ENERGY LOGISTICS & DISTRIBUTION

Industry In-Sight™

WINTER / SPRING 2019




JKC JORDAN KNAUFF & COMPANY

ENERGY EQUIPMENT & INFRASTRUCTURE ALLIANCE

The Voice of the Energy Supply Chain

ENERGYBUILDERS

IN THIS REPORT

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All charts in this report are updated to the latest information available at the time of publication. Due to differing reporting dates for various data used throughout the report, all charts are not updated to the same ending period.

INTRODUCTION ... About This Report

We are pleased to offer this periodic report which provides a comprehensive compilation of energy information, insights and data. It aggregates critical planning and forecasting information from a myriad of sources into one resource for energy supply chain analysts and decision-makers.

The energy supply chain is an increasingly complex network of upstream, midstream and downstream providers of construction, equipment, materials and services. As shale gas-oil and renewable energy continue to expand in the U.S., additional infrastructure is needed to connect the new sources to the current network of pipelines, storage and transmission stations. Current and new members of the supply chain will need to expand in order to build and service the additional infrastructure.

We define the Energy Logistics & Distribution Industry as any energy production, transportation and storage activities that take place from the well-head to the refinery or gas processing plant through delivery to the end user. Industry members include: producers and distributors of oil and natural gas, natural gas liquids, refined fuels and propane; energy storage and pipeline operators; oil and gas field services; producers and distributors of lubricants, oils, greases and fluids; service contractors, capital equipment manufacturers; materials suppliers; as well as logistics, transportation and maintenance providers.

Segments covered in this Industry In-Sight™ include:

- Crude oil and refined products, natural gas, liquefied natural gas (LNG), natural gas liquids including propane and heating/fuel oil, as well as drilling activity.
- Renewables, including solar, wind, hydropower and ethanol.
- Logistics, including storage and terminals, pipelines, trucking, shipping and rail.
- Economic and financial data pertinent to the Energy Logistics & Distribution Industry.

It is our intention that this publication will provide value in the following areas:

- **Aggregate Information** – The Data Center provides comprehensive statistics on the Energy Logistics & Distribution Industry including, among others: prices (domestic and international), production, consumption, inventory, imports/exports, LNG terminals, drilling activity, solar and wind capacities, energy consumption by sector and source, tank and underground storage capacities and utilization, pipeline mileage and trucking conditions. In all, the report offers more than 70 individual charts covering these topics and more. All charts in this report are updated to the latest information available at the time of publication.
- **Input to Business Decisions** – As a relevant and informative reference for use when contemplating decisions that will have a meaningful impact on your business. Accordingly, we welcome any input, feedback and suggestions to help us include meaningful and timely topical content in future publications. We especially would like to receive suggestions for ideas on Hot Topics in the Energy Logistics & Distribution Industry.
- **Identification of Opportunities** – The breadth of information provided will enable owners and operators of energy logistics businesses to track developments in energy segments outside of their day-to-day focus.
- **Public and Transaction Comparables by Segment** – This section provides the tracking of a cross-section of publicly-traded companies and transactions in various segments of the Energy Logistics & Distribution Industry. The data include operating metrics, such as revenues and EBITDA (earnings before interest, taxes, depreciation and amortization); and valuation analyses such as total enterprise value / latest twelve months revenues and total enterprise value / latest twelve months EBITDA.

Thank you for taking the time to review this Energy Logistics & Distribution Industry In-Sight™. Our goal is to provide the most comprehensive and beneficial information possible. Please forward your feedback and suggestions to any member of the Jordan Knauff & Company or Energy Equipment and Infrastructure Alliance team members listed on the last two pages of this report.

INTRODUCTION

Who is the Energy Equipment & Infrastructure Alliance (EEIA)?

EEIA ... The Voice of the Energy Supply Chain

The energy supply chain is over 120,000 companies in sixty industries, annually contributing more than $170 billion to the U.S. economy, with hundreds of thousands of workers in communities throughout every state of the union. They provide construction, well services, capital equipment, supplies, logistics, professional services and technology in support of energy operations. They build energy infrastructure including production sites, transmission infrastructure, pipelines, storage facilities, processing plants and export terminals.

The shale energy revolution is transforming prosperity, security and quality of life in America. In a few short years, it has brought rising employment, income and opportunity to workers and businesses of all sizes and in all fifty states, often to communities that until recently have known limited prospects for growth. It has given Americans a cleaner environment, lower energy costs, renewed national competitiveness and energy security.

Creating a supportive public and policymaker environment for this miracle depends on active public engagement by energy supply chain stakeholders -- the non-oil and gas companies where energy-driven jobs and opportunities are greatest.

EEIA is that voice. We mobilize and lead the North American supply chain in pursuit of government policies that support full development of our energy resources, while protecting public health, safety and the environment. We also work for widespread public support for energy development.

The Energy Equipment & Infrastructure Alliance (EEIA) is active on all fronts: federal and state legislative, regulatory, judicial and public opinion. Our strength is based upon the supply chain's enormous fifty-state contributions to jobs, economic growth and community prosperity. We conduct economic research that measures and reports the facts about the energy supply chain's tremendous contributions to the American economy.

We are an organization of leading supply chain companies, trade associations and labor organizations. We are the voices of the businesses and workers of America's energy miracle.




INTRODUCTION

Who is Jordan Knauff & Company (JKC)?

JKC was founded in 2001 to undertake a distinct mission: to assemble and maintain a staff of top-notch investment banking personnel and offer their knowledge and experience to provide the best available investment banking services to middle-market companies, the entrepreneurs that lead them and the financial entities that transact with them. JKC has been active within the Energy Logistics & Distribution Industry as operators, investors, board members and investment bankers prior to the firm's founding in 2001.

On a combined basis, over the course of their careers our employees have completed over 200 transactions as investors, owners, operators, buyers, sellers and investment bankers of middle-market businesses across a variety of industries. The majority of our firm's broad transaction experience has been with private companies owned by one shareholder, a partnership, a family or private equity investors.

Experience has taught us that the owners and executives of middle-market businesses tend to have very different needs and goals in capital transactions from those that are common to capital events related to larger companies. Our personnel apply their considerable expertise to accomplish important goals: delivery of successful outcomes for our clients. Pursuant to that, we direct and manage all aspects of the capital transaction process, assist our clients with the management of important constituents (employees, customers, vendors and lenders), act as a teammate to other important client advisors (legal counsel, accountant, tax advisor) and collaborate with transaction counsel in the negotiations with the parties on the other side of the transaction.

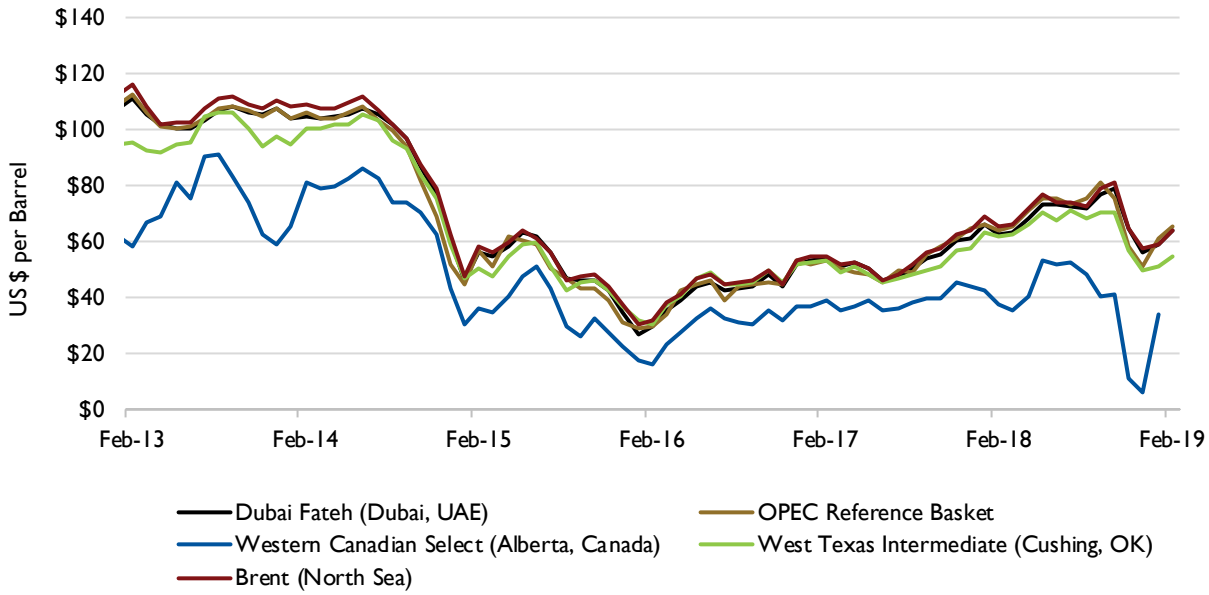
The Services We Provide

- Sell Companies: Generate a liquidity event on behalf of the owner(s) through whole, majority, or minority sale of assets, stock or units.
- Raise Capital: Representation of companies, management teams and entrepreneurs in the raising of senior debt, mezzanine debt or equity capital. Proceeds may be used for a variety of reasons, including, among others, recapitalizations, funding of growth, funding of acquisitions or liquidity for owners and investors.
- Acquisition Advisory: Assistance in sourcing and closing acquisitions -- whether it be a single transaction or a series of acquisitions as part of a consolidation strategy in an Industry Development Project™ (IDP) - a proprietary method for assisting private equity groups, companies or private investors that want to pursue multiple non-auction transactions within a single industry.
- Strategic Business Services: A suite of services for middle-market business owners and executives. Comprised of three components – Company Specific Valuation, Capital Road Map® and Strategic Industry Analysis – these services can be packaged together or used on an à la carte basis.

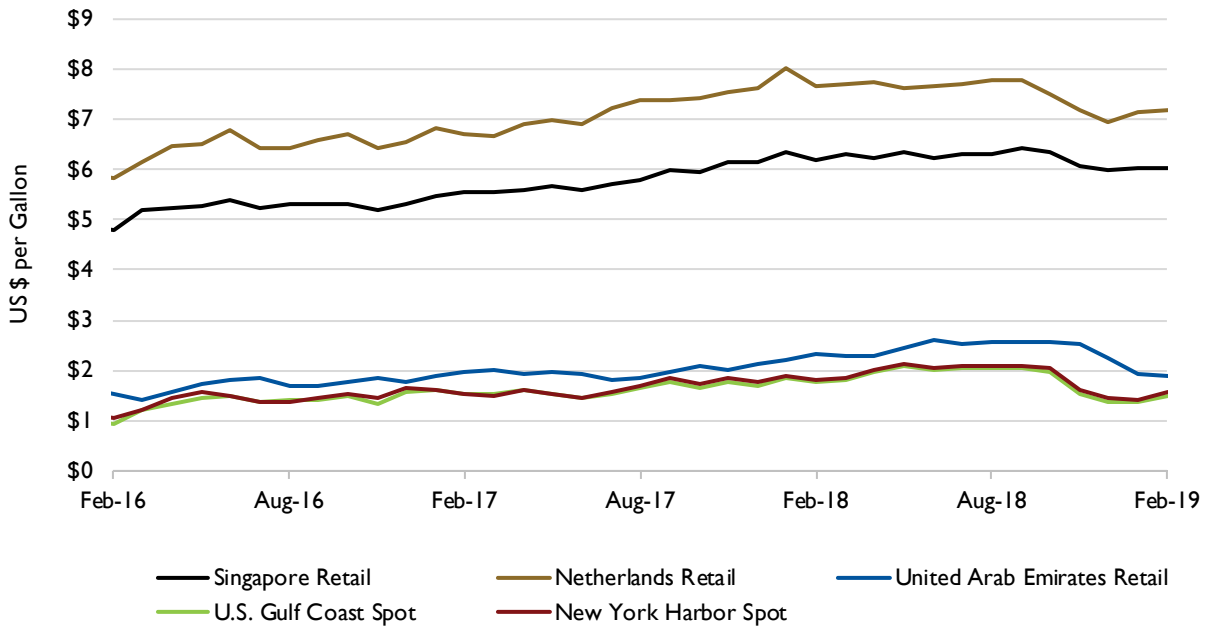
DATA CENTER

OIL

CRUDE OIL PRICES (MONTHLY AVERAGE) (1)



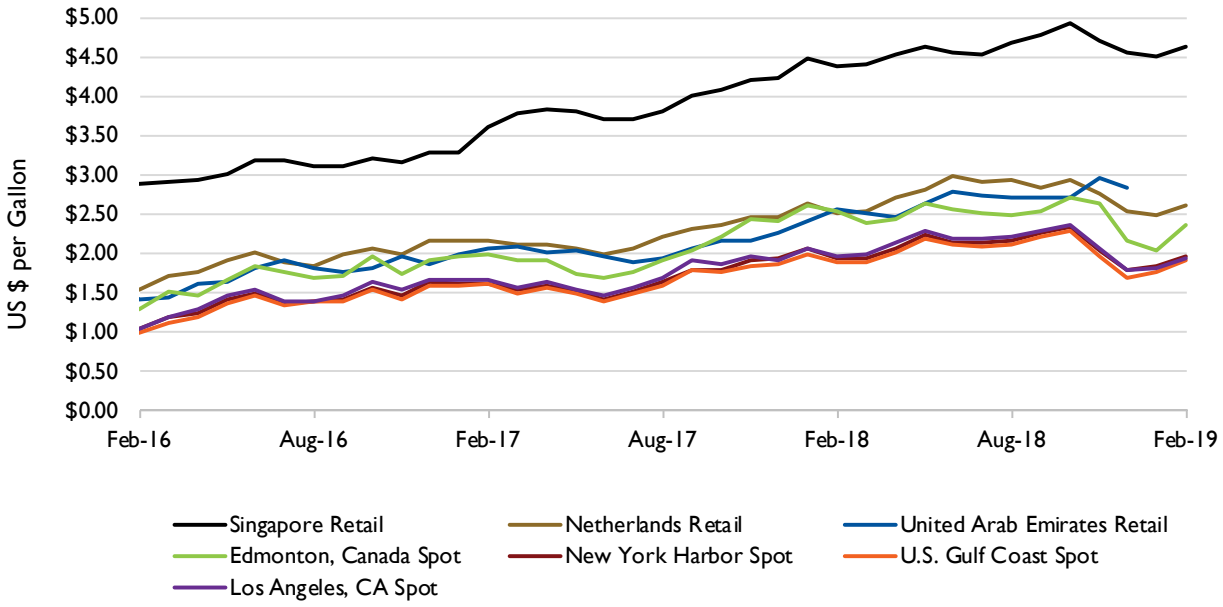
GASOLINE PRICES (MONTHLY AVERAGE) (2)



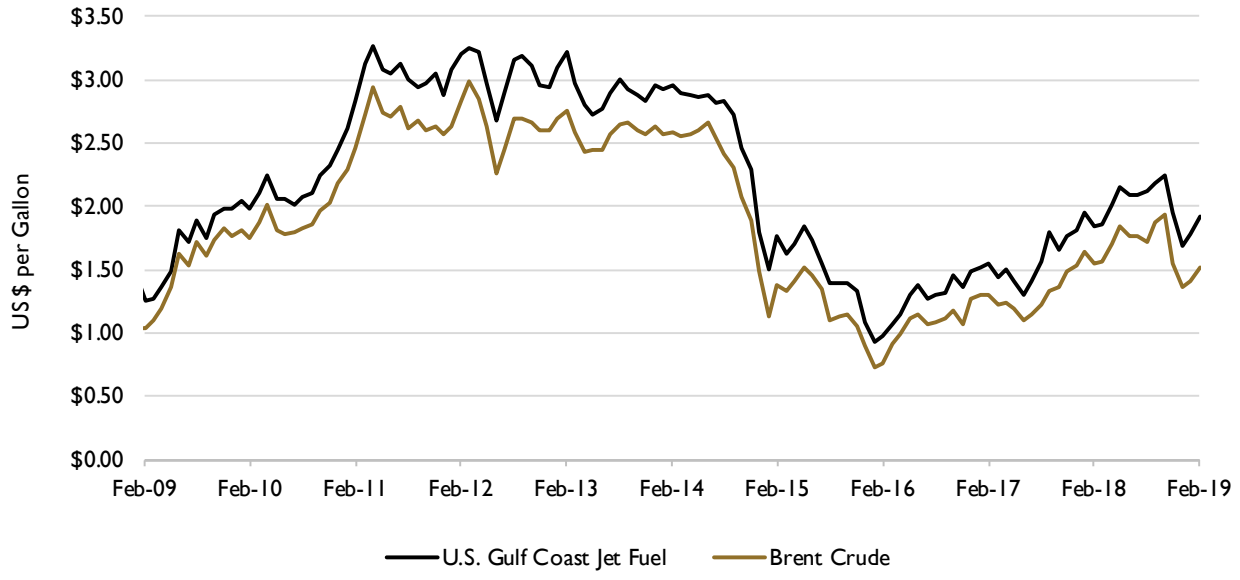
DATA CENTER

OIL

DIESEL PRICES (MONTHLY AVERAGE) (3)



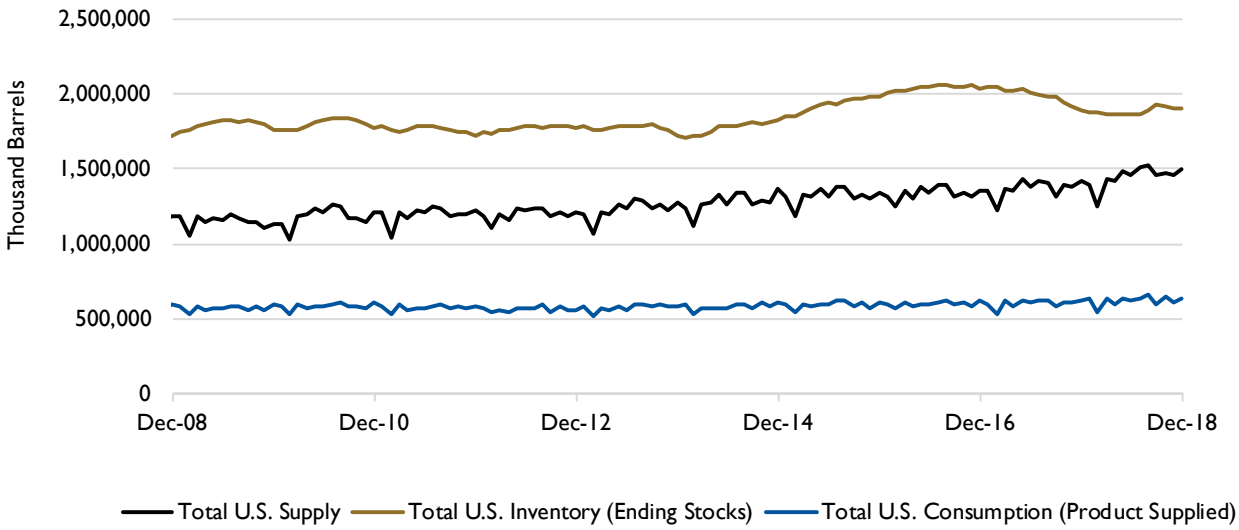
JET FUEL PRICES (MONTHLY AVERAGE) (4)



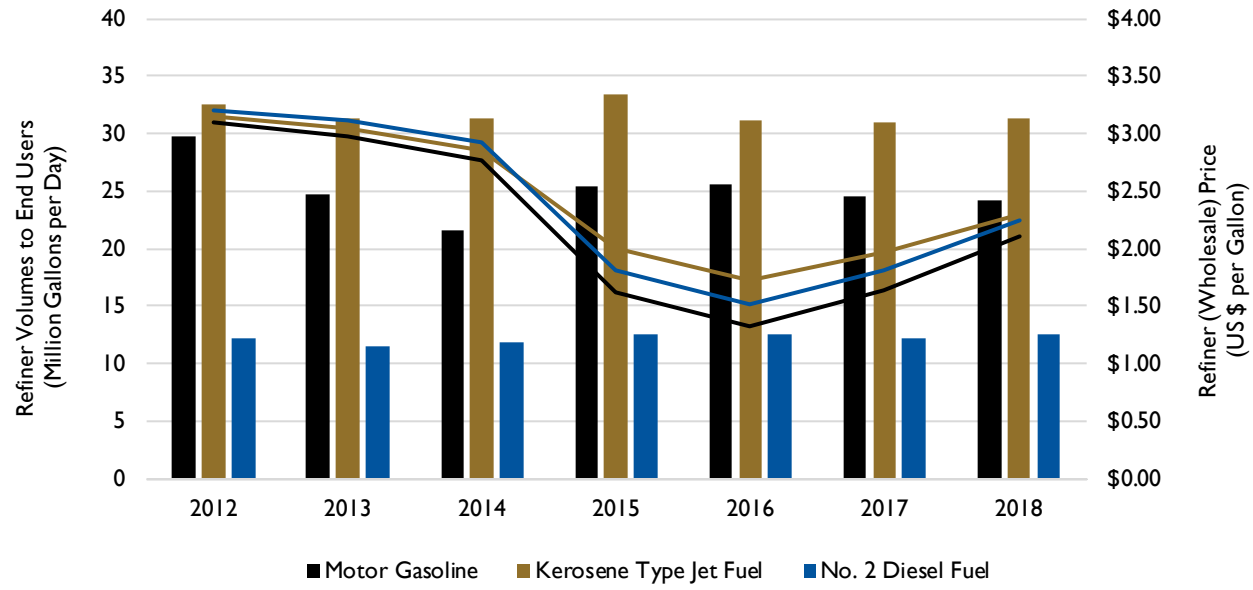
DATA CENTER

OIL

U.S. Crude Oil and Petroleum Products Supply, Inventory and Consumption (Monthly) (5)



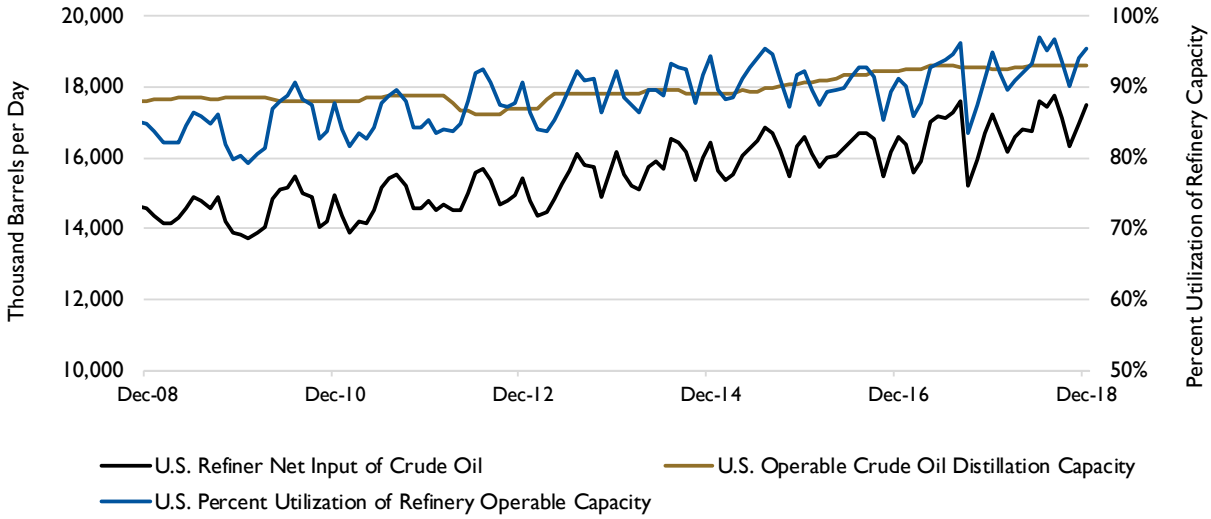
U.S. Refinery Volumes and Wholesale Prices of Petroleum Products (Annual Average) (6)



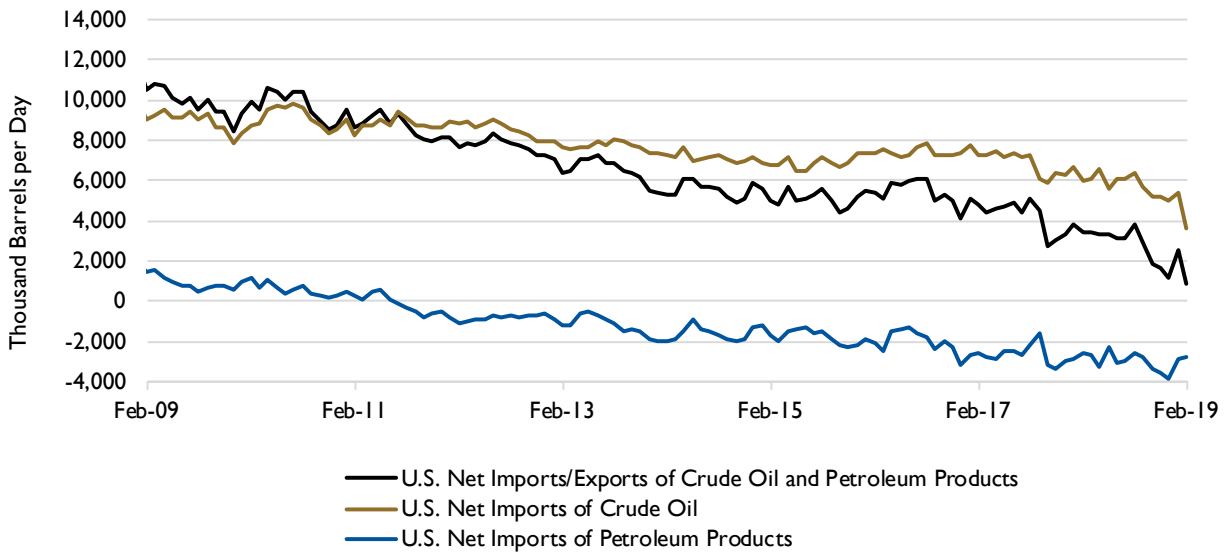
DATA CENTER

OIL

U.S. CRUDE OIL REFINERY INPUT, DISTILLATION CAPACITY AND REFINERY UTILIZATION (MONTHLY AVERAGE) (7)



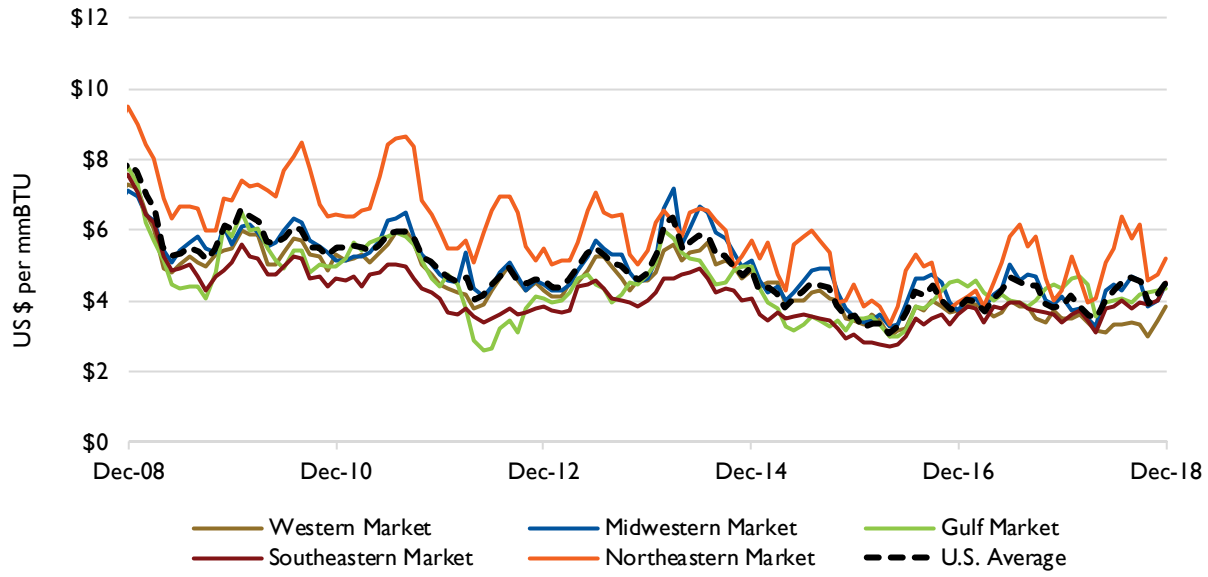
U.S. CRUDE OIL AND PETROLEUM PRODUCTS IMPORTS AND EXPORTS (MONTHLY AVERAGE) (8)



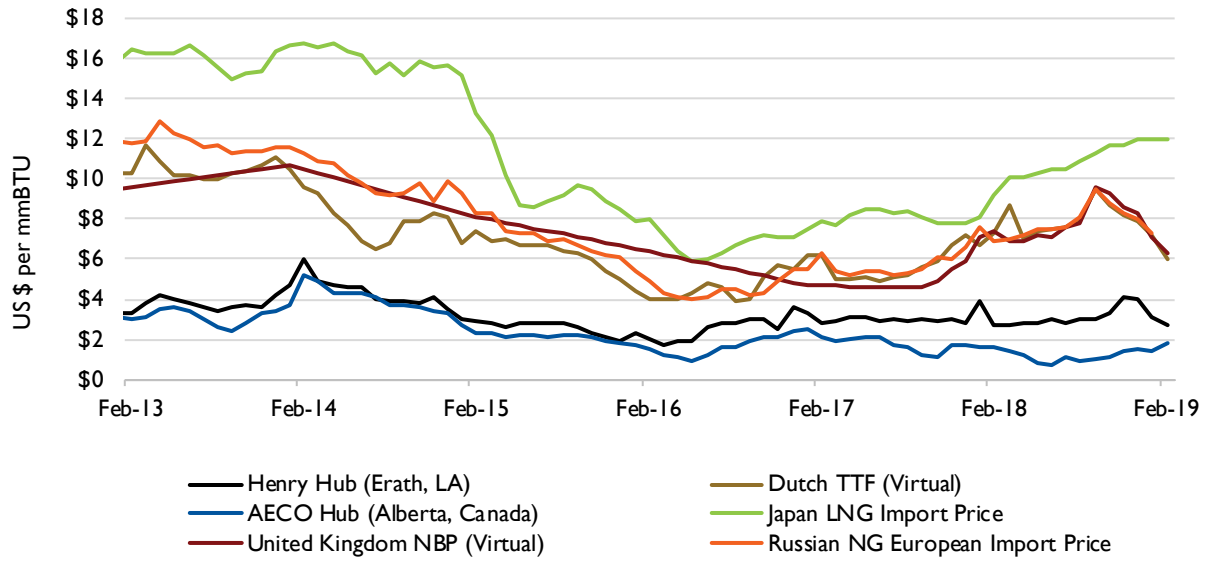
DATA CENTER

NATURAL GAS

DOMESTIC NATURAL GAS CITYGATE PRICES PER REGION (MONTHLY AVERAGE) (9)



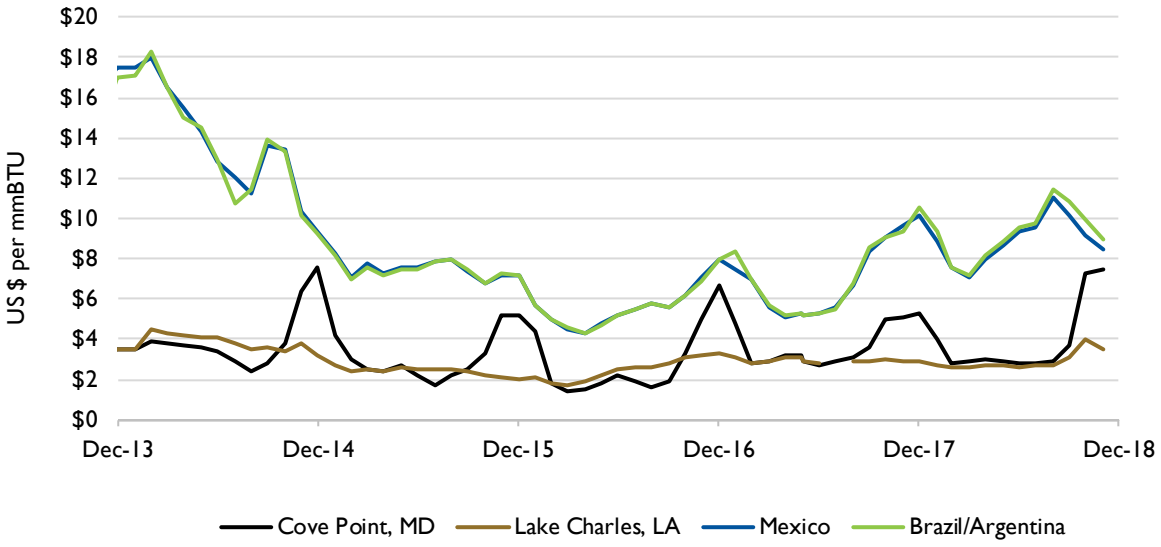
INTERNATIONAL NATURAL GAS PRICES (MONTHLY AVERAGE) (10)



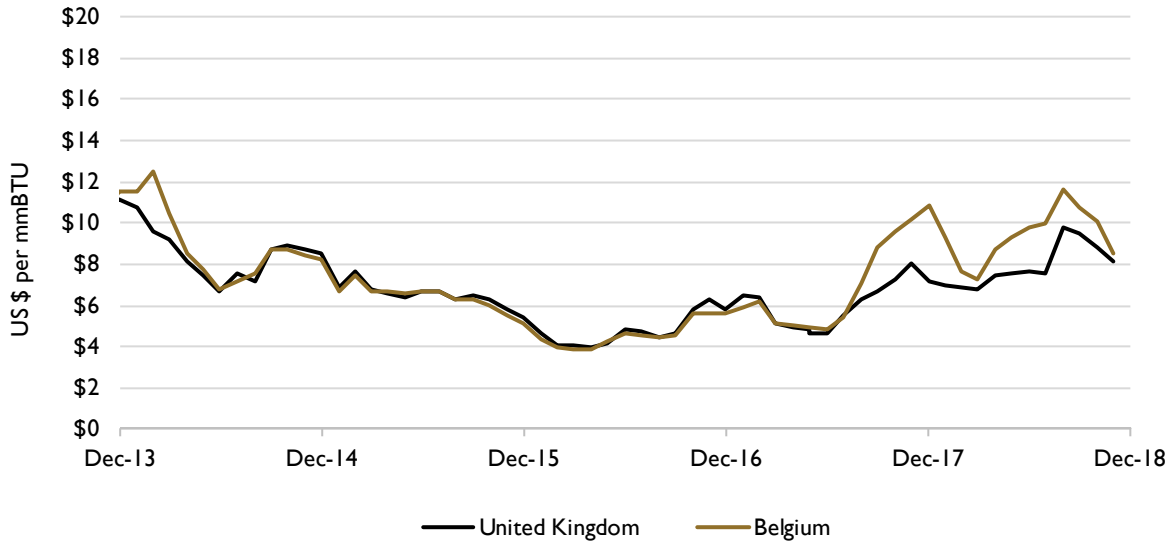
DATA CENTER

NATURAL GAS

AMERICAS LIQUEFIED NATURAL GAS PRICES (MONTHLY AVERAGE) (11)



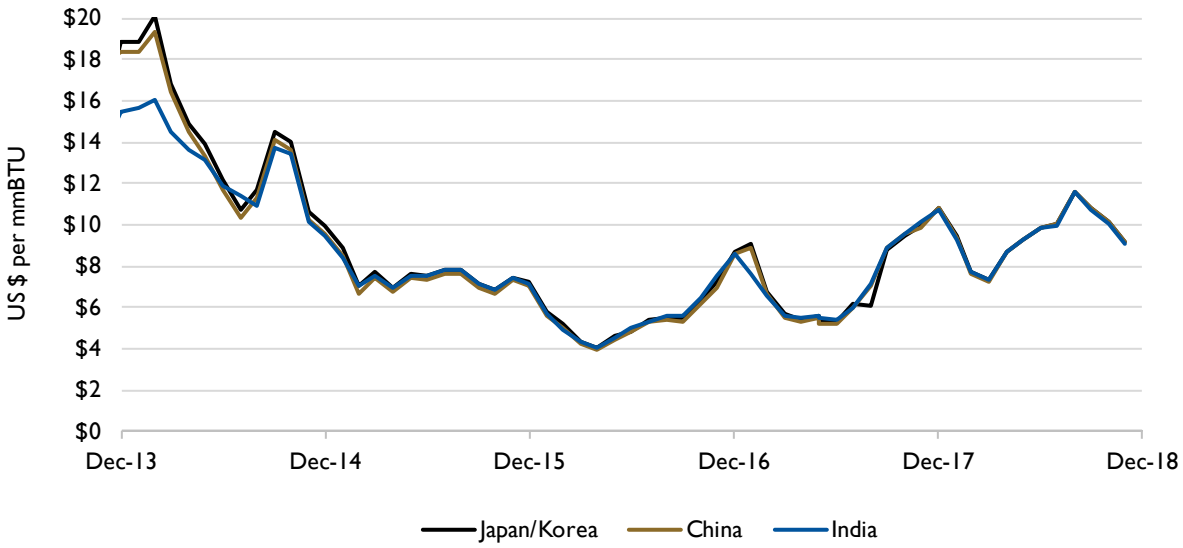
WESTERN EUROPE LIQUEFIED NATURAL GAS PRICES (MONTHLY AVERAGE) (12)



DATA CENTER

NATURAL GAS

ASIA LIQUEFIED NATURAL GAS PRICES (MONTHLY AVERAGE) (13)

