs and increases in statutory income in Latin America and Canada due to local currency devaluations. These factors resulted in an effective tax rate of 21.7 percent in 2018.

The tax rate for 2017 was unfavorably impacted by the enactment of The Act, the impairment of goodwill for which there was no corresponding tax deduction, charges related to tax attributes in the United States and Germany as a result of the Merger and certain non-deductible costs associated with the Merger. The tax rate was favorably impacted by the geographic mix of earnings, and the adoption of Accounting Standards Update ("ASU") 2016-09, "Compensation - Stock Compensation (Topic 718): Improvements to Employee Share-Based Payment Accounting," which resulted in the recognition of excess tax benefits related to the issuance of stock-based compensation in the provision for income taxes. These factors resulted in an effective tax rate of 78.7 percent for 2017.

The tax rate for 2016 was favorably impacted by the non-taxable gain on the Dow Silicones ownership restructure and a tax benefit on the reassessment of a deferred tax liability related to the basis difference in the Company’s investment in Dow Silicones. The tax rate was also favorably impacted by the geographic mix of earnings, the availability of foreign tax credits, the deductibility of the urethane matters class action lawsuit and opt-out cases settlements, and the asbestos-related charge. A reduction in equity earnings and non-deductible costs associated with transactions and productivity actions unfavorably impacted the tax rate. These factors resulted in an effective tax rate of 0.2 percent for 2016.

Net Income Attributable to Noncontrolling Interests

Net income attributable to noncontrolling interests was $134 million in 2018, $129 million in 2017 and $86 million in 2016. Net income attributable to noncontrolling interests increased in 2018 compared with 2017, primarily due to the sale of the Company's ownership interests in the SKC Haas Display Films group of companies. Net income attributable to noncontrolling interests increased in 2017 compared with 2016, primarily due to higher earnings from Dow Silicones' consolidated joint ventures and improved results from a cogeneration facility in Brazil. See Notes 18 and 23 to the Consolidated Financial Statements for additional information.

Preferred Stock Dividends

On December 30, 2016, the Company converted all outstanding shares of its Cumulative Convertible Perpetual Preferred Stock, Series A ("Preferred Stock") into shares of the Company's common stock. As a result of this conversion, no shares of Preferred Stock are issued or outstanding. On January 6, 2017, the Company filed an amendment to its Restated Certificate of Incorporation by way of a certificate of elimination with the Secretary of State of Delaware eliminating this series of preferred stock. Preferred Stock dividends of $340 million were recognized in 2016. See Note 17 to the Consolidated Financial Statements for additional information.

Net Income Available for the Common Stockholder

Net income available for the common stockholder was $4,499 million in 2018, compared with $466 million in 2017 and $3,978 million in 2016. Effective with the Merger, Dow no longer has publicly traded common stock. Dow's common shares are owned solely by its parent company, DowDuPont.

LIQUIDITY AND CAPITAL RESOURCES

The Company had cash and cash equivalents of $2,669 million at December 31, 2018 and $6,188 million at December 31, 2017, of which $1,963 million at December 31, 2018 and $4,318 million at December 31, 2017, was held by subsidiaries in foreign countries, including United States territories. The decrease in cash and cash equivalents held by subsidiaries in foreign countries is due to repatriation activities. For each of its foreign subsidiaries, the Company makes an assertion regarding the amount of earnings intended for permanent reinvestment, with the balance available to be repatriated to the United States.

The Company has completed its evaluation of the impact of The Act on its permanent reinvestment assertion. The Act required companies to pay a one-time transition tax on earnings of foreign subsidiaries, a majority of which were previously considered permanently reinvested by the Company. A tax liability was accrued for the estimated U.S. federal tax on all unrepatriated earnings at December 31, 2017, with further refinement during the 2018 measurement period, in accordance with The Act. The cumulative effect at December 31, 2018, was a charge of $780 million to "Provision for income taxes" in the consolidated statements of income, of which the full amount was covered by tax attributes (see Note 9 to the Consolidated Financial Statements for further details of The Act). The cash held by foreign subsidiaries for permanent reinvestment is generally used to finance the subsidiaries'

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operational activities and future foreign investments. The Company has the ability to repatriate additional funds to the U.S., which could result in an adjustment to the tax liability for foreign withholding taxes, foreign and/or U.S. state income taxes and the impact of foreign currency movements. At December 31, 2018, management believed that sufficient liquidity was available in the United States. The Company has and expects to continue repatriating certain funds from its non-U.S. subsidiaries that are not needed to finance local operations or separation activities; however, these particular repatriation activities have not and are not expected to result in a significant incremental tax liability to the Company.

The Company’s cash flows from operating, investing and financing activities, as reflected in the consolidated statements of cash flows, are summarized in the following table:

Cash Flow Summary In millions	2018	2017 [1]	2016 [1]
Cash provided by (used for):			
Operating activities	$3,894	$(4,958)	$(2,957)
Investing activities	(2,128)	7,552	5,092
Financing activities	(5,164)	(3,331)	(4,014)
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(100)	320	(77)
Summary			
Decrease in cash, cash equivalents and restricted cash	(3,498)	(417)	(1,956)
Cash, cash equivalents and restricted cash at beginning of year	6,207	6,624	8,580
Cash, cash equivalents and restricted cash at end of year	$2,709	$6,207	$6,624
Less: Restricted cash and cash equivalents, included in "Other current assets"	40	19	17
Cash and cash equivalents at end of year	$2,669	$6,188	$6,607

1. Updated for ASU 2016-15, "Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments" (including SEC interpretive guidance) and ASU 2016-18, "Statement of Cash Flows (Topic 230): Restricted Cash." See Notes 1 and 2 to the Consolidated Financial Statements for additional information.

Cash Flows from Operating Activities

Cash provided by operating activities increased in 2018 compared with 2017, primarily due to the change in the Company's accounts receivable securitization facilities discussed on the following page, a decrease in cash used for working capital requirements and higher cash earnings, which were partially offset by the absence of certain cash receipts in 2017. Cash used for operating activities increased in 2017 compared with 2016, primarily due to an increase in cash used for working capital requirements, higher pension contributions resulting from a change in control provision in a non-qualified U.S. pension plan, higher integration and separation costs and a cash payment related to the Bayer CropScience arbitration matter, partially offset by a cash receipt related to the Nova patent infringement award and advanced payments from customers for long-term ethylene supply agreements.

Cash Flows from Investing Activities

Cash used for investing activities in 2018 was primarily for capital expenditures and purchases of investments, which were partially offset by proceeds from sales and maturities of investments and proceeds from interests in trade accounts receivable conduits. Cash provided by investing activities in 2017 was primarily from proceeds from interests in trade accounts receivable conduits, proceeds from sales and maturities of investments and proceeds from divestitures, including the divestitures of the DAS Divested Ag Business and the EAA Business, which were partially offset by capital expenditures, purchases of investments and investments in and loans to nonconsolidated affiliates, primarily with Sadara. Cash provided by investing activities in 2016 was primarily from proceeds from interests in trade accounts receivable conduits and net cash acquired in the Dow Silicones ownership restructure, which were partially offset by capital expenditures and investments in and loans to nonconsolidated affiliates, primarily with

Sadara.

In 2018, the Company entered into a shareholder loan reduction agreement with Sadara and converted $312 million of the remaining loan and accrued interest balance into equity. The Company's note receivable from Sadara was zero at December 31, 2018. In addition, in the fourth quarter of 2018, the Company waived $70 million of accounts receivable with Sadara, which was converted into equity. In 2017, the Company loaned $735 million to Sadara and converted $718 million into equity, and had a note receivable from Sadara of $275 million at December 31, 2017. The Company expects to loan up to $500 million to Sadara in 2019. See Note 12 to the Consolidated Financial Statements for additional information.

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The Company's capital expenditures, including capital expenditures of consolidated variable interest entities, were $2,538 million in 2018, $3,144 million in 2017 and $3,804 million in 2016. The Company expects capital spending in 2019 to be approximately $2.5 billion, below depreciation and amortization expense and inclusive of capital spending for targeted cost synergy and business separation projects.

Capital spending in 2018, 2017 and 2016 included spending related to certain U.S. Gulf Coast investment projects including: a world-scale ethylene production facility and an ELITE™ Enhanced Polyethylene production facility, both of which commenced operations in 2017; a NORDEL™ Metallocene EPDM production facility, a Low Density Polyethylene ("LDPE") production facility, a High Melt Index ("HMI") AFFINITY™ polymer production facility and debottlenecking of an existing bi-modal gas phase polyethylene production facility, all of which commenced operations in 2018.

Cash Flows from Financing Activities

Cash used for financing activities in 2018 included dividends paid to DowDuPont and payments of long-term debt, which were partially offset by proceeds from issuance of long-term debt. Cash used for financing activities in 2017 included dividends paid to stockholders through the close of the Merger, a dividend paid to DowDuPont in the fourth quarter of 2017, and payments of long-term debt. Cash used for financing activities in 2016 included dividends paid to stockholders (including the accelerated payment of the fourth quarter preferred dividend), repurchases of common stock and payments of long-term debt. See Notes 15 and 17 to the Consolidated Financial Statements for additional information related to the issuance and retirement of debt and the Company's share repurchases and dividends.

Reclassification of Prior Year Amounts Related to Accounts Receivable Securitization

In connection with the review and implementation of ASU 2016-15 and additional interpretive guidance from the SEC related to the required method for calculating the cash received from beneficial interests in trade accounts receivable conduits, the Company changed the prior year presentation and amount of proceeds from interests in trade accounts receivable conduits. Changes related to the calculation and presentation of proceeds from interests in trade accounts receivable conduits resulted in a reclassification from cash used for operating activities to cash provided by investing activities of $9,462 million in 2017 and $8,551 million in 2016. In the fourth quarter of 2017, the Company suspended further sales of trade accounts receivable through these facilities and began reducing outstanding balances through collections of trade accounts receivable previously sold to such conduits. In September and October 2018, the North American and European facilities, respectively, were amended and the terms of the agreements changed from off-balance sheet arrangements to secured borrowing arrangements.

The following table reconciles cash flows from operating activities to a non-GAAP measure regarding cash flows from operating activities excluding the impact of ASU 2016-15 and related interpretive guidance for the years ended December 31, 2018, 2017 and 2016. Management believes this non-GAAP financial measure is relevant and meaningful as it presents cash flows from operating activities inclusive of all trade accounts receivable collection activity, which the Company utilizes in support of its operating activities.

Cash Flows from Operating Activities Excluding Impact of ASU 2016-15 and Additional Interpretive Guidance (non-GAAP) In millions	2018	2017	2016
Cash flows from operating activities - Updated for impact of ASU 2016-15 and additional interpretive guidance (GAAP)	$3,894	$(4,958)	$(2,957)
Less: Impact of ASU 2016-15 and additional interpretive guidance	(657)	(9,462)	(8,551)
Cash flows from operating activities - Excluding impact of ASU 2016-15 and additional interpretive guidance (non-GAAP)	$4,551	$4,504	$5,594

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Liquidity & Financial Flexibility

The Company’s primary source of incremental liquidity is cash flows from operating activities. The generation of cash from operations and the Company's ability to access debt markets is expected to meet the Company’s cash requirements for working capital, capital expenditures, debt maturities, contributions to pension plans, dividend distributions to its parent company and other needs. In addition to cash from operating activities, the Company’s current liquidity sources also include U.S. and Euromarket commercial paper, committed credit facilities and other debt markets. Additional details on sources of liquidity are as follows:

Commercial Paper

Dow issues promissory notes under its U.S. and Euromarket commercial paper programs. The Company had $10 million of commercial paper outstanding at December 31, 2018 ($231 million at December 31, 2017). The Company maintains access to the commercial paper market at competitive rates. Amounts outstanding under the Company's commercial paper programs during the period may be greater, or less than, the amount reported at the end of the period. Subsequent to December 31, 2018, the Company issued approximately $1.6 billion of commercial paper.

Committed Credit Facilities

In the event Dow has short-term liquidity needs and is unable to issue commercial paper for any reason, Dow has the ability to access liquidity through its committed and available credit facilities. At December 31, 2018, the Company had total committed credit facilities of $12.1 billion and available credit facilities of $7.6 billion. See Note 15 to the Consolidated Financial Statements for additional information on committed and available credit facilities.

Uncommitted Credit Facilities and Outstanding Letters of Credit

The Company had uncommitted credit facilities in the form of unused bank credit lines of approximately $3,480 million at December 31, 2018. These lines can be used to support short-term liquidity needs and general purposes, including letters of credit. Outstanding letters of credit were $439 million at December 31, 2018 ($433 million at December 31, 2017). These letters of credit support commitments made in the ordinary course of business.

Debt

As Dow continues to maintain its strong balance sheet and financial flexibility, management is focused on net debt (a non-GAAP financial measure), as Dow believes this is the best representation of the Company’s financial leverage at this point in time. As shown in the following table, net debt is equal to total gross debt minus "Cash and cash equivalents" and "Marketable securities." At December 31, 2018, net debt as a percent of total capitalization increased to 38.0 percent, compared with 35.4 percent at December 31, 2017, primarily due to a decrease in cash and cash equivalents, which more than offset a decrease in gross debt.

Total Debt at Dec 31

In millions	2018	2017
Notes payable	$305	$484
Long-term debt due within one year	340	752
Long-term debt	19,254	19,765
Gross debt	$19,899	$21,001
- Cash and cash equivalents	$2,669	$6,188
- Marketable securities	100	4
Net debt	$17,130	$14,809
Gross debt as a percent of total capitalization	41.6 %	43.7 %
Net debt as a percent of total capitalization	38.0 %	35.4 %

In the fourth quarter of 2018, the Company issued $2.0 billion of senior unsecured notes in an offering under Rule 144A of the Securities Act of 1933, which included $500 million due 2025; $600 million due 2028 and $900 million due 2048. See Note 15 to the Consolidated Financial Statements for additional information on the interest related to these notes. In addition, the Company tendered and redeemed $2.1 billion of notes issued with maturity in 2019. In addition, DHI, the intended parent of the Company after the Intended Business Separations, is obligated, should it issue a guarantee in respect of outstanding or committed indebtedness under Dow's Five Year Competitive Advance and Revolving Credit Facility Agreement ("Revolving Credit Agreement"), dated October 30, 2018, (as described below), to enter into a supplemental indenture with the Company and the trustee under the existing base indenture governing certain notes issued by the Company under which it will guarantee all outstanding debt securities and all amounts due under the existing base indenture.

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Dow’s public debt instruments and primary, private credit agreements contain, among other provisions, certain customary restrictive covenant and default provisions. The Company’s most significant debt covenant with regard to its financial position is the obligation to maintain the ratio of the Company’s consolidated indebtedness to consolidated capitalization at no greater than 0.65 to 1.00 at any time the aggregate outstanding amount of loans under the Revolving Credit Agreement equals or exceeds $500 million. The ratio of the Company’s consolidated indebtedness to consolidated capitalization as defined in the Revolving Credit Agreement was 0.41 to 1.00 at December 31, 2018. Management believes the Company was in compliance with all of its covenants and default provisions at December 31, 2018. See Note 15 to the Consolidated Financial Statements for information related to the Company’s notes payable and long-term debt activity and information on Dow’s covenants and default provisions.

On October 30, 2018, Dow terminated and replaced its $5.0 billion Revolving Credit Agreement, under substantially similar terms and conditions. The new Revolving Credit Agreement has a maturity date in October 2023. The Revolving Credit Agreement includes an event of default which would be triggered in the event DHI incurs or guarantees third party indebtedness for borrowed money in excess of $250 million or engages in any material business activity or directly owns any material assets, in each case, subject to certain conditions and exceptions. DHI may, at its option, cure the event of default by delivering an unconditional and irrevocable guaranty to the administrative agent within thirty days of the event or events giving rise to such event of default.

Management expects that the Company will continue to have sufficient liquidity and financial flexibility to meet all of its business obligations.

Credit Ratings
At January 31, 2019, the Company's credit ratings were as follows:

Credit Ratings	Long-Term Rating	Short-Term Rating	Outlook
Standard & Poor’s	BBB	A-2	Stable
Moody’s Investors Service	Baa2	P-2	Stable
Fitch Ratings	BBB+	F2	Stable

Downgrades in the Company’s credit ratings will increase borrowing costs on certain indentures and could impact the Company’s ability to access debt capital markets.

Dividends
Effective with the Merger, Dow no longer has publicly traded common stock. Dow's common shares are owned solely by its parent company, DowDuPont. The Company has committed to fund a portion of DowDuPont's share repurchases, dividends paid to common stockholders and governance expenses. Funding is accomplished through intercompany loans. On a quarterly basis, the Company’s Board of Directors review and determine a dividend distribution to DowDuPont to settle the intercompany loans. The dividend distribution considers the level of the Company’s earnings and cash flows and the outstanding intercompany loan balances. For the year ended December 31, 2018, the Company declared and paid dividends to DowDuPont of $3,711 million ($1,056 million for the year ended December 31, 2017). See Note 24 to the Consolidated Financial Statements for additional information.

Pre-Merger dividends paid to common stockholders are as follows:

Dividends Paid for the Years Ended Dec 31 In millions, except per share amounts	2017	2016
Dividends paid, per common share	$1.84	$1.84
Dividends paid to common stockholders	$2,179	$2,037

Dividends paid to preferred shareholders [1]	$—	$425

1. Dividends paid to preferred shareholders in 2016 includes payment of the fourth quarter 2016 declared dividend.

Share Repurchase Program

Effective with the Merger, Dow no longer has publicly traded common stock and therefore has no ongoing share repurchase program.

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Pension Plans

The Company has defined benefit pension plans in the United States and a number of other countries. In 2018, 2017 and 2016, the Company contributed $1,656 million, $1,676 million and $629 million to its pension plans, respectively, including contributions to fund benefit payments for its non-qualified pension plans. In the third quarter of 2018, the Company made a $1,100 million discretionary contribution to its principal U.S. pension plan, which is included in the 2018 contribution amount above. The discretionary contribution was primarily based on the Company's funding policy, which permits contributions to defined benefit pension plans when economics encourage funding, and reflected considerations relating to tax deductibility and capital structure.

The provisions of a U.S. non-qualified pension plan require the payment of plan obligations to certain participants upon a change in control of the Company, which occurred at the time of the Merger. Certain participants could elect to receive a lump-sum payment or direct the Company to purchase an annuity on their behalf using the after-tax proceeds of the lump sum. In the fourth quarter of 2017, the Company paid $940 million to plan participants and $230 million to an insurance company for the purchase of annuities, which were included in "Pension contributions" in the consolidated statements of cash flows. The Company also paid $205 million for income and payroll taxes for participants electing the annuity option. The Company recorded a settlement charge of $687 million associated with the payout in the fourth quarter of 2017.

Dow expects to contribute approximately $240 million to its pension plans in 2019. See Note 19 to the Consolidated Financial Statements for additional information concerning the Company’s pension plans.

Restructuring

The activities related to the DowDuPont Agriculture Division Program and the Synergy Program are expected to result in additional cash expenditures of approximately $480 million to $510 million, primarily through the end of 2019, consisting of severance and related benefit costs and costs associated with exit and disposal activities, including environmental remediation (see Note 7 to the Consolidated Financial Statements). The Company expects to incur additional costs in the future related to its restructuring activities. Future costs are expected to include demolition costs related to closed facilities and restructuring plan implementation costs; these costs will be recognized as incurred. The Company also expects to incur additional employee-related costs, including involuntary termination benefits, related to its other optimization activities. These costs cannot be reasonably estimated at this time.

Integration and Separation Costs

Integration and separation costs, which reflect costs related to the Merger, post-Merger integration and Intended Business Separation activities and costs related to the ownership restructure of Dow Silicones, were $1,044 million in 2018, $786 million in 2017 and $349 million in 2016. Integration and separation costs related to post-Merger integration and Intended Business Separation activities are expected to continue to be significant in 2019.

Contractual Obligations

The following table summarizes the Company’s contractual obligations, commercial commitments and expected cash requirements for interest at December 31, 2018. Additional information related to these obligations can be found in Notes 15, 16, and 19 to the Consolidated Financial Statements.

Contractual Obligations at Dec 31, 2018	Payments Due In				
In millions	2019	2020-2021	2022-2023	2024 and beyond	Total
Long-term debt obligations [1]	$340	$ 8,080	$ 1,990	$9,518	$19,928
Expected cash requirements for interest [2]	949	1,779	1,172	6,915	10,815

Pension and other postretirement benefits	370	818	2,576	5,614	9,378
Operating leases	412	697	550	978	2,637
Purchase obligations [3]	3,160	4,719	3,801	6,476	18,156
Other noncurrent obligations [4]	—	900	606	1,750	3,256
Total	$5,231	$ 16,993	$ 10,695	$31,251	$64,170

1. Excludes unamortized debt discount and issuance costs of $334 million. Includes capital lease obligations of $369 million. Assumes the option to extend the Dow Silicones Term Loan facility will be exercised.
2. Cash requirements for interest on long-term debt was calculated using current interest rates at December 31, 2018, and includes $4,915 million of various floating rate notes.
3. Includes outstanding purchase orders and other commitments greater than $1 million obtained through a survey conducted within the Company.
4. Includes liabilities related to asbestos litigation, environmental remediation, legal settlements and other noncurrent liabilities. The table excludes uncertain tax positions due to uncertainties in the timing of the effective settlement of tax positions with the respective taxing authorities and deferred tax liabilities as it is impractical to determine whether there will be a cash impact related to these liabilities. The table also excludes deferred revenue as it does not represent future cash requirements arising from contractual payment obligations.

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The Company expects to meet its contractual obligations through its normal sources of liquidity and believes it has the financial resources to satisfy these contractual obligations.

Off-Balance Sheet Arrangements

Off-balance sheet arrangements are obligations the Company has with nonconsolidated entities related to transactions, agreements or other contractual arrangements. The Company holds variable interests in joint ventures accounted for under the equity method of accounting. The Company is not the primary beneficiary of these joint ventures and therefore is not required to consolidate these entities (see Note 23 to the Consolidated Financial Statements). In addition, see Note 14 to the Consolidated Financial Statements for information regarding the transfer of financial assets.

Guarantees arise during the ordinary course of business from relationships with customers and nonconsolidated affiliates when the Company undertakes an obligation to guarantee the performance of others if specific triggering events occur. The Company had outstanding guarantees at December 31, 2018 of $5,408 million, compared with $5,663 million at December 31, 2017. Additional information related to guarantees can be found in the “Guarantees” section of Note 16 to the Consolidated Financial Statements.

Fair Value Measurements

See Note 19 to the Consolidated Financial Statements for information related to fair value measurements of pension and other postretirement benefit plan assets; see Note 21 for information related to other-than-temporary impairments; and, see Note 22 for additional information concerning fair value measurements.

OTHER MATTERS

Recent Accounting Guidance

See Note 2 to the Consolidated Financial Statements for a summary of recent accounting guidance.

Critical Accounting Estimates

The preparation of financial statements and related disclosures in accordance with accounting principles generally accepted in the United States of America (“U.S. GAAP”) requires management to make judgments, assumptions and estimates that affect the amounts reported in the consolidated financial statements and accompanying notes. Note 1 to the Consolidated Financial Statements describes the significant accounting policies and methods used in the preparation of the consolidated financial statements. Following are the Company’s accounting policies impacted by judgments, assumptions and estimates:

Litigation

The Company is subject to legal proceedings and claims arising out of the normal course of business including product liability, patent infringement, employment matters, governmental tax and regulation disputes, contract and commercial litigation and other actions. The Company routinely assesses the legal and factual circumstances of each matter, the likelihood of any adverse outcomes to these matters, as well as ranges of probable losses. A determination of the amount of the reserves required, if any, for these contingencies is made after thoughtful analysis of each known claim. Dow has an active risk management program consisting of numerous insurance policies secured from many carriers covering various timeframes. These policies may provide coverage that could be utilized to minimize the financial impact, if any, of certain contingencies. The required reserves may change in the future due to new developments in each matter. For further discussion, see Note 16 to the Consolidated Financial Statements.

Asbestos-Related Matters of Union Carbide Corporation

Union Carbide is and has been involved in a large number of asbestos-related suits filed primarily in state courts during the past four decades. These suits principally allege personal injury resulting from exposure to

asbestos-containing products and frequently seek both actual and punitive damages. The alleged claims primarily relate to products that Union Carbide sold in the past, alleged exposure to asbestos-containing products located on Union Carbide’s premises, and Union Carbide’s responsibility for asbestos suits filed against a former Union Carbide subsidiary, Amchem Products, Inc. Each year, Ankura Consulting Group, LLC ("Ankura") performs a review for Union Carbide based upon historical asbestos claims, resolution and historical defense spending. Union Carbide compares current asbestos claim, resolution and defense spending activity to the results of the most recent Ankura study at each balance sheet date to determine whether the asbestos-related liability continues to be appropriate.

In 2016, the Company elected to change its method of accounting for Union Carbide's asbestos-related defense and processing costs from expensing as incurred to estimating and accruing a liability. In addition to performing their annual review of pending and future asbestos claim resolution activity, Ankura also performed a review of Union Carbide's asbestos-related defense and processing costs to determine a reasonable estimate of future defense and processing costs to be included in the asbestos-related liability, through the terminal year of 2049.

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For additional information, see Part I, Item 3. Legal Proceedings; Asbestos-Related Matters of Union Carbide Corporation in Management's Discussion and Analysis of Financial Condition and Results of Operations; and Notes 1 and 16 to the Consolidated Financial Statements.

Environmental Matters

The Company determines the costs of environmental remediation of its facilities and formerly owned facilities based on evaluations of current law and existing technologies. Inherent uncertainties exist in such evaluations primarily due to unknown environmental conditions, changing governmental regulations and legal standards regarding liability, and emerging remediation technologies. The recorded liabilities are adjusted periodically as remediation efforts progress, or as additional technical or legal information becomes available. At December 31, 2018, the Company had accrued obligations of $820 million for probable environmental remediation and restoration costs, including $156 million for the remediation of Superfund sites. This is management's best estimate of the costs for remediation and restoration with respect to environmental matters for which the Company has accrued liabilities, although it is reasonably possible that the ultimate cost with respect to these particular matters could range up to approximately two times that amount. For further discussion, see Environmental Matters in Management's Discussion and Analysis of Financial Condition and Results of Operations and Notes 1 and 16 to the Consolidated Financial Statements.

Goodwill

The Company performs goodwill impairment testing at the reporting unit level. Reporting units are the level at which discrete financial information is available and reviewed by business management on a regular basis. The Company tests goodwill for impairment annually (in the fourth quarter), or more frequently when events or changes in circumstances indicate it is more likely than not that the fair value of a reporting unit has declined below its carrying value. Goodwill is evaluated for impairment using qualitative and/or quantitative testing procedures. At December 31, 2018, the Company has defined 12 reporting units; goodwill is carried by all of these reporting units.

The Company has the option to first perform qualitative testing to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying value. Qualitative factors assessed at the Company level include, but are not limited to, GDP growth rates, long-term hydrocarbon and energy prices, equity and credit market activity, discount rates, foreign exchange rates and overall financial performance. Qualitative factors assessed at the reporting unit level include, but are not limited to, changes in industry and market structure, competitive environments, planned capacity and new product launches, cost factors such as raw material prices, and financial performance of the reporting unit. If the Company chooses not to complete a qualitative assessment for a given reporting unit or if the initial assessment indicates that it is more likely than not that the estimated fair value of a reporting unit is less than its carrying value, additional quantitative testing is required.

Quantitative testing requires the fair value of the reporting unit to be compared with its carrying value. If the reporting unit's carrying value exceeds its fair value, an impairment charge is recognized for the difference. The Company utilizes a discounted cash flow methodology to calculate the fair value of its reporting units. This valuation technique has been selected by management as the most meaningful valuation method due to the limited number of market comparables for the Company's reporting units. However, where market comparables are available, the Company includes EBIT/EBITDA multiples as part of the reporting unit valuation analysis. The discounted cash flow valuations are completed using the following key assumptions: projected revenue growth rates or compounded annual growth rates, discount rates, tax rates, terminal values, currency exchange rates, and forecasted long-term hydrocarbon and energy prices, by geographic area and by year, which include the Company's key feedstocks as well as natural gas and crude oil (due to its correlation to naphtha). Currency exchange rates and long-term hydrocarbon and energy prices are established for the Company as a whole and applied consistently to all reporting units, while revenue growth rates, discount rates and tax rates are established by reporting unit to account for differences in business fundamentals and industry risk.

2018 Goodwill Impairment Testing

In 2018, there were no events or changes in circumstances identified that warranted interim goodwill impairment testing. In the fourth quarter of 2018, quantitative testing was performed on two reporting units and a qualitative assessment was performed for the remaining reporting units. For the quantitative testing, the fair values exceeded carrying values for both reporting units. Fair values exceeded carrying value in all scenarios where sensitivity analysis was performed, and the differences between fair value and carrying value of each reporting unit were determined to be reasonable. For the qualitative assessments, management considered the factors at both the Company level and the reporting unit level. Based on the qualitative assessment, management concluded it is not more likely than not that the fair value of the reporting unit is less than the carrying value of the reporting unit.

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Pension and Other Postretirement Benefits

The amounts recognized in the consolidated financial statements related to pension and other postretirement benefits are determined from actuarial valuations. Inherent in these valuations are assumptions including expected return on plan assets, discount rates at which the liabilities could have been settled at December 31, 2018, rate of increase in future compensation levels, mortality rates and health care cost trend rates. These assumptions are updated annually and are disclosed in Note 19 to the Consolidated Financial Statements. In accordance with U.S. GAAP, actual results that differ from the assumptions are accumulated and amortized over future periods and, therefore, affect expense recognized and obligations recorded in future periods. The U.S. pension plans represent 71 percent of the Company's pension plan assets and 69 percent of the pension obligations.

The Company uses the spot rate approach to determine the discount rate utilized to measure the service cost and interest cost components of net periodic pension and other postretirement benefit costs for the U.S. and other selected countries. Under the spot rate approach, the Company calculates service costs and interest costs by applying individual spot rates from the Willis Towers Watson RATE:Link yield curve (based on high-quality corporate bond yields) for each selected country to the separate expected cash flow components of service cost and interest cost; service cost and interest cost for all other plans (including all plans prior to adoption) are determined on the basis of the single equivalent discount rates derived in determining those plan obligations.

The following information relates to the U.S. plans only; a similar approach is used for the Company's non-U.S. plans.

The Company determines the expected long-term rate of return on assets by performing a detailed analysis of historical and expected returns based on the strategic asset allocation approved by the Company's Investment Committee and the underlying return fundamentals of each asset class. The Company's historical experience with the pension fund asset performance is also considered. The expected return of each asset class is derived from a forecasted future return confirmed by historical experience. The expected long-term rate of return is an assumption and not what is expected to be earned in any one particular year. The weighted-average long-term rate of return assumption used for determining net periodic pension expense for 2018 was 7.92 percent. The weighted-average assumption to be used for determining 2019 net periodic pension expense is 7.94 percent. Future actual pension expense will depend on future investment performance, changes in future discount rates and various other factors related to the population of participants in the Company's pension plans.

The discount rates utilized to measure the pension and other postretirement obligations of the U.S. qualified plans are based on the yield on high-quality corporate fixed income investments at the measurement date. Future expected actuarially determined cash flows for Dow's U.S. plans are individually discounted at the spot rates under the Willis Towers Watson U.S. RATE:Link 60-90 corporate yield curve (based on 60th to 90th percentile high-quality corporate bond yields) to arrive at the plan's obligations as of the measurement date. The weighted average discount rate utilized to measure pension obligations increased to 4.39 percent at December 31, 2018, from 3.66 percent at December 31, 2017.

At December 31, 2018, the U.S. qualified plans were underfunded on a projected benefit obligation basis by $4,066 million. The underfunded amount decreased $1,297 million compared with December 31, 2017. The decrease in the underfunded amount in 2018 was primarily due to the impact of higher discount rates and discretionary plan contributions made in 2018. The Company contributed $1,285 million to the U.S. qualified plans in 2018.

The assumption for the long-term rate of increase in compensation levels for the U.S. qualified plans was 4.25 percent. The Company uses a generational mortality table to determine the duration of its pension and other postretirement obligations.

The following discussion relates to the Company's significant pension plans.

The Company bases the determination of pension expense on a market-related valuation of plan assets that reduces year-to-year volatility. This market-related valuation recognizes investment gains or losses over a five-year period from the year in which they occur. Investment gains or losses for this purpose represent the difference between the expected return calculated using the market-related value of plan assets and the actual return based on the market value of plan assets. Since the market-related value of plan assets recognizes gains or losses over a five-year period, the future value of plan assets will be impacted when previously deferred gains or losses are recorded. Over the life of the plans, both gains and losses have been recognized and amortized. At December 31, 2018, net losses of $1,505 million remain to be recognized in the calculation of the market-related value of plan assets. These net losses will result in increases in future pension expense as they are recognized in the market-related value of assets.

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The net decrease in the market-related value of assets due to the recognition of prior losses is presented in the following table:

Net Decrease in Market-Related Asset Value Due to Recognition of Prior Losses In millions	
2019	$ 504
2020	299
2021	263
2022	439
Total	$ 1,505

The Company expects pension expense to decrease in 2019 by approximately $130 million. The decrease in pension expense is primarily due to the impact of higher discount rates and the full year impact of the significant 2018 contributions to the Company's U.S. pension plans.

A 25 basis point increase or decrease in the long-term return on assets assumption would change the Company’s total pension expense for 2019 by $58 million. A 25 basis point increase in the discount rate assumption would lower the Company's total pension expense for 2019 by $52 million. A 25 basis point decrease in the discount rate assumption would increase the Company's total pension expense for 2019 by $62 million. A 25 basis point change in the long-term return and discount rate assumptions would have an immaterial impact on the other postretirement benefit expense for 2019.

Income Taxes

Deferred tax assets and liabilities are determined based on temporary differences between the financial reporting and tax bases of assets and liabilities, applying enacted tax rates expected to be in effect for the year in which the differences are expected to reverse. Based on the evaluation of available evidence, both positive and negative, the Company recognizes future tax benefits, such as net operating loss carryforwards and tax credit carryforwards, to the extent that realizing these benefits is considered to be more likely than not.

At December 31, 2018, the Company had a net deferred tax asset balance of $1,367 million, after valuation allowances of $1,320 million.

In evaluating the ability to realize the deferred tax assets, the Company relies on, in order of increasing subjectivity, taxable income in prior carryback years, the future reversals of existing taxable temporary differences, tax planning strategies and forecasted taxable income using historical and projected future operating results.

At December 31, 2018, the Company had deferred tax assets for tax loss and tax credit carryforwards of $2,244 million, $300 million of which is subject to expiration in the years 2019 through 2023. In order to realize these deferred tax assets for tax loss and tax credit carryforwards, the Company needs taxable income of approximately $28,758 million across multiple jurisdictions. The taxable income needed to realize the deferred tax assets for tax loss and tax credit carryforwards that are subject to expiration between 2019 through 2023 is approximately $4,458 million.

The Company recognizes the financial statement effects of an uncertain income tax position when it is more likely than not, based on technical merits, that the position will be sustained upon examination. At December 31, 2018, the Company had uncertain tax positions for both domestic and foreign issues of $313 million.

The Company accrues for non-income tax contingencies when it is probable that a liability to a taxing authority has been incurred and the amount of the contingency can be reasonably estimated. At December 31, 2018, the Company had a non-income tax contingency reserve for both domestic and foreign issues of $91 million.

On December 22, 2017, The Act was enacted, making significant changes to the U.S. tax law (see Note 9 to the Consolidated Financial Statements for additional information). At December 31, 2017, the Company had not completed its accounting for the tax effects of The Act; however, the Company made a reasonable estimate of the effects on its existing deferred tax balances and the one-time transition tax. In accordance with SAB 118, income tax effects of The Act were refined upon obtaining, preparing, and analyzing additional information during the measurement period. At December 31, 2018, the Company had completed its accounting for the tax effects of The Act.

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Environmental Matters

Environmental Policies

Dow is committed to world-class environmental, health and safety ("EH&S") performance, as demonstrated by industry-leading performance, a long-standing commitment to RESPONSIBLE CARE®, and a strong commitment to achieve the Company's 2025 Sustainability Goals – goals that set the standard for sustainability in the chemical industry by focusing on improvements in Dow's local corporate citizenship and product stewardship, and by actively pursuing methods to reduce the Company's environmental impact.

To meet the Company's public commitments, as well as the stringent laws and government regulations related to environmental protection and remediation to which its global operations are subject, Dow has well-defined policies, requirements and management systems. Dow's EH&S Management System ("EMS") defines the "who, what, when and how" needed for the businesses to achieve the Company's policies, requirements, performance objectives, leadership expectations and public commitments. To ensure effective utilization, the EMS is integrated into a company-wide management system for EH&S, Operations, Quality and Human Resources.

It is Dow's policy to adhere to a waste management hierarchy that minimizes the impact of wastes and emissions on the environment. First, Dow works to eliminate or minimize the generation of waste and emissions at the source through research, process design, plant operations and maintenance. Second, Dow finds ways to reuse and recycle materials. Finally, unusable or non-recyclable hazardous waste is treated before disposal to eliminate or reduce the hazardous nature and volume of the waste. Treatment may include destruction by chemical, physical, biological or thermal means. Disposal of waste materials in landfills is considered only after all other options have been thoroughly evaluated. Dow has specific requirements for waste that is transferred to non-Dow facilities, including the periodic auditing of these facilities.

Dow believes third-party verification and transparent public reporting are cornerstones of world-class EH&S performance and building public trust. Numerous Dow sites in Europe, Latin America, Asia Pacific and U.S. & Canada have received third-party verification of Dow's compliance with RESPONSIBLE CARE® and with outside specifications such as ISO-14001. Dow continues to be a global champion of RESPONSIBLE CARE® and has worked to broaden the application and impact of RESPONSIBLE CARE® around the world through engagement with suppliers, customers and joint venture partners.

Dow's EH&S policies helped the Company achieve improvements in many aspects of EH&S performance in 2018. Dow's process safety performance was excellent in 2018 and improvements were made in injury/illness rates. Safety remains a priority for the entire Company. Further improvement in these areas, as well as environmental compliance, remains a top management priority, with initiatives underway to further improve performance and compliance in 2019 as Dow continues to implement the Company's 2025 Sustainability Goals.

Detailed information on Dow's performance regarding environmental matters and goals can be found online on Dow's Science & Sustainability webpage at www.dow.com. The Company's website and its content are not deemed incorporated by reference into this report.

Chemical Security

Public and political attention continues to be placed on the protection of critical infrastructure, including the chemical industry, from security threats. Terrorist attacks, natural disasters and cyber incidents have increased concern about the security and safety of chemical production and distribution. Many, including Dow and the American Chemistry Council, have called for uniform risk-based and performance-based national standards for securing the U.S. chemical industry. The Maritime Transportation Security Act of 2002 and its regulations further set forth risk-based and performance-based standards that must be met at U.S. Coast Guard-regulated facilities. U.S. Chemical Plant Security

legislation was passed in 2006 and the Department of Homeland Security is now implementing the regulations known as the Chemical Facility Anti-Terrorism Standards. The Company is complying with the requirements of the Rail Transportation Security Rule issued by the U.S. Transportation Security Administration. Dow continues to support uniform risk-based national standards for securing the chemical industry.

The focus on security, emergency planning, preparedness and response is not new to Dow. A comprehensive, multi-level security plan for the Company has been maintained since 1988. This plan, which has been activated in response to significant world and national events since then, is reviewed on an annual basis. Dow continues to improve its security plans, placing emphasis on the safety of Dow communities and people by being prepared to meet risks at any level and to address both internal and external identifiable risks. The security plan includes regular vulnerability assessments, security audits, mitigation efforts and physical security upgrades designed to reduce vulnerability. Dow’s security plans also are developed to avert interruptions of normal business operations that could materially and adversely affect the Company’s results of operations, liquidity and financial condition.

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Dow played a key role in the development and implementation of the American Chemistry Council's RESPONSIBLE CARE® Security Code ("Security Code"), which requires that all aspects of security – including facility, transportation and cyberspace – be assessed and gaps addressed. Through the Company's global implementation of the Security Code, Dow has permanently heightened the level of security – not just in the United States, but worldwide. Dow employs several hundred employees and contractors in its Emergency Services and Security department worldwide.

Through the implementation of the Security Code, including voluntary security enhancements and upgrades made since 2002, Dow is well-positioned to comply with U.S. chemical facility regulations and other regulatory security frameworks. Dow is currently participating with the American Chemistry Council to review and update the Security Code.

Dow continues to work collaboratively across the supply chain on RESPONSIBLE CARE®, Supply Chain Design, Emergency Preparedness, Shipment Visibility and transportation of hazardous materials. Dow is cooperating with public and private entities to lead the implementation of advanced tank car design, and track and trace technologies. Further, Dow's Distribution Risk Review process that has been in place for decades was expanded to address potential threats in all modes of transportation across the Company's supply chain. To reduce vulnerabilities, Dow maintains security measures that meet or exceed regulatory and industry security standards in all areas in which the Company operates.

Dow's initiatives relative to chemical security, emergency preparedness and response, Community Awareness and Emergency Responses and crisis management are implemented consistently at all Dow sites on a global basis. Dow participates with chemical associations globally and participates as an active member of the U.S. delegation to the G7 Global Partnership Sub-Working Group on Chemical Security.

