2021

Annual Report

2021 Overview

Financial Performance

- **$917 Million***
  Net Earnings Attributable to Common Stockholders
- **$2.87 Billion+**
  Net Cash from Operations
- **$2.17 Billion+**
  Free Cash Flow(2)
- **$2.17 Billion****
  EBITDA(1)
- **$2.74 Billion**
  Adjusted EBITDA(1)

* Includes the impact of after-tax non-cash impairment charges of $463 million related to the Company's U.K. operations

** Includes the impact of pre-tax non-cash impairment charges of $521 million related to the Company's U.K. operations

\+ Company record

Operational Performance

- **9.3 Million Tons**
  Gross Ammonia Production
- **18.5 Million Tons**
  Sales Volume
- **0.32**
  Year-end recordable incident rate per 200,000 work hours

ABOUT CF INDUSTRIES

At CF Industries, our mission is to provide clean energy to feed and fuel the world sustainably. With our employees focused on safe and reliable operations, environmental stewardship, and disciplined capital and corporate management, we are on a path to decarbonize our ammonia production network – the world's largest – to enable green and blue hydrogen and nitrogen products for energy, fertilizer, emissions abatement and other industrial activities. Our nine manufacturing complexes in the United States, Canada, and the United Kingdom, an unparalleled storage, transportation and distribution network in North America, and logistics capabilities enabling a global reach underpin our strategy to leverage our unique capabilities to accelerate the world's transition to clean energy. CF Industries routinely posts investor announcements and additional information on the Company's website at **www.cfindustries.com** and encourages those interested in the Company to check there frequently.

(1) EBITDA is defined as net earnings attributable to common stockholders plus interest expense—net, income taxes and depreciation and amortization. See reconciliations of EBITDA and adjusted EBITDA to the most directly comparable GAAP measures in the tables on page 8.

(2) Free cash flow is defined as net cash from operating activities less capital expenditures and distributions to noncontrolling interest. See reconciliation of free cash flow to the most directly comparable GAAP measure in the table on page 8.

Letter to Shareholders

FELLOW CF INDUSTRIES SHAREHOLDERS:

In 2021, the CF Industries team delivered outstanding results, including terrific safety performance and record free cash generation.

Global nitrogen demand throughout 2021 was robust, underpinned by the need to replenish global grains stocks and the strong economic recovery following the pandemic. Low global coarse grains stocks-to-use ratios support high crop prices and farm incomes. High crop prices lead to high demand for nitrogen fertilizer as farmers are incentivized to maximize yields. Additionally, increased economic activity drove strong industrial demand for ammonia, urea, nitric acid and diesel exhaust fluid.

Against this backdrop of strong demand were a set of factors that negatively affected global supply in 2021. Maintenance activities that were delayed from the previous year due to the COVID-19 pandemic took a considerable amount of production out of the global supply in 2021. Two significant weather events in North America (Winter Storm Uri and Hurricane Ida) further reduced production. Natural gas prices in Europe and Asia averaged approximately $30 per MMBtu from September to the end of the year, causing plants to curtail or shut down in those regions. Adding to these pressures, several important nitrogen-producing countries enacted nitrogen export limitations or bans in an effort to ensure fertilizer availability and affordability in their home markets, including China, Russia, Egypt, and Turkey.

The result was significantly constrained supply at the exact time demand was surging, which led to the predictable outcome of rapidly increasing nitrogen prices. This period saw energy spread differentials between low-cost North America and high-cost Europe and Asia that exceeded $20 per MMBtu for most of the fourth quarter. Global nitrogen prices rose to match production costs in those high-cost regions as the world demand required those plants to operate. This provided the backdrop for CF Industries to achieve high margins for our products.

For 2021, the Company reported net earnings attributable to common stockholders of $917 million, or $4.24 per diluted share, and EBITDA was approximately $2.2 billion. Net earnings and EBITDA reflect pre-tax non-cash impairment charges of $521 million related to our U.K. operations. Adjusted EBITDA was just over $2.7 billion. Net cash from operations was approximately $2.9 billion and free cash flow was nearly $2.2 billion, both Company records. Our operating cash flow to net earnings conversion rate was approximately 300% and our free cash flow to adjusted EBITDA conversion rate was approximately 80 percent[1].

(1) Operating cash flow to net earnings conversion rate is defined as net cash from operating activities divided by net earnings attributable to common stockholders. Free cash flow to adjusted EBITDA conversion rate is defined as free cash flow divided by adjusted EBITDA. See reconciliation of free cash flow to adjusted EBITDA conversion rate to the most directly comparable GAAP measure in the tables on page 8.

I WANT TO SHARE SOME OF THE OTHER HIGHLIGHTS FROM 2021:

- First and foremost, **we operated safely.** Our full year recordable incident rate was 0.32 incidents per 200,000 work hours, which is significantly better than industry averages. This was especially impressive as we had our highest level ever of maintenance activities during the year, including seven ammonia plant turnarounds.
- **We returned $800 million in capital to shareholders** through share repurchases and dividends.
- **We repaid $500 million in long-term debt** during the year while adding nearly $1 billion of cash to our balance sheet.
- **The strength of our balance sheet and business model was recognized** with upgrades to investment grade credit ratings from S&P Global Ratings and Fitch Ratings. We remain committed to further reducing gross debt by an additional $500 million.
- **We made substantial progress on our clean energy initiatives.** We started construction on North America's first carbon-free green ammonia production capacity and announced two projects that, when complete, will enable the production of almost 2 million tons of low carbon or "blue" ammonia (which is equivalent to 1.25 million tons of net-zero carbon ammonia) – ammonia produced conventionally with the CO_2 byproduct captured and geologically sequestered.

We overcame some challenges in 2021. The Company navigated two severe weather events in North America that disrupted production across the industry. Our team's ability to restart our plants safely and more quickly than our peers speaks to the skill of our people and the strength of our manufacturing network.

We made the difficult but necessary decision to temporarily shut down our ammonia plants in the United Kingdom in September due to high natural gas prices that made ammonia production unprofitable. We were able to restart one plant shortly thereafter supported by restructured CO_2 supply contracts. CO_2 is used in a number of applications in the U.K. including food and beverage, nuclear power, and hospitals. We continue to evaluate the situation in the U.K. and are working through numerous scenarios to develop a longer-term solution.

All things considered, 2021 was an outstanding year as we delivered a one-year total shareholder return of 87%, which was well above our fertilizer peer group index. We have outperformed our peer group index in total shareholder return over 3-, 5-, 7- and 10-year time frames. We also outperformed the S&P 500 on a 1-, 3- and 5-year basis and are comparable over 10 years.

OUR BUSINESS

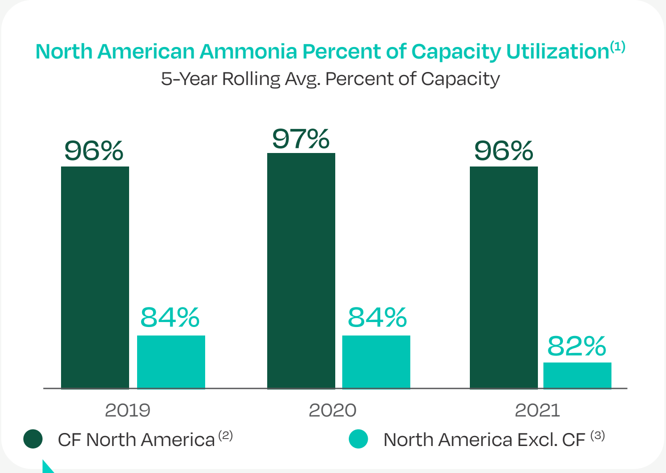
We believe our sustained record of total shareholder return outperformance over various time periods is a direct reflection of our ability to generate superior cash flow through the commodity cycle coupled with our disciplined approach to capital allocation.

At our core, CF Industries is a producer of ammonia. For decades, we have used the Haber-Bosch process to fix atmospheric nitrogen with hydrogen from natural gas to produce anhydrous ammonia, whose chemical composition is NH_3. We have made a business of selling ammonia and other ammonia-derivative fertilizer products such as urea and urea ammonium nitrate (UAN) for the energy that nitrogen fertilizer provides to increase crop yields.

Humankind's ability to produce nitrogen fertilizer has had an undeniably positive effect on the world. Along with advancements in seed technology and farming practices, the use of nitrogen fertilizer and other nutrients dramatically increased food production in the second half of the 1900s and lifted countless people out of hunger. At the same time, fertilizer allows more food to be grown on fewer acres. This reduces the amount of land cleared for agriculture, preserving carbon sequestering forests and important wildlife ecosystems.

Ammonia and its derivative fertilizer products are global commodities. As such, our focus is achieving the lowest delivered cost per ton. At CF Industries, we do this by leveraging our unique capabilities: outstanding operational capability and an efficient, high performing corporate team. In practice, this means high asset utilization and productivity, an extensive multimode distribution network to lower logistics costs, maximizing margins by optimizing customer locations and product type, and a focus on cost management.

With this focus, we have built what we believe are the most productive ammonia and nitrogen assets in the world. We invest in these productive assets to increase their safety and reliability and enhance their cash generation capability. Data collected by CRU, a global industry consulting firm, shows that our asset utilization over the last five years is approximately 14% higher than the average utilization rate of our North American competitors. Based on the size of our network, this translates into roughly 1.3 million tons of incremental gross ammonia per year that we are able to produce within our network as a result of our superior asset utilization. This incremental ammonia production volume is roughly equivalent to the ammonia we produce at our Medicine Hat or Port Neal complexes, which are the largest in North America after our Donaldsonville Complex. Put another way, our operational capabilities lead to capital and operational efficiency, saving our shareholders billions of dollars of capital and the accompanying annual overhead costs while allowing us to produce meaningfully greater volumes of ammonia with the same assets.



CF's **14% greater capacity utilization** yields an additional **~1.3 million tons of ammonia** annually[4]

(1) Data taken from the December 17, 2021 CRU Ammonia Database.
(2) Represents CF Industries historical North American production and CRU's capacity estimates for CF Industries.
(3) Calculated by removing CF Industries' annual reported production and capacity from the CRU data for all North American ammonia production peer group.
(4) ~1.3 million tons represents the difference between CF Industries' actual trailing 5-year average ammonia production of 9.2 million tons at 96% of capacity utilization and the 7.9 million tons CF Industries would have produced if operated at the 82% CRU North American benchmark excluding CF Industries.

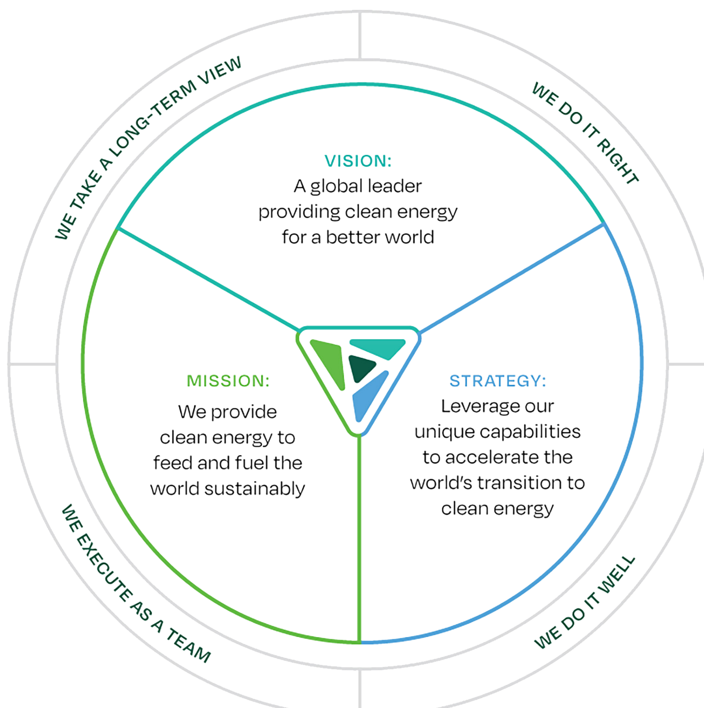
OUR BUSINESS IN A DECARBONIZING ECONOMY

The clear benefits of ammonia and its derivative nitrogen fertilizers in providing energy to crops to increase their yield come with a trade-off. While our manufacturing plants are among the most efficient in the global industry, particularly compared to facilities that use coal as a feedstock, the ammonia production process is nevertheless energy-intensive and therefore results in significant carbon emissions.

On a positive note, several other energy-intensive industries facing the same concerns about their carbon emissions have identified ammonia as a potential source of clean energy that could help them reduce their carbon footprint. This is due to ammonia's hydrogen component, which is widely viewed as a scalable source of clean energy. Ammonia can be a clean fuel itself as it does not release any carbon when used as an energy source. Ammonia also could serve as a medium to store and transport hydrogen. In essence, these industries are evaluating exploiting ammonia for the hydrogen value of the molecule – a value that is enhanced if the ammonia production process is decarbonized.

Our need to reduce our own carbon footprint and the ability to help others decarbonize the global economy intersect. As a result, our strategy is to leverage our unique capabilities to decarbonize our ammonia production network while helping to accelerate the world's transition to clean energy.

This approach builds on our existing business and core assets. We will still provide energy to agriculture end-users in the form of ammonia and derivative nitrogen fertilizers. But we are also pursuing growth opportunities available from providing clean energy in the form of decarbonized ammonia for use in a variety of applications.



CREATING LONG-TERM SHAREHOLDER VALUE

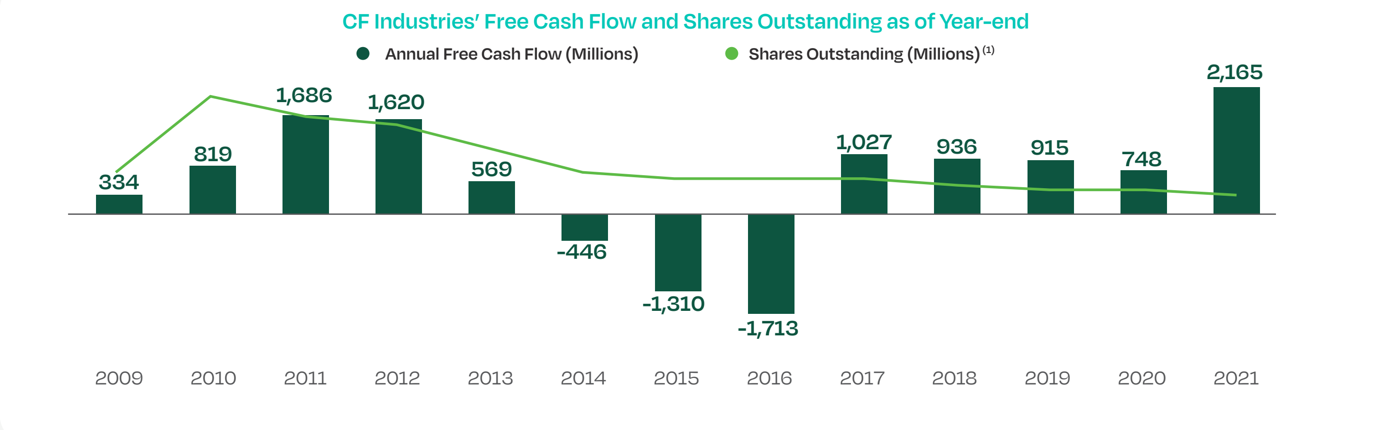
We believe that executing our strategy will enable CF Industries to continue to generate superior cash flow through the cycle while providing exciting growth opportunities.

We expect considerable demand growth to emerge in the years ahead as the global market for low carbon blue ammonia develops. We also expect widespread demand for green ammonia to follow as technology improvements reduce its production cost. Given the expected demand growth for blue and green ammonia, we evaluate opportunities to continue to grow our ammonia production platform, both organically and inorganically, so long as risk-adjusted returns exceed our cost of capital.

Given our strong cash generation, and relatively modest capital requirements, we expect to return substantial capital to shareholders through share repurchases and dividends. We continue to view share repurchases as an important tool for return-of and return-on capital. To that end, we announced a new $1.5 billion dollar share repurchase program which began in January 2022, and since 2010, we have reduced our outstanding share count by about 40 percent.

Investing in the business to grow cash generation, while at the same time reducing the outstanding share count, has had a dramatic impact for our shareholders. Since the start of 2010, shareholder participation in our cash generation capacity per share has doubled as shown on the chart below.

By Using Free Cash Flow to Grow Capacity and Repurchase Shares, Shareholders Accrued More of the Asset Base, Resulting in 2X Free Cash Flow Participation Since 2011



Non-GAAP reconciliation: Cash from Operations to Free Cash Flow (Millions)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Cash from Operations	$682	1,194	2,079	2,376	1,467	1,409	1,204	617	1,631	1,497	1,505	1,231	2,873
Capital expenditures	(236)	(258)	(247)	(524)	(824)	(1,809)	(2,469)	(2,211)	(473)	(422)	(404)	(309)	(514)
Distributions to non-controlling interests	(112)	(117)	(146)	(232)	(74)	(46)	(45)	(119)	(131)	(139)	(186)	(174)	(194)
Free Cash Flow	$334	819	1,686	1,620	569	(446)	(1,310)	(1,713)	1,027	936	915	748	2,165
End of year shares outstanding[1]	243	356	327	315	279	242	233	233	233	223	216	214	208

(1) Share count based on end of year common shares outstanding; share count prior to 2015 based on 5-for-1 split-adjusted shares.

CREATING VALUE FOR ALL STAKEHOLDERS

Our clean energy growth strategy and strong financial performance provide us a platform from which we believe we can have a positive impact across the many issues important to our broad group of stakeholders.

We established comprehensive ESG goals that are the foundation of our efforts. These include a dramatic reduction in carbon emissions across our global network with a commitment to achieve net-zero carbon emissions by 2050, and an intermediate goal of a 25% reduction in emissions intensity by 2030. This past year, we added a new goal to reduce our Scope 3 greenhouse gas emissions by 10% by 2030, and for the first time we calculated and published our Scope 3 emissions. We also have set specific goals related to inclusion, diversity and equity, community involvement and nutrient stewardship.

In 2021, we exceeded our expectations on certain goals, such as identifying decarbonization projects, increasing representation of females and persons of color in senior leadership roles, and nutrient stewardship. We also continue to focus, and make progress, on our other goals. We communicate our performance in these areas and others through our annual ESG and sustainability reporting, which are now available at sustainability.cfindustries.com. There, you can also access our submissions under the Global Reporting Initiative (GRI), Sustainability Accounting Standards Board (SASB) framework and the Task Force on Climate-related Financial Disclosures (TCFD).

A STRONG FUTURE AHEAD

We are very proud of our performance in 2021. When our financial results are viewed in the context of our shrinking share count, 2021 was the strongest year in our company's history.

We believe 2022 is poised to follow suit. We expect industry fundamentals to support a tight global nitrogen supply and demand balance and an extended period of positive operating conditions for low-cost producers like CF Industries. Longer-term, we are uniquely positioned to be at the forefront of decarbonizing the global economy and capturing new opportunities that develop for blue and green ammonia.

Thank you for your confidence in CF Industries. We look forward to working with you and earning your continued support in the years ahead.

Tony Will

Tony Will
President and Chief Executive Officer

Board of Directors

Javed Ahmed
Retired Chief Executive Officer
Tate & Lyle PLC

Robert C. Arzbaecher
Retired Chairman, President and
Chief Executive Offcer
Actuant Corporation

Deborah L. DeHaas
Retired Vice Chairman and the
Managing Partner of the Center for
Board Effectiveness
Deloitte

John W. Eaves
Executive Chairman
Arch Resources, Inc.

Stephen A. Furbacher*
Retired President and Chief
Operating Officer
Dynegy, Inc.

Stephen J. Hagge
Chairman of the Board
CF Industries Holdings, Inc.
Retired President and
Chief Executive Officer
Aptar Group, Inc.

Jesus Madrazo
Founder and Chairman
Kompali Farms

Anne P. Noonan
President and Chief Executive Officer
Summit Materials

Michael J. Toelle
Owner
T&T Farms

Theresa E. Wagler
Executive Vice President and Chief
Financial Officer
Steel Dynamics, Inc.

Celso L. White
Former Global Supply Chain Officer
Molson Coors Brewing Company

W. Anthony Will
President and Chief Executive Officer
CF Industries Holdings, Inc.

*Stephen A. Furbacher is retiring from the Board of Directors in 2022

Senior Management

Douglas C. Barnard
Senior Vice President,
General Counsel and Secretary

Christopher D. Bohn
Senior Vice President and
Chief Financial Officer

Linda M. Dempsey
Vice President,
Public Affairs

Bert A. Frost
Senior Vice President, Sales, Market
Development and Supply Chain

Ashraf K. Malik
Senior Vice President,
Manufacturing and Distribution

Susan L. Menzel
Senior Vice President,
Human Resources

W. Anthony Will
President and Chief Executive Officer

RECONCILIATION OF NON-GAAP FINANCIAL MEASURES

The Company reports its financial results in accordance with U.S. generally accepted accounting principles (GAAP). Management believes that EBITDA, adjusted EBITDA, free cash flow and free cash flow to adjusted EBIDTA conversion, which are non-GAAP financial measures, provide additional meaningful information regarding the Company's performance and financial strength. Non-GAAP financial measures should be viewed in addition to, and not as an alternative for, the Company's reported results prepared in accordance with GAAP. In addition, because not all companies use identical calculations, EBITDA, adjusted EBITDA, free cash flow and free cash flow to adjusted EBITDA conversion, included in this annual report may not be comparable to similarly titled measures of other companies. Reconciliations of EBITDA, adjusted EBITDA, free cash flow, and free cash flow to adjusted EBIDTA conversion to the most directly comparable GAAP measures are provided below.

EBITDA is defined as net earnings attributable to common stockholders plus interest expense — net, income taxes and depreciation and amortization. Other adjustments include the elimination of loan fee amortization that is included in both interest and amortization, and the portion of depreciation that is included in noncontrolling interest.

The Company has presented EBITDA because management uses the measure to track performance and believes that it is frequently used by securities analysts, investors and other interested parties in the evaluation of companies in the industry.

Adjusted EBITDA is defined as EBITDA adjusted with the selected items included in EBITDA as summarized in the table below. The Company has presented adjusted EBITDA because management uses adjusted EBITDA, and believes it is useful to investors, as a supplemental financial measure in the comparison of year-over-year performance. Free cash flow is defined as net cash provided by operating activities, as stated in the consolidated statements of cash flows, reduced by capital expenditures and distributions to noncontrolling interest.

Free cash flow to adjusted EBITDA conversion is defined as free cash flow divided by adjusted EBITDA. The Company has presented free cash flow and free cash flow to adjusted EBITDA conversion, because management uses these measures and believes they are useful to investors, as indications of the strength of the Company and its ability to generate cash and to evaluate the Company's cash generation ability relative to its industry competitors. It should not be inferred that the entire free cash flow amount is available for discretionary expenditures.

Reconciliation of net earnings attributable to common stockholders (GAAP measure) to EBITDA and adjusted EBITDA (Non-GAAP measures):

	Year ended December 31, 2021	2020
	IN MILLIONS	
Net earnings	$ 1,260	$ 432
Less: Net earnings attributable to noncontrolling interest	(343)	(115)
Net earnings attributable to common stockholders	917	317
Interest expense—net	183	161
Income tax provision	283	31
Depreciation and amortization	888	892
Less other adjustments:		
Depreciation and amortization in noncontrolling interest	(95)	(80)
Loan fee amortization(1)	(4)	(5)
EBITDA	2,172	1,316
Unrealized net mark-to-market loss (gain) on natural gas derivatives	25	(6)
COVID impact: Special COVID-19 bonus for operational workforce	—	19
COVID impact: Turnaround deferral(2)	—	7
Loss on foreign currency transactions, including intercompany loans	6	5
Asset impairments	521	—
Engineering cost write-off(3)	—	9
Loss on sale of surplus land	—	2
Property insurance proceeds	—	(2)
Loss on debt extinguishment	19	—
Total adjustments	571	34
Adjusted EBITDA	**$ 2,743**	**$ 1,350**

Reconciliation of net cash provided by operating activities (GAAP measure) to free cash flow (non-GAAP measure):

	Year ended December 31, 2021	2020
	IN MILLIONS	
Net cash provided by operating activities	$ 2,873	$ 1,231
Capital expenditures	(514)	(309)
Distributions to noncontrolling interest	(194)	(174)
Free cash flow	**$ 2,165**	**$ 748**
Adjusted EBITDA	$ 2,743	$ 1,350
Free cash flow to adjusted EBITDA conversion rate(4)	79%	55%

	Year ended December 31, 2021	2020
	IN MILLIONS	
Net cash from operating activities	$ 2,873	$ 1,231
Net earnings attributable to common stockholders	$ 917	$ 317
Operating cash flow to net earnings conversion rate(5)	**313%**	**388%**

(1) Loan fee amortization is included in both interest expense—net and depreciation and amortization.
(2) Represents expense incurred due to the deferral of certain plant turnaround activities as a result of the COVID-19 pandemic.
(3) Represents costs written off upon the cancellation of a project at one of our nitrogen complexes.
(4) Represents free cash flow divided by adjusted EBITDA.
(5) Represents net cash from operating activities divided by net earnings attributable to common stockholders.

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, DC 20549

FORM 10-K

(Mark One)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2021

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 001-32597

CF INDUSTRIES HOLDINGS, INC.

(Exact name of registrant as specified in its charter)

Delaware	**20-2697511**
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)
4 Parkway North, Suite 400	**60015**
Deerfield, Illinois	(Zip Code)
(Address of principal executive offices)	

(847) 405-2400

(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading symbol(s)	Name of each exchange on which registered
common stock, par value $0.01 per share	CF	New York Stock Exchange

Securities registered pursuant to section 12(g) 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 ☒ 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 ☐ 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. 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 such files). Yes ☒ No ☐

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	☐	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 has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒

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

The aggregate market value of the registrant's common stock held by non-affiliates as of June 30, 2021 (the last business day of the registrant's most recently completed second fiscal quarter), computed by reference to the closing sale price of the registrant's common stock, was $11,001,041,821.

207,304,882 shares of the registrant's common stock, par value $0.01 per share, were outstanding as of January 31, 2022.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant’s definitive proxy statement for its 2022 annual meeting of stockholders (Proxy Statement) are incorporated by reference into Part III of this Annual Report on Form 10-K. The Proxy Statement will be filed with the Securities and Exchange Commission, pursuant to Regulation 14A, not later than 120 days after the end of the 2021 fiscal year, or, if the registrant does not file the Proxy Statement within such 120-day period, the registrant will amend this Annual Report on Form 10-K to include the information required under Part III hereof not later than the end of such 120-day period.

CF INDUSTRIES HOLDINGS, INC.

TABLE OF CONTENTS

PART I

ITEM 1. BUSINESS.

Our Company

All references to "CF Holdings," "we," "us," "our" and "the Company," refer to CF Industries Holdings, Inc. and its subsidiaries, except where the context makes clear that the reference is only to CF Industries Holdings, Inc. itself and not its subsidiaries. All references to "CF Industries" refer to CF Industries, Inc., a 100% owned subsidiary of CF Industries Holdings, Inc. References to tons refer to short tons and references to tonnes refer to metric tons. Notes referenced throughout this document refer to consolidated financial statement note disclosures that are found in Item 8. Financial Statements and Supplementary Data—Notes to Consolidated Financial Statements.

Our mission is to provide clean energy to feed and fuel the world sustainably. With our employees focused on safe and reliable operations, environmental stewardship, and disciplined capital and corporate management, we are on a path to decarbonize our ammonia production network – the world's largest – to enable green and blue hydrogen and nitrogen products for energy, fertilizer, emissions abatement and other industrial activities. Our nine manufacturing complexes in the United States, Canada and the United Kingdom, an extensive storage, transportation and distribution network in North America, and logistics capabilities enabling a global reach underpin our strategy to leverage our unique capabilities to accelerate the world's transition to clean energy. Our principal customers are cooperatives, independent fertilizer distributors, traders, wholesalers and industrial users. Our core product is anhydrous ammonia (ammonia), which contains 82% nitrogen and 18% hydrogen. Our nitrogen products that are upgraded from ammonia are granular urea, urea ammonium nitrate solution (UAN) and ammonium nitrate (AN). Our other nitrogen products include diesel exhaust fluid (DEF), urea liquor, nitric acid and aqua ammonia, which are sold primarily to our industrial customers, and compound fertilizer products (NPKs), which are solid granular fertilizer products for which the nutrient content is a combination of nitrogen, phosphorus and potassium.

Our principal assets as of December 31, 2021 include:

- five U.S. nitrogen manufacturing facilities, located in Donaldsonville, Louisiana (the largest nitrogen complex in the world); Port Neal, Iowa; Yazoo City, Mississippi; Verdigris, Oklahoma; and Woodward, Oklahoma. These facilities are wholly owned directly or indirectly by CF Industries Nitrogen, LLC (CFN), of which we own approximately 89% and CHS Inc. (CHS) owns the remainder;
- two Canadian nitrogen manufacturing facilities, located in Medicine Hat, Alberta (the largest nitrogen complex in Canada) and Courtright, Ontario;
- two United Kingdom nitrogen manufacturing facilities, located in Billingham and Ince;
- an extensive system of terminals and associated transportation equipment located primarily in the Midwestern United States; and
- a 50% interest in Point Lisas Nitrogen Limited (PLNL), an ammonia production joint venture located in the Republic of Trinidad and Tobago that we account for under the equity method.

We have a strategic venture with CHS under which CHS owns an equity interest in CFN, a subsidiary of CF Holdings, which represents approximately 11% of the membership interests of CFN. We own the remaining membership interests. CHS also receives deliveries pursuant to a supply agreement under which CHS has the right to purchase annually from CFN up to approximately 1.1 million tons of granular urea and 580,000 tons of UAN at market prices. As a result of its minority equity interest in CFN, CHS is entitled to semi-annual cash distributions from CFN. We are also entitled to semi-annual cash distributions from CFN. See Note 18—Noncontrolling Interest for additional information on our strategic venture with CHS.

For the years ended December 31, 2021, 2020 and 2019, we sold 18.5 million, 20.3 million and 19.5 million product tons generating net sales of $6.54 billion, $4.12 billion and $4.59 billion, respectively.

Our principal executive offices are located outside of Chicago, Illinois, at 4 Parkway North, Suite 400, Deerfield, Illinois 60015, and our telephone number is 847-405-2400. Our Internet website address is *www.cfindustries.com.* Information made available on our website does not constitute part of this Annual Report on Form 10-K.

We make available free of charge on or through our Internet website, *www.cfindustries.com*, all of our reports on Forms 10-K, 10-Q and 8-K and all amendments to those reports as soon as reasonably practicable after such material is filed electronically with, or furnished to, the Securities and Exchange Commission (SEC). Copies of our Corporate Governance Guidelines, Code of Corporate Conduct and charters for the Audit Committee, Compensation and Management Development

Committee, Corporate Governance and Nominating Committee, and Environmental Sustainability and Community Committee of our Board of Directors (the Board) are also available on our Internet website. We will provide electronic or paper copies of these documents free of charge upon request. The SEC also maintains a website at *www.sec.gov* that contains reports, proxy and information statements and other information regarding issuers that file electronically with the SEC.

Our Commitment to a Clean Energy Economy

We are taking significant steps to support a global hydrogen and clean fuel economy, through the production of green and blue ammonia. Since ammonia is one of the most efficient ways to transport and store hydrogen and is also a fuel in its own right, we believe that the Company, as the world's largest producer of ammonia, with an unparalleled manufacturing and distribution network and deep technical expertise, is uniquely positioned to fulfill anticipated demand for hydrogen and ammonia from green and blue sources. Our approach includes green ammonia production, which refers to ammonia produced through a carbon-free process, and blue ammonia production, which relates to ammonia produced by conventional processes but with CO_2 removed through carbon capture and sequestration (CCS) and other certified carbon abatement projects.

In October 2020, we announced an initial green ammonia project at our Donaldsonville complex. In April 2021, we signed an engineering and procurement contract with thyssenkrupp to supply a 20 MW alkaline water electrolysis plant to produce green hydrogen at our Donaldsonville complex. Construction and installation, which is being managed by us, began in the fourth quarter of 2021 and is expected to finish in 2023, with an estimated total cost of approximately $100 million. The cost of the project is expected to fit within our annual capital expenditure budgets. We will integrate the green hydrogen generated by the electrolysis plant into existing ammonia synthesis loops to enable the production of approximately 20,000 tons per year of green ammonia. We believe that, when completed in 2023, the Donaldsonville green ammonia project will be the largest of its kind in North America.

In the third quarter of 2021, we signed a memorandum of understanding with Mitsui & Co., Inc. (Mitsui) that will guide us in a joint exploration of the development of blue ammonia projects in the United States. The preliminary studies we are conducting with Mitsui cover areas such as blue ammonia supply and supply chain infrastructure, CO_2 transportation and storage, expected environmental impacts, and blue ammonia economics and marketing opportunities in Japan and in other countries.

We have also announced steps to produce blue ammonia from our ammonia production network. In the fourth quarter of 2021, our Board of Directors authorized projects that will enable the annual production of up to 1.25 million tons of blue ammonia from our existing network starting in 2024. The projects will involve constructing units at our Donaldsonville and Yazoo City complexes that dehydrate and compress CO_2, a process essential for CO_2 transport via pipeline to sequestration sites. Management expects that, once the units are in service and sequestration is initiated, we could sequester up to 2.5 million tons of CO_2 per year (2 million tons at Donaldsonville and 500,000 tons at Yazoo City). Under current regulations, the projects would be expected to qualify for tax credits under Section 45Q of the Internal Revenue Code, which provides a credit per tonne of CO_2 sequestered.

Construction of the units at the Donaldsonville complex is expected to begin in 2022 and to be completed in 2024, with an estimated total cost of $200 million. The Yazoo City project will be timed to coincide with CO_2 transport pipeline construction. Once started, the project is expected to be completed in three years with an estimated total cost of $85 million. In addition, we are currently in advanced discussions with several parties regarding transportation and sequestration of CO_2 from Donaldsonville.

Company History

We were founded in 1946 as Central Farmers Fertilizer Company, and were owned by a group of regional agriculture cooperatives for the first 59 years of our existence. Central Farmers became CF Industries in 1970.

Originally established as a fertilizer brokerage company, we expanded owning and operating fertilizer manufacturing and distribution facilities in the early 1950s with a principal objective of assured supply for our owners. At various times in our history, we manufactured and/or distributed nitrogen, phosphate and potash fertilizers.

We operated as a traditional manufacturing and supply cooperative until 2002, when we adopted a new business model that established financial performance as our principal objective, rather than assured supply for our owners. A critical aspect of the new business model was to establish a more economically driven approach to the marketplace.

In August 2005, we completed our initial public offering (IPO) of common stock, which is listed on the New York Stock Exchange. In connection with the IPO, we consummated a reorganization transaction whereby we ceased to be a cooperative and our pre-IPO owners' equity interests in CF Industries were canceled in exchange for all of the proceeds of the offering and shares of our common stock. At the time of the IPO, our assets consisted of one wholly owned nitrogen manufacturing facility in Louisiana, United States; a joint venture nitrogen manufacturing facility in Alberta, Canada, of which we owned 66 percent; a phosphate mining and manufacturing operation in Florida, United States; and distribution facilities throughout North America.

In April 2010, we acquired Terra Industries Inc. (Terra), a leading North American producer and marketer of nitrogen fertilizer products for a purchase price of $4.6 billion, which was paid in cash and shares of our common stock. As a result of the Terra acquisition, we acquired five nitrogen fertilizer manufacturing facilities, an approximately 75.3% interest in Terra Nitrogen Company, L.P. (TNCLP) and certain joint venture interests.

In March 2014, we exited our phosphate mining and manufacturing business, which was located in Florida, through a sale to The Mosaic Company for approximately $1.4 billion in cash. As a result, our company became focused solely on nitrogen manufacturing and distribution.

In July 2015, we acquired the remaining 50% equity interest in CF Fertilisers UK Group Limited (formerly known as GrowHow UK Group Limited) (CF Fertilisers UK) not previously owned by us for total consideration of $570 million, and CF Fertilisers UK became wholly owned by us. This transaction added CF Fertilisers UK's nitrogen manufacturing complexes in Ince, United Kingdom and Billingham, United Kingdom to our consolidated manufacturing capacity.

In February 2016, our strategic venture with CHS commenced, at which time CHS made a capital contribution of $2.8 billion to CFN in exchange for membership interests in CFN, which represented approximately 11% of the total membership interests of CFN.

In late 2015 and 2016, we completed certain capacity expansion projects at Donaldsonville, Louisiana and Port Neal, Iowa. These projects, originally announced in 2012, included the construction of new ammonia, urea, and UAN plants at our Donaldsonville, Louisiana complex and new ammonia and urea plants at our Port Neal, Iowa complex. These plants increased our overall production capacity by approximately 25%, improved our product mix flexibility at Donaldsonville, and improved our ability to serve upper-Midwest urea customers from our Port Neal location. The total capital cost of the capacity expansion projects was $5.2 billion.

Prior to April 2, 2018, Terra Nitrogen, Limited Partnership, which owns and operates our nitrogen manufacturing facility in Verdigris, Oklahoma, was a subsidiary of TNCLP. TNCLP was a publicly traded limited partnership of which we were the sole general partner and the majority limited partner, and in which we owned an approximate 75.3% interest.

In 2018, we announced that, in accordance with the terms of TNCLP's First Amended and Restated Agreement of Limited Partnership (as amended by Amendment No. 1 to the First Amended and Restated Agreement of Limited Partnership, the TNCLP Agreement of Limited Partnership), Terra Nitrogen GP Inc. (TNGP), the sole general partner of TNCLP and an indirect wholly owned subsidiary of CF Holdings, elected to exercise its right to purchase all of the 4,612,562 publicly traded common units of TNCLP (the TNCLP Public Units). On April, 2, 2018, TNGP completed its purchase of the TNCLP Public Units (the Purchase) for an aggregate cash purchase price of $388 million. We funded the Purchase with cash on hand. Upon completion of the Purchase, CF Holdings owned, through its subsidiaries, 100 percent of the general and limited partnership interests of TNCLP.

Product Tons and Nutrient Tons

Unless otherwise stated, we measure our production and sales volume in this Annual Report on Form 10-K in product tons, which represents the weight of the product measured in short tons (one short ton is equal to 2,000 pounds). References to UAN product tons assume a 32% nitrogen content basis for production volume.

We also provide certain supplementary volume information measured in nutrient tons. Nutrient tons represent the weight of the product's nitrogen content, which varies by product. Ammonia represents 82% nitrogen content, granular urea represents 46% nitrogen content, UAN represents between 28% and 32% nitrogen content and AN represents between 29% and 35% nitrogen content.

Reportable Segments

Our reportable segments consist of the following segments: ammonia, granular urea, UAN, AN and Other. These segments are differentiated by products. We use gross margin to evaluate segment performance and allocate resources. Total other operating costs and expenses (consisting primarily of selling, general and administrative expenses and other operating—net) and non-operating expenses (consisting primarily of interest and income taxes), are centrally managed and are not included in the measurement of segment profitability reviewed by management. See Note 22—Segment Disclosures for additional information.

Our Products

Our primary nitrogen products are ammonia, granular urea, UAN and AN. Our historical sales of nitrogen products are shown in the following table. Net sales do not reflect amounts used internally, such as ammonia, in the manufacture of other products.

	2021		2020		2019	
	Sales Volume (tons)	Net Sales	Sales Volume (tons)	Net Sales	Sales Volume (tons)	Net Sales
	(tons in thousands; dollars in millions)					
Products						
Ammonia	3,589	$ 1,787	3,767	$ 1,020	3,516	$ 1,113
Granular urea	4,290	1,880	5,148	1,248	4,849	1,342
UAN	6,584	1,788	6,843	1,063	6,807	1,270
AN	1,720	510	2,216	455	2,109	506
Other[1]	2,318	573	2,322	338	2,257	359
Total	18,501	$ 6,538	20,296	$ 4,124	19,538	$ 4,590

(1) Other segment products include DEF, urea liquor, nitric acid, aqua ammonia and NPKs.

Gross margin was $2.39 billion, $801 million and $1.17 billion for the years ended December 31, 2021, 2020 and 2019, respectively.

We own and operate seven nitrogen manufacturing facilities in North America, including five nitrogen manufacturing facilities in the United States, and two in Canada. As of December 31, 2021, the combined production capacity of these seven facilities represented approximately 37%, 42%, 44% and 19% of North American ammonia, granular urea, UAN and AN production capacity, respectively. Each of our nitrogen manufacturing facilities in North America has on-site storage to provide flexibility to manage the flow of outbound shipments without impacting production. Our two United Kingdom nitrogen manufacturing facilities produce ammonia, AN and NPKs and serve primarily the British agricultural and industrial markets.

The following table shows the production capacities as of December 31, 2021 at each of our nitrogen manufacturing facilities:

	Average Annual Capacity[1]					
	Gross Ammonia[2]	Net Ammonia[2]	UAN[3]	Urea[4]	AN[5]	Other[6]
	(tons in thousands)					
Donaldsonville, Louisiana[7]	4,335	1,390	3,255	2,635	—	445
Medicine Hat, Alberta	1,230	770	—	810	—	—
Port Neal, Iowa	1,230	65	800	1,350	—	290
Verdigris, Oklahoma[8]	1,210	430	1,955	—	—	—
Woodward, Oklahoma	480	130	810	—	—	115
Yazoo City, Mississippi[8][9]	570	—	160	—	1,035	125
Courtright, Ontario[8][10]	500	265	345	—	—	400
Ince, U.K.[11]	380	15	—	—	575	415
Billingham, U.K.[8]	595	230	—	—	625	410
	10,530	3,295	7,325	4,795	2,235	2,200
Unconsolidated Affiliate						
Point Lisas, Trinidad[12]	360	360	—	—	—	—
Total	10,890	3,655	7,325	4,795	2,235	2,200

(1) Average annual capacity includes allowance for normal outages and planned maintenance shutdowns.

(2) Gross ammonia capacity includes ammonia used to produce upgraded products. Net ammonia capacity is gross ammonia capacity less ammonia used to produce upgraded products based on the product mix shown in the table.

(3) Measured in tons of UAN containing 32% nitrogen by weight.

(4) Reflects granular urea capacity from the Donaldsonville, Medicine Hat, and Port Neal facilities. Urea liquor and DEF production capacities are included in Other.
(5) AN includes prilled products (Amtrate and industrial-grade AN, or IGAN) and AN solution produced for sale.
(6) Includes product tons of: urea liquor and DEF from the Donaldsonville, Port Neal, Woodward, Yazoo City, and Courtright facilities; nitric acid from the Courtright, Yazoo City, Billingham, and Ince facilities; and NPKs from the Ince facility. Production of DEF can be increased by reducing urea and/or UAN production.
(7) The Donaldsonville facility capacities present an estimated production mix. This facility is capable of producing between 2.4 million and 3.3 million tons of granular urea and between 1.2 million and 4.3 million tons of UAN annually. The facility is also capable of producing up to 1.2 million product tons of 32.5% DEF.
(8) Reduction of UAN or AN production at the Yazoo City, Courtright, Verdigris, and Billingham facilities can allow more merchant nitric acid to be made available for sale.
(9) The Yazoo City facility's production capacity depends on product mix. With the facility maximizing the production of AN products, 160,000 tons of UAN can be produced. UAN production can be increased to 450,000 tons by reducing the production of AN to 900,000 tons.
(10) Production of urea liquor and DEF at the Courtright facility can be increased by reducing UAN production.
(11) The Ince facility can increase production of NPKs and nitric acid by reducing AN production. Production at the Ince facility is currently idled as of the date of this report.
(12) Represents our 50% interest in the capacity of PLNL.

The following table summarizes our production volume for the last three years:

	December 31,		
	2021	2020	2019
		(tons in thousands)	
Ammonia[1]	9,349	10,353	10,246
Granular urea	4,123	5,001	4,941
UAN (32%)	6,763	6,677	6,768
AN	1,646	2,115	2,128

(1) Gross ammonia production, including amounts subsequently upgraded on-site into granular urea, UAN or AN.

Nitrogen Manufacturing Facilities

Donaldsonville, Louisiana

The Donaldsonville facility is the world's largest and most flexible nitrogen complex. It has six ammonia plants, five urea plants, four nitric acid plants, three UAN plants, and one DEF plant. The complex, which is located on the Mississippi River, includes deep-water docking facilities, access to an ammonia pipeline, and truck and railroad loading capabilities. The complex has on-site storage for 140,000 tons of ammonia, 201,000 tons of UAN (measured on a 32% nitrogen content basis) and 130,000 tons of granular urea.

Medicine Hat, Alberta, Canada

The Medicine Hat facility, located in southeast Alberta, is the largest nitrogen complex in Canada. It has two ammonia plants and one urea plant. The complex has on-site storage for 60,000 tons of ammonia and 60,000 tons of granular urea.

Port Neal, Iowa

The Port Neal facility is located approximately 12 miles south of Sioux City, Iowa, on the Missouri River. The facility consists of two ammonia plants, three urea plants, two nitric acid plants and one UAN plant. The location has on-site storage for 85,000 tons of ammonia, 130,000 tons of granular urea, and 100,000 tons of 32% UAN.

Verdigris, Oklahoma

The Verdigris facility is located northeast of Tulsa, Oklahoma, near the Verdigris River. It is the second largest UAN production facility in North America. The facility comprises two ammonia plants, two nitric acid plants, two UAN plants and a port terminal. We lease the port terminal from the Tulsa-Rogers County Port Authority. The complex has on-site storage for 60,000 tons of ammonia and 100,000 tons of 32% UAN.

Woodward, Oklahoma

The Woodward facility is located in rural northwest Oklahoma and consists of one ammonia plant, two nitric acid plants, two urea plants and two UAN plants. The facility has on-site storage for 36,000 tons of ammonia and 84,000 tons of 32% UAN.

Yazoo City, Mississippi

The Yazoo City facility is located in central Mississippi and includes one ammonia plant, four nitric acid plants, one AN plant, two urea plants, one UAN plant and a dinitrogen tetroxide production and storage facility. The site has on-site storage for 50,000 tons of ammonia, 48,000 tons of 32% UAN and 11,000 tons of AN and related products.

Courtright, Ontario, Canada

The Courtright facility is located south of Sarnia, Ontario near the St. Clair River. The facility consists of an ammonia plant, a UAN plant, a nitric acid plant and a urea plant. The location has on-site storage for 64,000 tons of ammonia and 16,000 tons of 32% UAN.

Ince, United Kingdom

The Ince facility is located in northwestern England and consists of one ammonia plant, three nitric acid plants, one AN plant and three NPK plants. The location has on-site storage for 11,000 tons of ammonia, 95,000 tons of AN, and 40,000 tons of NPKs. Production at the Ince facility is currently idled as of the date of this report due to the impact of the current energy crisis in the United Kingdom that is more fully described in Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations—Overview of CF Holdings—Market Conditions and Current Developments—United Kingdom Energy Crisis.

Billingham, United Kingdom

The Billingham facility, located in the Teesside chemical area in northeastern England, is geographically split among three primary locations: the main site, which contains an ammonia plant, three nitric acid plants and a carbon dioxide plant; the Portrack site, approximately two miles away, which contains an AN fertilizer plant; and the North Tees site, approximately seven miles away, which contains an ammonia storage area. These locations collectively have on-site storage for 40,000 tons of ammonia and 128,000 tons of AN.

Point Lisas, Trinidad

The Point Lisas Nitrogen facility in the Republic of Trinidad and Tobago is owned jointly through a 50/50 venture with Koch Fertilizer LLC. This facility has the capacity to produce 720,000 tons of ammonia annually from natural gas supplied under a contract with The National Gas Company of Trinidad and Tobago Limited (NGC).

Nitrogen Product Raw Materials

Natural gas is the principal raw material and primary fuel source used in the ammonia production process at our nitrogen manufacturing facilities. In 2021, natural gas accounted for approximately 40% of our total production costs for nitrogen products. Our nitrogen manufacturing facilities have access to abundant, competitively-priced natural gas through a reliable network of pipelines that are connected to major natural gas trading hubs. Our facilities utilize the following natural gas hubs: Henry Hub in Louisiana; SONAT and TETCO ELA in Louisiana; ONEOK in Oklahoma; AECO in Alberta; Ventura in Iowa; Demarcation in Kansas; Welcome in Minnesota; Dawn and Parkway in Ontario; and the National Balancing Point (NBP) in the United Kingdom.

In 2021, our nitrogen manufacturing facilities consumed, in the aggregate, approximately 335 million MMBtus of natural gas. We employ a combination of daily spot and term purchases from a variety of quality suppliers to maintain a reliable, competitively-priced supply of natural gas. We also use certain financial instruments to hedge natural gas prices. See Note 16—Derivative Financial Instruments for additional information about our natural gas hedging activities.

Nitrogen Product Distribution

The safe, efficient and economical distribution of nitrogen products is critical for successful operations. Our nitrogen production facilities have access to multiple transportation modes by which we ship products to terminals, warehouses and customers. Each of our production facilities has a unique distribution pattern based on its production capacity and location.

Our North American nitrogen production facilities can ship products via truck and rail to customers and to our storage facilities in the U.S. and Canada, with access to our leased railcar fleet of approximately 5,000 tank and hopper cars, as well as railcars provided by rail carriers. Our United Kingdom nitrogen production facilities mainly ship products via truck.

The North American waterway system is also used extensively to ship products from our Donaldsonville, Verdigris and Yazoo City facilities. To ship ammonia and UAN, we employ a fleet of ten tow boats and twenty-eight river barges, which are primarily leased. We also utilize contract marine services to move granular urea. We can also export nitrogen products via seagoing vessels from our Donaldsonville, Yazoo City, Billingham and Ince manufacturing facilities.

The Donaldsonville facility is connected to the 2,000-mile long Nustar pipeline through which we have the ability to transport ammonia to ten terminals and shipping points in the Midwestern U.S. corn belt.

Storage Facilities and Other Properties

As of December 31, 2021, we owned or leased space at 51 in-market storage terminals and warehouses located in a 21-state region of the United States, Canada and the United Kingdom. Including storage at our production facilities, we have an aggregate storage capacity for approximately 3.0 million tons of product. Our storage capabilities are summarized in the following table:

	Ammonia		Granular Urea		UAN[1]		AN	
	Number of Facilities	Capacity (000 Tons)	Number of Facilities	Capacity (000 Tons)	Number of Facilities	Capacity (000 Tons)	Number of Facilities	Capacity (000 Tons)
Plants	9	546	3	320	6	549	3	234
Terminal and Warehouse Locations								
Owned[2]	22	780	—	—	8	209	—	—
Leased[3]	6	89	2	32	21	276	—	—
Total In-Market	28	869	2	32	29	485	—	—
Total Storage Capacity		1,415		352		1,034		234

(1) Capacity is expressed as the equivalent volume of UAN measured on a 32% nitrogen content basis.
(2) The owned facilities that store UAN also can store ammonia.
(3) Our lease agreements are typically for periods of one to five years.

Customers

The principal customers for our nitrogen products are cooperatives, independent fertilizer distributors, traders, wholesalers and industrial users. Sales are generated by our internal marketing and sales force. CHS was our largest customer in 2021 and accounted for approximately 14% of our consolidated net sales. We have a strategic venture with CHS under which CHS has a minority equity interest in CFN. See Note 18—Noncontrolling Interest for additional information on our strategic venture with CHS.

Competition

Our markets are global and intensely competitive, based primarily on delivered price and, to a lesser extent, on customer service and product quality. During the peak demand periods, product availability and delivery time also play a role in the buying decisions of customers.

Our primary North American-based competitors include Nutrien Ltd., Koch Fertilizer LLC and Iowa Fertilizer Company. There is also significant competition from products sourced from other regions of the world, including some with lower natural gas or other feedstock costs, which may include the benefit of government subsidies. Because ammonia, urea and UAN are widely-traded fertilizer products and there are limited barriers to entry, we experience competition from foreign-sourced products continuously. Producers of nitrogen-based fertilizers located in the Middle East, the Republic of Trinidad and Tobago, North Africa and Russia have been major exporters to North America in recent years.

Our primary United Kingdom competition comes from imported products supplied by companies including Yara International, Origin Fertilisers, Ameropa, CHS and Helm. Urea and UAN are not produced in the United Kingdom, but along with AN are widely-traded fertilizer products with limited barriers to entry.

