

HollyFrontier Corp
Form 10-K
February 20, 2019

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 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, 2018

OR

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

For the transition period from _____ to _____
Commission File Number 1-3876

HOLLYFRONTIER CORPORATION
(Exact name of registrant as specified in its charter)

Delaware	75-1056913
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)

2828 N. Harwood, Suite 1300	75201-1507
Dallas, Texas	
(Address of principal executive offices) (Zip Code)	
(214) 871-3555	
Registrant's telephone number, including area code	

Securities registered pursuant to Section 12(b) of the Act:
Common Stock, \$0.01 par value registered on the New York Stock Exchange.

Securities registered pursuant to 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

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such shorter period that the registrant was required to submit such files). Yes No

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405 of this chapter) is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

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 is a shell company (as defined in Rule 12b-2 of the Exchange Act).

Yes No

On June 30, 2018, the last business day of the registrant's most recently completed second fiscal quarter, the aggregate market value of the Common Stock, par value \$0.01 per share, held by non-affiliates of the registrant was approximately \$11.0 billion, based upon the closing price on the New York Stock Exchange on such date. (This is not deemed an admission that any person whose shares were not included in the computation of the amount set forth in the preceding sentence necessarily is an "affiliate" of the registrant.)

170,765,526 shares of Common Stock, par value \$.01 per share, were outstanding on February 15, 2019.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's proxy statement for its annual meeting of stockholders to be held on May 8, 2019, which proxy statement will be filed with the Securities and Exchange Commission within 120 days after December 31, 2018, are incorporated by reference in Part III.

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PART I

FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K contains certain “forward-looking statements” within the meaning of the federal securities laws. All statements, other than statements of historical fact included in this Form 10-K, including, but not limited to, those under “Business and Properties” in Items 1 and 2, “Risk Factors” in Item 1A, “Legal Proceedings” in Item 3 and “Management’s Discussion and Analysis of Financial Condition and Results of Operations” in Item 7, are forward-looking statements. Forward-looking statements use words such as “anticipate,” “project,” “expect,” “plan,” “goal,” “forecast,” “intend,” “should,” “would,” “could,” “believe,” “may,” and similar expressions and statements regarding our plans and objectives for future operations. These statements are based on management’s beliefs and assumptions using currently available information and expectations as of the date hereof, are not guarantees of future performance and involve certain risks and uncertainties. All statements concerning our expectations for future results of operations are based on forecasts for our existing operations and do not include the potential impact of any future acquisitions. Although we believe that the expectations reflected in these forward-looking statements are reasonable, we cannot assure you that our expectations will prove to be correct. Therefore, actual outcomes and results could materially differ from what is expressed, implied or forecast in these statements. Any differences could be caused by a number of factors including, but not limited to:

- risks and uncertainties with respect to the actions of actual or potential competitive suppliers of refined petroleum products in our markets;
- the demand for and supply of crude oil and refined products;
- the spread between market prices for refined products and market prices for crude oil;
- the possibility of constraints on the transportation of refined products;
 - the possibility of inefficiencies, curtailments or shutdowns in refinery operations or pipelines;
- effects of governmental and environmental regulations and policies;
- the availability and cost of our financing;
- the effectiveness of our capital investments and marketing strategies;
- our efficiency in carrying out construction projects;
- our ability to acquire refined or lubricant product operations or pipeline and terminal operations on acceptable terms and to integrate any existing or future acquired operations;
- the possibility of terrorist or cyber attacks and the consequences of any such attacks;
- general economic conditions; and
- other financial, operational and legal risks and uncertainties detailed from time to time in our Securities and Exchange Commission filings.

Cautionary statements identifying important factors that could cause actual results to differ materially from our expectations are set forth in this Form 10-K, including without limitation the forward-looking statements that are referred to above. When considering forward-looking statements, you should keep in mind the risk factors and other cautionary statements set forth in this Form 10-K under “Risk Factors” in Item 1A and in conjunction with the discussion in this Form 10-K in “Management’s Discussion and Analysis of Financial Condition and Results of Operations” under the heading “Liquidity and Capital Resources.” All forward-looking statements included in this Form 10-K and all subsequent written or oral forward-looking statements attributable to us or persons acting on our behalf are expressly qualified in their entirety by these cautionary statements. The forward-looking statements speak only as of the date made and, other than as required by law, we undertake no obligation to publicly update or revise any forward-looking statements, whether as a result of new information, future events or otherwise.

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DEFINITIONS

Within this report, the following terms have these specific meanings:

“Alkylation” means the reaction of propylene or butylene (olefins) with isobutane to form an iso-paraffinic gasoline (inverse of cracking).

“Aromatic oil” is long chain oil that is highly aromatic in nature and is used to manufacture tires and industrial rubber products and in the production of specialty asphalt.

“BPD” means the number of barrels per calendar day of crude oil or petroleum products.

“BPSD” means the number of barrels per stream day (barrels of capacity in a 24 hour period) of crude oil or petroleum products.

“Base oil” is a lubricant grade oil initially produced from refining crude oil or through chemical synthesis that is used in producing lubricant products such as lubricating greases, motor oil and metal processing fluids.

“Biodiesel” means a clean alternative fuel produced from renewable biological resources.

“Black wax crude oil” is a low sulfur, low gravity crude oil produced in the Uintah Basin in Eastern Utah that has certain characteristics that require specific facilities to transport, store and refine into transportation fuels.

“Catalytic reforming” means a refinery process which uses a precious metal (such as platinum) based catalyst to convert low octane naphtha to high octane gasoline blendstock and hydrogen. The hydrogen produced from the reforming process is used to desulfurize other refinery oils and is a primary source of hydrogen for the refinery.

“Cracking” means the process of breaking down larger, heavier and more complex hydrocarbon molecules into simpler and lighter molecules.

“Crude oil distillation” means the process of distilling vapor from liquid crudes, usually by heating, and condensing the vapor slightly above atmospheric pressure turning it back to liquid in order to purify, fractionate or form the desired products.

“Ethanol” means a high octane gasoline blend stock that is used to make various grades of gasoline.

“FCC,” or fluid catalytic cracking, means a refinery process that breaks down large complex hydrocarbon molecules into smaller more useful ones using a circulating bed of catalyst at relatively high temperatures.

“Gas oil” is a group of petroleum distillation products having boiling points between kerosene and lubricating oil and is used as fuel in construction and agricultural machinery.

“Hydrodesulfurization” means to remove sulfur and nitrogen compounds from oil or gas in the presence of hydrogen and a catalyst at relatively high temperatures.

“Hydrogen plant” means a refinery unit that converts natural gas and steam to high purity hydrogen, which is then used in the hydrodesulfurization, hydrocracking and isomerization processes.

“HF alkylation” or hydrofluoric alkylation, means a refinery process which combines isobutane and C3/C4 olefins using HF acid as a catalyst to make high octane gasoline blend stock.

“Isomerization” means a refinery process for rearranging the structure of C5/C6 molecules without changing their size or chemical composition and is used to improve the octane of C5/C6 gasoline blendstocks.

“LPG” means liquid petroleum gases.

“Lubricant” or “lube” means a solvent neutral paraffinic product used in commercial heavy duty engine oils, passenger car oils and specialty products for industrial applications such as heat transfer, metalworking, rubber and other general process oil.

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“MSAT2” means Control of Hazardous Air Pollutants from Mobile Sources, a rule issued by the U.S. Environmental Protection Agency to reduce hazardous emissions from motor vehicles and motor vehicle fuels.

“MEK” means a lube process that separates waxy oil from non-waxy oils using methyl ethyl ketone as a solvent.

“MMBTU” means one million British thermal units.

“Natural gasoline” means a low octane gasoline blend stock that is purchased and used to blend with other high octane stocks produced to make various grades of gasoline.

“Paraffinic oil” is a high paraffinic, high gravity oil produced by extracting aromatic oils and waxes from gas oil and is used in producing high-grade lubricating oils.

“Rack back” represents the portion of our Lubricants and Specialty Products business operations that entails the processing of feedstocks into base oils.

“Rack forward” represents the portion of our Lubricants and Specialty Products business operations that entails the processing of base oils into finished lubricants and the packaging, distribution and sale to customers.

“Refinery gross margin” means the difference between average net sales price and average cost per barrel sold. This does not include the associated depreciation and amortization costs.

“Reforming” means the process of converting gasoline type molecules into aromatic, higher octane gasoline blend stocks while producing hydrogen in the process.

“RINs” means renewable identification numbers and refers to serial numbers assigned to credits generated from renewable fuel production under the Environmental Protection Agency’s Renewable Fuel Standard (“RFS”) regulations, which require blending renewable fuels into the nation's fuel supply. In lieu of blending, refiners may purchase these transferable credits in order to comply with the regulations.

“Roofing flux” is produced from the bottom cut of crude oil and is the base oil used to make roofing shingles for the housing industry.

“ROSE,” or “Solvent deasphalter / residuum oil supercritical extraction,” means a refinery unit that uses a light hydrocarbon like propane or butane to extract non-asphaltene heavy oils from asphalt or atmospheric reduced crude. These deasphalted oils are then further converted to gasoline and diesel in the FCC process. The remaining asphaltenes are either sold, blended to fuel oil or blended with other asphalt as a hardener.

“Scanfiner” is a refinery unit that removes sulfur from gasoline to produce low sulfur gasoline blendstock.

“Sour crude oil” means crude oil containing quantities of sulfur greater than 0.4 percent by weight, while “sweet crude oil” means crude oil containing quantities of sulfur equal to or less than 0.4 percent by weight.

“Vacuum distillation” means the process of distilling vapor from liquid crudes, usually by heating, and condensing the vapor below atmospheric pressure turning it back to a liquid in order to purify, fractionate or form the desired products.

“White oil” is an extremely pure, highly-refined petroleum product that has a wide variety of applications ranging from pharmaceutical to cosmetic products.

“WTI” means West Texas Intermediate and is a grade of crude oil used as a common benchmark in oil pricing. WTI is a sweet crude oil and has a relatively low density.

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Items 1 and 2. Business and Properties

COMPANY OVERVIEW

References herein to HollyFrontier Corporation (“HollyFrontier”) include HollyFrontier and its consolidated subsidiaries. In accordance with the Securities and Exchange Commission’s (“SEC”) “Plain English” guidelines, this Annual Report on Form 10-K has been written in the first person. In this document, the words “we,” “our,” “ours” and “us” refer only to HollyFrontier and its consolidated subsidiaries or to HollyFrontier or an individual subsidiary and not to any other person, with certain exceptions. Generally, the words “we,” “our,” “ours” and “us” include Holly Energy Partners, L.P. (“HEP”) and its subsidiaries as consolidated subsidiaries of HollyFrontier, unless when used in disclosures of transactions or obligations between HEP and HollyFrontier or its other subsidiaries. This document contains certain disclosures of agreements that are specific to HEP and its consolidated subsidiaries and do not necessarily represent obligations of HollyFrontier. When used in descriptions of agreements and transactions, “HEP” refers to HEP and its consolidated subsidiaries.

We are principally an independent petroleum refiner that produces high-value light products such as gasoline, diesel fuel, jet fuel, specialty lubricant products, and specialty and modified asphalt. We were incorporated in Delaware in 1947 and maintain our principal corporate offices at 2828 N. Harwood, Suite 1300, Dallas, Texas 75201-1507. Our telephone number is 214-871-3555, and our internet website address is www.hollyfrontier.com. The information contained on our website does not constitute part of this Annual Report on Form 10-K. A print copy of this Annual Report on Form 10-K will be provided without charge upon written request to the Director, Investor Relations at the above address. A direct link to our SEC filings is available on our website under the Investor Relations tab. Also available on our website are copies of our Corporate Governance Guidelines, Audit Committee Charter, Compensation Committee Charter, Nominating / Corporate Governance Committee Charter, Environmental, Health, Safety, and Public Policy Committee Charter and Code of Business Conduct and Ethics, all of which will be provided without charge upon written request to the Director, Investor Relations at the above address. Our Code of Business Conduct and Ethics applies to all of our officers, employees and directors, including our principal executive officer, principal financial officer and principal accounting officer. Our common stock is traded on the New York Stock Exchange under the trading symbol “HFC.”

On November 12, 2018, we entered into an equity purchase agreement to acquire 100% of the issued and outstanding capital stock of Sonneborn US Holdings Inc. and 100% of the membership rights in Sonneborn Coöperatief U.A. (collectively, “Sonneborn”). The acquisition closed on February 1, 2019. Cash consideration paid was \$660.0 million. Sonneborn is a producer of specialty hydrocarbon chemicals such as white oils, petrolatums and waxes with manufacturing facilities in the United States and Europe.

On July 10, 2018, we entered into a definitive agreement to acquire Red Giant Oil Company LLC (“Red Giant Oil”), a privately-owned lubricants company. The acquisition closed on August 1, 2018. Cash consideration paid was \$54.2 million. Red Giant Oil is one of the largest suppliers of locomotive engine oil in North America and is headquartered in Council Bluffs, Iowa.

On October 29, 2016, we entered into a share purchase agreement with Suncor Energy Inc. (“Suncor”) to acquire 100% of the outstanding capital stock of Petro-Canada Lubricants Inc. (“PCLI”). The acquisition closed on February 1, 2017. Cash consideration paid was \$862.1 million, or \$1.125 billion Canadian dollars. PCLI is located in Mississauga, Ontario and is the largest producer of base oils in Canada with a plant having 15,600 BPD of lubricant production capacity, and is the largest manufacturer of high margin Group III base oils in North America.

As of December 31, 2018, we:

owned and operated a petroleum refinery in El Dorado, Kansas (the “El Dorado Refinery”), two refinery facilities located in Tulsa, Oklahoma (collectively, the “Tulsa Refineries”), a refinery in Artesia, New Mexico that is operated in conjunction with crude oil distillation and vacuum distillation and other facilities situated 65 miles away in Lovington, New Mexico (collectively, the “Navajo Refinery”), a refinery located in Cheyenne, Wyoming (the “Cheyenne Refinery”) and a refinery in Woods Cross, Utah (the “Woods Cross Refinery”);

owned and operated PCLI located in Mississauga, Ontario, which produces base oils and other specialized lubricant products;

owned and operated Red Giant Oil, which supplies locomotive engine oil and has storage and distribution facilities in Iowa, Kansas, Utah and Wyoming, along with a blending and packaging facility in Texas;

owned and operated HollyFrontier Asphalt Company LLC (“HFC Asphalt”), which operates various asphalt terminals in Arizona, New Mexico and Oklahoma; and

owned a 57% limited partner interest and a non-economic general partner interest in HEP. HEP owns and operates logistic assets consisting of petroleum product and crude oil pipelines, terminals, tankage, loading rack facilities and refinery

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processing units that principally support our refining and marketing operations in the Mid-Continent, Southwest and Rocky Mountain regions of the United States.

HEP is a variable interest entity (“VIE”) as defined under U.S. generally accepted accounting principles (“GAAP”). Information on HEP's assets and acquisitions completed in the past three years can be found under the “Holly Energy Partners, L.P.” section provided later in this discussion of Items 1 and 2, “Business and Properties.”

Our operations are currently organized into three reportable segments, Refining, Lubricants and Specialty Products and HEP. The Refining segment includes the operations of our El Dorado, Tulsa, Navajo, Cheyenne and Woods Cross Refineries and HFC Asphalt. The Lubricants and Specialty Products segment includes the operations of our Petro-Canada Lubricants business and Red Giant Oil in addition to specialty lubricant products produced at our Tulsa Refinery. The HEP segment involves all of the operations of HEP. See Note 20 “Segment Information” in the Notes to Consolidated Financial Statements for additional information on our reportable segments.

REFINERY OPERATIONS

Our refinery operations serve the Mid-Continent, Southwest and Rocky Mountain regions of the United States. We own and operate five complex refineries having a combined crude oil processing capacity of 457,000 barrels per stream day. Each of our refineries has the complexity to convert discounted, heavy and sour crude oils into a high percentage of gasoline, diesel and other high-value refined products.

The tables presented below and elsewhere in this discussion of our refinery operations set forth information, including non-GAAP performance measures, about our refinery operations. The cost of products and refinery gross and net operating margins do not include the non-cash effects of lower of cost or market inventory valuation adjustments and depreciation and amortization. Reconciliations to amounts reported under GAAP are provided under “Reconciliations to Amounts Reported Under Generally Accepted Accounting Principles” following Item 7A of Part II of this Form 10-K.

	Years Ended December 31,		
	2018	2017	2016
Consolidated			
Crude charge (BPD) ⁽¹⁾	431,570	438,800	423,910
Refinery throughput (BPD) ⁽²⁾	463,340	472,010	457,480
Sales of produced refined products (BPD) ⁽³⁾	452,630	452,270	440,640
Refinery utilization ⁽⁴⁾	94.4	% 96.0	% 92.8
Average per produced barrel sold ⁽⁵⁾			
Refinery gross margin ⁽⁶⁾	\$17.71	\$11.56	\$8.16
Refinery operating expenses ⁽⁷⁾	6.39	6.11	5.65
Net operating margin	\$11.32	\$5.45	\$2.51
Refinery operating expenses per throughput barrel ⁽⁸⁾	\$6.24	\$5.86	\$5.45
Feedstocks:			
Sweet crude oil	43	% 48	% 48
Sour crude oil	30	% 25	% 26
Heavy sour crude oil	17	% 16	% 16
Black wax crude oil	4	% 4	% 3
Other feedstocks and blends	6	% 7	% 7
Total	100	% 100	% 100

- (1) Crude charge represents the barrels per day of crude oil processed at our refineries.
- (2) Refinery throughput represents the barrels per day of crude and other refinery feedstocks input to the crude units and other conversion units at our refineries.
- (3) Represents barrels sold of refined products produced at our refineries (including HFC Asphalt) and does not include volumes of refined products purchased for resale or volumes of excess crude oil sold.
- (4) Represents crude charge divided by total crude capacity (BPSD). Our consolidated crude capacity is 457,000 BPSD.

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Represents average amount per produced barrel sold, which is a non-GAAP measure. Reconciliations to amounts (5) reported under GAAP are provided under “Reconciliations to Amounts Reported Under Generally Accepted Accounting Principles” following Item 7A of Part II of this Form 10-K.

(6) Excludes lower of cost or market inventory valuation adjustments.

(7) Represents total refining segment operating expenses, exclusive of depreciation and amortization, divided by sales volumes of refined products produced at our refineries.

(8) Represents total refining segment operating expenses, exclusive of depreciation and amortization, divided by refinery throughput.

Products and Customers

Set forth below is information regarding refined product sales:

	Years Ended					
	December 31,					
	2018	2017	2016			
Consolidated						
Sales of refined products:						
Gasolines	52	%	52	%	52	%
Diesel fuels	34	%	34	%	34	%
Jet fuels	3	%	4	%	4	%
Fuel oil	2	%	2	%	2	%
Asphalt	4	%	4	%	3	%
Base oils	2	%	2	%	3	%
LPG and other	3	%	2	%	2	%
Total	100	%	100	%	100	%

Light products are shipped to customers via product pipelines or are available for loading at our refinery truck facilities and terminals. Light products are also made available to customers at various other locations via exchange with other parties.

Our principal customers for gasoline include other refiners, convenience store chains, independent marketers and retailers. Diesel fuel is sold to other refiners, truck stop chains, wholesalers and railroads. Jet fuel is sold for commercial airline use. Base oils are intercompany sales to our Lubricants and Specialty Products segment. LPG's are sold to LPG wholesalers and LPG retailers. We produce and purchase asphalt products that are sold to governmental entities, paving contractors or manufacturers. Asphalt is also blended into fuel oil and is either sold locally or is shipped to the Gulf Coast. See Note 4 “Revenues” in the Notes to Consolidated Financial Statements for additional information on our significant customers.

Mid-Continent Region (El Dorado and Tulsa Refineries)

Facilities

The El Dorado Refinery is a high-complexity coking refinery with a 135,000 barrels per stream day processing capacity and the ability to process significant volumes of heavy and sour crudes. The integrated refining processes at the Tulsa West and East refinery facilities provide us with a highly complex refining operation having a combined crude processing rate of approximately 125,000 barrels per stream day.

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The following table sets forth information about our Mid-Continent region operations, including non-GAAP performance measures.

	Years Ended December 31,		
	2018	2017	2016
Mid-Continent Region (El Dorado and Tulsa Refineries)			
Crude charge (BPD) ⁽¹⁾	249,240	261,380	262,170
Refinery throughput (BPD) ⁽²⁾	264,730	277,940	280,920
Sales of produced refined products (BPD) ⁽³⁾	255,800	260,800	262,300
Refinery utilization ⁽⁴⁾	95.9 %	100.5 %	100.8 %
Average per produced barrel sold ⁽⁵⁾			
Refinery gross margin ⁽⁶⁾	\$14.44	\$9.91	\$7.44
Refinery operating expenses ⁽⁷⁾	5.51	5.15	4.73
Net operating margin	\$8.93	\$4.76	\$2.71
Refinery operating expenses per throughput barrel ⁽⁸⁾	\$5.32	\$4.83	\$4.42

Footnote references are provided under our Consolidated Refinery Operating Data table on page 7.

	Years Ended December 31,		
	2018	2017	2016
Mid-Continent Region (El Dorado and Tulsa Refineries)			
Feedstocks:			
Sweet crude oil	54 %	61 %	58 %
Sour crude oil	24 %	17 %	18 %
Heavy sour crude oil	16 %	16 %	17 %
Other feedstocks and blends	6 %	6 %	7 %
Total	100%	100%	100%

The El Dorado Refinery is located on 1,100 acres south of El Dorado, Kansas and is a fully integrated refinery. The principal processing units at the El Dorado Refinery consist of crude and vacuum distillation; hydrodesulfurization of naphtha, kerosene, diesel, and gas oil streams; isomerization; catalytic reforming; aromatics recovery; catalytic cracking; alkylation; delayed coking; hydrogen production; and sulfur recovery.