Climate Change

Climate change matters for Dow are likely to be driven by changes in regulations, public policy and physical climate parameters.

Regulatory Matters

Regulatory matters include cap and trade schemes; increased greenhouse gas ("GHG") limits; and taxes on GHG emissions, fuel and energy. The potential implications of each of these matters are all very similar, including increased cost of purchased energy, additional capital costs for installation or modification of GHG emitting equipment, and additional costs associated directly with GHG emissions (such as cap and trade systems or carbon taxes), which are primarily related to energy use. It is difficult to estimate the potential impact of these regulatory matters on energy prices.

Reducing Dow's overall energy usage and GHG emissions through new and unfolding projects will decrease the potential impact of these regulatory matters. Dow also has a dedicated commercial group to handle energy contracts and purchases, including managing emissions trading. The Company has not experienced any material impact related to regulated GHG emissions. The Company continues to evaluate and monitor this area for future developments.

Physical Climate Parameters

Many scientific academies throughout the world have concluded that it is very likely that human activities are contributing to global warming. At this point, it is difficult to predict and assess the probability and opportunity of a global warming trend on Dow specifically. Preparedness plans are developed that detail actions needed in the event of severe weather. These measures have historically been in place and these activities and associated costs are driven by normal operational preparedness. Dow continues to study the long-term implications of changing climate parameters on water availability, plant siting issues, and impacts and opportunities for products.

Dow’s Energy business and Public Affairs and Sustainability functions are tasked with developing and implementing a comprehensive strategy that addresses the potential challenges of energy security and GHG emissions on the Company. The Company continues to elevate its internal focus and external positions - to focus on the root causes of GHG emissions - including the unsustainable use of energy. Dow's energy plan provides the roadmap:

- Conserve - aggressively pursue energy efficiency and conservation
- Optimize - increase and diversify energy resources
- Accelerate - develop cost-effective, clean, renewable and alternative energy sources
- Transition - to a sustainable energy future

Through corporate energy efficiency programs and focused GHG management efforts, the Company has and is continuing to reduce its GHG emissions footprint. The Company’s manufacturing intensity, measured in Btu per pound of product, has improved by more than 40 percent since 1990. As part of the Company's 2025 Sustainability Goals, Dow will maintain GHG emissions below 2006 levels on an absolute basis for all GHGs.

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Dow intends to implement the recommendations of the Financial Stability Board Task Force on Climate-Related Disclosures ("Task Force") over the next two to four years, which is aligned with the recommendations of the Task Force.

Environmental Remediation

Dow accrues the costs of remediation of its facilities and formerly owned facilities based on current law and regulatory requirements. The nature of such remediation can include management of soil and groundwater contamination. The accounting policies adopted to properly reflect the monetary impacts of environmental matters are discussed in Note 1 to the Consolidated Financial Statements. To assess the impact on the financial statements, environmental experts review currently available facts to evaluate the probability and scope of potential liabilities. Inherent uncertainties exist in such evaluations primarily due to unknown environmental conditions, changing governmental regulations and legal standards regarding liability, and the ability to apply remediation technologies. These liabilities are adjusted periodically as remediation efforts progress or as additional technical or legal information becomes available. Dow had an accrued liability of $664 million at December 31, 2018, related to the remediation of current or former Dow-owned sites. At December 31, 2017, the liability related to remediation was $726 million.

In addition to current and former Dow-owned sites, under the federal Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA") and equivalent state laws (hereafter referred to collectively as "Superfund Law"), Dow is liable for remediation of other hazardous waste sites where Dow allegedly disposed of, or arranged for the treatment or disposal of, hazardous substances. Because Superfund Law imposes joint and several liability upon each party at a site, Dow has evaluated its potential liability in light of the number of other companies that also have been named potentially responsible parties (“PRPs”) at each site, the estimated apportionment of costs among all PRPs, and the financial ability and commitment of each to pay its expected share. The Company’s remaining liability for the remediation of Superfund sites was $156 million at December 31, 2018 ($152 million at December 31, 2017). The Company has not recorded any third-party recovery related to these sites as a receivable.

Information regarding environmental sites is provided below:

Environmental Sites	Dow-owned Sites[1]		Superfund Sites[2]	
	2018	2017	2018	2017
Number of sites at Jan 1	244	189	131	131
Sites added during year	3	60	2	2
Sites closed during year	(9)	(5)	(2)	(2)
Number of sites at Dec 31	238	244	131	131

1. Dow-owned sites are sites currently or formerly owned by Dow. In the United States, remediation obligations are imposed by the Resource Conservation and Recovery Act or analogous state law. At December 31, 2018, 32 of these sites (35 sites at December 31, 2017) were formerly owned by Dowell Schlumberger, Inc., a group of companies in which the Company previously owned a 50 percent interest. Dow sold its interest in Dowell Schlumberger in 1992.
2. Superfund sites are sites, including sites not owned by Dow, where remediation obligations are imposed by Superfund Law.

Additional information is provided below for the Company’s Midland, Michigan, manufacturing site and Midland off-site locations (collectively, the "Midland sites"), as well as a Superfund site in Wood-Ridge, New Jersey, the locations for which the Company has the largest potential environmental liabilities.

In the early days of operations at the Midland manufacturing site, wastes were usually disposed of on-site, resulting in soil and groundwater contamination, which has been contained and managed on-site under a series of Resource Conservation and Recovery Act permits and regulatory agreements. The Hazardous Waste Operating License for the Midland manufacturing site, issued in 2003, and renewed and replaced in September 2015, also included provisions for the Company to conduct an investigation to determine the nature and extent of off-site contamination from historic Midland manufacturing site operations. In January 2010, the Company, the U.S. Environmental Protection Agency ("EPA") and the State of Michigan ("State") entered into an Administrative Order on Consent that requires the Company to conduct a remedial investigation, a feasibility study and a remedial design for the Tittabawassee River, the Saginaw River and the Saginaw Bay, and pay the oversight costs of the EPA and the State under the authority of CERCLA. See Note 16 to the Consolidated Financial Statements for additional information. At December 31, 2018, the Company had an accrual of $134 million ($131 million at December 31, 2017) for environmental remediation and investigation associated with the Midland sites. In 2018, the Company spent $26 million ($24 million in 2017) for environmental remediation at the Midland sites.

Rohm and Haas, a wholly owned subsidiary of Dow, is a PRP at the Wood-Ridge, New Jersey Ventron/Velsicol Superfund Site, and the adjacent Berry’s Creek Study Area ("BCSA") (collectively, the "Wood-Ridge sites"). Rohm and Haas is a successor in interest to a company that owned and operated a mercury processing facility, where wastewater and waste handling resulted in contamination of soils and adjacent creek sediments. The Berry’s Creek Study Area PRP group completed a multi-stage Remedial Investigation ("RI") pursuant to an Administrative Order on Consent with U.S. EPA Region 2 to identify contamination in surface water, sediment and biota related to numerous contaminated sites in the Berry's Creek watershed, and submitted the report to the

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EPA in June 2016. That same month, the EPA concluded that an "iterative or adaptive approach" was appropriate for cleaning up the BCSA. Thus, each phase of remediation will be followed by a period of monitoring to assess its effectiveness and determine if there is a need for more work. The Feasibility Study ("FS") for the first phase of work was submitted in the third quarter of 2018. The EPA selected the interim remedy and issued an interim Record of Decision ("ROD"). The PRP group is negotiating agreements among the PRP's to fund design of the selected remedy and with the EPA to design the selected remedy. Although there is currently much uncertainty as to what will ultimately be required to remediate the BCSA and Rohm and Haas's share of these costs has yet to be determined, the range of activities that are required in the interim ROD is known in general terms. Based on the interim remedy selected by the EPA, the overall remediation accrual for the Wood-Ridge sites was increased by $21 million in the fourth quarter of 2018. At December 31, 2018, the Company had an accrual of $106 million ($88 million at December 31, 2017) for environmental remediation at the Wood-Ridge sites. In 2018, the Company spent $6 million ($7 million in 2017) on environmental remediation at the Wood-Ridge sites.

In the fourth quarter of 2016, the Company recorded a pretax charge of $295 million for environmental remediation at a number of historical locations, including the Midland manufacturing site/off-site matters and the Wood-Ridge sites, primarily resulting from the culmination of negotiations with regulators and/or final agency approval. This charge was included in "Cost of sales" in the consolidated statements of income. In total, the Company’s accrued liability for probable environmental remediation and restoration costs was $820 million at December 31, 2018, compared with $878 million at December 31, 2017. This is management’s best estimate of the costs for remediation and restoration with respect to environmental matters for which the Company has accrued liabilities, although it is reasonably possible that the ultimate cost with respect to these particular matters could range up to approximately two times that amount. Consequently, it is reasonably possible that environmental remediation and restoration costs in excess of amounts accrued could have a material impact on the Company’s results of operations, financial condition and cash flows. It is the opinion of the Company’s management, however, that the possibility is remote that costs in excess of the range disclosed will have a material impact on the Company’s results of operations, financial condition and cash flows.

The amounts charged to income on a pretax basis related to environmental remediation totaled $174 million in 2018, $171 million in 2017 and $504 million in 2016. The amounts charged to income on a pretax basis related to operating the Company’s current pollution abatement facilities, excluding internal recharges, totaled $772 million in 2018, $640 million in 2017 and $623 million in 2016. Capital expenditures for environmental protection were $76 million in 2018, $79 million in 2017 and $66 million in 2016.

Asbestos-Related Matters of Union Carbide Corporation

Union Carbide is and has been involved in a large number of asbestos-related suits filed primarily in state courts during the past four decades. These suits principally allege personal injury resulting from exposure to asbestos-containing products and frequently seek both actual and punitive damages. The alleged claims primarily relate to products that Union Carbide sold in the past, alleged exposure to asbestos-containing products located on Union Carbide’s premises, and Union Carbide’s responsibility for asbestos suits filed against a former Union Carbide subsidiary, Amchem. In many cases, plaintiffs are unable to demonstrate that they have suffered any compensable loss as a result of such exposure, or that injuries incurred in fact resulted from exposure to Union Carbide’s products.

The table below provides information regarding asbestos-related claims pending against Union Carbide and Amchem based on criteria developed by Union Carbide and its external consultants.

Asbestos-Related Claim Activity	2018	2017	2016
Claims unresolved at Jan 1	15,427	16,141	18,778
Claims filed	6,599	7,010	7,813

Claims settled, dismissed or otherwise resolved	(9,246)	(7,724)	(10,450)
Claims unresolved at Dec 31	12,780	15,427	16,141
Claimants with claims against both Union Carbide and Amchem	(4,675)	(5,530)	(5,741)
Individual claimants at Dec 31	8,105	9,897	10,400

Plaintiffs' lawyers often sue numerous defendants in individual lawsuits or on behalf of numerous claimants. As a result, the damages alleged are not expressly identified as to Union Carbide, Amchem or any other particular defendant, even when specific damages are alleged with respect to a specific disease or injury. In fact, there are no asbestos personal injury cases in which only Union Carbide and/or Amchem are the sole named defendants. For these reasons and based upon Union Carbide's litigation and settlement experience, Union Carbide does not consider the damages alleged against Union Carbide and Amchem to be a meaningful factor in its determination of any potential asbestos-related liability.

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For additional information see Part I, Item 3. Legal Proceedings and Asbestos-Related Matters and Note 16 to the Consolidated Financial Statements.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Dow's business operations give rise to market risk exposure due to changes in foreign exchange rates, interest rates, commodity prices and other market factors such as equity prices. To manage such risks effectively, the Company enters into hedging transactions, pursuant to established guidelines and policies that enable it to mitigate the adverse effects of financial market risk. Derivatives used for this purpose are designated as hedges per the accounting guidance related to derivatives and hedging activities, where appropriate. A secondary objective is to add value by creating additional non-specific exposure within established limits and policies; derivatives used for this purpose are not designated as hedges. The potential impact of creating such additional exposures is not material to the Company's results.

The global nature of Dow's business requires active participation in the foreign exchange markets. The Company has assets, liabilities and cash flows in currencies other than the U.S. dollar. The primary objective of the Company's foreign currency risk management is to optimize the U.S. dollar value of net assets and cash flows. To achieve this objective, the Company hedges on a net exposure basis using foreign currency forward contracts, over-the-counter option contracts, cross-currency swaps and nonderivative instruments in foreign currencies. Exposures primarily relate to assets, liabilities and bonds denominated in foreign currencies, as well as economic exposure, which is derived from the risk that currency fluctuations could affect the dollar value of future cash flows related to operating activities. The largest exposures are denominated in European currencies, the Japanese yen and the Chinese yuan, although exposures also exist in other currencies of Asia Pacific, Canada, Latin America, Middle East, Africa and India.

The main objective of interest rate risk management is to reduce the total funding cost to the Company and to alter the interest rate exposure to the desired risk profile. To achieve this objective, the Company hedges using interest rate swaps, "swaptions," and exchange-traded instruments. The Company's primary exposure is to the U.S. dollar yield curve.

Dow has a portfolio of equity securities derived primarily from the investment activities of its insurance subsidiaries. This exposure is managed in a manner consistent with the Company's market risk policies and procedures.

Inherent in Dow's business is exposure to price changes for several commodities. Some exposures can be hedged effectively through liquid tradable financial instruments. Natural gas and crude oil, along with feedstocks for ethylene and propylene production, constitute the main commodity exposures. Over-the-counter and exchange traded instruments are used to hedge these risks, when feasible.

Dow uses value-at-risk ("VAR"), stress testing and scenario analysis for risk measurement and control purposes. VAR estimates the maximum potential loss in fair market values, given a certain move in prices over a certain period of time, using specified confidence levels. The VAR methodology used by the Company is a variance/covariance model. This model uses a 97.5 percent confidence level and includes at least one year of historical data. The 2018 and 2017 year-end and average daily VAR for the aggregate of all positions are shown below. These amounts are immaterial relative to the total equity of the Company.

Total Daily VAR by Exposure Type at Dec 31	2018		2017	
In millions	Year-End	Average	Year-End	Average
Commodities	$26	$ 30	$32	$ 35
Equity securities	12	7	4	9
Foreign exchange	26	28	26	38

Interest rate	81	80	70	76
Composite	$145	$ 145	$132	$ 158

The Company’s daily VAR for the aggregate of all positions increased from a composite VAR of $132 million at December 31, 2017 to a composite VAR of $145 million at December 31, 2018. The interest rate VAR increased due to an increase in exposure. The equity securities VAR increased due to an increase in managed exposures and higher equity volatility. The commodities VAR decreased due to a decrease in managed exposure. See Note 21 to the Consolidated Financial Statements for further disclosure regarding market risk.

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ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Board of Directors of The Dow Chemical Company

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of The Dow Chemical Company and subsidiaries (the "Company") as of December 31, 2018 and 2017, the related consolidated statements of income, comprehensive income, equity, and cash flows, for each of the three years in the period ended December 31, 2018, and the related notes and the schedule listed in the Index at Item 15(a)2 (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018, in conformity with accounting principles generally accepted in the United States of America.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission and our report dated February 11, 2019, expressed an unqualified opinion on the Company's internal control over financial reporting.

Changes in Accounting Principles

As discussed in Note 16 to the financial statements, in the fourth quarter of 2016, the Company changed its accounting policy from expensing asbestos-related defense and processing costs as incurred to the accrual of asbestos-related defense and processing costs when probable of occurring and estimable. As discussed in Note 4 to the financial statements, in the first quarter of 2018, the Company changed its method of accounting for revenue due to the adoption of Accounting Standards Codification Topic 606, Revenue From Contracts With Customers.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ DELOITTE & TOUCHE LLP
Deloitte & Touche LLP
Midland, Michigan
February 11, 2019

We have served as the Company's auditor since 1905.

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The Dow Chemical Company and Subsidiaries
Consolidated Statements of Income

(In millions) For the years ended Dec 31,	2018	2017	2016
Net sales	$60,278	$55,508	$48,158
Cost of sales	47,705	43,612	37,668
Research and development expenses	1,536	1,648	1,593
Selling, general and administrative expenses	2,846	2,920	2,953
Amortization of intangibles	622	624	544
Restructuring, goodwill impairment and asset related charges - net	620	3,100	595
Integration and separation costs	1,044	786	349
Asbestos-related charge	—	—	1,113
Equity in earnings of nonconsolidated affiliates	950	762	442
Sundry income (expense) - net	181	195	1,486
Interest expense and amortization of debt discount	1,118	976	858
Income before income taxes	5,918	2,799	4,413
Provision for income taxes	1,285	2,204	9
Net income	4,633	595	4,404
Net income attributable to noncontrolling interests	134	129	86
Net income attributable to The Dow Chemical Company	4,499	466	4,318
Preferred stock dividends	—	—	340
Net income available for The Dow Chemical Company common stockholder	$4,499	$466	$3,978

See Notes to the Consolidated Financial Statements.

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The Dow Chemical Company and Subsidiaries
Consolidated Statements of Comprehensive Income

(In millions) For the years ended Dec 31,	2018	2017	2016
Net income	$ 4,633	$ 595	$ 4,404
Other comprehensive income (loss), net of tax			
Unrealized losses on investments	(67)	(46)	(4)
Cumulative translation adjustments	(225)	900	(644)
Pension and other postretirement benefit plans	(40)	391	(620)
Derivative instruments	75	(14)	113
Total other comprehensive income (loss)	(257)	1,231	(1,155)
Comprehensive income	4,376	1,826	3,249
Comprehensive income attributable to noncontrolling interests, net of tax	97	172	83
Comprehensive income attributable to The Dow Chemical Company	$ 4,279	$ 1,654	$ 3,166

See Notes to the Consolidated Financial Statements.

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The Dow Chemical Company and Subsidiaries
Consolidated Balance Sheets

(In millions, except share amounts) At Dec 31,	2018	2017
Assets		
Current Assets		
Cash and cash equivalents (variable interest entities restricted - 2018: $82; 2017: $107)	$2,669	$6,188
Marketable securities	100	4
Accounts and notes receivable:		
Trade (net of allowance for doubtful receivables - 2018: $106; 2017: $117)	8,246	7,338
Other	4,136	4,711
Inventories	9,260	8,376
Other current assets	852	627
Total current assets	25,263	27,244
Investments		
Investment in nonconsolidated affiliates	3,823	3,742
Other investments (investments carried at fair value - 2018: $1,699; 2017: $1,512)	2,648	2,510
Noncurrent receivables	394	594
Total investments	6,865	6,846
Property		
Property	61,437	60,426
Less accumulated depreciation	37,775	36,614
Net property (variable interest entities restricted - 2018: $734; 2017: $907)	23,662	23,812
Other Assets		
Goodwill	13,848	13,938
Other intangible assets (net of accumulated amortization - 2018: $5,762; 2017: $5,161)	4,913	5,549
Deferred income tax assets	2,031	1,722
Deferred charges and other assets	796	829
Total other assets	21,588	22,038
Total Assets	$77,378	$79,940
Liabilities and Equity		
Current Liabilities		
Notes payable	$305	$484
Long-term debt due within one year	340	752
Accounts payable:		
Trade	5,378	5,360
Other	3,330	3,062
Income taxes payable	791	694
Accrued and other current liabilities	3,611	4,025
Total current liabilities	13,755	14,377
Long-Term Debt (variable interest entities nonrecourse - 2018: $75; 2017: $249)	19,254	19,765
Other Noncurrent Liabilities		
Deferred income tax liabilities	664	764
Pension and other postretirement benefits - noncurrent	9,226	10,794
Asbestos-related liabilities - noncurrent	1,142	1,237
Other noncurrent obligations	5,368	5,994
Total other noncurrent liabilities	16,400	18,789
Stockholders’ Equity		

Common stock (authorized and issued 100 shares of $0.01 par value each)	—	—
Additional paid-in capital	7,042	6,553
Retained earnings	29,808	28,050
Accumulated other comprehensive loss	(9,885)	(8,591)
Unearned ESOP shares	(134)	(189)
The Dow Chemical Company’s stockholders’ equity	26,831	25,823
Noncontrolling interests	1,138	1,186
Total equity	27,969	27,009
Total Liabilities and Equity	$77,378	$79,940

See Notes to the Consolidated Financial Statements.

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The Dow Chemical Company and Subsidiaries
Consolidated Statements of Cash Flows

(In millions) For the years ended Dec 31,	2018	2017	2016
Operating Activities			
Net income	$4,633	$595	$4,404
Adjustments to reconcile net income to net cash provided by (used for) operating activities:			
Depreciation and amortization	3,329	3,155	2,862
Provision (Credit) for deferred income tax	(530)	933	(1,259)
Earnings of nonconsolidated affiliates less than (in excess of) dividends received	(42)	95	243
Net periodic pension benefit cost	380	1,137	389
Pension contributions	(1,656)	(1,676)	(629)
Net gain on sales of assets, businesses and investments	(67)	(1,156)	(214)
Net (gain) loss on step acquisition of nonconsolidated affiliate	47	—	(2,445)
Restructuring, goodwill impairment and asset related charges - net	620	3,100	595
Asbestos-related charge	—	—	1,113
Other net loss	426	378	361
Changes in assets and liabilities, net of effects of acquired and divested companies:			
Accounts and notes receivable	(1,532)	(11,927)	(8,833)
Inventories	(983)	(1,225)	610
Accounts payable	359	1,735	569
Other assets and liabilities, net	(1,090)	(102)	(723)
Cash provided by (used for) operating activities	3,894	(4,958)	(2,957)
Investing Activities			
Capital expenditures	(2,538)	(3,144)	(3,804)
Investment in gas field developments	(114)	(121)	(113)
Purchases of previously leased assets	(26)	(187)	—
Proceeds from sales of property and businesses, net of cash divested	155	1,691	284
Acquisitions of property and businesses, net of cash acquired	(20)	47	(187)
Cash acquired in step acquisition of nonconsolidated affiliate	—	—	1,070
Investments in and loans to nonconsolidated affiliates	(18)	(749)	(1,020)
Distributions and loan repayments from nonconsolidated affiliates	55	69	109
Proceeds from sales of ownership interests in nonconsolidated affiliates	4	64	22
Purchases of investments	(1,530)	(643)	(577)
Proceeds from sales and maturities of investments	1,216	1,163	733
Proceeds from interests in trade accounts receivable conduits	657	9,462	8,551
Other investing activities, net	31	(100)	24
Cash provided by (used for) investing activities	(2,128)	7,552	5,092
Financing Activities			
Changes in short-term notes payable	(176)	293	(33)
Proceeds from issuance of long-term debt	2,000	—	32
Payments on long-term debt	(3,058)	(621)	(588)
Purchases of treasury stock	—	—	(916)
Proceeds from issuance of parent company stock	112	66	—
Proceeds from sales of common stock	—	423	398
Employee taxes paid for share-based payment arrangements	(92)	(93)	(65)
Distributions to noncontrolling interests	(172)	(129)	(176)
Purchases of noncontrolling interests	—	—	(202)

Dividends paid to stockholders	—	(2,179)	(2,462)
Dividends paid to parent	(3,711)	(1,056)	—
Other financing activities, net	(67)	(35)	(2)
Cash used for financing activities	(5,164)	(3,331)	(4,014)
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(100)	320	(77)
Summary			
Decrease in cash, cash equivalents and restricted cash	(3,498)	(417)	(1,956)
Cash, cash equivalents and restricted cash at beginning of year	6,207	6,624	8,580
Cash, cash equivalents and restricted cash at end of year	$2,709	$6,207	$6,624
Less: Restricted cash and cash equivalents, included in "Other current assets"	40	19	17
Cash and cash equivalents at end of year	$2,669	$6,188	$6,607
Supplemental cash flow information			
Cash paid during year for:			
Interest, net of amounts capitalized	$1,198	$1,178	$1,192
Income taxes	$1,419	$1,805	$1,592

See Notes to the Consolidated Financial Statements.

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The Dow Chemical Company and Subsidiaries
Consolidated Statements of Equity

(In millions)	Preferred Stock	Common Stock	Add'l Paid in Capital	Retained Earnings	Accum Other Comp Loss	Unearned ESOP	Treasury Stock	Non-controlling Interests	Total Equity
2016									
Balance at Jan 1, 2016	$4,000	$3,107	$4,936	$28,425	$(8,667)	$ (272)	$(6,155)	$ 809	$26,183
Net income available for The Dow Chemical Company common stockholders	—	—	—	3,978	—	—	—	—	3,978
Other comprehensive loss	—	—	—	—	(1,155)	—	—	—	(1,155)
Dividends to stockholders	—	—	—	(2,037)	—	—	—	—	(2,037)
Common stock issued/sold	—	—	398	—	—	—	717	—	1,115
Stock-based compensation and allocation of ESOP shares	—	—	(376)	—	—	51	—	—	(325)
ESOP shares acquired	—	—	—	—	—	(18)	—	—	(18)
Impact of noncontrolling interests	—	—	—	—	—	—	—	433	433
Treasury stock purchases	—	—	—	—	—	—	(916)	—	(916)
Preferred stock converted to common stock	(4,000)	—	(695)	—	—	—	4,695	—	—
Other	—	—	(1)	(28)	—	—	—	—	(29)
Balance at Dec 31, 2016	$—	$3,107	$4,262	$30,338	$(9,822)	$ (239)	$(1,659)	$ 1,242	$27,229
2017									
Net income available for The Dow Chemical Company common stockholder	—	—	—	466	—	—	—	—	466
Other comprehensive income	—	—	—	—	1,231	—	—	—	1,231
Dividends to stockholders	—	—	—	(1,673)	—	—	—	—	(1,673)
Dividends to parent	—	—	—	(1,056)	—	—	—	—	(1,056)
Common stock issued/sold	—	—	423	—	—	—	724	—	1,147
Issuance of parent company stock	—	—	66	—	—	—	—	—	66
Stock-based compensation and allocation of ESOP shares	—	—	(368)	—	—	50	—	—	(318)
Impact of noncontrolling interests	—	—	—	—	—	—	—	(56)	(56)
Merger impact	—	(3,107)	2,172	—	—	—	935	—	—
Other	—	—	(2)	(25)	—	—	—	—	(27)
Balance at Dec 31, 2017	$—	$—	$6,553	$28,050	$(8,591)	$ (189)	$—	$ 1,186	$27,009
2018									
Adoption of accounting standards (Note 1)	—	—	—	989	(1,037)	—	—	—	(48)
Net income available for The Dow Chemical Company common stockholder	—	—	—	4,499	—	—	—	—	4,499
Other comprehensive loss	—	—	—	—	(257)	—	—	—	(257)

Dividends to parent	—	—	—	(3,711)	—	—	—	—	(3,711)
Issuance of parent company stock	—	—	112	—	—	—	—	—	112
Stock-based compensation and allocation of ESOP shares	—	—	377	—	—	55	—	—	432
Impact of noncontrolling interests	—	—	—	—	—	—	—	(48)	(48)
Other	—	—	—	(19)	—	—	—	—	(19)
Balance at Dec 31, 2018	$—	$—	$7,042	$29,808	$(9,885)	$(134)	$—	$ 1,138	$27,969

See Notes to the Consolidated Financial Statements.

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The Dow Chemical Company and Subsidiaries
Notes to the Consolidated Financial Statements
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NOTE 1 – SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Principles of Consolidation and Basis of Presentation

The accompanying consolidated financial statements of The Dow Chemical Company and its subsidiaries (“Dow” or the “Company”) were prepared in accordance with accounting principles generally accepted in the United States of America (“U.S. GAAP”) and include the assets, liabilities, revenues and expenses of all majority-owned subsidiaries over which the Company exercises control and, when applicable, entities for which the Company has a controlling financial interest or is the primary beneficiary. Intercompany transactions and balances are eliminated in consolidation. Investments in nonconsolidated affiliates (20-50 percent owned companies or less than 20 percent owned companies over which significant influence is exercised) are accounted for using the equity method.

Effective August 31, 2017, pursuant to the merger of equals transaction contemplated by the Agreement and Plan of Merger, dated as of December 11, 2015, as amended on March 31, 2017, Dow and E. I. du Pont de Nemours and Company ("DuPont") each merged with subsidiaries of DowDuPont Inc. ("DowDuPont") and, as a result, Dow and DuPont became subsidiaries of DowDuPont (the "Merger"). In accordance with the accounting guidance for earnings per share, the presentation of earnings per share is not required in financial statements of wholly owned subsidiaries.

See Note 3 for additional information on the Merger.

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Beginning September 1, 2017, transactions between DowDuPont, Dow and DuPont and their affiliates are reflected in these consolidated financial statements and will be disclosed as related party transactions, when material. Transactions between Dow and DuPont primarily consist of the sale and procurement of certain feedstocks, energy and raw materials that are consumed in each company's manufacturing process. See Note 24 for additional information.

Effective with the Merger, Dow’s business activities are components of its parent company’s business operations. Dow’s business activities, including the assessment of performance and allocation of resources, are reviewed and managed by DowDuPont. Information used by the chief operating decision maker of Dow relates to the Company in its entirety. Accordingly, there are no separate reportable business segments for the Company under Accounting Standards Codification ("ASC") Topic 280 “Segment Reporting” and the Company’s business results are reported in this Form 10-K as a single operating segment.

Except as otherwise indicated by the context, the term "Union Carbide" means Union Carbide Corporation, a wholly owned subsidiary of Dow, and "Dow Silicones" means Dow Silicones Corporation (formerly known as Dow Corning Corporation, which changed its name effective as of February 1, 2018), a wholly owned subsidiary of Dow.

Use of Estimates in Financial Statement Preparation

The preparation of financial statements in accordance with U.S. GAAP requires the use of estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenses during the reporting period. The Company’s consolidated financial statements include amounts that are based on management’s best estimates and judgments. Actual results could differ from those estimates.

Significant Accounting Policies

Asbestos-Related Matters

Accruals for asbestos-related matters, including defense and processing costs, are recorded based on an analysis of claim and resolution activity, defense spending, and pending and future claims. These accruals are assessed at each balance sheet date to determine if the asbestos-related liability remains appropriate. Accruals for asbestos-related matters are included in the consolidated balance sheets in “Accrued and other current liabilities” and “Asbestos-related liabilities - noncurrent.” See Note 16 for additional information.

Legal Costs

The Company expenses legal costs as incurred, with the exception of defense and processing costs associated with asbestos-related matters.

Foreign Currency Translation

The local currency has been primarily used as the functional currency throughout the world. Translation gains and losses of those operations that use local currency as the functional currency are included in the consolidated balance sheets in "Accumulated other comprehensive loss" ("AOCL"). For certain subsidiaries, the U.S. dollar is used as the functional currency. This occurs when the subsidiary operates in an economic environment where the products produced and sold are tied to U.S. dollar-denominated markets, or when the foreign subsidiary operates in a hyper-inflationary environment. Where the U.S. dollar is used as the functional currency, foreign currency translation gains and losses are reflected in income.

Environmental Matters

Accruals for environmental matters are recorded when it is probable that a liability has been incurred and the amount of the liability can be reasonably estimated based on current law and existing technologies. These accruals are adjusted periodically as assessment and remediation efforts progress or as additional technical or legal information

becomes available. Accruals for environmental liabilities are included in the consolidated balance sheets in “Accrued and other current liabilities” and “Other noncurrent obligations” at undiscounted amounts. Accruals for related insurance or other third-party recoveries for environmental liabilities are recorded when it is probable that a recovery will be realized and are included in the consolidated balance sheets in “Accounts and notes receivable - Other.”

Environmental costs are capitalized if the costs extend the life of the property, increase its capacity and/or mitigate or prevent contamination from future operations. Environmental costs are also capitalized in recognition of legal asset retirement obligations resulting from the acquisition, construction and/or normal operation of a long-lived asset. Costs related to environmental contamination treatment and cleanup are charged to expense. Estimated future incremental operations, maintenance and management costs directly related to remediation are accrued when such costs are probable and reasonably estimable.

Cash and Cash Equivalents

Cash and cash equivalents include time deposits and investments with maturities of three months or less at the time of purchase.

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Financial Instruments

The Company calculates the fair value of financial instruments using quoted market prices when available. When quoted market prices are not available for financial instruments, the Company uses standard pricing models with market-based inputs that take into account the present value of estimated future cash flows.

The Company utilizes derivatives to manage exposures to foreign currency exchange rates, commodity prices and interest rate risk. The fair values of all derivatives are recognized as assets or liabilities at the balance sheet date. Changes in the fair values of these instruments are reported in income or AOCL, depending on the use of the derivative and whether the Company has elected hedge accounting treatment.

Gains and losses on derivatives that are designated and qualify as cash flow hedging instruments are recorded in AOCL until the underlying transactions are recognized in income. Gains and losses on derivative and non-derivative instruments used as hedges of the Company’s net investment in foreign operations are recorded in AOCL as part of the cumulative translation adjustment. Prior to the adoption of Accounting Standards Update ("ASU") 2017-12, "Derivatives and Hedging (Topic 815): Targeted Improvements to Accounting for Hedging Activities" in 2018, the ineffective portions of hedges, if any, were recognized in income immediately. See Note 2 for additional information.

Gains and losses on derivatives designated and qualifying as fair value hedging instruments, as well as the offsetting losses and gains on the hedged items, are reported in income in the same accounting period. Derivatives not designated as hedging instruments are marked-to-market at the end of each accounting period with the results included in income.

Inventories

Inventories are stated at the lower of cost or net realizable value. The method of determining cost for each subsidiary varies among last-in, first-out (“LIFO”); first-in, first-out (“FIFO”); and average cost, and is used consistently from year to year. At December 31, 2018, approximately 24 percent, 70 percent and 6 percent of the Company's inventories were accounted for under the LIFO, FIFO and average cost methods, respectively. At December 31, 2017, approximately 24 percent, 67 percent and 9 percent of the Company's inventories were accounted for under the LIFO, FIFO and average cost methods, respectively.

The Company routinely exchanges and swaps raw materials and finished goods with other companies to reduce delivery time, freight and other transportation costs. These transactions are treated as non-monetary exchanges and are valued at cost.

Property

Land, buildings and equipment, including property under capital lease agreements, are carried at cost less accumulated depreciation. Depreciation is based on the estimated service lives of depreciable assets and is calculated using the straight-line method, unless the asset was capitalized before 1997 when the declining balance method was used. Fully depreciated assets are retained in property and accumulated depreciation accounts until they are removed from service. In the case of disposals, assets and related accumulated depreciation are removed from the accounts, and the net amounts, less proceeds from disposal, are included in income.

Impairment and Disposal of Long-Lived Assets

The Company evaluates long-lived assets and certain identifiable intangible assets for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. When undiscounted future cash flows are not expected to be sufficient to recover an asset’s carrying amount, the asset is written down to its fair value based on bids received from third parties or a discounted cash flow analysis based on market participant assumptions.

Long-lived assets to be disposed of by sale, if material, are classified as held for sale and reported at the lower of carrying amount or fair value less cost to sell, and depreciation is ceased. Long-lived assets to be disposed of other than by sale are classified as held and used until they are disposed of and reported at the lower of carrying amount or fair value, and depreciation is recognized over the remaining useful life of the assets.

Goodwill and Other Intangible Assets

The Company records goodwill when the purchase price of a business combination exceeds the estimated fair value of net identified tangible and intangible assets acquired. Goodwill is tested for impairment at the reporting unit level annually in the fourth quarter, or more frequently when events or changes in circumstances indicate that the fair value of a reporting unit has more likely than not declined below its carrying value. When testing goodwill for impairment, the Company may first assess qualitative factors. If an initial qualitative assessment identifies that it is more likely than not that the fair value of a reporting unit is less than its carrying value, additional quantitative testing is performed. The Company may also elect to skip the qualitative testing and proceed directly to the quantitative testing. If the quantitative testing indicates that goodwill is impaired, an impairment charge is recognized based on the difference between the reporting unit's carrying value and its fair value. The Company primarily utilizes a discounted cash flow methodology to calculate the fair value of its reporting units.

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Finite-lived intangible assets such as purchased customer lists, developed technology, patents, trademarks and software, are amortized over their estimated useful lives, generally on a straight-line basis for periods ranging primarily from 3 to 20 years. Indefinite-lived intangible assets are reviewed for impairment or obsolescence annually, or more frequently when events or changes in circumstances indicate that the carrying amount of an intangible asset may not be recoverable. If impaired, intangible assets are written down to fair value based on discounted cash flows.

Asset Retirement Obligations

The Company records asset retirement obligations as incurred and reasonably estimable, including obligations for which the timing and/or method of settlement are conditional on a future event that may or may not be within the control of the Company. The fair values of obligations are recorded as liabilities on a discounted basis and are accreted over time for the change in present value. Costs associated with the liabilities are capitalized and amortized over the estimated remaining useful life of the asset, generally for periods of 10 years or less.

Investments

Investments in debt securities, primarily held by the Company’s insurance operations, are classified as trading, available-for-sale or held-to-maturity. Investments classified as trading are reported at fair value with unrealized gains and losses related to mark-to-market adjustments included in income. Those classified as available-for-sale are reported at fair value with unrealized gains and losses recorded in AOCL. Those classified as held-to-maturity are recorded at amortized cost. The cost of investments sold is determined by FIFO or specific identification.

Investments in equity securities, primarily held by the Company’s insurance operations, with a readily determinable fair value are reported at fair value with unrealized gains and losses related to mark-to-market adjustments included in income. Equity securities without a readily determinable fair value are accounted for at cost, adjusted for impairments and observable price changes in orderly transactions.

The Company routinely reviews its investments for declines in fair value below the cost basis. When events or changes in circumstances indicate the carrying value of an asset may not be recoverable, the security is written down to fair value, establishing a new cost basis.

Revenue

Effective with the January 1, 2018 adoption of ASU 2014-09, "Revenue from Contracts with Customers (Topic 606)," and the associated ASUs (collectively, "Topic 606"), the Company recognizes revenue when its customer obtains control of promised goods or services in an amount that reflects the consideration which the Company expects to receive in exchange for those goods or services. To determine revenue recognition for the arrangements that the Company determines are within the scope of Topic 606, the Company performs the following five steps: (1) identify the contract(s) with a customer, (2) identify the performance obligations in the contract, (3) determine the transaction price, (4) allocate the transaction price to the performance obligations in the contract and (5) recognize revenue when (or as) the entity satisfies a performance obligation. See Note 4 for additional information.

Revenue related to the Company's insurance operations includes third-party insurance premiums, which are earned over the terms of the related insurance policies and reinsurance contracts.

In periods prior to the adoption of Topic 606, the Company's accounting policy was to recognize revenue when it was realized or realizable, and the earnings process was complete. Revenue for product sales was recognized as risk and title to the product transferred to the customer, which usually occurred at the time shipment was made. As such, title to the product passed when the product was delivered to the freight carrier. The Company’s standard terms of delivery were included in its contracts of sale, order confirmation documents and invoices. Revenue related to the initial licensing of patent and technology was recognized when earned; revenue related to running royalties was recognized

according to licensee production levels.

Severance Costs

The Company routinely reviews its operations around the world in an effort to ensure competitiveness across its businesses and geographic regions. When the reviews result in a workforce reduction related to the shutdown of facilities or other optimization activities, severance benefits are provided to employees primarily under Dow's ongoing benefit arrangements. These severance costs are accrued once management commits to a plan of termination and it becomes probable that employees will be entitled to benefits at amounts that can be reasonably estimated.

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Integration and Separation Costs

The Company classifies expenses related to the Merger and the ownership restructure of Dow Silicones as "Integration and separation costs" in the consolidated statements of income. Merger-related costs include: costs incurred to prepare for and close the Merger, post-Merger integration expenses and costs incurred to prepare for the separation of the agriculture business, materials science business and specialty products business. The Dow Silicones-related costs include costs incurred to prepare for and close the ownership restructure, as well as integration expenses. These costs primarily consist of financial advisor, information technology, legal, accounting, consulting and other professional advisory fees associated with preparation and execution of these activities.

Income Taxes

The Company accounts for income taxes using the asset and liability method. Under this method, deferred tax assets and liabilities are recognized for the future tax consequences of temporary differences between the carrying amounts and tax bases of assets and liabilities using enacted tax rates. The effect of a change in tax rates on deferred tax assets or liabilities is recognized in income in the period that includes the enactment date. The Company uses the portfolio approach for releasing income tax effects from AOCL.

Effective with the Merger, the Company and DuPont are subsidiaries of DowDuPont. The Company is included in DowDuPont's consolidated tax groups and related income tax returns within certain jurisdictions. The Company will continue to record a separate tax liability for its share of the taxable income and tax attributes and obligations on DowDuPont’s consolidated income tax returns following a formula consistent with the economic sharing of tax attributes and obligations. Dow and DuPont compute the amount due to DowDuPont for their share of taxable income and tax attributes and obligations on DowDuPont’s consolidated tax return. The amounts reported as income tax payable or receivable represent the Company’s payment obligation (or refundable amount) to DowDuPont based on a theoretical tax liability calculated based on the methodologies agreed, elected or required in each combined or consolidated filing jurisdiction.

The Company recognizes the financial statement effects of an uncertain income tax position when it is more likely than not, based on the technical merits, that the position will be sustained upon examination. The Company accrues for other tax contingencies when it is probable that a liability to a taxing authority has been incurred and the amount of the contingency can be reasonably estimated. The current portion of uncertain income tax positions is included in “Income taxes payable” and the long-term portion is included in “Other noncurrent obligations” in the consolidated balance sheets.