Seasonality

The fertilizer business is seasonal. The degree of seasonality of our business can change significantly from year to year due to weather conditions in the agricultural industry and other factors. The strongest demand for our products in North America occurs during the spring planting season, with a second period of strong demand following the fall harvest. In contrast, we and other fertilizer producers generally manufacture and distribute products throughout the year. As a result, we and/or our customers generally build inventories during the low demand periods of the year to ensure timely product availability during the peak sales seasons. Seasonality is greatest for ammonia due to the short application season and the limited ability of our customers and their customers to store significant quantities of this product. The seasonality of fertilizer demand generally results in our sales volumes and net sales being the highest during the spring and our working capital requirements being the highest just prior to the start of the spring planting season. Our quarterly financial results can vary significantly from one year to the next due to weather-related shifts in planting schedules and purchasing patterns.

Environmental, Health and Safety

We are subject to numerous environmental, health and safety laws and regulations in the United States, Canada, the United Kingdom, the European Union and the Republic of Trinidad and Tobago, including laws and regulations relating to the generation and handling of hazardous substances and wastes; the introduction of new chemicals or substances into a market; the cleanup of hazardous substance releases; the discharge of regulated substances to air or water; and the demolition of existing plant sites upon permanent closure. In the United States, these laws include the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the Toxic Substances Control Act (TSCA), the Occupational Safety and Health Act (OSHA) and various other federal, state and local statutes. Violations of environmental, health and safety laws can result in substantial penalties, court orders to install pollution-control equipment, civil and criminal sanctions, permit revocations and facility shutdowns. In addition, environmental, health and safety laws and regulations may impose joint and several liability, without regard to fault, for cleanup costs on potentially responsible parties who have released or disposed of hazardous substances into the environment. We may be subject to more stringent enforcement of existing or new environmental, health and safety laws in the future.

Environmental, Health and Safety Expenditures

Our environmental, health and safety capital expenditures in 2021 totaled approximately $31 million. We estimate that we will have approximately $63 million of capital expenditures for environmental, health and safety in 2022. In addition, to support safe and reliable operations at our continuous process manufacturing facilities, we conduct scheduled inspections, replacements and overhauls of our plant machinery and equipment, which are referred to as turnarounds. A further description of turnaround activities is included in Note 7—Property, Plant and Equipment—Net to our consolidated financial statements included in Item 8 of this report. Environmental, health and safety laws and regulations are complex, change frequently and have tended to become more stringent over time. We expect that continued government and public emphasis on environmental issues will result in increased future expenditures for environmental controls at our manufacturing and distribution facilities. Such expenditures could have a material adverse effect on our business, financial condition, results of operations and cash flows. Additionally, future environmental, health and safety laws and regulations or reinterpretation of current laws and regulations may require us to make substantial expenditures. Our costs to comply with, or any liabilities under, these laws and regulations could have a material adverse effect on our business, financial condition, results of operations and cash flows.

CERCLA/Remediation Matters

From time to time, we receive notices from governmental agencies or third parties alleging that we are a potentially responsible party at certain cleanup sites under CERCLA or other environmental cleanup laws. In 2011, we received a notice from the Idaho Department of Environmental Quality (IDEQ) that alleged that we were a potentially responsible party for the cleanup of a former phosphate mine site we owned in the late 1950s and early 1960s located in Georgetown Canyon, Idaho. The current owner of the property and a former mining contractor received similar notices for the site. Based on a Consent Order entered into with IDEQ and the U.S. Forest Service in 2014, we and the current property owner are currently conducting a remedial investigation and feasibility study of the site. In 2015, we and several other parties received a notice that the U.S. Department of the Interior and other trustees intend to undertake a natural resource damage assessment for 18 former phosphate mines and three former processing facilities in southeast Idaho, which includes the Georgetown Canyon former mine and processing facility. See Note 21—Contingencies for additional information.

Regulation of Greenhouse Gases

Our production facilities emit greenhouse gases (GHGs), such as carbon dioxide and nitrous oxide. Natural gas, a fossil fuel, is a primary raw material used in our nitrogen production process. We are subject to GHG regulations in the United Kingdom, Canada and the United States.

Our U.K. manufacturing plants are required to report GHG emissions annually to the United Kingdom Environment Agency pursuant to their site Environmental Permits and Climate Change Agreement, which specify energy efficiency targets. Failure to meet efficiency targets may require these plants to purchase CO_2 emissions allowances. Our facilities were previously subject to the European Union Greenhouse Gas Emission Trading System (EU ETS), which generally required us to hold or obtain emission allowances to offset GHG emissions from those aspects of our operations that were subject to regulation under this program. Beginning on January 1, 2021, our U.K. manufacturing plants became subject to the UK Emissions Trading Scheme (UK ETS). The UK ETS is similar to the EU ETS, although the U.K. ETS regulations established a lower emission cap than was established under the EU ETS. No agreement has been reached as to whether the UK ETS will establish a linkage with the EU ETS or other national emission trading systems.

In Canada, we are required to conduct an annual review of our operations with respect to compliance with Environment Canada's National Pollutant Release Inventory and Ontario's Mandatory Monitoring and Reporting Regulation and the GHG Reporting Regulation. In 2018, the federal Greenhouse Gas Pollution Pricing Act came into effect, pursuant to which Environment and Climate Change Canada (ECCC) implemented the Output-Based Performance Standard (OBPS), which was intended to function as a backstop to provincial greenhouse gas emissions regulations. In June 2019, the ECCC finalized the emission limits for carbon dioxide equivalent (CO_2e) emissions from nitrogen fertilizer products. These emission limits are based on 95% of the average emissions intensity for the production of such products from all Canadian nitrogen fertilizer plants, reflecting that such products are deemed to be energy-intensive and trade-exposed and thus subject to a less stringent emissions reduction requirement. In the provinces and territories where the OBPS applies, a facility whose carbon emissions exceed the applicable limits is required to offset emissions by obtaining and retiring surplus emission credits, obtaining qualifying emissions offsets, or paying a fee. The fee under the OBPS for calendar year 2021 was CAD $40 per tonne of excess carbon dioxide equivalent emissions, and will be CAD $50 per tonne in 2022. Under the current program, the excess emission fee will increase by CAD $15 per year after 2022, reaching CAD $170 per tonne by 2030. Ontario, Saskatchewan and Alberta filed suit challenging whether the federal government had jurisdiction to impose a federal carbon price on the provinces and territories, but in March 2021, the Supreme Court of Canada upheld the constitutionality of the Greenhouse Gas Pollution Pricing Act.

In July 2019, the Ontario government enacted a new GHG regulation, called the Emissions-Performance Standards program (EPS), that sets CO_2e emissions limits for nitrogen products based on a production weighted sectoral average. For facilities whose carbon emissions exceed the applicable limit, compliance options include the purchase of excess emission units, for a fee of CAD $40 per unit purchased in 2022 (which can be used to offset excess emissions in the 2021 calendar period) and CAD $50 per unit purchased in 2023 (to offset excess emissions in calendar year 2022). In September 2020, ECCC announced that the Ontario EPS met the federal government's minimum stringency benchmark requirements, and in September 2021, the ECCC announced that the federal OBPS would no longer apply in Ontario beginning in January 2022. Accordingly, the Ontario EPS became applicable on January 1, 2022.

In 2019, the Alberta government passed the Technology Innovation and Emission Reduction Implementation Act (TIER), which went into effect on January 1, 2020. The TIER requires large emitting facilities (other than electricity producers, which are subject to a different standard) to comply with the least stringent of a "facility-specific" benchmark of 90% of historical GHG emissions intensity from a three-year baseline, which intensity limit will be reduced by 1% a year beginning in 2021, or a benchmark reflecting the emissions intensity of the top 10% of facilities for a given sector. The compliance options under the TIER initially established the price for payments into its carbon fund at CAD $30 per excess tonne of emissions. In December 2019, the federal government determined that the TIER met the stringency requirements of the OBPS with respect to its regulation of large industrial emitters for 2020. The levy for excess emissions of CO_2e in Alberta for 2021 was CAD $40 per tonne and it is anticipated that the Alberta government will increase the levy for excess emissions of CO_2e for calendar year 2022 to CAD $50 per tonne, to match the price of carbon established in the OBPS.

In the United States, GHG regulation is evolving at state, regional and federal levels, although some of the more significant developments to date, including efforts of the United States Environmental Protection Agency (EPA) to regulate GHG emissions from fossil fuel-fired power plants, do not directly impose obligations on our facilities. The EPA issued a mandatory GHG reporting rule that required all of our U.S. manufacturing facilities, which are considered large emitters of GHGs, to commence monitoring GHG emissions beginning on January 1, 2010 and reporting the previous year's emissions annually starting in 2011. In addition, if we seek to modify or expand any of our major facilities and as a result, are required to obtain a Prevention of Significant Deterioration (PSD) construction permit applicable to such facilities, we could be subject to pollution control requirements applicable to GHGs in addition to requirements applicable to conventional air pollutants. Such requirements may result in increased costs or delays in completing such projects. Other than the states' implementation of this permitting requirement, none of the states where our U.S. production facilities are located-Iowa, Louisiana, Mississippi and Oklahoma-has proposed control regulations limiting GHG emissions.

Increasing concern over the impacts of climate change is driving countries to establish ever more ambitious GHG reduction targets. Approximately 200 countries, including the United States, Canada, the United Kingdom and the European Union (EU) have joined the Paris Agreement, an international agreement intended to provide a framework pursuant to which the parties to the agreement will attempt to hold the increase in global average temperatures to below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. Each signatory is required to develop its own national plan to attain this objective. In December 2020, the United Kingdom announced a target to reduce GHG emission 68% from 1990 levels by 2030. Canada has increased its emissions reduction target under the Paris Agreement to 40-45% below 2005 levels by 2030, up from 30%. In April 2021, the United States increased its goal to reduce GHG emissions to 50-52% below 2005 levels by 2030. Executive orders issued by the Biden administration, including in particular an executive order issued on January 27, 2021 focusing on climate change, evidence the administration's intent to undertake numerous initiatives in an effort to reduce GHG emissions, including promoting renewable energy development, limiting or prohibiting new oil and gas leases on federal lands, and in general, making climate change considerations a critical component of federal policy.

Regulatory Permits and Approvals

We hold numerous environmental and other governmental permits and approvals authorizing operations at each of our facilities. A decision by a government agency to deny or delay issuing a new or renewed regulatory material permit or approval, or to revoke or substantially modify an existing material permit or approval, could have a material adverse effect on our ability to continue operations at the affected facility. Any future expansion of our existing operations is also predicated upon securing the necessary environmental or other permits or approvals. More stringent environmental standards may impact our ability to obtain such permits.

Human Capital Resources

Our long-term success depends on our people. We are dedicated to creating a workplace where employees are proud to work and grow and where everyone feels empowered to do their best work. We do this by investing in extensive recruitment, training and professional development opportunities for our employees and fostering diversity and inclusion in our culture.

Employee Population. We employed approximately 3,000 employees at December 31, 2021, of which 67% were located in the United States, 19% in the United Kingdom, and 14% in Canada. As of December 31, 2021, 14% of our employees have worked for the Company more than 20 years, 17% of our employees have worked for the Company between 11 and 20 years, 29% of our employees have worked for the Company between 6 and 10 years, and 40% of our employees have worked at the Company for less than 6 years. Full-time employees represented approximately 99% of our workforce as of December 31, 2021 and approximately 15% were covered by a collective bargaining agreement. We supplement our workforce with contractors with specialized skill sets during periods of peak activity, such as during turnarounds and maintenance events.

Culture, Inclusion and Diversity. Our core values and their underlying principles reflect our commitment to a diverse and inclusive culture, treating one another with respect. Across the Company, all employees completed training to learn to recognize and address the effects of unconscious bias by challenging assumptions; encouraging diversity of experience, opinion, and expression; and supporting a workplace culture that actively strives to be more inclusive. As of December 31, 2021, approximately 14% of our global workforce was female and 16% of the Company's employees in frontline managerial roles were female. Minorities represented approximately 14% of the Company's U.S. workforce and 13% of our U.S. employees in managerial roles. In order to continue to improve the inclusiveness and diversity of our company and culture, our comprehensive ESG goals announced in 2020 include goals to increase the representation of females and persons of color in senior leadership roles and to implement a program designed to increase the hiring and promotion of minority and female candidates. As of December 31, 2021, we had exceeded our representation goal with approximately 38% of senior leadership roles held by females and persons of color.

Workforce Health and Safety. Operating in a safe and responsible manner is a core value and an integral part of what sets the Company apart. We believe that focusing on leading indicators - such as the behavioral safety practices we have incorporated into our annual incentive plan - to drive and measure activities that prevent and control safety incidents, results in our industry-leading safety record. As of December 31, 2021, our employee 12-month rolling average recordable incident rate (RIR) was 0.32 incidents per 200,000 work hours, and our total recordable injury count was nine. For the year ended December

31, 2021, our days away, restricted or transferred (DART) incident rate was 0.21 injuries per 200,000 work hours, and our lost time incident rate was 0.11.

Response to COVID-19 Pandemic. During fiscal 2020 and 2021, in response to the COVID-19 pandemic, we instituted and have continued to enforce safety precautions to protect the health and well-being of all of our employees, including the manufacturing workforce who operate our nitrogen manufacturing complexes and distribution facilities. See Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations—Overview of CF Holdings—Market Conditions and Current Developments—COVID-19 Pandemic, for a further discussion of the pandemic.

Talent Development. A core aspect of our culture is our commitment to identifying and developing talent to help employees accelerate growth and achieve their career goals. We invest in extensive assessment, training and professional development opportunities for our employees through a robust set of formal and informal programs, including targeted job movements, key experiences, and training, with an emphasis on creating a culture of inclusion. Leadership is the quality that drives our values and sets us apart. To help foster leadership, we have developed a set of leadership competencies that provide a common language for how to demonstrate leadership at every level of the organization. We view training and development programs as being a key part of succession planning, allowing us to grow a stronger company today and in the future.

ITEM 1A. RISK FACTORS.

In addition to the other information contained in this Annual Report on Form 10-K, you should carefully consider the factors discussed below before deciding to invest in any of our securities. These risks and uncertainties, individually or in combination, could materially and adversely affect our business, financial condition, results of operations and cash flows. References to tons refer to short tons and references to tonnes refer to metric tons.

Market Risks

Our business is cyclical, resulting in periods of industry oversupply during which our business, financial condition, results of operations and cash flows tend to be negatively affected.

Historically, selling prices for our products, which are generally global commodities, have fluctuated in response to periodic changes in supply and demand conditions. Demand for nitrogen is affected by planted acreage, crop selection and fertilizer application rates, driven by population growth, gross domestic product growth, changes in dietary habits and non-food use of crops, such as production of ethanol and other biofuels among other things. Demand also includes industrial uses of nitrogen, for example chemical manufacturing and emissions reductants such as diesel exhaust fluid (DEF). Supply is affected primarily by available production capacity and operating rates, raw material costs and availability, energy prices, government policies and global trade.

Periods of strong demand, high capacity utilization and increasing operating margins tend to stimulate global investment in production capacity. In the past, fertilizer producers, including CF Holdings, have built new production facilities or expanded capacity of existing production assets, or announced plans to do so. The construction of new nitrogen fertilizer manufacturing capacity in the industry, plus improvements to increase output from the existing production assets, increase nitrogen supply availability and affect the balance of supply and demand and nitrogen selling prices. In certain years, global nitrogen fertilizer capacity has increased faster than global nitrogen fertilizer demand, creating a surplus of global nitrogen fertilizer capacity, which has led to lower nitrogen fertilizer selling prices. For example, in the two-year period ended December 31, 2017, additional production capacity came on line and, at the same time, the average selling price for our products declined 34%, from $314 per ton in 2015 to $207 per ton in 2017.

Additional production capacity is expected to come on line over the next 12 months outside of North America. We cannot predict the impact of this additional capacity on nitrogen fertilizer selling prices. Also, global or local economic, political and financial conditions or changes in such conditions, or other factors, may cause acceleration of announced and/or ongoing projects. Similarly, lower energy prices can spur increases in production in high cost regions, which would result in increased supply and pressure on selling prices. Additionally, if imports increase into an oversupplied region, lower prices in that region could result.

During periods of industry oversupply, our financial condition, results of operations and cash flows tend to be affected negatively as the price at which we sell our products typically declines, resulting in possible reduced profit margins, write-downs in the value of our inventory and temporary or permanent curtailments of production. In 2016 and 2017, our financial performance, credit ratings and the trading price for our common stock were negatively impacted by the lower selling prices resulting from the global oversupply of nitrogen fertilizer. While in 2018 and 2019, we experienced increases in the average selling price for our products, in 2020, the average selling price for our products decreased 14% to $203 per ton compared to $235 per ton in 2019. In 2021, the average selling price for our products increased 74% to $353 per ton compared to 2020. Due to the cyclical nature of our industry, we cannot predict the timing of oversupply and undersupply conditions, the period of time that these conditions will persist or the degree to which oversupply conditions will impact our business, financial condition, results of operations and cash flows.

Our nitrogen products are global commodities, and we face intense global competition from other producers.

We are subject to intense price competition from our competitors. Most fertilizers and related nitrogen products that we produce, such as industrial grade ammonium nitrate (AN) and DEF, are global commodities, with little or no product differentiation, and customers make their purchasing decisions principally on the basis of delivered price and, to a lesser extent, customer service and product quality. As a consequence, conditions in the international market for nitrogen products significantly influence our operating results.

We compete with many producers, including state-owned and government-subsidized entities. Some of our competitors have greater total resources and are less dependent on earnings from fertilizer sales, which make them less vulnerable to industry downturns and better positioned to pursue new expansion and development opportunities. Furthermore, certain governments, in some cases as owners of some of our competitors, may be willing to accept lower prices and profitability on their products or subsidize production or consumption in order to support domestic employment or other political or social goals. Our competitive position could suffer if we are not able to expand our own resources to a similar extent, either through investments in new or existing operations or through acquisitions or joint ventures.

China, the world's largest producer and consumer of nitrogen fertilizers, currently has capacity surplus and many high-cost plants. As a result, the domestic nitrogen industry in China is operating at less than full capacity. A number of factors could encourage China to increase product capacity utilization, including changes in Chinese government policy, devaluation of the Chinese renminbi, the relaxation of Chinese environmental standards or decreases in Chinese producers' underlying costs such as the price of Chinese coal. Any resulting increase in export volume could adversely affect the balance between global supply and demand and may put downward pressure on global fertilizer prices, which could materially adversely affect our business, financial condition, results of operations and cash flows.

From time to time, certain of our competitors with significant nitrogen fertilizer export capacity have benefited from non-market pricing of natural gas, which has resulted in significant volumes of exports to the United States. For example, the 2016 revocations of U.S. antidumping measures on solid urea and fertilizer grade ammonium nitrate from Russia allowed for increased imports from that country into the United States in recent years. In addition, high volumes of urea ammonium nitrate solution (UAN) imports from Russia and Trinidad and Tobago have negatively affected U.S. producers' UAN profitability.

We also face competition from other fertilizer producers in the Middle East, Europe, Latin America and Africa. These producers, depending on market conditions, fluctuating input prices, geographic location and freight economics, may take actions at times with respect to price or selling volumes that adversely affect our business, financial condition, results of operations and cash flows. Some of these producers also benefit from non-market or government-set rates for natural gas pricing.

In addition, the international market for nitrogen products is influenced by such factors as currency exchange rates, including the relative value of the U.S. dollar and its impact on the cost of importing nitrogen products into the United States, foreign agricultural policies, the existence of, or changes in, import or foreign currency exchange barriers in certain foreign markets and the laws and policies of the markets in which we operate, including the imposition of new duties, tariffs or quotas, that affect foreign trade and investment. For example, the imposition of duties, tariffs or quotas in a region can directly impact product pricing in that region, which can lead to changes in global trade flows and impact the global supply and demand balance and pricing. Market participants customarily move product between regions of the world, or adjust trade flows, in response to these factors. North America, where we manufacture and sell most of our products, is one of the largest and most liquid nitrogen trading regions in the world. As a result, other manufacturers, traders and other market participants can move nitrogen products to North America when there is uncertainty associated with the supply and demand balance in other regions or when duties, tariffs or quotas impact prices or trade flows in other regions. Thus, duties, tariffs and quotas can lead to uncertainty in the global marketplace and impact the supply and demand balance in many regions, which could adversely affect our business, financial condition, results of operations and cash flows. On October 9, 2019, the European Commission (the Commission) imposed definitive anti-dumping duties on imports to the European Union of UAN manufactured in Russia, the Republic of Trinidad and Tobago and the United States. For imports of UAN manufactured in the United States, the fixed duty rate is €29.48 per tonne (or €26.74 per ton). The duties will remain in place for an initial five-year period unless the Commission suspends them before the five-year period has expired. After the initial five-year period, the Commission may renew the measures. The long-term impact of these duties on the international market for nitrogen products is uncertain.

A decline in agricultural production or limitations on the use of our products for agricultural purposes could materially adversely affect the demand for our products.

Conditions in the United States, Europe, India, Brazil, China and other global agricultural areas significantly impact our operating results. Agricultural planted areas and production can be affected by a number of factors, including weather patterns and field conditions, current and projected grain inventories and prices, crop disease and/or livestock disease, demand for agricultural products and governmental policies regarding production of or trade in agricultural products. These factors are outside of our control.

Governmental policies, including farm and biofuel subsidies, commodity support programs and tariffs, environmental and greenhouse gas policies, as well as the prices of fertilizer products, may also directly or indirectly influence the number of acres planted, the mix of crops planted and the use of fertilizers for particular agricultural applications. Ethanol production in the United States contributes significantly to corn demand, representing approximately 35% of total U.S. corn demand, due in part to federal legislation mandating use of renewable fuels. An increase in ethanol production has led to an increase in the amount of corn grown in the United States and to increased fertilizer usage on both corn and other crops that have also benefited from improved farm economics. While the current Renewable Fuel Standard encourages continued high levels of corn-based ethanol production, various interested parties have called to eliminate or reduce the renewable fuel mandate, or to eliminate or reduce corn-based ethanol as part of the renewable fuel mandate. Other factors that drive the ethanol market include the prices of ethanol, gasoline and corn. Lower gasoline prices and fewer aggregate miles, driven by increased automobile fuel efficiency, the continued expansion of electric vehicle use or the impact of decreased travel resulting from the coronavirus disease 2019 (COVID-19) pandemic, may put pressure on ethanol prices that could result in reduced profitability and lower production for the ethanol industry. This could have an adverse effect on corn-based ethanol production, planted corn acreage and fertilizer demand.

Developments in crop technology, such as nitrogen fixation, the conversion of atmospheric nitrogen into compounds that plants can assimilate, or nitrogen-efficient varieties, or developments in alternatives to traditional animal feed or alternative proteins, could also reduce the use of chemical fertilizers and adversely affect the demand for our products. Widespread adoption of emerging application technologies or alternative farming techniques could disrupt traditional application practices, affecting the volume or types of products used and timing of applications. In addition, from time to time various foreign government and U.S. state legislatures have considered limitations on the use and application of chemical fertilizers due to concerns about the negative impact of these products on the environment. For example, the United Kingdom is currently consulting with stakeholders and reviewing proposals to limit emissions from solid urea fertilizers, including a potential ban on urea fertilizers. While CF Fertilisers UK Limited does not sell solid urea fertilizer in the United Kingdom, other jurisdictions may consider limits on fertilizer use, such as the European Union, which announced its Farm to Fork and Biodiversity Strategies, or Canada, which as part of its Healthy Environment, Healthy Economy plan announced plans in late 2020 to introduce a target of reducing emissions from fertilizers by 30% below 2020 levels and has begun informal consultations with industry and other stakeholders on this proposal. These or other more stringent limitations on greenhouse gas emissions applicable to farmers, the end-users of our nitrogen fertilizers, could reduce the demand for our fertilizer products to the extent their use of our products increases farm-level emissions. Any reduction in the demand for chemical fertilizer products, including as a result of technological developments and/or limitations on the use and application of chemical fertilizers, could have a material adverse effect on our business, financial condition, results of operations and cash flows.

Our business is dependent on natural gas, the prices of which are subject to volatility.

Nitrogen from the atmosphere and hydrogen from natural gas, coal and other carbon energy feedstocks, or from the electrolysis of water, are the fundamental building blocks of nitrogen products. Energy feedstock costs comprise a significant portion of the total production cost of nitrogen products and, relative to the industry's marginal producers that set the global price of nitrogen, generally determine profitability for nitrogen producers. Our manufacturing processes utilize natural gas as the principal raw material used in our production of nitrogen products. We use natural gas both as a chemical feedstock and as a fuel to produce ammonia, granular urea, UAN, AN and other nitrogen products.

Most of our nitrogen manufacturing facilities are located in the United States and Canada. As a result, North American natural gas comprises a significant portion of the total production cost of our products. In recent years, the cost of North American natural gas for the production of nitrogen fertilizers has been significantly lower than the energy costs of the industry's marginal nitrogen producers. Changes in the supply of and demand for natural gas can lead to extended periods of higher natural gas prices. In addition, any increases in the volume of liquefied natural gas exported from the U.S. to other regions, particularly regions where nitrogen products are produced, could increase our natural gas costs and/or lower natural gas costs for our competitors. If high natural gas prices were to persist in North America and significantly erode our favorable energy cost differentials relative to the marginal nitrogen producers, it could have a material adverse effect on our business, financial condition, results of operations and cash flows.

The price of natural gas in North America has been volatile in recent years. During 2021, the daily closing price at the Henry Hub, the most heavily-traded natural gas pricing point in North America, reached a low of $2.36 per MMBtu on April 7, 2021 and a high of $23.61 per MMBtu on February 18, 2021. During the three-year period ended December 31, 2021, the daily closing price at the Henry Hub reached a low of $1.34 per MMBtu on September 22, 2020 and three consecutive days in October 2020 and a high of $23.61 per MMBtu on February 18, 2021.

We also have manufacturing facilities located in the United Kingdom. These facilities are subject to fluctuations associated with the price of natural gas in Europe, which has also been volatile in recent years and reached unprecedented high levels in 2021. The major natural gas trading point for the United Kingdom is the National Balancing Point (NBP). During 2021, the daily closing price at NBP reached a low of $5.58 per MMBtu on February 23, 2021 and a high of $60.10 per MMBtu on December 22, 2021. During the three-year period ended December 31, 2021, the daily closing price at NBP reached a low of $1.04 per MMBtu on May 22, 2020 and a high of $60.10 per MMBtu on December 22, 2021. The high price for natural gas in the United Kingdom has had an effect on our local operations, resulting in the idling of certain of our United Kingdom plants in 2021. Since the third quarter of 2021, the price for natural gas in the United Kingdom has remained high. The average daily market price of natural gas at NBP for January 2022 was $25.91 per MMBtu.

The price of natural gas in North America and worldwide has been volatile in recent years and has declined on average due in part to the development of significant natural gas reserves, including shale gas, and the rapid improvement in shale gas extraction techniques, such as hydraulic fracturing and horizontal drilling. Future production of natural gas from shale formations could be reduced by regulatory changes that restrict drilling or hydraulic fracturing or increase its cost or by reduction in oil exploration and development prompted by lower oil prices resulting in production of less associated gas.

Certain of our operating facilities are located near natural gas hubs that have experienced increased natural gas development and have favorable basis differences as compared to other North American hubs. Favorable basis differences in certain regions may dissipate over time due to increases in natural gas pipeline or storage capacity in those regions. Additionally, basis differentials may become materially unfavorable due to a lack of inbound gas pipeline or storage capacity in other regions during periods of unusually high demand. Increased demand for natural gas, particularly in the Gulf Coast Region, due to increased industrial demand and increased natural gas exports, could result in increased natural gas prices. If reduced production, increased demand or changes in basis were to occur, or if other developments adversely impact the supply and demand balance for natural gas in North America or elsewhere, natural gas prices could rise, which could have a material adverse effect on our business, financial condition, results of operations and cash flows.

Adverse weather conditions may decrease demand for our fertilizer products, increase the cost of natural gas or materially disrupt our operations. Adverse weather conditions could become more frequent and/or more severe as a result of climate change.

Weather conditions that delay or disrupt field work during the planting, growing, harvesting or application periods may cause agricultural customers to use different forms of nitrogen fertilizer, which may adversely affect demand for the forms that we sell or may impede farmers from applying our fertilizers until the following application period, resulting in lower seasonal demand for our products.

Adverse weather conditions during or following harvest may delay or eliminate opportunities to apply fertilizer in the fall. Weather can also have an adverse effect on crop yields, which could lower the income of growers and impair their ability to purchase fertilizer from our customers. Adverse weather conditions could also impact transportation of fertilizer, which could disrupt our ability to deliver our products to customers on a timely basis. Our quarterly financial results can vary significantly from one year to the next due to weather-related shifts in fertilizer applications, planting schedules and purchasing patterns. Over the longer-term, changes in weather patterns may shift the periods of demand for products and even the regions to which our products are distributed, which could require us to evolve our distribution system.

In addition, we use the North American waterway system extensively to ship products from some of our manufacturing facilities to our distribution facilities and our customers. We also export nitrogen fertilizer products via seagoing vessels from deep-water docking facilities at certain of our manufacturing sites. Therefore, persistent significant changes in river or ocean water levels (either up or down, such as a result of flooding, drought or climate change, for example), may require changes to our operating and distribution activities and/or significant capital improvements to our facilities.

Weather conditions or, in certain cases, weather forecasts, also can disrupt our operations and can affect the price of natural gas, the principal raw material used to make our nitrogen products. Colder and/or longer than normal winters and warmer than normal summers increase the demand for natural gas for power generation and for residential and industrial use, which can increase the cost and/or decrease the availability of natural gas. In addition, adverse weather events not only can cause loss of power at our facilities or damage to or delays in logistics capabilities disrupting our operations, but also can impact the supply of natural gas and utilities and cause prices to rise.

All of the adverse weather conditions described above, including those impacting our customers and our operations, such as the physical risk from storms, hurricanes, tornadoes, or floods could become more frequent and/or more severe as a result of climate change. Our Donaldsonville complex is located in an area of the United States that experiences a relatively high level of hurricane or high wind activity and several of our complexes are located in areas that experience severe weather. In the last several years, there has been an increase in the frequency and severity of adverse weather conditions, including in the geographic areas where we have operations. Any significant adverse weather event or combination of adverse weather events could decrease demand for our fertilizer products, increase the cost of natural gas or materially disrupt our operations — any of which could have a material adverse impact on our business, financial condition, results of operations and cash flows.

Our operating results fluctuate due to seasonality. Our inability to predict future seasonal fertilizer demand accurately could result in our having excess inventory, potentially at costs in excess of market value.

The fertilizer business is seasonal. The degree of seasonality of our business can change significantly from year to year due to conditions in the agricultural industry and other factors. The strongest demand for our products in North America occurs during the spring planting season, with a second period of strong demand following the fall harvest. In contrast, we and other fertilizer producers generally manufacture and distribute products throughout the year. As a result, we and/or our customers generally build inventories during the low demand periods of the year to ensure timely product availability during the peak sales seasons. Seasonality is greatest for ammonia due to the short application seasons and the limited ability of our customers and their customers to store significant quantities of this product. The seasonality of fertilizer demand generally results in our sales volumes and net sales being the highest during the spring and our working capital requirements to build inventory being the highest just prior to the start of the spring planting season.

If seasonal demand is less than we expect, we may be left with excess inventory that will have to be stored (in which case our results of operations would be negatively affected by any related increased storage costs) or liquidated (in which case the selling price could be below our production, procurement and storage costs). The risks associated with excess inventory and product shortages are exacerbated by the volatility of nitrogen fertilizer prices, the constraints of our storage capacity, and the relatively brief periods during which farmers can apply nitrogen fertilizers. If prices for our products rapidly decrease, we may be subject to inventory write-downs, adversely affecting our operating results.

A change in the volume of products that our customers purchase on a forward basis, or the percentage of our sales volume that is sold to our customers on a forward basis, could increase our exposure to fluctuations in our profit margins and working capital and materially adversely affect our business, financial condition, results of operations and cash flows.

We offer our customers the opportunity to purchase products from us on a forward basis at prices and delivery dates we propose. Under our forward sales programs, customers generally make an initial cash down payment at the time of order and pay the remaining portion of the contract sales value in advance of the shipment date. Forward sales improve our liquidity by reducing our working capital needs due to the cash payments received from customers in advance of shipment of the product and allow us to improve our production scheduling and planning and the utilization of our manufacturing and distribution assets.

Any cash payments received in advance from customers in connection with forward sales are reflected on our consolidated balance sheets as a current liability until the related orders are shipped, which can take up to several months.

We believe the ability to purchase products on a forward basis is most appealing to our customers during periods of generally increasing prices for nitrogen fertilizers. Our customers may be less willing or even unwilling to purchase products on a forward basis during periods of generally decreasing or stable prices or during periods of relatively high fertilizer prices due to the expectation of lower prices in the future or limited capital resources. Fixing the selling prices of our products, often months in advance of their ultimate delivery to customers, typically causes our reported selling prices and margins to differ from spot market prices and margins available at the time of shipment. In periods of rising fertilizer prices, selling our nitrogen fertilizers on a forward basis may result in lower profit margins than if we had not sold fertilizer on a forward basis.

Operational Risks

Our operations are dependent upon raw materials provided by third parties, and any delay or interruption in the delivery of raw materials may adversely affect our business.

We use natural gas and other raw materials in the manufacture of our nitrogen products. We purchase the natural gas and other raw materials from third party suppliers. Our natural gas is transported by pipeline to our facilities by third party transportation providers or through the use of facilities owned by third parties. Delays or interruptions in the delivery of natural gas or other raw materials may be caused by, among other things, severe weather or natural disasters, unscheduled downtime, labor difficulties or shortages, insolvency of our suppliers or their inability to meet existing contractual arrangements, deliberate sabotage and terrorist incidents, or mechanical failures. In addition, the transport of natural gas by pipeline is subject to additional risks, including delays or interruptions caused by capacity constraints, leaks or ruptures. Any delay or interruption in the delivery of natural gas or other raw materials, even for a limited period, could have a material adverse effect on our business, financial condition, results of operations and cash flows.

Our transportation and distribution activities rely on third party providers and are subject to environmental, safety and regulatory oversight. This exposes us to risks and uncertainties beyond our control that may adversely affect our operations and exposes us to additional liability.

We rely on natural gas pipelines to transport raw materials to our manufacturing facilities. In addition, we rely on railroad, barge, truck, vessel and pipeline companies to coordinate and deliver finished products to our distribution system and to ship finished products to our customers. We also lease rail cars in order to ship raw materials and finished products. These transportation operations, equipment and services are subject to various hazards, including adverse operating conditions on the inland waterway system, extreme weather conditions, system failures, work stoppages, shutdowns, delays, accidents such as spills and derailments, vessel groundings and other accidents and operating hazards. Additionally, due to the aging infrastructure of certain rail lines, bridges, roadways, pipelines, river locks, and equipment that our third party service providers utilize, we may experience delays in both the receipt of raw materials or the shipment of finished product while repairs, maintenance or replacement activities are conducted. Also, certain third party service providers, such as railroads, have experienced periodic service delays or shutdowns due to capacity constraints in their systems, operational and maintenance difficulties, blockades, weather or safety-related embargoes and delays, and other events, which could impact the shipping of our products and cause disruption in our supply chain.

These transportation operations, equipment and services are also subject to environmental, safety, and regulatory oversight. Due to concerns related to accidents, discharges or other releases of hazardous substances, terrorism or the potential use of fertilizers as explosives, governmental entities could implement new or more stringent regulatory requirements affecting the transportation of raw materials or finished products.

If shipping of our products is delayed or we are unable to obtain raw materials as a result of these transportation companies' failure to operate properly, or if new and more stringent regulatory requirements were implemented affecting transportation operations or equipment, or if there were significant increases in the cost of these services or equipment, our revenues and cost of operations could be adversely affected. In addition, increases in our transportation costs, or changes in such costs relative to transportation costs incurred by our competitors, could have a material adverse effect on our business, financial condition, results of operations and cash flows.

In the United States and Canada, the railroad industry continues various efforts to limit the railroads' potential liability stemming from the transportation of Toxic Inhalation Hazard materials, such as the anhydrous ammonia we transport to and from our manufacturing and distribution facilities. For example, various railroads shift liability to shippers by contract, purport to shift liability to shippers by tariff, or otherwise seek to require shippers to indemnify and defend the railroads from and against liabilities (including in negligence, strict liability, or statutory liability) that may arise from certain acts or omissions of the railroads, third parties who may have insufficient resources, or the Company, unknown causes or acts of god. These initiatives could materially and adversely affect our operating expenses and potentially our ability to transport anhydrous ammonia and increase our liability for releases of our anhydrous ammonia while in the care, custody and control of the railroads, third parties or us, for which our insurance may be insufficient or unavailable. New or more stringent regulatory requirements also could be implemented affecting the equipment used to ship our raw materials or finished products. Restrictions on service, increases in transportation costs, or changes in such costs relative to transportation costs incurred by our competitors, and any railroad industry initiatives that may impact our ability to transport our products, could have a material adverse effect on our business, financial condition, results of operations and cash flows.

We are reliant on a limited number of key facilities.

Our nitrogen manufacturing facilities are located at nine separate nitrogen complexes, the largest of which is the Donaldsonville complex, which represented approximately 40% of our ammonia production capacity as of December 31, 2021. The suspension of operations at any of these complexes could adversely affect our ability to produce our products and fulfill our commitments, and could have a material adverse effect on our business, financial condition, results of operations and cash flows. Operational disruptions could occur for many reasons, including natural disasters, weather, unplanned maintenance and other manufacturing problems, disease, strikes or other labor unrest or transportation interruptions. For example, our Donaldsonville complex is located in an area of the United States that experiences severe weather, including a relatively high level of hurricane or high wind activity, and several of our other complexes are also located in areas that experience severe weather. Such storms and severe weather events, depending on their severity and location, have the potential not only to damage our facilities and disrupt our operations, but also to affect adversely the shipping and distribution of our products. Moreover, our facilities may be subject to failure of equipment that may be difficult to replace or have long delivery lead times, due in part to a limited number of suppliers, and could result in operational disruptions.

We are subject to risks relating to our information technology systems, and any technology disruption or cybersecurity incident could negatively affect our operations.

We rely on internal and third-party information technology and computer control systems in many aspects of our business, including internal and external communications, the management of our accounting, financial and supply chain functions and plant operations. If we do not allocate and effectively manage the resources necessary to build, implement and sustain the proper technology infrastructure, we could be subject to transaction errors, inaccurate financial reporting, processing inefficiencies, the loss of customers, business disruptions, or the loss of or damage to our confidential business information due to a security breach. In addition, our information technology systems may be damaged, disrupted or shut down due to attacks by computer hackers, computer viruses, employee error or malfeasance, power outages, hardware failures, telecommunication or utility failures, catastrophes or other unforeseen events, and in any such circumstances our system redundancy and other disaster recovery planning may be ineffective or inadequate. Security breaches of our systems (or the systems of our customers, suppliers or other business partners) could result in the misappropriation, destruction or unauthorized disclosure of confidential information or personal data belonging to us or to our employees, business partners, customers or suppliers, and may subject us to legal liability.

As with most large systems, our information technology systems (and the systems of our suppliers) have in the past been, and in the future likely will be, subject to computer viruses, malicious codes, unauthorized access and other cyber attacks, and we expect the sophistication and frequency of such attacks to continue to increase. To date, we are not aware of any significant impact on our operations or financial results from such attempts; however, unauthorized access could disrupt our business operations, result in the loss of assets, and have a material adverse effect on our business, financial condition, or results of operations. Any of the attacks, breaches or other disruptions or damage described above could: interrupt our operations at one or more sites; delay production and shipments; result in the theft of our and our customers' intellectual property and trade secrets; damage customer and business partner relationships and our reputation; result in legal claims and proceedings, liability and penalties under privacy or other laws, or increased costs for security and remediation; or raise concerns regarding our accounting for transactions. Each of these consequences could adversely affect our business, reputation and our financial statements.

Our business involves the use, storage, and transmission of information about our employees, customers, and suppliers. The protection of such information, as well as our proprietary information, is critical to us. The regulatory environment surrounding information security and privacy is increasingly demanding, with the frequent imposition of new and constantly changing requirements. Breaches of our security measures or the accidental loss, inadvertent disclosure, or unapproved dissemination of proprietary information or sensitive or confidential data about us or our employees, customers or suppliers, including the potential loss or disclosure of such information or data as a result of fraud, trickery, or other forms of deception, could expose us or our employees, customers, suppliers or other individuals affected to a risk of loss or misuse of this information, which could ultimately result in litigation and potential legal and financial liability. These events could also damage our reputation or otherwise harm our business.

Acts of terrorism and regulations to combat terrorism could negatively affect our business.

Like other companies with major industrial facilities, we may be targets of terrorist activities. Many of our plants and facilities store significant quantities of ammonia and other materials that can be dangerous if mishandled. Any damage to infrastructure facilities, such as electric generation, transmission and distribution facilities, or injury to employees, who could be direct targets or indirect casualties of an act of terrorism, may affect our operations. Any disruption of our ability to produce or distribute our products could result in a significant decrease in revenues and significant additional costs to replace, repair or insure our assets, which could have a material adverse effect on our business, financial condition, results of operations and cash flows.

Due to concerns related to terrorism or the potential use of certain nitrogen products as explosives, we are subject to various security laws and regulations. In the United States, these security laws include the Maritime Transportation Security Act of 2002 and the Chemical Facilities Anti-Terrorism Standards regulation. In addition, President Obama issued in 2013 Executive Order 13650 Improving Chemical Facility Safety and Security to improve chemical facility safety in coordination with owners and operators. Governmental entities could implement new or impose more stringent regulations affecting the security of our plants, terminals and warehouses or the transportation and use of fertilizers and other nitrogen products. These regulations could result in higher operating costs or limitations on the sale of our products and could result in significant unanticipated costs, lower revenues and reduced profit margins. We manufacture and sell certain nitrogen products that can be used as explosives. It is possible that governmental entities in the United States or elsewhere could impose additional limitations on the use, sale or distribution of nitrogen products, thereby limiting our ability to manufacture or sell those products, or that illicit use of our products could result in liability for us.

We are subject to risks associated with international operations.

Our international business operations are subject to numerous risks and uncertainties, including difficulties and costs associated with complying with a wide variety of complex laws, treaties and regulations; unexpected changes in regulatory environments; currency fluctuations; tax rates that may exceed those in the United States; earnings that may be subject to withholding requirements; and the imposition of tariffs, exchange controls or other restrictions.

Changes in governmental trade policies can lead to the imposition of new taxes, levies, duties, tariffs or quotas affecting agricultural commodities, fertilizer or industrial products. These can alter costs, trade flows, access to supplies or demand, and regional balances for our products.

Our principal reporting currency is the U.S. dollar and our business operations and investments outside the United States increase our risk related to fluctuations in foreign currency exchange rates. The main currencies to which we are exposed, besides the U.S. dollar, are the Canadian dollar, the British pound and the euro. These exposures may change over time as business practices evolve and economic conditions change. We may selectively reduce some foreign currency exchange rate risk by, among other things, requiring contracted purchases of our products to be settled in, or indexed to, the U.S. dollar or a currency freely convertible into U.S. dollars, or hedging through foreign currency derivatives. These efforts, however, may not be effective and could have a material adverse effect on our business, financial condition, results of operations and cash flows.

We are subject to anti-corruption laws and regulations and economic sanctions programs in various jurisdictions, including the U.S. Foreign Corrupt Practices Act of 1977, the United Kingdom Bribery Act of 2010, the Canadian Corruption of Foreign Public Officials Act, and economic sanctions programs administered by the United Nations, the European Union and the Office of Foreign Assets Control of the U.S. Department of the Treasury, and regulations set forth under the Comprehensive Iran Accountability Divestment Act. As a result of doing business internationally, we are exposed to a risk of violating anti-corruption laws and sanctions regulations applicable in those countries where we, our partners or agents operate. Violations of anti-corruption and sanctions laws and regulations are punishable by civil penalties, including fines, denial of export privileges, injunctions, asset seizures, debarment from government contracts (and termination of existing contracts) and revocations or restrictions of licenses, as well as criminal fines and imprisonment. The violation of applicable laws by our employees, consultants, agents or partners could subject us to penalties and could have a material adverse effect on our business, financial condition, results of operations and cash flows.

We are subject to antitrust and competition laws in various countries throughout the world. We cannot predict how these laws or their interpretation, administration and enforcement will change over time. Changes in antitrust laws globally, or in their interpretation, administration or enforcement, may limit our existing or future operations and growth.

Financial Risks

Our operations and the production and handling of our products involve significant risks and hazards. We are not fully insured against all potential hazards and risks incident to our business. Therefore, our insurance coverage may not adequately cover our losses.

Our operations are subject to hazards inherent in the manufacture, transportation, storage and distribution of chemical products, including ammonia, which is highly toxic and can be corrosive, and ammonium nitrate, which is explosive. These hazards include: explosions; fires; severe weather and natural disasters; train derailments, collisions, vessel groundings and other transportation and maritime incidents; leaks and ruptures involving storage tanks, pipelines and rail cars; spills, discharges and releases of toxic or hazardous substances or gases; deliberate sabotage and terrorist incidents; mechanical failures; unscheduled plant downtime; labor difficulties and other risks. Some of these hazards can cause bodily injury and loss of life, severe damage to or destruction of property and equipment and environmental damage, and may result in suspension of operations for an extended period of time and/or the imposition of civil or criminal penalties and liabilities.

In April 2013, there was a fire and explosion at the West Fertilizer Co. fertilizer storage and distribution facility in West, Texas. According to published reports, 15 people were killed and approximately 200 people were injured in the incident, and the fire and explosion damaged or destroyed a number of homes and buildings around the facility. Various subsidiaries of CF Industries Holdings, Inc. (the CF Entities) were named as defendants along with other companies in lawsuits alleging various theories of negligence, strict liability, and breach of warranty under Texas law. Although we did not own or operate the facility or directly sell our products to West Fertilizer Co., products that the CF Entities manufactured and sold to others were delivered to the facility and may have been stored at the West facility at the time of the incident. Nearly all of the cases, including all wrongful death and personal injury claims, have been resolved pursuant to confidential settlements that have been or we expect will be fully funded by insurance. The remaining subrogation and statutory indemnification claims total approximately

$37 million, before prejudgment interest. The increased focus on the risks associated with fertilizers as a result of the incident could impact the regulatory environment and requirements applicable to fertilizer manufacturing and storage facilities.

We maintain property, business interruption, casualty and liability insurance policies, but we are not fully insured against all potential hazards and risks incident to our business. If we were to incur significant liability for which we were not fully insured, it could have a material adverse effect on our business, financial condition, results of operations and cash flows. We are subject to various self-insured retentions, deductibles and limits under these insurance policies. The policies also contain exclusions and conditions that could have a material adverse impact on our ability to receive indemnification thereunder. Our policies are generally renewed annually. As a result of market conditions, our premiums, self-insured retentions and deductibles for certain insurance policies can increase substantially and, in some instances, certain insurance may become unavailable or available only for reduced amounts of coverage. In addition, significantly increased costs could lead us to decide to reduce, or possibly eliminate, coverage. There can be no assurance that we will be able to buy and maintain insurance with adequate limits and reasonable pricing terms and conditions.

Our substantial indebtedness could adversely affect our cash flow, prevent us from fulfilling our obligations and impair our ability to pursue or achieve other business objectives.

As of December 31, 2021, we had approximately $3.5 billion of total funded indebtedness, consisting primarily of unsecured senior notes with varying maturity dates between 2023 and 2044, or approximately 36% of our total capitalization (total debt plus total stockholders' equity), and an additional $750 million of unsecured senior borrowing availability (reflecting no outstanding borrowings and no outstanding letters of credit) for general corporate purposes under our revolving credit agreement (the Revolving Credit Agreement). Our substantial debt service obligations will have an impact on our earnings and cash flow for so long as the indebtedness is outstanding.

Our indebtedness could, as a result of our debt service obligations or through the operation of the financial and other restrictive covenants to which we are subject under the agreements and instruments governing that indebtedness and otherwise, have important consequences. For example, it could:

- make it more difficult for us to pay or refinance our debts as they become due during adverse economic and industry conditions because any related decrease in revenues could cause us not to have sufficient cash flows from operations to make our scheduled debt payments;
- cause us to be less able to take advantage of significant business opportunities, such as acquisition opportunities, and to react to changes in market or industry conditions;
- cause us to use a portion of our cash flow from operations for debt service, reducing the availability of cash to fund working capital and capital expenditures, and other business activities;
- cause us to be more vulnerable to general adverse economic and industry conditions;
- expose us to the risk of increased interest rates because certain of our borrowings, including borrowings under the Revolving Credit Agreement, could be at variable rates of interest;
- make us more leveraged than some of our competitors, which could place us at a competitive disadvantage;
- restrict our ability to pay dividends on our common stock or utilize excess cash to repurchase shares of our common stock;
- limit our ability to borrow additional amounts to fund working capital, capital expenditures and other general corporate purposes; and
- result in our credit ratings being downgraded, which could increase the cost of further borrowings.

We expect to consider options to refinance our outstanding indebtedness from time to time. Our ability to obtain any financing, whether through the issuance of new debt securities or otherwise, and the terms of any such financing are dependent on, among other things, our financial condition, financial market conditions within our industry and generally, credit ratings and numerous other factors, including factors beyond our control. Consequently, in the event that we need to access the credit markets, including to refinance our debt, there can be no assurance that we will be able to obtain financing on acceptable terms or within an acceptable timeframe, if at all. An inability to obtain financing with acceptable terms when needed could have a material adverse effect on our business, financial condition, results of operations and cash flows.

The terms of our existing indebtedness allow us to incur significant additional debt. If we incur additional indebtedness, the risks that we face as a result of our leverage could intensify. If our financial condition or operating results deteriorate, our relations with our creditors, including the holders of our outstanding debt securities, the lenders under the Revolving Credit Agreement and our suppliers, may be materially and adversely affected.

A failure to satisfy the financial maintenance covenants under the Revolving Credit Agreement or a breach of the covenants under any of the agreements governing our indebtedness could limit the borrowing availability under the Revolving Credit Agreement or result in an event of default under such agreements.

Our ability to comply with the covenants in the agreements and instruments governing our indebtedness, including the consolidated interest coverage ratio and consolidated net leverage ratio maintenance covenants contained in the Revolving Credit Agreement, will depend upon our future performance and various other factors, such as market prices for our nitrogen products, natural gas prices and other business, competitive and regulatory factors, many of which are beyond our control. We may not be able to maintain compliance with all of these covenants. In that event, we may not be able to access the borrowing availability under the Revolving Credit Agreement and we would need to seek an amendment to our debt agreements or would need to refinance our indebtedness. There can be no assurance that we can obtain future amendments or waivers of our debt agreements and instruments, or refinance our debt, and, even if we were able to do so, such relief might only last for a limited period, potentially necessitating additional amendments, waivers or refinancings. Any noncompliance by us with the covenants under our debt agreements and instruments could result in an event of default under those debt agreements and instruments. An event of default under an agreement or instrument governing any of our indebtedness may allow our creditors to accelerate the related debt and may result in the acceleration of any other debt to which a cross-acceleration or cross-default provision applies. If our lenders or holders of our debt securities accelerate the repayment of borrowings, we may be forced to liquidate certain assets to repay all or part of our indebtedness, which could materially and adversely impair our business operations. An event of default under the Revolving Credit Agreement would permit the lenders thereunder to terminate all commitments to extend further credit under the Revolving Credit Agreement. In the event our creditors accelerate the repayment of our indebtedness, we cannot assure that we would have sufficient assets to make such repayment.

Potential future downgrades of our credit ratings could adversely affect our access to capital, cause vendors to change their credit terms for doing business with us, and could otherwise have a material adverse effect on us.

As of February 14, 2022, our corporate credit rating by S&P Global Ratings is BBB- with a stable outlook; our corporate credit rating by Moody's Investor Services, Inc. is Ba1 with a positive outlook; and our corporate credit rating with Fitch Ratings, Inc. is BBB- with a stable outlook. These ratings and our current credit condition affect, among other things, our ability to access new capital, especially debt, as well as the payment terms that vendors are willing to provide us. Negative changes in these ratings may result in more stringent covenants and higher interest rates under the terms of any new debt, and could cause vendors to shorten our payment terms, require us to pay in advance for materials or services, or provide letters of credit, security, or other credit enhancements in order to do business with us.