The Tulsa West facility is located on a 750-acre site in Tulsa, Oklahoma situated along the Arkansas River. The principal processing units at the Tulsa West facility consist of crude and vacuum distillation (with light ends recovery), naphtha hydrodesulfurization, propane de-asphalting, lubes extraction, MEK dewaxing, delayed coker and butane splitter units.

The Tulsa East facility is located on a 466-acre site also in Tulsa, Oklahoma situated along the Arkansas River. The principal process units at the Tulsa East facility consist of crude and vacuum distillation, naphtha hydrodesulfurization, FCC, isomerization, catalytic reforming, alkylation, scanfiner, diesel hydrodesulfurization and sulfur units.

Markets and Competition

The primary markets for the El Dorado Refinery's refined products are Colorado and the Plains States, which include the Kansas City metropolitan area. The gasoline, diesel and jet fuel produced by the El Dorado Refinery are primarily shipped via pipeline to terminals for distribution by truck or rail. We ship product via the NuStar Pipeline Operating

Partnership L.P. Pipeline to the northern Plains States, via the Magellan Pipeline Company, L.P. (“Magellan”) mountain pipeline to Denver, Colorado, and on the Magellan mid-continent pipeline to the Plains States. Additionally, HEP's on-site truck and rail racks facilitate access to local refined product markets.

The El Dorado Refinery faces competition from other Plains States and Mid-Continent refiners, but the principal competitors for the El Dorado Refinery are Gulf Coast refiners. Our Gulf Coast competitors typically have lower production costs due to greater economies of scale; however, they incur higher refined product transportation costs, which allows the El Dorado Refinery to compete effectively in the Plains States and Rocky Mountain region with Gulf Coast refineries.

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The Tulsa Refineries serve the Mid-Continent region of the United States. Distillates and gasolines are primarily delivered from the Tulsa Refineries to market via pipelines owned and operated by Magellan. These pipelines connect the refinery to distribution channels throughout Colorado, Oklahoma, Kansas, Missouri, Illinois, Iowa, Minnesota, Nebraska and Arkansas. Additionally, HEP's on-site truck and rail racks facilitate access to local refined product markets.

The Tulsa Refineries' principal customers for conventional gasoline include other refiners, convenience store chains, independent marketers and retailers. Truck stop operators and railroads are the primary diesel customers. Jet fuel is sold primarily for commercial use. The refinery's asphalt and roofing flux products are sold via truck or railcar directly from the refineries or to customers throughout the Mid-Continent region primarily to paving contractors and manufacturers of roofing products.

Products

Set forth below is information regarding refined product sales attributable to our Mid-Continent region:

	Years Ended					
	December 31,					
	2018	2017	2016			
Mid-Continent Region (El Dorado and Tulsa Refineries)						
Sales of refined products:						
Gasolines	51	% 50	% 50	%		
Diesel fuels	33	% 33	% 33	%		
Jet fuels	6	% 7	% 7	%		
Fuel oil	1	% 1	% 1	%		
Asphalt	3	% 3	% 3	%		
Base oils	4	% 4	% 4	%		
LPG and other	2	% 2	% 2	%		
Total	100%	100%	100%			

Crude Oil and Feedstock Supplies

Both of our Mid-Continent Refineries are connected via pipeline to Cushing, Oklahoma, a significant crude oil pipeline trading and storage hub. The El Dorado Refinery and the Tulsa Refineries are located approximately 125 miles and 50 miles, respectively, from Cushing, Oklahoma. Local pipelines provide direct access to regional Oklahoma crude production as well as access to United States onshore and Canadian crudes. The proximity of the refineries to the Cushing pipeline and storage hub provides the flexibility to optimize their crude slate with a wide variety of crude oil supply options. Additionally, we have transportation service agreements to transport Canadian crude oil on the Spearhead and Keystone Pipelines, enabling us to transport Canadian crude oil to Cushing for subsequent shipment to either of our Mid-Continent Refineries.

We also purchase isobutane, natural gasoline, butane and other feedstocks for processing at our Mid-Continent Refineries. The El Dorado Refinery is connected to Conway, Kansas, a major gas liquids trading and storage hub, via the Oneok Pipeline. From time to time, other feedstocks such as gas oil, naphtha and light cycle oil are purchased from other refiners for use at our refineries.

Southwest Region (Navajo Refinery)

Facilities

The Navajo Refinery has a crude oil processing capacity of 100,000 barrels per stream day and has the ability to process sour crude oils into high-value light products such as gasoline, diesel fuel and jet fuel.

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The following table sets forth information about our Southwest region operations, including non-GAAP performance measures.

	Years Ended December 31,		
	2018	2017	2016
Southwest Region (Navajo Refinery)			
Crude charge (BPD) ⁽¹⁾	109,440	100,040	98,090
Refinery throughput (BPD) ⁽²⁾	118,630	109,280	107,690
Sales of produced refined products (BPD) ⁽³⁾	120,520	111,630	111,390
Refinery utilization ⁽⁴⁾	109.4 %	100.0 %	98.1 %
Average per produced barrel sold ⁽⁵⁾			
Refinery gross margin ⁽⁶⁾	\$19.05	\$12.40	\$9.49
Refinery operating expenses ⁽⁷⁾	4.81	5.20	5.05
Net operating margin	\$14.24	\$7.20	\$4.44
Refinery operating expenses per throughput barrel ⁽⁸⁾	\$4.89	\$5.31	\$5.23

Footnote references are provided under our Consolidated Refinery Operating Data table on page 7.

	Years Ended December 31,		
	2018	2017	2016
Southwest Region (Navajo Refinery)			
Feedstocks:			
Sweet crude oil	27 %	25 %	28 %
Sour crude oil	65 %	66 %	63 %
Other feedstocks and blends	8 %	9 %	9 %
Total	100%	100%	100%

The Navajo Refinery's Artesia, New Mexico facility is located on a 561-acre site and is a fully integrated refinery with crude distillation, vacuum distillation, FCC, ROSE (solvent deasphalter), HF alkylation, catalytic reforming, hydrodesulfurization, mild hydrocracking, isomerization, sulfur recovery and product blending units.

The Artesia facility is operated in conjunction with a refining facility located in Lovington, New Mexico, approximately 65 miles east of Artesia. The principal equipment at the Lovington facility consists of a crude distillation unit and associated vacuum distillation units. The Lovington facility processes crude oil into intermediate products that are transported to Artesia by means of three intermediate pipelines owned by HEP. These products are then upgraded into finished products at the Artesia facility. The combined crude oil capacity of the Navajo Refinery facilities is 100,000 BPSD and it typically processes or blends an additional 10,000 BPSD of natural gasoline, butane, gas oil and naphtha.

Markets and Competition

The Navajo Refinery primarily serves the southwestern United States market, including the metropolitan areas of El Paso, Texas; Albuquerque, Moriarty and Bloomfield, New Mexico; Phoenix and Tucson, Arizona; and portions of northern Mexico. Our products are shipped through HEP's pipelines from Artesia, New Mexico to El Paso, Texas and from El Paso to Albuquerque and to Mexico via products pipeline systems owned by Magellan and from El Paso to Tucson and Phoenix via a products pipeline system owned by Kinder Morgan's subsidiary, SFPP, L.P. ("SFPP"). In addition, petroleum products from the Navajo Refinery are transported to markets in northwest New Mexico, to Moriarty, New Mexico, near Albuquerque, via HEP's pipelines running from Artesia to San Juan County, New

Mexico, and to Bloomfield, New Mexico. We have refined product storage through our pipelines and terminals agreement with HEP at terminals in Artesia and Moriarty, New Mexico.

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Products

Set forth below is information regarding refined product sales attributable to our Southwest region:

	Years Ended					
	December 31,					
	2018	2017	2016			
Southwest Region (Navajo Refinery)						
Sales of refined products:						
Gasolines	50	%	51	%	52	%
Diesel fuels	40	%	39	%	39	%
Fuel oil	3	%	3	%	3	%
Asphalt	4	%	4	%	3	%
LPG and other	3	%	3	%	3	%
Total	100%		100%		100%	

Crude Oil and Feedstock Supplies

The Navajo Refinery is situated near the Permian Basin, an area that has historically, and continues to have, abundant supplies of crude oil available both for regional users and for export to other areas. We purchase crude oil from independent producers in southeastern New Mexico and west Texas as well as from major oil companies. The crude oil is gathered through HEP's pipelines and through third-party tank trucks and crude oil pipeline systems for delivery to the Navajo Refinery.

We also purchase volumes of isobutane, natural gasoline and other feedstocks to supply the Navajo Refinery from sources in Texas and the Mid-Continent area that are delivered to our region on a common carrier pipeline owned by Enterprise Products, L.P. Ultimately all volumes of these products are shipped to the Artesia refining facilities on HEP's intermediate pipelines running from Lovington to Artesia. From time to time, we purchase gas oil, naphtha and light cycle oil from other refiners for use as feedstock.

Rocky Mountain Region (Cheyenne and Woods Cross Refineries)

Facilities

The Cheyenne and the Woods Cross Refineries have crude oil processing capacities of 52,000 and 45,000 barrels per stream day, respectively. The Cheyenne Refinery processes heavy Canadian crudes as well as local sweet crudes such as that produced from the Bakken shale and similar resources. The Woods Cross Refinery processes regional sweet and black wax crude as well as Canadian sour crude oils into high-value light products.

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The following tables set forth information about our Rocky Mountain region operations, including non-GAAP performance measures.

	Years Ended December 31,		
	2018	2017	2016
Rocky Mountain Region (Cheyenne and Woods Cross Refineries)			
Crude charge (BPD) ⁽¹⁾	72,890	77,380	63,650
Refinery throughput (BPD) ⁽²⁾	79,980	84,790	68,870
Sales of produced refined products (BPD) ⁽³⁾	76,300	79,840	66,950
Refinery utilization ⁽⁴⁾	75.1	% 79.8	% 65.6 %
Average per produced barrel sold ⁽⁵⁾			
Refinery gross margin ⁽⁶⁾	\$26.55	\$15.78	\$8.80
Refinery operating expenses ⁽⁷⁾	11.83	10.46	10.17
Net operating margin	\$14.72	\$5.32	\$(1.37)
Refinery operating expenses per throughput barrel ⁽⁸⁾	\$11.28	\$9.85	\$9.89
Feedstocks:			
Sweet crude oil	28 %	34 %	39 %
Heavy sour crude oil	42 %	35 %	35 %
Black wax crude oil	21 %	22 %	18 %
Other feedstocks and blends	9 %	9 %	8 %
Total	100 %	100 %	100 %

Footnote references are provided under our Consolidated Refinery Operating Data table on page 7.

The Cheyenne Refinery facility is located on a 255-acre site and is a fully integrated refinery with crude distillation, vacuum distillation, coking, FCC, HF alkylation, catalytic reforming, hydrodesulfurization of naphtha and distillates, butane isomerization, hydrogen production, sulfur recovery and product blending units.

The Woods Cross Refinery facility is located on a 200-acre site and is a fully integrated refinery with crude distillation, solvent deasphalter, FCC, HF alkylation, catalytic reforming, hydrodesulfurization, isomerization, sulfur recovery and product blending units. The facility typically processes or blends an additional 2,000 BPSD of natural gasoline, butane and gas oil over its 45,000 BPSD capacity.

Markets and Competition

The Cheyenne Refinery primarily markets its products in eastern Colorado, including metropolitan Denver, eastern Wyoming and western Nebraska. Because of the location of the Cheyenne Refinery, we are able to sell a significant portion of its diesel directly from the truck rack at the refinery, therefore, eliminating transportation costs. The Cheyenne Refinery ships refined products via the Magellan pipeline serving Denver and Colorado Springs, Colorado.

The Woods Cross Refinery's primary market is Utah, which is currently supplied by a number of local refiners and the Pioneer Pipeline. It also supplies a small percentage of the refined products consumed in the combined Idaho, Wyoming, eastern Washington and Nevada markets. Our Woods Cross Refinery ships refined products over a common carrier pipeline system owned by Andeavor Logistics Northwest Pipelines LLC to numerous terminals, including HEP's terminal at Spokane, Washington and to third-party terminals at Pocatello and Boise, Idaho and Pasco, Washington as well as to Cedar City, Utah and Las Vegas, Nevada via the UNEV Pipeline.

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Products

Set forth below is information regarding refined product sales attributable to our Rocky Mountain region:

Years Ended
December 31,
2018 2017 2016

Rocky Mountain Region
(Cheyenne and Woods Cross
Refineries)

Sales of refined products:

Gasolines	55	%	58	%	59	%
Diesel fuels	33	%	32	%	32	%
Fuel oil	3	%	3	%	2	%
Asphalt	5	%	4	%	4	%
LPG and other	4	%	3	%	3	%
Total	100	%	100	%	100	%

Crude Oil and Feedstock Supplies

Crude oil is transported to the Cheyenne Refinery from suppliers in Canada, Colorado, Nebraska, North Dakota and Wyoming via common carrier pipelines owned by Enbridge, Plains and HEP, as well as by truck. The Woods Cross Refinery currently obtains crude oil from suppliers in Canada, Wyoming and Utah as delivered via common carrier pipelines, including the SLC Pipeline and Frontier Pipeline owned by HEP. Supplies of black wax crude oil are shipped via truck.

HollyFrontier Asphalt Company

We manufacture commodity and modified asphalt products at our manufacturing facilities located in Glendale, Arizona; Albuquerque, New Mexico; Artesia, New Mexico and Catoosa, Oklahoma. Our Albuquerque and Artesia facilities manufacture modified hot asphalt products and commodity and modified asphalt emulsions from base asphalt materials provided by our refineries and third-party suppliers. Our Glendale facility manufactures modified hot asphalt products from base asphalt materials provided by our refineries and third-party suppliers. Our Catoosa facility manufactures specialty modified asphalt and commodity asphalt products. We market these asphalt products in Arizona, California, Colorado, New Mexico, Oklahoma, Kansas, Missouri, Texas, Arkansas and northern Mexico. Our products are shipped via third-party trucking companies to commercial customers that provide asphalt based materials for commercial and government projects.

LUBRICANTS AND SPECIALTY PRODUCTS OPERATIONS

Our lubricants and specialty products operations consist of our Petro-Canada Lubricants, Red Giant Oil and Tulsa rack forward businesses.

Our Petro-Canada Lubricants business produces automotive, industrial and food grade lubricants and greases, base and process oils and specialty fluids. It is the largest manufacturer of high margin Group III base oils in North America as well as the world's largest producer of pharmaceutical white oils. Products are marketed in 80 countries worldwide to a diverse customer base through a global sales force and distributor network.

Our Red Giant Oil business provides high quality lubricants to the railroad industry, which represents a market of a small number of high-value customers who associate the Red Giant Oil name with a niche suite of products.

Our Tulsa Refinery produces high quality base oils, process oils, waxes, horticultural oils and asphalt performance products. Products are marketed worldwide through strategically located terminals in the United States and selected distributors internationally.

The following table sets forth information about our lubricants and specialty products operations and includes our Petro-Canada Lubricants business for the period February 1, 2017 (date of acquisition) through December 31, 2018. Red Giant Oil is included for the period August 1, 2018 (date of acquisition) through December 31, 2018.

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	Years Ended December 31,			
	2018	2017	2016	
Lubricants and Specialty Products				
Throughput (BPD)	19,590	21,710	—	
Sales of produced refined products (BPD)	30,510	32,910	12,030	
Sales of produced refined products:				
Finished products	48	% 45	% 50	%
Base oils	31	% 31	% 50	%
Other	21	% 24	% —	%
Total	100	% 100	% 100	%

PCLI owns and operates a refinery located in Mississauga, Ontario having lubricant production capacity of 15,600 BPD and has the flexibility to match unique lubricant product formulations. The primary operating units include a hydrogen plant and hydrotreating, solvent dewaxing, hydrodentrification, catalytic dewaxing and hydrobon/platformer units. The Mississauga plant also includes packaging facilities and has extensive distribution capabilities with marine, truck and rail access.

Red Giant Oil, headquartered in Council Bluffs, Iowa, owns and operates blending and distribution facilities in Council Bluffs, Iowa; Joshua, TX; Newcastle, Wyoming; Ogden, Utah and Pittsburg, Kansas.

HOLLY ENERGY PARTNERS, L.P.

HEP is a Delaware limited partnership that trades on the New York Stock Exchange under the trading symbol “HEP.” HEP owns and operates logistic assets consisting of petroleum product and crude oil pipelines, terminals, tankage, loading rack facilities and refinery processing units that principally support our refining and marketing operations in the Mid-Continent, Southwest and Rocky Mountain regions of the United States and Delek's refinery in Big Spring, Texas. Additionally, HEP owns a 75% interest in UNEV Pipeline, LLC (“UNEV”), the owner of a pipeline running from Woods Cross, Utah to Las Vegas, Nevada (the “UNEV Pipeline”) and associated product terminals, and a 50% ownership interest in each of Osage Pipe Line Company, LLC, the owner of a pipeline running from Cushing, Oklahoma to El Dorado, Kansas (the “Osage Pipeline”) and Cheyenne Pipeline, LLC, the owner of a pipeline running from Fort Laramie, Wyoming to Cheyenne, Wyoming (the “Cheyenne Pipeline”).

HEP generates revenues by charging tariffs for transporting petroleum products and crude oil through its pipelines, by leasing certain pipeline capacity to Delek, by charging fees for terminalling and storing refined products and other hydrocarbons and providing other services at its storage tanks, terminals and refinery processing units. HEP does not take ownership of products that it transports, terminals, stores or refines; therefore, it is not directly exposed to changes in commodity prices.

HEP's recent acquisitions (2016 through present) are summarized below:

SLC Pipeline and Frontier Aspen

On October 31, 2017, HEP acquired the remaining 75% interest in SLC Pipeline LLC, the owner of a pipeline that serves refineries in the Salt Lake City, Utah area (the “SLC Pipeline”), and the remaining 50% interest in Frontier Aspen LLC, the owner of a pipeline running from Wyoming to Frontier Station, Utah (the “Frontier Pipeline”), from subsidiaries of Plains All American Pipeline, L.P. (“Plains”) for cash consideration of \$250.0 million.

Woods Cross Assets

On October 3, 2016, HEP acquired from us all the membership interests of Woods Cross Operating LLC, which owns the crude unit, FCCU and polymerization unit of the first phase of our Woods Cross Refinery expansion project that was completed in the second quarter of 2016, for cash consideration of approximately \$278.0 million.

Cheyenne Pipeline

On June 3, 2016, HEP acquired a 50% interest in Cheyenne Pipeline LLC, owner of the Cheyenne Pipeline, in exchange for a contribution of \$42.6 million in cash to Cheyenne Pipeline LLC. The 87-mile crude oil pipeline runs from Fort Laramie, Wyoming to Cheyenne, Wyoming and has an 80,000 BPD capacity.

Tulsa Tanks

On March 31, 2016, HEP acquired crude oil tanks located at our Tulsa Refineries from Plains for \$39.5 million.

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Magellan Asset Exchange

On February 22, 2016, we obtained a 50% membership interest in Osage Pipe Line Company, LLC (“Osage”) in exchange for a 20-year terminalling services agreement, whereby, a subsidiary of Magellan Midstream Partners (“Magellan Midstream”) will provide terminalling services for all of our products originating in Artesia, New Mexico that require terminalling in or through El Paso, Texas. Osage is the owner of the Osage pipeline, a 135-mile pipeline that transports crude oil from Cushing, Oklahoma to our El Dorado Refinery in Kansas and also has a connection to the Jayhawk pipeline that services the CHS refinery in McPherson, Kansas. The Osage pipeline is the primary pipeline that supplies our El Dorado Refinery with crude oil. Also on February 22, 2016, we contributed the 50% membership interest in Osage to HEP, and in exchange received HEP's El Paso terminal. Pursuant to this exchange, HEP agreed to build two connections to Magellan Midstream's El Paso terminal. In addition, HEP agreed to become operator of the Osage Pipeline.

Transportation Agreements

Agreements with HEP

HEP serves our refineries under long-term pipeline, terminal and tankage throughput agreements and refinery processing tolling agreements expiring from 2020 through 2036. Under these agreements, we pay HEP fees to transport, store and process throughput volumes of refined products, crude oil and feedstocks on HEP's pipelines, terminals, tankage, loading rack facilities and refinery processing units that result in minimum annual payments to HEP, including UNEV (a consolidated subsidiary of HEP). Under these agreements, the agreed upon tariff rates are subject to annual tariff rate adjustments on July 1 at a rate based upon the percentage change in Producer Price Index (“PPI”) or Federal Energy Regulatory Commission index. As of December 31, 2018, these agreements result in minimum annualized payments to HEP of \$314.2 million.

Our transactions with HEP including the transactions discussed above and fees paid under our transportation agreements with HEP and UNEV are eliminated and have no impact on our consolidated financial statements.

Agreement with Delek

HEP has a 15-year pipelines and terminals agreement with Delek expiring in 2020, under which Delek has agreed to transport on HEP's pipelines and throughput through its terminals, volumes of refined products that results in a minimum level of annual revenue. The agreed upon tariff rates are increased or decreased annually at a rate equal to the percentage change in PPI, but will not decrease below the initial tariff rate. Also, HEP has a capacity lease agreement with Delek under which Delek leases space on HEP's Orla to El Paso pipeline for the shipment of up to 15,000 barrels of refined product per day. The terms under this agreement expire in 2020 through 2022.