Provision is made for taxes on undistributed earnings of foreign subsidiaries and related companies to the extent that such earnings are not deemed to be permanently invested.

See Note 9 for further information relating to the enactment of the Tax Cuts and Jobs Act ("The Act").

Changes to Prior Period Consolidated Financial Statements

In the first quarter of 2018, the Company adopted new accounting standards that required retrospective application. The Company updated the consolidated statements of income as a result of adopting ASU 2017-07, "Compensation - Retirement Benefits (Topic 715): Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost." The consolidated statements of cash flows were updated as a result of adopting ASU 2016-15, "Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments" and ASU 2016-18, "Statement of Cash Flows (Topic 230): Restricted Cash." See Note 2 for additional information on the ASUs. In the third quarter of 2018, the U.S. Securities and Exchange Commission's ("SEC") Office of the Chief Accountant provided additional guidance related to ASU 2016-15 that indicated an entity must evaluate daily transaction activity to calculate the value of cash received from beneficial interests in conduits, resulting in additional

retrospective updates to the consolidated statements of cash flows.

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Changes to the consolidated financial statements as a result of the retrospective application of the new accounting standards are summarized as follows:

Summary of Changes to the Consolidated Statements of Income	2017		2016	
In millions	As Filed	Updated[1]	As Filed	Updated[1]
Cost of sales	$44,308	$43,612	$37,640	$37,668
Research and development expenses	$1,637	$1,648	$1,584	$1,593
Selling, general and administrative expenses	$2,917	$2,920	$2,956	$2,953
Sundry income (expense) - net	$877	$195	$1,452	$1,486

1. Reflects changes resulting from the adoption of ASU 2017-07. See Note 2 for additional information.

Summary of Changes to the Consolidated Statements of Cash Flows	2017		2016	
In millions	As Filed	Updated [1]	As Filed	Updated[1]
Operating Activities				
Accounts and notes receivable	$(4,734)	$(11,927)	$(1,539)	$(8,833)
Proceeds from interests in trade accounts receivable conduits	$2,269	$—	$1,257	$—
Other assets and liabilities, net	$(104)	$(102)	$(717)	$(723)
Cash provided by (used for) operating activities	$4,502	$(4,958)	$5,600	$(2,957)
Investing Activities				
Payment into escrow account	$(130)	$—	$(835)	$—
Distribution from escrow account	$130	$—	$835	$—
Acquisitions of property and businesses, net of cash acquired	$16	$47	$(187)	$(187)
Cash acquired in step acquisition of nonconsolidated affiliate	$—	$—	$1,050	$1,070
Proceeds from interests in trade accounts receivable conduits	$—	$9,462	$—	$8,551
Cash provided by (used for) investing activities	$(1,941)	$7,552	$(3,479)	$5,092
Financing Activities				
Other financing activities, net	$(4)	$(35)	$(2)	$(2)
Cash used for financing activities	$(3,300)	$(3,331)	$(4,014)	$(4,014)
Summary				
Decrease in cash, cash equivalents and restricted cash	$(419)	$(417)	$(1,970)	$(1,956)
Cash, cash equivalents and restricted cash at beginning of period	$6,607	$6,624	$8,577	$8,580
Cash, cash equivalents and restricted cash at end of period	$6,188	$6,207	$6,607	$6,624

1. Reflects the adoption of ASU 2016-15 and ASU 2016-18. In connection with the review and implementation of ASU 2016-15, the Company also changed the value of “Proceeds from interests in trade accounts receivable conduits” due to additional interpretive guidance of the required method for calculating the cash received from beneficial interests in the conduits, including additional guidance from the SEC's Office of the Chief Accountant issued in the third quarter of 2018.

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Opening Balance Sheet Impact of Accounting Standards Adoption

In the first quarter of 2018, the Company adopted Topic 606, ASU 2016-01 and ASU 2016-16, "Income Taxes (Topic 740): Intra-Entity Transfers of Assets Other Than Inventory." See Note 2 for additional information on these ASUs. The cumulative effect on the Company's January 1, 2018, consolidated balance sheet as a result of adopting these accounting standards is summarized in the following table:

Summary of Impacts to the Consolidated Balance Sheet	Dec 31, 2017	Adjustments due to:			Jan 1, 2018
In millions	As Filed	Topic 606	ASU 2016-01	ASU 2016-16	Updated
Assets					
Inventories	$8,376	$(11)	$ —	$ —	$8,365
Other current assets	$627	$29	$ —	$ 31	$687
Total current assets	$27,244	$18	$ —	$ 31	$27,293
Deferred income tax assets	$1,722	$25	$ —	$ 10	$1,757
Deferred charges and other assets	$829	$43	$ —	$ —	$872
Total other assets	$22,038	$68	$ —	$ 10	$22,116
Total Assets	$79,940	$86	$ —	$ 41	$80,067
Liabilities					
Accounts payable - Other	$3,062	$10	$ —	$ —	$3,072
Income taxes payable	$694	$(2)	$ —	$ —	$692
Accrued and other current liabilities	$4,025	$50	$ —	$ —	$4,075
Total current liabilities	$14,377	$58	$ —	$ —	$14,435
Other noncurrent obligations	$5,994	$117	$ —	$ —	$6,111
Total other noncurrent liabilities	$18,789	$117	$ —	$ —	$18,906
Stockholders' Equity					
Retained earnings	$28,050	$(89)	$ (20)	$ 41	$27,982
Accumulated other comprehensive loss	$(8,591)	$—	$ 20	$ —	$(8,571)
The Dow Chemical Company's stockholders' equity	$25,823	$(89)	$ —	$ 41	$25,775
Total equity	$27,009	$(89)	$ —	$ 41	$26,961
Total Liabilities and Equity	$79,940	$86	$ —	$ 41	$80,067

The most significant changes as a result of adopting Topic 606 relate to the Company's contract liabilities which include payments received in advance of performance. Contract liabilities, which are included in "Accrued and other current liabilities" and "Other noncurrent obligations" in the consolidated balance sheets, increased as certain performance obligations, which were previously recognized over time and related to the licensing of certain rights to patents and technology, as well as other performance obligations, are now recognized at a point in time as none of the three criteria for 'over time' recognition under Topic 606 are met.

In the second quarter of 2018, the Company early adopted ASU 2018-02. This standard was adopted on April 1, 2018, and resulted in a $1,057 million increase to retained earnings due to the reclassification from accumulated other comprehensive loss. The reclassification was primarily related to the change in the federal corporate tax rate and the effect of The Act on the Company's pension plans, derivative instruments, available-for-sale securities and cumulative translation adjustments. This reclassification is reflected in the "Adoption of accounting standards" line in the consolidated statements of equity. See Note 2 for additional information.

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Current Period Impact of Topic 606

The following table summarizes the effects of adopting Topic 606 on the Company's consolidated balance sheets, which was applied prospectively to contracts not completed at January 1, 2018. The effect of adopting Topic 606 did not have a material impact on the consolidated statements of income and the consolidated statements of cash flows.

Summary of Impacts to the Consolidated Balance Sheets

In millions	As Reported at Dec 31, 2018	Adjustments	Balance at Dec 31, 2018 Excluding Adoption of Topic 606
Assets			
Inventories	$ 9,260	$ 6	$ 9,266
Other current assets	$ 852	$ (16)	$ 836
Total current assets	$ 25,263	$ (10)	$ 25,253
Deferred income tax assets	$ 2,031	$ (26)	$ 2,005
Deferred charges and other assets	$ 796	$ (43)	$ 753
Total other assets	$ 21,588	$ (69)	$ 21,519
Total Assets	$ 77,378	$ (79)	$ 77,299
Liabilities			
Accounts payable - Other	$ 3,330	$ (10)	$ 3,320
Income taxes payable	$ 791	$ 2	$ 793
Accrued and other current liabilities	$ 3,611	$ (15)	$ 3,596
Total current liabilities	$ 13,755	$ (23)	$ 13,732
Other noncurrent obligations	$ 5,368	$ (140)	$ 5,228
Total other noncurrent liabilities	$ 16,400	$ (140)	$ 16,260
Stockholders' Equity			
Retained earnings	$ 29,808	$ 84	$ 29,892
The Dow Chemical Company's stockholders' equity	$ 26,831	$ 84	$ 26,915
Total equity	$ 27,969	$ 84	$ 28,053
Total Liabilities and Equity	$ 77,378	$ (79)	$ 77,299

Dividends

Prior to the Merger, the Company declared dividends of $1.38 per share in 2017 ($1.84 per share in 2016). Effective with the Merger, Dow no longer has publicly traded common stock. Dow's common shares are owned solely by its parent company, DowDuPont. As a result, the Company’s Board of Directors ("Board") determines whether or not there will be a dividend distribution to DowDuPont. See Note 24 for additional information.

NOTE 2 – RECENT ACCOUNTING GUIDANCE

In the fourth quarter of 2018, the Company early adopted ASU 2018-14, "Compensation - Retirement Benefits - Defined Benefit Plans - General (Subtopic 715-20): Disclosure Framework - Changes to the Disclosure Requirements for Defined Benefit Plans," which, as part of the Financial Accounting Standards Board ("FASB") disclosure framework project, removes disclosures that are no longer considered cost beneficial, clarifies the specific requirements of certain disclosures and adds new disclosure requirements that are considered relevant for employers that sponsor defined benefit pension and/or other postretirement benefit plans. The new standard is effective for fiscal years ending after December 15, 2020, and early adoption is permitted. The new guidance should be applied on a

retrospective basis for all periods presented. See Note 19 for updated disclosures for defined benefit pension and other postretirement benefit plans.

In the second quarter of 2018, the Company early adopted ASU 2017-12, "Derivatives and Hedging (Topic 815): Targeted Improvements to Accounting for Hedging Activities," which amends the hedge accounting recognition and presentation under Topic 815, with the objectives of improving the financial reporting of hedging relationships to better portray the economic results of an entity's risk management activities and simplifying the application of hedge accounting by preparers. The new standard expands the strategies eligible for hedge accounting, relaxes the timing requirements of hedge documentation and effectiveness assessments, and permits, in certain cases, the use of qualitative assessments on an ongoing basis to assess hedge effectiveness. The new guidance also requires new disclosures and presentation. The new standard is effective for fiscal years, and interim periods

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within those fiscal years, beginning after December 15, 2018. Early adoption is permitted in any interim or annual period after issuance of the ASU. Entities must adopt the new guidance by applying a modified retrospective approach to hedging relationships existing as of the adoption date. The adoption of the new guidance did not have a material impact on the consolidated financial statements.

In the second quarter of 2018, the Company early adopted ASU 2018-02, "Income Statement - Reporting Comprehensive Income (Topic 220): Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income," which allows a reclassification from accumulated other comprehensive income to retained earnings for stranded tax effects resulting from The Act, which was enacted on December 22, 2017, and requires certain disclosures about stranded tax effects. An entity has the option of applying the new guidance at the beginning of the period of adoption or retrospectively to each period (or periods) in which the tax effects related to items remaining in accumulated other comprehensive income are recognized. The new standard is effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2018, and early adoption is permitted, including adoption in an interim period for reporting periods in which the financial statements have not yet been issued. The Company's adoption of the new standard was applied prospectively at the beginning of the second quarter of 2018, with a reclassification of the stranded tax effects as a result of the The Act from accumulated other comprehensive loss to retained earnings. See Note 1 for additional information.

In the first quarter of 2018, the Company adopted ASU 2014-09, "Revenue from Contracts with Customers (Topic 606)," which is the new comprehensive revenue recognition standard that supersedes the revenue recognition requirements in Topic 605, "Revenue Recognition," and most industry specific guidance. The standard's core principle is that a company will recognize revenue when it transfers promised goods or services to a customer in an amount that reflects the consideration to which the company expects to be entitled in exchange for those goods or services. In 2015 and 2016, the FASB issued additional ASUs related to Topic 606 that delayed the effective date of the guidance and clarified various aspects of the new revenue guidance, including principal versus agent considerations, identification of performance obligations, and accounting for licenses, and included other improvements and practical expedients. The new guidance was effective for annual and interim periods beginning after December 15, 2017. The Company elected to adopt the new guidance using the modified retrospective transition method for all contracts not completed as of the date of adoption. The Company recognized the cumulative effect of applying the new revenue standard as an adjustment to the opening balance of retained earnings at the beginning of the first quarter of 2018. The comparative periods have not been restated and continue to be accounted for under Topic 605. The adoption of the new guidance did not have a material impact on the consolidated financial statements. See Notes 1 and 4 for additional disclosures regarding the Company's contracts with customers as well as the impact of adopting Topic 606.

In the first quarter of 2018, the Company adopted ASU 2016-01, "Financial Instruments - Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Financial Liabilities," which amends the guidance in U.S. GAAP on the classification and measurement of financial instruments. Changes to the current guidance primarily affects the accounting for equity investments, financial liabilities under the fair value option, and the presentation and disclosure requirements for financial instruments. In addition, the ASU clarifies guidance related to the valuation allowance assessment when recognizing deferred tax assets resulting from unrealized losses on available-for-sale debt securities. The new standard was effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2017. The Company applied the amendments in the new guidance by means of a cumulative-effect adjustment to the opening balance of retained earnings at the beginning of the first quarter of 2018. The adoption of the new guidance did not have a material impact on the consolidated financial statements. See Notes 1 and 21 for additional information.

In the first quarter of 2018, the Company adopted ASU 2016-15, "Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments," which addresses diversity in practice in how certain cash

receipts and cash payments are presented and classified in the statements of cash flows and addresses eight specific cash flow issues. The new standard was effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2017. A key provision in the new guidance impacted the presentation of proceeds from interests in certain trade accounts receivable conduits, which were retrospectively reclassified from "Operating Activities" to "Investing Activities" in the consolidated statements of cash flows. See Note 1 for additional information.

In the first quarter of 2018, the Company adopted ASU 2016-16, "Income Taxes (Topic 740): Intra-Entity Transfers of Assets Other Than Inventory," which requires an entity to recognize the income tax consequences of an intra-entity transfer of an asset other than inventory when the transfer occurs. The amendments were effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2017. The new guidance was applied on a modified retrospective basis through a cumulative-effect adjustment directly to retained earnings at the beginning of the first quarter of 2018. The adoption of this guidance did not have a material impact on the consolidated financial statements. See Note 1 for additional information.

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In the first quarter of 2018, the Company adopted ASU 2016-18, "Statement of Cash Flows (Topic 230): Restricted Cash," which clarifies how entities should present restricted cash and restricted cash equivalents in the statements of cash flows, and as a result, entities will no longer present transfers between cash and cash equivalents and restricted cash and restricted cash equivalents in the statements of cash flows. An entity with a material balance of restricted cash and restricted cash equivalents must disclose information about the nature of the restrictions. The new standard was effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2017. The new guidance changed the presentation of restricted cash in the consolidated statements of cash flows and was implemented on a retrospective basis in the first quarter of 2018. See Note 1 for additional information.

In the first quarter of 2018, the Company adopted ASU 2017-07, "Compensation - Retirement Benefits (Topic 715): Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost," which amends the requirements related to the income statement presentation of the components of net periodic benefit cost for employer sponsored defined benefit pension and other postretirement benefit plans. Under the new guidance, an entity must disaggregate and present the service cost component of net periodic benefit cost in the same income statement line items as other employee compensation costs arising from services rendered during the period, and only the service cost component will be eligible for capitalization. Other components of net periodic benefit cost must be presented separately from the line items that includes the service cost. The new standard was effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2017. Entities were required to use a retrospective transition method to adopt the requirement for separate income statement presentation of the service cost and other components, and a prospective transition method to adopt the requirement to limit the capitalization of benefit cost to the service component. Accordingly, in the first quarter of 2018, the Company used a retrospective transition method to reclassify net periodic benefit cost, other than the service component, from "Cost of sales," "Research and development expenses" and "Selling, general and administrative expenses" to "Sundry income (expense) - net" in the consolidated statements of income. See Note 1 for additional information.

Accounting Guidance Issued But Not Adopted at December 31, 2018

In February 2016, the FASB issued ASU 2016-02, "Leases (Topic 842)," and associated ASUs related to Topic 842, which requires organizations that lease assets to recognize on the balance sheet the assets and liabilities for the rights and obligations created by those leases. The new guidance requires that a lessee recognize assets and liabilities for leases, and recognition, presentation and measurement in the financial statements will depend on its classification as a finance or operating lease. In addition, the new guidance will require disclosures to help investors and other financial statement users better understand the amount, timing and uncertainty of cash flows arising from leases. Lessor accounting remains largely unchanged from current U.S. GAAP but does contain some targeted improvements to align with the new revenue recognition guidance issued in 2014 (Topic 606). The new standard is effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2018, and early adoption is permitted.

The Company has a cross-functional team in place to evaluate and implement the new guidance and the Company has substantially completed the implementation of a third-party software solution to facilitate compliance with accounting and reporting requirements. The team continues to review existing lease arrangements and has collected and loaded a significant portion of the lease portfolio into the software. The Company continues to enhance accounting systems and update business processes and controls related to the new guidance for leases. Collectively, these activities are expected to enable the Company to meet the new accounting and disclosure requirements upon adoption in the first quarter of 2019.

The ASU requires a modified retrospective transition approach, applying the new standard to all leases existing at the date of initial adoption. An entity may choose to use either (1) the effective date or (2) the beginning of the earliest comparative period presented in the financial statements at the date of initial application. The Company has elected to

apply the transition requirements at the January 1, 2019, effective date rather than at the beginning of the earliest comparative period presented. This approach allows for a cumulative effect adjustment in the period of adoption, and prior periods will not be restated. In addition, the Company has elected the package of practical expedients permitted under the transition guidance, which does not require reassessment of prior conclusions related to contracts containing a lease, lease classification and initial direct lease costs. As an accounting policy election, the Company will exclude short-term leases (term of 12 months or less) from the balance sheet presentation and will account for non-lease and lease components in a contract as a single lease component for all asset classes. The Company is finalizing the evaluation of the January 1, 2019, impact and estimates a material increase of lease-related assets and liabilities, ranging from $2.4 billion to $2.8 billion in the consolidated balance sheets. The impact to the Company's consolidated statements of income and consolidated statements of cash flows is not expected to be material.

In August 2018, the FASB issued ASU 2018-13, "Fair Value Measurement (Topic 820): Disclosure Framework - Changes to the Disclosure Requirements for Fair Value Measurement," which is part of the FASB disclosure framework project to improve the effectiveness of disclosures in the notes to the financial statements. The amendments in the new guidance remove, modify and

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add certain disclosure requirements related to fair value measurements covered in Topic 820, "Fair Value Measurement." The new standard is effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2019. Early adoption is permitted for either the entire standard or only the requirements that modify or eliminate the disclosure requirements, with certain requirements applied prospectively, and all other requirements applied retrospectively to all periods presented. The Company is currently evaluating the impact of adopting this guidance.

In August 2018, the FASB issued ASU 2018-15, "Intangibles - Goodwill and Other - Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That is a Service Contract," which requires a customer in a cloud computing arrangement that is a service contract to follow the internal-use software guidance in Topic 350, "Intangibles - Goodwill and Other" to determine which implementation costs to capitalize as assets or expense as incurred. The new standard is effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2019. Early adoption is permitted and an entity can elect to apply the new guidance on a prospective or retrospective basis. The Company is currently evaluating the impact of adopting this guidance.

NOTE 3 – MERGER WITH DUPONT

Effective August 31, 2017, Dow and DuPont completed the merger of equals transaction contemplated by the Agreement and Plan of Merger, dated as of December 11, 2015, as amended on March 31, 2017 (the "Merger Agreement"), by and among the Company, DuPont, DowDuPont, Diamond Merger Sub, Inc. and Orion Merger Sub, Inc. Pursuant to the Merger Agreement, (i) Diamond Merger Sub, Inc. was merged with and into Dow, with Dow surviving the merger as a subsidiary of DowDuPont (the "Diamond Merger") and (ii) Orion Merger Sub, Inc. was merged with and into DuPont, with DuPont surviving the merger as a subsidiary of DowDuPont (the "Orion Merger" and, together with the Diamond Merger, the "Mergers"). Following the consummation of the Mergers, each of Dow and DuPont became subsidiaries of DowDuPont (collectively, the "Merger"). Following the Merger, Dow and DuPont intend to pursue, subject to certain customary conditions, including, among others, the effectiveness of registration statements filed with the SEC and approval by the board of directors of DowDuPont ("DowDuPont Board"), the separation of the combined company's agriculture, materials science and specialty products businesses through one or more tax-efficient transactions ("Intended Business Separations"). Additional information about the Merger is included in Current Reports on Form 8-K filed with the SEC on December 11, 2015, March 31, 2017, August 4, 2017 and September 1, 2017.

Upon completion of the Diamond Merger, each share of common stock, par value $2.50 per share, of Dow ("Dow Common Stock") (excluding any shares of Dow Common Stock that were held in treasury immediately prior to the effective time of the Diamond Merger, which were automatically canceled and retired for no consideration) was converted into the right to receive one fully paid and non-assessable share of common stock, par value $0.01 per share, of DowDuPont ("DowDuPont Common Stock"). As provided in the Merger Agreement, at the effective time of the Mergers, (i) all options, deferred stock, performance deferred stock and other equity awards relating to shares of Dow Common Stock outstanding immediately prior to the effective time of the Mergers were generally automatically converted into options and deferred stock and other equity awards relating to shares of DowDuPont Common Stock after giving effect to appropriate adjustments to reflect the Mergers and otherwise generally on the same terms and conditions as applied under the applicable plans and award agreements immediately prior to the effective time of the Mergers. See Note 20 for additional information on the conversion of the equity awards.

In the third quarter of 2017, as a result of the Diamond Merger and the Merger, the Company recorded a reduction in "Treasury stock" of $935 million, a reduction in "Common stock" of $3,107 million and an increase in "Additional paid in capital" of $2,172 million. At September 1, 2017, the Company has 100 shares of common stock issued and

outstanding, par value $0.01 per share, owned solely by its parent, DowDuPont.

On August 31, 2017, following the Diamond Merger, Dow requested that the New York Stock Exchange ("NYSE") withdraw the shares of Dow Common Stock from listing on the NYSE and filed a Form 25 with the SEC to report that the shares of Dow Common Stock are no longer listed on the NYSE. The shares of Dow Common Stock were suspended from trading on the NYSE prior to the open of trading on September 1, 2017.

As a condition of the regulatory approval of the Merger, Dow and DuPont agreed to certain closing conditions, which are as follows:

- Dow divested its global Ethylene Acrylic Acid copolymers and ionomers business ("EAA Business") to SK Global Chemical Co., Ltd., on September 1, 2017, as part of a divestiture commitment given to the European Commission ("EC") in connection with the EC's conditional approval of the Merger granted on March 27, 2017. See Note 6 for additional information on this transaction.

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- DuPont divested its Cereal Broadleaf Herbicides and Chewing Insecticides portfolios as well as its Crop Protection research and development ("R&D") pipeline and organization (excluding seed treatment, nematicides, late-stage R&D programs and certain personnel needed to support marketed products and R&D programs that will remain with DuPont) (collectively, the "DuPont Divested Assets") to FMC Corporation ("FMC") on November 1, 2017, as part of the EC's conditional approval granted on March 27, 2017. Also on November 1, 2017, DuPont completed its acquisition of FMC's Health and Nutrition business, excluding its Omega-3 products.

- On May 2, 2017, Dow and DuPont announced that China's Ministry of Commerce ("MOFCOM") granted conditional regulatory approval for the companies' proposed merger of equals which included commitments already made to the EC including DuPont's divestiture of the DuPont Divested Assets and Dow's divestiture of the EAA Business. In addition, Dow and DuPont made commitments related to the supply and distribution in China of certain herbicide and insecticide ingredients and formulations for rice crops for five years after the closing of the Merger.

- Dow divested a select portion of Dow AgroSciences' corn seed business in Brazil ("DAS Divested Ag Business") to CITIC Agri Fund on November 30, 2017. The divestiture was part of the commitment given to Brazil's Administrative Council for Economic Defense ("CADE") in connection with the CADE's conditional approval of the Merger granted on May 17, 2017, which was incremental to commitments already made to the EC, China and regulatory agencies in other jurisdictions. See Note 6 for additional information on this transaction.

- On June 15, 2017, Dow and DuPont announced that a proposed agreement had been reached with the Antitrust Division of the United States Department of Justice that permitted the companies to proceed with the proposed merger of equals transaction. The proposed agreement was consistent with commitments already made to the EC.

Intended Business Separations

In furtherance of the Intended Business Separations, Dow and DuPont are engaged in a series of internal reorganization and realignment steps (the “Internal Reorganization”) to realign their businesses into three subgroups: agriculture, materials science and specialty products. DowDuPont has also formed two wholly owned subsidiaries: Dow Holdings Inc. (“DHI”), to serve as a holding company for its materials science business, and Corteva, Inc. (“Corteva”), to serve as a holding company for its agriculture business. Following the separation and distribution of DHI, which is targeted to occur by April 1, 2019, DowDuPont, as the remaining company, which is referred to herein as “New DuPont,” will continue to hold the agriculture and specialty products businesses. New DuPont is then targeted to complete the separation and distribution of Corteva on June 1, 2019, resulting in New DuPont holding the specialty products businesses of DowDuPont. Following the distributions, DowDuPont will be known as DuPont.

As part of the Internal Reorganization, 1) the assets and liabilities of the materials science business will be transferred or conveyed to legal entities that then will be aligned under DHI, 2) the assets and liabilities of the agriculture business will be transferred or conveyed to legal entities that then will be aligned under Corteva, and 3) the assets and liabilities of the specialty products business will be transferred or conveyed to legal entities that then will be aligned with New DuPont. Following the Internal Reorganization, DowDuPont expects to distribute DHI and Corteva through separate, pro rata U.S. federal tax-free spin-offs in which DowDuPont stockholders, at such time, would receive shares of common stock of DHI and of Corteva.

Additional information is included in the Form 10 registration statements for the separation of DowDuPont's materials science business (filed as Dow Holdings Inc.) filed with the SEC on September 7, 2018, as amended on October 19, 2018 and November 19, 2018, and the agriculture business (filed as Corteva, Inc.) filed with the SEC on October 18, 2018, as amended on December 19, 2018.

NOTE 4 – REVENUE

Revenue Recognition

The majority of the Company's revenue is derived from product sales. In 2018, 99 percent of the Company's sales related to product sales (98 percent in 2017 and 99 percent in 2016). The remaining sales were primarily related to Dow's insurance operations and licensing of patents and technologies. As of January 1, 2018, the Company accounts for revenue in accordance with Topic 606, "Revenue from Contracts with Customers," except for revenue from Dow's insurance operations, which is accounted for in accordance with Topic 944, "Financial Services - Insurance."

Product Sales

Product sales consist of sales of the Company's products to manufacturers and distributors. The Company considers order confirmations or purchase orders, which in some cases are governed by master supply agreements, to be contracts with a customer.

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Product sale contracts are generally short-term contracts where the time between order confirmation and satisfaction of all performance obligations is less than one year. However, the Company has some long-term contracts which can span multiple years.

Revenues from product sales are recognized when the customer obtains control of the Company's product, which occurs at a point in time, usually upon shipment, with payment terms typically in the range of 30 to 60 days after invoicing, depending on business and geographic region. When the Company performs shipping and handling activities after the transfer of control to the customer (e.g., when control transfers prior to shipment), these are considered fulfillment activities, and accordingly, the costs are accrued when the related revenue is recognized. Taxes collected from customers relating to product sales and remitted to governmental authorities are excluded from revenues. The Company elected to use the practical expedient to expense cash and non-cash sales incentives, as the amortization period for the costs to obtain the contract would have been one year or less.

Certain long-term contracts include a series of distinct goods that are delivered continuously to the customer through a pipeline (e.g., feedstocks). For these types of product sales, the Company invoices the customer in an amount that directly corresponds with the value to the customer of the Company's performance to date. As a result, the Company recognizes revenue based on the amount billable to the customer in accordance with the right to invoice practical expedient.

The transaction price includes estimates for reductions in revenue from customer rebates and right of returns on product sales. These amounts are estimated based upon the most likely amount of consideration to which the customer will be entitled. The Company's obligation for right of returns is limited primarily to the Seed principal product group. All estimates are based on historical experience, anticipated performance and the Company's best judgment at the time to the extent it is probable that a significant reversal of revenue recognized will not occur. All estimates for variable consideration are reassessed periodically. The Company elected the practical expedient to not adjust the amount of consideration for the effects of a significant financing component for all instances in which the period between payment and transfer of the goods will be one year or less.

For contracts with multiple performance obligations, the Company allocates the transaction price to each performance obligation based on the relative standalone selling price. The standalone selling price is the observable price which depicts the price as if sold to a similar customer in similar circumstances.

Patents, Trademarks and Licenses

The Company enters into licensing arrangements in which it licenses certain rights of its patents and technology to customers. Revenue from the majority of the Company's licenses for patents and technology is derived from sales-based royalties. The Company estimates the amount of sales-based royalties it expects to be entitled to based on historical sales to the customer. For the remaining revenue from licensing arrangements, payments are typically received from the Company's licensees based on billing schedules established in each contract. Revenue is recognized by the Company when the performance obligation is satisfied.

Remaining Performance Obligations

Remaining performance obligations represent the transaction price allocated to unsatisfied or partially unsatisfied performance obligations. At December 31, 2018, the Company had remaining performance obligations related to material rights granted to customers for contract renewal options of $102 million and unfulfilled performance obligations for the licensing of technology of $407 million. The Company expects revenue to be recognized for the remaining performance obligations over the next one to six years.

The remaining performance obligations are for product sales that have expected durations of one year or less, product sales of materials delivered through a pipeline for which the Company has elected the right to invoice practical expedient, or variable consideration attributable to royalties for licenses of patents and technology. The Company has received advance payments from customers related to long-term supply agreements that are deferred and recognized over the life of the contract, with remaining contract terms that range up to 22 years. The Company will have rights to future consideration for revenue recognized when product is delivered to the customer. These payments are included in "Accrued and other current liabilities" and "Other noncurrent obligations" in the consolidated balance sheets.

Disaggregation of Revenue

The Company disaggregates its revenue from contracts with customers by principal product group and geographic region, as the Company believes it best depicts the nature, amount, timing and uncertainty of its revenue and cash flows. See Note 25 for net trade revenue by principal product group and geographic region for 2018.

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Contract Balances

The Company receives payments from customers based upon contractual billing schedules. Accounts receivable are recorded when the right to consideration becomes unconditional. Contract assets include amounts related to the Company’s contractual right to consideration for completed performance obligations not yet invoiced. Contract liabilities include payments received in advance of performance under the contract, and are realized when the associated revenue is recognized under the contract. "Contract liabilities - current" primarily reflects deferred revenue from prepayments from customers for product to be delivered in a time period of 12 months or less. "Contract liabilities - noncurrent" includes advance payments that the Company has received from customers related to long-term supply agreements and royalty payments that are deferred and recognized over the life of the contract.

Revenue recognized in 2018 from amounts included in contract liabilities at the beginning of the period was approximately $240 million. In 2018, the amount of contract assets reclassified to receivables as a result of the right to the transaction consideration becoming unconditional was approximately $12 million. The Company did not recognize any asset impairment charges related to contract assets in 2018.

The following table summarizes the contract balances at December 31, 2018 and 2017:

Contract Balances In millions	Dec 31, 2018	Topic 606 Adjustments Jan 1, 2018	Dec 31, 2017
Accounts and notes receivable - Trade	$8,246	$ —	$7,338
Contract assets - current [1]	$37	$ 18	$—
Contract assets - noncurrent [2]	$47	$ 43	$—
Contract liabilities - current [3]	$165	$ 50	$117
Contract liabilities - noncurrent [4]	$1,390	$ 117	$1,365

1. Included in "Other current assets" in the consolidated balance sheets.
2. Included in "Deferred charges and other assets" in the consolidated balance sheets.
3. Included in "Accrued and other current liabilities" in the consolidated balance sheets.
4. Included in "Other noncurrent obligations" in the consolidated balance sheets.

NOTE 5 – ACQUISITIONS

Ownership Restructure of Dow Silicones

On June 1, 2016, the Company announced the closing of the transaction with Corning Incorporated ("Corning"), Dow Silicones and HS Upstate Inc., (“Splitco”), pursuant to which Corning exchanged with Dow Silicones its 50 percent equity interest in Dow Silicones for 100 percent of the stock of Splitco which held Corning's historical proportional interest in the Hemlock Semiconductor Group ("HSC Group") and approximately $4.8 billion in cash. As a result, Dow Silicones, previously a 50:50 joint venture between Dow and Corning, became a wholly owned subsidiary of Dow. In connection with the ownership restructure, on May 31, 2016, Dow Silicones incurred $4.5 billion of indebtedness in order to fund the contribution of cash to Splitco. See Notes 12, 15 and 23 for additional information.

At June 1, 2016, the Company's equity interest in Dow Silicones, excluding the HSC Group, was $1,968 million. This equity interest was remeasured to fair value. As a result, the Company recognized a non-taxable gain of $2,445 million in the second quarter of 2016, net of closing costs and other comprehensive loss related to the Company's interest in Dow Silicones. The gain was included in "Sundry income (expense) - net" in the consolidated statements of income. The Company recognized a tax benefit of $141 million on the ownership restructure in the second quarter of 2016, primarily due to the reassessment of a previously recognized deferred tax liability related to the basis difference in the Company’s investment in Dow Silicones. In addition, the fair value step-up of "Inventories"

acquired was an increase of $317 million, which was expensed to "Cost of sales" over a three-month period beginning on June 1, 2016. In 2018, the Company recorded a pretax loss of $47 million for post-closing adjustments related to the Dow Silicones ownership restructure, included in "Sundry income (expense) - net" in the consolidated statements of income.

The ownership restructure resulted in the recognition of $3,229 million of "Goodwill" which was not deductible for tax purposes. Goodwill largely consisted of expected synergies resulting from the ownership restructure. Cost synergies were achieved through a combination of workforce consolidation and savings from actions such as harmonizing energy contracts at large sites, optimizing warehouse and logistics footprints, implementing materials and maintenance best practices, combining information technology service structures and leveraging existing R&D knowledge management systems.

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The Company evaluated the disclosure requirements under ASC 805 "Business Combinations" and determined the ownership restructure was not considered a material business combination for purposes of disclosing the revenue and earnings of Dow Silicones since the date of the ownership restructure as well as supplemental pro forma information.

Beginning in June 2016, the results of Dow Silicones, excluding the HSC Group, were fully consolidated in the Company’s consolidated statements of income. Prior to June 2016, the Company’s 50 percent share of Dow Silicones’ results of operations was reported in “Equity in earnings of nonconsolidated affiliates” in the consolidated statements of income. The results of the HSC Group continue to be treated as an equity method investment and reported as “Equity in earnings of nonconsolidated affiliates” in the consolidated statements of income.

NOTE 6 – DIVESTITURES

Merger Remedy - Divestiture of the Global Ethylene Acrylic Acid Copolymers and Ionomers Business

On February 2, 2017, as a condition of regulatory approval of the Merger, Dow announced it would divest the EAA Business to SK Global Chemical Co., Ltd. The divestiture included production assets located in Freeport, Texas, and Tarragona, Spain, along with associated intellectual property and product trademarks. Under terms of the purchase agreement, SK Global Chemical Co., Ltd will honor certain customer and supplier contracts and other agreements. On September 1, 2017, the sale was completed for $296 million, net of working capital adjustments, costs to sell and other adjustments, with proceeds subject to customary post-closing adjustments. As a result, in 2017, the Company recognized a pretax gain of $227 million on the sale, included in "Sundry income (expense) - net" in the consolidated statements of income.

Merger Remedy - Divestiture of a Portion of Dow AgroSciences' Brazil Corn Seed Business

On July 11, 2017, as a condition of regulatory approval of the Merger, Dow announced it had entered into a definitive agreement with CITIC Agri Fund to sell a select portion of Dow AgroSciences' corn seed business in Brazil, including some seed processing plants and seed research centers, a copy of Dow AgroSciences' Brazilian corn germplasm bank, the MORGAN™ brand and a license for the use of the DOW SEMENTES™ brand for a certain period of time. On November 30, 2017, the sale was completed for $1,093 million, net of working capital adjustments, costs to sell and other adjustments, with proceeds subject to customary post-closing adjustments. As a result, in 2017, the Company recognized a pretax gain of $635 million on the sale, included in "Sundry income (expense) - net" in the consolidated statements of income.

The Company evaluated the divestiture of the EAA Business and determined it did not represent a strategic shift that had a major effect on the Company’s operations and financial results and did not qualify as an individually significant component of the Company. The divestiture of a portion of Dow AgroSciences' corn seed business did not qualify as a component of the Company. As a result, these divestitures were not reported as discontinued operations.

NOTE 7 – RESTRUCTURING, GOODWILL IMPAIRMENT AND ASSET RELATED CHARGES - NET

The "Restructuring, goodwill impairment and asset related charges - net" line in the consolidated statements of income is used to record charges for restructuring programs, goodwill impairments, and other asset related charges, which includes other asset impairments.

DowDuPont Agriculture Division Restructuring Program

During the fourth quarter of 2018 and in connection with the ongoing integration activities, DowDuPont approved restructuring actions to simplify and optimize certain organizational structures within the Agriculture division in preparation for its intended separation as a standalone company ("Agriculture Division Program"). As a result of these actions, the Company expects to record total pretax restructuring charges of $31 million, comprised of $28 million of

severance and related benefit costs and $3 million of asset write-downs and write-offs. For the year ended December 31, 2018, the Company recorded pretax restructuring charges of $25 million, consisting of severance and related benefit costs of $24 million and asset write-downs and write-offs of $1 million. The impact of these charges is shown as "Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income. The Company expects actions related to the Agriculture Division Program to be substantially complete by mid 2019.

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The following table summarizes the activities related to the Agriculture Division Program. At December 31, 2018, $23 million was included in "Accrued and other current liabilities" in the consolidated balance sheets.

DowDuPont Agriculture Division Program In millions	Severance and Related Benefit Costs	Asset Write-downs and Write-offs	Total
2018 restructuring charges	$ 24	$ 1	$25
Charges against the reserve	—	(1)	(1)
Cash payments	(1)	—	(1)
Reserve balance at Dec 31, 2018	$ 23	$ —	$23

DowDuPont Cost Synergy Program

In September and November 2017, DowDuPont approved post-merger restructuring actions under the DowDuPont Cost Synergy Program (the "Synergy Program") which is designed to integrate and optimize the organization following the Merger and in preparation for the Intended Business Separations. The Company expects to record total pretax restructuring charges of approximately $1.3 billion, which included initial estimates of approximately $525 million to $575 million of severance and related benefit costs; $400 million to $440 million of asset write-downs and write-offs, and $290 million to $310 million of costs associated with exit and disposal activities.

As a result of the Synergy Program, the Company recorded pretax restructuring charges of $687 million in 2017, consisting of severance and related benefit costs of $357 million, asset write-downs and write-offs of $287 million and costs associated with exit and disposal activities of $43 million. For the year ended December 31, 2018, the Company recorded pretax restructuring charges of $551 million, consisting of severance and related benefit costs of $204 million, asset write-downs and write-offs of $226 million and costs associated with exit and disposal activities of $121 million. The impact of these charges is shown as "Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income. The Company expects to record additional restructuring charges during 2019 and substantially complete the Synergy Program by the end of 2019.

The following table summarizes the activities related to the Synergy Program. At December 31, 2018, $272 million was included in "Accrued and other current liabilities" ($231 million at December 31, 2017) and $55 million was included in "Other noncurrent obligations" ($118 million at December 31, 2017) in the consolidated balance sheets.

DowDuPont Synergy Program In millions	Severance and Related Benefit Costs	Asset Write-downs and Write-offs	Costs Associated with Exit and Disposal Activities	Total
2017 restructuring charges	$ 357	$ 287	$ 43	$687
Charges against the reserve	—	(287)	—	(287)
Cash payments	(51)	—	—	(51)
Reserve balance at Dec 31, 2017	$ 306	$ —	$ 43	$349
2018 restructuring charges	204	226	121	551
Charges against the reserve	—	(226)	—	(226)
Cash payments	(248)	—	(99)	(347)
Reserve balance at Dec 31, 2018	$ 262	$ —	$ 65	$327

Asset Write-downs and Write-offs

The restructuring charges related to the write-down and write-off of assets in 2017 totaled $287 million. Details regarding the write-downs and write-offs are as follows:

- The Company will close or consolidate several manufacturing, R&D and administrative facilities around the world aligned with seed and crop protection activities, including the write-down of other non-manufacturing assets. As a result, the Company recorded a charge of $94 million. These facilities will be shut down or consolidated by the end of 2019.

- The Company recorded a charge of $83 million for asset write-downs and write-offs aligned with electronics and imaging product lines, including the shutdown of a metalorganic manufacturing facility in Cheonan, South Korea, the write-off of in-process research and development and other intangible assets, and the consolidation of certain R&D facilities. The South Korean facility was shut down in the second quarter of 2018.

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- The Company recorded a charge of $22 million for asset write-downs and write-offs aligned with an energy project, including the write-off of capital projects and other non-manufacturing assets.

- The Company wrote-off $21 million of assets aligned with safety and construction products, including intangible assets as a result of the Clean Filtration Technologies plant shutdown in the fourth quarter of 2017.