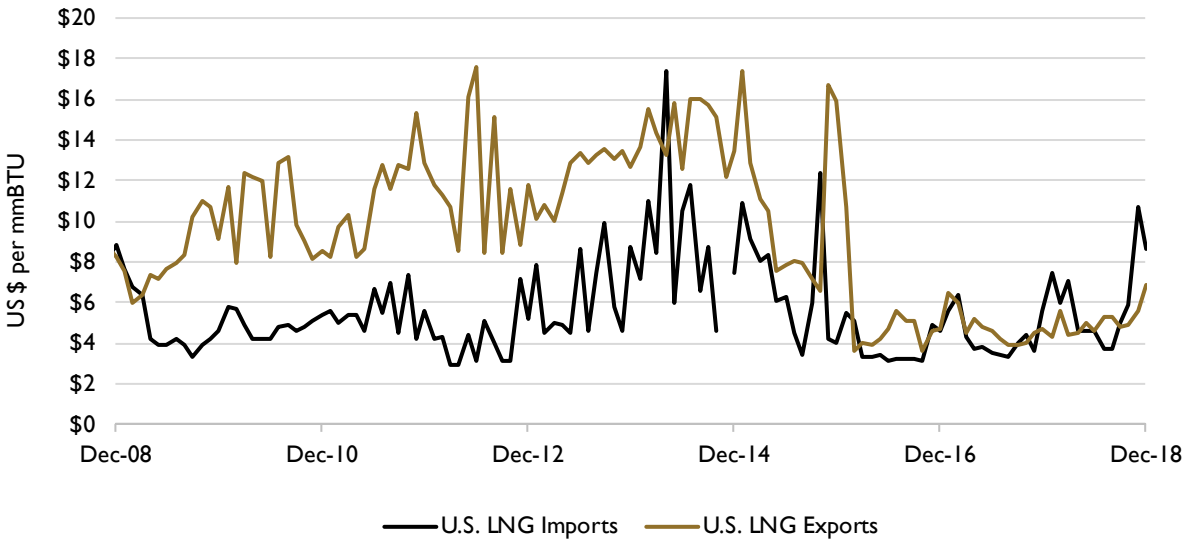


WORLD LIQUEFIED NATURAL GAS PRICES MAP (MONTHLY AVERAGE) (14)

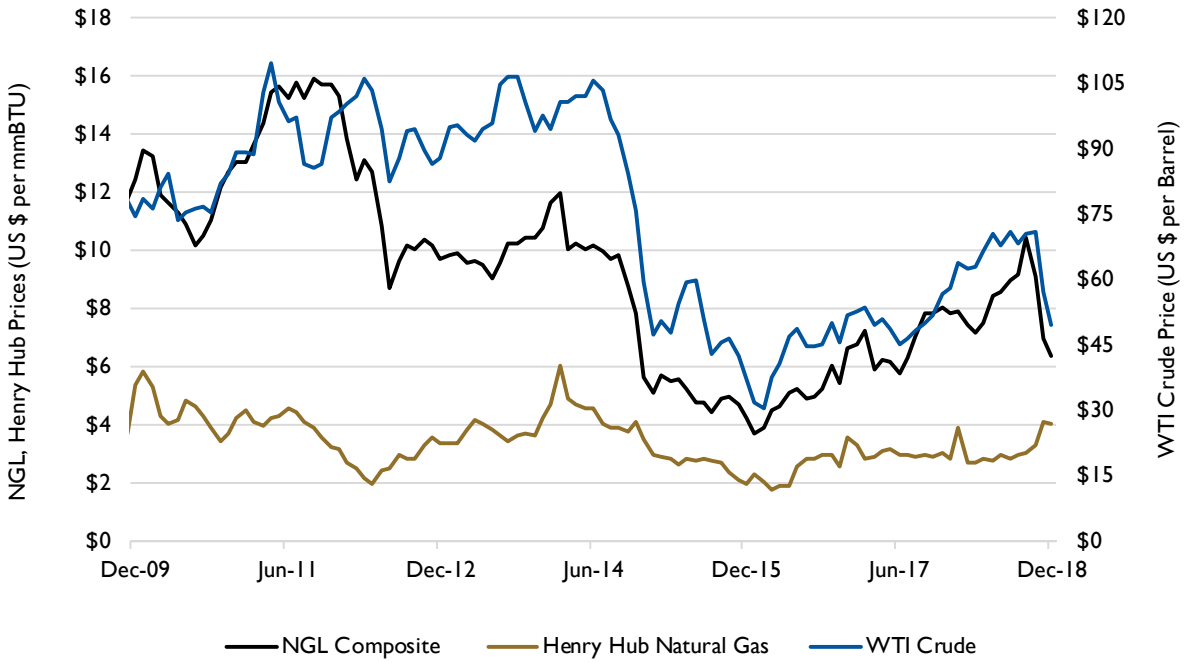
DATA CENTER

NATURAL GAS

U.S. IMPORT / EXPORT LIQUEFIED NATURAL GAS PRICES (MONTHLY AVERAGE) (15)



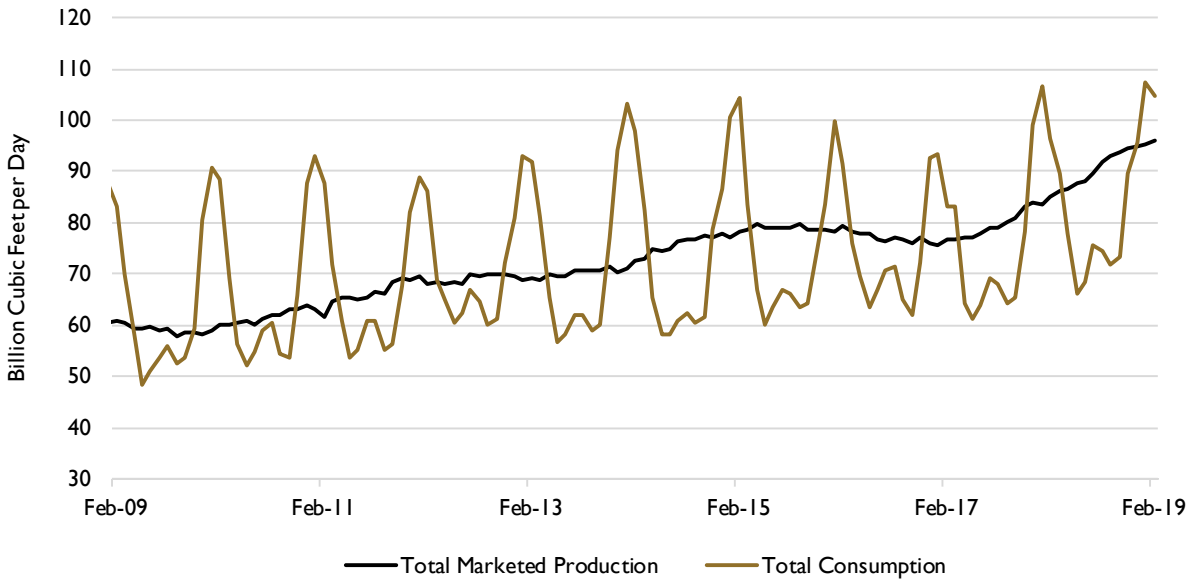
NATURAL GAS PLANT LIQUIDS PRICES (MONTHLY AVERAGE) (16)



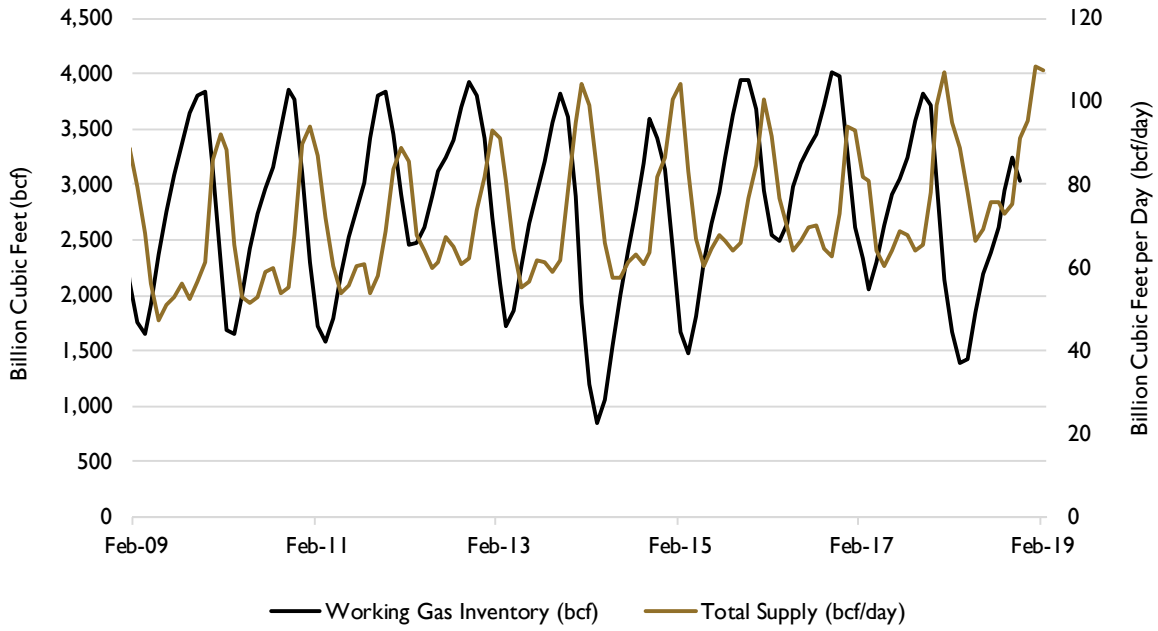
DATA CENTER

NATURAL GAS

U.S. Natural Gas Production and Consumption (Monthly) (17)



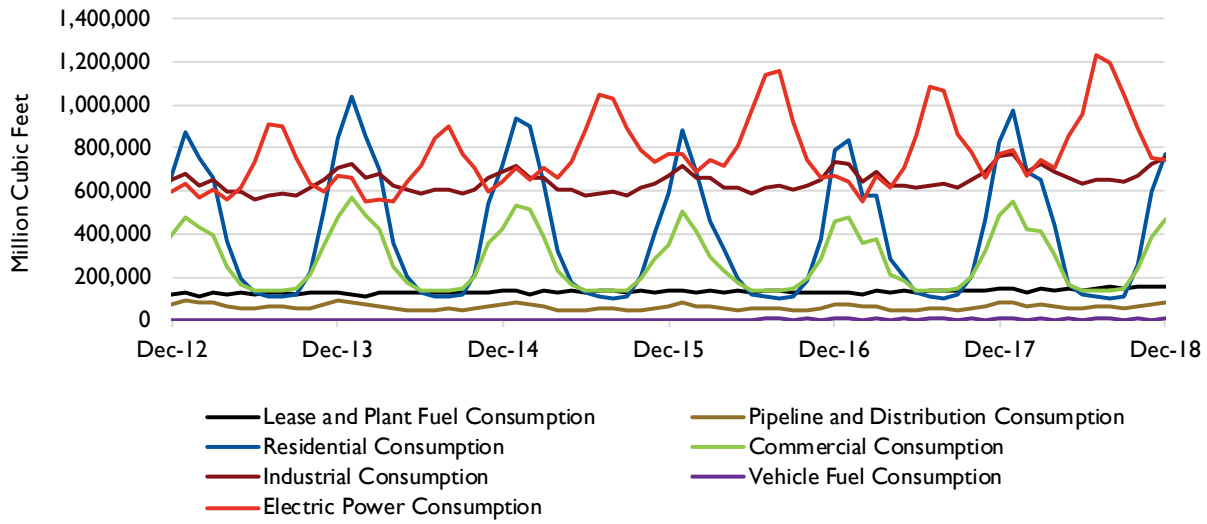
U.S. Natural Gas Supply and Inventory (Monthly) (18)



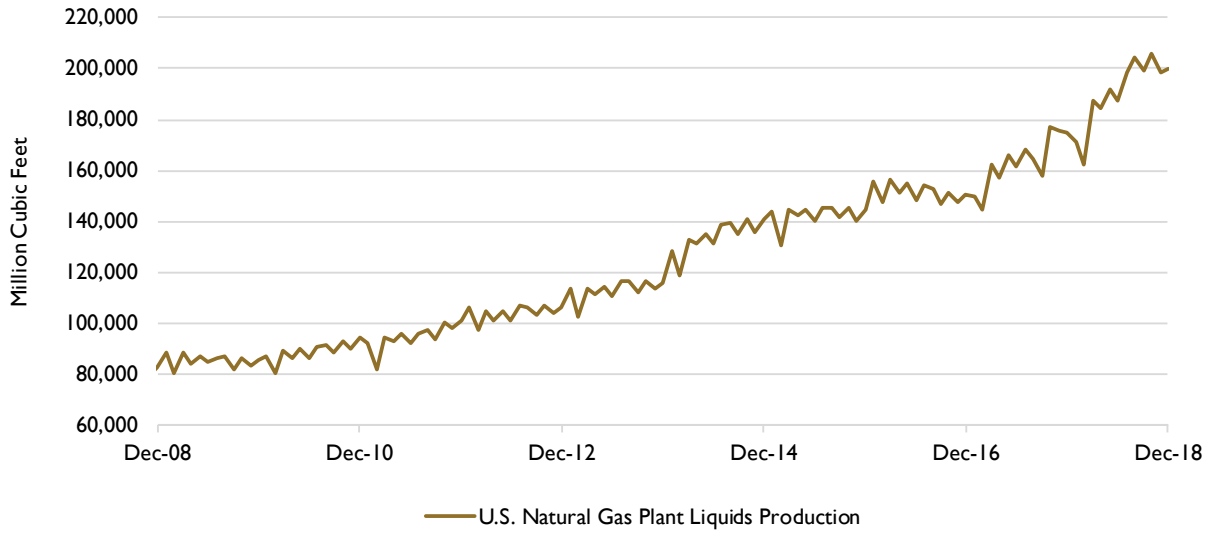
DATA CENTER

NATURAL GAS

U.S. Natural Gas Consumption by End Use (Monthly) (19)



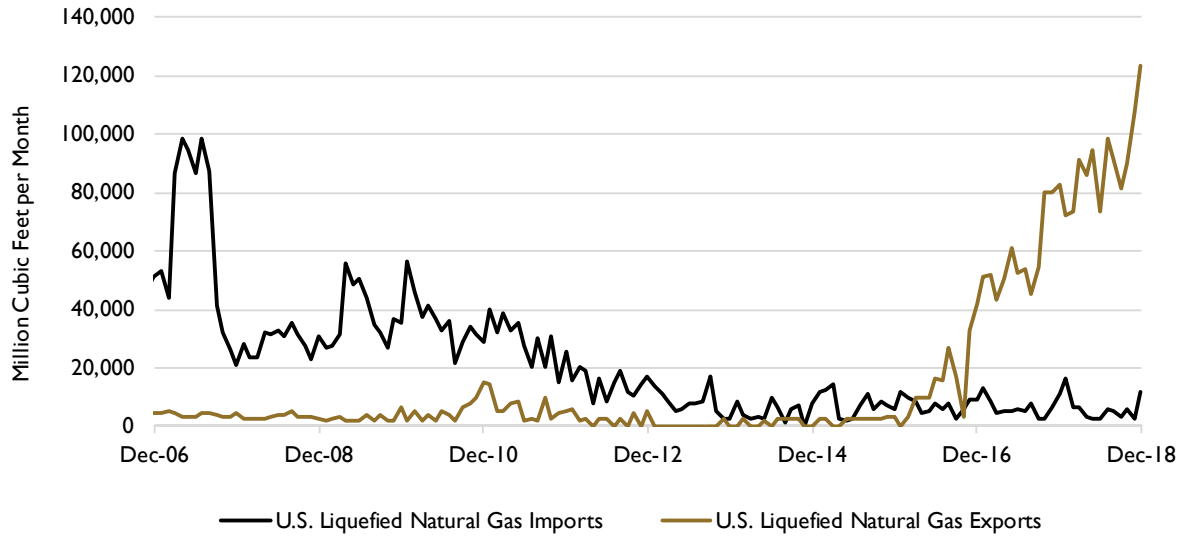
U.S. Natural Gas Plant Liquids Production (Monthly) (20)



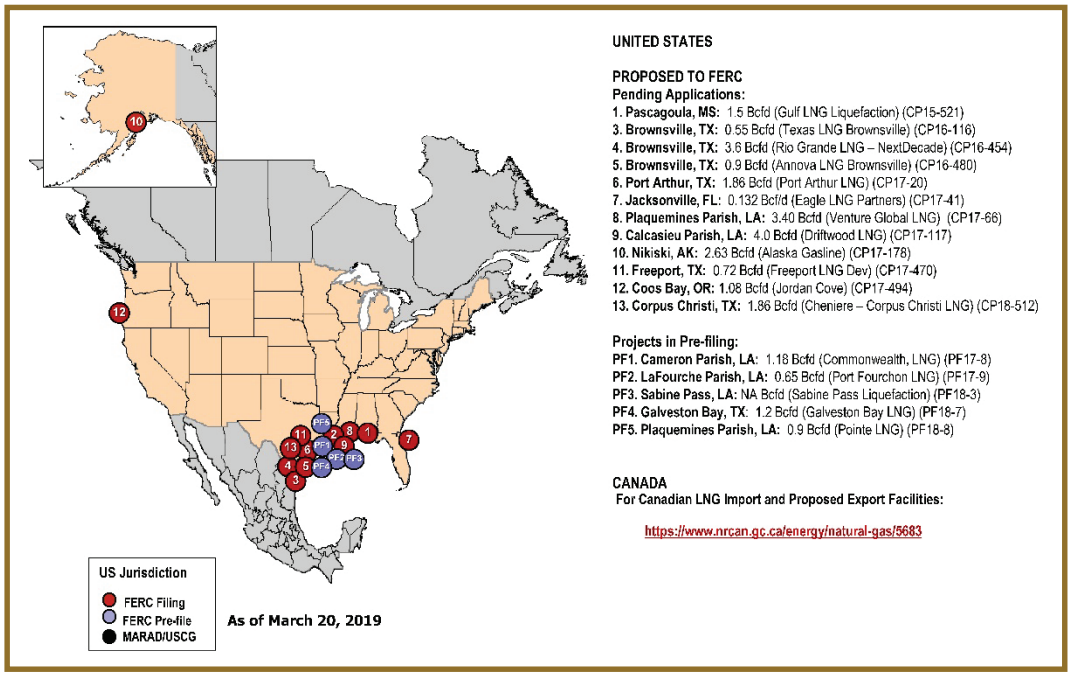
DATA CENTER

NATURAL GAS

U.S. LIQUEFIED NATURAL GAS IMPORT AND EXPORT VOLUMES (MONTHLY) (21)



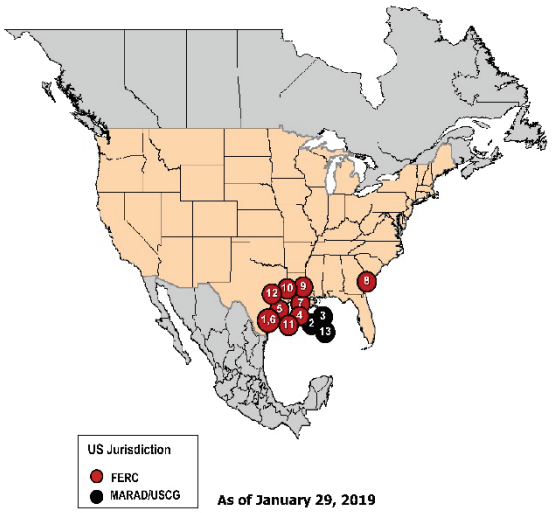
NORTH AMERICAN LNG EXPORT TERMINALS – *PROPOSED* (22)



DATA CENTER

NATURAL GAS

NORTH AMERICAN LNG IMPORT/EXPORT TERMINALS – *APPROVED* (23)



Import Terminals

U.S.

APPROVED - UNDER CONSTRUCTION - FERC
1. **Corpus Christi, TX:** 0.4 Bcfd (Cheniere – Corpus Christi LNG) (CP12-507)

APPROVED – NOT UNDER CONSTRUCTION - FERC
None

APPROVED - NOT UNDER CONSTRUCTION - MARAD/Coast Guard
2. **Gulf of Mexico:** 1.0 Bcfd (Main Pass McMoRan Exp.)
3. **Gulf of Mexico:** 1.4 Bcfd (TORP Technology-Bienville LNG)

Export Terminals

U.S.

APPROVED - UNDER CONSTRUCTION - FERC
4. **Hackberry, LA:** 2.1 Bcfd (Sempra–Cameron LNG) (CP13-25)
5. **Freeport, TX:** 2.14 Bcfd (Freeport LNG Dev/Freeport LNG Expansion/FLNG Liquefaction) (CP12-509) (CP15-518)
6. **Corpus Christi, TX:** 2.14 Bcfd (Cheniere – Corpus Christi LNG) (CP12-507)
7. **Sabine Pass, LA:** 1.40 Bcfd (Sabine Pass Liquefaction) (CP13-552) ★
8. **Elba Island, GA:** 0.35 Bcfd (Southern LNG Company) (CP14-103)

APPROVED – NOT UNDER CONSTRUCTION - FERC
9. **Lake Charles, LA:** 2.2 Bcfd (Southern Union – Lake Charles LNG) (CP14-120)
10. **Lake Charles, LA:** 1.08 Bcfd (Magnolia LNG) (CP14-347)
11. **Hackberry, LA:** 1.41 Bcfd (Sempra - Cameron LNG) (CP15-560)
12. **Sabine Pass, TX:** 2.1 Bcfd (ExxonMobil – Golden Pass) (CP14-517)

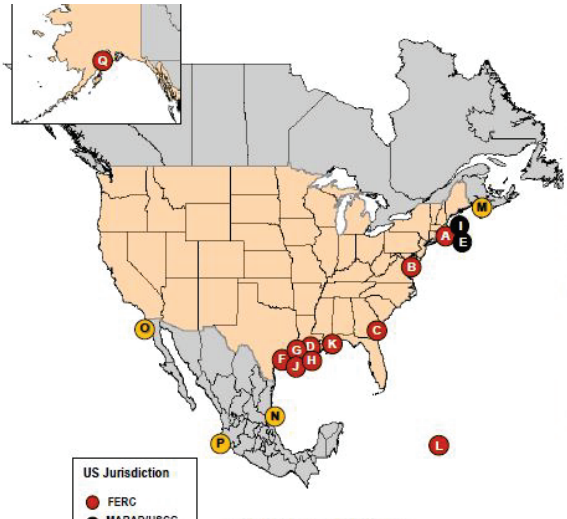
APPROVED – NOT UNDER CONSTRUCTION – MARAD/Coast Guard
13. **Gulf of Mexico:** 1.8 Bcfd (Delfin LNG)

CANADA
For Canadian LNG Import and Proposed Export Facilities go to:

https://www.nrcan.gc.ca/energy/natural-gas/5683

★Trains 5 & 6 with Train 5 under construction

NORTH AMERICAN LNG IMPORT/EXPORT TERMINALS – *EXISTING* (24)



Import Terminals

U.S.
A. Everett, MA: 1.035 Bcfd (GDF SUEZ - DOMAC)
B. Cove Point, MD: 1.8 Bcfd (Dominion - Cove Point LNG)
C. Elba Island, GA: 1.6 Bcfd (El Paso - Southern LNG)
D. Lake Charles, LA: 2.1 Bcfd (Southern Union - Trunkline LNG) ★
E. Offshore Boston: 0.8 Bcfd (Excelerate Energy – Northeast Gateway)
F. Freeport, TX: 1.5 Bcfd (Cheniere/Freeport LNG Dev.)★
G. Sabine, LA: 4.0 Bcfd (Cheniere/Sabine Pass LNG)★
H. Hackberry, LA: 1.8 Bcfd (Sempra - Cameron LNG)
I. Offshore Boston, MA: 0.4 Bcfd (GDF SUEZ – Neptune LNG)
J. Sabine Pass, TX: 2.0 Bcfd (ExxonMobil – Golden Pass) (Phase I & II)
K. Pascagoula, MS: 1.5 Bcfd (El Paso/Crest/Sonangol - Gulf LNG Energy LLC)
L. Peñuelas, PR: 0.3 Bcfd (EcoElectrica)

CANADA
M. Saint John, NB: 1.0 Bcfd (Repsol/Fort Reliance - Canaport LNG)

MEXICO
N. Altamira, Tamulipas: 0.7 Bcfd (Shell/Total/Mitsui – Altamira LNG)
O. Baja California, MX: 1.0 Bcfd (Sempra – Energia Costa Azul)
P. Manzanillo, MX: 0.5 Bcfd (KMS GNL de Manzanillo)

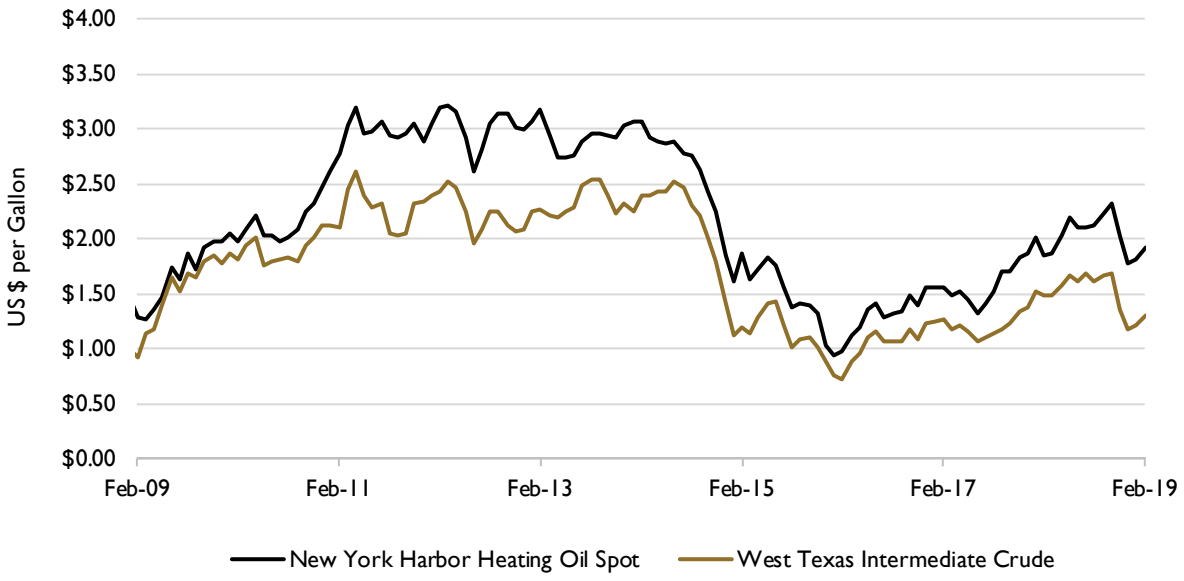
Export Terminals

U.S.
B. Cove Point, MD: 0.82 Bcfd (Dominion–Cove Point LNG) (CP13-113)
G. Sabine, LA: 2.8 Bcfd (Cheniere/Sabine Pass LNG – Trains 1, 2, 3 & 4)
Q. Kenai, AK: 0.2 Bcfd (ConocoPhillips)

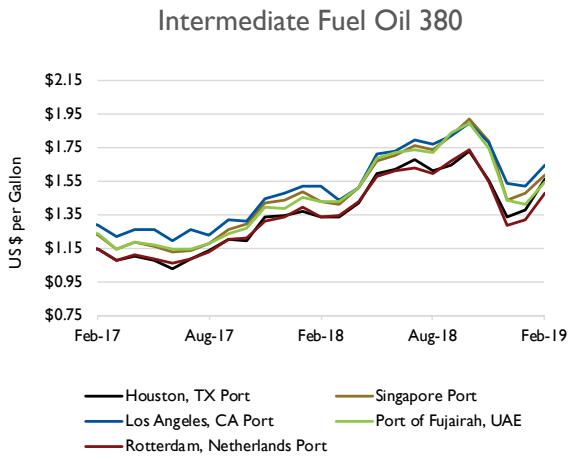
DATA CENTER

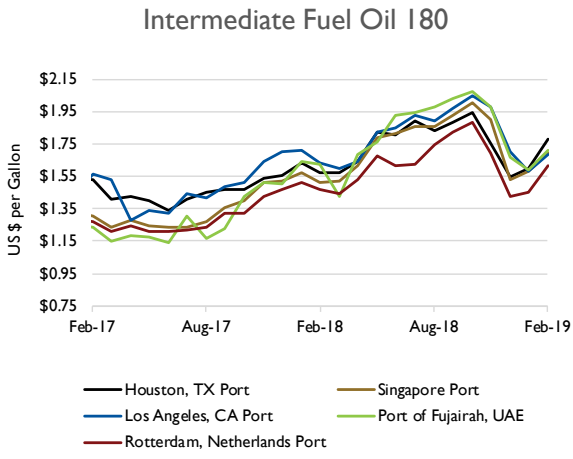
PROPANE AND HEATING/FUEL OIL

HEATING OIL PRICES (MONTHLY AVERAGE) (25)



INTERMEDIATE FUEL OIL AKA "BUNKER FUEL" PRICES (MONTHLY AVERAGE) (26)

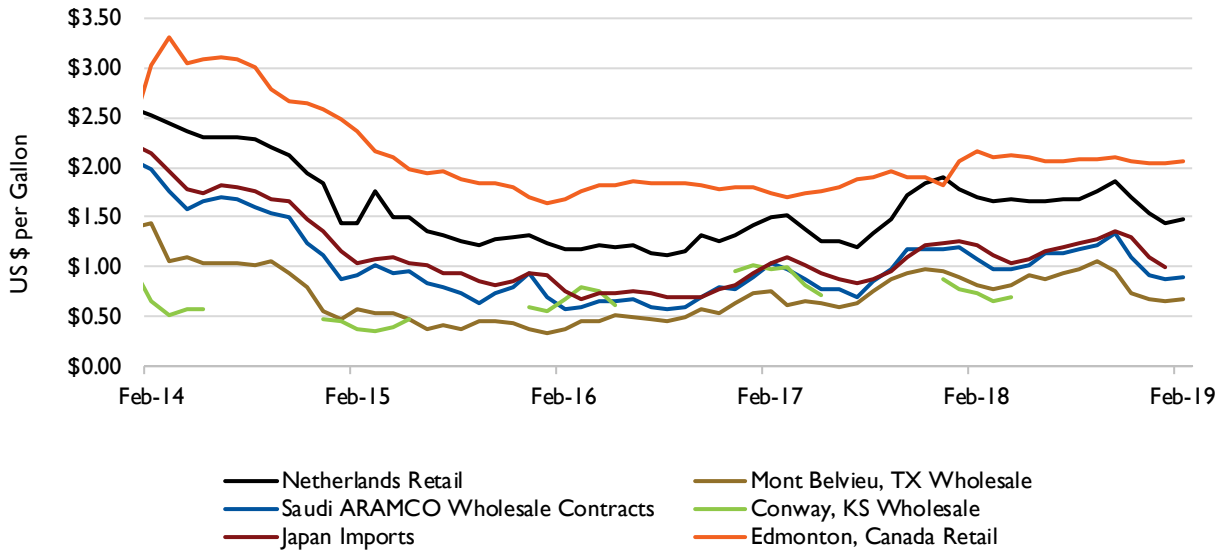




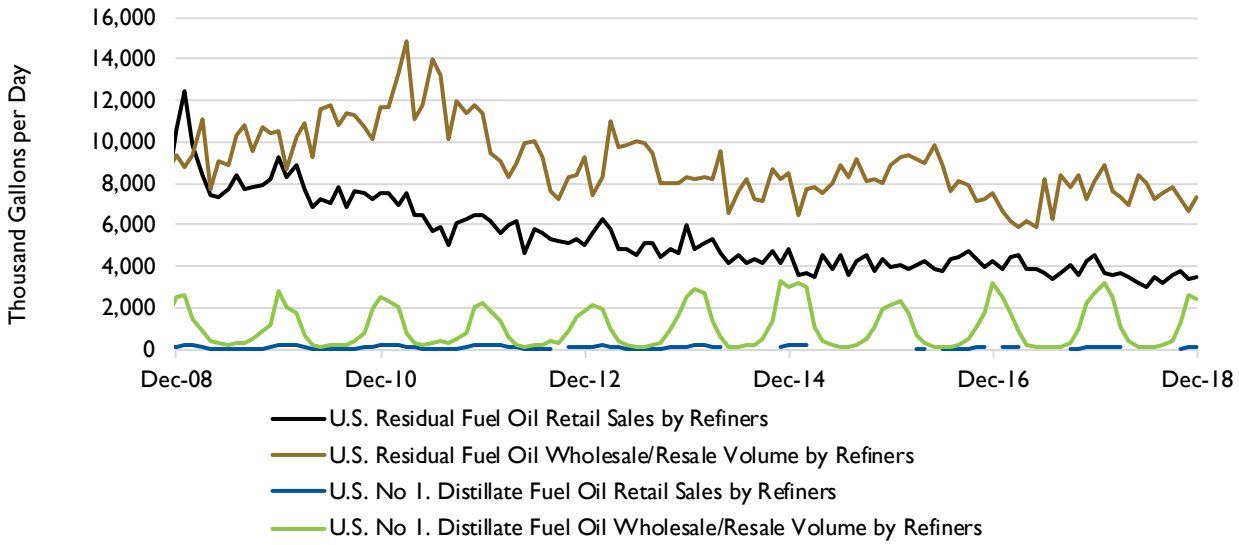
DATA CENTER

PROPANE AND HEATING/FUEL OIL

PROPANE PRICES (MONTHLY AVERAGE) (27)



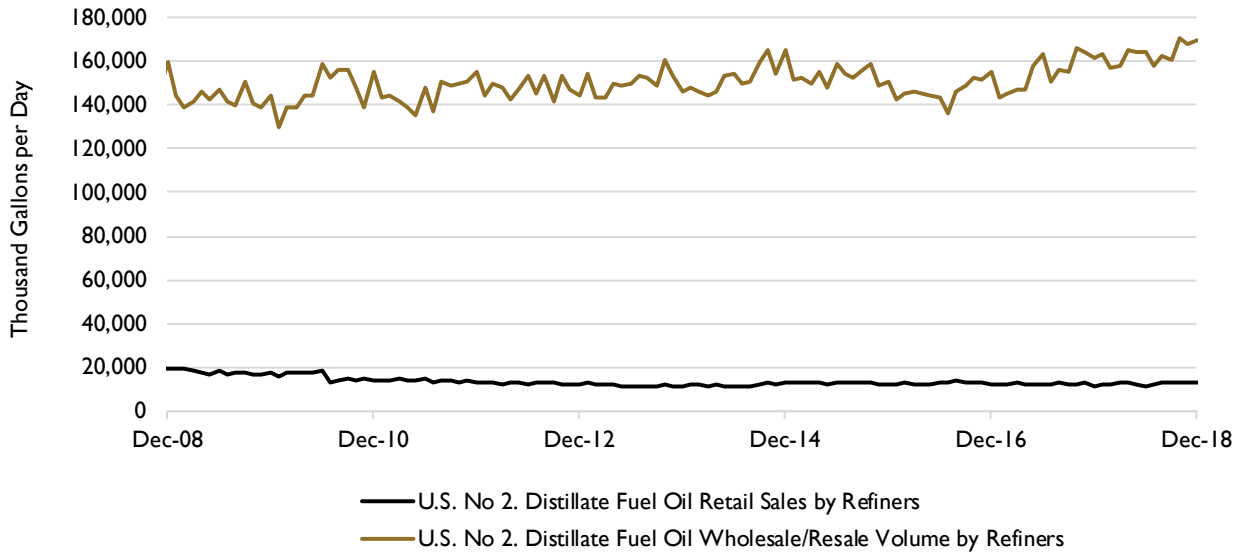
NO. 1 DISTILLATE FUEL OIL, RESIDUAL FUEL OIL WHOLESALE, RETAIL SALES VOLUME BY REFINERS (MONTHLY) (28)



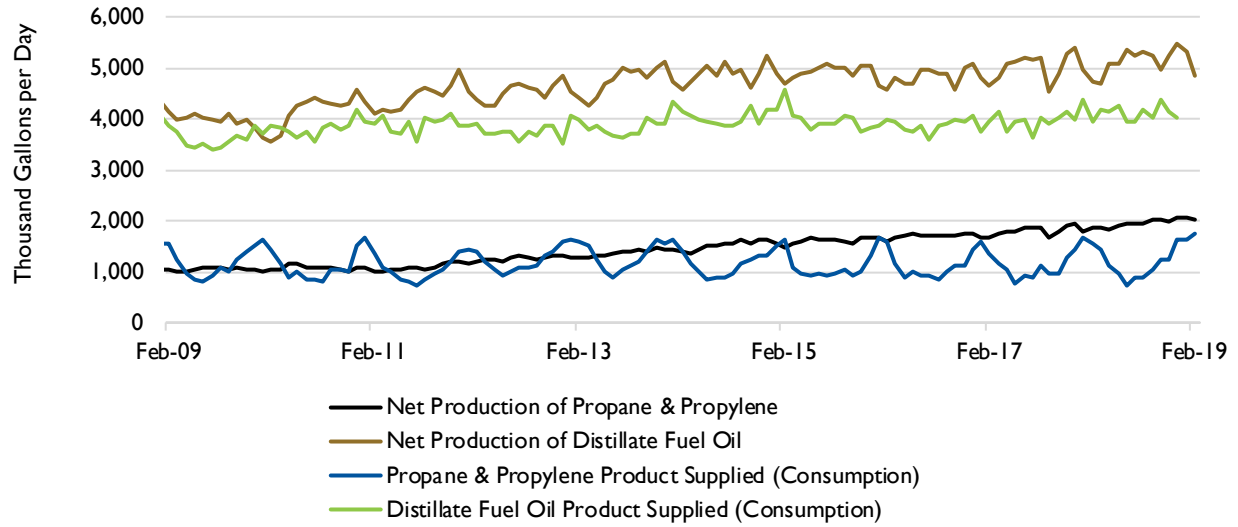
DATA CENTER

PROPANE AND HEATING/FUEL OIL

No. 2 Distillate Fuel Oil Wholesale, Retail Sales Volume by Refiners (Monthly) (29)



