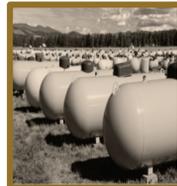
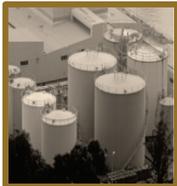


ENERGY LOGISTICS & DISTRIBUTION

Industry In-Sight™

SPRING / SUMMER 2018



The Voice of the Energy Supply Chain



IN THIS REPORT

Introduction	5
Data Center	8
Data Center: Abbreviations & Acronyms, Definitions, Descriptions and Chart Notes	47
Hot Topics	62
Public and Transaction Comparables by Segment	64
Factoids: Little-known Facts and Stats	82

TABLE OF CONTENTS

INTRODUCTION	5
DATA CENTER	8
▪ OIL	
• Crude Oil and Gasoline Prices	8
• Diesel and Jet Fuel Prices	9
• U.S. Crude Oil and Petroleum Products Supply, Inventory and Consumption	10
• U.S. Refinery Volumes and Wholesale Prices of Petroleum Products	10
• U.S. Crude Oil Refinery Input, Distillation Capacity and Refinery Utilization	11
• U.S. Crude Oil and Petroleum Products Imports and Exports	11
▪ NATURAL GAS	
• Domestic and International Natural Gas Prices	12
• Americas and Western Europe Liquefied Natural Gas Prices	13
• Asia Liquefied Natural Gas Prices and World Liquefied Natural Gas Prices Map	14
• U.S. Import/Export Liquefied Natural Gas Prices and Natural Gas Plant Liquids Prices	15
• U.S. Natural Gas Production and Consumption and U.S. Natural Gas Supply and Inventory	16
• U.S. Natural Gas Consumption by End Use and U.S. Natural Gas Plant Liquids Production	17
• U.S. Liquefied Natural Gas Import and Export Volumes	18
• North America Liquefied Natural Gas Export Terminals – Proposed	18
• North America Liquefied Natural Gas Import/Export Terminals – Approved and Existing	19
▪ PROPANE AND HEATING/FUEL OIL	
• Heating Oil and Intermediate Fuel Oil aka “Bunker Fuel” Prices	20
• Propane Prices	21
• No. 1 Distillate Fuel Oil, Residual Fuel Oil Wholesale, Retail Sales Volume	21
• No. 2 Distillate Fuel Oil Wholesale, Retail Sales Volume	22
• Propane & Propylene and Distillate Fuel Oil Production and Consumption	22
• U.S. Ending Stocks of Propane & Propylene and Distillate Fuel Oil	23
▪ DRILLING ACTIVITY	
• U.S. Land Well Count, Rig Count and Wells per Rig	23
• U.S. Drilling Permits and U.S. Drilling Permits, Top 5 States	24
• Drilled but Uncompleted (DUC) Wells vs. Crude Oil Price	25
• Hydraulic Fracturing Sand Consumption and Producer Price Index	25
• Crude Oil Production, Rig Count and Production per Rig	26
• Natural Gas Production, Rig Count and Production per Rig	26
• U.S. Drilling Rigs by Type	27
▪ RENEWABLES	
• Wind and Solar Prices	27
• U.S. Total Renewable Energy Consumption	28



TABLE OF CONTENTS

▪ RENEWABLES (Continued)	
• U.S. Solar, Wind and Hydroelectric Energy Consumption	28
• U.S. Wood, Waste, Biofuels and Geothermal Energy Consumption	29
• Corn and Ethanol Prices and Corn Cost per Gallon of Ethanol	29
• U.S. Solar	
– Energy Consumption and Net Generation	30
– Distributed Photovoltaic and Utility-Scale Electricity Generation by Sector	31
– Capacity Installations	32
• U.S. Wind Power	
– Capacity Installations	32
– Utility-Scale Capacity Installations	33
– Under Construction or in Advanced Development	33
▪ U.S. AGGREGATED ENERGY CONSUMPTION	
• Energy Consumption by Sector and by Source	34
• Electricity Prices by Sector	35
▪ LOGISTICS	
• Storage and Terminals	
– Commercial Crude Oil, Petroleum and Other Liquids Commercial Inventory	36
– Natural Gas Underground Storage Capacity	37
– Crude Oil Refinery, Tank and Underground Storage Capacity and Utilization	37
• Pipelines	
– Crude Oil and Natural Gas Pipeline Mileage	38
– Crude Oil and Petroleum Products Pipeline Movements Between PADDs	38
– Natural Gas Cumulative Interstate Pipeline Systems Capacity	39
– Crude Oil and Petroleum Products Exports to Mexico	39
• Truckers	
– Truck Tonnage Index and Heavy Truck Sales	40
– Trucking Conditions Index and Freight Transportation Services Index	40
• Shipping	
– Crude Oil Refinery Receipts by Transportation Method	41
– Crude Oil Movements by Tanker and Barge Between PADDs	41
• Rail	
– Movements of Crude Oil by Rail	42
– Rail Carloads of Petroleum and Petroleum Products	42
▪ ECONOMIC / FINANCIAL	
• Manufacturers’ Monthly Shipments and Purchasing Managers’ Index	43
• U.S. New Housing Starts and Total U.S. Construction Spending	43
• London Interbank Offered Rate (LIBOR) and Bank Prime Loan Interest Rates	44

TABLE OF CONTENTS

- **ECONOMIC / FINANCIAL (Continued)**
 - Commercial and Industrial Loans vs. Banking Standards and U.S. Treasury Yield Curve 45
 - Corporate Spreads to Treasuries by Quality 46

- DATA CENTER: ABBREVIATIONS & ACRONYMS, DEFINITIONS, DESCRIPTIONS AND CHART NOTES**
 - Abbreviations & Acroynms 47
 - Definitions 48
 - Descriptions 50
 - Chart Notes 51

- HOT TOPICS** 62

- PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT**
 - Petroleum Products Equity Comparables and Selected Transactions 64
 - Natural Gas Equity Comparables 65
 - Natural Gas Selected Transactions 66
 - Propane and Heating/Fuel Oil Equity Comparables and Selected Transactions 67
 - Drilling Equity Comparables and Selected Transactions 68
 - Lubricants and Greases Equity Comparables and Selected Transactions 69
 - Solar Equity Comparables and Selected Transactions 70
 - Wind Equity Comparables and Selected Transactions 71
 - Oil and Gas Field Services Equity Comparables 72
 - Equipment and Physical Technology Equity Comparables 73
 - Oil and Gas Field Services, Equipment and Physical Technology Selected Transactions 74
 - Storage and Terminals Equity Comparables 75
 - Storage and Terminals Selected Transactions 76
 - Pipelines Equity Comparables 77
 - Pipeline Selected Transactions 78
 - Truckers Equity Comparables 79
 - Truckers Selected Transactions 80
 - Average Public EBITDA Trading Multiples – All JKC Energy Sectors 81

- FACTOIDS: LITTLE-KNOWN FACTS AND STATS** 82

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.

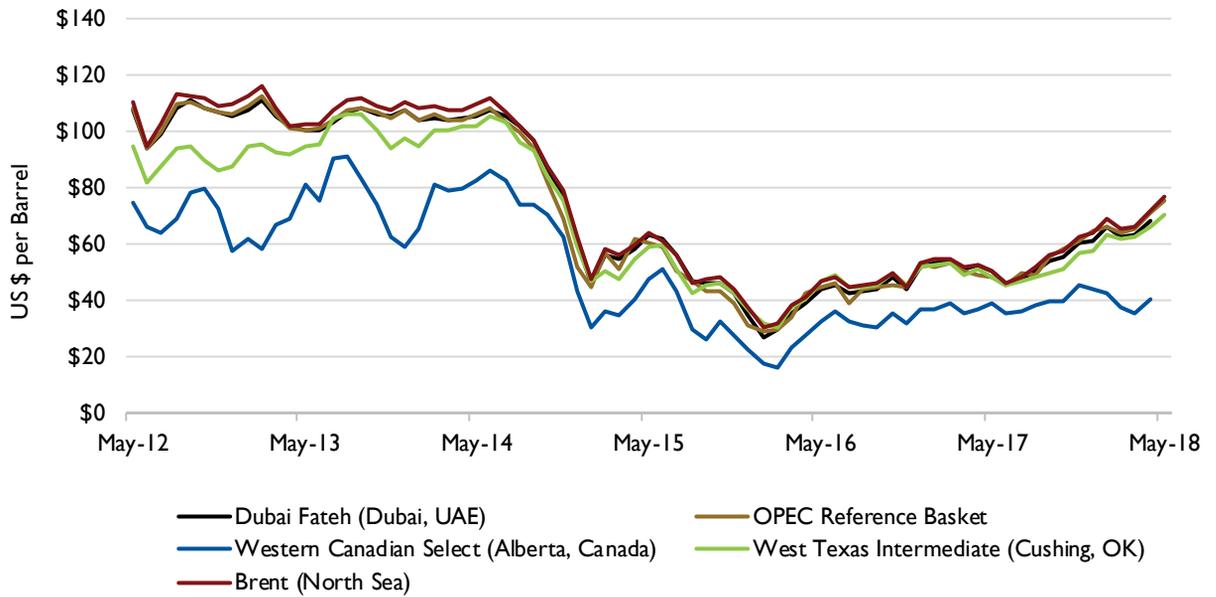
The Services We Provide

- **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.

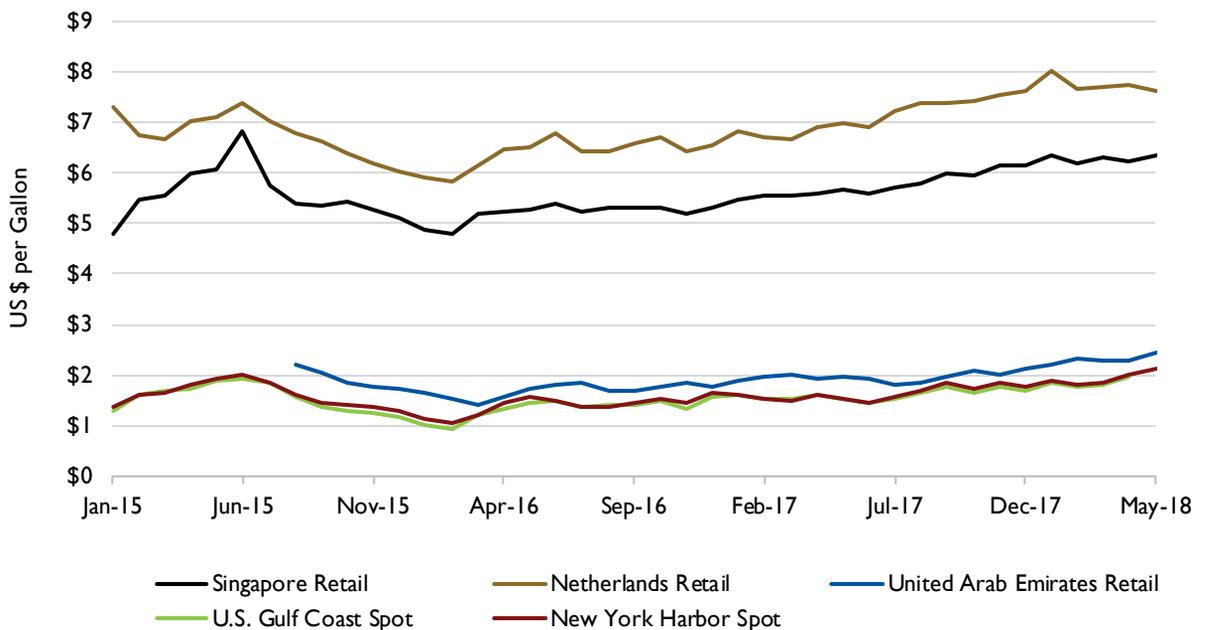
DATA CENTER

OIL

CRUDE OIL PRICES (MONTHLY AVERAGE) (1)



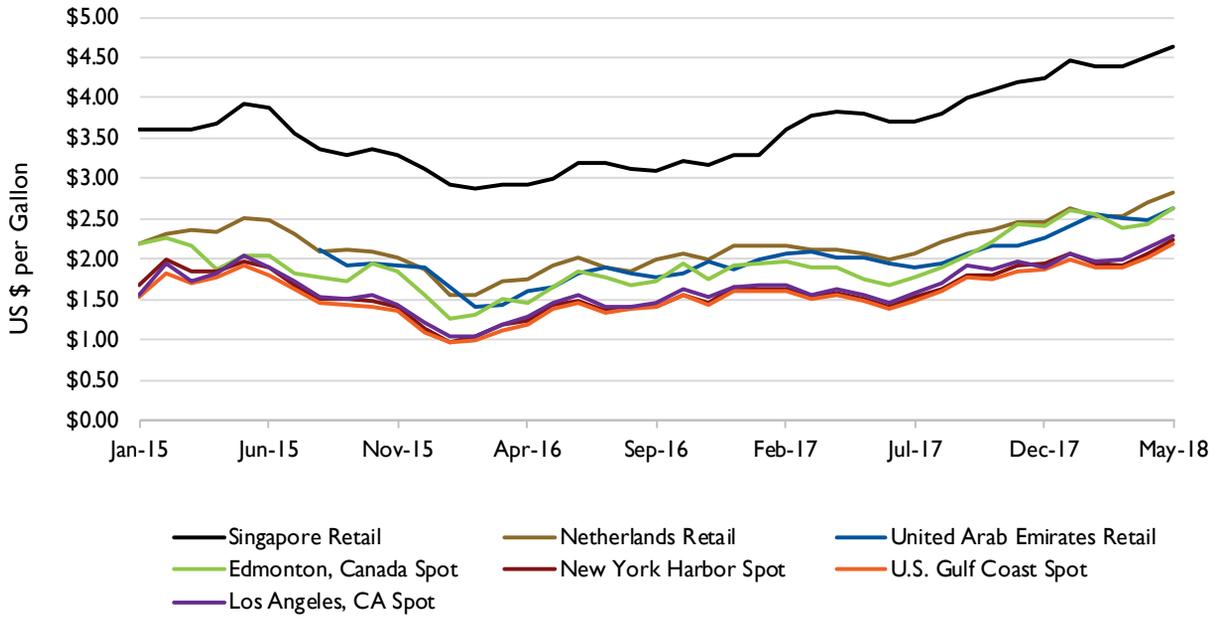
GASOLINE PRICES (MONTHLY AVERAGE) (2)



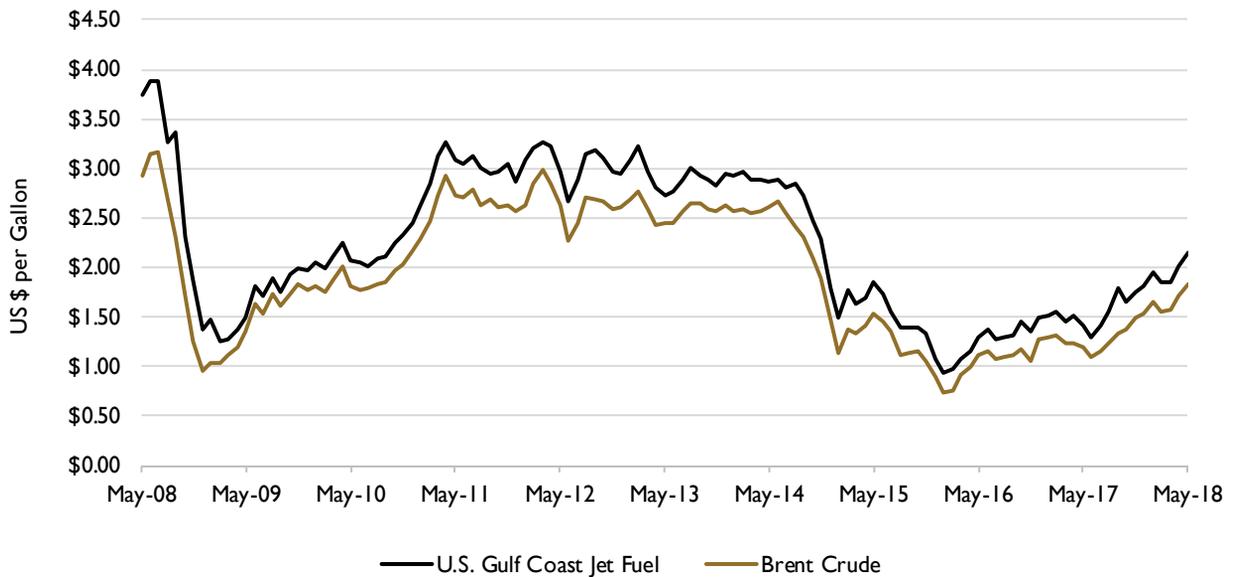
DATA CENTER

OIL

DIESEL PRICES (MONTHLY AVERAGE) (3)



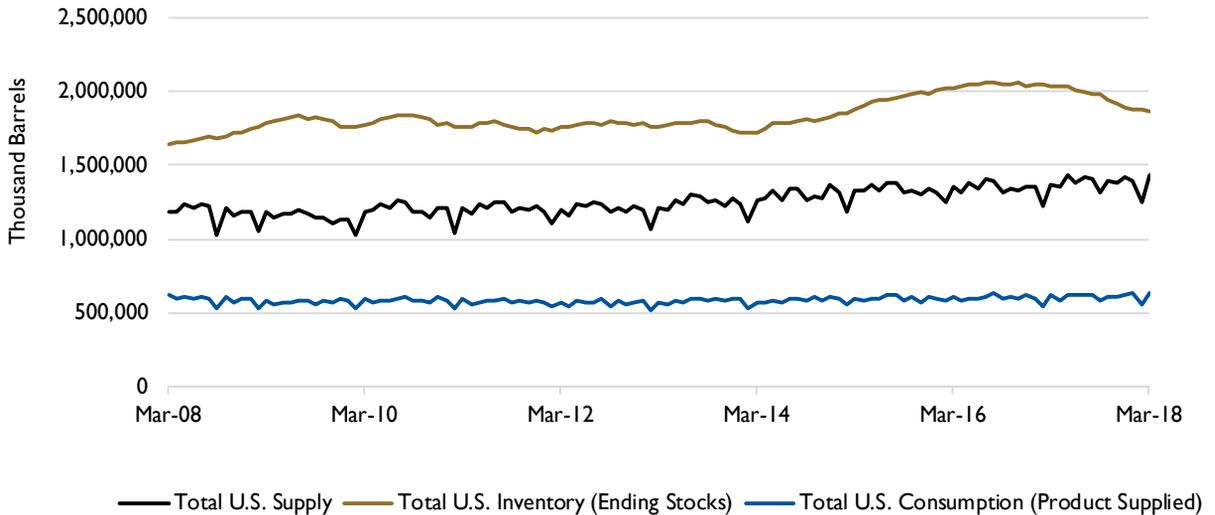
JET FUEL PRICES (MONTHLY AVERAGE) (4)



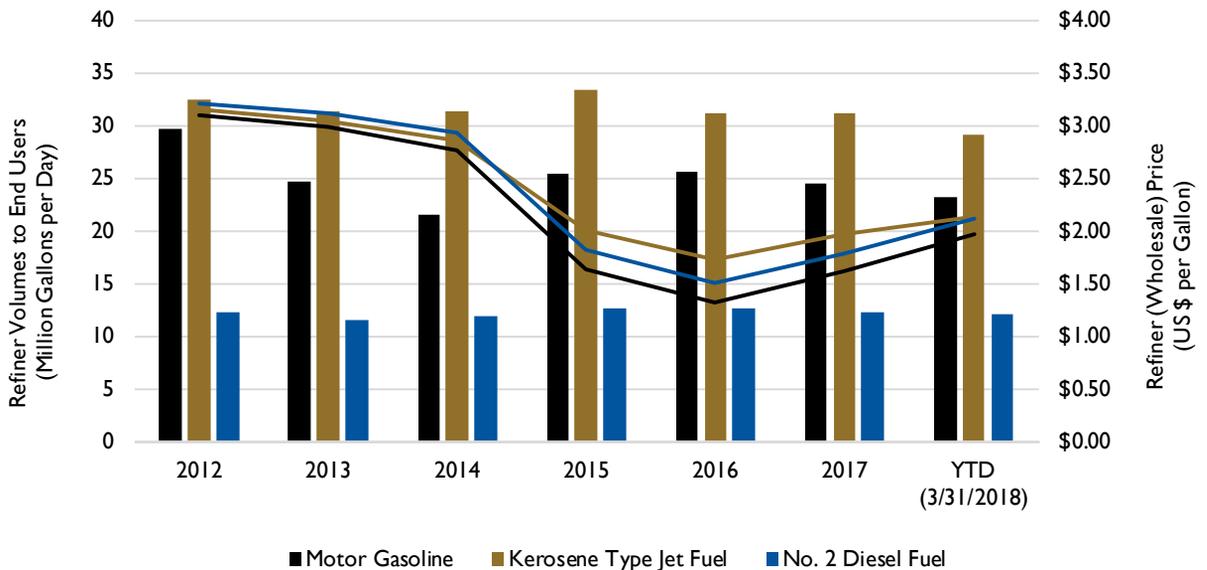
DATA CENTER

OIL

U.S. CRUDE OIL AND PETROLEUM PRODUCTS SUPPLY, INVENTORY AND CONSUMPTION (MONTHLY) ⁽⁵⁾



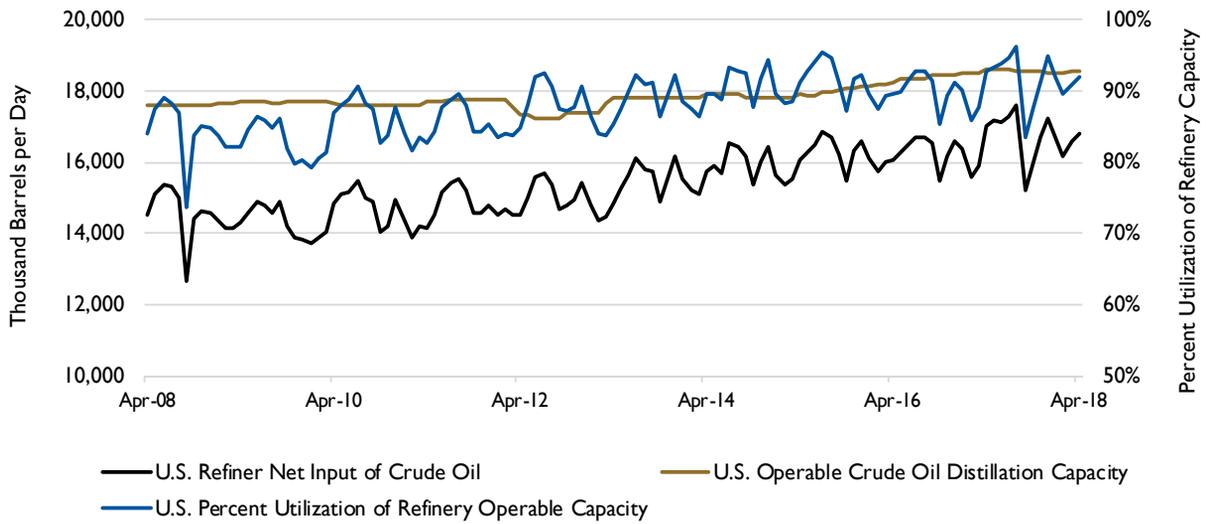
U.S. REFINERY VOLUMES AND WHOLESALE PRICES OF PETROLEUM PRODUCTS (ANNUAL AVERAGE) ⁽⁶⁾



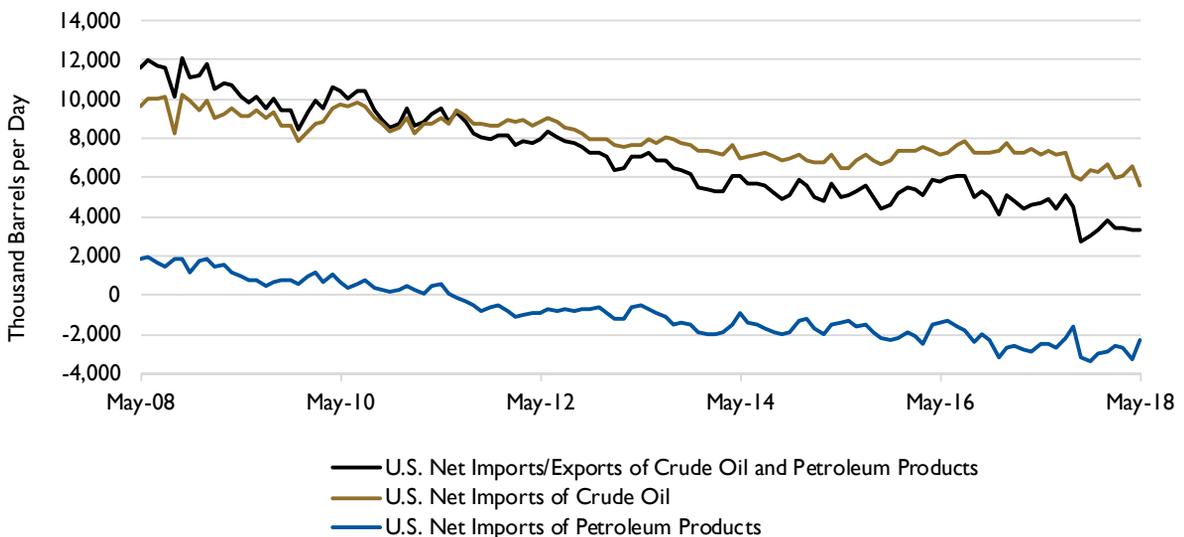
DATA CENTER

OIL

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



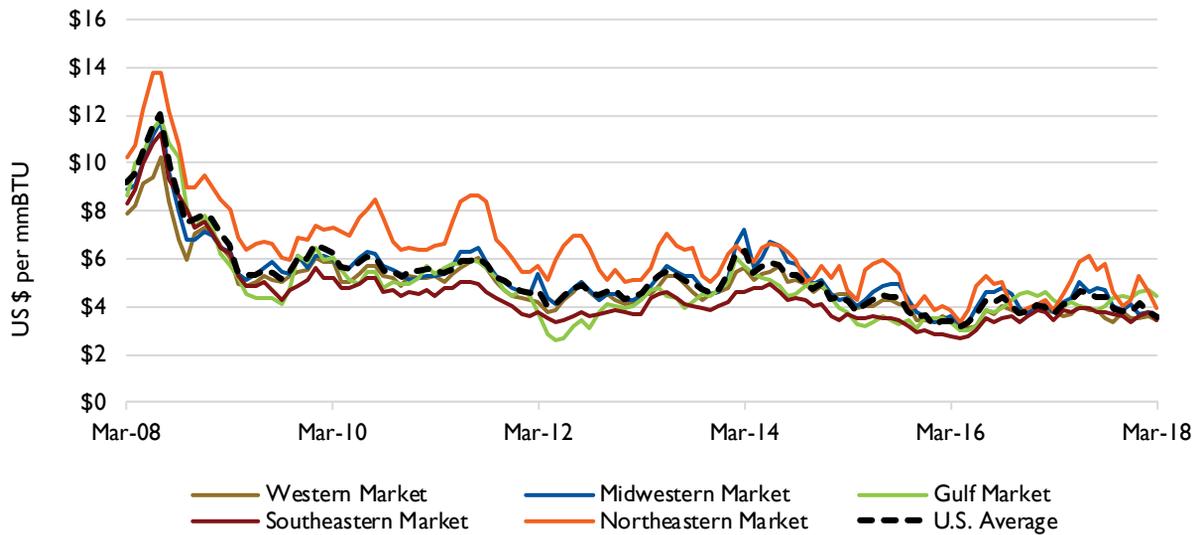
U.S. CRUDE OIL AND PETROLEUM PRODUCTS IMPORTS AND EXPORTS (MONTHLY AVERAGE) (8)