As of December 31, 2018, HEP's assets included:

Pipelines

approximately 810 miles of refined product pipelines, including 340 miles of leased pipelines, that transport gasoline, diesel and jet fuel principally from our Navajo Refinery in New Mexico to our customers in the metropolitan and rural areas of Texas, New Mexico, Arizona, Colorado, Utah and northern Mexico;

approximately 510 miles of refined product pipelines that transport refined products from Delek's Big Spring refinery in Texas to its customers in Texas and Oklahoma;

two 65-mile pipelines that transport intermediate feedstocks and crude oil from our Navajo Refinery crude oil distillation and vacuum facilities in Lovington, New Mexico to our petroleum refinery facilities in Artesia, New Mexico;

one 65-mile intermediate pipeline that is used for the shipment of crude oil from the gathering systems in Barnsdall and Beeson, New Mexico to our Navajo Refinery;

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- the SLC Pipeline, a 95-mile intrastate crude oil pipeline system that transports crude oil into the Salt Lake City, Utah area from the Utah terminus of the Frontier Pipeline, as well as crude oil flowing from Wyoming and Utah via Plains Rocky Mountain Pipeline;
- the Frontier Pipeline, a 289-mile crude oil pipeline running from Casper, Wyoming to Frontier Station, Utah through a connection to the SLC Pipeline;
- approximately 940 miles of crude oil trunk, gathering and connection pipelines located in west Texas, New Mexico and Oklahoma that primarily deliver crude oil to our Navajo Refinery;
- approximately 8 miles of refined product pipelines that support our Woods Cross Refinery located near Salt Lake City, Utah;
- gasoline and diesel connecting pipelines that support our Tulsa East facility;
- five intermediate product and gas pipelines between our Tulsa East and Tulsa West facilities;
- crude receiving assets located at our Cheyenne Refinery;
- a 75% interest in the UNEV Pipeline, a 427-mile, 12-inch refined products pipeline running from Woods Cross, Utah to Las Vegas, Nevada;

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a 50% interest in the Osage Pipeline, a 135-mile pipeline that transports crude oil from Cushing, Oklahoma to our El Dorado Refinery and also has a connection to the Jayhawk pipeline that services the CHS refinery in McPherson, Kansas; and

a 50% interest in the Cheyenne Pipeline, an 87-mile crude oil pipeline running from Fort Laramie, Wyoming to Cheyenne, Wyoming.

Refined Product Terminals and Refinery Tankage

two refined product terminals located in Moriarty and Bloomfield, New Mexico, with an aggregate capacity of approximately 414,000 barrels, that are integrated with HEP's refined product pipeline system that serves our Navajo Refinery;

one refined product terminal located in Spokane, Washington, with a capacity of approximately 400,000 barrels, that serves third-party common carrier pipelines;

one refined product terminal near Mountain Home, Idaho, with a capacity of 120,000 barrels, that serves a nearby United States Air Force Base;

two refined product terminals, located in Wichita Falls and Abilene, Texas, and one tank farm in Orla, Texas with aggregate capacity of approximately 500,000 barrels, that are integrated with HEP's refined product pipelines that serve Delek's Big Spring, Texas refinery;

a refined product terminal in Catoosa, Oklahoma that stores specialty lubricant products and is utilized by our Tulsa Refineries;

a refined product loading rack facility at each of our El Dorado, Tulsa, Navajo, Cheyenne and Woods Cross Refineries, heavy product / asphalt loading rack facilities at our Tulsa East facility, Navajo Refinery Lovington facility and Cheyenne Refinery, LPG loading rack facilities at our El Dorado Refinery, Tulsa West facility and Cheyenne Refinery, lube oil loading racks at our Tulsa West facility and crude oil Leased Automatic Custody Transfer units located at our Cheyenne Refinery;

on-site crude oil tankage at our Tulsa, El Dorado, Navajo, Cheyenne and Woods Cross Refineries having an aggregate storage capacity of approximately 1,350,000 barrels;

on-site refined and intermediate product tankage at our El Dorado, Tulsa and Cheyenne Refineries having an aggregate storage capacity of approximately 8,800,000 barrels;

eleven crude oil tanks adjacent to our El Dorado Refinery with a capacity of approximately 1,200,000 barrels that primarily serve our El Dorado Refinery;

Frontier Pipeline's tankage with an aggregate capacity of approximately 72,000 barrels; and

a 75% interest in UNEV Pipeline's product terminals near Cedar City, Utah and Las Vegas, Nevada with an aggregate capacity of approximately 615,000 barrels.

Refinery Processing Units

a naphtha fractionation tower at our El Dorado Refinery, with a capacity of 50,000 BPD of desulfurized naphtha;

a hydrogen generation unit at our El Dorado Refinery, with a capacity of 6.1 million standard cubic feet per day of natural gas.

a crude unit, which is primarily an atmospheric distillation tower, a desalter and heat exchangers, at our Woods Cross Refinery, with a feedstock capacity of 15,000 BPD of crude oil;

- a FCC unit at our Woods Cross Refinery, which converts crude oil to high-value refined products such as gasoline, diesel and liquefied petroleum gases, with a capacity of 8,000 BPD; and

- a polymerization unit at our Woods Cross Refinery, that uses the output of the fluid cracking unit and converts them into gasoline blendstock, with a capacity of 2,500 BPD.

ADDITIONAL OPERATIONS AND OTHER INFORMATION

Corporate Offices

Our principal corporate offices are leased and located in Dallas, Texas. Functions performed in our Dallas office include overall corporate management, refinery and HEP management, planning and strategy, corporate finance, crude acquisition, logistics, contract administration, marketing, investor relations, governmental affairs, accounting, tax, treasury, information technology, legal and human resources support functions.

Employees and Labor Relations

As of December 31, 2018, we had 3,622 employees, of which 1,158 are currently covered by collective bargaining agreements having various expiration dates between 2019 and 2020. We consider our employee relations to be good.

Environmental Regulation

We are subject to numerous international, federal, state, provincial and local laws regulating worker health and safety, the discharge of substances into the environment, or otherwise relating to the protection of the environment and natural resources. Permits or other authorizations are required under these laws for the operation of our refineries, pipelines and related facilities, which can result in the imposition of costly reporting, installation of pollution control equipment and maintenance obligations. Moreover, these permits and authorizations are subject to revocation, modification and renewal, as well as challenges from third parties.

Failure to comply with these laws and regulations may result in the assessment of sanctions, including administrative, civil and criminal penalties; the imposition of investigatory, remedial or corrective action obligations or the incurrence of capital expenditures; the occurrence of delays in the permitting, development or expansion of projects; and the issuance of injunctive relief limiting or prohibiting certain operations. Compliance with applicable environmental laws, regulations and permits will continue to have an impact on our operations, the results of our operations and our capital expenditures.

Clean Air Act - Our operations are subject to certain requirements of the Federal Clean Air Act (“CAA”) as well as related state and local laws and regulations. Certain CAA regulatory programs applicable to our refineries require capital expenditures for the installation of certain air pollution control devices, operational procedures to minimize emissions, and monitoring and reporting of emissions. Additionally, the Environmental Protection Agency (“EPA”) has the authority under the CAA to modify the formulation of the refined transportation fuel products we manufacture in order to limit the emissions associated with their final use. Also, in October 2015, the EPA lowered the National Ambient Air Quality Standard (“NAAQS”) for ozone from 75 to 70 parts per billion, and state implementation of the revised NAAQS could result in stricter permitting requirements, delay or the inability to obtain such permits, and increased expenditures for pollution control equipment, the costs of which could be significant. Moreover, in February 2016, a new EPA rule became effective that requires, among other things, benzene monitoring at the refinery fence line beginning in January 2018 and submittal of fence line monitoring data to the EPA on a quarterly basis; upgraded storage tank controls requirements, including new applicability thresholds; enhanced performance requirements for flares, continuous monitoring of flares and pressure release devices, and analysis and remedy of flare release events; compliance with emissions standards for delayed coking units; and requirements related to air emissions resulting from startup, shutdown and maintenance events. These new rules, as well as subsequent rulemaking under the CAA or similar laws, or new agency interpretations of existing laws and regulations, may necessitate additional expenditures in future years and result in increased costs on our operations.

Fuel Quality Regulation - We are subject to the EPA’s Control of Hazardous Air Pollutants from Mobile Sources (also known as the Mobile Source Air Toxics rule, or “MSAT2”) regulations that impose reductions in the benzene content of our produced gasoline. In addition to reducing benzene concentration in our gasoline, our refineries currently purchase benzene credits to meet these requirements. If economically justified or otherwise determined to be beneficial, we may implement additional benzene reduction projects to eliminate or reduce the need to purchase benzene credits.

Pursuant to the Energy Independence and Security Act of 2007 (“EISA”), and the EPA’s corresponding Renewable Fuel Standard (“RFS”) regulations, most refiners are required to blend increasing amounts of biofuels with refined products through 2022 or purchase Renewable Identification Numbers (“RINs”) in lieu of blending. Under the RFS, the

percentage of renewable fuels that refineries are obligated to blend into their finished petroleum products is adjusted annually. In November 2018, the EPA finalized the RFS targets for 2019, which maintained the volume required for conventional (i.e., corn ethanol) renewable fuel, increased the volume required for advanced biofuels, and increased the volume required for cellulosic biofuel compared to the 2018 RFS requirements. The EPA also increased the biomass-based diesel volume for 2020 compared to 2019. Because the EISA requires specified volumes of biofuels, if the demand for motor fuels decreases in future years, even higher percentages of biofuels may be required.

The EPA has historically used its waiver authority to establish volumes lower than the statutory volumes required by EISA, but the EPA's interpretation of its waiver authority, as well as its implementation of the RFS, has been subject to numerous court challenges. Lawsuits have been filed by the renewable fuel industry challenging the EPA's grant of small refinery exemptions. Additionally, in November 2017, the EPA denied petitions requesting to change the point of obligation for compliance under the RFS program to the terminal rack. Legal challenges of the EPA's decision may be expected. We cannot predict the outcome of these matters or whether they may result in increased RFS compliance costs. There also continues to be a shortage of advanced biofuel production resulting in increased difficulties meeting RFS mandates. As a result, we may be unable to blend sufficient quantities of renewable fuel to meet our requirements and, therefore, may have to purchase an increasing number of RINs. It is not possible at this time to predict with certainty what those volumes or costs may be, but given the potential increase in volumes and the volatile price of RINs, increases in renewable volume requirements could have an adverse impact on our results of operations.

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Finally, while there is no current regulatory standard that authenticates RINs that may be purchased on the open market from third parties, we believe that the RINs we purchase are from reputable sources, are valid and serve to demonstrate compliance with applicable RFS requirements. However, if any of the RINs purchased by us on the open market are subsequently found by the EPA to be invalid, we could secure significant costs, penalties, or other liabilities in connection with replacing any invalid RINs and resolving any enforcement action brought by the EPA.

In April 2014, the EPA promulgated the Tier 3 Motor Vehicle Emission and Fuel Standards, which requires a reduction in annual average gasoline sulfur content from 30 ppm to 10 ppm. These new requirements, other CAA requirements, and other presently existing or future environmental regulations may cause us to make substantial capital expenditures and purchase sulfur credits at significant cost to enable our refineries to produce products that meet applicable requirements.

Climate Change - In recent years, various legislative and regulatory measures to address climate change and greenhouse gas (“GHG”) emissions (including carbon dioxide, methane and nitrous oxides) have been discussed or implemented. They include proposed and enacted federal regulation and state actions to develop statewide, regional or nationwide programs designed to control and reduce GHG emissions from fixed sources, such as our refineries, as well as power plants, mobile transportation sources and fuels. Measures to date have included cap and trade programs, carbon taxes, vehicle efficiency standards and low carbon fuel standards. Although it is not possible to predict the requirements of any GHG legislation that may be enacted, any laws or regulations that may be adopted to restrict or reduce GHG emissions will likely require us to incur increased operating and capital costs. In August 2015, the EPA finalized the “Clean Power Plan” requiring states to reduce carbon dioxide emissions from coal fired power plants that will likely result in a combination of plant closures, switching to renewable energy and natural gas, and demand reduction. However, the Clean Power Plan was challenged in various courts, and the U.S. Supreme Court has stayed implementation of the rule. The U.S. Court of Appeals for the District of Columbia has held the litigation in abeyance. In October 2017, the EPA proposed to repeal the Clean Power Plan, and on August 21, 2018, the EPA proposed a replacement rule titled the Affordable Clean Energy Rule. Neither the Clean Power Plan nor the Affordable Clean Energy Rule would directly affect our operations. To the extent the EPA fully implements a rule that imposes higher costs on electricity generating units it could result in increased power costs for our refineries in future years.

EPA rules require us to report GHG emissions from our refinery operations and consumer use of fuel products produced at our refineries on an annual basis. While the cost of compliance with the reporting rule is not material, data gathered under the rule may be used in the future to support additional regulation of GHG. Moreover, the EPA directly regulates GHG emissions from refineries and other major sources through the Prevention of Significant Deterioration (“PSD”) and Federal Operating Permit programs and may require Best Available Control Technology (“BACT”) for GHG emissions above a certain threshold if emissions of other pollutants would otherwise require PSD permitting. While this does not impose any limits or controls on GHG emissions from current operations, future projects or operational changes that increase GHG emissions, such as capacity increases, may be subject to emission limits or technological requirements pertaining to GHG emissions, such as BACT.

Severe limitations on GHG emissions could also adversely affect demand for the gasoline that we produce. Recently, activists concerned about the potential effects of climate change have directed their attention at sources of funding for fossil-fuel energy companies, which has resulted in certain financial institutions, funds and other sources of capital restricting or eliminating their investment in oil and natural gas activities. Ultimately, this could make it more difficult to secure funding for exploration and production activities and result in decreased production of oil, which indirectly could have an adverse impact on our operations. Notwithstanding potential risks related to climate change, the International Energy Agency estimates that global energy demand will continue to rise and will not peak until after 2040 and that oil and natural gas will continue to represent a substantial percentage of global energy use over that time. Finally, it should be noted that some scientists have concluded that increasing concentrations of GHGs in the Earth’s atmosphere may produce climate changes that have significant physical effects, such as increased frequency

and severity of storms, floods and other extreme weather events; if any such effects were to occur, they could have an adverse effect on our operations.

Water Discharges - Our operations are also subject to the Federal Clean Water Act (“CWA”), the Federal Safe Drinking Water Act (“SDWA”) and comparable state and local requirements. The CWA, the SDWA and analogous laws prohibit any discharge into surface waters, ground waters, injection wells and publicly-owned treatment works except in conformance with legal authorization, such as pre-treatment permits and National Pollutant Discharge Elimination System (“NPDES”) permits, issued by federal, state and local governmental agencies. The EPA commenced a study from 2015-2017 related to the discharges of metals and dioxin from petroleum refining operations and wastewater discharges from refineries in connection with the consideration of new effluent limitation guidelines that would be incorporated into refinery sector NPDES permits. To date, the EPA has not proposed any new effluent limitation guidelines applicable to our operations, but future rulemakings related to this issue could require us to incur increased costs related to the treatment of wastewater resulting from our operations.

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The CWA also regulates filling or discharges to wetlands and other “waters of the United States.” In 2015, the EPA, in conjunction with the U.S. Army Corps of Engineers (the “Corps”), issued a final rule regarding the definition of “waters of the United States,” which expanded the regulatory reach of the existing CWA regulations. The final rule is currently stayed in 28 states as a result of litigation, but remains in effect in the District of Columbia as well as in 22 states and the U.S. territories. On February 28, 2017, the President of the United States issued an Executive Order directing the EPA and the Corps to rescind or revise the rule. On December 11, 2018, the EPA and the Corps proposed a revised definition of “waters of the United States,” but has not finalized the rulemaking process. If the rule expands the scope of the CWA’s jurisdiction, we could face increased costs and delays with respect to obtaining permits for discharges resulting from our operations.

Hazardous Substances and Wastes - We generate wastes that may be subject to the Resource Conservation and Recovery Act and comparable state and local requirements. The EPA and various state agencies have limited the approved methods of disposal for certain hazardous and non-hazardous wastes. Although the EPA is currently working on several rulemakings that could impact how our refineries manage various waste streams, it does not appear that these rules will significantly impact our refineries.

The Comprehensive Environmental Response, Compensation and Liability Act (“CERCLA”), also known as “Superfund,” imposes strict, and under certain circumstances, joint and several liability on certain classes of persons who are considered to be responsible for the cost of cleaning up hazardous substances that have been released into the environment and for damages to natural resources. These persons include current and former owners or operators of property where a release has occurred, and any persons who disposed of, or arranged for the transport or disposal of, hazardous substances at the property. In the course of our historical operations, as well as in our current operations, we have generated waste, some of which falls within the statutory definition of a “hazardous substance” and some of which may have been disposed of at sites that may be subject to cleanup and cost recovery actions under CERCLA in the future. Similarly, locations now owned or operated by us, where third parties have disposed such hazardous substances in the past, may also be subject to cleanup and cost recovery actions under CERCLA. Some states have enacted laws similar to CERCLA which impose similar responsibilities and liabilities on responsible parties. It is also not uncommon for neighboring landowners and other third parties to file claims under state law for personal injury and property damage allegedly caused by hazardous substances or other pollutants released into the environment.

Oil Pollution Act - The Oil Pollution Act of 1990 (“OPA”) and regulations thereunder generally subject owners and operators of facilities to strict, joint and several liability for all containment and cleanup costs, natural resource damages, and potential governmental oversight costs arising from oil spills into the waters of the U.S. The OPA also imposes ongoing requirements on a responsible party, including the preparation of oil spill response plans and proof of financial responsibility to cover environmental cleanup and restoration costs that could be incurred in connection with an oil spill.

Our Canadian assets and operations are also required to comply with various Canadian federal, provincial and municipal regulations. The regulations are in many cases conceptually similar to those described above for our U.S. operations. The principal legislation affecting our Canadian operations is the Canadian Environmental Protection Act and its regulations at a federal level and various provincial statutes and regulations such as the Ontario Environmental Protection Act, the Ontario Occupational Health and Safety Act and the Ontario Water Resources Act. All these laws contain broad prohibitions against causing harm to air, land, water, people or any other living organism and in many cases contain detailed prescriptive rules governing many aspects of our operations.

As is the case with all companies engaged in industries similar to ours, we face potential exposure to future claims and lawsuits involving environmental matters. These matters include soil and water contamination, air pollution, GHG emissions, personal injury and property damage allegedly caused by substances that we manufactured, handled, used, released or disposed. We currently have environmental remediation projects that relate to recovery, treatment and

monitoring activities resulting from past releases of refined product and crude oil into the environment. As of December 31, 2018, we had an accrual of \$110.2 million related to such environmental liabilities.

We are and have been the subject of various local, state, provincial, federal and private proceedings and inquiries relating to compliance with environmental laws and regulations and conditions, including those discussed above. Compliance with current and future environmental regulations is expected to require additional expenditures, including expenditures for investigation and remediation, which may be significant, at our refineries and at pipeline transportation facilities. To the extent that future expenditures for these purposes are material and can be reasonably determined, these costs are disclosed and accrued, if applicable.

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Occupational Health and Safety - Our operations are subject to various laws and regulations relating to occupational health and safety, including the Occupational Safety and Health Act (“OSHA”) and comparable state statutes. We maintain a comprehensive safety program, including mechanical integrity and safety-related maintenance programs and training, to ensure compliance with all applicable laws and regulations to protect the safety of our workers and the public. Some of our operations are also subject to OSHA Process Safety Management (“PSM”) regulations and EPA Risk Management Plan (“RMP”) regulations, both of which are designed to prevent or minimize the consequences of catastrophic releases of toxic, reactive, flammable or explosive chemicals. In January 2017, the EPA revised the RMP requirements for incident investigation and accident history reporting, emergency preparedness, and the performance of process hazard analyses and third party compliance audits. However, many of the revised requirements do not become effective until 2021, but the EPA is engaged in an active rulemaking to rescind or amend significant elements of the RMP amendments. Also in January 2017, OSHA announced changes to its National Emphasis Program, which specifically identified oil refineries as facilities for increased inspections and instructed inspectors to use data gathered from EPA RMP inspections to identify refiners for additional PSM inspections. Compliance with applicable state and federal occupational health and safety laws and regulations, as well as environmental regulations, has required, and continues to require, substantial expenditures.

Occupational health and environmental legislation, regulations and regulatory programs change frequently. We cannot predict what additional occupational health and environmental legislation or regulations will be enacted or become effective in the future or how existing or future laws or regulations will be administered or interpreted with respect to our operations. Compliance with more stringent laws or regulations or adverse changes in the interpretation of existing laws or regulations by government agencies could have an adverse effect on our financial position and the results of our operations and could require substantial expenditures for the installation and operation of systems and equipment that we do not currently possess.

Insurance

Our operations are subject to hazards of operations, including fire, explosion and weather-related perils. We maintain various insurance coverages, including business interruption insurance, subject to certain deductibles. We are not fully insured against certain risks because such risks are not fully insurable, coverage is unavailable, or premium costs, in our judgment, do not justify such expenditures.

We have a risk management oversight committee consisting of members from our senior management. This committee oversees our risk enterprise program, monitors our risk environment and provides direction for activities to mitigate identified risks that may adversely affect the achievement of our goals.

Item 1A. Risk Factors

Investing in us involves a degree of risk, including the risks described below. Our operating results have been, and will continue to be, affected by a wide variety of risk factors, many of which are beyond our control, that could have adverse effects on profitability during any particular period. You should carefully consider the following risk factors together with all of the other information included in this Annual Report on Form 10-K, including the financial statements and related notes, when deciding to invest in us. Additional risks and uncertainties not currently known to us or that we currently deem to be immaterial may also materially and adversely affect our business operations. If any of the following risks were to actually occur, our business, financial condition or results of operations could be materially and adversely affected.

The headings provided in this Item 1A. are for convenience and reference purposes only and shall not affect or limit the extent or interpretation of the risk factors.