- The Company recorded a charge of $67 million for other miscellaneous asset write-downs and write-offs, including the shutdown of several small manufacturing facilities and the write-off of non-manufacturing assets, certain corporate facilities and data centers. These manufacturing facilities will be shut down primarily by the end of 2019.

The restructuring charges related to the write-down and write-off of assets in 2018 totaled $226 million. Details regarding the write-downs and write-offs are as follows:

- The Company recorded a charge of $171 million related primarily to the consolidation or shutdown of manufacturing, R&D and other non-manufacturing facilities and the write-down of inventory aligned with seed and crop protection activities. These facilities will be shut down primarily by the end of the third quarter of 2019.

- The Company recorded a charge of $27 million for asset write-downs and write-offs aligned with industrial biosciences product lines, including the shutdown of a microbial control manufacturing facility. The manufacturing facility will be shut down by the end of 2019.

- The Company recorded a charge of $28 million for other miscellaneous asset write-downs and write-offs, including the shutdown of several small manufacturing facilities and the write-off of non-manufacturing assets and certain corporate facilities. These manufacturing facilities will be shut down by the end of the third quarter of 2019.

Costs Associated with Exit and Disposal Activities
The restructuring charges for costs associated with exit and disposal activities, including contract cancellation penalties and environmental remediation liabilities, totaled $43 million in 2017 and $121 million in 2018.

2016 Restructuring
On June 27, 2016, Dow's Board approved a restructuring plan that incorporated actions related to the ownership restructure of Dow Silicones. These actions, aligned with Dow’s value growth and synergy targets, resulted in a global workforce reduction of approximately 2,500 positions, with most of these positions resulting from synergies related to the ownership restructure of Dow Silicones.

As a result of these actions, the Company recorded pretax restructuring charges of $449 million in the second quarter of 2016, consisting of severance and related benefit costs of $268 million, asset write-downs and write-offs of $153 million and costs associated with exit and disposal activities of $28 million. The impact of these charges is shown as "Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income. The 2016 restructuring activities were substantially complete at June 30, 2018, with remaining liabilities for severance and related benefit costs and costs associated with exit and disposal activities to be settled over time.

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The following table summarizes the activities related to the Company's 2016 restructuring reserve.

2016 Restructuring Charges In millions	Severance and Related Benefit Costs	Asset Write-downs and Write-offs	Costs Associated with Exit and Disposal Activities	Total
2016 restructuring charges	$ 268	$ 153	$ 28	$449
Charges against the reserve	—	(153)	—	(153)
Cash payments	(67)	—	(1)	(68)
Reserve balance at Dec 31, 2016	$ 201	$ —	$ 27	$228
Adjustments to the reserve [1]	—	—	(7)	(7)
Cash payments	(150)	—	(3)	(153)
Reserve balance at Dec 31, 2017	$ 51	$ —	$ 17	$68
Adjustments to the reserve [1]	(8)	—	14	6
Cash payments	(37)	—	(4)	(41)
Reserve balance at Jun 30, 2018	$ 6	$ —	$ 27	$33

1. Included in "Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income.

Asset Write-downs and Write-offs
The restructuring charges related to the write-down and write-off of assets in the second quarter of 2016 totaled $153 million. Details regarding the write-downs and write-offs are as follows:

- The Company recorded a charge of $70 million for asset write-downs and write-offs including the shutdown of a solar manufacturing facility in Midland, Michigan; the write-down of a solar facility in Milpitas, California; and, the write-off of capital projects and in-process research and development. The Midland facility was shut down in the third quarter of 2016.

- To enhance competitiveness and streamline costs associated with the ownership restructure of Dow Silicones, a silicones manufacturing facility in Yamakita, Japan, was shut down in the fourth quarter of 2018. In addition, an idled facility was shut down in the second quarter of 2016. As a result, the Company recorded a charge of $25 million.

- The Company recorded a charge of $25 million to close and/or consolidate certain corporate facilities and data centers.

- A decision was made to shut down a small manufacturing facility and to write-down other non-manufacturing assets, including a cost method investment and certain aircraft. As a result, the Company recorded a charge of $33 million. The manufacturing facility was shut down in the second quarter of 2016.

Costs Associated with Exit and Disposal Activities
The restructuring charges for costs associated with exit and disposal activities, including contract cancellation penalties, environmental remediation and warranty liabilities, were $28 million in the second quarter of 2016.

Dow expects to incur additional costs in the future related to its restructuring activities. Future costs are expected to include demolition costs related to closed facilities and restructuring plan implementation costs; these costs will be recognized as incurred. The Company also expects to incur additional employee-related costs, including involuntary

termination benefits, related to its other optimization activities. These costs cannot be reasonably estimated at this time.

Goodwill Impairment

Upon completion of the goodwill impairment testing in the fourth quarter of 2017, the Company determined the fair value of the Coatings & Performance Monomers reporting unit was lower than its carrying amount. As a result, the Company recorded an impairment charge of $1,491 million in the fourth quarter of 2017, included in “Restructuring, goodwill impairment and asset related charges - net” in the consolidated statements of income. See Note 13 for additional information on the impairment charge.

Asset Related Charges

2018 Charges

In 2018, the Company recognized an additional pretax impairment charge of $34 million related primarily to capital additions made to a biopolymers manufacturing facility in Santa Vitoria, Minas Gerais, Brazil, which was impaired in 2017. The impairment charge was included in “Restructuring, goodwill impairment and asset related charges - net” in the consolidated statements of income.

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2017 Charges
In the fourth quarter of 2017, the Company recognized a $622 million pretax impairment charge related to a biopolymers manufacturing facility in Santa Vitoria, Minas Gerais, Brazil. The Company determined it would not pursue an expansion of the facility's ethanol mill into downstream derivative products, primarily as a result of cheaper ethane-based production as well as the Company's new assets coming online on the U.S. Gulf Coast which can be used to meet growing market demands in Brazil. As a result of this decision, cash flow analysis indicated the carrying amount of the impacted assets was not recoverable. The impairment charge was included in "Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income. See Notes 22 and 23 for additional information.

The Company also recognized other pretax impairment charges of $317 million in the fourth quarter of 2017, including charges related to manufacturing assets of $230 million, an equity method investment of $81 million and other assets of $6 million. The impairment charges were included in "Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income. See Note 22 for additional information.

2016 Charges
In the fourth quarter of 2016, the Company recognized a $143 million pretax impairment charge related to its equity interest in AgroFresh Solutions, Inc. ("AFSI") due to a decline in the market value of AFSI. The impairment charge was included in "Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income. See Notes 12, 22 and 23 for additional information.

NOTE 8 – SUPPLEMENTARY INFORMATION
Sundry Income (Expense) – Net

In millions	2018	2017	2016
Non-operating pension and other postretirement benefit plan net credits (costs) [1]	$119	$(682)	$34
Gain on sales of other assets and investments	59	182	170
Interest income	109	106	107
Foreign exchange losses	(119)	(72)	(126)
Post-closing adjustments on divestiture of MEGlobal	20	—	(1)
Gain and post-closing adjustments related to Dow Silicones ownership restructure [2]	(47)	—	2,445
Loss on early extinguishment of debt [3]	(54)	—	—
Loss on divestitures	(14)	—	(25)
Gain on divestiture of DAS Divested Ag Business [4]	—	635	—
Gain on divestiture of the EAA Business [4]	—	227	—
Gain related to Nova patent infringement award [5]	—	137	—
Loss related to Bayer CropScience arbitration matter [5]	—	(469)	—
Impact of split-off of chlorine value chain	—	7	6
Settlement of the urethane matters class action lawsuit and opt-out cases [5]	—	—	(1,235)
Costs associated with transactions and productivity actions	—	—	(41)
Implant liability adjustment [5]	—	—	27
Reclassification of cumulative translation adjustments	4	8	—
Other - net	104	116	125
Total sundry income (expense) – net	$181	$195	$1,486

1. Presented in accordance with ASU 2017-07. See Notes 1, 2 and 19 for additional information.
2. See Note 5 for additional information.
3. See Note 15 for additional information.
4. See Note 6 for additional information.

5. See Note 16 for additional information.

Accrued and Other Current Liabilities

“Accrued and other current liabilities” were $3,611 million at December 31, 2018 and $4,025 million at December 31, 2017. Accrued payroll, which is a component of "Accrued and other current liabilities," was $926 million at December 31, 2018 and $1,109 million at December 31, 2017. No other components of "Accrued and other current liabilities" were more than 5 percent of total current liabilities.

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NOTE 9 – INCOME TAXES

On December 22, 2017, The Act was enacted. The Act reduces the U.S. federal corporate income tax rate from 35 percent to 21 percent, requires companies to pay a one-time transition tax on earnings of certain foreign subsidiaries that were previously deferred, creates new provisions related to foreign sourced earnings, eliminates the domestic manufacturing deduction and moves to a hybrid territorial system. At December 31, 2017, the Company had not completed its accounting for the tax effects of The Act; however, the Company made a reasonable estimate of the effects on its existing deferred tax balances and the one-time transition tax. In accordance with Staff Accounting Bulletin 118 ("SAB 118"), income tax effects of The Act were refined upon obtaining, preparing, and analyzing additional information during the measurement period. At December 31, 2018, the Company had completed its accounting for the tax effects of The Act.

- As a result of The Act, the Company remeasured its U.S. federal deferred tax assets and liabilities based on the rates at which they are expected to reverse in the future, which is generally 21 percent. The Company recorded a cumulative benefit of $29 million ($79 million benefit in 2018 and $50 million charge in 2017) to “Provision for income taxes” in the consolidated statements of income with respect to the remeasurement of the Company's deferred tax balances.

- The Act requires a mandatory deemed repatriation of post-1986 undistributed foreign earnings and profits, which results in a one-time transition tax. The Company recorded a cumulative charge of $780 million ($85 million benefit in 2018 and $865 million charge in 2017) to "Provision for income taxes" in the consolidated statements of income with respect to the one-time transition tax.

- In 2018, the Company recorded an indirect impact of The Act related to prepaid tax on the intercompany sale of inventory. The amount recorded related to inventory was a charge of $38 million to "Provision for income taxes" in the consolidated statements of income.

- For tax years beginning after December 31, 2017, The Act introduced new provisions for U.S. taxation of certain global intangible low-taxed income (“GILTI”). The Company has made the policy election to record any liability associated with GILTI in the period in which it is incurred.

Geographic Allocation of Income and Provision for Income Taxes

In millions	2018	2017	2016
Income (Loss) before income taxes			
Domestic [1, 2]	$1,668	$(1,973)	$485
Foreign [1]	4,250	4,772	3,928
Income before income taxes	$5,918	$2,799	$4,413
Current tax expense (benefit)			
Federal	$290	$(308)	$91
State and local	8	—	21
Foreign	1,517	1,579	1,156
Total current tax expense	$1,815	$1,271	$1,268
Deferred tax expense (benefit)			
Federal [3]	$(323)	$1,027	$(1,255)
State and local	(7)	56	(10)
Foreign	(200)	(150)	6
Total deferred tax expense (benefit)	$(530)	$933	$(1,259)
Provision for income taxes	$1,285	$2,204	$9
Net income	$4,633	$595	$4,404

1. In 2017, the domestic component of "Income before income taxes" included approximately $308 million ($2.1 billion in 2016) and the foreign component contained $562 million (zero in 2016) of income from portfolio actions. See Notes 5 and 6 for additional information.
2. In 2017, the domestic component of "Income before income taxes" included approximately $2.7 billion of expense related to a goodwill impairment, non-qualified pension plan change in control charges and litigation settlements. In 2016, the domestic component of "Income before income taxes" included approximately $2.6 billion of expenses related to the urethane matters class action lawsuit and opt-out cases settlements, asbestos-related charge and charges for environmental matters. See Notes 13, 16 and 19 for additional information.
3. The 2018 and 2017 amounts reflect the tax impact of The Act which accelerated the utilization of tax credits and required remeasurement of all U.S. deferred tax assets and liabilities. The 2016 amount reflects the tax impact of accrued one-time items and reduced domestic income which limited the utilization of tax credits.

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In 2017, as a result of the Merger and subsequent change in the Company's ownership, certain net operating loss carryforwards available for the Company's consolidated German tax group were derecognized. In addition, the sale of stock between two consolidated subsidiaries in 2014 created a gain that was initially deferred for tax purposes. This deferred gain became taxable as a result of activities executed in anticipation of the Intended Business Separations. As a result, in 2017, the Company recorded a charge of $267 million to "Provision for income taxes" in the consolidated statements of income.

Reconciliation to U.S. Statutory Rate	2018	2017	2016
Statutory U.S. federal income tax rate	21.0 %	35.0 %	35.0 %
Equity earnings effect	(2.1)	(4.2)	(1.2)
Foreign income taxed at rates other than the statutory U.S. federal income tax rate [1]	5.2	(15.9)	(7.0)
U.S. tax effect of foreign earnings and dividends	(0.5)	(1.6)	(4.6)
Unrecognized tax benefits	0.1	1.1	(0.8)
Acquisitions, divestitures and ownership restructuring activities [2]	0.3	11.7	(21.2)
Impact of U.S. tax reform	(2.1)	32.7	—
State and local income taxes	0.4	3.2	0.2
Goodwill impairment	—	19.2	—
Excess tax benefits from stock-based compensation [3]	(0.9)	(3.5)	—
Other - net	0.3	1.0	(0.2)
Effective Tax Rate	21.7 %	78.7 %	0.2 %

1. Includes the impact of valuation allowances in foreign jurisdictions.
2. See Notes 5 and 6 for additional information.
3. Reflects the impact of the adoption of ASU 2016-09, "Compensation - Stock Compensation (Topic 718), Improvements to Employee Share-Based Payment Accounting," which was adopted January 1, 2017, and resulted in the recognition of excess tax benefits related to stock-based compensation in "Provision for income taxes."

Deferred Tax Balances at Dec 31	2018		2017	
In millions	Assets	Liabilities	Assets	Liabilities
Property	$460	$ 2,550	$508	$ 2,474
Tax loss and credit carryforwards	2,244	—	1,734	—
Postretirement benefit obligations	2,226	213	2,442	136
Other accruals and reserves	1,250	110	1,251	146
Intangibles	151	942	176	1,010
Inventory	68	163	35	171
Investments	181	60	272	158
Other – net	587	442	420	414
Subtotal	$7,167	$ 4,480	$6,838	$ 4,509
Valuation allowances	(1,320)	—	(1,371)	—
Total	$5,847	$ 4,480	$5,467	$ 4,509

Operating Loss and Tax Credit Carryforwards at Dec 31	2018	2017
In millions	Assets	Assets
Operating loss carryforwards		
Expire within 5 years	$268	$246
Expire after 5 years or indefinite expiration	1,319	1,305
Total operating loss carryforwards	$1,587	$1,551
Tax credit carryforwards		
Expire within 5 years	$32	$39

Expire after 5 years or indefinite expiration	625	144
Total tax credit carryforwards	$657	$183
Total operating loss and tax credit carryforwards	$2,244	$1,734

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Undistributed earnings of foreign subsidiaries and related companies that are deemed to be permanently invested amounted to $6,800 million at December 31, 2018 and $7,052 million at December 31, 2017. The Act imposed U.S. tax on all post-1986 foreign unrepatriated earnings accumulated through December 31, 2017. Unrepatriated earnings generated after December 31, 2017, are now subject to tax in the current year. All undistributed earnings are still subject to certain taxes upon repatriation, primarily where foreign withholding taxes apply. It is not practicable to calculate the unrecognized deferred tax liability on undistributed earnings.

The following table provides a reconciliation of the Company's unrecognized tax benefits:

Total Gross Unrecognized Tax Benefits

In millions	2018	2017	2016
Total unrecognized tax benefits at Jan 1	$253	$231	$280
Decreases related to positions taken on items from prior years	(7)	(4)	(12)
Increases related to positions taken on items from prior years [1]	68	37	153
Increases related to positions taken in the current year [2]	2	10	135
Settlement of uncertain tax positions with tax authorities [1]	—	(12)	(325)
Decreases due to expiration of statutes of limitations	(1)	(9)	—
Foreign exchange gain	(2)	—	—
Total unrecognized tax benefits at Dec 31	$313	$253	$231
Total unrecognized tax benefits that, if recognized, would impact the effective tax rate	$236	$243	$223
Total amount of interest and penalties (benefit) recognized in "Provision for income taxes"	$(12)	$2	$(55)
Total accrual for interest and penalties recognized in the consolidated balance sheets	$109	$110	$89

1. The 2016 balance includes the impact of a settlement agreement related to a historical change in the legal ownership structure of a nonconsolidated affiliate discussed below.
2. The 2016 balance includes $126 million assumed in the Dow Silicones ownership restructure.

On January 9, 2017, the U.S. Supreme Court denied certiorari in the Company’s tax treatment of partnerships and transactions associated with Chemtech, a wholly owned subsidiary. The Company has fully accrued the position and does not expect a future impact to “Provision for income taxes” in the consolidated statements of income as a result of the ruling.

In the fourth quarter of 2016, a settlement of $206 million was reached on a tax matter associated with a historical change in the legal ownership structure of a nonconsolidated affiliate. As a result of the settlement, the Company recorded a charge of $13 million to “Provision for income taxes” in the consolidated statements of income.

Dow and its consolidated subsidiaries are included in DowDuPont's consolidated federal income tax group and consolidated tax return. Generally, the consolidated tax liability of the DowDuPont U.S. tax group for each year will be apportioned among the members of the consolidated group based on each member’s separate taxable income. Dow and DuPont intend that, to the extent federal and/or state corporate income tax liabilities are reduced through the utilization of tax attributes of the other, settlement of any receivable and payable generated from the use of the other party’s sub-group attributes will be in accordance with a tax sharing agreement and/or tax matters agreement.

Each year, the Company files tax returns in the various national, state and local income taxing jurisdictions in which it operates. These tax returns are subject to examination and possible challenge by the tax authorities. Positions challenged by the tax authorities may be settled or appealed by the Company. As a result, there is an uncertainty in income taxes recognized in the Company’s financial statements in accordance with accounting for income taxes and accounting for uncertainty in income taxes. The ultimate resolution of such uncertainties is not expected to have a material impact on the Company's results of operations.

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Tax years that remain subject to examination for the Company's major tax jurisdictions are shown below:

Tax Years Subject to Examination by Major Tax Jurisdiction at Dec 31, 2018 Jurisdiction	Earliest Open Year
Argentina	2011
Brazil	2006
Canada	2012
China	2008
Germany	2009
Italy	2013
The Netherlands	2016
Switzerland	2012
United States:	
Federal income tax	2004
State and local income tax	2004

The reserve for non-income tax contingencies related to issues in the United States and foreign locations was $91 million at December 31, 2018 and $110 million at December 31, 2017. This is management's best estimate of the potential liability for non-income tax contingencies. Inherent uncertainties exist in estimates of tax contingencies due to changes in tax law, both legislated and concluded through the various jurisdictions' tax court systems. It is the opinion of the Company's management that the possibility is remote that costs in excess of those accrued will have a material impact on the Company's consolidated financial statements.

NOTE 10 – INVENTORIES

The following table provides a breakdown of inventories:

Inventories at Dec 31 In millions	2018	2017
Finished goods	$5,640	$5,213
Work in process	2,214	1,747
Raw materials	941	898
Supplies	880	848
Total	$9,675	$8,706
Adjustment of inventories to a LIFO basis	(415)	(330)
Total inventories	$9,260	$8,376

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NOTE 11 – PROPERTY

The following table provides a breakdown of property:

Property at Dec 31 In millions	Estimated Useful Lives (Years)	2018	2017
Land and land improvements	0-25	$2,557	$2,535
Buildings	5-50	6,067	5,920
Machinery and equipment	3-25	45,133	43,208
Other property	3-50	5,414	5,277
Construction in progress	—	2,266	3,486
Total property		$61,437	$60,426

In millions	2018	2017	2016
Depreciation expense	$2,432	$2,329	$2,130
Capitalized interest	$88	$240	$243

NOTE 12 – NONCONSOLIDATED AFFILIATES

The Company’s investments in companies accounted for using the equity method (“nonconsolidated affiliates”), by classification in the consolidated balance sheets, and dividends received from nonconsolidated affiliates are shown in the following tables:

Investments in Nonconsolidated Affiliates at Dec 31 In millions	2018 [1]	2017 [1]
Investment in nonconsolidated affiliates	$3,823	$3,742
Other noncurrent obligations	(495)	(752)
Net investment in nonconsolidated affiliates	$3,328	$2,990

1. The carrying amount of the Company’s investments in nonconsolidated affiliates at December 31, 2018, was $10 million less than its share of the investees’ net assets, ($32 million less at December 31, 2017), exclusive of additional differences relating to EQUATE Petrochemical Company K.S.C.C. ("EQUATE") and AFSI, which are discussed separately in the disclosures that follow.

Dividends Received from Nonconsolidated Affiliates In millions	2018	2017 [1]	2016
Dividends from nonconsolidated affiliates	$908	$865	$685

1. Includes a non-cash dividend of $8 million.

Except for AFSI, the nonconsolidated affiliates in which the Company has investments are privately held companies; therefore, quoted market prices are not available.

Dow Silicones and the HSC Group

As a result of the Dow Silicones ownership restructure, Dow Silicones, previously a 50:50 joint venture between Dow and Corning, became a wholly owned subsidiary of Dow as of June 1, 2016. The Company's equity interest in Dow Silicones, which was previously classified as "Investment in nonconsolidated affiliates" in the consolidated balance sheets, was remeasured to fair value. See Note 5 for additional information on the Dow Silicones ownership restructure. Dow Silicones continues to maintain equity interests in the HSC Group, which includes Hemlock

Semiconductor L.L.C. and DC HSC Holdings LLC. The negative investment balance in Hemlock Semiconductor L.L.C. was $495 million at December 31, 2018 ($752 million at December 31, 2017).

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EQUATE

At December 31, 2018, the Company had an investment balance in EQUATE of $131 million ($42 million at December 31, 2017), which is classified as "Investment in nonconsolidated affiliates" in the consolidated balance sheets. The Company's investment in EQUATE was $502 million less than the Company's proportionate share of EQUATE's underlying net assets at December 31, 2018 ($516 million less at December 31, 2017), which represents the difference between the fair values of certain MEGlobal assets acquired by EQUATE and the Company's related valuation on a U.S. GAAP basis. A basis difference of $184 million at December 31, 2018 ($200 million at December 31, 2017) is being amortized over the remaining useful lives of the assets and the remainder is considered a permanent difference.

AFSI

On July 31, 2015, the Company sold its AgroFresh business to AFSI. Proceeds received on the divestiture of AgroFresh included 17.5 million common shares of AFSI, which were valued at $210 million and represented an approximate 35 percent ownership interest in AFSI. Based on the December 31, 2016 closing stock price of AFSI, the value of this investment would have been lower than the carrying value by $143 million. In the fourth quarter of 2016, the Company determined the decline in market value of AFSI was other-than-temporary and recognized a $143 million pretax impairment charge related to its equity interest in AFSI. The impairment charge was included in "Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income. At December 31, 2018, the Company's investment in AFSI was $101 million less than the Company's proportionate share of AFSI's underlying net assets ($92 million less at December 31, 2017). This amount primarily relates to the other-than-temporary decline in the Company's investment in AFSI.

On April 4, 2017, the Company and AFSI revised certain agreements related to the divestiture of the AgroFresh business and Dow entered into a stock purchase agreement to purchase up to 5,070,358 shares of AFSI's common stock, which represented approximately 10 percent of AFSI's common stock outstanding at signing of the agreement, subject to certain terms and conditions. On November 19, 2018, the stock purchase agreement concluded. At December 31, 2018, the Company held a 42 percent ownership interest in AFSI (36 percent at December 31, 2017). See Notes 22 and 23 for further information on this investment.

Sadara

The Company and Saudi Arabian Oil Company formed Sadara Chemical Company ("Sadara") to build and operate a world-scale, fully integrated chemicals complex in Jubail Industrial City, Kingdom of Saudi Arabia. Sadara achieved its first polyethylene production in December 2015 and announced the start-up of its mixed feed cracker and a third polyethylene train (which added to the two polyethylene trains already in operation) in August 2016. Sadara achieved successful startup of its remaining production units in 2017. In 2018, the Company entered into a shareholder loan reduction agreement with Sadara and converted $312 million of the remaining loan and accrued interest balance into equity. At December 31, 2018, the Company's note receivable with Sadara was zero. In addition, in the fourth quarter of 2018, the Company waived $70 million of accounts receivable with Sadara, which was converted into equity. In 2017, the Company loaned $735 million to Sadara and converted $718 million into equity, and had a note receivable from Sadara of $275 million at December 31, 2017, included in "Noncurrent receivables" in the consolidated balance sheets.

Transactions with Nonconsolidated Affiliates

The Company has service agreements with certain nonconsolidated affiliates, including contracts to manage the operations of manufacturing sites and the construction of new facilities; licensing and technology agreements; and marketing, sales, purchase, lease and sublease agreements.

The Company sells excess ethylene glycol produced at Dow's manufacturing facilities in the United States and Europe to MEGlobal, a subsidiary of EQUATE. The Company also sells ethylene to MEGlobal as a raw material for its ethylene glycol plants in Canada. Sales of these products to MEGlobal represented 1 percent of total net sales in 2018, 2017 and 2016.

Dow Silicones supplies trichlorosilane, a raw material used in the production of polycrystalline silicon, to the HSC Group. Sales of this material to the HSC Group represented less than 1 percent of total net sales in 2018 and 2017. Sales of this material to the HSC Group for the period of June 1, 2016 through December 31, 2016 represented less than 1 percent of total net sales in 2016.

Dow is responsible for marketing the majority of Sadara products outside of the Middle East zone through the Company’s established sales channels. Under this arrangement, the Company purchases and sells Sadara products for a marketing fee. Purchases of Sadara products represented 8 percent of "Cost of sales" in 2018 (3 percent in 2017 and not material in 2016).

Dow purchases products from The SCG-Dow Group, primarily for marketing and distribution in Asia Pacific. Purchases of products from The SCG-Dow Group represented 2 percent of "Cost of sales" in 2018 (2 percent in 2017 and 3 percent in 2016).

Sales to and purchases from other nonconsolidated affiliates were not material to the consolidated financial statements.

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Balances due to or due from nonconsolidated affiliates at December 31, 2018 and 2017 were as follows:

Balances Due To or Due From Nonconsolidated Affiliates at Dec 31 In millions	2018	2017
Accounts and notes receivable - Other	$562	$474
Noncurrent receivables	8	283
Total assets	$570	$757
Accounts payable - Other	$1,328	$1,260

Principal Nonconsolidated Affiliates

Dow had an ownership interest in 51 nonconsolidated affiliates at December 31, 2018 (53 at December 31, 2017). The Company's principal nonconsolidated affiliates and its ownership interest (direct and indirect) for each at December 31, 2018, 2017 and 2016 are as follows:

Principal Nonconsolidated Affiliates at Dec 31	Country	Ownership Interest		
		2018	2017	2016
EQUATE Petrochemical Company K.S.C.C.	Kuwait	42.5 %	42.5 %	42.5 %
The HSC Group:				
DC HSC Holdings LLC [1]	United States	50 %	50 %	50 %
Hemlock Semiconductor L.L.C.	United States	50.1 %	50.1 %	50.1 %
The Kuwait Olefins Company K.S.C.C.	Kuwait	42.5 %	42.5 %	42.5 %
The Kuwait Styrene Company K.S.C.C.	Kuwait	42.5 %	42.5 %	42.5 %
Map Ta Phut Olefins Company Limited [2]	Thailand	32.77 %	32.77 %	32.77 %
Sadara Chemical Company	Saudi Arabia	35 %	35 %	35 %
The SCG-Dow Group:				
Siam Polyethylene Company Limited	Thailand	50 %	50 %	50 %
Siam Polystyrene Company Limited	Thailand	50 %	50 %	50 %
Siam Styrene Monomer Co., Ltd.	Thailand	50 %	50 %	50 %
Siam Synthetic Latex Company Limited	Thailand	50 %	50 %	50 %

1. DC HSC Holdings LLC holds an 80.5 percent indirect ownership interest in Hemlock Semiconductor Operations LLC.

2. The Company's effective ownership of Map Ta Phut Olefins Company Limited is 32.77 percent, of which the Company directly owns 20.27 percent and indirectly owns 12.5 percent through its equity interest in Siam Polyethylene Company Limited.

The Company’s investment in and equity earnings from its principal nonconsolidated affiliates are shown in the tables below:

Investment in Principal Nonconsolidated Affiliates at Dec 31 In millions	2018	2017
Investment in nonconsolidated affiliates	$3,411	$3,323
Other noncurrent obligations	(495)	(752)
Net investment in principal nonconsolidated affiliates	$2,916	$2,571

Equity Earnings from Principal Nonconsolidated Affiliates In millions	2018	2017	2016 [1]
Equity in earnings of principal nonconsolidated affiliates	$950	$701	$449

1.

Equity in earnings of principal nonconsolidated affiliates for 2016 includes the results of Dow Silicones through May 31, 2016.

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The summarized financial information that follows represents the combined accounts (at 100 percent) of the principal nonconsolidated affiliates.

Summarized Balance Sheet Information at Dec 31 In millions	2018	2017
Current assets	$8,741	$8,039
Noncurrent assets	27,385	28,300
Total assets	$36,126	$36,339
Current liabilities	$5,706	$5,164
Noncurrent liabilities	20,807	22,240
Total liabilities	$26,513	$27,404
Noncontrolling interests	$332	$304

Summarized Income Statement Information [1] In millions	2018	2017	2016 [2]
Sales	$15,619	$13,345	$12,003
Gross profit	$3,130	$2,461	$2,518
Net income	$1,943	$1,401	$831

1. The results in this table reflect purchase and sale activity between certain principal nonconsolidated affiliates and the Company, as previously discussed in the "Transactions with Nonconsolidated Affiliates" section.
2. The summarized income statement information for 2016 includes the results of Dow Silicones through May 31, 2016.

NOTE 13 – GOODWILL AND OTHER INTANGIBLE ASSETS

The following table shows changes in the carrying amount of goodwill for the years ended December 31, 2018 and 2017:

Goodwill In millions	
Balance at Jan 1, 2017	$15,272
Sale of SKC Haas Display Films [1]	(34)
Divestiture of the EAA Business [2]	(23)
Divestiture of the DAS Divested Ag Business [3]	(128)
Dissolution of joint venture [4]	48
Goodwill impairment	(1,491)
Foreign currency impact	299
Other	(5)
Balance at Dec 31, 2017	$13,938
Foreign currency impact	(80)
Other	(10)
Balance at Dec 31, 2018	$13,848

1. On June 30, 2017, the Company sold its ownership interest in the SKC Haas Display Films group of companies. See Note 18 for additional information.
2. On September 1, 2017, the Company divested its EAA Business to SK Global Chemical Co., Ltd. See Note 6 for additional information.
3. On November 30, 2017, the Company divested the DAS Divested Ag Business to CITIC Agri Fund. See Note 6 for additional information.

4. On December 31, 2017, the Company dissolved a crude acrylic acid joint venture. See Note 23 for additional information.

Effective with the Merger, the Company updated its reporting units to align with the level at which discrete financial information is available for review by management. A relative fair value method was used to reallocate goodwill for reporting units of which the composition had changed. The new reporting units are: Agriculture, Coatings & Performance Monomers, Construction Chemicals, Consumer Solutions, Electronics & Imaging, Energy Solutions, Hydrocarbons & Energy, Industrial Biosciences, Industrial Solutions, Nutrition & Health, Packaging and Specialty Plastics, Polyurethanes & CAV, Safety & Construction and Transportation & Advanced Polymers. At December 31, 2017, goodwill was carried by all of these reporting units.

In 2018, the Energy Solutions and Construction Chemicals reporting units were combined into Industrial Solutions and Polyurethanes & CAV, respectively. At December 31, 2018, goodwill was carried by all reporting units.

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Goodwill Impairments
The carrying amounts of goodwill at December 31, 2018 and 2017, were net of accumulated impairments of $1,920 million.

Goodwill Impairment Testing
The Company performs an impairment test of goodwill annually in the fourth quarter. In 2018, the Company performed quantitative testing for 2 reporting units (11 in 2017 and 3 in 2016) and a qualitative assessment was performed for the remaining reporting units. The qualitative assessments indicated that it was not more likely than not that fair value was less than the carrying value for those reporting units included in the qualitative test.

The quantitative testing conducted in 2018 and 2016 concluded that no goodwill impairments existed.

Upon completion of the quantitative testing in the fourth quarter of 2017, the Company determined the Coatings & Performance Monomers reporting unit was impaired. Throughout 2017, the Coatings & Performance Monomers reporting unit did not consistently meet expected financial performance targets, primarily due to increasing commoditization in coatings markets and competition, as well as customer consolidation in end markets which reduced growth opportunities. As a result, the Coatings & Performance Monomers reporting unit lowered future revenue and profitability expectations. The fair value of the Coatings & Performance Monomers reporting unit was determined using a discounted cash flow methodology that reflected reductions in projected revenue growth rates, primarily driven by modified sales volume and pricing assumptions, as well as revised expectations for future growth rates. These discounted cash flows did not support the carrying value of the Coatings & Performance Monomers reporting unit. As a result, the Company recorded a goodwill impairment charge for the Coatings & Performance Monomers reporting unit of $1,491 million in the fourth quarter of 2017, included in “Restructuring, goodwill impairment and asset related charges - net” in the consolidated statements of income. The Coatings & Performance Monomers reporting unit carried $1,071 million of goodwill at December 31, 2017. No other goodwill impairments were identified as a result of the 2017 testing.

Other Intangible Assets
The following table provides information regarding the Company’s other intangible assets:

Other Intangible Assets at Dec 31	2018			2017		
In millions	Gross Carrying Amount	Accum Amort	Net	Gross Carrying Amount	Accum Amort	Net
Intangible assets with finite lives:						
Developed technology	$3,255	$(1,934)	$1,321	$3,263	$(1,690)	$1,573
Software	1,529	(876)	653	1,420	(780)	640
Trademarks/tradenames	688	(631)	57	697	(570)	127
Customer-related	4,911	(2,151)	2,760	5,035	(1,965)	3,070
Other	243	(170)	73	245	(156)	89
Total other intangible assets, finite lives	$10,626	$(5,762)	$4,864	$10,660	$(5,161)	$5,499
In-process research and development ("IPR&D")	49	—	49	50	—	50
Total other intangible assets	$10,675	$(5,762)	$4,913	$10,710	$(5,161)	$5,549

The following table provides information regarding amortization expense related to intangible assets:

Amortization Expense In millions	2018	2017	2016

Other intangible assets, excluding software	$622	$624	$544
Software, included in “Cost of sales”	$100	$87	$73

In the fourth quarter of 2017, the Company wrote-off $69 million of intangible assets (including $11 million of IPR&D) as part of the Synergy Program. In the second quarter of 2016, the Company wrote-off $11 million of IPR&D as part of the 2016 restructuring charge. These charges were included in "Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income. See Note 7 for additional information.

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Total estimated amortization expense for the next five fiscal years is as follows:

Estimated Amortization Expense for Next Five Years In millions	
2019	$ 648
2020	$ 614
2021	$ 585
2022	$ 516
2023	$ 488

NOTE 14 – TRANSFERS OF FINANCIAL ASSETS

The Company has historically sold trade accounts receivable of select North American entities and qualifying trade accounts receivable of select European entities on a revolving basis to certain multi-seller commercial paper conduit entities ("conduits"). The proceeds received are comprised of cash and interests in specified assets of the conduits (the receivables sold by the Company) that entitle the Company to the residual cash flows of such specified assets in the conduits after the commercial paper has been repaid. Neither the conduits nor the investors in those entities have recourse to other assets of the Company in the event of nonpayment by the debtors.

In the fourth quarter of 2017, the Company suspended further sales of trade accounts receivable through these facilities and began reducing outstanding balances through collections of trade accounts receivable previously sold to such conduits. In September and October 2018, the North American and European facilities, respectively, were amended and the terms of the agreements changed from off-balance sheet arrangements to secured borrowing arrangements. See Note 15 for additional information on the secured borrowing arrangements.

For the year ended December 31, 2018, the Company recognized a loss of $7 million on the sale of these receivables ($25 million loss for the year ended December 31, 2017 and $20 million loss for the year ended December 31, 2016), which is included in “Interest expense and amortization of debt discount” in the consolidated statements of income.

The following table summarizes the carrying value of interests held, which represents the Company's maximum exposure to loss related to the receivables sold, and the percentage of anticipated credit losses related to the trade accounts receivable sold. Also provided is the sensitivity of the fair value of the interests held to hypothetical adverse changes in the anticipated credit losses; amounts shown below are the corresponding hypothetical decreases in the carrying value of interests.

Interests Held at Dec 31 In millions	2018	2017
Carrying value of interests held [1]	$ —	$ 677
Percentage of anticipated credit losses	—%	2.64 %
Impact to carrying value - 10% adverse change	$ —	$ —
Impact to carrying value - 20% adverse change	$ —	$ 1

1. Included in "Accounts and notes receivable - other" in the consolidated balance sheets.

Credit losses, net of any recoveries, on receivables sold were insignificant for the years ended December 31, 2018, 2017 and 2016.

Following is an analysis of certain cash flows between the Company and the conduits:

Cash Proceeds			
In millions	2018	2017	2016
Sale of receivables	$—	$1	$1
Collections reinvested in revolving receivables	$—	$21,293	$21,652
Interests in conduits [1]	$657	$9,462	$8,551

1. Presented in "Investing Activities" in the consolidated statements of cash flows in accordance with ASU 2016-15. See Notes 1 and 2 for additional information. In connection with the review and implementation of ASU 2016-15, the Company also changed the prior year value of “Interests in conduits” due to additional interpretive guidance of the required method for calculating the cash received from beneficial interests in the conduits, including additional guidance from the SEC's Office of the Chief Accountant issued in the third quarter of 2018 that indicated an entity must evaluate daily transaction activity to calculate the value of cash received from beneficial interests in conduits.

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Following is additional information related to the sale of receivables under these facilities:

Trade Accounts Receivable Sold at Dec 31		
In millions	2018	2017
Delinquencies on sold receivables still outstanding	$ —	$82
Trade accounts receivable outstanding and derecognized	$ —	$612

In 2017, the Company repurchased $5 million of previously sold receivables.

NOTE 15 – NOTES PAYABLE, LONG-TERM DEBT AND AVAILABLE CREDIT FACILITIES

Notes Payable at Dec 31		
In millions	2018	2017
Commercial paper	$10	$231
Notes payable to banks and other lenders	295	253
Total notes payable	$305	$484
Year-end average interest rates	8.61 %	4.42 %

Long-Term Debt at Dec 31	2018		2017	
In millions	Average Rate	2018	Average Rate	2017
Promissory notes and debentures:				
Final maturity 2018	— %	$—	5.78 %	$339
Final maturity 2019	9.80 %	7	8.55 %	2,122
Final maturity 2020	4.46 %	1,547	4.46 %	1,547
Final maturity 2021	4.71 %	1,424	4.71 %	1,424
Final maturity 2022	3.50 %	1,373	3.50 %	1,373
Final maturity 2023	7.64 %	325	7.64 %	325
Final maturity 2024 and thereafter	5.73 %	8,859	5.92 %	6,857
Other facilities:				
U.S. dollar loans, various rates and maturities	3.59 %	4,533	2.44 %	4,564
Foreign currency loans, various rates and maturities	3.21 %	713	3.00 %	814
Medium-term notes, varying maturities through 2025	3.26 %	778	3.20 %	873
Tax-exempt bonds	— %	—	5.66 %	343
Capital lease obligations		369		282
Unamortized debt discount and issuance costs		(334)		(346)
Long-term debt due within one year [1]		(340)		(752)
Long-term debt		$19,254		$19,765

1. Presented net of current portion of unamortized debt issuance costs.

Maturities of Long-Term Debt for Next Five Years at Dec 31, 2018 [1]

In millions	
2019	$340
2020	$1,833
2021	$6,247
2022	$1,510
2023	$480

1. Assumes the option to extend a term loan facility related to the Dow Silicones ownership restructure will be exercised.

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2018 Activity
In 2018, the Company redeemed $333 million of 5.70 percent notes at maturity and an aggregate principal amount of $91 million of International Notes ("InterNotes") at maturity. In addition, approximately $138 million of long-term debt was repaid by consolidated variable interest entities. The Company also called an aggregate principal amount of $343 million tax-exempt bonds of various interest rates and maturities in 2029, 2033 and 2038. As a result of these redemptions, the Company recognized a pretax loss of $6 million on the early extinguishment of debt, included in “Sundry income (expense) - net” in the consolidated statements of income.

In November 2018, the Company issued $2.0 billion of senior unsecured notes in an offering under Rule 144A of the Securities Act of 1933. The offering included $900 million aggregate principal amount of 5.55 percent notes due 2048; $600 million aggregate principal amount of 4.80 percent notes due 2028; and $500 million aggregate principal amount of 4.55 percent notes due 2025.

In December 2018, the Company tendered and redeemed $2.1 billion of 8.55 percent notes issued by the Company with maturity in 2019. As a result, the Company recognized a pretax loss of $48 million on the early extinguishment of debt, included in "Sundry income (expense) - net" in the consolidated statements of income.

2017 Activity
In 2017, the Company redeemed $436 million of 6.00 percent notes that matured on September 15, 2017, and $32 million aggregate principal amount of InterNotes at maturity. In addition, approximately $119 million of long-term debt was repaid by consolidated variable interest entities.