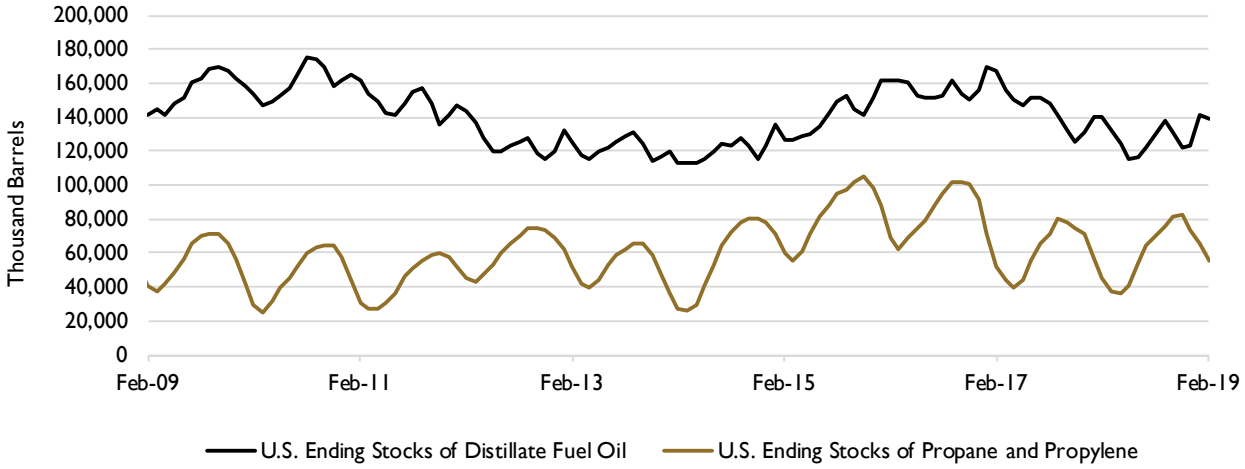
Propane & Propylene and Distillate Fuel Oil Production and Consumption (Monthly) (30)



DATA CENTER

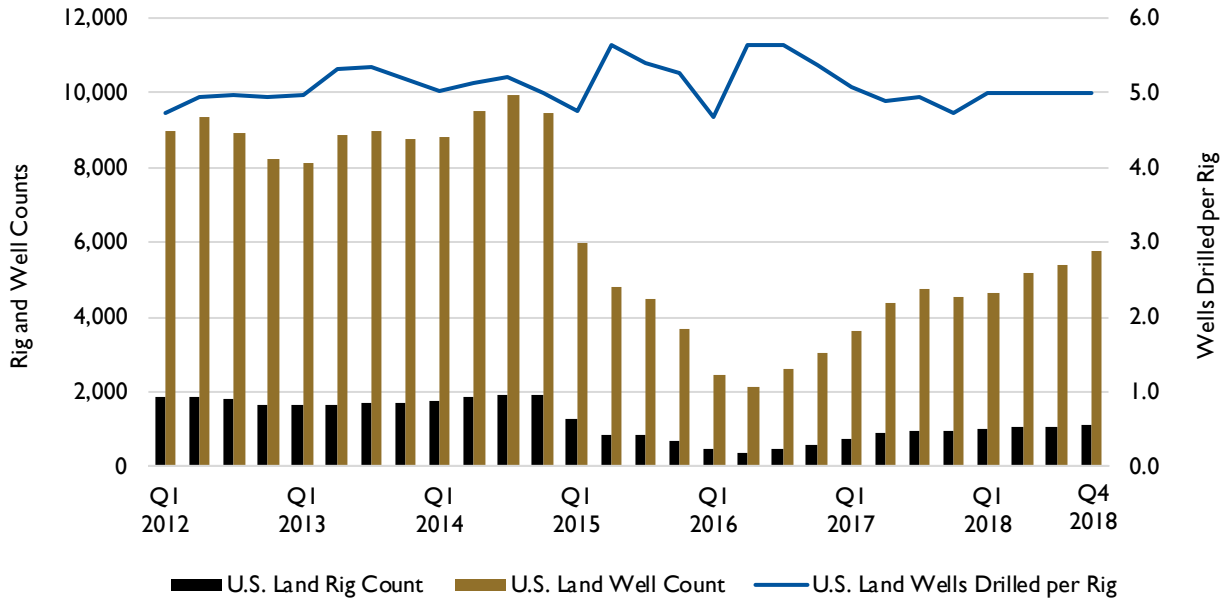
PROPANE AND HEATING/FUEL OIL

U.S. Ending Stocks of Propane & Propylene and Distillate Fuel Oil (Monthly Average) (31)



DRILLING ACTIVITY

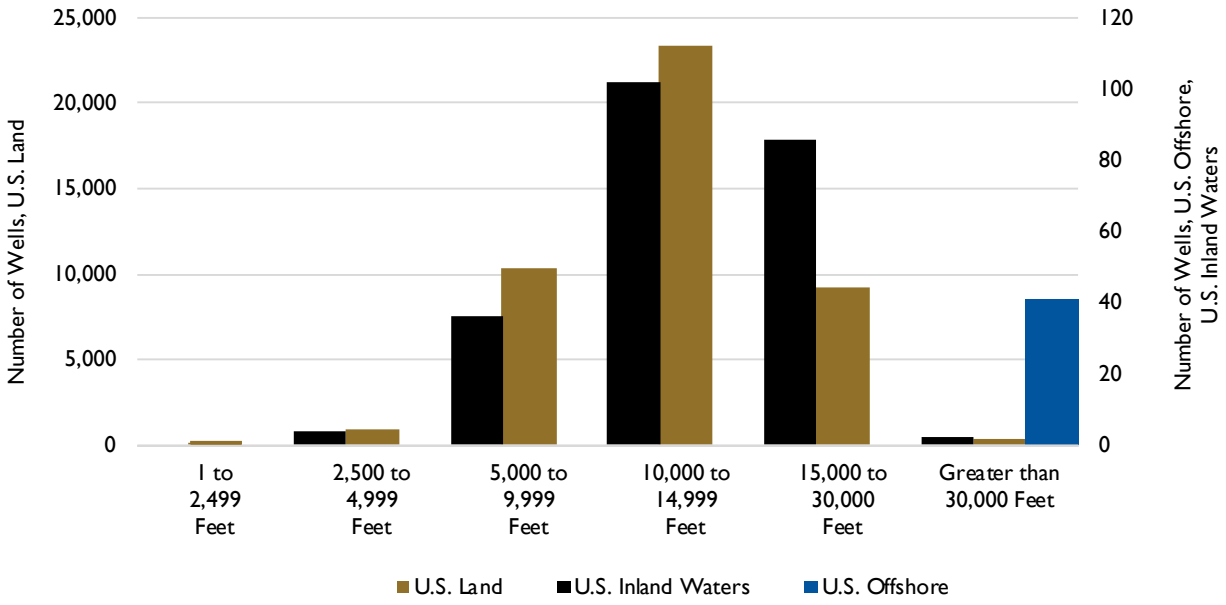
U.S. Land Well Count, Rig Count and Wells per Rig (Quarterly) (32)



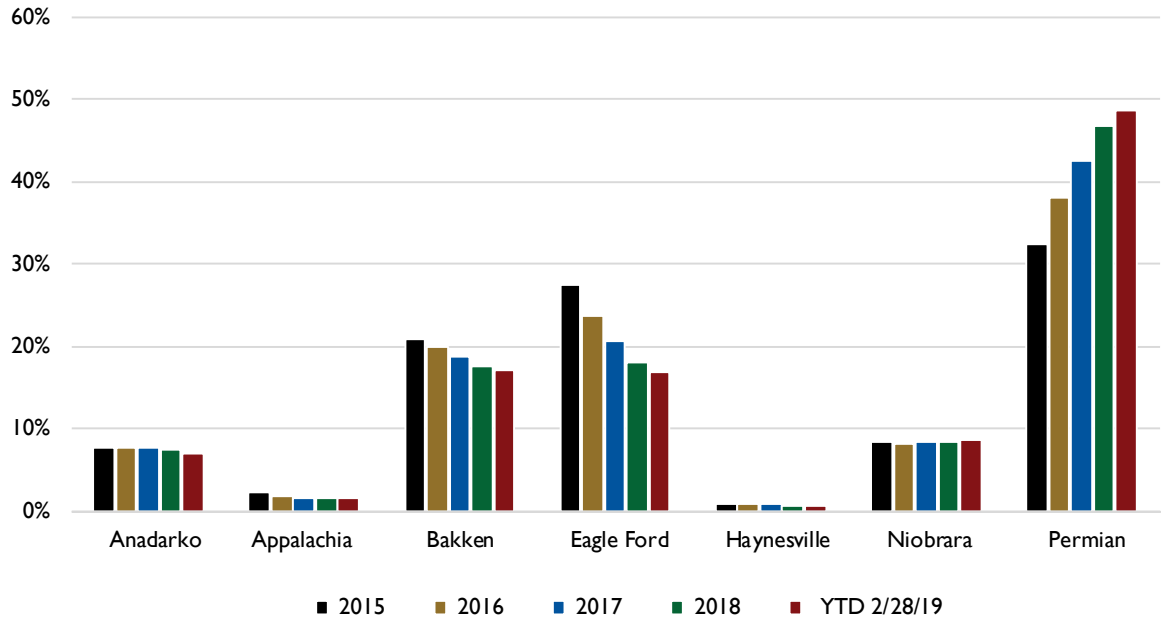
DATA CENTER

DRILLING ACTIVITY

U.S. WELL STARTS BY DEPTH (YEAR TO DATE FEBRUARY 28, 2019) (33)



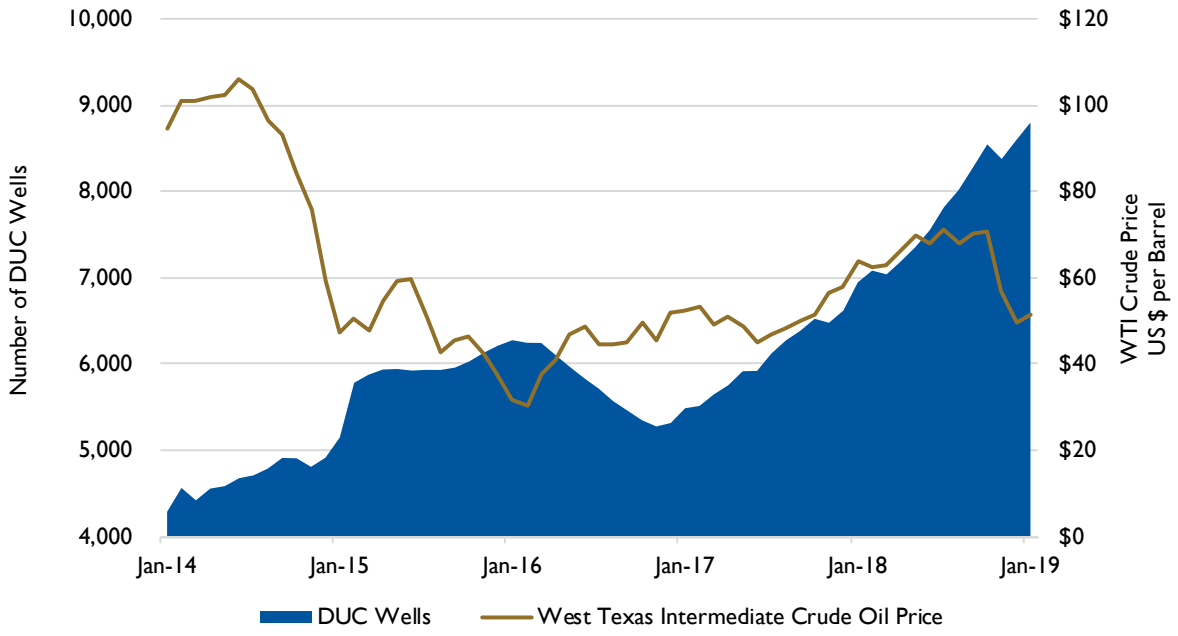
PERCENTAGE OF CRUDE OIL PRODUCTION PER SHALE REGION (MONTHLY) (34)



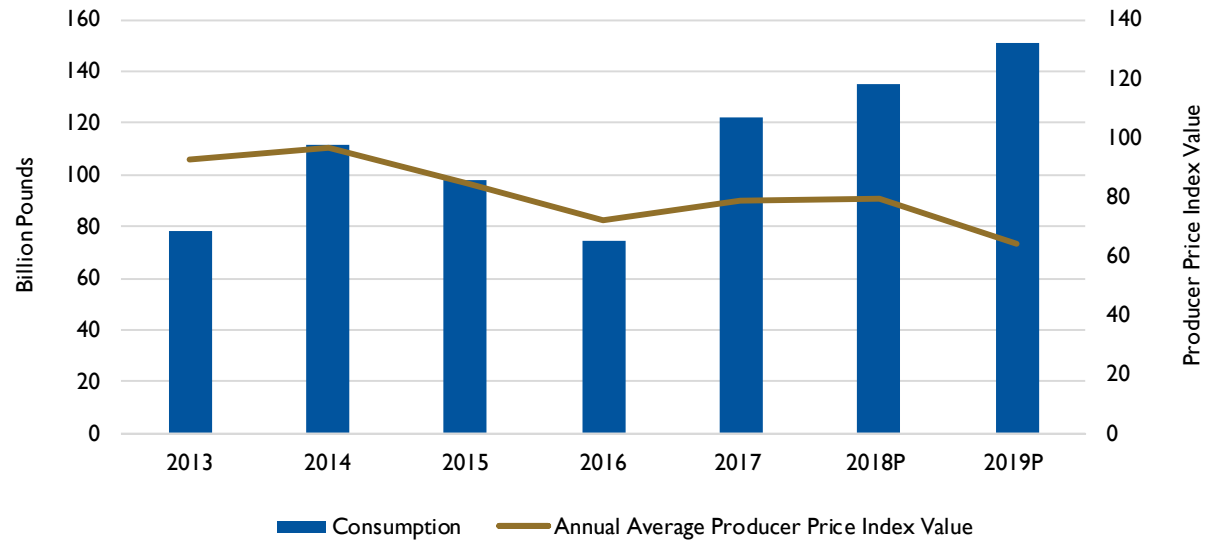
DATA CENTER

DRILLING ACTIVITY

DRILLED BUT UNCOMPLETED (DUC) WELLS VS. CRUDE OIL PRICE (MONTHLY) (35)



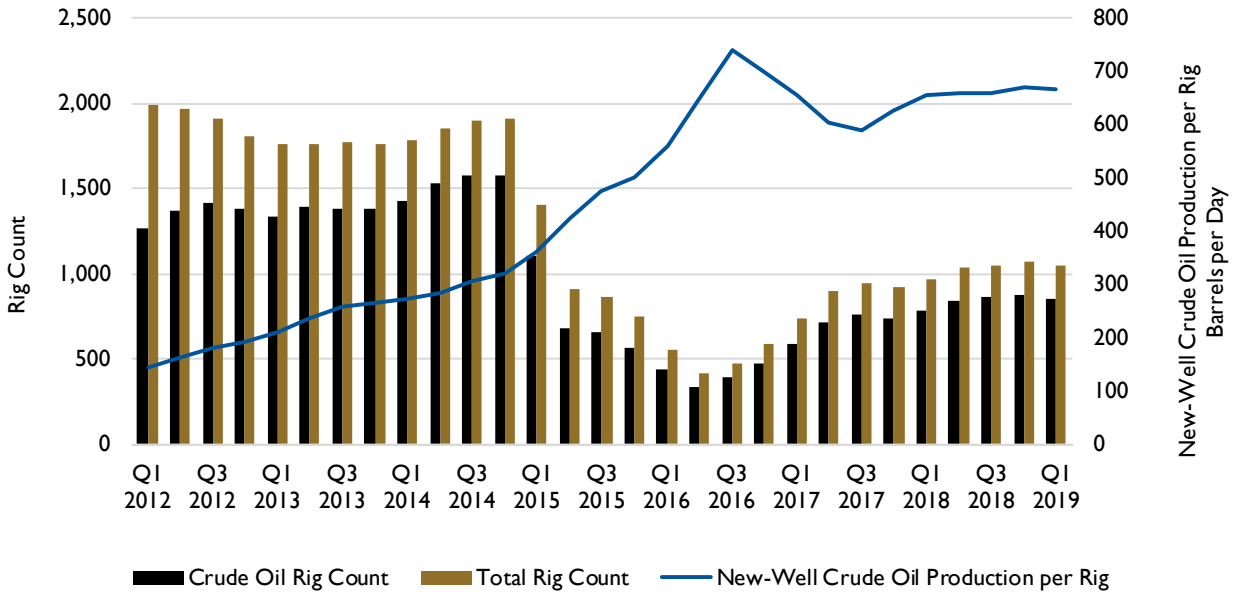
HYDRAULIC FRACTURING SAND CONSUMPTION AND PRODUCER PRICE INDEX (ANNUAL) (36)



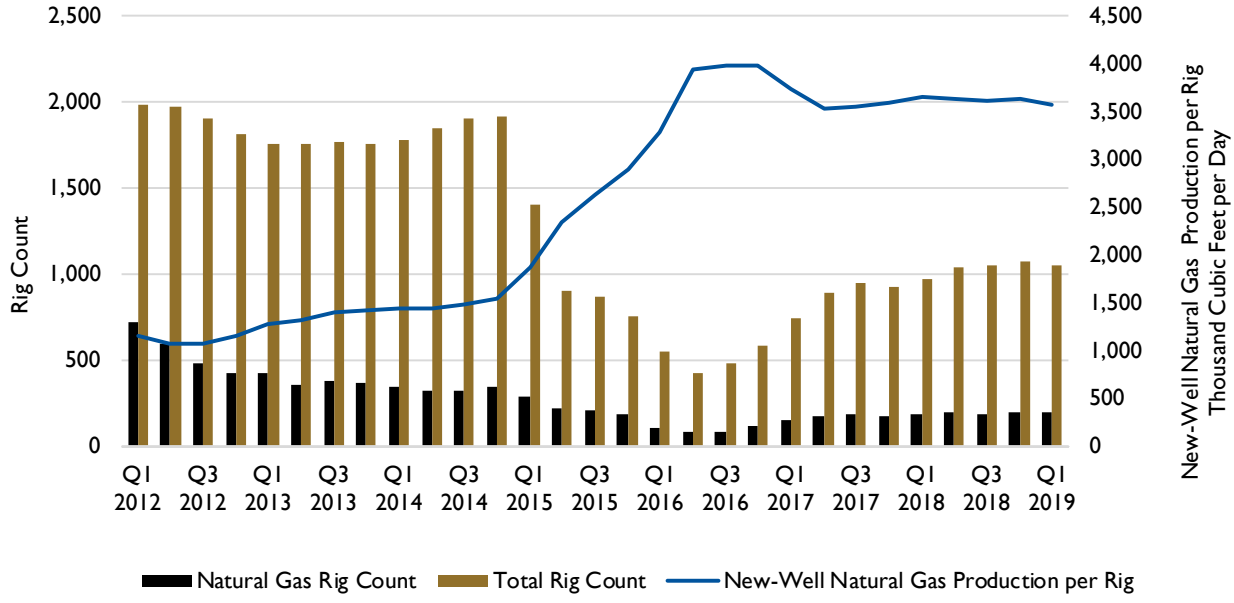
DATA CENTER

DRILLING ACTIVITY

CRUDE OIL PRODUCTION, RIG COUNT AND PRODUCTION PER RIG (QUARTERLY) (37)



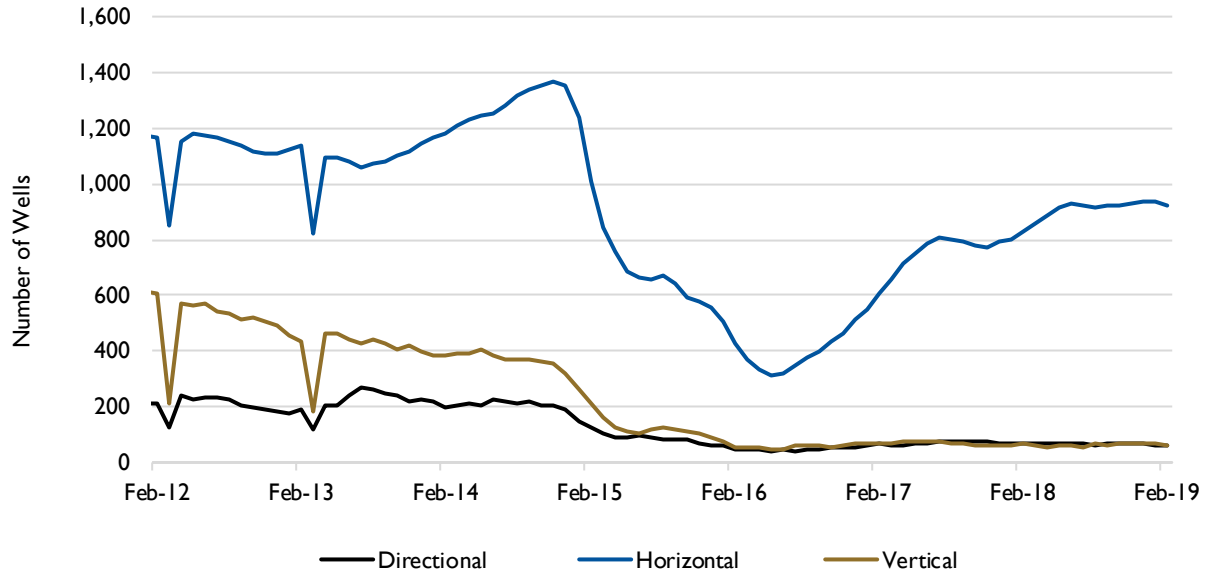
NATURAL GAS PRODUCTION, RIG COUNT AND PRODUCTION PER RIG (QUARTERLY) (38)



DATA CENTER

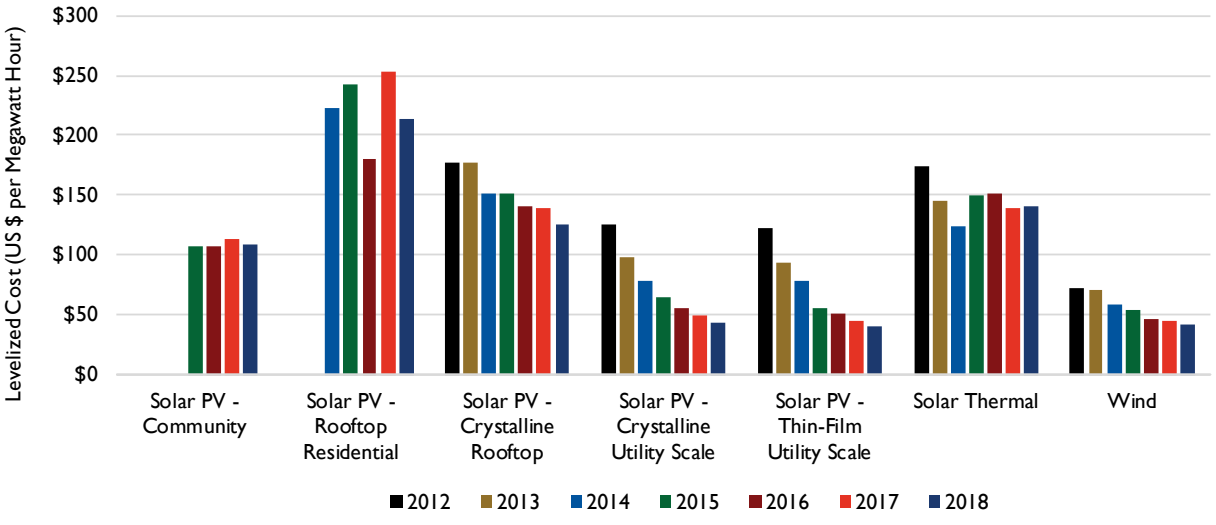
DRILLING ACTIVITY

U.S. DRILLING RIGS BY TYPE (MONTHLY) (39)



RENEWABLES

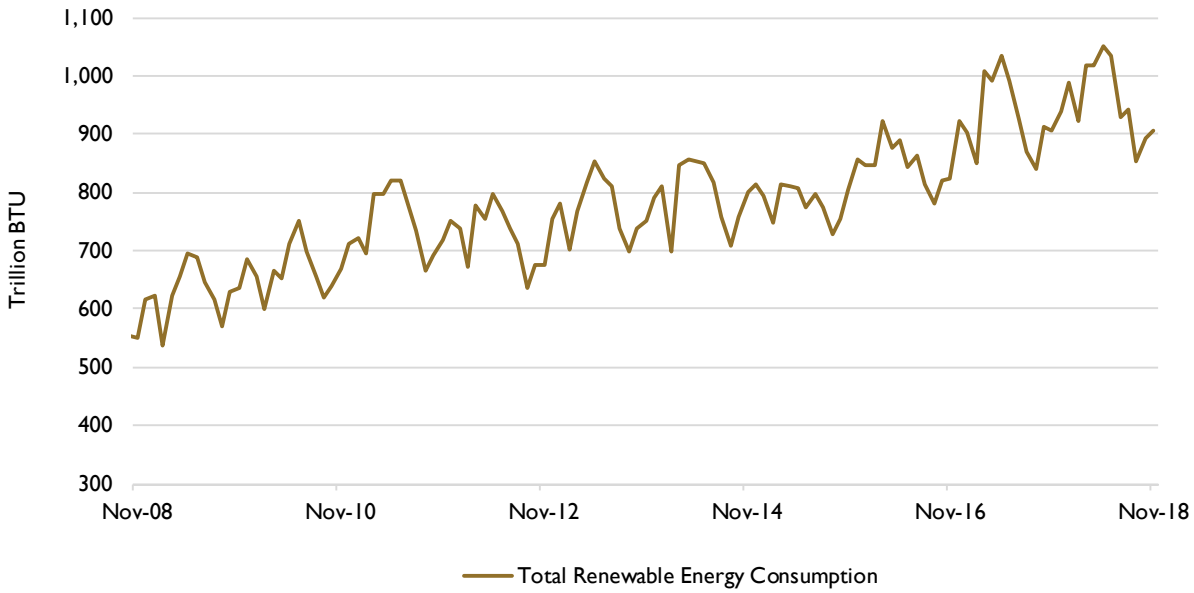
WIND AND SOLAR PRICES (ANNUAL AVERAGE) (40)



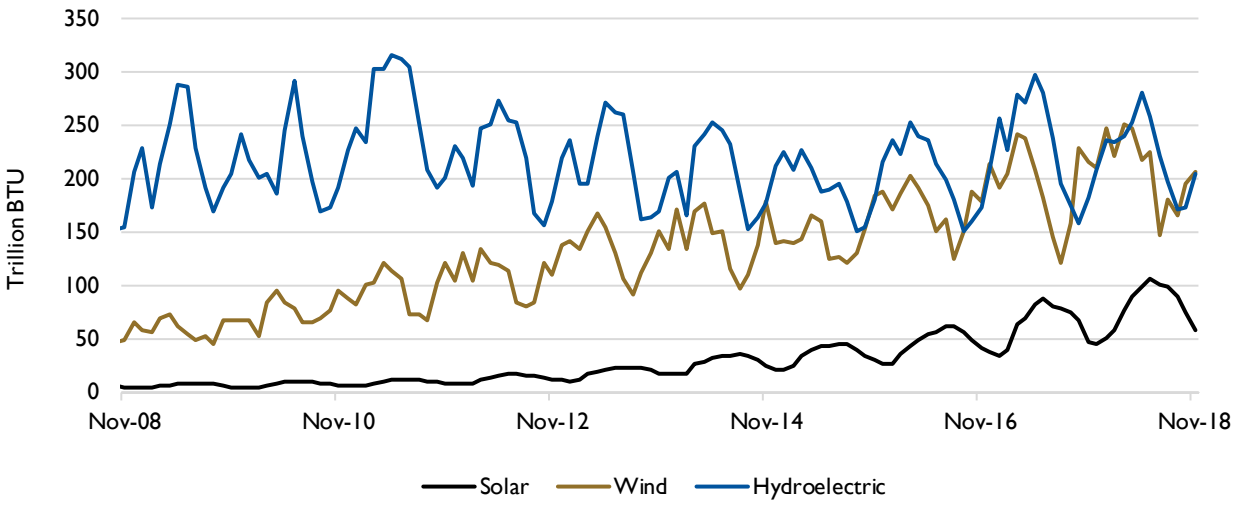
DATA CENTER

RENEWABLES

U.S. TOTAL RENEWABLE ENERGY CONSUMPTION (MONTHLY) (41)



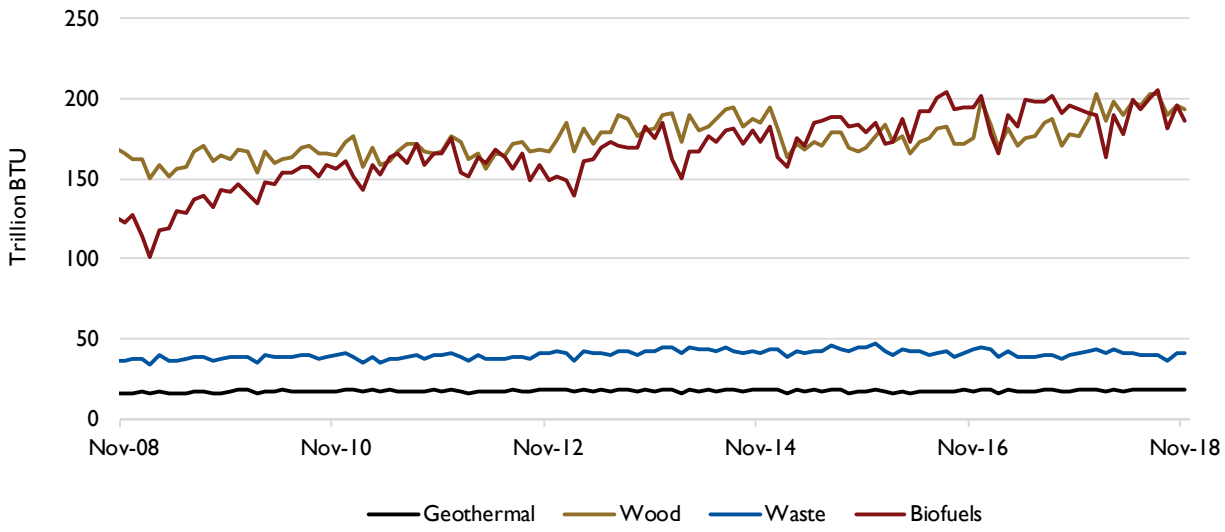
U.S. SOLAR, WIND AND HYRDOELECTRIC ENERGY CONSUMPTION (MONTHLY) (42)



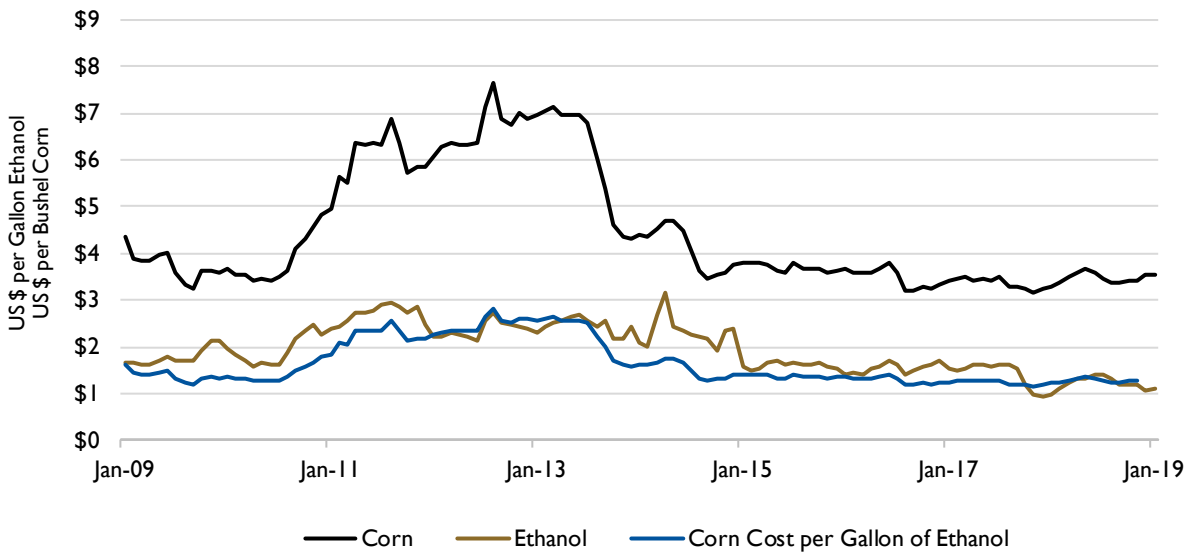
DATA CENTER

RENEWABLES

U.S. Wood, Waste, Biofuels and Geothermal Energy Consumption (Monthly) (43)



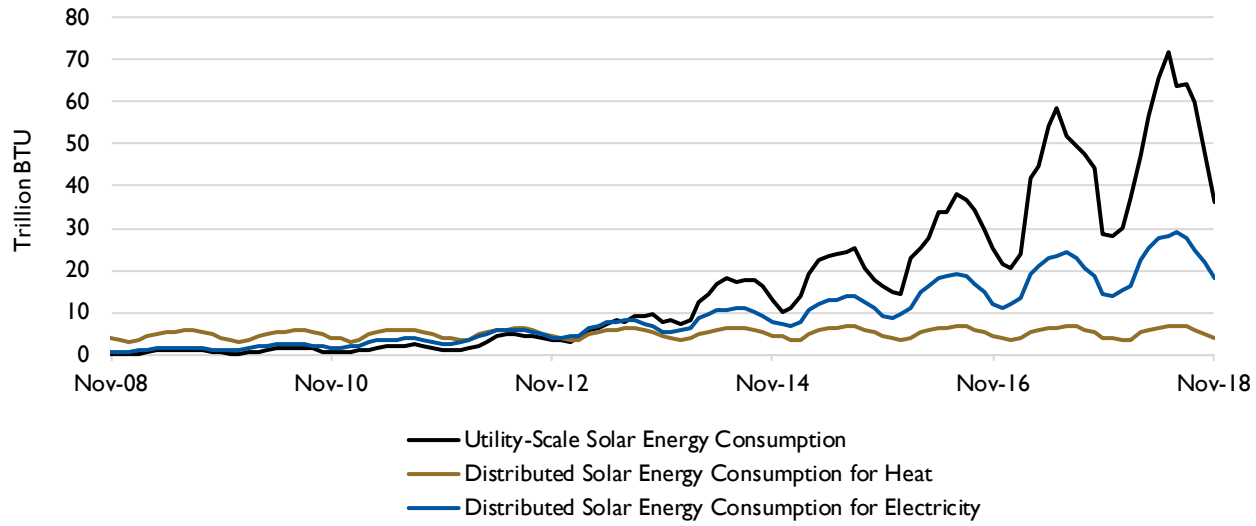
Corn and Ethanol Prices and Corn Cost per Gallon of Ethanol (Monthly Average) (44)



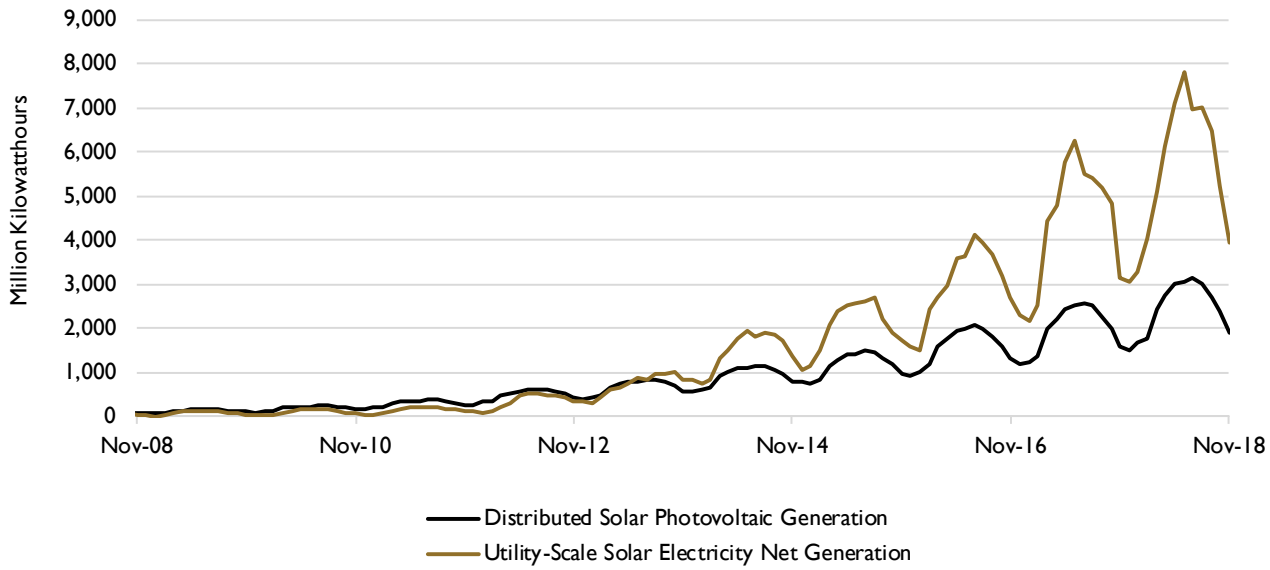
DATA CENTER

RENEWABLES

U.S. Solar Energy Consumption (Monthly) (45)