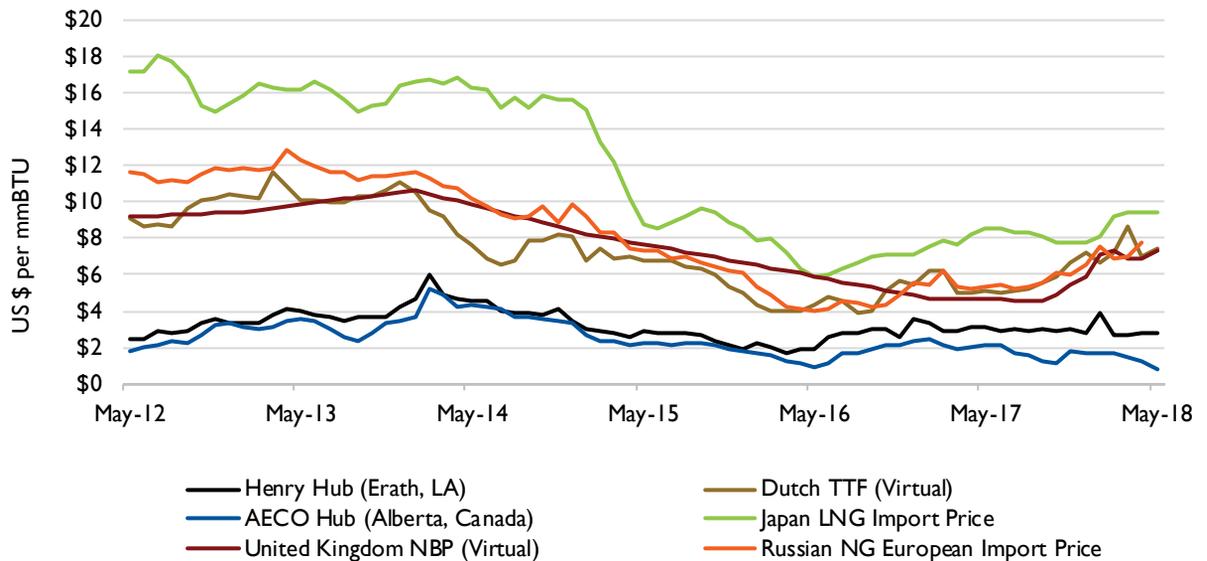
DATA CENTER

NATURAL GAS

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

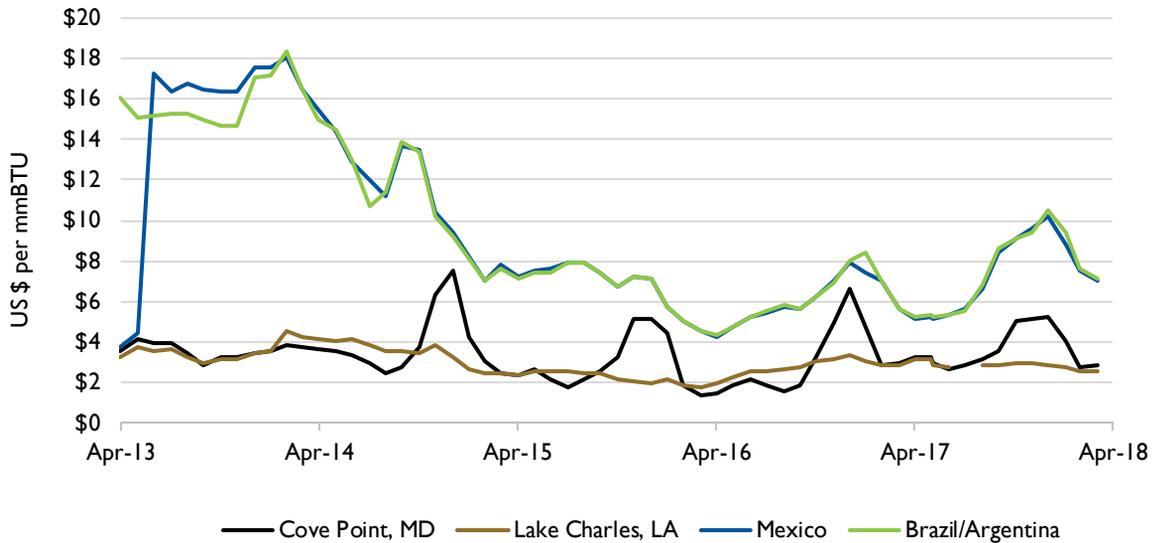


INTERNATIONAL NATURAL GAS PRICES (MONTHLY AVERAGE) ⁽¹⁰⁾

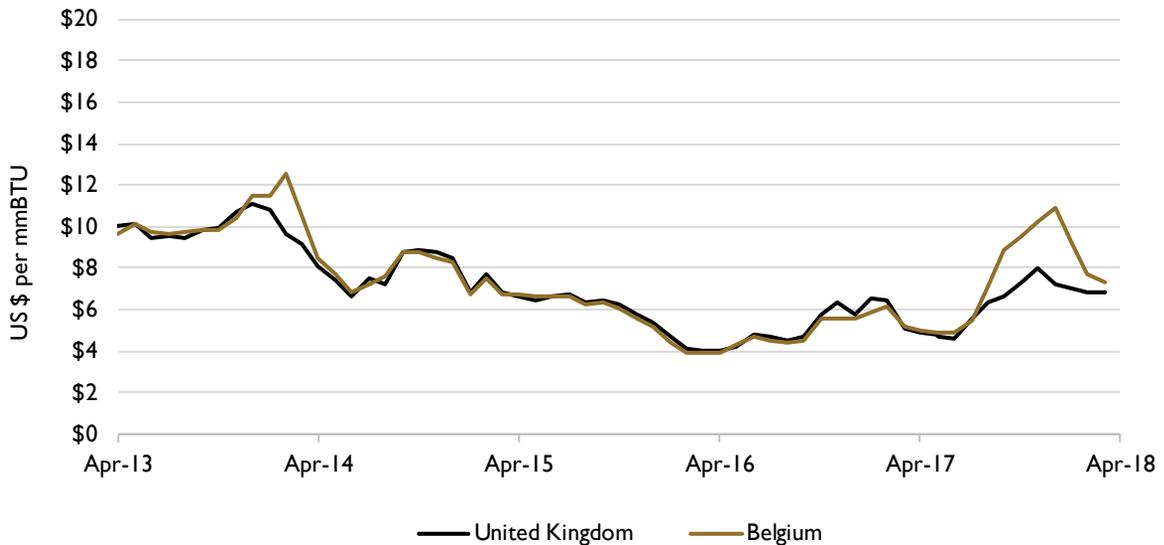


DATA CENTER NATURAL GAS

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



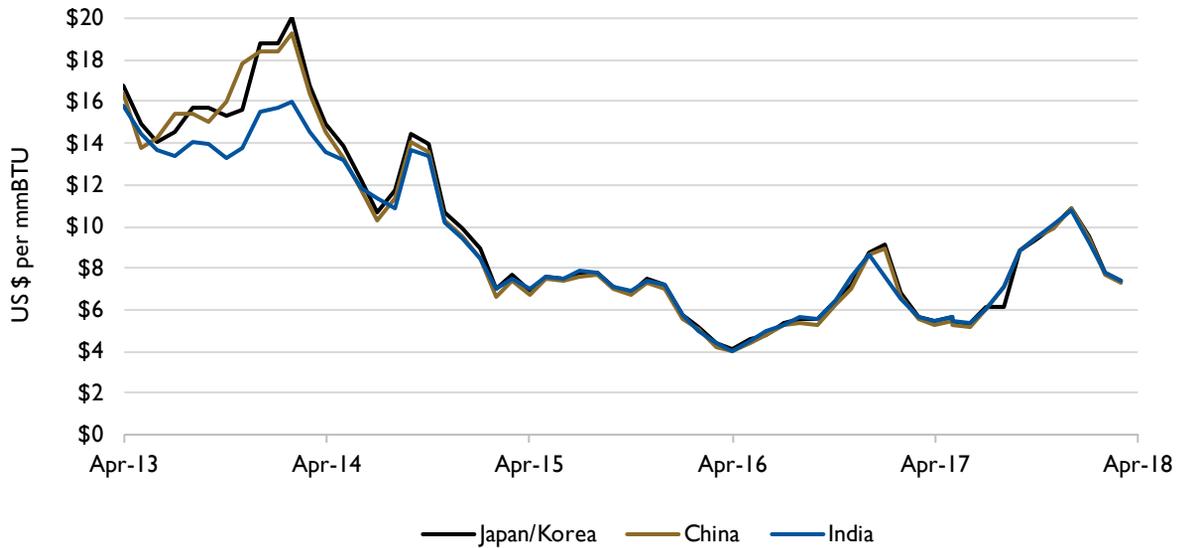
WESTERN EUROPE LIQUEFIED NATURAL GAS PRICES (MONTHLY AVERAGE) (12)



DATA CENTER

NATURAL GAS

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



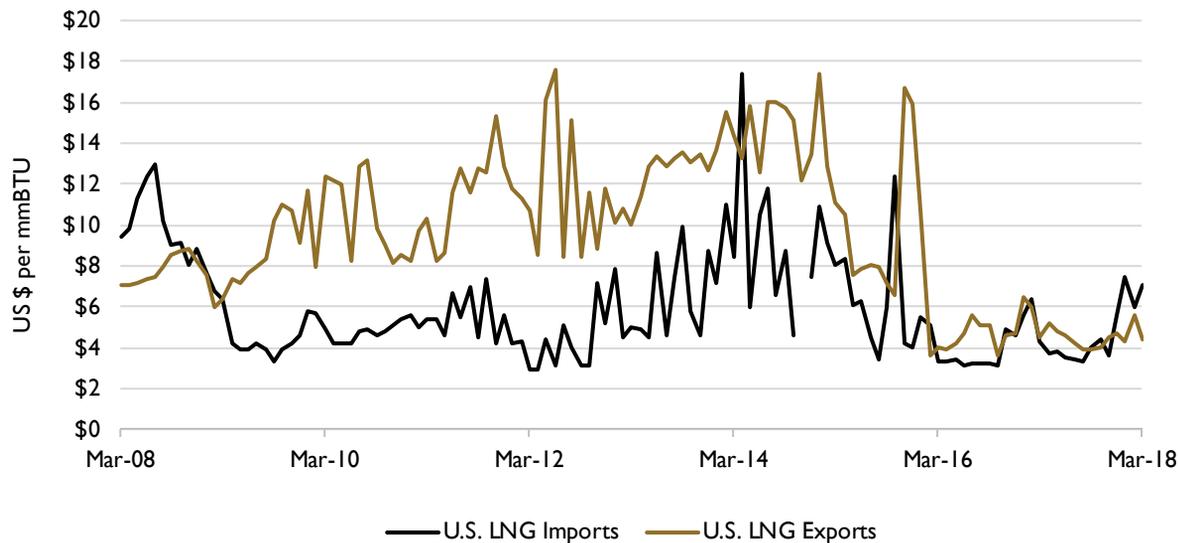
WORLD LIQUEFIED NATURAL GAS PRICES MAP (MONTHLY AVERAGE) (14)



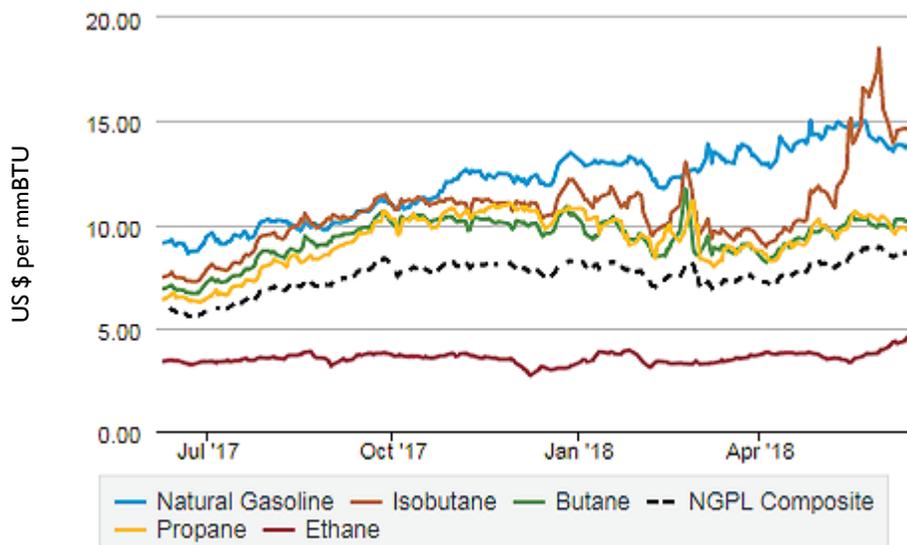
DATA CENTER

NATURAL GAS

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



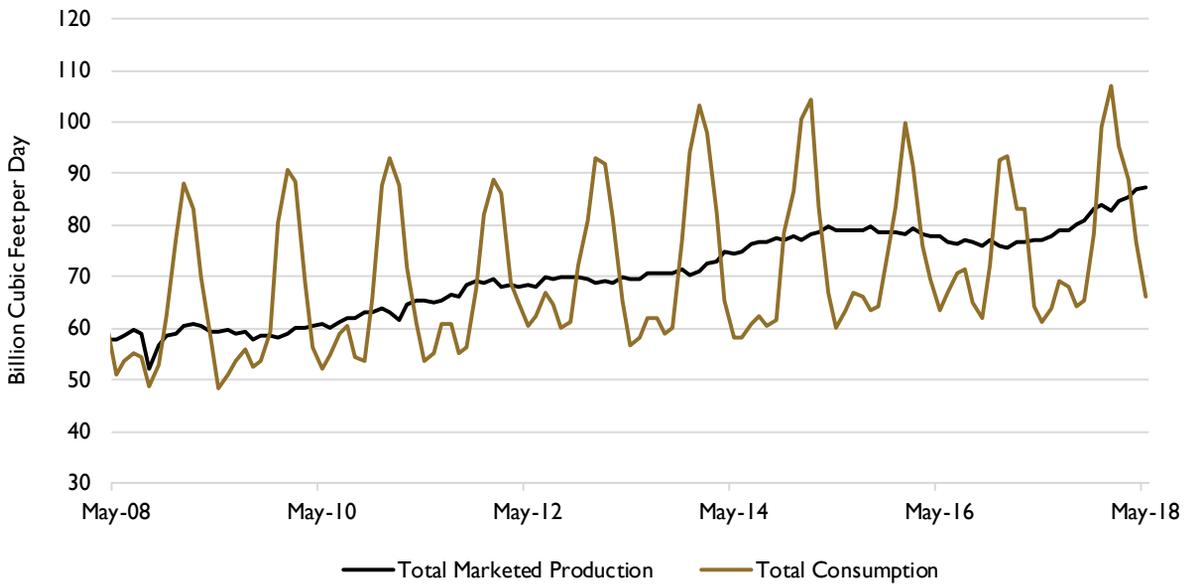
NATURAL GAS PLANT LIQUIDS PRICES (MONTHLY AVERAGE) ⁽¹⁶⁾



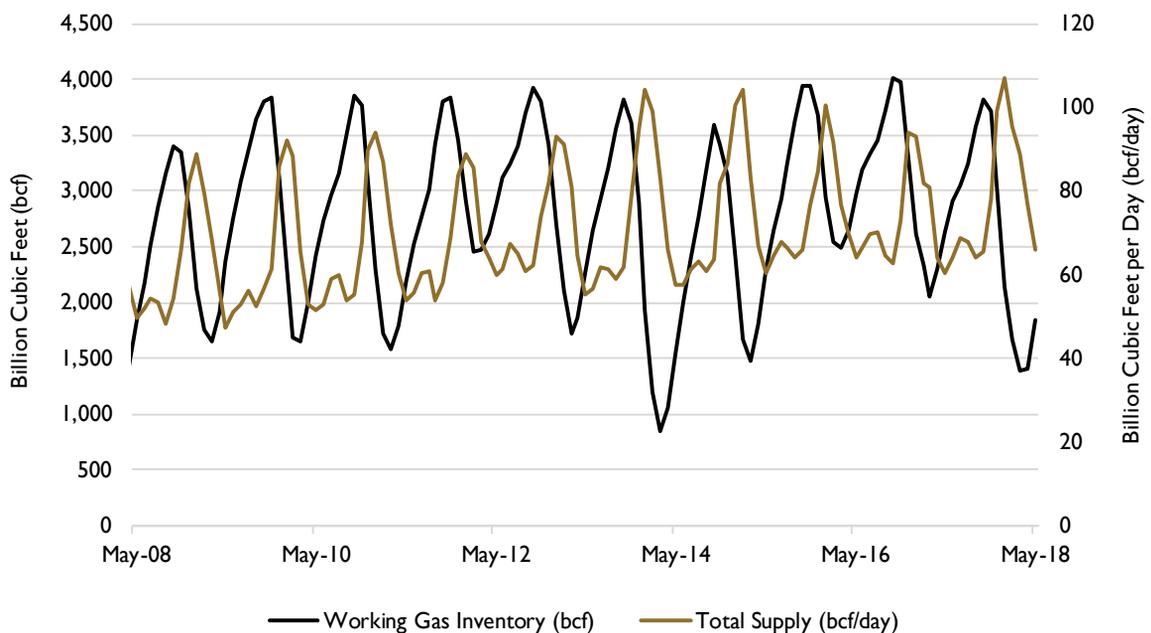
DATA CENTER

NATURAL GAS

U.S. NATURAL GAS PRODUCTION AND CONSUMPTION (MONTHLY) (17)



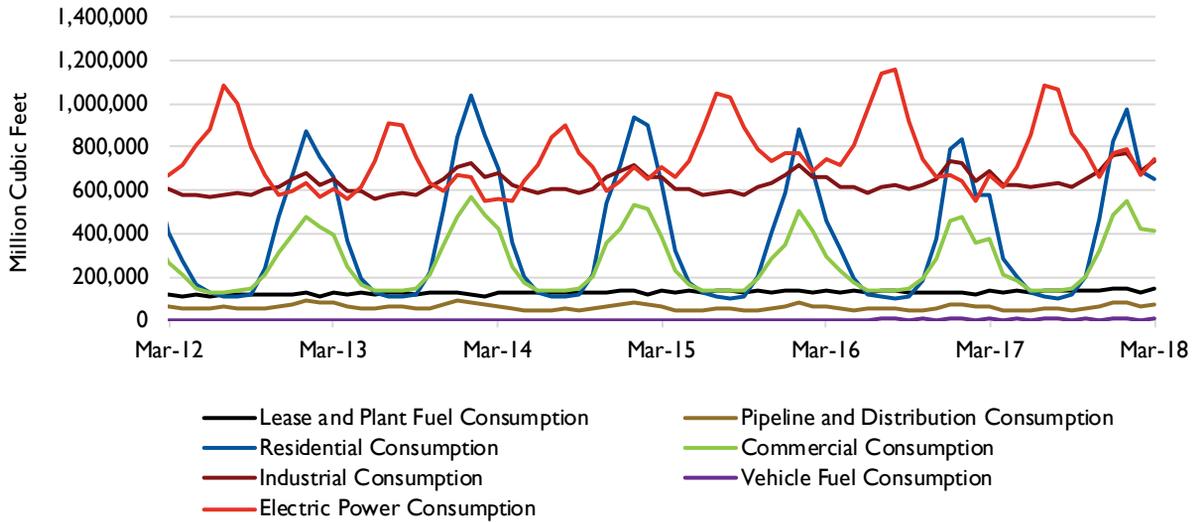
U.S. NATURAL GAS SUPPLY AND INVENTORY (MONTHLY) (18)



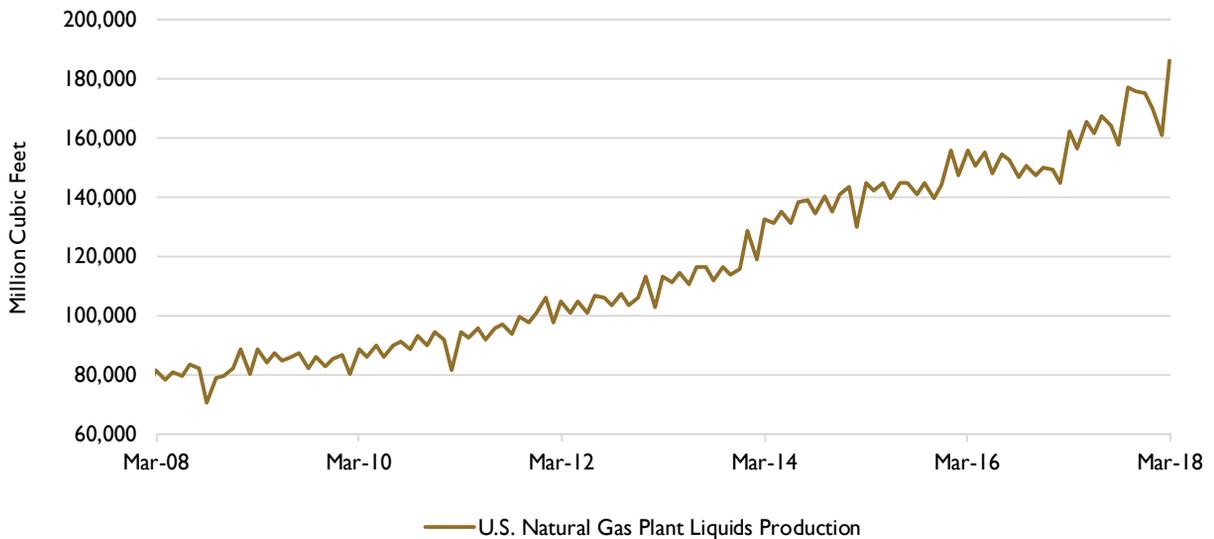
DATA CENTER

NATURAL GAS

U.S. NATURAL GAS CONSUMPTION BY END USE (MONTHLY) ⁽¹⁹⁾



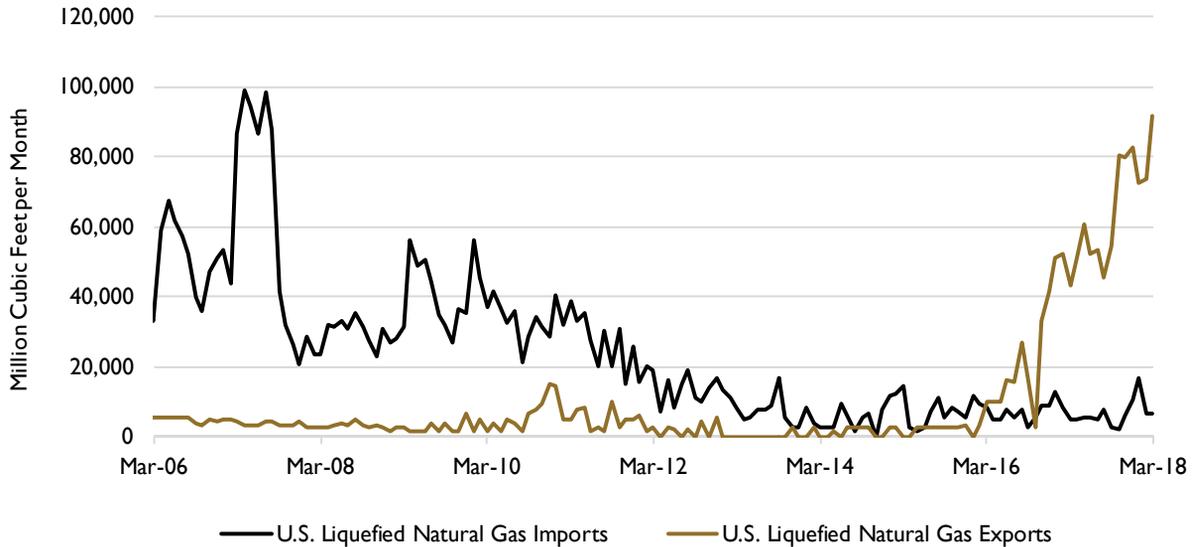
U.S. NATURAL GAS PLANT LIQUIDS PRODUCTION (MONTHLY) ⁽²⁰⁾



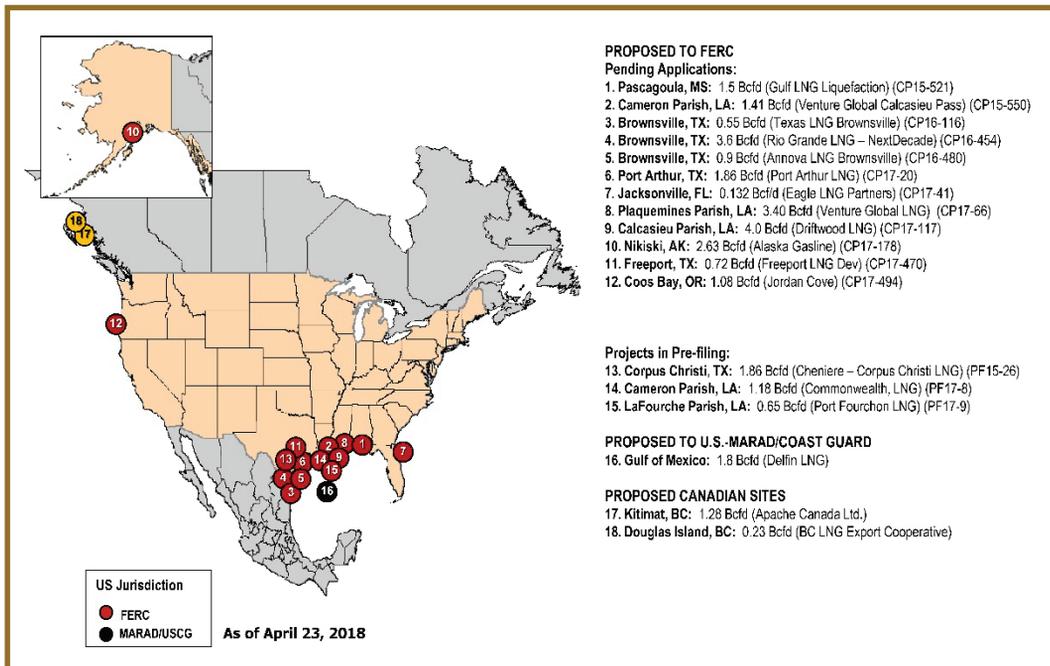
DATA CENTER

NATURAL GAS

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



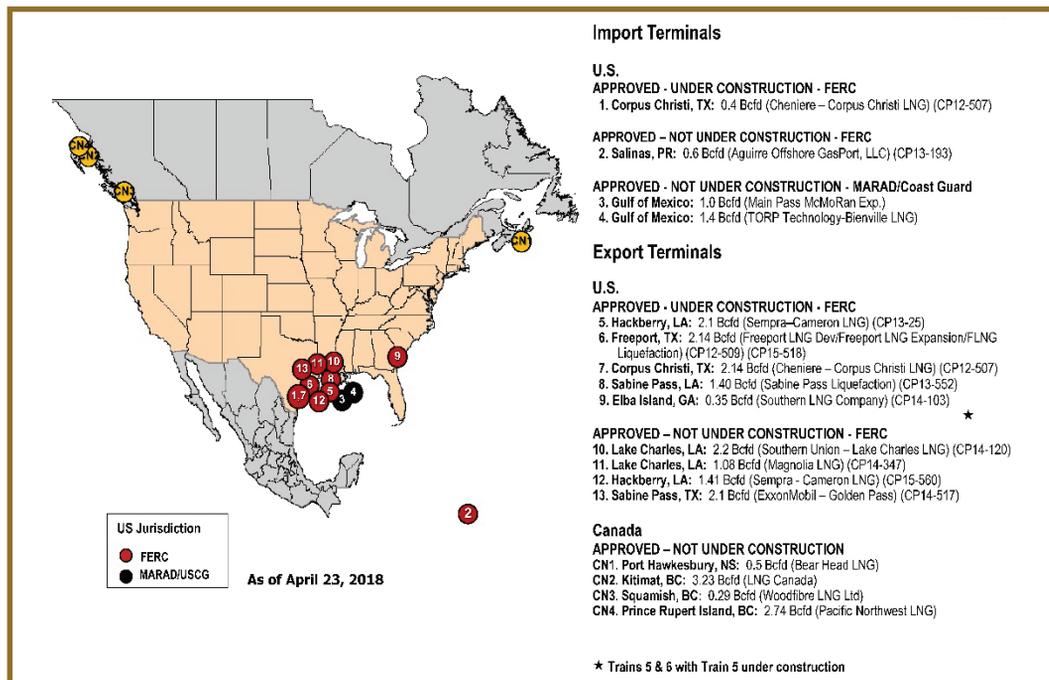
NORTH AMERICAN LNG EXPORT TERMINALS — PROPOSED ⁽²²⁾