2016 Activity
In 2016, the Company redeemed $349 million of 2.50 percent notes that matured on February 15, 2016, and $52 million aggregate principal amount of InterNotes at maturity. In addition, approximately $128 million of long-term debt (net of $28 million of additional borrowings) was repaid by consolidated variable interest entities.

As part of the Dow Silicones ownership restructure, the fair value of debt assumed by Dow was $4,672 million and is reflected in the long-term debt table above.

Available Credit Facilities
The following table summarizes the Company's credit facilities:

Committed and Available Credit Facilities at Dec 31, 2018

In millions	Effective Date	Committed Credit	Credit Available	Maturity Date	Interest
Five Year Competitive Advance and Revolving Credit Facility	October 2018	$ 5,000	$ 5,000	October 2023	Floating rate
Bilateral Revolving Credit Facility	August 2015	100	100	March 2019	Floating rate
Bilateral Revolving Credit Facility	August 2015	100	100	October 2019	Floating rate
Bilateral Revolving Credit Facility	August 2015	100	100	March 2020	Floating rate
Bilateral Revolving Credit Facility	August 2015	280	280	March 2020	Floating rate
Bilateral Revolving Credit Facility	August 2015	100	100	March 2020	Floating rate

Bilateral Revolving Credit Facility	August 2015	200	200	March 2020	Floating rate
Term Loan Facility	February 2016	4,500	—	December 2021	Floating rate
Bilateral Revolving Credit Facility	May 2016	200	200	May 2020	Floating rate
Bilateral Revolving Credit Facility	July 2016	200	200	July 2020	Floating rate
Bilateral Revolving Credit Facility	August 2016	100	100	August 2020	Floating rate
North American Securitization Facility	September 2018	800	800	September 2019	Floating rate
European Securitization Facility [1]	October 2018	457	457	October 2020	Floating rate
Total Committed and Available Credit Facilities		$ 12,137	$ 7,637		

1. Equivalent to Euro 400 million.

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Term Loan Facility
In connection with the ownership restructure of Dow Silicones on May 31, 2016, Dow Silicones incurred $4.5 billion of indebtedness under a certain third party credit agreement ("Term Loan Facility"). The Company subsequently guaranteed the obligations of Dow Silicones under the Term Loan Facility and, as a result, the covenants and events of default applicable to the Term Loan Facility are substantially similar to the covenants and events of default set forth in the Company's Five Year Competitive Advance and Revolving Credit Facility. In the second quarter of 2018, Dow Silicones exercised the 19-month extension option making amounts borrowed under the Term Loan Facility repayable on December 30, 2019. In addition, Dow Silicones amended the Term Loan Facility to include an additional 2-year extension option, at Dow Silicones' election, upon satisfaction of certain customary conditions precedent. Dow Silicones intends to exercise the 2-year extension option on the Term Loan Facility.

Secured Borrowings
In September 2018, the Company renewed its North American accounts receivable securitization facility for a one year term and amended the terms of the agreement from an off-balance sheet arrangement to a secured borrowing arrangement, with a borrowing capacity up to $800 million. Under the structure of the amended agreement, the Company will use select trade accounts receivable to collateralize the credit facility with certain lenders. At December 31, 2018, the facility had not been drawn upon.

In October 2018, the Company renewed its European accounts receivable securitization facility for a two year term and amended the terms of the agreement from an off-balance sheet arrangement to a secured borrowing arrangement, with a borrowing capacity up to Euro 400 million. Under the structure of the amended agreement, the Company will use select trade accounts receivable to collateralize the credit facility with certain lenders. At December 31, 2018, the facility had not been drawn upon.

Uncommitted Credit Facilities and Outstanding Letters of Credit
The Company had uncommitted credit facilities in the form of unused bank credit lines of approximately $3,480 million at December 31, 2018. These lines can be used to support short-term liquidity needs and general purposes, including letters of credit. Outstanding letters of credit were $439 million at December 31, 2018 ($433 million at December 31, 2017). These letters of credit support commitments made in the ordinary course of business.

Debt Covenants and Default Provisions
The Company’s outstanding long-term debt has been issued primarily under indentures which contain, among other provisions, certain customary restrictive covenants with which the Company must comply while the underlying notes are outstanding. Failure of the Company to comply with any of its covenants, could result in a default under the applicable indenture and allow the note holders to accelerate the due date of the outstanding principal and accrued interest on the underlying notes.

The Company's indenture covenants include obligations to not allow liens on principal U.S. manufacturing facilities, enter into sale and lease-back transactions with respect to principal U.S. manufacturing facilities, merge or consolidate with any other corporation, or sell, lease or convey, directly or indirectly, all or substantially all of the Company’s assets. The outstanding debt also contains customary default provisions. The Company remains in compliance with these covenants after the Merger.

The Company’s primary, private credit agreements also contain certain customary restrictive covenant and default provisions in addition to the covenants set forth above with respect to the Company’s debt. Significant other restrictive covenants and default provisions related to these agreements include:

(a)

the obligation to maintain the ratio of the Company's consolidated indebtedness to consolidated capitalization at no greater than 0.65 to 1.00 at any time the aggregate outstanding amount of loans under the Five Year Competitive Advance and Revolving Credit Facility Agreement dated October 30, 2018, equals or exceeds $500 million,

(b) a default if the Company or an applicable subsidiary fails to make any payment, including principal, premium or interest, under the applicable agreement on other indebtedness of, or guaranteed by, the Company or such applicable subsidiary in an aggregate amount of $100 million or more when due, or any other default or other event under the applicable agreement with respect to such indebtedness occurs which permits or results in the acceleration of $400 million or more in the aggregate of principal, and

(c) a default if the Company or any applicable subsidiary fails to discharge or stay within 60 days after the entry of a final judgment against the Company or such applicable subsidiary of more than $400 million.

Failure of the Company to comply with any of the covenants or default provisions could result in a default under the applicable credit agreement which would allow the lenders to not fund future loan requests and to accelerate the due date of the outstanding principal and accrued interest on any outstanding indebtedness.

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NOTE 16 – COMMITMENTS AND CONTINGENT LIABILITIES

Environmental Matters

Introduction

Accruals for environmental matters are recorded when it is probable that a liability has been incurred and the amount of the liability can be reasonably estimated based on current law and existing technologies. At December 31, 2018, the Company had accrued obligations of $820 million for probable environmental remediation and restoration costs, including $156 million for the remediation of Superfund sites. These obligations are included in "Accrued and other current liabilities" and "Other noncurrent obligations" in the consolidated balance sheets. This is management’s best estimate of the costs for remediation and restoration with respect to environmental matters for which the Company has accrued liabilities, although it is reasonably possible that the ultimate cost with respect to these particular matters could range up to approximately two times that amount. Consequently, it is reasonably possible that environmental remediation and restoration costs in excess of amounts accrued could have a material impact on the Company’s results of operations, financial condition and cash flows. It is the opinion of the Company’s management, however, that the possibility is remote that costs in excess of the range disclosed will have a material impact on the Company’s results of operations, financial condition or cash flows. Inherent uncertainties exist in these estimates primarily due to unknown conditions, changing governmental regulations and legal standards regarding liability, and emerging remediation technologies for handling site remediation and restoration. At December 31, 2017, the Company had accrued obligations of $878 million for probable environmental remediation and restoration costs, including $152 million for the remediation of Superfund sites.

In the fourth quarter of 2016, the Company recorded a pretax charge of $295 million for environmental remediation at a number of historical locations, including the Midland manufacturing site/off-site matters and the Wood-Ridge sites, primarily resulting from the culmination of negotiations with regulators and/or final agency approval. These charges were included in "Cost of sales" in the consolidated statements of income.

The following table summarizes the activity in the Company's accrued obligations for environmental matters for the years ended December 31, 2018 and 2017:

Accrued Obligations for Environmental Matters In millions	2018	2017
Balance at Jan 1	$878	$909
Accrual adjustment	175	172
Payments against reserve	(209)	(220)
Foreign currency impact	(24)	17
Balance at Dec 31	$820	$878

The amounts charged to income on a pretax basis related to environmental remediation totaled $174 million in 2018, $171 million in 2017 and $504 million in 2016. Capital expenditures for environmental protection were $76 million in 2018, $79 million in 2017 and $66 million in 2016.

Midland Off-Site Environmental Matters

On June 12, 2003, the Michigan Department of Environmental Quality ("MDEQ") issued a Hazardous Waste Operating License (the "License") to the Company’s Midland, Michigan manufacturing site (the “Midland site”), which was renewed and replaced by the MDEQ on September 25, 2015, and included provisions requiring the Company to conduct an investigation to determine the nature and extent of off-site contamination in the City of Midland soils, the Tittabawassee River and Saginaw River sediment and floodplain soils, and the Saginaw Bay, and, if necessary, undertake remedial action. In 2016, final regulatory approval was received from the MDEQ for the City of Midland and Dow is continuing the long term monitoring requirements of the Remedial Action Plan.

Tittabawassee and Saginaw Rivers, Saginaw Bay

The Company, the U.S. Environmental Protection Agency (“EPA”) and the State of Michigan ("State") entered into an administrative order on consent (“AOC”), effective January 21, 2010, that requires the Company to conduct a remedial investigation, a feasibility study and a remedial design for the Tittabawassee River, the Saginaw River and the Saginaw Bay, and pay the oversight costs of the EPA and the State under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act. These actions, to be conducted under the lead oversight of the EPA, will build upon the investigative work completed under the State Resource Conservation Recovery Act program from 2005 through 2009.

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The Tittabawassee River, beginning at the Midland Site and extending down to the first six miles of the Saginaw River, are designated as the first Operable Unit for purposes of conducting the remedial investigation, feasibility study and remedial design work. This work will be performed in a largely upriver to downriver sequence for eight geographic segments of the Tittabawassee and upper Saginaw Rivers. In the first quarter of 2012, the EPA requested the Company address the Tittabawassee River floodplain ("Floodplain") as an additional segment. In January 2015, the Company and the EPA entered into an order to address remediation of the Floodplain. The remedial work is expected to take place over the next three years. The remainder of the Saginaw River and the Saginaw Bay are designated as a second Operable Unit and the work associated with that unit may also be geographically segmented. The AOC does not obligate the Company to perform removal or remedial action; that action can only be required by a separate order. The Company and the EPA have been negotiating orders separate from the AOC that obligate the Company to perform remedial actions under the scope of work of the AOC. The Company and the EPA have entered into four separate orders to perform limited remedial actions in five of the eight geographic segments in the first Operable Unit, and the order to address the Floodplain.

Alternative Dispute Resolution Process

The Company, the EPA, the U.S. Department of Justice ("DOJ"), and the natural resource damage trustees (which include the Michigan Office of the Attorney General, the MDEQ, the U.S. Fish and Wildlife Service, the U.S. Bureau of Indian Affairs and the Saginaw-Chippewa tribe) have been engaged in negotiations to seek to resolve potential governmental claims against the Company related to historical off-site contamination associated with the City of Midland, the Tittabawassee and Saginaw Rivers and the Saginaw Bay. The Company and the governmental parties started meeting in the fall of 2005 and entered into a Confidentiality Agreement in December 2005. The Company continues to conduct negotiations under the Federal Alternative Dispute Resolution Act with all of the governmental parties, except the EPA which withdrew from the alternative dispute resolution process on September 12, 2007.

On September 28, 2007, the Company and the natural resource damage trustees entered into a Funding and Participation Agreement that addressed the Company’s payment of past costs incurred by the natural resource damage trustees, payment of the costs of a trustee coordinator and a process to review additional cooperative studies that the Company might agree to fund or conduct with the natural resource damage trustees. On March 18, 2008, the Company and the natural resource damage trustees entered into a Memorandum of Understanding ("MOU") to provide a mechanism for the Company to fund cooperative studies related to the assessment of natural resource damages. This MOU was amended and funding of cooperative studies was extended until March 2014. All cooperative studies have been completed. On April 7, 2008, the natural resource damage trustees released their “Natural Resource Damage Assessment Plan for the Tittabawassee River System Assessment Area.”

At December 31, 2018, the accrual for these off-site matters was $95 million (included in the total accrued obligation of $820 million). At December 31, 2017, the Company had an accrual for these off-site matters of $83 million (included in the total accrued obligation of $878 million).

Environmental Matters Summary

It is the opinion of the Company’s management that the possibility is remote that costs in excess of those disclosed will have a material impact on the Company’s results of operations, financial condition or cash flows.

Litigation

Asbestos-Related Matters of Union Carbide Corporation

Introduction

Union Carbide is and has been involved in a large number of asbestos-related suits filed primarily in state courts during the past four decades. These suits principally allege personal injury resulting from exposure to asbestos-containing products and frequently seek both actual and punitive damages. The alleged claims primarily

relate to products that Union Carbide sold in the past, alleged exposure to asbestos-containing products located on Union Carbide’s premises, and Union Carbide’s responsibility for asbestos suits filed against a former Union Carbide subsidiary, Amchem Products, Inc. ("Amchem"). In many cases, plaintiffs are unable to demonstrate that they have suffered any compensable loss as a result of such exposure, or that injuries incurred in fact resulted from exposure to Union Carbide’s products.

Union Carbide expects more asbestos-related suits to be filed against Union Carbide and Amchem in the future, and will aggressively defend or reasonably resolve, as appropriate, both pending and future claims.

Estimating the Asbestos-Related Liability

Based on a study completed in January 2003 by Ankura Consulting Group, LLC ("Ankura"), Union Carbide increased its December 31, 2002 asbestos-related liability for pending and future claims for a 15-year period ending in 2017 to $2.2 billion, excluding future defense and processing costs. Since then, Union Carbide has compared current asbestos claim and resolution activity to the results of the most recent Ankura study at each balance sheet date to determine whether the accrual continues to be

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appropriate. In addition, Union Carbide has requested Ankura to review Union Carbide’s historical asbestos claim and resolution activity each year since 2004 to determine the appropriateness of updating the most recent Ankura study.

In October 2016, Union Carbide requested Ankura to review its historical asbestos claim and resolution activity and determine the appropriateness of updating its December 2014 study. In response to the request, Ankura reviewed and analyzed asbestos-related claim and resolution data through September 30, 2016. The resulting study, completed by Ankura in December 2016, provided estimates for the undiscounted cost of disposing of pending and future claims against Union Carbide and Amchem, excluding future defense and processing costs, for both a 15-year period and through the terminal year of 2049.

Based on the study completed in December 2016 by Ankura, and Union Carbide's own review, it was determined that an adjustment to the accrual was necessary. Union Carbide determined that using the estimate through the terminal year of 2049 was more appropriate due to increasing knowledge and data about the costs to resolve claims and diminished volatility in filing rates. Using the range in the Ankura December 2016 study, which was estimated to be between $502 million and $565 million for the undiscounted cost of disposing of pending and future claims, Union Carbide increased its asbestos-related liability for pending and future claims through the terminal year of 2049 by $104 million, included in "Asbestos-related charge" in the consolidated statements of income.

In September 2014, Union Carbide began to implement a strategy designed to reduce and to ultimately stabilize and forecast defense costs associated with asbestos-related matters. The strategy included a number of important changes including: invoicing protocols including capturing costs by plaintiff; review of existing counsel roles, work processes and workflow; and the utilization of enterprise legal management software, which enabled claim-specific tracking of asbestos-related defense and processing costs. Union Carbide reviewed the information generated from this new strategy and determined that it now had the ability to reasonably estimate asbestos-related defense and processing costs for the same periods that it estimates its asbestos-related liability for pending and future claims. Union Carbide believes that including estimates of the liability for asbestos-related defense and processing costs provides a more complete assessment and measure of the liability associated with resolving asbestos-related matters, which Union Carbide and the Company believe is preferable in these circumstances.

In October 2016, in addition to the study for asbestos claim and resolution activity, Union Carbide requested Ankura to review asbestos-related defense and processing costs and provide an estimate of defense and processing costs associated with resolving pending and future asbestos-related claims facing Union Carbide and Amchem for the same periods of time that Union Carbide uses for estimating resolution costs. In December 2016, Ankura conducted the study and provided Union Carbide with an estimate of future defense and processing costs for both a 15-year period and through the terminal year of 2049. The resulting study estimated asbestos-related defense and processing costs for pending and future asbestos claims to be between $1,009 million and $1,081 million through the terminal year of 2049.

In the fourth quarter of 2016, Union Carbide and the Company elected to change their method of accounting for asbestos-related defense and processing costs from expensing as incurred to estimating and accruing a liability. This change is believed to be preferable as asbestos-related defense and processing costs represent expenditures related to legacy activities that do not contribute to current or future revenue generating activities of the Company. The change is also reflective of the manner in which Union Carbide manages its asbestos-related exposure, including careful monitoring of the correlation between defense spending and resolution costs. Together, these two sources of cost more accurately represent the “total cost” of resolving asbestos-related claims now and in the future.

This accounting policy change was reflected as a change in accounting estimate effected by a change in accounting principle. As a result of this accounting policy change and based on the December 2016 Ankura study of

asbestos-related defense and processing costs and Union Carbide's own review of the data, Union Carbide recorded a pretax charge for asbestos-related defense and processing costs of $1,009 million in the fourth quarter of 2016, included in “Asbestos-related charge” in the consolidated statements of income.

In October 2017, Union Carbide requested Ankura to review its historical asbestos claim and resolution activity (including asbestos-related defense and processing costs) and determine the appropriateness of updating its December 2016 study. In response to that request, Ankura reviewed and analyzed data through September 30, 2017. In December 2017, Ankura stated that an update of its December 2016 study would not provide a more likely estimate of future events than the estimate reflected in the study and, therefore, the estimate in that study remained applicable. Based on Union Carbide's own review of the asbestos claim and resolution activity (including asbestos-related defense and processing costs) and Ankura's response, Union Carbide determined that no change to the accrual was required. At December 31, 2017, the asbestos-related liability for pending and future claims against Union Carbide and Amchem, including future asbestos-related defense and processing costs, was $1,369 million, and approximately 16 percent of the recorded liability related to pending claims and approximately 84 percent related to future claims.

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In October 2018, Union Carbide requested Ankura to review its historical asbestos claim and resolution activity (including asbestos-related defense and processing costs) and determine the appropriateness of updating its December 2016 study. In response to that request, Ankura reviewed and analyzed data through September 30, 2018. The resulting study, completed by Ankura in December 2018, provided estimates for the undiscounted cost of disposing of pending and future claims against Union Carbide and Amchem, including future defense and processing costs, through the terminal year of 2049. Based on the study completed in December 2018 by Ankura, and Union Carbide's own review, it was determined that no adjustment to the accrual was required. At December 31, 2018, Union Carbide's asbestos-related liability for pending and future claims and defense and processing costs was $1,260 million, and approximately 16 percent of the recorded liability related to pending claims and approximately 84 percent related to future claims.

Summary

The Company's management believes the amounts recorded by Union Carbide for the asbestos-related liability (including defense and processing costs) reflect reasonable and probable estimates of the liability based upon current, known facts. However, future events, such as the number of new claims to be filed and/or received each year, the average cost of defending and disposing of each such claim, as well as the numerous uncertainties surrounding asbestos litigation in the United States over a significant period of time, could cause the actual costs for Union Carbide to be higher or lower than those projected or those recorded. Any such events could result in an increase or decrease in the recorded liability.

Because of the uncertainties described above, Union Carbide cannot estimate the full range of the cost of resolving pending and future asbestos-related claims facing Union Carbide and Amchem. As a result, it is reasonably possible that an additional cost of disposing of Union Carbide's asbestos-related claims, including future defense and processing costs, could have a material impact on the Company's results of operations and cash flows for a particular period and on the consolidated financial position.

Urethane Matters

Class Action Lawsuit

On February 16, 2006, the Company, among others, received a subpoena from the DOJ as part of a previously announced antitrust investigation of manufacturers of polyurethane chemicals, including methylene diphenyl diisocyanate, toluene diisocyanate, polyether polyols and system house products. The Company cooperated with the DOJ and, following an extensive investigation, on December 10, 2007, the Company received notice from the DOJ that it had closed its investigation of potential antitrust violations involving these products without indictments or pleas.

In 2005, the Company, among others, was named as a defendant in multiple civil class action lawsuits alleging a conspiracy to fix the price of various urethane chemical products, namely the products that were the subject of the above described DOJ antitrust investigation. On July 29, 2008, a Kansas City federal district court (the "district court") certified a class of purchasers of the products for the six-year period from 1999 through 2004 ("plaintiff class"). In January 2013, the class action lawsuit went to trial with the Company as the sole remaining defendant, the other defendants having previously settled. On February 20, 2013, the federal jury returned a damages verdict of approximately $400 million against the Company, which ultimately was trebled under applicable antitrust laws, less offsets from other settling defendants, resulting in a judgment entered in July 2013 in the amount of $1.06 billion. The Company appealed this judgment to the U.S. Tenth Circuit Court of Appeals ("Court of Appeals"), and on September 29, 2014, the Court of Appeals issued an opinion affirming the district court judgment.

On March 9, 2015, the Company filed a petition for writ of certiorari ("Writ Petition") with the United States Supreme Court, seeking judicial review and requesting that it correct fundamental errors in the Court of Appeals decision. In

the first quarter of 2016, the Company changed its risk assessment on this matter as a result of growing political uncertainties due to events within the Supreme Court, including Justice Scalia's death, and the increased likelihood for unfavorable outcomes for businesses involved in class action lawsuits. On February 26, 2016, the Company announced a proposed settlement under which the Company would pay the plaintiff class $835 million, which included damages, class attorney fees and post-judgment interest. On July 29, 2016, the U.S. District Court for the District of Kansas granted final approval of the settlement. The settlement resolved the $1.06 billion judgment and any subsequent claim for attorneys' fees, costs and post-judgment interest against the Company. As a result, in the first quarter of 2016, the Company recorded a loss of $835 million, included in "Sundry income (expense) - net" in the consolidated statements of income. The Company continues to believe that it was not part of any conspiracy and the judgment was fundamentally flawed as a matter of class action law. The case is now concluded.

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Opt-Out Cases

Shortly after the July 2008 class certification ruling, a series of "opt-out" cases were filed by a number of large volume purchasers who elected not to be class members in the district court case. These opt-out cases were substantively identical to the class action lawsuit, but expanded the period of time to include 1994 through 1998. A consolidated jury trial of the opt-out cases began on March 8, 2016. Prior to a jury verdict, on April 5, 2016, the Company entered into a binding settlement for the opt-out cases under which the Company would pay the named plaintiffs $400 million, inclusive of damages and attorney fees. Payment of this settlement occurred on May 4, 2016. The Company changed its risk assessment on this matter as a result of the class settlement and the uncertainty of a jury trial outcome along with the automatic trebling of an adverse verdict. As a result, the Company recorded a loss of $400 million in the first quarter of 2016, included in "Sundry income (expense) - net" in the consolidated statements of income. As with the class action case, the Company continues to deny allegations of price fixing and maintains that it was not part of any conspiracy. The case is now concluded.

Bayer CropScience v. Dow AgroSciences ICC Arbitration

On August 13, 2012, Bayer CropScience AG and Bayer CropScience NV (together, “Bayer”) filed a request for arbitration with the International Chamber of Commerce ("ICC") International Court of Arbitration against Dow AgroSciences LLC, a wholly owned subsidiary of the Company, and other subsidiaries of the Company (collectively, “DAS”) under a 1992 license agreement executed by predecessors of the parties (the “License Agreement”). In its request for arbitration, Bayer alleged that (i) DAS breached the License Agreement, (ii) the License Agreement was properly terminated with no ongoing rights to DAS, (iii) DAS infringed its patent rights related to the use of the pat gene in certain soybean and cotton seed products, and (iv) Bayer was entitled to monetary damages and injunctive relief. DAS denied that it breached the License Agreement and asserted that the License Agreement remained in effect because it was not properly terminated. DAS also asserted that all of Bayer’s patents at issue are invalid and/or not infringed, and, therefore, for these reasons (and others), a license was not required. During the pendency of the arbitration proceeding, DAS filed six re-examination petitions with the United States Patent & Trademark Office (“USPTO”) against the Bayer patents, asserting that each patent is invalid based on the doctrine against double-patenting and/or prior art. The USPTO granted all six petitions, and, on February 26, 2015, the USPTO issued an office action rejecting the patentability of the sole Bayer patent claim in the only asserted Bayer patent that has not expired and that forms the basis for the vast majority of the damages in the arbitral award discussed below.

A three-member arbitration tribunal presided over the arbitration proceeding (the “tribunal”). In a decision dated October 9, 2015, the tribunal determined that (i) DAS breached the License Agreement, (ii) Bayer properly terminated the License Agreement, (iii) all of the patents remaining in the proceeding are valid and infringed, and (iv) that Bayer is entitled to monetary damages in the amount of $455 million inclusive of pre-judgment interest and costs (the “arbitral award”). One of the arbitrators, however, issued a partial dissent finding that all of the patents are invalid based on the double-patenting doctrine. The tribunal also denied Bayer’s request for injunctive relief.

On October 16, 2015, Bayer filed a motion in U.S. District Court for the Eastern District of Virginia ("Federal District Court") seeking to confirm the arbitral award. DAS opposed the motion and filed separate motions to vacate the award, or in the alternative, to stay enforcement of the award until the USPTO issued final office actions with respect to the re-examination proceedings. On January 15, 2016, the Federal District Court denied DAS's motions and confirmed the award. DAS appealed the Federal District Court's decision. On March 1, 2017, the U.S. Court of Appeals for the Federal Circuit ("Federal Circuit") affirmed the arbitral award. As a result of this action, in the first quarter of 2017, the Company recorded a loss of $469 million, inclusive of the arbitral award and post-judgment interest, which was included in "Sundry income (expense) - net" in the consolidated statements of income. On May 19, 2017, the Federal Circuit issued a mandate denying DAS's request to stay the arbitral award pending judicial review by the United States Supreme Court. On May 26, 2017, the Company paid the $469 million arbitral award to Bayer as a result of that decision. On September 11, 2017, DAS filed a petition for writ of certiorari with the United

States Supreme Court to review the case, but the Court denied DAS's petition.

The litigation is now concluded with no risk of further liability. The Company continues to believe that the arbitral award is fundamentally flawed because, among other things, it allowed for the enforcement of invalid patents. The arbitral award and subsequent related judicial decisions will not impact DAS's commercialization of its soybean and cotton seed products, including those containing the ENLIST™ technologies.

Rocky Flats Matter

The Company and Rockwell International Corporation ("Rockwell") (collectively, the "defendants") were defendants in a class action lawsuit filed in 1990 on behalf of property owners ("plaintiffs") in Rocky Flats, Colorado, who asserted claims for nuisance and trespass based on alleged property damage caused by plutonium releases from a nuclear weapons facility owned by the U.S. Department of Energy ("DOE") (the "facility"). Dow and Rockwell were both DOE contractors that operated the facility - Dow from 1952 to 1975 and Rockwell from 1975 to 1989. The facility was permanently shut down in 1989.

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In 1993, the United States District Court for the District of Colorado ("District Court") certified the class of property owners. The plaintiffs tried their case as a public liability action under the Price Anderson Act ("PAA"). In 2005, the jury returned a damages verdict of $926 million. Dow and Rockwell appealed the jury award to the U.S. Tenth Circuit Court of Appeals ("Court of Appeals") which concluded the PAA had its own injury requirements, on which the jury had not been instructed, and also vacated the District Court's class certification ruling, reversed and remanded the case, and vacated the District Court's judgment. The plaintiffs argued on remand to the District Court that they were entitled to reinstate the judgment as a state law nuisance claim, independent of the PAA. The District Court rejected that argument and entered judgment in favor of the defendants. The plaintiffs appealed to the Court of Appeals, which reversed the District Court's ruling, holding that the PAA did not preempt the plaintiffs' nuisance claim under Colorado law and that the plaintiffs could seek reinstatement of the prior nuisance verdict under Colorado law.

Dow and Rockwell continued to litigate this matter in the District Court and in the United States Supreme Court following the appellate court decision. On May 18, 2016, Dow, Rockwell and the plaintiffs entered into a settlement agreement for $375 million, of which $131 million was paid by Dow. The DOE authorized the settlement pursuant to the PAA and the nuclear hazards indemnity provisions contained in Dow's and Rockwell's contracts. The District Court granted preliminary approval to the class settlement on August 5, 2016. On April 28, 2017, the District Court conducted a fairness hearing and granted final judgment approving the class settlement and dismissed class claims against the defendants ("final judgment order").

On December 13, 2016, the United States Civil Board of Contract Appeals unanimously ordered the United States government to pay the amounts stipulated in the settlement agreement. On January 17, 2017, the Company received a full indemnity payment of $131 million from the United States government for Dow's share of the class settlement. On January 26, 2017, the Company placed $130 million in an escrow account for the settlement payment owed to the plaintiffs. The funds were subsequently released from escrow as a result of the final judgment order. The litigation is now concluded.

Dow Silicones Chapter 11 Related Matters

Introduction

In 1995, Dow Silicones, then a 50:50 joint venture between Dow and Corning, voluntarily filed for protection under Chapter 11 of the U.S. Bankruptcy Code in order to resolve Dow Silicones' breast implant liabilities and related matters (the "Chapter 11 Proceeding"). Dow Silicones emerged from the Chapter 11 Proceeding on June 1, 2004 (the "Effective Date") and is implementing the Joint Plan of Reorganization (the "Plan"). The Plan provides funding for the resolution of breast implant and other product liability litigation covered by the Chapter 11 Proceeding and provides a process for the satisfaction of commercial creditor claims in the Chapter 11 Proceeding. As of June 1, 2016, Dow Silicones is a wholly owned subsidiary of Dow.

Breast Implant and Other Product Liability Claims

Under the Plan, a product liability settlement program administered by an independent claims office (the "Settlement Facility") was created to resolve breast implant and other product liability claims. Product liability claimants rejecting the settlement program in favor of pursuing litigation must bring suit against a litigation facility (the "Litigation Facility"). Under the Plan, total payments committed by Dow Silicones to resolving product liability claims are capped at a maximum $2,350 million net present value ("NPV") determined as of the Effective Date using a discount rate of seven percent (approximately $3,876 million undiscounted at December 31, 2018). Of this amount, no more than $400 million NPV determined as of the Effective Date can be used to fund the Litigation Facility.

Dow Silicones has an obligation to fund the Settlement Facility and the Litigation Facility over a 16-year period, commencing at the Effective Date. At December 31, 2018, Dow Silicones and its insurers have made life-to-date payments of $1,762 million to the Settlement Facility and the Settlement Facility reported an unexpended balance of

$118 million.

On June 1, 2016, as part of the ownership restructure of Dow Silicones and in accordance with ASC 450 "Accounting for Contingencies," the Company recorded a liability of $290 million for breast implant and other product liability claims (“Implant Liability”), which reflected the estimated impact of the settlement of future claims primarily based on reported claim filing levels in the Revised Settlement Program (the “RSP”) and on the resolution of almost all cases pending against the Litigation Facility. The RSP was a program sponsored by certain other breast implant manufacturers in the context of multi-district, coordinated federal breast implant cases and was open from 1995 through 2010. The RSP was also a revised successor to an earlier settlement plan involving Dow Silicones (prior to its bankruptcy filing). While Dow Silicones withdrew from the RSP, many of the benefit categories and payment levels in Dow Silicones settlement program were drawn from the RSP. Based on the comparability in design and actual claim experience of both plans, management concluded that claim information from the RSP provides a reasonable basis to estimate future claim filing levels for the Settlement Facility.

In the fourth quarter of 2016, with the assistance of a third party consultant ("consultant"), Dow Silicones updated its estimate of its Implant Liability to $263 million, primarily reflecting a decrease in Class 7 costs (claimants who have breast implants made by certain other manufacturers using primarily Dow Silicones silicone gel), a decrease resulting from the passage of time, decreased

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claim filing activity and administrative costs compared with the previous estimate, and an increase in investment income resulting from insurance proceeds. Based on the consultant's updated estimate and Dow Silicones own review of claim filing activity, Dow Silicones determined that an adjustment to the Implant Liability was required. Accordingly, Dow Silicones decreased its Implant Liability in the fourth quarter of 2016 by $27 million, which was included in "Sundry income (expense) - net" in the consolidated statements of income. At December 31, 2018, the Implant Liability was $263 million, of which $111 million was included in “Accrued and other current liabilities” and $152 million was included in "Other noncurrent obligations" in the consolidated balance sheets. At December 31, 2017, the Implant Liability was $263 million, which was included in "Other noncurrent obligations" in the consolidated balance sheets.

Dow Silicones is not aware of circumstances that would change the factors used in estimating the Implant Liability and believes the recorded liability reflects the best estimate of the remaining funding obligations under the Plan; however, the estimate relies upon a number of significant assumptions, including: future claim filing levels in the Settlement Facility will be similar to those in the revised settlement program, which management uses to estimate future claim filing levels for the Settlement Facility; future acceptance rates, disease mix, and payment values will be materially consistent with historical experience; no material negative outcomes in future controversies or disputes over Plan interpretation will occur; and the Plan will not be modified. If actual outcomes related to any of these assumptions prove to be materially different, the future liability to fund the Plan may be materially different than the amount estimated. If Dow Silicones was ultimately required to fund the full liability up to the maximum capped value, the liability would be $2,114 million at December 31, 2018.

Commercial Creditor Issues

The Plan provides that each of Dow Silicones commercial creditors (the “Commercial Creditors”) would receive in cash the sum of (a) an amount equal to the principal amount of their claims and (b) interest on such claims. The actual amount of interest that will ultimately be paid to these Commercial Creditors is uncertain due to pending litigation between Dow Silicones and the Commercial Creditors regarding the appropriate interest rates to be applied to outstanding obligations from the 1995 bankruptcy filing date through the Effective Date, as well as the presence of any recoverable fees, costs, and expenses. Upon the Plan becoming effective, Dow Silicones paid approximately $1,500 million to the Commercial Creditors, representing principal and an amount of interest that Dow Silicones considers undisputed.

In 2006, the U.S. Court of Appeals for the Sixth Circuit concluded that there is a general presumption that contractually specified default interest should be paid by a solvent debtor to unsecured creditors (the “Interest Rate Presumption”) and permitting the Commercial Creditors to recover fees, costs, and expenses where allowed by relevant loan agreements. The matter was remanded to the U.S. District Court for the Eastern District of Michigan ("District Court") for further proceedings, including rulings on the facts surrounding specific claims and consideration of any equitable factors that would preclude the application of the Interest Rate Presumption. On May 10, 2017, the District Court entered a stipulated order resolving pending discovery motions and established a discovery schedule for the Commercial Creditors matter. As a result, Dow Silicones and its third party consultants conducted further analysis of the Commercial Creditors claims and defenses. This analysis indicated the estimated remaining liability to the Commercial Creditors to be within a range of $77 million to $260 million. No single amount within the range appears to be a better estimate than any other amount within the range. Therefore, Dow Silicones recorded the minimum liability within the range, which resulted in a decrease to the Commercial Creditor liability of $33 million in the second quarter of 2017, which was included in "Sundry income (expense) - net" in the consolidated statements of income. At December 31, 2018, the liability related to Dow Silicones' potential obligation to pay additional interest to the Commercial Creditors in the Chapter 11 Proceeding was $82 million ($78 million at December 31, 2017) and included in "Accrued and other current liabilities" in the consolidated balance sheets. The actual amount of interest that will be paid to these creditors is uncertain and will ultimately be resolved through continued proceedings in the

District Court.

Indemnifications

In connection with the June 1, 2016 ownership restructure of Dow Silicones, the Company is indemnified by Corning for 50 percent of future losses associated with certain pre-closing liabilities, including the Implant Liability and Commercial Creditors matters described above, subject to certain conditions and limits. The maximum amount of indemnified losses which may be recovered are subject to a cap that declines over time. Indemnified losses are capped at (1) $1 billion between May 31, 2018 and May 31, 2023, and (2) no recoveries are permitted after May 31, 2023. No indemnification assets were recorded at December 31, 2018 or 2017.

Summary

The amounts recorded by Dow Silicones for the Chapter 11 related matters described above were based upon current, known facts, which management believes reflect reasonable and probable estimates of the liability. However, future events could cause the actual costs for Dow Silicones to be higher or lower than those projected or those recorded. Any such events could result in an increase or decrease in the recorded liability.

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Other Litigation Matters

In addition to the specific matters described above, the Company is party to a number of other claims and lawsuits arising out of the normal course of business with respect to product liability, patent infringement, employment matters, governmental tax and regulation disputes, contract and commercial litigation, and other actions. Certain of these actions purport to be class actions and seek damages in very large amounts. All such claims are being contested. Dow has an active risk management program consisting of numerous insurance policies secured from many carriers at various times. These policies may provide coverage that could be utilized to minimize the financial impact, if any, of certain contingencies described above. It is the opinion of the Company's management that the possibility is remote that the aggregate of all such other claims and lawsuits will have a material adverse impact on the results of operations, financial condition and cash flows of the Company.

Gain Contingency - Dow v. Nova Chemicals Corporation Patent Infringement Matter

On December 9, 2010, Dow filed suit in the Federal Court in Ontario, Canada ("Federal Court") alleging that Nova Chemicals Corporation ("Nova") was infringing the Company's Canadian polyethylene patent 2,106,705 (the "'705 Patent"). Nova counterclaimed on the grounds of invalidity and non-infringement. In accordance with Canadian practice, the suit was bifurcated into a merits phase, followed by a damages phase. Following trial in the merits phase, in May 2014 the Federal Court ruled that the Company's '705 Patent was valid and infringed by Nova. Nova appealed to the Canadian Federal Court of Appeal, which affirmed the Federal Court decision in August 2016. Nova then sought leave to appeal its loss to the Supreme Court of Canada, which dismissed Nova's petition in April 2017. As a result, Nova has exhausted all appeal rights on the merits, and it is undisputed that Nova owes Dow the profits it earned from its infringing sales as determined in the trial for the damages phase.

On April 19, 2017, the Federal Court issued a Public Judgment in the damages phase, which detailed its conclusions on how to calculate the profits to be awarded to Dow. Dow and Nova submitted their respective calculations of the damages to the Federal Court in May 2017. On June 29, 2017, the Federal Court issued a Confidential Supplemental Judgment, concluding that Nova must pay $645 million Canadian dollars (equivalent to $495 million U.S. dollars) to Dow, plus pre- and post-judgment interest, for which Dow received payment of $501 million from Nova on July 6, 2017. Although Nova is appealing portions of the damages judgment, certain portions of it are indisputable and will be owed to Dow regardless of the outcome of any further appeals by Nova. As a result of these actions and in accordance with ASC 450-30 "Gain Contingencies," the Company recorded a $160 million pretax gain in the second quarter of 2017 of which $137 million was included in "Sundry income (expense) - net" and $23 million was included in "Selling, general and administrative expenses" in the consolidated statements of income. At December 31, 2018, the Company had $341 million ($341 million at December 31, 2017) included in "Other noncurrent obligations" related to the disputed portion of the damages judgment. Dow is confident of its chances of defending the entire judgment on appeal, particularly the trial court's determinations on important factual issues, which will be accorded deferential review on appeal.

Purchase Commitments

The Company has outstanding purchase commitments and various commitments for take-or-pay or throughput agreements. The Company was not aware of any purchase commitments that were negotiated as part of a financing arrangement for the facilities that will provide the contracted goods or services or for the costs related to those goods or services at December 31, 2018 and 2017.

Guarantees

The following table provides a summary of the final expiration, maximum future payments and recorded liability reflected in the consolidated balance sheets for each type of guarantee:

Guarantees	Dec 31, 2018	Dec 31, 2017

In millions	Final Expiration	Maximum Future Payments	Recorded Liability	Final Expiration	Maximum Future Payments	Recorded Liability
Guarantees	2023	$ 4,523	$ 25	2023	$ 4,774	$ 49
Residual value guarantees	2028	885	130	2027	889	135
Total guarantees		$ 5,408	$ 155		$ 5,663	$ 184

Guarantees

Guarantees arise during the ordinary course of business from relationships with customers and nonconsolidated affiliates when the Company undertakes an obligation to guarantee the performance of others (via delivery of cash or other assets) if specified triggering events occur. With guarantees, such as commercial or financial contracts, non-performance by the guaranteed party triggers the obligation of the Company to make payments to the beneficiary of the guarantee. The majority of the Company’s guarantees relate to debt of nonconsolidated affiliates, which have expiration dates ranging from less than one year to less than

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five years, and trade financing transactions in Latin America, which typically expire within one year of inception. The Company's current expectation is that future payment or performance related to the non-performance of others is considered remote.

The Company has entered into guarantee agreements ("Guarantees") related to project financing for Sadara, a nonconsolidated affiliate. The total of an Islamic bond and additional project financing (collectively "Total Project Financing") obtained by Sadara is approximately $12.5 billion. Sadara had $11.7 billion of Total Project Financing outstanding at December 31, 2018 ($12.4 billion at December 31, 2017). The Company's guarantee of the Total Project Financing is in proportion to the Company's 35 percent ownership interest in Sadara, or up to approximately $4.2 billion when the project financing is fully drawn. Sadara successfully completed an extensive operational testing program in December 2018, however, the Guarantees will be released upon the satisfactory fulfillment of certain project completion conditions, which is expected by the middle of 2019, and must occur no later than December 2020.