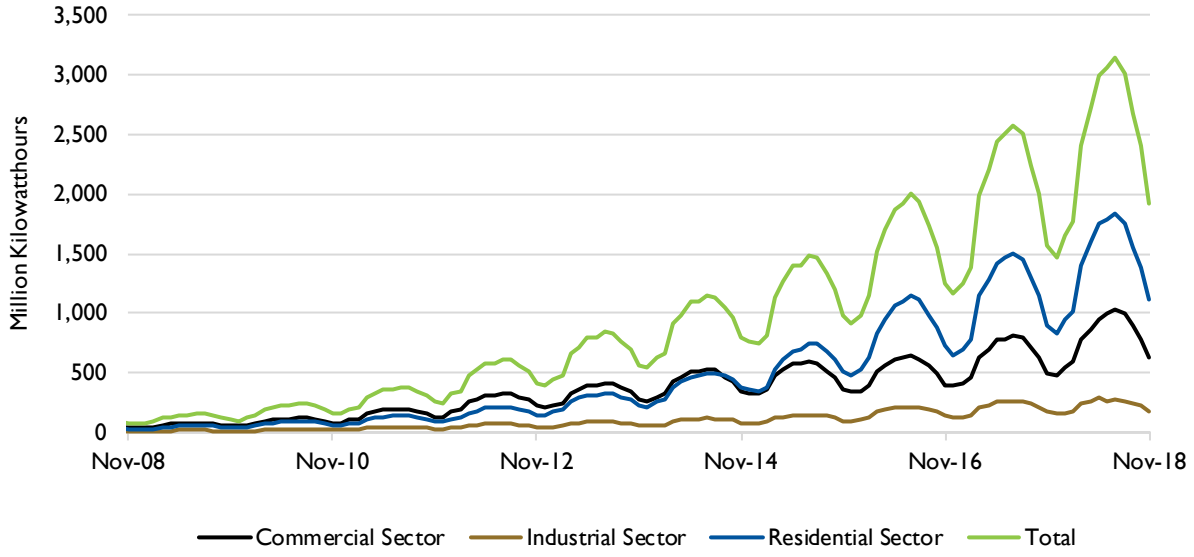
U.S. Solar Energy Net Generation (Monthly) (46)



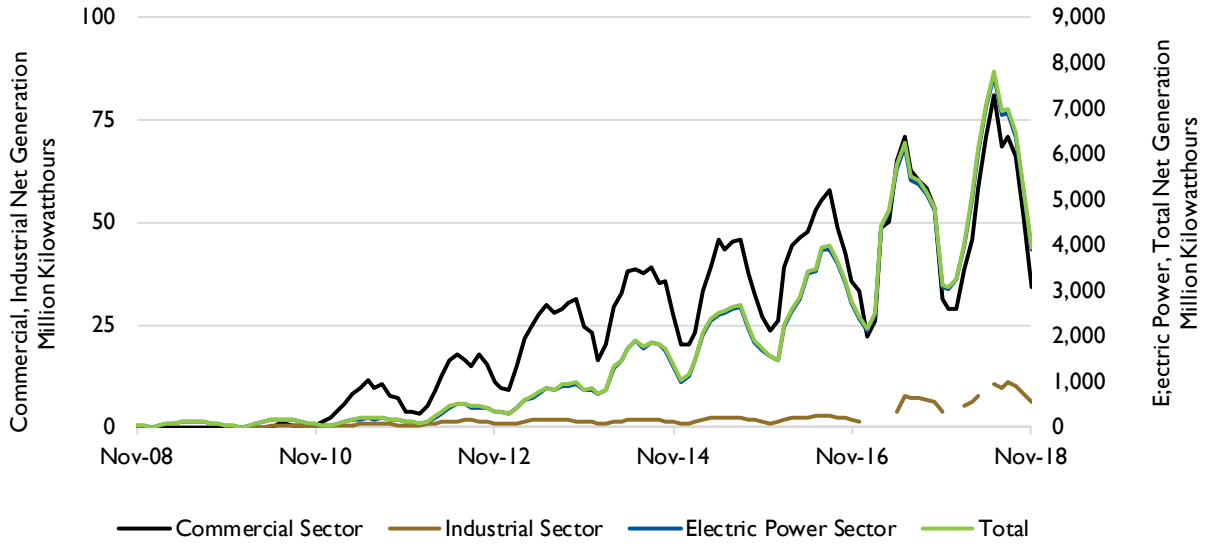
DATA CENTER

RENEWABLES

DISTRIBUTED SOLAR PHOTOVOLTAIC GENERATION BY SECTOR (MONTHLY) (47)



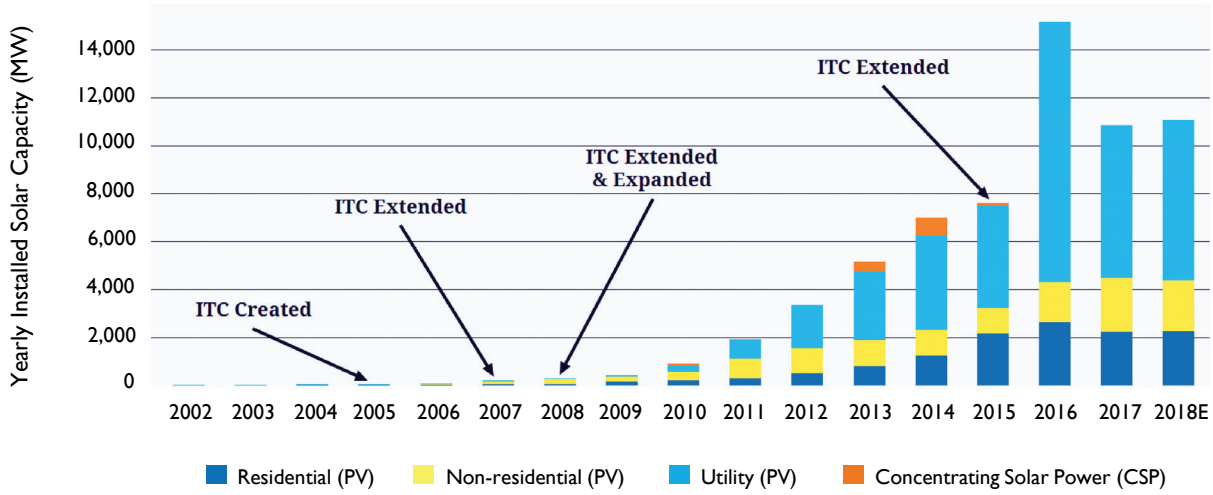
UTILITY-SCALE SOLAR ELECTRICITY NET GENERATION BY SECTOR (MONTHLY) (48)



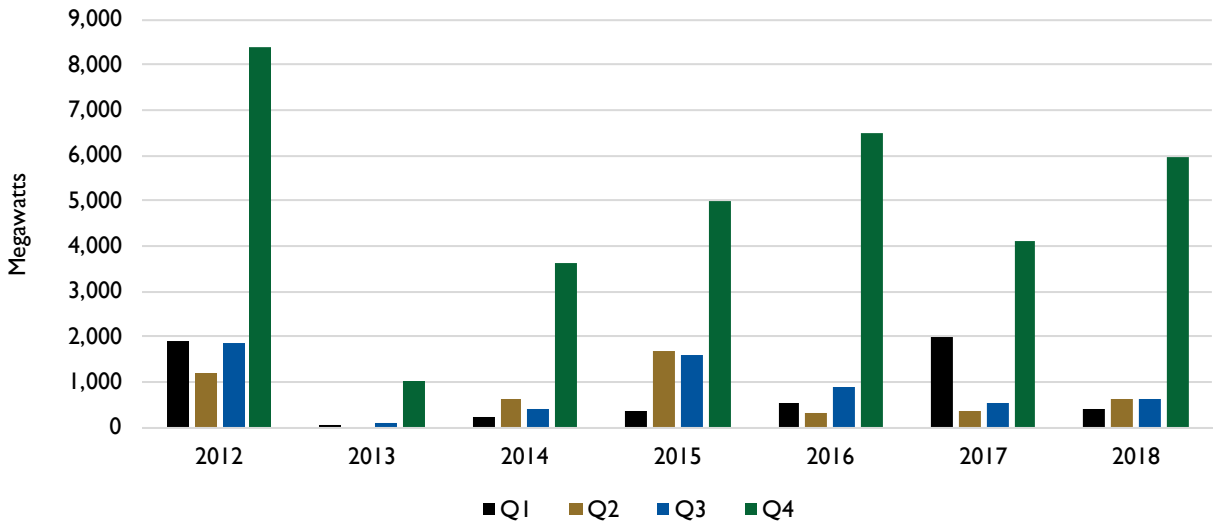
DATA CENTER

RENEWABLES

U.S. Solar Capacity Installations (Annual) (49)



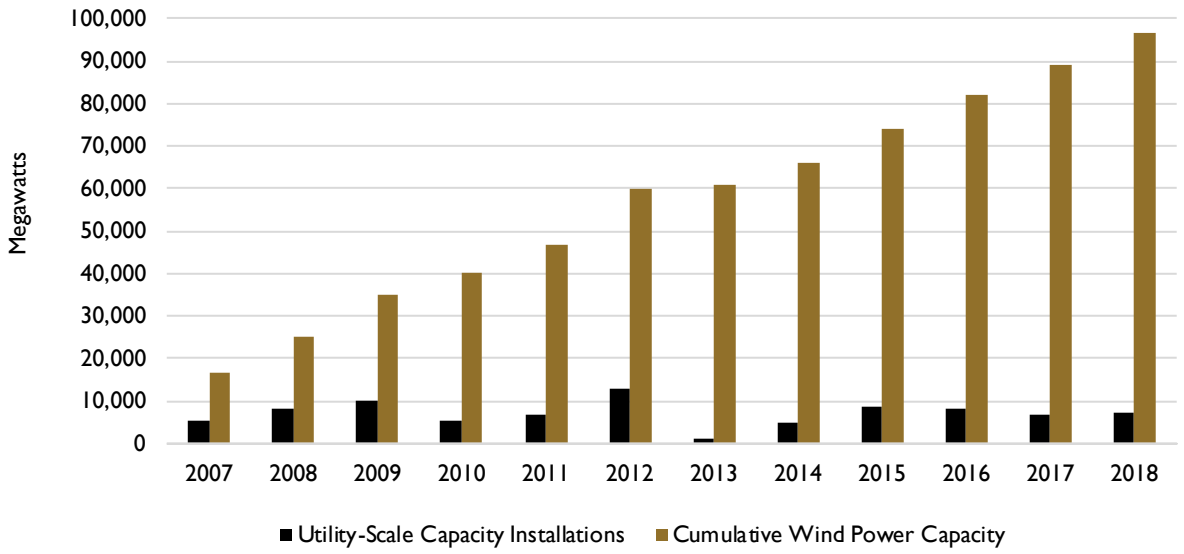
U.S. Wind Power Capacity Installations (Quarterly) (50)



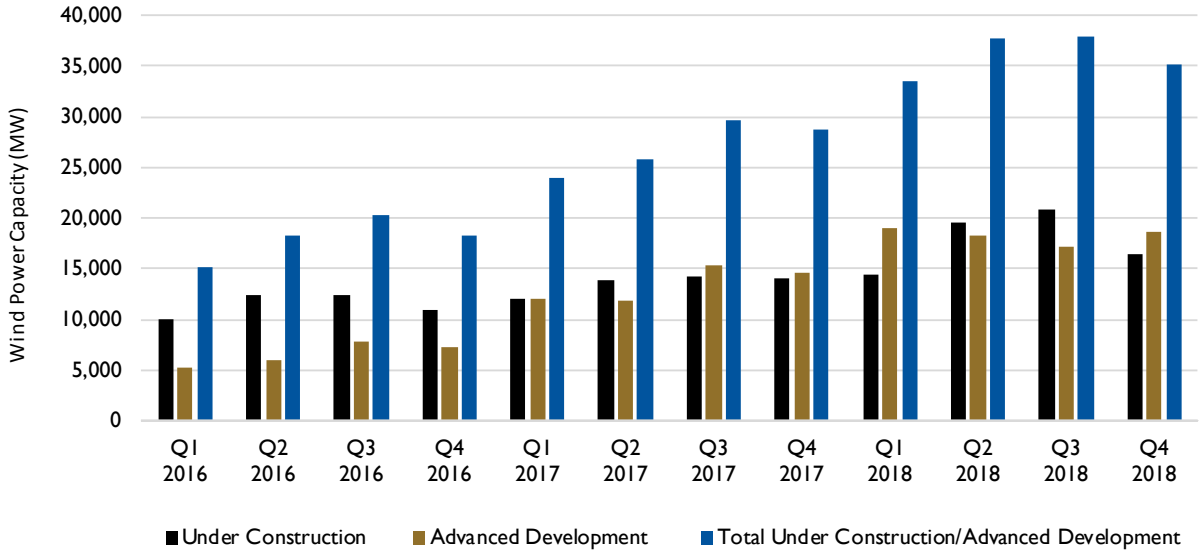
DATA CENTER

RENEWABLES

UTILITY-SCALE WIND POWER CAPACITY INSTALLATIONS (ANNUAL) (51)



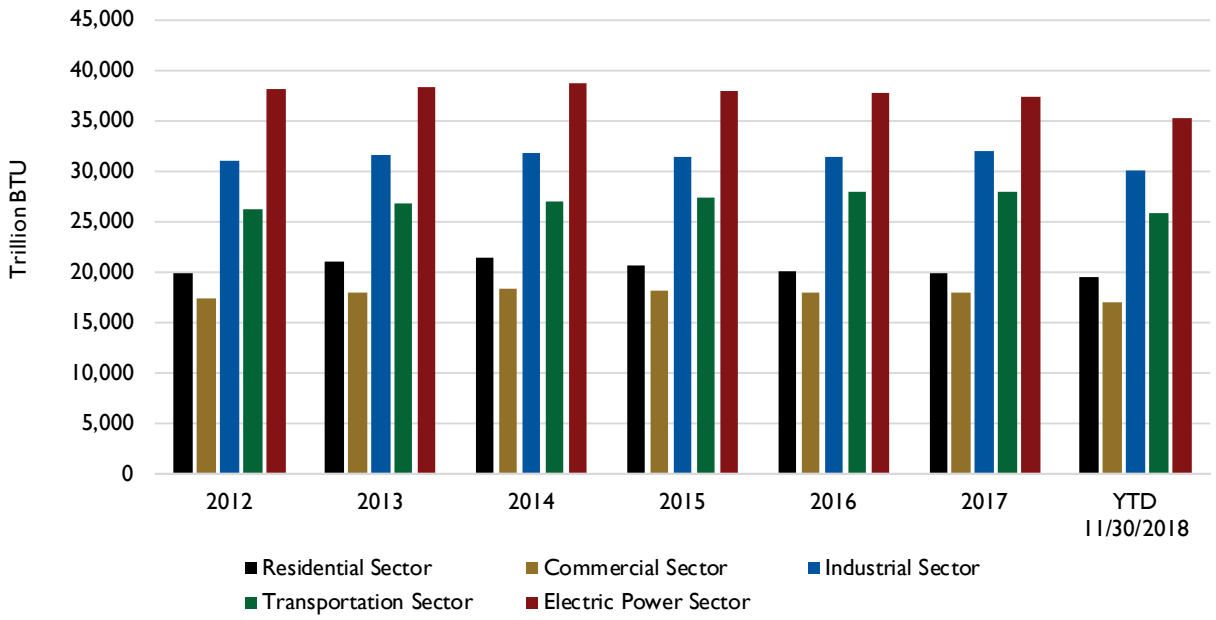
WIND POWER UNDER CONSTRUCTION OR IN ADVANCED DEVELOPMENT (QUARTERLY) (52)



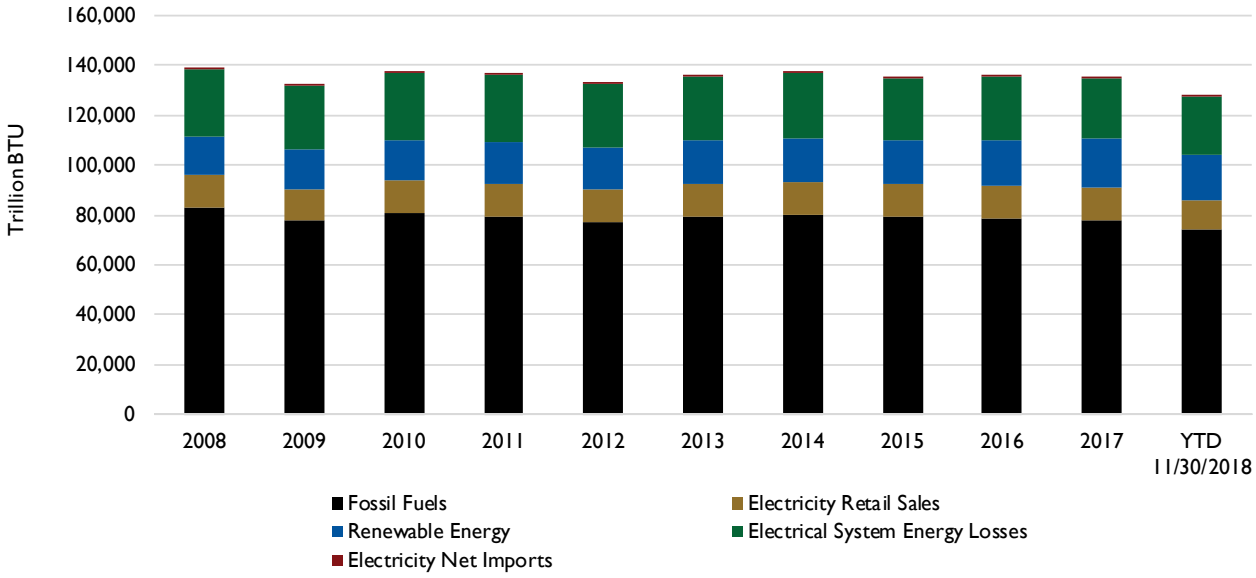
DATA CENTER

U.S. AGGREGATED ENERGY CONSUMPTION

ENERGY CONSUMPTION BY SECTOR (ANNUAL) (53)



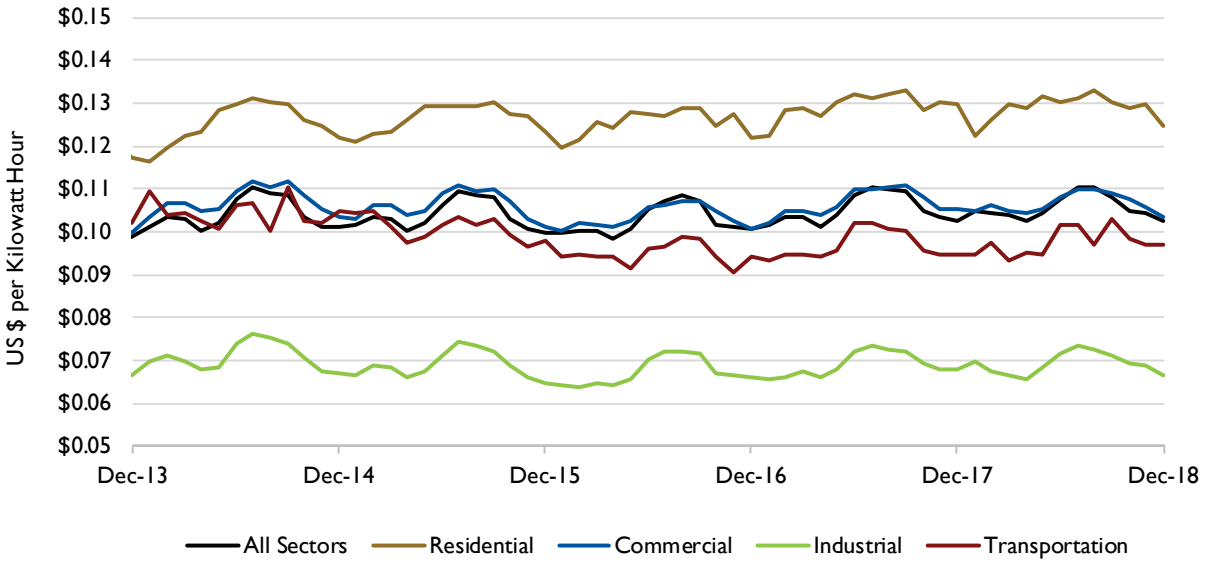
ENERGY CONSUMPTION BY SOURCE (ANNUAL) (54)



DATA CENTER

U.S. AGGREGATED ENERGY CONSUMPTION

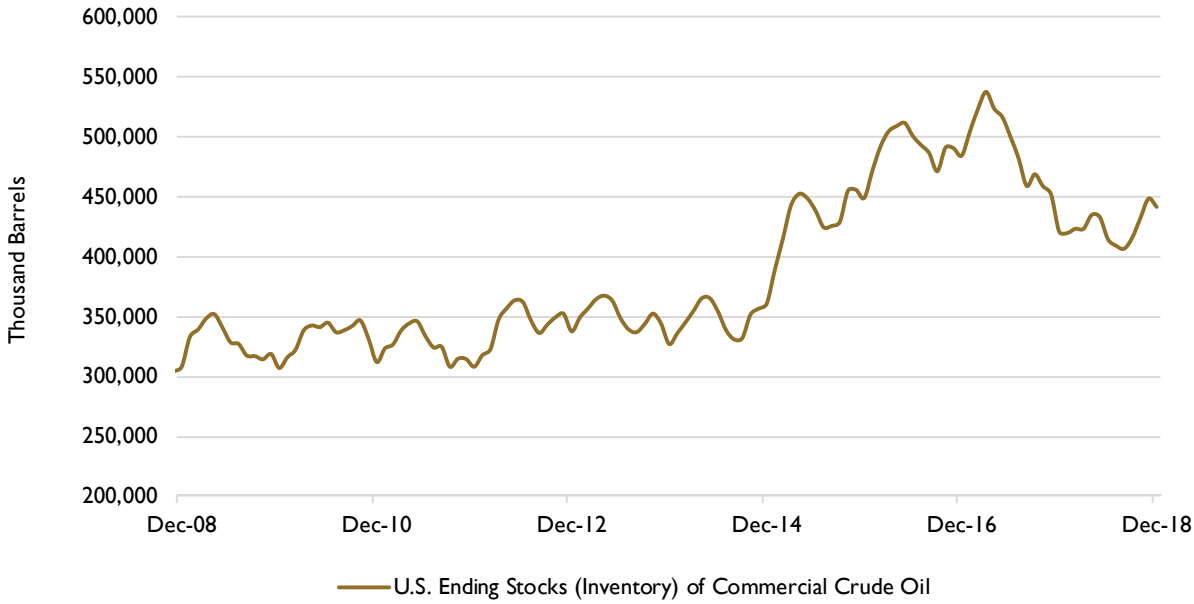
ELECTRICITY PRICES BY SECTOR (MONTHLY AVERAGE) (55)



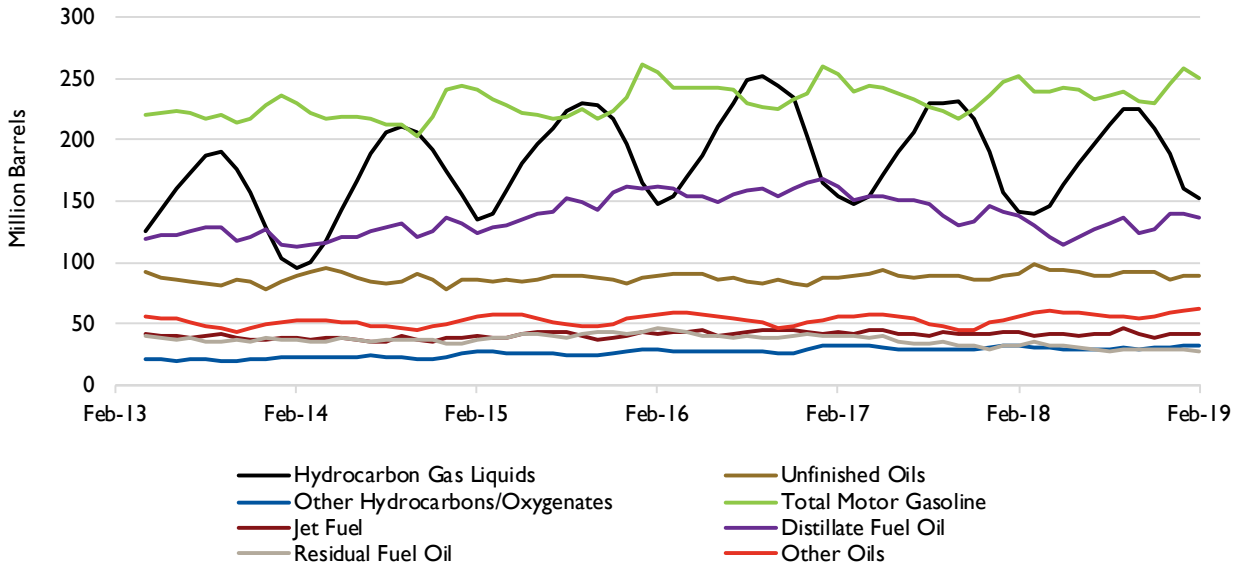
DATA CENTER

LOGISTICS - STORAGE AND TERMINALS

COMMERCIAL CRUDE OIL INVENTORY (MONTHLY) (56)



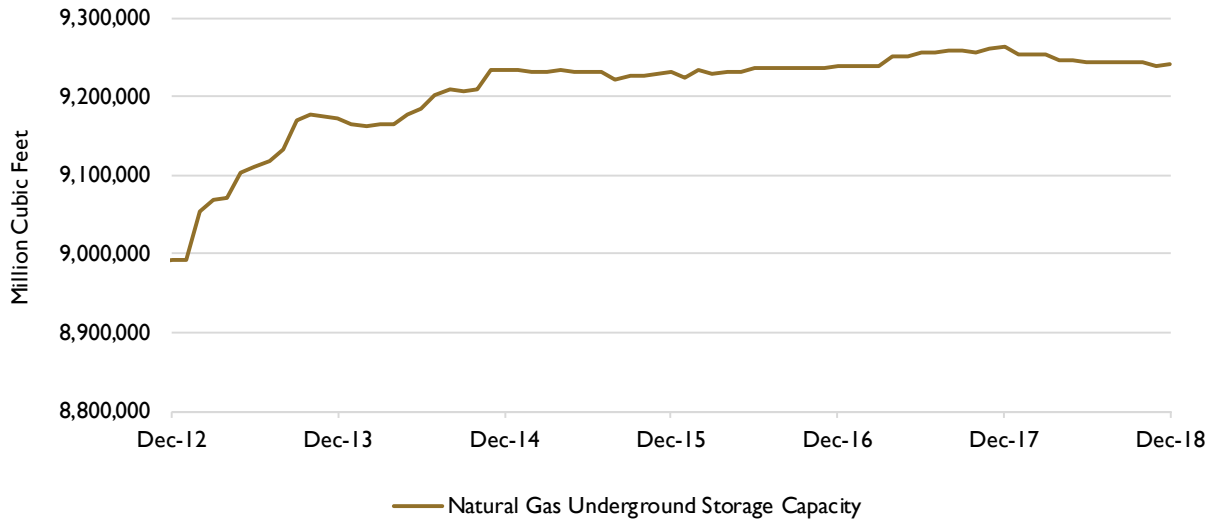
PETROLEUM AND OTHER LIQUIDS COMMERCIAL INVENTORY (MONTHLY) (57)



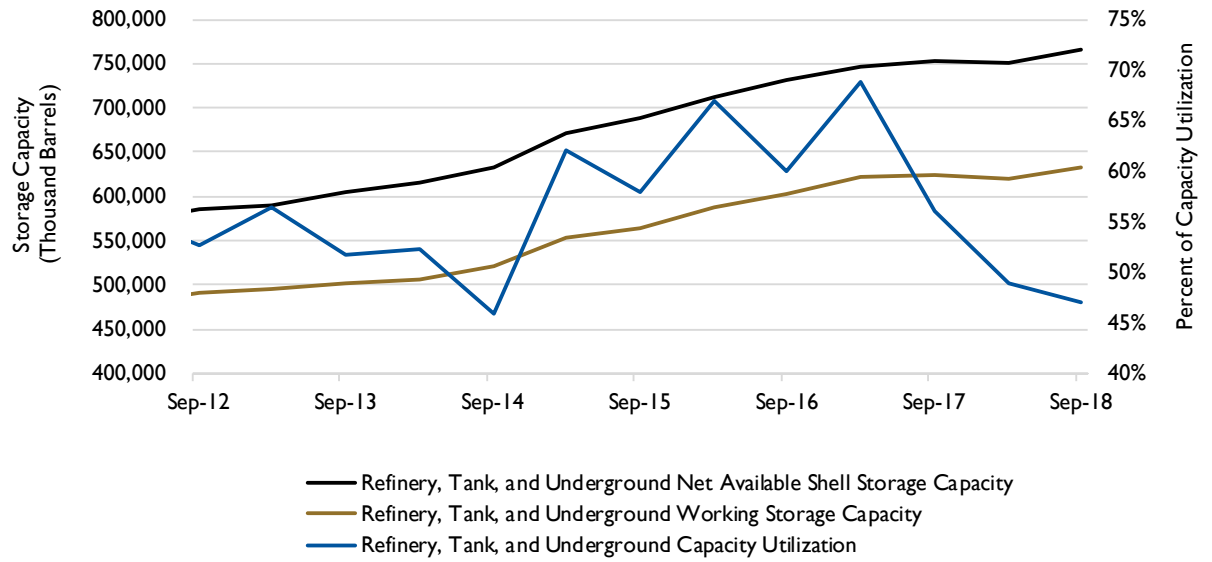
DATA CENTER

LOGISTICS - STORAGE AND TERMINALS

NATURAL GAS UNDERGROUND STORAGE CAPACITY (MONTHLY) (58)



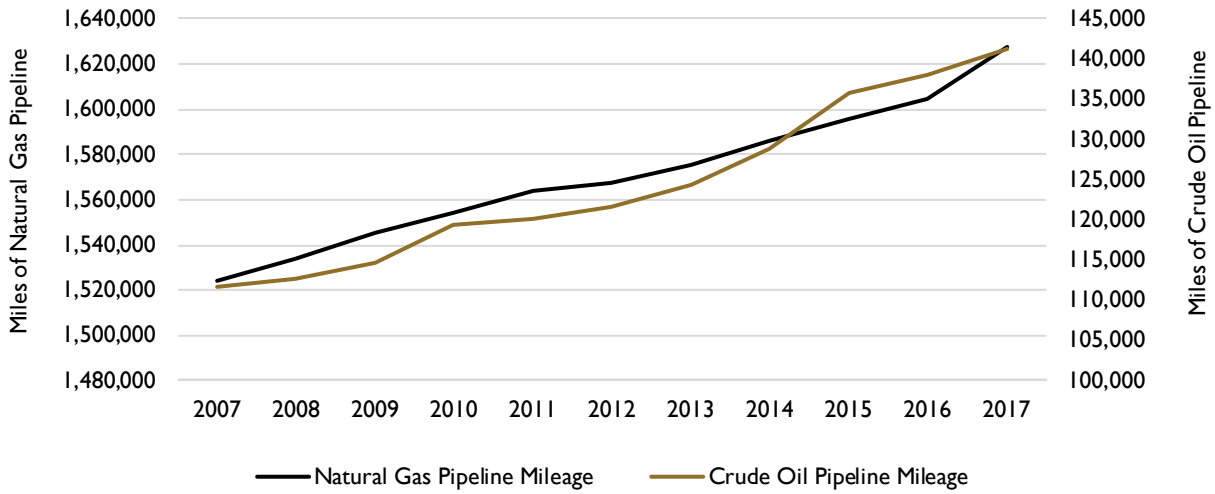
COMMERCIAL CRUDE OIL REFINERY, TANK AND UNDERGROUND STORAGE CAPACITY AND UTILIZATION (MONTHLY) (59)



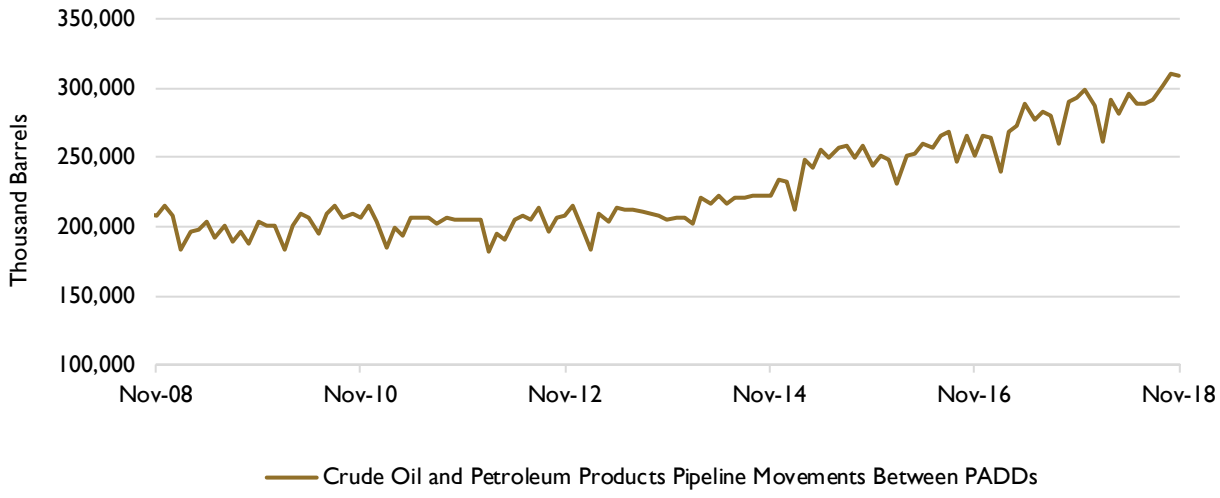
DATA CENTER

LOGISTICS - PIPELINES

CRUDE OIL AND NATURAL GAS PIPELINE MILEAGE (ANNUAL) (60)



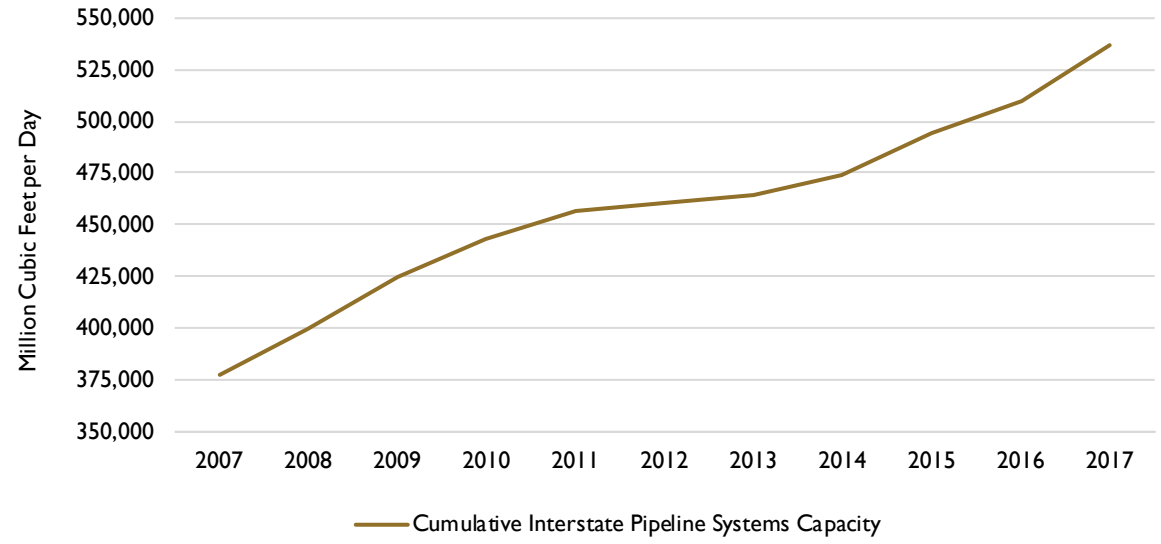
CRUDE OIL AND PETROLEUM PRODUCTS PIPELINE MOVEMENTS BETWEEN PETROLEUM ADMINISTRATION FOR DEFENSE DISTRICTS (PADDS) (MONTHLY) (61)



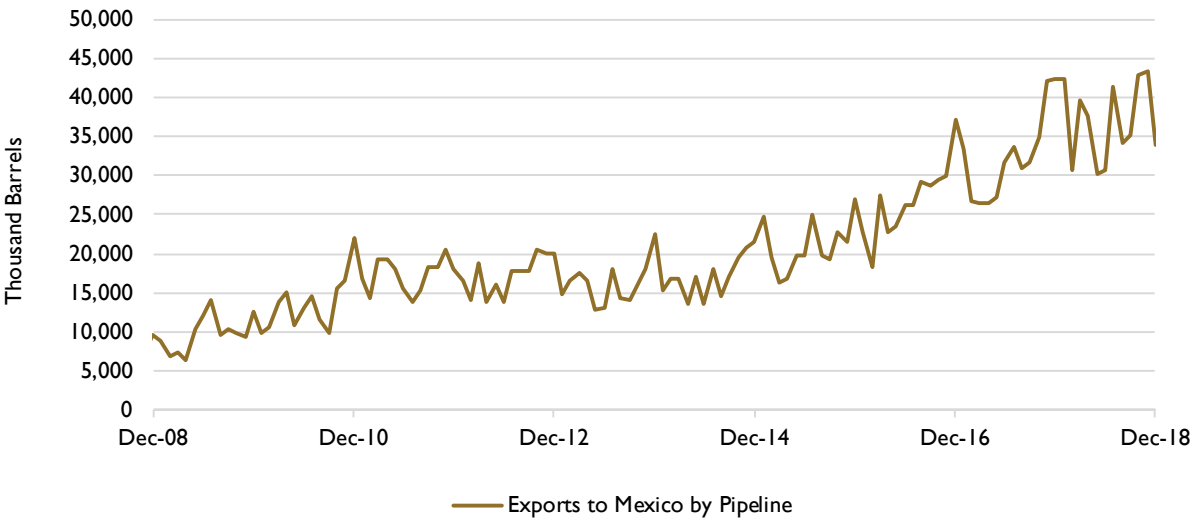
DATA CENTER

LOGISTICS - PIPELINES

NATURAL GAS CUMULATIVE INTERSTATE PIPELINE SYSTEMS CAPACITY (ANNUAL) (62)