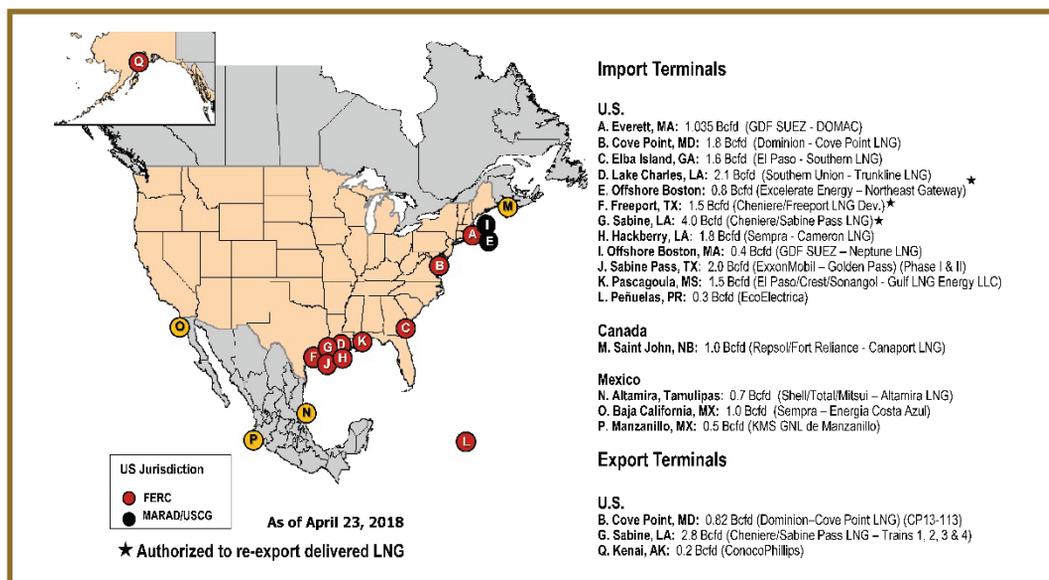
DATA CENTER

NATURAL GAS

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



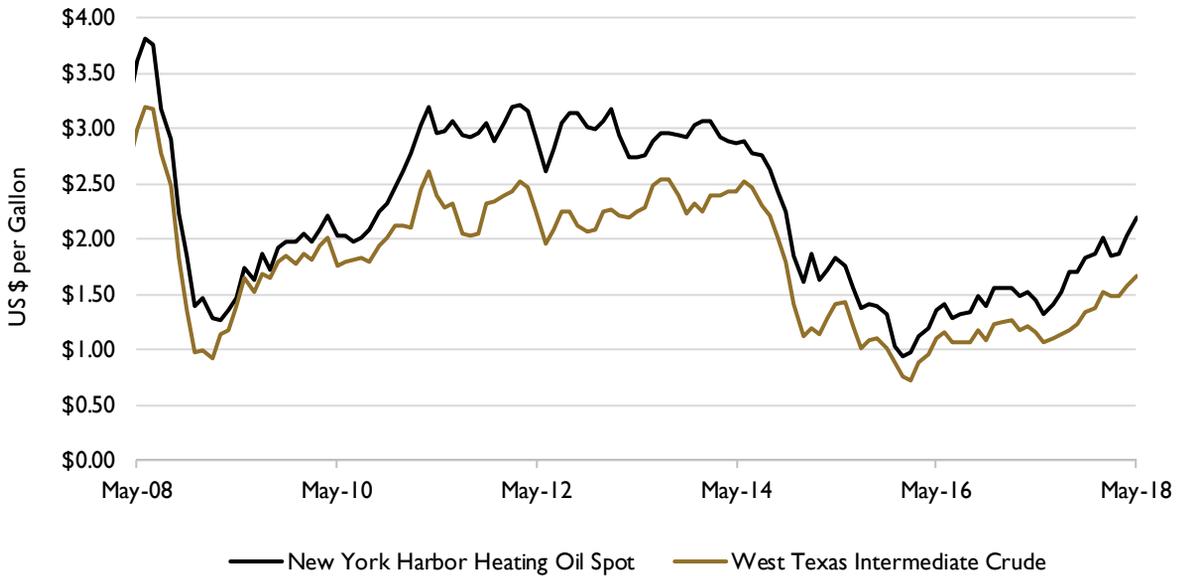
NORTH AMERICAN LNG IMPORT/EXPORT TERMINALS — *EXISTING* (24)



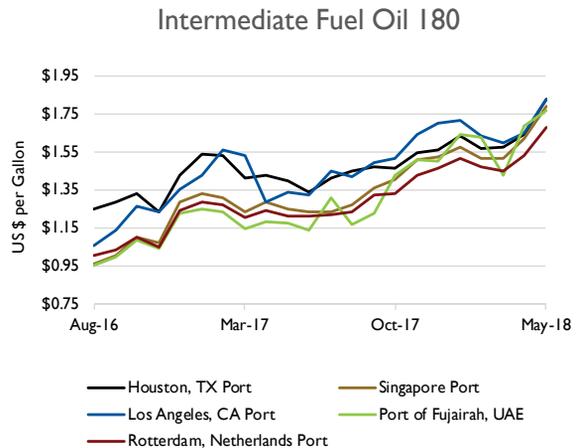
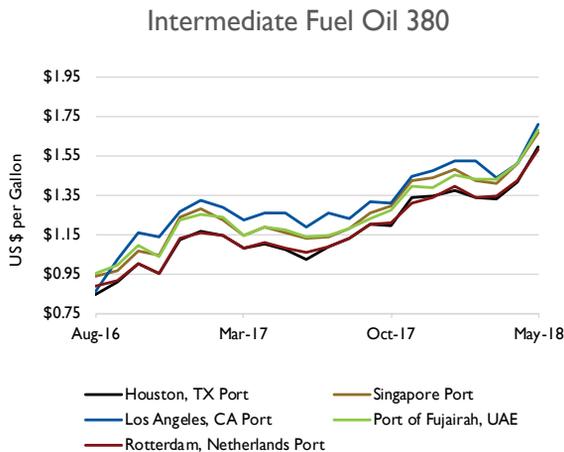
DATA CENTER

PROPANE AND HEATING/FUEL OIL

HEATING OIL PRICES (MONTHLY AVERAGE) (25)



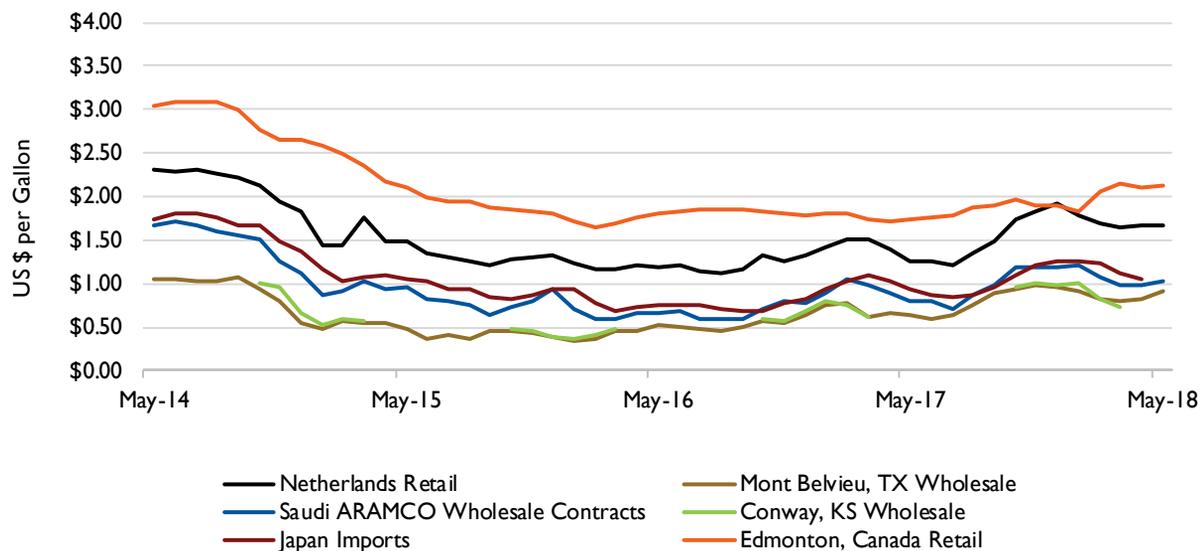
INTERMEDIATE FUEL OIL AKA “BUNKER FUEL” PRICES (MONTHLY AVERAGE) (26)



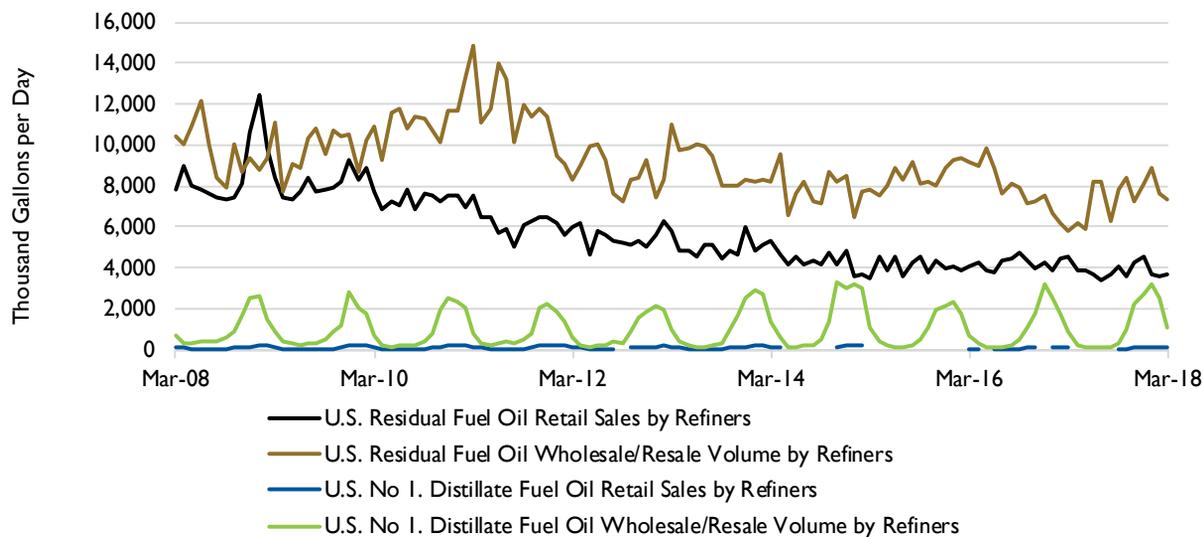
DATA CENTER

PROPANE AND HEATING/FUEL OIL

PROPANE PRICES (MONTHLY AVERAGE) (27)



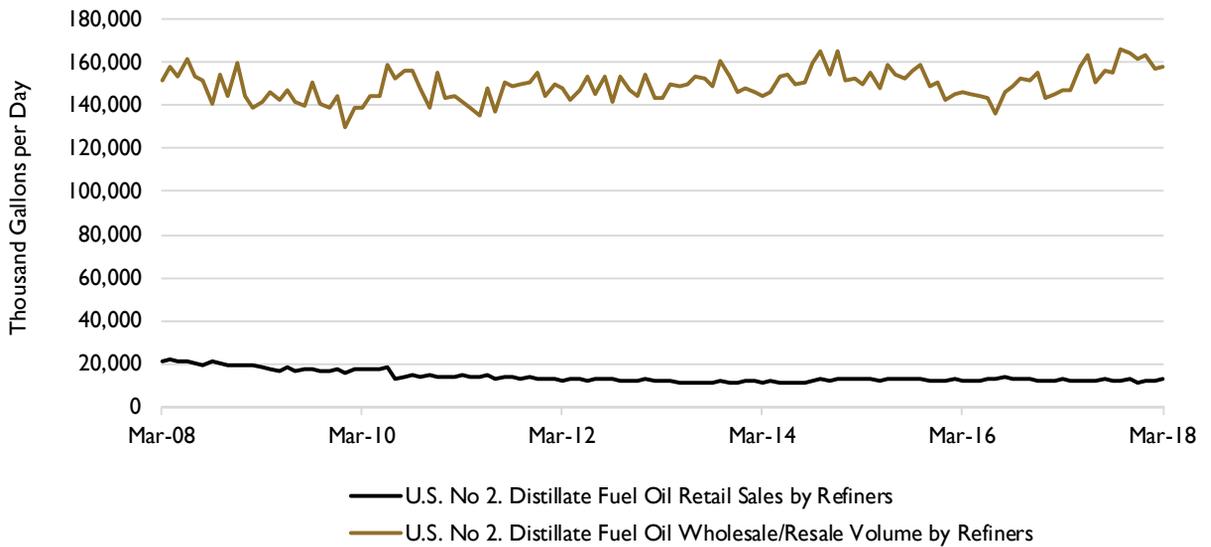
NO. 1 DISTILLATE FUEL OIL, RESIDUAL FUEL OIL WHOLESALE, RETAIL SALES VOLUME BY REFINERS (MONTHLY) (28)



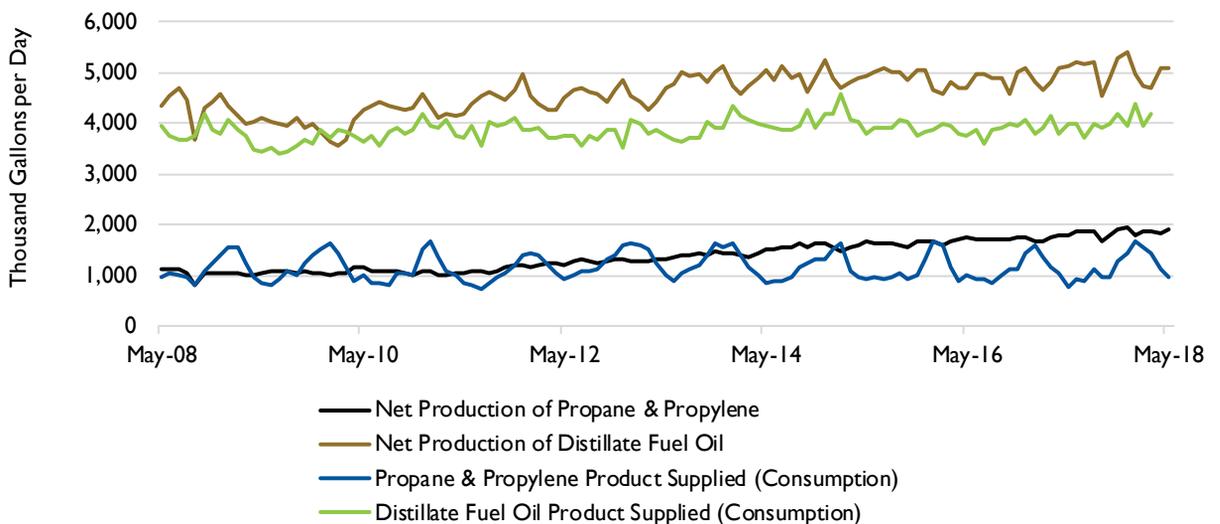
DATA CENTER

PROPANE AND HEATING/FUEL OIL

NO. 2 DISTILLATE FUEL OIL WHOLESALE, RETAIL SALES VOLUME BY REFINERS (MONTHLY) ⁽²⁹⁾



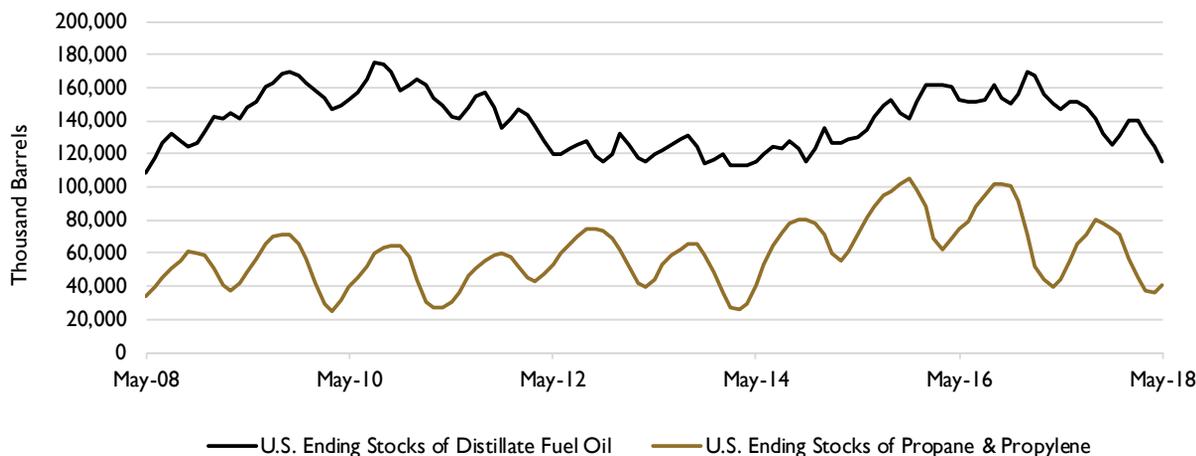
PROPANE & PROPYLENE AND DISTILLATE FUEL OIL PRODUCTION AND CONSUMPTION (MONTHLY) ⁽³⁰⁾



DATA CENTER

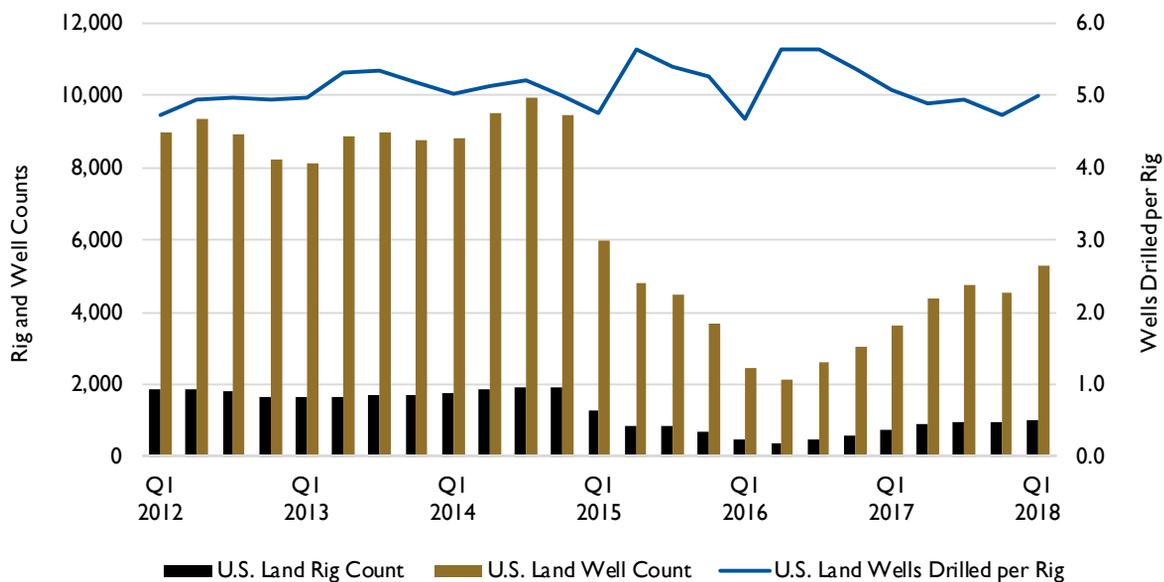
PROPANE AND HEATING/FUEL OIL

U.S. ENDING STOCKS OF PROPANE & PROPYLENE AND DISTILLATE FUEL OIL (MONTHLY AVERAGE) ⁽³¹⁾



DRILLING ACTIVITY

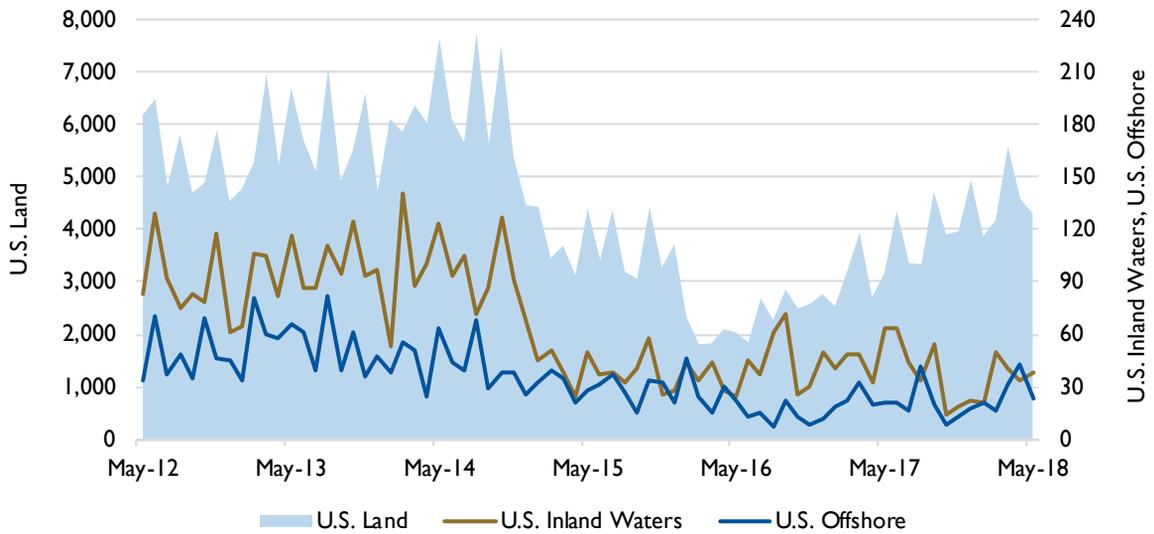
U.S. LAND WELL COUNT, RIG COUNT AND WELLS PER RIG (QUARTERLY) ⁽³²⁾



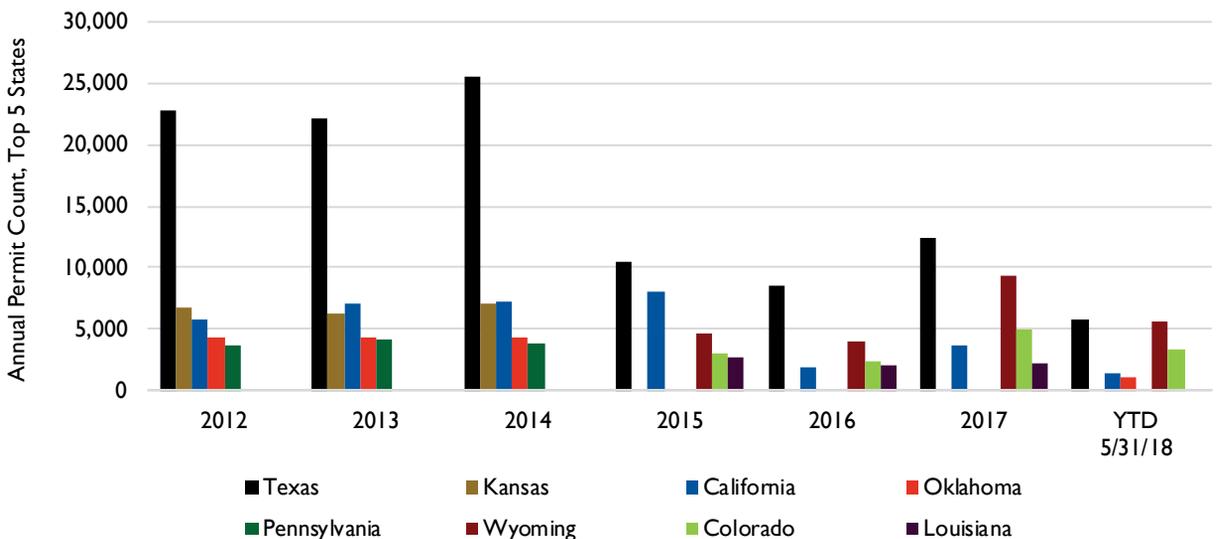
DATA CENTER

DRILLING ACTIVITY

U.S. DRILLING PERMITS (MONTHLY) (33)



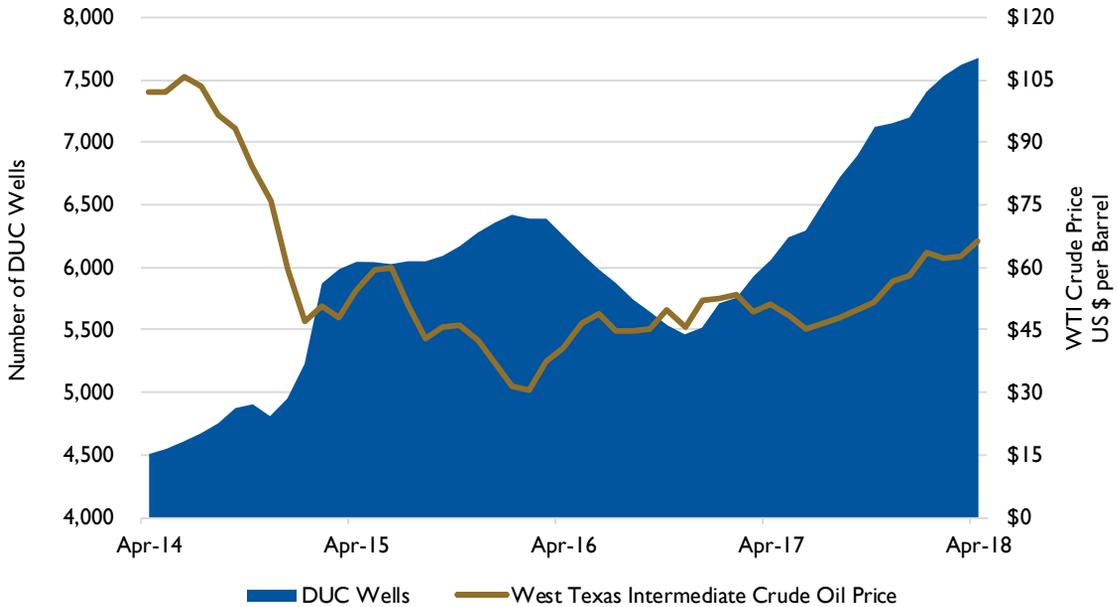
U.S. DRILLING PERMITS, TOP 5 STATES (ANNUAL) (34)