Residual Value Guarantees
The Company provides guarantees related to leased assets specifying the residual value that will be available to the lessor at lease termination through sale of the assets to the lessee or third parties.

Operating Leases
The Company routinely leases premises for use as sales and administrative offices, warehouses and tanks for product storage, motor vehicles, railcars, computers, office machines and equipment. In addition, the Company leases aircraft in the United States. The terms for these leased assets vary depending on the lease agreement. Some leases contain renewal provisions, purchase options and escalation clauses.

Rental expenses under leases, net of sublease rental income, were $771 million in 2018, $757 million in 2017 and $661 million in 2016. Future minimum payments under leases with remaining non-cancelable terms in excess of one year are as follows:

Minimum Lease Commitments at Dec 31, 2018 In millions	
2019	$412
2020	369
2021	328
2022	297
2023	253
2024 and thereafter	978
Total	$2,637

Asset Retirement Obligations
Dow has 164 manufacturing sites in 35 countries. Most of these sites contain numerous individual manufacturing operations, particularly at the Company's larger sites. Asset retirement obligations are recorded as incurred and reasonably estimable, including obligations for which the timing and/or method of settlement are conditional on a future event that may or may not be within the control of the Company. The retirement of assets may involve such efforts as remediation and treatment of asbestos, contractually required demolition, and other related activities, depending on the nature and location of the assets; and retirement obligations are typically realized only upon demolition of those facilities. In identifying asset retirement obligations, the Company considers identification of legally enforceable obligations, changes in existing law, estimates of potential settlement dates and the calculation of

an appropriate discount rate to be used in calculating the fair value of the obligations. Dow has a well-established global process to identify, approve and track the demolition of retired or to-be-retired facilities; and no assets are retired from service until this process has been followed. Dow typically forecasts demolition projects based on the usefulness of the assets; environmental, health and safety concerns; and other similar considerations. Under this process, as demolition projects are identified and approved, reasonable estimates are determined for the time frames during which any related asset retirement obligations are expected to be settled. For those assets where a range of potential settlement dates may be reasonably estimated, obligations are recorded. Dow routinely reviews all changes to items under consideration for demolition to determine if an adjustment to the value of the asset retirement obligation is required.

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The Company has recognized asset retirement obligations for the following activities: demolition and remediation activities at manufacturing sites primarily in the United States, Canada, Brazil, Argentina, Columbia, China, Japan, United Arab Emirates and Europe; and capping activities at landfill sites in the United States, Canada and Brazil. The Company has also recognized conditional asset retirement obligations related to asbestos encapsulation as a result of planned demolition and remediation activities at manufacturing and administrative sites primarily in the United States, Canada, Argentina, Columbia, China and Europe. The aggregate carrying amount of conditional asset retirement obligations recognized by the Company (included in the asset retirement obligations balance shown below) was $24 million at December 31, 2018 ($20 million at December 31, 2017).

The following table shows changes in the aggregate carrying amount of the Company’s asset retirement obligations for the years ended December 31, 2018 and 2017:

Asset Retirement Obligations In millions	2018	2017
Balance at Jan 1	$104	$110
Additional accruals	10	3
Liabilities settled	(4)	(9)
Accretion expense	3	5
Revisions in estimated cash flows	—	(9)
Other	1	4
Balance at Dec 31	$114	$104

The discount rate used to calculate the Company’s asset retirement obligations at December 31, 2018, was 3.54 percent (2.04 percent at December 31, 2017). These obligations are included in the consolidated balance sheets as "Accrued and other current liabilities" and "Other noncurrent obligations."

The Company has not recognized conditional asset retirement obligations for which a fair value cannot be reasonably estimated in its consolidated financial statements. Assets that have not been submitted/reviewed for potential demolition activities are considered to have continued usefulness and are generally still operating normally. Therefore, without a plan to demolish the assets or the expectation of a plan, such as shortening the useful life of assets for depreciation purposes in accordance with the accounting guidance related to property, plant and equipment, the Company is unable to reasonably forecast a time frame to use for present value calculations. As such, the Company has not recognized obligations for individual plants/buildings at its manufacturing sites where estimates of potential settlement dates cannot be reasonably made. In addition, the Company has not recognized conditional asset retirement obligations for the capping of its approximately 37 underground storage wells and 128 underground brine mining and other wells at Dow-owned sites when there are no plans or expectations of plans to exit the sites. It is the opinion of the Company’s management that the possibility is remote that such conditional asset retirement obligations, when estimable, will have a material impact on the Company’s consolidated financial statements based on current costs.

NOTE 17 – STOCKHOLDERS’ EQUITY

Merger with DuPont

Effective with the Merger, each share of Dow Common Stock (excluding any shares of Dow Common Stock that were held in treasury, which were automatically canceled and retired for no consideration) was converted into the right to receive one fully paid and non-assessable share of DowDuPont Common Stock. As a result, in the third quarter of 2017, the Company recorded a reduction in "Treasury stock" of $935 million, a reduction in "Common stock" of $3,107 million and an increase in "Additional paid in capital" of $2,172 million in the consolidated balance sheets. The Company has 100 shares of common stock issued and outstanding, par value $0.01 per share, owned solely by its

parent, DowDuPont. See Note 3 for additional information.

Cumulative Convertible Perpetual Preferred Stock, Series A

Equity securities in the form of Cumulative Convertible Perpetual Preferred Stock, Series A ("preferred series A") were issued on April 1, 2009 to Berkshire Hathaway Inc. in the amount of $3 billion (3 million shares) and the Kuwait Investment Authority in the amount of $1 billion (1 million shares). Shareholders of preferred series A could convert all or any portion of their shares, at their option, at any time, into shares of the Company's common stock at an initial conversion ratio of 24.2010 shares of common stock for each share of preferred series A. On or after the fifth anniversary of the issuance date, if the common stock price exceeded $53.72 per share for any 20 trading days in a consecutive 30-day window, the Company had the option, at any time, in whole or in part, to convert preferred series A into common stock at the then applicable conversion rate.

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On December 15, 2016, the trading price of Dow's common stock closed at $58.35, marking the 20th trading day in the previous 30 trading days that the common stock closed above $53.72, triggering the right of the Company to exercise its conversion right. On December 16, 2016, the Company sent a Notice of Conversion at the Option of the Company (the "Notice") to all holders of its preferred series A. Pursuant to the Notice, on December 30, 2016 (the "Conversion Date") all 4 million outstanding shares of preferred series A (with a carrying value of $4,000 million) were converted into shares of common stock at a conversion ratio of 24.2010 shares of common stock for each share of preferred series A, resulting in the issuance of 96.8 million shares of common stock from treasury stock. The treasury stock issued was carried at an aggregate historical cost of $4,695 million, resulting in a reduction to "Additional paid-in capital" in the consolidated balance sheets of $695 million. From and after the Conversion Date, no shares of the preferred series A are issued or outstanding and all rights of the holders of the preferred series A have terminated. On January 6, 2017, the Company filed an amendment to the Company’s Restated Certificate of Incorporation by way of a certificate of elimination (the “Certificate of Elimination”) with the Secretary of State of the State of Delaware which had the effect of: (a) eliminating the previously designated 4 million shares of the preferred series A, none of which were outstanding at the time of the filing; (b) upon such elimination, causing such preferred series A to resume the status of authorized and unissued shares of preferred stock, par value $1.00 per share, of the Company, without designation as to series; and (c) eliminating from the Company’s Restated Certificate of Incorporation all references to, and all matters set forth in, the certificates of designations for the preferred series A.

The Company paid cumulative dividends on preferred series A at a rate of 8.5 percent per annum, or $85 million per quarter. The final dividend for the preferred series A was declared on December 15, 2016 and payable on the earlier of the Conversion Date (if applicable) or January 3, 2017, to shareholders of record at December 15, 2016. The dividend was paid in full on the Conversion Date.

Common Stock

Prior to the Merger, the Company issued common stock shares out of treasury stock or as new common stock shares for purchases under the Employee Stock Purchase Plan, for options exercised and for the release of deferred, performance deferred and restricted stock. The number of new common stock shares issued to employees and non-employee directors prior to the Merger was zero in 2017 (zero in 2016). See Note 20 for additional information on changes to Dow equity awards in connection with the Merger.

Retained Earnings

There are no significant restrictions limiting the Company’s ability to pay dividends. Prior to the Merger, the Company declared dividends of $1.38 per share in 2017 ($1.84 per share in 2016). Effective with the Merger, Dow no longer has publicly traded common stock. Dow's common shares are owned solely by its parent company, DowDuPont. As a result, the Company’s Board determines whether or not there will be a dividend distribution to DowDuPont. See Note 24 for additional information.

Undistributed earnings of nonconsolidated affiliates included in retained earnings were $1,760 million at December 31, 2018 and $1,731 million at December 31, 2017.

Employee Stock Ownership Plan

The Dow Employee Stock Ownership Plan (the “ESOP”) is an integral part of The Dow Chemical Company Employees’ Savings Plan (the “Plan”). A significant majority of full-time employees in the United States are eligible to participate in the Plan. Dow uses the ESOP to provide the Company’s matching contribution in the form of stock to Plan participants. Prior to the Merger, contributions were in the form of Dow Common Stock. Effective with the Merger, shares of Dow stock held by the ESOP were converted into shares of DowDuPont Common Stock at a ratio of 1:1.

In connection with the acquisition of Rohm and Haas on April 1, 2009, the Rohm and Haas Employee Stock Ownership Plan (the "Rohm and Haas ESOP") was merged into the Plan, and the Company assumed the $78 million balance of debt at 9.8 percent interest with final maturity in 2020 that was used to finance share purchases by the Rohm and Haas ESOP in 1990. The outstanding balance of the debt was $10 million at December 31, 2018 and $17 million at December 31, 2017.

Dividends on unallocated shares held by the ESOP are used by the ESOP to make debt service payments and to purchase additional shares if dividends exceed the debt service payments. Dividends on allocated shares are used by the ESOP to make debt service payments to the extent needed; otherwise, they are paid to the Plan participants. Shares are released for allocation to participants based on the ratio of the current year’s debt service to the sum of the principal and interest payments over the life of the loan. The shares are allocated to Plan participants in accordance with the terms of the Plan.

Compensation expense for allocated shares is recorded at the fair value of the shares on the date of allocation. Compensation expense for ESOP shares was $175 million in 2018, $248 million in 2017 and $192 million in 2016. At December 31, 2018, 15.3 million shares out of a total 21.8 million shares held by the ESOP had been allocated to participants’ accounts; 1.5 million shares were released but unallocated; and 5.0 million shares, at a fair value of $267 million, were considered unearned.

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Treasury Stock

In 2013, the Board approved a share buy-back program. As a result of subsequent authorizations approved by the Board, the total authorized amount of the share repurchase program was $9.5 billion. Effective with the Merger, the share repurchase program was canceled. Over the duration of the program, a total of $8.1 billion was spent on the repurchase of Dow Common Stock.

The Company historically issued shares for purchases under the Employee Stock Purchase Plan, for options exercised as well as for the release of deferred, performance deferred and restricted stock out of treasury stock or as new common stock shares. The number of treasury shares issued to employees and non-employee directors under the Company's stock-based compensation programs are summarized in the following table. See Note 20 for additional information on changes to Dow equity awards in connection with the Merger.

Treasury Shares Issued Under Stock-Based Compensation Programs			
In thousands	2018	2017 [1]	2016
To employees and non-employee directors	N/A	14,195	14,494

1. Reflects activity prior to the Merger.

The following table provides a reconciliation of Dow Common Stock activity, prior to the Merger, for the years ended December 31, 2017 and 2016:

Shares of Dow Common Stock In thousands	Issued	Held in Treasury
Balance at Jan 1, 2016	1,242,795	125,853
Issued [1]	—	(14,494)
Repurchased	—	17,107
Preferred stock converted to common stock	—	(96,804)
Balance at Dec 31, 2016	1,242,795	31,662
Issued [1]	—	(14,195)
Converted to DowDuPont shares or canceled on Aug 31, 2017 [2]	(1,242,795)	(17,467)
Balance at Aug 31, 2017	—	—

1. Shares issued to employees and non-employee directors under the Company's equity compensation plans.
2. Each share of Dow Common Stock issued and outstanding immediately prior to the Merger was converted into one share of DowDuPont Common Stock; treasury shares were canceled as a result of the Merger.

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Accumulated Other Comprehensive Loss

The following table summarizes the changes and after-tax balances of each component of AOCL for the years ended December 31, 2018, 2017 and 2016:

Accumulated Other Comprehensive Loss In millions	Unrealized Gains (Losses) on Investments	Cumulative Translation Adj	Pension and Other Postretire Benefits	Derivative Instruments	Total Accum Other Comp Loss
2016					
Balance at Jan 1, 2016	$ 47	$ (1,737)	$ (6,769)	$ (208)	$ (8,667)
Other comprehensive income (loss) before reclassifications	32	(644)	(1,354)	84	(1,882)
Amounts reclassified from accumulated other comprehensive income (loss)	(36)	—	734	29	727
Net other comprehensive income (loss)	$ (4)	$ (644)	$ (620)	$ 113	$ (1,155)
Balance at Dec 31, 2016	$ 43	$ (2,381)	$ (7,389)	$ (95)	$ (9,822)
2017					
Other comprehensive income (loss) before reclassifications	25	908	(23)	1	911
Amounts reclassified from accumulated other comprehensive income (loss)	(71)	(8)	414	(15)	320
Net other comprehensive income (loss)	$ (46)	$ 900	$ 391	$ (14)	$ 1,231
Balance at Dec 31, 2017	$ (3)	$ (1,481)	$ (6,998)	$ (109)	$ (8,591)
2018					
Balance at Jan 1, 2018 [1]	$ 17	$ (1,481)	$ (6,998)	$ (109)	$ (8,571)
Other comprehensive income (loss) before reclassifications	(74)	(221)	(495)	4	(786)
Amounts reclassified from accumulated other comprehensive income (loss)	7	(4)	455	71	529
Net other comprehensive income (loss)	$ (67)	$ (225)	$ (40)	$ 75	$ (257)
Reclassification of stranded tax effects [2]	$ (1)	$ (107)	$ (927)	$ (22)	$ (1,057)
Balance at Dec 31, 2018	$ (51)	$ (1,813)	$ (7,965)	$ (56)	$ (9,885)

1. The beginning balance of "Unrealized gains (losses) on investments" was increased by $20 million to reflect the impact of adoption of ASU 2016-01. See Notes 1 and 2 for additional information.
2. Amounts reclassified to retained earnings as a result of the adoption of ASU 2018-02. See Notes 1 and 2 for additional information.

The tax effects on the net activity related to each component of other comprehensive income (loss) for the years ended December 31, 2018, 2017 and 2016 were as follows:

Tax Benefit (Expense) [1] In millions	2018	2017	2016
Unrealized gains (losses) on investments	$17	$26	$(2)
Cumulative translation adjustments	(6)	(98)	(171)
Pension and other postretirement benefit plans	(9)	(213)	438
Derivative instruments	(20)	(3)	(32)
Tax benefit (expense) from income taxes related to other comprehensive income (loss) items	$(18)	$(288)	$233

1. Prior year amounts have been updated to conform with the current year presentation.

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A summary of the reclassifications out of AOCL for the years ended December 31, 2018, 2017 and 2016 is provided as follows:

Reclassifications Out of Accumulated Other Comprehensive Loss In millions	2018	2017	2016	Consolidated Statements of Income Classification
Unrealized (gains) losses on investments	$9	$(110)	$(56)	See (1) below
Tax (benefit) expense	(2)	39	20	See (2) below
After tax	$7	$(71)	$(36)	
Cumulative translation adjustments	$(4)	$(8)	$—	See (3) below
Pension and other postretirement benefit plans	$594	$607	$913	See (4) below
Tax benefit	(139)	(193)	(179)	See (2) below
After tax	$455	$414	$734	
Derivative instruments	$89	$(13)	$34	See (5) below
Tax benefit	(18)	(2)	(5)	See (2) below
After tax	$71	$(15)	$29	
Total reclassifications for the period, after tax	$529	$320	$727	

1. "Net sales" and "Sundry income (expense) - net."
2. "Provision for income taxes."
3. "Sundry income (expense) - net."
4. These AOCL components are included in the computation of net periodic benefit cost of the Company's defined benefit pension and other postretirement benefit plans. See Note 19 for additional information. In the year ended December 31, 2016, $360 million was included in “Sundry income (expense) - net” (zero impact to "Provision for income taxes") related to the Dow Silicones ownership restructure. See Note 5 for additional information.
5. "Cost of sales," "Sundry income (expense) - net" and "Interest expense and amortization of debt discount."

NOTE 18 – NONCONTROLLING INTERESTS

Ownership interests in the Company's subsidiaries held by parties other than the Company are presented separately from the Company's equity in the consolidated balance sheets as "Noncontrolling interests." The amount of consolidated net income attributable to the Company and the noncontrolling interests are both presented on the face of the consolidated statements of income.

The following table summarizes the activity for equity attributable to noncontrolling interests for the years ended December 31, 2018, 2017 and 2016:

Noncontrolling Interests In millions	2018	2017	2016 [1]
Balance at Jan 1	$1,186	$1,242	$809
Net income attributable to noncontrolling interests	134	129	86
Distributions to noncontrolling interests [2]	(145)	(109)	(123)
Acquisition of noncontrolling interests [3]	—	—	473
Deconsolidation of noncontrolling interests [4]	—	(119)	—
Cumulative translation adjustments	(39)	41	(4)
Other	2	2	1
Balance at Dec 31	$1,138	$1,186	$1,242

1. The 2016 activity presented in the table excludes a $202 million cash payment for the purchase of a noncontrolling interest, as the noncontrolling interest was classified as "Accrued and other current liabilities" in the consolidated

balance sheets.

2. Distributions to noncontrolling interests is net of $27 million in 2018 ($20 million in 2017 and $53 million in 2016) in dividends paid to a joint venture, which were reclassified to "Equity in earnings of nonconsolidated affiliates" in the consolidated statements of income.

3. Assumed in the ownership restructure of Dow Silicones. See Note 5 for additional information.

4. On June 30, 2017, the Company sold its ownership interest in the SKC Haas Display Films group of companies. See Note 13 for additional information.

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NOTE 19 – PENSION PLANS AND OTHER POSTRETIREMENT BENEFITS

Dow and DuPont did not merge their defined benefit pension plans and other postretirement benefit plans as a result of the Merger.

Defined Benefit Pension Plans

The Company has both funded and unfunded defined benefit pension plans that cover employees in the United States and a number of other countries. The U.S. qualified plan covering the parent company is the largest plan. Benefits for employees hired before January 1, 2008, are based on length of service and the employee's three highest consecutive years of compensation. Employees hired after January 1, 2008, earn benefits that are based on a set percentage of annual pay, plus interest.

The Company's funding policy is to contribute to the plans when pension laws and/or economics either require or encourage funding. In 2018, the Company contributed $1,656 million to its pension plans, which included a $1,100 million discretionary contribution to its principal U.S. pension plan in the third quarter of 2018. Total contributions in 2018 also included contributions to fund benefit payments for the Company's non-qualified pension plans. The Company expects to contribute approximately $240 million to its pension plans in 2019.

The provisions of a U.S. non-qualified pension plan require the payment of plan obligations to certain participants upon a change in control of the Company, which occurred at the time of the Merger. Certain participants could elect to receive a lump-sum payment or direct the Company to purchase an annuity on their behalf using the after-tax proceeds of the lump sum. In the fourth quarter of 2017, the Company paid $940 million to plan participants and $230 million to an insurance company for the purchase of annuities, which were included in "Pension contributions" in the consolidated statements of cash flows. The Company also paid $205 million for income and payroll taxes for participants electing the annuity option, of which $201 million was included in "Cost of sales" and $4 million was included in "Selling, general and administrative expenses" in the consolidated statements of income. The Company recorded a settlement charge of $687 million associated with the payout in the fourth quarter of 2017, which was included in "Sundry income (expense) - net" in the consolidated statements of income.

The weighted-average assumptions used to determine pension plan obligations and net periodic benefit costs for all plans are summarized in the table below:

Weighted-Average Assumptions for All Pension Plans	Benefit Obligations at Dec 31		Net Periodic Costs for the Year Ended		
	2018	2017	2018	2017	2016
Discount rate	3.69%	3.17%	3.17%	3.52%	3.85%
Interest crediting rate for applicable benefits	3.72%	3.61%	3.61%	3.45%	4.81%
Rate of compensation increase	3.84%	3.88%	3.88%	3.90%	4.04%
Expected return on plan assets	—	—	7.11%	7.16%	7.22%

The weighted-average assumptions used to determine pension plan obligations and net periodic benefit costs for U.S. plans are summarized in the table below:

Weighted-Average Assumptions for U.S. Pension Plans	Benefit Obligations at Dec 31		Net Periodic Costs for the Year Ended		
	2018	2017	2018	2017	2016
Discount rate	4.39%	3.66%	3.66%	4.11%	4.40%

Interest crediting rate for applicable benefits	4.50%	4.50%	4.50%	4.50%	4.50%
Rate of compensation increase	4.25%	4.25%	4.25%	4.25%	4.50%
Expected return on plan assets	—	—	7.92%	7.91%	7.77%

Other Postretirement Benefit Plans

The Company provides certain health care and life insurance benefits to retired employees and survivors. The Company's plans outside of the United States are not significant; therefore, this discussion relates to the U.S. plans only. The plans provide health care benefits, including hospital, physicians' services, drug and major medical expense coverage, and life insurance benefits. In general, for employees hired before January 1, 1993, the plans provide benefits supplemental to Medicare when retirees are eligible for these benefits. The Company and the retiree share the cost of these benefits, with the Company portion increasing as the retiree has increased years of credited service, although there is a cap on the Company portion. The Company has the ability to change these benefits at any time. Employees hired after January 1, 2008, are not covered under the plans.

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The Company funds most of the cost of these health care and life insurance benefits as incurred. In 2018, Dow did not make any contributions to its other postretirement benefit plan trusts. The trusts did not hold assets at December 31, 2018. The Company does not expect to contribute assets to its other postretirement benefit plan trusts in 2019.

The weighted-average assumptions used to determine other postretirement benefit obligations and net periodic benefit costs for the U.S. plans are provided below:

Weighted-Average Assumptions for U.S. Other Postretirement Benefits Plans	Benefit Obligations at Dec 31		Net Periodic Costs for the Year Ended		
	2018	2017	2018	2017	2016
Discount rate	4.24 %	3.51 %	3.51 %	3.83 %	3.96 %
Health care cost trend rate assumed for next year	6.50 %	6.75 %	6.75 %	7.00 %	7.25 %
Rate to which the cost trend rate is assumed to decline (the ultimate health care cost trend rate)	5.00 %	5.00 %	5.00 %	5.00 %	5.00 %
Year that the rate reaches the ultimate health care cost trend rate	2025	2025	2025	2025	2025

Assumptions

The Company determines the expected long-term rate of return on plan assets by performing a detailed analysis of key economic and market factors driving historical returns for each asset class and formulating a projected return based on factors in the current environment. Factors considered include, but are not limited to, inflation, real economic growth, interest rate yield, interest rate spreads and other valuation measures and market metrics. The expected long-term rate of return for each asset class is then weighted based on the strategic asset allocation approved by the governing body for each plan. The Company’s historical experience with the pension fund asset performance is also considered.

The Company uses the spot rate approach to determine the discount rate utilized to measure the service cost and interest cost components of net periodic pension and other postretirement benefit costs for the U.S. and other selected countries. Under the spot rate approach, the Company calculates service costs and interest costs by applying individual spot rates from the Willis Towers Watson RATE:Link yield curve (based on high-quality corporate bond yields) for each selected country to the separate expected cash flow components of service cost and interest cost. Service cost and interest cost for all other plans are determined on the basis of the single equivalent discount rates derived in determining those plan obligations.

The discount rates utilized to measure the pension and other postretirement obligations of the U.S. qualified plans are based on the yield on high-quality corporate fixed income investments at the measurement date. Future expected actuarially determined cash flows for Dow’s U.S. plans are individually discounted at the spot rates under the Willis Towers Watson U.S. RATE:Link 60-90 corporate yield curve (based on 60th to 90th percentile high-quality corporate bond yields) to arrive at the plan’s obligations as of the measurement date.

The Company utilizes a modified version of the Society of Actuaries’ mortality tables released in 2014 and a modified version of the generational mortality improvement scale released in 2018 for purposes of measuring the U.S. pension and other postretirement obligations, based on an evaluation of the mortality experience of the Company’s pension plans.

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Summarized information on the Company's pension and other postretirement benefit plans is as follows:

Change in Projected Benefit Obligations, Plan Assets and Funded Status of All Significant Plans	Defined Benefit Pension Plans		Other Postretirement Benefits	
In millions	2018	2017	2018	2017
Change in projected benefit obligations:				
Benefit obligations at beginning of year	$31,851	$30,280	$1,567	$1,835
Service cost	520	506	12	14
Interest cost	886	883	45	54
Plan participants' contributions	19	14	—	—
Actuarial changes in assumptions and experience	(1,754)	1,804	(13)	(198)
Benefits paid	(1,476)	(1,440)	(123)	(151)
Plan amendments	17	14	—	—
Acquisitions/divestitures/other [1]	(45)	50	—	—
Effect of foreign exchange rates	(418)	932	(10)	13
Termination benefits/curtailment cost/settlements [2]	—	(1,192)	—	—
Benefit obligations at end of year	$29,600	$31,851	$1,478	$1,567
Change in plan assets:				
Fair value of plan assets at beginning of year	$23,401	$21,208	$—	$—
Actual return on plan assets	(742)	2,500	—	—
Employer contributions	1,656	1,676	—	—
Plan participants' contributions	19	14	—	—
Benefits paid	(1,476)	(1,440)	—	—
Acquisitions/divestitures/other [3]	—	(15)	—	—
Effect of foreign exchange rates	(314)	646	—	—
Settlements [4]	—	(1,188)	—	—
Fair value of plan assets at end of year	$22,544	$23,401	$—	$—
Funded status:				
U.S. plans with plan assets	$(4,066)	$(5,363)	$—	$—
Non-U.S. plans with plan assets	(2,263)	(2,333)	—	—
All other plans	(727)	(754)	(1,478)	(1,567)
Funded status at end of year	$(7,056)	$(8,450)	$(1,478)	$(1,567)
Amounts recognized in the consolidated balance sheets at Dec 31:				
Deferred charges and other assets	$491	$548	$—	$—
Accrued and other current liabilities	(52)	(48)	(131)	(125)
Pension and other postretirement benefits - noncurrent	(7,495)	(8,950)	(1,347)	(1,442)
Net amount recognized	$(7,056)	$(8,450)	$(1,478)	$(1,567)
Pretax amounts recognized in accumulated other comprehensive loss at Dec 31:				
Net loss (gain)	$10,841	$10,899	$(315)	$(326)
Prior service credit	(224)	(265)	—	—
Pretax balance in accumulated other comprehensive loss at end of year	$10,617	$10,634	$(315)	$(326)

1. The 2018 impact includes the divestiture of a business with pension benefit obligations of $37 million. The 2017 impact includes the reclassification of a China pension liability of $69 million from "Other noncurrent obligations"

to "Pension and other postretirement benefits - noncurrent" and the divestiture of a South Korean company with pension benefit obligations of $25 million.

2. The 2017 impact includes the settlement of certain plan obligations for a U.S. non-qualified pension plan of $1,170 million required due to a change in control provision. The 2017 impact also includes the conversion of a South Korean pension plan of $22 million to a defined contribution plan.

3. The 2017 impact relates to the divestiture of a South Korean company.

4. The 2017 impact includes payments made of $1,170 million to settle certain plan obligations of a U.S. non-qualified pension plan required due to a change in control provision. The 2017 impact also includes payments made of $18 million to convert a South Korean pension plan to a defined contribution plan.

A significant component of the overall decrease in the Company's benefit obligation for the year ended December 31, 2018 was due to the weighted-average change in discount rates, which increased from 3.17 percent at December 31, 2017 to 3.69 percent at December 31, 2018. A significant component of the overall increase in the Company's benefit obligation for the year ended December 31, 2017 was also due to the weighted-average change in discount rates, which decreased from 3.52 percent at December 31, 2016 to 3.17 percent at December 31, 2017.

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The accumulated benefit obligation for all pension plans was $28.3 billion and $30.4 billion at December 31, 2018 and 2017, respectively.

Pension Plans with Accumulated Benefit Obligations in Excess of Plan Assets at Dec 31 In millions	2018	2017
Accumulated benefit obligations	$25,392	$27,248
Fair value of plan assets	$18,902	$19,515

Pension Plans with Projected Benefit Obligations in Excess of Plan Assets at Dec 31 In millions	2018	2017
Projected benefit obligations	$26,599	$28,576
Fair value of plan assets	$19,051	$19,578

Net Periodic Benefit Costs for All Significant Plans for the Year Ended Dec 31	Defined Benefit Pension Plans			Other Postretirement Benefits		
In millions	2018	2017	2016	2018	2017	2016
Net Periodic Benefit Costs:						
Service cost	$520	$506	$463	$12	$14	$13
Interest cost	886	883	846	45	54	52
Expected return on plan assets	(1,644)	(1,548)	(1,447)	—	—	—
Amortization of prior service credit	(24)	(25)	(24)	—	—	(3)
Amortization of unrecognized (gain) loss	642	638	587	(24)	(6)	(7)
Curtailment/settlement/other [1]	—	683	(36)	—	—	—
Net periodic benefit costs	$380	$1,137	$389	$33	$62	$55
Changes in plan assets and benefit obligations recognized in other comprehensive (income) loss:						
Net (gain) loss	$584	$845	$1,954	$(13)	$(199)	$14
Prior service cost	17	14	—	—	—	—
Amortization of prior service credit	24	25	24	—	—	3
Amortization of unrecognized gain (loss)	(642)	(638)	(587)	24	6	7
Settlement loss [2]	—	(687)	—	—	—	—
Total recognized in other comprehensive (income) loss	$(17)	$(441)	$1,391	$11	$(193)	$24
Total recognized in net periodic benefit cost and other comprehensive (income) loss	$363	$696	$1,780	$44	$(131)	$79

1. The 2017 impact relates to the settlement of a U.S. non-qualified plan triggered by a change in control provision. The 2016 impact relates to the curtailment of benefits for certain participants of a Dow Silicones plan in the U.S.
2. The 2017 impact relates to the settlement of a U.S. non-qualified plan triggered by a change in control provision.

On January 1, 2018, the Company adopted ASU 2017-07, which impacted the presentation of the components of net periodic benefit cost in the consolidated statements of income. Net periodic benefit cost, other than the service cost component, is now included in "Sundry income (expense) - net" in the consolidated statements of income. See Notes 1, 2 and 8 for additional information.

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Estimated Future Benefit Payments

The estimated future benefit payments, reflecting expected future service, as appropriate, are presented in the following table:

Estimated Future Benefit Payments at Dec 31, 2018 In millions	Defined Benefit Pension Plans	Other Postretirement Benefits
2019	$1,549	$ 133
2020	1,559	129
2021	1,585	129
2022	1,624	125
2023	1,663	120
2024-2028	8,641	519
Total	$16,621	$ 1,155

Plan Assets

Plan assets consist primarily of equity and fixed income securities of U.S. and foreign issuers, and include alternative investments such as real estate, private market securities and absolute return strategies. At December 31, 2018, plan assets totaled $22.5 billion and included no directly held common stock of DowDuPont. At December 31, 2017, plan assets totaled $23.4 billion and included no directly held common stock of DowDuPont.

The Company's investment strategy for the plan assets is to manage the assets in relation to the liability in order to pay retirement benefits to plan participants over the life of the plans. This is accomplished by identifying and managing the exposure to various market risks, diversifying investments across various asset classes and earning an acceptable long-term rate of return consistent with an acceptable amount of risk, while considering the liquidity needs of the plans.

The plans are permitted to use derivative instruments for investment purposes, as well as for hedging the underlying asset and liability exposure and rebalancing the asset allocation. The plans use value-at-risk, stress testing, scenario analysis and Monte Carlo simulations to monitor and manage both the risk within the portfolios and the surplus risk of the plans.

Equity securities primarily include investments in large- and small-cap companies located in both developed and emerging markets around the world. Fixed income securities include investment and non-investment grade corporate bonds of companies diversified across industries, U.S. treasuries, non-U.S. developed market securities, U.S. agency mortgage-backed securities, emerging market securities and fixed income related funds. Alternative investments primarily include investments in real estate, private equity limited partnerships and absolute return strategies. Other significant investment types include various insurance contracts and interest rate, equity, commodity and foreign exchange derivative investments and hedges.

The Company mitigates the credit risk of investments by establishing guidelines with investment managers that limit investment in any single issue or issuer to an amount that is not material to the portfolio being managed. These guidelines are monitored for compliance both by the Company and external managers. Credit risk related to derivative activity is mitigated by utilizing multiple counterparties, collateral support agreements and centralized clearing, where appropriate.

The Northern Trust Collective Government Short Term Investment money market fund is utilized as the sweep vehicle for the U.S. plans, which from time to time can represent a significant investment. For one U.S. plan, approximately 35 percent of the liability is covered by a participating group annuity issued by Prudential Insurance Company.

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The weighted-average target allocation for plan assets of the Company's pension plans is summarized as follows:

Target Allocation for Plan Assets at Dec 31, 2018	Target Allocation
Asset Category	
Equity securities	36 %
Fixed income securities	35
Alternative investments	28
Other investments	1
Total	100 %

Fair value calculations may not be indicative of net realizable value or reflective of future fair values. Furthermore, although the Company believes its valuation methods are appropriate and consistent with other market participants, the use of different methodologies or assumptions to determine the fair value of certain financial instruments could result in a different fair value measurement at the reporting date.

For pension plan assets classified as Level 1 measurements (measured using quoted prices in active markets), total fair value is either the price of the most recent trade at the time of the market close or the official close price, as defined by the exchange on which the asset is most actively traded on the last trading day of the period, multiplied by the number of units held without consideration of transaction costs.

For pension plan assets classified as Level 2 measurements, where the security is frequently traded in less active markets, fair value is based on the closing price at the end of the period; where the security is less frequently traded, fair value is based on the price a dealer would pay for the security or similar securities, adjusted for any terms specific to that asset or liability. Market inputs are obtained from well-established and recognized vendors of market data and subjected to tolerance and quality checks. For derivative assets and liabilities, standard industry models are used to calculate the fair value of the various financial instruments based on significant observable market inputs, such as foreign exchange rates, commodity prices, swap rates, interest rates and implied volatilities obtained from various market sources. For other pension plan assets for which observable inputs are used, fair value is derived through the use of fair value models, such as a discounted cash flow model or other standard pricing models.

For pension plan assets classified as Level 3 measurements, total fair value is based on significant unobservable inputs including assumptions where there is little, if any, market activity for the investment.

Certain pension plan assets are held in funds where fair value is based on an estimated net asset value per share (or its equivalent) as of the most recently available fund financial statements which are received on a monthly or quarterly basis. These valuations are reviewed for reasonableness based on applicable sector, benchmark and company performance. Adjustments to valuations are made where appropriate to arrive at an estimated net asset value per share at the measurement date. These funds are not classified within the fair value hierarchy.

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The following table summarizes the bases used to measure the Company's pension plan assets at fair value for the years ended December 31, 2018 and 2017:

Basis of Fair Value Measurements	Dec 31, 2018				Dec 31, 2017			
In millions	Total	Level 1	Level 2	Level 3	Total	Level 1	Level 2	Level 3
Cash and cash equivalents	$877	$818	$59	$ —	$772	$671	$101	$ —
Equity securities:								
U.S. equity securities [1]	$3,493	$3,251	$241	$ 1	$3,755	$3,416	$339	$ —
Non - U.S. equity securities	4,242	3,497	707	38	5,551	4,533	978	40
Total equity securities	$7,735	$6,748	$948	$ 39	$9,306	$7,949	$1,317	$ 40
Fixed income securities:								
Debt - government-issued	$4,751	$285	$4,466	$ —	$4,596	$158	$4,437	$ 1
Debt - corporate-issued	2,929	411	2,518	—	3,300	351	2,935	14
Debt - asset-backed	90	—	89	1	101	—	100	1
Total fixed income securities	$7,770	$696	$7,073	$ 1	$7,997	$509	$7,472	$ 16
Alternative investments: [2]								
Private market securities	$1	$—	$—	$ 1	$—	$—	$—	$ —
Real estate	19	19	—	—	21	21	—	—
Derivatives - asset position	451	17	434	—	261	2	259	—
Derivatives - liability position	(506)	(19)	(487)	—	(305)	(2)	(303)	—
Total alternative investments	$(35)	$17	$(53)	$ 1	$(23)	$21	$(44)	$ —
Other investments [2]	$380	$47	$333	$ —	$273	$37	$236	$ —
Subtotal	$16,727	$8,326	$8,360	$ 41	$18,325	$9,187	$9,082	$ 56
Investments measured at net asset value: [2]								
Hedge funds	$1,637				$1,595			
Private market securities	2,196				1,390			
Real estate	2,080				2,200			
Total investments measured at net asset value	$5,913				$5,185			
Items to reconcile to fair value of plan assets:								
Pension trust receivables [3]	$29				$27			
Pension trust payables [4]	(125)				(136)			
Total	$22,544				$23,401			

1. No DowDuPont common stock was directly held at December 31, 2018 or December 31, 2017.
2. The Company reviewed its fair value technique and elected to present assets valued at net asset value per share as a practical expedient outside of the fair value hierarchy. The assets are presented as "Investments measured at net asset value." Prior period amounts were updated to conform with the current year presentation.
3. Primarily receivables for investment securities sold.
4. Primarily payables for investment securities purchased.

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The following table summarizes the changes in the fair value of Level 3 pension plan assets for the years ended December 31, 2018 and 2017:

Fair Value Measurement of Level 3 Pension Plan Assets In millions	Equity Securities	Fixed Income Securities	Alternative Investments	Other Investments	Total
Balance at Jan 1, 2017, as previously reported	$ 33	$ 17	$ 4,117	$ 95	$4,262
Reclassification of investments measured at net asset value [1]	—	—	(4,061)	(95)	(4,156)
Balance at Jan 1, 2017, as restated	$ 33	$ 17	$ 56	$ —	$106
Actual return on assets:					
Relating to assets sold during 2017	(1)	—	5	—	4
Relating to assets held at Dec 31, 2017	5	1	(1)	—	5
Purchases, sales and settlements, net	3	(2)	(60)	—	(59)
Balance at Dec 31, 2017	$ 40	$ 16	$ —	$ —	$56
Actual return on assets:					
Relating to assets sold during 2018	—	4	(1)	1	4
Relating to assets held at Dec 31, 2018	(3)	(4)	—	—	(7)
Purchases, sales and settlements, net	2	(15)	2	(1)	(12)
Balance at Dec 31, 2018	$ 39	$ 1	$ 1	$ —	$41

1. The Company reviewed its fair value technique and elected to present assets valued at net asset value per share as a practical expedient outside of the fair value hierarchy, including those classified as Level 3 pension plan assets. The assets are presented as "Investments measured at net asset value."

Defined Contribution Plans

U.S. employees may participate in defined contribution plans (Employee Savings Plans or 401(k) plans) by contributing a portion of their compensation, which is partially matched by the Company. Defined contribution plans also cover employees in some subsidiaries in other countries, including Australia, Brazil, Canada, Italy, Spain and the United Kingdom. Expense recognized for all defined contribution plans was $242 million in 2018, $367 million in 2017 and $283 million in 2016.

NOTE 20 – STOCK-BASED COMPENSATION

The Company grants stock-based compensation to employees and non-employee directors in the form of stock incentive plans, which include stock options, restricted stock units ("RSUs") (formerly termed deferred stock) and restricted stock. The Company also provides stock-based compensation in the form of performance stock units ("PSUs") (formerly termed performance deferred stock) and the Employee Stock Purchase Plan (“ESPP”), which grants eligible employees the right to purchase shares of the Company's common stock at a discounted price.

In connection with the Merger, on August 31, 2017 ("Conversion Date") all outstanding Dow stock options and RSU awards were converted into stock options and RSU awards with respect to DowDuPont common stock. The stock options and RSU awards have the same terms and conditions under the applicable plans and award agreements prior to the Merger. All outstanding and nonvested PSU awards were converted into RSU awards with respect to DowDuPont common stock at the greater of the applicable performance target or the actual performance as of the effective time of the Merger. Changes in the fair value of liability instruments are recognized as compensation expense each quarter. Dow and DuPont did not merge their stock-based compensation plans as a result of the Merger. The Dow and DuPont stock-based compensation plans were assumed by DowDuPont and continue in place with the ability to grant and issue DowDuPont common stock.

The total stock-based compensation expense included in the consolidated statements of income was $224 million, $359 million and $261 million in 2018, 2017 and 2016, respectively. The income tax benefits related to stock-based compensation arrangements were $50 million, $133 million and $97 million in 2018, 2017 and 2016, respectively.

Accounting for Stock-Based Compensation

The Company grants stock-based compensation awards that vest over a specified period or upon employees meeting certain performance and/or retirement eligibility criteria. The fair value of equity instruments issued to employees is measured on the grant date. The fair value of liability instruments (granted to executive employees subject to stock ownership requirements, that provide the recipient the option to elect to receive a cash payment equal to the value of the stock award on the date of delivery) is measured at the end of each quarter. The fair value of equity and liability instruments is expensed over the vesting period or, in the case of retirement, from the grant date to the date on which retirement eligibility provisions have been met and additional service is no longer required. The Company estimates expected forfeitures.