CRUDE OIL AND PETROLEUM PRODUCTS EXPORTS TO MEXICO (MONTHLY) (63)

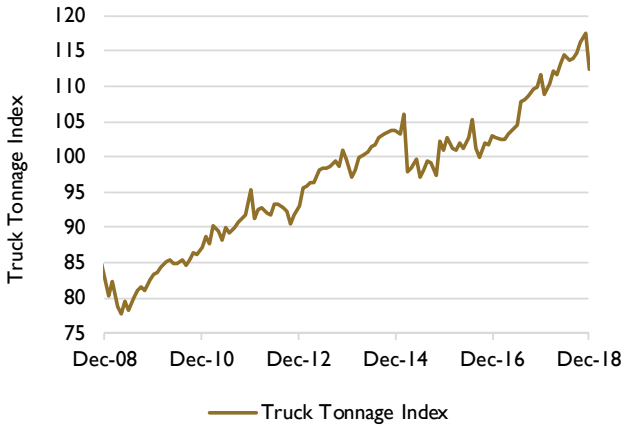


DATA CENTER

LOGISTICS - TRUCKERS

TRUCK TONNAGE INDEX (MONTHLY) (64)

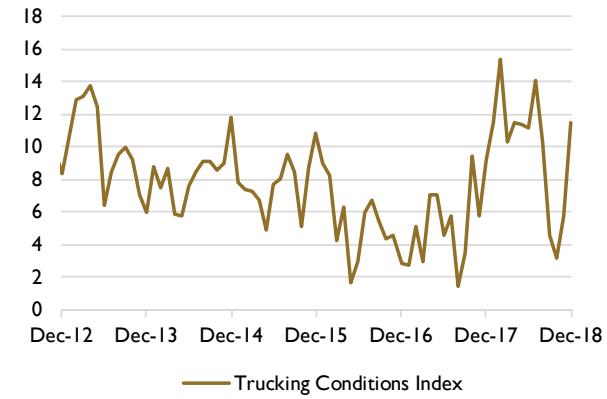
MEASURES GROSS TONNAGE OF FREIGHT



HEAVY TRUCK SALES (MONTHLY) (65)

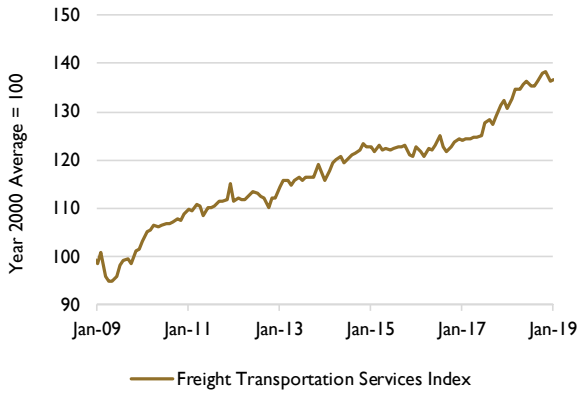
TRUCKING CONDITIONS INDEX (MONTHLY) (66)

INCLUDES FRIGHT VOLUMES, RATES, FLEET CAPACITY, BANKRUPTCIES, FUEL PRICE AND FINANCING



FREIGHT TRANSPORTATION SERVICES INDEX (MONTHLY) (67)

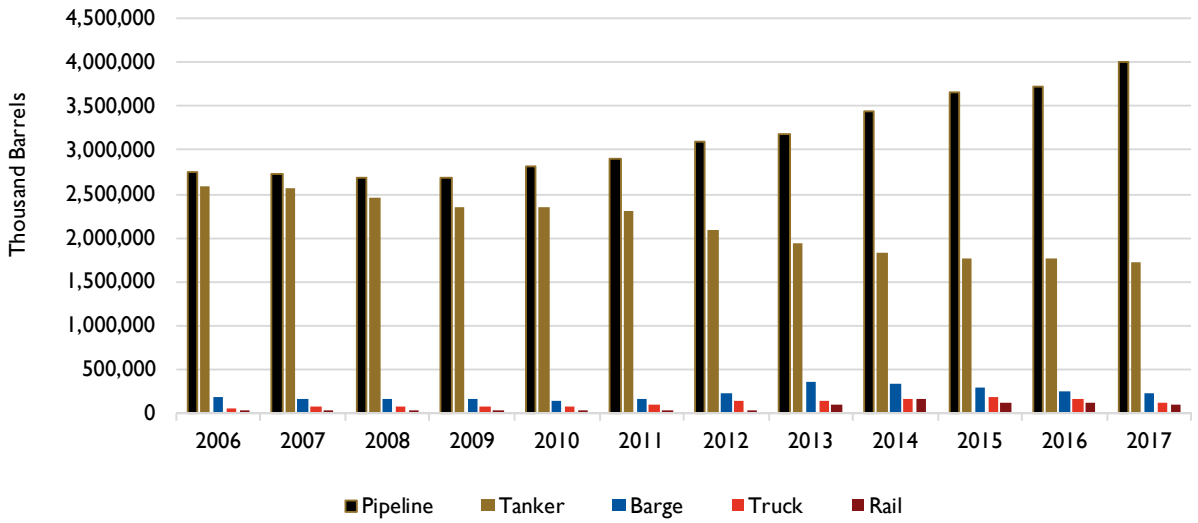
INCLUDES TRUCKING, RAIL, WATERWAYS, PIPELINES AND AIR FRIGHT



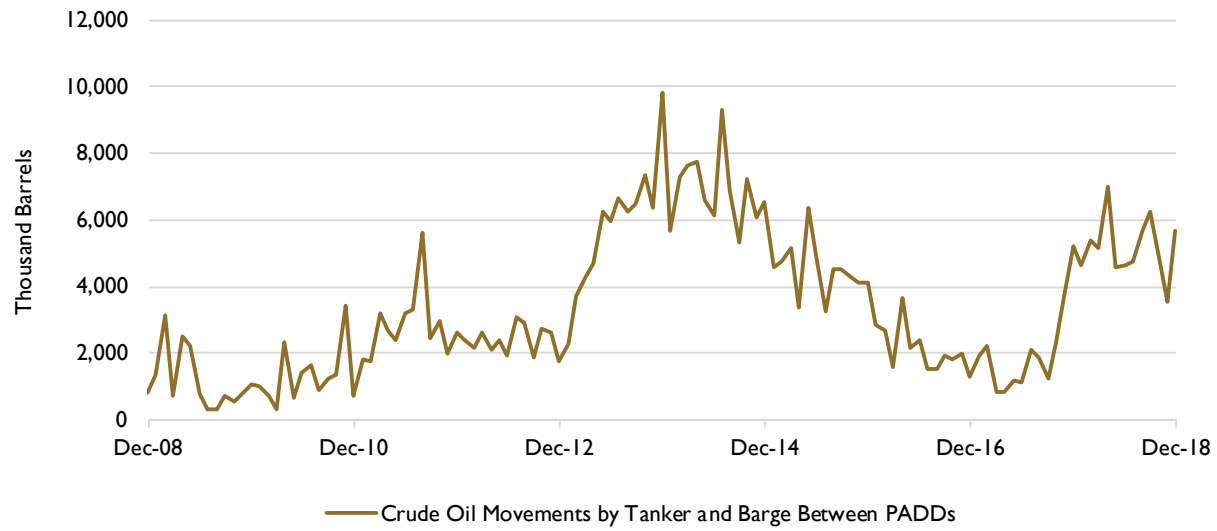
DATA CENTER

LOGISTICS - SHIPPING

CRUDE OIL REFINERY RECEIPTS BY TRANSPORTATION METHOD (ANNUAL) (68)



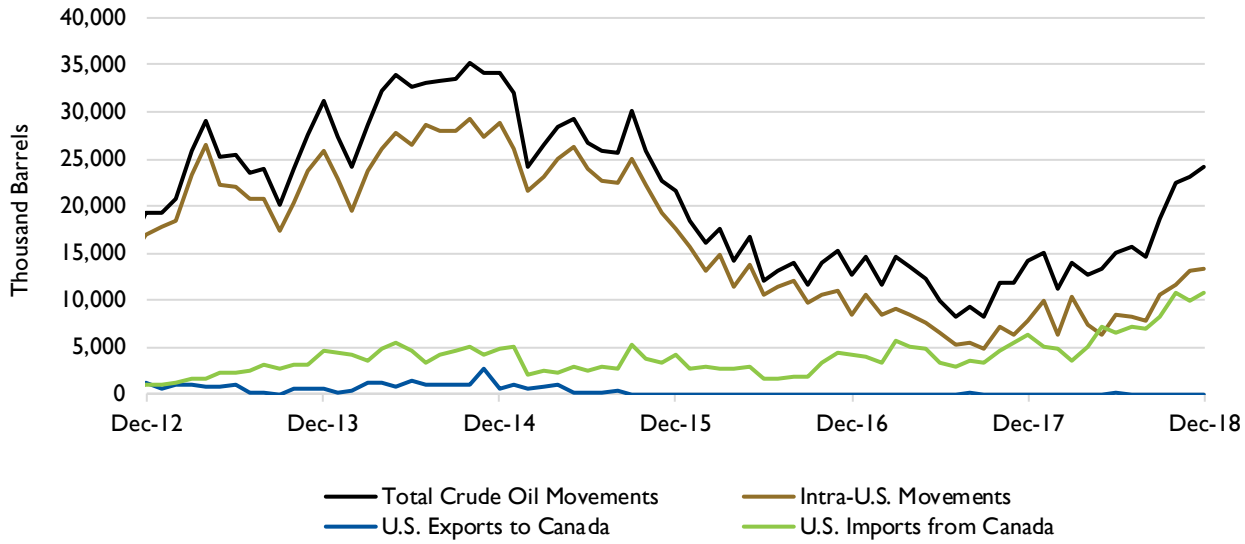
CRUDE OIL MOVEMENTS BY TANKER AND BARGE BETWEEN PETROLEUM ADMINISTRATION FOR DEFENSE DISTRICTS (PADDS) (MONTHLY) (69)



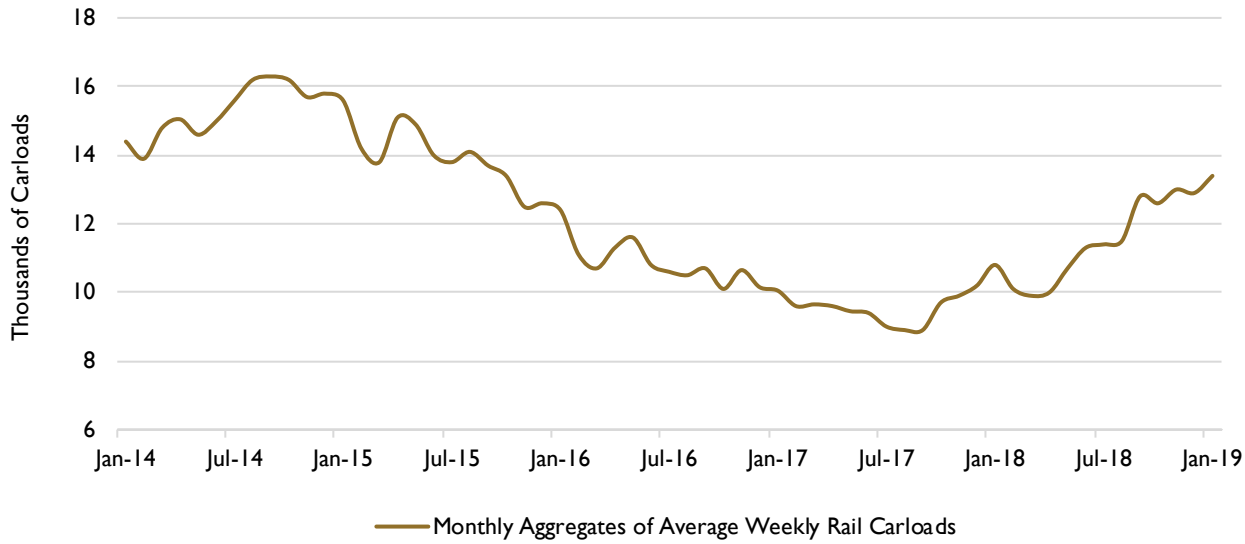
DATA CENTER

LOGISTICS - RAIL

MOVEMENTS OF CRUDE OIL BY RAIL (MONTHLY) (70)



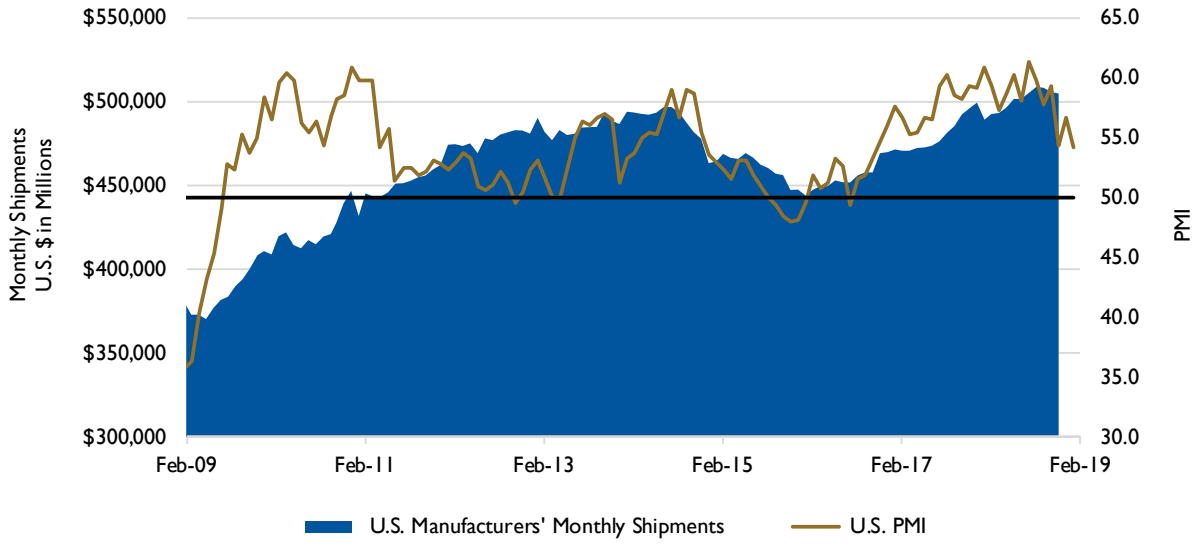
AVERAGE WEEKLY RAIL CARLOADS OF PETROLEUM AND PETROLEUM PRODUCTS (MONTHLY AGGREGATE) (71)



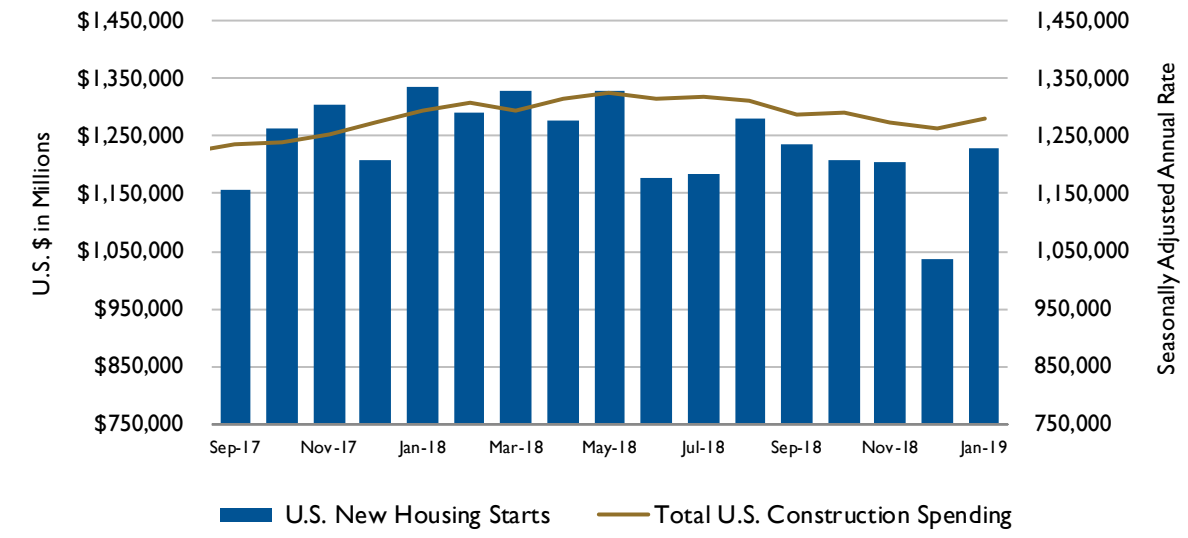
DATA CENTER

ECONOMIC / FINANCIAL

U.S. Manufacturers' Monthly Shipments and U.S. Purchasing Managers' Index (PMI) (Monthly) (72)



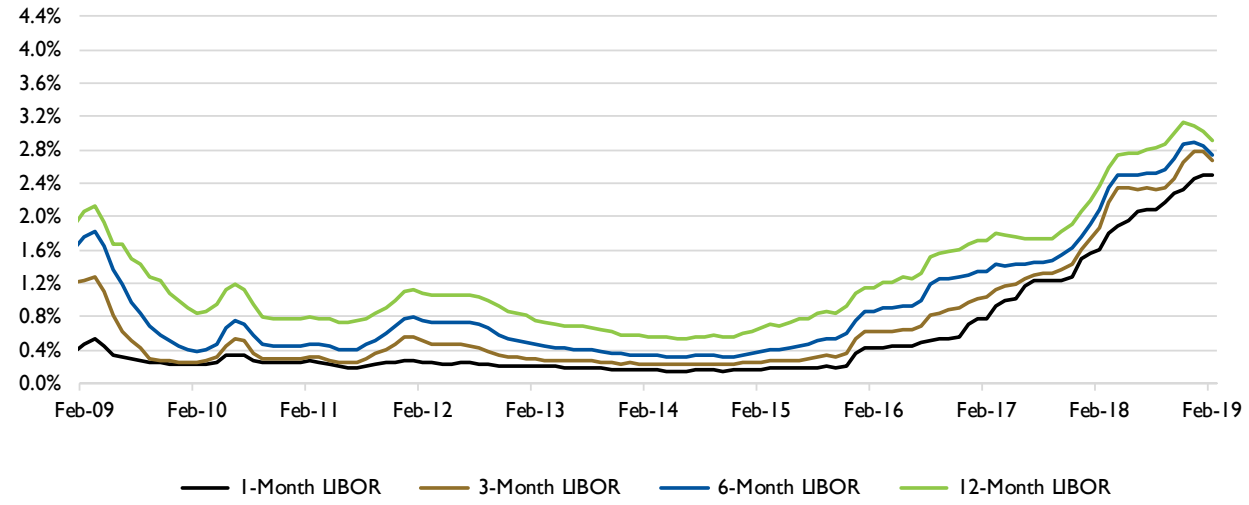
U.S. New Housing Starts and Total U.S. Construction Spending (Monthly) (73)



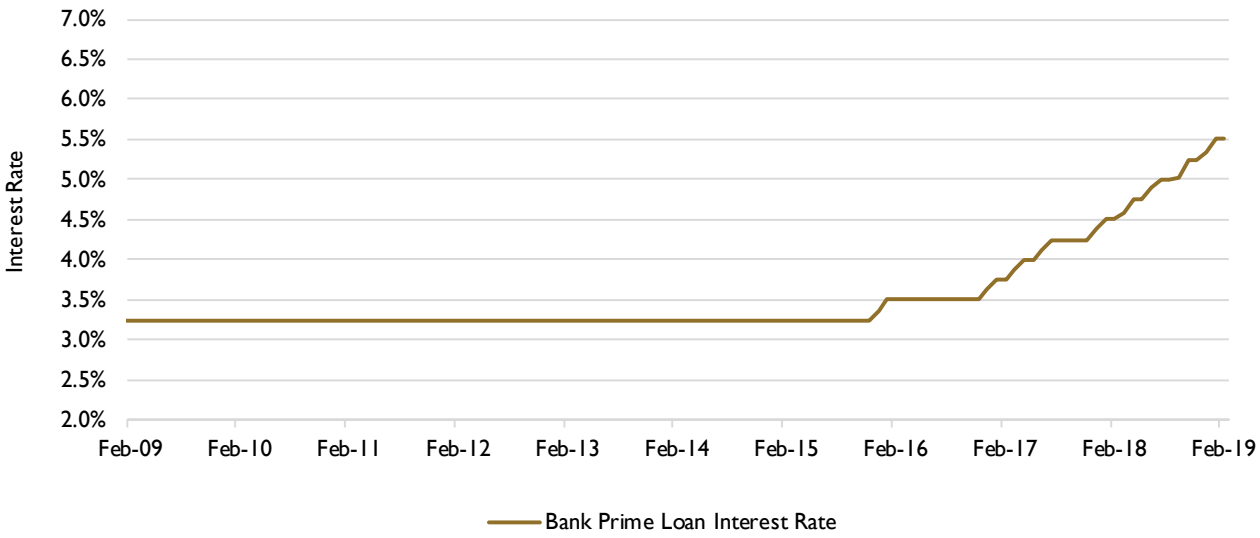
DATA CENTER

ECONOMIC / FINANCIAL

LONDON INTERBANK OFFERED RATE (LIBOR) (MONTHLY AVERAGE) BASED ON U.S. DOLLAR (74)



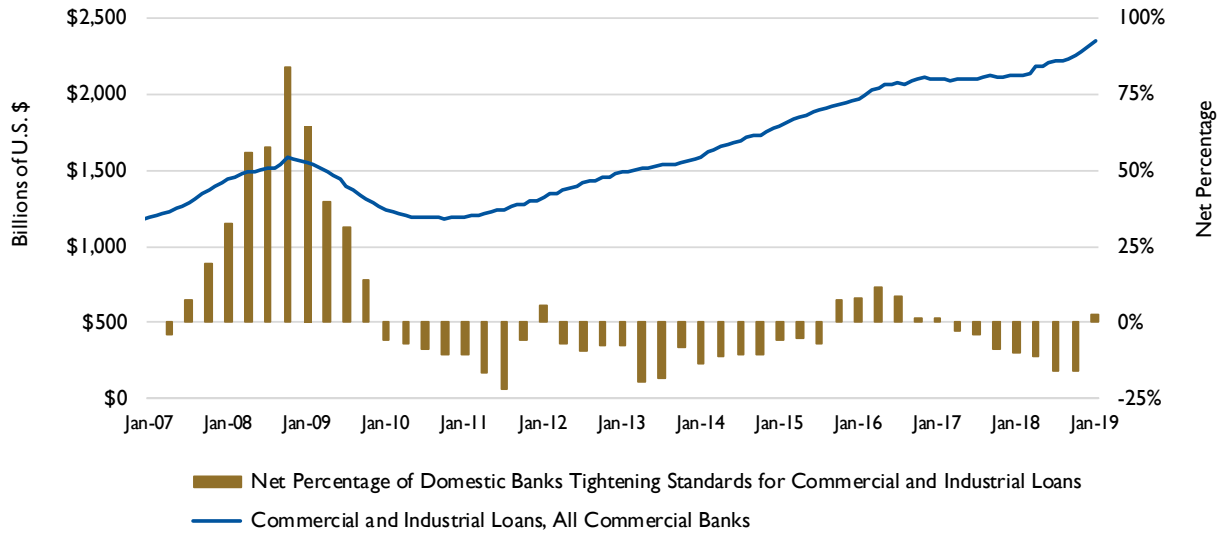
BANK PRIME LOAN INTEREST RATES (MONTHLY AVERAGE) (75)



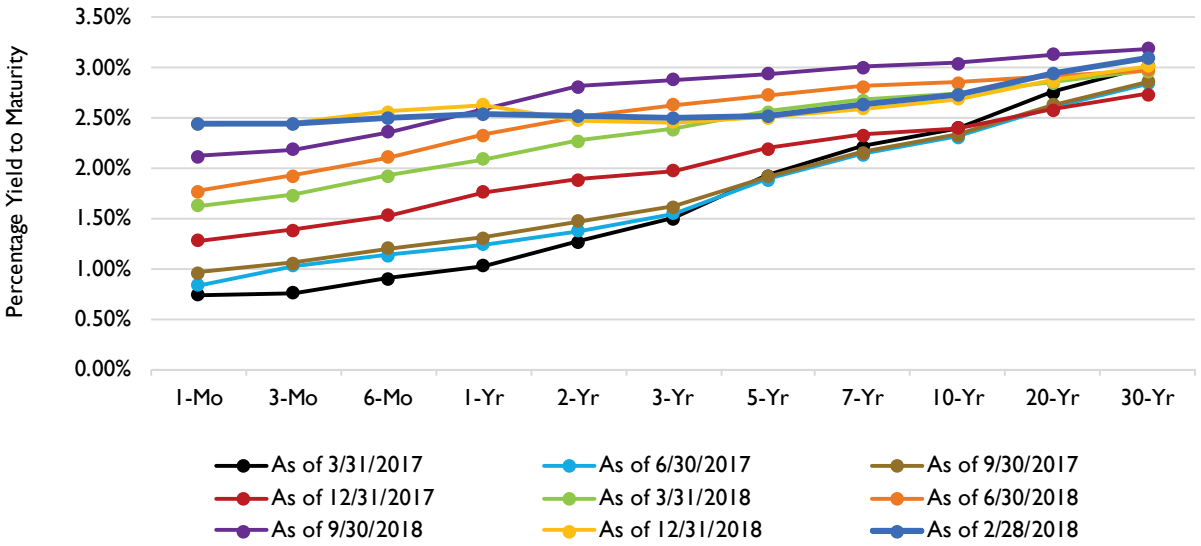
DATA CENTER

ECONOMIC / FINANCIAL

COMMERCIAL AND INDUSTRIAL LOANS VS. BANKING STANDARDS (QUARTERLY, MONTHLY) (76)



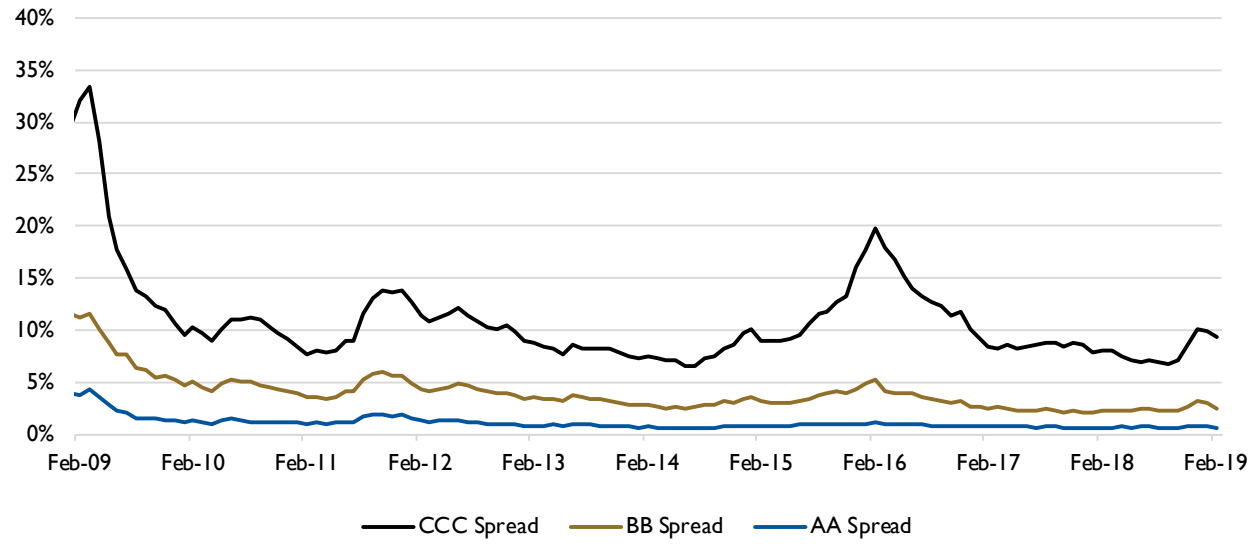
U.S. TREASURY YIELD CURVE (MONTHLY, ANNUAL) (77)



DATA CENTER

ECONOMIC / FINANCIAL

CORPORATE SPREADS TO TREASURIES BY QUALITY (MONTHLY AVERAGE) (78)



DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

ABBREVIATIONS & ACRONYMS

AECO – Alberta Energy Company
ARAMCO – Saudi Arabian Oil Company, formerly the Arabian-American Oil Company
BCF – Billion cubic feet
BTU – British thermal unit
CIF – Costs, insurance and freight
CMT – Constant maturity treasury
DUC – Drilled but uncompleted wells
EBITDA – Earnings before interest, taxes, depreciation and amortization
IFO – Intermediate fuel oil
ITC – Investment Tax Credit
LCOE – Levelized cost of energy
LIBOR – London Interbank Offered Rate
LNG – Liquefied natural gas
LPG – Liquefied petroleum gas
mmBTU – Millions of British Thermal Units
MTBE – Methyl tertiary butyl ether
MW – Megawatt
NBP – National Balancing Point
NGPL – Natural gas plant liquids
NYMEX – New York Mercantile Exchange
OAS – Option-adjusted spread
OPEC – The Organization of Petroleum Exporting Countries
PADD – Petroleum Administration for Defense District
PG&E – Pacific Gas & Electric
PMI – U.S. Purchasing Managers Index
PV – Photovoltaic
SoCal – Southern California
SPR – Strategic Petroleum Reserve
TETCO-M3 – Texas Eastern Transmission Corporation Pipeline Zone M3
TTF – Title Transfer Facility
UAE – United Arab Emirates
WTI – West Texas Intermediate crude oil

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

DEFINITIONS

Biofuels – liquid fuels and blending components produced from biomass feedstocks, used primarily for transportation.

British Thermal Unit (BTU) – A traditional unit of heat; it is defined as the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit.

Ending Stocks – A proxy for inventory, defined as the total volume of a given commodity held in storage (leases, refineries, processing plants, pipelines, terminals, tank farms) at the end of the last day of a given month.

Distillate Fuel Oil – A general classification for a variety of petroleum fractions produced in petroleum distillation operations. Included within this classification are No. 1, No. 2 and No. 4 diesel fuels (used in on-highway and off-highway diesel engines), as well as No. 1, No. 2 and No. 4 fuel oils (used primarily for space heating and electric power generation).

Distributed Solar Energy – Refers to solar energy generated by small-scale photovoltaic generation plants. Small-scale is defined as a plant with capacity below one megawatt.

Index – A figure in a system or scale representing the average value of specified prices, shares, or other items as compared with some reference figure.

Intermediate Fuel Oil – Also known as IFO and Bunker Fuel, fuel utilized by ships and barges to facilitate international exchange of various commodities across an array of industries.

Investment Tax Credit – A federal policy tax incentive that supports the deployment of solar energy in the United States.

LIBOR – The London Interbank Offered Rate is the average interest rate at which leading banks borrow funds of a sizeable amount from other banks in the London market.

Liquefied Natural Gas – Natural gas that has been cooled to a liquid state, at about -260°Fahrenheit, for shipping and storage.

Liquefied Petroleum Gas – A group of hydrocarbon gases, primarily propane, normal butane and isobutene, derived from crude oil refining or natural gas processing.

Natural Gas Liquids – A group of hydrocarbons including ethane, propane, normal butane, isobutene and natural gasoline. Generally include natural gas plant liquids and all liquefied refinery gases except olefins.

Natural Gas Plant Liquids – Ethane, propane, butane, isobutane, pentane and pentane plus.

Petroleum Administration for Defense District (PADD) – A geographic aggregation of the 50 States and the District of Columbia into five Districts. PADD 1 is the East Coast region, PADD 2 is the Midwest region, PADD 3 is the Gulf Coast region and PADD 5 is the West Coast region.

Petroleum Products – Obtained from the processing of crude oil (including lease condensate), natural gas and other hydrocarbon compounds. Petroleum products include unfinished oils, liquefied petroleum gases, pentanes plus, aviation gasoline, motor gasoline, naphtha-type jet fuel, kerosene-type jet fuel, kerosene, distillate fuel oil, residual fuel oil, petrochemical feedstocks, special naphthas, lubricants, waxes, petroleum coke, asphalt, road oil, still gas and miscellaneous products.

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

DEFINITIONS

Product Supplied – A widely utilized proxy for consumption of petroleum products, measuring the disappearance of said products from primary sources. Primary sources include, among others, refineries, processing plants, blending plants, pipelines and bulk terminals.

Propylene – Petrochemical feedstock that is recovered from refinery or petrochemical processes. It is an olefinic hydrocarbon that is gaseous at standard temperature and pressure.

Residual Fuel Oil – The general classification for heavy oils that remain after lighter oils are distilled away in the process of petroleum refining.

Spot vs. Wholesale Price – "Spot" prices are defined by the U.S. Energy Information Administration as, "the price for a one-time open market transaction for immediate delivery of a specific quantity of a product at a specific location where the commodity is purchased 'on the spot' at current market rates."

In this report, certain charts contain both "spot" and "wholesale" prices for given commodities alongside each other within the same chart. In these instances, the wholesale prices shown are, in fact, wholesale market "spot" prices. Thus, the terms are interchangeable in charts where both terms are present in describing respective price series.

Strategic Petroleum Reserve (SPR) – An emergency fuel storage of crude oil maintained by the United States Department of Energy for use during periods of major supply interruption.

Virtual Trading Point – Commodity trading center created to service a specific geographic region but does not have a physical location.

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

DESCRIPTIONS

General Conversion Information

- International pricing data for various commodities were converted by JKC from the units utilized by the original data source (in the form of currency value per unit of energy content or volume) to appropriate domestic units (in the form of U.S. dollars per common domestic unit of energy content or volume) in order to allow for convenient, informative comparison of international and domestic commodity price series through displaying them on a singular chart in consistent units. Appropriate domestic units for a given commodity are determined by whatever units are most commonly utilized in the United States to denote prices of that commodity, per the U.S. Energy Information Administration.
- International currency units were converted to U.S. dollars using historical exchange rates published by x-rates.com.
- Energy content and volume conversion factors differ by commodity. International energy content or volume units were converted using the various sources listed below:
  - Google.com In-Browser Unit Converter
    - Alberta Energy Co. Hub Natural Gas – gigajoules to mmBTU
    - Dutch TTF Hub Natural Gas – megawatt hours to mmBTU
    - Houston; Los Angeles; Rotterdam; Singapore; Port of Fujairah, UAE IFO 380, IFO 180 Bunker Fuel – liters/kilogram to gallons per metric ton
  - Iowa State University Liquid Fuel Measurements and Conversions
    - Netherlands Retail LPG – liters to metric tons, metric tons to barrels
    - Saudi ARAMCO Propane – metric tons to barrels
    - Japan Propane Imports – metric tons to barrels
    - Holland Retail Gasoline – liters to gallons
    - Singapore Retail Gasoline – liters to gallons
    - UAE Gasoline – liters to gallons
    - Edmonton Diesel Fuel – liters to gallons
    - Singapore Retail Diesel – liters to gallons
    - Holland Retail Diesel – liters to gallons
    - UAE Diesel – liters to gallons
  - Official Nebraska Government Website
    - Netherlands Retail LPG – barrels to gallons
    - Saudi ARAMCO Propane – barrels to gallons
    - Japan Propane Imports – barrels to gallons
  - Lanka IOC Oil Company
    - Houston; Los Angeles; Rotterdam; Singapore; Port of Fujairah, UAE IFO 380, IFO 180 Bunker Fuel – density, in liters per kilogram

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

CHART NOTES

All charts in this report are updated to the latest information available at the time of publication. Due to differing reporting dates for various data used throughout the report, all charts are not updated to the same ending period.

(1) Crude Oil Prices

- Sources: U.S. Energy Information Administration (Brent, West Texas Intermediate), IndexMundi via WorldBank (Dubai Fateh), Alberta.ca Economic Dashboard (Western Canadian Select), OPEC.org and Quandl.com (OPEC Reference Basket).
- The Organization of Petroleum Exporting Countries (OPEC) reference basket is a composite of the following blends of crude oil: Saharan Blend (Algeria), Girassol (Angola), Oriente (Ecuador), Zafiro (Equatorial Guinea), Rabi Light (Gabon), Iran Heavy (Islamic Republic of Iran), Basra Light (Iraq), Kuwait Export (Kuwait), Es Sider (Libya), Bonny Light (Nigeria), Qatar Marine (Qatar), Arab Light (Saudi Arabia), Murban (United Arab Emirates), Merey (Venezuela).
- All prices are spot or wholesale.

(2) Gasoline Prices

- Sources: U.S. Energy Information Administration (New York Harbor, U.S. Gulf Coast), Trading Economics (Singapore, Netherlands Retail), United Arab Emirates Ministry of Energy (UAE Retail).
- New York Harbor Spot, U.S. Gulf Coast Spot, Netherlands Retail and Singapore Retail all represent the price history of conventional gasoline in their respective locations. United Arab Emirates Retail represents an aggregate of unleaded 95, unleaded 98 and unleaded 91 prices in the United Arab Emirates.