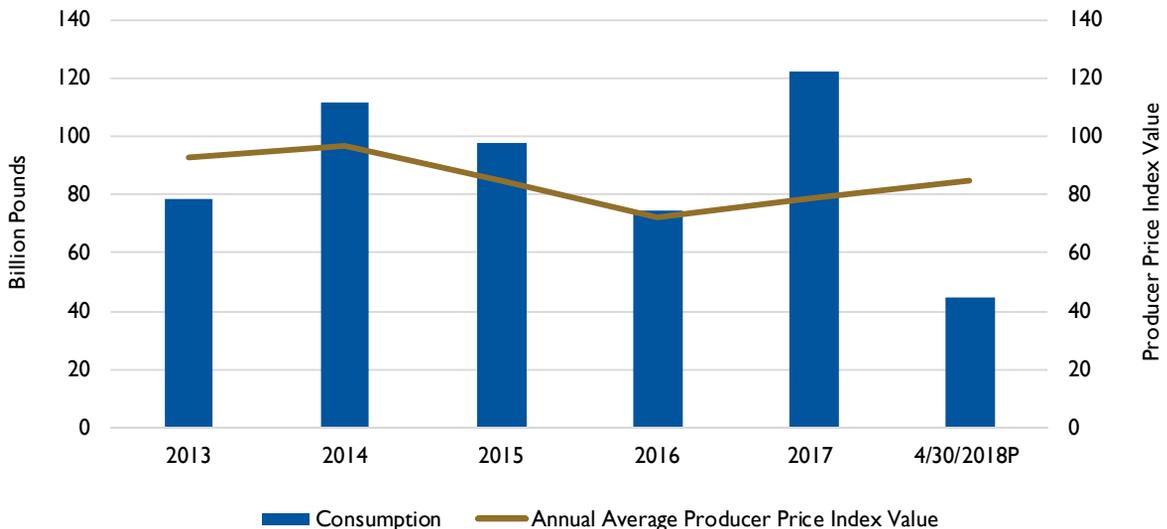
DATA CENTER

DRILLING ACTIVITY

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



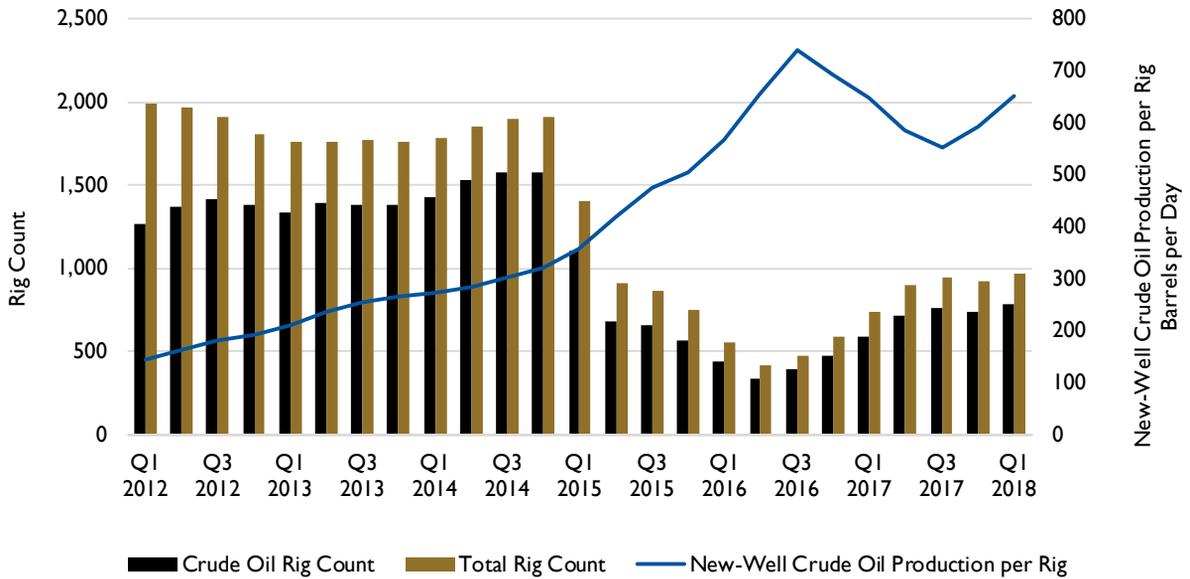
HYDRAULIC FRACTURING SAND CONSUMPTION AND PRODUCER PRICE INDEX (ANNUAL) ⁽³⁶⁾



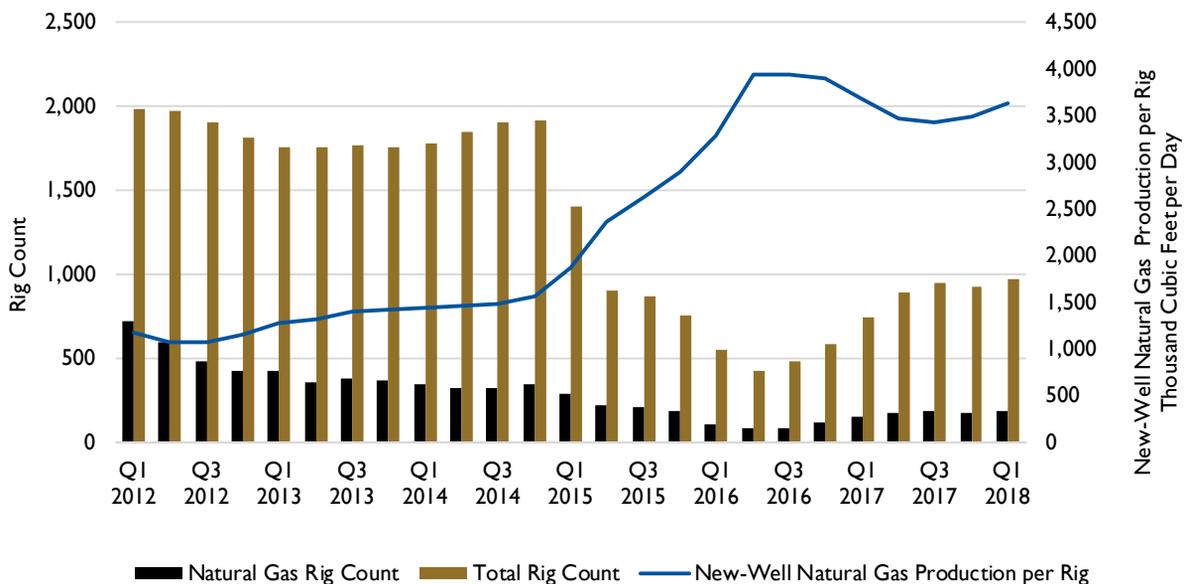
DATA CENTER

DRILLING ACTIVITY

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

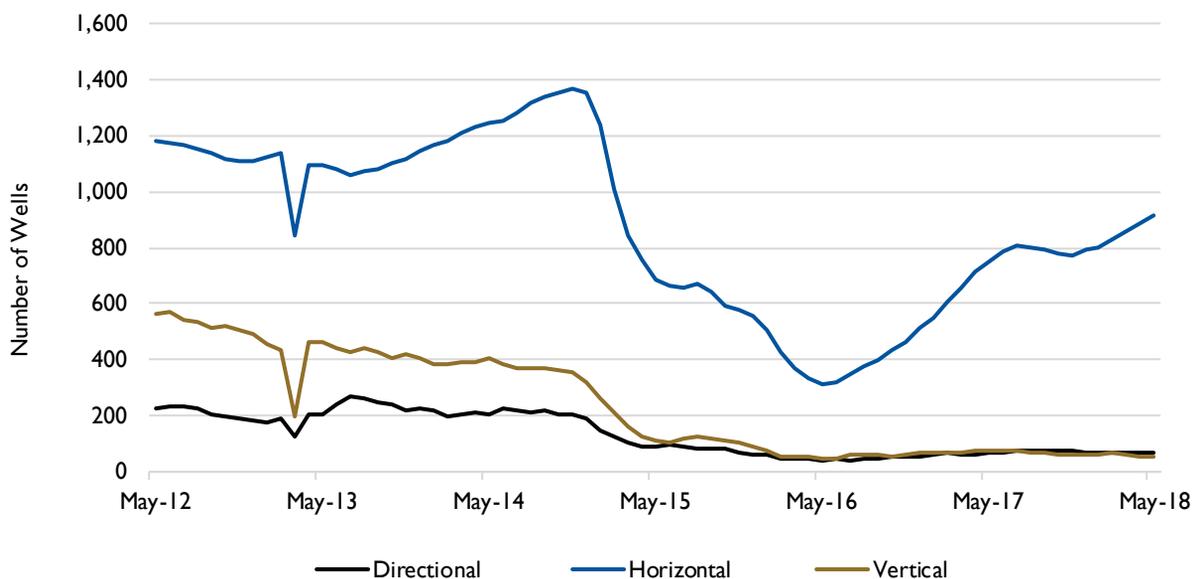


NATURAL GAS PRODUCTION, RIG COUNT AND PRODUCTION PER RIG (QUARTERLY) ⁽³⁸⁾



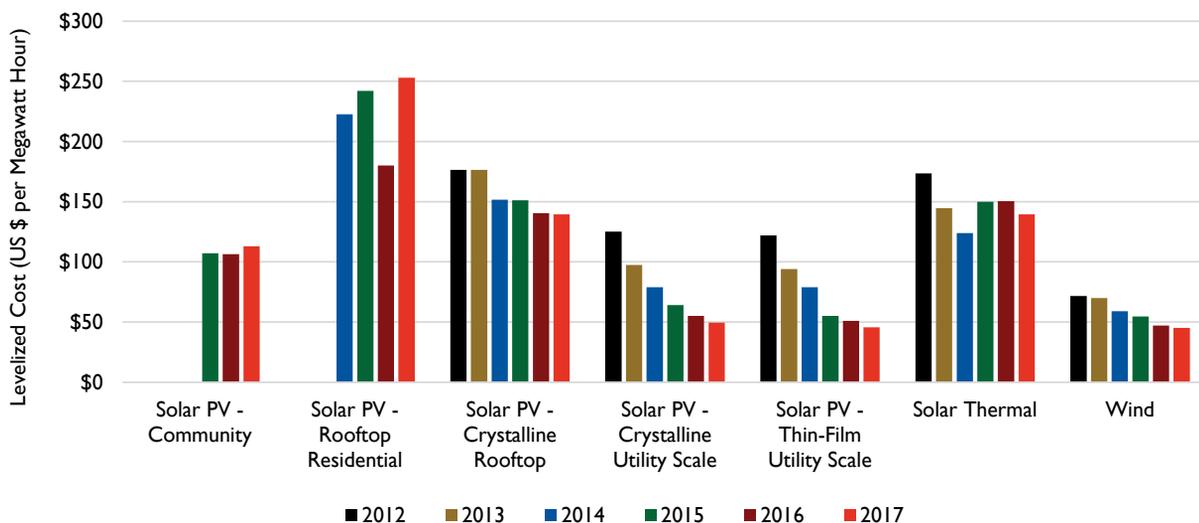
DATA CENTER DRILLING ACTIVITY

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



RENEWABLES

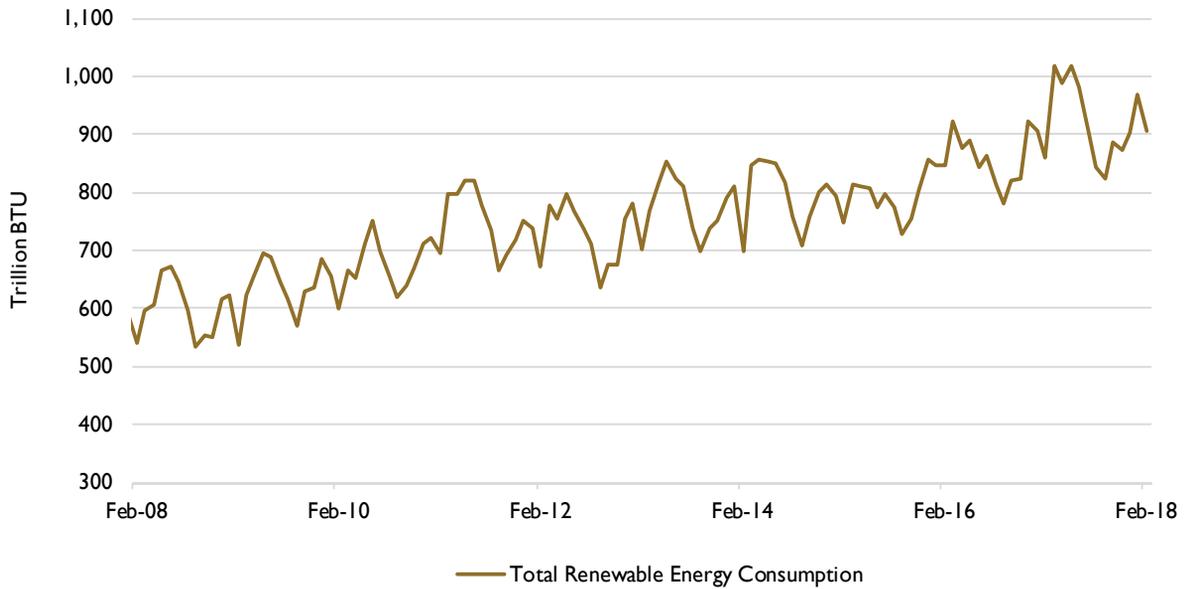
WIND AND SOLAR PRICES (ANNUAL AVERAGE) (40)



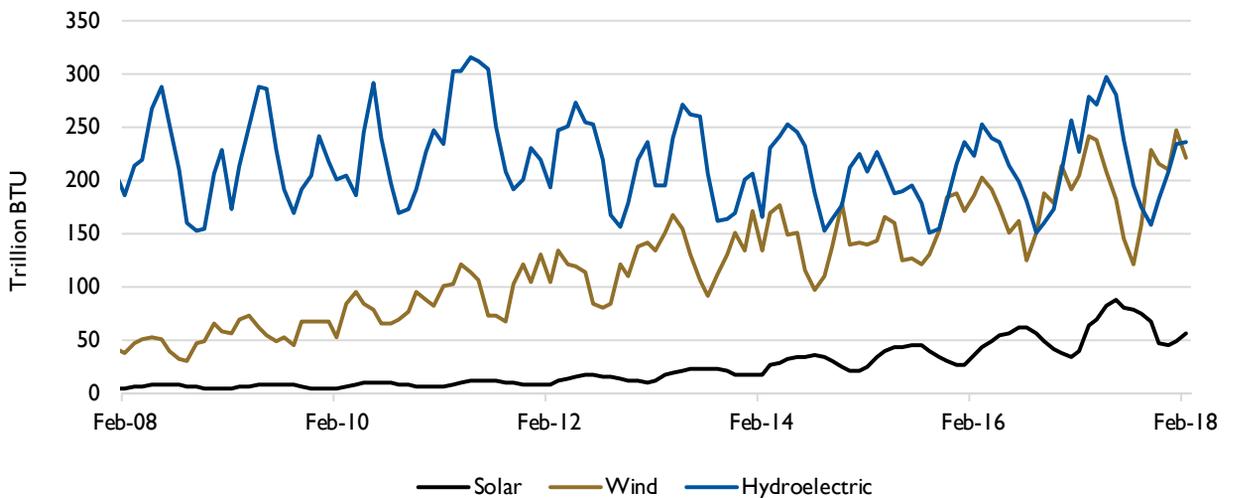
DATA CENTER

RENEWABLES

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



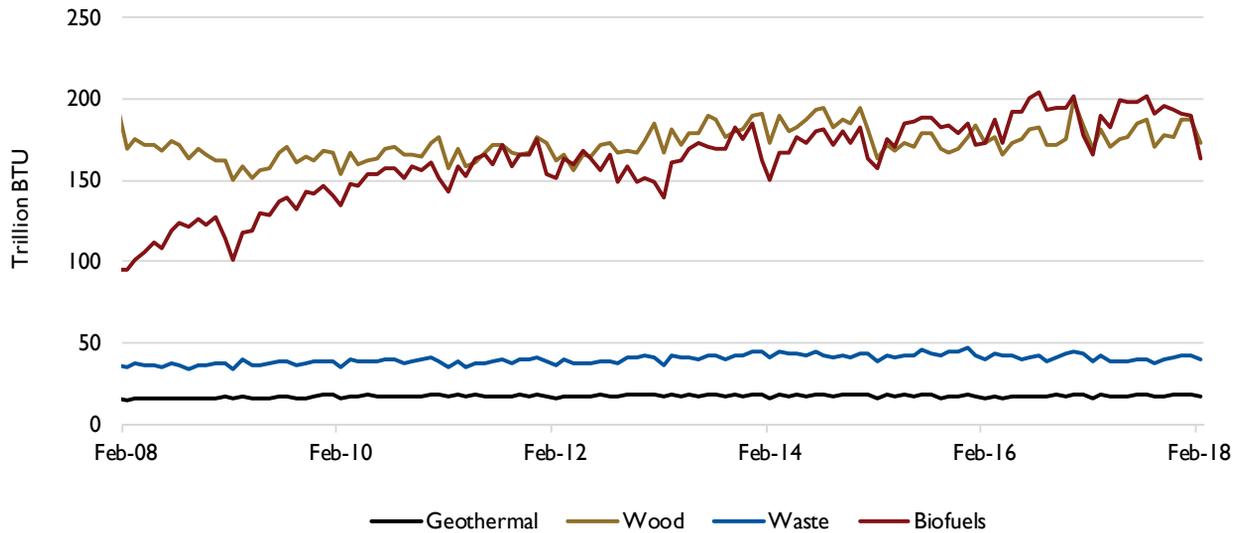
U.S. SOLAR, WIND AND HYDROELECTRIC ENERGY CONSUMPTION (MONTHLY) (42)



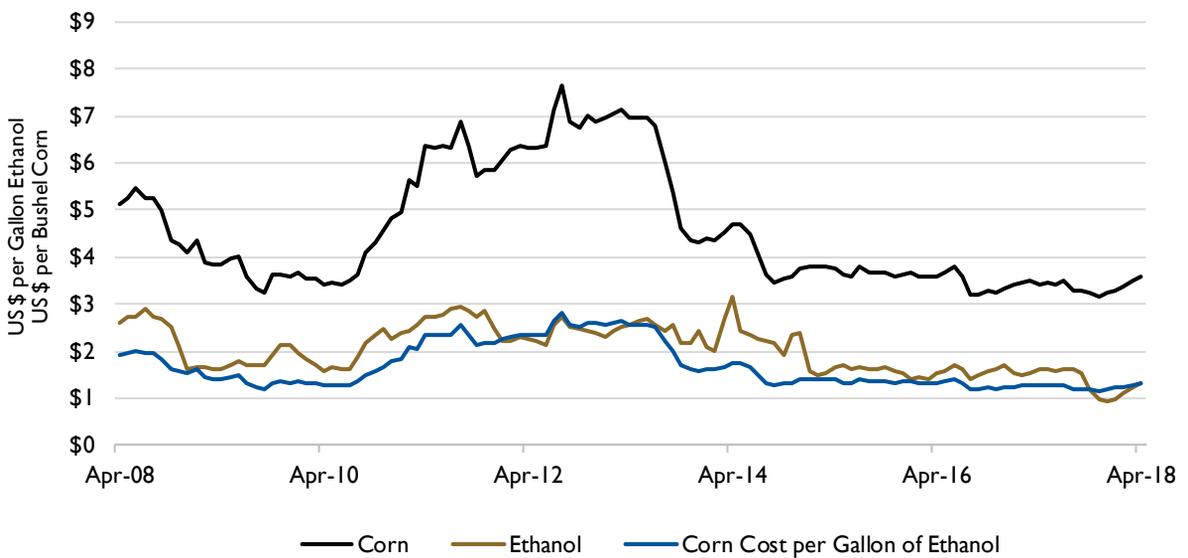
DATA CENTER

RENEWABLES

U.S. WOOD, WASTE, BIOFUELS AND GEOTHERMAL ENERGY CONSUMPTION (MONTHLY) (43)

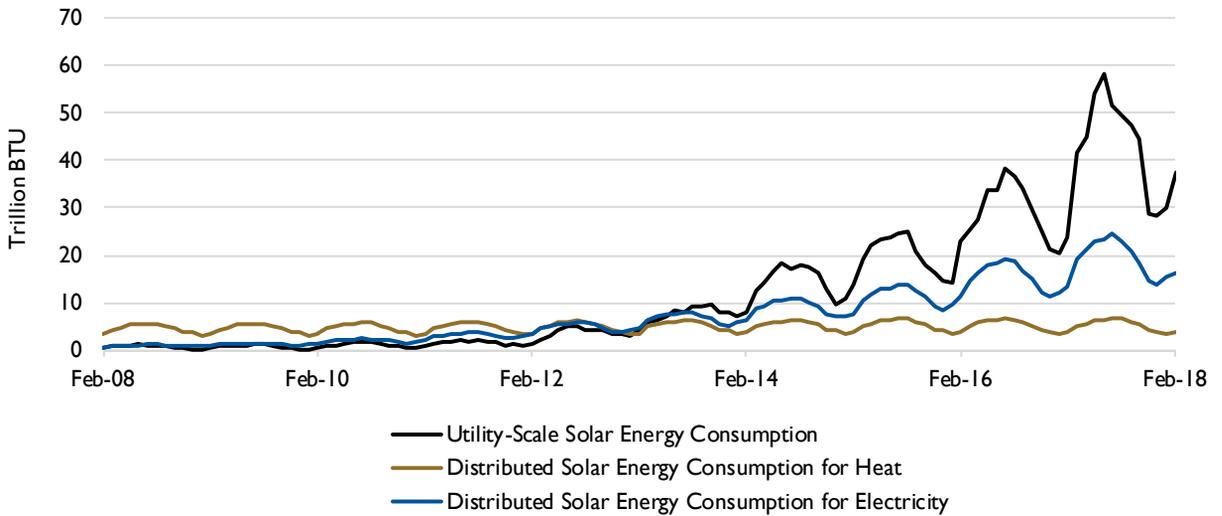


CORN AND ETHANOL PRICES AND CORN COST PER GALLON OF ETHANOL (MONTHLY AVERAGE) (44)

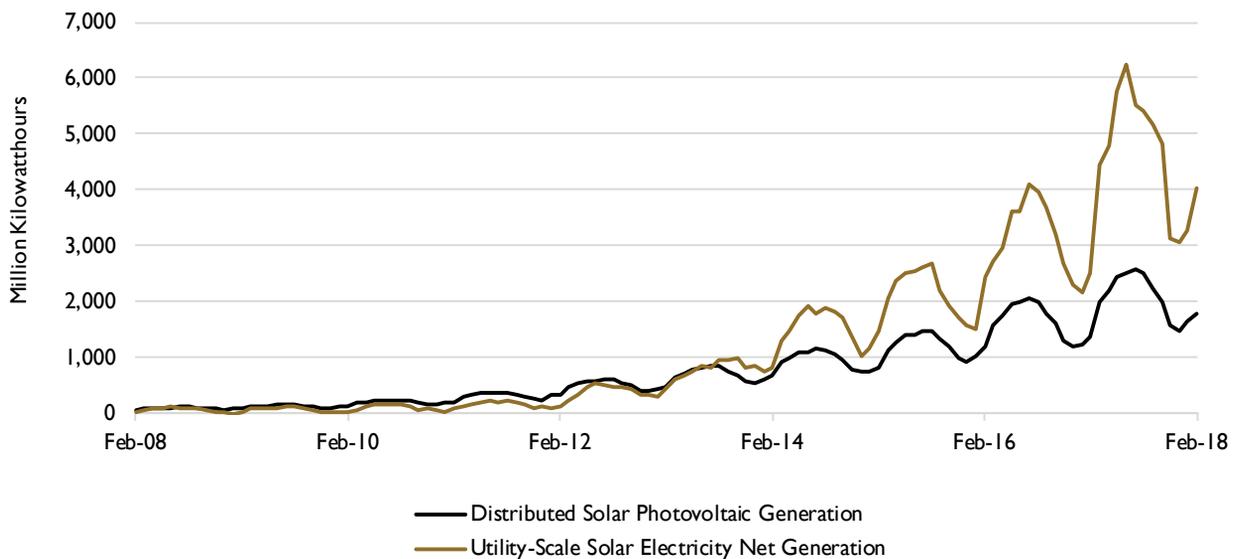


DATA CENTER RENEWABLES

U.S. SOLAR ENERGY CONSUMPTION (MONTHLY) (45)



U.S. SOLAR ENERGY NET GENERATION (MONTHLY) (46)



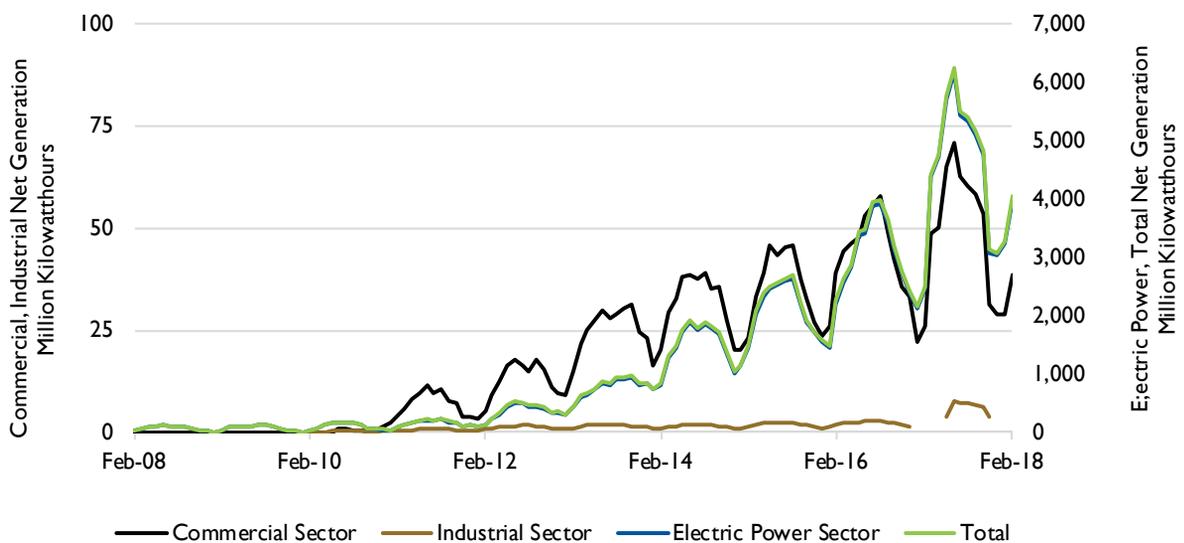
DATA CENTER

RENEWABLES

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

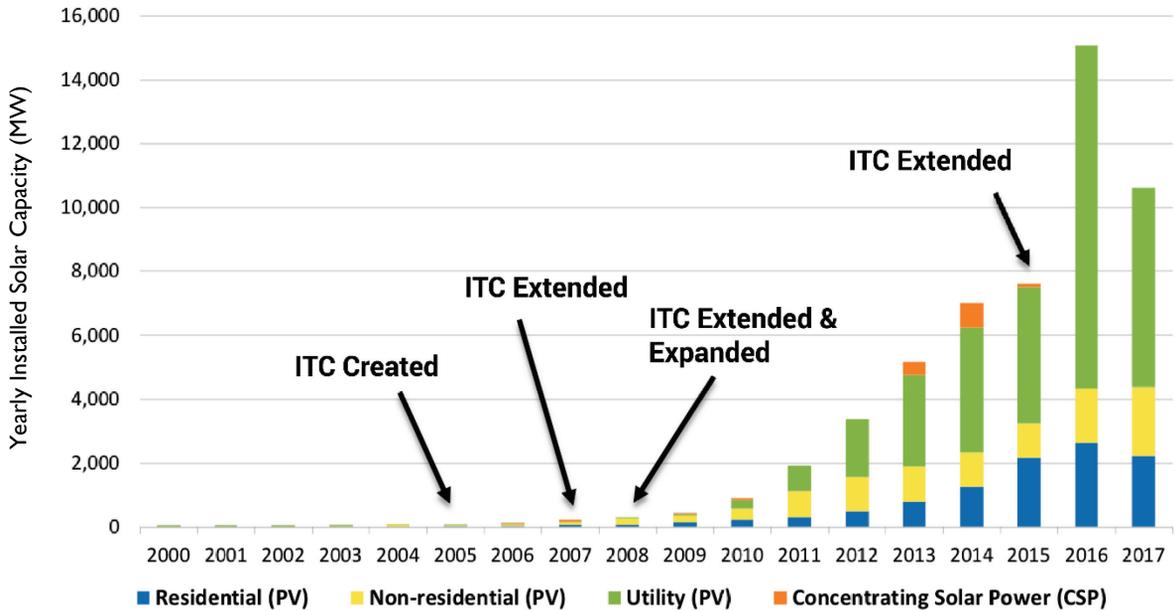


UTILITY-SCALE SOLAR ELECTRICITY NET GENERATION BY SECTOR (MONTHLY) (48)