Tax matters, including changes in tax laws or rates, adverse determinations by taxing authorities and imposition of new taxes could adversely affect our results of operations and financial condition.

We are subject to taxes in (i) the United States, where most of our operations are located, and (ii) several foreign jurisdictions where our subsidiaries are organized or conduct business. Tax laws or rates in the various jurisdictions in which we operate may be subject to significant change. Our future effective tax rate could also be affected by changes in our mix of earnings from jurisdictions with differing statutory tax rates and tax systems, changes in valuation of deferred tax assets and liabilities or changes in tax laws or their interpretation.

We are also subject to regular reviews, examinations and audits by the Internal Revenue Service (IRS) and other taxing authorities in jurisdictions where we conduct business. Although we believe our tax estimates are reasonable, if a taxing authority disagrees with the positions we have taken, we could face additional tax liabilities, including interest and penalties. There can be no assurance that payment of such additional amounts upon final adjudication of any disputes will not have a material impact on our financial condition, results of operations and cash flows.

We have used the cash we generate outside the United States primarily to fund development of our business in non-U.S. jurisdictions. If the funds generated by our U.S. business are not sufficient to meet our need for cash in the United States, we may need to repatriate a portion of our future international earnings to the United States. Under the tax laws of the foreign countries in which we operate, those international earnings could be subject to withholding taxes when repatriated; therefore, the repatriation of those earnings could result in an increase in our worldwide effective tax rate and an increase in our use of cash to pay these taxes.

We also need to comply with other new, evolving or revised tax laws and regulations. The enactment of, or increases in, carbon taxes, tariffs or value added taxes, or other changes in the application of existing taxes, in markets in which we are currently active, or may be active in the future, or on specific products that we sell or with which our products compete, could have an adverse effect on our financial condition and results of operations.

The United States and other countries in which we operate are in the process of implementing the Organization for Economic Co-operation and Development's (OECD) Base Erosion and Profit Shifting Project (BEPS), which is intended to improve tax disclosure and transparency and eliminate structures and activities that could be perceived by a particular country as resulting in tax avoidance. The OECD has partially developed and continues with development of a framework to assist member countries in adopting BEPS related legislation. Each country is permitted to introduce its own legislation to implement BEPS legislation. As a number of our business operations do business across country lines, we are subject to BEPS. The implementation of BEPS could result in tax changes and may adversely affect our provision for income taxes, results of operations and cash flows. In some cases, BEPS legislation could result in double taxation on a portion of our profits without an appropriate mechanism to recover the incremental tax amount in another jurisdiction.

Our business is subject to risks involving derivatives and the risk that our hedging activities might not prevent losses.

We may utilize natural gas derivatives to hedge our financial exposure to the price volatility of natural gas, the principal raw material used in the production of nitrogen-based products. We have used natural gas futures, swaps and option contracts traded in over-the-counter markets or on exchanges. We have also used fixed-price, physical purchase and sales contracts to hedge our exposure to natural gas price volatility. In order to manage our exposure to changes in foreign currency exchange rates, we may from time to time use foreign currency derivatives (primarily forward exchange contracts).

Our use of derivatives can result in volatility in reported earnings due to the unrealized mark-to-market adjustments that occur from changes in the value of the derivatives that do not qualify for, or to which we do not apply, hedge accounting. To the extent that our derivative positions lose value, we may be required to post collateral with our counterparties, adversely affecting our liquidity.

Hedging arrangements are imperfect and unhedged risks will always exist. In addition, our hedging activities may themselves give rise to various risks that could adversely affect us. For example, we are exposed to counterparty credit risk when our derivatives are in a net asset position. The counterparties to our derivatives are multi-national commercial banks, major financial institutions or large energy companies.

Our liquidity could be negatively impacted by a counterparty default on settlement of one or more of our derivative financial instruments or by the triggering of any cross default provisions or credit support requirements against us. Additionally, the International Swaps and Derivative Association master netting arrangements for most of our derivative instruments contain credit-risk-related contingent features, such as cross default provisions and credit support requirements. In the event of certain defaults or a credit ratings downgrade, our counterparty may request early termination and net settlement of certain derivative trades or may require us to collateralize derivatives in a net liability position.

At other times we may not utilize derivatives or derivative strategies to hedge certain risks or to reduce the financial exposure of price volatility. As a result, we may not prevent certain material adverse impacts that could have been mitigated through the use of derivative strategies.

Environmental and Regulatory Risks

We are subject to numerous environmental, health and safety laws, regulations and permitting requirements, as well as potential environmental liabilities, which may require us to make substantial expenditures.

We are subject to numerous environmental, health and safety laws and regulations in the United States, Canada, the United Kingdom, the European Union, the Republic of Trinidad and Tobago and other locations, including laws and regulations relating to the generation and handling of hazardous substances and wastes; the introduction of new chemicals or substances into a market; the cleanup of hazardous substance releases; the discharge of regulated substances to air or water; and the demolition and cleanup of existing plant sites upon permanent closure. In the United States, these laws include the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the Toxic Substances Control Act and various other federal, state, provincial, local and international laws. In November 2021, the Infrastructure Investment and Jobs Act reinstated and doubled the Superfund tax on chemicals, including ammonia and nitric acid. These taxes will be in place from July 1, 2022 through December 31, 2031 and apply to all domestic and imported products not used as fertilizer.

As a producer of nitrogen fertilizer products working with hazardous substances, our business faces risks of spills, discharges or other releases of those substances into the environment. Certain environmental laws, including CERCLA, impose joint and several liability, without regard to fault, for cleanup costs on persons who have disposed of or released hazardous substances into the environment. Given the nature of our business, we have incurred, are incurring currently, and are likely to incur periodically in the future, liabilities under CERCLA and other environmental cleanup laws at our current facilities or facilities previously owned by us or other acquired businesses, adjacent or nearby third-party facilities or offsite disposal locations. The costs associated with future cleanup activities that we may be required to conduct or finance may be material. Additionally, we may become liable to third parties for damages, including personal injury and property damage, resulting from the disposal or release of hazardous substances into the environment.

Violations of environmental, health and safety laws can result in substantial penalties, court orders to install pollution-control equipment, civil and criminal sanctions, permit revocations and facility shutdowns. Environmental, health and safety laws change regularly and have tended to become more stringent over time. As a result, we have not always been and may not always be in compliance with all environmental, health and safety laws and regulations. We may be subject to more stringent enforcement of existing or new environmental, health and safety laws in the future. Additionally, future environmental, health and safety laws and regulations or reinterpretation of current laws and regulations may require us to make substantial expenditures. Our costs to comply with, or any liabilities under, these laws and regulations could have a material adverse effect on our business, financial condition, results of operations and cash flows.

From time to time, our production, distribution or storage of anhydrous ammonia and other hazardous or regulated substances has resulted in accidental releases that have temporarily disrupted our operations and/or resulted in liability for administrative penalties and/or claims for personal injury. To date, our costs to resolve these liabilities have not been material. However, we could incur significant costs if our liability coverage is not sufficient to pay for all or a large part of any judgments against us, or if our insurance carrier refuses coverage for these losses.

We hold numerous environmental and other governmental permits and approvals authorizing operations at each of our facilities. Expansion or modification of our operations is predicated upon securing necessary environmental or other permits or approvals. A decision by a government agency to deny or delay issuing a new or renewed regulatory material permit or approval, or to revoke or substantially modify an existing permit or approval, or a determination that we have violated a law or permit as a result of a governmental inspection of our facilities could have a material adverse effect on our ability to continue operations at our facilities and on our business, financial condition, results of operations and cash flows.

Future regulatory or legislative restrictions on greenhouse gas (GHG) emissions in the jurisdictions in which we operate could materially adversely affect our business, financial condition, results of operations and cash flows.

Our production facilities emit GHGs, such as carbon dioxide and nitrous oxide, and natural gas, a fossil fuel, is a primary raw material used in our nitrogen production process. Because conventional ammonia production generates CO_2 as an unavoidable chemical byproduct, ammonia production globally is considered an emissions- and energy-intensive industry. We are subject to GHG regulations in the United Kingdom, Canada and the United States. In the United States, our existing facilities, which are considered large emitters of GHGs, currently are only subject to GHG emissions reporting obligations. New facilities that we build, or existing facilities that we modify in the future, could also be subject to GHG emissions standards included in their air permits.

Beginning on January 1, 2021, our U.K. manufacturing plants became subject to the UK Emissions Trading Scheme (UK ETS), which generally requires us to hold or obtain emissions allowances to offset GHG emissions from those aspects of our operations that are subject to regulation under this program. Given the recent development of the UK ETS, there is substantial uncertainty as to the liquidity in the market for, and the stability of the price of, emission allowances that will be necessary for compliance with the regulations. Our manufacturing plants in the Alberta and Ontario provinces of Canada are subject to provincial or federal laws that impose a price on excess GHG emissions. Each of these laws establishes carbon dioxide equivalent (CO_2e) emissions standards applicable to our facilities in terms of emissions per unit of production, with the provincial laws and the federal law using different formulas for establishing these intensity limits and changes in these limits over time. If CO_2e emissions exceed the applicable limits, the excess emissions must be offset, either through obtaining qualifying emission credits or offsets or by making a payment for each ton of excess emissions.

Increasing concern over the impacts of climate change is driving countries to establish ever more ambitious GHG reduction targets. Approximately 200 countries, including the United States, Canada, the United Kingdom and the members of the European Union (EU), have joined the Paris Agreement, an international agreement intended to provide a framework pursuant to which the parties to the agreement will attempt to hold the increase in global average temperatures to below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5ºC above pre-industrial levels. Each signatory is required to develop its own national plan to attain this objective. In December 2020, the United Kingdom announced a target to reduce GHG emissions 68% from 1990 levels by 2030. Canada has increased its emissions reduction target under the Paris Agreement to 40-45% (up from 30%) below 2005 levels by 2030. In April 2021, the United States increased its goal to reduce emissions to 50-52% below 2005 levels by 2030. The Biden administration has also issued several executive orders focused on climate change to promote more active management of these issues across the executive branch, including by the EPA and the Departments of Agriculture, Interior, Transportation and Treasury.

In July 2021, the EU proposed a new carbon border adjustment mechanism that would require importers of certain products, including nitrogen fertilizers, to pay an import tax approximately equal to the costs incurred by EU producers of the products starting in 2026. Other governments are also considering border adjustment mechanisms for carbon intensive products. The imposition of any carbon border adjustment taxes may distort investment and trade flows, which could adversely impact our business.

More stringent GHG regulations, if they are enacted, are likely to have a significant impact on us, because our production facilities emit GHGs such as carbon dioxide and nitrous oxide and because natural gas, a fossil fuel, is a primary raw material used in our nitrogen production process. Regulation of GHGs may require us to make changes in our operating activities that would increase our operating costs, reduce our efficiency, limit our output, require us to make capital improvements to our facilities, increase our costs for or limit the availability of energy, raw materials or transportation, or otherwise materially adversely affect our business, financial condition, results of operations and cash flows. Changes could also be made to tax policies related to decarbonization and clean energy that could impact our business and investment decisions. In addition, to the extent that GHG restrictions are not imposed in countries where our competitors operate or are less stringent than regulations that may be imposed in the United States, Canada or the United Kingdom, our competitors may have cost or other competitive advantages over us.

Strategic Risks

The market for green and blue (low-carbon) ammonia may be slow to develop, may not develop to the size expected or may not develop at all. Moreover, we may not be successful in the development and implementation of our green and blue ammonia projects in a timely or economic manner, or at all, due to a number of factors, many of which are beyond our control.

The market for green and blue (low-carbon) ammonia is developing and evolving, may not develop to the size or at the rate we expect, and is dependent in part on the developing market for green and blue (low-carbon) hydrogen, for which ammonia can serve as a transport and storage mechanism. These markets are heavily influenced by demand for clean energy, technology evolution and federal, state and local government laws, regulations and policies concerning carbon emissions, clean energy, and corporate accountability in the United States and abroad.

We believe the demand for green and blue ammonia could take several years to materialize and then ten or more years to fully develop and mature, and we cannot be certain that this market or the market for green and blue hydrogen will grow to the size or at the rate we expect. Hydrogen currently accounts for less than 1% of the world’s energy needs.

The recognition and acceptance of green and blue ammonia as a transport and storage mechanism for green and blue hydrogen, the use of green and blue ammonia as a fuel in its own right, the use of green and blue ammonia as a fertilizer, and the development and growth of end market demand and applications for green and blue hydrogen and green and blue ammonia are uncertain and dependent on a number of factors outside of our control. These factors include, among others, the extent to which and rate at which cost competitive global renewable energy capacity increases, the pricing of traditional and alternative sources of energy, the realization of technological improvements required to increase the efficiency and lower the costs of production of green and blue ammonia, the regulatory environment, the rate and extent of infrastructure investment and development, which may be affected by the relevant parties’ ability to obtain permits for these investments, the availability of tax benefits and other incentives and our ability to provide green and blue ammonia offerings cost-effectively. In addition, further development of alternative decarbonization technologies may result in viable alternatives to the use of blue ammonia for many potential decarbonization applications, resulting in lower than expected market demand growth relative to our current expectations. If a sustainable market for green or blue ammonia or hydrogen fails to develop, develops more slowly than we anticipate, or develops in a way that is not viable to serve with our assets and capabilities, we may decide not to implement, or may not be successful in implementing, one or more elements of our multi-year strategic plan.

Our clean energy strategy also depends on the realization of certain technical improvements required to increase the efficiency and lower the costs of production of green and blue ammonia. Over time, as we seek to convert additional existing facilities to green and blue production and further expand our green and blue ammonia production capacity, we may face operational difficulties and execution risks related to the design, development and construction. If our assumptions about the engineering and processing characteristics necessary to successfully build the facility capacity that we are contemplating and to scale up to larger production quantities prove to be incorrect, we may be unable to produce substantial quantities of green or blue ammonia, and the cost to construct or convert such green and blue ammonia facilities, or the production costs associated with the operation of such facilities, may be higher than we project. The production of blue ammonia depends to a large extent upon development by third parties of carbon capture and storage wells, which are not well-established technologies and are subject to a permitting process and operational risks, which may result in delays, impact viability in some or all situations, or create long-term liabilities.

We may not be successful in the expansion of our business.

We routinely consider possible expansions of our business, both within the United States and elsewhere. Major investments in our business, including acquisitions, partnerships, joint ventures, business combination transactions or other major investments, such as our green and blue ammonia projects, require significant managerial resources, the diversion of which from our other activities or opportunities may negatively affect the existing operations of our business. We may be unable to identify or successfully compete for certain acquisition targets, which may hinder or prevent us from acquiring a target or completing other transactions. The risks of any expansion of our business through investments, acquisitions, partnerships, joint ventures or business combination transactions may increase due to the significant capital and other resources that we may have to commit to any such expansion, which may not be recoverable if the expansion initiative to which they were devoted is ultimately not implemented. In addition, these efforts may require capital resources that could otherwise be used for the improvement and expansion of our existing business. As a result of these and other factors, including general economic risk, we may not be able to realize our projected returns from any future acquisitions, partnerships, joint ventures, business combination transactions or other major investments. Among the risks associated with the pursuit and consummation of acquisitions, partnerships, joint ventures or other major investments or business combinations are those involving:

- difficulties in integrating the parties' operations, systems, technologies, products, cultures, and personnel;
- incurrence of significant transaction-related expenses;
- potential integration or restructuring costs;
- potential impairment charges related to the goodwill, intangible assets or other assets to which any such transaction relates, in the event that the economic benefits of such transaction prove to be less than anticipated;
- other unanticipated costs associated with such transactions;
- our ability to achieve operating and financial efficiencies, synergies and cost savings;
- our ability to obtain the desired financial or strategic benefits from any such transaction;
- the parties' ability to retain key business relationships, including relationships with employees, customers, partners and suppliers;
- potential loss of key personnel;
- entry into markets or involvement with products with which we have limited current or prior experience or in which competitors may have stronger positions;
- assumption of contingent liabilities, including litigation;
- exposure to unanticipated liabilities, including litigation;
- differences in the parties' internal control environments, which may require significant time and resources to resolve in conformity with applicable legal and accounting standards;
- increased scope, geographic diversity and complexity of our operations;
- the tax effects of any such transaction; and
- the potential for costly and time-consuming litigation, including stockholder lawsuits.

Moreover, legal proceedings or other risks from acquisitions and other business combinations may arise years after a transaction has been completed and may involve matters unrelated to the business acquired. For example, we were recently named along with other parties in certain product liability actions relating to a product containing the herbicide paraquat, which was allegedly sold, manufactured, distributed and/or marketed by Terra Industries Inc. (Terra) before it exited such lines of business, which exit occurred more than ten years before CF Holdings acquired Terra in April 2010.

In addition, major capital projects may be dependent on the availability and performance of engineering firms, construction firms, equipment and material suppliers, transportation providers and other vendors necessary to design and implement those projects on a timely basis and on acceptable terms. Major investments such as capital improvements at our facilities are subject to a number of risks, any of which could prevent us from completing capital projects in a timely or economic manner or at all, including, without limitation, cost overruns, non-performance of third parties, the inability to obtain necessary permits or other permitting matters, adverse weather, defects in materials and workmanship, labor and raw material shortages, transportation constraints, engineering and construction change orders, errors in design, construction or start-up, and other unforeseen difficulties.

International acquisitions, partnerships, joint ventures, investments or business combinations and other international expansions of our business involve additional risks and uncertainties, including, but not limited to:

- the impact of particular economic, tax, currency, political, legal and regulatory risks associated with specific countries;
- challenges caused by distance and by language and cultural differences;
- difficulties and costs of complying with a wide variety of complex laws, treaties and regulations;
- unexpected changes in regulatory environments;

- political and economic instability, including the possibility for civil unrest;
- nationalization of properties by foreign governments;
- tax rates that may exceed those in the United States, and earnings that may be subject to withholding requirements;
- the imposition of tariffs, exchange controls or other restrictions; and
- the impact of currency exchange rate fluctuations.

If we finance acquisitions, partnerships, joint ventures, business combination transactions or other major investments by issuing equity or convertible or other debt securities or loans, our existing stockholders may be diluted or we could face constraints under the terms of, and as a result of the repayment and debt-service obligations under, the additional indebtedness. A business combination transaction between us and another company could result in our stockholders receiving cash or shares of another entity on terms that such stockholders may not consider desirable. Moreover, the regulatory approvals associated with a business combination may result in divestitures or other changes to our business, the effects of which are difficult to predict.

We are subject to risk associated with our strategic venture with CHS Inc. (CHS).

We may not realize the full benefits from our strategic venture with CHS that are expected. The realization of the expected benefits of the CHS strategic venture depends on our ability to operate and manage the strategic venture successfully, and on the market prices of the nitrogen fertilizer products that are the subject of our supply agreement with CHS over the life of the agreement, among other factors. Additionally, any challenges related to the CHS strategic venture could harm our relationships with CHS or our other customers.

COVID-19 Pandemic Risk

Our business and operations may be adversely affected by the COVID-19 pandemic.

The coronavirus disease 2019 (COVID-19) pandemic could have a material and adverse effect on our business, financial condition, results of operations or cash flows. The rapid spread of COVID-19 has resulted in governmental authorities implementing numerous measures to try to contain the virus, such as travel bans and restrictions, quarantines, shelter in place orders and shutdowns. If significant portions of our workforce are unable to work effectively, including because of illness, quarantines, government actions, facility closures or other restrictions, we may be unable to meet customer demand or perform fully under our contracts. The COVID-19 pandemic could also affect our customers, suppliers and third party service providers, including transportation providers, and result in restrictions on or disruptions of transportation, port closures or increased border controls or closures, or other impacts on domestic and global supply chains or distribution channels, which could increase our costs and/or limit our ability to meet customer demand.

In addition, the COVID-19 pandemic could reduce, and has in the past reduced, the demand for energy, including crude oil, as well as natural gas and coal, which are nitrogen feedstocks. Reduced demand for nitrogen feedstocks could reduce the cost of nitrogen production outside of North America, which could increase global nitrogen supply and reduce the market prices of our products. Lower demand for crude oil could also reduce the supply and therefore increase the cost of natural gas, which is the principal raw material used in our production of nitrogen products. The pandemic has also disrupted traditional food supply chains, which may have a material impact on livestock and food demand, including the demand for corn. Each of these consequences could have a material adverse effect on our business, financial condition, results of operations or cash flows.

We are unable to predict the ultimate impact the COVID-19 pandemic may have on our business, financial condition, results of operations or cash flows. The extent to which our operations may be impacted by COVID-19 will depend on future developments, which are highly uncertain and cannot be accurately predicted, including the further spread of the virus, the rise of new variants of COVID-19, the duration of the pandemic and the type and duration of actions that may be taken by various governmental authorities in response to these developments. In 2020, the pandemic significantly increased global market uncertainty and caused an economic slowdown, which resulted in a global recession. Persistent weakness in economic activity caused by a deterioration of global market and economic conditions could materially adversely affect our business, financial condition, results of operations or cash flows.

FORWARD LOOKING STATEMENTS

From time to time, in this Annual Report on Form 10-K as well as in other written reports and oral statements, we make forward-looking statements that are not statements of historical fact and may involve a number of risks and uncertainties. These statements relate to analyses and other information that are based on forecasts of future results and estimates of amounts not yet determinable. These statements may also relate to our prospects, future developments and business strategies. We have used the words “anticipate,” “believe,” “could,” “estimate,” “expect,” “intend,” “may,” “plan,” “predict,” “project,” “will” or “would” and similar terms and phrases, including references to assumptions, to identify forward-looking statements in this document. These forward-looking statements are made based on currently available competitive, financial and economic data, our current expectations, estimates, forecasts and projections about the industries and markets in which we operate and management’s beliefs and assumptions concerning future events affecting us. These statements are not guarantees of future performance and are subject to risks, uncertainties and factors relating to our operations and business environment, all of which are difficult to predict and many of which are beyond our control. Therefore, our actual results may differ materially from what is expressed in or implied by any forward-looking statements. We want to caution you not to place undue reliance on any forward-looking statements. We do not undertake any responsibility to release publicly any revisions to these forward-looking statements to take into account events or circumstances that occur after the date of this document. Additionally, we do not undertake any responsibility to provide updates regarding the occurrence of any unanticipated events which may cause actual results to differ from those expressed or implied by the forward-looking statements contained in this document.

Important factors that could cause actual results to differ materially from our expectations are disclosed under “Risk Factors” and elsewhere in this Annual Report on Form 10-K. Such factors include, among others:

- the cyclical nature of our business and the impact of global supply and demand on our selling prices;
- the global commodity nature of our nitrogen products, the conditions in the international market for nitrogen products, and the intense global competition from other producers;
- conditions in the United States, Europe and other agricultural areas, including the influence of governmental policies and technological developments on the demand for agricultural products;
- the volatility of natural gas prices in North America and the United Kingdom;
- weather conditions and the impact of severe adverse weather events;
- the seasonality of the fertilizer business;
- the impact of changing market conditions on our forward sales programs;
- difficulties in securing the supply and delivery of raw materials, increases in their costs or delays or interruptions in their delivery;
- reliance on third party providers of transportation services and equipment;
- our reliance on a limited number of key facilities;
- risks associated with cyber security;
- acts of terrorism and regulations to combat terrorism;
- risks associated with international operations;
- the significant risks and hazards involved in producing and handling our products against which we may not be fully insured;
- our ability to manage our indebtedness and any additional indebtedness that may be incurred;
- our ability to maintain compliance with covenants under our revolving credit agreement and the agreements governing our indebtedness;
- downgrades of our credit ratings;
- risks associated with changes in tax laws and disagreements with taxing authorities;
- risks involving derivatives and the effectiveness of our risk measurement and hedging activities;
- potential liabilities and expenditures related to environmental, health and safety laws and regulations and permitting requirements;
- regulatory restrictions and requirements related to greenhouse gas emissions;
- the development and growth of the market for green and blue (low-carbon) ammonia and the risks and uncertainties relating to the development and implementation of our green and blue ammonia projects;
- risks associated with expansions of our business, including unanticipated adverse consequences and the significant resources that could be required;
- risks associated with the operation or management of the CHS strategic venture, risks and uncertainties relating to the market prices of the fertilizer products that are the subject of our supply agreement with CHS over the life of the supply agreement, and the risk that any challenges related to the CHS strategic venture will harm our other business relationships; and
- the impact of the novel coronavirus disease 2019 (COVID-19) pandemic on our business and operations.

ITEM 1B. UNRESOLVED STAFF COMMENTS.

None.

ITEM 2. PROPERTIES.

Information regarding our facilities and properties is included in Item 1. Business—Nitrogen Manufacturing Facilities and Item 1. Business—Storage Facilities and Other Properties.

ITEM 3. LEGAL PROCEEDINGS.

Litigation

West Fertilizer Co.

On April 17, 2013, there was a fire and explosion at the West Fertilizer Co. fertilizer storage and distribution facility in West, Texas. According to published reports, 15 people were killed and approximately 200 people were injured in the incident, and the fire and explosion damaged or destroyed a number of homes and buildings around the facility. Various subsidiaries of CF Industries Holdings, Inc. (the CF Entities) were named as defendants along with other companies in lawsuits filed in 2013, 2014 and 2015 in the District Court of McLennan County, Texas by the City of West, individual residents of the County and other parties seeking recovery for damages allegedly sustained as a result of the explosion. The cases were consolidated for discovery and pretrial proceedings in the District Court of McLennan County under the caption "In re: West Explosion Cases." The two-year statute of limitations expired on April 17, 2015. As of that date, over 400 plaintiffs had filed claims, including at least 9 entities, 325 individuals, and 80 insurance companies. Plaintiffs allege various theories of negligence, strict liability, and breach of warranty under Texas law. Although we did not own or operate the facility or directly sell our products to West Fertilizer Co., products that the CF Entities manufactured and sold to others were delivered to the facility and may have been stored at the West facility at the time of the incident.

The Court granted in part and denied in part the CF Entities' Motions for Summary Judgment in August 2015. Nearly all of the cases, including all wrongful death and personal injury claims, have been resolved pursuant to confidential settlements that have been or we expect will be fully funded by insurance. The remaining subrogation and statutory indemnification claims total approximately $37 million, before prejudgment interest, and are in various stages of discovery and pre-trial proceedings. The remaining claims are expected to be set for trial in 2022. We believe we have strong legal and factual defenses and intend to continue defending the CF Entities vigorously in the remaining lawsuits. The Company cannot provide a range of reasonably possible loss due to the uncertain nature of this litigation, including uncertainties around the potential allocation of responsibility by a jury to other defendants or responsible third parties. The recognition of a potential loss in the future in the West Fertilizer Co. litigation could negatively affect our results in the period of recognition. However, based upon currently available information, we expect any potential loss to be fully indemnified by insurance and do not believe that this litigation will have a material adverse effect on our consolidated financial position, results of operations or cash flows.

Environmental

For information on pending proceedings relating to environmental remediation matters, see Item 1. Business—Environmental, Health and Safety—CERCLA/Remediation Matters and Note 21—Contingencies to our consolidated financial statements included in Item 8 of this report.

ITEM 4. MINE SAFETY DISCLOSURES.

Not applicable.

PART II

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

Our common stock is traded on the New York Stock Exchange under the symbol "CF." As of February 14, 2022, there were 677 stockholders of record.

The following table sets forth share repurchases, on a trade date basis, for each of the three months of the quarter ended December 31, 2021:

	Issuer Purchases of Equity Securities			
Period	Total number of shares (or units) purchased	Average price paid per share (or unit)[1]	Total number of shares (or units) purchased as part of publicly announced plans or programs[2]	Maximum number (or approximate dollar value) of shares (or units) that may yet be purchased under the plans or programs (in thousands)[2]
October 1, 2021 - October 31, 2021	7,717 [3]	$ 60.56	—	$ 513,429
November 1, 2021 - November 30, 2021	656,695 [4]	64.32	652,352	471,441
December 1, 2021 - December 31, 2021	6,816,628 [5]	65.85	6,816,416	22,577
Total	7,481,040	$ 65.71	7,468,768	

(1) Average price paid per share of CF Industries Holdings, Inc. (CF Holdings) common stock repurchased under the 2019 Stock Repurchase Program, as defined below, is the execution price, excluding commissions paid to brokers.

(2) On February 13, 2019, we announced that our Board of Directors authorized the repurchase of up to $1 billion of CF Holdings common stock through December 31, 2021 (the 2019 Share Repurchase Program). On November 3, 2021, we announced that our Board of Directors authorized the repurchase of up to $1.5 billion of CF Holdings common stock from January 1, 2022 through December 31, 2024 (the 2021 Share Repurchase Program). These share repurchase programs are discussed in Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations—Liquidity and Capital Resources—Share Repurchase Programs and in Note 19—Stockholders' Equity, in the notes to the consolidated financial statements included in Item 8. Financial Statements and Supplementary Data.

(3) Represents shares withheld to pay employee tax obligations upon the lapse of restrictions on restricted stock units and upon the exercise of nonqualified stock options, and shares withheld to cover the price of shares issued upon the exercise of nonqualified stock options.

(4) Includes 4,343 shares withheld to pay employee tax obligations upon the lapse of restrictions on restricted stock units and performance restricted stock units.

(5) Includes 212 shares withheld to pay employee tax obligations upon the lapse of restrictions on restricted stock units.

ITEM 6. [RESERVED]

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

You should read the following discussion and analysis in conjunction with the consolidated financial statements and related notes included in Item 8. Financial Statements and Supplementary Data. All references to "CF Holdings," "we," "us," "our" and "the Company" refer to CF Industries Holdings, Inc. and its subsidiaries, except where the context makes clear that the reference is only to CF Industries Holdings, Inc. itself and not its subsidiaries. All references to "CF Industries" refer to CF Industries, Inc., a 100% owned subsidiary of CF Industries Holdings, Inc. References to tons refer to short tons and references to tonnes refer to metric tons. Notes referenced in this discussion and analysis refer to the notes to consolidated financial statements that are found in Item 8. Financial Statements and Supplementary Data—Notes to Consolidated Financial Statements. For a discussion and analysis of the year ended December 31, 2020 compared to December 31, 2019, you should read Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations in our 2020 Annual Report on Form 10-K filed with the Securities and Exchange Commission (SEC) on February 24, 2021. The following is an outline of the discussion and analysis included herein:

Overview of CF Holdings

Our Company

Our mission is to provide clean energy to feed and fuel the world sustainably. With our employees focused on safe and reliable operations, environmental stewardship, and disciplined capital and corporate management, we are on a path to decarbonize our ammonia production network – the world's largest – to enable green and blue hydrogen and nitrogen products for energy, fertilizer, emissions abatement, and other industrial activities. Our nine manufacturing complexes in the United States, Canada and the United Kingdom, an extensive storage, transportation and distribution network in North America, and logistics capabilities enabling a global reach underpin our strategy to leverage our unique capabilities to accelerate the world's transition to clean energy. Our principal customers are cooperatives, independent fertilizer distributors, traders, wholesalers and industrial users. Our core product is anhydrous ammonia (ammonia), which contains 82% nitrogen and 18% hydrogen. Our nitrogen products that are upgraded from ammonia are granular urea, urea ammonium nitrate solution (UAN) and ammonium nitrate (AN). Our other nitrogen products include diesel exhaust fluid (DEF), urea liquor, nitric acid and aqua ammonia, which are sold primarily to our industrial customers, and compound fertilizer products (NPKs), which are solid granular fertilizer products for which the nutrient content is a combination of nitrogen, phosphorus and potassium.

Our principal assets as of December 31, 2021 include:

- five U.S. nitrogen manufacturing facilities, located in Donaldsonville, Louisiana (the largest nitrogen complex in the world); Port Neal, Iowa; Yazoo City, Mississippi; Verdigris, Oklahoma; and Woodward, Oklahoma. These facilities are wholly owned directly or indirectly by CF Industries Nitrogen, LLC (CFN), of which we own approximately 89% and CHS Inc. (CHS) owns the remainder. See Note 18—Noncontrolling Interest for additional information on our strategic venture with CHS;
- two Canadian nitrogen manufacturing facilities, located in Medicine Hat, Alberta (the largest nitrogen complex in Canada) and Courtright, Ontario;
- two United Kingdom nitrogen manufacturing facilities, located in Billingham and Ince;

- an extensive system of terminals and associated transportation equipment located primarily in the Midwestern United States; and
- a 50% interest in Point Lisas Nitrogen Limited (PLNL), an ammonia production joint venture located in the Republic of Trinidad and Tobago that we account for under the equity method.

Our Commitment to a Clean Energy Economy

We are taking significant steps to support a global hydrogen and clean fuel economy, through the production of green and blue ammonia. Since ammonia is one of the most efficient ways to transport and store hydrogen and is also a fuel in its own right, we believe that the Company, as the world's largest producer of ammonia, with an unparalleled manufacturing and distribution network and deep technical expertise, is uniquely positioned to fulfill anticipated demand for hydrogen and ammonia from green and blue sources. Our approach includes green ammonia production, which refers to ammonia produced through a carbon-free process, and blue ammonia production, which relates to ammonia produced by conventional processes but with CO_2 removed through carbon capture and sequestration (CCS) and other certified carbon abatement projects.

In October 2020, we announced an initial green ammonia project at our Donaldsonville complex. In April 2021, we signed an engineering and procurement contract with thyssenkrupp to supply a 20 MW alkaline water electrolysis plant to produce green hydrogen at our Donaldsonville complex. Construction and installation, which is being managed by us, began in the fourth quarter of 2021 and is expected to finish in 2023, with an estimated total cost of approximately $100 million. The cost of the project is expected to fit within our annual capital expenditure budgets. We will integrate the green hydrogen generated by the electrolysis plant into existing ammonia synthesis loops to enable the production of approximately 20,000 tons per year of green ammonia. We believe that, when completed in 2023, the Donaldsonville green ammonia project will be the largest of its kind in North America.

In the third quarter of 2021, we signed a memorandum of understanding with Mitsui & Co., Inc. (Mitsui) that will guide us in a joint exploration of the development of blue ammonia projects in the United States. The preliminary studies we are conducting with Mitsui cover areas such as blue ammonia supply and supply chain infrastructure, CO_2 transportation and storage, expected environmental impacts, and blue ammonia economics and marketing opportunities in Japan and in other countries.

We have also announced steps to produce blue ammonia from our ammonia production network. In the fourth quarter of 2021, our Board of Directors authorized projects that we believe will enable the annual production of up to 1.25 million tons of blue ammonia from our existing network starting in 2024. The projects will involve constructing units at our Donaldsonville and Yazoo City complexes that dehydrate and compress CO_2, a process essential for CO_2 transport via pipeline to sequestration sites. Management expects that, once the units are in service and sequestration is initiated, we could sequester up to 2.5 million tons of CO_2 per year (2 million tons at Donaldsonville and 500,000 tons at Yazoo City). Under current regulations, the projects would be expected to qualify for tax credits under Section 45Q of the Internal Revenue Code, which provides a credit per tonne of CO_2 sequestered.

Construction of the units at the Donaldsonville complex is expected to begin in 2022 and to be completed in 2024, with an estimated total cost of $200 million. The Yazoo City project will be timed to coincide with CO_2 transport pipeline construction. Once started, the project is expected to be completed in three years with an estimated total cost of $85 million. In addition, we are currently in advanced discussions with several parties regarding transportation and sequestration of CO_2 from Donaldsonville.

Industry Factors

We operate in a highly competitive, global industry. Our operating results are influenced by a broad range of factors, including those outlined below.

Global Supply and Demand Factors

Our products are globally traded commodities and are subject to price competition. The customers for our products make their purchasing decisions principally on the basis of delivered price and, to a lesser extent, on customer service and product quality. The selling prices of our products fluctuate in response to global market conditions, changes in supply and demand and cost factors.

Historically, global fertilizer demand has been driven primarily by population growth, gross domestic product growth, changes in dietary habits, planted acreage, and application rates, among other things. We expect these key variables to continue to have major impacts on long-term fertilizer demand for the foreseeable future. Short-term fertilizer demand growth may depend on global economic conditions, farm sector income, weather patterns, the level of global grain stocks relative to consumption, fertilizer application rates, and governmental regulations, including fertilizer subsidies or requirements mandating increased use of bio-fuels or industrial nitrogen products. Other geopolitical factors like temporary disruptions in fertilizer trade related to government intervention or changes in the buying/selling patterns of key exporting/consuming countries such as China, India, Russia and Brazil, among others, often play a major role in shaping near-term market fundamentals. The economics of nitrogen-based fertilizer manufacturing play a key role in decisions to increase or reduce production capacity. Supply of fertilizers is generally driven by available capacity and operating rates, raw material costs and availability, government policies and global trade. Raw materials are dependent on energy sources such as natural gas or coal; therefore, supply costs are affected by the supply of and demand for these commodities.

Global Trade in Fertilizer

In addition to the relationship between global supply and demand, profitability within a particular geographic region is determined by the supply/demand balance within that region. Regional supply and demand can be influenced significantly by factors affecting trade within regions. Some of these factors include the relative cost to produce and deliver product, relative currency values, the availability of credit, agricultural supply and demand, industrial product demand and policies such as emissions abatement and governmental nitrogen product trade policies, including the imposition of duties, tariffs or quotas, that affect foreign trade or investment. The development of additional natural gas reserves in North America over the last decade has decreased natural gas costs relative to the rest of the world, making North American nitrogen fertilizer producers more competitive. Changes in currency values may also alter our cost competitiveness relative to producers in other regions of the world.

Imports account for a significant portion of the nitrogen fertilizer consumed in North America. Producers of nitrogen-based fertilizers located in the Middle East, the Republic of Trinidad and Tobago, North Africa and Russia have been major exporters to North America in recent years. As a result, the North American nitrogen fertilizer market for certain nitrogen products is dependent on imports to balance supply and demand.

Farmers' Economics

The demand for fertilizer is affected by the aggregate crop planting decisions and fertilizer application rate decisions of individual farmers. Individual farmers make planting decisions based largely on prospective profitability of a harvest, while the specific varieties and amounts of fertilizer they apply depend on factors like their current liquidity, soil conditions, weather patterns, crop and fertilizer prices, fertilizer products used and timing of applications, expected yields and the types of crops planted.

Market Conditions and Current Developments

Selling Prices and Sales Volume

The selling prices for all of our major products were higher in 2021 than 2020, driven by the impact of a tighter global nitrogen supply and demand balance, as a result of strong global demand as well as decreased global supply availability as higher global energy costs drove lower global operating rates. The average selling price for our products for 2021 and 2020 was $353 per ton and $203 per ton, respectively. The increase in average selling prices of 74% in 2021 from 2020 resulted in an increase in net sales of approximately $2.76 billion.

Our total sales volume was 9% lower in 2021 than in 2020 with lower sales volume reported in all segments. We shipped 18.5 million tons of product in 2021 compared to 20.3 million tons in 2020 due primarily to lower supply from the impact of both planned and unplanned maintenance activity and the impact of weather-related outages. The lower sales volumes also reflect the idling of certain portions of our U.K. operations in September due to the United Kingdom energy crisis, which is further discussed below. Lower sales volume resulted in a decrease in net sales of approximately $404 million.

Sales volume for our products in 2021, 2020 and 2019 is shown in the table below.

	2021		2020		2019	
	Sales Volume (tons)	Net Sales	Sales Volume (tons)	Net Sales	Sales Volume (tons)	Net Sales
	(tons in thousands; dollars in millions)					
Ammonia	3,589	$ 1,787	3,767	$ 1,020	3,516	$ 1,113
Granular urea	4,290	1,880	5,148	1,248	4,849	1,342
UAN	6,584	1,788	6,843	1,063	6,807	1,270
AN	1,720	510	2,216	455	2,109	506
Other	2,318	573	2,322	338	2,257	359
Total	18,501	$ 6,538	20,296	$ 4,124	19,538	$ 4,590

Natural Gas Prices

Natural gas is the principal raw material used to produce our nitrogen products. We use natural gas both as a chemical feedstock and as a fuel to produce nitrogen products. Natural gas is a significant cost component of manufactured nitrogen products, representing approximately 40% of our production costs in 2021. The following table presents the average daily market price of natural gas at the Henry Hub, the most heavily-traded natural gas pricing point in North America, and the National Balancing Point, the major trading point for natural gas in the United Kingdom:

	Year ended December 31,						
	2021	2020	2019	2021 v. 2020		2020 v. 2019	
Natural gas supplemental data (per MMBtu)							
Average daily market price of natural gas Henry Hub (Louisiana)	$ 3.82	$ 1.99	$ 2.51	$ 1.83	92 %	$ (0.52)	(21)%
Average daily market price of natural gas National Balancing Point (United Kingdom)	$ 15.50	$ 3.20	$ 4.44	$ 12.30	384 %	$ (1.24)	(28)%

Most of our nitrogen fertilizer manufacturing facilities are located in the United States and Canada. As a result, the price of natural gas in North America directly impacts a substantial portion of our operating expenses. North American natural gas prices during 2021 were higher on average than during 2020 due to tight supply and demand conditions within the market. Demand for natural gas was strong throughout 2021 as cold weather early in the year, including the impact of Winter Storm Uri in February, contributed to strength in demand. Warmer weather in the summer of 2021 contributed to higher natural gas usage for electrical generation, and the economy emerging from COVID-19 pandemic conditions added to the strong summer demand. The supply response from natural gas producers during 2021 was insufficient to offset these demand factors, leading to higher prices throughout the year. In addition, liquefied natural gas (LNG) exports increased significantly in 2021 compared to 2020 as favorable pricing differentials between North America and global natural gas prices led LNG facilities in the United States to run at near maximum levels. The average daily market price at the Henry Hub, the most heavily-traded natural gas pricing point in North America, was $3.82 per MMBtu for 2021 compared to $1.99 per MMBtu for 2020, an increase of 92%. During 2021, the daily closing price at the Henry Hub reached a low of $2.36 per MMBtu on April 7, 2021 and a high of $23.61 per MMBtu on February 18, 2021 as a result of Winter Storm Uri.

In February 2021, the central portion of the United States experienced extreme and unprecedented cold weather due to the impact of Winter Storm Uri. Certain natural gas suppliers and natural gas pipelines declared force majeure events due to natural gas well freeze-offs or frozen equipment. This occurred at the same time as large increases in natural gas demand were occurring due to the cold temperatures. Due to these unprecedented factors, several states declared a state of emergency, and natural gas was redirected for residential use. At certain of our manufacturing locations, we reduced our natural gas consumption, and, as a consequence, our plants at these locations either operated at reduced rates or temporarily suspended operations. We net settled certain natural gas contracts with our suppliers and received prevailing market prices, which were in excess of our cost. As a result, we recognized a gain of $112 million, which is reflected in cost of sales in our consolidated statement of operations for the year ended December 31, 2021.

Our two nitrogen manufacturing facilities located in the United Kingdom are subject to fluctuations associated with the price of natural gas in Europe. The price of natural gas in the United Kingdom increased throughout 2021 and reached unprecedented high levels in the third quarter, and even higher levels in the fourth quarter. The increase in natural gas prices was due to the combination of low storage levels in Europe, reduced supply from Russia, and a tight global supply and demand balance in the LNG market as a result of strong demand in both Europe and Asia to fill storage locations in anticipation of winter. Due to the high price levels for natural gas, we halted certain of our U.K. manufacturing operations in September 2021. See the discussion under “United Kingdom Energy Crisis,” below, for further information.

The major natural gas trading point for the United Kingdom is the National Balancing Point (NBP). The average daily market price at NBP was $15.50 per MMBtu for 2021 compared to $3.20 per MMBtu for 2020, an increase of 384%. During 2021, the daily closing price at NBP reached a low of $5.58 per MMBtu on February 23, 2021 and a high of $60.10 per MMBtu on December 22, 2021. The average daily market price of natural gas at NBP for January 2022 was $25.91 per MMBtu.

In 2021, the total cost of natural gas used for production at all of our locations, which includes the impact of realized natural gas derivatives and excludes the $112 million gain that resulted from the net settlement of certain natural gas contracts with our suppliers, increased 88% to $4.21 from $2.24 per MMBtu in 2020. This increase in natural gas costs resulted in a decrease in gross margin of $663 million.

United Kingdom Energy Crisis

During the third quarter of 2021, the United Kingdom began experiencing an energy crisis that included a substantial increase in the price of natural gas. In the first half of 2021, natural gas prices had increased to levels that were considered high compared to historical prices, and prices then more than doubled in the third quarter of 2021.

On September 15, 2021, we announced the halt of operations at both our Ince and Billingham manufacturing facilities in the United Kingdom due to negative profitability driven by the high cost of natural gas. The halt of operations at our U.K. plants impacted the availability of certain products in the United Kingdom, including carbon dioxide, which is a byproduct of ammonia production. Due to the critical nature of carbon dioxide to certain industries in the United Kingdom, on September 21, 2021, we entered into an interim agreement with the U.K. government. Under the terms of the agreement, the U.K. government agreed to cover the costs to restart the ammonia plant at Billingham and to offset losses incurred from production for a 21-day period. As a result, we resumed production of ammonia at the Billingham facility in order to produce carbon dioxide for the United Kingdom. While the interim agreement was in place, we entered into new carbon dioxide pricing and offtake agreements with our customers, which had an initial term through January 31, 2022. The amount of financial support provided by the U.K. government under the terms of the interim agreement was not material. As of the filing of this report, production continues at our Billingham facility and continues to be idled at our Ince facility.

During the third quarter of 2021, the U.K. energy crisis necessitated an evaluation of the long-lived assets, including the definite-lived intangible assets, and goodwill of our U.K. operations to determine if their fair value had declined to below their carrying value. We concluded that a decline in fair value had occurred, and we recorded long-lived asset and goodwill impairment charges of $495 million. The continued impacts of the U.K. energy crisis in the fourth quarter of 2021 triggered an additional impairment test, and we recognized an additional goodwill impairment charge of $26 million. We recognized total impairment charges of $521 million in 2021, consisting of long-lived and intangible asset impairment charges of $236 million and goodwill impairment charges of $285 million. See “Items Affecting Comparability of Results—U.K. energy crisis impacts,” and “Liquidity and Capital Resources—United Kingdom Energy Crisis,” below, Note 6—United Kingdom Energy Crisis and Impairment Charges, Note 7—Property, Plant and Equipment—Net and Note 8—Goodwill and Other Intangible Assets for further information. As of December 31, 2021, after the recognition of the $521 million of impairment charges noted above, we have no remaining goodwill related to our U.K. operations, and the remaining long-lived assets related to our U.K. operations were approximately $425 million, consisting primarily of property, plant and equipment.

The results of our U.K. operations are included in our Ammonia, AN and Other segments, and account for a small portion of our consolidated gross margin. For the year ended December 31, 2021, our U.K. operations generated negative gross margin representing approximately 1% of our consolidated gross margin. For the year ended December 31, 2020, gross margin generated by our U.K. operations accounted for 2% of our consolidated gross margin.

Manufacturing Costs and Granular Urea Purchases

In 2021, we experienced lower production levels and higher manufacturing and maintenance costs than in 2020. Certain of our plants operated at lower operating rates or temporarily suspended operations during 2021 due to the lack of natural gas due to Winter Storm Uri or the impact of Hurricane Ida, or due to maintenance activity, including activity that was deferred from 2020 as a result of the COVID-19 pandemic. In 2021, we had the highest level of maintenance activity in our history, including turnarounds at seven of our 17 ammonia plants. Because of these factors, including the halt of operations in the United Kingdom, we incurred higher costs for manufacturing, maintenance and repair activity for both scheduled and unscheduled downtime in 2021.

In response to the lower production in 2021 as a result of weather conditions and maintenance activity, we procured additional granular urea in order to meet customer obligations and provide additional manufacturing flexibility. In the year ended December 31, 2021, we purchased approximately $71 million of granular urea, which we sold to customers for $68 million.

COVID-19 Pandemic

In March 2020, the World Health Organization characterized the outbreak of coronavirus disease 2019 (COVID-19) as a pandemic. Due to the use of fertilizer products in crop production to support the global food supply chain, our business operations were designated as part of the critical infrastructure by the United States and as essential businesses in the United Kingdom and Canada, with corresponding designations by those states and provinces in which we operate. As a result, our manufacturing complexes were permitted to continue to operate and, through the date of this report, we have not suspended or shutdown operations as a result of the pandemic. In addition, we have continued to ship products by all modes of transportation to our customers, and we have not experienced any significant delays in marine, rail or truck transportation services due to the pandemic. Through the date of this report, we have not experienced any meaningful impact in customer demand as a result of the pandemic.

In response to the pandemic along with the rise of new variants of COVID-19, we instituted and have continued to enforce safety precautions and encourage safe behavior in order to protect the health and well-being of all of our employees. We will continue to monitor safety guidelines related to COVID-19 as issued by governmental authorities and adjust our safety protocols, as needed.

Financial Executive Summary

We reported net earnings attributable to common stockholders of $917 million in 2021 compared to $317 million in 2020, an increase in net earnings of 189%, or $600 million. Diluted net earnings per share attributable to common stockholders increased $2.77 per share, to $4.24 per share in 2021 compared to $1.47 per share in 2020. These increases were due primarily to higher operating results driven by an increase in gross margin, partially offset by impairment charges related to our U.K. operations.

Impact of higher gross margin

Gross margin increased by $1.59 billion in 2021 to $2.39 billion as compared to $801 million in 2020. The following table and related discussion describe the significant factors that drove the increase in gross margin.

	Year Ended December 31, 2020	Variance due to the following items: Higher Average Selling Prices[1]	Volume[1]	Higher Natural Gas Costs[2]	Unrealized MTM on natural gas derivatives[3]	Higher Manufacturing, Maintenance and Other Costs	Increase in Purchased Urea[4]	Gain on Net Settlement of Natural Gas Contracts	Year Ended December 31, 2021
	(dollars in millions)								
Consolidated									
Net sales	$ 4,124	$ 2,757	$ (404)	$ —	$ —	$ —	$ 61	$ —	$ 6,538
Cost of sales	3,323	—	(312)	663	31	494	64	(112)	4,151
Gross margin	$ 801	$ 2,757	$ (92)	$ (663)	$ (31)	$ (494)	$ (3)	$ 112	$ 2,387
Gross margin %	19.4 %								36.5 %

(1) Selling price and volume impact of granular urea purchased to satisfy customer commitments is reflected in the Increase in Purchased Urea column.
(2) Higher natural gas costs include the impact, if any, of realized natural gas derivatives.
(3) Represents the variance in the net unrealized mark-to-market gains and losses on natural gas derivatives compared to the prior year period.
(4) Represents the impact of the incremental tons compared to the prior year period.

- Average selling prices increased 74% in 2021 to $353 per ton from $203 per ton in 2020, which increased gross margin by approximately $2.76 billion,
- Sales volume decreased 9% to 18.5 million product tons in 2021 from 20.3 million product tons in 2020, which reduced gross margin by approximately $92 million,
- The cost of natural gas used for production increased 88% to $4.21 per MMBtu in 2021 from $2.24 per MMBtu in 2020, which reduced gross margin by $663 million,
- We incurred higher manufacturing, maintenance and other costs, which reduced gross margin by $494 million, due primarily to higher plant turnaround and maintenance activity,
- We purchased 201,000 tons of granular urea for $71 million to meet customer obligations, which we sold to customers for $68 million, and
- The gain on the net settlement of certain natural gas contracts with our suppliers as a result of Winter Storm Uri was $112 million.

Impact of impairment charges

Net earnings and diluted net earnings per share in 2021 were impacted by impairment charges related to our U.K. operations of $521 million, consisting of long-lived and intangible asset impairment charges of $236 million and goodwill impairment charges of $285 million. The after-tax impact of the impairment charges to net earnings attributable to common stockholders and diluted net earnings per share attributable to common stockholders was $463 million and $2.14, respectively. See "Market Conditions and Current Developments—United Kingdom Energy Crisis," above, Note 6—United Kingdom Energy Crisis and Impairment Charges, Note 7—Property, Plant and Equipment—Net and Note 8—Goodwill and Other Intangible Assets, for further information.

The following table includes gross margin, operating earnings, earnings before income taxes, net earnings attributable to common stockholders and diluted net earnings per share attributable to common stockholders for 2021, and shows the impact of the impairment charges on each of these measures by also including the corresponding "as adjusted" measure, which excludes the before- and after-tax impacts of the impairment charges. Management utilizes these "as adjusted" measures, and believes they provide useful information to investors, for assessing period-to-period changes in our underlying operating performance, because these "as adjusted" measures exclude the non-cash impairment charges that resulted from the U.K. energy crisis, as more fully described above.