(3) Diesel Prices

- Sources: U.S. Energy Information Administration (U.S. Gulf Coast, New York Harbor, Los Angeles, CA), Ec.euopa.eu European Commission (Netherlands Retail), Knoema.com (Singapore Retail), United Arab Emirates (UAE Retail).
- New York Harbor, U.S. Gulf Coast and Los Angeles, CA prices represent ultra-low sulfur No. 2 diesel.
- Edmonton, Canada price represents low-sulfur diesel.
- Singapore Retail, United Arab Emirates Retail and Netherlands Retail prices represent conventional gasoil found at the pump. Gasoil is an alternative term for diesel commonly used throughout Europe.
- Netherlands Retail prices exclude taxes, Singapore Retail prices include taxes.

(4) Jet Fuel Prices

- Source: U.S. Energy Information Administration.
- All prices are spot or wholesale prices.

(5) U.S. Crude Oil and Petroleum Products Supply, Inventory and Consumption

- Source: U.S. Energy Information Administration.
- Crude Oil and Petroleum Products consist of natural gas plant liquids (ethane, propane, butane, isobutane, pentane), other liquids (hydrogen, oxygenates and renewable fuels like fuel ethanol, motor and aviation gasoline blending components, unfinished oils) and finished petroleum products (motor gasoline, aviation gasoline, kerosene-type jet fuel, kerosene, distillate fuel oil, residual fuel oil, petrochemical feedstocks, napthas, lubricants, waxes, petroleum cokes, asphalt and road oil, still gas, miscellaneous products).
- Supply is comprised of field production, renewable fuels and oxygenate plant net production, refinery and blender net production, imports and net Petroleum Administration for Defense District (PADD) receipts. Net PADD receipts represent the net volume of product movement into and out of each PADD by tanker, barge and pipeline.
- Ending Stocks is a proxy for inventory and is defined as primary stocks held in storage as of midnight on the last day of the month. Primary stocks include products held in storage at, or in, leases, refineries, natural gas processing plants, pipelines, tank farms and bulk terminals with the capacity to store at least 50,000 barrels or that can receive product by tanker, barge or pipeline. Ending Stocks include volumes in the Strategic Petroleum Reserve (SPR) maintained by the Federal Government for use during periods of major supply interruption.
- Product Supplied is a proxy for consumption as it measures the disappearance of said product from primary sources, including refineries, processing plants, blending plants, pipelines and bulk terminals.

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

(6) U.S. Refinery Volumes and Wholesale Prices of Petroleum Products

- Source: U.S. Energy Information Administration Petroleum Marketing Monthly.

(7) U.S. Crude Oil Refinery Input, Distillation Capacity and Refinery Utilization

- Source: U.S. Energy Information Administration Petroleum Supply Weekly.
- Net Input is defined as gross inputs less gross production. Crude Oil Refinery Net Input values are monthly aggregates of weekly net input averages, measured in thousands of barrels per day. The resulting values are represented as monthly average refinery inputs, measured in thousands of barrels per day.
- Refinery Capacity refers to the maximum amount of crude oil designed to flow into the distillation (or crude) unit of the refinery. Operable Capacity is equal to the sum of operating and idle capacity. Idle Capacity is capacity that is not in operation, not under active repair, and can be placed in operation within 30 days.

(8) U.S. Crude Oil and Petroleum Products Imports and Exports

- Source: U.S. Energy Information Administration Petroleum Supply Monthly.
- U.S. Net Imports of Petroleum Products data fall below zero at which point the U.S. becomes a net exporter.

(9) Domestic Natural Gas Citygate Prices per Region

- Source: U.S. Energy Information Administration.
- The prices shown are "Citygate" prices. A Citygate is defined as "a point or measuring station at which a distributing gas utility receives gas from a natural gas pipeline company or transmission system." The Citygate price represents the benchmark price for a given region, accounting for all costs of acquisition, storage, and transportation of gas as well as other charges associated with local distribution companies obtaining the gas for sale to end-users.
- The Western market contains Oregon, Washington, California, Nevada, Arizona, New Mexico, Utah, Wyoming, Colorado, Montana, and Idaho.
- The Midwestern market contains North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Minnesota, Iowa, Missouri, Arkansas, Wisconsin, Michigan, Illinois, and Indiana.
- The Gulf market contains Texas and Louisiana; the Southeastern market contains Florida, Mississippi, Alabama, Georgia, Tennessee, North Carolina, and South Carolina.
- The Northeastern market contains Kentucky, Virginia, West Virginia, Ohio, Pennsylvania, New York, Vermont, New Hampshire, Maine, Massachusetts, Rhode Island, Connecticut, Delaware, New Jersey, and Maryland.

(10) International Natural Gas Prices

- Sources: U.S. Energy Information Administration (Henry Hub), NGX Clearinghouse (AECO Hub), BP Statistical Review of World Energy 2017 (United Kingdom NBP), World Bank via Index Mundi (Russian NG European Import Price), Knoema via World Bank (Japan LNG Import), my.Elexys.be Market Information (Dutch TTF).
- Henry Hub serves as the primary global pricing benchmark.
- Alberta Energy Company (AECO) Hub serves North America.
- United Kingdom National Balancing Point (NBP) serves the British Isles.
- Dutch Title Transfer Facility (TTF) serves continental Europe.
- Virtual Trading Point (Virtual) does not have a physical location and was created to serve a specific region.
- Japan LNG Import Price represents aggregate import prices of liquefied natural gas in Japan and is a price benchmark serving the Asia-Pacific region. The price includes costs, insurance and freight (CIF).
- All price benchmarks above represent gaseous state natural gas transported by pipeline, with the exception of Japan LNG Import Price, which represents liquid state natural gas transported by ship.
- All prices are spot or wholesale.

(11), (12), (13) and (14) Liquefied Natural Gas Prices

- Sources: Federal Energy Regulatory Commission (U.S., Mexico, Belgium, India), World Bank via Bluegold Research (Brazil/Argentina, Japan/Korea, China, United Kingdom).
- All prices are "landed" prices. Landed price is the price received at the regasification terminal and is based on a netback calculation that removes the costs of pipeline transportation, regasification, waterborne shipping and liquefaction, so as to best represent the effective price to the producer or seller at a specific location or defined point.

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

(15) U.S. Import / Export Liquefied Natural Gas Prices
- Source: U.S. Energy Information Administration.
- All prices are spot or wholesale.

(16) Natural Gas Plant Liquids Prices
- Source: U.S. Energy Information Administration.
- Natural gas liquids spot prices at Mont Belvieu, TX.
- Natural Gas Plant Liquids (NGPL) Composite price includes ethane, propane, butane, isobutane and natural gasoline. Daily closing spot prices for each component are averaged into a monthly series, then weighted according to the portion of a representative natural gas plant liquids barrel that they occupy. The NGPL Composite price excludes natural gas liquids produced at crude oil refineries.

(17) U.S. Natural Gas Production and Consumption
- Source: U.S. Energy Information Administration.
- Marketed Production is equal to gross withdrawals of natural gas from production reservoirs, less gas used for reservoir re-pressuring, nonhydrocarbon gases removed in treating and processing operations, and quantities vented and flared (gas that is disposed of by release into the atmosphere).

(18) U.S. Natural Gas Supply and Inventory
- Source: U.S. Energy Information Administration.
- Working Gas is defined as the total amount of natural gas in storage less the amount of base gas. Base gas is the amount of gas intended as permanent inventory.

(19) U.S. Natural Gas Consumption by End Use
- Source: U.S. Energy Information Administration.

(20) U.S. Natural Gas Plant Liquids Production
- Source: U.S. Energy Information Administration.
- Natural Gas Plant Liquids Production refers to the sum of all production of ethane, propane, butane, isobutane, pentane and pentane plus.

(21) U.S. Liquefied Natural Gas Import and Export Volumes
- Source: U.S. Energy Information Administration.

(22), (23) and (24) North American LNG Import / Export Terminals – Proposed, Approved and Existing
- Source: Federal Energy Regulatory Commission.

(25) Heating Oil Prices
- Source: U.S. Energy Information Administration.
- Spot prices of No 2. heating oil at New York Harbor, alongside the spot prices of West Texas Intermediate crude oil for comparison purposes.

(26) Intermediate Fuel Oil aka "Bunker Fuel" Prices
- Source: Ship & Bunker.
- Intermediate Fuel Oil, also known as IFO and Bunker Fuel, is fuel utilized by ships and barges to facilitate international exchange of various commodities across an array of industries, including energy. It is classified in the maritime field by its viscosity, measured in centistokes. IFO 380 has a maximum viscosity of 380 centistokes, while IFO 180 has a maximum viscosity of 180 centistokes. IFO 380 is comprised of 98% residual fuel oil and 2% distillate fuel oil. IFO 180 is comprised of 88% residual fuel oil and 12% distillate fuel oil.

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

(27) Propane Prices

- Sources: U.S. Energy Information Administration (Conway, KS and Mont Belvieu, TX spot prices), Government of Canada National Energy Board (Edmonton, Canada trading hub prices), Ec.euopa.eu European Commission (Netherlands Retail prices), LPG Australia and news articles (Saudi ARAMCO contract prices), Knoema.com and Petroleum Association of Japan (Japan Imports prices).
- Conway, KS and Mont Belvieu, TX retail prices are propane prices, while Saudi ARAMCO Contracts and Japan Imports are liquefied petroleum gas (LPG) prices. Netherlands Retail and Edmonton, Canada retail prices are auto propane and exclude taxes.
- Propane and LPG prices are represented on the same chart due to the fact that propane is dealt in international marketplaces as LPG, and is referred to as LPG in many European and Asian countries. LPG is comprised of a mixture of propane and butane.
- Conway, KS wholesale prices are typically available only for the winter months (October through March), during which propane demand is driven by cold weather, therefore, the data series displayed is intermittent.

(28) No. 1 Distillate Fuel Oil, Residual Fuel Oil Wholesale, Retail Sales Volume by Refiners

- Source: U.S. Energy Information Administration.
- No. 1 Distillate Fuel Oil consists of No. 1 diesel fuel and No. 1 fuel oil. The former is used in high-speed diesel engines, including those used by metropolitan buses and smaller automobiles. No. 1 fuel oil is utilized primarily as fuel for portable outdoor stoves and heaters.
- Residual Fuel Oil is the general classification for heavy oils that remain after lighter oils are distilled away in the process of petroleum refining. Residual Fuel Oil includes No. 5 and No. 6 fuel oils. The former is used in steam-powered vessels, and the latter is used for electric power generation, space heating, vessel bunkering and industrial processes.
- All wholesale and retail sales volumes refer to those sold by refiners only.

(29) No. 2 Distillate Fuel Oil Wholesale, Retail Sales Volume by Refiners

- Source: U.S. Energy Information Administration.
- No. 2 Distillate Fuel Oil consists of No. 2 diesel fuel and No. 2 fuel oil (heating oil). No. 2 diesel fuel is utilized in on-and-off highway diesel engines, including those used by railroad locomotives, trucks, automobiles and agricultural machinery. No. 2 fuel oil (heating oil) is used for space heating and moderate capacity industrial/commercial burner units.
- All wholesale and retail sales volumes refer to those sold by refiners only.

(30) Propane & Propylene and Distillate Fuel Oil Production and Consumption

- Source: U.S. Energy Information Administration.
- Distillate Fuel Oil is a general classification for a variety of petroleum fractions produced in petroleum distillation operations. Included within this classification are No. 1, No. 2 and No. 4 diesel fuels (used in on-highway and off-highway diesel engines), as well as No. 1, No. 2 and No. 4 fuel oils (used primarily for space heating and electric power generation).
- Propylene is an important petrochemical feedstock that is recovered from refinery or petrochemical processes. It is an olefinic hydrocarbon that is gaseous at standard temperature and pressure.
- Product Supplied is a proxy for consumption as it measures the disappearance of said product from primary sources, including refineries, processing plants, blending plants, pipelines and bulk terminals.

(31) U.S. Ending Stocks of Propane & Propylene and Distillate Fuel Oil

- Source: U.S. Energy Information Administration.
- Distillate Fuel Oil is a general classification for a variety of petroleum fractions produced in petroleum distillation operations. Included within this classification are No. 1, No. 2 and No. 4 diesel fuels (used in on-highway and off-highway diesel engines), as well as No. 1, No. 2 and No. 4 fuel oils (used primarily for space heating and electric power generation).
- Propylene is an important petrochemical feedstock that is recovered from refinery or petrochemical processes. It is an olefinic hydrocarbon that is gaseous at standard temperature and pressure.
- Ending Stocks are defined as the total volume of a propane and propylene/distillate fuel oil held in storage as of the last day of the period. Ending Stocks are monthly averages of Ending Stocks reported at the end of each week during that month, not the amount of Ending Stocks reported at the end of the month. The resulting values are represented as monthly average inventory levels.

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

(32) U.S. Land Well Count, Rig Count and Wells per Rig

- Source: Platts S&P Global Quarterly Well Count Report.
- Well and rig count data include only those on United States land. Thus, no offshore data is included.
- Platts RigData U.S. Land Rig Count methodology states that a rig is added to the count every time a new oil platform, or rig, is set up on a given site, or every time an existing rig moves to a new location and drills on that site.
- Platts RigData derives U.S. Land Well Count data through tracking new drilling permits and drilling activity only. Thus, the wells comprising the U.S. Land Well Count do not necessarily have to be completed or produce oil or gas in order to be included. For this reason, the well count represented overstates the amount of completed and producing wells that exist on U.S. land.

(33) U.S. Well Starts by Depth

- Source: Platts RigData.
- Total number of well starts by depth on U.S. Land, U.S. Inland Waters and U.S. Offshore, respectively.

(34) Percentage of Oil Production per Shale Region

- Source: U.S. Energy Information Administration Drilling Productivity Report.
- Percentage of total U.S. crude oil production from each of the shale regions.

(35) Drilled but Uncompleted Wells vs. Crude Oil Price

- Source: U.S. Energy Information Administration Drilling Productivity Report.
- Drilled but Uncompleted (DUC) Wells are oil and gas wells that have been drilled but haven't gone through the process of completion (the process of installing well casing, tubing and other equipment that prepares a well for production). The number of DUC wells has significant implications on the domestic supply response to crude oil price changes. If crude oil prices decrease, it is theoretically likely that the amount of DUC wells will increase, and vice versa in an increasing crude oil price scenario. Therefore, the West Texas Intermediate Crude price is tracked for comparative purposes.

(36) Hydraulic Fracturing Sand Consumption and Producer Price Index

- Sources: IHS Markit (consumption), U.S. Bureau of Labor Statistics (producer price index).
- Hydraulic Fracturing Sand is sand utilized as a proppant in the process of hydraulic fracturing to help facilitate the extraction of oil and gas from subsurface rock formations.
- Total 2017 Hydraulic Fracturing Sand Consumption contains actual data for January through April 2017, while May through December 2017 consumption data is projected based on IHS Markit's ProppantIQ research.
- The Producer Price Index for Hydraulic Fracturing Sand measures the weighted average period-to-period change in the selling prices received by domestic producers of hydraulic fracturing sand.
- 2017 Producer Price Index shows annual average as of 9/29/2017.
- Hydraulic Fracturing Sand Producer Price Index Base = 100 at December 2012.

(37) and (38) Crude Oil and Natural Gas Production, Rig Count and Production per Rig

- Sources: U.S. Energy Information Administration Drilling Productivity Report (new-well crude oil and natural gas production per rig), Baker Hughes Inc. (rig count).
- New-Well Crude Oil or Natural Gas Production per Rig in each quarter represents the average of each month's value. New-well production per rig is estimated by dividing several trailing months of data on total production from new wells in each region by that region's monthly rig count, lagged by two months. New-well production per rig is intended to indicate an average rig's contribution to total crude oil production from new wells.
- The determination between a crude oil rig and a natural gas rig is made by the operating company at the time of issuance of the rig permit by the relevant state's permitting authority. The classification of a given rig as an oil or gas rig is based solely upon the operator's judgment after drilling an appraisal well and determining its specific hydrocarbon content. For example, if a well's production comes 50% from gas, 20% from Natural Gas Liquids and 30% from oil, it could either be listed as a gas rig, because gas comprises the largest share of hydrocarbons, or an oil rig because oil drives the well's economics. This determination is at the judgment of the operator.

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

(39) U.S. Drilling Rigs by Type

- Source: Baker Hughes North America Rotary Rig Count.
- A vertical well is a well that penetrates the earth vertically below the surface-mounted drilling platform, or the surface location of the well.
- A directional well is classified as one in which the surface location of the well is not vertically above the target reservoir. Thus, the well deviates horizontally from its surface location in order to reach the target reservoir, at a specific azimuth and incline. Azimuth measures the cardinal direction of the well's path relative to the surface location, and incline measures degrees of deviation from vertical.
- Per Baker Hughes methodology, a horizontal well is a type of directional well that deviates from vertical by greater than 80 degrees, or one in which the lower part of the wellbore is parallel to the "pay zone." The pay zone is the section of a reservoir that contains hydrocarbons that can be produced economically.

(40) Wind and Solar Prices

- Source: Lazard's Levelized Cost of Energy Analysis 2012-2016.
- The Levelized Cost of Energy (LCOE) is the net present value of the per-megawatt hour cost of building and operating a generating plant over an assumed financial life and duty cycle. It is utilized as a means of comparing the cost-competitiveness of various energy-generating technologies of unequal life spans, project sizes, capital profiles and capacities.
- The respective levelized costs of each generation technology for each year are a simple average of the high and low values of the cost range associated with that generating technology during that year.
- Solar PV refers to solar photovoltaic.
- Solar PV – Community refers to a solar power plant whose electricity is shared by more than one household.
- Solar PV – Rooftop Residential refers to a Solar PV system that has its solar panels mounted on the rooftop of a residential structure.
- Solar PV – Crystalline Rooftop refers to crystalline solar panels mounted on rooftops. Crystalline panels are a type of solar panel that achieves the photoelectric effect, the chemical process that converts solar (light) energy to electricity, through use of crystalline silicone solar cells.
- Solar PV – Crystalline Utility-Scale refers to a solar power plant that uses crystalline panels to generate power that is fed into the grid, supplying a utility with energy.
- Solar PV – Thin Film Utility-Scale refers to a solar power plant that uses thin-film solar panels to generate power that is fed into the grid, supplying a utility with energy. Thin-film panels differ from crystalline panels in that the photoemissive materials, those which produce an electric current when contacted by sufficient solar energy, are not cut from crystals.
- Solar Thermal refers to solar technology that generates thermal energy to heat water or other fluids, rather than generating electricity.

(41) U.S. Total Renewable Energy Consumption

- Source: U.S. Energy Information Administration Monthly Energy Review.
- Total Renewable Energy Consumption is comprised of hydroelectric, geothermal, solar, wind, wood, waste and biofuels.
- Waste refers to biomass waste and is organic non-fossil material of biological origin that is a byproduct or a discarded product. Biomass waste includes municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural crop byproducts, straw and other biomass solids, liquids and gases.
- Biofuels are liquid fuels and blending components produced from biomass feedstocks, used primarily for transportation. Biomass is organic, non-fossil material comprised of decayed biological matter.

(42) U.S. Solar, Wind and Hydroelectric Energy Consumption

- Source: U.S. Energy Information Administration Monthly Energy Review.

(43) U.S. Wood, Waste, Biofuels and Geothermal Energy Consumption

- Source: U.S. Energy Information Administration Monthly Energy Review.
- Biofuels are liquid fuels and blending components produced from biomass feedstocks, used primarily for transportation. Biomass is organic, non-fossil material comprised of decayed biological matter.

(44) Corn and Ethanol Prices and Corn Cost per Gallon of Ethanol

- Source: U.S. Department of Agriculture Economic Research Service (corn and ethanol price).

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

(45) U.S. Solar Energy Consumption

- Source: U.S. Energy Information Administration Monthly Energy Review.
- Utility-scale solar energy refers to solar energy generated by plants with a capacity of at least one megawatt that is transmitted via the transmission grid to a high volume of consumers. Thus, Utility-Scale Solar Energy Consumption represents consumption of solar energy generated at plants with capacity of at least one megawatt.
- Distributed solar energy refers to solar energy generated by small-scale generating plants with capacity below one megawatt that is distributed over a specific locality with a small volume of consumers relative to utility-scale energy consumers. Thus, Distributed Solar Energy Consumption represents consumption of solar energy generated at small-scale generating plants.

(46) U.S. Solar Energy Net Generation

- Source: U.S. Energy Information Administration Monthly Energy Review.
- Distributed Solar Photovoltaic Generation refers to energy generated by small-scale photovoltaic generation plants. Small-scale is defined as a plant with capacity below one megawatt. Photovoltaic generation refers to solar energy generated by photovoltaic solar panels.
- Utility-Scale Solar Electricity Net Generation refers to generation of solar energy by plants with capacity equal to or above one megawatt. Net generation is defined as the amount of gross generation less electrical energy consumed by the generating plant for service or auxiliaries.

(47) Distributed Solar Photovoltaic Generation by Sector

- Source: U.S. Energy Information Administration Monthly Energy Review.
- Distributed Solar Photovoltaic Generation refers to energy generated by small-scale photovoltaic generation plants. Small-scale is defined as a plant with capacity below one megawatt. Photovoltaic generation refers to solar energy generated by photovoltaic solar panels.

(48) Utility-Scale Solar Electricity Net Generation by Sector

- Source: U.S. Energy Information Administration Monthly Energy Review.
- Utility-Scale Solar Electricity Net Generation refers to generation of solar energy by plants with capacity equal to or above one megawatt. Net generation is defined as the amount of gross generation less electrical energy consumed by the generating plant for service or auxiliaries.
- Gaps in the data represent periods for which there was no data reported, or the data value was trivially small and thus deemed unnecessary to report.

(49) U.S. Solar Capacity Installations

- Source: Solar Energy Industries Association Q1 2017 Solar Market Insight Report.
- The Investment Tax Credit (ITC) is a federal policy tax incentive that supports the deployment of solar energy in the United States. The ITC allows those who install a solar system to claim up to 30% of the price paid to install the system as a tax credit when filing Federal taxes, thereby significantly discounting the cost associated with transitioning to solar energy.

(50) U.S. Wind Power Capacity Installations

- Source: American Wind Energy Association U.S. Wind Energy Quarterly Market Report.
- Wind Power Generation Capacity Installations refers to non-utility-scale wind power capacity additions. Utility-scale is defined as installations of wind turbines larger than 100 kilowatts.

(51) Utility-Scale Wind Power Capacity Installations

- Source: American Wind Energy Association U.S. Wind Energy Quarterly Market Report.
- Utility-Scale Wind Capacity includes installations of wind turbines larger than 100 kilowatts. Capacity installations may not always equate to an equal increase in cumulative wind power capacity due to decommissioned, uprated and repowered wind turbines.

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

(52) Wind Power Under Construction or in Advanced Development

- Source: American Wind Energy Association (AWEA) U.S. Wind Energy Quarterly Market Report.
- AWEA defines projects as being "in advanced development" if it has not yet begun construction, but has either signed a power purchase agreement, announced a firm turbine order, or been announced to proceed under utility ownership.

(53) U.S. Aggregated Energy Consumption by Sector

- Source: U.S. Energy Information Administration.
- Energy consumed by the electric power sector is primary energy only. Primary energy is energy in its original form, before any transformation to secondary or tertiary forms of energy. For example, coal can be converted to synthetic gas and then to electricity. Under these circumstances, coal is primary energy, synthetic gas is secondary energy and electricity is tertiary energy.

(54) U.S. Aggregated Energy Consumption by Source

- Source: U.S. Energy Information Administration.
- Total consumption of each category of energy is as accurate as possible. However, some data is unavailable or unreported and, thus, some total consumption values may be understated.
- Fossil Fuels includes coal, petroleum-based products, natural gas and natural gas-based products.
- Renewable Energy includes conventional hydroelectric, solar, biomass, nuclear, geothermal and wind.
- Biomass is a renewable energy source derived from organic matter such as wood, crop waste, or garbage, with wood being the largest contributor.
- Fossil Fuels and Renewable Energy consumption represent consumption of primary energy, which is energy in its original form, before transformation to secondary or tertiary forms of energy. Thus, to arrive at total energy consumption, Electricity Retail Sales (representing consumption of secondary and tertiary forms of energy) is added alongside consumption of Fossil Fuels and Renewable Energy.
- Electrical System Energy Losses are a deduction from total energy consumption, and are incorrectly represented as positively contributing to total energy consumption. Thus, total energy consumption figures in each year are overstated by the amount of electrical system energy losses.

(55) Electricity Prices by Sector

- Source: U.S. Energy Information Administration.

(56) Commercial Crude Oil Inventory

- Source: U.S. Energy Information Administration.
- U.S. Ending Stocks of Commercial Crude Oil represents stocks (inventory) of crude oil held in storage for commercial use. This figure excludes both lease stock and volumes in the Strategic Petroleum Reserve (SPR). Lease stock is crude oil stored in tanks at sites where producers are drilling on leased land. They're excluded from total commercial crude oil inventory because they aren't yet available for commercial use. The SPR is petroleum maintained by the Federal Government for use during periods of major supply interruption.
- Ending stocks (inventory) are primary stocks of crude oil held in storage as of midnight on the last day of the month. Primary stocks include crude oil held in storage at, or in, leases, refineries, natural gas processing plants, pipelines, tank farms and bulk terminals with the capacity to store a minimum of 50,000 barrels of petroleum products or that can receive petroleum products by tanker, barge or pipeline.

(57) Petroleum and Other Liquids Commercial Inventory

- Source: U.S. Energy Information Administration.
- Hydrocarbon Gas Liquids (HGLs) are molecules of carbon and hydrogen in various combinations. HGLs include alkanes, or paraffins (ethane, propane, butane, isobutene, natural gasoline) and alkenes, or olefins (ethylene, propylene, butylene, isobutylene).
- Unfinished Oils are all oils that require further processing and are produced by partial refining of crude oil. Unfinished Oils include napthas and lighter oils, kerosene and light gas oils, heavy gas oils and residuum.
- Other Hydrocarbons/Oxygenates are substances that increase the amount of oxygen in various gasoline blends when added to them. This category includes fuel ethanol, methanol and methyl tertiary butyl ether (MTBE).
- Total Motor Gasoline includes finished motor gasoline and motor gasoline blending components.

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

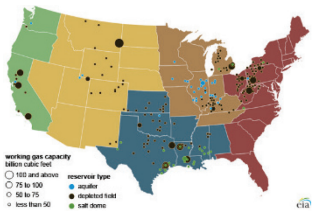
(57) Petroleum and Other Liquids Commercial Inventory (continued)

- Distillate Fuel Oil is a general classification for a variety of petroleum fractions produced in petroleum distillation operations. Included within this classification are No. 1, No. 2 and No. 4 diesel fuels (used in on-highway and off-highway diesel engines), as well as No. 1, No. 2 and No. 4 fuel oils (used primarily for space heating and electric power generation).
- Residual Fuel Oil is the general classification for heavy oils that remain after lighter oils are distilled away in the process of petroleum refining. Residual Fuel Oil includes No. 5 and No. 6 fuel oils. The former is used in steam-powered vessels, and the latter is used for electric power generation, space heating, vessel bunkering and industrial processes.
- Other Oils include aviation gasoline blending components, finished aviation gasoline, kerosene, petrochemical feedstocks, special napthas, lubricants, waxes, petroleum coke, asphalt and road oil, still gas and miscellaneous products.

(58) Natural Gas Underground Storage Capacity

- Source: U.S. Energy Information Administration.
- Underground Storage Capacity refers to total natural gas storage capacity in underground storage facilities called "salt domes," which are caverns hollowed out in subsurface salt formations. Salt domes are the primary means of natural gas storage in the United States.

U.S. Underground Natural Gas Storage Facilities by Type (July 2015)



(59) Commercial Crude Oil Refinery, Tank and Underground Storage Capacity and Utilization

- Source: U.S. Energy Information Administration.
- Commercial Crude Oil Storage Capacity refers to working storage capacity. Working capacity is the volume difference between a crude oil storage tank's maximum safe fill capacity and the volume below which pump suction is ineffective, called tank bottoms.
- Crude Oil Shell Storage Capacity is the design capacity of a petroleum storage tank. It includes tank bottoms, working storage capacity and contingency space. Contingency space is defined as available storage space above the defined maximum operating inventory level that remains empty during normal operations. Shell Storage Capacity is always greater than or equal to working storage capacity.
- Crude Oil Storage Capacity data is released only twice per year for the months of March and September. Thus, the data series excludes inventory levels for all months other than March and September of each year.

(60) Crude Oil and Natural Gas Pipeline Mileage

- Source: Pipeline and Hazardous Materials Safety Administration.
- The chart includes information from only Federal Energy Regulatory Commission-regulated pipeline companies.
- Crude Oil Pipeline Mileage represents total mileage of pipelines dedicated to the transport of crude oil and those dedicated to the transport of petroleum products. Pipeline Mileage for crude oil includes trunk lines only.
- Pipeline Mileage for natural gas includes both trunk and gathering lines.
- Trunk lines are synonymous with transmission lines, which are large, cross-country pipelines that move oil or gas from producing areas to refineries. Gathering lines are pipelines that transport oil or gas from the area in which it was produced to a storage facility which acts as an intermediate stop before transportation by truck, railcar, or trunk line.

(61) Crude Oil and Petroleum Products Pipeline Movements Between Petroleum Administration for Defense Districts (PADDs)

- Source: Federal Reserve Bank of St. Louis, with data provided by the U.S. Energy Information Administration.
- Crude Oil and Petroleum Products Pipeline Movements Between PADDs represents the total volume of crude oil and petroleum products transported between each PADD. The data does not include movements within each PADD.

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

(62) Natural Gas Cumulative Interstate Pipeline Systems Capacity

- Source: U.S. Energy Information Administration.
- Cumulative Interstate Capacity refers to capacity of natural gas pipelines crossing between states. Thus, capacity of intrastate pipelines is not included and the data should not be interpreted as representing total capacity of natural gas pipelines.

(63) Crude Oil and Petroleum Products Exports to Mexico

- Source: U.S. Energy Information Administration.
- Petroleum Products include pentanes plus, liquefied petroleum gases, unfinished oils, finished motor gasoline, motor gasoline blending components, oxygenates, fuel ethanol, distillate fuel oil, kerosene, kerosene-type jet fuel, special napthas, residual fuel oil, waxes, petroleum coke, asphalt and road oil, lubricants and miscellaneous products.

(64) Truck Tonnage Index

- Source: U.S. Department of Transportation, Bureau of Transportation Statistics.
- The Truck Tonnage Index measures the gross tonnage of freight that is transported by motor carriers for a given month. The Index serves as an indicator of shipping activity in the United States.
- Created by the U.S. Department of Transportation, Bureau of Transportation Statistics via information published in the American Trucking Association (ATA) Monthly Truck Tonnage Report.
- In January 2018, ATA revised the seasonally adjusted index back five years as part of its annual revision. In addition, ATA re-indexed the seasonally adjusted and not seasonally adjusted tonnage indexes to 2015 = 100 back to 1973.

(65) Heavy Truck Sales

- Source: Federal Reserve Bank of St. Louis.
- Heavy Trucks are trucks with more than 14,000 pounds gross vehicle weight.

(66) Trucking Conditions Index

- Source: FTR Transportation Intelligence.
- The Trucking Conditions Index summarizes the status of the trucking industry through tracking changes in six major conditions including freight volumes, freight rates, fleet capacity, fleet bankruptcies, fuel price and financing.
- An index value greater than zero represents a positive environment in the truck market, and an index value below zero represents a negative environment. An index value above 10 is a sign that volumes, prices and margin are in a solidly favorable range.

(67) Freight Transportation Services Index

- Source: Federal Reserve Bank of St. Louis.
- The Freight Transportation Services Index measures the output of the for-hire freight transportation industry and consists of data from for-hire trucking, rail, inland waterways, pipelines and air freight.

(68) Crude Oil Refinery Receipts by Transportation Method

- Source: U.S. Energy Information Administration.
- Refinery Receipts by Pipeline, Tanker, Barge, Truck and Rail refer to total volumes of crude oil of domestic and international origin that are in transit to, or received by, domestic refineries. Volumes of crude oil in transit via pipeline are excluded from receipts. Foreign crude oil is included in receipts only after entry through customs.
- Refinery inputs track volumes of crude oil that are entered into refining processes (e.g., distillation units, cokers, etc.).
- The volume difference between refinery receipts and refinery inputs is that which is in transit but not yet received by refineries plus that which has been received and is held in bonded storage, awaiting entry into refining processes.

(69) Crude Oil Movements by Tanker and Barge Movements Between Petroleum Administration for Defense Districts (PADDs)

- Source: U.S. Energy Information Administration.
- The data series shown on the chart is an aggregate of all crude oil movements between Petroleum Administration for Defense Districts (PADDs). This includes crude oil movement from PADD 1 to PADD 2 and PADD 3; PADD 2 to PADD 1 and PADD 3; and PADD 3 to PADD 1, PADD 2 and PADD 5.
- PADD 1 is the East Coast region, PADD 2 is the Midwest region, PADD 3 is the Gulf Coast region and PADD 5 is the West Coast region.

DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES

(70) Movements of Crude Oil by Rail
- Source: U.S. Energy Information Administration.

(71) Average Weekly Rail Carloads of Petroleum and Petroleum Products
- Source: Association of American Railroads.
- Monthly aggregates of the average weekly number of rail carloads transporting petroleum and petroleum products in the United States.
- Excludes the U.S. operations of Canadian railroads.

(72) U.S. Manufacturers' Monthly Shipments and U.S. Purchasing Managers' Index (PMI)
- Sources: For Manufacturers' Monthly Shipments - U.S. Census Bureau Manufacturers' Shipments, Inventories and Orders Survey; and for U.S. Purchasing Managers' Index (PMI) – Institute for Supply Management Manufacturing Report on Business®.
- A PMI above 50 represents expansion within the manufacturing sector compared with the prior month.

(73) U.S. New Housing Starts and Total U.S. Construction Spending
- Source: U.S. Census Bureau.

(74) London Interbank Offered Rate (LIBOR), Based on U.S. Dollar
- Source: ICE Benchmark Administration Limited via the Federal Reserve Bank of St. Louis.
- The London Interbank Offered Rate is the average interest rate at which leading banks borrow funds of a sizeable amount from other banks in the London market. LIBOR is the most widely used benchmark or reference rate for short term interest rates. The chart values are monthly percent averages of daily figures and are not seasonally adjusted.

(75) Bank Prime Loan Interest Rates
- Source: Federal Reserve Bank of St. Louis.
- The Bank Prime Loan Interest Rate is that posted by a majority of top 25 (by assets in domestic offices) insured, U.S.-chartered commercial banks. Prime is one of several base rates used by banks to price short-term business loans.
- The chart values are monthly percent averages of daily figures and are not seasonally adjusted.

(76) Commercial and Industrial Loans vs. Banking Standards
- Source: Federal Reserve Bank of St. Louis.
- Net Percentage of Domestic Banks Tightening Standards for Commercial and Industrial Loans to large and middle-market firms. Quarterly, not seasonally adjusted.
- Commercial and Industrial Loans, All Commercial Banks. Monthly, seasonally adjusted.

(77) U.S. Treasury Yield Curve
- Source: U.S. Treasury.
- U.S. Treasury Yield Curve rates are commonly referred to as Constant Maturity Treasury (CMT) rates. Yields are interpolated by the U.S. Treasury from the daily yield curve.
- The curve, which relates the yield on a security to its time to maturity, is based on the closing market bid yields on actively traded U.S. Treasury securities in the over-the-counter market.

(78) Corporate Spreads to Treasuries by Quality
- Source: Federal Reserve Bank of St. Louis.
- Corporate Spreads to Treasuries represent the spread, or difference, between the yield curve of an index of corporate bonds of a given rating category and the spot rate U.S. Treasury curve. The spot rate U.S. Treasury curve is a yield curve that uses U.S. Treasury spot rates rather than yields, and represents the rate for a zero-coupon U.S. Treasury bond.
- The corporate bond yield indexes are Bank of America Merrill Lynch Option-Adjusted Spread (OAS) Indexes for all bonds with a given investment rating of AA, BB or CCC or below that are publically issued in the U.S. domestic market. Each respective OAS index is calculated using each constituent bond's OAS, weighted by market capitalization. A bond's OAS is the bond's yield spread relative to the risk-free rate of return, typically the U.S. Treasury securities yield, adjusted to account for an embedded option.

HOT TOPICS

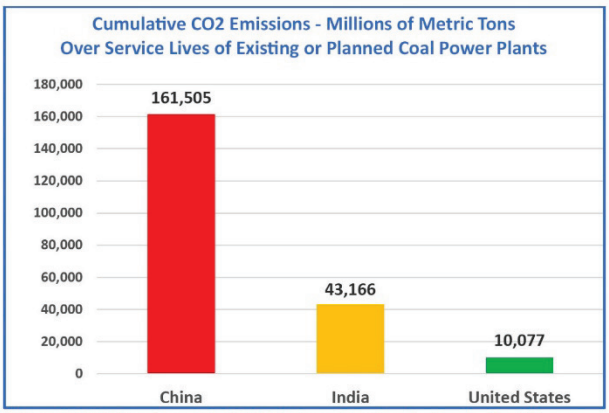
U.S. NATURAL GAS CAN MITIGATE CLIMATE CHANGE

Most people believe that the earth's climate is changing, and that greenhouse gasses, especially carbon dioxide (CO2) emitted from burning fossil fuels, are contributing to the change. Within hours, greenhouse gasses emitted from any country become part of our global atmosphere. So fighting climate change means all countries must reduce CO2 emissions. The U.S. is leading the world in reducing CO2 emissions, with our levels now at a 25-year low. But progress here at home, while important, will do little to solve the global problem. Here's why.

Electricity generation is the largest single source of CO2 emissions globally. When used to generate electricity, natural gas emits 60% less CO2 than coal. In the U.S., emissions are declining because natural gas has replaced coal as the biggest source of energy for electricity production, and its share keeps growing. This is a result of two recent developments: our greatly increased production of natural gas from hydraulic fracturing, and the new pipelines we have built to deliver it to electric generating plants.