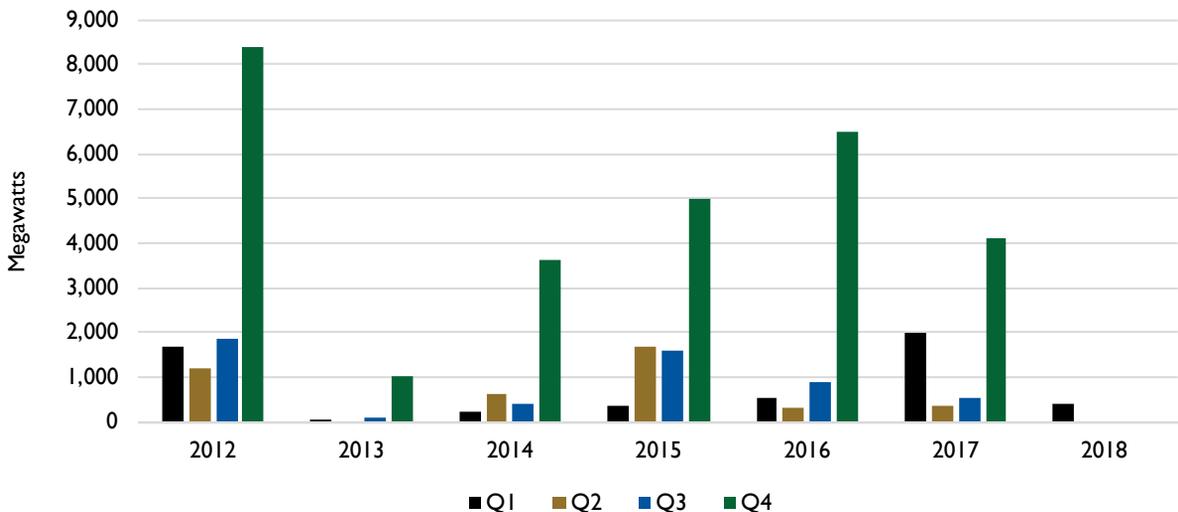


DATA CENTER RENEWABLES

U.S. SOLAR CAPACITY INSTALLATIONS (ANNUAL) (49)

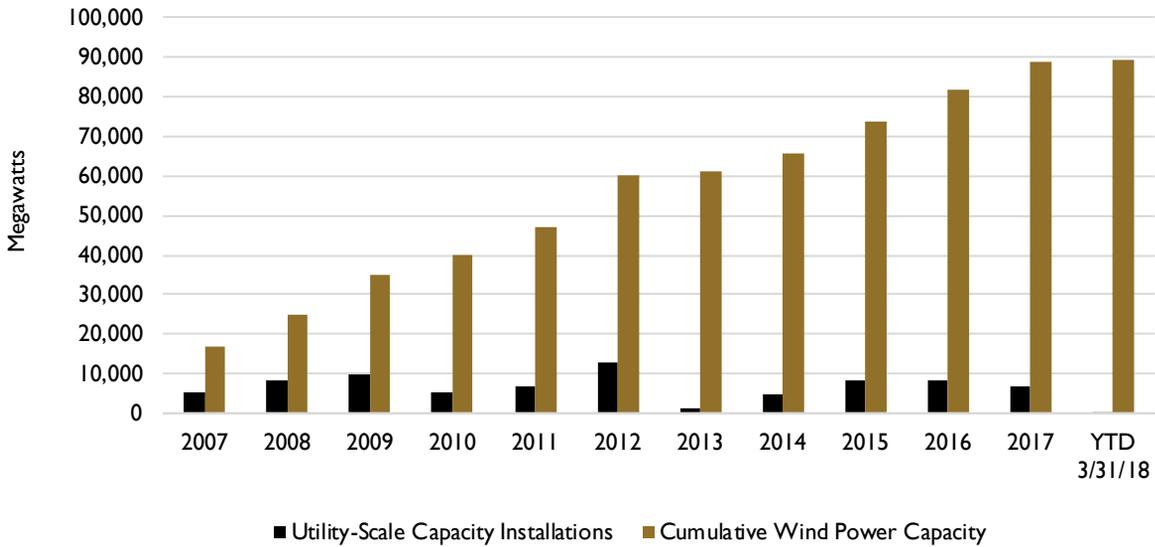


U.S. WIND POWER CAPACITY INSTALLATIONS (QUARTERLY) (50)

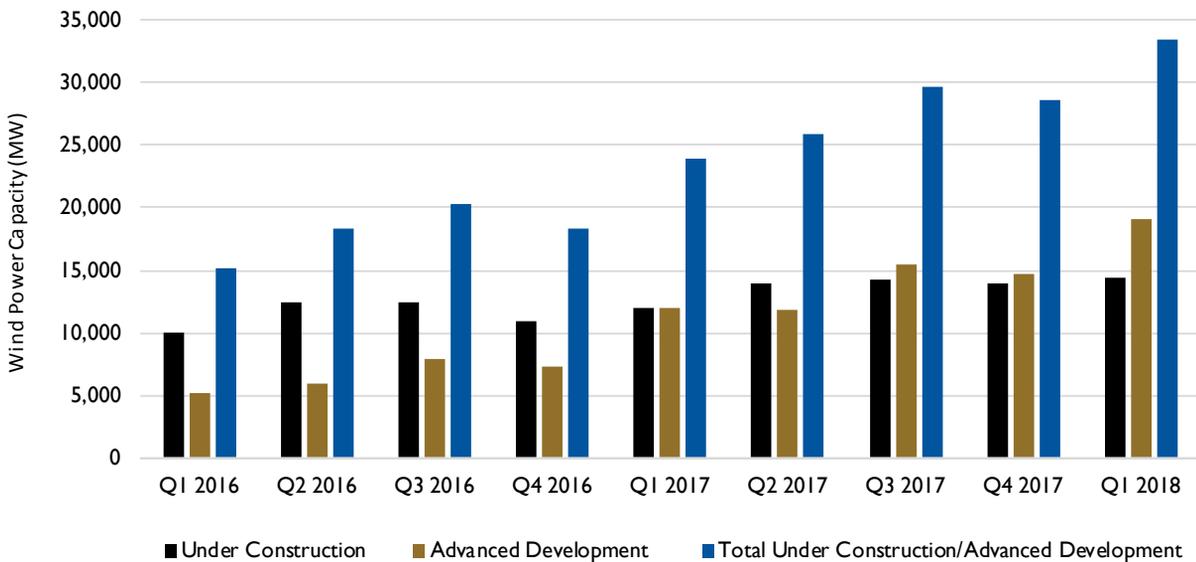


DATA CENTER RENEWABLES

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



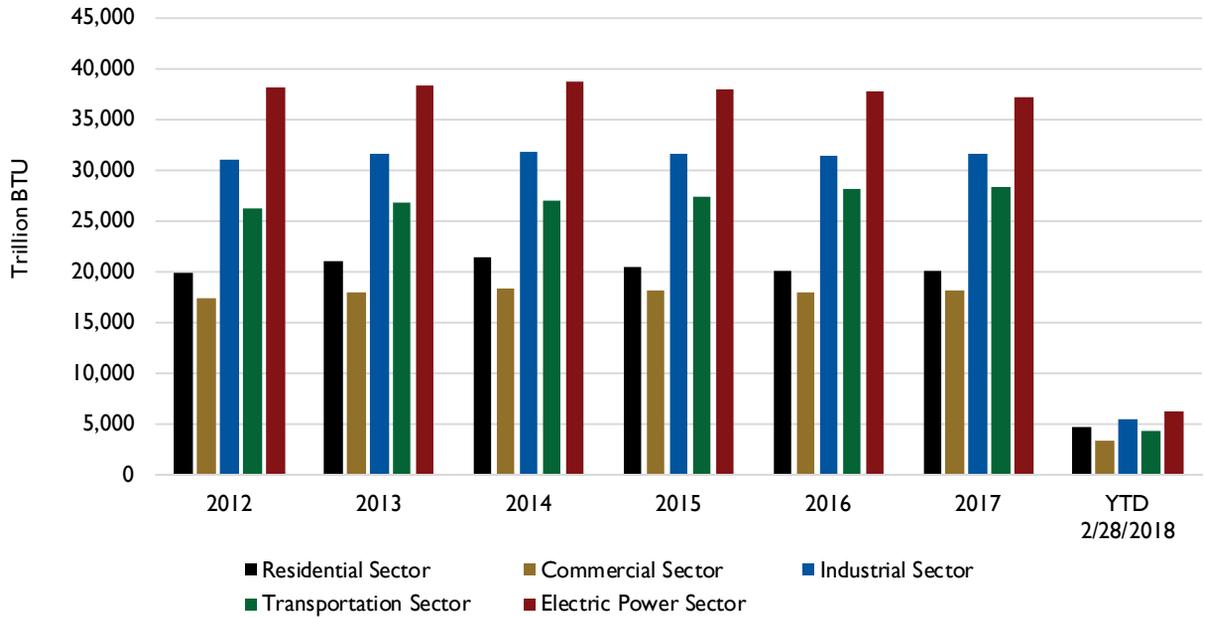
WIND POWER UNDER CONSTRUCTION OR IN ADVANCED DEVELOPMENT (QUARTERLY) ⁽⁵²⁾



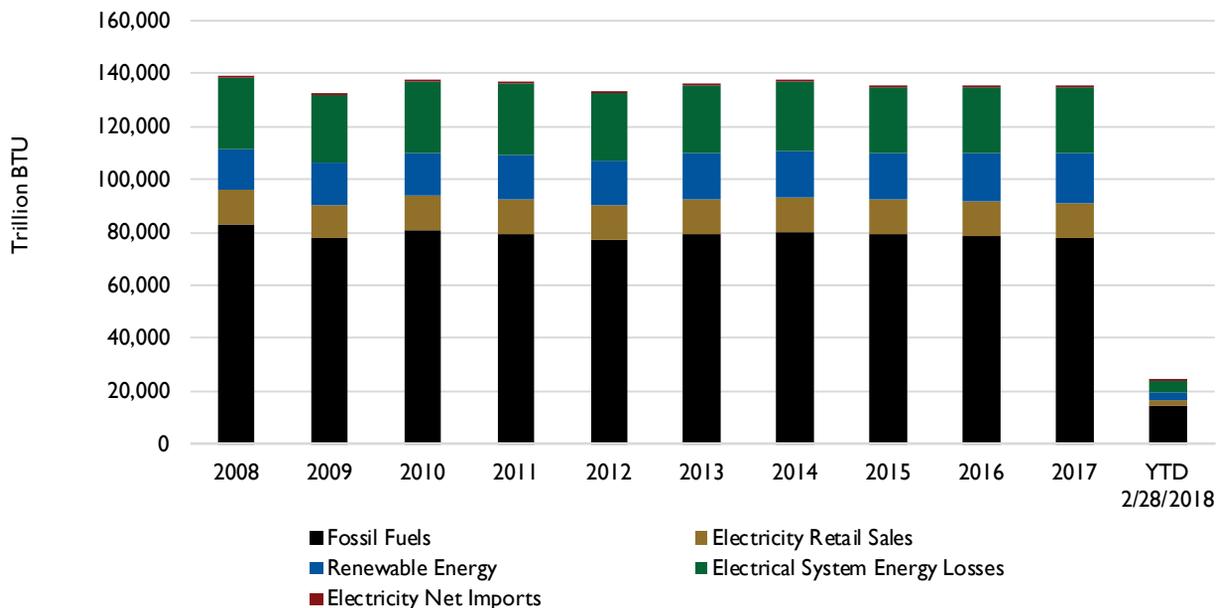
DATA CENTER

U.S. AGGREGATED ENERGY CONSUMPTION

ENERGY CONSUMPTION BY SECTOR (ANNUAL) ⁽⁵³⁾



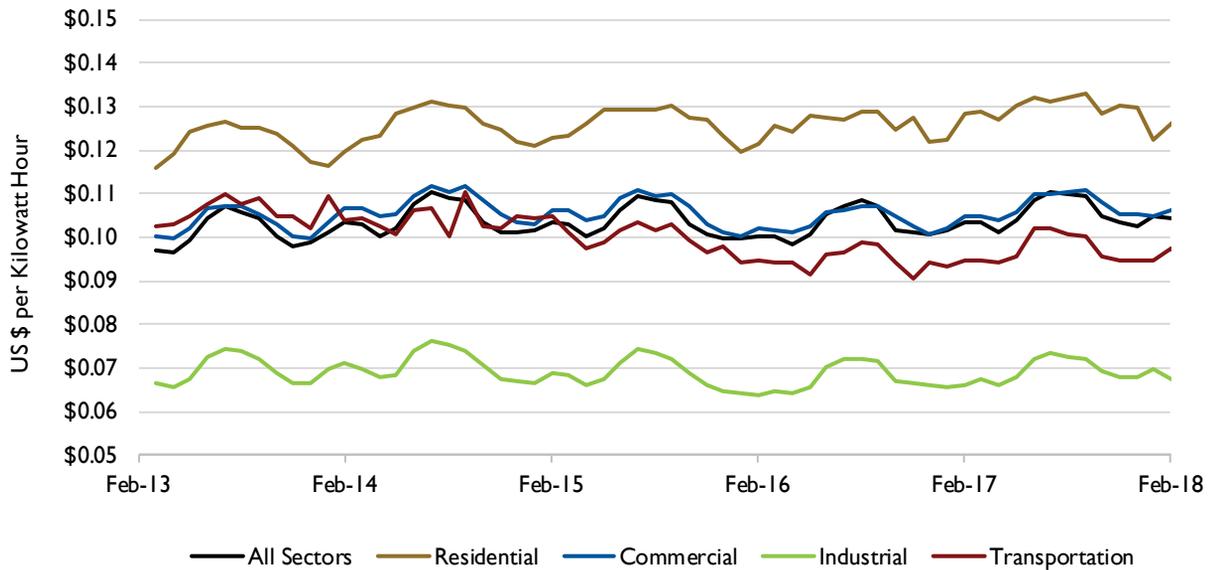
ENERGY CONSUMPTION BY SOURCE (ANNUAL) ⁽⁵⁴⁾



DATA CENTER

U.S. AGGREGATED ENERGY CONSUMPTION

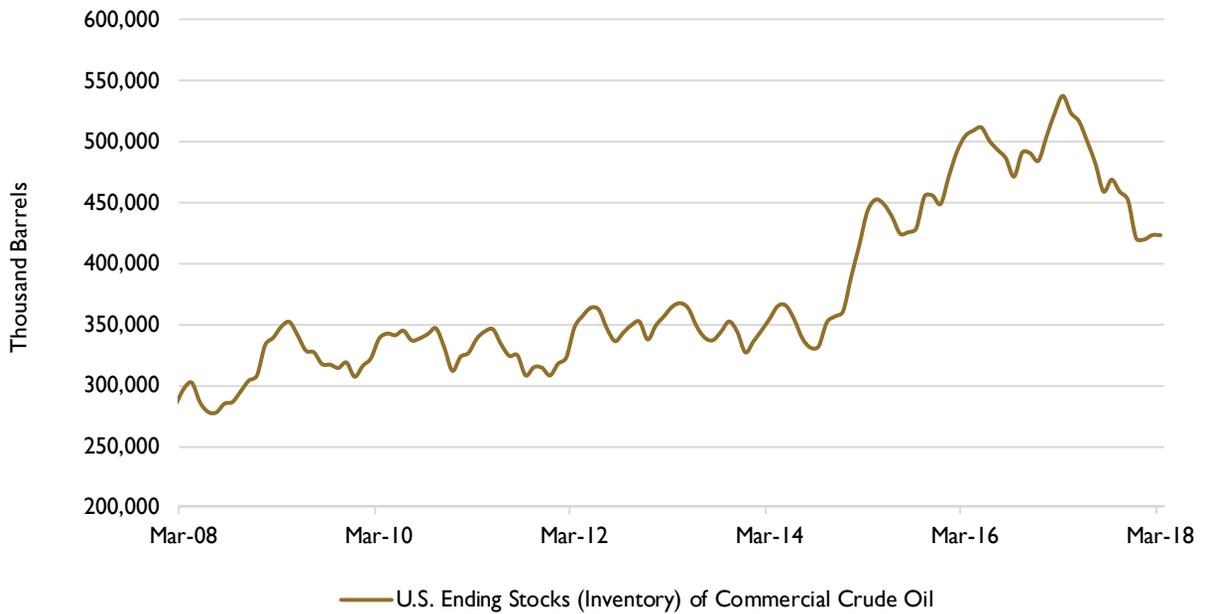
ELECTRICITY PRICES BY SECTOR (MONTHLY AVERAGE) ⁽⁵⁵⁾



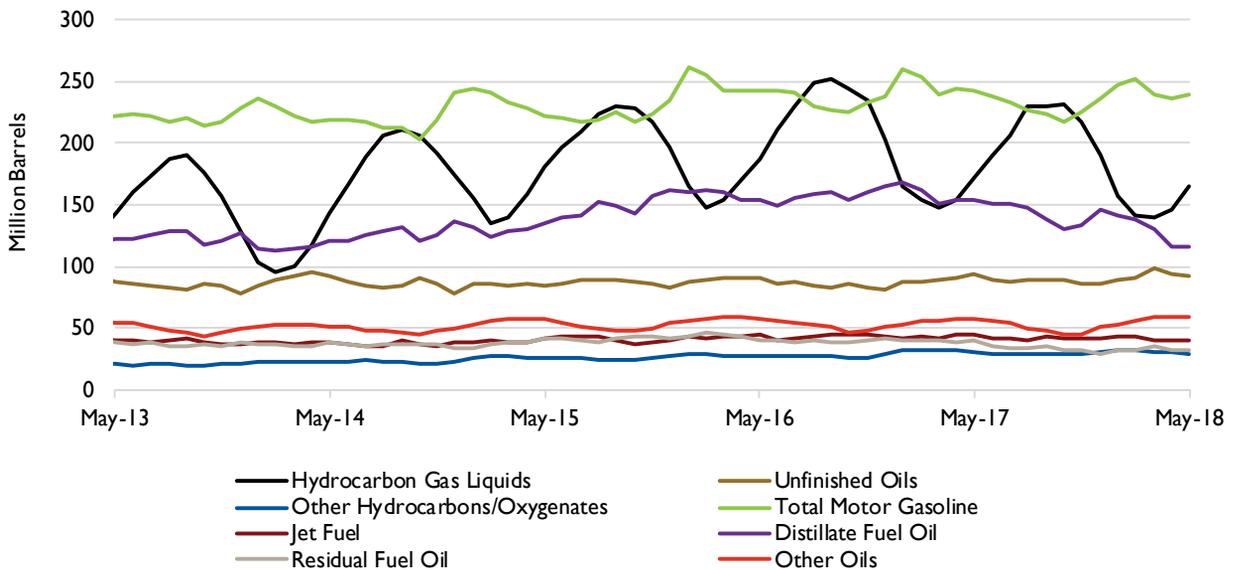
DATA CENTER

LOGISTICS - STORAGE AND TERMINALS

COMMERCIAL CRUDE OIL INVENTORY (MONTHLY) ⁽⁵⁶⁾



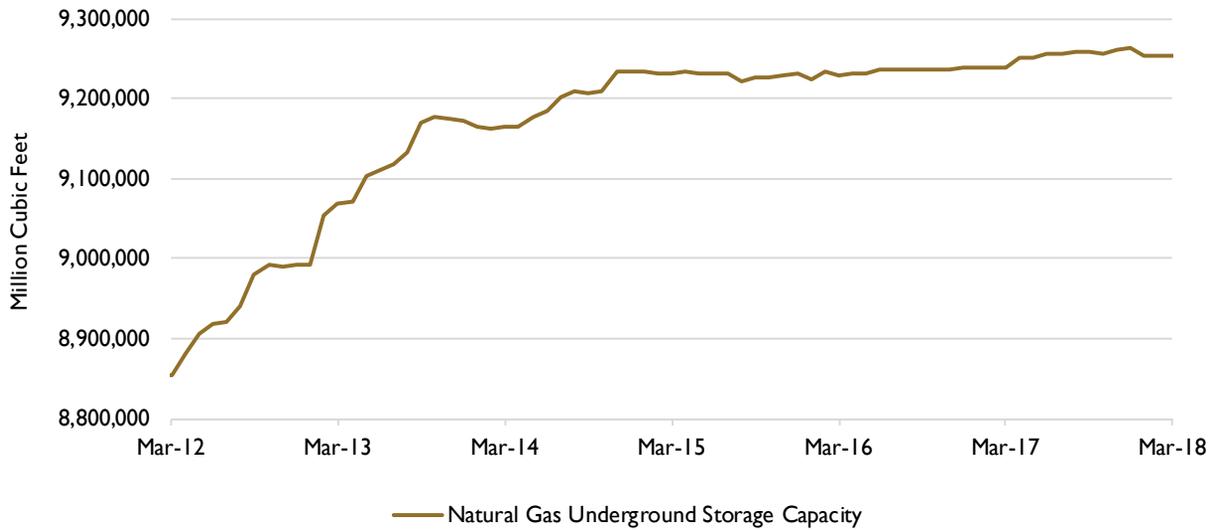
PETROLEUM AND OTHER LIQUIDS COMMERCIAL INVENTORY (MONTHLY) ⁽⁵⁷⁾



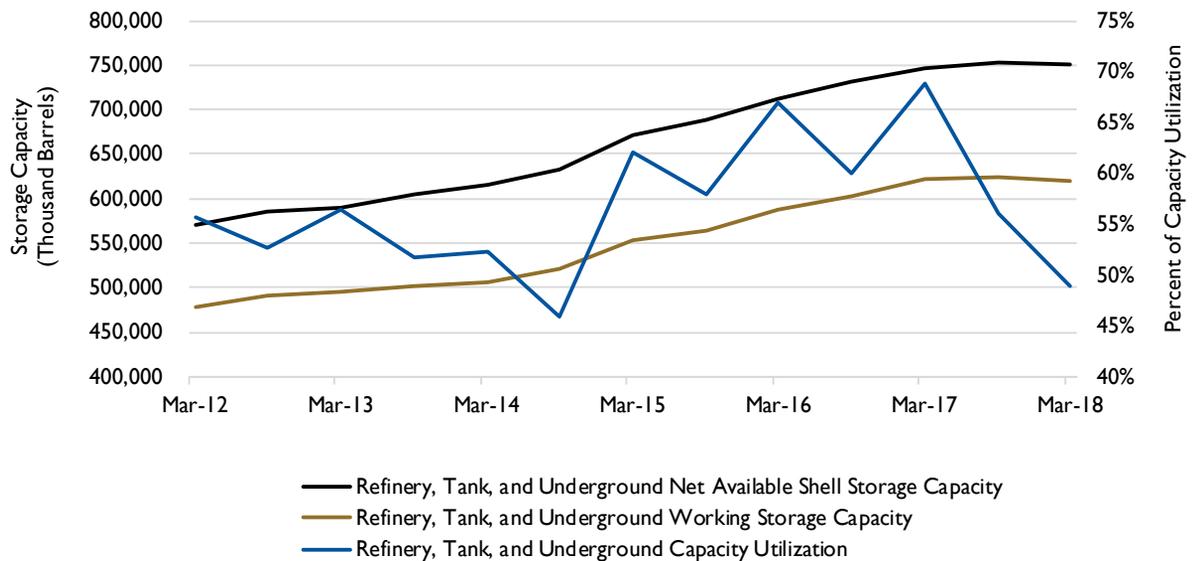
DATA CENTER

LOGISTICS - STORAGE AND TERMINALS

NATURAL GAS UNDERGROUND STORAGE CAPACITY (MONTHLY) (58)



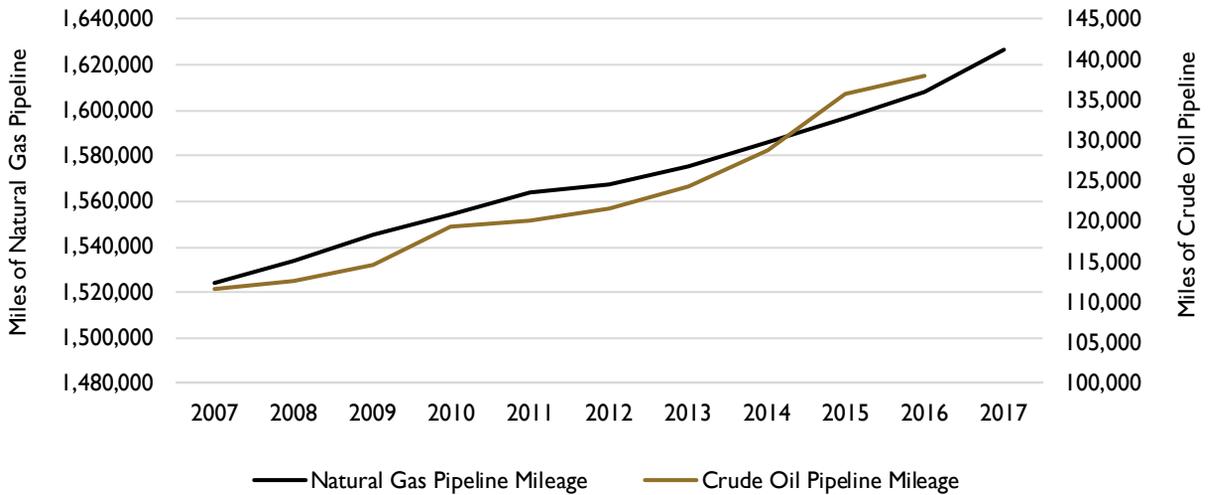
COMMERCIAL CRUDE OIL REFINERY, TANK AND UNDERGROUND STORAGE CAPACITY AND UTILIZATION (MONTHLY) (59)