The availability and cost of renewable identification numbers and other required credits could have an adverse effect on our financial condition and results of operations.

Pursuant to the 2007 Energy Independence and Security Act, the EPA promulgated the RFS regulations reflecting the increased volume of renewable fuels mandated to be blended into the nation's fuel supply. The regulations, in part, require refiners to add annually increasing amounts of “renewable fuels” to their petroleum products or purchase credits, known as RINs, in lieu of such blending. We currently purchase RINs for some fuel categories on the open market in order to comply with the quantity of renewable fuels we are required to blend under the RFS regulations. Since the EPA first began mandating biofuels in excess of the “blend wall” (the 10% ethanol limit prescribed by most automobile warranties), the price of RINs has been extremely volatile. While we cannot predict the future prices of RINs, the costs to obtain the necessary number of RINs could be material. If we are unable to pass the costs of compliance with the RFS regulations on to our customers, if sufficient RINs are unavailable for purchase, if we

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have to pay a significantly higher price for RINs or if we are otherwise unable to meet the RFS mandates, our financial condition and results of operations could be adversely affected.

In addition, the RFS regulations are highly complex and evolving, requiring us to periodically update our compliance systems. The RFS regulations require the EPA to determine and publish the applicable annual volume and percentage standards for each compliance year by November 30 for the forthcoming year, and such blending percentages could be higher or lower than amounts estimated and accrued for in our consolidated financial statements. The future cost of RINs is difficult to estimate until such time as the EPA finalizes the applicable standards for the forthcoming compliance year. Moreover, in addition to increased price volatility in the RIN market, there have been multiple instances of RINs fraud occurring in the marketplace over the past several years. The EPA has initiated several enforcement actions against refiners who purchase fraudulent RINs, resulting in substantial costs to the refiner. We cannot predict with certainty our exposure to increased RINs costs in the future, nor can we predict the extent by which costs associated with RFS regulations will impact our future results of operations.

The prices of crude oil and refined and finished lubricant products materially affect our profitability, and are dependent upon many factors that are beyond our control, including general market demand and economic conditions, seasonal and weather-related factors, regional and grade differentials and governmental regulations and policies.

Among these factors is the demand for crude oil and refined and finished lubricant products, which is largely driven by the conditions of local and worldwide economies as well as by weather patterns and the taxation of these products relative to other energy sources. Governmental regulations and policies, particularly in the areas of taxation, energy and the environment, also have a significant impact on our activities. Operating results can be affected by these industry factors, product and crude pipeline capacities, crude oil differentials (including regional and grade differentials), changes in transportation costs, accidents or interruptions in transportation, competition in the particular geographic areas that we serve, and factors that are specific to us, such as the success of particular marketing programs and the efficiency of our refinery operations. The demand for crude oil and refined and finished lubricant products can also be reduced due to a local or national recession or other adverse economic condition, which results in lower spending by businesses and consumers on gasoline and diesel fuel, higher gasoline prices due to higher crude oil prices, a shift by consumers to more fuel-efficient vehicles or alternative fuel vehicles (such as ethanol or wider adoption of gas/electric hybrid vehicles), or an increase in vehicle fuel economy, whether as a result of technological advances by manufacturers, legislation mandating or encouraging higher fuel economy or the use of alternative fuel.

We do not produce crude oil and must purchase all our crude oil, the price of which fluctuates based upon worldwide and local market conditions. Our profitability depends largely on the spread between market prices for refined petroleum products and crude oil prices. This margin is continually changing and may fluctuate significantly from time to time. Crude oil and refined products are commodities whose price levels are determined by market forces beyond our control. For example, the reversal of certain existing pipelines or the construction of certain new pipelines transporting additional crude oil or refined products to markets that serve competing refineries could affect the market dynamic that has allowed us to take advantage of favorable pricing. Also, in December 2015, the U.S. Congress lifted the ban on the ability of producers to export domestic crude oil. This could potentially impact crack spreads and price differentials between domestic and foreign crude oils. A deterioration of crack spreads or price differentials between domestic and foreign crude oils could have a material adverse effect on our business, financial condition, results of operations and cash flows.

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Additionally, due to the seasonality of refined products markets and refinery maintenance schedules, results of operations for any particular quarter of a fiscal year are not necessarily indicative of results for the full year and can vary year to year in the event of unseasonably cool weather in the summer months and / or unseasonably warm weather in the winter months in the markets in which we sell our petroleum products. In general, prices for refined products are influenced by the price of crude oil. Although an increase or decrease in the price for crude oil may result in a similar increase or decrease in prices for refined products, there may be a time lag in the realization of the similar increase or decrease in prices for refined products. The effect of changes in crude oil prices on operating results, therefore, depends in part on how quickly refined product prices adjust to reflect these changes. A substantial or prolonged increase in crude oil prices without a corresponding increase in refined product prices, a substantial or prolonged decrease in refined product prices without a corresponding decrease in crude oil prices, or a substantial or prolonged decrease in demand for refined products could have a significant negative effect on our earnings and cash flow. Also, crude oil supply contracts are generally short-term contracts with market-responsive pricing provisions. We purchase our refinery feedstocks weeks before manufacturing and selling the refined products. Price level changes during the period between purchasing feedstocks and selling the manufactured refined products from these feedstocks could have a significant effect on our financial condition and results of operations. Also, our crude oil and refined products inventories are valued at the lower of cost or market under the last-in, first-out (“LIFO”) inventory valuation methodology. If the market value of our inventory were to decline to an amount less than our LIFO cost, we would record a write-down of inventory and a non-cash charge to cost of products sold even when there is no underlying economic impact at that point in time. Continued volatility in crude oil and refined products prices could result in lower of cost or market inventory charges in the future, or in reversals reducing cost of products sold in subsequent periods should prices recover. For example, we recorded a non-cash increase to cost of products sold in the amount of \$136.3 million and a decrease of \$108.7 million for the years ended December 31, 2018 and 2017, respectively.

A material decrease in the supply of crude oil or other raw materials available to our refineries and other facilities could significantly reduce our production levels and negatively affect our operations.

To maintain or increase production levels at our refineries, we must continually contract for crude oil supplies from third parties. A material decrease in crude oil production from the fields that supply our refineries, as a result of depressed commodity prices, lack of drilling activity, natural production declines or otherwise, could result in a decline in the volume of crude oil available to our refineries. In addition, any prolonged disruption of a significant pipeline that is used in supplying crude oil to our refineries or the potential operation of a new, converted or expanded crude oil pipeline that transports crude oil to other markets could result in a decline in the volume of crude oil available to our refineries. Such an event could result in an overall decline in volumes of refined products processed at our refineries and therefore a corresponding reduction in our cash flow. In addition, the future growth of our operations will depend in part upon whether we can contract for additional supplies of crude oil at a greater rate than the rate of natural decline in our currently connected supplies. If we are unable to secure additional crude oil supplies of sufficient quality or crude pipeline expansion to our refineries, we will be unable to take full advantage of current and future expansion of our refineries' production capacities.

For certain raw materials and utilities used by our refineries and other facilities, there are a limited number of suppliers and, in some cases, we source from a single supplier and/or suppliers in economies that have experienced instability or the supplies are specific to the particular geographic region in which a facility is located. Any significant disruption in supply could affect our ability to obtain raw materials, or increase the cost of such raw materials, which could significantly reduce our production levels or have a material adverse effect on our business, financial condition and results of operations. In addition, certain raw materials that we use are subject to various regulatory laws, and a change in the ability to legally use such raw materials may impact our liquidity, financial position and results of operations.

It is also common in the refining industry for a facility to have a sole, dedicated source for its utilities, such as steam, electricity, water and gas. Having a sole or limited number of suppliers may limit our negotiating power, particularly in the case of rising raw material costs. Any new supply agreements we enter into may not have terms as favorable as those contained in our current supply agreements.

Additionally, there is growing concern over the reliability of water sources. The decreased availability or less favorable pricing for water as a result of population growth, drought or regulation could negatively impact our operations.

If our raw material, utility or water supplies were disrupted, our businesses may incur increased costs to procure alternative supplies or incur excessive downtime, which would have a direct negative impact on our operations.

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We may not be able to successfully execute our business strategies to grow our business. Further, if we are unable to complete capital projects at their expected costs or in a timely manner, if we are unsuccessful in integrating the operations of assets we acquire, or if the market conditions assumed in our project economics deteriorate, our financial condition, results of operations, or cash flows could be materially and adversely affected.

One of the ways we may grow our business is through the construction of new refinery processing units (or the purchase and refurbishment of used units from another refinery) and the expansion of existing ones. Projects are generally initiated to increase the yields of higher-value products, increase the amount of lower cost crude oils that can be processed, increase refinery production capacity, meet new governmental requirements, or maintain the operations of our existing assets. Additionally, our growth strategy includes projects that permit access to new and/or more profitable markets. The construction process involves numerous regulatory, environmental, political, and legal uncertainties, most of which are not fully within our control, including:

- third party challenges to, denials, or delays with respect to the issuance of requisite regulatory approvals and/or obtaining or renewing permits, licenses, registrations and other authorizations;
- societal and political pressures and other forms of opposition;
- compliance with or liability under environmental regulations;
- unplanned increases in the cost of construction materials or labor;
- disruptions in transportation of modular components and/or construction materials;
- severe adverse weather conditions, natural disasters, or other events (such as equipment malfunctions, explosions, fires, spills) affecting our facilities, or those of vendors and suppliers;
- shortages of sufficiently skilled labor, or labor disagreements resulting in unplanned work stoppages;
- market-related increases in a project's debt or equity financing costs; and/or
- nonperformance or force majeure by, or disputes with, vendors, suppliers, contractors, or sub-contractors involved with a project.

If we are unable to complete capital projects at their expected costs or in a timely manner our financial condition, results of operations, or cash flows could be materially and adversely affected. Delays in making required changes or upgrades to our facilities could subject us to fines or penalties as well as affect our ability to supply certain products we make. In addition, our revenues may not increase immediately upon the expenditure of funds on a particular project. For instance, if we build a new refinery processing unit, the construction will occur over an extended period of time and we will not receive any material increases in revenues until after completion of the project. Moreover, we may construct facilities to capture anticipated future growth in demand for refined products in a region in which such growth does not materialize. As a result, new capital investments may not achieve our expected investment return, which could adversely affect our financial condition or results of operations.

Our forecasted internal rates of return are also based upon our projections of future market fundamentals which are not within our control, including changes in general economic conditions, available alternative supply and customer demand.

An additional component of our growth strategy is to selectively acquire complementary assets or businesses for our refining operations in order to increase earnings and cash flow. Our ability to do so will be dependent upon a number of factors, including our ability to identify attractive acquisition candidates, consummate acquisitions on favorable terms, successfully integrate acquired assets and obtain financing to fund acquisitions and to support our growth, and other factors beyond our control. Risks associated with acquisitions include those relating to:

- diversion of management time and attention from our existing business;
- challenges in managing the increased scope, geographic diversity and complexity of operations and inefficiencies that may result therefrom;

• difficulties in integrating the financial, technological and management standards, processes, procedures and controls of an acquired business with those of our existing operations;

• liability for known or unknown environmental conditions or other contingent liabilities not covered by indemnification or insurance;

• greater than anticipated expenditures required for compliance with environmental or other regulatory standards or for investments to improve operating results;

• difficulties or delays in achieving anticipated operational improvements or benefits or inaccurate assumptions about future synergies or revenues;

• incurrence of additional indebtedness to finance acquisitions or capital expenditures relating to acquired assets; and

• issuance of additional equity, which could result in further dilution of the ownership interest of existing stockholders.

Any acquisitions that we do consummate may have adverse effects on our business and operating results.

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Our ability to grow our Lubricants and Specialty Products segment depends, in part, on our ability to continuously develop, manufacture and introduce new products and product enhancements on a timely and cost-effective basis, in response to customers' demands for higher performance process lubricants, coatings, greases and other product offerings. Our competitors may develop new products or enhancements to their products that offer performance, features and lower prices that may render our products less competitive or obsolete, and, as a consequence, we may lose business and/or significant market share. Our efforts to respond to changes in consumer demand in a timely and cost-efficient manner to drive growth could be adversely affected by unfavorable margins or difficulties or delays in product development and service innovation, including the inability to identify viable new products, successfully complete research and development, obtain regulatory approvals, obtain intellectual property protection or gain market acceptance of new products or service techniques. The development and commercialization of new products require significant expenditures over an extended period of time, and some products that we seek to develop may never become profitable, and we could be required to write-off our investments related to a new product that does not reach commercial viability.

Currency fluctuations or devaluations may impact our operating results.

Fluctuations or devaluations in foreign currencies relative to the U.S. dollar can impact our revenue and our costs of doing business. Most of our products and services are sold through contracts denominated in U.S. dollars; however, some of our revenue, local expenses and manufacturing costs are incurred in local currencies and, therefore, changes in the exchange rates between the U.S. dollar and foreign currencies can increase or decrease our revenue and expenses reported in U.S. dollars and may impact our results of operations. We recognize foreign currency transaction gains and losses arising from our operations in the period incurred. As a result, currency fluctuations between the U.S. dollar and the currencies in which we do business have caused and will continue to cause foreign currency transaction and translation gains and losses, which could be material. Any significant change in the value of the currencies of the countries in which we do business against the U.S. dollar could affect our competitiveness and control of our cost structure, which could have a material adverse effect on our business, financial condition and results of operations.

Our business is subject to the risks of international operations.

We derive a portion of our revenue and earnings from international operations. Compliance with applicable U.S. and foreign laws and regulations, such as import and export requirements, anti-corruption laws, foreign exchange controls and cash repatriation restrictions, environmental laws, labor laws and anti-competition regulations, increases the cost of doing business in foreign jurisdictions. Although we have implemented policies and procedures to comply with these laws and regulations, a violation by any of our employees, contractors or agents could nevertheless occur. In some cases, compliance with the laws and regulations of one country could violate the laws and regulations of another country. Violations of these laws and regulations could materially adversely affect our company's brand, international growth efforts and business.

We may incur significant costs to comply with new or changing environmental, energy, health and safety laws and regulations, and face potential exposure for environmental matters.

Our refinery and pipeline operations are subject to international, federal, state, provincial and local laws regulating, among other things, the generation, storage, handling, use, transportation and distribution of petroleum and hazardous substances by pipeline, truck, rail and barge, the emission and discharge of materials into the environment, waste management, and characteristics and composition of gasoline and diesel fuels, and other matters otherwise relating to the protection of the environment. In addition, as a result of recent acquisitions, we have manufacturing and distribution operations in foreign countries that are subject to environmental laws and regulations of such foreign countries. Permits or other authorizations are required under these laws for the operation of our refineries, pipelines and related operations, and these permits and authorizations are subject to revocation, modification and renewal or

may require operational changes, which may involve significant costs. Furthermore, a violation of permit conditions or other legal or regulatory requirements could result in substantial fines, criminal sanctions, permit revocations, injunctions, and/or refinery shutdowns. In addition, major modifications of our operations due to changes in the law could require changes to our existing permits or expensive upgrades to our existing pollution control equipment, which could have a material adverse effect on our business, financial condition, or results of operations. For example, in October 2015, the EPA lowered the NAAQS for ozone from 75 to 70 parts per billion for both the 8-hour primary and secondary standards. The EPA published a final rule in November 2017 that issued area designations with respect to ground level ozone for approximately 85% of the U.S. counties as either “attainment/unclassifiable” or “unclassifiable.” By final rulemakings published in June and July 2018, the EPA established ozone air quality designations for the areas not addressed in its November 2017 rulemaking. State implementation of the revised NAAQS could result in stricter permitting requirements, delay or prohibit our ability to obtain such permits, and result in increased expenditures for pollution control equipment, the costs of which could be significant. Also, in February 2016, a new EPA rule became effective that amends three refinery standards already in effect, imposing additional or, in some cases, new emission control requirements on subject refineries. The final rule requires, among other things, benzene monitoring at the refinery fence line and submittal of fence line monitoring data to the EPA on a quarterly basis; upgraded storage tank controls requirements, including new applicability thresholds; enhanced performance requirements for flares, continuous monitoring of flares and pressure

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release devices and analysis and remedy of flare release events; and compliance with emissions standards for delayed coking units. Refineries have up to three years from the effective date of the final rule to come into compliance with certain requirements of the rule, such as the performance requirements for flares, while other aspects of the rule require compliance to be achieved at a sooner date. For example, the rule's fence line monitoring requirements became effective January 31, 2018. In July 2016, the EPA issued a final rule providing refiners an additional 18 months to comply with a small subset of the rules related to air emissions resulting from startup, shutdown and maintenance events. In December 2016, the EPA granted petitions for reconsideration from industry and environmental organizations on aspects of the rule related to work practice standards for certain process units and equipment, as well as fence line monitoring requirements. In November 2018, the EPA published amendments to the new rules to clarify and correct certain requirements. These new rules, as well as subsequent rulemaking under the CAA or similar laws, or new agency interpretations of existing laws and regulations, may necessitate additional expenditures in future years and result in increased costs on our operations. Compliance with applicable environmental laws, regulations and permits will continue to have an impact on our operations, results of our operations and capital requirements.

As is the case with all companies engaged in industries similar to ours, we face potential exposure to future claims and lawsuits involving environmental matters. The matters include, but are not limited to, soil, groundwater and waterway contamination, air pollution, personal injury and property damage allegedly caused by substances which we manufactured, handled, used, released or disposed.

We are and have been the subject of various local, state, provincial, federal, international and private proceedings relating to environmental regulations, conditions and inquiries. Current and future environmental regulations are expected to require additional expenditures, including expenditures for investigation and remediation, which may be significant, at our facilities. To the extent that future expenditures for these purposes are material and can be reasonably determined, these costs are disclosed and accrued.

Our operations are also subject to various laws and regulations relating to occupational health and safety. We maintain safety, training and maintenance programs as part of our ongoing efforts to ensure compliance with applicable laws and regulations but cannot guarantee that these efforts will always be successful. Compliance with applicable health and safety laws and regulations has required and continues to require substantial expenditures. Failure to appropriately manage occupational health and safety risks associated with our business could also adversely impact our employees, communities, stakeholders, reputation and results of operations.

The costs of environmental and safety regulations are already significant and compliance with more stringent laws or regulations or adverse changes in the interpretation of existing regulations by government agencies could have an adverse effect on the financial position and the results of our operations and could require substantial expenditures for the installation and operation of systems and equipment that we do not currently possess.

From time to time, new federal energy policy legislation is enacted by the U.S. Congress or the governments of other foreign countries in which we operate. For example, in December 2007, the U.S. Congress passed the Energy Independence and Security Act, which, among other provisions, mandates annually increasing levels for the use of renewable fuels such as ethanol, commencing in 2008 and escalating for 15 years, as well as increasing energy efficiency goals, including higher fuel economy standards for motor vehicles, among other steps. In Canada, fuel content legislation also exists at the federal and provincial level. These statutory mandates may have the impact over time of offsetting projected increases in the demand for refined petroleum products in certain markets, particularly gasoline. In the near term, the new renewable fuel standard presents ethanol production and logistics challenges for both the ethanol and refining industries and may require additional capital expenditures or expenses by us to accommodate increased ethanol use. Other legislative changes may similarly alter the expected demand and supply projections for refined petroleum products in ways that cannot be predicted.

For additional information on regulations and related liabilities or potential liabilities affecting our business, see “Regulation” under Items 1 and 2, “Business and Properties,” and Item 3, “Legal Proceedings.”

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The adoption of climate change legislation or regulations could result in increased operating costs and reduced demand for the refined products we produce.

The EPA has determined that emissions of carbon dioxide, methane and other greenhouse gas emissions, or “GHGs,” present an endangerment to public health and the environment because emissions of such gases are, according to the EPA, contributing to warming of the earth's atmosphere and other climatic changes. Based on these findings, the EPA has begun adopting and implementing regulations to restrict emissions of GHGs under existing provisions of the federal CAA. For example, the EPA adopted rules that require certain large stationary sources to obtain permits to authorize emissions of GHGs. The EPA has also adopted rules requiring the reporting of GHG emissions from specified large GHG emission sources in the United States, including petroleum refineries, on an annual basis. Both the EPA and Environment and Climate Change Canada have adopted regulations that limit GHG emissions from automobiles and light-duty trucks, which may result in a reduction in demand for the refined products that we produce. Similar regulations may exist or be enacted in other foreign countries in which we operate.

Although the U.S. Congress has previously considered legislation to reduce GHG emissions, federal legislative action appears unlikely at this time. Meanwhile, many states have pursued or are considering their own initiatives designed to reduce GHG emissions, such as cap and trade programs, carbon taxes, low carbon fuel standards, and vehicle efficiency standards. Similar measures are being pursued in Canada at the federal and provincial level, and the provinces of Quebec, Ontario, and Alberta have all implemented either cap and trade programs or levied carbon taxes.

The adoption of legislation or regulatory programs to reduce emissions of GHGs could require us to incur increased operating costs, such as costs to purchase and operate emissions control systems, to acquire emissions allowances or comply with new regulatory or reporting requirements. Any such legislation or regulatory programs could also increase the cost of consuming, and thereby reduce demand for, the refined products that we produce. Consequently, legislation and regulatory programs to reduce emissions of GHGs could have an adverse effect on our business, financial condition and results of operations.

Our operations are subject to catastrophic losses, operational hazards and unforeseen interruptions and other disruptive risks for which we may not be adequately insured.

Our operations are subject to catastrophic losses, operational hazards, unforeseen interruptions and other disruptive risks such as natural disasters, adverse weather, accidents, maritime disasters (including those involving marine vessels/terminals), fires, explosions, hazardous materials releases, cyber-attacks, power failures, mechanical failures and other events beyond our control. These events could result in an injury, loss of life, property damage or destruction, as well as a curtailment or an interruption in our operations and may affect our ability to meet marketing commitments.