	Year ended December 31, 2021		
	As reported	Impact of impairment charges	As adjusted[(1)]
	(dollars in millions, except per share)		
Gross margin	$ 2,387	$ —	$ 2,387
Operating earnings	1,729	521	2,250
Earnings before income taxes	1,543	521	2,064
Net earnings attributable to common stockholders	917	463	1,380
Diluted net earnings per share attributable to common stockholders	4.24	2.14	6.38

(1) The "as adjusted" financial measures presented above are non-GAAP financial measures that should be viewed in addition to, and not as an alternative for, our reported results calculated and presented in accordance with accounting principles generally accepted in the United States (U.S. GAAP).

Items Affecting Comparability of Results

In addition to the impact of market conditions discussed above, certain items impacted the comparability of our financial results during the years ended December 31, 2021 and 2020. The following table and related discussion outline these items and how they impacted the comparability of our financial results during these periods. During the years ended December 31, 2021 and 2020, we reported net earnings attributable to common stockholders of $917 million and $317 million, respectively.

	2021		2020	
	Pre-Tax	After-Tax[(1)]	Pre-Tax	After-Tax[(1)]
	(in millions)			
Unrealized net mark-to-market loss (gain) on natural gas derivatives[(2)]	$ 25	$ 19	$ (6)	$ (5)
COVID impacts:				
Special COVID-19 bonus for operational workforce[(2)]	—	—	19	15
Turnaround deferral[(2)]	—	—	7	6
Asset impairments	521	463	—	—
Loss on foreign currency transactions, including intercompany loans[(3)]	6	5	5	4
Engineering cost write-off[(3)]	—	—	9	7
Loss on sale of surplus land[(3)]	—	—	2	1
Insurance proceeds[(3)]	—	—	(37)	(28)
Loss on debt extinguishment	19	15	—	—
Terra amended tax returns—interest income and income tax benefit[(4)]	—	—	(26)	(44)

(1) The tax impact is calculated utilizing a marginal effective rate of 23.6% and 23.2% in 2021 and 2020, respectively, except for asset impairments, which reflects the amount of income tax benefit recognized on the long-lived and intangible asset impairment charges.
(2) Included in cost of sales in our consolidated statements of operations.
(3) Included in other operating—net in our consolidated statements of operations.
(4) Included in interest expense, interest income and income tax provision in our consolidated statements of operations.

The following describes the significant items that impacted the comparability of our financial results in 2021 and 2020. Descriptions of items below that refer to amounts in the table above, refer to the pre-tax amounts, except for the discussion under *Terra amended tax returns*.

Unrealized net mark-to-market loss (gain) on natural gas derivatives

Natural gas is the largest and most volatile single component of the manufacturing cost for nitrogen-based products. At certain times, we have managed the risk of changes in natural gas prices through the use of derivative financial instruments. The derivatives that we use for this purpose are primarily natural gas fixed price swaps, basis swaps and options. We use natural gas derivatives as an economic hedge of natural gas price risk, but without the application of hedge accounting. This can result in volatility in reported earnings due to the unrealized mark-to-market adjustments that occur from changes in the value of the derivatives, which are reflected in cost of sales in our consolidated statements of operations. In 2021 and 2020, we recognized an unrealized net mark-to-market loss (gain) on natural gas derivatives of $25 million and $(6) million, respectively.

COVID impacts

In March 2020, a short-term bonus program was initiated to compensate operational employees for continuing their critical tasks at the beginning of the COVID-19 pandemic. The bonus program concluded in June 2020. Approximately $19 million was paid as part of the program and was recognized in cost of sales in our consolidated statement of operations for the year ended December 31, 2020.

In addition, certain plant turnaround activities were deferred because of the COVID-19 pandemic. As a result, we incurred $7 million of expense for the year ended December 31, 2020, which was recognized in cost of sales in our consolidated statement of operations.

Asset impairments

As a result of the U.K. energy crisis and the events described under “Market Conditions and Current Developments—United Kingdom Energy Crisis,” above, we recognized impairment charges of $521 million in 2021, including long-lived and intangible asset impairment charges of $236 million and goodwill impairment charges of $285 million. See Note 6—United Kingdom Energy Crisis and Impairment Charges, Note 7—Property, Plant and Equipment—Net and Note 8—Goodwill and Other Intangible Assets, for further information.

Loss on foreign currency transactions, including intercompany loans

In 2021 and 2020, we recognized losses of $6 million and $5 million, respectively, which consist of foreign currency exchange rate impacts on foreign currency denominated transactions, including the impact of changes in foreign currency exchange rates on intercompany loans that were not permanently invested.

Engineering cost write-off

In 2020, a project at one of our nitrogen complexes was cancelled and, as a result, $9 million of previously capitalized engineering costs were expensed in the year ended December 31, 2020. The expense is reflected in other operating—net in our consolidated statement of operations.

Loss on sale of surplus land

In 2020, we recognized a loss of $2 million on the sale of surplus land, which is reflected in other operating—net in our consolidated statement of operations.

Insurance proceeds

We recognized income of $37 million in 2020 related to insurance claims at one of our nitrogen complexes, which consisted of $35 million related to business interruption insurance proceeds and $2 million related to property insurance proceeds. These proceeds are reflected in other operating—net in our consolidated statement of operations.

Loss on debt extinguishment

On March 20, 2021, we redeemed in full all of the remaining $250 million outstanding principal amount of the 3.400% senior secured notes due December 2021 (the 2021 Notes) in accordance with the optional redemption provisions in the indenture governing the 2021 Notes. The total aggregate redemption price paid in connection with the redemption of the 2021 Notes was $258 million, including accrued interest. As a result, we recognized a loss on debt extinguishment of $6 million, consisting primarily of the premium paid on the redemption of the 2021 Notes prior to their scheduled maturity.

On September 10, 2021, we redeemed $250 million principal amount, representing one-third of the $750 million principal amount outstanding immediately prior to such redemption, of the 3.450% senior notes due 2023 (the 2023 Notes), in accordance with the optional redemption provisions in the indenture governing the 2023 Notes. The total aggregate redemption price paid in connection with the redemption of the 2023 Notes was approximately $265 million, including accrued interest. As a result, we recognized a loss on debt extinguishment of $13 million, consisting primarily of the premium paid on the redemption of the $250 million principal amount of the 2023 Notes prior to their scheduled maturity.

Terra amended tax returns

We completed the acquisition of Terra Industries Inc. (Terra) in April 2010. After the acquisition, we determined that the manner in which Terra reported the repatriation of cash from foreign affiliates to its U.S. parent for U.S. and foreign income tax purposes was not appropriate. As a result, in 2012 we amended certain tax returns, including Terra's income and withholding tax returns, back to 1999 (the Amended Tax Returns) and paid additional income and withholding taxes, and related interest and penalties. In 2013, the Internal Revenue Service (IRS) commenced an examination of the U.S. tax aspects of the Amended Tax Returns.

In 2020, we received IRS Notices indicating the amount of tax and interest to be refunded and received with respect to the income tax and withholding tax returns. As a result, we recognized $26 million ($23 million, net of tax) of interest-related income and $18 million of additional income tax benefit. See "Liquidity and Capital Resources—Terra Amended Tax Returns," below, for additional information.

Consolidated Results of Operations

The following table presents our consolidated results of operations and supplemental data:

	Year ended December 31,						
	2021	2020	2019(1)	2021 v. 2020		2020 v. 2019	
	(in millions, except as noted)						
Net sales	$ 6,538	$ 4,124	$ 4,590	$ 2,414	59 %	$ (466)	(10)%
Cost of sales (COS)	4,151	3,323	3,416	828	25 %	(93)	(3)%
Gross margin	2,387	801	1,174	1,586	198 %	(373)	(32)%
Gross margin percentage	36.5 %	19.4 %	25.6 %	17.1 %		(6.2)%	
Selling, general and administrative expenses	223	206	239	17	8 %	(33)	(14)%
Goodwill impairment	285	—	—	285	N/M	—	— %
Long-lived and intangible asset impairment	236	—	—	236	N/M	—	— %
Other operating—net	(39)	(17)	(73)	(22)	(129)%	56	77 %
Total other operating costs and expenses	705	189	166	516	273 %	23	14 %
Equity in earnings (loss) of operating affiliate	47	11	(5)	36	327 %	16	N/M
Operating earnings	1,729	623	1,003	1,106	178 %	(380)	(38)%
Interest expense—net	183	161	217	22	14 %	(56)	(26)%
Loss on debt extinguishment	19	—	21	19	N/M	(21)	(100)%
Other non-operating—net	(16)	(1)	(7)	(15)	N/M	6	86 %
Earnings before income taxes	1,543	463	772	1,080	233 %	(309)	(40)%
Income tax provision	283	31	126	252	N/M	(95)	(75)%
Net earnings	1,260	432	646	828	192 %	(214)	(33)%
Less: Net earnings attributable to noncontrolling interest	343	115	153	228	198 %	(38)	(25)%
Net earnings attributable to common stockholders	$ 917	$ 317	$ 493	$ 600	189 %	$ (176)	(36)%
Diluted net earnings per share attributable to common stockholders	$ 4.24	$ 1.47	$ 2.23	$ 2.77	188 %	$ (0.76)	(34)%
Diluted weighted-average common shares outstanding	216.2	215.2	221.6	1.0	— %	(6.4)	(3)%
Dividends declared per common share	$ 1.20	$ 1.20	$ 1.20	$ —	— %	$ —	— %
Natural gas supplemental data (per MMBtu)							
Cost of natural gas used for production in COS(2)	$ 4.21	$ 2.24	$ 2.74	$ 1.97	88 %	$ (0.50)	(18)%
Average daily market price of natural gas Henry Hub (Louisiana)	$ 3.82	$ 1.99	$ 2.51	$ 1.83	92 %	$ (0.52)	(21)%
Average daily market price of natural gas National Balancing Point (United Kingdom)	$ 15.50	$ 3.20	$ 4.44	$ 12.30	384 %	$ (1.24)	(28)%
Unrealized net mark-to-market loss (gain) on natural gas derivatives	$ 25	$ (6)	$ 14	$ 31	N/M	$ (20)	N/M
Depreciation and amortization	$ 888	$ 892	$ 875	$ (4)	— %	$ 17	2 %
Capital expenditures	$ 514	$ 309	$ 404	$ 205	66 %	$ (95)	(24)%
Sales volume by product tons (000s)	18,501	20,296	19,538	(1,795)	(9)%	758	4 %
Production volume by product tons (000s):							
Ammonia(3)	9,349	10,353	10,246	(1,004)	(10)%	107	1 %
Granular urea	4,123	5,001	4,941	(878)	(18)%	60	1 %
UAN (32%)	6,763	6,677	6,768	86	1 %	(91)	(1)%
AN	1,646	2,115	2,128	(469)	(22)%	(13)	(1)%

N/M—Not Meaningful

(1) For a discussion and analysis of the year ended December 31, 2019, see Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations in our 2020 Annual Report on Form 10-K filed with the SEC on February 24, 2021.

(2) Includes the cost of natural gas and related transportation that is included in cost of sales during the period under the first-in, first-out inventory cost method. Includes realized gains and losses on natural gas derivatives settled during the period. Excludes unrealized mark-to-market gains and losses on natural gas derivatives.

(3) Gross ammonia production, including amounts subsequently upgraded on-site into granular urea, UAN, or AN.

The following is a discussion and analysis of our consolidated results of operations for the year ended December 31, 2021 compared to the year ended December 31, 2020. For a discussion and analysis of our consolidated results of operations for the year ended December 31, 2020 compared to the year ended December 31, 2019, see Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations in our 2020 Annual Report on Form 10-K filed with the SEC on February 24, 2021.

Net Sales

Our net sales are derived primarily from the sale of nitrogen products and are determined by the quantities of nitrogen products we sell and the selling prices we realize. The volumes, mix and selling prices we realize are determined to a great extent by a combination of global and regional supply and demand factors. Net sales also include shipping and handling costs that are billed to our customers. Sales incentives are reported as a reduction in net sales.

Our total net sales increased $2.41 billion, or 59%, to $6.54 billion in 2021 compared to $4.12 billion in 2020 due to a 74% increase in average selling prices, partially offset by a 9% decrease in sales volume.

Average selling prices were $353 per ton in 2021 compared to $203 per ton in 2020, an increase of 74%, due to higher average selling prices across all of our segments, primarily driven by the impact of a tighter global nitrogen supply and demand balance, as a result of strong global demand and decreased global supply availability as higher global energy costs drove lower global operating rates. Our total sales volume of 18.5 million product tons in 2021 was 9% lower compared to 20.3 million product tons in 2020 as a result of decreased supply due to lower production due primarily to a high level of plant turnaround and maintenance activity and downtime resulting from the impacts of Winter Storm Uri and Hurricane Ida.

Gross ammonia production for 2021 was approximately 9.3 million tons compared to 10.4 million tons in 2020. Management expects gross ammonia production for 2022 will return to historical levels (9.5 to 10.0 million tons) based on normal operating conditions and a return to a typical level of planned maintenance activities.

Cost of Sales

Our cost of sales includes manufacturing costs, purchased product costs, and distribution costs. Manufacturing costs, the most significant element of cost of sales, consist primarily of raw materials, realized and unrealized gains and losses on natural gas derivatives, maintenance, direct labor, depreciation and other plant overhead expenses. Purchased product costs primarily include the cost to purchase nitrogen fertilizers to augment or replace production at our facilities. Distribution costs consist of the cost of freight required to transport finished products from our plants to our distribution facilities, which are recognized in cost of sales when the product is sold to our customers, and storage costs incurred prior to final shipment to customers.

Our cost of sales increased $828 million, or 25%, to $4.15 billion in 2021 as compared to $3.32 billion in 2020. The increase in our cost of sales was due primarily to higher costs for natural gas, including the impact of realized derivatives, which increased cost of sales by $663 million; higher manufacturing, maintenance and other costs, which increased cost of sales by $494 million; and higher costs for purchased products as we purchased $71 million of granular urea in 2021 to meet customer obligations. Cost of sales also includes the impact of a $25 million unrealized net mark-to-market loss on natural gas derivatives in 2021 compared to a $6 million gain in 2020.

These items increasing our cost of sales were partially offset by the $112 million gain we recognized from the net settlement of certain natural gas contracts with our suppliers in February 2021 due to Winter Storm Uri as described above under the heading "Natural Gas Prices" in the section titled "Market Conditions and Current Developments." The $112 million gain on the net settlement of certain natural gas contracts in February 2021 is reflected in, and had the effect of reducing, our cost of sales in 2021. In addition, there was a $312 million decline in cost of sales in 2021, as compared to 2020, due primarily to a 9% decline in sales volume.

Cost of sales averaged $224 per ton in 2021, a 37% increase from $164 per ton in 2020. The cost of natural gas used for production, including the impact of realized derivatives, increased 88% to $4.21 per MMBtu in 2021 from $2.24 per MMBtu in 2020. The cost of natural gas used for production of $4.21 per MMBtu in 2021 does not include the $112 million gain from the net settlement of certain natural gas contracts in February 2021.

Selling, General and Administrative Expenses

Our selling, general and administrative expenses consist primarily of corporate office expenses such as salaries and other payroll-related costs for our executive, administrative, legal, financial, IT, and sales functions, as well as certain taxes and insurance and other professional service fees, including those for corporate initiatives.

Selling, general and administrative expenses increased $17 million, or 8%, to $223 million in 2021 from $206 million in 2020. The increase was due primarily to higher incentive compensation, due to strong operating performance.

Long-lived and Intangible Asset Impairment and Goodwill Impairment

In 2021, we recognized total impairment charges of $521 million, consisting of long-lived and intangible asset impairment charges of $236 million and goodwill impairment charges of $285 million. See "United Kingdom Energy Crisis" under "Market Conditions and Current Developments," above for further information.

Other Operating—Net

Other operating—net includes administrative costs that do not relate directly to our central operations. Costs included in "other operating costs" can include foreign currency transaction gains and losses, unrealized gains and losses on foreign currency derivatives, litigation expenses and gains and losses on the disposal of fixed assets.

Other operating—net was $39 million of income in 2021 compared to $17 million of income in 2020. The income in 2021 primarily includes a gain of $29 million on sales of carbon credits. In addition, other operating—net includes the amount received under the terms of the agreement with the U.K. government associated with the restart of our Billingham facility, partially offset by a loss on foreign currency transactions of $6 million, which includes the impact of changes in foreign currency exchange rates on intercompany loans that were not permanently invested. The income in 2020 primarily includes insurance proceeds of $37 million, partially offset by $9 million of expense related to the cancellation of a project, which is described in the section above titled "Items Affecting Comparability of Results—Engineering cost write-off," and a loss on foreign currency transactions of $5 million.

Equity in Earnings of Operating Affiliate

Equity in earnings of operating affiliate consists of our 50% ownership interest in PLNL. We include our share of the net earnings from our equity method investment in PLNL as an element of earnings from operations because this investment provides additional production and is integrated with our other supply chain and sales activities. Our share of the net earnings includes the amortization of certain tangible assets identified as part of the application of purchase accounting at acquisition.

Equity in earnings of operating affiliate was $47 million in 2021 compared to $11 million in 2020. The increase was due primarily to an increase in the operating results of PLNL as a result of higher ammonia selling prices partially offset by higher natural gas costs.

Interest Expense—Net

Our interest expense—net includes the interest expense on our long-term debt, amortization of the related fees required to execute financing agreements, annual fees pursuant to our revolving credit agreement and interest on tax liabilities. Capitalized interest relating to the construction of major capital projects reduces interest expense as the interest is capitalized and amortized over the estimated useful lives of the related assets. Interest expense—net also includes interest income, which includes amounts earned on our cash, cash equivalents, and investments and any interest earned related to income tax refunds.

Net interest expense increased by $22 million to $183 million in 2021 from $161 million in 2020. The increase was due primarily to $26 million of interest income in 2020 related to the finalization of the Terra amended tax returns, which is more fully described under "Items Affecting Comparability of Results—Terra Amended Tax Returns," above.

Loss on Debt Extinguishment

On March 20, 2021, we redeemed in full all of the remaining $250 million outstanding principal amount of the 2021 Notes in accordance with the optional redemption provisions in the indenture governing the 2021 Notes. The total aggregate redemption price paid in connection with the redemption on the 2021 Notes was $258 million, including accrued interest. As a result, we recognized a loss on debt extinguishment of $6 million, consisting primarily of the premium paid on the redemption of the 2021 Notes prior to their scheduled maturity.

On September 10, 2021, we redeemed $250 million principal amount, representing one-third of the $750 million principal amount outstanding immediately prior to such redemption, of the 2023 Notes, in accordance with the optional redemption provisions in the indenture governing the 2023 Notes. The total aggregate redemption price paid in connection with the redemption of the 2023 Notes was approximately $265 million, including accrued interest. As a result, we recognized a loss on debt extinguishment of $13 million, consisting primarily of the premium paid on the redemption of the $250 million principal amount of the 2023 Notes prior to their scheduled maturity.

Other Non-Operating—Net

Other non-operating—net was $16 million of income in 2021 compared to $1 million of income in 2020. The $16 million of income in 2021 was due primarily to a gain of $20 million on the sale of EU carbon credits that, due to Brexit, could no longer be utilized by our U.K. plants for carbon emission obligations in the United Kingdom.

Income Tax Provision

Our income tax provision for 2021 was $283 million on pre-tax income of $1,543 million, or an effective tax rate of 18.3%, compared to an income tax provision of $31 million on pre-tax income of $463 million, or an effective tax rate of 6.7%, in 2020.

For 2021, we did not record an income tax benefit related to the goodwill impairment charges described in Note 6—United Kingdom Energy Crisis and Impairment Charges as the goodwill impairment charges are non-deductible for income tax purposes. Our income tax provision for 2021 includes a $26 million benefit reflecting the impact of agreement on certain issues related to U.S. federal income tax audits, including a discrete income tax benefit of approximately $15 million due to the reversal of an accrual for unrecognized tax benefits as a result of the effective settlement of the U.S. federal income tax audit for the 2012-2016 tax years.

For 2020, our income tax provision includes a $27 million benefit related to the settlement of certain U.S. and foreign income tax audits, which primarily related to the settlement of the audit of the Terra amended tax returns, which is more fully described under "Items Affecting Comparability of Results—Terra Amended Tax Returns," above.

Our effective tax rate is impacted by earnings attributable to the noncontrolling interest in CFN, as our consolidated income tax provision does not include a tax provision on the earnings attributable to the noncontrolling interest. Our effective tax rate for 2021 of 18.3%, which is based on pre-tax income of $1,543 million, would be 5.3 percentage points higher, or 23.6%, if based on pre-tax income exclusive of the earnings attributable to the noncontrolling interest of $343 million. Our effective tax rate for 2020 of 6.7%, which is based on pre-tax income of $463 million, would be 2.2 percentage points higher, or 8.9%, if based on pre-tax income exclusive of the earnings attributable to the noncontrolling interest of $115 million.

Both 2021 and 2020 were impacted by additional discrete tax items. See Note 11—Income Taxes for additional information.

Net Earnings Attributable to Noncontrolling Interest

Net earnings attributable to noncontrolling interest includes the net earnings attributable to the approximately 11% CHS minority equity interest in CFN, a subsidiary of CF Holdings.

Net earnings attributable to noncontrolling interest increased $228 million, or 198%, to $343 million in 2021 compared to $115 million in 2020 due to higher earnings of CFN driven by higher average selling prices due primarily to a tighter global nitrogen supply and demand balance as higher global energy costs drove lower global operating rates.

Diluted Net Earnings Per Share Attributable to Common Stockholders

Net earnings per share attributable to common stockholders increased 188% to $4.24 per diluted share in 2021 from $1.47 per diluted share in 2020. This increase is due primarily to higher operating results driven by an increase in gross margin, partially offset by impairment charges related to our U.K. operations.

Operating Results by Business Segment

Our reportable segment structure reflects how our chief operating decision maker, as defined in U.S. GAAP, assesses the performance of our reportable segments and makes decisions about resource allocation. These segments are differentiated by products. Our management uses gross margin to evaluate segment performance and allocate resources. Total other operating costs and expenses (consisting primarily of selling, general and administrative expenses and other operating—net) and non-operating expenses (consisting primarily of interest and income taxes), are centrally managed and are not included in the measurement of segment profitability reviewed by management. The following table presents summary operating results by business segment and the major drivers of the variance in net sales, cost of sales and gross margin:

		Variance due to the following items:							
	Year Ended December 31, 2020	Higher Average Selling Prices[1]	Volume[1]	Higher Natural Gas Costs[2]	Unrealized MTM on natural gas derivatives[3]	Higher Manufacturing, Maintenance and Other Costs	Increase in Purchased Urea[4]	Gain on Net Settlement of Natural Gas Contracts	Year Ended December 31, 2021
	(dollars in millions)								
Consolidated									
Net sales	$ 4,124	$ 2,757	$ (404)	$ —	$ —	$ —	$ 61	$ —	$ 6,538
Cost of sales	3,323	—	(312)	663	31	494	64	(112)	4,151
Gross margin	$ 801	$ 2,757	$ (92)	$ (663)	$ (31)	$ (494)	$ (3)	$ 112	$ 2,387
Gross margin %	19.4 %								36.5 %
Ammonia									
Net sales	$ 1,020	$ 792	$ (25)	$ —	$ —	$ —	$ —	$ —	$ 1,787
Cost of sales	850	—	(33)	194	9	254	—	(112)	1,162
Gross margin	$ 170	$ 792	$ 8	$ (194)	$ (9)	$ (254)	$ —	$ 112	$ 625
Gross margin %	16.7 %								35.0 %
Granular Urea									
Net sales	$ 1,248	$ 814	$ (243)	$ —	$ —	$ —	$ 61	$ —	$ 1,880
Cost of sales	847	—	(155)	144	8	84	64	—	992
Gross margin	$ 401	$ 814	$ (88)	$ (144)	$ (8)	$ (84)	$ (3)	$ —	$ 888
Gross margin %	32.1 %								47.2 %
UAN									
Net sales	$ 1,063	$ 756	$ (31)	$ —	$ —	$ —	$ —	$ —	$ 1,788
Cost of sales	949	—	(27)	168	7	22	—	—	1,119
Gross margin	$ 114	$ 756	$ (4)	$ (168)	$ (7)	$ (22)	$ —	$ —	$ 669
Gross margin %	10.7 %								37.4 %
AN									
Net sales	$ 455	$ 159	$ (104)	$ —	$ —	$ —	$ —	$ —	$ 510
Cost of sales	390	—	(83)	97	4	67	—	—	475
Gross margin	$ 65	$ 159	$ (21)	$ (97)	$ (4)	$ (67)	$ —	$ —	$ 35
Gross margin %	14.3 %								6.9 %
Other									
Net sales	$ 338	$ 236	$ (1)	$ —	$ —	$ —	$ —	$ —	$ 573
Cost of sales	287	—	(14)	60	3	67	—	—	403
Gross margin	$ 51	$ 236	$ 13	$ (60)	$ (3)	$ (67)	$ —	$ —	$ 170
Gross margin %	15.1 %								29.7 %

(1) Selling price and volume impact of granular urea purchased to satisfy customer commitments is reflected in the Increase in Purchased Urea column.
(2) Higher natural gas costs include the impact, if any, of realized natural gas derivatives.
(3) Represents the variance in the net unrealized mark-to-market gains and losses on natural gas derivatives compared to the prior year period.
(4) Represents the impact of the incremental tons compared to the prior year period.

The following is a discussion and analysis of our operating results by business segment for the year ended December 31, 2021 compared to the year ended December 31, 2020. For a discussion and analysis of our operating results by business segment for the year ended December 31, 2020 compared to the year ended December 31, 2019, see Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations in our 2020 Annual Report on Form 10-K filed with the SEC on February 24, 2021.

Ammonia Segment

Our ammonia segment produces anhydrous ammonia (ammonia), which is our most concentrated nitrogen product. Ammonia contains 82% nitrogen and 18% hydrogen. The results of our ammonia segment consist of sales of ammonia to external customers. In addition, ammonia is the base nitrogen product that we upgrade into other nitrogen products such as granular urea, UAN and AN. We produce ammonia at all of our nitrogen manufacturing complexes.

The following table presents summary operating data for our ammonia segment:

	Year ended December 31,						
	2021	2020	2019	2021 v. 2020		2020 v. 2019	
	(in millions, except as noted)						
Net sales	$ 1,787	$ 1,020	$ 1,113	$ 767	75 %	$ (93)	(8)%
Cost of sales	1,162	850	878	312	37 %	(28)	(3)%
Gross margin	$ 625	$ 170	$ 235	$ 455	268 %	$ (65)	(28)%
Gross margin percentage	35.0 %	16.7 %	21.1 %	18.3 %		(4.4)%	
Sales volume by product tons (000s)	3,589	3,767	3,516	(178)	(5)%	251	7 %
Sales volume by nutrient tons (000s)(1)	2,944	3,090	2,884	(146)	(5)%	206	7 %
Average selling price per product ton	$ 498	$ 271	$ 317	$ 227	84 %	$ (46)	(15)%
Average selling price per nutrient ton(1)	$ 607	$ 330	$ 386	$ 277	84 %	$ (56)	(15)%
Gross margin per product ton	$ 174	$ 45	$ 67	$ 129	287 %	$ (22)	(33)%
Gross margin per nutrient ton(1)	$ 212	$ 55	$ 81	$ 157	285 %	$ (26)	(32)%
Depreciation and amortization	$ 209	$ 176	$ 167	$ 33	19 %	$ 9	5 %
Unrealized net mark-to-market loss (gain) on natural gas derivatives	$ 7	$ (2)	$ 4	$ 9	N/M	$ (6)	N/M

N/M—Not Meaningful

(1) Ammonia represents 82% nitrogen content. Nutrient tons represent the tons of nitrogen within the product tons.

Year Ended December 31, 2021 Compared to Year Ended December 31, 2020

Net Sales. Net sales in our ammonia segment increased by $767 million, or 75%, to $1.79 billion in 2021 from $1.02 billion in 2020 due primarily to an 84% increase in average selling prices, partially offset by a 5% decrease in sales volume. Average selling prices increased to $498 per ton in 2021 compared to $271 per ton in 2020. The increase in average selling prices was due primarily to the impact of a tighter global nitrogen supply and demand balance. Sales volume was lower in 2021 due primarily to lower supply availability resulting from reduced inventory and production due to plant turnaround and maintenance activity and from weather-related outages, including the impact of Winter Storm Uri and Hurricane Ida.

Cost of Sales. Cost of sales in our ammonia segment averaged $324 per ton in 2021, a 43% increase from $226 per ton in 2020. The increase is due primarily to higher realized natural gas costs, higher costs related to plant turnaround, maintenance and repair activity, and higher costs for ammonia purchased from our joint venture in Trinidad, partially offset by the impact of the $112 million gain on the net settlement of certain natural gas contracts in February 2021. See "Market Conditions and Current Developments" above, for additional information on the operational impact of Winter Storm Uri.

Gross Margin. Gross margin in our ammonia segment increased by $455 million to $625 million in 2021 from $170 million in 2020, and our gross margin percentage was 35.0% in 2021 compared to 16.7% in 2020. The increase in gross margin was due primarily to an 84% increase in average selling prices, which increased gross margin by $792 million, and the $112 million gain on the net settlement of certain natural gas contracts in February 2021. These factors were partially offset by a $254 million net increase in manufacturing, maintenance and other costs, an increase in realized natural gas costs, which decreased gross margin by $194 million, and a 5% decrease in sales volume, which decreased gross margin by $8 million. Gross margin also includes the impact of a $7 million unrealized net mark-to-market loss on natural gas derivatives in 2021 compared to a $2 million gain in 2020.

Granular Urea Segment

Our granular urea segment produces granular urea, which contains 46% nitrogen. Produced from ammonia and carbon dioxide, it has the highest nitrogen content of any of our solid nitrogen fertilizers. Granular urea is produced at our Donaldsonville, Louisiana; Medicine Hat, Alberta; and Port Neal, Iowa nitrogen complexes.

The following table presents summary operating data for our granular urea segment:

	Year ended December 31,						
	2021	2020	2019	2021 v. 2020		2020 v. 2019	
	(in millions, except as noted)						
Net sales	$ 1,880	$ 1,248	$ 1,342	$ 632	51 %	$ (94)	(7)%
Cost of sales	992	847	861	145	17 %	(14)	(2)%
Gross margin	$ 888	$ 401	$ 481	$ 487	121 %	$ (80)	(17)%
Gross margin percentage	47.2 %	32.1 %	35.8 %	15.1 %		(3.7)%	
Sales volume by product tons (000s)	4,290	5,148	4,849	(858)	(17)%	299	6 %
Sales volume by nutrient tons (000s)[1]	1,973	2,368	2,231	(395)	(17)%	137	6 %
Average selling price per product ton	$ 438	$ 242	$ 277	$ 196	81 %	$ (35)	(13)%
Average selling price per nutrient ton[1]	$ 953	$ 527	$ 602	$ 426	81 %	$ (75)	(12)%
Gross margin per product ton	$ 207	$ 78	$ 99	$ 129	165 %	$ (21)	(21)%
Gross margin per nutrient ton[1]	$ 450	$ 169	$ 216	$ 281	166 %	$ (47)	(22)%
Depreciation and amortization	$ 235	$ 270	$ 264	$ (35)	(13)%	$ 6	2 %
Unrealized net mark-to-market loss (gain) on natural gas derivatives	$ 6	$ (2)	$ 4	$ 8	N/M	$ (6)	N/M

N/M—Not Meaningful

(1) Granular urea represents 46% nitrogen content. Nutrient tons represent the tons of nitrogen within the product tons.

Year Ended December 31, 2021 Compared to Year Ended December 31, 2020

Net Sales. Net sales in our granular urea segment increased $632 million, or 51%, to $1.88 billion in 2021 compared to $1.25 billion in 2020 due primarily to an 81% increase in average selling prices, partially offset by a 17% decrease in sales volume. Average selling prices increased to $438 per ton in 2021 compared to $242 per ton in 2020. The increase was due primarily to the impact of a tighter global nitrogen supply and demand balance. Sales volume was lower due primarily to lower supply availability resulting from reduced production due to plant turnaround, maintenance and repair activity and the impact of weather-related outages. Due to the reduced production, we purchased granular urea in 2021, which we sold for $68 million, to meet customer obligations.

Cost of Sales. Cost of sales in our granular urea segment averaged $231 per ton in 2021, a 41% increase from $164 per ton in 2020, due primarily to higher realized natural gas costs and higher costs related to plant turnaround, maintenance and repair activity due primarily to weather-related outages. In addition, we purchased $71 million of granular urea in 2021 to meet customer obligations.

Gross Margin. Gross margin in our granular urea segment increased by $487 million to $888 million in 2021 from $401 million in 2020, and our gross margin percentage was 47.2% in 2021 compared to 32.1% in 2020. The increase in gross margin was driven by an 81% increase in average selling prices, which increased gross margin by approximately $814 million. The impact of higher average selling prices was partially offset by higher realized natural gas costs, which decreased gross margin by $144 million, a 17% decrease in sales volume, which decreased gross margin by $88 million, and an $84 million net increase in manufacturing, maintenance and other costs. In addition, we experienced lower production throughout 2021. As a result, in 2021, we purchased 201,000 tons of granular urea to meet customer obligations, which had the impact of reducing our gross margin percentage in our granular urea segment by 2.0 percentage points. Gross margin includes the impact of a $6 million unrealized net mark-to-market loss on natural gas derivatives in 2021 compared to a $2 million gain in 2020.

UAN Segment

Our UAN segment produces urea ammonium nitrate solution (UAN). UAN, a liquid fertilizer product with a nitrogen content that typically ranges from 28% to 32%, is produced by combining urea and ammonium nitrate. UAN is produced at our nitrogen complexes in Courtright, Ontario; Donaldsonville, Louisiana; Port Neal, Iowa; Verdigris, Oklahoma; Woodward, Oklahoma; and Yazoo City, Mississippi.

The following table presents summary operating data for our UAN segment:

	Year ended December 31,							
	2021	2020	2019	2021 v. 2020		2020 v. 2019		
	(in millions, except as noted)							
Net sales	$ 1,788	$ 1,063	$ 1,270	$ 725	68 %	$ (207)	(16)%
Cost of sales	1,119	949	981	170	18 %	(32)	(3)%
Gross margin	$ 669	$ 114	$ 289	$ 555	N/M	$ (175)	(61)%
Gross margin percentage	37.4 %	10.7 %	22.8 %	26.7 %		(12.1)%	
Sales volume by product tons (000s)	6,584	6,843	6,807	(259)	(4)%	36	1 %
Sales volume by nutrient tons (000s)[1]	2,075	2,155	2,144	(80)	(4)%	11	1 %
Average selling price per product ton	$ 272	$ 155	$ 187	$ 117	75 %	$ (32)	(17)%
Average selling price per nutrient ton[1]	$ 862	$ 493	$ 592	$ 369	75 %	$ (99)	(17)%
Gross margin per product ton	$ 102	$ 17	$ 42	$ 85	N/M	$ (25)	(60)%
Gross margin per nutrient ton[1]	$ 322	$ 53	$ 135	$ 269	N/M	$ (82)	(61)%
Depreciation and amortization	$ 259	$ 256	$ 251	$ 3	1 %	$ 5	2 %
Unrealized net mark-to-market loss (gain) on natural gas derivatives	$ 5	$ (2)	$ 4	$ 7	N/M	$ (6)	N/M

N/M—Not Meaningful

(1) UAN represents between 28% and 32% of nitrogen content, depending on the concentration specified by the customer. Nutrient tons represent the tons of nitrogen within the product tons.

Year Ended December 31, 2021 Compared to Year Ended December 31, 2020

Net Sales. Net sales in our UAN segment increased $725 million, or 68%, to $1.79 billion in 2021 compared to $1.06 billion in 2020 due primarily to a 75% increase in average selling prices, partially offset by a 4% decrease in sales volume. Average selling prices increased to $272 per ton in 2021 compared to $155 per ton in 2020 due primarily to the impact of a tighter global nitrogen supply and demand balance. The decrease in sales volume was due to lower supply availability from reduced production during the first nine months of 2021 due to plant turnaround and maintenance activity and the impact of weather-related outages.

Cost of Sales. Cost of sales in our UAN segment averaged $170 per ton in 2021, a 23% increase from $138 per ton in 2020, due primarily to the impact of higher realized natural gas costs and higher costs related to plant turnaround, maintenance and repair activity.

Gross Margin. Gross margin in our UAN segment increased by $555 million to $669 million in 2021 from $114 million in 2020, and our gross margin percentage was 37.4% in 2021 compared to 10.7% in 2020. The increase in gross margin was due to a 75% increase in average selling prices, which increased gross margin by $756 million. The impact of higher average selling prices was partially offset by higher realized natural gas costs, which decreased gross margin by $168 million, a $22 million net increase in manufacturing, maintenance and other costs, and a 4% decrease in sales volume, which decreased gross margin by $4 million. Gross margin includes the impact of a $5 million unrealized net mark-to-market loss on natural gas derivatives in 2021 compared to a $2 million gain in 2020.

Antidumping and Countervailing Duty Investigations

On June 30, 2021, we filed petitions with the U.S. Department of Commerce (Commerce) and the U.S. International Trade Commission (ITC) requesting the initiation of antidumping and countervailing duty investigations on imports of UAN from Russia and Trinidad. On August 13, 2021, the ITC made an affirmative preliminary determination that there is a reasonable indication that the U.S. UAN industry is materially injured by reason of imports of UAN from Russia and Trinidad.

On November 30, 2021, Commerce announced preliminary countervailing duty determinations finding that UAN imports from Russia are unfairly subsidized at rates ranging from 9.66% to 9.84% and UAN imports from Trinidad are unfairly subsidized at a rate of 1.83%, and imposed preliminary cash deposit requirements on those imports.

On January 27, 2022, Commerce announced preliminary antidumping duty determinations finding that Russian UAN imports are dumped (i.e. sold at less than fair value) into the U.S. market at rates ranging from 9.15% to 127.19%, and that Trinidadian UAN imports are dumped at a rate of 63.08%, and imposed preliminary cash deposit requirements on those imports.

We expect that Commerce will issue final determinations later in 2022 and, if any of Commerce's final determinations are affirmative, the ITC would make a final determination as to whether the unfairly traded imports materially injure or threaten material injury to the U.S. UAN industry. If the ITC makes affirmative final determinations, then Commerce can impose duties equal to the level of dumping and unfair subsidies it finds. At this time, we cannot predict the outcome of the proceedings, including whether final antidumping or countervailing duties will be imposed on imports from either Russia or Trinidad, or the rate of any such duties.

AN Segment

Our AN segment produces ammonium nitrate (AN). AN, which has a nitrogen content between 29% and 35%, is produced by combining anhydrous ammonia and nitric acid. AN is used as nitrogen fertilizer and is also used by industrial customers for commercial explosives and blasting systems. AN is produced at our nitrogen complexes in Yazoo City, Mississippi and Ince and Billingham, United Kingdom.

The following table presents summary operating data for our AN segment:

	Year ended December 31,						
	2021	2020	2019	2021 v. 2020		2020 v. 2019	
	(in millions, except as noted)						
Net sales	$ 510	$ 455	$ 506	$ 55	12 %	$ (51)	(10)%
Cost of sales	475	390	399	85	22 %	(9)	(2)%
Gross margin	$ 35	$ 65	$ 107	$ (30)	(46)%	$ (42)	(39)%
Gross margin percentage	6.9 %	14.3 %	21.1 %	(7.4)%		(6.8)%	
Sales volume by product tons (000s)	1,720	2,216	2,109	(496)	(22)%	107	5 %
Sales volume by nutrient tons (000s)[(1)]	582	747	708	(165)	(22)%	39	6 %
Average selling price per product ton	$ 297	$ 205	$ 240	$ 92	45 %	$ (35)	(15)%
Average selling price per nutrient ton[(1)]	$ 876	$ 609	$ 715	$ 267	44 %	$ (106)	(15)%
Gross margin per product ton	$ 20	$ 29	$ 51	$ (9)	(31)%	$ (22)	(43)%
Gross margin per nutrient ton[(1)]	$ 60	$ 87	$ 151	$ (27)	(31)%	$ (64)	(42)%
Depreciation and amortization	$ 77	$ 100	$ 88	$ (23)	(23)%	$ 12	14 %
Unrealized net mark-to-market loss on natural gas derivatives	$ 4	$ —	$ 1	$ 4	N/M	$ (1)	(100)%

N/M—Not Meaningful

(1) AN represents between 29% and 35% of nitrogen content. Nutrient tons represent the tons of nitrogen within the product tons.

Year Ended December 31, 2021 Compared to Year Ended December 31, 2020

On September 15, 2021, we announced the halt of operations at both our Ince and Billingham manufacturing facilities in the United Kingdom due to negative profitability driven by the high cost of natural gas. Shortly thereafter, we restarted production at our Billingham facility; however, production continues to be idled at our Ince facility. See the discussion under "Market Conditions and Current Developments—United Kingdom Energy Crisis," above, for further information.

Net Sales. Net sales in our AN segment increased $55 million, or 12%, to $510 million in 2021 from $455 million in 2020 due primarily to a 45% increase in average selling prices, partially offset by a 22% decrease in sales volume. Average selling prices increased to $297 per ton in 2021 compared to $205 per ton in 2020 due primarily to the impact of a tighter global nitrogen supply and demand balance. Sales volume decreased due primarily to lower supply availability as a result of reduced production due to plant turnaround and maintenance activity and idled operations at our Ince facility.

Cost of Sales. Cost of sales in our AN segment averaged $277 per ton in 2021, a 57% increase from $176 per ton in 2020, due primarily to higher realized natural gas costs and higher costs related to plant turnaround and maintenance activity, including the impact of the idled Ince facility. Natural gas costs increased significantly in both the United States and the United Kingdom in 2021. See the discussion under “Market Conditions and Current Developments—Natural Gas Prices,” above, for further information.

Gross Margin. Gross margin in our AN segment decreased by $30 million to $35 million in 2021 from $65 million in 2020, and our gross margin percentage was 6.9% in 2021 compared to 14.3% in 2020. The decrease in gross margin was due to an increase in realized natural gas costs, which decreased gross margin by $97 million, a net increase of $67 million in manufacturing, maintenance and other costs, and a 22% decrease in sales volume, which decreased gross margin by $21 million. These factors were partially offset by a 45% increase in average selling prices, which increased gross margin by $159 million. Gross margin also includes the impact of a $4 million unrealized net mark-to-market loss on natural gas derivatives in 2021.

Other Segment

Our Other segment primarily includes the following products:

- Diesel exhaust fluid (DEF) is an aqueous urea solution typically made with 32.5% or 50% high-purity urea and the remainder deionized water.
- Urea liquor is a liquid product that we sell in concentrations of 40%, 50% and 70% urea as a chemical intermediate.
- Nitric acid is a nitrogen-based mineral acid that is used in the production of nitrate-based fertilizers, nylon precursors and other specialty chemicals.
- Compound fertilizer products (NPKs) are granular fertilizer products for which the nutrient content is a combination of nitrogen, phosphorus and potassium.

The following table presents summary operating data for our Other segment:

	Year ended December 31,						
	2021	2020	2019	2021 v. 2020		2020 v. 2019	
	(in millions, except as noted)						
Net sales	$ 573	$ 338	$ 359	$ 235	70 %	$ (21)	(6)%
Cost of sales	403	287	297	116	40 %	(10)	(3)%
Gross margin	$ 170	$ 51	$ 62	$ 119	233 %	$ (11)	(18)%
Gross margin percentage	29.7 %	15.1 %	17.3 %	14.6 %		(2.2)%	
Sales volume by product tons (000s)	2,318	2,322	2,257	(4)	— %	65	3 %
Sales volume by nutrient tons (000s)[1]	458	457	444	1	— %	13	3 %
Average selling price per product ton	$ 247	$ 146	$ 159	$ 101	69 %	$ (13)	(8)%
Average selling price per nutrient ton[1]	$ 1,251	$ 740	$ 809	$ 511	69 %	$ (69)	(9)%
Gross margin per product ton	$ 73	$ 22	$ 27	$ 51	232 %	$ (5)	(19)%
Gross margin per nutrient ton[1]	$ 371	$ 112	$ 140	$ 259	231 %	$ (28)	(20)%
Depreciation and amortization	$ 87	$ 68	$ 72	$ 19	28 %	$ (4)	(6)%
Unrealized net mark-to-market loss on natural gas derivatives	$ 3	$ —	$ 1	$ 3	N/M	$ (1)	(100)%

N/M—Not Meaningful
(1) Nutrient tons represent the tons of nitrogen within the product tons.

Year Ended December 31, 2021 Compared to Year Ended December 31, 2020

Net Sales. Net sales in our Other segment increased $235 million, or 70%, to $573 million in 2021 from $338 million in 2020 due to a 69% increase in average selling prices. Average selling prices increased to $247 per ton in 2021 compared to $146 per ton in 2020, due primarily to the impact of a tighter global nitrogen supply and demand balance. Sales volume was essentially unchanged as higher DEF sales volumes were partially offset by lower NPK sales volumes, as a result of idled operations at our Ince facility, and lower urea liquor sales volumes.

Cost of Sales. Cost of sales in our Other segment averaged $174 per ton in 2021, a 40% increase from $124 per ton in 2020, due primarily to higher realized natural gas costs and higher costs related to plant turnaround and maintenance activity, including the impact of the idled Ince facility.

Gross Margin. Gross margin in our Other segment increased by $119 million to $170 million in 2021 from $51 million in 2020, and our gross margin percentage was 29.7% in 2021 compared to 15.1% in 2020. The increase in gross margin was due to a 69% increase in average selling prices, which increased gross margin by $236 million, and an increase of $13 million due to product mix. These factors were partially offset by a $67 million net increase in manufacturing, maintenance and other costs and an increase in realized natural gas costs, which reduced gross margin by $60 million. Gross margin also includes the impact of a $3 million unrealized net mark-to-market loss on natural gas derivatives in 2021.

Liquidity and Capital Resources

Our primary uses of cash are generally for operating costs, working capital, capital expenditures, debt service, investments, taxes, share repurchases and dividends. Our working capital requirements are affected by several factors, including demand for our products, selling prices, raw material costs, freight costs and seasonal factors inherent in the business. In addition, we may from time to time seek to retire or purchase our outstanding debt through cash purchases, in open market or privately negotiated transactions or otherwise. Such repurchases, if any, will depend on prevailing market conditions, our liquidity requirements, contractual restrictions and other factors. The amounts involved may be material.

Generally, our primary source of cash is cash from operations, which includes cash generated by customer advances. We may also from time to time access the capital markets or engage in borrowings under our revolving credit agreement.

On March 20, 2021, we redeemed in full all of the remaining $250 million outstanding principal amount of the 2021 Notes, in accordance with the optional redemption provisions in the indenture governing the 2021 Notes. On September 10, 2021, we redeemed $250 million principal amount, representing one-third of the $750 million principal amount outstanding immediately prior to such redemption, of the 2023 Notes, in accordance with the optional redemption provisions in the indenture governing the 2023 Notes. See the discussion under “Debt,” below, for further information.

In 2021, we repurchased approximately 8.6 million shares of CF Holdings common stock under the 2019 share repurchase program for $540 million. See the discussion under “Share Repurchase Programs,” below, for further information.

Our cash and cash equivalents balance was $1.63 billion at December 31, 2021, an increase of $945 million from $683 million at December 31, 2020. At December 31, 2021, we were in compliance with all applicable covenant requirements under our revolving credit agreement and senior notes, and unused borrowing capacity under our revolving credit agreement was $750 million.

United Kingdom Energy Crisis

As discussed under “Market Conditions and Current Developments—United Kingdom Energy Crisis,” above, during the third quarter of 2021, the United Kingdom began experiencing an energy crisis that included a substantial increase in the price of natural gas, which impacted our U.K. operations. Management continues to assess these volatile market conditions in the United Kingdom. The factors that could lead to the resolution of the U.K. energy crisis, and the timing of any such resolution, are unknown to us. Production continues to be idled at our Ince facility, while the Billingham facility is currently operating. There remains significant uncertainty regarding future plans for these sites pending greater clarity as to the future cost of natural gas and electricity, selling prices for the products we produce in the United Kingdom and U.K. government policy. Persistence of the current levels of energy costs and product prices facing our U.K. operations could lead to the continued idling or shutting down of our U.K. facilities. This could result in, among other things, additional funding to support the cash needs of the U.K. operations and recognition of further losses or further asset impairment charges related to our U.K. operations. Each of these actions could have a material adverse impact on our results of operations and cash flows.

Cash Equivalents

Cash equivalents include highly liquid investments that are readily convertible to known amounts of cash with original maturities of three months or less. Under our short-term investment policy, we may invest our cash balances, either directly or through mutual funds, in several types of investment-grade securities, including notes and bonds issued by governmental entities or corporations. Securities issued by governmental entities include those issued directly by the U.S. and Canadian federal governments; those issued by state, local or other governmental entities; and those guaranteed by entities affiliated with governmental entities.

Share Repurchase Programs

On February 13, 2019, our Board of Directors (the Board) authorized the repurchase of up to $1 billion of CF Holdings common stock through December 31, 2021 (the 2019 Share Repurchase Program). Repurchases under our share repurchase programs may be made from time to time in the open market, through privately negotiated transactions, block transactions or otherwise. The manner, timing and amount of repurchases will be determined by our management based on the evaluation of market conditions, stock price, and other factors.

The following table summarizes the shares repurchased under the 2019 Share Repurchase Program.

	Shares	Amounts
	(in millions)	
Shares repurchased in 2019	7.6	$ 337
Shares repurchased in 2020	2.6	100
Shares repurchased in 2021	8.6	540
Total shares repurchased under the 2019 Share Repurchase Program	18.8	$ 977

Shares repurchased, including those repurchased under share repurchase programs, are retired as approved by the Board. As of December 31, 2021, we held 27,962 shares of treasury stock.

On November 3, 2021, the Board authorized the repurchase of up to $1.5 billion of CF Holdings common stock from January 1, 2022 through December 31, 2024 (the 2021 Share Repurchase Program).

Capital Spending

We make capital expenditures to sustain our asset base, increase our capacity or capabilities, improve plant efficiency and comply with various environmental, health and safety requirements. Capital expenditures totaled $514 million in 2021 compared to $309 million in 2020. The increase in capital expenditures reflects higher capital spending due to maintenance deferred from 2020 as well as activity that was previously planned to occur in 2022, but accelerated into 2021.

Capital expenditures in 2022 are estimated to be in the range of $500 to $550 million, which includes capital expenditures at our Donaldsonville complex related to green and blue ammonia projects. Planned capital expenditures are generally subject to change due to delays in regulatory approvals or permitting, unanticipated increases in cost, changes in scope and completion time, performance of third parties, delays in the receipt of equipment, adverse weather, defects in materials and workmanship, labor or material shortages, transportation constraints, acceleration or delays in the timing of the work and other unforeseen difficulties.

Government Policies

The policies or laws of governments around the world can result in the imposition of taxes, duties, tariffs or other restrictions or regulatory requirements on imports and exports of raw materials, finished goods or services from a particular country or region of the world. The policies and laws of governments can also impact the subsidization of natural gas prices, and subsidies or quotas applied to domestic producers or farmers. Due to the critical role that fertilizers play in food production, the construction and operation of fertilizer plants often are influenced by economic, political and social objectives. Additionally, the import or export of fertilizer can be subject to local taxes imposed by governments which can have the effect of either encouraging or discouraging import and export activity. The impact of changes in governmental policies or laws or the political or social objectives of a country could have a material impact on fertilizer demand and selling prices and therefore could impact our liquidity.