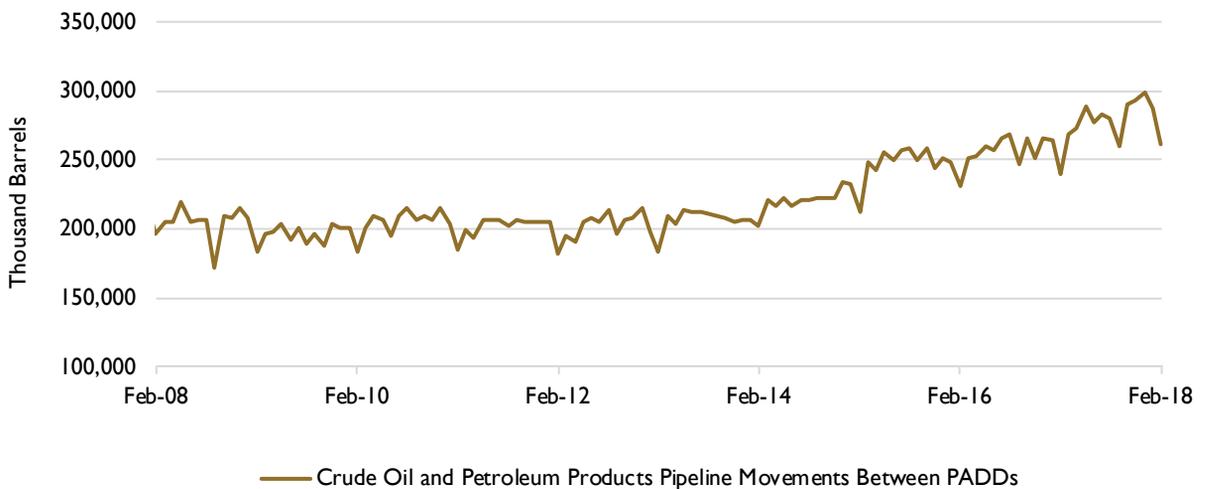
DATA CENTER

LOGISTICS - PIPELINES

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



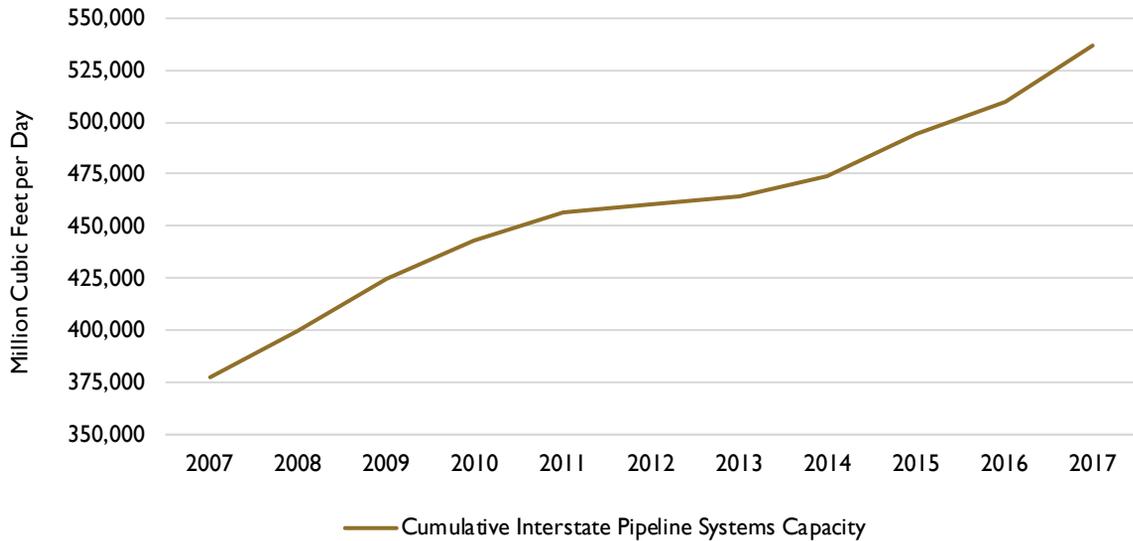
CRUDE OIL AND PETROLEUM PRODUCTS PIPELINE MOVEMENTS BETWEEN PETROLEUM ADMINISTRATION FOR DEFENSE DISTRICTS (PADDs) (MONTHLY) (61)



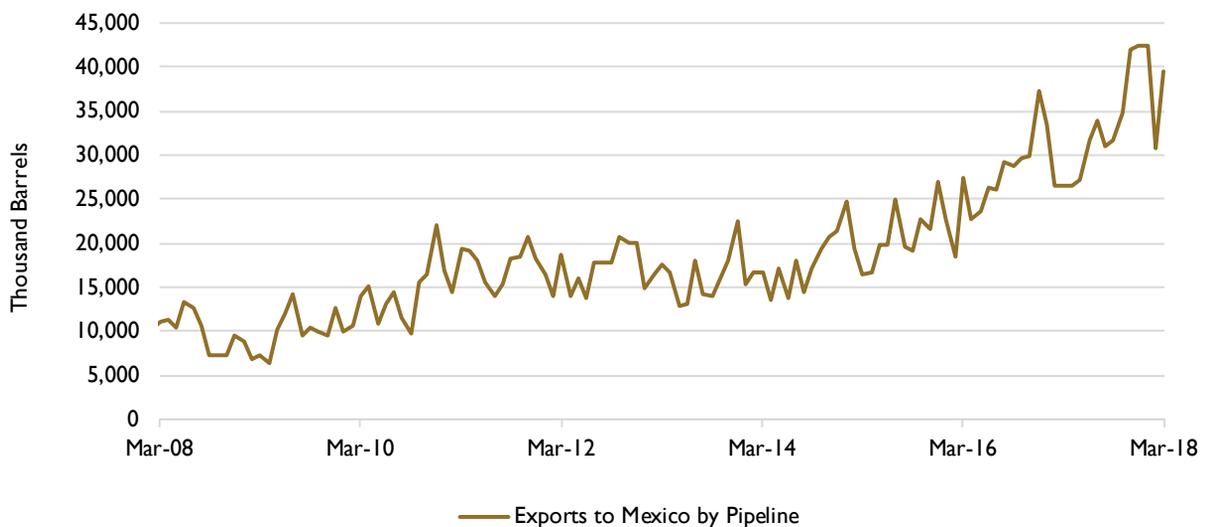
DATA CENTER

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

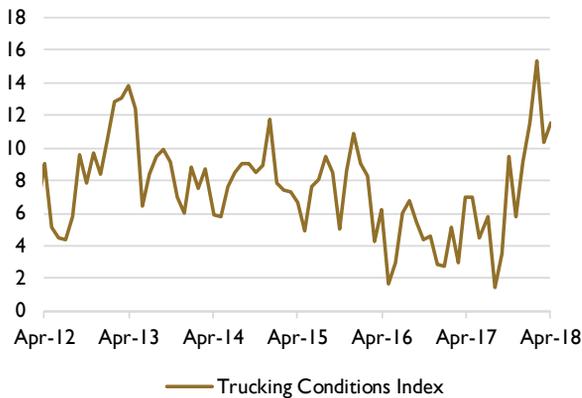


HEAVY TRUCK SALES
(MONTHLY) ⁽⁶⁵⁾



TRUCKING CONDITIONS INDEX
(MONTHLY) ⁽⁶⁶⁾

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



FREIGHT TRANSPORTATION SERVICES INDEX (MONTHLY) ⁽⁶⁷⁾

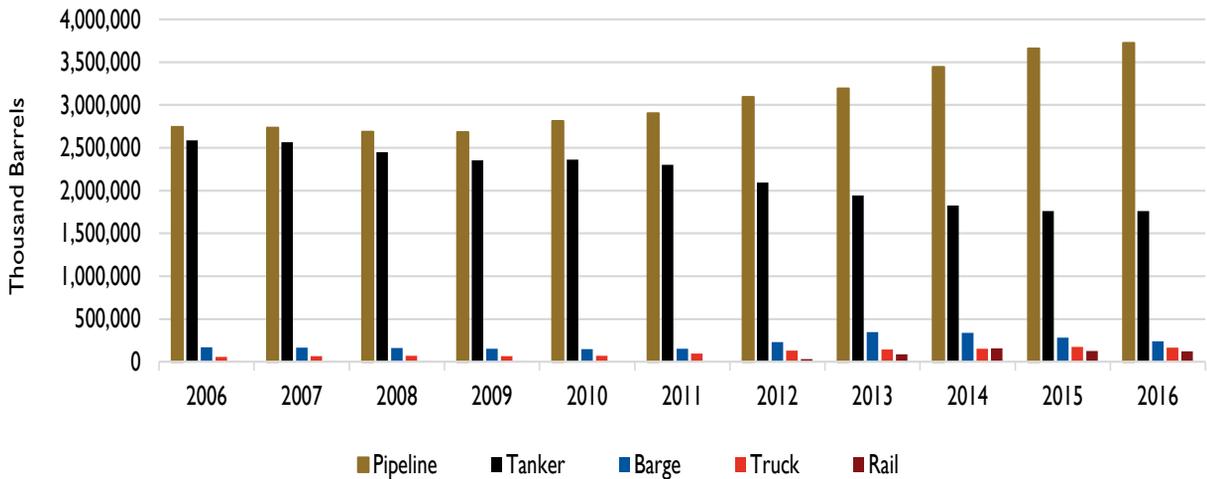
INCLUDES TRUCKING, RAIL, WATERWAYS, PIPELINES AND AIR FREIGHT



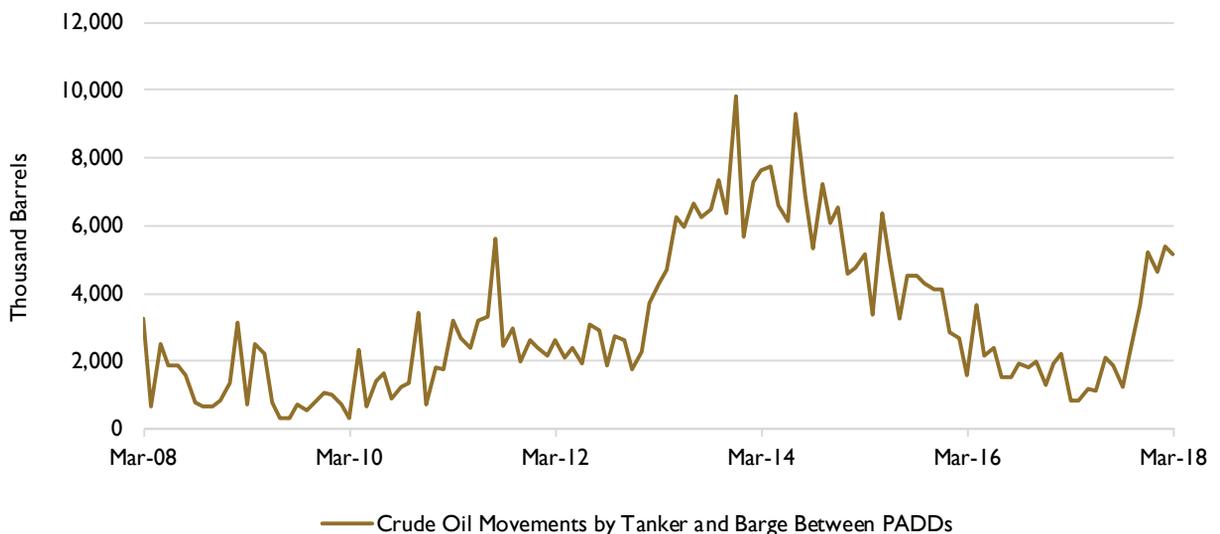
DATA CENTER

LOGISTICS - SHIPPING

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



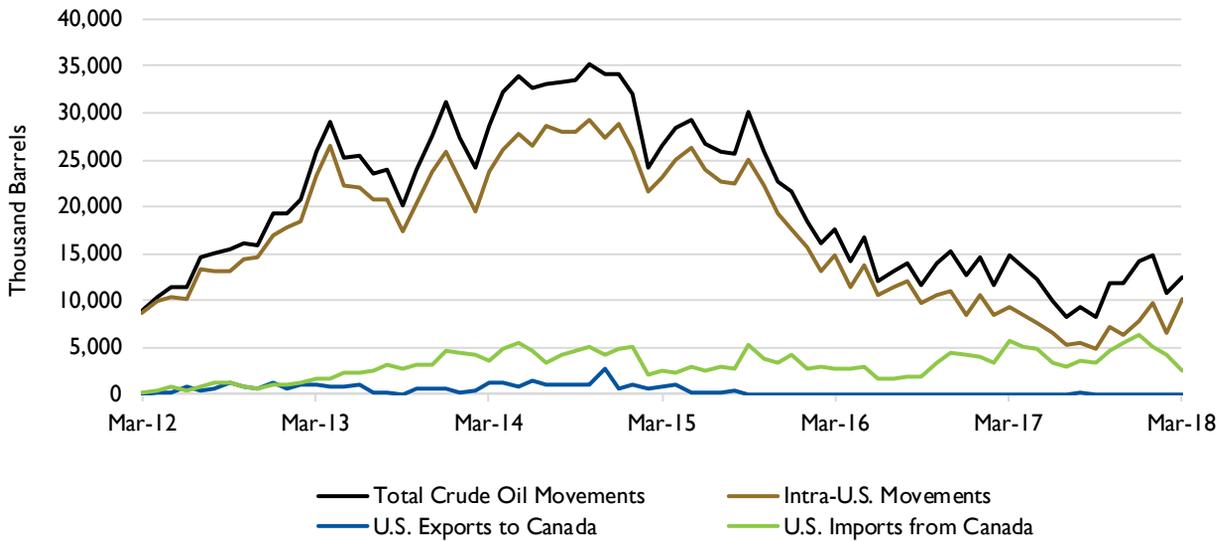
CRUDE OIL MOVEMENTS BY TANKER AND BARGE BETWEEN PETROLEUM ADMINISTRATION FOR DEFENSE DISTRICTS (PADDs) (MONTHLY) ⁽⁶⁹⁾



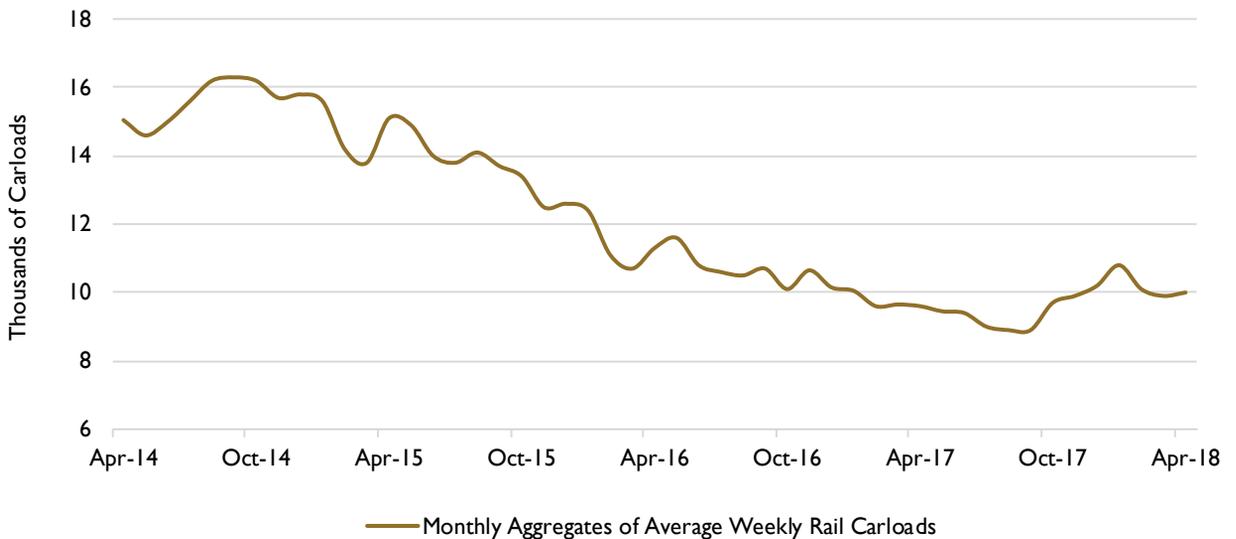
DATA CENTER

LOGISTICS - RAIL

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



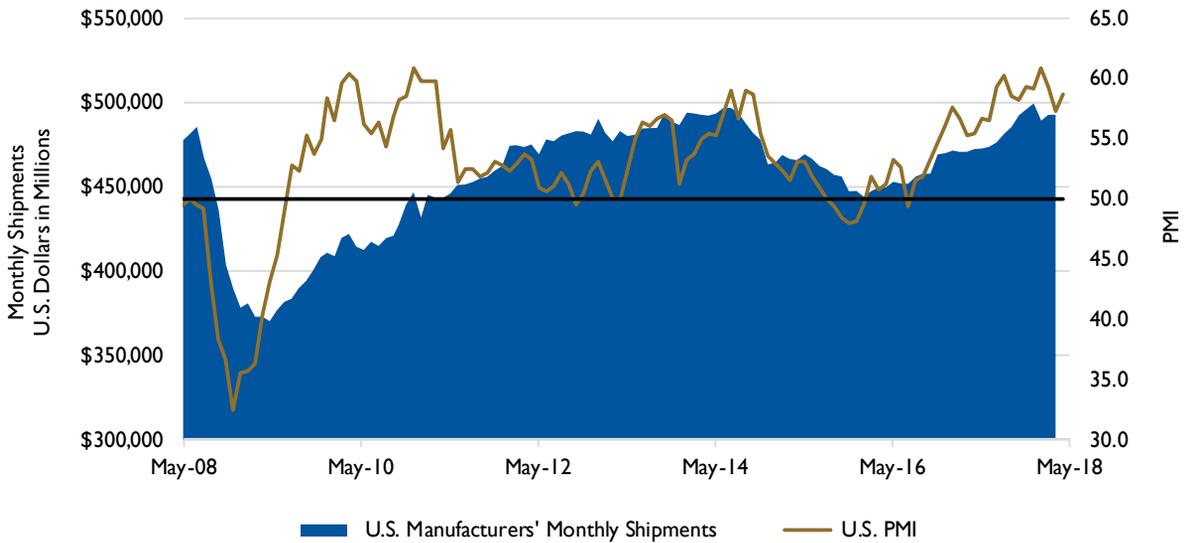
AVERAGE WEEKLY RAIL CARLOADS OF PETROLEUM AND PETROLEUM PRODUCTS (MONTHLY AGGREGATE) ⁽⁷¹⁾



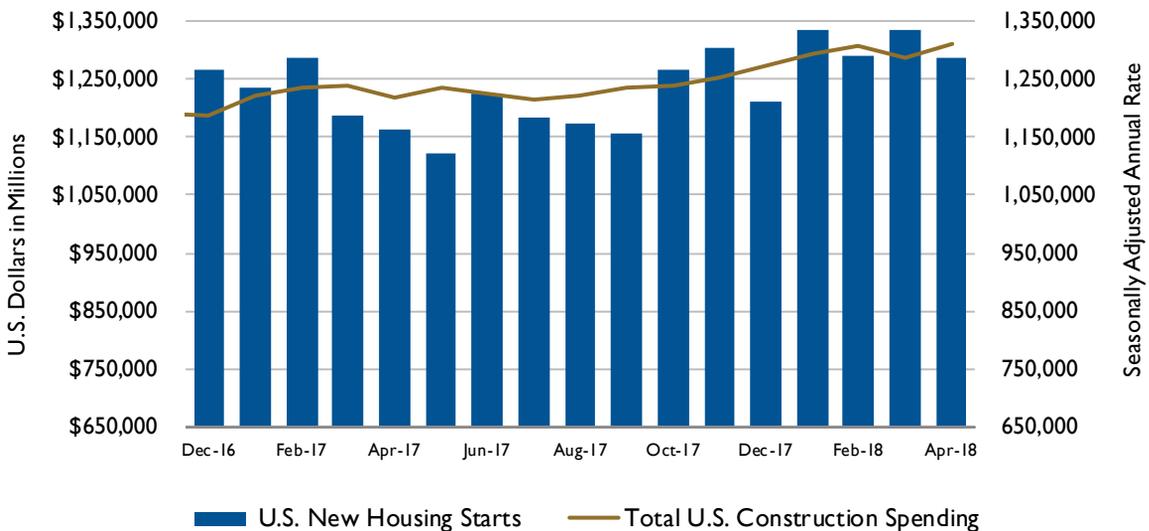
DATA CENTER

ECONOMIC / FINANCIAL

U.S. MANUFACTURERS' MONTHLY SHIPMENTS AND U.S. PURCHASING MANAGERS' INDEX (PMI) (MONTHLY) (72)



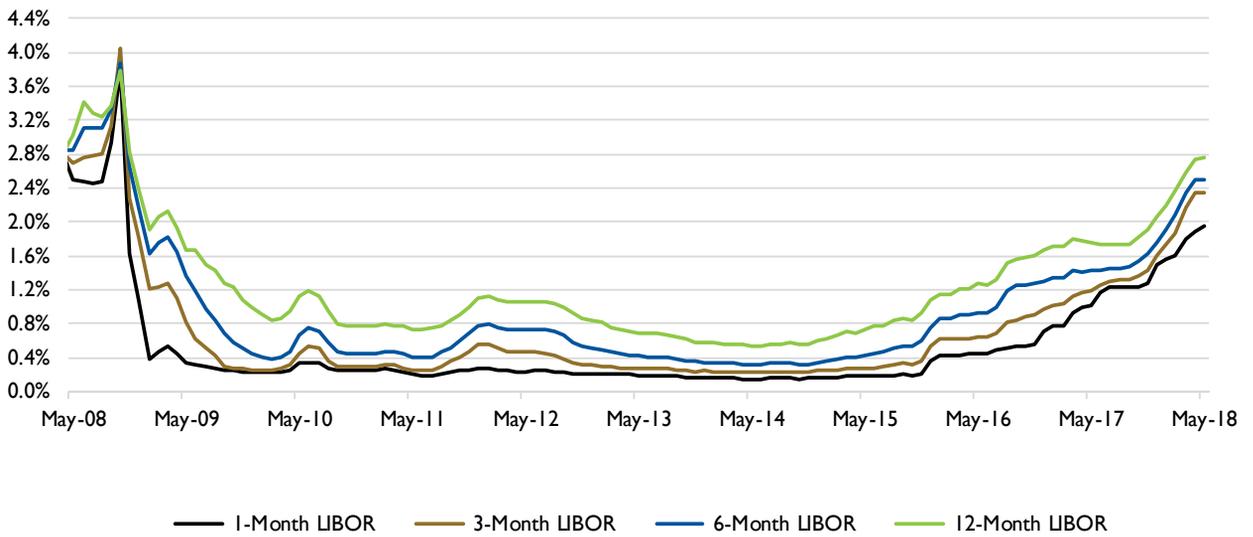
U.S. NEW HOUSING STARTS AND TOTAL U.S. CONSTRUCTION SPENDING (MONTHLY) (73)



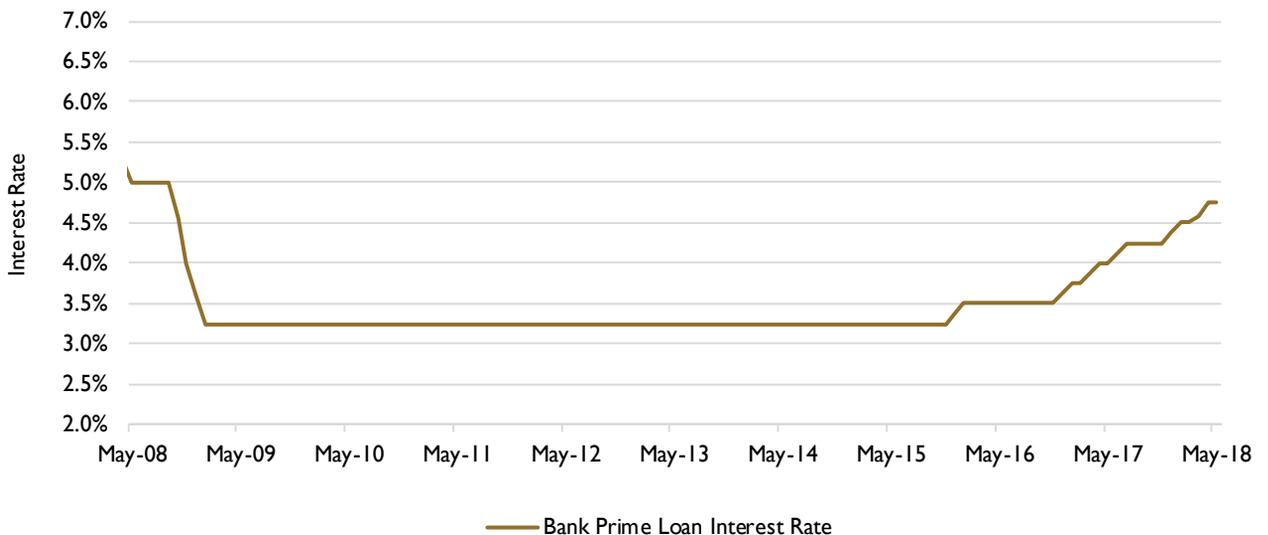
DATA CENTER

ECONOMIC / FINANCIAL

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



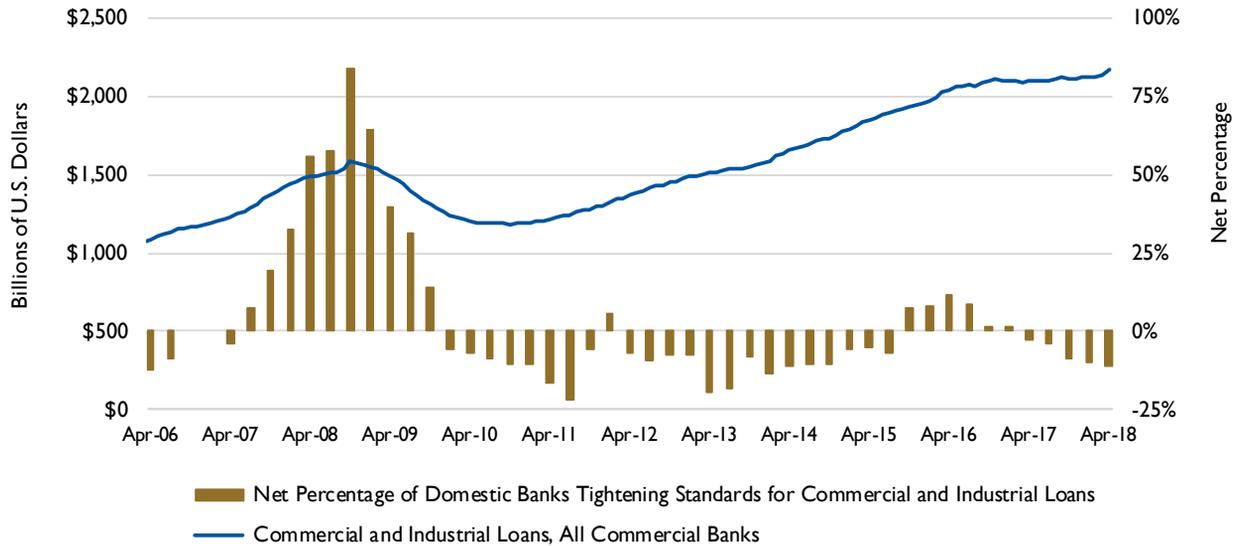
BANK PRIME LOAN INTEREST RATES (MONTHLY AVERAGE) ⁽⁷⁵⁾



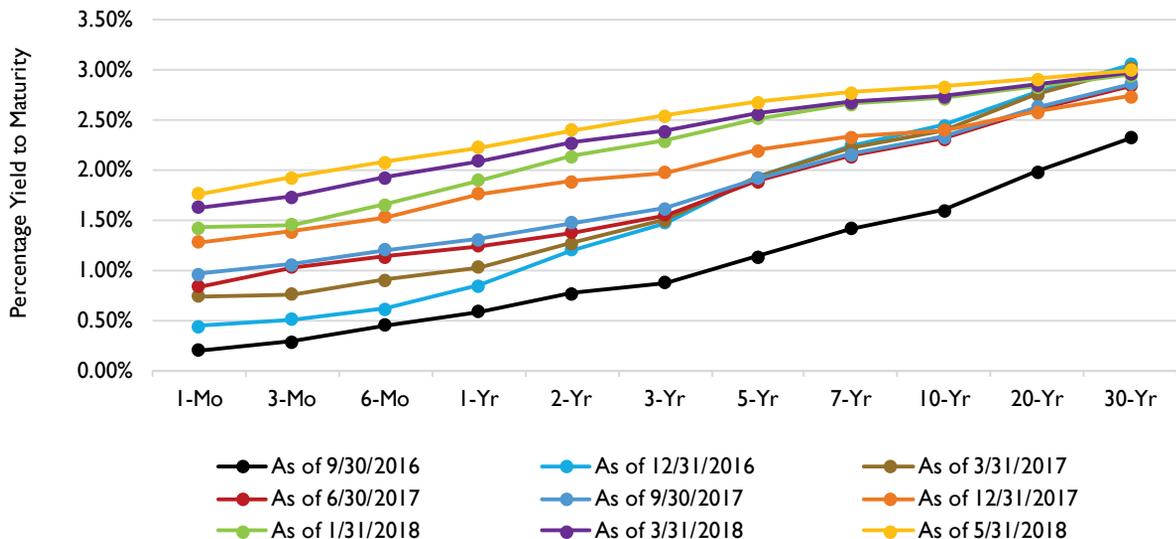
DATA CENTER

ECONOMIC / FINANCIAL

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



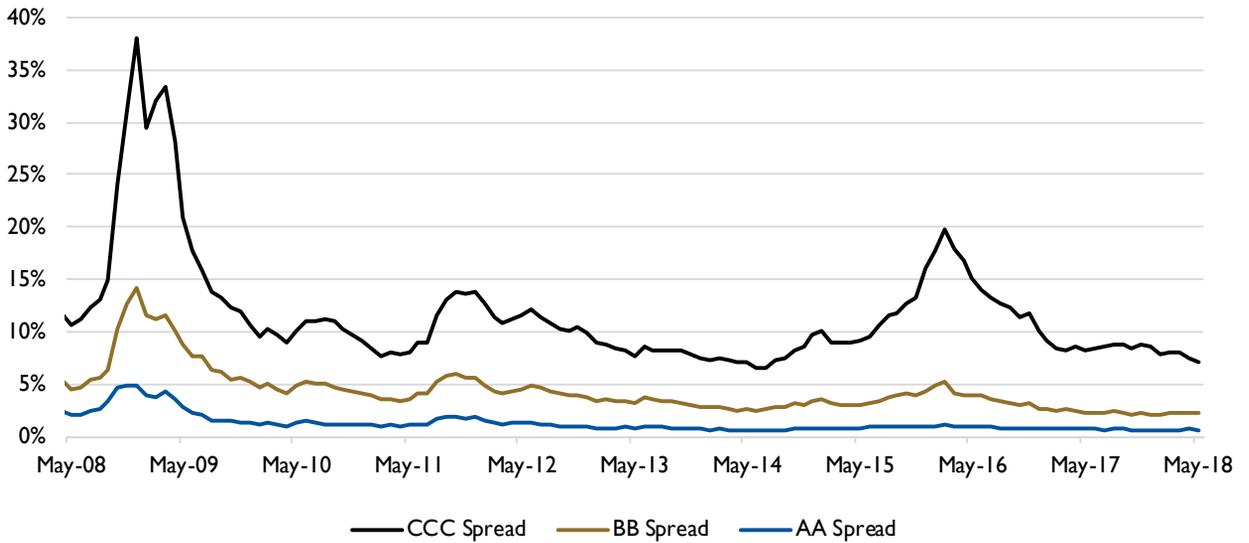
U.S. TREASURY YIELD CURVE (MONTHLY, ANNUAL) (77)



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), Meroy (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.europa.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, naphthas, 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 repressuring, 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.europa.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. Drilling Permits

- Source: Platts RigData.
- Total number of drilling permits issued per month on U.S. Land, U.S. Inland Waters and U.S. Offshore, respectively.