On the other hand, China and India today are the world's greatest emitters of greenhouse gasses. If current trends continue, by 2030 these two countries together will account for 42% of global CO2 emissions and rising, compared to 12% from the U.S. and falling. This is because they are burning more and more coal for electricity generation. Their growing and increasingly wealthy populations need energy, and they have lots of coal but very limited access to natural gas and no ability to add nearly enough renewables to make a difference.

Since 2000, China has built 70% of the world's new coal-fired electric generating capacity, and is now home to fully half of the world's coal plant fleet. Adding to this, China today has as much new coal generating capacity under construction as the entire capacity now in operation in the United States. The U.S. has no new coal-fired plants planned or under construction.



Milions of Metric Tons, from units of 30 MW or larger. Based on plant service life of 40 years.
For plants already over 40, assumes 5 more years of operations.
Source: CoalSwarm Global Coal Plant Tracker, January 2019. Chart Copyright 2019 EEIA

HOT TOPICS

U.S. NATURAL GAS CAN MITIGATE CLIMATE CHANGE (CONTINUED)

China's coal power plants today emit four times more CO2 into the atmosphere as those in the U.S. Over their service lives, China's coal plants will release sixteen times more CO2 into earth's atmosphere than those in the United States. Meanwhile, because of plant retirements U.S. coal generating capacity has fallen by 33% since 2010 and is slated to fall another 25% by 2025.

As for climate change, according to the International Energy Agency, for the world to have a 50% chance of limiting global warming to 1.75° (C), China would have to shut down all of its coal plants over the next 25 years, including the ones now under construction. But they have announced no such plans or intentions. With limited access to natural gas, they continue to build coal plants at a rapid rate to provide power to their growing population and economy.

U.S. natural gas can to come to the planet's rescue. Exporting our natural gas to China and other coal-burning Asian countries will help them make the same great progress we are making here in the U.S. American producers can supply more than enough natural gas to do so. One of the biggest impediments is lack of pipelines to get U.S. gas from prolific shale formations to an expanding fleet of export terminals.

Those who campaign to stop construction of North American natural gas pipelines on the premise that they are helping to alleviate climate change, are actually standing in the way of progress in other countries. High coal-consuming countries would accelerate their migration to natural gas if they were confident of long-term access to the large and economic supplies that additional North American production, pipeline transport and export infrastructure would guarantee.

HOT TOPICS

THE PERMIAN BASIN IS RAMPING UP PRODUCTION AND IS FORECASTED TO PRODUCE MORE OIL THAN EVERY OPEC NATION EXCEPT SAUDI ARABIA BY 2023

The U.S. has ridden the shale boom to the top of the global oil production landscape. The Permian Basin of West Texas and Southeast New Mexico is the hottest oilfield on earth, a testament to just how far the domestic energy industry has come since the hardships that defined the mid-2000s. In 2005, domestic oil and gas production had been in decline for 35 consecutive years, leaving total U.S. oil production at a meager 5.2 million barrels per day (bpd).[1] At this time, the U.S had little control over an ever-dwindling supply of the economy's lifeblood, the bulk of which resided in the hands of foreign counterparts whose interests were misaligned with the U.S.

Turn the page to today, and the U.S. is the world's leading oil producer mainly due to the shale revolution.[2] At the heart of this revolution is the shale-rich Permian Basin, one of the areas of new oil discoveries and increased production in the U.S. Last year, IHS Markit forecast that by 2023, total oil production in the region will reach 5.4 million bpd and the Permian Basin alone will produce more oil than every OPEC nation except Saudi Arabia.[3] An estimated $308 billion in upstream spending and 41,000 new wells are expected to drive this growth, which could account for up to 60% of the growth in total global production between 2018 and 2023.[3] In the past 24 months ending March 2019, production in the Permian Basin has increased almost 85% to 4.1 million barrels of oil per day.[4] While the region's ability to maintain such growth through 2023 is subject to many factors, it is evident that production is accelerating. Production of both natural gas and natural gas liquids (NGLs) in the Permian Basin are also expected to double between 2018 and 2023, reaching 15 billion cubic feet per day and 1.7 million bpd, respectively.[3]

Life on the ground in the Permian Basin has been quite aptly described by The Wall Street Journal (WSJ) as a "fracking-related gold rush," a place where barbers can make up to $180,000 per year cutting weather-trodden scalps, and the only bar in town with a patio can book tables for $6,000.[5] The Permian Basin is a Big Oil playground, dominated by the industry's largest companies. Two such companies, Chevron Corporation and ExxonMobil, recently published production forecasts which highlight their intent in the region. After doubling production from the region in 2018, ExxonMobil expects to produce 1 million bpd in the Permian Basin by 2024.[6] In the next five years, Chevron plans to more than double its production in the Permian Basin to 900,000 barrels of oil a day.[7]

Smaller independent companies that pioneered the shale boom are losing ground to Big Oil. The figures above underline an industry-old trend which has now manifested in the shale game. In the face of challenge, small exploration companies engineer new ways to produce hydrocarbons, ultimately paving the way for Big Oil to move in. Equipped with new production techniques and economies of scale, Big Oil is capable of capturing the profitability that eludes smaller independent producers.[7]

HOT TOPICS

THE PERMIAN BASIN IS RAMPING UP PRODUCTION AND IS FORECASTED TO PRODUCE MORE OIL THAN EVERY OPEC NATION EXCEPT SAUDI ARABIA BY 2023 (CONTINUED)

Per Chevron's CEO Mike Wirth, "At times, we were criticized for not going faster. We were steadily building up the knowledge to do this well, not to do it fast."[7] Scale provides numerous benefits that allow Big Oil the advantage of profitable exploration and production in a relatively low oil price environment. Sheer size allows them to hedge a smaller proportion of their overall production relative to independents, thereby enhancing the returns of large players when prices jump. Scale also allows larger producers to avoid pipeline bottlenecks connected to key acreage which forces smaller companies to market its production at discounted prices. To highlight the leverage held by Chevron and ExxonMobil, the current land positions held by these two producers are larger in size than Rhode Island or Yosemite National Park.[7]

As the larger producers continue their shale expansion, many have gained favor with investors – in the past year Chevron's stock price has increased 14% and all of the largest oil companies have outperformed the S&P 500 even though crude prices have declined. With oil prices below $60 per barrel, margins are simply too narrow for independent producers to consistently compete with the big players.[8] As the WSJ notes, "…[at today's prices], even a modest increase in the cost of borrowing is enough to wipe out any potential profits this year for some companies."[9]

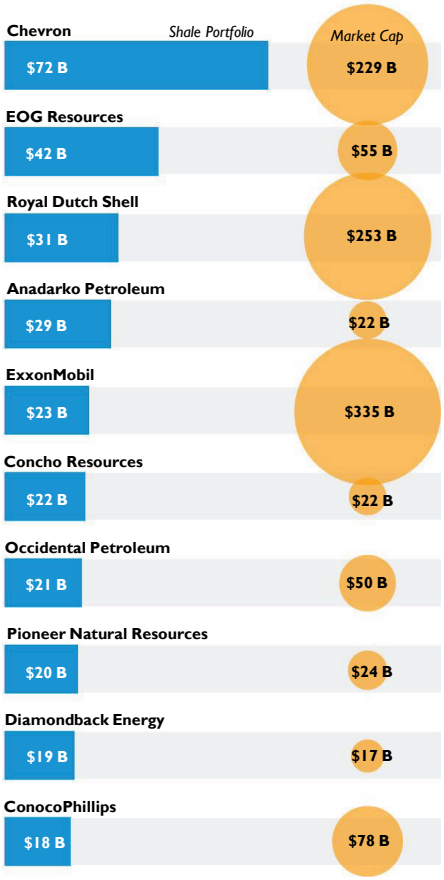
Big Oil's competition, small and independent operators ("wildcatters"), face contrasting prospects. These wildcatters, who leveraged low interest rates after the Great Recession to pioneer the very technologies that catalyzed the shale boom, have been collectively losing money for nearly a decade. Per figures from Dealogic, the combined value of debt and equity issuances to shale companies has fallen nearly 60% over the last two years, from $56.9 billion in 2016 to $22.8 billion in 2018.[9] In addition, spending amongst smaller companies is poised to fall 11% in 2019.[7]

While smaller companies grapple with margins, it is clear that Big Oil has no plans to take its foot off the gas in the Permian Basin. In the ten months since IHS Markit predicted Permian Basin production of 5.4 million bpd by 2023, production has already increased 25%, and the industry is eyeing another milestone. Per CNN Business, the U.S. is set to surpass Saudi Arabia as the world's leading exporter of oil, natural gas liquids, and petroleum products later this year.[10] This has important national security implications. As the U.S. will continue to import oil to power its economy, it is no longer as beholden to foreign oil as it once was.

HOT TOPICS

THE PERMIAN BASIN IS RAMPING UP PRODUCTION AND IS FORECASTED TO PRODUCE MORE OIL THAN EVERY OPEC NATION EXCEPT SAUDI ARABIA BY 2023 (CONTINUED)

Top 10 Shale Portfolios by Value ($ Billions)
As of March 4, 2019



Source: The Wall Street Journal / Rystad Energy.

1) Forbes, "How The Shale Boom Turned The World Upside Down," April 21, 2017.
2) U.S. Energy Information Administration, "The United States is Now the Largest Global Crude Oil Producer," September 12, 2018.
3) IHS Markit Outlook, "'Stunning' Permian Basin Oil Production to More than Double from 2017-2023, Exceeding Expectations," June 13, 2018.
4) U.S. Energy Information Administration, "Drilling Activity Report," March 2019.
5) The Wall Street Journal, "In This Oil Boom Town, Even a Barber Can Make $180,000," March 1, 2019.
6) ExxonMobil, "ExxonMobil to Increase, Accelerate Permian Output to 1 Million Barrels per Day by 2024," March 5, 2019.
7) The Wall Street Journal, "Chevron, ExxonMobil Tighten Their Grip on Fracking," March 5, 2019.
8) The Wall Street Journal, "Oil Giants Start to Dominate U.S. Shale Boom," November 15, 2018.
9) The Wall Street Journal, "Frackers Face Harsh Reality as Wall Street Backs Away," February 24, 2019.
10) CNN Business, "America is Set to Surpass Saudi Arabia in a 'Remarkable' Oil Milestone," March 21, 2019.

PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

PETROLEUM PRODUCTS

EQUITY COMPARABLES (1)

Petroleum Products (United States & Canada)

Company	LTM[2] Revenues	LTM[2] EBITDA	Margin	Stock Price 12/31/18	% of 52-Week High	Market Cap	Total Enterprise Value[3]	TEV / LTM Revenues	TEV / LTM EBITDA	Net Debt[4]/ EBITDA
Calumet Specialty Products Partners, L.P.	$3,498	$293	8.4%	$2.21	25.3%	$170	$1,858	0.5x	6.3x	5.3x
Chevron Corporation	158,902	33,641	21.2	108.79	81.3	207,873	235,335	1.5x	7.0x	0.7x
CVR Energy, Inc.	7,124	806	11.3	34.48	72.3	3,466	4,556	0.6x	5.7x	0.6x
EnLink Midstream, LLC	7,694	1,100	14.3	9.49	47.5	1,721	9,538	1.2x	8.7x	3.9x
Gibson Energy Inc.	5,018	291	5.8	13.69	80.1	1,978	2,924	0.6x	10.1x	2.9x
Exxon Mobil Corporation	279,332	39,584	14.2	68.19	76.4	288,703	329,537	1.2x	8.3x	0.9x
HollyFrontier Corporation	17,715	2,067	11.7	51.12	61.4	8,835	10,720	0.6x	5.2x	0.6x
Keyera Corp.	3,272	642	19.6	18.91	66.3	3,958	5,599	1.7x	8.7x	2.7x
Marathon Petroleum Corporation	96,706	7,659	7.9	59.01	66.7	40,767	59,092	0.6x	7.7x	3.4x
Parkland Fuel Corporation	10,584	649	6.1	25.90	74.5	3,448	5,019	0.5x	7.7x	2.5x
Phillips 66	111,461	6,511	5.8	86.15	69.5	39,726	52,615	0.5x	8.1x	1.3x
NuStar Energy L.P.	1,962	655	33.4	20.93	58.3	2,240	6,919	3.5x	10.6x	4.8x
Valero Energy Corporation	111,407	6,662	6.0	74.97	59.0	31,810	38,385	0.3x	5.8x	0.9x
Median			**11.3%**		**66.7%**			**0.6x**	**7.7x**	**2.5x**
Mean			**12.7%**		**64.5%**			**1.0x**	**7.7x**	**2.3x**

SELECTED TRANSACTIONS

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
9/13/2018	MPM Holdings Inc. (OTCPK:MPMQ)	KCC Corporation (KOSE:A002380); SJL Partners; Wonik QnC Corporation (KOSDAQ:A074600)	$2,664.9	1.0x	7.4x
8/15/2018	KMG Chemicals, Inc.	Cabot Microelectronics Corporation (NasdaqGS:CCMP)	$1,606.5	3.5x	13.5x
4/5/2017	Houghton International Inc.	Quaker Chemical Corporation (NYSE:KWR)	$1,415.4	1.8x	11.8x
1/31/2017	Sealweld Corporation	KMG Electronic Chemicals Luxembourg Holdings Sarl; KMG Industrial Lubricants Canada, Inc.	$17.3	1.4x	6.6x
9/25/2016	LANXESS Solutions US Inc.	LANXESS Deutschland GmbH	$2,450.7	1.4x	8.2x
4/1/2015	Valves Inc. of Texas	KMG Chemicals, Inc. (NYSE:KMG)	$38.9	3.2x	11.4x

(1) Matching public companies to middle-market companies is an imperfect comparable analysis due to the variables of size, equipment, markets, etc. Nonetheless JKC's research has yielded this list as the closest available.
(2) LTM is defined as last twelve months.
(3) Total Enterprise Value is defined as market capitalization plus total debt less cash and cash equivalents.
(4) Net Debt is defined as total debt less cash and cash equivalents.

PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

NATURAL GAS

EQUITY COMPARABLES (1)

Natural Gas (United States & Canada)

Company	LTM[2] Revenues	LTM[2] EBITDA	LTM[2] Margin	Stock Price 12/31/18	% of 52-Week High	Market Cap	Total Enterprise Value[3]	TEV / LTM Revenues	TEV / LTM EBITDA	Net Debt[4]/ EBITDA
Alliant Energy Corporation	$3,535	$1,195	33.8%	$42.25	90.7%	$9,973	$15,825	4.5x	13.2x	5.0x
AltaGas Ltd.	3,120	687	22.0	10.19	47.4	2,739	11,740	3.8x	17.1x	10.7x
Atmos Energy Corporation	3,104	1,088	35.1	92.72	92.0	10,838	14,525	4.7x	13.3x	3.2x
Avista Corporation	1,397	447	32.0	42.48	80.3	2,790	4,761	3.4x	10.7x	4.7x
Baytex Energy Corp.	817	495	60.6	1.77	38.7	978	2,413	3.0x	4.9x	3.1x
Calumet Specialty Products Partners, L.P.	3,498	293	8.4	2.21	25.3	170	1,858	0.5x	6.3x	5.3x
Cenovus Energy Inc.	15,275	1,952	12.8	7.04	64.7	8,645	14,478	0.9x	7.4x	3.1x
Chesapeake Utilities Corporation	717	144	20.0	81.30	87.0	1,332	1,845	2.6x	12.8x	4.3x
Corning Natural Gas Holding Corporation	36	9	24.4	18.50	95.3	56	113	3.1x	12.9x	6.2x
Crestwood Equity Partners LP	3,654	311	8.5	27.91	68.8	1,988	4,456	1.2x	14.3x	5.6x
Dominion Energy, Inc.	13,366	6,533	48.9	71.46	87.5	46,912	86,766	6.5x	13.3x	5.4x
EnLink Midstream, LLC	7,694	1,100	14.3	9.49	47.5	1,721	9,538	1.2x	8.7x	3.9x
Enbridge Inc.	33,988	7,464	22.0	31.08	83.1	62,837	123,083	3.6x	16.5x	6.3x
Enterprise Products Partners L.P.	36,534	6,767	18.5	24.59	81.8	53,641	79,939	2.2x	11.8x	3.8x
Epsilon Energy Ltd.	27	14	50.7	4.39	96.9	120	107	4.0x	7.9x	(1.0)x
Eversource Energy	8,448	2,581	30.5	65.04	92.2	20,610	34,948	4.1x	13.5x	5.6x
Genesis Energy, L.P.	2,913	568	19.5	18.47	71.4	2,264	6,719	2.3x	11.8x	6.0x
National Fuel Gas Company	1,663	741	44.6	51.18	86.5	4,400	6,301	3.8x	8.5x	2.7x
New Jersey Resources Corporation	3,022	316	10.5	45.67	88.1	4,046	5,500	1.8x	17.4x	5.3x
Northwest Natural Holding Company	706	245	34.7	60.46	84.2	1,744	2,624	3.7x	10.7x	3.8x
MDU Resources Group, Inc.	4,532	624	13.8	23.84	80.5	4,673	6,521	1.4x	10.5x	3.3x
OGE Energy Corp.	2,270	791	34.8	39.19	93.8	7,828	10,884	4.8x	13.8x	3.9x
ONE Gas, Inc.	1,634	440	26.9	79.60	90.7	4,181	5,639	3.5x	12.8x	3.6x
ONEOK, Inc.	12,593	2,254	17.9	53.95	74.9	22,193	31,062	2.5x	13.8x	4.2x
RGC Resources, Inc.	68	18	27.1	29.96	95.6	240	310	4.6x	16.8x	4.8x
South Jersey Industries, Inc.	1,641	318	19.3	27.80	75.7	2,371	5,558	3.4x	17.5x	9.7x
Southwest Gas Holdings, Inc.	2,880	592	20.6	76.50	89.0	4,054	6,173	2.1x	10.4x	3.7x
Summit Midstream Partners, LP	506	249	49.2	10.05	43.8	737	2,249	4.4x	9.0x	5.0x
Targa Resources Corp.	10,484	1,267	12.1	36.02	60.8	8,259	15,462	1.5x	12.2x	5.1x
TransCanada Corporation	10,025	5,901	58.9	35.73	78.3	32,799	71,039	7.1x	12.0x	6.1x
Valener Inc	63	0	0.0	14.17	84.6	557	690	11.0x	NM	NM
Median			**22.0%**		**83.1%**			**3.4x**	**12.5x**	**4.8x**
Mean			**26.9%**		**76.7%**			**3.5x**	**12.1x**	**4.8x**

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PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

NATURAL GAS

SELECTED TRANSACTIONS (1)

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
11/8/2018	Western Gas Partners, LP (NYSE:WES)	Western Gas Equity Partners, LP (NYSE:WGP)	$13,427.9	6.5x	12.0x
10/22/2018	EnLink Midstream Partners, LP (NYSE:ENLK)	EnLink Midstream, LLC (NYSE:ENLC)	$12,923.5	1.7x	12.2x
10/9/2018	Antero Midstream Partners LP (NYSE:AM)	Antero Midstream GP LP (NYSE:AMGP)	$7,359.7	7.7x	11.5x
9/28/2018	American Midstream Partners, LP (NYSE:AMID)	ArcLight Capital Partners, LLC	$1,595.1	2.0x	14.2x
8/27/2018	Blue Ridge Mountain Resources, Inc. (OTCPK:BRMR)	Eclipse Resources Corporation (NYSE:ECR)	$348.0	3.6x	12.8x
8/1/2018	Energy Transfer Operating, LP	Energy Transfer, LP (NYSE:ET)	$69,430.8	2.1x	10.9x
5/17/2018	Williams Partners LP (NYSE:WPZ)	The Williams Companies, Inc. (NYSE:WMB)	$57,052.1	7.0x	14.1x
4/25/2018	Rice Midstream Partners LP (NYSE:RMP)	EQM Midstream Partners, LP (NYSE:EQM)	$2,443.1	7.7x	9.9x
11/1/2017	Southcross Energy Partners, LP (NYSE:SXE)	American Midstream Partners, LP (NYSE:AMID)	$624.1	1.0x	14.8x
7/19/2017	Avista Corporation (NYSE:AVA)	Hydro One Limited (TSX:H)	$5,332.4	3.7x	11.3x
5/15/2017	Ceiba Energy Services Inc. (TSXV:CEB)	Secure Energy Services Inc. (TSX:SES)	$28.2	4.3x	30.3x
4/3/2017	Rockies Express Pipeline LLC	Tallgrass Energy Partners, LP (NYSE:TEP)	$4,043.9	-	7.3x
2/21/2017	Delta Natural Gas Company, Inc. (NasdaqGS:DGAS)	PNG Companies LLC	$260.2	3.7x	13.7x
2/1/2017	ONEOK Partners, LP	ONEOK, Inc. (NYSE:OKE)	$23,721.4	2.3x	12.9x
1/25/2017	WGL Holdings, Inc. (NYSE:WGL)	AltaGas Ltd. (TSX:ALA)	$6,634.5	2.7x	15.3x

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PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

PROPANE AND HEATING/FUEL OIL

EQUITY COMPARABLES (1)

Propane and Heating/Fuel Oil (United States & Canada)

Company	LTM[2] Revenues	LTM[2] EBITDA	LTM[2] Margin	Stock Price 12/31/18	% of 52-Week High	Market Cap	Total Enterprise Value[3]	TEV / LTM Revenues	TEV / LTM EBITDA	Net Debt[4]/ EBITDA
AmeriGas Partners, L.P.	$2,856	$554	19.4%	$25.30	52.3%	$2,352	$5,193	1.8x	9.4x	5.3x
Ferrellgas Partners, L.P.	1,789	194	10.8	0.54	11.4	52	2,082	1.2x	10.7x	10.9x
NGL Energy Partners LP	24,197	483	2.0	9.59	54.3	1,187	4,018	0.2x	8.3x	4.5x
Spire Inc.	2,005	455	22.7	74.08	91.3	3,756	6,389	3.2x	14.1x	6.1x
Star Group, L.P.	1,776	68	3.8	9.34	84.1	493	578	0.3x	8.5x	2.5x
Suburban Propane Partners, L.P.	1,348	269	20.0	19.27	72.1	1,188	2,438	1.8x	9.1x	4.8x
UGI Corporation	7,726	1,388	18.0	53.35	90.0	9,275	13,831	1.8x	10.0x	3.1x
Median			**18.0%**		**72.1%**			**1.8x**	**9.4x**	**4.8x**
Mean			**13.8%**		**65.1%**			**1.5x**	**10.0x**	**5.3x**

SELECTED TRANSACTIONS

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
10/18/2018	Propane Distribution Assets of Musco Fuel & Propane LLP	Superior Plus Corp. (TSX:SPB)	$14.5	-	-
10/11/2018	Salathe Gas Company, LLC/North Star Exchange, Inc.	Ferrellgas Partners, LP (NYSE:FGP)	-	-	-
9/18/2018	Propane Distribution and Other Assets of Porco Energy Corp	Superior Plus Corp. (TSX:SPB)	$15.5	-	-
9/14/2018	United Liquid Gas Company	Superior Plus Corp. (TSX:SPB)	-	-	-
7/12/2018	Diamond Propane, Inc.	Ferrellgas Partners, LP (NYSE:FGP)	-	-	-
5/30/2018	NGL Propane, LLC	Superior Plus Energy Services, Inc.	$900.0	-	10.6x
5/8/2018	Propane Distribution Assets of Blue Flame Gas Inc.	Superior Plus Corp. (TSX:SPB)	$8.0	-	-
2/14/2018	Propane Distribution Assets and the Fuels and Lubricants Business of Hi-Grade Oil Co.	Superior Plus Energy Services, Inc.	$6.4	-	-
11/7/2017	Hicksgas, LLC	DCC plc (LSE:DCC)	$200.0	-	-
9/27/2017	Canwest Propane Ltd.	Superior Plus LP	$352.1	-	-
9/5/2017	Service Plus Propane, Inc.	Ferrellgas Partners, LP (NYSE:FGP)	-	-	-
8/8/2017	Dixie Fuel Company, Inc.	Revere Gas Inc.	-	-	-
7/5/2017	Yankee Propane Inc. And Virginia Propane, Inc.	Superior Plus Corp. (TSX:SPB)	$31.5	-	-
5/11/2017	Bell-Gaz Itée	Groupe Filgo-Sonic	-	-	-
3/15/2017	Valley Center Propane, LLC	Ferrellgas Partners, LP (NYSE:FGP)	-	-	-

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PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

DRILLING

EQUITY COMPARABLES (1)

Drilling (United States & Canada)

Company	LTM[2] Revenues	LTM[2] EBITDA	Margin	Stock Price 12/31/18	% of 52-Week High	Market Cap	Total Enterprise Value[3]	TEV / LTM Revenues	TEV / LTM EBITDA	Net Debt[4]/ EBITDA
AKITA Drilling Ltd.	$87	$7	7.8%	$2.98	48.6%	$119	$165	1.9x	24.5x	8.9x
Baker Hughes, a GE company	22,877	2,829	12.4	21.50	56.9	11,038	36,389	1.6x	12.9x	1.2x
CES Energy Solutions Corp.	930	107	11.5	2.31	45.9	616	961	1.0x	9.0x	3.4x
Diamond Offshore Drilling, Inc.	1,060	270	25.4	9.44	43.1	1,297	2,794	2.6x	10.4x	5.6x
Ensco plc	1,705	248	14.5	3.56	37.4	1,547	5,917	3.5x	23.9x	17.8x
Ensign Energy Services Inc.	847	186	21.9	3.51	61.2	551	1,087	1.3x	5.9x	6.5x
Halliburton Company	23,995	4,338	18.1	26.58	45.9	23,285	31,706	1.3x	7.3x	1.9x
Helmerich & Payne, Inc.	2,671	674	25.2	47.94	63.9	5,227	5,395	2.0x	8.0x	0.3x
Independence Contract Drilling, Inc.	143	31	22.1	3.12	56.9	236	302	2.1x	9.6x	3.8x
National Oilwell Varco, Inc.	8,453	901	10.7	25.70	52.4	9,853	11,344	1.3x	12.6x	1.4x
Precision Drilling Corporation	1,129	261	23.1	1.74	44.5	510	1,675	1.5x	6.4x	4.5x
Rowan Companies plc	825	61	7.4	8.39	40.2	1,066	2,544	3.1x	41.6x	24.3x
Secure Energy Services Inc.	2,153	127	5.9	5.14	71.4	831	1,120	0.5x	8.8x	2.4x
Trinidad Drilling Ltd.	461	111	24.2	1.22	79.1	335	702	1.5x	6.3x	3.4x
Unit Corporation	843	373	44.2	14.28	49.1	772	1,538	1.8x	4.1x	1.7x
Median			**18.1%**		**49.1%**			**1.6x**	**9.0x**	**3.4x**
Mean			**18.3%**		**53.1%**			**1.8x**	**12.7x**	**5.8x**

SELECTED TRANSACTIONS

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
10/8/2018	Rowan Companies plc (NYSE:RDC)	Ensco plc (NYSE:ESV)	$3,133.2	3.3x	20.7x
10/1/2018	Sidewinder Drilling LLC	Independence Contract Drilling Inc. (NYSE:ICD)	$291.8	2.6x	45.1x
8/27/2018	Blue Ridge Mountain Resources, Inc. (OTCPK:BRMR)	Eclipse Resources Corporation (NYSE:ECR)	$347.9	3.6x	12.8x
8/13/2018	Trinidad Drilling Ltd. (TSX:TDG)	Ensign Energy Services Inc. (TSX:ESI)	$714.0	1.5x	5.1x
6/5/2018	Xtreme Drilling Corp.	AKITA Drilling Ltd. (TSX:AKT.A)	$155.0	2.8x	162.4x
2/15/2018	Layne Christensen Company (NasdaqGS:LAYN)	Granite Construction Incorporated (NYSE:GVA)	$491.9	1.0x	16.5x
5/30/2017	Atwood Oceanics, Inc. (NYSE:ATW)	Ensco plc (NYSE:ESV)	$1,759.6	2.2x	4.7x
5/19/2017	Savanna Energy Services Corp.	Total Energy Services Inc. (TSX:TOT)	$458.2	1.4x	16.6x

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PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

LUBRICANTS AND GREASES

EQUITY COMPARABLES (1)

Lubricants and Greases (United States & Canada)

Company	LTM(2) Revenues	LTM(2) EBITDA	LTM(2) Margin	Stock Price 12/31/18	% of 52-Week High	Market Cap	Total Enterprise Value(3)	TEV / LTM Revenues	TEV / LTM EBITDA	Net Debt(4)/ EBITDA
Albemarle Corporation	$3,375	$954	28.3%	$77.07	55.6%	$8,185	$9,399	2.8x	9.8x	1.2x
Ashland Global Holdings Inc.	3,738	627	16.8	70.96	81.9	4,434	6,669	1.8x	10.6x	3.8x
Clean Harbors, Inc.	3,300	483	14.6	49.35	68.1	2,764	4,135	1.3x	8.6x	2.7x
CSW Industrials, Inc.	342	71	20.6	48.35	84.5	738	749	2.2x	10.6x	(0.0)x
FMC Corporation	4,728	1,287	27.2	73.96	74.9	9,959	12,557	2.7x	9.8x	2.0x
Ingevity Corporation	1,134	321	28.3	83.69	78.5	3,512	4,203	3.7x	13.1x	2.1x
Kraton Corporation	2,012	383	19.1	21.84	40.5	698	2,255	1.1x	5.9x	3.8x
NewMarket Corporation	2,290	383	16.7	412.09	94.2	4,699	5,370	2.3x	14.0x	1.8x
Ocean Bio-Chem, Inc.	43	5	12.1	3.28	68.6	31	37	0.9x	7.1x	1.2x
Quaker Chemical Corporation	868	122	14.0	177.71	81.8	2,370	2,324	2.7x	19.1x	(0.6)x
Stepan Company	1,994	233	11.7	74.00	81.4	1,666	1,679	0.8x	7.2x	(0.1)x
Synalloy Corporation	281	33	11.6	16.59	66.9	147	203	0.7x	6.2x	2.3x
Trecora Resources	288	18	6.3	7.80	50.0	190	294	1.0x	16.3x	5.3x
Valvoline Inc.	2,297	428	18.6	19.35	75.5	3,641	4,867	2.1x	11.4x	2.9x
Median			**16.8%**		**75.2%**			**2.0x**	**10.2x**	**2.1x**
Mean			**17.6%**		**71.6%**			**1.9x**	**10.7x**	**2.0x**

SELECTED TRANSACTIONS

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
9/13/2018	MPM Holdings Inc. (OTCPK:MPMQ)	KCC Corporation (KOSE:A002380); SJL Partners; Wonik QnC Corporation (KOSDAQ:A074600)	$2,664.9	1.0x	7.4x
8/15/2018	KMG Chemicals, Inc.	Cabot Microelectronics Corporation (NasdaqGS:CCMP)	$1,606.5	3.5x	13.5x
4/5/2017	Houghton International Inc.	Quaker Chemical Corporation (NYSE:KWR)	$1,415.4	1.8x	11.8x
1/31/2017	Sealweld Corporation	KMG Electronic Chemicals Luxembourg Holdings Sarl; KMG Industrial Lubricants Canada, Inc.	$17.3	1.4x	6.6x
9/25/2016	LANXESS Solutions US Inc.	LANXESS Deutschland GmbH	$2,450.7	1.4x	8.2x
4/1/2015	Valves Inc. of Texas	KMG Chemicals, Inc. (NYSE:KMG)	$38.9	3.2x	11.4x

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PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

SOLAR

EQUITY COMPARABLES (1)

Solar (United States & Canada)

Company	LTM[2] Revenues	LTM[2] EBITDA	LTM[2] Margin	Stock Price 12/31/18	% of 52-Week High	Market Cap	Total Enterprise Value[3]	TEV / LTM Revenues	TEV / LTM EBITDA	Net Debt[4]/ EBITDA
Boralex Inc.	$351	$211	60.1%	$12.34	67.3%	$1,100	$3,431	9.8x	16.3x	11.4x
Capital Power Corporation	915	438	47.8	19.49	89.3	1,985	3,568	3.9x	8.2x	4.2x
NextEra Energy Partners, LP	771	510	66.1	43.05	85.0	2,411	8,091	10.5x	15.9x	6.6x
NRG Energy, Inc.	9,478	1,691	17.8	39.60	91.9	11,481	17,377	1.8x	10.3x	3.5x
TerraForm Power, Inc.	689	443	64.3	11.22	92.4	2,347	8,675	12.6x	19.6x	12.6x
Vivint Solar, Inc.	290	(43)	(14.9)	3.81	51.2	455	1,594	5.5x	NM	NM
Median			**54.0%**		**87.1%**			**7.6x**	**15.9x**	**6.6x**
Mean			**40.2%**		**79.5%**			**7.3x**	**14.0x**	**7.7x**

SELECTED TRANSACTIONS

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
2/5/2018	8point3 Energy Partners LP (NasdaqGS:CAFD)	Capital Dynamics, Inc.	$1,671.3	23.8x	17.0x
5/4/2017	Up to 20 Megawatts of Solar Energy Power Generation Assets	Kontrol Energy Corp. (CNSX:KNR)	$22.6	-	4.1x
3/7/2017	TerraForm Global, Inc. (NasdaqGS:GLBL)	Orion US Holdings 1 LP	$1,651.8	6.6x	17.2x
1/20/2016	Capstone Infrastructure Corporation	Irving Infrastructure Corp.	$1,435.1	-	12.7x
12/3/2014	Hawaiian Electric Industries, Inc. (NYSE:HE)	NextEra Energy, Inc. (NYSE:NEE)	$4,398.8	1.3x	8.5x

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PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

WIND

EQUITY COMPARABLES (1)

Wind (United States & Canada)

Company	LTM[2] Revenues	LTM[2] EBITDA	Margin	Stock Price 12/31/18	% of 52-Week High	Market Cap	Total Enterprise Value[3]	TEV / LTM Revenues	TEV / LTM EBITDA	Net Debt[4]/ EBITDA
Algonquin Power & Utilities Corp.	$1,647	$655	39.7%	$10.06	93.5%	$4,862	$8,930	5.4x	13.6x	5.2x
Avangrid, Inc.	6,478	1,885	29.1	50.09	91.8	15,478	21,934	3.4x	11.6x	3.4x
Boralex Inc.	351	211	60.1	12.34	67.3	1,100	3,431	9.8x	16.3x	11.4x
Brookfield Renewable Partners L.P.	2,982	1,866	62.6	25.91	80.5	8,085	25,490	8.5x	13.7x	5.6x
Innergex Renewable Energy Inc.	423	280	66.4	9.19	86.3	1,222	4,396	10.4x	15.7x	12.1x
NextEra Energy Partners, LP	771	510	66.1	43.05	85.0	2,411	8,091	10.5x	15.9x	6.6x
Northland Power Inc.	1,140	835	73.2	15.90	85.7	2,866	8,784	7.7x	10.5x	6.7x
Pattern Energy Group Inc.	473	305	64.5	18.62	84.8	1,827	5,140	10.9x	16.9x	7.3x
TerraForm Power, Inc.	689	443	64.3	11.22	92.4	2,347	8,675	12.6x	19.6x	12.6x
TransAlta Renewables Inc.	327	199	61.0	7.60	76.8	1,997	2,756	8.4x	13.8x	3.2x
Median			**63.5%**		**85.3%**			**9.2x**	**14.8x**	**6.7x**
Mean			**58.7%**		**84.4%**			**8.8x**	**14.8x**	**7.4x**

SELECTED TRANSACTIONS

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
10/30/2017	Alterra Power Corp. (TSX:AXY)	Innergex Renewable Energy Inc. (TSX:INE)	$745.0	10.6x	31.0x
7/28/2017	Boralex Inc. (TSX:BLX)	Caisse de dépôt et placement du Québec	$3,437.5	12.5x	20.3x
6/19/2017	Pattern Energy Group Inc. (NasdaqGS:PEGI)	Public Sector Pension Investment Board	$4,313.7	12.2x	18.6x
3/7/2017	TerraForm Global, Inc. (NasdaqGS:GLBL)	Orion US Holdings 1 LP	$1,651.8	6.6x	17.2x
1/20/2016	Capstone Infrastructure Corp.	Irving Infrastructure Corp.	$1,435.1	-	12.7x

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PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

OIL AND GAS FIELD SERVICES

EQUITY COMPARABLES (1)

Oil and Gas Field Services (United States & Canada)