Emission Credit Activity

Our U.K. manufacturing plants are subject to greenhouse gas (GHG) regulations in the United Kingdom. After the United Kingdom's exit from the European Union, the U.K. government instituted new GHG regulations in 2021, including establishing the U.K. Emission Trading Scheme (UK ETS). The UK ETS replaces the European Union Emissions Trading System for U.K. companies. In conjunction with these changes, the U.K. GHG regulations established a lower emission cap than applied to us under the European GHG regulations. Under the new U.K. requirements, we are required to obtain and surrender emission allowances equivalent to our annual greenhouse gas emissions, although we are also allocated a certain number of free allowances. As a result of the new GHG regulations and the establishment of the UK ETS, our remaining European Union emission credits were no longer applicable for us in the United Kingdom, and we need U.K. emission credits to offset any emissions that are in excess of the number of free allowances allocated to us. Accordingly, in the third quarter of 2021, we sold our remaining EU emission credits for approximately $20 million and recognized a corresponding gain, as the credits were earned by us in prior years due to approved emission abatement actions that we had taken and, therefore, did not have a recognized cost associated with them. We subsequently purchased approximately 321,000 of U.K. emission credits for approximately $19 million. During the fourth quarter of 2021, as we have estimated that we have sufficient emission credits for our 2021 obligations, we sold the excess U.K. emission credits, including those purchased in the third quarter of 2021, for approximately $46 million, and recognized a corresponding gain of $27 million.

Canada Revenue Agency Competent Authority Matter

In 2016, the Canada Revenue Agency (CRA) and Alberta Tax and Revenue Administration (Alberta TRA) issued Notices of Reassessment for tax years 2006 through 2009 to one of our Canadian affiliates asserting a disallowance of certain patronage allocations. We filed Notices of Objection with respect to the Notices of Reassessment with the CRA and Alberta TRA and posted letters of credit in lieu of paying the additional tax liability assessed. The letters of credit serve as security until the matter is resolved. In 2018, the matter, including the related transfer pricing topic, was accepted for consideration under the bilateral settlement provisions of the U.S.-Canada tax treaty (the Treaty) by the United States and Canadian competent authorities, and included tax years 2006 through 2011. In the second quarter of 2021, the Company entered the transfer pricing aspect of the matter into the arbitration process under the terms of the Treaty.

In February 2022, we were informed that a decision was reached by the arbitration board regarding the transfer pricing matter with the CRA for tax years 2006 through 2011, as discussed in Note 11—Income Taxes. We are awaiting further details of the results of the arbitration proceedings and the settlement provisions between the United States and Canadian competent authorities. We need to decide whether to accept the decision of the arbitration board or pursue other resolution alternatives, which is expected to occur in the first quarter of 2022.

If we were to accept the decision of the arbitration board, the associated letters of credit would be cancelled and we would owe additional tax and interest to Canada, which would likely be due in the second quarter of 2022. Simultaneously, pursuant to the arbitration determination, the Company would file amended tax returns for the relevant tax years with the United States to request a refund of tax overpaid. The receipt of tax overpaid and any related interest would occur in a period later than the settlement of tax and interest owed. While we are not currently able to estimate the amounts due to, or to be received from, the taxing jurisdictions, each of the individual amounts that would ultimately be paid or received could be material.

Terra Amended Tax Returns

In 2020, we received U.S. federal income tax refunds, including interest, of $110 million relating to amended tax returns that we had filed in 2012 related to prior tax years. See discussion under "Items Affecting Comparability of Results—Terra Amended Tax Returns," above, for further information.

In 2017, we made a Voluntary Disclosures Program filing with the CRA with respect to the Canadian tax aspects of the amended U.S. tax returns and paid additional Canadian taxes due. In late 2020, the CRA settled with us the voluntary disclosure matter, and, in the first quarter of 2021, we received approximately $20 million of withholding tax refunds, including interest, from the CRA. These amounts were previously recorded in our consolidated balance sheet as of December 31, 2020.

Repatriation of Foreign Earnings and Income Taxes

We have operations in Canada, the United Kingdom and a 50% interest in a joint venture in the Republic of Trinidad and Tobago. Historically, the estimated additional U.S. and foreign income taxes due upon repatriation of the earnings of these foreign operations to the U.S. were recognized in our consolidated financial statements as the earnings were recognized, unless the earnings were considered to be permanently reinvested based upon our then current plans. However, the cash payment of the income tax liabilities associated with repatriation of earnings from foreign operations occurred at the time of the repatriation. As a result, the recognition of income tax expense related to foreign earnings, as applicable, and the payment of taxes resulting from repatriation of those earnings could occur in different periods.

In light of changes made by the Tax Cuts and Jobs Act, commencing with the 2018 tax year, the United States no longer taxes earnings of foreign subsidiaries even when such earnings are earned or repatriated to the United States, unless such earnings are subject to U.S. rules on passive income or certain anti-abuse provisions. Foreign subsidiary earnings may still be subject to withholding taxes when repatriated to the United States.

Cash balances held by our joint venture are maintained at sufficient levels to fund local operations as accumulated earnings are repatriated from the joint venture on a periodic basis.

As of December 31, 2021, approximately $205 million of our consolidated cash and cash equivalents balance of $1.63 billion was held by our Canadian and United Kingdom subsidiaries. Historically, and for the current year, the cash balance held by the Canadian subsidiaries represented accumulated earnings of our foreign operations that were not considered to be permanently reinvested. As of December 31, 2021, we would not expect any additional cash tax cost to repatriate the Canadian and United Kingdom cash balances if we were to repatriate this cash in the future, other than foreign withholding tax.

Debt

Revolving Credit Agreement

We have a senior unsecured revolving credit agreement (the Revolving Credit Agreement), which provides for a revolving credit facility of up to $750 million with a maturity of December 5, 2024. The Revolving Credit Agreement includes a letter of credit sub-limit of $125 million. Borrowings under the Revolving Credit Agreement may be used for working capital, capital expenditures, acquisitions, share repurchases and other general corporate purposes.

Borrowings under the Revolving Credit Agreement may be denominated in U.S. dollars, Canadian dollars, euros and British pounds, and bear interest at a per annum rate equal to an applicable eurocurrency rate or base rate plus, in either case, a specified margin. We are required to pay an undrawn commitment fee on the undrawn portion of the commitments under the Revolving Credit Agreement and customary letter of credit fees. The specified margin and the amount of the commitment fee depend on CF Holdings' credit rating at the time.

CF Industries is the lead borrower, and CF Holdings is the sole guarantor, under the Revolving Credit Agreement.

The Revolving Credit Agreement contains representations and warranties and affirmative and negative covenants customary for a financing of this type. The financial covenants applicable to CF Holdings and its subsidiaries in the Revolving Credit Agreement:

(i) require that the interest coverage ratio (as defined in the Revolving Credit Agreement) be not less than 2.75:1.00 as of the last day of each fiscal quarter and

(ii) require that the total net leverage ratio (as defined in the Revolving Credit Agreement) be not greater than 3.75:1.00 (the Maximum Total Net Leverage Ratio) as of the last day of each fiscal quarter, provided that, if any borrower or subsidiary consummates a material acquisition during any fiscal quarter, CF Industries may elect to increase the Maximum Total Net Leverage Ratio to 4.25:1.00 for the period of four consecutive fiscal quarters commencing with such fiscal quarter (and no further such election may be made unless and until the Maximum Total Net Leverage Ratio is less than or equal to 3.75:1.00 as of the end of two consecutive fiscal quarters after the end of such period).

As of December 31, 2021, we were in compliance with all covenants under the Revolving Credit Agreement.

The Revolving Credit Agreement contains events of default (with notice requirements and cure periods, as applicable) customary for a financing of this type, including, but not limited to, non-payment of principal, interest or fees; inaccuracy of representations and warranties in any material respect; and failure to comply with specified covenants. Upon the occurrence and during the continuance of an event of default under the Revolving Credit Agreement and after any applicable cure period, subject to specified exceptions, the administrative agent may, and at the request of the requisite lenders is required to, accelerate the loans under the Revolving Credit Agreement or terminate the lenders' commitments under the Revolving Credit Agreement.

As of December 31, 2021, we had unused borrowing capacity under the Revolving Credit Agreement of $750 million and no outstanding letters of credit. In addition, there were no borrowings outstanding under the Revolving Credit Agreement as of December 31, 2021 or 2020, or during the year ended December 31, 2021.

In March 2020, we borrowed $500 million under the Revolving Credit Agreement to ensure we maintained ample financial flexibility in light of the uncertainty in the global markets, including the financial credit markets, caused by the COVID-19 pandemic. In April 2020, due to confidence in the functioning of the credit markets and strong nitrogen fertilizer business conditions, we repaid the $500 million of borrowings that were outstanding under the Revolving Credit Agreement as of March 31, 2020, which returned our unused borrowing capacity under the Revolving Credit Agreement to $750 million. Maximum borrowings under the Revolving Credit Agreement during 2020 were $500 million. The weighted-average annual interest rate of borrowings under the Revolving Credit Agreement during 2020 was 2.05%.

Letters of Credit

In addition to the letters of credit that may be issued under the Revolving Credit Agreement, as described above, we have also entered into a bilateral agreement with capacity to issue letters of credit up to $250 million. As of December 31, 2021, approximately $223 million of letters of credit were outstanding under this agreement.

Senior Notes

Long-term debt presented on our consolidated balance sheets as of December 31, 2021 and 2020 consisted of the following debt securities issued by CF Industries:

	Effective Interest Rate	December 31, 2021 Principal Outstanding	December 31, 2021 Carrying Amount [1]	December 31, 2020 Principal Outstanding	December 31, 2020 Carrying Amount [1]
		(in millions)			
Public Senior Notes:					
3.450% due June 2023	3.562%	$ 500	$ 499	$ 750	$ 748
5.150% due March 2034	5.279%	750	741	750	741
4.950% due June 2043	5.031%	750	742	750	742
5.375% due March 2044	5.465%	750	741	750	741
Senior Secured Notes:					
3.400% due December 2021	3.782%	—	—	250	249
4.500% due December 2026[2]	4.759%	750	742	750	740
Total long-term debt		$ 3,500	$ 3,465	$ 4,000	$ 3,961
Less: Current maturities of long-term debt		—	—	250	249
Long-term debt, net of current maturities		$ 3,500	$ 3,465	$ 3,750	$ 3,712

(1) Carrying amount is net of unamortized debt discount and deferred debt issuance costs. Total unamortized debt discount was $8 million and $9 million as of December 31, 2021 and 2020, respectively, and total deferred debt issuance costs were $27 million and $30 million as of December 31, 2021 and 2020, respectively.

(2) Effective August 23, 2021, these notes are no longer secured, in accordance with the terms of the applicable indenture.

Public Senior Notes

Under the indentures (including the applicable supplemental indentures) governing our senior notes due 2023, 2034, 2043 and 2044 identified in the table above (the Public Senior Notes), each series of Public Senior Notes is guaranteed by CF Holdings. Interest on the Public Senior Notes is payable semiannually, and the Public Senior Notes are redeemable at our option, in whole at any time or in part from time to time, at specified make-whole redemption prices.

On September 10, 2021, we redeemed $250 million principal amount, representing one-third of the $750 million principal amount outstanding immediately prior to such redemption, of the 2023 Notes, in accordance with the optional redemption provisions in the indenture governing the 2023 Notes. The total aggregate redemption price paid in connection with the redemption of the 2023 Notes, which was funded with cash on hand, was approximately $265 million, including accrued interest. As a result, we recognized a loss on debt extinguishment of $13 million in the third quarter of 2021, consisting primarily of the premium paid on the redemption of the $250 million principal amount of the 2023 Notes prior to their scheduled maturity.

The indentures governing the Public Senior Notes contain covenants that limit, among other things, the ability of CF Holdings and its subsidiaries, including CF Industries, to incur liens on certain assets to secure debt, to engage in sale and leaseback transactions, to merge or consolidate with other entities and to sell, lease or transfer all or substantially all of the assets of CF Holdings and its subsidiaries to another entity. Each of the indentures governing the Public Senior Notes provides for customary events of default, which include (subject in certain cases to customary grace and cure periods), among others, nonpayment of principal or interest on the applicable Public Senior Notes; failure to comply with other covenants or agreements under the indenture; certain defaults on other indebtedness; the failure of CF Holdings' guarantee of the applicable Public Senior Notes to be enforceable; and specified events of bankruptcy or insolvency. Under each indenture governing the Public Senior Notes, in the case of an event of default arising from one of the specified events of bankruptcy or insolvency, the applicable Public Senior Notes would become due and payable immediately, and, in the case of any other event of default (other than an event of default related to CF Industries' and CF Holdings' reporting obligations), the trustee or the holders of at least 25% in aggregate principal amount of the applicable Public Senior Notes then outstanding may declare all of such Public Senior Notes to be due and payable immediately.

Under each of the indentures governing the Public Senior Notes, specified changes of control involving CF Holdings or CF Industries, when accompanied by a ratings downgrade, as defined with respect to the applicable series of Public Senior

Notes, constitute change of control repurchase events. Upon the occurrence of a change of control repurchase event with respect to a series of Public Senior Notes, unless CF Industries has exercised its option to redeem such Public Senior Notes, CF Industries will be required to offer to repurchase them at a price equal to 101% of the principal amount thereof, plus accrued and unpaid interest, if any, to, but not including, the date of repurchase.

Senior Secured Notes

On March 20, 2021, we redeemed in full all of the remaining $250 million outstanding principal amount of the 2021 Notes in accordance with the optional redemption provisions in the indenture governing the 2021 Notes. The total aggregate redemption price paid in connection with the redemption of the 2021 Notes was $258 million, including accrued interest. As a result, we recognized a loss on debt extinguishment of $6 million in the first quarter of 2021, consisting primarily of the premium paid on the redemption of the 2021 Notes prior to their scheduled maturity.

Under the terms of the indenture governing the 4.500% senior secured notes due 2026 (the 2026 Notes), the 2026 Notes are guaranteed by CF Holdings. Until August 23, 2021, the 2026 Notes were guaranteed by certain subsidiaries of CF Industries. The requirement for subsidiary guarantees of the 2026 Notes was eliminated, and all subsidiary guarantees were automatically released, as a result of an investment grade rating event under the terms of the indenture governing the 2026 Notes on August 23, 2021. Prior to the investment grade rating event, subject to certain exceptions, the obligations under the 2026 Notes and related guarantees were secured by a first priority security interest in collateral consisting of substantially all of the assets of CF Industries, CF Holdings and the subsidiary guarantors. As a result of the investment grade rating event, the liens on the collateral securing the obligations under the 2026 Notes and related guarantees were automatically released on August 23, 2021, and the indenture covenant that had limited dispositions of assets constituting collateral no longer applies.

Interest on the 2026 Notes is payable semiannually, and the 2026 Notes are redeemable at our option, in whole at any time or in part from time to time, at specified make-whole redemption prices.

Under the indenture governing the 2026 Notes, specified changes of control involving CF Holdings or CF Industries, when accompanied by a ratings downgrade, as defined with respect to the 2026 Notes, constitute change of control repurchase events. Upon the occurrence of a change of control repurchase event with respect to the 2026 Notes, unless CF Industries has exercised its option to redeem such notes, CF Industries will be required to offer to repurchase them at a price equal to 101% of the principal amount thereof, plus accrued and unpaid interest, if any, to, but not including, the date of repurchase.

The indentures governing the 2026 Notes contain covenants that limit, among other things, the ability of CF Holdings and its subsidiaries, including CF Industries, to incur liens on certain assets to secure debt, to engage in sale and leaseback transactions, to merge or consolidate with other entities and to sell, lease or transfer all or substantially all of the assets of CF Holdings and its subsidiaries to another entity. The indenture governing the 2026 Notes provides for customary events of default, which include (subject in certain cases to customary grace and cure periods), among others, nonpayment of principal or interest of the 2026 Notes; failure to comply with other covenants or agreements under the indenture; certain defaults on other indebtedness; the failure of CF Holdings' guarantee of the 2026 Notes to be enforceable; and specified events of bankruptcy or insolvency. Under the indenture governing the 2026 Notes, in the case of an event of default arising from one of the specified events of bankruptcy or insolvency, the 2026 Notes would become due and payable immediately, and, in the case of any other event of default (other than an event of default related to CF Industries' and CF Holdings' reporting obligations), the trustee or the holders of at least 25% in aggregate principal amount of the 2026 Notes then outstanding may declare all of such notes to be due and payable immediately.

Forward Sales and Customer Advances

We offer our customers the opportunity to purchase products from us on a forward basis at prices and on delivery dates we propose. Therefore, our reported nitrogen fertilizer selling prices and margins may differ from market spot prices and margins available at the time of shipment.

Customer advances, which typically represent a portion of the contract's value, are received shortly after the contract is executed, with any remaining unpaid amount generally being collected by the time control transfers to the customer, thereby reducing or eliminating the accounts receivable related to such sales. Any cash payments received in advance from customers in connection with forward sales contracts are reflected on our consolidated balance sheets as a current liability until control transfers and revenue is recognized. As of December 31, 2021 and 2020, we had $700 million and $130 million, respectively, in customer advances on our consolidated balance sheets.

While customer advances are generally a significant source of liquidity, the level of forward sales contracts is affected by many factors including current market conditions and our customers' outlook of future market fundamentals. During periods of declining prices, customers tend to delay purchasing fertilizer in anticipation that prices in the future will be lower than the current prices. If the level of sales under our forward sales programs were to decrease in the future, our cash received from customer advances would likely decrease and our accounts receivable balances would likely increase. Additionally, borrowing under the Revolving Credit Agreement could become necessary. Due to the volatility inherent in our business and changing customer expectations, we cannot estimate the amount of future forward sales activity.

Under our forward sales programs, a customer may delay delivery of an order due to weather conditions or other factors. These delays generally subject the customer to potential charges for storage or may be grounds for termination of the contract by us. Such a delay in scheduled shipment or termination of a forward sales contract due to a customer's inability or unwillingness to perform may negatively impact our reported sales.

Natural Gas

Natural gas is the principal raw material used to produce nitrogen products. We use natural gas both as a chemical feedstock and as a fuel to produce ammonia, granular urea, UAN, AN and other products. Expenditures on natural gas are a significant portion of our production costs, representing approximately 40% of our total production costs in 2021. As a result of these factors, natural gas prices have a significant impact on our operating expenses and can thus affect our liquidity.

We enter into agreements for a portion of our future natural gas supply and related transportation. As of December 31, 2021, our natural gas purchase agreements have terms that range from one to two years and a total minimum commitment of approximately $780 million, and our natural gas transportation agreements have terms that range from one to ten years and a total minimum commitment of approximately $165 million. Our minimum commitments to purchase and transport natural gas are based on prevailing market-based forward prices excluding reductions for plant maintenance and turnaround activities.

Because most of our nitrogen manufacturing facilities are located in the United States and Canada, the price of natural gas in North America directly impacts a substantial portion of our operating expenses. Due to increases in natural gas production resulting from the rise in production from shale gas formations, natural gas prices in North America have declined in the last decade, but are subject to volatility. During 2021, the daily closing price at the Henry Hub, the most heavily-traded natural gas pricing point in North America, reached a low of $2.36 per MMBtu on April 7, 2021 and a high of $23.61 per MMBtu on February 18, 2021. During the three-year period ended December 31, 2021, the daily closing price at the Henry Hub reached a low of $1.34 per MMBtu on September 22, 2020 and three consecutive days in October 2020 and a high of $23.61 per MMBtu on February 18, 2021.

We also have manufacturing facilities located in the United Kingdom. These facilities are subject to fluctuations associated with the price of natural gas in Europe. The major natural gas trading point for the United Kingdom is the National Balancing Point (NBP). During 2021, the daily closing price at NBP reached a low of $5.58 per MMBtu on February 23, 2021 and a high of $60.10 per MMBtu on December 22, 2021. During the three-year period ended December 31, 2021, the daily closing price at NBP reached a low of $1.04 per MMBtu on May 22, 2020, and a high of $60.10 per MMBtu on December 22, 2021.

Natural gas costs in our cost of sales, including the impact of realized natural gas derivatives, increased 88% to $4.21 per MMBtu in 2021 from $2.24 per MMBtu in 2020.

Derivative Financial Instruments

We use derivative financial instruments to reduce our exposure to changes in prices for natural gas that will be purchased in the future. Natural gas is the largest and most volatile component of our manufacturing cost for our nitrogen-based products. From time to time, we may also use derivative financial instruments to reduce our exposure to changes in foreign currency exchange rates. Volatility in reported quarterly earnings can result from the unrealized mark-to-market adjustments in the value of the derivatives. In 2021 and 2020, we recognized an unrealized net mark-to-market loss (gain) on natural gas derivatives of $25 million and $(6) million, respectively, which is reflected in cost of sales in our consolidated statements of operations.

Derivatives expose us to counterparties and the risks associated with their ability to meet the terms of the contracts. For derivatives that are in net asset positions, we are exposed to credit loss from nonperformance by the counterparties. We control our credit risk through the use of multiple counterparties that are multinational commercial banks, other major financial institutions or large energy companies, and the use of International Swaps and Derivatives Association (ISDA) master netting arrangements. The ISDA agreements are master netting arrangements commonly used for over-the-counter derivatives that mitigate exposure to counterparty credit risk, in part, by creating contractual rights of netting and setoff, the specifics of which vary from agreement to agreement.

The ISDA agreements for most of our derivative instruments contain credit-risk-related contingent features, such as cross default provisions. In the event of certain defaults or termination events, our counterparties may request early termination and net settlement of certain derivative trades or may require us to collateralize derivatives in a net liability position. As of December 31, 2021 and 2020, the aggregate fair value of the derivative instruments with credit-risk-related contingent features in net liability positions was $31 million and $6 million, respectively, which also approximates the fair value of the assets that may be needed to settle the obligations if the credit-risk-related contingent features were triggered at the reporting dates.

As of December 31, 2021, our open natural gas derivative contracts consisted of natural gas fixed price swaps, basis swaps and options for 60.0 million MMBtus. As of December 31, 2020, we had open natural gas derivative contracts consisting of natural gas fixed price swaps and basis swaps for 34.1 million MMBtus. At both December 31, 2021 and 2020, we had no cash collateral on deposit with counterparties for derivative contracts. The credit support documents executed in connection with certain of our ISDA agreements generally provide us and our counterparties the right to set off collateral against amounts owing under the ISDA agreements upon the occurrence of a default or a specified termination event.

Embedded Derivative Liability

Under the terms of our strategic venture with CHS, if our credit rating as determined by two of three specified credit rating agencies is below certain levels, we are required to make a non-refundable yearly payment of $5 million to CHS. Since 2016, our credit ratings have been below certain levels and, as a result, we made an annual payment of $5 million to CHS in the fourth quarter of each year. These payments will continue on a yearly basis until the earlier of the date that our credit rating is upgraded to or above certain levels by two of three specified credit rating agencies or February 1, 2026. This obligation is recognized on our consolidated balance sheets as an embedded derivative. As of December 31, 2021 and 2020, the embedded derivative liability was $15 million and $18 million, respectively. See Note 10—Fair Value Measurements for additional information.

Defined Benefit Pension Plans

We contributed $40 million to our pension plans in 2021. In 2022, we expect to contribute approximately $29 million to our pension plans. In addition, we expect to contribute a total of approximately $68 million to our U.K. plans in the three-year period from 2023 to 2025, as agreed with the plans' trustees.

Distributions on Noncontrolling Interest in CFN

The CFN Board of Managers approved semi-annual distribution payments for the years ended December 31, 2021, 2020 and 2019, in accordance with CFN's limited liability company agreement, as follows:

Approved and paid	Distribution Period	Distribution Amount (in millions)	
First quarter of 2022	Six months ended December 31, 2021	$	247
Third quarter of 2021	Six months ended June 30, 2021		130
First quarter of 2021	Six months ended December 31, 2020		64
Third quarter of 2020	Six months ended June 30, 2020		86
First quarter of 2020	Six months ended December 31, 2019		88
Third quarter of 2019	Six months ended June 30, 2019		100

Cash Flows

Operating Activities

Net cash provided by operating activities in 2021 was $2.87 billion as compared to $1.23 billion in 2020, an increase of $1.64 billion. The increase in cash flow from operations was due primarily to higher net earnings and favorable changes in net working capital. Net earnings in 2021 was $1.26 billion compared to $432 million in 2020. The increase in net earnings was due primarily to higher average selling prices and a $112 million gain on the net settlement of certain natural gas contracts with our suppliers in February 2021, partially offset by higher costs related to manufacturing, maintenance and repair activity. During 2021, net changes in working capital increased cash flow from operations by $448 million, while in 2020 net changes in working capital contributed $12 million to cash flow from operations. The increased cash flow from working capital changes was primarily driven by an increase in customer advances and accounts payable and accrued expenses, partially offset by changes in accounts receivable and inventory.

Investing Activities

Net cash used in investing activities was $466 million in 2021 compared to $299 million in 2020, or an increase of $167 million. This increase was due primarily to higher capital expenditures. During 2021, capital expenditures totaled $514 million compared to $309 million in 2020.

Financing Activities

Net cash used in financing activities was $1.46 billion in 2021 compared to $542 million in 2020. In 2021, we paid $518 million in connection with the redemption of the 2021 Notes and the partial redemption of the 2023 Notes. In 2021, we repurchased shares of common stock for $540 million, of which $1 million was accrued and unpaid as of December 31, 2021, compared to share repurchases of $100 million in 2020. Dividends paid on common stock in 2021 and 2020 were $260 million and $258 million, respectively. Distributions to noncontrolling interest totaled $194 million in 2021 as compared to $174 million in 2020.

Critical Accounting Estimates

Our discussion and analysis of our financial condition, results of operations, liquidity and capital resources is based upon our consolidated financial statements, which have been prepared in accordance with U.S. GAAP. U.S. GAAP requires that we select policies and make estimates and judgments that affect the reported amounts of assets, liabilities, revenues, expenses and related disclosure of contingent assets and liabilities. On an ongoing basis, we evaluate our estimates. We base our estimates on historical experience, technological assessment, opinions of appropriate outside experts, and the most recent information available to us. Actual results may differ from these estimates. Changes in estimates that may have a material impact on our results are discussed in the context of the underlying financial statements to which they relate. The following discussion presents information about our most critical accounting estimates.

Recoverability of Long-Lived Assets, Goodwill and Investment in Unconsolidated Affiliate

We review the carrying values of our property, plant and equipment and other long-lived assets, including our finite-lived intangible assets, goodwill and our investment in an unconsolidated affiliate in accordance with U.S. GAAP in order to assess recoverability. Factors that we must estimate when performing impairment tests include production and sales volumes, selling prices, raw material costs, operating rates, operating expenses, inflation, discount rates, exchange rates, tax rates and capital spending. Judgment is involved in estimating each of these factors, which include inherent uncertainties. The factors we use are consistent with those used in our internal planning process. The recoverability of the values associated with our goodwill, long-lived assets and our investment in an unconsolidated affiliate is dependent upon future operating performance of the specific businesses to which they are attributed. Certain of the operating assumptions are particularly sensitive to the cyclical nature of the fertilizer business. Adverse changes in demand for our products, increases in supply and the availability and costs of key raw materials could significantly affect the results of our review.

The recoverability and impairment tests of long-lived assets are required only when conditions exist that indicate the carrying value may not be recoverable. For goodwill, impairment tests are required at least annually, or more frequently whenever events or circumstances indicate that the carrying value may not be recoverable. Our investment in an unconsolidated affiliate is reviewed for impairment whenever events or circumstances indicate that its carrying value may not be recoverable. When circumstances indicate that the fair value of our investment is less than its carrying value, and the reduction in value is other than temporary, the reduction in value would be recognized immediately in earnings.

We evaluate goodwill for impairment in the fourth quarter at the reporting unit level. Our evaluation can begin with a qualitative assessment of the factors that could impact the significant inputs used to estimate fair value. If after performing the qualitative assessment, we determine that it is not more likely than not that the fair value of a reporting unit is less than its carrying amount, including goodwill, then no further analysis is necessary. However, if it is unclear based on the results of the qualitative test, we perform a quantitative test, which involves comparing the fair value of a reporting unit with its carrying amount, including goodwill. We use an income-based valuation method, determining the present value of future cash flows, to estimate the fair value of a reporting unit. If the fair value of a reporting unit exceeds its carrying amount, no further testing is necessary. If the fair value of the reporting unit is less than its carrying amount, goodwill impairment would be recognized equal to the amount of the carrying value in excess of the reporting unit's fair value, limited to the total amount of goodwill allocated to the reporting unit. We identified no goodwill impairment in 2020 or 2019.

During the third quarter of 2021, in light of the unprecedented increase in natural gas prices in the United Kingdom and its estimated impact on our U.K. operations, we identified a triggering event indicating possible impairment of goodwill within our U.K. Ammonia, U.K. AN and U.K. Other reporting units. Due to the triggering event, we performed an interim quantitative goodwill impairment analysis as of September 30, 2021 for our U.K. Ammonia, U.K. AN and U.K. Other reporting units. We estimated the fair value of the reporting units using the income approach described in Note 6—United Kingdom Energy Crisis and Impairment Charges. Based on the evaluation performed, we determined that the carrying value of all three reporting units exceeded their fair value, which resulted in a goodwill impairment charge totaling $259 million in the third quarter of 2021. The goodwill impairment was calculated as the amount that the carrying value of the reporting unit, including any goodwill, exceeded its fair value. The continued impacts of the U.K. energy crisis in the fourth quarter of 2021 triggered an additional impairment test, and we recognized an additional goodwill impairment charge of $26 million. In 2021, we recognized total goodwill impairment charges of $285 million. As of December 31, 2021, after the recognition of the $285 million of goodwill impairment charges noted above, we have no remaining goodwill related to our U.K. operations. As of December 31, 2021, the carrying value of our goodwill was $2.09 billion. Our annual evaluation of impairment in the fourth quarter of 2021 included a qualitative assessment for our North America reporting units, where the remaining goodwill is allocated, and resulted in no indication of impairment.

As a result of the triggering event described above, we also performed a recoverability test on our long-lived assets within the U.K. Ammonia, U.K. AN and U.K. Other asset groups, including our definite-lived intangible assets, as of September 30, 2021. The recoverability test was based on forecasts of undiscounted cash flows, as described in Note 6—United Kingdom Energy Crisis and Impairment Charges. The results of the recoverability test indicated that the long-lived assets within our U.K. Ammonia, U.K. AN and U.K. Other asset groups were not fully recoverable, and, as a result, long-lived asset impairment charges, inclusive of the definite-lived intangible assets, of $236 million were recorded. That impairment was allocated to each of the underlying assets, of which $50 million was allocated to definite-lived intangible assets. As of December 31, 2021 and 2020, the carrying value of our intangible assets was $45 million and $104 million, respectively.

As discussed above, the results of our fourth quarter 2021 long-lived asset impairment test indicated that no additional long-lived asset impairment should be recorded as the undiscounted cash flows were in excess of the carrying values for each of the U.K. asset groups. Of the factors discussed above, the assumptions for product selling prices and natural gas costs included in the expected cash flows utilized in the long-lived asset impairment test were more sensitive than others. Assuming that all other assumptions utilized in our expected cash flows and the other inputs used in our long-lived asset test remained unchanged, a decrease of $5.00 per product ton in the average selling price or an increase of $0.50 per MMBtu in the cost of natural gas would have resulted in long-lived asset impairment for certain of the U.K. asset groups as the undiscounted cash flows would have been lower than their carrying values, and the resulting long-lived asset impairment charges for the fourth quarter of 2021 would have been as follows:

Assumption	Increase in Long-lived Asset Impairment (in millions)	
	+$5.00	**-$5.00**
Average Selling Price per Product Ton	$ —	$ 10
	+$0.50	**-$0.50**
Natural Gas Cost per MMBtu[1]	$ 13	$ —

[1] The sensitivity impact of a $0.50/MMBtu increase or decrease in the cost of natural gas includes any corresponding impact to selling prices from contractually stipulated sales provisions.

See “Items Affecting Comparability of Results—U.K. energy crisis impacts,” “Liquidity and Capital Resources—United Kingdom Energy Crisis,” above, Note 6—United Kingdom Energy Crisis and Impairment Charges, Note 7—Property, Plant and Equipment—Net and Note 8—Goodwill and Other Intangible Assets for further information.

PLNL is our joint venture investment in the Republic of Trinidad and Tobago and operates an ammonia plant that relies on natural gas supplied, under a Gas Sales Contract (the NGC Contract), by the National Gas Company of Trinidad and Tobago Limited (NGC). The joint venture is accounted for under the equity method. The joint venture experienced past curtailments in the supply of natural gas from NGC, which reduced the ammonia production at PLNL. The NGC Contract had an initial expiration date of September 2018 and was extended on the same terms until September 2023. Any NGC commitment to supply gas beyond 2023 will be based on new agreements. If NGC does not make sufficient quantities of natural gas available to PLNL at prices that permit profitable operations, PLNL may cease operating its facility and we would write off the remaining investment in PLNL. The carrying value of our equity method investment in PLNL at December 31, 2021 is $82 million.

Projected Benefit Obligations

The projected benefit obligations (PBOs) for our defined benefit pension plans are affected by plan design, actuarial estimates and discount rates. Key assumptions that affect our PBO are discount rates and, in addition for our United Kingdom plans, inflation rates, including an adjusted U.K. retail price index (RPI).

The December 31, 2021 PBO was computed based on a weighted-average discount rate of 2.8% for our North America plans and 2.0% for our United Kingdom plans, which were based on yields for high-quality (AA rated or better) fixed income debt securities that match the timing and amounts of expected benefit payments as of the measurement date of December 31, 2021. Declines in comparable bond yields would increase our PBO. For our United Kingdom plans, the 3.3% RPI used to calculate our PBO is developed using the Bank of England implied retail price inflation curve, which is based on the difference between yields on fixed interest government bonds and index-linked government bonds.

For North America qualified pension plans, our PBO was $841 million as of December 31, 2021, which was $11 million higher than pension plan assets. For our United Kingdom pension plans, our PBO was $590 million as of December 31, 2021, which was $85 million higher than pension plan assets. The tables below estimate the impact of a 50 basis point increase or decrease in the key assumptions on our December 31, 2021 PBO:

	Increase/(Decrease) in December 31, 2021 PBO			
	North America Plans		United Kingdom Plans	
Assumption	+50 bps	-50 bps	+50 bps	-50 bps
	(in millions)			
Discount Rate	$ (48)	$ 53	$ (43)	$ 49
RPI	N/A	N/A	26	(26)

See Note 12—Pension and Other Postretirement Benefits for further discussion of our pension plans.

Income Taxes

We are subject to the income tax laws of the many jurisdictions in which we operate, and we recognize expense, assets and liabilities based on estimates of amounts that ultimately will be determined to be taxable or deductible in tax returns filed in various jurisdictions. These tax laws are complex, and how they apply to our facts is sometimes open to interpretation. Differences in interpretation of the tax laws and regulations, including negotiations with taxing authorities in various jurisdictions and resolution of disputes arising from federal, state and international tax audits, can result in differences in taxes paid, which may be higher or lower than our estimates. The judgments made at a point in time may change from previous conclusions based on the outcome of tax audits, as well as changes to, or further interpretations of, tax laws and regulations, and these changes could significantly impact the provision for income taxes, the amount of taxes payable and the deferred tax asset and liability balances. We adjust our income tax provision in the period in which these changes occur.

We also engage in a significant amount of cross border transactions. The taxability of cross border transactions has received an increasing level of scrutiny among regulators across the globe, including the jurisdictions in which we operate. The tax rules and regulations of the various jurisdictions in which we operate are complex, and in many cases, there is not symmetry between the rules of the various jurisdictions. As a result, there are instances where regulators within the jurisdictions involved in a cross border transaction may reach different conclusions regarding the taxability of the transaction in their respective jurisdictions based on the same set of facts and circumstances. We work closely with regulators to reach a common understanding and conclusion regarding the taxability of cross border transactions.

Recent Accounting Pronouncements

See Note 3—New Accounting Standards for a discussion of recent accounting pronouncements.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK.

We are exposed to the impact of changes in commodity prices, interest rates and foreign currency exchange rates.

Commodity Prices

Our net sales, cash flows and estimates of future cash flows related to nitrogen-based products are sensitive to changes in selling prices as well as changes in the prices of natural gas and other raw materials unless these costs have been fixed or hedged. A $1.00 per MMBtu change in the price of natural gas would change the cost to produce a ton of ammonia, granular urea, UAN (32%) and AN by approximately $33, $22, $14 and $16, respectively.

Natural gas is the largest and most volatile component of the manufacturing cost for nitrogen-based products. At certain times, we have managed the risk of changes in natural gas prices through the use of derivative financial instruments. The derivative instruments that we may use for this purpose are primarily natural gas fixed price swaps, basis swaps and options. These derivatives settle using primarily a NYMEX futures price index, which represents the basis for fair value at any given time. The contracts represent anticipated natural gas needs for future periods and settlements are scheduled to coincide with anticipated natural gas purchases during those future periods. As of December 31, 2021, we had natural gas derivative contracts covering certain periods through March 2022.

As of December 31, 2021 and 2020, we had open derivative contracts for 60.0 million MMBtus and 34.1 million MMBtus, respectively. A $1.00 per MMBtu increase in the forward curve prices of natural gas at December 31, 2021 would result in a favorable change in the fair value of these derivative positions of $35 million, and a $1.00 per MMBtu decrease in the forward curve prices of natural gas would change their fair value unfavorably by $35 million.

From time to time we may purchase nitrogen products on the open market to augment or replace production at our facilities.

Interest Rates

As of December 31, 2021, we had five series of senior notes totaling $3.50 billion of principal outstanding with maturity dates of June 1, 2023, December 1, 2026, March 15, 2034, June 1, 2043 and March 15, 2044. The senior notes have fixed interest rates. As of December 31, 2021, the carrying value and fair value of our senior notes was approximately $3.47 billion and $4.11 billion, respectively.

Borrowings under the Revolving Credit Agreement bear current market rates of interest and we are subject to interest rate risk on such borrowings. There were no borrowings outstanding under the Revolving Credit Agreement as of December 31, 2021 or 2020. Maximum borrowings under the Revolving Credit Agreement during 2020 were $500 million. The weighted-average annual interest rate of borrowings under the Revolving Credit Agreement during 2020 was 2.05%.

Foreign Currency Exchange Rates

We are directly exposed to changes in the value of the Canadian dollar, the British pound and the euro. We generally do not maintain any exchange rate derivatives or hedges related to these currencies.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA.

Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors
CF Industries Holdings, Inc.:

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of CF Industries Holdings, Inc. and subsidiaries (the Company) as of December 31, 2021 and 2020, the related consolidated statements of operations, comprehensive income, equity, and cash flows for each of the years in the three-year period ended December 31, 2021, and the related notes (collectively, the consolidated financial statements). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2021 and 2020, and the results of its operations and its cash flows for each of the years in the three-year period ended December 31, 2021, in conformity with U.S. generally accepted accounting principles.

We also have 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, 2021, 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 24, 2022 expressed an unqualified opinion on the effectiveness of the Company's internal control over financial reporting.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these consolidated 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 consolidated 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 consolidated 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 consolidated 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 consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current period audit of the consolidated financial statements that were communicated or required to be communicated to the audit committee and that: (1) relate to accounts or disclosures that are material to the consolidated financial statements and (2) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matters below, providing separate opinions on the critical audit matters or on the accounts or disclosures to which they relate.

Evaluation of the measurement of projected benefit obligations

As discussed in Note 12 to the consolidated financial statements, the Company's projected benefit obligation (PBO) associated with its defined benefit pension plans established in North America and the United Kingdom were $841 million and $590 million as of December 31, 2021, respectively. The Company's PBO represents an actuarially determined estimate of the present value of the future benefit payments attributed to past service under its pension plans to the beneficiaries of those plans. Determining the PBO requires the Company to make assumptions, including the selection of a discount rate for each of the North American and United Kingdom plans and assumptions relating to inflationary increases, including but not limited to an adjusted retail price index (RPI) for the United Kingdom plans. The selected discount rate and estimated inflationary increases are then applied to these future benefit payments in determining the present value of those obligations as of December 31, 2021.

We identified the evaluation of the Company's measurement of the PBO to be a critical audit matter. Specialized skills were needed to evaluate the assumptions regarding the discount rates utilized in the measurement of the PBO for each of the North American and United Kingdom plans and the adjusted RPI utilized in the measurement of the PBO for the Company's United Kingdom plans. In addition, a high degree of auditor judgment was required regarding the evaluation of these discount rates and the adjusted RPI, as minor changes to these assumptions could have a significant impact on the PBO.

The following are the primary procedures we performed to address this critical audit matter. We evaluated the design and tested the operating effectiveness of certain internal controls over the Company's pension accounting process, including controls related to the determination of discount rates and adjusted RPI assumptions utilized in determining the Company's PBO for each of the North American and United Kingdom pension plans. We involved actuarial professionals with specialized skills and knowledge, who evaluated the Company's PBO by evaluating the Company's actuary reports. Specifically, as it relates to the selected discount rates and adjusted RPI assumptions, the actuarial professionals:

- developed an understanding and assessed the methods used by the Company's actuaries to develop the discount rates and adjusted RPI
- evaluated the relevance and reliability of information used by the Company's actuaries in the development of the discount rates and the adjusted RPI
- evaluated the North American discount rates' period over period change using market trends based on published yield curves and indices
- recalculated the Company's single equivalent discount rate using the PBO cash flows and the Company's actuaries' proprietary yield curve for the North American discount rates
- independently developed a single equivalent discount rate using the PBO cash flows and publicly available yield curves for the North American pension plans, and compared that to the Company's selected discount rates for North America
- developed discount rates using publicly available yield curves for the United Kingdom, adjusted for the assessment of the timing of payments expected to be made to beneficiaries under the Company's pension plans, and compared those to the Company's selected discount rates for the United Kingdom
- developed an inflationary factor using published spot rate projection based on the assessment of the timing of payments expected to be made to beneficiaries under the Company's pension plans within the United Kingdom, and compared that to the Company's adjusted RPI.

Impairment of U.K. goodwill and long-lived assets

As discussed in Note 6 to the consolidated financial statements, the Company recognized long-lived assets and goodwill impairment charges of $236 million and $285 million, respectively, in the year ended December 31, 2021. Long-lived assets are reviewed for impairment at the asset group level whenever events or changes in circumstances indicate the asset group's carrying amount may not be recoverable. An entity may first assess qualitative factors to determine whether it is necessary perform a quantitative goodwill impairment test. If a quantitative test for goodwill impairment is necessary, the Company must estimate the fair value of the reporting units to which goodwill is assigned. Management concluded the United Kingdom (U.K.) energy crisis necessitated a quantitative impairment evaluation of long-lived assets and goodwill of the Company's U.K. Ammonia, U.K. AN and U.K. Other asset groups and reporting units to determine if their fair value had declined below their carrying value. Fair values of the asset groups and reporting units were estimated using the income approach. Management's estimated future cash flows for the U.K. asset groups and U.K. reporting units involved the use of significant judgments and assumptions with respect to forecasted product selling prices and projected natural gas costs, among other factors.

We identified the evaluation of the long-lived assets and goodwill impairment analyses for the U.K. Ammonia, U.K. AN, and U.K. Other asset groups and reporting units as a critical audit matter. Subjective auditor judgment was required to evaluate the forecasted product selling prices and projected natural gas costs. Changes to these assumptions could have had a substantial impact on the fair value of each asset group or reporting unit and, as a result, on the amount of the impairment charges recognized.

The following are the primary procedures we performed to address the critical audit matter:

- evaluated the design and tested the operating effectiveness of internal controls related to the valuation of long-lived assets and goodwill, including controls related to the assumptions about forecasted product selling prices and projected natural gas costs
- evaluated the forecasted product selling prices by comparing them to the Company's historical selling prices and external market data
- evaluated the projected natural gas costs by comparing them to external market and industry data
- performed sensitivity analyses over forecasted product selling prices and projected natural gas costs to evaluate management's selected assumptions relative to a range of reasonable outcomes.

(signed) KPMG LLP

We have served as the Company's auditor since 1983.

Chicago, Illinois
February 24, 2022

CONSOLIDATED STATEMENTS OF OPERATIONS

	Year ended December 31,		
	2021	2020	2019
	(in millions, except per share amounts)		
Net sales	$ 6,538	$ 4,124	$ 4,590
Cost of sales	4,151	3,323	3,416
Gross margin	2,387	801	1,174
Selling, general and administrative expenses	223	206	239
Goodwill impairment	285	—	—
Long-lived and intangible asset impairment	236	—	—
Other operating—net	(39)	(17)	(73)
Total other operating costs and expenses	705	189	166
Equity in earnings (loss) of operating affiliate	47	11	(5)
Operating earnings	1,729	623	1,003
Interest expense	184	179	237
Interest income	(1)	(18)	(20)
Loss on debt extinguishment	19	—	21
Other non-operating—net	(16)	(1)	(7)
Earnings before income taxes	1,543	463	772
Income tax provision	283	31	126
Net earnings	1,260	432	646
Less: Net earnings attributable to noncontrolling interest	343	115	153
Net earnings attributable to common stockholders	$ 917	$ 317	$ 493
Net earnings per share attributable to common stockholders:			
Basic	$ 4.27	$ 1.48	$ 2.24
Diluted	$ 4.24	$ 1.47	$ 2.23
Weighted-average common shares outstanding:			
Basic	215.0	214.9	220.2
Diluted	216.2	215.2	221.6

See Accompanying Notes to Consolidated Financial Statements.

CF INDUSTRIES HOLDINGS, INC.

CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME

	Year ended December 31,		
	2021	2020	2019
		(in millions)	
Net earnings	$ 1,260	$ 432	$ 646
Other comprehensive income:			
Foreign currency translation adjustment—net of taxes	3	44	62
Derivatives—net of taxes	—	(1)	—
Defined benefit plans—net of taxes	60	3	(57)
	63	46	5
Comprehensive income	1,323	478	651
Less: Comprehensive income attributable to noncontrolling interest	343	115	153
Comprehensive income attributable to common stockholders	$ 980	$ 363	$ 498

See Accompanying Notes to Consolidated Financial Statements.

CF INDUSTRIES HOLDINGS, INC.

CONSOLIDATED BALANCE SHEETS

	December 31, 2021	December 31, 2020
	(in millions, except share and per share amounts)	
Assets		
Current assets:		
Cash and cash equivalents	$ 1,628	$ 683
Accounts receivable—net	497	265
Inventories	408	287
Prepaid income taxes	4	97
Other current assets	56	35
Total current assets	2,593	1,367
Property, plant and equipment—net	7,081	7,632
Investment in affiliate	82	80
Goodwill	2,091	2,374
Operating lease right-of-use assets	243	259
Other assets	285	311
Total assets	$ 12,375	$ 12,023
Liabilities and Equity		
Current liabilities:		
Accounts payable and accrued expenses	$ 565	$ 424
Income taxes payable	24	—
Customer advances	700	130
Current operating lease liabilities	89	88
Current maturities of long-term debt	—	249
Other current liabilities	54	15
Total current liabilities	1,432	906
Long-term debt, net of current maturities	3,465	3,712
Deferred income taxes	1,029	1,184
Operating lease liabilities	162	174
Other liabilities	251	444
Equity:		
Stockholders' equity:		
Preferred stock—$0.01 par value, 50,000,000 shares authorized	—	—
Common stock—$0.01 par value, 500,000,000 shares authorized, 2021—207,603,940 shares issued and 2020—214,057,701 shares issued	2	2
Paid-in capital	1,375	1,317
Retained earnings	2,088	1,927
Treasury stock—at cost, 2021—27,962 shares and 2020—102,843 shares	(2)	(4)
Accumulated other comprehensive loss	(257)	(320)
Total stockholders' equity	3,206	2,922
Noncontrolling interest	2,830	2,681
Total equity	6,036	5,603
Total liabilities and equity	$ 12,375	$ 12,023

See Accompanying Notes to Consolidated Financial Statements.

CONSOLIDATED STATEMENTS OF EQUITY

	Common Stockholders							
	$0.01 Par Value Common Stock	Treasury Stock	Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive Loss	Total Stockholders' Equity	Noncontrolling Interest	Total Equity
				(in millions)				
Balance as of December 31, 2018	$ 2	$ (504)	$ 1,368	$ 2,463	$ (371)	$ 2,958	$ 2,773	$ 5,731
Net earnings	—	—	—	493	—	493	153	646
Other comprehensive income	—	—	—	—	5	5	—	5
Purchases of treasury stock	—	(337)	—	—	—	(337)	—	(337)
Retirement of treasury stock	—	843	(110)	(733)	—	—	—	—
Acquisition of treasury stock under employee stock plans	—	(4)	—	—	—	(4)	—	(4)
Issuance of $0.01 par value common stock under employee stock plans	—	2	17	—	—	19	—	19
Stock-based compensation expense	—	—	28	—	—	28	—	28
Cash dividends ($1.20 per share)	—	—	—	(265)	—	(265)	—	(265)
Distributions declared to noncontrolling interest	—	—	—	—	—	—	(186)	(186)
Balance as of December 31, 2019	$ 2	$ —	$ 1,303	$ 1,958	$ (366)	$ 2,897	$ 2,740	$ 5,637
Net earnings	—	—	—	317	—	317	115	432
Other comprehensive income	—	—	—	—	46	46	—	46
Purchases of treasury stock	—	(100)	—	—	—	(100)	—	(100)
Retirement of treasury stock	—	107	(17)	(90)	—	—	—	—
Acquisition of treasury stock under employee stock plans	—	(13)	—	—	—	(13)	—	(13)
Issuance of $0.01 par value common stock under employee stock plans	—	2	6	—	—	8	—	8
Stock-based compensation expense	—	—	25	—	—	25	—	25
Cash dividends ($1.20 per share)	—	—	—	(258)	—	(258)	—	(258)
Distributions declared to noncontrolling interest	—	—	—	—	—	—	(174)	(174)
Balance as of December 31, 2020	$ 2	$ (4)	$ 1,317	$ 1,927	$ (320)	$ 2,922	$ 2,681	$ 5,603
Net earnings	—	—	—	917	—	917	343	1,260
Other comprehensive income	—	—	—	—	63	63	—	63
Purchases of treasury stock	—	(540)	—	—	—	(540)	—	(540)
Retirement of treasury stock	—	554	(58)	(496)	—	—	—	—
Acquisition of treasury stock under employee stock plans	—	(13)	—	—	—	(13)	—	(13)
Issuance of $0.01 par value common stock under employee stock plans	—	1	65	—	—	66	—	66
Stock-based compensation expense	—	—	30	—	—	30	—	30
Cash dividends ($1.20 per share)	—	—	—	(260)	—	(260)	—	(260)
Deferred tax related to noncontrolling interest	—	—	21	—	—	21	—	21
Distributions declared to noncontrolling interest	—	—	—	—	—	—	(194)	(194)
Balance as of December 31, 2021	$ 2	$ (2)	$ 1,375	$ 2,088	$ (257)	$ 3,206	$ 2,830	$ 6,036

See Accompanying Notes to Consolidated Financial Statements.