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The Company historically used a lattice-based option valuation model to estimate the fair value of stock options and used a Monte Carlo simulation for the market portion of PSU awards. Effective with the first quarter of 2018 grant, the Company began using the Black-Scholes option valuation model to estimate the fair value of stock options. This valuation methodology was adopted as a result of the Merger to align valuation methodologies with DuPont and better align with industry practice. The Company used the Black-Scholes option valuation model for subscriptions to purchase shares under the ESPP. The weighted-average assumptions used to calculate total stock-based compensation are included in the following table:

Weighted-Average Assumptions	2018	2017	2016
Dividend yield	2.13 %	3.01 %	4.13 %
Expected volatility	23.34%	23.71%	31.60%
Risk-free interest rate	2.83 %	1.28 %	1.12 %
Expected life of stock options granted during period (years)	6.2	7.5	7.8
Life of Employee Stock Purchase Plan (months)	—	3	4

The dividend yield assumption was equal to the dividend yield on the grant date, which reflected the most recent DowDuPont quarterly dividend payment of $0.38 per share in 2018 ($0.46 per share in 2017 and 2016 on Dow Common Stock). The expected volatility assumptions for the 2016 and 2017 stock options and ESPP were based on an equal weighting of the historical daily volatility for the contractual term of the awards and current implied volatility from exchange-traded options. The expected volatility assumptions for the 2018 stock options were based on an equal weighting of the historical daily volatility for the expected term of the awards and current implied volatility from exchange-traded options. The expected volatility assumption for the market portion of the 2016 and 2017 PSU awards were based on historical daily volatility for the term of the award. The risk-free interest rate was based on the weighted-average of U.S. Treasury strip rates over the contractual term of the 2016 and 2017 options. The risk-free interest rate was based on the U.S. Treasury strip rates over the expected life of the 2018 options. The expected life of stock options granted was based on an analysis of historical exercise patterns.

Stock Incentive Plan

The Company has historically granted equity awards under various plans (the "Prior Plans"). On February 9, 2012, the Board authorized The Dow Chemical Company 2012 Stock Incentive Plan (the "2012 Plan"), which was approved by stockholders at the Company's annual meeting on May 10, 2012 ("Original Effective Date") and became effective on that date. On February 13, 2014, the Board adopted The Dow Chemical Company Amended and Restated 2012 Stock Incentive Plan (the "2012 Restated Plan"). The 2012 Restated Plan was approved by stockholders at the Company's annual meeting on May 15, 2014, and became effective on that date. The Prior Plans were superseded by the 2012 Plan and the 2012 Restated Plan (collectively, the "2012 Plan"). Under the 2012 Plan, the Company may grant options, RSUs, PSUs, restricted stock, stock appreciation rights and stock units to employees and non-employee directors until the tenth anniversary of the Original Effective Date, subject to an aggregate limit and annual individual limits. The terms of the grants are fixed at the grant date. Dow's stock-based compensation programs were assumed by DowDuPont and continue in place with the ability to grant and issue DowDuPont common stock. At December 31, 2018, there were approximately 19 million shares of DowDuPont common stock available for grant under the 2012 Plan.

Stock Options

The Company grants stock options to certain employees, subject to certain annual and individual limits, with terms of the grants fixed at the grant date. The exercise price of each stock option equals the market price of the common stock on the grant date. Options vest from one to three years, and have a maximum term of 10 years.

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The following table summarizes stock option activity for 2018:

Stock Options	2018	
Shares in thousands	Shares	Exercise Price [1]
Outstanding at Jan 1, 2018	26,628	$ 38.30
Granted	6,571	$ 71.43
Exercised	(4,074)	$ 30.65
Forfeited/Expired	(279)	$ 61.47
Outstanding at Dec 31, 2018	28,846	$ 46.70
Remaining contractual life in years		5.46
Aggregate intrinsic value in millions	$327	
Exercisable at Dec 31, 2018	21,813	$ 39.99
Remaining contractual life in years		4.40
Aggregate intrinsic value in millions	$322	

1. Weighted-average per share.

Additional Information about Stock Options

In millions, except per share amounts	2018	2017	2016
Weighted-average fair value per share of options granted	$15.38	$14.44	$10.95
Total compensation expense for stock option plans	$68	$37	$32
Related tax benefit	$15	$14	$12
Total amount of cash received from the exercise of options	$112	$310	$312
Total intrinsic value of options exercised [1]	$160	$286	$153
Related tax benefit	$36	$106	$57

1. Difference between the market price at exercise and the price paid by the employee to exercise the options.

Total unrecognized compensation cost related to unvested stock option awards of $36 million at December 31, 2018, is expected to be recognized over a weighted-average period of 1.91 years.

Restricted Stock Units

The Company grants restricted stock units to certain employees. The grants vest after a designated period of time, generally one to five years. The following table shows changes in nonvested RSUs:

RSU Awards	2018	
Shares in thousands	Shares	Grant Date Fair Value [1]
Nonvested at Jan 1, 2018	13,346	$ 50.71
Granted	2,022	$ 71.46
Vested	(5,409)	$ 46.04
Canceled	(224)	$ 59.40
Nonvested at Dec 31, 2018	9,735	$ 57.41

1. Weighted-average per share.

Additional Information about RSUs

In millions, except per share amounts	2018	2017	2016
Weighted-average fair value per share of RSUs granted	$71.46	$61.29	$46.25

Total fair value of RSUs vested	$382	$179	$166
Related tax benefit	$86	$66	$61
Total compensation expense for RSU awards	$144	$178	$97
Related tax benefit	$32	$66	$36

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In 2018, the Company paid $45 million in cash, equal to the value of the stock award on the date of delivery, to certain executive employees to settle approximately 625,000 RSUs (there were no RSUs settled in cash in 2017 and 2016). Total unrecognized compensation cost related to RSU awards of $126 million at December 31, 2018, is expected to be recognized over a weighted-average period of 1.68 years. At December 31, 2018, approximately 18,000 RSUs with a grant date weighted-average fair value per share of $35.12 had previously vested, but were not issued. These shares are scheduled to be issued to employees within six months to three years or upon retirement.

Total incremental pretax compensation expense resulting from the conversion of PSU awards into RSU awards was $25 million ($20 million was recognized in the second half of 2017 and $5 million to be recognized over the remaining service period). Approximately 5,000 employees were impacted by the conversion.

Performance Stock Units

The Company grants performance stock units to certain employees. The grants vest when the Company attains specified performance targets, such as return on capital and relative total shareholder return, over a predetermined period, generally one to three years. In November 2017, the Company granted PSUs to senior leadership measured on the realization of cost savings in connection with cost synergy commitments, as well as the Company's ability to complete the Intended Business Separations. Performance and payouts are determined independently for each metric. Compensation expense related to PSU awards is recognized over the lesser of the service or performance period. Changes in the fair value of liability instruments are recognized as compensation expense each quarter.

The following table shows the PSU awards granted:

PSU Awards Shares in thousands		Target Shares Granted[1]	Grant Date Fair Value[2]
Year	Performance Period		
2017	Sep 1, 2017 – Aug 31, 2019	232	$ 71.16
2017 [3]	Jan 1, 2017 – Dec 31, 2019	1,728	$ 81.99
2016 [3]	Jan 1, 2016 – Dec 31, 2018	2,283	$ 52.68

1. At the end of the performance period, the actual number of shares issued can range from zero to 200% of target shares granted.
2. Weighted-average per share.
3. Converted to RSUs as a result of the Merger.

There was no activity in nonvested PSUs in 2018. At January 1, 2018 and December 31, 2018, there were 232,000 target shares of nonvested PSUs outstanding with a grant date fair value of $71.16.

Additional Information about PSUs

In millions, except share amounts	2018	2017	2016
Total fair value of PSUs vested and delivered [1]	$ —	$202	$103
Related tax benefit	$ —	$75	$38
Total compensation expense for PSU awards	$ 12	$106	$125
Related tax benefit	$ 3	$39	$46
Shares of PSUs settled in cash (in thousands) [2]	—	616	861
Total cash paid to settle PSUs [3]	$ —	$38	$40

1. Includes the fair value of shares vested in prior years and delivered in the reporting year.
2. PSU awards vested in prior years and delivered in the reporting year.
3.

Cash paid to certain executive employees for PSU awards vested in prior periods and delivered in the reporting year, equal to the value of the stock award on the date of delivery.

Total unrecognized compensation cost related to PSU awards of $8 million at December 31, 2018, is expected to be recognized over a weighted-average period of 0.67 years.

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Restricted Stock

Under the 2012 Plan, the Company may grant shares (including options, stock appreciation rights, stock units and restricted stock) to non-employee directors over the 10-year duration of the program, subject to the plan's aggregate limit as well as annual individual limits. The restricted stock issued under this plan cannot be sold, assigned, pledged or otherwise transferred by the non-employee director, until retirement or termination of service to the Company. The following table shows the restricted stock issued under this plan:

Restricted Stock Shares

Year	Issued (in thousands)	Weighted-Average Fair Value
2018	36	$ 62.82
2017	33	$ 62.04
2016	32	$ 50.55

Employee Stock Purchase Plan

On February 9, 2012, the Board authorized The Dow Chemical Company 2012 Employee Stock Purchase Plan (the "2012 ESPP") which was approved by stockholders at the Company’s annual meeting on May 10, 2012. When offered, most employees are eligible to purchase shares of common stock of the Company valued at up to 10 percent of their annual base salary. The value is determined using the plan price multiplied by the number of shares subscribed to by the employee. The plan price of the stock is set at an amount equal to at least 85 percent of the fair market value (closing price) of the common stock on a date during the fourth quarter of the year prior to the offering, or the average fair market value (closing price) of the common stock over a period during the fourth quarter of the year prior to the offering, in each case, specified by the Executive Vice President of Human Resources. The most recent offering of the 2012 ESPP closed on July 15, 2017. The ESPP was not offered in 2018 and no current offerings remain outstanding.

Additional Information about Employee Stock Purchase Plan

In millions, except per share amounts	2018	2017	2016
Weighted-average fair value per share of purchase rights granted	$	~~$~~ 10.70	$ 3.40
Total compensation expense for ESPP	$	~~$~~ 38	$ 7
Related tax benefit	$	~~$~~ 14	$ 3
Total amount of cash received from the exercise of purchase rights	$	~~$~~ 179	$ 86
Total intrinsic value of purchase rights exercised [1]	$	~~$~~ 48	$ 23
Related tax benefit	$	~~$~~ 18	$ 9

1. Difference between the market price at exercise and the price paid by the employee to exercise the purchase rights.

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NOTE 21 – FINANCIAL INSTRUMENTS

The following table summarizes the fair value of financial instruments at December 31, 2018 and 2017:

Fair Value of Financial Instruments at Dec 31	2018				2017			
In millions	Cost	Gain	Loss	Fair Value	Cost	Gain	Loss	Fair Value
Cash equivalents [1]	$566	$—	$—	$566	$2,280	$—	$—	$2,280
Marketable securities	$100	$—	$—	$100	$4	$—	$—	$4
Other investments:								
Debt securities:								
Government debt [2]	$714	$9	$(23)	$700	$637	$13	$(11)	$639
Corporate bonds	1,026	20	(63)	983	704	32	(3)	733
Total debt securities	$1,740	$29	$(86)	$1,683	$1,341	$45	$(14)	$1,372
Equity securities [3]	16	1	(1)	16	164	2	(26)	140
Total other investments	$1,756	$30	$(87)	$1,699	$1,505	$47	$(40)	$1,512
Total cash equivalents, marketable securities and other investments	$2,422	$30	$(87)	$2,365	$3,789	$47	$(40)	$3,796
Long-term debt including debt due within one year [4]	$(19,594)	$351	$(971)	$(20,214)	$(20,517)	$6	$(2,104)	$(22,615)
Derivatives relating to:								
Interest rates	$—	$—	$(64)	$(64)	$—	$—	$(4)	$(4)
Foreign currency	—	120	(43)	77	—	22	(112)	(90)
Commodities [5]	—	91	(178)	(87)	—	130	(256)	(126)
Total derivatives	$—	$211	$(285)	$(74)	$—	$152	$(372)	$(220)

1. Prior period amounts were updated to conform with the current year presentation.
2. U.S. Treasury obligations, U.S. agency obligations, agency mortgage-backed securities and other municipalities' obligations.
3. Equity securities with a readily determinable fair value. Presented in accordance with ASU 2016-01. See Notes 1 and 2 for additional information.
4. Cost includes fair value hedge adjustments of $18 million at December 31, 2018 and $19 million at December 31, 2017 on $2,290 million of debt at December 31, 2018 and $2,390 million of debt at December 31, 2017.
5. Presented net of cash collateral where master netting arrangements allow.

Cost approximates fair value for all other financial instruments.

Cash Equivalents

At December 31, 2018, the Company had $410 million ($1,771 million at December 31, 2017) of held-to-maturity securities (primarily treasury bills and time deposits) classified as cash equivalents, as these securities had maturities of three months or less at the time of purchase. The Company's investments in held-to-maturity securities are held at amortized cost, which approximates fair value. At December 31, 2018, the Company had investments in money market funds of $156 million classified as cash equivalents ($509 million at December 31, 2017).

Marketable Securities

At December 31, 2018, the Company had $100 million ($4 million at December 31, 2017) of debt securities with maturities of less than one year at the time of purchase.

Debt Securities

The Company’s investments in debt securities are primarily classified as available-for-sale. The following table provides the investing results from available-for-sale securities for the years ended December 31, 2018, 2017 and 2016.

Investing Results [1]

In millions	2018	2017	2016
Proceeds from sales of available-for-sale securities	$1,053	$245	$396
Gross realized gains	$21	$5	$15
Gross realized losses	$30	$—	$1

1. Prior period amounts were updated to conform with the current year presentation as a result of the adoption of ASU 2016-01.

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The following table summarizes the contractual maturities of the Company's investments in debt securities:

Contractual Maturities of Debt Securities at Dec 31, 2018 [1] In millions	Amortized Cost	Fair Value
Within one year	$ 124	$ 124
One to five years	455	444
Six to ten years	717	683
After ten years	444	432
Total	$ 1,740	$ 1,683

1. Includes marketable securities with maturities of less than one year.

Portfolio managers regularly review the Company's holdings to determine if any investments in debt securities are other-than-temporarily impaired. The analysis includes reviewing the amount of the impairment, as well as the length of time it has been impaired.

The credit rating of the issuer, current credit rating trends, the trends of the issuer's overall sector, the ability of the issuer to pay expected cash flows and the length of time the security has been in a loss position are considered in determining whether unrealized losses represent an other-than-temporary impairment. The Company did not have any credit-related losses in 2018, 2017 or 2016.

The following tables provide the fair value and gross unrealized losses of the Company's investments in debt securities that were deemed to be temporarily impaired at December 31, 2018 and 2017, aggregated by investment category:

Temporarily Impaired Debt Securities at Dec 31, 2018	Less than 12 months		12 months or more		Total	
In millions	Fair Value	Unrealized Losses	Fair Value	Unrealized Losses	Fair Value	Unrealized Losses
Government debt [1]	$287	$ (17)	$187	$ (6)	$474	$ (23)
Corporate bonds	724	(58)	64	(5)	788	(63)
Total temporarily impaired debt securities	$1,011	$ (75)	$251	$ (11)	$1,262	$ (86)

1. U.S. Treasury obligations, U.S. agency obligations, agency mortgage-backed securities and other municipalities' obligations.

Temporarily Impaired Debt Securities at Dec 31, 2017	Less than 12 months		12 months or more		Total	
In millions	Fair Value	Unrealized Losses	Fair Value	Unrealized Losses	Fair Value	Unrealized Losses
Government debt [1]	$295	$ (4)	$151	$ (7)	$446	$ (11)
Corporate bonds	163	(2)	19	(1)	182	(3)
Total temporarily impaired debt securities	$458	$ (6)	$170	$ (8)	$628	$ (14)

1. U.S. Treasury obligations, U.S. agency obligations, agency mortgage-backed securities and other municipalities' obligations.

Equity Securities

The Company's investments in equity securities with a readily determinable fair value totaled $16 million at December 31, 2018 ($140 million at December 31, 2017). The aggregate carrying value of the Company's investments in equity securities where fair value is not readily determinable totaled $206 million at December 31, 2018, reflecting the

carrying value of the investments. There were no material adjustments to the carrying value of the not readily determinable investments for impairment or observable price changes for the year ended December 31, 2018. The net unrealized gain recognized in earnings on equity securities totaled $7 million for the year ended December 31, 2018.

Repurchase and Reverse Repurchase Agreement Transactions

The Company enters into repurchase and reverse repurchase agreements. These transactions are accounted for as collateralized borrowings and lending transactions bearing a specified rate of interest and are short-term in nature with original maturities of 30 days or less. The underlying collateral is typically treasury bills with longer maturities than the repurchase agreement. The impact of these transactions is not material to the Company’s results. There were no repurchase or reverse repurchase agreements outstanding at December 31, 2018 and 2017.

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Risk Management

Dow's business operations give rise to market risk exposure due to changes in foreign exchange rates, interest rates, commodity prices and other market factors such as equity prices. To manage such risks effectively, the Company enters into hedging transactions, pursuant to established guidelines and policies that enable it to mitigate the adverse effects of financial market risk. Derivatives used for this purpose are designated as hedges per the accounting guidance related to derivatives and hedging activities, where appropriate. A secondary objective is to add value by creating additional non-specific exposure within established limits and policies; derivatives used for this purpose are not designated as hedges. The potential impact of creating such additional exposures is not material to the Company's results. Accounting guidance requires companies to recognize all derivative instruments as either assets or liabilities at fair value.

The Company's risk management program for interest rate, foreign currency and commodity risks is based on fundamental, mathematical and technical models that take into account the implicit cost of hedging. Risks created by derivative instruments and the mark-to-market valuations of positions are strictly monitored at all times, using value-at-risk and stress tests. Counterparty credit risk arising from these contracts is not significant because the Company minimizes counterparty concentration, deals primarily with major financial institutions of solid credit quality, and the majority of its hedging transactions mature in less than three months. In addition, the Company minimizes concentrations of credit risk through its global orientation by transacting with large, internationally diversified financial counterparties. It is the Company's policy to not have credit risk-related contingent features in its derivative instruments. No significant concentration of counterparty credit risk existed at December 31, 2018. The Company does not anticipate losses from credit risk, and the net cash requirements arising from counterparty risk associated with risk management activities are not expected to be material in 2019.

The Company revises its strategies as market conditions dictate and management reviews its overall financial strategies and the impacts from using derivatives in its risk management program with the Company's senior leadership who also reviews these strategies with the DowDuPont Board and/or relevant committees thereof.

The notional amounts of the Company's derivative instruments presented on a net basis at December 31, 2018 and 2017, were as follows:

Notional Amounts - Net In millions	Dec 31, 2018	Dec 31, 2017 [1]
Derivatives designated as hedging instruments:		
Interest rate swaps	$2,049	$185
Foreign currency contracts	$4,457	$4,343
Derivatives not designated as hedging instruments:		
Interest rate swaps	$5	$—
Foreign currency contracts	$19,285	$12,041

1. Prior period amounts were previously presented on a gross basis and have been updated to conform with the current year net presentation.

The notional amounts of the Company's commodity derivatives at December 31, 2018 and 2017, were as follows:

Commodity Notionals - Net	Dec 31, 2018	Dec 31, 2017 [1]	Notional Volume Unit
Derivatives designated as hedging instruments:			

Hydrocarbon derivatives	39.9	71.3	million barrels of oil equivalent
Seed derivatives	—	3.9	million bushels
Derivatives not designated as hedging instruments:			
Hydrocarbon derivatives	1.2	4.1	million barrels of oil equivalent
Power derivatives	73.9	—	thousands of megawatt hours

1. Prior period amounts were previously presented on a gross basis and have been updated to conform with the current year net presentation.

Interest Rate Risk Management

The main objective of interest rate risk management is to reduce the total funding cost to the Company and to alter the interest rate exposure to the desired risk profile. To achieve this objective, the Company hedges using interest rate swaps, “swaptions,” and exchange-traded instruments. At December 31, 2018, the Company had open interest rate swaps with maturity dates that extend through 2022.

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Foreign Currency Risk Management
The global nature of Dow's business requires active participation in the foreign exchange markets. The Company has assets, liabilities and cash flows in currencies other than the U.S. dollar. The primary objective of the Company's foreign currency risk management is to optimize the U.S. dollar value of net assets and cash flows. To achieve this objective, the Company hedges on a net exposure basis using foreign currency forward contracts, over-the-counter option contracts, cross-currency swaps and nonderivative instruments in foreign currencies. Exposures primarily relate to assets, liabilities and bonds denominated in foreign currencies, as well as economic exposure, which is derived from the risk that currency fluctuations could affect the dollar value of future cash flows related to operating activities. At December 31, 2018, the Company had foreign currency contracts with various expiration dates, through 2019.

Commodity Risk Management
The Company has exposure to the prices of commodities in its procurement of certain raw materials. The primary purpose of commodity hedging activities is to manage the price volatility associated with these forecasted inventory purchases. At December 31, 2018, the Company had futures contracts, options and swaps to buy, sell or exchange commodities. These agreements have various expiration dates through 2022.

Derivatives Not Designated in Hedging Relationships
Foreign Currency Contracts
The Company also uses foreign exchange forward contracts, options and cross-currency swaps that are not designated as hedging instruments primarily to manage foreign currency exposure.

Commodity Contracts
The Company utilizes futures, options and swap instruments that are effective as economic hedges of commodity price exposures, but do not meet hedge accounting criteria for derivatives and hedging, to reduce exposure to commodity price fluctuations on purchases of raw materials and inventory.

Interest Rate Contracts
The Company uses swap instruments that are not designated as hedging instruments to manage the interest rate exposures. Dow uses interest rate swaps, "swaptions," and exchange-traded instruments to accomplish this objective.

Accounting for Derivative Instruments and Hedging Activities
Cash Flow Hedges
For derivatives that are designated and qualify as cash flow hedging instruments, the gain or loss on the derivative is recorded in AOCL; it is reclassified to income in the same period or periods that the hedged transaction affects income. The unrealized amounts in AOCL fluctuate based on changes in the fair value of open contracts at the end of each reporting period. The Company anticipates volatility in AOCL and net income from its cash flow hedges. The amount of volatility varies with the level of derivative activities and market conditions during any period.

The net gain from interest rate hedges included in AOCL at December 31, 2018 was $23 million after tax (net loss of $3 million after tax at December 31, 2017). These contracts have maturity dates that extend through 2022.

The Company had open foreign currency contracts designated as cash flow hedges of the currency risk associated with forecasted transactions not extending beyond 2019. The portion of the mark-to-market effects of the foreign currency contracts is recorded in AOCL; it is reclassified to income in the same period or periods that the underlying item affects income. The net gain from the foreign currency hedges included in AOCL at December 31, 2018 was $15 million after tax (net loss of $19 million after tax at December 31, 2017).

Commodity swaps, futures and option contracts with maturities of not more than 60 months are utilized and designated as cash flow hedges of forecasted commodity purchases. Current open contracts hedge forecasted transactions until December 2022. The designated portion of the mark-to-market effect of the cash flow hedge instrument is recorded in AOCL; it is reclassified to income in the same period or periods that the underlying commodity purchase affects income. The net loss from commodity hedges included in AOCL at December 31, 2018 was $87 million after tax (net loss of $73 million after tax at December 31, 2017).

Fair Value Hedges

For interest rate swap instruments that are designated and qualify as fair value hedges, the gain or loss on the derivative as well as the offsetting loss or gain on the hedged item attributable to the hedged risk are recognized in current period income and reflected as “Interest expense and amortization of debt discount” in the consolidated statements of income. The short-cut method is used when the criteria are met. At December 31, 2018 and 2017, the Company had no open interest rate swaps designated as fair value hedges of underlying fixed rate debt obligations.

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Net Foreign Investment Hedges

For derivative instruments that are designated and qualify as net foreign investment hedges, the designated portion of the gain or loss on the derivative is included in “Cumulative translation adjustments” in AOCL. The Company had outstanding foreign-currency denominated debt designated as a hedge of net foreign investment of $182 million at December 31, 2018 ($177 million at December 31, 2017). The results of hedges of the Company’s net investment in foreign operations included in “Cumulative translation adjustments” in AOCL was a net gain of $113 million after tax for the year ended December 31, 2018 (net loss of $76 million after tax for the year ended December 31, 2017).

Amounts to be Reclassified within the Next Twelve Months

The net after-tax amounts to be reclassified from AOCL to income within the next 12 months are a $45 million loss for commodity contracts, a $13 million gain for foreign currency contracts and a $1 million gain for interest rate contracts.

The following tables provide the fair value and gross balance sheet classification of derivative instruments at December 31, 2018 and 2017:

Fair Value of Derivative Instruments		Dec 31, 2018		
In millions	Balance Sheet Classification	Gross	Counterparty and Cash Collateral Netting [1]	Net Amounts Included in the Consolidated Balance Sheets
Asset derivatives:				
Derivatives designated as hedging instruments:				
Foreign currency contracts	Other current assets	$98	$ (42)	$ 56
Commodity contracts	Other current assets	47	(13)	34
Commodity contracts	Deferred charges and other assets	18	(3)	15
Total		$163	$ (58)	$ 105
Derivatives not designated as hedging instruments:				
Foreign currency contracts	Other current assets	$128	$ (64)	$ 64
Commodity contracts	Other current assets	41	(1)	40
Commodity contracts	Deferred charges and other assets	4	(2)	2
Total		$173	$ (67)	$ 106
Total asset derivatives		$336	$ (125)	$ 211
Liability derivatives:				
Derivatives designated as hedging instruments:				
Interest rate swaps	Other noncurrent obligations	$64	$ —	$ 64
Foreign currency contracts	Accrued and other current liabilities	46	(42)	4
Commodity contracts	Accrued and other current liabilities	111	(18)	93
Commodity contracts	Other noncurrent obligations	86	(9)	77
Total		$307	$ (69)	$ 238
Derivatives not designated as hedging instruments:				
Foreign currency contracts	Accrued and other current liabilities	$103	$ (64)	$ 39
Commodity contracts	Accrued and other current liabilities	7	(4)	3

Commodity contracts	Other noncurrent obligations	8	(3)	5
Total		$118	$ (71)	$ 47
Total liability derivatives		$425	$ (140)	$ 285

1. Counterparty and cash collateral amounts represent the estimated net settlement amount when applying netting and set-off rights included in master netting arrangements between Dow and its counterparties and the payable or receivable for cash collateral held or placed with the same counterparty.

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Fair Value of Derivative Instruments		Dec 31, 2017		
In millions	Balance Sheet Classification	Gross	Counterparty and Cash Collateral Netting [1]	Net Amounts Included in the Consolidated Balance Sheets
Asset derivatives:				
Derivatives designated as hedging instruments:				
Foreign currency contracts	Other current assets	$51	$ (46)	$ 5
Commodity contracts	Other current assets	20	(4)	16
Commodity contracts	Deferred charges and other assets	70	(5)	65
Total		$141	$ (55)	$ 86
Derivatives not designated as hedging instruments:				
Foreign currency contracts	Other current assets	$75	$ (58)	$ 17
Commodity contracts	Other current assets	50	(5)	45
Commodity contracts	Deferred charges and other assets	7	(3)	4
Total		$132	$ (66)	$ 66
Total asset derivatives		$273	$ (121)	$ 152
Liability derivatives:				
Derivatives designated as hedging instruments:				
Interest rate swaps	Other noncurrent obligations	$4	$ —	$ 4
Foreign currency contracts	Accrued and other current liabilities	109	(46)	63
Commodity contracts	Accrued and other current liabilities	96	(15)	81
Commodity contracts	Other noncurrent obligations	143	(12)	131
Total		$352	$ (73)	$ 279
Derivatives not designated as hedging instruments:				
Foreign currency contracts	Accrued and other current liabilities	$107	$ (58)	$ 49
Commodity contracts	Accrued and other current liabilities	45	(6)	39
Commodity contracts	Other noncurrent obligations	8	(3)	5
Total		$160	$ (67)	$ 93
Total liability derivatives		$512	$ (140)	$ 372

1. Counterparty and cash collateral amounts represent the estimated net settlement amount when applying netting and set-off rights included in master netting arrangements between Dow and its counterparties and the payable or receivable for cash collateral held or placed with the same counterparty.

Assets and liabilities related to forward contracts, interest rate swaps, currency swaps, options and other conditional or exchange contracts executed with the same counterparty under a master netting arrangement are netted. Collateral accounts are netted with corresponding assets or liabilities, when applicable. The Company posted cash collateral of $26 million at December 31, 2018 ($21 million at December 31, 2017). Counterparties posted cash collateral of $34 million with the Company at December 31, 2018 (zero at December 31, 2017).

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Effect of Derivative Instruments	Amount of gain (loss) recognized in OCI [1]			Amount of gain (loss) recognized in income [2]			
In millions	2018	2017	2016	2018	2017	2016	Income Statement Classification
Derivatives designated as hedging instruments:							
Fair value hedges:							
Interest rate swaps	$—	$—	$—	$—	$(2)	$—	Interest expense and amortization of debt discount [3]
Cash flow hedges:							
Interest rate swaps	26	2	2	(3)	4	6	Interest expense and amortization of debt discount
Foreign currency contracts	19	(30)	8	(18)	7	(5)	Cost of sales
Foreign currency contracts	(3)	(5)	25	—	(17)	(13)	Sundry income (expense) - net
Commodity contracts	(45)	35	55	(69)	7	(28)	Cost of sales
Net investment hedges:							
Foreign currency contracts	116	(73)	5	—	—	—	
Total derivatives designated as hedging instruments	$113	$(71)	$95	$(90)	$(1)	$(40)	
Derivatives not designated as hedging instruments:							
Foreign currency contracts	$—	$—	$—	$101	$(289)	$(180)	Sundry income (expense) - net
Commodity contracts	—	—	—	(12)	(9)	6	Cost of sales
Total derivatives not designated as hedging instruments	$—	$—	$—	$89	$(298)	$(174)	
Total derivatives	$113	$(71)	$95	$(1)	$(299)	$(214)	

1. OCI is defined as other comprehensive income (loss).
2. Pretax amounts.
3. Gain (loss) recognized in income of derivatives is offset by gain (loss) recognized in income of the hedged item.

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NOTE 22 – FAIR VALUE MEASUREMENTS

Fair Value Measurements on a Recurring Basis

The following table summarizes the bases used to measure certain assets and liabilities at fair value on a recurring basis:

Basis of Fair Value Measurements on a Recurring Basis	Dec 31, 2018				Dec 31, 2017			
In millions	Level 1	Level 2	Level 3	Total	Level 1	Level 2	Level 3	Total
Assets at fair value:								
Cash equivalents [1]	$—	$566	$ —	$566	$—	$2,280	$—	$2,280
Marketable securities	—	100	—	100	—	4	—	4
Interests in trade accounts receivable conduits [2]	—	—	—	—	—	—	677	677
Equity securities [3]	16	—	—	16	88	52	—	140
Debt securities: [3]								
Government debt [4]	—	700	—	700	—	639	—	639
Corporate bonds	—	983	—	983	—	733	—	733
Derivatives relating to: [5]								
Foreign currency	—	226	—	226	—	126	—	126
Commodities	17	93	—	110	47	100	—	147
Total assets at fair value	$33	$2,668	$ —	$2,701	$135	$3,934	$677	$4,746
Liabilities at fair value:								
Long-term debt including debt due within one year [6]	$—	$20,214	$ —	$20,214	$—	$22,615	$—	$22,615
Derivatives relating to: [5]								
Interest rates	—	64	—	64	—	4	—	4
Foreign currency	—	149	—	149	—	216	—	216
Commodities	23	189	—	212	31	261	—	292
Total liabilities at fair value	$23	$20,616	$ —	$20,639	$31	$23,096	$—	$23,127

1. Treasury bills, time deposits, and money market funds included in "Cash and cash equivalents" in the consolidated balance sheets and held at amortized cost, which approximates fair value.

2. Included in "Accounts and notes receivable – Other" in the consolidated balance sheets. See Note 14 for additional information on transfers of financial assets.

3. The Company’s investments in debt securities, which are primarily available-for-sale, and equity securities are included in “Other investments” in the consolidated balance sheets.

4. U.S. Treasury obligations, U.S. agency obligations, agency mortgage-backed securities and other municipalities’ obligations.

5. See Note 21 for the classification of derivatives in the consolidated balance sheets.

6. See Note 21 for information on fair value measurements of long-term debt.

For assets and liabilities classified as Level 1 measurements (measured using quoted prices in active markets), total fair value is either the price of the most recent trade at the time of the market close or the official close price, as defined by the exchange on which the asset is most actively traded on the last trading day of the period, multiplied by the number of units held without consideration of transaction costs.

For assets and liabilities classified as Level 2 measurements, where the security is frequently traded in less active markets, fair value is based on the closing price at the end of the period; where the security is less frequently traded, fair value is based on the price a dealer would pay for the security or similar securities, adjusted for any terms specific to that asset or liability, or by using observable market data points of similar, more liquid securities to imply the price. Market inputs are obtained from well-established and recognized vendors of market data and subjected to tolerance and quality checks.

For derivative assets and liabilities, standard industry models are used to calculate the fair value of the various financial instruments based on significant observable market inputs, such as foreign exchange rates, commodity prices, swap rates, interest rates and implied volatilities obtained from various market sources. Market inputs are obtained from well-established and recognized vendors of market data and subjected to tolerance/quality checks. For all other assets and liabilities for which observable inputs are used, fair value is derived through the use of fair value models, such as a discounted cash flow model or other standard pricing models. See Note 21 for further information on the types of instruments used by the Company for risk management.
There were no transfers between Levels 1 and 2 in the years ended December 31, 2018 and 2017.

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For assets classified as Level 3 measurements, the fair value is based on significant unobservable inputs including assumptions where there is little, if any, market activity. The fair value of the Company's interests held in trade accounts receivable conduits is determined by calculating the expected amount of cash to be received using the key input of anticipated credit losses in the portfolio of receivables sold that have not yet been collected. Given the short-term nature of the underlying receivables, discount rate and prepayments are not factors in determining the fair value of the interests. See Note 14 for further information on assets classified as Level 3 measurements.
For equity securities calculated at net asset value per share (or its equivalent), the Company had $120 million in private market securities and $29 million in real estate at December 31, 2018. There are no redemption restrictions and the underfunded commitments on these investments were $89 million at December 31, 2018.
The following table summarizes the changes in fair value measurements using Level 3 inputs for the years ended December 31, 2018 and 2017:

Fair Value Measurements Using Level 3 Inputs for Interests Held in Trade Accounts Receivable Conduits [1]	2018	2017
In millions		
Balance at Jan 1	$677	$1,237
Gain (loss) included in earnings [2]	3	(8)
Purchases [3]	—	8,910
Settlements [3, 4]	(680)	(9,462)
Balance at Dec 31	$—	$677

1. Included in "Accounts and notes receivable – Other" in the consolidated balance sheets.
2. Included in "Selling, general and administrative expenses" in the consolidated statements of income.
3. Presented in accordance with ASU 2016-15. See Notes 1 and 2 for additional information. In connection with the review and implementation of ASU 2016-15, the Company also changed the prior year value of "Purchases" and "Settlements" due to additional interpretive guidance of the required method for calculating the cash received from beneficial interests in the conduits, including additional guidance from the SEC's Office of the Chief Accountant issued in the third quarter of 2018 that indicated an entity must evaluate daily transaction activity to calculate the value of cash received from beneficial interests in conduits.
4. Includes noncash transactions of $23 million for the year ended December 31, 2018.

Fair Value Measurements on a Nonrecurring Basis
The following table summarizes the bases used to measure certain assets at fair value on a nonrecurring basis in the consolidated balance sheets in 2018, 2017 and 2016:

Basis of Fair Value Measurements on a Nonrecurring Basis at Dec 31	(Level 1)	(Level 3)	Total Losses
In millions			
2018			
Assets at fair value:			
Long-lived assets and other assets	$ —	$ 17	$(261)
2017			
Assets at fair value:			
Long-lived assets, intangible assets, other assets and equity method investments	$ —	$ 61	$(1,226)
Goodwill	$ —	$ —	$(1,491)
2016			
Assets at fair value:			
Long-lived assets, other assets and equity method investments	$ 46	$ —	$(296)

2018 Fair Value Measurements on a Nonrecurring Basis

The Company has or will shut down a number of manufacturing, R&D, other non-manufacturing facilities and corporate facilities around the world as part of its restructuring programs. In 2018, the write-down of inventory, corporate facilities and all but one manufacturing facility and related assets, were written down to zero. The remaining manufacturing facility, which was classified as a Level 3 measurement, was written down to a fair value of $17 million using unobservable inputs, including assumptions a market participant would use to measure the fair value of the group of assets, which included a third party appraisal. The impairment charges related to the restructuring programs, totaling $227 million, were included in "Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income. See Note 7 for additional information on the Company's restructuring activities.

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In 2018, the Company recognized an additional pretax impairment charge of $34 million related primarily to capital additions made to the biopolymers manufacturing facility in Santa Vitoria, Minas Gerais, Brazil, that was impaired in 2017. The assets were written down to zero in 2018. The impairment charge was included in “Restructuring, goodwill impairment and asset related charges - net” in the consolidated statements of income. See Note 7 for additional information on the Company's restructuring activities.

2017 Fair Value Measurements on a Nonrecurring Basis
The Company has or will shut down a number of manufacturing, R&D and corporate facilities around the world as part of the Synergy Program. The manufacturing facilities and related assets (including intangible assets), corporate facilities and data centers associated with this plan were written down to zero in the fourth quarter of 2017. The impairment charges related to the Synergy Program, totaling $287 million, were included in "Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income. See Note 7 for additional information on the Company's restructuring activities.

In the fourth quarter of 2017, the Company recognized a $622 million pretax impairment charge related to a biopolymers manufacturing facility in Santa Vitoria, Minas Gerais, Brazil. The Company determined it would not pursue an expansion of the facility’s ethanol mill into downstream derivative products, primarily as a result of cheaper ethane-based production as well as the Company’s new assets coming online on the U.S. Gulf Coast which can be used to meet growing market demands in Brazil. As a result of this decision, cash flow analysis indicated the carrying amount of the impacted assets was not recoverable and the assets were written down to zero in the fourth quarter of 2017. The impairment charge was included in “Restructuring, goodwill impairment and asset related charges - net” in the consolidated statements of income. See Notes 7 and 23 for additional information.

The Company also recognized other pretax impairment charges of $317 million in the fourth quarter of 2017, including charges related to manufacturing assets of $230 million, an equity method investment of $81 million and other assets of $6 million. The assets, classified as Level 3 measurements, were valued at $61 million using unobservable inputs, including assumptions a market participant would use to measure the fair value of the group of assets, which included projected cash flows. The impairment charges were included in "Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income. See Notes 7 and 23 for additional information.

In the fourth quarter of 2017, the Company performed its annual goodwill impairment testing utilizing a discounted cash flow methodology as its valuation technique. As a result, the Company determined the fair value of the Coatings & Performance Monomers reporting unit was lower than its carrying amount and recorded an impairment charge of $1,491 million, included in “Restructuring, goodwill impairment and asset related charges - net” in the consolidated statements of income. See Note 13 for additional information on the impairment charge.

2016 Fair Value Measurements on a Nonrecurring Basis
As part of the 2016 restructuring plan, the Company shut down a number of manufacturing and corporate facilities. The manufacturing facilities and related assets, corporate facilities and data centers associated with this plan were written down to zero in the second quarter of 2016. The Company also rationalized its aircraft fleet in the second quarter of 2016. Certain aircraft, classified as a Level 3 measurement, were considered held for sale and written down to fair value, using unobservable inputs, including assumptions a market participant would use to measure the fair value of the aircraft. The aircraft were subsequently sold in the second half of 2016. The impairment charges related to the 2016 restructuring plan, totaling $153 million, were included in "Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income. See Note 7 for additional information on the Company's restructuring activities.

The Company recognized an impairment charge of $143 million in the fourth quarter of 2016, related to its equity interest in AFSI. This investment, classified as a Level 1 measurement, was written down to $46 million using quoted prices in an active market. The impairment charge was included in “Restructuring, goodwill impairment and asset related charges - net" in the consolidated statements of income. See Notes 7 and 12 for additional information.

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NOTE 23 – VARIABLE INTEREST ENTITIES

Consolidated Variable Interest Entities ("VIEs")

The Company holds a variable interest in the following joint ventures or entities for which it is the primary beneficiary.

Asia Pacific joint ventures

The Company has variable interests in three joint ventures that own and operate manufacturing and logistics facilities, which produce chemicals and provide services in Asia Pacific. The Company's variable interests in these joint ventures relate to arrangements between the joint ventures and the Company, involving the majority of the output on take-or-pay terms with pricing ensuring a guaranteed return to the joint ventures.

Polishing materials joint venture

The Company has variable interests in a joint venture that manufactures products in Japan for the semiconductor industry. Each joint venture partner holds several equivalent variable interests, with the exception of a royalty agreement held exclusively between the joint venture and the Company. In addition, the entire output of the joint venture is sold to the Company for resale to third-party customers.