(34) U.S. Drilling Permits, Top 5 States

- Source: Platts RigData.
- The five states that issued the highest number of drilling permits each year.

(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 naphthas 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

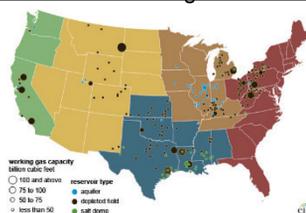
(57) Petroleum and Other Liquids Commercial Inventory (continued)

- 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 naphthas, 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 naphthas, 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 TOPIC

OUTLOOK FOR U.S. PARTICIPATION IN THE GLOBAL LNG MARKET

Both the U.S. and global liquefied natural gas (LNG) markets are early into a major transformative growth spurt. According to the firm Energy Ventures Analysis (EVA), new LNG liquefaction and export projects currently in operation (Sabine Pass, TX and Cove Point, MD) are now producing at a rate of 23 million tons per annum (mtpa), which converts to 3 billion cubic feet per day (bcf/d) of production. Additional capacity now under construction (Cameron-Lake Charles, LA; Elba Island, GA; and Freeport and Corpus Christi, TX) will be coming online between November 2018 and early 2020 and will have an additional capacity of 41 mtpa, or 5.3 bcf/d.

That brings U.S. LNG exports from essentially zero in 2016 to 1.7 bcf/d in 2017 to 8.3 bcf/d by early 2020 – huge growth in just a little over three years. By 2025, LNG exports will grow to 11 bcf/d, according to DrillingInfo.com’s Maria Sanchez. To put that in context of overall U.S. production, total U.S. dry natural gas production pre-LNG was about 73 bcf/d in 2016 and is forecast by the U.S. Energy Information Administration (EIA) to reach about 83 bcf/d in 2019 – meaning the lion’s share of production growth can be attributed to LNG exports, and that new LNG exports will consume about 10% of total U.S. production.

Added to by rapidly growing U.S. pipeline exports to Mexico, now at over 4 bcf/d and rising rapidly, these expanding export markets can’t come too soon. One reason is rapid growth of Permian Basin natural gas production, which is actually a by-product of crude oil production. Another production growth enabler is the un-bottlenecking of Appalachian Basin production resulting from large transmission pipelines newly in service (ETP’s Rover) or under construction (Dominion’s Atlantic Coast Pipeline, EQT’s Mountain Valley Pipeline, Enbridge’s NEXUS line and Williams’ Atlantic Sunrise). These projects provide new and badly needed takeaway capacity of no less than about 9 bcf/d.

U.S. producers, while enjoying these new demand drivers, must remain cautious about further rapid growth in global LNG demand. The total global market was about 39 bcf/d in 2017⁽¹⁾, with 55% of that demand coming from three countries: Japan, South Korea and China; while 55% of the supply came from Qatar, Australia and Malaysia. Substantial demand growth is likely from China and India, both trying to improve their air quality, but restraints include lack of pipeline capacity to carry gas inland, along with competition from very cheap coal and increasing domestic natural gas production.

The global demand side of the equation is governed by new investment in LNG import capacity. One of the competitive factors is proximity of production to import terminals, which affects transportation costs and ultimately the cost of the re-gasified LNG in the local market. Here the Australians and Malaysians have the advantage. But American producers, while at a transportation cost disadvantage in the large Asian markets, enjoy a substantial advantage in a lower input cost of the natural gas, now around \$3 per thousand cubic feet (mcf), and forecast to remain in that vicinity for several years.

Bottom line for the U.S.: growth in global LNG markets, expansion of U.S. liquefaction capacity, ongoing growth of inexpensive natural gas providing lower input costs, and new pipelines to bring product to export terminals – all these factors point to U.S. LNG growing from nothing to consuming between 10% and 15% of U.S. production over the next several years, while driving an equivalent amount of production growth.



(1) Energy Ventures Analysis.

HOT TOPIC

CHINA SHAKES-UP CRUDE OIL TRADING

On March 26, 2018, China's long-awaited yuan-denominated crude oil futures launched on the Shanghai International Energy Exchange (INE) in a landmark move intended to shake-up the well-established crude oil trading landscape, and potentially the U.S. dollar's worldwide currency dominance.

Today, the world has three main oil benchmarks: Brent, quoted on the Intercontinental Exchange; West Texas Intermediate (WTI), quoted on the Chicago Mercantile Exchange; and Dubai-Oman, a less-prominent benchmark, quoted on the Dubai Mercantile Exchange. These benchmarks accurately represent the grade, or quality, of the oils transacted in the markets that they govern as well as the supply-demand dynamics of these markets, allowing regional and local transactions to be reliably priced against them. In addition, they are quoted in U.S. dollars, the world's primary reserve currency, facilitating efficient market function. The specific grades that these benchmarks represent are available from myriad producers. These factors create a highly liquid market (thanks to the ubiquity of financial speculators) that allows commercial participants to effectively hedge risk factors, such as price volatility.

China, the world's largest energy importer, has created a potential new benchmark that better reflects the quality of oil transacted in the East Asian market. The yuan-denomination will allow Chinese commercial participants to hedge risk while paying in domestic currency which, in turn, will give the country more leverage to price global energy supplies. A prudent move for China given their ever-accelerating dependence on foreign oil (last year China surpassed the U.S. as the world's largest crude oil importer). Moreover, the INE is located in Shanghai's free-trade zone, enabling foreign participants to invest in a Chinese commodity derivative for the first time.

China's open-trade derivative debut represents a conspicuous attempt to wrangle a degree of price control away from the U.S. dollar while simultaneously internationalizing the renminbi, of which the yuan is the unit, in the global market. This has triggered much conjecture amongst the financial community that, if the contract were to become successful enough, it could become a legitimate benchmark to grades distinct from Western contracts. Even further, if the contract gains enough traction amongst investors to the degree that demand swings from the U.S. dollar to the renminbi, the latter could usurp the former as the world's dominant petro-currency.

Although the new crude futures market has been widely considered a success to date, with its average daily volume rising 147% in May over April,⁽¹⁾ retail and financial investors make up the bulk of the trades, satisfying only the liquidity requirement of benchmark formation. Further, China's tendency for market intervention and capital controls may be an impediment to the benchmark's success. Additional obstacles include INE's high fees and margin requirements, exchange rate risk and the appetite for hedging the yuan against the U.S. dollar, as well as off-kilter trading windows.

Is this move by the Chinese the beginning of the end of the U.S. dollar's petro-currency dominance and another step in China's drive to replace the U.S. dollar with the renminbi as the world's primary reserve currency (as the U.S. dollar replaced the pound sterling after World War II)? ... **We encourage everyone to stay tuned ...**

(1) S&P Global Platts, China's Crude Oil Futures Market Liquidity Hits Record High in Early June, June 5, 2018.

PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

PETROLEUM PRODUCTS

EQUITY COMPARABLES (1)

Petroleum Products (United States & Canada)

Company	LTM ⁽²⁾			Stock Price 03/31/18	% of 52-Week High	Market Cap	Total Enterprise Value ⁽³⁾	TEV / LTM		Net Debt ⁽⁴⁾ EBITDA
	Revenues	EBITDA	Margin					Revenues	EBITDA	
Andeavor	38,000	2,728	7.2	100.56	82.6	15,381	26,123	0.7x	9.6x	3.0x
Calumet Specialty Products Partners, LP	3,628	231	6.4	7.05	70.9	541	2,473	0.7x	10.7x	8.4x
Chevron Corporation	133,606	24,116	18.1	114.04	85.2	217,845	252,981	1.9x	10.5x	1.4x
CVR Energy, Inc.	6,018	393	6.5	30.22	76.1	2,624	4,094	0.7x	10.4x	1.9x
EnLink Midstream Partners, LP	6,186	898	14.5	13.66	72.0	4,781	10,239	1.7x	11.4x	4.3x
Gibson Energy Inc.	4,993	196	3.9	12.88	84.5	1,845	2,757	0.6x	14.1x	5.1x
Exxon Mobil Corporation	248,391	34,987	14.1	74.61	83.5	316,157	362,128	1.5x	10.4x	1.0x
HollyFrontier Corporation	15,299	1,729	11.3	48.86	91.8	8,650	11,045	0.7x	6.4x	0.9x
Keyera Corp.	2,833	493	17.4	25.99	78.7	5,327	6,507	2.3x	13.2x	2.5x
Marathon Petroleum Corporation	69,859	5,912	8.5	73.11	97.6	34,683	52,413	0.8x	8.9x	2.1x
Parkland Fuel Corporation	8,621	371	4.3	22.48	89.3	2,956	4,500	0.5x	12.1x	4.2x
Phillips 66	93,072	3,424	3.7	95.92	89.3	44,730	54,064	0.6x	15.8x	3.1x
NuStar Energy LP	1,802	618	34.3	20.39	38.7	1,900	6,323	3.5x	10.2x	6.0x
Valero Energy Corporation	92,882	5,927	6.4	92.77	92.8	39,977	43,908	0.5x	7.4x	0.7x

Median			7.8%		84.0%			0.7x	10.5x	2.8x
Mean			11.2%		80.9%			1.2x	10.8x	3.2x

SELECTED TRANSACTIONS

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
11/8/2017	Alon USA Partners, LP	Delek US Holdings, Inc. (NYSE:DK)	\$1,050.4	0.5x	5.9x
2/2/2017	ONEOK Partners, LP	ONEOK, Inc. (NYSE:OKE)	\$23,722.4	2.7x	12.9x
4/5/2017	Houghton International Inc.	Quaker Chemical Corporation (NYSE:KWR)	\$1,415.4	-	11.8x
10/14/2016	Alon USA Energy, Inc.	Delek US Holdings, Inc. (NYSE:DK)	\$1,488.1	0.3x	16.6x
9/25/2016	LANXESS Solutions US Inc.	LANXESS Deutschland GmbH	\$2,450.7	-	8.2x
3/31/2015	Alon USA Energy, Inc.	Delek US Holdings, Inc. (NYSE:DK)	\$1,624.1	0.3x	4.5x

(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⁾			Stock Price 03/31/18	% of 52-Week High	Market Cap	Total Enterprise Value ⁽³⁾	TEV / LTM		Net Debt ⁽⁴⁾ EBITDA
	Revenues	EBITDA	Margin					Revenues	EBITDA	
Alliant Energy Corporation	\$3,445	\$1,169	33.9%	\$40.86	89.7%	\$9,453	\$14,907	4.3x	12.8x	4.6x
AltaGas Ltd.	2,114	557	26.4	18.49	75.2	3,289	7,157	3.4x	12.8x	5.0x
Atmos Energy Corporation	3,100	1,085	35.0	84.24	90.0	9,347	12,811	4.1x	11.8x	3.0x
Avista Corporation	1,419	455	32.1	51.25	97.0	3,363	5,308	3.7x	11.7x	4.1x
Baytex Energy Corp.	673	298	44.4	2.74	73.4	648	1,955	2.9x	6.6x	4.5x
Calumet Specialty Products Partners, LP	3,628	231	6.4	7.05	70.9	541	2,473	0.7x	10.7x	8.4x
Cenovus Energy Inc.	14,045	1,484	10.6	8.51	71.4	10,453	17,357	1.2x	11.7x	4.9x
Chesapeake Utilities Corporation	672	137	20.4	70.35	81.5	1,150	1,602	2.4x	11.7x	3.3x
Corning Natural Gas Holding Corporation	33	8	25.5	17.55	73.1	53	108	3.3x	12.8x	5.7x
Crestwood Equity Partners LP	4,168	280	6.7	25.60	87.5	1,811	4,090	1.0x	14.6x	5.2x
Dominion Energy Midstream Partners, LP	460	227	49.2	15.35	44.0	1,534	7,102	15.4x	31.4x	3.3x
EnLink Midstream Partners, LP	6,186	898	14.5	13.66	72.0	4,781	10,239	1.7x	11.4x	4.3x
Enbridge Energy Partners, LP	2,415	1,504	62.3	9.64	49.1	4,089	16,573	6.9x	11.0x	4.9x
Enterprise Products Partners LP	31,220	5,272	16.9	24.48	83.0	53,156	77,947	2.5x	14.8x	4.8x
Epsilon Energy Ltd.	26	18	68.8	1.94	74.4	107	100	3.9x	5.6x	(0.5)x
Eversource Energy	7,935	2,667	33.6	58.92	89.1	18,671	32,202	4.1x	12.1x	5.2x
Genesis Energy, LP	2,339	476	20.3	19.71	58.8	2,416	6,839	2.9x	14.4x	7.8x
National Fuel Gas Company	1,596	737	46.2	51.45	84.1	4,415	6,333	4.0x	8.6x	2.5x
New Jersey Resources Corporation	2,718	343	12.6	40.10	88.2	3,513	5,061	1.9x	14.7x	3.8x
Northwest Natural Gas Company	730	244	33.4	57.65	82.9	1,658	2,488	3.4x	10.2x	3.3x
MDU Resources Group, Inc.	4,482	641	14.3	28.16	99.8	5,500	7,180	1.6x	11.2x	2.7x
OGE Energy Corp.	2,298	826	35.9	32.77	87.8	6,544	9,698	4.2x	11.7x	3.9x
ONE Gas, Inc.	1,628	454	27.9	66.02	83.0	3,454	4,990	3.1x	11.0x	3.2x
ONEOK, Inc.	12,526	1,910	15.2	56.92	92.8	23,373	32,631	2.6x	17.1x	4.2x
RGC Resources, Inc.	65	18	27.2	25.40	79.4	203	272	4.2x	15.3x	2.8x
Rice Midstream Partners LP	316	246	77.7	18.10	69.1	1,852	2,473	7.8x	10.1x	1.1x
South Jersey Industries, Inc.	1,339	364	27.2	28.16	73.3	2,235	3,771	2.8x	10.4x	4.1x
Southwest Gas Holdings, Inc.	2,648	572	21.6	67.63	77.9	3,259	5,252	2.0x	9.2x	3.5x
Summit Midstream Partners, LP	470	251	53.5	14.05	56.8	1,027	2,410	5.1x	9.6x	4.3x
Targa Resources Corp.	9,158	1,111	12.1	44.00	72.6	9,629	15,433	1.7x	13.9x	4.6x
TransCanada Corporation	10,442	5,197	49.8	41.32	81.7	36,604	73,777	7.1x	14.2x	6.5x
Valener Inc.	52	0	0.0	15.68	86.9	612	766	14.8x	NM	NM
WGL Holdings, Inc.	2,442	511	20.9	83.65	96.3	4,296	6,802	2.8x	13.3x	4.6x
Median			27.2%		81.5%			3.3x	11.7x	4.2x
Mean			29.8%		78.6%			4.0x	12.4x	4.2x

- (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

SELECTED TRANSACTIONS (1)

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
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)	EQT 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

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

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⁾			Stock Price	% of 52-Week High	Market Cap	Total Enterprise Value ⁽³⁾	TEV / LTM		Net Debt ⁽⁴⁾
	Revenues	EBITDA	Margin	03/31/18				Revenues	EBITDA	EBITDA
AmeriGas Partners, LP	\$2,740	\$592	21.6%	\$39.97	82.6%	\$3,716	\$6,594	2.4x	11.1x	4.6x
Ferrellgas Partners, LP	2,181	223	10.2	3.12	50.6	303	2,458	1.1x	11.0x	10.0x
NGL Energy Partners LP	17,283	312	1.8	11.00	47.4	1,332	4,468	0.3x	14.3x	8.5x
Spire Inc.	1,957	459	23.5	72.30	87.3	3,495	6,214	3.2x	13.5x	5.6x
Star Group, LP	1,528	95	6.2	9.35	79.9	523	653	0.4x	6.9x	1.6x
Suburban Propane Partners, LP	1,330	273	20.5	22.01	80.7	1,351	2,665	2.0x	9.8x	4.7x
UGI Corporation	7,205	1,492	20.7	44.42	85.4	7,685	12,686	1.8x	8.5x	2.8x
Median			20.5%		80.7%			1.8x	11.0x	4.7x
Mean			14.9%		73.4%			1.6x	10.7x	5.4x

SELECTED TRANSACTIONS

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
5/11/2017	Bell-Gaz Itée	Groupe Filgo-Sonic	-	-	-
3/15/2017	Valley Center Propane, LLC	Ferrellgas Partners, LP (NYSE:FGP)	-	-	-
12/2/2016	DOC Retail, Inc.	Holston Gases, Inc.	-	-	-
11/22/2016	Zephyr Solutions, Inc.	Aterian Investment Partners, LLC	-	-	-
10/11/2016	33 MMcf/d Gas-Processing Facility with Pipelines and Retail Propane Business	Noble Energy Partners	-	-	-
6/17/2016	Caledon Propane Inc.	Superior Plus Corp. (TSX:SPB)	-	-	-
6/15/2016	Selph's Propane, Inc.	Ferrellgas Partners, LP (NYSE:FGP)	-	-	-
1/15/2016	Hopatcong Gas Services Inc.	Combined Energy Services, Inc.	-	-	-
12/28/2015	Gulf Oil LP	ArcLight Capital Partners, LLC	-	-	-
12/11/2015	CenterPoint Energy, Inc. (NYSE:CNP)	Elliott Management Corporation	-	-	2.3x
6/10/2015	Smart Touch Energy	Shiplay Energy Company, Inc.	-	-	-

- (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

DRILLING

EQUITY COMPARABLES (1)

Drilling (United States & Canada)

Company	LTM ⁽²⁾			Stock Price 03/31/18	% of 52-Week High	Market Cap	Total Enterprise Value ⁽³⁾	TEV / LTM		Net Debt ⁽⁴⁾ EBITDA
	Revenues	EBITDA	Margin					Revenues	EBITDA	
AKITA Drilling Ltd.	\$61	(\$10)	(16.6)%	\$5.75	80.3%	\$104	\$103	1.7x	NM	NM
Baker Hughes, a GE company	19,594	2,005	10.2	27.77	44.6	11,647	37,437	1.9x	18.7x	0.9x
CES Energy Solutions Corp.	836	105	12.5	4.56	77.7	1,223	1,550	1.9x	14.8x	3.2x
Diamond Offshore Drilling, Inc.	1,376	518	37.6	14.66	71.8	2,012	3,608	2.6x	7.0x	3.0x
Enscoc plc	1,789	385	21.5	4.39	46.2	1,920	5,783	3.2x	15.0x	10.7x
Ensign Energy Services Inc.	782	157	20.1	4.68	73.1	736	1,284	1.6x	8.2x	3.6x
Halliburton Company	22,081	3,992	18.1	46.94	81.1	41,068	49,631	2.2x	12.4x	2.1x
Helmerich & Payne, Inc.	2,172	521	24.0	66.56	88.7	7,246	7,313	3.4x	14.0x	0.2x
Independence Contract Drilling, Inc.	95	11	11.2	3.78	63.5	144	191	2.0x	17.9x	4.9x
National Oilwell Varco, Inc.	7,358	515	7.0	36.81	91.3	13,993	15,334	2.1x	29.8x	2.9x
Precision Drilling Corporation	1,050	245	23.3	2.78	53.0	814	2,106	2.0x	8.6x	5.4x
Rowan Companies plc	1,120	343	30.6	11.54	66.6	1,457	2,635	2.4x	7.7x	3.8x
Secure Energy Services Inc.	2,003	110	5.5	5.69	69.9	934	1,167	0.6x	10.6x	2.5x
Trinidad Drilling Ltd.	405	79	19.6	1.38	67.4	377	778	1.9x	9.8x	5.3x
Unit Corporation	769	303	39.4	19.76	73.7	1,068	1,903	2.5x	6.3x	2.7x

Median		19.6%		71.8%		2.0x	11.5x	3.1x
Mean		17.6%		69.9%		2.1x	12.9x	3.6x

SELECTED TRANSACTIONS

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
2/15/2018	Layne Christensen Company (NasdaqGS:LAYN)	Granite Construction Inc. (NYSE:GVA)	\$491.9	1.0x	16.5x
5/31/2017	Atwood Oceanics, Inc. (NYSE:ATW)	Enscoc plc (NYSE:ESV)	\$1,760.6	2.2x	4.7x
5/19/2017	Savanna Energy Services Corp.	Total Energy Services Inc. (TSX:TOT)	\$458.2	1.4x	16.6x
12/12/2016	Seventy Seven Energy Inc.	Patterson-UTI Energy, Inc. (NasdaqGS:PTEN)	\$1,878.9	-	18.8x
11/23/2016	Savanna Energy Services Corp.	Total Energy Services Inc. (TSX:TOT)	\$362.5	1.4x	13.3x
5/19/2016	FMC Technologies, Inc.	TechnipFMC plc (NYSE:FTI)	\$6,803.9	-	8.4x

(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

LUBRICANTS AND GREASES

EQUITY COMPARABLES (1)

Lubricants and Greases (United States & Canada)

Company	LTM ⁽²⁾			Stock Price	% of 52-Week High	Market Cap	Total Enterprise Value ⁽³⁾	TEV / LTM		Net Debt ⁽⁴⁾
	Revenues	EBITDA	Margin	03/31/18				Revenues	EBITDA	EBITDA
Albemarle Corporation	\$3,172	\$905	28.5%	\$92.74	64.0%	\$10,269	\$11,112	3.5x	12.3x	0.9x
Ashland Global Holdings Inc.	3,566	607	17.0	69.79	54.4	4,343	6,681	1.9x	11.0x	4.0x
Clean Harbors, Inc.	3,006	430	14.3	48.81	79.2	2,758	4,030	1.3x	9.4x	3.3x
CSW Industrials, Inc.	326	67	20.6	45.05	90.1	719	734	2.2x	10.9x	0.2x
FMC Corporation	3,493	895	25.6	76.57	77.6	10,297	13,248	3.8x	14.8x	3.3x
Ingevity Corporation	989	259	26.2	73.69	89.8	3,111	3,488	3.5x	13.5x	2.7x
KMG Chemicals, Inc.	402	92	22.9	59.95	84.9	930	1,245	3.1x	13.5x	3.4x
Kraton Corporation	2,005	349	17.4	47.71	89.4	1,512	3,071	1.5x	8.8x	4.5x
NewMarket Corporation	2,245	389	17.3	401.68	83.0	4,731	5,250	2.3x	13.5x	1.4x
Ocean Bio-Chem, Inc.	39	5	11.6	4.12	72.2	38	40	1.0x	8.8x	0.4x
Quaker Chemical Corporation	837	115	13.8	148.13	89.3	1,971	1,950	2.3x	16.9x	(0.1)x
Stepan Company	1,956	223	11.4	83.18	89.5	1,873	1,865	1.0x	8.4x	0.2x
Synalloy Corporation	217	15	6.8	14.60	94.2	128	153	0.7x	10.4x	2.3x
Trecora Resources	261	29	11.1	13.60	95.1	332	428	1.6x	14.8x	3.6x
Valvoline Inc.	2,195	559	25.5	22.13	86.3	4,427	5,478	2.5x	9.8x	1.9x
Median			17.3%		86.3%			2.2x	11.0x	2.3x
Mean			18.0%		82.6%			2.2x	11.8x	2.1x

SELECTED TRANSACTIONS

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
5/22/2017	Huntsman Corporation (NYSE:HUN)	Clariant AG (SWX:CLN)	\$10,790.9	1.1x	9.6x
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	\$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

SOLAR

EQUITY COMPARABLES (1)

Solar (United States & Canada)

Company	LTM ⁽²⁾			Stock Price 03/31/18	% of 52-Week High	Market Cap	Total Enterprise Value ⁽³⁾	TEV / LTM		Net Debt ⁽⁴⁾ EBITDA
	Revenues	EBITDA	Margin					Revenues	EBITDA	
Borex Inc.	\$351	\$222	63.3%	\$17.35	89.4%	\$1,323	\$3,460	9.9x	15.6x	9.7x
Capital Power Corporation	779	406	52.2	18.80	91.4	1,958	4,259	5.5x	10.5x	3.9x
NextEra Energy Partners, LP	821	538	65.5	39.99	88.1	2,169	6,890	8.4x	12.8x	6.3x
NRG Energy, Inc.	10,668	2,726	25.6	30.53	98.0	9,698	27,552	2.6x	10.1x	5.7x
TerraForm Power, Inc.	587	348	59.3	10.73	75.6	1,589	5,983	10.2x	17.2x	9.9x
Vivint Solar, Inc.	283	(18)	(6.5)	3.65	59.9	420	1,461	5.2x	NM	NM
Median			55.7%		88.7%			6.9x	12.8x	6.3x
Mean			43.2%		83.7%			6.9x	13.2x	7.1x

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
12/11/2017	Canadian Solar Inc. (NasdaqGS:CSIQ)	Shawn (Xiaohua) Qu and Hanbing Zhang	\$3,109.4	1.1x	15.4x
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 I LP	\$1,651.8	6.6x	17.2x
1/20/2016	Capstone Infrastructure Corp.	Irving Infrastructure Corp.	\$1,435.1	-	12.7x