CF INDUSTRIES HOLDINGS, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS

	Year ended December 31,		
	2021	2020	2019
	(in millions)		
Operating Activities:			
Net earnings	$ 1,260	$ 432	$ 646
Adjustments to reconcile net earnings to net cash provided by operating activities:			
Depreciation and amortization	888	892	875
Deferred income taxes	(196)	(74)	149
Stock-based compensation expense	30	25	28
Unrealized net loss (gain) on natural gas derivatives	25	(6)	14
Loss on embedded derivative	1	3	4
Loss on debt extinguishment	19	—	21
Goodwill impairment	285	—	—
Long-lived and intangible asset impairment	236	—	—
Gain on sale of emission credits	(49)	—	—
Loss (gain) on disposal of property, plant and equipment	3	15	(40)
Undistributed (earnings) losses of affiliate—net of taxes	(6)	(1)	2
Changes in:			
Accounts receivable—net	(235)	(19)	(6)
Inventories	(123)	27	(26)
Accrued and prepaid income taxes	94	8	22
Accounts payable and accrued expenses	142	(15)	(72)
Customer advances	570	11	(30)
Other—net	(71)	(67)	(82)
Net cash provided by operating activities	2,873	1,231	1,505
Investing Activities:			
Additions to property, plant and equipment	(514)	(309)	(404)
Proceeds from sale of property, plant and equipment	1	2	70
Distributions received from unconsolidated affiliate	—	6	—
Insurance proceeds for property, plant and equipment	—	2	15
Purchase of investments held in nonqualified employee benefit trust	(13)	—	—
Proceeds from sale of investments held in nonqualified employee benefit trust	12	—	—
Purchase of U.K. emission credits	(10)	—	—
Proceeds from sale of emission credits	58	—	—
Net cash used in investing activities	(466)	(299)	(319)
Financing Activities:			
Payments of long-term borrowings	(518)	—	(769)
Proceeds from short-term borrowings	—	500	—
Repayments of short-term borrowings	—	(500)	—
Payment to CHS related to credit provision	(5)	(5)	(5)
Financing fees	—	—	(3)
Purchases of treasury stock	(539)	(100)	(370)
Dividends paid on common stock	(260)	(258)	(265)
Distributions to noncontrolling interest	(194)	(174)	(186)
Proceeds from issuances of common stock under employee stock plans	64	5	19
Cash paid for shares withheld for taxes	(11)	(10)	(4)
Net cash used in financing activities	(1,463)	(542)	(1,583)
Effect of exchange rate changes on cash and cash equivalents	1	6	2
Increase (decrease) in cash and cash equivalents	945	396	(395)
Cash and cash equivalents at beginning of period	683	287	682
Cash and cash equivalents at end of period	$ 1,628	$ 683	$ 287

See Accompanying Notes to Consolidated Financial Statements.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Background and Basis of Presentation

Our mission is to provide clean energy to feed and fuel the world sustainably. With our employees focused on safe and reliable operations, environmental stewardship, and disciplined capital and corporate management, we are on a path to decarbonize our ammonia production network – the world's largest – to enable green and blue hydrogen and nitrogen products for energy, fertilizer, emissions abatement and other industrial activities. Our nine nitrogen manufacturing complexes in the United States, Canada and the United Kingdom, an extensive storage, transportation and distribution network in North America, and logistics capabilities enabling a global reach underpin our strategy to leverage our unique capabilities to accelerate the world's transition to clean energy. Our principal customers are cooperatives, independent fertilizer distributors, traders, wholesalers and industrial users. Our core product is anhydrous ammonia (ammonia), which contains 82% nitrogen and 18% hydrogen. Our nitrogen products that are upgraded from ammonia are granular urea, urea ammonium nitrate solution (UAN) and ammonium nitrate (AN). Our other nitrogen products include diesel exhaust fluid (DEF), urea liquor, nitric acid and aqua ammonia, which are sold primarily to our industrial customers, and compound fertilizer products (NPKs), which are solid granular fertilizer products for which the nutrient content is a combination of nitrogen, phosphorus and potassium.

All references to "CF Holdings," "the Company," "we," "us" and "our" refer to CF Industries Holdings, Inc. and its subsidiaries, except where the context makes clear that the reference is only to CF Industries Holdings, Inc. itself and not its subsidiaries. All references to "CF Industries" refer to CF Industries, Inc., a 100% owned subsidiary of CF Industries Holdings, Inc.

Our principal assets as of December 31, 2021 include:

- five U.S. nitrogen manufacturing facilities, located in Donaldsonville, Louisiana; Port Neal, Iowa; Yazoo City, Mississippi; Verdigris, Oklahoma; and Woodward, Oklahoma. These facilities are wholly owned directly or indirectly by CF Industries Nitrogen, LLC (CFN), of which we own approximately 89% and CHS Inc. (CHS) owns the remainder. See Note 18—Noncontrolling Interest for additional information on our strategic venture with CHS;
- two Canadian nitrogen manufacturing facilities, located in Medicine Hat, Alberta and Courtright, Ontario;
- two United Kingdom nitrogen manufacturing facilities, located in Billingham and Ince;
- an extensive system of terminals and associated transportation equipment located primarily in the Midwestern United States; and
- a 50% interest in Point Lisas Nitrogen Limited (PLNL), an ammonia production joint venture located in the Republic of Trinidad and Tobago that we account for under the equity method.

2. Summary of Significant Accounting Policies

Consolidation and Noncontrolling Interest

The consolidated financial statements of CF Holdings include the accounts of CF Industries and all majority-owned subsidiaries. All significant intercompany transactions and balances have been eliminated.

We own approximately 89% of the membership interests in CFN and consolidate CFN in our financial statements. CHS' minority equity interest in CFN is included in noncontrolling interest in our consolidated financial statements.

See Note 18—Noncontrolling Interest for additional information.

Use of Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States (U.S. GAAP) requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent liabilities at the date of the consolidated financial statements and the reported amounts of revenues and expenses for the periods presented. Significant estimates and assumptions are used for, but are not limited to, net realizable value of inventories, environmental remediation liabilities, environmental and litigation contingencies, the cost of emission credits required to meet environmental regulations, the cost of customer incentives, the cost to fulfill contractual commitments to our customers, useful lives of property and identifiable intangible assets, the evaluation of potential impairments of property, investments, identifiable intangible assets and goodwill, income tax and valuation reserves, allowances for doubtful accounts receivable, the measurement of the fair values of investments for which markets are not active, the determination of the benefit obligation and annual expense of defined benefit pension and other postretirement plans and the valuation of stock-based compensation awards granted to employees.

Revenue Recognition

We follow a five-step model for revenue recognition. The five steps are: (1) identification of the contract(s) with the customer, (2) identification of the performance obligation(s) in the contract(s), (3) determination of the transaction price, (4) allocation of the transaction price to the performance obligation(s), and (5) recognition of revenue when (or as) each performance obligation is satisfied. Control of our products transfers to our customers when the customer is able to direct the use of, and obtain substantially all of the benefits from, our products, which occurs at the later of when title or risk of loss transfers to the customer. Control generally transfers to the customer at a point in time upon loading of our product onto transportation equipment or delivery to a customer destination. Revenue from forward sales programs is recognized on the same basis as other sales regardless of when the customer advances are received.

In situations where we have agreed to arrange delivery of the product to the customer’s intended destination and control of the product transfers upon loading of our product, we have elected to not identify delivery of the product as a performance obligation. We account for freight income associated with the delivery of these products as freight revenue, since this activity fulfills our obligation to transfer the product to the customer. Shipping and handling costs incurred by us are included in cost of sales.

We offer cash incentives to certain customers based on the volume of their purchases over a certain period. Customer incentives are reported as a reduction in net sales.

Cash and Cash Equivalents

Cash and cash equivalents include highly liquid investments that are readily convertible to known amounts of cash with original maturities of three months or less. The carrying value of cash and cash equivalents approximates fair value.

Investments

Short-term investments and noncurrent investments are accounted for primarily as available-for-sale securities reported at fair value. Changes in the fair value of available-for-sale debt securities are recognized in other comprehensive income. Changes in the fair value of available-for-sale equity securities are recognized through earnings. The carrying values of short-term investments approximate fair values because of the short maturities and the highly liquid nature of these investments.

Inventories

Inventories are reported at the lower of cost and net realizable value with cost determined on a first-in, first-out and average cost basis. Inventory includes the cost of materials, production labor and production overhead. Inventory at warehouses and terminals also includes distribution costs to move inventory to the distribution facilities. Net realizable value is reviewed at least quarterly. Fixed production costs related to idle capacity are not included in the cost of inventory but are charged directly to cost of sales in the period incurred.

Investment in Unconsolidated Affiliate

The equity method of accounting is used for our investment in an affiliate that we do not consolidate, but over which we have the ability to exercise significant influence. Our equity method investment for which the results are included in operating earnings consists of our 50% ownership interest in PLNL, which operates an ammonia production facility in the Republic of Trinidad and Tobago. Our share of the net earnings from this investment is reported as an element of earnings from operations because PLNL’s operations provide additional production and are integrated with our supply chain and sales activities in the Ammonia segment. See Note 9—Equity Method Investment for additional information.

Profits resulting from sales or purchases with equity method investees are eliminated until realized by the investee or investor, respectively. Investments in affiliates are reviewed for impairment whenever events or circumstances indicate that the carrying value may not be recoverable. If circumstances indicate that the fair value of an investment in an affiliate is less than its carrying value, and the reduction in value is other than temporary, the reduction in value would be recognized immediately in earnings.

Property, Plant and Equipment

Property, plant and equipment are stated at cost. Depreciation and amortization are computed using the straight-line method and are recorded over the estimated useful life of the property, plant and equipment. Useful lives are as follows:

	Years
Mobile and office equipment	3 to 10
Production facilities and related assets	2 to 30
Land improvements	10 to 30
Buildings	10 to 40

We periodically review the useful lives assigned to our property, plant and equipment and we change the estimates to reflect the results of those reviews.

Scheduled inspections, replacements and overhauls of plant machinery and equipment at our continuous process manufacturing facilities during a full plant shutdown are referred to as plant turnarounds. Plant turnarounds are accounted for under the deferral method, as opposed to the direct expense or built-in overhaul methods. Under the deferral method, expenditures related to turnarounds are capitalized in property, plant and equipment when incurred and amortized to production costs on a straight-line basis over the period benefited, which is until the next scheduled turnaround in up to five years. If the direct expense method were used, all turnaround costs would be expensed as incurred. Internal employee costs and overhead amounts are not considered turnaround costs and are not capitalized. Turnaround costs are classified as investing activities in our consolidated statements of cash flows. See Note 7—Property, Plant and Equipment—Net for additional information.

Recoverability of Long-Lived Assets

We review property, plant and equipment and other long-lived assets at the asset group level in order to assess recoverability based on expected future undiscounted cash flows whenever events or circumstances indicate that the carrying value may not be recoverable. If the sum of the expected future net undiscounted cash flows is less than the carrying value, an impairment loss would be recognized. The impairment loss is measured as the amount by which the carrying value exceeds the fair value of the asset. See Note 6—United Kingdom Energy Crisis and Impairment Charges and Note 7—Property, Plant and Equipment—Net for additional information.

Goodwill and Other Intangible Assets

Goodwill represents the excess of the purchase price of an acquired entity over the amounts assigned to the assets acquired and liabilities assumed. Goodwill is not amortized, but is reviewed for impairment annually or more frequently whenever events or circumstances indicate that the carrying value may not be recoverable. We perform our annual goodwill impairment review in the fourth quarter of each year at the reporting unit level. Our evaluation can begin with a qualitative assessment of the factors that could impact the significant inputs used to estimate fair value. If after performing the qualitative assessment, we determine that it is not more likely than not that the fair value of a reporting unit is less than its carrying amount, including goodwill, then no further analysis is necessary. However, if the results of the qualitative test are unclear, we perform a quantitative test, which involves comparing the fair value of a reporting unit with its carrying amount, including goodwill. We use an income-based valuation method, determining the present value of future cash flows, to estimate the fair value of a reporting unit. If the fair value of a reporting unit exceeds its carrying amount, no further analysis is necessary. If the fair value of the reporting unit is less than its carrying amount, goodwill impairment would be recognized equal to the amount of the carrying value in excess of the reporting unit's fair value, limited to the total amount of goodwill allocated to the reporting unit.

Our intangible assets are presented in other assets on our consolidated balance sheets. See Note 6—United Kingdom Energy Crisis and Impairment Charges and Note 8—Goodwill and Other Intangible Assets for additional information regarding our goodwill and other intangible assets.

Leases

Right-of-use (ROU) assets represent our right to use an underlying asset for the lease term and lease liabilities represent our obligation to make lease payments arising from the lease. ROU assets and lease liabilities are recognized at the lease commencement date based on the present value of lease payments over the lease term. The discount rate used to calculate the present value represents our secured incremental borrowing rate and is calculated based on the treasury yield curve commensurate with the term of each lease, and a spread representative of our secured borrowing costs. Our lease terms may include options to extend or terminate the lease when it is reasonably certain that we will exercise that option.

Leases may be classified as either operating leases or finance leases. We have made an accounting policy election to not include leases with an initial term of 12 months or less on the balance sheet. For finance leases, if any, ROU assets are amortized over the lease term on a straight-line basis and interest expense is recognized using the effective interest method and based on the lease liability at period end. For operating leases, rental payments, including rent holidays, leasehold incentives, and scheduled rent increases are expensed on a straight-line basis. Leasehold improvements are amortized over the shorter of the depreciable lives of the corresponding fixed assets or the lease term including any applicable renewals. For our rail car leases, barge tow charters, and terminal and warehouse storage agreements, we have made an accounting policy election to not separate lease and non-lease components, such as operating costs and maintenance, due to sufficient data not being available. As a result, the non-lease components are included in the ROU assets and lease liabilities on our consolidated balance sheet. See Note 25—Leases for additional information.

Income Taxes

Income taxes are accounted for under the asset and liability method. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those differences are projected to be recovered or settled. Realization of deferred tax assets is dependent on our ability to generate sufficient taxable income of an appropriate character in future periods. A valuation allowance is established if it is determined to be more likely than not that a deferred tax asset will not be realized. Significant judgment is applied in evaluating the need for and magnitude of appropriate valuation allowances against deferred tax assets.

We record our tax expense for Global Intangible Low-Taxed Income (GILTI) as an expense in the period in which incurred and as such do not record a deferred tax liability for taxes that may be due in future periods.

Interest and penalties related to unrecognized tax benefits are reported as interest expense and income tax expense, respectively.

See Note 11—Income Taxes for additional information.

Customer Advances

Customer advances represent cash received from customers following acceptance of orders under our forward sales programs. Under such advances, the customer prepays a portion of the value of the sales contract prior to obtaining control of the product, thereby reducing or eliminating accounts receivable from customers. Revenue is recognized when the customer obtains control of the product.

Derivative Financial Instruments

Natural gas is the principal raw material used to produce nitrogen-based products. We manage the risk of changes in natural gas prices primarily through the use of derivative financial instruments. The derivative instruments that we use are primarily natural gas fixed price swaps, basis swaps and options traded in the over-the-counter (OTC) markets. The derivatives reference primarily a NYMEX futures price index, which represent the basis for fair value at any given time. These derivatives are traded in months forward and settlements are scheduled to coincide with anticipated gas purchases during those future periods. We do not use derivatives for trading purposes and are not a party to any leveraged derivatives.

Derivative financial instruments are accounted for at fair value and recognized as current or noncurrent assets and liabilities on our consolidated balance sheets. We use natural gas derivatives as an economic hedge of natural gas price risk, but without the application of hedge accounting. As a result, changes in fair value of these contracts are recognized in earnings. The fair values of derivative instruments and any related cash collateral are reported on a gross basis rather than on a net basis. Cash flows related to natural gas derivatives are reported as operating activities.

See Note 16—Derivative Financial Instruments for additional information.

Debt Issuance Costs

Costs associated with the issuance of debt are recorded on the balance sheet as a direct deduction from the carrying amount of the related debt liability. Costs associated with entering into revolving credit facilities are recorded as an asset in noncurrent assets. All debt issuance costs are amortized over the term of the related debt using the effective interest rate method. Debt issuance discounts are netted against the related debt and are amortized over the term of the debt using the effective interest method. See Note 13—Financing Agreements for additional information.

Environmental

Environmental expenditures that relate to current operations are expensed or capitalized as appropriate. Expenditures that relate to an existing condition caused by past operations are expensed. Expenditures that increase the capacity or extend the useful life of an asset, improve the safety or efficiency of the operations, or mitigate or prevent future environmental contamination are capitalized. Liabilities are recorded when it is probable that an obligation has been incurred and the costs can be reasonably estimated. Environmental liabilities are not discounted.

Emission Credits

Emission credits may be generated by or granted to the Company through emissions trading systems or other regulatory programs. From time to time, we may also purchase emission credits. We have elected to account for emission credits using the intangible asset model. Under this model, emission credits that are purchased are measured at their cost basis and tested for impairment annually. We do not recognize any internally generated emission credits under the intangible asset model until a monetary transaction occurs, such as a sale of the emission credits. If a facility exceeds regulatory emissions allowance levels and offsetting credits are not held by us, our obligation is recognized as an operating expense and a liability at the fair value of the emissions allowance deficit.

Stock-based Compensation

We grant stock-based compensation awards under our equity and incentive plans. The awards that have been granted to date are nonqualified stock options, restricted stock awards, restricted stock units and performance restricted stock units. The cost of employee services received in exchange for the awards is measured based on the fair value of the award on the grant date and is recognized as expense on a straight-line basis over the period during which the employee is required to provide the services. We have elected to recognize equity award forfeitures as they occur in determining the compensation cost to be recognized in each period. See Note 20—Stock-based Compensation for additional information.

Treasury Stock

We periodically retire treasury shares acquired through repurchases of our common stock and return those shares to the status of authorized but unissued. We account for treasury stock transactions under the cost method. For each reacquisition of common stock, the number of shares and the acquisition price for those shares is added to the treasury stock count and total value. When treasury shares are retired, we allocate the excess of the repurchase price over the par value of shares acquired to both retained earnings and paid-in capital. The portion allocated to paid-in capital is determined by applying the average paid-in capital per share, and the remaining portion is recorded to retained earnings.

Litigation

From time to time, we are subject to ordinary, routine legal proceedings related to the usual conduct of our business. We may also be involved in proceedings regarding public utility and transportation rates, environmental matters, taxes and permits relating to the operations of our various plants and facilities. Accruals for such contingencies are recorded to the extent management concludes their occurrence is probable and the financial impact of an adverse outcome is reasonably estimable. Legal fees are recognized as incurred and are not included in accruals for contingencies. Disclosure for specific legal contingencies is provided if the likelihood of occurrence is at least reasonably possible and the exposure is considered material to the consolidated financial statements.

In making determinations of likely outcomes of litigation matters, many factors are considered. These factors include, but are not limited to, history, scientific and other evidence, and the specifics and status of each matter. If the assessment of various factors changes, the estimates may change. Predicting the outcome of claims and litigation, and estimating related costs and exposure, involves substantial uncertainties that could cause actual costs to vary materially from estimates and accruals.

Foreign Currency Translation and Remeasurement

We translate the financial statements of our foreign subsidiaries with non-U.S. dollar functional currencies using period-end exchange rates for assets and liabilities and weighted-average exchange rates for each period for revenues and expenses. The resulting translation adjustments are recorded as a separate component of accumulated other comprehensive income (loss) within stockholders' equity.

Foreign currency-denominated assets and liabilities are remeasured into U.S. dollars at exchange rates existing at the respective balance sheet dates. Gains and losses resulting from these foreign currency transactions are included in other operating—net in our consolidated statements of operations. Gains and losses resulting from intercompany foreign currency transactions that are of a long-term investment nature, if any, are reported in other comprehensive income.

3. New Accounting Standards

On January 1, 2020, we adopted Accounting Standards Update (ASU) No. 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. This ASU aligns the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software. This ASU does not affect the accounting for the service element of a hosting arrangement that is a service contract. We adopted this ASU prospectively. The adoption of this ASU did not have a material impact on our consolidated financial statements; however, it could have an effect on future financial results if significant new software involving a cloud computing arrangement is implemented. In this case, a certain portion of the implementation costs would be deferred and expensed over the term of the cloud computing arrangement.

4. Revenue Recognition

Our performance obligations under a customer contract correspond to each shipment of product that we make to our customer under the contract. As a result, each contract may have more than one performance obligation based on the number of products ordered, the quantity of product to be shipped and the mode of shipment requested by the customer. When we enter into a contract with a customer, we are obligated to provide the product in that contract during a mutually agreed upon time period. Depending on the terms of the contract, either we or the customer arranges delivery of the product to the customer's intended destination. When we arrange delivery of the product and control of the product transfers upon loading, we recognize freight revenue, which was not material for 2021, 2020 or 2019.

Certain of our contracts require us to supply products on a continuous basis to the customer. We recognize revenue on these contracts based on the quantity of products transferred to the customer during the period. For 2021, 2020 and 2019, the total amount of revenue for these contracts was $92 million, $44 million and $55 million, respectively.

From time to time, we will enter the marketplace to purchase product in order to satisfy the obligations of our customer contracts. When we purchase product for this purpose, we are the principal in the transaction and recognize revenue on a gross basis. As discussed in Note 9—Equity Method Investment, we have transactions in the normal course of business with PLNL, reflecting our obligation to purchase 50% of the ammonia produced by PLNL at current market prices. During the year ended December 31, 2021, in addition to products purchased from PLNL, we recognized $68 million of revenue from sales of granular urea, which we purchased in order to satisfy obligations under contracts with our customers due primarily to the impact of Winter Storm Uri. Other than products purchased from PLNL and granular urea purchased as a result of Winter Storm Uri, products purchased in the marketplace in order to satisfy the obligations of our customers were not material during 2021, 2020 or 2019.

Transaction Price

We agree with our customers on the selling price of each transaction. This transaction price is generally based on the product, market conditions, including supply and demand balances, freight arrangements including where control transfers, and customer incentives. In our contracts with customers, we allocate the entire transaction price to the sale of product to the customer, which is the basis for the determination of the relative standalone selling price allocated to each performance obligation. Any sales tax, value added tax, and other tax we collect concurrently with our revenue-producing activities are excluded from revenue. Returns of our product by our customers are permitted only when the product is not to specification. Returns were not material during 2021, 2020 or 2019.

We offer cash incentives to certain customers generally based on the volume of their purchases over the fertilizer year ending June 30. Our cash incentives do not provide an option to the customer for additional product. Accrual of these incentives involves the use of estimates, including how much product the customer will purchase and whether the customer will achieve a certain level of purchases within the incentive period. The balances of customer incentives accrued at December 31, 2021 and 2020 were not material.

Revenue Disaggregation

We track our revenue by product and by geography. See Note 22—Segment Disclosures for our revenue by reportable segment, which are Ammonia, Granular Urea, UAN, AN and Other. The following table summarizes our revenue by product and by geography (based on destination of our shipment) for 2021, 2020 and 2019:

	Ammonia	Granular Urea	UAN	AN	Other	Total
			(in millions)			
Year ended December 31, 2021						
North America	$ 1,575	$ 1,880	$ 1,667	$ 212	$ 400	$ 5,734
Europe and other	212	—	121	298	173	804
Total revenue	$ 1,787	$ 1,880	$ 1,788	$ 510	$ 573	$ 6,538
Year ended December 31, 2020						
North America	$ 874	$ 1,183	$ 998	$ 197	$ 235	$ 3,487
Europe and other	146	65	65	258	103	637
Total revenue	$ 1,020	$ 1,248	$ 1,063	$ 455	$ 338	$ 4,124
Year ended December 31, 2019						
North America	$ 948	$ 1,269	$ 1,176	$ 200	$ 256	$ 3,849
Europe and other	165	73	94	306	103	741
Total revenue	$ 1,113	$ 1,342	$ 1,270	$ 506	$ 359	$ 4,590

Accounts Receivable and Customer Advances

Our customers purchase our products through sales on credit or forward sales. Products sold to our customers on credit are recorded as accounts receivable when the customer obtains control of the product. Customers that purchase our products on credit are required to pay in accordance with our customary payment terms, which are generally less than 30 days. For 2021, 2020 and 2019, the amount of customer bad debt expense recognized was not material.

For forward sales, the customer prepays a portion of the value of the sales contract prior to obtaining control of the product. These prepayments, when received, are recorded as customer advances and are recognized as revenue when the customer obtains control of the product. Forward sales are customarily offered for periods of less than one year in advance of when the customer obtains control of the product.

As of December 31, 2021 and 2020, we had $700 million and $130 million, respectively, in customer advances on our consolidated balance sheets. The increase in the balance of customer advances was due primarily to higher average selling prices and an increase in forward contracts amidst an increasing price environment. During 2021, all of our customer advances that were recorded as of December 31, 2020 were recognized as revenue.

We have certain customer contracts with performance obligations where if the customer does not take the required amount of product specified in the contract, then the customer is required to make a payment to us, which may vary based upon the terms and conditions of the applicable contract. As of December 31, 2021, excluding contracts with original durations of less than one year, and based on the minimum product tonnage to be sold and current market price estimates, our remaining performance obligations under these contracts are approximately $809 million. We expect to recognize approximately 44% of these performance obligations as revenue in 2022, approximately 50% as revenue during 2023 and 2024, approximately 4% as revenue during 2025 and 2026, and the remainder thereafter. If these customers do not fulfill their contractual obligations under such contracts, the legally enforceable minimum amount that they would pay to us under these contracts is approximately $162 million as of December 31, 2021. Other than the performance obligations described above, any performance obligations with our customers that were unfulfilled or partially filled at December 31, 2021 will be satisfied in 2022.

All of our contracts require that the period between the payment for goods and the transfer of those goods to the customer occur within normal contractual terms that do not exceed one year; therefore, we have not adjusted the transaction price of any of our contracts to recognize a significant financing component. We have also expensed any incremental costs associated with obtaining a contract that has a duration of less than one year, and there were no costs capitalized during 2021, 2020 or 2019.

5. Net Earnings Per Share

Net earnings per share were computed as follows:

	Year ended December 31,		
	2021	2020	2019
	(in millions, except per share amounts)		
Net earnings attributable to common stockholders	$ 917	$ 317	$ 493
Basic earnings per common share:			
Weighted-average common shares outstanding	215.0	214.9	220.2
Net earnings attributable to common stockholders	$ 4.27	$ 1.48	$ 2.24
Diluted earnings per common share:			
Weighted-average common shares outstanding	215.0	214.9	220.2
Dilutive common shares—stock-based awards	1.2	0.3	1.4
Diluted weighted-average shares outstanding	216.2	215.2	221.6
Net earnings attributable to common stockholders	$ 4.24	$ 1.47	$ 2.23

Dilutive earnings per share is calculated using weighted-average common shares outstanding, including the dilutive effect of stock-based awards as determined under the treasury stock method. In the computation of diluted earnings per common share, potentially dilutive stock-based awards are excluded if the effect of their inclusion is anti-dilutive. Shares for anti-dilutive stock-based awards not included in the computation of diluted earnings per common share were 0.9 million, 3.3 million and 1.4 million for the years ended December 31, 2021, 2020 and 2019, respectively.

6. United Kingdom Energy Crisis and Impairment Charges

During the third quarter of 2021, the United Kingdom began experiencing an energy crisis that included a substantial increase in the price of natural gas. In the first half of 2021, natural gas prices had increased to levels that were considered high compared to historical prices, and prices then more than doubled within the third quarter of 2021. On September 15, 2021, we announced the halt of operations at both our Ince and Billingham manufacturing facilities in the United Kingdom due to negative profitability driven by the high cost of natural gas. The halt of operations at our U.K. plants impacted the availability of certain products in the United Kingdom, including carbon dioxide, which is a byproduct of ammonia production. Due to the critical nature of carbon dioxide to certain industries in the United Kingdom, on September 21, 2021, we entered into an interim agreement with the U.K. government. Under the terms of the agreement, the U.K. government agreed to cover the costs to restart the ammonia plant at Billingham and to offset losses incurred from production for a 21-day period. As a result, we resumed production of ammonia at the Billingham facility in order to produce carbon dioxide for the United Kingdom. While the interim agreement was in place, we entered into new carbon dioxide pricing and offtake agreements with our customers, which had an initial term through January 31, 2022. The amount of financial support provided by the U.K. government under the terms of the interim agreement was not material. As of the filing of this report, production continues to be idled at our Ince facility.

Impairment Charges

The U.K. energy crisis necessitated an evaluation of the long-lived assets, including definite-lived intangible assets, and goodwill of our U.K. operations to determine if their fair value had declined to below their carrying value. We performed the impairment evaluations on the U.K. Ammonia, U.K. AN and U.K. Other asset groups' long-lived assets, including definite-lived intangible assets, and the U.K. Ammonia, U.K. AN and U.K. Other reporting units' goodwill as of September 30, 2021. Our assets groups are the same as our reporting units. Based on these analyses, we concluded that a decline in fair value had occurred, and we recognized impairment charges of $495 million in the third quarter of 2021, consisting of long-lived and intangible asset impairment charges of $236 million and a goodwill impairment charge of $259 million.

In the fourth quarter of 2021, natural gas prices in the United Kingdom continued to rise, which triggered an additional impairment test of long-lived assets and goodwill and resulted in an additional goodwill impairment charge of $26 million. The results of our long-lived asset impairment test indicated that no additional long-lived asset impairment should be recorded as the undiscounted cash flows were in excess of the carrying values for each of the U.K. asset groups. In total, we recognized impairment charges of $521 million in 2021, consisting of long-lived and intangible asset impairment charges of $236 million and goodwill impairment charges of $285 million.

The valuation of our asset groups and reporting units requires significant judgment in evaluating recent indicators of market activity and estimating future cash flows, discount rates, and other factors. Expected cash flows used in the long-lived asset and goodwill impairment tests reflect assumptions about product selling prices and natural gas costs, as well as estimates of future production and sales volumes, operating rates, operating expenses, inflation, discount rates, tax rates and capital spending. The valuation also incorporated assumptions regarding the time it could take for the U.K. energy crisis to be resolved.

For purposes of our goodwill impairment analyses, we estimated the fair value of the reporting units using the income approach, which incorporated the estimated future cash flows and a terminal value discounted to their present value using an appropriate risk-adjusted discount rate from the perspective of a market participant. The estimated future cash flows were based on our internal forecasts, updated for recent events. These estimated future cash flows went beyond the specific operating plans, using a terminal value calculation, which incorporated historical and forecasted trends and an estimate of long-term future growth rates. The future growth rates were based on our view of the long-term outlook for each reporting unit.

The discount rates utilized in the income approach, for our goodwill impairment tests, and to discount the cash flows in calculating the long-lived asset impairment, were derived using a capital asset pricing model and analyzing published rates for industries relevant to our reporting units to estimate the cost of equity financing. The discount rates are commensurate with the risks and uncertainties inherent in the business and in the United Kingdom and our cash flow forecasts, updated for recent events.

The fair value of our property, plant and equipment utilized in the long-lived asset impairment analysis was estimated using the indirect method of the cost approach by determining the reproduction cost new of the assets and applying an appropriate inutility adjustment for certain assets in an idled state. Additional assumptions utilized in the long-lived asset impairment analysis were royalty rates and attrition rates in estimating the fair value of our definite-lived intangible assets, consisting of trade names and customer relationships, for which we used the relief from royalty method of the income approach and the multi-period excess earnings method, respectively. Due to the inherent uncertainties involved in making estimates and assumptions, actual results may differ from those assumed in our forecasts.

As of December 31, 2021, after the recognition of the $26 million goodwill impairment charge in the fourth quarter of 2021, we have no remaining goodwill related to our U.K. operations, and the remaining long-lived assets related to our U.K. operations were approximately $425 million, primarily consisting of property, plant and equipment. For further information see Note 7—Property, Plant and Equipment—Net and Note 8—Goodwill and Other Intangible Assets.

As discussed above, the results of our fourth quarter long-lived asset impairment test indicated that no additional long-lived asset impairment should be recorded as the undiscounted cash flows were in excess of the carrying values for each of the U.K. asset groups. Of the factors discussed above, the assumptions regarding product selling prices and natural gas costs included in the expected cash flows utilized in the long-lived asset impairment test were more sensitive than others. Assuming that all other assumptions utilized in our expected cash flows and the other inputs used in our long-lived asset test remained unchanged, a decrease of $5.00 per product ton in the average selling price or an increase of $0.50 per MMBtu in the cost of natural gas would have resulted in long-lived asset impairment for certain of the U.K. asset groups as the undiscounted cash flows would have been lower than their carrying values, and the resulting long-lived asset impairment charges for the fourth quarter of 2021 would have been as follows:

Assumption	Increase in Long-lived Asset Impairment (in millions)	
	+$5.00	-$5.00
Average Selling Price per Product Ton	$ —	$ 10
	+$0.50	-$0.50
Natural Gas Cost per MMBtu(1)	$ 13	$ —

(1) The sensitivity impact of a $0.50/MMBtu increase or decrease in the cost of natural gas includes any corresponding impact to selling prices from contractually stipulated sales provisions.

7. Property, Plant and Equipment—Net

Property, plant and equipment—net consists of the following:

	December 31,	
	2021	2020
	(in millions)	
Land	$ 68	$ 68
Machinery and equipment[(1)]	12,757	12,539
Buildings and improvements[(1)]	915	895
Construction in progress[(1)]	148	275
Property, plant and equipment[(2)]	13,888	13,777
Less: Accumulated depreciation and amortization	6,807	6,145
Property, plant and equipment—net	$ 7,081	$ 7,632

(1) As of December 31, 2021, machinery and equipment, buildings and improvements, and construction in progress include impairment charges in 2021 of $169 million, $5 million and $8 million, respectively.

(2) As of December 31, 2021 and 2020, we had property, plant and equipment that was accrued but unpaid of approximately $35 million and $43 million, respectively.

Depreciation and amortization related to property, plant and equipment was $871 million, $876 million and $855 million in 2021, 2020 and 2019, respectively.

Asset impairment—During the third quarter of 2021, in light of the substantial increase in natural gas prices in the United Kingdom and its estimated impact on our U.K. operations, we identified a triggering event indicating possible impairment of the long-lived assets related to our U.K. manufacturing facilities within our Ammonia, AN and Other segments, including property, plant, and equipment. Accordingly, we performed a recoverability test on the U.K. Ammonia, U.K. AN and U.K. Other asset groups' long-lived assets as of September 30, 2021. Our assets groups are the same as our reporting units. The recoverability tests were based on forecasts of undiscounted cash flows within each of our U.K. asset groups. The results of the recoverability tests indicated that the long-lived assets within our U.K. Ammonia, U.K. AN and U.K. Other asset groups were not fully recoverable. As a result, long-lived asset impairment charges of $236 million were recorded. The amount of the impairment that was allocated to property, plant and equipment was $182 million.

In the fourth quarter of 2021, natural gas prices in the United Kingdom continued to rise, which triggered an additional impairment test of the long-lived assets in our U.K. asset groups. This test indicated that no additional long-lived asset impairment should be recorded as the undiscounted cash flows were in excess of the carrying values for each of the U.K. asset groups. Long-lived assets on our consolidated balance sheet as of December 31, 2021 include approximately $425 million related to the U.K. asset groups, which primarily consists of approximately $385 million of property, plant and equipment. See Note 6—United Kingdom Energy Crisis and Impairment Charges and Note 8—Goodwill and Other Intangible Assets for additional information.

Sale of Pine Bend facility—In 2019, we sold our Pine Bend dry bulk storage and logistics facility in Minnesota, received proceeds of $55 million and recognized a pre-tax gain of $45 million. The gain is reflected in other operating—net in our consolidated statement of operations for the year ended December 31, 2019.

Plant turnarounds—Scheduled inspections, replacements and overhauls of plant machinery and equipment at our continuous process manufacturing facilities during a full plant shutdown are referred to as plant turnarounds. The expenditures related to turnarounds are capitalized in property, plant and equipment when incurred. The following is a summary of capitalized plant turnaround costs:

	Year ended December 31,		
	2021	2020	2019
	(in millions)		
Net capitalized turnaround costs at beginning of the year	$ 226	$ 246	$ 252
Additions	250	84	102
Depreciation	(121)	(104)	(112)
Effect of exchange rate changes	—	—	4
Net capitalized turnaround costs at end of the year	$ 355	$ 226	$ 246

Scheduled replacements and overhauls of plant machinery and equipment include the dismantling, repair or replacement and installation of various components including piping, valves, motors, turbines, pumps, compressors, heat exchangers and the replacement of catalysts when a full plant shutdown occurs. Scheduled inspections are also conducted during full plant shutdowns, including required safety inspections which entail the disassembly of various components such as steam boilers, pressure vessels and other equipment requiring safety certifications. Internal employee costs and overhead amounts are not considered turnaround costs and are not capitalized.

8. Goodwill and Other Intangible Assets

Goodwill

The following table shows the carrying amount of goodwill by reportable segment as of December 31, 2021 and 2020:

	Ammonia	Granular Urea	UAN	AN	Other	Total
			(in millions)			
Balance as of December 31, 2020	$ 587	$ 828	$ 576	$ 310	$ 73	$ 2,374
Impairment losses	(9)	—	—	(241)	(35)	(285)
Effect of exchange rate changes	1	—	—	—	1	2
Balance as of December 31, 2021	$ 579	$ 828	$ 576	$ 69	$ 39	$ 2,091

Goodwill is not amortized, but is reviewed for impairment annually in the fourth quarter or more frequently whenever events or circumstances indicate that the carrying value may not be recoverable. During the third quarter of 2021, in light of the unprecedented increase in natural gas prices in the United Kingdom and its estimated impact on our U.K. operations, we identified a triggering event indicating possible impairment of goodwill within our U.K. Ammonia, U.K. AN and U.K. Other reporting units. Due to the triggering event, we performed an interim quantitative goodwill impairment analysis as of September 30, 2021 for our U.K. Ammonia, U.K. AN and U.K. Other reporting units. We estimated the fair value of the reporting units using the income approach described in Note 6—United Kingdom Energy Crisis and Impairment Charges. Based on the evaluation performed, we determined that the carrying value of all three reporting units exceeded their fair value, which resulted in a goodwill impairment charge totaling $259 million in the third quarter of 2021. The goodwill impairment was calculated as the amount that the carrying value of the reporting unit, including any goodwill, exceeded its fair value, limited to the total amount of goodwill allocated to the reporting unit.

In the fourth quarter of 2021, the continued impacts of the U.K. energy crisis triggered an additional impairment test of goodwill, which resulted in an additional goodwill impairment charge of $26 million. As a result, we have no remaining goodwill related to our U.K. operations on our consolidated balance sheet as of December 31, 2021. See Note 6—United Kingdom Energy Crisis and Impairment Charges for additional information.

Other Intangible Assets

All of our identifiable intangible assets have definite lives and are presented in other assets on our consolidated balance sheets at gross carrying amount, net of accumulated amortization, as follows:

	December 31, 2021			December 31, 2020		
	Gross Carrying Amount[(1)]	Accumulated Amortization	Net	Gross Carrying Amount	Accumulated Amortization	Net
	(in millions)					
Customer relationships	$ 84	$ (60)	$ 24	$ 133	$ (52)	$ 81
Trade names	31	(10)	21	32	(9)	23
Total intangible assets	$ 115	$ (70)	$ 45	$ 165	$ (61)	$ 104

(1) As of December 31, 2021, the gross carrying amount for customer relationships and trade names include impairment charges in 2021 of $49 million and $1 million, respectively.

Our customer relationships and trade names are being amortized over a weighted-average life of approximately 20 years. During the fourth quarter of 2021, as we had estimated that we had sufficient emission credits for our 2021 obligations, we sold excess U.K. emission credits, including those purchased in the third quarter of 2021, for approximately $46 million and recognized a corresponding gain of $27 million, which is included in other operating—net in our consolidated statement of operations. Amortization expense of our identifiable intangible assets for each of the years ended December 31, 2021, 2020 and 2019 was $8 million. The gross carrying amount and accumulated amortization of our intangible assets are also impacted by the effect of exchange rate changes. Total estimated amortization expense for each of the fiscal years 2022-2026 is $4 million.

In the third quarter of 2021, as a result of the triggering event described above, we also performed a recoverability test on our long-lived assets within the U.K. Ammonia, U.K. AN and U.K. Other asset groups, including our definite-lived intangible assets, as of September 30, 2021. The recoverability test was based on forecasts of undiscounted cash flows, as described in Note 6—United Kingdom Energy Crisis and Impairment Charges. The results of the recoverability test indicated that the long-lived assets within our U.K. Ammonia, U.K. AN and U.K. Other asset groups were not fully recoverable. As a result, long-lived asset impairment charges, inclusive of the definite-lived intangible assets, of $236 million were recorded. The amount of the impairment that was allocated to definite-lived intangible assets was $50 million.

In the fourth quarter of 2021, natural gas prices in the United Kingdom continued to rise, which triggered an additional impairment test of the long-lived assets in our U.K. asset groups. This test indicated that no additional long-lived asset impairment should be recorded as the undiscounted cash flows were in excess of the carrying values for each of the U.K. asset groups. See Note 6—United Kingdom Energy Crisis and Impairment Charges and Note 7—Property, Plant and Equipment—Net for additional information.

Long-lived assets on our consolidated balance sheet as of December 31, 2021 include approximately $425 million related to the U.K. asset groups, including approximately $30 million of customer relationships and trade names.

9. Equity Method Investment

We have a 50% ownership interest in PLNL, which operates an ammonia production facility in the Republic of Trinidad and Tobago. We include our share of the net earnings from this equity method investment as an element of earnings from operations because PLNL provides additional production to our operations and is integrated with our other supply chain and sales activities in the Ammonia segment.

As of December 31, 2021, the total carrying value of our equity method investment in PLNL was $82 million, $39 million more than our share of PLNL's book value. The excess is attributable to the purchase accounting impact of our acquisition of the investment in PLNL and reflects the revaluation of property, plant and equipment. The increased basis for property, plant and equipment is being amortized over a remaining period of approximately 11 years. Our equity in earnings of PLNL is different from our ownership interest in income reported by PLNL due to amortization of this basis difference.

We have transactions in the normal course of business with PLNL reflecting our obligation to purchase 50% of the ammonia produced by PLNL at current market prices. Our ammonia purchases from PLNL totaled $150 million, $57 million and $69 million in 2021, 2020 and 2019, respectively.

The Trinidadian tax authority (the Board of Inland Revenue) issued a proposed tax assessment against PLNL with respect to tax years 2011 and 2012 asserting that PLNL should have withheld tax at a higher rate on dividends paid to its Trinidadian owners. The Board of Inland Revenue also would have assessed statutory interest and penalties on the amount of tax owed when a final assessment was issued. As we own a 50% interest in PLNL, our effective share of any assessment that was determined to be a liability of PLNL would be 50%, which would be reflected as a reduction in our equity in earnings of PLNL. During the third quarter of 2019, the Trinidadian government offered a tax amnesty period that provided taxpayers the opportunity to pay any prior year tax obligations and avoid accumulated interest or penalties. During the tax amnesty period, PLNL evaluated the proposed assessment, including considering the outcome of certain recent legal cases involving other taxpayers. As a result of this evaluation, in the third quarter of 2019, PLNL paid withholding tax to the Board of Inland Revenue under the amnesty program for tax years back to 2011, and recognized a charge for $32 million in the third quarter of 2019. Our 50% share of PLNL's tax charge was $16 million, which reduced our equity in earnings of operating affiliate for 2019.

10. Fair Value Measurements

Our cash and cash equivalents and other investments consist of the following:

	December 31, 2021			
	Cost Basis	Unrealized Gains	Unrealized Losses	Fair Value
	(in millions)			
Cash	$ 121	$ —	$ —	$ 121
Cash equivalents:				
U.S. and Canadian government obligations	1,452	—	—	1,452
Other debt securities	55	—	—	55
Total cash and cash equivalents	$ 1,628	$ —	$ —	$ 1,628
Nonqualified employee benefit trusts	17	3	—	20

	December 31, 2020			
	Cost Basis	Unrealized Gains	Unrealized Losses	Fair Value
	(in millions)			
Cash	$ 108	$ —	$ —	$ 108
Cash equivalents:				
U.S. and Canadian government obligations	552	—	—	552
Other debt securities	23	—	—	23
Total cash and cash equivalents	$ 683	$ —	$ —	$ 683
Nonqualified employee benefit trusts	16	3	—	19

Under our short-term investment policy, we may invest our cash balances, either directly or through mutual funds, in several types of investment-grade securities, including notes and bonds issued by governmental entities or corporations. Securities issued by governmental entities include those issued directly by the U.S. and Canadian federal governments; those issued by state, local or other governmental entities; and those guaranteed by entities affiliated with governmental entities.

Assets and Liabilities Measured at Fair Value on a Recurring Basis

The following tables present assets and liabilities included in our consolidated balance sheets as of December 31, 2021 and 2020 that are recognized at fair value on a recurring basis, and indicate the fair value hierarchy utilized to determine such fair value:

	December 31, 2021			
	Total Fair Value	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
	(in millions)			
Cash equivalents	$ 1,507	$ 1,507	$ —	$ —
Nonqualified employee benefit trusts	20	20	—	—
Derivative assets	16	—	16	—
Derivative liabilities	(47)	—	(47)	—
Embedded derivative liability	(15)	—	(15)	—

	December 31, 2020			
	Total Fair Value	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
	(in millions)			
Cash equivalents	$ 575	$ 575	$ —	$ —
Nonqualified employee benefit trusts	19	19	—	—
Derivative assets	1	—	1	—
Derivative liabilities	(7)	—	(7)	—
Embedded derivative liability	(18)	—	(18)	—

Cash Equivalents

As of December 31, 2021 and 2020, our cash equivalents consisted primarily of U.S. and Canadian government obligations and money market mutual funds that invest in U.S. government obligations and other investment-grade securities.

Nonqualified Employee Benefit Trusts

We maintain trusts associated with certain nonqualified supplemental pension plans. The fair values of the trust assets are based on daily quoted prices in an active market, which represents the net asset values of the shares held in the trusts, and are included on our consolidated balance sheets in other assets. Debt securities are accounted for as available-for-sale securities and changes in fair value are reported in other comprehensive income. Changes in the fair value of available-for-sale equity securities in the trust assets are recognized through earnings.

Derivative Instruments

The derivative instruments that we use are primarily natural gas fixed price swaps, basis swaps and options traded in the OTC markets with multi-national commercial banks, other major financial institutions or large energy companies. The natural gas derivative contracts represent anticipated natural gas needs for future periods and settlements are scheduled to coincide with anticipated natural gas purchases during those future periods. The natural gas derivative contracts settle using primarily a NYMEX futures price index. To determine the fair value of these instruments, we use quoted market prices from NYMEX and standard pricing models with inputs derived from or corroborated by observable market data such as forward curves supplied by an industry-recognized independent third party. See Note 16—Derivative Financial Instruments for additional information.

Embedded Derivative Liability

Under the terms of our strategic venture with CHS, if our credit rating as determined by two of three specified credit rating agencies is below certain levels, we are required to make a non-refundable yearly payment of $5 million to CHS. Since 2016, our credit ratings have been below certain levels and, as a result, we made an annual payment of $5 million to CHS in the fourth quarter of each year. These payments will continue on a yearly basis until the earlier of the date that our credit rating is upgraded to or above certain levels by two of the three specified credit rating agencies or February 1, 2026. This obligation is recognized on our consolidated balance sheets as an embedded derivative and is included within other current liabilities and other liabilities. As of December 31, 2021 and 2020, the embedded derivative liability was $15 million and $18 million, respectively. Included in other operating—net in our consolidated statements of operations for the years ended December 31, 2021, 2020 and 2019 is a net loss of $1 million, $3 million and $4 million, respectively.

The inputs into the fair value measurement include the probability of future upgrades and downgrades of our credit rating based on historical credit rating movements of other public companies and the discount rates to be applied to potential annual payments based on applicable credit spreads of other public companies at different credit rating levels. Based on these inputs, our fair value measurement is classified as Level 2.

See Note 18—Noncontrolling Interest for additional information regarding our strategic venture with CHS.

Financial Instruments

The carrying amounts and estimated fair value of our financial instruments are as follows:

	December 31, 2021		December 31, 2020	
	Carrying Amount	Fair Value	Carrying Amount	Fair Value
	(in millions)			
Long-term debt, including current maturities	$ 3,465	$ 4,113	$ 3,961	$ 4,731

The fair value of our long-term debt was based on quoted prices for identical or similar liabilities in markets that are not active or valuation models in which all significant inputs and value drivers are observable and, as a result, they are classified as Level 2 inputs.

The carrying amounts of cash and cash equivalents, as well as instruments included in other current assets and other current liabilities that meet the definition of financial instruments, approximate fair values because of their short-term maturities.

Assets and Liabilities Measured at Fair Value on a Nonrecurring Basis

We also have assets and liabilities that may be measured at fair value on a nonrecurring basis; that is, the assets and liabilities are not measured at fair value on an ongoing basis, but are subject to fair value adjustments in certain circumstances, such as when there is evidence of impairment, when there is allocation of purchase price in an acquisition or when a new liability is being established that requires fair value measurement. These include long-lived assets, goodwill and other intangible assets and investments in unconsolidated subsidiaries, such as equity method investments, which may be written down to fair value as a result of impairment. The fair value measurements related to each of these rely primarily on Company-specific inputs and the Company's assumptions about the use of the assets. Since certain of the Company's assumptions would involve inputs that are not observable, these fair values would reside within Level 3 of the fair value hierarchy. See Note 6—United Kingdom Energy Crisis and Impairment Charges for additional information on the fair values and unobservable inputs utilized in the impairment evaluations performed in 2021 for the long-lived assets, including definite-lived intangible assets, and goodwill related to our U.K. operations.

11. Income Taxes

Income Tax Provision

The components of earnings before income taxes and the components of our income tax provision are as follows:

	Year ended December 31,		
	2021	2020	2019
		(in millions)	
Domestic	$ 1,979	$ 421	$ 679
Non-U.S.	(436)	42	93
Earnings before income taxes	$ 1,543	$ 463	$ 772
Current			
Federal	$ 394	$ 106	$ 4
Foreign	30	6	21
State	55	(7)	(48)
	479	105	(23)
Deferred			
Federal	(137)	(76)	112
Foreign	(50)	4	—
State	(9)	(2)	37
	(196)	(74)	149
Income tax provision	$ 283	$ 31	$ 126

Terra Amended Tax Returns

We completed the acquisition of Terra Industries Inc. (Terra) in April 2010. After the acquisition, we determined that the manner in which Terra reported the repatriation of cash from foreign affiliates to its U.S. parent for U.S. and foreign income tax purposes was not appropriate. As a result, in 2012 we amended certain tax returns, including Terra's income and withholding tax returns, back to 1999 (the Amended Tax Returns) and paid additional income and withholding taxes, and related interest and penalties. In 2013, the Internal Revenue Service (IRS) commenced an examination of the U.S. tax aspects of the Amended Tax Returns. In 2017, we also made a Voluntary Disclosures Program filing with the Canada Revenue Agency (CRA) with respect to the Canadian tax aspects of the Amended Tax Returns and paid additional Canadian taxes due.

In early 2019, the IRS completed its examination of the Amended Tax Returns and submitted its audit reports and related refund claims to the Joint Committee on Taxation of the U.S. Congress (the Joint Committee). For purposes of its review, the Joint Committee separated the IRS audit reports into two separate matters: (i) an income tax related matter and (ii) a withholding tax matter. In late 2019, we received notification that the Joint Committee had approved the IRS audit reports and related income tax refunds relating to the income tax related matter. As a result of the approval by the Joint Committee, we recognized in the fourth quarter of 2019 the following amounts in our consolidated statement of operations: (i) $5 million of interest income ($4 million, net of tax); and (ii) a reduction in income tax expense of $10 million as a result of the favorable settlement of certain uncertain tax positions. No income tax refunds were received in 2019 related to the Amended Tax Returns.

In 2020, we received notification that the Joint Committee approved the IRS audit report and related withholding tax refunds relating to the withholding tax matter and we received IRS Notices indicating the amount of tax and interest to be refunded and received with respect to the income tax and withholding tax returns. As a result of these events, we recognized $26 million of interest-related income and $18 million of income tax benefit, which consisted of the following:

- additional income of $26 million ($23 million, net of tax) representing $16 million of interest income related to the U.S. Federal income tax matter and withholding tax matter and a $10 million reversal of previously accrued interest related to the Canadian tax aspects of this matter,
- a reduction in our liabilities for unrecognized tax benefits of $12 million with a corresponding reduction in income tax expense related to the U.S. Federal withholding tax matter, and

- an additional income tax benefit of $9 million related to the U.S. Federal income tax matter and related state amended returns.

In 2020, we received U.S. Federal income tax refunds, including interest, of $110 million relating to the Amended Tax Returns, consisting of $68 million related to the income tax matter and $42 million related to the withholding tax matter, which finalized these matters with the IRS. As a result, all U.S. federal tax years commencing before January 1, 2012 are now closed.

In addition, in late 2020, the CRA settled with us the voluntary disclosure matter, and, in the first quarter of 2021, we received approximately $20 million of withholding tax refunds, including interest, from the CRA. These amounts were previously recorded in our consolidated balance sheet as of December 31, 2020.

Canada Revenue Agency Competent Authority Matter

In 2016, the CRA and Alberta Tax and Revenue Administration (TRA) issued Notices of Reassessment for tax years 2006 through 2009 to one of our Canadian affiliates asserting a disallowance of certain patronage allocations. The tax assessments totaled CAD $174 million (or approximately $138 million), including provincial taxes but excluding any interest or penalties. We filed Notices of Objection with respect to the Notices of Reassessment with the CRA and Alberta TRA and we posted letters of credit in lieu of paying the additional tax liability assessed. The letters of credit serve as security until the matter is resolved. In 2018, the matter, including the related transfer pricing topic, was accepted for consideration under the bilateral settlement provisions of the U.S.-Canada tax treaty (the Treaty) by the United States and Canadian competent authorities, and included tax years 2006 through 2011. In the second quarter of 2021, the Company entered the matter into the arbitration process under the terms of the Treaty.

In February 2022, we were informed that a decision was reached by the arbitration board regarding the matter. See Note 26—Subsequent Event for further information.

Effective Tax Rate

Differences in the expected income tax provision based on statutory rates applied to earnings before income taxes and the income tax provision reflected in the consolidated statements of operations are summarized below.