Company	LTM(2) Revenues	LTM(2) EBITDA	LTM(2) Margin	Stock Price 12/31/18	% of 52-Week High	Market Cap	Total Enterprise Value(3)	TEV / LTM Revenues	TEV / LTM EBITDA	Net Debt(4)/ EBITDA
Archrock, Inc.	$904	$339	37.4%	$7.49	54.5%	$969	$2,477	2.7x	7.3x	4.5x
Baker Hughes, a GE company	22,877	2,829	12.4	21.50	56.9	11,038	36,389	1.6x	12.9x	1.2x
Blueknight Energy Partners, L.P.	306	55	18.0	1.15	20.5	46	(61)	(0.2)x	(1.1)x	4.9x
CARBO Ceramics Inc.	211	(29)	(14.0)	3.48	27.4	96	136	0.6x	NM	NM
Cathedral Energy Services Ltd.	118	(1)	(0.8)	0.52	38.6	26	27	0.2x	NM	NM
CES Energy Solutions Corp.	930	107	11.5	2.31	45.9	616	961	1.0x	9.0x	3.4x
Cypress Energy Partners, L.P.	295	20	6.8	5.62	66.1	67	154	0.5x	7.7x	3.2x
Dawson Geophysical Company	154	5	3.2	3.38	40.2	78	44	0.3x	9.0x	(5.4)x
Eco-Stim Energy Solutions, Inc.	71	(24)	(33.9)	0.26	4.5	5	17	0.2x	NM	NM
ENGlobal Corporation	56	(4)	(6.7)	0.57	38.8	16	10	0.2x	NM	NM
Enservco Corporation	49	4	8.8	0.37	24.7	20	45	0.9x	10.5x	5.8x
Ensign Energy Services Inc.	847	186	21.9	3.51	61.2	551	1,087	1.3x	5.9x	6.5x
Enterprise Group, Inc.	28	3	10.1	0.16	35.7	9	14	0.5x	5.0x	1.9x
Essential Energy Services Ltd.	139	16	11.8	0.22	36.6	31	48	0.3x	2.9x	0.9x
High Arctic Energy Services Inc	160	43	26.9	2.32	72.2	119	105	0.7x	2.4x	(0.3)x
Hyduke Energy Services Inc.	24	(7)	(29.6)	0.01	6.0	1	6	0.3x	NM	NM
Innospec Inc.	1,477	195	13.2	61.76	74.2	1,508	1,646	1.1x	8.5x	0.5x
Keane Group, Inc.	2,137	366	17.1	8.18	41.3	856	1,125	0.5x	3.1x	0.7x
Matrix Service Company	1,198	21	1.8	17.94	69.7	486	412	0.3x	19.3x	(3.4)x
McDermott International, Inc.	6,705	309	4.6	6.54	24.0	1,181	4,157	0.6x	13.5x	9.6x
Mullen Group Ltd.	924	139	15.0	8.95	72.1	938	1,296	1.4x	9.4x	2.7x
Newpark Resources, Inc.	947	110	11.6	6.87	59.0	624	760	0.8x	6.9x	1.0x
North American Construction Group Ltd.	301	65	21.5	8.90	70.2	222	329	1.1x	5.1x	4.1x
Parkland Fuel Corporation	10,584	649	6.1	25.90	74.5	3,448	5,019	0.5x	7.7x	2.5x
Pioneer Energy Services Corp.	590	86	14.5	1.23	19.4	96	508	0.9x	5.9x	4.8x
Precision Drilling Corporation	1,129	261	23.1	1.74	44.5	510	1,675	1.5x	6.4x	4.5x
Profire Energy, Inc.	46	9	19.4	1.45	27.4	70	55	1.2x	6.3x	(1.7)x
ProPetro Holding Corp.	1,705	383	22.4	12.32	53.8	1,030	1,040	0.6x	2.7x	(0.2)x
Secure Energy Services Inc.	2,153	127	5.9	5.14	71.4	831	1,120	0.5x	8.8x	2.4x
Select Energy Services, Inc.	1,529	235	15.4	6.32	28.8	510	844	0.6x	3.6x	0.1x
Shawcor Ltd.	1,032	90	8.7	12.15	56.2	852	910	0.9x	10.1x	0.5x
Smart Sand, Inc.	203	50	24.7	2.22	20.1	92	135	0.7x	2.7x	0.9x
STEP Energy Services Ltd.	573	81	14.1	1.42	14.9	95	315	0.5x	3.9x	2.4x
USA Compression Partners, LP	584	315	53.8	12.98	67.3	1,251	3,456	5.9x	11.0x	5.6x
Median			**12.1%**		**42.9%**			**0.6x**	**6.9x**	**2.4x**
Mean			**11.1%**		**44.7%**			**0.9x**	**7.1x**	**2.2x**

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PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

EQUIPMENT AND PHYSICAL TECHNOLOGY

EQUITY COMPARABLES (1)

Equipment and Physical Technology (United States & Canada)

Company	LTM[2] Revenues	LTM[2] EBITDA	LTM[2] Margin	Stock Price 12/31/18	% of 52-Week High	Market Cap	Total Enterprise Value[3]	TEV / LTM Revenues	TEV / LTM EBITDA	Net Debt[4]/ EBITDA
AKITA Drilling Ltd.	$87	$7	7.8%	$2.98	48.6%	$119	$165	1.9x	24.5x	8.9x
Aveda Transportation and Energy Services Inc.	170	13	7.8	0.76	98.1	44	99	0.6x	7.5x	4.4x
CSI Compressco LP	439	91	20.7	2.32	28.8	106	755	1.7x	8.3x	7.1x
Enerflex Ltd.	1,248	151	12.1	11.71	85.4	1,041	1,158	0.9x	7.7x	0.6x
Exterran Corporation	1,361	205	15.1	17.70	53.1	640	1,022	0.8x	5.0x	1.9x
Forum Energy Technologies, Inc.	1,064	44	4.1	4.13	23.0	448	888	0.8x	20.2x	10.7x
Gardner Denver Holdings, Inc.	2,690	625	23.2	20.45	53.8	4,065	5,565	2.1x	8.9x	2.3x
Geospace Technologies Corporation	79	(1)	(1.3)	10.31	64.7	140	103	1.3x	NM	NM
Gulf Island Fabrication, Inc.	221	(16)	(7.1)	7.22	51.8	109	54	0.2x	NM	NM
Halliburton Company	23,995	4,338	18.1	26.58	45.9	23,285	31,706	1.3x	7.3x	1.9x
Hanwei Energy Services Corp.	8	(1)	(11.4)	0.01	36.4	3	7	0.9x	NM	NM
Helix Energy Solutions Group, Inc.	740	154	20.8	5.41	49.7	802	923	1.2x	6.0x	1.0x
ION Geophysical Corporation	180	43	23.8	5.18	16.0	73	165	0.9x	3.8x	2.1x
Key Energy Services, Inc.	522	25	4.8	2.07	11.3	42	243	0.5x	9.7x	8.0x
McCoy Global Inc.	36	1	3.5	0.73	62.5	20	15	0.4x	11.7x	(3.6)x
Mitcham Industries, Inc.	41	(14)	(33.4)	2.56	56.0	31	43	1.1x	NM	NM
Nabors Industries Ltd.	3,058	760	24.9	2.00	22.6	716	4,308	1.4x	5.7x	4.1x
National Oilwell Varco, Inc.	8,453	901	10.7	25.70	52.4	9,853	11,344	1.3x	12.6x	1.4x
Natural Gas Services Group, Inc.	66	22	33.9	16.44	56.0	216	153	2.3x	6.8x	(2.8)x
Parker Drilling Company	468	65	13.9	0.34	1.6	3	501	1.1x	7.7x	7.7x
PHX Energy Services Corp.	232	25	11.0	1.73	71.3	100	103	0.4x	4.1x	0.6x
RigNet, Inc.	235	24	10.0	12.64	52.6	245	296	1.3x	12.5x	2.1x
RPC, Inc.	1,721	370	21.5	9.87	37.0	2,120	1,992	1.2x	5.4x	(0.3)x
Schlumberger Limited	32,815	6,747	20.6	36.08	44.9	49,964	64,899	2.0x	9.6x	2.2x
SEACOR Holdings Inc.	836	141	16.9	37.00	62.7	675	978	1.2x	6.9x	1.3x
Solaris Oilfield Infrastructure, Inc.	197	119	60.6	12.09	50.4	330	467	2.4x	3.9x	(0.1)x
Strad Energy Services Ltd.	88	19	22.0	0.92	72.0	53	59	0.7x	3.0x	0.5x
Superior Drilling Products, Inc.	18	4	22.3	1.17	23.2	29	35	1.9x	8.7x	1.6x
TechnipFMC plc	12,553	(367)	(2.9)	19.58	55.9	8,818	7,360	0.6x	NM	NM
TerraVest Industries Inc.	210	32	15.2	7.45	92.4	131	207	1.0x	6.5x	2.5x
TETRA Technologies, Inc.	999	151	15.1	1.68	32.9	211	1,155	1.2x	7.7x	5.3x
Weatherford International plc	5,744	666	11.6	0.56	12.7	560	8,234	1.4x	12.4x	11.1x
ZCL Composites Inc.	129	16	12.4	4.61	50.9	141	144	1.1x	9.0x	(0.1)x
Median			**13.9%**		**50.9%**			**1.2x**	**7.7x**	**2.0x**
Mean			**13.0%**		**47.8%**			**1.2x**	**8.7x**	**3.0x**

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PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

OIL AND GAS FIELD SERVICES AND EQUIPMENT AND PHYSICAL TECHNOLOGY

SELECTED TRANSACTIONS (1)

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
1/20/2019	ZCL Composites Inc. (TSX:ZCL)	Shawcor Ltd. (TSX:SCL)	$233.7	1.7x	12.5x
10/29/2018	Adler Hot Oil Service, LLC.	Enservco Corporation (AMEX:ENSV)	$12.5	0.7x	4.3x
6/5/2018	Xtreme Drilling Corp.	AKITA Drilling Ltd. (TSX:AKT.A)	$155.0	2.8x	162.4x
5/1/2018	KLX Inc. (NasdaqGS:KLXI)	Aviall Inc.	$4,482.9	-	15.7x
4/16/2018	Aveda Transportation and Energy Services Inc. (TSXV:AVE)	Daseke Companies, Inc.	$2,139.8	0.7x	4.8x
1/16/2018	USA Compression Partners, LP (NYSE:USAC)	Energy Transfer Partners, LP (NYSE:ETP); Energy Transfer Equity, LP (NYSE:ETE)	$2,033.4	7.3x	14.3x
1/2/2018	Archrock Partners, LP	Archrock, Inc. (NYSE:AROC)	$2,405.5	4.3x	10.5x
12/11/2017	Pure Technologies Ltd.	Xylem Inc. (NYSE:XYL)	$395.2	4.0x	26.5x
5/19/2017	Savanna Energy Services Corp.	Total Energy Services Inc. (TSX:TOT)	$458.2	1.8x	16.6x
5/15/2017	Ceiba Energy Services Inc.	Secure Energy Services Inc. (TSX:SES)	$27.2	4.5x	29.2x
4/24/2017	Flowchem Ltd.	KMG Chemicals, Inc. (NYSE:KMG)	$495.0	N/A	11.5x
3/13/2017	Amec Foster Wheeler plc (LSE:AMFW)	John Wood Group PLC (LSE:WG.)	$4,032.4	0.6x	10.6x
12/12/2016	Seventy Seven Energy Inc.	Patterson-UTI Energy, Inc. (NasdaqGS:PTEN)	$1,878.9	3.1x	18.8x
10/13/2016	Critical Flow Solutions Inc.	CIRCOR International, Inc. (NYSE:CIR)	$214.0	1.8x	8.6x

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PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

STORAGE AND TERMINALS

EQUITY COMPARABLES (1)

Storage and Terminals (United States & Canada)

Company	LTM[2] Revenues	LTM[2] EBITDA	LTM[2] Margin	Stock Price 12/31/18	% of 52-Week High	Market Cap	Total Enterprise Value[3]	TEV / LTM Revenues	TEV / LTM EBITDA	Net Debt[4]/ EBITDA
Alliant Energy Corporation	$3,535	$1,195	33.8%	$42.25	90.7%	$9,973	$15,825	4.5x	13.2x	5.0x
AltaGas Ltd.	3,120	687	22.0	10.19	47.4	2,739	11,740	3.8x	17.1x	10.7x
Blueknight Energy Partners, L.P.	306	55	18.0	1.15	20.5	46	(61)	(0.2)x	(1.1)x	4.9x
Buckeye Partners, L.P.	4,108	879	21.4	28.99	50.7	4,455	9,569	2.3x	10.9x	5.4x
Chart Industries, Inc.	1,084	152	14.0	65.03	81.0	2,029	2,386	2.2x	15.7x	2.8x
EnLink Midstream, LLC	7,694	1,100	14.3	9.49	47.5	1,721	9,538	1.2x	8.7x	3.9x
EQM Midstream Partners, LP	1,495	1,228	82.1	43.25	55.5	5,210	8,714	5.8x	7.1x	3.3x
Gibson Energy Inc.	5,018	291	5.8	13.69	80.1	1,978	2,924	0.6x	10.1x	2.9x
Green Plains Partners LP	101	67	66.9	13.57	71.4	314	449	4.5x	6.7x	2.1x
Magellan Midstream Partners, L.P.	2,827	1,263	44.7	57.06	75.3	13,021	17,070	6.0x	13.5x	3.2x
MPLX LP	6,185	3,029	49.0	30.30	76.9	24,061	38,071	6.2x	12.6x	4.4x
NuStar Energy L.P.	1,962	655	33.4	20.93	58.3	2,240	6,919	3.5x	10.6x	4.8x
Median			**27.7%**		**64.9%**			**3.6x**	**10.7x**	**4.2x**
Mean			**33.8%**		**62.9%**			**3.4x**	**10.4x**	**4.4x**

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PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

STORAGE AND TERMINALS

SELECTED TRANSACTIONS (1)

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
11/8/2018	Western Gas Partners, LP (NYSE:WES)	Western Gas Equity Partners, LP (NYSE:WGP)	$13,427.9	6.5x	12.0x
10/22/2018	EnLink Midstream Partners, LP (NYSE:ENLK)	EnLink Midstream, LLC (NYSE:ENLC)	$12,923.5	1.7x	12.2x
10/18/2018	Valero Energy Partners LP	Valero Energy Corporation (NYSE:VLO)	$4,069.8	7.6x	10.5x
9/19/2018	Dominion Energy Midstream Partners, LP (NYSE:DM)	Dominion Energy, Inc. (NYSE:D)	$10,405.4	13.6x	19.7x
8/1/2018	Energy Transfer Partners, LP (NYSE:ETP)	Energy Transfer Equity, LP (NYSE:ETE)	$69,412.3	2.1x	10.8x
7/30/2018	Four Corners Area Assets	Harvest Midstream Company	$1,125.0	-	13.2x
7/10/2018	Transmontaigne Partners LP (NYSE:TLP)	TLP Acquisition Holdings LLC	$1,254.3	6.1x	11.5x
6/29/2018	Boardwalk Pipeline Partners, LP	Boardwalk GP LP	$6,792.1	5.3x	8.3x
5/17/2018	Enbridge Energy Partners, LP (NYSE:EEP)	Enbridge Inc. (TSX:ENB)	$15,925.8	6.6x	10.1x
4/30/2018	Andeavor (NYSE:ANDV)	Marathon Petroleum Corporation (NYSE:MPC)	$35,101.9	0.9x	12.7x
4/26/2018	Rice Midstream Partners LP (NYSE:RMP)	EQM Midstream Partners, LP (NYSE:EQM)	$2,443.1	7.7x	9.9x
3/26/2018	Tallgrass Energy Partners, LP (NYSE:TEP)	Tallgrass Equity, LLC	$4,176.5	6.4x	6.9x
8/29/2017	Arc Logistics Partners LP (NYSE:ARCX)	Zenith Energy U.S. Logistics Holdings, LLC	$658.0	6.2x	10.4x
8/14/2017	Western Refining Logistics, LP (NYSE:WNRL)	Andeavor Logistics LP (NYSE:ANDX)	$1,842.8	0.8x	14.4x
6/19/2017	Rice Energy Inc. (NYSE:RICE)	EQT Corporation (NYSE:EQT)	$10,239.2	9.9x	34.1x
6/2/2017	AMTROL Inc.	Worthington Steel of Michigan, Inc.	$283.0	1.1x	7.4x
5/18/2017	PennTex Midstream Partners, LP	Energy Transfer Partners, LP (NYSE:ETP)	$562.6	7.3x	18.9x
5/15/2017	Ceiba Energy Services Inc. (TSXV:CEB)	Secure Energy Services Inc. (TSX:SES)	$28.2	4.3x	30.3x
4/4/2017	World Point Terminals, LP (NYSE:WPT)	World Point Terminals Inc.	$611.3	5.9x	10.0x
2/1/2017	ONEOK Partners, LP	ONEOK, Inc. (NYSE:OKE)	$23,721.4	2.7x	12.9x

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PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

PIPELINES

EQUITY COMPARABLES (1)

Oil and Gas Pipelines (United States & Canada)

Company	LTM[2] Revenues	LTM[2] EBITDA	LTM[2] Margin	Stock Price 12/31/18	% of 52-Week High	Market Cap	Total Enterprise Value[3]	TEV / LTM Revenues	TEV / LTM EBITDA	Net Debt[4]/ EBITDA
Antero Midstream Partners LP	$1,028	$650	63.2%	$21.39	61.9%	$4,007	$5,561	5.4x	8.6x	2.5x
ATCO Ltd.	3,582	1,318	36.8	28.30	85.7	3,238	13,504	3.8x	10.2x	5.7x
Blueknight Energy Partners, L.P.	306	55	18.0	1.15	20.5	46	(61)	(0.2)x	(1.1)x	4.9x
Buckeye Partners, L.P.	4,108	879	21.4	28.99	50.7	4,455	9,569	2.3x	10.9x	5.4x
Crestwood Equity Partners LP	3,654	311	8.5	27.91	68.8	1,988	4,456	1.2x	14.3x	5.6x
Enable Midstream Partners, LP	3,431	1,052	30.7	13.53	70.2	5,861	10,019	2.9x	9.5x	4.1x
Enbridge Inc.	33,988	7,464	22.0	31.08	83.1	62,837	123,083	3.6x	16.5x	6.3x
Energy Transfer LP	54,087	8,638	16.0	13.21	68.3	34,572	111,577	2.1x	12.9x	5.3x
Enterprise Products Partners L.P.	36,534	6,767	18.5	24.59	81.8	53,641	79,939	2.2x	11.8x	3.8x
Equitrans Midstream Corporation	1,495	1,216	81.3	20.02	85.3	5,090	13,601	9.1x	11.2x	3.6x
EQM Midstream Partners, LP	1,495	1,228	82.1	43.25	55.5	5,210	8,714	5.8x	7.1x	3.3x
Genesis Energy, L.P.	2,913	568	19.5	18.47	71.4	2,264	6,719	2.3x	11.8x	6.0x
Gibson Energy Inc.	5,018	291	5.8	13.69	80.1	1,978	2,924	0.6x	10.1x	2.9x
Inter Pipeline Ltd.	1,900	916	48.2	14.17	73.3	5,703	9,585	5.0x	10.5x	4.5x
Kinder Morgan Canada Limited	281	142	50.4	35.02	79.7	1,221	671	2.4x	4.7x	(22.4)x
Kinder Morgan, Inc.	14,144	6,277	44.4	15.38	77.6	33,944	70,759	5.0x	11.3x	5.4x
ONEOK, Inc.	12,593	2,254	17.9	53.95	74.9	22,193	31,062	2.5x	13.8x	4.2x
Plains All American Pipeline, L.P.	34,055	2,691	7.9	20.04	72.3	14,554	26,405	0.8x	9.8x	3.4x
Sanchez Midstream Partners LP	84	37	44.2	1.72	13.0	27	556	6.6x	15.0x	4.8x
SemGroup Corporation	2,503	304	12.1	13.78	44.5	1,090	3,998	1.6x	13.2x	7.2x
Southcross Energy Partners, L.P.	621	60	9.7	0.22	10.0	18	548	0.9x	9.1x	8.6x
Summit Midstream Partners, LP	506	249	49.2	10.05	43.8	737	2,249	4.4x	9.0x	5.0x
Targa Resources Corp.	10,484	1,267	12.1	36.02	60.8	8,259	15,462	1.5x	12.2x	5.1x
TC PipeLines, LP	722	621	86.0	32.12	56.3	2,290	4,617	6.4x	7.4x	3.3x
The Williams Companies, Inc.	8,686	3,657	42.1	22.05	65.5	26,692	50,299	5.8x	13.8x	6.1x
TransCanada Corporation	10,025	5,901	58.9	35.73	78.3	32,799	71,039	7.1x	12.0x	6.1x
Western Midstream Partners, LP	1,990	1,045	52.5	27.73	64.6	6,071	13,168	6.6x	12.6x	4.5x
Median			**30.7%**		**68.8%**			**2.9x**	**11.2x**	**4.9x**
Mean			**35.5%**		**62.9%**			**3.6x**	**10.7x**	**3.9x**

(1) Matching public companies to middle-market companies is an imperfect comparable analysis due to the variables of size, equipment, markets, etc. Nonetheless JKC's research has yielded this list as the closest available.
(2) LTM is defined as last twelve months.
(3) Total Enterprise Value is defined as market capitalization plus total debt less cash and cash equivalents.
(4) Net Debt is defined as total debt less cash and cash equivalents.

PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

PIPELINES

SELECTED TRANSACTIONS (1)

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
11/8/2018	Western Gas Partners, LP (NYSE:WES)	Western Gas Equity Partners, LP (NYSE:WGP)	$13,427.9	6.5x	12.0x
10/18/2018	Valero Energy Partners LP	Valero Energy Corporation (NYSE:VLO)	$4,069.8	7.6x	10.5x
10/9/2018	Antero Midstream Partners LP (NYSE:AM)	Antero Midstream GP LP (NYSE:AMGP)	$7,359.7	7.7x	11.5x
9/28/2018	American Midstream Partners, LP (NYSE:AMID)	ArcLight Capital Partners, LLC	$1,595.1	2.0x	14.2x
7/10/2018	Transmontaigne Partners LP (NYSE:TLP)	TLP Acquisition Holdings LLC	$1,254.3	6.1x	11.5x
5/17/2018	Williams Partners LP	The Williams Companies, Inc. (NYSE:WMB)	$57,090.5	7.0x	14.1x
5/17/2018	Enbridge Energy Partners, LP (NYSE:EEP)	Enbridge Inc. (TSX:ENB)	$15,925.8	6.6x	10.1x
5/10/2018	Amberjack Pipeline Company LLC	Shell Midstream Partners, LP (NYSE:SHLX)	$1,928.7	8.2x	9.4x
3/26/2018	Tallgrass Energy Partners, LP (NYSE:TEP)	Tallgrass Equity, LLC	$4,176.5	6.4x	6.9x
8/15/2017	Western Refining Logistics, LP (NYSE:WNRL)	Andeavor Logistics LP (NYSE:ANDX)	$1,843.8	0.8x	14.4x
12/20/2016	Howard Midstream Partners, LP	Alberta Investment Management Corporation	$1,394.7	4.3x	14.4x
11/21/2016	Sunoco Logistics Partners LP	Energy Transfer Partners, LP (NYSE:ETP)	$15,527.3	1.5x	13.7x
10/24/2016	JP Energy Partners LP	American Midstream Partners, LP (NYSE:AMID)	$465.0	-	11.3x
5/31/2016	Rose Rock Midstream, LP	SemGroup Corporation (NYSE:SEMG)	$1,649.9	-	10.4x
2/1/2016	Dominion Energy Questar Corporation	Dominion Energy, Inc. (NYSE:D)	$6,092.9	-	9.7x
10/12/2015	Casper Crude to Rail, LLC	USD Partners LP (NYSE:USDP)	$215.2	-	8.1x
5/13/2015	Williams Partners LP (NYSE:WPZ)	The Williams Companies, Inc. (NYSE:WMB)	$52,065.9	7.2x	17.8x
4/6/2015	QEP Midstream Partners, LP	Tesoro Logistics LP (NYSE:TLLP)	$1,133.6	-	11.1x

(1) Total Enterprise Value is defined as market capitalization plus total debt less cash and cash equivalents.

PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

TRUCKERS

EQUITY COMPARABLES (1)

Truckers (United States & Canada)

Company	LTM[2] Revenues	LTM[2] EBITDA	LTM[2] Margin	Stock Price 12/31/18	% of 52-Week High	Market Cap	Total Enterprise Value[3]	TEV / LTM Revenues	TEV / LTM EBITDA	Net Debt[4]/ EBITDA
Adams Resources & Energy, Inc.	$1,750	$12	0.7%	$38.71	76.9%	$163	$35	0.0x	2.9x	(9.4)x
ArcBest Corporation	3,094	232	7.5	34.26	66.6	880	917	0.3x	3.9x	(0.0)x
Covenant Transportation Group, Inc.	885	134	15.1	19.20	54.6	352	568	0.6x	4.2x	1.6x
Daseke, Inc.	1,613	166	10.3	3.68	25.4	237	953	0.6x	5.7x	3.8x
Heartland Express, Inc.	611	166	27.2	18.30	76.6	1,499	1,379	2.3x	8.3x	(1.0)x
Hess Corporation	6,152	2,579	41.9	40.50	54.1	11,998	17,090	2.8x	6.6x	1.5x
J.B. Hunt Transport Services, Inc.	8,615	1,117	13.0	93.04	70.6	10,158	11,220	1.3x	10.0x	1.0x
Knight-Swift Transportation Holdings Inc.	5,344	966	18.1	25.07	48.3	4,346	5,229	1.0x	5.4x	0.9x
Landstar System, Inc.	4,619	374	8.1	95.67	74.3	3,933	3,835	0.8x	10.2x	(0.1)x
Marten Transport, Ltd.	788	152	19.3	16.19	54.7	882	846	1.1x	5.6x	(0.4)x
Old Dominion Freight Line, Inc.	4,044	1,047	25.9	123.49	72.5	10,095	9,963	2.5x	9.5x	(0.1)x
P.A.M. Transportation Services, Inc.	533	89	16.7	39.41	56.3	235	419	0.8x	4.7x	2.1x
Patriot Transportation Holding, Inc.	114	10	8.5	19.71	82.8	66	49	0.4x	5.0x	(2.1)x
Parkland Fuel Corporation	10,584	649	6.1	25.90	74.5	3,448	5,019	0.5x	7.7x	2.5x
Roadrunner Transportation Systems, Inc.	2,225	(23)	(1.0)	0.50	6.0	19	537	0.2x	NM	NM
Ryder System, Inc.	8,409	2,029	24.1	48.15	53.3	2,556	8,779	1.0x	4.3x	3.2x
Saia, Inc.	1,654	243	14.7	55.82	64.1	1,422	1,543	0.9x	6.3x	0.5x
Schneider National, Inc.	4,977	675	13.6	18.67	61.2	3,305	3,322	0.7x	4.9x	(0.0)x
TFI International Inc.	3,789	491	12.9	25.87	72.0	2,261	3,344	0.9x	6.8x	2.3x
Titanium Transportation Group Inc.	135	16	12.1	0.94	53.3	34	74	0.5x	4.5x	2.4x
Universal Logistics Holdings, Inc.	1,462	136	9.3	18.09	48.0	513	830	0.6x	6.1x	2.8x
USA Truck, Inc.	534	47	8.8	14.97	51.4	122	218	0.4x	4.6x	3.4x
Werner Enterprises, Inc.	2,458	445	18.1	29.54	67.2	2,103	2,218	0.9x	5.0x	0.2x
YRC Worldwide Inc.	5,092	268	5.3	3.15	17.9	107	802	0.2x	3.0x	2.4x
Median			**13.0%**		**58.7%**			**0.7x**	**5.4x**	**1.0x**
Mean			**14.0%**		**57.6%**			**0.9x**	**5.9x**	**0.8x**

(1) Matching public companies to middle-market companies is an imperfect comparable analysis due to the variables of size, equipment, markets, etc. Nonetheless JKC's research has yielded this list as the closest available.
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PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

TRUCKERS

SELECTED TRANSACTIONS (1)

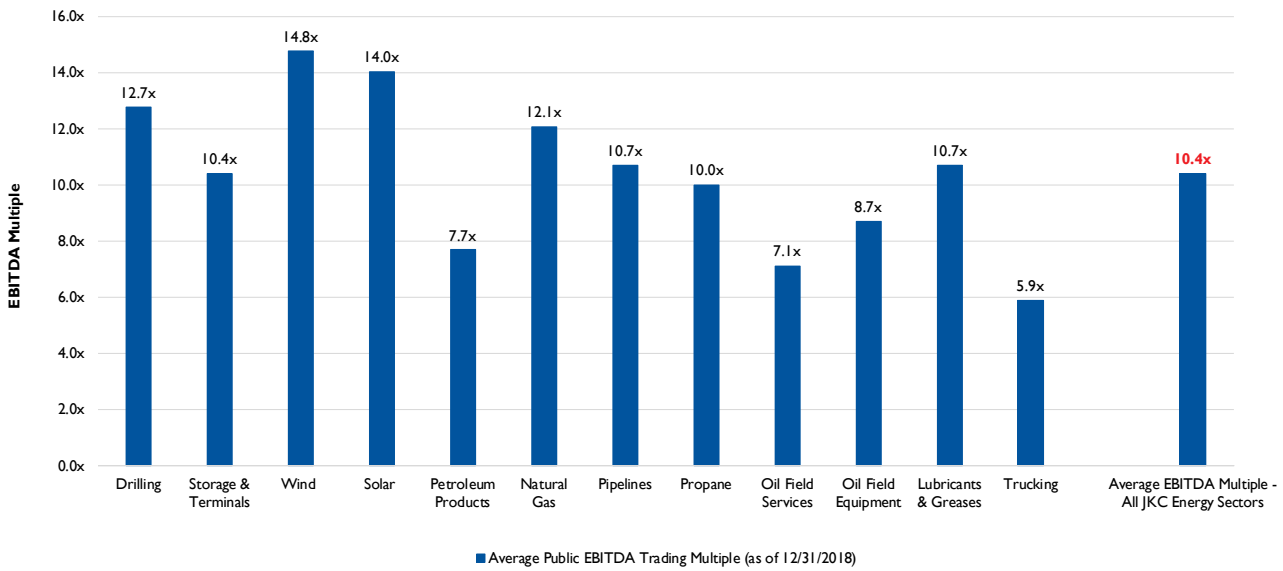
Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
11/5/2018	CaseStack, Inc.	Hub Group, Inc. (NasdaqGS:HUBG)	$255.0	1.1x	11.6x
8/31/2018	Mode Transportation, LLC	York Capital Management	$238.5	-	10.0x
12/7/2017	Keen Transport, Inc.	Wallenius Wilhelmsen ASA (OB:WALWIL)	$64.0	0.8x	6.4x
7/19/2016	Span-Alaska Transportation, Inc.	Matson Logistics, Inc.	$197.6	-	9.4x
5/2/2016	Trimac Transportation Ltd.	Trimac Corporation	$215.9	-	5.9x
9/9/2015	Con-way Inc.	XPO Logistics, Inc. (NYSE:XPO)	$3,057.0	-	6.2x
8/17/2015	Liberty International Inc.	Janel Corporation (OTCPK:JANL)	$2.3	-	26.6x
7/28/2015	Stagecoach Cartage and Distribution, LLC	Roadrunner Transportation Systems, Inc. (NYSE:RRTS)	$40.0	-	5.7x
5/25/2015	Hodges Trucking Company, LLC	Rodan Transport (U.S.A.) Ltd.	$42.0	-	3.0x
5/6/2015	Quality Distribution Inc.	Apax Partners LLP	$823.3	-	12.0x
5/4/2015	Bridge Terminal Transport Inc.	XPO Logistics, Inc. (NYSE:XPO)	$100.0	-	8.1x
4/21/2015	Command Transportation, LLC	Echo Global Logistics, Inc. (NasdaqGS:ECHO)	$391.0	-	10.6x
1/20/2015	Wheels Group Inc.	Radiant Global Logistics Ltd.	$80.1	-	13.5x

(1) Total Enterprise Value is defined as market capitalization plus total debt less cash and cash equivalents.

PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

AVERAGE PUBLIC EBITDA TRADING MULTIPLES

ALL JKC ENERGY SECTORS (AS OF 12/31/2018)



FACTOIDS: LITTLE-KNOWN FACTS AND STATS

Petroleum Products (1)

- The search for oil and gas begins with aerial surveys and surface observation by geologists to see if an area has the kind of the rock formations that might contain petroleum. Companies then conduct seismic surveys to get a better picture of the underground rock formations. The only way to determine whether a rock formation actually contains oil or gas is to drill a well.
- There are many different types of drilling rigs. The smallest are mounted on trucks, while the largest are installed on ships or offshore platforms. Some are specially equipped for sour gas exploration, Arctic operations, slanted holes or horizontal drilling.

Natural Gas (2)

- The first natural gas well was dug in 1821 by William Hart in New York. Hart's well was only 27 feet deep. Today's wells can be 30,000 feet deep.
- Unlike conventional gas, which is found in underground reservoirs composed of sandstone, unconventional gas is found in different types of formations, including coal beds, shale and oil sands. ICF International forecasts that production of unconventional gas, including coalbed methane, tight gas and shale gas, will grow from 42% of total U.S. natural production in 2007 to 64% in 2020.

Propane and Heating/Fuel Oil

- Propane is not toxic and does not spill, pool, or leave a residue, which makes it harmless to soil or water in the event of a tank leak.(3)
- Home heating oil contains 35% more BTUs per gallon than natural gas.(4)

(1) Petroleum Services Association of Canada.
(2) Interstate Natural Gas Association of America.
(3) Poore's Propane.
(4) Santa Energy.

FACTOIDS: LITTLE-KNOWN FACTS AND STATS

Lubricants and Greases (1)

- Over the past five years, the lubricants industry has shifted toward a more sustainable ecosystem, where companies are actively developing bio-based feedstock routes, complying with ecolabel norms, and improving overall production process to reduce byproducts and waste.
- At the Institute of Science & Technology for Advanced Studies & Research (ISTAR), researchers have successfully modified karanja oil (a non-traditional vegetable oil) into biolubricants.

Solar

- When a solar power plant is built, it's usually backed by a power purchase agreement with a customer (utility, business, or homeowner) that lasts 20 to 25 years. However, since solar panels last 40 or 50 years, once a site is established and the infrastructure is built, a solar power plant has a very long effective lifespan.(2)
- In 1878, the first solar power generator was displayed at the Universal Exhibition in Paris. The inventor, Augustin Mouchot, dazzled the crowds with his solar-powered ice maker.(3)

Wind

- Most of the components of wind turbines installed in the United States are manufactured here. There are 500 wind-related manufacturing facilities located across 41 states, and the U.S. wind industry currently employs more than 105,000 people.(4)
- Wind now supplies 6.3% of the country's electricity and is on pace to provide 10% of U.S. electricity by 2020.(5)

(1) Grand View Research.
(2) The Motley Fool.
(3) Solar-estimate.org.
(4) U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy.
(5) Wind Solar Alliance.

FACTOIDS: LITTLE-KNOWN FACTS AND STATS

Oil and Gas Field Services

- Over the past five years, the oil and gas field services industry in the U.S. has declined by 10.1% and is expected to reach $75 billion in revenue in 2019. In the same timeframe, the number of businesses has declined by 2.1% and the number of employees has declined by 3.0%.(1)
- The field operation segment was the largest segment in the oil and gas field services industry in 2016, followed by equipment rental and then analytical and consulting services.(2)

Equipment and Physical Technology

- Corporate investments in new energy technology companies are growing strongly, reaching their highest ever level of just over $6 billion in 2017. While there is some increase in investments by utilities, the vast majority of the growth is coming from information and communications technology (ICT) companies, mostly investing in electric vehicle start-ups and digital solutions for smart grids and efficiency.(3)
- Oxford PV, a startup working in tandem with Oxford University, is developing new technology which uses a new kind of material to make solar cells. The perovskite cell is the first new technology in years to offer better efficiency in the conversion of light to electric power at a lower cost than existing technologies. In the U.S., a company called Swift Solar raised $7 million to bring the same technology to market.(4)

Storage and Terminals (5)

- Storage is essential as a buffer point in the fuel supply chain. Receipt and delivery of liquid products in larger volumes takes place by means of sea transport, inland barge, road, rail and cross country pipeline. Tank storage thus provides an essential interface between these various modes of transport and is at the same time a crucial partner in the irregular flows of supply and demand.
- Products typically stored by third party bulk liquid storage providers include crude oil, petroleum and chemicals as well as potable liquids, edible oils and fats. The industry also provides additional services, such as heating, blending and transformation of these products.

(1) IBIS World.
(2) Grand View Research.
(3) International Energy Agency.
(4) TechCrunch.
(5) The Tank Storage Association.

FACTOIDS: LITTLE-KNOWN FACTS AND STATS

PIPELINES (1)

- Over the past five years, oil and gas pipeline construction in the U.S. has grown by 4.4% to reach revenue of $62 billion in 2018. Construction consists of pipeline additions and alterations, new pipelines and pipeline maintenance.
- In the same timeframe, the number of businesses in the pipeline construction industry has grown by 1.2% and the number of employees has grown by 2.3%.

TRUCKERS (2)

- Not all truck loads are created equal: a van shipment will pay drivers less than a flatbed, and a flatbed will pay less than a reefer (refrigerated) shipment. The prices paid to drivers also vary dramatically by state. The top five states for outbound flatbed prices paid are Texas, Alabama, Arkansas, Illinois and Georgia.
- The top five markets in 2018 for outbound flatbed freight volumes were Houston, TX; Atlanta, GA; Cleveland, OH; Fort Worth, TX; and Dallas, TX.

(1) IBIS World.
(2) DAT Solutions, LLC.

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ABOUT JORDAN KNAUFF & COMPANY

Jordan Knauff & Company was founded in 2001 to undertake a distinct mission: to assemble and maintain a staff of top-notch investment banking personnel and offer their knowledge and experience to provide the best available investment banking services to middle-market companies, the entrepreneurs who lead them and the financial entities that transact with them. On a combined basis, over the course of their careers our employees have completed over 200 transactions as investors, owners, operators, buyers, sellers and investment bankers of middle-market businesses across a variety of industries. The majority of our firm's broad transaction experience has been with private companies owned by one shareholder, a partnership, a family or private equity investors.

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ABOUT THE ENERGY EQUIPMENT & INFRASTRUCTURE ALLIANCE

EEIA is a Washington, D.C.-based trade association representing the North American natural gas and petroleum production, transportation and processing infrastructure supply chain. That supply chain is comprised of 60 industries that provide construction, equipment, materials, services and supplies to energy infrastructure and operations. EEIA advocates for sound legislative and regulatory policies at the federal and state levels. Our members include companies, trade associations and labor organizations operating in the energy sector. We advocate for our industries both directly with policymakers, and through mobilization of business leaders and workers to act and speak for the value and benefits of full and responsible development of our energy resources in their communities and with their political leaders.

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