We may not be able to maintain or obtain insurance of the type and amount we desire at reasonable rates and exclusions from coverage may limit our ability to recover the amount of the full loss in all situations. As a result of market conditions, premiums and deductibles for certain of our insurance policies could increase. In some instances, certain insurance could become unavailable or available only for reduced amounts of coverage. We are not fully insured against all risks incident to our business and therefore, we self-insure certain risks. If any refinery were to experience an interruption in operations, earnings from the refinery could be materially adversely affected (to the extent not recoverable through insurance) because of lost production and repair costs.

The energy industry is highly capital intensive, and the entire or partial loss of individual facilities can result in significant costs to both industry companies, such as us, and their insurance carriers. In recent years, several large energy industry claims have resulted in significant increases in the level of premium costs and deductible periods for participants in the energy industry. As a result of large energy industry claims, insurance companies that have

historically participated in underwriting energy-related facilities may discontinue that practice or demand significantly higher premiums or deductible periods to cover these facilities. If significant changes in the number or financial solvency of insurance underwriters for the energy industry occur, or if other adverse conditions over which we have no control prevail in the insurance market, we may be unable to obtain and maintain adequate insurance at reasonable cost. In addition, we cannot assure you that our insurers will renew our insurance coverage on acceptable terms, if at all, or that we will be able to arrange for adequate alternative coverage in the event of non-renewal. Further, our underwriters could have credit issues that affect their ability to pay claims. If a significant accident or event occurs that is self-insured or not fully insured, it could have a material adverse effect on our business, financial condition and results of operations.

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An impairment of our long-lived assets or goodwill could reduce our earnings or negatively impact our financial condition and results of operations.

An impairment of our long-lived assets or goodwill could reduce our earnings or negatively impact our results of operations and financial condition. We continually monitor our business, the business environment and the performance of our operations to determine if an event has occurred that indicates that a long-lived asset or goodwill may be impaired. If a triggering event occurs, which is a determination that involves judgment, we may be required to utilize cash flow projections to assess our ability to recover the carrying value based on the ability to generate future cash flows. We may also conduct impairment testing based on both the guideline public company and guideline transaction methods. Our long-lived assets and goodwill impairment analyses are sensitive to changes in key assumptions used in our analysis, estimates of future crack spreads, forecasted production levels, operating costs and capital expenditures. If the assumptions used in our analysis are not realized, it is possible a material impairment charge may need to be recorded in the future. We cannot accurately predict the amount and timing of any additional impairments of long-lived assets or goodwill in the future.

As market prices for refined products and market prices for crude oil continue to fluctuate, we will need to continue to evaluate the carrying value of our refinery reporting units. During the year ended December 31, 2016, we recorded goodwill and long-lived asset impairment charges of \$309.3 million and \$344.8 million, respectively, on the carrying value of our Cheyenne Refinery. A reasonable expectation exists that future deterioration in gross margins could result in an impairment of goodwill and the long-lived assets of the El Dorado reporting unit at some point in the future. Any additional impairment charges that we may take in the future could be material to our results of operations and financial condition.

Competition in the refining and marketing industry is intense, and an increase in competition in the markets in which we sell our products could adversely affect our earnings and profitability.

We compete with a broad range of refining and marketing companies, including certain multinational oil companies. Because of their geographic diversity, larger and more complex refineries, integrated operations and greater resources, some of our competitors may be better able to withstand volatile market conditions, to obtain crude oil in times of shortage and to bear the economic risks inherent in all areas of the refining industry.

We are not engaged in petroleum exploration and production activities and do not produce any of the crude oil feedstocks used at our refineries. We do not have a retail business and therefore are dependent upon others for outlets for our refined products. Certain of our competitors, however, obtain a portion of their feedstocks from company-owned production and have retail outlets. Competitors that have their own production or extensive retail outlets, with brand-name recognition, are at times able to offset losses from refining operations with profits from producing or retailing operations, and may be better positioned to withstand periods of depressed refining margins or feedstock shortages.

In recent years there have been several refining and marketing consolidations or acquisitions between entities competing in our geographic market. These transactions could increase the future competitive pressures on us.

The markets in which we compete may be impacted by competitors' plans for expansion projects and refinery improvements that could increase the production of refined products in our areas of operation and significantly affect our profitability.

Also, the potential operation of new or expanded refined product transportation pipelines, or the conversion of existing pipelines into refined product transportation pipelines, could impact the supply of refined products to our existing markets and negatively affect our profitability.

In addition, we compete with other industries that provide alternative means to satisfy the energy and fuel requirements of our industrial, commercial and individual consumers. The more successful these alternatives become as a result of governmental regulations, technological advances, consumer demand, improved pricing or otherwise, the greater the impact on pricing and demand for our products and our profitability. There are presently significant governmental and consumer pressures to increase the use of alternative fuels in the United States.

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A disruption to or proration of the refined product distribution systems or manufacturing facilities we utilize could negatively impact our profitability.

We utilize various common carrier or other third party pipeline systems to deliver our products to market. The key systems utilized by the Cheyenne, El Dorado, Navajo, Woods Cross, and Tulsa Refineries are Rocky Mountain, NuStar Energy and Magellan, SFPP and Plains, Chevron and UNEV, and Magellan, respectively.

All five refineries also utilize systems owned by HEP. If these key pipelines or their associated tanks and terminals become inoperative or decrease the capacity available to us, we may not be able to sell our product, or we may be required to hold our product in inventory or supply products to our customers through an alternative pipeline or by rail or additional tanker trucks from the refinery, all of which could increase our costs and result in a decline in profitability.

We have manufacturing facilities in foreign countries that support the Lubricants and Specialty Products segment. If one of our facilities is damaged or disrupted, resulting in production being halted for an extended period, we may not be able to timely supply our customers. We take steps to mitigate this risk, including business continuity and contingency planning and procuring property and casualty insurance (including business interruption insurance). Nevertheless, the loss of sales in any one region over an extended period of time could have a material adverse effect on our business, financial condition and results of operations.

We may be subject to information technology system failures, network disruptions and breaches in data security. In addition, our business is subject to increasingly stringent data protection requirements.

Information technology system failures, network disruptions (whether intentional by a third party or due to natural disaster), breaches of network or data security, or disruption or failure of the network system used to monitor and control pipeline operations could disrupt our operations by impeding our processing of transactions, our ability to protect customer or company information and our financial reporting. Our computer systems, including our back-up systems, could be damaged or interrupted by power outages, computer and telecommunications failures, computer viruses, internal or external security breaches, events such as fires, earthquakes, floods, tornadoes and hurricanes, and/or errors by our employees. There can be no assurance that a system failure or data security breach will not have a material adverse effect on our financial condition and results of operations.

We are subject to laws, directives, and regulations relating to the collection, use, retention, disclosure, security and transfer of personal data relating to our customers and employees. These laws, directives and regulations, and their interpretation and enforcement continue to evolve and may be inconsistent from jurisdiction to jurisdiction. For example, the General Data Protection Regulation, which went into effect in the European Union on May 25, 2018, applies to all of our activities conducted in the European Union and may also apply to related products and services that we offer to customers in the European Union. Noncompliance with these legal obligations relating to privacy and data protection could result in penalties, legal proceedings by governmental entities or others, and significant legal and financial exposure and could affect our ability to retain and attract customers.

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We may not be able to obtain funding on acceptable terms or at all because of volatility and uncertainty in the credit and capital markets. This may hinder or prevent us from meeting our future capital needs.

The domestic and global financial markets and economic conditions are disrupted and volatile from time to time due to a variety of factors, including low consumer confidence, high unemployment, geoeconomic and geopolitical issues, weak economic conditions and uncertainty in the financial services sector. In addition, the fixed-income markets have experienced periods of extreme volatility, which negatively impacted market liquidity conditions. Recently, the equity and debt markets for many energy industry companies have been adversely affected by low oil prices. As a result, the cost of raising money in the debt and equity capital markets has increased substantially at times while the availability of funds from these markets diminished significantly. In particular, as a result of concerns about the stability of financial markets generally and the solvency of lending counterparties specifically, the cost of obtaining money from the credit markets may increase as many lenders and institutional investors increase interest rates, enact tighter lending standards, refuse to refinance existing debt on similar terms or at all and reduce, or in some cases cease to provide, funding to borrowers. In addition, lending counterparties under any existing revolving credit facility and other debt instruments may be unwilling or unable to meet their funding obligations, or we may experience a decrease in our capacity to issue debt or obtain commercial credit or a deterioration in our credit profile, including a rating agency lowering or withdrawing of our credit ratings if, in its judgment, the circumstances warrant. Due to these factors, we cannot be certain that new debt or equity financing will be available on acceptable terms. If funding is not available when needed, or is available only on unfavorable terms, we may be unable to meet our obligations as they come due or we may be required to sell assets. Moreover, without adequate funding, we may be unable to execute our growth strategy, complete future acquisitions or construction projects, take advantage of other business opportunities or respond to competitive pressures, comply with regulatory requirements, or meet our short-term or long-term working capital requirements, any of which could have a material adverse effect on our revenues and results of operations. Failure to comply with regulatory requirements in a timely manner or meet our short-term or long-term working capital requirements could subject us to regulatory action.

We depend upon HEP for a substantial portion of the crude supply and distribution network that serve our refineries, and we own a significant equity interest in HEP.

At December 31, 2018, we owned a 57% limited partner interest and a non-economic general partner interest in HEP. HEP operates a system of crude oil and petroleum product pipelines; distribution terminals and refinery tankage in Idaho, Kansas, Nevada, New Mexico, Oklahoma, Texas, Utah, Washington and Wyoming and refinery units in Kansas and Utah. HEP generates revenues by charging tariffs for transporting petroleum products and crude oil through its pipelines, leasing certain pipeline capacity to Delek, charging fees for terminalling refined products and other hydrocarbons and storing and providing other services at its terminals. HEP serves the Cheyenne, El Dorado, Navajo, Woods Cross and Tulsa Refineries under several long-term pipeline and terminal, tankage and throughput agreements expiring in 2020 through 2036, serves the El Dorado Refinery under long-term tolling agreements expiring in 2030 and serves the Woods Cross Refinery under long-term tolling agreements expiring in 2031. Furthermore, our financial statements include the consolidated results of HEP. HEP is subject to its own operating and regulatory risks, including, but not limited to:

- its reliance on its significant customers, including us;
- competition from other pipelines;
- environmental regulations affecting pipeline operations;
- operational hazards and risks;
- pipeline tariff regulations affecting the rates HEP can charge;
- limitations on additional borrowings and other restrictions due to HEP's debt covenants; and
- other financial, operational and legal risks.

The occurrence of any of these risks could directly or indirectly affect HEP's as well as our financial condition, results of operations and cash flows as HEP is a consolidated VIE. Additionally, these risks could affect HEP's ability to continue operations which could affect their ability to serve our supply and distribution network needs.

For additional information about HEP, see "Holly Energy Partners, L.P." under Items 1 and 2, "Business and Properties." For risks related to HEP's business, see Item 1A of HEP's Annual Report on Form 10-K for the fiscal year ended December 31, 2018.

We are exposed to the credit risks, and certain other risks, of our key customers and vendors.

We are subject to risks of loss resulting from nonpayment or nonperformance by our customers. We derive a significant portion of our revenues from contracts with key customers.

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If any of our key customers default on their obligations to us, our financial results could be adversely affected. Furthermore, some of our customers may be highly leveraged and subject to their own operating and regulatory risks. In addition, nonperformance by vendors who have committed to provide us with products or services could result in higher costs or interfere with our ability to successfully conduct our business.

Any substantial increase in the nonpayment and/or nonperformance by our customers or vendors could have a material adverse effect on our results of operations and cash flows.

Terrorist attacks (including cyber-attacks), and the threat of terrorist attacks or domestic vandalism, have resulted in increased costs to our business. Continued global hostilities or other sustained military campaigns may adversely impact our results of operations.

The long-term impacts of terrorist attacks and the threat of future terrorist attacks (including cyber-attacks) on the energy transportation industry in general, and on us in particular, are unknown. Increased security measures taken by us as a precaution against possible terrorist attacks or vandalism have resulted in increased costs to our business. Uncertainty surrounding continued global hostilities or other sustained military campaigns, and the possibility that infrastructure facilities could be direct targets of, or indirect casualties of, an act of terror, may affect our operations in unpredictable ways, including disruptions of crude oil supplies and markets for refined products. In addition, disruption or significant increases in energy prices could result in government-imposed price controls. Any one of, or a combination of, these occurrences could have a material adverse effect on our business, financial condition and results of operations.

Changes in the insurance markets attributable to terrorist attacks could make certain types of insurance more difficult for us to obtain. Moreover, the insurance that may be available to us may be significantly more expensive than our existing insurance coverage. Instability in the financial markets as a result of terrorism or war could also affect our ability to raise capital including our ability to repay or refinance debt.

Increases in required fuel economy and regulation of CO₂ emissions from motor vehicles may reduce demand for transportation fuels.

In 2010, the EPA and the National Highway Traffic Safety Administration (“NHTSA”) finalized new standards, raising the required Corporate Average Fuel Economy (“CAFE”) of the nation's passenger fleet by 40% to approximately 35 miles per gallon (“m.p.g.”) by 2016 and imposing the first-ever federal GHG emissions standards on cars and light trucks. In September 2011, the EPA and the Department of Transportation finalized first-time standards for fuel economy of medium and heavy duty trucks. On August 28, 2012, the EPA and NHTSA adopted standards through model year 2025 in two phases. The first phase establishes final standards for 2017-2021 model year vehicles that are projected to require 40.3 - 41.0 m.p.g. in model year 2021 on an average industry fleet-wide basis. The second phase of the CAFE program represents non-final “augural” standards for 2022-2025 model year vehicles that are projected to require 48.7 - 49.7 m.p.g. in model year 2025, on an average industry fleet-wide basis. In 2017, the EPA and NHTSA announced that the agencies were reconsidering the second phase CAFE standards, which could result in maintaining the first phase standards for the 2022-2025 model years. On August 2, 2018, the EPA and NHTSA proposed the Safer Affordable Fuel Economy Rule which amended the existing CAFE standards and proposed new standards covering model years through 2026. A final rule is expected in 2019. Any increases in fuel economy standards, along with mandated increases in use of renewable fuels discussed above, could result in decreasing demand for petroleum fuels. Decreasing demand for petroleum fuels could have a material effect on our financial condition and results of operation.

To successfully operate our petroleum refining facilities, we are required to expend significant amounts for capital outlays and operating expenditures.

The refining business is characterized by high fixed costs resulting from the significant capital outlays associated with refineries, terminals, pipelines and related facilities. We are dependent on the production and sale of quantities of refined products at refined product margins sufficient to cover operating costs, including any increases in costs resulting from future inflationary pressures or market conditions and increases in costs of fuel and power necessary in operating our facilities. Furthermore, future major capital investment, various environmental compliance related projects, regulatory requirements or competitive pressures could result in additional capital expenditures, which may not produce a return on investment. Such capital expenditures may require significant financial resources that may be contingent on our access to capital markets and commercial bank loans. Additionally, other matters, such as regulatory requirements or legal actions, may restrict our access to funds for capital expenditures.

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Our refineries consist of many processing units, a number of which have been in operation for many years. One or more of the units may require unscheduled downtime for unanticipated maintenance or repairs that are more frequent than our scheduled turnaround for such units. Scheduled and unscheduled maintenance could reduce our revenues during the period of time that the units are not operating. We have taken significant measures to expand and upgrade units in our refineries by installing new equipment and redesigning older equipment to improve refinery capacity. The installation and redesign of key equipment at our refineries involves significant uncertainties, including the following: our upgraded equipment may not perform at expected throughput levels; operating costs of the upgraded equipment may be higher than expected; the yield and product quality of new equipment may differ from design and/or specifications and redesign, modification or replacement of the equipment may be required to correct equipment that does not perform as expected, which could require facility shutdowns until the equipment has been redesigned or modified. Any of these risks associated with new equipment, redesigned older equipment, or repaired equipment could lead to lower revenues or higher costs or otherwise have a negative impact on our future financial condition and results of operations.

In addition, we expect to execute turnarounds at our refineries, which involve numerous risks and uncertainties. These risks include delays and incurrence of additional and unforeseen costs. The turnarounds allow us to perform maintenance, upgrades, overhaul and repair of process equipment and materials, during which time all or a portion of the refinery will be under scheduled downtime.

We may be unable to pay future dividends.

We will only be able to pay dividends from our available cash on hand, cash from operations or borrowings under our credit agreement. The declaration of future dividends on our common stock will be at the discretion of our board of directors and will depend upon many factors, including our results of operations, financial condition, earnings, capital requirements, and restrictions in our debt agreements and legal requirements. We cannot assure you that any dividends will be paid or the frequency or amounts of such payments.

Potential product, service or other related liability claims and litigation could adversely affect our business, reputation and results of operations.

A significant portion of our operating responsibility on refined product pipelines is to insure the quality and purity of the products loaded at our loading racks. If our quality control measures were to fail, we may have contaminated or off-specification commingled pipelines and storage tanks or off-specification product could be sent to public gasoline stations. The development, manufacture and sale of specialty lubricant products also involves an inherent risk of exposure to potential product liability claims. These types of incidents could result in product liability claims from our customers. Our Lubricants and Specialty Products segment could also be subject to false advertising claims, product recalls, workplace exposure, product seizures and related adverse publicity.

Any of these incidents is a significant commercial risk. Substantial damage awards have been made in certain jurisdictions against manufacturers and resellers based upon claims for injuries caused by the use of or exposure to various products. There can be no assurance that product liability claims against us would not have a material adverse effect on our business, reputation or results of operations or our ability to maintain existing customers or retain new customers. Although we maintain product and other general liability insurance, there can be no assurance that the types or levels of coverage maintained are adequate to cover these potential risks, or that we will be able to continue to maintain existing insurance or obtain comparable insurance at a reasonable cost, if at all.

In addition, if any party with whom we have a sponsorship relationship were to generate adverse publicity, our company could be harmed. A negative public perception of our company, whether justified or not, could impair our reputation, expose us to litigation, damage our brand equity and have a material adverse effect on our business.

We may be unable to adequately protect our intellectual property, which may limit our ability to compete in our markets.

We have trademarks and patents issued, applied for, or acquired in the United States and in various foreign countries, some of which may prove to be material to our business. Despite our efforts to protect such intellectual property, it is possible that competitors or other unauthorized third parties may obtain, copy, use or disclose our technologies, products, and processes. In addition, the laws and/or judicial systems of foreign countries in which we design, manufacture, market and sell our products may afford little or no effective protection of our intellectual property. These potential risks to our intellectual property could subject us to increased competition and negatively impact our liquidity, financial position and results of operations.

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Our hedging transactions may limit our gains and expose us to other risks.

We periodically enter into derivative transactions as it relates to inventory levels and/or future production to manage the risks from changes in the prices of crude oil, refined products and other feedstocks. These transactions limit our potential gains if commodity prices move above or below the certain price levels established by our hedging instruments. We hedge price risk on inventories above our target levels to minimize the impact these price fluctuations have on our earnings and cash flows. Consequently, our hedging results may fluctuate significantly from one reporting period to the next depending on commodity price fluctuations and our relative physical inventory positions. These transactions may also expose us to risks of financial losses; for example, if our production is less than we anticipated at the time we entered into a hedge agreement or if a counterparty to our hedge agreements fails to perform its obligations under the agreements.

Changes in our credit profile, or a significant increase in the price of crude oil, may affect our relationship with our suppliers, which could have a material adverse effect on our liquidity and limit our ability to purchase sufficient quantities of crude oil to operate our refineries at desired capacity.

An unfavorable credit profile, or a significant increase in the price of crude oil, could affect the way crude oil suppliers view our ability to make payments and induce them to shorten the payment terms of their invoices with us or require credit enhancement. Due to the large dollar amounts and volume of our crude oil and other feedstock purchases, any imposition by our suppliers of more burdensome payment terms or credit enhancement requirements on us may have a material adverse effect on our liquidity and our ability to make payments to our suppliers. This in turn could cause us to be unable to operate our refineries at desired capacity. A failure to operate our refineries at desired capacity could adversely affect our profitability and cash flow.

Our credit facility contains certain covenants and restrictions that may constrain our business and financing activities.

The operating and financial restrictions and covenants in our credit facility and any future financing agreements could adversely affect our ability to finance future operations or capital needs or to engage, expand or pursue our business activities. For example, our revolving credit facility imposes usual and customary requirements for this type of credit facility, including: (i) limitations on liens and indebtedness; (ii) a prohibition on changes in control and (iii) restrictions on engaging in mergers and consolidations. If we fail to satisfy the covenants set forth in the credit facility or another event of default occurs under the credit facility, the maturity of the loan could be accelerated or we could be prohibited from borrowing for our future working capital needs and issuing letters of credit. We might not have, or be able to obtain, sufficient funds to make these immediate payments. If we desire to undertake a transaction that is prohibited by the covenants in our credit facility, we will need to obtain consent under our credit facility. Such refinancing may not be possible or may not be available on commercially acceptable terms.

Our business may suffer due to a departure of any of our key senior executives or other key employees. Furthermore, a shortage of skilled labor or disruptions in our labor force may make it difficult for us to maintain labor productivity.

Our future performance depends to a significant degree upon the continued contributions of our senior management team and key technical personnel. We do not currently maintain key man life insurance, non-compete agreements, or employment agreements with respect to any member of our senior management team. The loss or unavailability to us of any member of our senior management team or a key technical employee could significantly harm us. We face competition for these professionals from our competitors, our customers and other companies operating in our industry. To the extent that the services of members of our senior management team and key technical personnel would be unavailable to us for any reason, we may be required to hire other personnel to manage and operate our company. We may not be able to locate or employ such qualified personnel on acceptable terms, or at all.