	Year ended December 31,		
	2021	2020	2019
	(in millions, except percentages)		
Earnings before income taxes	$ 1,543	$ 463	$ 772
Expected tax provision at U.S. statutory rate of 21%	$ 324	$ 97	$ 162
State income taxes, net of federal	34	(1)	2
Net earnings attributable to noncontrolling interest	(72)	(24)	(32)
Foreign tax rate differential	(1)	1	2
U.S. tax on foreign earnings	—	(6)	3
Foreign partnership basis difference	—	(7)	—
Non-deductible goodwill impairment	60	—	—
Federal income tax return audits	(38)	—	—
Terra amended tax returns	—	(24)	(10)
Other	(24)	(5)	(1)
Income tax provision	$ 283	$ 31	$ 126
Effective tax rate	18.3 %	6.7 %	16.3 %

Our effective tax rate is impacted by earnings attributable to the noncontrolling interest in CFN, as our consolidated income tax provision does not include a tax provision on the earnings attributable to the noncontrolling interest. As a result, earnings attributable to the noncontrolling interest of $343 million, $115 million and $153 million in 2021, 2020 and 2019, respectively, which are included in earnings before income taxes, impacted the effective tax rate in all three years. See Note 18—Noncontrolling Interest for additional information.

The foreign tax rate differential is impacted by the inclusion of equity earnings from our equity method investment in PLNL, a foreign operating affiliate, which are included in pre-tax earnings on an after-tax basis. In 2021 and 2020, the foreign tax rate differential includes $12 million and $6 million of tax expense, respectively, for the revaluing of deferred taxes due to an enacted rate change in the jurisdiction of a foreign affiliate.

U.S. tax on foreign earnings is inclusive of the current year tax on global intangible low-tax income (GILTI), benefit from the GILTI Section 250 deduction and foreign tax credits, as well as adjustments to prior year amounts for these items.

Non-deductible goodwill impairment in the table above relates to the goodwill impairment described in Note 6—United Kingdom Energy Crisis and Impairment Charges, above. We did not record an income tax benefit for the goodwill impairment as it is nondeductible for income tax purposes.

We reached agreement on certain issues related to U.S. federal income tax audits for the 2012-2016 tax years and reversed accruals for unrecognized tax benefits of $13 million related to those tax years. This resulted in a $38 million federal income tax benefit, which included the reduction in our unrecognized tax benefits. The federal income tax benefit was offset by $12 million of state income tax liability resulting from adjustments to U.S. federal taxable income, which is included in the line "State income tax, net of federal" in the table above.

Deferred Taxes

Deferred tax assets and deferred tax liabilities are as follows:

	December 31, 2021	December 31, 2020
	(in millions)	
Deferred tax assets:		
Net operating loss and capital loss carryforwards, state	$ 38	$ 72
Net operating loss and capital loss carryforwards, foreign	122	122
Retirement and other employee benefits	51	69
State tax credits	29	69
Operating lease liabilities	62	61
Other	43	23
	345	416
Valuation allowance	(150)	(157)
	195	259
Deferred tax liabilities:		
Depreciation and amortization	(157)	(204)
Investments in partnerships	(998)	(1,173)
Operating lease right-of-use assets	(60)	(60)
Other	(9)	(6)
	(1,224)	(1,443)
Net deferred tax liability	$ (1,029)	$ (1,184)

We consider the earnings of our United Kingdom subsidiaries to be permanently reinvested. As of December 31, 2021, we would not expect any additional U.S. and foreign income tax that would be due upon repatriation of these accumulated earnings, other than foreign withholding tax, which we have not accrued.

As of December 31, 2021, our net operating loss and capital loss carryforwards are primarily comprised of state net operating loss carryforwards of $37 million with expiration dates generally ranging from 2027 to 2037 and foreign capital loss carryforwards of $118 million, which can be carried forward indefinitely. Our foreign affiliates, including the foreign affiliate described above, have operations that do not normally generate capital gains and have no practical plans to do so in the future. As a result, we have recorded a full valuation allowance against all foreign capital loss carryforwards.

As of December 31, 2021, we have state tax credit carryforwards resulting in a deferred tax asset of $29 million. The state tax credits have expiration dates generally ranging from 2038 to 2041.

In 2021, the valuation allowance activity is primarily attributable to state tax credit carryforwards and excess foreign tax credits associated with certain U.S. taxed foreign branch income. Due to the expiration of statute of limitations on state tax credits and increases in taxable income, we no longer have valuation allowances on the remaining state tax credit carryforwards resulting in a decrease of $27 million. The excess foreign tax credits carried forward, subject to U.S. foreign tax credit limitation rules, are not expected to be utilized prior to expiration and have a full valuation allowance of approximately of $18 million. These foreign tax credits are reflected in the other line within deferred tax assets in the table above.

In 2020, as a result of an intercompany transaction with a foreign affiliate, we recognized a capital loss which will be carried forward and for which we recorded a deferred tax asset of approximately $90 million. The foreign affiliate operations do not normally generate capital gains and there is no practical plan to do so in the future; therefore, we established a full valuation allowance of approximately $90 million against the deferred tax asset.

In 2019, as a result of group legal entity reorganizations, foreign net operating loss carryforwards were eliminated, which resulted in a net decrease of $99 million in the net operating loss carryforwards deferred tax asset. We recorded a corresponding reduction in the related valuation allowance of $99 million as these losses were not anticipated to be realized. The valuation allowance activity in 2020 was primarily attributable to a capital loss.

Unrecognized Tax Benefits

A reconciliation of the beginning and ending amount of unrecognized tax benefits is as follows:

	December 31,	
	2021	2020
	(in millions)	
Unrecognized tax benefits:		
Balance as of January 1	$ 81	$ 104
Additions for tax positions taken during the current year	—	—
Additions for tax positions taken during prior years	5	—
Reductions related to lapsed statutes of limitations	—	—
Reductions related to settlements with tax jurisdictions	(59)	(23)
Balance as of December 31	$ 27	$ 81

Our effective tax rate would be affected by $21 million if these unrecognized tax benefits were to be recognized in the future.

In 2021, we increased the amount of our unrecognized tax benefits for $5 million related to an addition for state investment tax credits. In addition, we reduced the amount of unrecognized tax benefits in 2021 by $59 million primarily related to the effective settlement of the U.S. federal income tax audits for the 2012-2016 tax years, as described above.

In 2020, as a result of the settlement and finalization of carryover impacts of the Terra Amended Tax Returns on other tax periods, we reduced our liability for unrecognized tax benefits by $19 million and recorded a corresponding deferred income tax liability. In addition, we reduced our liabilities for unrecognized tax benefits by $4 million with a corresponding reduction in income tax provision.

We file federal, provincial, state and local income tax returns principally in the United States, Canada and the United Kingdom, as well as in certain other foreign jurisdictions. In general, filed tax returns remain subject to examination by United States tax jurisdictions for years 2017 and thereafter, by Canadian tax jurisdictions for years 2006 and thereafter, and by the United Kingdom for years 2019 and thereafter.

Interest expense and penalties of $(29) million and $4 million were recorded for the years ended December 31, 2020 and 2019, respectively. Interest expense and penalties recorded for the year ended December 31, 2021 were not material. Amounts recognized in our consolidated balance sheets for accrued interest and penalties related to income taxes of $4 million and $4 million as of December 31, 2021 and 2020, respectively, are included in other liabilities.

12. Pension and Other Postretirement Benefits

We maintain five funded pension plans, consisting of three in North America (one U.S. plan and two Canadian plans) and two in the United Kingdom. One of our Canadian plans is closed to new employees and the two United Kingdom plans are closed to new employees and future accruals. The portion of the U.S. plan that is open to new employees is a cash balance plan, which provides benefits based on years of service and interest credits. We also provide group medical insurance benefits to certain retirees in North America. The specific medical benefits provided to retirees vary by group and location.

Our plan assets, benefit obligations, funded status and amounts recognized on our consolidated balance sheets for our North America and United Kingdom plans as of the December 31 measurement date are as follows:

	Pension Plans				Retiree Medical Plans	
	North America		United Kingdom		North America	
	December 31,		December 31,		December 31,	
	2021	2020	2021	2020	2021	2020
	(in millions)					
Change in plan assets						
Fair value of plan assets as of January 1	$ 846	$ 790	$ 491	$ 418	$ —	$ —
Return on plan assets	15	96	20	58	—	—
Employer contributions	14	22	26	23	4	4
Plan participant contributions	—	—	—	—	—	1
Benefit payments	(46)	(66)	(27)	(25)	(4)	(5)
Foreign currency translation	1	4	(5)	17	—	—
Fair value of plan assets as of December 31	830	846	505	491	—	—
Change in benefit obligation						
Benefit obligation as of January 1	(884)	(839)	(643)	(597)	(35)	(37)
Service cost	(20)	(17)	—	—	—	—
Interest cost	(21)	(25)	(9)	(11)	(1)	(1)
Benefit payments	46	66	27	25	4	5
Foreign currency translation	(1)	(4)	6	(20)	—	—
Plan participant contributions	—	—	—	—	—	(1)
Change in assumptions and other	39	(65)	29	(40)	—	(1)
Benefit obligation as of December 31	(841)	(884)	(590)	(643)	(32)	(35)
Funded status as of December 31	$ (11)	$ (38)	$ (85)	$ (152)	$ (32)	$ (35)

The line titled “Change in assumptions and other” for our North America pension plans primarily reflects the impact of gains due to the increase in discount rates for 2021 and losses due to the decrease in discount rates for 2020.

The line titled “Change in assumptions and other” for our U.K. pension plans primarily reflects gains due to the increase in discount rates for 2021 and losses due to the decrease in discount rates for 2020. For 2021, the gains from the decrease in discount rates were partially offset by losses due to an increase in the inflation rate assumptions.

The line titled “Benefit payments” for 2020 includes $22 million of lump sum payments for our U.S. pension plan paid in December 2020.

Amounts recognized on the consolidated balance sheets consist of the following:

	Pension Plans				Retiree Medical Plans	
	North America		United Kingdom		North America	
	December 31,		December 31,		December 31,	
	2021	2020	2021	2020	2021	2020
	(in millions)					
Other assets	$ 16	$ 10	$ —	$ —	$ —	$ —
Accrued expenses	—	—	—	—	(3)	(3)
Other liabilities	(27)	(48)	(85)	(152)	(29)	(32)
	$ (11)	$ (38)	$ (85)	$ (152)	$ (32)	$ (35)

Pre-tax amounts recognized in accumulated other comprehensive loss consist of the following:

	Pension Plans				Retiree Medical Plans	
	North America		United Kingdom		North America	
	December 31,		December 31,		December 31,	
	2021	2020	2021	2020	2021	2020
	(in millions)					
Prior service cost	$ 3	$ 4	$ 1	$ 1	$ —	$ —
Net actuarial loss	43	79	89	129	4	4
	$ 46	$ 83	$ 90	$ 130	$ 4	$ 4

Net periodic benefit cost (income) and other amounts recognized in other comprehensive (income) loss for the years ended December 31 included the following:

	Pension Plans						Retiree Medical Plans		
	North America			United Kingdom			North America		
	2021	2020	2019	2021	2020	2019	2021	2020	2019
	(in millions)								
Service cost	$ 20	$ 17	$ 14	$ —	$ —	$ —	$ —	$ —	$ —
Interest cost	21	25	30	9	11	15	1	1	1
Expected return on plan assets	(24)	(30)	(32)	(14)	(14)	(18)	—	—	—
Amortization of prior service cost (benefit)	1	1	—	—	—	—	—	—	(1)
Amortization of actuarial loss (gain)	5	3	—	4	3	—	—	(1)	(1)
Net periodic benefit cost (income)	23	16	12	(1)	—	(3)	1	—	(1)
Net actuarial (gain) loss	(31)	(1)	3	(36)	(4)	60	—	1	(4)
Prior service cost (credit)	—	—	4	—	—	(3)	—	—	—
Amortization of prior service (cost) benefit	(1)	(1)	—	—	—	—	—	—	1
Amortization of actuarial (loss) gain	(5)	(3)	—	(4)	(3)	—	—	1	1
Total recognized in other comprehensive (income) loss	(37)	(5)	7	(40)	(7)	57	—	2	(2)
Total recognized in net periodic benefit cost (income) and other comprehensive (income) loss	$ (14)	$ 11	$ 19	$ (41)	$ (7)	$ 54	$ 1	$ 2	$ (3)

In the table above, the line titled "Prior service cost (credit)" in 2019 relates to plan amendments for updates to certain mortality tables for the U.S. plan and a conversion option for pensions in payment for the U.K. plans.

Service cost is recognized in cost of sales and selling, general and administrative expenses, and the other components of net periodic benefit cost are recognized in other non-operating—net in our consolidated statements of operations.

The accumulated benefit obligation (ABO) in aggregate for the defined benefit pension plans in North America was approximately $797 million and $834 million as of December 31, 2021 and 2020, respectively. The ABO in aggregate for the defined benefit pension plans in the United Kingdom was approximately $590 million and $643 million as of December 31, 2021 and 2020, respectively.

The following table presents aggregated information for those individual defined benefit pension plans that have an ABO in excess of plan assets as of December 31, which, for 2021, excludes the three North American defined benefit pension plans and, for 2020, excludes two of the North American defined benefit pension plans, as each has plan assets in excess of its ABO:

	North America		United Kingdom	
	2021	2020	2021	2020
	(in millions)			
Accumulated benefit obligation	$ —	$ (678)	$ (590)	$ (643)
Fair value of plan assets	—	667	505	491

The following table presents aggregated information for those individual defined benefit pension plans that have a projected benefit obligation (PBO) in excess of plan assets as of December 31, which excludes two North American defined benefit pension plans that have plan assets in excess of its PBO:

	North America		United Kingdom	
	2021	2020	2021	2020
	(in millions)			
Projected benefit obligation	$ (684)	$ (715)	(590)	$ (643)
Fair value of plan assets	656	667	505	491

Our pension funding policy in North America is to contribute amounts sufficient to meet minimum legal funding requirements plus discretionary amounts that we may deem to be appropriate. Actual contributions may vary from estimated amounts depending on changes in assumptions, actual returns on plan assets, changes in regulatory requirements and funding decisions.

In accordance with United Kingdom pension legislation, our United Kingdom pension funding policy is to contribute amounts sufficient to meet the funding level target agreed between the employer and the trustees of the United Kingdom plans. Actual contributions are usually agreed with the plan trustees in connection with each triennial valuation and may vary following each such review depending on changes in assumptions, actual returns on plan assets, changes in regulatory requirements and funding decisions.

We currently estimate that our consolidated pension funding contributions for 2022 will be approximately $2 million for the North American plans and $27 million for the United Kingdom plans.

The expected future benefit payments for our pension and retiree medical plans are as follows:

	Pension Plans		Retiree Medical Plans
	North America	United Kingdom	North America
	(in millions)		
2022	$ 47	$ 28	$ 3
2023	48	28	2
2024	49	29	2
2025	49	30	2
2026	50	31	2
2027-2031	253	167	9

The following assumptions were used in determining the benefit obligations and expense:

	Pension Plans						Retiree Medical Plans		
	North America			United Kingdom			North America		
	2021	2020	2019	2021	2020	2019	2021	2020	2019
Weighted-average discount rate—obligation	2.8 %	2.4 %	3.1 %	2.0 %	1.5 %	2.0 %	2.7 %	2.2 %	3.0 %
Weighted-average discount rate—expense	2.4 %	3.1 %	4.1 %	1.5 %	2.0 %	2.9 %	2.2 %	3.0 %	4.1 %
Weighted-average cash balance interest crediting rate—obligation	3.0 %	3.0 %	3.0 %	n/a	n/a	n/a	n/a	n/a	n/a
Weighted-average cash balance interest crediting rate—expense	3.0 %	3.0 %	3.0 %	n/a	n/a	n/a	n/a	n/a	n/a
Weighted-average rate of increase in future compensation	4.2 %	4.2 %	4.2 %	n/a	n/a	n/a	n/a	n/a	n/a
Weighted-average expected long-term rate of return on assets—expense	3.2 %	4.1 %	4.6 %	3.3 %	3.4 %	4.4 %	n/a	n/a	n/a
Weighted-average retail price index—obligation	n/a	n/a	n/a	3.3 %	3.0 %	3.0 %	n/a	n/a	n/a
Weighted-average retail price index—expense	n/a	n/a	n/a	3.0 %	3.0 %	3.3 %	n/a	n/a	n/a

n/a—not applicable

The discount rates for all plans are developed by plan using spot rates derived from a hypothetical yield curve of high quality (AA rated or better) fixed income debt securities as of the year-end measurement date to calculate discounted cash flows (the projected benefit obligation) and solving for a single equivalent discount rate that produces the same projected benefit obligation. In determining our benefit obligation, we use the actuarial present value of the vested benefits to which each eligible employee is currently entitled, based on the employee's expected date of separation or retirement.

The cash balance interest crediting rate for the U.S. plan is based on the greater of 10-year Treasuries or 3.0%.

For our North America plans, the expected long-term rate of return on assets is based on analysis of historical rates of return achieved by equity and non-equity investments and current market characteristics, adjusted for estimated plan expenses and weighted by target asset allocation percentages. As of January 1, 2022, our weighted-average expected long-term rate of return on assets is 3.6%, which will be used in determining expense for 2022.

For our United Kingdom plans, the expected long-term rate of return on assets is based on the expected long-term performance of the underlying investments, adjusted for investment managers' fees and estimated plan expenses. As of January 1, 2022, our weighted-average expected long-term rate of return on assets is 3.4%, which will be used in determining expense for 2022.

The retail price index for the United Kingdom plans is developed using the Bank of England implied retail price inflation curve, which is based on the difference between yields on fixed interest government bonds and index-linked government bonds.

For the measurement of the benefit obligation at December 31, 2021 for our primary (U.S.) retiree medical benefit plans, the assumed health care cost trend rates, for pre-65 retirees, start with a 6.3% increase in 2022, followed by a gradual decline in increases to 4.5% for 2030 and thereafter. For post-65 retirees, the assumed health care cost trend rates start with a 6.8% increase in 2022, followed by a gradual decline in increases to 4.5% for 2030 and thereafter. For the measurement of the benefit obligation at December 31, 2020 for our primary (U.S.) retiree medical benefit plans, the assumed health care cost trend rates, for pre-65 retirees, started with a 6.3% increase in 2021, followed by a gradual decline in increases to 4.5% for 2030 and thereafter. For post-65 retirees, the assumed health care cost trend rates started with a 7.0% increase in 2021, followed by a gradual decline in increases to 4.5% for 2030 and thereafter.

The objectives of the investment policies governing the pension plans are to administer the assets of the plans for the benefit of the participants in compliance with all laws and regulations, and to establish an asset mix that provides for diversification and considers the risk of various different asset classes with the purpose of generating favorable investment returns. The investment policies consider circumstances such as participant demographics, time horizon to retirement and liquidity needs, and provide guidelines for asset allocation, planning horizon, general portfolio issues and investment manager evaluation criteria. The investment strategies for the plans, including target asset allocations and investment vehicles, are subject to change within the guidelines of the policies.

The target asset allocation for our U.S. pension plan is 80% non-equity and 20% equity, which has been determined based on analysis of actual historical rates of return and plan needs and circumstances. The equity investments are tailored to exceed the growth of the benefit obligation and are a combination of U.S. and non-U.S. total stock market index mutual funds. The non-equity investments consist primarily of investments in debt securities and money market instruments that are selected based on investment quality and duration to mitigate volatility of the funded status and annual required contributions. The non-equity investments have a duration profile that is similar to the benefit obligation in order to mitigate the impact of interest rate changes on the funded status. This investment strategy is achieved through the use of mutual funds and individual securities.

The target asset allocation for one of the Canadian plans is 70% non-equity and 30% equity, and 100% non-equity for the other Canadian plan. This investment strategy is achieved through the use of a mutual fund for equity investments and individual securities for non-equity investments. The equity investment is a passively managed portfolio that diversifies assets across multiple securities, economic sectors and countries. The non-equity investments consist primarily of investments in debt securities that are selected based on investment quality and duration to mitigate volatility of the funded status and annual required contributions. The non-equity investments have a duration profile that is similar to the benefit obligation in order to mitigate the impact of interest rate changes on the funded status.

The pension assets in the United Kingdom plans are each administered by a Board of Trustees consisting of employer-nominated trustees, member-nominated trustees and an independent trustee, with a requirement that member-nominated trustees represent at least one-third of each Board of Trustees. It is the responsibility of the trustees to ensure prudent management and investment of the assets in the plans. The trustees meet on a quarterly basis to review and discuss fund performance and other administrative matters.

The trustees' investment objectives are to hold assets that generate returns sufficient to cover prudently each plan's liability without exposing the plans to unacceptable risk. This is accomplished through the asset allocation strategy of each plan. For both plans, if the asset allocation moves more than plus or minus 5% from the benchmark allocation, the trustees may decide to amend the asset allocation. At a minimum, the trustees review the investment strategy at every triennial actuarial valuation to ensure that the strategy remains consistent with its funding principles. The trustees may review the strategy more frequently if opportunities arise to reduce risk within the investments without jeopardizing the funding position.

Assets of the United Kingdom plans are invested in externally managed pooled funds. The assets are allocated between a growth portfolio and a matching portfolio. The growth portfolio seeks a return premium on investments across multiple asset classes. Growth portfolio funds may include, among others, traditional equities and bonds, growth fixed income, hedged funds, and may use derivatives. The matching portfolio seeks to align asset changes with changes in liabilities due to interest rates and inflation expectations. Matching portfolio funds are composed of corporate bonds, U.K. gilts and liability-driven investment funds and generally invest in fixed income debt securities including government bonds, gilts, gilt repurchase agreements, swaps and investment grade corporate bonds and may use derivatives. The target asset allocation for one of the United Kingdom plans is 55% in the growth portfolio and 45% in the matching portfolio and the other United Kingdom plan is 60% in the growth portfolio (including a legacy holding in an actively managed property fund) and 40% in the matching portfolio.

The fair values of our pension plan assets as of December 31, 2021 and 2020, by major asset class, are as follows:

	North America			
	December 31, 2021			
	Total Fair Value	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
	(in millions)			
Cash and cash equivalents[1]	$ 14	$ 10	$ 4	$ —
Equity mutual funds				
Index equity[2]	157	157	—	—
Pooled equity[3]	34	—	34	—
Fixed income				
U.S. Treasury bonds and notes[4]	61	61	—	—
Corporate bonds and notes[5]	460	—	460	—
Government and agency securities[6]	103	—	103	—
Other[7]	7	—	7	—
Total assets at fair value by fair value levels	$ 836	$ 228	$ 608	$ —
Accruals and payables—net	(6)			
Total assets	$ 830			

	United Kingdom			
	December 31, 2021			
	Total Fair Value	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
	(in millions)			
Cash and cash funds[8]	$ 15	$ 8	$ 7	$ —
Pooled equity funds[9]	122	—	122	—
Pooled diversified funds[10]	52	—	52	—
Debt funds				
Pooled U.K. government fixed and index-linked securities funds[11]	78	—	78	—
Pooled global debt funds[12]	88	—	88	—
Pooled liability-driven investment funds[13]	67	—	67	—
Total assets at fair value by fair value levels	$ 422	$ 8	$ 414	$ —
Funds measured at NAV as a practical expedient[14]	83			
Total assets	$ 505			

	North America			
	December 31, 2020			
	Total Fair Value	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
	(in millions)			
Cash and cash equivalents[1]	$ 30	$ 7	$ 23	$ —
Equity mutual funds				
Index equity[2]	134	134	—	—
Pooled equity[3]	30	—	30	—
Fixed income				
U.S. Treasury bonds and notes[4]	37	37	—	—
Corporate bonds and notes[5]	499	—	499	—
Government and agency securities[6]	110	—	110	—
Other[7]	7	—	7	—
Total assets at fair value by fair value levels	$ 847	$ 178	$ 669	$ —
Accruals and payables—net	(1)			
Total assets	$ 846			

	United Kingdom			
	December 31, 2020			
	Total Fair Value	Quoted Prices in Active Markets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
	(in millions)			
Cash and cash funds[8]	$ 22	$ 5	$ 17	$ —
Pooled equity funds[9]	118	—	118	—
Pooled diversified funds[10]	55	—	55	—
Debt funds				
Pooled U.K. government fixed and index-linked securities funds[11]	73	—	73	—
Pooled global debt funds[12]	88	—	88	—
Pooled liability-driven investment funds[13]	83	—	83	—
Total assets at fair value by fair value levels	$ 439	$ 5	$ 434	$ —
Funds measured at NAV as a practical expedient[14]	52			
Total assets	$ 491			

(1) Cash and cash equivalents are primarily short-term U.S. treasury bills and short-term money market funds in 2021, and also included repurchase agreements in 2020.

(2) The index equity funds are mutual funds that utilize a passively managed investment approach designed to track specific equity indices. They are valued at quoted market prices in an active market, which represent the net asset values of the shares held by the plan.

(3) The equity pooled mutual funds consist of pooled funds that invest in common stock and other equity securities that are traded on U.S., Canadian, and foreign markets.

(4) U.S. Treasury bonds and notes are valued based on quoted market prices in an active market.

(5) Corporate bonds and notes, including private placement securities, are valued by institutional bond pricing services, which gather information from market sources and integrate credit information, observed market movements and sector news into their pricing applications and models.

(6) Government and agency securities consist of U.S. municipal bonds and Canadian provincial bonds that are valued by institutional bond pricing services, which gather information on current trading activity, market movements, trends, and specific data on specialty issues.

(7) Other includes primarily mortgage-backed and asset-backed securities, which are valued by institutional pricing services, which gather information from market sources and integrate credit information, observed market movements and sector news into their pricing applications and models.

(8) Cash and cash funds include a cash fund that holds primarily short-dated term money market securities.

(9) Pooled equity funds invest in a broad array of global equity, equity-related securities, a range of diversifiers and may use derivatives for efficient portfolio management. The funds are valued at net asset value (NAV) as determined by the fund managers based on the value of the underlying net assets of the fund.

(10) Pooled diversified funds invest in a broad array of asset classes and a range of diversifiers including the use of derivatives. The funds are valued at NAV as determined by the fund managers based on the value of the underlying net assets of the fund.

(11) Pooled U.K. government fixed and index-linked securities funds invest primarily in Sterling denominated fixed income and inflation-linked fixed income securities issued or guaranteed by the U.K. government and may use derivatives for efficient portfolio management. The funds are valued at NAV as determined by the fund managers based on the value of the underlying net assets of the fund.

(12) Pooled global debt funds invest in a broad array of debt securities from corporate and government bonds to emerging markets and high-yield fixed and floating rate securities of varying maturities. The funds are valued at NAV as determined by the fund managers based on the value of the underlying net assets of the fund.

(13) Pooled liability-driven investment funds invest primarily in gilt repurchase agreements, physical U.K. government gilts, and derivatives to provide exposure to interest rates and inflation, thus hedging these elements of risk associated with pension liabilities. The funds are valued at NAV as determined by the fund managers based on the value of the underlying net assets of the fund.

(14) Funds measured at NAV as a practical expedient include funds of funds with return strategies with exposure to varying asset classes and credit strategies, as well as alternative investment strategies not precluding multi-asset credit strategies, global macro strategies, commodities, fixed income, equities and currency, and funds that invest primarily in freehold and leasehold property in the United Kingdom. The funds are valued using NAV as determined by the fund managers based on the value of the underlying assets of the fund.

We have defined contribution plans covering substantially all employees in North America and the United Kingdom. Depending on the specific provisions of each plan, qualified employees receive company contributions based on a percentage of base salary, matching of employee contributions up to specified limits, or a combination of both. In 2021, 2020 and 2019, we recognized expense related to our contributions to the defined contribution plans of $25 million, $22 million and $20 million, respectively.

In addition to our qualified defined benefit pension plans, we also maintain certain nonqualified supplemental pension plans for highly compensated employees as defined under federal law. The amounts recognized in accrued expenses and other liabilities in our consolidated balance sheets for these plans were $1 million and $14 million, respectively, as of December 31, 2021, and $4 million and $16 million, respectively, as of December 31, 2020. We recognized expense for these plans of $2 million, $2 million and $1 million in 2021, 2020 and 2019, respectively.

13. Financing Agreements

Revolving Credit Agreement

We have a senior unsecured revolving credit agreement (the Revolving Credit Agreement), which provides for a revolving credit facility of up to $750 million with a maturity of December 5, 2024. The Revolving Credit Agreement includes a letter of credit sub-limit of $125 million. Borrowings under the Revolving Credit Agreement may be used for working capital, capital expenditures, acquisitions, share repurchases and other general corporate purposes.

Borrowings under the Revolving Credit Agreement may be denominated in U.S. dollars, Canadian dollars, euros and British pounds, and bear interest at a per annum rate equal to, at our option, an applicable eurocurrency rate or base rate plus, in either case, a specified margin. We are required to pay an undrawn commitment fee on the undrawn portion of the commitments under the Revolving Credit Agreement and customary letter of credit fees. The specified margin and the amount of the commitment fee depend on CF Holdings' credit rating at the time.

As of December 31, 2021, we had unused borrowing capacity under the Revolving Credit Agreement of $750 million and no outstanding letters of credit. There were no borrowings outstanding under the Revolving Credit Agreement as of December 31, 2021 or 2020, or during the year ended December 31, 2021. Maximum borrowings under the Revolving Credit Agreement during the year ended December 31, 2020 were $500 million. The weighted-average annual interest rate of borrowings under the Revolving Credit Agreement during the year ended December 31, 2020 was 2.05%. Borrowings under the Revolving Credit Agreement in March 2020 were repaid in full in April 2020.

The Revolving Credit Agreement contains representations and warranties and affirmative and negative covenants, including financial covenants. As of December 31, 2021, we were in compliance with all covenants under the Revolving Credit Agreement.

Letters of Credit

In addition to the letters of credit that may be issued under the Revolving Credit Agreement, as described above, we have also entered into a bilateral agreement with capacity to issue letters of credit up to $250 million. As of December 31, 2021, approximately $223 million of letters of credit were outstanding under this agreement.

Senior Notes

Long-term debt presented on our consolidated balance sheets as of December 31, 2021 and 2020 consisted of the following debt securities issued by CF Industries:

	Effective Interest Rate	December 31, 2021		December 31, 2020	
		Principal	Carrying Amount[1]	Principal	Carrying Amount[1]
		(in millions)			
Public Senior Notes:					
3.450% due June 2023	3.562%	$ 500	$ 499	$ 750	$ 748
5.150% due March 2034	5.279%	750	741	750	741
4.950% due June 2043	5.031%	750	742	750	742
5.375% due March 2044	5.465%	750	741	750	741
Senior Secured Notes:					
3.400% due December 2021	3.782%	—	—	250	249
4.500% due December 2026[2]	4.759%	750	742	750	740
Total long-term debt		$ 3,500	$ 3,465	$ 4,000	$ 3,961
Less: Current maturities of long-term debt		—	—	250	249
Long-term debt, net of current maturities		$ 3,500	$ 3,465	$ 3,750	$ 3,712

(1) Carrying amount is net of unamortized debt discount and deferred debt issuance costs. Total unamortized debt discount was $8 million and $9 million as of December 31, 2021 and 2020, respectively, and total deferred debt issuance costs were $27 million and $30 million as of December 31, 2021 and 2020, respectively.

(2) Effective August 23, 2021, these notes are no longer secured, in accordance with the terms of the applicable indenture.

Under the indentures (including the applicable supplemental indentures) governing the senior notes due 2023, 2034, 2043 and 2044 identified in the table above (the Public Senior Notes), each series of Public Senior Notes is guaranteed by CF Holdings.

Under the terms of the indenture governing the 4.500% senior secured notes due December 2026 (the 2026 Notes) identified in the table above, the 2026 Notes are guaranteed by CF Holdings. Until August 23, 2021, the 2026 Notes were guaranteed by certain subsidiaries of CF Industries. The requirement for subsidiary guarantees of the 2026 Notes was eliminated, and all subsidiary guarantees were automatically released, as a result of an investment grade rating event under the terms of the indenture governing the 2026 Notes on August 23, 2021.

On March 20, 2021, we redeemed in full all of the remaining $250 million outstanding principal amount of the 3.400% senior secured notes due December 2021 (the 2021 Notes), in accordance with the optional redemption provisions in the indenture governing the 2021 Notes. The total aggregate redemption price paid in connection with the redemption of the 2021 Notes was $258 million, including accrued interest. As a result, we recognized a loss on debt extinguishment of $6 million, consisting primarily of the premium paid on the redemption of the 2021 Notes prior to their scheduled maturity.

On September 10, 2021, we redeemed $250 million principal amount, representing one-third of the $750 million principal amount outstanding immediately prior to such redemption, of the 3.450% senior notes due 2023 (2023 Notes), in accordance with the optional redemption provisions in the indenture governing the 2023 Notes. The total aggregate redemption price paid in connection with the redemption of the 2023 Notes was approximately $265 million, including accrued interest. As a result, we recognized a loss on debt extinguishment of $13 million, consisting primarily of the premium paid on the redemption of the $250 million principal amount of the 2023 Notes prior to their scheduled maturity.

Interest on the Public Senior Notes and the 2026 Notes is payable semiannually, and the Public Senior Notes and the 2026 Notes are redeemable at our option, in whole at any time or in part from time to time, at specified make-whole redemption prices.

14. Interest Expense

Details of interest expense are as follows:

	Year ended December 31,		
	2021	2020	2019
	(in millions)		
Interest on borrowings[1]	$ 175	$ 185	$ 223
Fees on financing agreements[1]	9	8	13
Interest on tax liabilities[2]	1	(14)	3
Interest capitalized	(1)	—	(2)
Interest expense	$ 184	$ 179	$ 237

(1) See Note 13—Financing Agreements for additional information.

(2) Interest on tax liabilities for the year ended December 31, 2020 includes a reduction in interest accrued on the reserve for unrecognized tax benefits.

15. Other Operating—Net

Details of other operating—net are as follows:

	Year ended December 31,		
	2021	2020	2019
	(in millions)		
Insurance proceeds[1]	$ —	$ (37)	$ (37)
Loss (gain) on disposal of property, plant and equipment—net[2]	3	15	(40)
Gain on sale of emission credits	(29)	—	—
Loss (gain) on foreign currency transactions[3]	6	5	(1)
Loss on embedded derivative[4]	1	3	4
Other[5]	(20)	(3)	1
Other operating—net	$ (39)	$ (17)	$ (73)

(1) Insurance proceeds in 2020 and 2019 relate to property and business interruption insurance claims at one of our nitrogen complexes.

(2) Loss (gain) on disposal of property, plant and equipment—net in 2020 includes $9 million of engineering costs written off upon the cancellation of a project at one of our nitrogen complexes, and in 2019, includes the gain on sale of our Pine Bend facility of $45 million. See Note 7—Property, Plant and Equipment—Net for additional information on the sale of our Pine Bend facility.

(3) Loss (gain) on foreign currency transactions consists of foreign currency exchange rate impacts on foreign currency denominated transactions, including the impact of changes in foreign currency exchange rates on intercompany loans that were not permanently invested.

(4) Loss on embedded derivative consists of unrealized and realized losses related to a provision of our strategic venture with CHS. See Note 10—Fair Value Measurements for additional information.

(5) Other includes the recovery of certain precious metals used in the manufacturing process, litigation expenses, and, in 2021, the amount received under the terms of the agreement with the U.K. government associated with the restart of our Billingham facility.

16. Derivative Financial Instruments

We use derivative financial instruments to reduce our exposure to changes in prices for natural gas that will be purchased in the future. Natural gas is the largest and most volatile component of our manufacturing cost for nitrogen-based products. From time to time, we may also use derivative financial instruments to reduce our exposure to changes in foreign currency exchange rates. The derivatives that we use to reduce our exposure to changes in prices for natural gas are primarily natural gas fixed price swaps, basis swaps and options traded in the OTC markets. These natural gas derivatives settle using primarily a NYMEX futures price index, which represents the basis for fair value at any given time. We enter into natural gas derivative contracts with respect to natural gas to be consumed by us in the future, and settlements of those derivative contracts are scheduled to coincide with our anticipated purchases of natural gas used to manufacture nitrogen products during those future periods. We use natural gas derivatives as an economic hedge of natural gas price risk, but without the application of hedge accounting. As a result, changes in fair value of these contracts are recognized in earnings. As of December 31, 2021, we had natural gas derivative contracts covering certain periods through March 2022.

As of December 31, 2021, our open natural gas derivative contracts consisted of natural gas fixed price swaps, basis swaps and options for 60.0 million MMBtus of natural gas. As of December 31, 2020, we had open natural gas derivative contracts consisting of natural gas fixed price swaps and basis swaps for 34.1 million MMBtus of natural gas. For the year ended December 31, 2021, we used derivatives to cover approximately 16% of our natural gas consumption.

The effect of derivatives in our consolidated statements of operations is shown in the table below.

		Gain (loss) recognized in income		
		Year ended December 31,		
	Location	2021	2020	2019
			(in millions)	
Natural gas derivatives				
Unrealized net (losses) gains	Cost of sales	$ (25)	$ 6	$ (14)
Realized net gains (losses)	Cost of sales	1	(13)	4
Gain on net settlement of natural gas derivatives due to Winter Storm Uri	Cost of sales	112	—	—
Net derivative gains (losses)		$ 88	$ (7)	$ (10)

Gain on net settlement of natural gas derivatives due to Winter Storm Uri

We also enter into supply agreements to facilitate the availability of natural gas to operate our plants. When we purchase natural gas under these agreements, we intend to take physical delivery for use in our plants. Certain of these supply agreements allow us to fix the price of the deliveries for the following month using an agreed upon first of month price. We utilize the Normal Purchase Normal Sales (NPNS) derivative scope exception for these fixed price contracts and, therefore, we do not account for them as derivatives.

In February 2021, the central portion of the United States experienced extreme and unprecedented cold weather due to the impact of Winter Storm Uri. Certain natural gas suppliers and natural gas pipelines declared force majeure events due to natural gas well freeze-offs or frozen equipment. This occurred at the same time as large increases in natural gas demand were occurring due to the extreme cold temperatures. Due to these unprecedented factors, several states declared a state of emergency and natural gas was redirected for residential usage. We net settled certain natural gas contracts with our suppliers and received prevailing market prices, which were in excess of our cost. We no longer qualified for the NPNS derivative scope exception for the natural gas that was net settled with our suppliers due to the impact of Winter Storm Uri. As a result, we recognized a gain of $112 million from the net settlement of these natural gas contracts, which is reflected in cost of sales in our consolidated statement of operations for the year ended December 31, 2021.

The fair values of derivatives on our consolidated balance sheets are shown below. As of December 31, 2021 and 2020, none of our derivative instruments were designated as hedging instruments. See Note 10—Fair Value Measurements for additional information on derivative fair values.

	Asset Derivatives			Liability Derivatives		
	Balance Sheet Location	December 31,		Balance Sheet Location	December 31,	
		2021	2020		2021	2020
		(in millions)			(in millions)	
Natural gas derivatives	Other current assets	$ 16	$ 1	Other current liabilities	$ (47)	$ (7)

The counterparties to our derivative contracts are multinational commercial banks, major financial institutions and large energy companies. Our derivative contracts are executed with several counterparties under International Swaps and Derivatives Association (ISDA) agreements. The ISDA agreements are master netting arrangements commonly used for OTC derivatives that mitigate exposure to counterparty credit risk, in part, by creating contractual rights of netting and setoff, the specifics of which vary from agreement to agreement. These rights are described further below:

- Settlement netting generally allows us and our counterparties to net, into a single net payable or receivable, ordinary settlement obligations arising between us under the ISDA agreement on the same day, in the same currency, for the same types of derivative instruments, and through the same pairing of offices.
- Close-out netting rights are provided in the event of a default or other termination event (as defined in the ISDA agreements), including bankruptcy. Depending on the cause of early termination, the non-defaulting party may elect to terminate all or some transactions outstanding under the ISDA agreement. The values of all terminated transactions and certain other payments under the ISDA agreement are netted, resulting in a single net close-out amount payable to or by the non-defaulting party.

- Setoff rights are provided by certain of our ISDA agreements and generally allow a non-defaulting party to elect to set off, against the final net close-out payment, other matured and contingent amounts payable between us and our counterparties under the ISDA agreement or otherwise. Typically, these setoff rights arise upon the early termination of all transactions outstanding under an ISDA agreement following a default or specified termination event.

Most of our ISDA agreements contain credit-risk-related contingent features such as cross default provisions. In the event of certain defaults or termination events, our counterparties may request early termination and net settlement of certain derivative trades or, under certain ISDA agreements, may require us to collateralize derivatives in a net liability position. As of December 31, 2021 and 2020, the aggregate fair value of the derivative instruments with credit-risk-related contingent features in net liability positions was $31 million and $6 million, respectively, which also approximates the fair value of the assets that may be needed to settle the obligations if the credit-risk-related contingent features were triggered at the reporting dates. The credit support documents executed in connection with certain of our ISDA agreements generally provide us and our counterparties the right to set off collateral against amounts owing under the ISDA agreements upon the occurrence of a default or a specified termination event. As of December 31, 2021 and 2020, we had no cash collateral on deposit with counterparties for derivative contracts.

The following table presents amounts relevant to offsetting of our derivative assets and liabilities as of December 31, 2021 and 2020:

	Amounts presented in consolidated balance sheets[1]	Gross amounts not offset in consolidated balance sheets		Net amount
		Financial instruments	Cash collateral received (pledged)	
	(in millions)			
December 31, 2021				
Total derivative assets	$ 16	$ —	$ —	$ 16
Total derivative liabilities	(47)	—	—	(47)
Net derivative liabilities	$ (31)	$ —	$ —	$ (31)
December 31, 2020				
Total derivative assets	$ 1	$ —	$ —	$ 1
Total derivative liabilities	(7)	—	—	(7)
Net derivative liabilities	$ (6)	$ —	$ —	$ (6)

(1) We report the fair values of our derivative assets and liabilities on a gross basis on our consolidated balance sheets. As a result, the gross amounts recognized and net amounts presented are the same.

We do not believe the contractually allowed netting, close-out netting or setoff of amounts owed to, or due from, the counterparties to our ISDA agreements would have a material effect on our financial position.

17. Supplemental Balance Sheet Data

Accounts Receivable—Net

Accounts receivable—net consist of the following:

	December 31, 2021	December 31, 2020
	(in millions)	
Trade	$ 464	$ 256
Other	33	9
Accounts receivable—net	$ 497	$ 265

Inventories

Inventories consist of the following:

	December 31, 2021	December 31, 2020
	(in millions)	
Finished goods	$ 358	$ 246
Raw materials, spare parts and supplies	50	41
Total inventories	$ 408	$ 287

Accounts Payable and Accrued Expenses

Accounts payable and accrued expenses consist of the following:

	December 31, 2021	December 31, 2020
	(in millions)	
Accounts payable	$ 110	$ 85
Accrued natural gas costs	168	106
Payroll and employee-related costs	88	68
Accrued interest	30	32
Other	169	133
Total accounts payable and accrued expenses	$ 565	$ 424

Payroll and employee-related costs include accrued salaries and wages, vacation, benefits, incentive plans and payroll taxes.

Accrued interest includes interest payable on our outstanding senior notes. See Note 13—Financing Agreements and Note 14—Interest Expense for additional information.

Other includes accrued utilities, property and other taxes, sales incentives and other credits, accrued litigation settlement costs, accrued maintenance and professional services.

Other Current Liabilities

As of December 31, 2021, other current liabilities of $54 million primarily includes $47 million of unrealized loss on natural gas derivatives and $5 million representing the current portion of the unrealized loss on the embedded derivative liability related to our strategic venture with CHS. As of December 31, 2020, other current liabilities of $15 million primarily includes $7 million of unrealized loss on natural gas derivatives and $5 million representing the current portion of the unrealized loss on the embedded derivative liability related to our strategic venture with CHS.

See Note 10—Fair Value Measurements, Note 16—Derivative Financial Instruments and Note 18—Noncontrolling Interest for additional information.

Other Liabilities

Other liabilities consist of the following:

	December 31,	
	2021	2020
	(in millions)	
Benefit plans and deferred compensation	$ 165	$ 256
Tax-related liabilities	62	155
Unrealized loss on embedded derivative	10	13
Other	14	20
Other liabilities	$ 251	$ 444

Benefit plans and deferred compensation include liabilities for pensions, retiree medical benefits, and the noncurrent portion of incentive plans. See Note 12—Pension and Other Postretirement Benefits for additional information.

18. Noncontrolling Interest

A reconciliation of the beginning and ending balances of noncontrolling interest and distributions payable to the noncontrolling interest on our consolidated balance sheets is provided below.

	Year ended December 31,		
	2021	2020	2019
		(in millions)	
Noncontrolling interest:			
Balance as of January 1	$ 2,681	$ 2,740	$ 2,773
Earnings attributable to noncontrolling interest	343	115	153
Declaration of distributions payable	(194)	(174)	(186)
Balance as of December 31	$ 2,830	$ 2,681	$ 2,740
Distributions payable to noncontrolling interest:			
Balance as of January 1	$ —	$ —	$ —
Declaration of distributions payable	194	174	186
Distributions to noncontrolling interest	(194)	(174)	(186)
Balance as of December 31	$ —	$ —	$ —

We have a strategic venture with CHS under which CHS owns an equity interest in CFN, a subsidiary of CF Holdings, which represents approximately 11% of the membership interests of CFN. We own the remaining membership interests. Under the terms of CFN's limited liability company agreement, each member's interest will reflect, over time, the impact of the profitability of CFN, any member contributions made to CFN and withdrawals and distributions received from CFN. For financial reporting purposes, the assets, liabilities and earnings of the strategic venture are consolidated into our financial statements. CHS' interest in the strategic venture is recorded in noncontrolling interest in our consolidated financial statements. CHS also receives deliveries pursuant to a supply agreement under which CHS has the right to purchase annually from CFN up to approximately 1.1 million tons of granular urea and 580,000 tons of UAN at market prices. As a result of its equity interest in CFN, CHS is entitled to semi-annual cash distributions from CFN. We are also entitled to semi-annual cash distributions from CFN. The amounts of distributions from CFN to us and CHS are based generally on the profitability of CFN and determined based on the volume of granular urea and UAN sold by CFN to us and CHS pursuant to supply agreements, less a formula driven amount based primarily on the cost of natural gas used to produce the granular urea and UAN, and adjusted for the allocation of items such as operational efficiencies and overhead amounts. Additionally, under the terms of the strategic venture, we recognized an embedded derivative related to our credit rating. See Note 10—Fair Value Measurements for additional information.

On January 31, 2022, the CFN Board of Managers approved semi-annual distribution payments for the distribution period ended December 31, 2021 in accordance with CFN's limited liability company agreement. On January 31, 2022, CFN distributed $247 million to CHS for the distribution period ended December 31, 2021.

19. Stockholders' Equity

Common Stock

Our Board of Directors (the Board) has authorized certain programs to repurchase shares of our common stock. These programs have generally permitted repurchases to be made from time to time in the open market, through privately-negotiated transactions, through block transactions or otherwise. Our management has determined the manner, timing and amount of repurchases under these programs based on the evaluation of market conditions, stock price and other factors.

On February 13, 2019, the Board authorized the repurchase of up to $1 billion of CF Holdings common stock through December 31, 2021 (the 2019 Share Repurchase Program). The following table summarizes the share repurchases under the 2019 Share Repurchase Program.

	Shares	Amounts
	(in millions)	
Shares repurchased in 2019	7.6	$ 337
Shares repurchased in 2020	2.6	100
Shares repurchased in 2021	8.6	540
Total shares repurchased under the 2019 Share Repurchase Program	18.8	$ 977

The shares we repurchase are held as treasury stock. If the Board authorizes us to retire the shares, they are returned to the status of authorized but unissued shares. As part of the retirements, we reduce our treasury stock, paid-in capital and retained earnings balances. In 2020, we retired 2.8 million shares of repurchased stock, including shares repurchased under the 2019 Share Repurchase Program. As of December 31, 2020, we held 102,843 shares of treasury stock. In 2021, we retired 8.9 million shares of repurchased stock, including shares repurchased under the 2019 Share Repurchase Program. As of December 31, 2021, we held 27,962 shares of treasury stock.

On November 3, 2021, the Board authorized the repurchase of up to $1.5 billion of CF Holdings common stock from January 1, 2022 through December 31, 2024 (the 2021 Share Repurchase Program).

Changes in common shares outstanding are as follows:

	Year ended December 31,		
	2021	2020	2019
Beginning balance	213,954,858	216,023,826	222,818,495
Exercise of stock options	1,806,940	321,465	629,186
Issuance of restricted stock(1)	643,882	552,362	267,165
Purchase of treasury shares(2)	(8,829,702)	(2,942,795)	(7,691,020)
Ending balance	207,575,978	213,954,858	216,023,826

(1) Includes shares issued from treasury.
(2) Includes shares withheld to pay employee tax obligations upon the vesting of restricted stock or the exercise of stock options.

Preferred Stock

CF Holdings is authorized to issue 50 million shares of $0.01 par value preferred stock. Our Second Amended and Restated Certificate of Incorporation, as amended, authorizes the Board, without any further stockholder action or approval, to issue these shares in one or more classes or series, and (except in the case of our Series A Junior Participating Preferred Stock, 500,000 shares of which are authorized and the terms of which were specified in the original certificate of incorporation of CF Holdings) to fix the rights, preferences and privileges of the shares of each wholly unissued class or series and any of its qualifications, limitations or restrictions. The Series A Junior Participating Preferred Stock had been established in CF Holdings' original certificate of incorporation in connection with our former stockholder rights plan that expired in 2015. No shares of preferred stock have been issued.

Accumulated Other Comprehensive Loss

Changes to accumulated other comprehensive loss and the impact on other comprehensive income (loss) are as follows:

	Foreign Currency Translation Adjustment	Unrealized Gain (Loss) on Derivatives	Defined Benefit Plans	Accumulated Other Comprehensive Loss
	(in millions)			
Balance as of December 31, 2018	$ (250)	$ 5	$ (126)	$ (371)
Loss arising during the period	—	—	(62)	(62)
Reclassification to earnings(1)	—	—	(2)	(2)
Effect of exchange rate changes and deferred taxes	62	—	7	69
Balance as of December 31, 2019	(188)	5	(183)	(366)
Gain arising during the period	—	—	1	1
Reclassification to earnings(1)	—	(1)	6	5
Effect of exchange rate changes and deferred taxes	44	—	(4)	40
Balance as of December 31, 2020	(144)	4	(180)	(320)
Gain arising during the period	—	—	67	67
Reclassification to earnings(1)	—	—	12	12
Effect of exchange rate changes and deferred taxes	3	—	(19)	(16)
Balance as of December 31, 2021	$ (141)	$ 4	$ (120)	$ (257)

(1) Reclassifications out of accumulated other comprehensive loss to the consolidated statements of operations were not material.

20. Stock-based Compensation

2014 Equity and Incentive Plan

On May 14, 2014, our shareholders approved the CF Industries Holdings, Inc. 2014 Equity and Incentive Plan (the 2014 Equity and Incentive Plan) which replaced the CF Industries Holdings, Inc. 2009 Equity and Incentive Plan. Under the 2014 Equity and Incentive Plan, we may grant incentive stock options, nonqualified stock options, stock appreciation rights, restricted stock, restricted stock units, performance awards (payable in cash or stock) and other stock-based awards to our officers, employees, consultants and independent contractors (including non-employee directors). The purpose of the 2014 Equity and Incentive Plan is to provide an incentive that is aligned with the interests of our shareholders.

Share Reserve and Individual Award Limits

The maximum number of shares reserved for the grant of awards under the 2014 Equity and Incentive Plan is the sum of (i) 13.9 million and (ii) the number of shares subject to outstanding awards under our predecessor plans to the extent such awards terminate or expire without delivery of shares. For purposes of determining the number of shares of stock available for grant under the 2014 Equity and Incentive Plan, each option or stock appreciation right is counted against the reserve as one share. Each share of stock granted, other than an option or a stock appreciation right, is counted against the reserve as 1.61 shares. If any outstanding award expires or is settled in cash, any unissued shares subject to the award are again available for grant under the 2014 Equity and Incentive Plan. Shares tendered in payment of the exercise price of an option and shares withheld by the Company or otherwise received by the Company to satisfy tax withholding obligations are not available for future grant under the 2014 Equity and Incentive Plan. As of December 31, 2021, we had 5.0 million shares available for future awards under the 2014 Equity and Incentive Plan. The 2014 Equity and Incentive Plan provides that no more than 5.0 million shares underlying awards of stock options and stock appreciation rights may be granted to a participant in any one calendar year.