Ethylene storage joint venture

The Company has variable interests in a joint venture that provides ethylene storage in Alberta, Canada. The Company's variable interests relate to arrangements involving a majority of the joint venture's storage capacity on take-or-pay terms with pricing ensuring a guaranteed return to the joint venture; and favorably priced leases provided to the joint venture. The Company provides the joint venture with operation and maintenance services and utilities.

Ethanol production and cogeneration in Brazil

The Company held a variable interest in a joint venture located in Brazil that produces ethanol from sugarcane. In August 2015, the partner exercised an equity option which required Dow to purchase their equity interest. On March 31, 2016, the partner's equity investment transferred to the Company. On July 11, 2016, the Company paid $202 million to the former partner, which was classified as "Purchases of noncontrolling interests" in the consolidated statements of cash flows. This former joint venture is now 100 percent owned by the Company. The Company continues to hold variable interests in a related entity that owns a cogeneration facility. The Company's variable interests are the result of a tolling arrangement where it provides fuel to the entity and purchases a majority of the cogeneration facility’s output on terms that ensure a return to the entity’s equity holders.

Assets and Liabilities of Consolidated VIEs

The Company's consolidated financial statements include the assets, liabilities and results of operations of VIEs for which the Company is the primary beneficiary. The other equity holders’ interests are reflected in "Net income attributable to noncontrolling interests" in the consolidated statements of income and "Noncontrolling interests" in the consolidated balance sheets.

The following table summarizes the carrying amounts of these entities’ assets and liabilities included in the Company’s consolidated balance sheets at December 31, 2018 and 2017:

Assets and Liabilities of Consolidated VIEs at Dec 31

In millions	2018	2017
Cash and cash equivalents	$82	$107
Other current assets	114	131
Net property	734	907
Other noncurrent assets	45	50

Total assets [1]	$975	$1,195
Current liabilities	$334	$303
Long-term debt	75	249
Other noncurrent obligations	31	41
Total liabilities [2]	$440	$593

1. All assets were restricted at December 31, 2018 and 2017.
2. All liabilities were nonrecourse at December 31, 2018 and 2017.

In addition, the Company holds a variable interest in an entity created to monetize accounts receivable of select European entities. Dow is the primary beneficiary of this entity as a result of holding subordinated notes while maintaining servicing responsibilities for the accounts receivable. The carrying amounts of assets and liabilities included in the Company's consolidated balance sheets pertaining to this entity were current assets of zero (zero restricted) at December 31, 2018 ($671 million, zero restricted, at

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December 31, 2017) and current liabilities of zero (zero nonrecourse) at December 31, 2018 (less than $1 million, zero nonrecourse, at December 31, 2017).

Amounts presented in the consolidated balance sheets and the table above as restricted assets or nonrecourse obligations relating to consolidated VIEs at December 31, 2018 and 2017 are adjusted for intercompany eliminations and parental guarantees.

Nonconsolidated VIEs
The Company holds a variable interest in the following entities for which Dow is not the primary beneficiary.

Polysilicon joint venture
As a result of the Dow Silicones ownership restructure, the Company holds variable interests in Hemlock Semiconductor L.L.C. The variable interests relate to an equity interest held by the Company and arrangements between the Company and the joint venture to provide services. The Company is not the primary beneficiary, as it does not direct the activities that most significantly impact the economic performance of this entity; therefore, the entity is accounted for under the equity method of accounting. At December 31, 2018, the Company had a negative investment basis of $495 million in this joint venture (negative $752 million at December 31, 2017), classified as "Other noncurrent obligations" in the consolidated balance sheets. The Company's maximum exposure to loss was zero at December 31, 2018 (zero at December 31, 2017). See Note 12 for additional information on this joint venture.

Silicon joint ventures
Also as a result of the Dow Silicones ownership restructure, the Company holds minority voting interests in certain joint ventures that produce silicon inputs for the Company. These joint ventures operate under supply agreements that sell inventory to the equity owners using pricing mechanisms that guarantee a return, therefore shielding the joint ventures from the obligation to absorb expected losses. As a result of the pricing mechanisms of these agreements, these entities are determined to be VIEs. The Company is not the primary beneficiary, as it does not hold the power to direct the activities that most significantly impact the economic performance of these entities; therefore, the entities are accounted for under the equity method of accounting. The Company's maximum exposure to loss as a result of its involvement with these variable interest entities is determined to be the carrying value of the investment in these entities. At December 31, 2018, the Company's investment in these joint ventures was $100 million ($103 million at December 31, 2017), classified as "Investment in nonconsolidated affiliates" in the consolidated balance sheets, representing the Company's maximum exposure to loss.

AFSI
The Company holds a variable interest in AFSI, a company that produces and sells proprietary technologies for the horticultural market. The variable interest in AFSI relates to a tax receivable agreement that entitles Dow to additional consideration in the form of tax savings, which is contingent on the operations and earnings of AFSI. The Company is not the primary beneficiary, as Dow is a minority shareholder in AFSI and AFSI is governed by a board of directors, the composition of which is mandated by AFSI's corporate governance requirements that a majority of the directors be independent.

On April 4, 2017, the Company entered into a stock purchase agreement to purchase up to 5,070,358 shares of AFSI's common stock, which represented approximately 10 percent of AFSI's common stock outstanding at signing of the agreement, subject to certain terms and conditions. On November 19, 2018, the stock purchase agreement concluded. The Company's investment in AFSI was $48 million at December 31, 2018 ($51 million at December 31, 2017), classified as "Investment in nonconsolidated affiliates" in the consolidated balance sheets. In the fourth quarter of 2016, as a result of a decline in the market value of AFSI, the Company recognized a $143 million pretax impairment charge related to its equity interest in AFSI, recorded in "Restructuring, goodwill impairment and asset related charges

- net" in the consolidated statements of income (see Notes 12 and 22 for further information).

At December 31, 2018, the Company's receivable with AFSI related to the tax receivable agreement was $8 million ($4 million at December 31, 2017), classified as "Accounts and notes receivable - Other" in the consolidated balance sheets. The Company's maximum exposure to loss was $56 million at December 31, 2018 ($55 million at December 31, 2017).

Crude acrylic acid joint venture

The Company held a variable interest in a joint venture that manufactured crude acrylic acid in the United States and Germany on behalf of the Company and the other joint venture partner. The variable interest related to a cost-plus arrangement between the joint venture and each joint venture partner. The Company was not the primary beneficiary, as a majority of the joint venture’s output was committed to the other joint venture partner; therefore, the entity was accounted for under the equity method of accounting.

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In the fourth quarter of 2017, the joint venture was dissolved by mutual agreement with return of the originally contributed assets to the partners. The carrying value of the Company's investment prior to the dissolution was $168 million, which was also determined to be fair value, therefore, no gain or loss was recognized as a result of the transaction. The fair value of assets recognized included $47 million of cash, $67 million of other assets and $48 million of goodwill (net of $6 million settlement of an affiliate's pre-existing obligation).

NOTE 24 – RELATED PARTY TRANSACTIONS

Effective with the Merger, Dow reports transactions with DowDuPont and DuPont and its affiliates as related party transactions.

DowDuPont

The Company has committed to fund a portion of DowDuPont's share repurchases, dividends paid to common stockholders and certain governance expenses. Funding is accomplished through intercompany loans. On a quarterly basis, the Company's Board reviews and determines a dividend distribution to DowDuPont to settle the intercompany loans. The dividend distribution considers the level of the Company’s earnings and cash flows and the outstanding intercompany loan balances. In 2018, the Company declared and paid dividends to DowDuPont of $3,711 million ($1,056 million in 2017). At December 31, 2018, the Company's outstanding intercompany loan balance was insignificant (insignificant at December 31, 2017). In addition, at December 31, 2018, Dow had a receivable related to a tax sharing agreement with DowDuPont of $89 million ($354 million at December 31, 2017), included in "Accounts and notes receivable - Other" in the consolidated balance sheets.

DuPont and its Affiliates

Dow sells to and procures from DuPont and its affiliates certain feedstocks, energy and raw materials that are consumed in each company's manufacturing process. In addition, Dow and DuPont have tolling arrangements and recognize product sales for agriculture products. The following table presents amounts due to or due from DuPont and its affiliates at December 31, 2018:

Balances Due To or Due From DuPont and its Affiliates In millions	Dec 31, 2018	Dec 31, 2017
Accounts and notes receivable - Other	$ 288	$ 26
Accounts payable - Other	$ 201	$ 12

The following table presents revenue earned and expenses incurred related to transactions with DuPont and its affiliates:

Sales to DuPont and its Affiliates In millions	2018
Net sales	$ 320
Cost of sales	$ 219

The Company also transferred certain feedstocks and energy to DuPont at cost which totaled $343 million in 2018 and was reflected in "Cost of sales" in the consolidated statements of income.

Purchases from DuPont and its affiliates were $261 million in 2018 (insignificant for the period September 1, 2017 through December 31, 2017).

NOTE 25 – BUSINESS AND GEOGRAPHIC REGIONS

Effective with the Merger, Dow's business activities are components of its parent company's business operations. Dow's business activities, including the assessment of performance and allocation of resources, ultimately are reviewed and managed by DowDuPont. Information used by the chief operating decision maker of Dow relates to the Company in its entirety. Accordingly, there are no separate reportable business segments for the Company under ASC Topic 280 "Segment Reporting" and the Company's business results are reported in this Form 10-K as a single operating segment. See Note 3 for additional information on the Merger.

Beginning in the third quarter of 2018, Dow realigned the following joint ventures, product lines and principal product groups in preparation for the Intended Business Separations:

- Realignment of the HSC Group joint ventures (DC HSC Holdings LLC and Hemlock Semiconductor L.L.C.) from the Consumer Solutions principal product group to the Electronics & Imaging principal product group.

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- Realignment of certain cellulosics product lines from the Nutrition & Health principal product group to the Consumer Solutions principal product group.
- Certain roofing products were realigned from the Safety & Construction principal product group to Corporate.
- Realignment of the previously divested Epoxy and Chlorinated Organics principal product groups to Corporate.
- The Construction Chemicals principal product group was combined with the Polyurethanes & CAV principal product group.
- Certain product lines associated with the oil and gas industry were realigned from the Industrial Solutions principal product group to the Polyurethanes & CAV principal product group.

These reporting changes were retrospectively applied to all periods presented.

Principal Product Groups

Dow combines science and technology to develop innovative solutions that are essential to human progress. Dow has one of the strongest and broadest toolkits in the industry, with robust technology, asset integration, scale and competitive capabilities that enable it to address complex global issues. Dow’s market-driven, industry-leading portfolio of advanced materials, industrial intermediates and plastics deliver a broad range of differentiated technology-based products and solutions to customers in 175 countries in high-growth markets such as packaging, infrastructure and consumer care. The Company's products are manufactured at 164 sites in 35 countries across the globe. In 2018, Dow had annual sales of approximately $60 billion. The following is a description of the Company’s principal product groups:

Principal Product Groups Aligned with the Materials Science Business

Coatings & Performance Monomers

Coatings & Performance Monomers makes critical ingredients and additives that help advance the performance of paints and coatings. The product grouping offers innovative and sustainable products to accelerate paint and coatings performance across diverse market segments, including architectural paints and coatings, as well as industrial coatings applications used in maintenance and protective industries, wood, metal packaging, traffic markings, thermal paper and leather. These products enhance coatings by improving hiding and coverage characteristics, enhancing durability against nature and the elements, reducing volatile organic compounds (“VOC”) content, reducing maintenance and improving ease of application. Coatings & Performance Monomers also manufactures critical building blocks based on acrylics needed for the production of coatings, textiles, and home and personal care products.

Consumer Solutions

Consumer Solutions uses innovative, versatile silicone-based technology to provide ingredients and solutions to customers in high performance building, consumer goods, elastomeric applications and the pressure sensitive adhesives industry that help them meet modern consumer preferences in attributes such as texture, feel, scent, durability and consistency; provides a wide array of silicone-based products and solutions that enable Dow’s customers to increase the appeal of their products, extend shelf life, improve performance of products under a wider range of conditions and provide a more sustainable offering; provides standalone silicone materials that are used as intermediates in a wide range of applications including adhesion promoters, coupling agents, crosslinking agents, dispersing agents and surface modifiers; and collaborates closely with global and regional brand owners to deliver innovative solutions for creating new and unrivaled consumer benefits and experiences in cleaning, laundry, skin and hair care applications, among others.

Hydrocarbons & Energy

Hydrocarbons & Energy is the largest global producer of ethylene, an internal feedstock, and a leading producer of propylene and aromatics products that are used to manufacture materials that consumers use every day. It also produces and procures the power and feedstocks used by the Company's manufacturing sites.

Industrial Solutions

Industrial Solutions is the world’s largest producer of purified ethylene oxide. It provides a broad portfolio of solutions that address world needs by enabling and improving the manufacture of consumer and industrial goods and services, including products and innovations that minimize friction and heat in mechanical processes, manage the oil and water interface, deliver ingredients for maximum effectiveness, facilitate dissolvability, enable product identification and provide the foundational building blocks for the development of chemical technologies. Industrial Solutions supports manufacturers associated with a large variety of end-markets, notably better crop protection offerings in agriculture, coatings, detergents and cleaners, solvents for electronics processing, inks and textiles.

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Packaging and Specialty Plastics

Packaging and Specialty Plastics serves growing, high-value sectors using world-class technology, broad existing product lines and a rich product pipeline that creates competitive advantages for the entire packaging value chain. Dow is also a leader in polyolefin elastomers and ethylene propylene diene monomer ("EPDM") rubber serving automotive, consumer, wire and cable and construction markets. Market growth is expected to be driven by major shifts in population demographics; improving socioeconomic status in emerging geographies; consumer and brand owner demand for increased functionality; global efforts to reduce food waste; growth in telecommunications networks; global development of electrical transmission and distribution infrastructure; and renewable energy applications.

Polyurethanes & CAV

Polyurethanes & Chlor-Alkali & Vinyl ("CAV") is the world’s largest producer of propylene oxide, propylene glycol and polyether polyols, and a leading producer of aromatic isocyanates and fully formulated polyurethane systems for rigid, semi-rigid and flexible foams, and coatings, adhesives, sealants, elastomers and composites that serve energy efficiency, consumer comfort, industrial and enhanced mobility market sectors. Polyurethanes & CAV provides cost advantaged chlorine and caustic soda supply and markets caustic soda, a valuable co-product of the chlor-alkali manufacturing process, and ethylene dichloride and vinyl chloride monomer. The product grouping also provides cellulose ethers, redispersible latex powders, silicones and acrylic emulsions used as key building blocks for differentiated building and construction materials across many market segments and applications ranging from roofing and flooring to gypsum-, cement-, concrete- or dispersion-based building materials.

Corporate

Corporate includes certain enterprise and governance activities (including insurance operations, environmental operations, etc.); non-business aligned joint ventures; gains and losses on sales of financial assets; non-business aligned litigation expenses; discontinued or non-aligned businesses; and foreign exchange gains (losses).

Principal Product Groups Aligned with the Agriculture Business

Crop Protection

Crop Protection serves the global production agriculture industry with crop protection products for field crops such as wheat, corn, soybean and rice, and specialty crops such as trees, fruits and vegetables. Principal crop protection products are weed control, disease control and insect control offerings for foliar or soil application or as a seed treatment.

Seed

Seed provides seed/plant biotechnology products and technologies to improve the productivity and profitability of its customers. Seed develops, produces and markets canola, cereals, corn, cotton, rice, soybean and sunflower seeds.

Principal Product Groups Aligned with the Specialty Products Business

Electronics & Imaging

Electronics & Imaging is a leading global supplier of differentiated materials and systems for a broad range of consumer electronics including mobile devices, television monitors, personal computers and electronics used in a variety of industries. Dow offers a broad portfolio of semiconductor and advanced packaging materials including chemical mechanical planarization ("CMP") pads and slurries, photoresists and advanced coatings for lithography, metallization solutions for back-end-of-line advanced chip packaging, and silicones for light emitting diode ("LED") packaging and semiconductor applications. This product line also includes innovative metallization processes for metal finishing, decorative and industrial applications and cutting-edge materials for the manufacturing of rigid and flexible displays for liquid crystal displays and quantum dot applications.

Industrial Biosciences
Industrial Biosciences is an innovator that works with customers to improve the performance, productivity and sustainability of their products and processes through advanced microbial control technologies such as advanced diagnostics and biosensors, ozone delivery technology and biological microbial control.

Nutrition & Health
Nutrition & Health uses cellulosics and other technologies to improve the functionality and delivery of food and the safety and performance of pharmaceutical products.

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Safety & Construction
Safety & Construction unites market-driven science with the strength of highly regarded brands such as STYROFOAM™ brand insulation products, GREAT STUFF™ insulating foam sealants and adhesives, and DOW FILMTEC™ reverse osmosis and nanofiltration elements to deliver products to a broad array of markets including industrial, building and construction, consumer and water processing. Safety & Construction is a leader in the construction space, delivering insulation, air sealing and weatherization systems to improve energy efficiency, reduce energy costs and provide more sustainable buildings. Safety & Construction is also a leading provider of purification and separation technologies including reverse osmosis membranes and ion exchange resins to help customers with a broad array of separation and purification needs such as reusing waste water streams and making more potable drinking water.

Transportation & Advanced Polymers
Transportation & Advanced Polymers provides high-performance adhesives, lubricants and fluids to engineers and designers in the transportation, electronics and consumer end-markets. Key products include MOLYKOTE® lubricants, DOW CORNING® silicone solutions for healthcare, MULTIBASE™ TPSiV™ silicones for thermoplastics and BETASEAL™, BETAMATE™ and BETAFORCE™ structural and elastic adhesives.

The following table provides sales to external customers by principal product group:

Sales to External Customers by Principal Product Group

In millions	2018	2017	2016
Coatings & Performance Monomers	$3,987	$3,761	$3,362
Consumer Solutions	5,660	5,067	3,077
Crop Protection	4,666	4,553	4,628
Electronics & Imaging	2,630	2,615	2,307
Hydrocarbons & Energy	7,401	6,831	5,088
Industrial Biosciences	500	484	419
Industrial Solutions	4,736	4,083	3,675
Nutrition & Health	598	563	529
Packaging and Specialty Plastics	15,239	14,110	13,316
Polyurethanes & CAV	10,368	8,548	7,143
Safety & Construction	1,983	1,932	1,877
Seed	1,003	1,393	1,545
Transportation & Advanced Polymers	1,202	1,167	897
Corporate	285	383	281
Other	20	18	14
Total	$60,278	$55,508	$48,158

Sales are attributed to geographic regions based on customer location; long-lived assets are attributed to geographic regions based on asset location. The United States is home to 52 of the Company's 164 manufacturing sites, representing 67 percent of the Company’s long-lived assets value.

Geographic Region Information In millions	United States	EMEA [1]	Rest of World	Total
2018				
Sales to external customers	$20,008	$18,148	$22,122	$60,278
Long-lived assets	$15,782	$2,921	$4,959	$23,662
2017				

Sales to external customers	$19,166	$16,393	$19,949	$55,508
Long-lived assets	$15,715	$2,999	$5,098	$23,812
2016				
Sales to external customers	$16,681	$13,633	$17,844	$48,158
Long-lived assets	$14,812	$2,708	$5,966	$23,486

1. Europe, Middle East and Africa.

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NOTE 26 - SELECTED QUARTERLY FINANCIAL DATA

2018

In millions, except per share amounts (Unaudited)	1st	2nd	3rd	4th	Year
Net sales	$14,899	$15,793	$14,976	$14,610	$60,278
Cost of sales	$11,552	$12,400	$11,933	$11,820	$47,705
Gross margin	$3,347	$3,393	$3,043	$2,790	$12,573
Restructuring, goodwill impairment and asset related charges - net [1]	$165	$98	$108	$249	$620
Integration and separation costs	$202	$231	$278	$333	$1,044
Net income [2]	$1,377	$1,310	$1,036	$910	$4,633
Net income attributable to The Dow Chemical Company	$1,342	$1,279	$1,000	$878	$4,499

1. See Note 7 for additional information.
2. Includes tax adjustments related to The Act, enacted on December 22, 2017. See Note 9 for additional information.

2017

In millions, except per share amounts (Unaudited)	1st	2nd	3rd	4th	Year
Net sales	$13,230	$13,834	$13,633	$14,811	$55,508
Cost of sales [1]	$10,194	$10,761	$10,663	$11,994	$43,612
Gross margin [1]	$3,036	$3,073	$2,970	$2,817	$11,896
Restructuring, goodwill impairment and asset related charges - net [2]	$(1)	$(12)	$139	$2,974	$3,100
Integration and separation costs	$109	$136	$283	$258	$786
Net income (loss) [3]	$915	$1,359	$805	$(2,484)	$595
Net income (loss) attributable to The Dow Chemical Company	$888	$1,321	$783	$(2,526)	$466
Earnings per common share - basic [4]	$0.74	$1.08	N/A	N/A	N/A
Earnings per common share - diluted [4]	$0.72	$1.07	N/A	N/A	N/A
Dividends declared per share of common stock [4, 5]	$0.46	$0.46	$0.46	N/A	$1.38
Market price range of common stock: [4, 6]					
High	$65.00	$65.26	N/A	N/A	N/A
Low	$57.09	$60.20	N/A	N/A	N/A

1. Previously reported amounts have been updated to reflect the impact of adoption of ASU 2017-07.
2. See Note 7 for additional information.
3. See Notes 6, 8, 9, 16 and 19 for additional information on items materially impacting "Net income (loss)." The fourth quarter of 2017 included: tax adjustments related to The Act, enacted on December 22, 2017; a gain related to the DAS Divested Ag Business; and, a charge related to payment of plan obligations to certain participants of a U.S. non-qualified pension plan. The third quarter of 2017 included a gain related to the sale of the Company's EAA Business. The second quarter of 2017 included a gain related to the Nova patent infringement award. The first quarter of 2017 included a loss related to the Bayer CropScience arbitration matter.
4. Effective with the Merger, all issued and outstanding shares of the Company's common stock are owned solely by its parent, DowDuPont Inc.
5. Dow declared its last dividend on common stock in July 2017.
6. Composite price as reported by the New York Stock Exchange.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

Not applicable.

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ITEM 9A. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

As of the end of the period covered by this Annual Report on Form 10-K, the Company carried out an evaluation, under the supervision and with the participation of the Company's Disclosure Committee and the Company's management, including the Chief Executive Officer and the Chief Financial Officer, of the effectiveness of the design and operation of the Company's disclosure controls and procedures pursuant to paragraph (b) of Exchange Act Rules 13a-15 and 15d-15. Based upon that evaluation, the Chief Executive Officer and the Chief Financial Officer concluded that the Company's disclosure controls and procedures were effective.

Changes in Internal Control Over Financial Reporting

There were no changes in the Company's internal control over financial reporting identified in connection with the evaluation required by paragraph (d) of Exchange Act Rules 13a-15 and 15d-15 that was conducted during the last fiscal quarter that have materially affected, or are reasonably likely to materially affect, the Company's internal control over financial reporting.

Management's Report on Internal Control Over Financial Reporting

Management is responsible for establishing and maintaining adequate internal control over financial reporting. The Company's internal control framework and processes are designed to provide reasonable assurance to management and the Board of Directors regarding the reliability of financial reporting and the preparation of the Company's consolidated financial statements in accordance with accounting principles generally accepted in the United States of America.

The Company's internal control over financial reporting includes those policies and procedures that:

- pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the Company;
- provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the Company are being made only in accordance with authorizations of management and Directors of the Company; and
- provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of the Company's assets that could have a material effect on the consolidated financial statements.

Because of its inherent limitations, any system of internal control over financial reporting can provide only reasonable assurance and may not prevent or detect misstatements.

Management assessed the effectiveness of the Company's internal control over financial reporting and concluded that, as of December 31, 2018, such internal control is effective. In making this assessment, management used the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO") in Internal Control—Integrated Framework (2013).

The Company's independent auditors, Deloitte & Touche LLP, with direct access to the Company's Board of Directors through the Dow Audit Subcommittee of the DowDuPont Audit Committee, have audited the consolidated financial statements prepared by the Company. Their report on the consolidated financial statements is included in Part II, Item 8. Financial Statements and Supplementary Data. Deloitte & Touche LLP's report on the Company's internal control over financial reporting is referenced therein and included herein.

February 11, 2019

/s/ JIM FITTERLING
Jim Fitterling
Director and Chief Executive Officer

/s/ HOWARD UNGERLEIDER
Howard Ungerleider
Director, President and Chief Financial Officer

/s/ RONALD C. EDMONDS
Ronald C. Edmonds
Controller and Vice President of Controllers and Tax

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REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Board of Directors of The Dow Chemical Company

Opinion on Internal Control over Financial Reporting

We have audited the internal control over financial reporting of The Dow Chemical Company and subsidiaries (the "Company") as of December 31, 2018, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control - Integrated Framework (2013) issued by COSO.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated financial statements as of and for the year ended December 31, 2018, of the Company and the financial statement schedule listed in the Index at Item 15(a)2 and our report dated February 11, 2019, expressed an unqualified opinion on those financial statements and financial statement schedule and included an explanatory paragraph regarding a) a change in accounting policy in the fourth quarter of 2016 from expensing asbestos-related defense and processing costs as incurred to the accrual of asbestos-related defense and processing costs when probable of occurring and estimable and b) in the first quarter of 2018, a change in its method of accounting for revenue due to the adoption of Accounting Standards Codification Topic 606, Revenue From Contracts with Customers.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Report on Internal Control over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/S/ DELOITTE & TOUCHE LLP

Deloitte & Touche LLP

Midland, Michigan
February 11, 2019

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ITEM 9B. OTHER INFORMATION
None.

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The Dow Chemical Company and Subsidiaries
PART III
ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE
Omitted pursuant to General Instruction I of Form 10-K.

ITEM 11. EXECUTIVE COMPENSATION
Omitted pursuant to General Instruction I of Form 10-K.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS
Omitted pursuant to General Instruction I of Form 10-K.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE
Omitted pursuant to General Instruction I of Form 10-K.

ITEM 14. PRINCIPAL ACCOUNTING FEES AND SERVICES
Independent Registered Public Accountants
Deloitte and Touche LLP (“Deloitte”) has issued its reports, included in the Company’s Annual Report on Form 10-K, on the audited Consolidated Financial Statements of the Company and internal control over financial reporting for the period January 1 through December 31, 2018. The Dow Audit Subcommittee appointed Deloitte to be the independent auditor for the Company and its consolidated subsidiaries for 2018, which was ratified by holders of Dow Common Stock on July 1, 2018. Following the closing of the DowDuPont transaction, the Dow Audit Subcommittee of the DowDuPont Audit Committee, is directly responsible for the appointment, compensation, retention and oversight of the Company’s independent registered public accounting firm.

The Dow Audit Subcommittee carefully considers the qualifications and competence of candidates for the independent registered public accounting firm. In accordance with its pre-approval policies and procedures, the Dow Audit Subcommittee pre-approved all professional services rendered by and associated fees paid to Deloitte, for the Company, for the years ended December 31, 2018 and 2017. Professional services were performed by Deloitte, its member firms of Deloitte Touche Tohmatsu Limited, and their respective affiliates (“Deloitte Entities”). Total fees paid to the Deloitte Entities are shown by category in the following table:

Type of Fees In thousands	2018	2017
Audit Fees [1]	$26,199	$25,792
Audit-Related Fees [2]	6,976	8,062
Tax Fees [3]	600	1,729
Total	$33,775	$35,583

1. The aggregate fees billed for the integrated audit of the Company's annual financial statements and internal control over financial reporting, the reviews of the financial statements in quarterly reports on Form 10-Q, comfort letters, consents, statutory audits, and other regulatory filings.
2. The aggregate fees billed primarily for audits of carve-out financial statements, assessment of controls relating to outsourced services, audits and reviews supporting divestiture activities, and agreed-upon procedures engagements.
3.

The aggregate fees billed primarily for preparation of expatriate employees' tax returns and related compliance services.

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The Dow Chemical Company and Subsidiaries
PART IV

ITEM 15. EXHIBITS, FINANCIAL STATEMENT SCHEDULES

(a) The following documents are filed as part of this report:

(1) The Company's 2018 Consolidated Financial Statements and the Report of Independent Registered Public Accounting Firm are included in Part II, Item 8. Financial Statements and Supplementary Data.

(2) Financial Statement Schedules – The following Financial Statement Schedule should be read in conjunction with the Consolidated Financial Statements and Report of Independent Registered Public Accounting Firm included in Part II, Item 8. Financial Statements and Supplementary Data:

Schedule II Valuation and Qualifying Accounts

Schedules other than the one listed above are omitted due to the absence of conditions under which they are required or because the information called for is included in the Consolidated Financial Statements or the Notes to the Consolidated Financial Statements.

(3) The following exhibits are filed with or incorporated by reference into this Annual Report on Form 10-K:

Exhibit No.	Description of Exhibit
2.1	Shareholders' Agreement, dated as of October 8, 2011, between Dow Saudi Arabia Holding B.V. and Performance Chemicals Holding Company, incorporated by reference to Exhibit 99.1 to The Dow Chemical Company Current Report on Form 8-K/A filed on June 27, 2012.
2.1.1	First Amendment, effective June 1, 2012, to the Shareholders' Agreement, dated as of October 8, 2011, between Performance Chemicals Holding Company, Dow Saudi Arabia Holding B.V., Saudi Arabian Oil Company, Dow Europe Holding B.V. and The Dow Chemical Company, incorporated by reference to Exhibit 99.1 to The Dow Chemical Company Current Report on Form 8-K filed February 14, 2013.
2.2	Transaction Agreement, dated as of December 10, 2015, among The Dow Chemical Company, Corning Incorporated, Dow Corning Corporation and HS Upstate Inc., incorporated by reference to Exhibit 2.1 to The Dow Chemical Company Current Report on Form 8-K filed December 11, 2015.
2.2.1	Tax Matters Agreement, dated as of December 10, 2015, among The Dow Chemical Company, Corning Incorporated, Dow Corning Corporation and HS Upstate Inc., incorporated by reference to Exhibit 2.2 to The Dow Chemical Company Current Report on Form 8-K filed December 11, 2015.
2.3	Agreement and Plan of Merger, dated as of December 11, 2015, among The Dow Chemical Company, E. I. du Pont de Nemours and Company, Diamond Merger Sub, Inc., Orion Merger Sub, Inc. and Diamond-Orion HoldCo Inc., incorporated by reference to Exhibit 2.1 to The Dow Chemical Company Current Report on Form 8-K filed December 11, 2015.
2.3.1	Amendment No. 1 to Agreement and Plan of Merger, dated as of March 31, 2017, among The Dow Chemical Company, E. I. du Pont de Nemours and Company, Diamond Merger Sub, Inc., Orion Merger Sub, Inc. and DowDuPont Inc. f/k/a Diamond-Orion HoldCo Inc., incorporated by reference to Exhibit 2.1 to The Dow Chemical Company Current Report on Form 8-K filed March 31, 2017.

3.1	The Amended and Restated Certificate of Incorporation of The Dow Chemical Company as filed with the Secretary of State, State of Delaware on August 31, 2017, incorporated by reference to Exhibit 3.1 to The Dow Chemical Company Current Report on Form 8-K filed September 1, 2017.
3.2	The Amended and Restated Bylaws of The Dow Chemical Company, incorporated by reference to Exhibit 3.2 to The Dow Chemical Company Current Report on Form 8-K filed September 1, 2017.
4.1	Indenture, dated as of April 1, 1992 (the "1992 Indenture"), between The Dow Chemical Company and the First National Bank of Chicago, as trustee (incorporated by reference to Exhibit 4.1 to The Dow Chemical Company's Registration Statement on Form S-3, File No. 333-88617, filed with the SEC on October 8, 1999 (the "S-3 Registration Statement")).

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4.1.1	Supplemental Indenture, dated as of January 1, 1994, between The Dow Chemical Company and The First National Bank of Chicago, as trustee, to the 1992 Indenture (incorporated by reference to Exhibit 4.2 to the S-3 Registration Statement).
4.1.2	Second Supplemental Indenture, dated as of October 1, 1999, between The Dow Chemical Company and Bank One Trust Company, N.A. (formerly The First National Bank of Chicago), as trustee, to the 1992 Indenture (incorporated by reference to Exhibit 4.3 to the S-3 Registration Statement).
4.1.3	Third Supplemental Indenture, dated as of May 15, 2001, between The Dow Chemical Company and Bank One Trust Company, N.A. (formerly The First National Bank of Chicago), as trustee, to the 1992 Indenture (incorporated by reference to Exhibit 4.4 to The Dow Chemical Company's Registration Statement on Form S-4, File No. 333-67368) filed with the SEC on August 13, 2001).
4.2	Indenture, dated May 1, 2008 (the "2008 Indenture"), between The Dow Chemical Company and The Bank of New York Trust Company, N.A., as trustee, (incorporated by reference to Exhibit 4.1 to Post-Effective Amendment No. 1 to The Dow Chemical Company's Registration Statement on Form S-3, File No. 333-140859, filed with the SEC on May 6, 2008).
4.2.1	First Supplemental Indenture, dated November 30, 2018, between The Dow Chemical Company, Dow Holdings Inc. and The Bank of New York Mellon Trust Company, N.A., as trustee, to the 2008 Indenture (incorporated by reference to Exhibit 4.1 to The Dow Chemical Company's Current Report on Form 8_K, filed with the SEC on December 3, 2018).
4.3	The Dow Chemical Company agrees to provide the SEC, on request, copies of all other such indentures and instruments that define the rights of holders of long-term debt of The Dow Chemical Company and its consolidated subsidiaries, pursuant to Item 601(b)(4)(iii)(A) of Regulation S-K.
10.1	The Dow Chemical Company Executives' Supplemental Retirement Plan - Restricted and Cadre Benefits, as restated and effective September 1, 2017, incorporated by reference to Exhibit 10(a)(iv) to The Dow Chemical Company Current Report on Form 8-K filed November 3, 2017.
10.1.2*	An Amendment to The Dow Chemical Company Executives' Supplemental Retirement Plan - Restricted and Cadre Benefits, effective January 1, 2018.
10.2	The Dow Chemical Company Executives' Supplemental Retirement Plan - Supplemental Benefits, as restated and effective September 1, 2017, incorporated by reference to Exhibit 10(a)(v) to The Dow Chemical Company Current Report on Form 8-K filed November 3, 2017.
10.3	The Dow Chemical Company 1994 Executive Performance Plan, as amended and restated on December 10, 2008, effective as of January 1, 2009, incorporated by reference to Exhibit 10(h) to The Dow Chemical Company Annual Report on Form 10-K for the year ended December 31, 2008.
10.4	The template used for The Dow Chemical Company Key Employee Insurance Program (“KEIP”), incorporated by reference to Exhibit 10(o) to The Dow Chemical Company Annual Report on Form 10-K for the year ended December 31, 2002.
10.5	The Dow Chemical Company Elective Deferral Plan (for deferrals made through December 31, 2004), as amended, restated and effective as of April 14, 2010, incorporated by reference to Exhibit 10.2 to The Dow

	Chemical Company Current Report on Form 8-K filed May 3, 2010.
10.5.1	An Amendment to The Dow Chemical Company Elective Deferral Plan (for deferrals made through December 31, 2004), effective as of April 14, 2010, incorporated by reference to Exhibit 10.5 to The Dow Chemical Company Current Report on Form 8-K filed May 3, 2010.
10.6	The Dow Chemical Company Elective Deferral Plan (for deferrals after January 1, 2005), restated and effective September 1, 2017, incorporated by reference to Exhibit 4.1 to The Dow Chemical Company Registration Statement on Form S-8 filed September 5, 2017.
10.6.1*	An Amendment to The Dow Chemical Company Elective Deferral Plan (for deferrals after January 1, 2005), effective November 15, 2018.

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10.7	The Dow Chemical Company Voluntary Deferred Compensation Plan for Non-Employee Directors, as amended and restated on December 10, 2008, effective as of January 1, 2009, incorporated by reference to Exhibit 10(cc) to The Dow Chemical Company Annual Report on Form 10-K for the year ended December 31, 2008.
10.8	Employment agreement dated February 14, 2006, between Heinz Haller and The Dow Chemical Company, incorporated by reference to Exhibit 10(ii) to The Dow Chemical Company Annual Report on Form 10-K for the year ended December 31, 2008.
10.9	Change in Control Executive Severance Agreement - Tier 1, incorporated by reference to Exhibit 10(jj) to The Dow Chemical Company Annual Report on Form 10-K for the year ended December 31, 2007.
10.10	Change in Control Executive Severance Agreement - Tier 2, incorporated by reference to Exhibit 10(kk) to The Dow Chemical Company Annual Report on Form 10-K for the year ended December 31, 2007.
21*	Subsidiaries of The Dow Chemical Company.
23.1*	Consent of Independent Registered Public Accounting Firm.
23.2*	Ankura Consulting Group, LLC's Consent.
31.1*	Certification Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2*	Certification Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1*	Certification Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
32.2*	Certification Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
99.1	Guarantee relating to the 9.80% Debentures of Rohm and Haas Company, (incorporated by reference to Exhibit 99.6 to The Dow Chemical Company's Current Report on Form 8-K, filed with the SEC on April 1, 2009).
101.INS	XBRL Instance Document.
101.SCH	XBRL Taxonomy Extension Schema Document.
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document.
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document.
101.LAB	XBRL Taxonomy Extension Label Linkbase Document.
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document.

*Filed herewith

A copy of any exhibit can be obtained via the Internet through the Dow SEC Filings section of the DowDuPont website (www.dow-dupont.com/investors), or the Company will provide a copy of any exhibit upon receipt of a

written request for the particular exhibit or exhibits desired. All requests should be addressed to the Controller and Vice President of Controllers and Tax of the Company at the address of the Company's principal executive offices. The referenced website and its content are not deemed incorporated by reference into this report.

ITEM 16. FORM 10-K SUMMARY

Not applicable.

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The Dow Chemical Company and Subsidiaries Schedule II
Valuation and Qualifying Accounts

(In millions) For the years ended Dec 31,	2018	2017	2016
Accounts Receivable - Allowance for Doubtful Receivables			
Balance at beginning of year	$117	$110	$94
Additions charged to expenses	23	33	31
Additions charged to other accounts [1]	4	3	—
Deductions from reserves [2]	(38)	(29)	(15)
Balance at end of year	$106	$117	$110
Inventory - Obsolescence Reserve			
Balance at beginning of year	$115	$123	$152
Additions charged to expenses	87	40	29
Deductions from reserves [3]	(55)	(48)	(58)
Balance at end of year	$147	$115	$123
Reserves for Other Investments and Noncurrent Receivables			
Balance at beginning of year	$437	$358	$494
Additions charged to expenses [4]	44	83	153
Deductions from reserves [5]	(16)	(4)	(289)
Balance at end of year	$465	$437	$358
Deferred Tax Assets - Valuation Allowance			
Balance at beginning of year	$1,371	$1,061	$1,000
Additions charged to expenses	161	370	155
Deductions from reserves	(212)	(60)	(94)
Balance at end of year	$1,320	$1,371	$1,061

1. Additions to allowance for doubtful accounts charged to other accounts were classified as "Accounts and notes receivable - Other" in the consolidated balance sheets. These reserves relate to the Company's sale of trade accounts receivable. Anticipated credit losses in the portfolio of receivables sold were used to fair value the Company's interests held in trade accounts receivable conduits. See Notes 14 and 22 to the Consolidated Financial Statements for further information.
2. Deductions include write-offs, recoveries, currency translation adjustment and other miscellaneous items.
3. Deductions include disposals and currency translation adjustments.
4. In 2016, additions to reserves for "Other investments and noncurrent receivables" charged to costs and expenses include $143 million related to the Company's investment in AgroFresh Solutions, Inc. See Note 7 to the Consolidated Financial Statements for further information.
5. In 2016, deductions from reserves for "Other investments and noncurrent receivables" include $237 million related to the Dow Silicones ownership restructure. See Note 5 to the Consolidated Financial Statements for further information on the Dow Silicones ownership restructure.

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The Dow Chemical Company and Subsidiaries
Signatures

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

THE DOW CHEMICAL COMPANY

By /s/ RONALD C. EDMONDS
Ronald C. Edmonds, Controller and Vice President of Controllers and Tax
Date February 11, 2019

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

By /s/ RONALD C. EDMONDS
Ronald C. Edmonds, Controller and Vice President of Controllers and Tax
Date February 11, 2019

By /s/ JIM FITTERLING
Jim Fitterling, Director and Chief Executive Officer
Date February 11, 2019

By /s/ HOWARD UNGERLEIDER
Howard Ungerleider, Director, President and Chief Financial Officer
Date February 11, 2019

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The Dow Chemical Company and Subsidiaries
Trademark Listing

The following trademarks or service marks of The Dow Chemical Company and certain affiliated companies of Dow appear in this report: AFFINITY, BETAFORCE, BETAMATE, BETASEAL, DOW, DOW CORNING, ELITE, FILMTEC, GREAT STUFF, MOLYKOTE, MULTIBASE, NORDEL, STYROFOAM, TPSiV

The following trademarks or service marks of Dow AgroSciences LLC and certain affiliated companies of Dow AgroSciences LLC appear in this report: DOW SEMENTES, ENLIST, MORGAN

The following registered service mark of American Chemistry Council appears in this report: RESPONSIBLE CARE

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