Furthermore, our operations require skilled and experienced laborers with proficiency in multiple tasks. A shortage of trained workers due to retirements or otherwise could have an adverse impact on our labor productivity and costs and our ability to expand production in the event there is an increase in the demand for our products and services, which could adversely affect our operations.

As of December 31, 2018, approximately 32% of our employees were represented by labor unions under collective bargaining agreements with various expiration dates. We may not be able to renegotiate our collective bargaining agreements when they expire on satisfactory terms or at all. A failure to do so may increase our costs. In addition, our existing labor agreements may not prevent a strike or work stoppage at any of our facilities in the future, and any work stoppage could negatively affect our results of operations and financial condition.

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The market price of our common stock may fluctuate significantly, and the value of a stockholder's investment could be impacted.

The market price of our common stock may be influenced by many factors, some of which are beyond our control, including:

- our quarterly or annual earnings or those of other companies in our industry;
- changes in accounting standards, policies, guidance, interpretations or principles;
- general economic, industry and stock market conditions;
- the failure of securities analysts to cover our common stock or changes in financial estimates by analysts;
- future sales of our common stock;
- announcements by us or our competitors of significant contracts or acquisitions;
- sales of common stock by us, our senior officers or our affiliates; and/or
- the other factors described in these Risk Factors.

In recent years, the stock market has experienced extreme price and volume fluctuations. This volatility has had a significant impact on the market price of securities issued by many companies, including companies in our industry. The price of our common stock could fluctuate based upon factors that have little or nothing to do with our company, and these fluctuations could materially reduce our stock price.

Item 1B. Unresolved Staff Comments

We do not have any unresolved staff comments.

Item 3. Legal Proceedings

Commitment and Contingency Reserves

We periodically establish reserves for certain legal proceedings. The establishment of a reserve involves an estimation process that includes the advice of legal counsel and subjective judgment of management. While management believes these reserves to be adequate, future changes in the facts and circumstances could result in the actual liability exceeding the estimated ranges of loss and amounts accrued.

While the outcome and impact on us cannot be predicted with certainty, based on advice of counsel, management believes that the resolution of these proceedings through settlement or adverse judgment will not either individually or in the aggregate have a materially adverse effect on our financial condition, results of operations or cash flows.

Environmental Matters

We are reporting the following proceedings to comply with SEC regulations which require us to disclose proceedings arising under provisions regulating the discharge of materials into the environment or protecting the environment if we reasonably believe that such proceedings may result in monetary sanctions of \$100,000 or more. Our respective subsidiaries have or will develop corrective action plans regarding these disclosures that will be implemented in consultation with the respective federal and state agencies. It is not possible to predict the ultimate outcome of these proceedings, although none are currently expected to have a material effect on our financial condition, results of operations or cash flows.

Cheyenne

HollyFrontier Cheyenne Refining LLC (“HFCR”) has been engaged in discussions with the Wyoming Department of Environmental Quality (“WDEQ”) relating to Notices of Violations issued in late 2016 and 2018 for possible violations of air quality standards related to operation of certain refinery units at the Cheyenne Refinery in 2016 and 2017. HFCR and the WDEQ are working towards settlement of these matters.

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El Dorado

HollyFrontier El Dorado Refining LLC (“HFEDR”) is engaged in discussions with, and has responded to document requests from, the EPA and the U.S. Department of Justice (“DOJ”) regarding potential Clean Air Act violations relating to flaring devices and other equipment at the refinery. Topics of the discussions include (a) three information requests for activities occurring January 1, 2009 through May 31, 2014 and a September 2017 incident, (b) Risk Management Program compliance issues relating to a November 2014 inspection and (c) a Notice of Violation issued by the EPA in August 2017. HFEDR will continue to work with the EPA and DOJ to resolve these matters.

Tulsa

HollyFrontier Tulsa Refining LLC (“HFTR”) operates under two Consent Decrees with the EPA and the Oklahoma Department of Environmental Quality (“ODEQ”). On December 13, 2017, during a meeting between the parties, ODEQ proposed stipulated penalties related to violations of the two Consent Decrees. The violations relate to Clean Air Act regulated fuel gas and flare operations. HFTR is working with the ODEQ and the EPA to document a settlement agreement.

Other

We are a party to various other litigation and proceedings that we believe, based on advice of counsel, will not either individually or in the aggregate have a materially adverse impact on our financial condition, results of operations or cash flows.

Item 4. Mine Safety Disclosures

Not Applicable.

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PART II

Item 5. Market for the 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 trading symbol "HFC."

In September 2018, our Board of Directors approved a \$1 billion share repurchase program, which replaced all existing share repurchase programs, authorizing us to repurchase common stock in the open market or through privately negotiated transactions. The timing and amount of stock repurchases will depend on market conditions and corporate, regulatory and other relevant considerations. This program may be discontinued at any time by the Board of Directors. The following table includes repurchases made under this program during the fourth quarter of 2018.

Period	Total Number of Shares Purchased	Average Price Paid Per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Maximum Dollar Value of Shares that May Yet Be Purchased under the Plans or Programs
October 2018	1,360,987	\$ 66.34	1,360,987	\$ 859,039,458
November 2018	450,000	\$ 61.36	450,000	\$ 831,427,985
December 2018	912,360	\$ 53.93	810,000	\$ 787,613,605
Total for October to December 2018	2,723,347		2,620,987	

During the quarter ended December 31, 2018, 102,360 shares were withheld from certain executives and employees under the terms of our share-based compensation agreements to provide funds for the payment of payroll and income taxes due at vesting of restricted stock awards.

As of February 13, 2019, we had approximately 97,419 stockholders, including beneficial owners holding shares in street name.

We intend to consider the declaration of a dividend on a quarterly basis, although there is no assurance as to future dividends since they are dependent upon future earnings, capital requirements, our financial condition and other factors.

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Item 6. Selected Financial Data

The following table shows our selected financial information as of the dates or for the periods indicated. This table should be read in conjunction with Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our consolidated financial statements and related notes thereto included elsewhere in this Annual Report on Form 10-K.

	Years Ended December 31,				
	2018	2017	2016	2015	2014
	(In thousands, except per share data)				
FINANCIAL DATA					
For the period					
Sales and other revenues	\$ 17,714,666	\$ 14,251,299	\$ 10,535,700	\$ 13,237,920	\$ 19,764,327
Income (loss) before income taxes	1,524,467	868,863	(171,534)	1,208,568	467,500
Income tax expense (benefit)	347,243	(12,379)	19,411	406,060	141,172
Net income (loss)	1,177,224	881,242	(190,945)	802,508	326,328
Less net income attributable to noncontrolling interest	79,264	75,847	69,508	62,407	45,036
Net income (loss) attributable to HollyFrontier stockholders	\$ 1,097,960	\$ 805,395	\$ (260,453)	\$ 740,101	\$ 281,292
Earnings (loss) per share attributable to HollyFrontier stockholders - basic	\$ 6.25	\$ 4.54	\$ (1.48)	\$ 3.91	\$ 1.42
Earnings (loss) per share attributable to HollyFrontier stockholders - diluted	\$ 6.19	\$ 4.52	\$ (1.48)	\$ 3.90	\$ 1.42
Cash dividends declared per common share	\$ 1.32	\$ 1.32	\$ 1.32	\$ 1.31	\$ 3.26
Average number of common shares outstanding:					
Basic	175,009	176,174	176,101	188,731	197,243
Diluted	176,661	177,196	176,101	188,940	197,428
Net cash provided by operating activities	\$ 1,554,416	\$ 951,390	\$ 606,948	\$ 985,868	\$ 758,596
Net cash used for investing activities	\$ (360,520)	\$ (959,670)	\$ (801,597)	\$ (381,748)	\$ (292,322)
Net cash provided by (used for) financing activities	\$ (664,328)	\$ (72,630)	\$ 838,695	\$ (1,105,572)	\$ (838,392)
At end of period					
Cash, cash equivalents and investments in marketable securities	\$ 1,154,752	\$ 630,757	\$ 1,134,727	\$ 210,552	\$ 1,042,095
Working capital	\$ 2,128,224	\$ 1,640,118	\$ 1,767,780	\$ 587,450	\$ 1,549,004
Total assets	\$ 10,994,601	\$ 10,692,154	\$ 9,435,661	\$ 8,388,299	\$ 9,230,047
Total debt	\$ 2,411,540	\$ 2,498,993	\$ 2,235,137	\$ 1,040,040	\$ 1,054,297
Total equity	\$ 6,459,059	\$ 5,896,940	\$ 5,301,985	\$ 5,809,773	\$ 6,100,719

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Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

This Item 7 contains "forward-looking" statements. See "Forward-Looking Statements" at the beginning of this Annual Report on Form 10-K. In this document, the words "we," "our," "ours" and "us" refer only to HollyFrontier and its consolidated subsidiaries or to HollyFrontier or an individual subsidiary and not to any other person with certain exceptions. Generally, the words "we," "our," "ours" and "us" include HEP and its subsidiaries as consolidated subsidiaries of HollyFrontier, unless when used in disclosures of transactions or obligations between HEP and HollyFrontier or its other subsidiaries. This document contains certain disclosures of agreements that are specific to HEP and its consolidated subsidiaries and do not necessarily represent obligations of HollyFrontier. When used in descriptions of agreements and transactions, "HEP" refers to HEP and its consolidated subsidiaries.

Overview

We are an independent petroleum refiner and marketer that produces high-value light products such as gasoline, diesel fuel, jet fuel and other specialty products. We own and operate refineries located in Kansas, Oklahoma, New Mexico, Wyoming and Utah and market our refined products principally in the Southwest U.S., the Rocky Mountains extending into the Pacific Northwest and in other neighboring Plains states. In addition, we produce base oils and other specialized lubricants in the U.S., Canada and the Netherlands, and export products to more than 80 countries. We also own a 57% limited partner interest and a non-economic general partner interest in HEP, a master limited partnership that provides petroleum product and crude oil transportation, terminalling, storage and throughput services to the petroleum industry, including HollyFrontier Corporation subsidiaries.

On November 12, 2018, we entered into an equity purchase agreement to acquire 100% of the issued and outstanding capital stock of Sonneborn. The acquisition closed on February 1, 2019. Cash consideration paid was \$660.0 million. Sonneborn is a producer of specialty hydrocarbon chemicals such as white oils, petrolatums and waxes with manufacturing facilities in the United States and Europe.

On July 10, 2018, we entered into a definitive agreement to acquire Red Giant Oil, a privately-owned lubricants company. The acquisition closed on August 1, 2018. Cash consideration paid was \$54.2 million. Red Giant Oil is one of the largest suppliers of locomotive engine oil in North America and is headquartered in Council Bluffs, Iowa with storage and distribution facilities in Iowa, Kansas, Utah and Wyoming, along with a blending and packaging facility in Texas.

On October 29, 2016, we entered into a share purchase agreement with Suncor to acquire 100% of the outstanding capital stock of PCLI. The acquisition closed on February 1, 2017. Cash consideration paid was \$862.1 million, or \$1.125 billion Canadian dollars. PCLI is a Canadian-based producer of base oils with a plant having 15,600 BPD of lubricant production capacity that is located in Mississauga, Ontario. The facility is downstream integrated from base oils to finished lubricants and produces a broad spectrum of specialty lubricants and white oils that are distributed to end customers worldwide through a global sales network with locations in Canada, the United States, Europe and China.

For the year ended December 31, 2018, net income attributable to HollyFrontier stockholders was \$1,098.0 million compared to net income of \$805.4 million and a net loss of \$260.5 million for the years ended December 31, 2017, and 2016, respectively. Overall gross refining margins per produced barrel sold for 2018 increased 53% over the year ended December 31, 2017 due to higher crack spreads and crude oil basis differentials.

Pursuant to the 2007 Energy Independence and Security Act, the EPA promulgated the RFS regulations, which increased the volume of renewable fuels mandated to be blended into the nation's fuel supply. The regulations, in part,

require refiners to add annually increasing amounts of “renewable fuels” to their petroleum products or purchase credits, known as RINs, in lieu of such blending. Compliance with RFS regulations significantly increases our cost of products sold, with RINs costs totaling \$184.0 million for the year ended December 31, 2018, which is net of the \$97.0 million cost reduction resulting from small refinery RINs waivers granted by the EPA in 2018 as described in Note 8 “Inventories” in the Notes to Consolidated Financial Statements.

OUTLOOK

Going into 2019, despite tightening crude differentials, we are optimistic that strength in the diesel markets will continue, and we expect to see a seasonal rebound in gasoline markets. For the first quarter 2019, we expect to run between 400,000 and 410,000 barrels per day of crude oil, primarily driven by the scheduled turnaround in mid-February at our Tulsa refinery.

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In our Lubricants and Specialty Products segment, the Rack Forward business continues to perform well based on strong macroeconomic conditions that support healthy demand and pricing for finished products. We expect this to be offset somewhat by further cyclical weakness and oversupply in the base oil markets which will depress Rack Back earnings in 2019.

At HEP, we anticipate an annual distribution growth rate of 2% and coverage to average 1.0x for the full year of 2019 with higher coverage ratios expected in the second half of the year due to contractual tariff escalators.

A more detailed discussion of our financial and operating results for the years ended December 31, 2018, 2017 and 2016 is presented in the following sections.

Results Of Operations

Financial Data

	Years Ended December 31,		
	2018	2017	2016
	(In thousands, except per share data)		
Sales and other revenues	\$ 17,714,666	\$ 14,251,299	\$ 10,535,700
Operating costs and expenses:			
Cost of products sold (exclusive of depreciation and amortization):			
Cost of products sold (exclusive of lower of cost or market inventory valuation adjustment)	13,940,782	11,467,873	8,766,027
Lower of cost or market inventory valuation adjustment	136,305	(108,685)	(291,938)
Operating expenses (exclusive of depreciation and amortization)	14,077,087	11,359,188	8,474,089
Selling, general and administrative expenses (exclusive of depreciation and amortization)	1,285,838	1,296,669	1,021,152
Depreciation and amortization	290,424	265,721	125,930
Goodwill and asset impairment	437,324	409,937	363,027
Total operating costs and expenses	—	19,247	654,084
Income (loss) from operations	16,090,673	13,350,762	10,638,282
Other income (expense):	1,623,993	900,537	(102,582)
Earnings of equity method investments	5,825	12,510	14,213
Interest income	16,892	3,736	2,491
Interest expense	(131,363)	(117,597)	(72,192)
Loss on early extinguishment of debt	—	(12,225)	(8,718)
Gain on foreign currency transactions	6,197	16,921	—
Gain (loss) on foreign currency swap	—	24,545	(6,520)
Remeasurement gain on HEP pipeline interest acquisitions	—	36,254	—
Other, net	2,923	4,182	1,774
Income (loss) before income taxes	(99,526)	(31,674)	(68,952)
Income tax expense (benefit)	1,524,467	868,863	(171,534)
Net income (loss)	347,243	(12,379)	19,411
Less net income attributable to noncontrolling interest	1,177,224	881,242	(190,945)
Net income (loss) attributable to HollyFrontier stockholders	79,264	75,847	69,508
Earnings (loss) per share attributable to HollyFrontier stockholders:	\$ 1,097,960	\$ 805,395	\$ (260,453)
Basic	\$ 6.25	\$ 4.54	\$ (1.48)

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Diluted	\$6.19	\$4.52	\$(1.48)
Cash dividends declared per common share	\$1.32	\$1.32	\$1.32
Average number of common shares outstanding:			
Basic	175,009	176,174	176,101
Diluted	176,661	177,196	176,101

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Other Financial Data

	Years Ended December 31,		
	2018	2017	2016
	(In thousands)		
Net cash provided by operating activities	\$1,554,416	\$951,390	\$606,948
Net cash used for investing activities	\$(360,520)	\$(959,670)	\$(801,597)
Net cash provided by (used for) financing activities	\$(664,328)	\$(72,630)	\$838,695
Capital expenditures	\$311,029	\$272,259	\$479,790
EBITDA ⁽¹⁾	\$1,996,998	\$1,316,814	\$191,686

Earnings before interest, taxes, depreciation and amortization, which we refer to as “EBITDA,” is calculated as net income (loss) attributable to HollyFrontier stockholders plus (i) interest expense, net of interest income, (ii) income tax provision, and (iii) depreciation and amortization. EBITDA is not a calculation provided for under GAAP; however, the amounts included in the EBITDA calculation are derived from amounts included in our consolidated financial statements. EBITDA should not be considered as an alternative to net income or operating income as an (1) indication of our operating performance or as an alternative to operating cash flow as a measure of liquidity.

EBITDA is not necessarily comparable to similarly titled measures of other companies. EBITDA is presented here because it is a widely used financial indicator used by investors and analysts to measure performance. EBITDA is also used by our management for internal analysis and as a basis for financial covenants. EBITDA presented above is reconciled to net income under “Reconciliations to Amounts Reported Under Generally Accepted Accounting Principles” following Item 7A of Part II of this Form 10-K.

Supplemental Segment Operating Data

Our operations are organized into three reportable segments, Refining, Lubricants and Specialty Products and HEP. See Note 20 “Segment Information” in the Notes to Consolidated Financial Statements for additional information on our reportable segments.

Refining Segment Operating Data

Our refinery operations include the El Dorado, Tulsa, Navajo, Cheyenne and Woods Cross Refineries. The following tables set forth information, including non-GAAP performance measures, about our consolidated refinery operations. The cost of products and refinery gross and net operating margins do not include the non-cash effects of goodwill and asset impairments charges, lower of cost or market inventory valuation adjustments and depreciation and amortization. Reconciliations to amounts reported under GAAP are provided under “Reconciliations to Amounts Reported Under Generally Accepted Accounting Principles” following Item 7A of Part II of this Form 10-K.

	Years Ended December 31,		
	2018	2017	2016
Consolidated			
Crude charge (BPD) ⁽¹⁾	431,570	438,800	423,910
Refinery throughput (BPD) ⁽²⁾	463,340	472,010	457,480
Sales of produced refined products (BPD) ⁽³⁾	452,630	452,270	440,640
Refinery utilization ⁽⁴⁾	94.4 %	96.0 %	92.8 %
Average per produced barrel sold ⁽⁵⁾			
Refinery gross margin ⁽⁶⁾	\$17.71	\$11.56	\$8.16
Refinery operating expenses ⁽⁷⁾	6.39	6.11	5.65
Net operating margin	\$11.32	\$5.45	\$2.51
Refinery operating expenses per throughput barrel ⁽⁸⁾	\$6.24	\$5.86	\$5.45

- (1) Crude charge represents the barrels per day of crude oil processed at our refineries.
- (2) Refinery throughput represents the barrels per day of crude and other refinery feedstocks input to the crude units and other conversion units at our refineries.
- (3) Represents barrels sold of refined products produced at our refineries (including HFC Asphalt) and does not include volumes of refined products purchased for resale or volumes of excess crude oil sold.
- (4) Represents crude charge divided by total crude capacity (BPSD). Our consolidated crude capacity is 457,000 BPSD.
Represents average amount per produced barrel sold, which is a non-GAAP measure. Reconciliations to amounts reported under GAAP are provided under “Reconciliations to Amounts Reported Under Generally Accepted Accounting Principles” following Item 7A of Part II of this Form 10-K.

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- (6) Excludes lower of cost or market inventory valuation adjustments.
- (7) Represents total refining segment operating expenses, exclusive of depreciation and amortization, divided by sales volumes of refined products produced at our refineries.
- (8) Represents total refining segment operating expenses, exclusive of depreciation and amortization, divided by refinery throughput.

Lubricants and Specialty Products Segment Operating Data

The following table sets forth information about our lubricants and specialty products operations and includes our Petro-Canada Lubricants business for the period February 1, 2017 (date of acquisition) through December 31, 2017. Red Giant Oil is included for the period August 1, 2018 (date of acquisition) through December 31, 2018.

	Years Ended December 31,		
Lubricants and Specialty Products	2018	2017	2016
Throughput (BPD)	19,590	21,710	—
Barrels sold (BPD)	30,510	32,910	12,030

Our Lubricants and Specialty Products segment includes base oil production activities, by-product sales to third parties and intra-segment base oil sales to rack forward referred to as “rack back.” “Rack forward” includes the purchase of base oils and the blending, packaging, marketing and distribution and sales of finished lubricants and specialty products to third parties. Supplemental financial data attributable to our Lubricants and Specialty Products segment is presented below:

	Rack Back (1)	Rack Forward (2)	Eliminations (3)	Total Lubricants and Specialty Products
(In thousands)				
Year Ended December 31, 2018				
Sales and other revenues	\$682,892	\$1,650,056	\$(520,245)	\$1,812,703
Cost of products sold	633,459	1,268,326	(520,245)	1,381,540
Operating expenses	111,155	56,665	—	167,820
Selling, general and administrative expenses	32,086	111,664	—	143,750
Depreciation and amortization	26,955	16,300	—	43,255
Income (loss) from operations	\$(120,763)	\$197,101	\$—	\$76,338
Year Ended December 31, 2017				
Sales and other revenues	\$621,153	\$1,415,842	\$(442,959)	\$1,594,036
Cost of products sold (exclusive of lower of cost or market inventory valuation adjustment)	504,782	1,032,161	(442,959)	1,093,984
Lower of cost or market inventory valuation adjustment	—	(1,206)	—	(1,206)
Operating expenses	95,303	127,158	—	222,461
Selling, general and administrative expenses	27,764	77,902	—	105,666
Depreciation and amortization	23,471	8,423	—	31,894
Income (loss) from operations	\$(30,167)	\$171,404	\$—	\$141,237
Year Ended December 31, 2016				
Sales and other revenues	\$—	\$464,359	\$—	\$464,359
	—	377,136	—	377,136

Cost of products sold (exclusive of lower of cost or market inventory valuation adjustment)				
Lower of cost or market inventory valuation adjustment	—	(4,090) —	
Operating expenses	—	13,867	—	13,867
Selling, general and administrative expenses	—	2,899	—	2,899
Depreciation and amortization	—	620	—	620
Income from operations	\$—	\$73,927	\$—	\$73,927

- (1) Rack back consists of our PCLI base oil production activities, by-product sales to third parties and intra-segment base oil sales to rack forward.
- (2) Rack forward activities include the purchase of base oils from rack back and the blending, packaging, marketing and distribution and sales of finished lubricants and specialty products to third parties.