Restricted Stock Awards, Restricted Stock Units and Performance Restricted Stock Units

The fair value of a restricted stock award (RSA) or a restricted stock unit (RSU) is equal to the number of shares subject to the award multiplied by the closing market price of our common stock on the date of grant. We estimated the fair value of each performance restricted stock unit (PSU) on the date of grant using a Monte Carlo simulation. Generally, RSUs vest in three equal annual installments following the date of grant. PSUs are granted to key employees and generally vest three years from the date of grant subject to the attainment of applicable performance goals during the performance period. The RSAs awarded to non-management members of the Board vest the earlier of one year from the date of the grant or the date of the next annual stockholder meeting. During the vesting period, the holders of the RSAs are entitled to dividends and voting rights. During the vesting period, the holders of the RSUs are paid dividend equivalents in cash to the extent we pay cash dividends. PSUs accrue dividend equivalents to the extent we pay cash dividends on our common stock during the performance and vesting periods. Upon vesting of the PSUs, holders are paid the cash equivalent of the dividends paid during the performance and vesting periods based on the shares of common stock, if any, delivered in settlement of PSUs. Holders of RSUs and PSUs are not entitled to voting rights unless and until the awards have vested.

A summary of restricted stock activity during the year ended December 31, 2021 is presented below.

	Restricted Stock Awards		Restricted Stock Units		Performance Restricted Stock Units	
	Shares	Weighted-Average Grant-Date Fair Value	Shares	Weighted-Average Grant-Date Fair Value	Shares	Weighted-Average Grant-Date Fair Value
Outstanding as of December 31, 2020	50,895	$ 27.51	614,094	$ 43.70	445,498	$ 45.72
Granted	35,508	49.28	389,059	38.69	243,845	48.25
Restrictions lapsed (vested)[1]	(50,895)	27.51	(310,061)	43.38	(243,406)	45.73
Forfeited	—	—	(32,243)	42.02	(20,669)	47.42
Outstanding as of December 31, 2021	35,508	49.28	660,849	40.98	425,268	46.83

(1) For performance restricted stock units, the shares represent the performance restricted stock units granted in 2018, for which the three-year performance period ended December 31, 2020.

The 2021, 2020 and 2019 weighted-average grant date fair value for RSAs was $49.28, $27.51, and $41.84, for RSUs was $38.69, $45.23, and $41.94, and for PSUs was $48.25, $47.93, and $43.09, respectively.

The actual tax benefit realized from restricted stock vested in each of the years ended December 31, 2021, 2020 and 2019 was $7 million, $5 million and $3 million, respectively. The fair value of restricted stock vested was $29 million, $22 million and $11 million for the years ended December 31, 2021, 2020 and 2019, respectively.

Stock Options

Under the 2014 Equity and Incentive Plan and our predecessor plans, we have granted to plan participants nonqualified stock options to purchase shares of our common stock. The exercise price of these options was equal to the market price of our common stock on the date of grant. The contractual life of each option was ten years and generally one-third of the options vested on each of the first three anniversaries of the date of grant. No stock option awards have been granted to plan participants since 2017.

A summary of stock option activity during the year ended December 31, 2021 is presented below:

	Shares	Weighted-Average Exercise Price
Outstanding as of December 31, 2020	4,569,041	$ 40.41
Exercised	(1,806,940)	36.45
Forfeited	—	—
Expired	(124,515)	53.80
Outstanding as of December 31, 2021	2,637,586	42.48
Exercisable as of December 31, 2021	2,637,586	42.48

	Weighted-Average Remaining Contractual Term (years)	Aggregate Intrinsic Value[(1)] (in millions)
Outstanding as of December 31, 2021	3.5	$ 75
Exercisable as of December 31, 2021	3.5	$ 75

(1) The aggregate intrinsic value represents the total pre-tax intrinsic value, based on our closing stock price of $70.78 as of December 31, 2021, which would have been received by the option holders had all option holders exercised their options as of that date.

Selected amounts pertaining to stock option exercises are as follows:

	Year ended December 31,		
	2021	2020	2019
		(in millions)	
Cash received from stock option exercises	$ 64	$ 8	$ 18
Actual tax benefit realized from stock option exercises	$ 9	$ 1	$ 3
Pre-tax intrinsic value of stock options exercised	$ 39	$ 4	$ 12

Compensation Cost

Compensation cost is recorded primarily in selling, general and administrative expenses. The following table summarizes stock-based compensation costs and related income tax benefits:

	Year ended December 31,		
	2021	2020	2019
		(in millions)	
Stock-based compensation expense	$ 30	$ 26	$ 28
Income tax benefit	(7)	(6)	(6)
Stock-based compensation expense, net of income taxes	$ 23	$ 20	$ 22

As of December 31, 2021, pre-tax unrecognized compensation cost was $15 million for RSAs and RSUs, which will be recognized over a weighted-average period of 1.6 years, and $13 million for PSUs, which will be recognized over a weighted-average period of 1.6 years.

Excess tax benefits realized from the vesting of restricted stock or stock option exercises are recognized as an income tax benefit in our consolidated statements of operations and are required to be reported as an operating cash inflow rather than a reduction of taxes paid. The excess tax benefits realized in 2021, 2020 and 2019 were $22 million, $3 million and $7 million, respectively.

21. Contingencies

West Fertilizer Co.

On April 17, 2013, there was a fire and explosion at the West Fertilizer Co. fertilizer storage and distribution facility in West, Texas. According to published reports, 15 people were killed and approximately 200 people were injured in the incident, and the fire and explosion damaged or destroyed a number of homes and buildings around the facility. Various subsidiaries of CF Industries Holdings, Inc. (the CF Entities) were named as defendants along with other companies in lawsuits filed in 2013, 2014 and 2015 in the District Court of McLennan County, Texas by the City of West, individual residents of the County and other parties seeking recovery for damages allegedly sustained as a result of the explosion. The cases were consolidated for discovery and pretrial proceedings in the District Court of McLennan County under the caption “In re: West Explosion Cases.” The two-year statute of limitations expired on April 17, 2015. As of that date, over 400 plaintiffs had filed claims, including at least 9 entities, 325 individuals, and 80 insurance companies. Plaintiffs allege various theories of negligence, strict liability, and breach of warranty under Texas law. Although we did not own or operate the facility or directly sell our products to West Fertilizer Co., products that the CF Entities manufactured and sold to others were delivered to the facility and may have been stored at the West facility at the time of the incident.

The Court granted in part and denied in part the CF Entities' Motions for Summary Judgment in August 2015. Nearly all of the cases, including all wrongful death and personal injury claims, have been resolved pursuant to confidential settlements that have been or we expect will be fully funded by insurance. The remaining subrogation and statutory indemnification claims total approximately $37 million, before prejudgment interest, and are in various stages of discovery and pre-trial proceedings. The remaining claims are expected to be set for trial in 2022. We believe we have strong legal and factual defenses and intend to continue defending the CF Entities vigorously in the remaining lawsuits. The Company cannot provide a range of reasonably possible loss due to the uncertain nature of this litigation, including uncertainties around the potential allocation of responsibility by a jury to other defendants or responsible third parties. The recognition of a potential loss in the future in the West Fertilizer Co. litigation could negatively affect our results in the period of recognition. However, based upon currently available information, we expect any potential loss to be fully indemnified by insurance and do not believe that this litigation will have a material adverse effect on our consolidated financial position, results of operations or cash flows.

Other Litigation

From time to time, we are subject to ordinary, routine legal proceedings related to the usual conduct of our business, including proceedings regarding public utility and transportation rates, environmental matters, taxes and permits relating to the operations of our various plants and facilities. Based on the information available as of the date of this filing, we believe that the ultimate outcome of these routine matters will not have a material adverse effect on our consolidated financial position, results of operations or cash flows.

Environmental

From time to time, we receive notices from governmental agencies or third parties alleging that we are a potentially responsible party at certain cleanup sites under the Comprehensive Environmental Response, Compensation, and Liability Act or other environmental cleanup laws. In 2011, we received a notice from the Idaho Department of Environmental Quality (IDEQ) that alleged that we were a potentially responsible party for the cleanup of a former phosphate mine site we owned in the late 1950s and early 1960s located in Georgetown Canyon, Idaho. The current owner of the property and a former mining contractor received similar notices for the site. In 2014, we and the current property owner entered into a Consent Order with IDEQ and the U.S. Forest Service to conduct a remedial investigation and feasibility study of the site. In 2015, we and several other parties received a notice that the U.S. Department of the Interior and other trustees intended to undertake a natural resource damage assessment for 18 former phosphate mines and three former processing facilities in southeast Idaho, which includes the Georgetown Canyon former mine and processing facility. In June 2021, we received another notice from the U.S. Department of the Interior that the natural resource damage trustees were commencing a 'subsequent' phase of the natural resource damage assessment, but no further details were provided with respect to said assessment. Because the former mine site is still in the remedial investigation and feasibility study stage, and because a schedule for a natural resource injury assessment has yet to be determined, we are not able to estimate at this time our potential liability, if any, with respect to the cleanup of the site or a possible claim for natural resource damages. However, based on the results of the site investigation conducted to date, we do not expect the remedial or financial obligations to which we may be subject involving this or other cleanup sites will have a material adverse effect on our consolidated financial position, results of operations or cash flows.

22. Segment Disclosures

Our reportable segments consist of Ammonia, Granular Urea, UAN, AN, and Other. These segments are differentiated by products. Our management uses gross margin to evaluate segment performance and allocate resources. Total other operating costs and expenses (consisting primarily of selling, general and administrative expenses and other operating—net) and non-operating expenses (consisting primarily of interest and income taxes) are centrally managed and are not included in the measurement of segment profitability reviewed by management.

Our assets, with the exception of goodwill, are not monitored by or reported to our chief operating decision maker by segment; therefore, we do not present total assets by segment. Goodwill by segment is presented in Note 8—Goodwill and Other Intangible Assets.

Segment data for sales, cost of sales and gross margin for 2021, 2020 and 2019 are presented in the table below.

	Ammonia[(1)]	Granular Urea[(2)]	UAN[(2)]	AN[(2)]	Other[(2)]	Consolidated
	(in millions)					
Year ended December 31, 2021						
Net sales	$ 1,787	$ 1,880	$ 1,788	$ 510	$ 573	$ 6,538
Cost of sales	1,162	992	1,119	475	403	4,151
Gross margin	$ 625	$ 888	$ 669	$ 35	$ 170	2,387
Total other operating costs and expenses[(3)]						705
Equity in earnings of operating affiliate						47
Operating earnings						$ 1,729
Year ended December 31, 2020						
Net sales	$ 1,020	$ 1,248	$ 1,063	$ 455	$ 338	$ 4,124
Cost of sales	850	847	949	390	287	3,323
Gross margin	$ 170	$ 401	$ 114	$ 65	$ 51	801
Total other operating costs and expenses						189
Equity in earnings of operating affiliate						11
Operating earnings						$ 623
Year ended December 31, 2019						
Net sales	$ 1,113	$ 1,342	$ 1,270	$ 506	$ 359	$ 4,590
Cost of sales	878	861	981	399	297	3,416
Gross margin	$ 235	$ 481	$ 289	$ 107	$ 62	1,174
Total other operating costs and expenses						166
Equity in loss of operating affiliate						(5)
Operating earnings						$ 1,003

(1) Cost of sales and gross margin for the Ammonia segment for the year ended December 31, 2021 include a $112 million gain on the net settlement of certain natural gas contracts with our suppliers. See Note 16—Derivative Financial Instruments for additional information.

(2) The cost of ammonia that is upgraded into other products is transferred at cost into the upgraded product results.

(3) Total other operating costs and expenses for the year ended December 31, 2021 includes long-lived and intangible asset impairment charges of $236 million and goodwill impairment charges of $285 million.

Depreciation and amortization by segment for 2021, 2020 and 2019 is as follows:

	Ammonia	Granular Urea	UAN	AN	Other	Corporate	Consolidated
				(in millions)			
Depreciation and amortization							
Year ended December 31, 2021	$ 209	$ 235	$ 259	$ 77	$ 87	$ 21	$ 888
Year ended December 31, 2020	176	270	256	100	68	22	892
Year ended December 31, 2019	167	264	251	88	72	33	875

Enterprise-wide data by geographic region is as follows:

	Year ended December 31,		
	2021	2020	2019
		(in millions)	
Sales by geographic region (based on destination of shipments):			
United States	$ 5,086	$ 3,036	$ 3,387
Foreign:			
Canada	568	397	410
North America, excluding U.S. and Canada	79	54	53
United Kingdom	464	332	413
Other foreign	341	305	327
Total foreign	1,452	1,088	1,203
Consolidated	$ 6,538	$ 4,124	$ 4,590

	December 31,		
	2021	2020	2019
		(in millions)	
Property, plant and equipment—net by geographic region:			
United States	$ 6,211	$ 6,527	$ 6,991
Foreign:			
Canada	485	525	558
United Kingdom	385	580	621
Total foreign	870	1,105	1,179
Consolidated	$ 7,081	$ 7,632	$ 8,170

Our principal customers are cooperatives, independent fertilizer distributors, traders, wholesalers and industrial users. In 2021, 2020 and 2019, CHS accounted for approximately 14%, 13% and 15% of our consolidated net sales, respectively. See Note 18—Noncontrolling Interest for additional information.

23. Supplemental Cash Flow Information

The following provides additional information relating to cash flow activities:

	Year ended December 31,		
	2021	2020	2019
		(in millions)	
Cash paid during the year for			
Interest—net of interest capitalized	$ 176	$ 184	$ 228
Income taxes—net of refunds	430	111	(41)
Supplemental disclosure of noncash investing and financing activities:			
Change in capitalized expenditures in accounts payable and accrued expenses	$ (8)	$ 1	$ (6)
Change in accrued share repurchases	(1)	—	(33)

24. Asset Retirement Obligations

Asset retirement obligations (AROs) are legal obligations associated with the retirement of long-lived assets that result from the acquisition, construction, development or normal operation of such assets. AROs are initially recognized as incurred when sufficient information exists to estimate fair value. We have AROs at our nitrogen manufacturing complexes and at our distribution and storage facilities that are conditional upon cessation of operations. These AROs include certain decommissioning activities as well as the removal and disposal of certain chemicals, waste materials, structures, equipment, vessels, piping and storage tanks. Also included are reclamation of land and the closure of certain effluent ponds and/or waste storage areas. The most recent estimate of the aggregate cost of these AROs expressed in 2021 dollars is approximately $116 million. We have not recorded a liability for these conditional AROs as of December 31, 2021 because we do not believe there is currently a reasonable basis for estimating a date or range of dates of cessation of operations at our nitrogen manufacturing facilities or our distribution and storage facilities, which is necessary in order to estimate fair value. In reaching this conclusion, we considered the historical performance of each complex or facility and have taken into account factors such as planned maintenance, asset replacements and upgrades of plant and equipment, which if conducted as in the past, can extend the physical lives of our nitrogen manufacturing facilities and our distribution and storage facilities indefinitely. We also considered the possibility of changes in technology, risk of obsolescence, and availability of raw materials in arriving at our conclusion.

25. Leases

We have operating leases for certain property and equipment under various noncancelable agreements, the most significant of which are rail car leases and barge tow charters for the distribution of our products. The rail car leases currently have minimum terms ranging from one to eleven years and the barge tow charter commitments range from two to six years. Our rail car leases and barge tow charters commonly contain provisions for automatic renewal that can extend the lease term unless canceled by either party. We also have operating leases for terminal and warehouse storage for our distribution system, some of which contain minimum throughput requirements. The storage agreements contain minimum terms generally ranging from one to ten years and commonly contain provisions for automatic renewal thereafter unless canceled by either party. The renewal provisions for our rail car leases, barge tow charters and terminal and warehouse storage agreements are not reasonably certain to be exercised.

The components of lease costs were as follows:

	Year ended December 31,		
	2021	2020	2019
		(in millions)	
Operating lease cost	$ 102	$ 107	$ 95
Short-term lease cost	25	17	26
Variable lease cost	7	6	4
Total lease cost	$ 134	$ 130	$ 125

Supplemental cash flow information related to leases was as follows:

	Year ended December 31,		
	2021	2020	2019
	(in millions)		
Operating cash flows - cash paid for amounts included in the measurement of operating lease liabilities	$ 97	$ 105	$ 93
Right-of-use (ROU) assets obtained in exchange for operating lease obligations	80	80	73

Supplemental balance sheet information related to leases was as follows:

	December 31,	
	2021	2020
	(in millions)	
Operating lease ROU assets	$ 243	$ 259
Current operating lease liabilities	$ 89	$ 88
Operating lease liabilities	162	174
Total operating lease liabilities	$ 251	$ 262

	December 31,	
	2021	2020
Operating leases		
Weighted-average remaining lease term	4 years	4 years
Weighted-average discount rate(1)	3.8 %	4.7 %

(1) Upon adoption of the new lease accounting standard, discount rates used for existing leases were established at January 1, 2019.

The following table reconciles the undiscounted cash flows for our operating leases to the operating lease liabilities recorded on our consolidated balance sheet as of December 31, 2021.

	Operating lease payments
	(in millions)
2022	$ 91
2023	69
2024	50
2025	30
2026	19
Thereafter	11
Total lease payments	270
Less: imputed interest	(19)
Present value of lease liabilities	251
Less: Current operating lease liabilities	(89)
Operating lease liabilities	$ 162

26. Subsequent Event

In February 2022, we were informed that a decision was reached by the arbitration board regarding the transfer pricing matter with the CRA for tax years 2006 through 2011, as discussed in Note 11—Income Taxes above. We are awaiting further details of the results of the arbitration proceedings and the settlement provisions between the United States and Canadian competent authorities. We need to decide whether to accept the decision of the arbitration board or pursue other resolution alternatives, which is expected to occur in the first quarter of 2022.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE.

None.

ITEM 9A. CONTROLS AND PROCEDURES.

(a) *Disclosure Controls and Procedures.* The Company's management, with the participation of the Company's principal executive officer and principal financial officer, has evaluated the effectiveness of the Company's disclosure controls and procedures (as such term is defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (the Exchange Act)) as of the end of the period covered by this report. Based on such evaluation, the Company's principal executive officer and principal financial officer have concluded that, as of the end of such period, the Company's disclosure controls and procedures are effective in (i) ensuring that information required to be disclosed by the Company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms and (ii) ensuring that information required to be disclosed by the Company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the Company's management, including the Company's principal executive officer and principal financial officer, as appropriate to allow timely decisions regarding required disclosure.

(b) *Management's Report on Internal Control over Financial Reporting.*

Management's Report on Internal Control over Financial Reporting

The Company's management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act, for the Company. Under the supervision and with the participation of our senior management, including our principal executive officer and principal financial officer, we assessed the effectiveness of our internal control over financial reporting as of December 31, 2021, using the criteria set forth in the *Internal Control—Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission in 2013. Based on this assessment, management has concluded that our internal control over financial reporting is effective as of December 31, 2021. KPMG LLP, the independent registered public accounting firm that audited the Company's consolidated financial statements, has issued an attestation report on the Company's internal control over financial reporting as of December 31, 2021, which appears on the following page.

(c) *Changes in Internal Control over Financial Reporting.* There have not been any changes in the Company's internal control over financial reporting (as such term is defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) during the quarter ended December 31, 2021 that have materially affected, or are reasonably likely to materially affect, the Company's internal control over financial reporting.

Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors
CF Industries Holdings, Inc.:

Opinion on Internal Control Over Financial Reporting

We have audited CF Industries Holdings, Inc. and subsidiaries' (the Company) internal control over financial reporting as of December 31, 2021, based on criteria established in *Internal Control – Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission. In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2021, based on criteria established in *Internal Control – Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of the Company as of December 31, 2021 and 2020, the related consolidated statements of operations, comprehensive income, equity, and cash flows for each of the years in the three-year period ended December 31, 2021, and the related notes (collectively, the consolidated financial statements), and our report dated February 24, 2022 expressed an unqualified opinion on those consolidated financial statements.

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 of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audit also included 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.

(signed) KPMG LLP

Chicago, Illinois
February 24, 2022

ITEM 9B. OTHER INFORMATION.

None.

ITEM 9C. DISCLOSURE REGARDING FOREIGN JURISDICTIONS THAT PREVENT INSPECTIONS.

Not applicable.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE.

Information appearing in the Proxy Statement under the headings “Proposal 1: Election of Directors—Director Nominees”; “Proposal 1: Election of Directors—Director Nominee Biographies”; “Executive Officers”; “Corporate Governance—Committees of the Board—Audit Committee”; and, if required, “Delinquent Section 16(a) Reports” is incorporated herein by reference.

We have adopted a Code of Corporate Conduct that applies to our employees, directors and officers, including our principal executive officer, principal financial officer and principal accounting officer. The Code of Corporate Conduct is posted on our Internet website, *www.cfindustries.com*. We will provide an electronic or paper copy of this document free of charge upon request. We intend to disclose on our Internet website any amendment to any provision of the Code of Corporate Conduct that relates to any element of the definition of “code of ethics” enumerated in Item 406(b) of Regulation S-K under the Exchange Act and any waiver from any such provision granted to our principal executive officer, principal financial officer, principal accounting officer or controller or persons performing similar functions.

ITEM 11. EXECUTIVE COMPENSATION.

During the last completed fiscal year, Stephen J. Hagge, Javed Ahmed, Anne P. Noonan, Michael J. Toelle and Celso L. White served as the members of the Compensation and Management Development Committee of the Board.

Information appearing under the following headings of the Proxy Statement is incorporated herein by reference: “Compensation Discussion and Analysis,” “Compensation Discussion and Analysis—Other Compensation Governance Practices and Considerations—Compensation and Benefits Risk Analysis,” “Compensation Committee Report,” “Executive Compensation” and “Corporate Governance—Director Compensation.”

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS.

Information appearing under the following headings of the Proxy Statement is incorporated herein by reference: “Common Stock Ownership—Common Stock Ownership of Certain Beneficial Owners” and “Common Stock Ownership—Common Stock Ownership of Directors and Management.”

We currently issue stock-based compensation under the 2014 Equity and Incentive Plan. Under the 2014 Equity and Incentive Plan, we may grant incentive stock options, nonqualified stock options, stock appreciation rights, restricted stock, restricted stock units, performance awards (payable in cash or stock) and other stock or cash-based awards.

Equity Compensation Plan Information as of December 31, 2021

Plan category	Number of securities to be issued upon exercise of outstanding options, warrants and rights[(1)]	Weighted-average exercise price of outstanding options, warrants and rights[(2)]	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in the first column)[(3)]
Equity compensation plans approved by security holders	4,897,075	$ 42.48	5,037,620
Equity compensation plans not approved by security holders	—	—	—
Total	4,897,075	$ 42.48	5,037,620

(1) Includes 2,637,586 shares issuable pursuant to outstanding nonqualified stock options, 660,849 shares issuable pursuant to restricted stock units (RSUs) and 1,598,640 shares issuable pursuant to performance restricted stock units (PSUs) under our 2014 Equity and Incentive Plan and our 2009 Equity Incentive Plan. PSUs are subject to attainment of the applicable performance goals during the three-year performance period and are reflected at their maximum potential payout. The PSUs shown in the table above reflect the full amount awarded to plan participants in 2019, 2020 and 2021. The three-year performance periods for the PSUs awarded in 2019, 2020

and 2021 are in each case composed of three one-year periods with performance goals set annually. Because accounting rules require performance goals to be set before a PSU is determined for accounting purposes to have been granted, the number of PSUs reported as outstanding as of December 31, 2021 in "Note 20—Stock-based Compensation" reflects all of the 2019 PSUs awarded, but only two-thirds of the 2020 PSUs awarded and one-third of the 2021 PSUs awarded.

(2) RSUs and PSUs are not reflected in the weighted-average exercise price as these awards do not have an exercise price.

(3) Under the 2014 Equity and Incentive Plan, the number of shares available for issuance will be reduced (i) by one share for each share issued pursuant to options and stock appreciation rights and (ii) by 1.61 shares for each share of stock issued pursuant to RSUs and PSUs.

See Note 20—Stock-based Compensation for additional information on the 2014 Equity and Incentive Plan.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE.

Information appearing in the Proxy Statement under the headings "Corporate Governance—Director Independence" and "Policy Regarding Related Person Transactions" is incorporated herein by reference.

ITEM 14. PRINCIPAL ACCOUNTANT FEES AND SERVICES.

Information appearing in the Proxy Statement under the headings "Proposal 4: Ratification of Selection of Independent Registered Public Accounting Firm for 2022—Audit and Non-Audit Fees" and "Proposal 4: Ratification of Selection of Independent Registered Public Accounting Firm for 2022—Pre-Approval of Audit and Non-Audit Services" is incorporated herein by reference.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES.

(a) Documents filed as part of this report:

(1) All financial statements:

The following financial statements are included in Part II, Item 8. Financial Statements and Supplementary Data:

Financial statement schedules are omitted because they are not applicable or the required information is included in the consolidated financial statements or notes thereto.

(2) Exhibits

A list of exhibits filed with this Annual Report on Form 10-K (or incorporated by reference to exhibits previously filed or furnished) is provided in the Exhibit Index on page 119 of this report.

ITEM 16. FORM 10-K SUMMARY.

None.

CF INDUSTRIES HOLDINGS, INC.

EXHIBIT INDEX

EXHIBIT NO.	DESCRIPTION
2.1	Agreement and Plan of Merger, dated as of July 21, 2005, by and among CF Industries Holdings, Inc., CF Merger Corp. and CF Industries, Inc. (incorporated by reference to Exhibit 2.1 to Amendment No. 3 to CF Industries Holdings, Inc.'s Registration Statement on Form S-1 filed with the SEC on July 26, 2005, File No. 333-124949)
2.2	Agreement and Plan of Merger, dated as of March 12, 2010, by and among CF Industries Holdings, Inc., Composite Merger Corporation and Terra Industries Inc. (incorporated by reference to Exhibit 2.1 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on March 12, 2010)
2.3	Asset Purchase Agreement, dated October 28, 2013, among CF Industries Holdings, Inc., CF Industries, Inc. and The Mosaic Company (incorporated by reference to Exhibit 2.1 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on November 1, 2013)*
2.4	Second Amended and Restated Limited Liability Company Agreement of CF Industries Nitrogen, LLC, dated as of December 18, 2015, by and between CF Industries Sales, LLC and CHS Inc. *,**
2.5	First Amendment to the Second Amended and Restated Limited Liability Company Agreement of CF Industries Nitrogen, LLC, dated as of March 30, 2018, by and among CF Industries Nitrogen, LLC, CF Industries Sales, LLC, CF USA Holdings, LLC and CHS Inc. (incorporated by reference to Exhibit 2.1 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 3, 2018)*
3.1	Second Amended and Restated Certificate of Incorporation, as amended (incorporated by reference to Exhibit 3.2 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on July 25, 2017)
3.2	Fourth Amended and Restated Bylaws of CF Industries Holdings, Inc., effective October 14, 2015, as amended April 20, 2018 and as further amended May 4, 2021 (incorporated by reference to Exhibit 3.1 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 6, 2021)
4.1	Specimen common stock certificate (incorporated by reference to Exhibit 4.3 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on July 25, 2017)
4.2	Description of common stock of CF Industries Holdings, Inc.
4.3	Indenture, dated as of May 23, 2013, among CF Industries, Inc., CF Industries Holdings, Inc. and Wells Fargo Bank, National Association, as trustee (incorporated by reference to Exhibit 4.1 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on May 23, 2013)
4.4	First Supplemental Indenture, dated as of May 23, 2013, among CF Industries, Inc., CF Industries Holdings, Inc. and Wells Fargo Bank, National Association, as trustee, relating to CF Industries, Inc.'s 3.450% Senior Notes due 2023 (includes form of note) (the "2023 Notes Supplement") (incorporated by reference to Exhibit 4.2 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on May 23, 2013)
4.5	First Supplement, dated as of November 21, 2016, relating to the 2023 Notes Supplement (incorporated by reference to Exhibit 4.10 to CF Industries Holdings, Inc.'s Annual Report on Form 10-K filed with the SEC on February 23, 2017)
4.6	Second Supplement, dated as of March 29, 2018, relating to the 2023 Notes Supplement (incorporated by reference to Exhibit 4.2 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 3, 2018)
4.7	Third Supplement, dated as of March 22, 2019, relating to the 2023 Notes Supplement (incorporated by reference to Exhibit 4.2 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 2, 2019)
4.8	Fourth Supplement, dated as of January 28, 2022, relating to the 2023 Notes Supplement (incorporated by reference to Exhibit 4.1 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on February 1, 2022)
4.9	Second Supplemental Indenture, dated as of May 23, 2013, among CF Industries, Inc., CF Industries Holdings, Inc. and Wells Fargo Bank, National Association, as trustee, relating to CF Industries, Inc.'s 4.950% Senior Notes due 2043 (includes form of note) (the "2043 Notes Supplement") (incorporated by reference to Exhibit 4.3 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on May 23, 2013)
4.10	First Supplement, dated as of November 21, 2016, relating to the 2043 Notes Supplement (incorporated by reference to Exhibit 4.12 to CF Industries Holdings, Inc.'s Annual Report on Form 10-K filed with the SEC on February 23, 2017)

EXHIBIT NO.	DESCRIPTION
4.11	Second Supplement, dated as of March 29, 2018, relating to the 2043 Notes Supplement (incorporated by reference to Exhibit 4.3 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 3, 2018)
4.12	Third Supplement, dated as of March 22, 2019, relating to the 2043 Notes Supplement (incorporated by reference to Exhibit 4.3 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 2, 2019)
4.13	Fourth Supplement, dated as of January 28, 2022, relating to the 2043 Notes Supplement (incorporated by reference to Exhibit 4.4 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on February 1, 2022)
4.14	Third Supplemental Indenture, dated as of March 11, 2014, among CF Industries, Inc., CF Industries Holdings, Inc. and Wells Fargo Bank, National Association, as trustee, relating to CF Industries, Inc.'s 5.150% Senior Notes due 2034 (includes form of note) (the "2034 Notes Supplement") (incorporated by reference to Exhibit 4.2 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on March 11, 2014)
4.15	First Supplement, dated as of November 21, 2016, relating to the 2034 Notes Supplement (incorporated by reference to Exhibit 4.14 to CF Industries Holdings, Inc.'s Annual Report on Form 10-K filed with the SEC on February 23, 2017)
4.16	Second Supplement, dated as of March 29, 2018, relating to the 2034 Notes Supplement (incorporated by reference to Exhibit 4.4 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 3, 2018)
4.17	Third Supplement, dated as of March 22, 2019, relating to the 2034 Notes Supplement (incorporated by reference to Exhibit 4.4 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 2, 2019)
4.18	Fourth Supplement, dated as of January 28, 2022, relating to the 2034 Notes Supplement (incorporated by reference to Exhibit 4.3 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on February 1, 2022)
4.19	Fourth Supplemental Indenture, dated as of March 11, 2014, among CF Industries, Inc., CF Industries Holdings, Inc. and Wells Fargo Bank, National Association, as trustee, relating to CF Industries, Inc.'s 5.375% Senior Notes due 2044 (includes form of note) (the "2044 Notes Supplement") (incorporated by reference to Exhibit 4.3 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on March 11, 2014)
4.20	First Supplement, dated as of November 21, 2016, relating to the 2044 Notes Supplement (incorporated by reference to Exhibit 4.16 to CF Industries Holdings, Inc.'s Annual Report on Form 10-K filed with the SEC on February 23, 2017)
4.21	Second Supplement, dated as of March 29, 2018, relating to the 2044 Notes Supplement (incorporated by reference to Exhibit 4.5 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 3, 2018)
4.22	Third Supplement, dated as of March 22, 2019, relating to the 2044 Notes Supplement (incorporated by reference to Exhibit 4.5 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 2, 2019)
4.23	Fourth Supplement, dated as of January 31, 2022, relating to the 2044 Notes Supplement (incorporated by reference to Exhibit 4.5 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on February 1, 2022)
4.24	Indenture, dated as of November 21, 2016, among CF Industries Holdings, Inc., CF Industries, Inc., the Subsidiary Guarantors (as defined therein) party thereto and Wells Fargo Bank, National Association, as trustee and collateral agent, relating to CF Industries, Inc.'s 3.400% Senior Secured Notes due 2021 (includes form of note) (the "2021 Notes Indenture") (incorporated by reference to Exhibit 4.1 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on November 22, 2016)
4.25	First Supplemental Indenture, dated as of March 29, 2018, relating to the 2021 Notes Indenture (incorporated by reference to Exhibit 4.6 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 3, 2018)
4.26	Second Supplemental Indenture, dated as of March 22, 2019, relating to the 2021 Notes Indenture (incorporated by reference to Exhibit 4.6 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 2, 2019)

EXHIBIT NO.	DESCRIPTION
4.27	Indenture, dated as of November 21, 2016, among CF Industries Holdings, Inc., CF Industries, Inc., the Subsidiary Guarantors (as defined therein) party thereto and Wells Fargo Bank, National Association, as trustee and collateral agent, relating to CF Industries, Inc.'s 4.500% Senior Secured Notes due 2026 (includes form of note) (the "2026 Notes Indenture") (incorporated by reference to Exhibit 4.2 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on November 22, 2016)
4.28	First Supplemental Indenture, dated as of March 29, 2018, relating to the 2026 Notes Indenture (incorporated by reference to Exhibit 4.7 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 3, 2018)
4.29	Second Supplemental Indenture, dated as of March 22, 2019, relating to the 2026 Notes Indenture (incorporated by reference to Exhibit 4.7 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 2, 2019)
4.30	Third Supplemental Indenture, dated as of January 28, 2022, relating to the 2026 Notes Indenture (incorporated by reference to Exhibit 4.2 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on February 1, 2022)
4.31	Pledge and Security Agreement, dated as of November 21, 2016, among CF Industries Holdings, Inc., CF Industries, Inc., the other Guarantors (as defined therein) party thereto and Wells Fargo Bank, National Association, as collateral agent under the indenture relating to CF Industries, Inc.'s 3.400% Senior Secured Notes due 2021 (incorporated by reference to Exhibit 4.3 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on November 22, 2016)
4.32	Pledge and Security Agreement, dated as of November 21, 2016, among CF Industries Holdings, Inc., CF Industries, Inc., the Subsidiary Guarantors (as defined therein) party thereto and Wells Fargo Bank, National Association, as collateral agent under the indenture relating to CF Industries, Inc.'s 4.500% Senior Secured Notes due 2026 (incorporated by reference to Exhibit 4.4 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on November 22, 2016)
4.33	First Lien/First Lien Intercreditor Agreement, dated as of November 21, 2016, among Morgan Stanley Senior Funding, Inc., as authorized representative of the Credit Agreement Secured Parties, Wells Fargo Bank, National Association, as collateral agent in connection with CF Industries, Inc.'s 3.400% Senior Secured Notes due 2021 and 4.500% Senior Secured Notes due 2026 and each additional Authorized Representative from time to time party thereto for the Other First-Priority Secured Parties of the Series with respect to which it is acting in such capacity (incorporated by reference to Exhibit 4.5 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on November 22, 2016)
10.1	Change in Control Severance Agreement, effective as of April 29, 2005, and amended and restated as of July 24, 2007, by and among CF Industries, Inc., CF Industries Holdings, Inc. and Douglas C. Barnard (incorporated by reference to Exhibit 10.3 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on November 5, 2007)***
10.2	Change in Control Severance Agreement, effective as of September 1, 2009, amended as of October 20, 2010, and amended further and restated as of February 17, 2014, by and between CF Industries Holdings, Inc. and Christopher D. Bohn (incorporated by reference to Exhibit 10.3 to CF Industries Holdings, Inc.'s Annual Report on Form 10-K filed with the SEC on February 27, 2014)***
10.3	Change in Control Severance Agreement, effective as of November 21, 2008, by and between CF Industries Holdings, Inc. and Bert A. Frost (incorporated by reference to Exhibit 10.11 to CF Industries Holdings, Inc.'s Annual Report on Form 10-K filed with the SEC on February 26, 2009)***
10.4	Change in Control Severance Agreement, effective as of November 19, 2007 and amended and restated as of March 6, 2009, by and between CF Industries Holdings, Inc. and Richard A. Hoker (incorporated by reference to Exhibit (e)(9) to CF Industries Holdings, Inc.'s Solicitation/Recommendation Statement on Schedule 14D-9 filed with the SEC on March 23, 2009)***
10.5	Change in Control Severance Agreement, effective as of October 9, 2017, by and between CF Industries Holdings, Inc. and Susan L. Menzel (incorporated by reference to Exhibit 10.1 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on November 2, 2017)***
10.6	Change in Control Severance Agreement, effective as of April 24, 2007, amended as of July 24, 2007, and amended further and restated as of February 17, 2014, by and between CF Industries Holdings, Inc. and W. Anthony Will (incorporated by reference to Exhibit 99.1 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on February 20, 2014)***

EXHIBIT NO.	DESCRIPTION
10.7	Change in Control Severance Agreement, effective as of February 2, 2012, and amended and restated as of September 1, 2019, by and between CF Industries Holdings, Inc. and Ashraf K. Malik (incorporated by reference to Exhibit 10.1 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on October 31, 2019)***
10.8	Change in Control Severance Agreement, effective as of February 27, 2020, by and between CF Industries Holdings, Inc. and Linda M. Dempsey (incorporated by reference to Exhibit 10.1 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 7, 2020)***
10.9	Form of Amendment to Change in Control Severance Agreement (incorporated by reference to Exhibit 10.3 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on December 24, 2015)***
10.10	Form of Indemnification Agreement with Officers and Directors (incorporated by reference to Exhibit 10.10 to Amendment No. 2 to CF Industries Holdings, Inc.'s Registration Statement on Form S-1 filed with the SEC on July 20, 2005, File No. 333-124949)***
10.11	CF Industries Holdings, Inc. 2009 Equity and Incentive Plan (incorporated by reference to Appendix A to CF Industries Holdings, Inc.'s Definitive Proxy Statement on Schedule 14A filed with the SEC on March 16, 2009)***
10.12	Amendment, dated as of July 21, 2016, to the CF Industries Holdings, Inc. 2009 Equity and Incentive Plan (incorporated by reference to Exhibit 10.3 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on August 4, 2016)***
10.13	CF Industries Holdings, Inc. 2014 Equity and Incentive Plan (incorporated by reference to Appendix C to CF Industries Holdings, Inc.'s Definitive Proxy Statement on Schedule 14A filed with the SEC on April 3, 2014)***
10.14	Amendment, dated as of July 21, 2016, to the CF Industries Holdings, Inc. 2014 Equity and Incentive Plan (incorporated by reference to Exhibit 10.4 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on August 4, 2016)***
10.15	CF Industries Holdings, Inc. Supplemental Benefit and Deferral Plan (incorporated by reference to Exhibit 10.1 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on October 20, 2014)***
10.16	Form of Non-Qualified Stock Option Award Agreement (incorporated by reference to Exhibit 10.6 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on August 3, 2009)***
10.17	Form of Non-Qualified Stock Option Award Agreement (incorporated by reference to Exhibit 10.17 to CF Industries Holdings, Inc.'s Annual Report on Form 10-K filed with the SEC on February 27, 2014)***
10.18	Form of Non-Qualified Stock Option Award Agreement (incorporated by reference to Exhibit 10.2 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on November 6, 2014)***
10.19	Form of Non-Qualified Stock Option Award Agreement (incorporated by reference to Exhibit 10.2 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 7, 2015)***
10.20	Form of Amendment to Non-Qualified Stock Option Award Agreements (incorporated by reference to Exhibit 10.5 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 7, 2015)***
10.21	Form of Non-Qualified Stock Option Award Agreement (incorporated by reference to Exhibit 10.23 to CF Industries Holdings, Inc.'s Annual Report on Form 10-K filed with the SEC on February 25, 2016)***
10.22	Form of Non-Qualified Stock Option Award Agreement (incorporated by reference to Exhibit 10.6 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on August 4, 2016)***
10.23	Form of Non-Qualified Stock Option Award Amendment Letter Agreement, dated as of July 19, 2018 (incorporated by reference to Exhibit 10.2 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on August 2, 2018)***
10.24	Form of Restricted Stock Unit Award Agreement (incorporated by reference to Exhibit 10.7 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on August 4, 2016)***
10.25	Form of Restricted Stock Unit Award Agreement (incorporated by reference to Exhibit 10.32 to CF Industries Holdings, Inc.'s Annual Report on Form 10-K filed with the SEC on February 23, 2017)***
10.26	Form of Performance Restricted Stock Unit Award Agreement (incorporated by reference to Exhibit 10.8 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on August 4, 2016)***

EXHIBIT NO.	DESCRIPTION
10.27	Form of Performance Restricted Stock Unit Award Agreement (incorporated by reference to Exhibit 10.40 to CF Industries Holdings, Inc.'s Annual Report on Form 10-K filed with the SEC on February 23, 2017)***
10.28	Form of Performance Restricted Stock Unit Award Agreement (incorporated by reference to Exhibit 10.1 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on May 4, 2017)***
10.29	Form of Performance Restricted Stock Unit Award Agreement (incorporated by reference to Exhibit 10.43 to CF Industries Holdings, Inc.'s Annual Report on Form 10-K filed with the SEC on February 22, 2019)***
10.30	Form of Non-Employee Director Restricted Stock Award Agreement (incorporated by reference to Exhibit 10.3 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on August 7, 2014)***
10.31	Form of Equity Award Amendment Letter Agreement, dated as of July 21, 2016 (incorporated by reference to Exhibit 10.5 to CF Industries Holdings, Inc.'s Quarterly Report on Form 10-Q filed with the SEC on August 4, 2016)***
10.32	CF Industries Holdings, Inc. Annual Incentive Plan (incorporated by reference to Exhibit 10.1 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on December 14, 2018)***
10.33	Fourth Amended and Restated Revolving Credit Agreement, dated as of December 5, 2019, among CF Industries Holdings, Inc., the borrowers from time to time party thereto, the lenders from time to time party thereto, Citibank, N.A., as administrative agent, and Morgan Stanley Bank, N.A. and Goldman Sachs Bank USA, as issuing banks (incorporated by reference to Exhibit 10.1 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on December 5, 2019)
10.34	Amendment No. 1 to the Fourth Amended and Restated Credit Agreement, dated as of January 27, 2022, among CF Industries Holdings, Inc., CF Industries, Inc., the lenders party thereto, the issuing banks party thereto and Citibank, N.A. as administrative agent (incorporated by reference to Exhibit 4.6 to CF Industries Holdings, Inc.'s Current Report on Form 8-K filed with the SEC on February 1, 2022)
10.35	Amended and Restated Pledge and Security Agreement, dated as of December 5, 2019, among CF Industries Holdings, Inc., CF Industries, Inc., the other Grantors (as defined therein) party thereto and Citibank, N.A., as administrative agent (incorporated by reference to Exhibit 10.34 to CF Industries Holdings, Inc.'s Annual Report on Form 10-K filed with the SEC on February 24, 2021)
10.36	Second Amended and Restated Guaranty Agreement, dated as of December 5, 2019, by and among CF Industries Holdings, Inc., CF Industries, Inc. and the other Guarantors (as defined therein) party thereto in favor of Citibank, N.A., as administrative agent (incorporated by reference to Exhibit 10.35 to CF Industries Holdings, Inc.'s Annual Report on Form 10-K filed with the SEC on February 24, 2021)
10.37	Amended and Restated Nitrogen Fertilizer Purchase Agreement, dated December 18, 2015, by and between CF Industries Nitrogen, LLC and CHS Inc. ****
21	Subsidiaries of the registrant
23	Consent of KPMG LLP, independent registered public accounting firm
31.1	Certification of Principal Executive Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
31.2	Certification of Principal Financial Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
32.1	Certification of Principal Executive Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
32.2	Certification of Principal Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
101	The following financial information from CF Industries Holdings, Inc.'s Annual Report on Form 10-K for the fiscal year ended December 31, 2021, formatted in Inline XBRL (eXtensible Business Reporting Language): (1) Consolidated Statements of Operations, (2) Consolidated Statements of Comprehensive Income, (3) Consolidated Balance Sheets, (4) Consolidated Statements of Equity, (5) Consolidated Statements of Cash Flows and (6) Notes to Consolidated Financial Statements
104	Cover Page Interactive Data File (included in the Exhibit 101 Inline XBRL Document Set)

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* Schedules (or similar attachments) have been omitted pursuant to Item 601(a)(5) of Regulation S-K.

** Portions omitted pursuant to Item 601(b)(2)(ii) of Regulation S-K.

*** Management contract or compensatory plan or arrangement required to be filed (and/or incorporated by reference) as an exhibit to this Annual Report on Form 10-K pursuant to Item 15(a)(3) of Form 10-K.

**** Portions omitted to pursuant to Item 601(b)(10)(iv) of Regulation S-K.

CF INDUSTRIES HOLDINGS, INC.

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.

CF INDUSTRIES HOLDINGS, INC.

Date: February 24, 2022

By: /s/ W. ANTHONY WILL

W. Anthony Will
President and Chief Executive Officer

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.

Signature	Title(s)	Date
/s/ W. ANTHONY WILL W. Anthony Will	President and Chief Executive Officer, Director (Principal Executive Officer)	February 24, 2022
/s/ CHRISTOPHER D. BOHN Christopher D. Bohn	Senior Vice President and Chief Financial Officer (Principal Financial Officer)	February 24, 2022
/s/ RICHARD A. HOKER Richard A. Hoker	Vice President and Corporate Controller (Principal Accounting Officer)	February 24, 2022
/s/ STEPHEN J. HAGGE Stephen J. Hagge	Chairman of the Board	February 24, 2022
/s/ JAVED AHMED Javed Ahmed	Director	February 24, 2022
/s/ ROBERT C. ARZBAECHER Robert C. Arzbaecher	Director	February 24, 2022
/s/ DEBORAH L. DEHAAS Deborah L. DeHaas	Director	February 24, 2022
/s/ JOHN W. EAVES John W. Eaves	Director	February 24, 2022
/s/ STEPHEN A. FURBACHER Stephen A. Furbacher	Director	February 24, 2022
/s/ JESUS MADRAZO YRIS Jesus Madrazo Yris	Director	February 24, 2022
/s/ ANNE P. NOONAN Anne P. Noonan	Director	February 24, 2022
/s/ MICHAEL J. TOELLE Michael J. Toelle	Director	February 24, 2022
/s/ THERESA E. WAGLER Theresa E. Wagler	Director	February 24, 2022
/s/ CELSO L. WHITE Celso L. White	Director	February 24, 2022

Stockholder Information

CORPORATE HEADQUARTERS
CF Industries Holdings, Inc.
4 Parkway North
Deerfield, Illinois 60015-2590
Telephone 847.405.2400

INDEPENDENT AUDITORS
KPMG LLP
Chicago, Illinois 60601

CORPORATE GOVERNANCE
Information on CF Industries Holdings, Inc.'s corporate governance, including its board of directors, management, board committees, code of corporate conduct and corporate governance guidelines, can be found on the investor relations section of the company's website at **cfindustries.com**.

DIVIDEND POLICY
CF Industries Holdings, Inc. pays quarterly cash dividends on its common stock at a rate of $0.30 per share. The declaration and payment of dividends to holders of common stock is at the discretion of the board of directors and will depend on many factors, including general economic and business conditions, strategic plans, financial results and condition, legal requirements and other factors as the board of directors deems relevant. The company currently does not offer a dividend reinvestment plan.

FORWARD-LOOKING STATEMENTS
All statements in this publication, other than those relating to historical facts, are "forward-looking statements" within the meaning of federal securities laws. The company's safe harbor statement, describing those statements and detailing certain risks and uncertainties involved in those statements, is found in the enclosed annual report on Form 10-K. It is also found in the company's filings, financial news releases and presentations.

INVESTOR INFORMATION
A copy of this annual report, as well as company news releases, SEC filings and other materials of interest to stockholders, can be found on the investor relations section of the company's website at **cfindustries.com**.

QUARTERLY CONFERENCE CALLS, INVESTOR CONFERENCES AND INVESTOR EMAIL UPDATES
CF Industries Holdings, Inc. conducts quarterly conference calls and updates to discuss the company's performance and prospects. The company's executives also regularly appear at major investor conferences in the U.S. and internationally. These generally are accessible via the company's website at **cfindustries.com**. At the site, investors also may sign up to receive e-mail alerts of news, upcoming events and corporate filings.

REQUEST FOR ANNUAL REPORT ON FORM 10-K
Investors may download a copy from the company's website at cfindustries.com. Stockholders also may, upon request to investor relations at the corporate headquarters address shown on this page, receive a hard copy of the company's complete audited financial statements free of charge.

STOCKHOLDER QUESTIONS
Stockholders with questions about the company, its operations and performance should contact investor relations at the corporate headquarters address or phone number. Stockholders with questions about their CF Industries stockholder accounts should contact the company's transfer agent and registrar as follows:

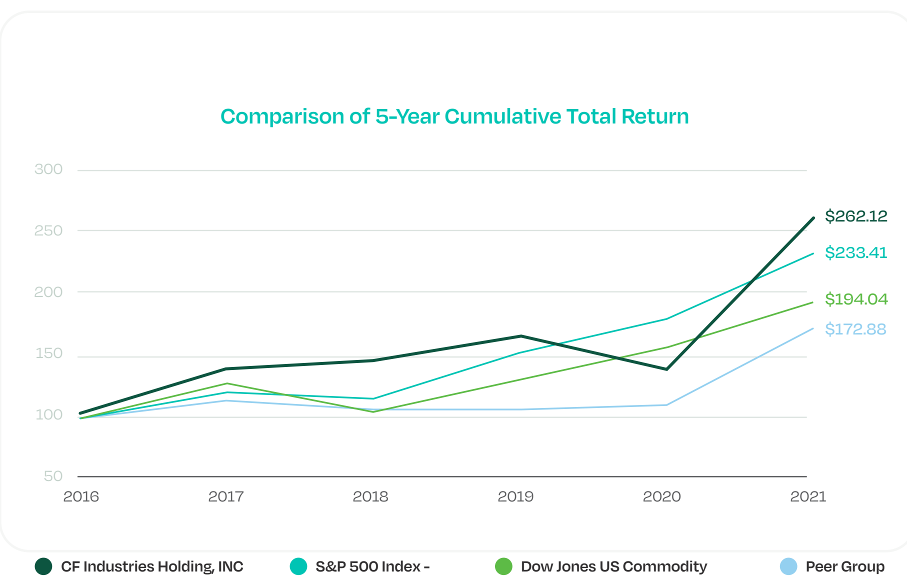
CORRESPONDENCE:
Computershare
P.O. Box 30170
College Station, TX 77842-3170

OVERNIGHT CORRESPONDENCE:
Computershare
211 Quality Circle, Suite 210
College Station, TX 77845

SHAREHOLDER WEBSITE:
computershare.com/investor

SHAREHOLDER ONLINE INQUIRIES:
us.computershare.com/investor/contact

TELEPHONE INQUIRIES:
866.298.4984 — U.S.
201.680.6578 — Outside U.S.



This graph presents a comparison of the cumulative total shareholder return on CF Industries Holdings, Inc. common stock with the cumulative total return of the Dow Jones U.S. Commodity Chemicals Index (DJUSCC), the S&P500 index, and a peer group of publicly traded manufacturers of agricultural chemical fertilizers ("Peer Group"), in each case based on an initial investment of $100 on December 31, 2016 and assuming dividend reinvestment. The Peer Group consists of Agrium Inc. ("Agrium"), The Mosaic Company ("Mosaic"), Potash Corporation of Saskatchewan Inc. ("PotashCorp"), Nutrien Ltd. ("Nutrien"), Incitec Pivot Limited, OCI N.V., CVR Partners LP, LSB Industries, Inc. and Yara International ASA. Agrium and PotashCorp are included in the peer group from December 31, 2016 through December 31, 2017. On January 2, 2018, Agrium and PotashCorp completed a merger of equals transaction to form Nutrien. Nutrien was included in the peer group for the period from January 2, 2018 through December 31, 2021. For Yara International ASA, Incitec Pivot Limited and OCI N.V., cumulative total shareholder return has been calculated using the company's home exchange stock prices converted into U.S. dollars.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