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(3) Intra-segment sales of rack back produced base oils to rack forward are eliminated under the “Eliminations” column.

Results of Operations – Year Ended December 31, 2018 Compared to Year Ended December 31, 2017

Summary

Net income attributable to HollyFrontier stockholders for the year ended December 31, 2018 was \$1,098.0 million (\$6.25 per basic and \$6.19 per diluted share), a \$292.6 million increase compared to net income attributable to HollyFrontier stockholders of \$805.4 million (\$4.54 per basic and \$4.52 per diluted share) for the year ended December 31, 2017. Net income increased due principally to an increase in gross refining margins. For the year ended December 31, 2018, lower of cost or market inventory reserve adjustments decreased pre-tax earnings by \$136.3 million compared to an increase of \$108.7 million for the year ended December 31, 2017. Refinery gross margins for the year ended December 31, 2018 increased to \$17.71 per produced barrel from \$11.56 for the year ended December 31, 2017. During 2018, our Cheyenne Refinery was granted a one-year small refinery exemption from the EPA for the 2015 and 2017 calendar years and our Woods Cross Refinery was granted a one-year small refinery exemption for 2017. As a result of these exemptions, we recorded reductions totaling \$97.0 million to our cost of products sold. During 2017, our Cheyenne Refinery and Woods Cross Refinery were each granted a one-year small refinery exemption from the EPA at which time we recorded a \$57.8 million decrease to our cost of products sold, reflecting the reinstatement of RINs previously expensed in 2016.

Sales and Other Revenues

Sales and other revenues increased 24% from \$14,251.3 million for the year ended December 31, 2017 to \$17,714.7 million for the year ended December 31, 2018 due to a year-over-year increase in sales prices. Sales and other revenues for the years ended December 31, 2018 and 2017 include \$108.4 million and \$77.2 million, respectively, in HEP revenues attributable to pipeline and transportation services provided to unaffiliated parties. Additionally, sales and other revenues included \$1,799.5 million and \$1,594.0 million in unaffiliated revenues related to our Lubricants and Specialty Products segment for the years ended December 31, 2018 and 2017.

Cost of Products Sold

Total cost of products sold increased 24% from \$11,359.2 million for the year ended December 31, 2017 to \$14,077.1 million for the year ended December 31, 2018, due principally to higher crude oil costs. Additionally, for the year ended December 31, 2018, we recognized a \$136.3 million lower of cost or market inventory valuation charge compared to a benefit of \$108.7 million for the same period of 2017, resulting in a new \$360.1 million inventory reserve at December 31, 2018. The reserve at December 31, 2018 is based on market conditions and prices at that time. During the years ended December 31, 2018 and 2017, we recorded \$97.0 million and \$57.8 million, respectively, RINs cost reduction as a result of our Cheyenne Refinery and Woods Cross Refinery small refinery exemptions.

Gross Refinery Margins

Gross refinery margin per barrel sold increased 53% from \$11.56 for the year ended December 31, 2017 to \$17.71 for the year ended December 31, 2018. This was due to the effects of an increase in the average per barrel sold sales price, partially offset by increased crude oil and feedstock prices during the current year. Gross refinery margin does not include the non-cash effects of lower of cost or market inventory valuation adjustments, asset impairment charges or depreciation and amortization. See “Reconciliations to Amounts Reported Under Generally Accepted Accounting Principles” following Item 7A of Part II of this Form 10-K for a reconciliation to the income statement of sale prices of products sold and cost of products purchased.

Operating Expenses

Operating expenses, exclusive of depreciation and amortization, decreased 1% from \$1,296.7 million for the year ended December 31, 2017 to \$1,285.8 million for the year ended December 31, 2018 due principally to lower purchased fuel costs, partially offset by higher repair and maintenance costs as a result of a fire and resulting damage at our Woods Cross Refinery in March 2018.

Selling, General and Administrative Expenses

Selling, general and administrative expenses increased 9% from \$265.7 million for the year ended December 31, 2017 to \$290.4 million for the year ended December 31, 2018, due principally to higher legal and professional fees, salary costs and enterprise system initiatives. Additionally, we incurred \$3.6 million in integration costs of our Petro-Canada Lubricants business during the year ended December 31, 2018 compared to \$27.9 million during the year ended December 31, 2017.

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Depreciation and Amortization Expenses

Depreciation and amortization increased 7% from \$409.9 million for the year ended December 31, 2017 to \$437.3 million for the year ended December 31, 2018. This increase was due principally to depreciation and amortization attributable to capitalized improvement projects and capitalized refinery turnaround costs.

Asset Impairment

During the year ended December 31, 2017, we recorded a \$19.2 million long-lived asset impairment charge resulting from management's plan to cease further expansion of our Woods Cross Refinery to add lubricants production. See Note 10 "Goodwill, Long-lived Assets and Intangibles" in the Notes to Consolidated Financial Statements for additional information on this impairment.

Interest Income

Interest income for the year ended December 31, 2018 was \$16.9 million compared to \$3.7 million for the year ended December 31, 2017. This increase was due to higher interest rates and higher cash balances during 2018.

Interest Expense

Interest expense was \$131.4 million for the year ended December 31, 2018 compared to \$117.6 million for the year ended December 31, 2017. This increase was due to interest attributable to higher debt levels and market interest rate increases during the current year relative to 2017. For the years ended December 31, 2018 and 2017, interest expense included \$71.9 million and \$58.4 million, respectively, in interest costs attributable to HEP operations.

Loss on Early Extinguishment of Debt

For the year ended December 31, 2017, a \$12.2 million loss was recorded upon HEP's redemption of its \$300 million aggregate principal amount of 6.5% senior notes maturing March 2020 at a cost of \$309.8 million.

Gain on Foreign Currency Transactions

Remeasurement adjustments resulting from the conversion of the intercompany financing structure on our PCLI acquisition from local currencies to the U.S. dollar resulted in \$6.2 million and \$16.9 million gains for the years ended December 31, 2018 and 2017, respectively. The \$6.2 million gain for 2018 consists of a \$41.8 million gain on foreign exchange forward contracts (utilized as an economic hedge), net of a \$35.6 million remeasurement loss on our intercompany financing structure.

Gain on Foreign Currency Swap

During the year ended December 31, 2017, we recorded a \$24.5 million gain on currency swap contracts that effectively fixed the conversion rate on \$1.125 billion Canadian dollars (the PCLI purchase price), which were settled on February 1, 2017, in connection with the closing of the PCLI acquisition.

Income Taxes

For the year ended December 31, 2018, we recorded an income tax expense of \$347.2 million compared to an income tax benefit of \$12.4 million for the year ended December 31, 2017. Our effective tax rates, before consideration of earnings attributable to the noncontrolling interest, were 22.8% and (1.4)% for the years ended December 31, 2018 and 2017, respectively. During the year ended December 31, 2017, we recorded a tax benefit of \$307.1 million as a result of the Tax Cut and Jobs Act which was enacted on December 22, 2017.

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Results of Operations – Year Ended December 31, 2017 Compared to Year Ended December 31, 2016

Summary

Net income attributable to HollyFrontier stockholders for the year ended December 31, 2017 was \$805.4 million (\$4.54 per basic and \$4.52 per diluted share), a \$1,065.8 million increase compared to a net loss attributable to HollyFrontier stockholders of \$260.5 million (\$1.48 per basic and diluted share) for the year ended December 31, 2016. Net income increased due principally to an increase in refining segment sales volumes and gross refining margins and the inclusion of earnings attributable to the operations of our Petro-Canada Lubricants business acquired in 2017. Additionally, we recorded long-lived asset impairment charges totaling \$23.2 million for the year ended December 31, 2017 compared to goodwill and long-lived asset impairment charges totaling \$654.1 million for the year ended December 31, 2016. For the year ended December 31, 2017, lower of cost or market inventory reserve adjustments increased pre-tax earnings by \$108.7 million compared to \$291.9 million for the year ended December 31, 2016. Refinery gross margins for the year ended December 31, 2017 increased to \$11.56 per barrel sold from \$8.16 for the year ended December 31, 2016. During 2017, our Cheyenne Refinery and Woods Cross Refinery were each granted a one-year small refinery exemption from the EPA at which time we recorded a \$30.5 million and \$27.3 million, respectively, decrease to our cost of products sold, reflecting the reinstatement of RINs previously expensed in 2016. The Tax Cut and Jobs Act was enacted on December 22, 2017, resulting in a tax benefit of \$307.1 million for the year ended December 31, 2017.

Sales and Other Revenues

Sales and other revenues increased 35% from \$10,535.7 million for the year ended December 31, 2016 to \$14,251.3 million for the year ended December 31, 2017 due to a year-over-year increase in sales prices and higher product sales volumes. Sales and other revenues for the years ended December 31, 2017 and 2016 include \$77.2 million and \$68.9 million, respectively, in HEP revenues attributable to pipeline and transportation services provided to unaffiliated parties. Additionally, the operations of our Petro-Canada Lubricants business contributed \$1,125.3 million in sales and other revenues to our Lubricants and Specialty Products segment for the year ended December 31, 2017.

Cost of Products Sold

Total cost of products sold increased 34% from \$8,474.1 million for the year ended December 31, 2016 to \$11,359.2 million for the year ended December 31, 2017, due principally to higher crude oil costs and higher sales volumes of products. Additionally, cost of products sold reflects a \$108.7 million benefit that is attributable to a decrease in the lower of cost or market reserve for the year ended December 31, 2017, a \$183.3 million decrease compared to \$291.9 million for the same period in 2016. The reserve at December 31, 2017 is based on market conditions and prices at that time. Additionally, we recorded a \$30.5 million and \$27.3 million RINs cost reduction during 2017 as a result of the reinstatement of previously utilized RINs following our Cheyenne Refinery and Woods Cross Refinery, respectively, small refinery exemptions.

Gross Refinery Margins

Gross refinery margin per barrel sold increased 42% from \$8.16 for the year ended December 31, 2016 to \$11.56 for the year ended December 31, 2017. This was due to the effects of an increase in the average per barrel sold sales price, partially offset by increased crude oil and feedstock prices during 2017. Gross refinery margin does not include the non-cash effects of lower of cost or market inventory valuation adjustments, goodwill and asset impairment charges or depreciation and amortization. See “Reconciliations to Amounts Reported Under Generally Accepted Accounting Principles” following Item 7A of Part II of this Form 10-K for a reconciliation to the income statement of sale prices of products sold and cost of products purchased.

Operating Expenses

Operating expenses, exclusive of depreciation and amortization, increased 27% from \$1,021.2 million for the year ended December 31, 2016 to \$1,296.7 million for the year ended December 31, 2017 due principally to \$208.7 million

in costs attributable to the operations of our Petro-Canada Lubricants business and higher purchased fuel costs compared to 2016.

Selling, General and Administrative Expenses

Selling, general and administrative expenses increased 111% from \$125.9 million for the year ended December 31, 2016 to \$265.7 million for the year ended December 31, 2017, due principally to \$128.3 million in costs attributable to the operations of our Petro-Canada Lubricants business and related acquisition and integration costs. Incremental direct acquisition and integration costs of our Petro-Canada Lubricants business totaled \$27.9 million and \$13.4 million for the years ended December 31, 2017 and 2016, respectively.

Depreciation and Amortization Expenses

Depreciation and amortization increased 13% from \$363.0 million for the year ended December 31, 2016 to \$409.9 million for the year ended December 31, 2017. This increase was due principally to \$30.9 million in depreciation and amortization expenses attributable to the operations of our Petro-Canada Lubricants business and capitalized improvement projects and capitalized refinery turnaround costs.

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Goodwill and Asset Impairment

During the year ended December 31, 2017, we recorded a \$19.2 million long-lived asset impairment charge resulting from management's plan to cease further expansion of our Woods Cross Refinery to add lubricants production compared to goodwill and long-lived asset impairment charges of \$309.3 million and \$344.8 million, respectively, for the year ended December 31, 2016 that related to our Cheyenne Refinery. See Note 10 "Goodwill, Long-lived Assets and Intangibles" in the Notes to Consolidated Financial Statements for additional information on these impairments.

Interest Income

Interest income for the year ended December 31, 2017 was \$3.7 million compared to \$2.5 million for the year ended December 31, 2016. This increase was due to higher interest rates received on cash balances during 2017.

Interest Expense

Interest expense was \$117.6 million for the year ended December 31, 2017 compared to \$72.2 million for the year ended December 31, 2016. This increase was due to interest attributable to higher debt levels during 2017 relative to 2016. For the years ended December 31, 2017 and 2016, interest expense included \$58.4 million and \$52.6 million, respectively, in interest costs attributable to HEP operations.

Loss on Early Extinguishment of Debt

For the year ended December 31, 2017, a \$12.2 million loss was recorded upon HEP's redemption of its \$300 million aggregate principal amount of 6.5% senior notes maturing March 2020 at a cost of \$309.8 million.

For the year ended December 31, 2016, we recognized an \$8.7 million loss on the early retirement of a financing arrangement, a component of outstanding debt, upon HEP's purchase of crude oil tanks from an affiliate of Plains. See Note 12 "Debt" in the Notes to Consolidated Financial Statements for additional information on this financing arrangement.

Gain on Foreign Currency Transactions

Remeasurement adjustments resulting from the conversion of the intercompany financing structure on our PCLI acquisition from local currencies to the U.S. dollar resulted in a \$16.9 million gain for the year ended December 31, 2017.

Gain (Loss) on Foreign Currency Swap

During the years ended December 31, 2017 and 2016, we recorded a \$24.5 million gain and a \$6.5 million loss, respectively, on currency swap contracts that effectively fixed the conversion rate on \$1.125 billion Canadian dollars (the PCLI purchase price), which were settled on February 1, 2017, in connection with the closing of the PCLI acquisition.

Income Taxes

For the year ended December 31, 2017, we recorded a net income tax benefit of \$12.4 million compared to an income tax expense of \$19.4 million for the year ended December 31, 2016. Our effective tax rates, before consideration of earnings attributable to the noncontrolling interest, were (1.4)% and (11.3)% for the years ended December 31, 2017 and 2016, respectively. During the year ended December 31, 2017, we recorded a tax benefit of \$307.1 million as a result of the Tax Cut and Jobs Act which was enacted on December 22, 2017. During the year ended December 31, 2016, we recorded a \$309.3 million goodwill impairment charge, a significant driver of our \$171.5 million loss before income taxes for the year ended December 31, 2016, that is not deductible for income tax purposes.

LIQUIDITY AND CAPITAL RESOURCES

HollyFrontier Credit Agreement

We have a \$1.35 billion senior unsecured revolving credit facility maturing in February 2022 (the “HollyFrontier Credit Agreement”). The HollyFrontier Credit Agreement may be used for revolving credit loans and letters of credit from time to time and is available to fund general corporate purposes. At December 31, 2018, we were in compliance with all covenants, had no outstanding borrowings and had outstanding letters of credit totaling \$2.2 million under the HollyFrontier Credit Agreement.

HollyFrontier Financing Arrangements

In December 2018, certain of our wholly-owned subsidiaries entered into financing arrangements whereby such subsidiaries sold a portion of their precious metals catalyst to a financial institution and then leased back the precious metals catalyst in exchange for total cash received of \$32.5 million. The volume of the precious metals catalyst and the lease rate are fixed over the one-year term of each lease, and the lease payments are recorded as interest expense. At maturity, we must repurchase the precious metals catalyst at its then fair market value.

HEP Credit Agreement

HEP has a \$1.4 billion senior secured revolving credit facility maturing in July 2022 (the “HEP Credit Agreement”) and is available to fund capital expenditures, investments, acquisitions, distribution payments, working capital and for general partnership purposes. It is also available to fund letters of credit up to a \$50 million sub-limit and has a \$300 million accordion. During the year ended December 31, 2018, HEP received advances totaling \$337.0 million and repaid \$426.0 million under the HEP Credit Agreement. At December 31, 2018, HEP was in compliance with all of its covenants, had outstanding borrowings of \$923.0 million and no outstanding letters of credit under the HEP Credit Agreement.

See Note 12 "Debt" in the Notes to Consolidated Financial Statements for additional information on our debt instruments.

HEP Common Unit Continuous Offering Program

In May 2016, HEP established a continuous offering program under which HEP may issue and sell common units from time to time, representing limited partner interests, up to an aggregate gross sales amount of \$200 million. During the year ended December 31, 2018, HEP issued 171,246 common units under this program, providing \$5.2 million in gross proceeds. As of December 31, 2018, HEP has issued 2,413,153 common units under this program, providing \$82.3 million in gross proceeds.

HEP intends to use the net proceeds for general partnership purposes, which may include funding working capital, repayment of debt, acquisitions and capital expenditures. Amounts repaid under HEP’s credit facility may be reborrowed from time to time.

HEP Private Placement Agreement

On January 25, 2018, HEP entered into a common unit purchase agreement in which certain purchasers agreed to purchase in a private placement 3,700,000 HEP common units, representing limited partner interests, at a price of \$29.73 per common unit. The private placement closed on February 6, 2018, at which time HEP received proceeds of approximately \$110.0 million, which were used to repay indebtedness under the HEP Credit Agreement.

Liquidity

We believe our current cash and cash equivalents, along with future internally generated cash flow and funds available under our credit facilities will provide sufficient resources to fund currently planned capital projects and our liquidity needs for the foreseeable future. In addition, components of our growth strategy include the expansion of existing units at our facilities and selective acquisition of complementary assets for our refining operations intended to increase earnings and cash flow.

As of December 31, 2018, our cash and cash equivalents totaled \$1,154.8 million. We consider all highly-liquid instruments with a maturity of three months or less at the time of purchase to be cash equivalents. Cash equivalents are stated at cost, which approximates market value. These primarily consist of investments in conservative, highly-rated instruments issued by financial institutions, government and corporate entities with strong credit standings and money market funds.

In September 2018, our Board of Directors approved a \$1 billion share repurchase program, which replaced all existing share repurchase programs, authorizing us to repurchase common stock in the open market or through privately negotiated transactions. The timing and amount of stock repurchases will depend on market conditions and corporate, regulatory and other relevant considerations. This program may be discontinued at any time by our Board of Directors. As of December 31, 2018, we had remaining authorization to repurchase up to \$787.6 million under this stock repurchase program. In addition, we are authorized by our Board of Directors to repurchase shares in an amount sufficient to offset shares issued under our compensation programs.

Cash and cash equivalents increased \$524.0 million for the year ended December 31, 2018. Net cash provided by operating activities of \$1,554.4 million exceeded net cash used by investing and financing activities of \$360.5 million and \$664.3 million, respectively.

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Cash Flows – Operating Activities

Year Ended December 31, 2018 Compared to Year Ended December 31, 2017

Net cash flows provided by operating activities were \$1,554.4 million for the year ended December 31, 2018 compared to \$951.4 million for the year ended December 31, 2017, an increase of \$603.0 million. Net income for the year ended December 31, 2018 was \$1,177.2 million, an increase of \$296.0 million compared to \$881.2 million for the year ended December 31, 2017. Non-cash adjustments to net income consisting of depreciation and amortization, long-lived asset impairment charges, lower of cost or market inventory valuation adjustment, earnings of equity method investments, inclusive of distributions, loss on extinguishment of debt, remeasurement gain on pipeline interest acquisitions, loss on sale of assets, deferred income taxes, equity-based compensation expense and fair value changes to derivative instruments totaled \$663.3 million for the year ended December 31, 2018 compared to \$189.2 million for the same period in 2017. Changes in working capital items decreased operating cash flows by \$87.7 million and \$6.1 million for the years ended December 31, 2018 and 2017, respectively. For the year ended December 31, 2018, turnaround expenditures increased to \$217.2 million from \$135.1 million for the same period of 2017.

Year Ended December 31, 2017 Compared to Year Ended December 31, 2016

Net cash flows provided by operating activities were \$951.4 million for the year ended December 31, 2017 compared to \$606.9 million for the year ended December 31, 2016, an increase of \$344.4 million. Net income for the year ended December 31, 2017 was \$881.2 million, an increase of \$1,072.2 million compared to net loss of \$190.9 million for the year ended December 31, 2016. Non-cash adjustments to net income consisting of depreciation and amortization, goodwill and long-lived asset impairment charges, lower of cost or market inventory valuation adjustment, earnings of equity method investments, inclusive of distributions, loss on extinguishment of debt, remeasurement gain on pipeline interest acquisitions, gain or loss on sale of assets, deferred income taxes, equity-based compensation expense, fair value changes to derivative instruments and excess tax expense from equity-based compensation totaled \$189.2 million for the year ended December 31, 2017 compared to \$842.6 million for the same period in 2016. Changes in working capital items decreased cash flows by \$6.1 million for the year ended December 31, 2017 and increased cash flows by \$74.7 million for the year ended December 31, 2016. For the year ended December 31, 2017, turnaround expenditures increased to \$135.1 million from \$125.3 million for the same period of 2016.

Cash Flows – Investing Activities and Planned Capital Expenditures

Year Ended December 31, 2018 Compared to Year Ended December 31, 2017

Net cash flows used for investing activities were \$360.5 million for the year ended December 31, 2018 compared to \$959.7 million for the year ended December 31, 2017, a decrease of \$599.2 million. Current year investing activities reflect a net cash outflow of \$54.2 million upon the acquisition of Red Giant Oil. Prior year investing activities reflect a net cash outflow of \$870.6 million upon the acquisition of PCLI. Cash expenditures for properties, plants and equipment for 2018 increased to \$311.0 million from \$272.3 million for the same period in 2017. These include HEP capital expenditures of \$54.1 million and \$44.8 million for the years ended December 31, 2018 and 2017, respectively. In addition, in 2017, HEP purchased the remaining interests in SLC Pipeline and Frontier Pipeline for \$245.4 million. We received proceeds of \$3.1 million and \$1.4 million from the sale of assets during the years ended December 31, 2018 and 2017, respectively. For the year ended December 31, 2017, we invested \$41.6 million, in marketable securities and received proceeds of \$465.7 million, from the sale or maturity of marketable securities.

Year Ended December 31, 2017 Compared to Year Ended December 31, 2016

Net cash flows used for investing activities were \$959.7 million for the year ended December 31, 2017 compared to \$801.6 million for the year ended December 31, 2016, an increase of \$158.1 million. Investing activities in 2017 reflect a net cash outflow of \$870.6 million upon the acquisition of PCLI. Cash expenditures for properties, plants and equipment for 2017 decreased to \$272.3 million from \$479.8 million for the same period in 2016. These include HEP

capital expenditures of \$44.8 million and \$107.6 million for the years ended December 31, 2017 and 2016, respectively. In addition, in 2017, HEP purchased the remaining interests in SLC Pipeline and Frontier Pipeline for \$245.4 million. In 2016, HEP purchased a 50% interest in Cheyenne Pipeline for \$42.6 million. We received proceeds of \$1.4 million and \$0.8 million from the sale of assets during the years ended December 31, 2017 and 2016, respectively. For the years ended December 31, 2017 and 2016, we invested \$41.6 million and \$546.6 million, respectively, in marketable securities and received proceeds of \$465.7 million and \$266.6 million, respectively, from the sale or maturity of marketable securities.

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Planned Capital Expenditures

HollyFrontier Corporation

Each year our Board of Directors approves our annual capital budget which includes specific projects that management is authorized to undertake. Additionally, when conditions warrant or as new opportunities arise, additional projects may be approved. The funds appropriated for a particular capital project may be expended over a period of several years, depending on the time required to complete the project. Therefore, our planned capital expenditures for a given year consist of expenditures appropriated in that year's capital budget plus expenditures for projects appropriated in prior years which have not yet been completed. During 2019, we expect to spend approximately \$510.0 million to \$560.0 million in cash for capital projects and refinery turnarounds appropriated in 2019 and prior years. Refinery turnaround spending is amortized over the useful life of the turnaround. Our expected capital and turnaround cash spending for 2019 is as follows:

	Expected Cash Spending Range (In millions)	
Type:		
Capital	\$275.0	\$300.0
Turnarounds	235.0	260.0
Total	\$510.0	\$560.0

The refining industry is capital intensive and requires on-going investments to sustain our refining operations. This includes replacement of, or rebuilding, refinery units and components that extend the useful life. We also invest in projects that improve operational reliability and profitability via enhancements that improve refinery processing capabilities as well as production yield and flexibility. Our capital expenditures also include projects related to environmental, health and safety compliance and include initiatives as a result of federal and state mandates.

Our refinery operations and related emissions are highly regulated at both federal and state levels, and we invest in our facilities as needed to remain in compliance with these standards. Additionally, when faced with new emissions or fuels standards, we seek to execute projects that facilitate compliance and also improve the operating costs and / or yields of associated refining processes.

HEP

Each year the Holly Logistic Services, L.L.C. board of directors approves HEP's annual capital budget, which specifies capital projects that HEP management is authorized to undertake. Additionally, at times when conditions warrant or as new opportunities arise, special projects may be approved. The funds allocated for a particular capital project may be expended over a period in excess of a year, depending on the time required to complete the project. Therefore, HEP's planned capital expenditures for a given year consist of expenditures approved for capital projects included in its current year capital budget as well as, in certain cases, expenditures approved for capital projects in capital budgets for prior years. The 2019 HEP capital budget is comprised of \$10.0 million for maintenance capital expenditures and \$20.0 million to \$25.0 million for expansion capital expenditures. HEP expects the majority of the expansion capital budget to be invested in refined product pipeline expansions, crude system enhancements, new storage tanks, and enhanced blending capabilities at our racks. In addition, HEP may spend funds periodically to perform capital upgrades or additions to its assets where a customer reimburses HEP for such costs. The upgrades or additions would generally benefit the customer over the remaining life of the related service agreements.

Cash Flows – Financing Activities

Year Ended December 31, 2018 Compared to Year Ended December 31, 2017

Net cash flows used for financing activities were \$664.3 million for the year ended December 31, 2018 compared to \$72.6 million for the year ended December 31, 2017, an increase of \$591.7 million. During the year ended December 31, 2018, we received \$32.5 million in proceeds from our financing arrangement related to precious metals, purchased \$363.4 million of treasury stock and paid \$233.5 million in dividends. Also during this period, HEP received \$337.0 million and repaid \$426.0 million under the HEP Credit Agreement, received \$114.8 million in net proceeds from the issuance of its common units and paid distributions of \$125.7 million to noncontrolling interests. During the year ended December 31, 2017, we received \$26.0 million and repaid \$26.0 million under the HollyFrontier Credit Agreement, paid \$235.5 million in dividends and purchased \$15.9 million of treasury stock. Also during 2017, HEP received \$969.0 million and repaid \$510.0 million under the HEP Credit Agreement, paid \$309.8 million upon the redemption of HEP's 6.5% senior notes, received \$101.8 million in net proceeds from issuance of HEP's 6.0% senior notes, received \$52.1 million in net proceeds from the issuance of its common units and paid distributions of \$110.4 million to noncontrolling interests.

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Year Ended December 31, 2017 Compared to Year Ended December 31, 2016

Net cash flows used for financing activities were \$72.6 million for the year ended December 31, 2017 compared to cash flows provided by financing activities of \$838.7 million for the year ended December 31, 2016, an increase of \$911.3 million. During the year ended December 31, 2017, we received \$26.0 million and repaid \$26.0 million under the HollyFrontier Credit Agreement, paid \$235.5 million in dividends and purchased \$15.9 million of treasury stock. Also during this period, HEP received \$969.0 million and repaid \$510.0 million under the HEP Credit Agreement, received \$101.8 million in net proceeds from issuance of HEP's 6.0% senior notes, paid \$309.8 million upon the redemption of HEP's 6.5% senior notes, received \$52.1 million in net proceeds from the issuance of its common units and paid distributions of \$110.4 million to noncontrolling interests. During the year ended December 31, 2016, we received \$992.6 million in net proceeds upon issuance of our 5.875% senior notes, received \$350.0 million and repaid \$350.0 million under a term loan, received \$315.0 million and repaid \$315.0 million under the HollyFrontier Credit Agreement, purchased \$138.1 million of treasury stock and paid \$234.0 million in dividends. In addition, we extinguished our financing arrangement with Plains for \$39.5 million. Also during this period, HEP received \$554.0 million and repaid \$713.0 million under the HEP Credit Agreement, received \$394.0 million in net proceeds from issuance of HEP's 6.0% senior notes, received \$125.9 million in net proceeds from the issuance of its common units and paid distributions of \$92.6 million to noncontrolling interests.

Contractual Obligations and Commitments

The following table presents our long-term contractual obligations as of December 31, 2018 in total and by period due beginning in 2019. The table below does not include our contractual obligations to HEP under our long-term transportation agreements as these related-party transactions are eliminated in the Consolidated Financial Statements. A description of these agreements is provided under "Holly Energy Partners, L.P." under Items 1 and 2, "Business and Properties." Also, the table below does not reflect renewal options on our operating leases that are likely to be exercised.

Contractual Obligations and Commitments	Total	Payments Due by Period			
		2019	2020 & 2021	2022 & 2023	Thereafter
	(In thousands)				
HollyFrontier Corporation					
Long-term debt - principal	\$1,000,000	\$—	\$—	\$—	\$1,000,000
Long-term debt - interest ⁽¹⁾	425,950	58,750	117,500	117,500	132,200
Financing arrangements	32,850	32,850	—	—	—
Supply agreements ⁽²⁾	2,398,966	660,349	781,052	492,194	465,371
Transportation and storage agreements ⁽³⁾	1,411,287	144,756	262,215	219,499	784,817
Other long-term obligations	29,358	15,655	8,800	2,259	2,644
Operating leases	441,191	97,110	162,729	117,764	63,588
	5,739,602	1,009,470	1,332,296	949,216	2,448,620
Holly Energy Partners					
Long-term debt - principal ⁽⁴⁾	1,423,000	—	—	923,000	500,000
Long-term debt - interest ⁽⁵⁾	313,303	70,784	141,568	83,451	17,500
Pipeline operating leases	55,814	6,566	13,133	13,133	22,982
Operating leases	4,572	686	1,210	1,040	1,636
Other agreements	10,136	3,599	5,006	1,531	—
	1,806,825	81,635	160,917	1,022,155	542,118
Total	\$7,546,427	\$1,091,105	\$1,493,213	\$1,971,371	\$2,990,738

(1) Interest payments consist of interest on our 5.875% senior notes.

- We have long-term supply agreements to secure certain quantities of crude oil, feedstock and other resources used in the production process at market prices. We have estimated future payments under these fixed-quantity
- (2) agreements expiring between 2019 and 2025 using current market rates. Additionally, commitments include purchases of 20,000 BPD of crude oil under a 10-year agreement to supply our Woods Cross Refinery.
- (3) Consists of contractual obligations under agreements with third parties for the transportation of crude oil, natural gas and feedstocks to our refineries and for terminal and storage services under contracts expiring between 2019 and 2039.
- (4) HEP's long-term debt consists of the \$500.0 million principal balance on the 6% HEP senior notes and \$923.0 million of outstanding borrowings under the HEP Credit Agreement. The HEP Credit Agreement expires in 2022. Interest payments consist of interest on the 6% HEP senior notes and interest on long-term debt under the HEP
- (5) Credit Agreement. Interest on the HEP Credit Agreement debt is based on the weighted average rate of 4.24% at December 31, 2018.

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CRITICAL ACCOUNTING POLICIES

Our discussion and analysis of our financial condition and results of operations are based upon our consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States. The preparation of these financial statements requires us to make estimates and judgments that affect the reported amounts of assets, liabilities, revenues and expenses, and related disclosure of contingent assets and liabilities as of the date of the financial statements. Actual results may differ from these estimates under different assumptions or conditions. We consider the following policies to be the most critical to understanding the judgments that are involved and the uncertainties that could impact our results of operations, financial condition and cash flows. For additional information, see Note 1 “Description of Business and Summary of Significant Accounting Policies” in the Notes to Consolidated Financial Statements.

Inventory Valuation

Inventories related to our refining operations are stated at the lower of cost, using the LIFO method for crude oil and unfinished and finished refined products, or market. In periods of rapidly declining prices, LIFO inventories may have to be written down to market value due to the higher costs assigned to LIFO layers in prior periods. In addition, the use of the LIFO inventory method may result in increases or decreases to cost of sales in years that inventory volumes decline as the result of charging cost of sales with LIFO inventory costs generated in prior periods. At December 31, 2018 and 2017, market values had fallen below historical LIFO inventory costs and, as a result, we recorded lower of cost or market inventory valuation reserves of \$360.1 million and \$223.8 million, respectively.

Inventories of our Petro-Canada Lubricants business are stated at the lower of cost, using the first-in, first-out method, or net realizable value.

At December 31, 2018, our lower of cost or market inventory valuation reserve was \$360.1 million. This amount, or a portion thereof, is subject to reversal as a reduction to cost of products sold in subsequent periods as inventories giving rise to the reserve are sold, and a new reserve is established. Such a reduction to cost of products sold could be significant if inventory values return to historical cost price levels. Additionally, further decreases in overall inventory values could result in additional charges to cost of products sold should the lower of cost or market inventory valuation reserve be increased.

Goodwill and Long-lived Assets

As of December 31, 2018, our goodwill balance was \$2.2 billion, with goodwill assigned to our Refining, Lubricants and Specialty Products and HEP segments of \$1.7 billion, \$0.2 billion and \$0.3 billion, respectively. Goodwill represents the excess of the cost of an acquired entity over the fair value of the assets acquired and liabilities assumed. Goodwill is not subject to amortization and is tested annually or more frequently if an event occurs or circumstances change that would more likely than not reduce the fair value of a reporting unit below its carrying amount. Our goodwill impairment testing first entails a comparison of our reporting units fair values relative to their respective carrying values. If carrying value exceeds fair value for a reporting unit, we measure goodwill impairment as the excess of the carrying amount of reporting unit goodwill over the implied fair value of that goodwill based on estimates of the fair value of all assets and liabilities in the reporting unit.

Our long-lived assets principally consist of our refining assets that are organized as refining asset groups and the assets of our Lubricants and Specialty Products business. The refinery asset groups also constitute our individual refinery reporting units that are used for testing and measuring goodwill impairments. Our long-lived assets are evaluated for impairment by identifying whether indicators of impairment exist and if so, assessing whether the long-lived assets are recoverable from estimated future undiscounted cash flows. The actual amount of impairment

loss measured, if any, is equal to the amount by which the asset group's carrying value exceeds its fair value.

We performed our annual goodwill impairment testing as of July 1, 2018 and determined there was no impairment of goodwill attributable to our reporting units.

Contingencies

We are subject to proceedings, lawsuits and other claims related to environmental, labor, product and other matters. We are required to assess the likelihood of any adverse judgments or outcomes to these matters as well as potential ranges of probable losses. A determination of the amount of reserves required, if any, for these contingencies is made after careful analysis of each individual issue. The required reserves may change in the future due to new developments in each matter or changes in approach such as a change in settlement strategy in dealing with these matters.

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RISK MANAGEMENT

We use certain strategies to reduce some commodity price and operational risks. We do not attempt to eliminate all market risk exposures when we believe that the exposure relating to such risk would not be significant to our future earnings, financial position, capital resources or liquidity or that the cost of eliminating the exposure would outweigh the benefit.

Commodity Price Risk Management

Our primary market risk is commodity price risk. We are exposed to market risks related to the volatility in crude oil and refined products, as well as volatility in the price of natural gas used in our refining operations. We periodically enter into derivative contracts in the form of commodity price swaps, forward purchase and sales and futures contracts to mitigate price exposure with respect to our inventory positions, natural gas purchases, sales prices of refined products and crude oil costs.

Foreign Currency Risk Management

We are exposed to market risk related to the volatility in foreign currency exchange rates. We periodically enter into derivative contracts in the form of foreign exchange forward and foreign exchange swap contracts to mitigate the exposure associated with fluctuations on intercompany notes with our foreign subsidiaries that are not denominated in the U.S. dollar.

As of December 31, 2018, we have the following notional contract volumes related to all outstanding derivative contracts used to mitigate commodity price and foreign currency risk:

Contract Description	Total Outstanding Notional	Notional Contract Volumes by Year of Maturity			Unit of Measure
		2019	2020	2021	
Natural gas price swaps - long	5,400,000	1,800,000	1,800,000	1,800,000	MMBTU
Crude oil price swaps (basis spread) - long	9,503,000	4,745,000	4,758,000	—	Barrels
NYMEX futures (WTI) - short	650,000	650,000	—	—	Barrels
Forward gasoline and diesel contracts - long	325,000	325,000	—	—	Barrels
Foreign currency forward contracts	440,460,402	440,460,402	—	—	U.S. dollar
Forward commodity contracts (platinum) ⁽¹⁾	41,147	41,147	—	—	Troy ounces

(1) Represents an embedded derivative within our catalyst financing arrangements, which may be refinanced or require repayment under certain conditions. See Note 12 “Debt” in the Notes to Consolidated Financial Statements for additional information on these financing arrangements.

The following sensitivity analysis provides the hypothetical effects of market price fluctuations to the commodity positions hedged under our derivative contracts:

Commodity-based Derivative Contracts	Estimated Change in Fair Value at December 31,	
	2018	2017
Hypothetical 10% change in underlying commodity prices	\$ 1,485	\$ 5,451

Interest Rate Risk Management

The market risk inherent in our fixed-rate debt is the potential change arising from increases or decreases in interest rates as discussed below.

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For the fixed rate HollyFrontier Senior Notes and HEP Senior Notes, changes in interest rates will generally affect fair value of the debt, but not earnings or cash flows. The outstanding principal, estimated fair value and estimated change in fair value (assuming a hypothetical 10% change in the yield-to-maturity rates) for this debt as of December 31, 2018 is presented below:

	Outstanding Principal	Estimated Fair Value	Estimated Change in Fair Value
	(In thousands)		
HollyFrontier Senior Notes	\$ 1,000,000	\$ 1,019,160	\$ 33,135
HEP Senior Notes	\$ 500,000	\$ 488,310	\$ 14,809

For the variable rate HEP Credit Agreement, changes in interest rates would affect cash flows, but not the fair value. At December 31, 2018, outstanding borrowings under the HEP Credit Agreement were \$923.0 million. A hypothetical 10% change in interest rates applicable to the HEP Credit Agreement would not materially affect cash flows.

Our operations are subject to hazards of petroleum processing operations, including fire, explosion and weather-related perils. We maintain various insurance coverages, including business interruption insurance, subject to certain deductibles. We are not fully insured against certain risks because such risks are not fully insurable, coverage is unavailable, or premium costs, in our judgment, do not justify such expenditures.

Financial information is reviewed on the counterparties in order to review and monitor their financial stability and assess their ongoing ability to honor their commitments under the derivative contracts. We have not experienced, nor do we expect to experience, any difficulty in the counterparties honoring their commitments.

We have a risk management oversight committee consisting of members from our senior management. This committee oversees our risk enterprise program, monitors our risk environment and provides direction for activities to mitigate identified risks that may adversely affect the achievement of our goals.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

See “Risk Management” under “Management’s Discussion and Analysis of Financial Condition and Results of Operations.”

Reconciliations to Amounts Reported Under Generally Accepted Accounting Principles

Reconciliations of earnings before interest, taxes, depreciation and amortization (“EBITDA”) to amounts reported under generally accepted accounting principles in financial statements.

Earnings before interest, taxes, depreciation and amortization, which we refer to as EBITDA, is calculated as net income (loss) attributable to HollyFrontier stockholders plus (i) interest expense, net of interest income, (ii) income tax provision, and (iii) depreciation and amortization. EBITDA is not a calculation provided for under GAAP; however, the amounts included in the EBITDA calculation are derived from amounts included in our consolidated financial statements. EBITDA should not be considered as an alternative to net income or operating income as an indication of our operating performance or as an alternative to operating cash flow as a measure of liquidity. EBITDA is not necessarily comparable to similarly titled measures of other companies. EBITDA is presented here because it is a widely used financial indicator used by investors and analysts to measure performance. EBITDA is also used by our management for internal analysis and as a basis for financial covenants.

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Set forth below is our calculation of EBITDA.

	Years Ended December 31,		
	2018	2017	2016
	(In thousands)		
Net income (loss) attributable to HollyFrontier stockholders	\$1,097,960	\$805,395	\$(260,453)
Add (subtract) income tax provision	347,243	(12,379)	19,411
Add interest expense	131,363	117,597	72,192
Subtract interest income	(16,892)	(3,736)	(2,491)
Add depreciation and amortization	437,324	409,937	363,027
EBITDA	\$1,996,998	\$1,316,814	\$191,686

Reconciliations of refinery operating information (non-GAAP performance measures) to amounts reported under generally accepted accounting principles in financial statements.

Refinery gross margin and net operating margin are non-GAAP performance measures that are used by our management and others to compare our refining performance to that of other companies in our industry. We believe these margin measures are helpful to investors in evaluating our refining performance on a relative and absolute basis. Refinery gross margin per produced barrel sold is total refining segment revenues less total refining segment cost of products sold, exclusive of lower of cost or market inventory valuation adjustments, divided by sales volumes of produced refined products sold. Net operating margin per barrel sold is the difference between refinery gross margin and refinery operating expenses per produced barrel sold. These two margins do not include the non-cash effects of lower of cost or market inventory valuation adjustments, goodwill and asset impairment charges or depreciation and amortization. Each of these component performance measures can be reconciled directly to our consolidated statements of income. Other companies in our industry may not calculate these performance measures in the same manner.

Below are reconciliations to our consolidated statements of income for refinery net operating and gross margin and operating expenses, in each case averaged per produced barrel sold. Due to rounding of reported numbers, some amounts may not calculate exactly.

Reconciliation of average refining segment net operating margin per produced barrel sold to refinery gross margin to total sales and other revenues

	Years Ended December 31,		
	2018	2017	2016
	(Dollars in thousands, except per barrel amounts)		
Consolidated			
Net operating margin per produced barrel sold	\$11.32	\$ 5.45	\$ 2.51
Add average refinery operating expenses per produced barrel sold	6.39	6.11	5.65
Refinery gross margin per produced barrel sold	17.71	11.56	8.16
Times produced barrels sold (BPD)	452,630	452,270	440,640
Times number of days in period	365	365	366
Refining segment gross margin	2,925,868	1,908,308	1,315,998
Add (subtract) rounding	(154)	335	1,112
Total refining segment gross margin	2,925,714	1,908,643	1,317,110
Add refining segment cost of products sold	13,250,849	11,009,419	9,003,605
Refining segment sales and other revenues	16,176,563	12,918,062	10,320,715
Add lubricants and specialty products segment sales and other revenues	1,812,703	1,594,036	464,359
Add HEP segment sales and other revenues	506,220	454,362	402,043

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Subtract corporate, other and eliminations
Sales and other revenues

(780,820(715,161) (651,417)