(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

WIND

EQUITY COMPARABLES (1)

Wind (United States & Canada)

Company	LTM ⁽²⁾			Stock Price 03/31/18	% of 52-Week High	Market Cap	Total Enterprise Value ⁽³⁾	TEV / LTM		Net Debt ⁽⁴⁾ EBITDA
	Revenues	EBITDA	Margin					Revenues	EBITDA	
Algonquin Power & Utilities Corp.	\$1,607	\$635	39.5%	\$9.90	88.7%	\$4,288	\$8,112	5.0x	12.8x	6.0x
Avangrid, Inc.	6,070	1,868	30.8	51.12	95.6	15,801	21,977	3.6x	11.8x	3.2x
Borex Inc.	351	222	63.3	17.35	89.4	1,323	3,460	9.9x	15.6x	9.7x
Brookfield Renewable Partners LP	2,741	1,653	60.3	31.07	88.1	9,714	27,530	10.0x	16.7x	6.7x
Innergex Renewable Energy Inc.	344	253	73.6	10.21	83.8	1,351	3,940	11.5x	15.6x	11.2x
NextEra Energy Partners, LP	821	538	65.5	39.99	88.1	2,169	6,890	8.4x	12.8x	6.3x
Northland Power Inc.	1,162	854	73.5	17.84	92.3	3,138	9,498	8.2x	11.1x	7.0x
Pattern Energy Group Inc.	413	202	48.9	17.29	65.1	1,695	4,788	11.6x	23.7x	11.4x
TerraForm Power, Inc.	587	348	59.3	10.73	75.6	1,589	5,983	10.2x	17.2x	9.9x
TransAlta Renewables Inc.	343	210	61.3	9.19	72.9	2,302	3,123	9.1x	14.9x	3.5x
Median			60.8%		88.1%			9.5x	15.2x	6.8x
Mean			57.6%		84.0%			8.7x	15.2x	7.5x

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	Borex 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 I LP	\$1,651.8	6.6x	17.2x
1/20/2016	Capstone Infrastructure Corp.	Irving Infrastructure Corp.	\$1,435.1	-	12.7x

(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

OIL AND GAS FIELD SERVICES

EQUITY COMPARABLES ⁽¹⁾

Oil and Gas Field Services (United States & Canada)

Company	LTM ⁽²⁾			Stock Price 03/31/18	% of 52-Week High	Market Cap	Total Enterprise Value ⁽³⁾	TEV / LTM		Net Debt ⁽⁴⁾ EBITDA
	Revenues	EBITDA	Margin					Revenues	EBITDA	
Archrock, Inc.	\$817	\$279	34.1%	\$8.75	64.1%	\$621	\$1,986	2.4x	7.1x	5.1x
Baker Hughes, a GE company	19,594	2,005	10.2	27.77	44.6	11,647	37,437	1.9x	18.7x	0.9x
Blueknight Energy Partners, LP	180	64	35.6	4.25	57.8	171	27	0.1x	0.4x	5.2x
CARBO Ceramics Inc.	203	(43)	(21.4)	7.25	55.3	199	218	1.1x	NM	NM
Cathedral Energy Services Ltd.	115	5	4.4	1.17	74.8	58	57	0.5x	11.3x	(0.2)x
CES Energy Solutions Corp.	836	105	12.5	4.56	77.7	1,223	1,550	1.9x	14.8x	3.2x
Cypress Energy Partners, LP	286	15	5.3	5.59	60.3	67	156	0.5x	10.3x	7.0x
Dawson Geophysical Company	165	11	6.6	6.42	94.7	147	116	0.7x	10.8x	(2.6)x
Eco-Stim Energy Solutions, Inc.	59	(22)	(37.0)	0.95	48.2	71	70	1.2x	NM	NM
ENGlobal Corporation	56	(5)	(8.1)	0.83	43.3	23	14	0.2x	NM	NM
Enservco Corporation	48	5	10.2	0.91	75.8	47	76	1.6x	15.5x	5.5x
Ensign Energy Services Inc.	782	157	20.1	4.68	73.1	736	1,284	1.6x	8.2x	3.6x
Enterprise Group, Inc.	29	5	17.6	0.35	90.8	19	35	1.2x	6.9x	0.8x
Essential Energy Services Ltd.	139	12	8.5	0.40	63.4	57	71	0.5x	6.0x	2.1x
High Arctic Energy Services Inc.	154	39	25.0	2.91	69.4	155	137	0.9x	3.6x	(0.4)x
Hydruke Energy Services Inc.	38	(6)	(17.1)	0.16	33.9	11	15	0.4x	NM	NM
Innospec Inc.	1,373	183	13.3	68.60	92.3	1,701	1,835	1.3x	10.1x	0.8x
Keane Group, Inc.	1,815	271	14.9	14.80	74.6	1,661	1,848	1.0x	6.8x	0.7x
Matrix Service Company	1,090	33	3.0	13.70	67.7	367	344	0.3x	10.6x	(1.2)x
McDermott International, Inc.	3,073	459	14.9	18.27	67.1	1,737	1,911	0.6x	4.2x	0.3x
Mullen Group Ltd.	888	124	14.0	11.42	83.6	1,184	1,498	1.7x	12.0x	2.6x
Newalta Corporation	192	37	19.1	0.96	53.2	85	354	1.8x	9.7x	7.6x
Newpark Resources, Inc.	816	78	9.5	8.10	79.4	723	827	1.0x	10.6x	1.6x
North American Construction Group Ltd.	244	50	20.7	5.30	92.2	134	237	1.0x	4.7x	1.9x
Parkland Fuel Corporation	8,621	371	4.3	22.48	89.3	2,956	4,500	0.5x	12.1x	4.2x
Pioneer Energy Services Corp.	495	63	12.7	2.70	60.0	210	598	1.2x	9.5x	6.3x
Precision Drilling Corporation	1,050	245	23.3	2.78	53.0	814	2,106	2.0x	8.6x	5.4x
Profire Energy, Inc.	43	9	20.9	2.73	91.0	133	118	2.8x	13.2x	(1.9)x
ProPetro Holding Corp.	1,195	187	15.7	15.89	69.4	1,320	1,368	1.1x	7.3x	0.4x
Secure Energy Services Inc.	2,003	110	5.5	5.69	69.9	934	1,167	0.6x	10.6x	2.5x
Select Energy Services, Inc.	969	148	15.2	12.62	57.5	1,342	1,823	1.9x	12.4x	0.5x
Shawcor Ltd.	1,207	170	14.1	18.92	61.1	1,325	1,306	1.1x	7.7x	0.1x
Smart Sand, Inc.	155	28	18.1	5.82	34.9	238	204	1.3x	7.3x	0.5x
STEP Energy Services Ltd.	483	107	22.1	7.58	61.3	458	440	0.9x	4.1x	(0.2)x
USA Compression Partners, LP	292	151	51.7	16.93	87.6	1,053	1,843	6.3x	12.2x	5.4x
Median			14.0%		67.7%			1.1x	9.7x	1.6x
Mean			12.0%		67.8%			1.3x	9.3x	2.2x

- (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

EQUIPMENT AND PHYSICAL TECHNOLOGY

EQUITY COMPARABLES (1)

Equipment and Physical Technology (United States & Canada)

Company	LTM ⁽²⁾			Stock Price 03/31/18	% of 52-Week High	Market Cap	Total Enterprise Value ⁽³⁾	TEV / LTM			Net Debt ⁽⁴⁾
	Revenues	EBITDA	Margin					Revenues	EBITDA	EBITDA	
AKITA Drilling Ltd.	\$61	(\$10)	(16.6)%	\$5.75	80.3%	\$104	\$103	1.7x	NM	NM	
Aveda Transportation and Energy Services Inc.	170	13	7.8	0.40	76.5	23	80	0.5x	6.1x	4.4x	
CSI Compressco LP	315	73	23.2	7.26	71.5	286	863	2.7x	11.8x	8.3x	
Enerflex Ltd.	1,229	153	12.4	11.91	74.7	1,055	1,236	1.0x	8.1x	1.2x	
Exterran Corporation	1,320	188	14.3	26.70	79.3	955	1,274	1.0x	6.8x	2.0x	
Gardner Denver Holdings, Inc.	2,513	345	13.7	30.68	80.7	6,051	7,728	3.1x	22.4x	5.0x	
Geospace Technologies Corporation	72	(27)	(37.0)	9.87	52.8	134	88	1.2x	NM	NM	
Gulf Island Fabrication, Inc.	190	(45)	(23.6)	7.10	50.9	107	98	0.5x	NM	NM	
Halliburton Company	22,081	3,992	18.1	46.94	81.1	41,068	49,631	2.2x	12.4x	2.1x	
Hanwei Energy Services Corp.	8	(1)	(9.2)	0.03	72.7	6	8	1.0x	NM	NM	
Helix Energy Solutions Group, Inc.	641	114	17.8	5.79	66.6	857	1,086	1.7x	9.5x	1.7x	
ION Geophysical Corporation	199	55	27.5	27.10	83.5	375	481	2.4x	8.8x	1.2x	
McCoy Global Inc.	32	(7)	(23.4)	1.02	52.8	28	21	0.6x	NM	NM	
Mitcham Industries, Inc.	48	(15)	(32.0)	3.24	63.3	39	42	0.9x	NM	NM	
Nabors Industries Ltd.	2,736	615	22.5	6.99	48.9	2,206	6,099	2.2x	9.9x	6.3x	
National Oilwell Varco, Inc.	7,358	515	7.0	36.81	91.3	13,993	15,334	2.1x	29.8x	2.9x	
Natural Gas Services Group, Inc.	64	23	35.9	23.85	80.7	310	241	3.8x	10.6x	(2.8)x	
Parker Drilling Company	454	68	15.0	0.64	34.3	88	525	1.2x	7.7x	6.8x	
PHX Energy Services Corp.	194	11	5.6	1.50	49.7	88	100	0.5x	9.3x	1.2x	
RigNet, Inc.	211	20	9.6	13.60	59.4	248	272	1.3x	13.5x	1.7x	
RPC, Inc.	1,733	437	25.2	18.03	66.6	3,890	3,798	2.2x	8.7x	(0.2)x	
Schlumberger Limited	31,375	6,880	21.9	64.78	80.1	89,782	103,311	3.3x	15.0x	2.0x	
SEACOR Holdings Inc.	626	141	22.4	51.10	73.7	917	1,344	2.1x	9.6x	1.9x	
Solaris Oilfield Infrastructure, Inc.	93	50	54.1	16.56	69.1	416	469	5.0x	9.3x	(0.5)x	
Strad Energy Services Ltd.	92	20	21.6	1.15	85.5	69	76	0.8x	3.8x	0.3x	
Superior Drilling Products, Inc.	17	4	25.6	1.66	92.7	41	51	3.0x	11.9x	2.3x	
TechnipFMC plc	14,794	2,000	13.5	29.45	84.1	13,736	10,875	0.7x	5.4x	(1.2)x	
TerraVest Industries Inc.	173	23	13.2	7.66	96.5	140	188	1.1x	8.3x	2.9x	
TETRA Technologies, Inc.	860	110	12.8	3.75	82.6	473	1,283	1.5x	11.6x	7.0x	
Weatherford International plc	5,736	(258)	(4.5)	2.29	33.4	2,276	9,407	1.6x	NM	NM	
ZCL Composites Inc.	146	23	15.9	9.10	75.9	281	261	1.8x	11.3x	(0.6)x	
Median			13.7%		74.7%			1.6x	9.5x	1.9x	
Mean			10.0%		70.7%			1.8x	10.9x	2.3x	

(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

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
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
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

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

PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

STORAGE AND TERMINALS

EQUITY COMPARABLES (1)

Storage and Terminals (United States & Canada)

Company	LTM ⁽²⁾			Stock Price 03/31/18	% of 52-Week High	Market Cap	Total Enterprise Value ⁽³⁾	TEV / LTM		Net Debt ⁽⁴⁾ / EBITDA
	Revenues	EBITDA	Margin					Revenues	EBITDA	
Alliant Energy Corporation	\$3,445	\$1,169	33.9%	\$40.86	89.7%	\$9,453	\$14,907	4.3x	12.8x	4.6x
AltaGas Ltd.	2,114	557	26.4	18.49	75.2	3,289	7,157	3.4x	12.8x	5.0x
Blueknight Energy Partners, LP	180	64	35.6	4.25	57.8	171	27	0.1x	0.4x	5.2x
Buckeye Partners, LP	3,862	949	24.6	37.39	53.5	5,726	10,912	2.8x	11.5x	4.9x
Chart Industries, Inc.	1,064	125	11.8	59.03	95.6	1,825	2,204	2.1x	17.6x	2.9x
EnLink Midstream, LLC	6,186	895	14.5	14.65	73.3	2,650	9,800	1.6x	11.0x	4.4x
EQT Midstream Partners, LP	867	714	82.3	59.03	73.9	4,757	5,919	6.8x	8.3x	1.8x
Gibson Energy Inc.	4,993	196	3.9	12.88	84.5	1,845	2,757	0.6x	14.1x	5.1x
Green Plains Partners LP	106	68	64.5	17.40	82.9	554	687	6.5x	10.1x	2.0x
Magellan Midstream Partners, LP	2,544	1,120	44.0	58.35	74.8	13,315	17,651	6.9x	15.8x	4.0x
MPLX LP	4,267	2,021	47.4	33.04	83.9	26,228	34,063	8.0x	16.9x	5.9x
NuStar Energy LP	1,802	618	34.3	20.39	38.7	1,900	6,323	3.5x	10.2x	6.0x
Spectra Energy Partners, LP	2,029	1,015	50.0	33.64	72.4	16,312	25,423	12.5x	25.0x	8.4x
Median			34.3%		74.8%			3.5x	12.8x	4.9x
Mean			36.4%		73.5%			4.6x	12.8x	4.6x

(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

STORAGE AND TERMINALS

SELECTED TRANSACTIONS (1)

Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
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)	EQT 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
11/1/2017	Southcross Energy Partners, LP (NYSE:SXE)	American Midstream Partners, LP (NYSE:AMID)	\$624.1	1.0x	14.8x
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
10/31/2016	Dominion Energy Questar Pipeline, LLC	Dominion Energy Midstream Partners, LP (NYSE:DM)	\$1,700.3	-	10.7x
10/24/2016	JP Energy Partners LP	American Midstream Partners, LP (NYSE:AMID)	\$465.0	-	11.3x
9/26/2016	Columbia Pipeline Partners LP	Columbia Pipeline Group, Inc.	\$9,695.0	-	13.6x
7/10/2016	Southern Natural Gas Company, LLC	The Southern Company (NYSE:SO)	\$4,094.0	-	10.3x

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

PUBLIC AND TRANSACTION COMPARABLES BY SEGMENT

PIPELINES

EQUITY COMPARABLES (1)

Oil and Gas Pipelines (United States & Canada)

Company	LTM ⁽²⁾			Stock Price 03/31/18	% of 52-Week High	Market Cap	Total Enterprise Value ⁽³⁾	TEV / LTM		Net Debt ⁽⁴⁾ EBITDA
	Revenues	EBITDA	Margin					Revenues	EBITDA	
Antero Midstream Partners LP	\$827	\$516	62.4%	\$25.89	72.8%	\$4,840	\$6,051	7.3x	11.7x	2.5x
ATCO Ltd.	3,814	1,345	35.3	32.09	80.1	3,672	13,849	3.6x	10.3x	5.5x
Blueknight Energy Partners, LP	180	64	35.6	4.25	57.8	171	27	0.1x	0.4x	5.2x
Buckeye Partners, LP	3,862	949	24.6	37.39	53.5	5,726	10,912	2.8x	11.5x	4.9x
Crestwood Equity Partners LP	4,168	280	6.7	25.60	87.5	1,811	4,090	1.0x	14.6x	5.2x
Enable Midstream Partners, LP	2,885	903	31.3	13.72	79.5	5,935	9,754	3.4x	10.8x	4.0x
Enbridge Energy Partners, LP	2,415	1,504	62.3	9.64	49.1	4,089	16,573	6.9x	11.0x	4.9x
Enbridge Inc.	35,639	7,920	22.2	31.42	70.2	53,260	118,772	3.3x	15.0x	6.5x
Energy Transfer Equity, LP	42,744	6,686	15.6	14.21	71.7	15,365	90,757	2.1x	13.6x	6.2x
Energy Transfer Partners, LP	30,439	5,982	19.7	16.22	66.6	18,880	59,306	1.9x	9.9x	5.5x
Enterprise Products Partners LP	31,220	5,272	16.9	24.48	83.0	53,156	77,947	2.5x	14.8x	4.8x
EQT GP Holdings, LP	867	711	82.0	23.08	72.7	6,143	10,466	12.1x	14.7x	1.8x
EQT Midstream Partners, LP	867	714	82.3	59.03	73.9	4,757	5,919	6.8x	8.3x	1.8x
Genesis Energy, LP	2,339	476	20.3	19.71	58.8	2,416	6,839	2.9x	14.4x	7.8x
Gibson Energy Inc.	4,993	196	3.9	12.88	84.5	1,845	2,757	0.6x	14.1x	5.1x
Inter Pipeline Ltd.	1,805	897	49.7	17.34	77.4	6,623	10,817	6.0x	12.1x	4.6x
Kinder Morgan Canada Limited	530	278	52.5	14.37	92.7	1,490	3,405	6.4x	12.2x	(0.3)x
Kinder Morgan, Inc.	13,699	5,819	42.5	15.06	68.7	33,223	72,320	5.3x	12.4x	6.5x
NuStar GP Holdings, LLC	47	0	0.0	11.55	40.4	496	538	11.5x	NM	NM
ONEOK, Inc.	12,526	1,910	15.2	56.92	92.8	23,373	32,631	2.6x	17.1x	4.2x
Plains All American Pipeline, LP	27,954	1,659	5.9	22.03	69.0	15,976	28,210	1.0x	17.0x	5.9x
Sanchez Midstream Partners LP	80	32	40.1	10.35	66.1	154	686	8.6x	21.5x	5.7x
SemGroup Corporation	2,287	260	11.4	21.40	58.4	1,692	4,458	1.9x	17.2x	9.4x
Southcross Energy Partners, LP	667	57	8.6	1.63	34.4	130	653	1.0x	11.4x	9.1x
Summit Midstream Partners, LP	470	251	53.5	14.05	56.8	1,027	2,410	5.1x	9.6x	4.3x
Tallgrass Energy GP, LP	691	384	55.7	19.02	64.5	1,105	5,068	7.3x	13.2x	6.3x
Targa Resources Corp.	9,158	1,111	12.1	44.00	72.6	9,629	15,433	1.7x	13.9x	4.6x
TC PipeLines, LP	572	468	81.8	34.69	56.2	2,474	4,973	8.7x	10.6x	4.9x
The Williams Companies, Inc.	8,131	3,499	43.0	24.86	73.8	20,567	47,122	5.8x	13.5x	5.9x
TransCanada Corporation	10,442	5,197	49.8	41.32	81.7	36,604	73,777	7.1x	14.2x	6.5x
Western Gas Equity Partners, LP	2,169	946	43.6	33.12	69.9	7,251	13,548	6.2x	14.3x	3.9x
Western Gas Partners, LP	2,169	946	43.6	42.67	69.1	6,512	10,138	4.7x	10.7x	3.9x
Williams Partners LP	8,110	3,646	45.0	34.43	78.1	32,968	50,243	6.2x	13.8x	4.5x
Median			35.6%		70.2%			4.7x	13.3x	5.0x
Mean			35.6%		69.2%			4.7x	12.8x	5.1x

- (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
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

(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⁾			Stock Price 03/31/18	% of 52-Week High	Market Cap	Total Enterprise Value ⁽³⁾	TEV / LTM		Net Debt ⁽⁴⁾ EBITDA
	Revenues	EBITDA	Margin					Revenues	EBITDA	
Adams Resources & Energy, Inc.	\$1,406	\$17	1.2%	\$43.50	86.0%	\$183	\$76	0.1x	4.4x	(6.4)x
ArcBest Corporation	2,875	182	6.3	32.05	80.7	822	914	0.3x	5.0x	0.4x
Covenant Transportation Group, Inc.	720	107	14.8	29.83	89.4	547	745	1.0x	7.0x	1.6x
Daseke, Inc.	1,013	104	10.3	9.79	67.4	560	1,151	1.1x	11.1x	4.1x
Heartland Express, Inc.	634	140	22.1	17.99	71.3	1,499	1,423	2.2x	10.1x	(0.7)x
Hess Corporation	5,427	2,011	37.1	50.62	91.2	15,948	19,382	3.6x	9.6x	1.4x
J.B. Hunt Transport Services, Inc.	7,509	1,043	13.9	117.15	92.6	12,858	13,930	1.9x	13.4x	1.0x
Knight-Swift Transportation Holdings Inc.	3,425	578	16.9	46.01	88.6	8,198	9,095	2.7x	15.7x	1.4x
Landstar System, Inc.	3,916	307	7.8	109.65	92.5	4,604	4,484	1.1x	14.6x	(0.4)x
Marten Transport, Ltd.	712	136	19.2	22.80	77.0	1,244	1,228	1.7x	9.0x	(0.1)x
Old Dominion Freight Line, Inc.	3,529	826	23.4	146.97	96.4	12,107	12,074	3.4x	14.6x	(0.1)x
P.A.M. Transportation Services, Inc.	448	57	12.7	36.35	84.1	224	376	0.8x	6.6x	2.6x
Patriot Transportation Holding, Inc.	112	11	9.4	19.00	80.7	63	51	0.5x	4.8x	(1.3)x
Parkland Fuel Corporation	8,621	371	4.3	22.48	89.3	2,956	4,500	0.5x	12.1x	4.2x
Roadrunner Transportation Systems, Inc.	2,082	(55)	(2.6)	2.54	26.1	98	529	0.3x	NM	NM
Ryder System, Inc.	7,496	1,770	23.6	72.79	80.6	3,867	9,198	1.2x	5.2x	3.2x
Saia, Inc.	1,448	195	13.4	75.15	93.6	1,911	2,039	1.4x	10.5x	0.7x
Schneider National, Inc.	4,516	575	12.7	26.06	86.9	4,610	4,770	1.1x	8.3x	0.2x
TFI International Inc.	3,671	416	11.3	25.68	95.1	2,288	3,454	0.9x	8.3x	2.8x
Titanium Transportation Group Inc.	113	11	10.1	0.76	70.0	28	77	0.7x	6.7x	4.6x
Universal Logistics Holdings, Inc.	1,267	84	6.6	21.15	82.5	600	831	0.7x	9.9x	3.1x
USA Truck, Inc.	470	34	7.3	25.49	91.2	205	313	0.7x	9.1x	2.7x
Werner Enterprises, Inc.	2,178	363	16.6	36.50	83.0	2,645	2,706	1.2x	7.5x	0.1x
YRC Worldwide Inc.	4,935	246	5.0	8.83	50.1	299	1,114	0.2x	4.5x	3.2x
Median			12.0%		85.1%			1.0x	9.0x	1.4x
Mean			12.6%		81.1%			1.2x	9.0x	1.2x

(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

TRUCKERS

SELECTED TRANSACTIONS (1)

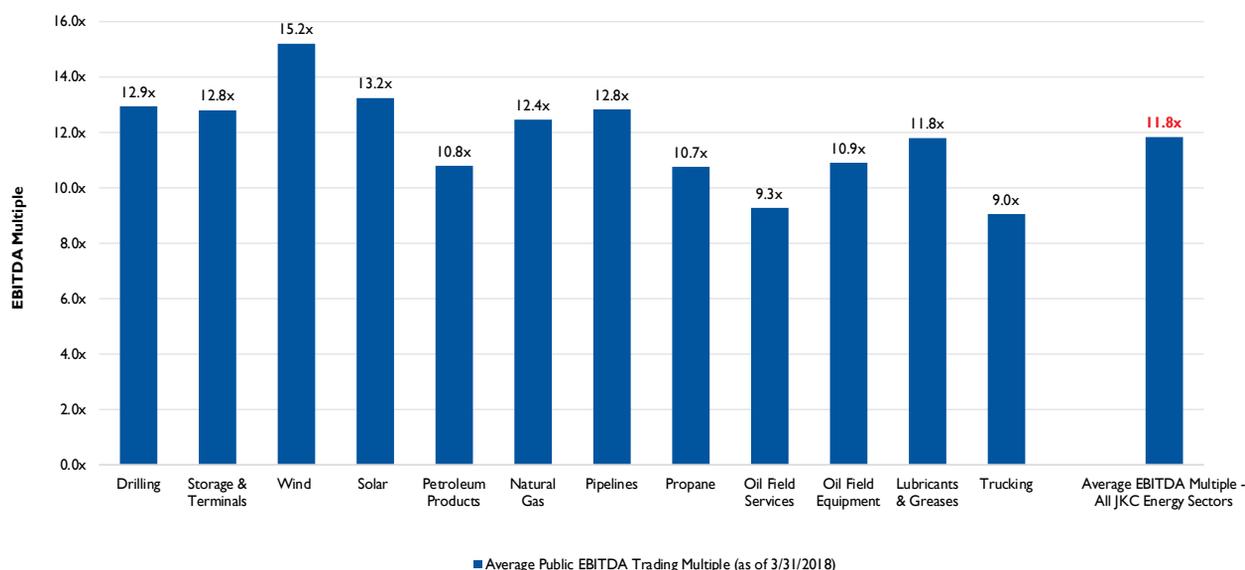
Announced / Closed Date	Target(s)	Acquirer	Total Enterprise Value (TEV)	TEV / Revenues	TEV / EBITDA
12/7/2017	Keen Transport, Inc.	Wallenius Wilhelmsen Logistics ASA (OB:WWL)	\$64.0	0.8x	6.4x
7/19/2016	Span-Alaska Transportation, Inc.	Matson Logistics, Inc.	\$198.6	-	10.4x
5/2/2016	Trimac Transportation 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

(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 3/31/2018)



FACTOIDS: LITTLE-KNOWN FACTS AND STATS

PETROLEUM PRODUCTS (1)

- Distillate fuel oil is the second most-consumed petroleum product in the United States. Distillate fuel oil includes diesel fuel and heating oil. Total distillate fuel oil consumption is about 20% of total U.S. petroleum consumption.

NATURAL GAS (2)

- Natural gas utilities add an average of one new customer every minute nationwide.
- In the U.S. natural gas utilities install two miles of pipeline every hour.

PROPANE AND HEATING/FUEL OIL

- Approximately 7.8 million households use propane for in-home heating 4.6 million homes for water heating and more than 42 million homes use propane for outdoor grilling. (3)
- The Internal Revenue Service requires heating oil and other distillate fuel oils that are not for highway use to be colored with a red dye. The red color identifies the fuel as exempt from the federal, state and local taxes applied to fuels sold for use on public roadways. (4)

LUBRICANTS AND GREASES (5)

- Over one million tons of greases are used every year, representing about three percent of all the lubricants used in the world.

(1) U.S. Energy Information Administration.

(2) 2018 American Gas Association Playbook.

(3) National Propane Gas Association, Today's Propane.

(4) U.S. Energy Information Administration.

(5) Royal Dutch Shell plc.

FACTOIDS: LITTLE-KNOWN FACTS AND STATS

SOLAR (1)

- California is the dominant state in installed cumulative solar capacity with 21,074 installed megawatts. Filling out the top five list is North Carolina at 4,308 megawatts, Arizona at 3,400 megawatts, Nevada at 2,595 megawatts and New Jersey at 2,390 megawatts of installed capacity.
- In 2017, 59% of all solar capacity installed was utility-scale (plants with capacity equal to or above one megawatt).

WIND (2)

- There are over 54,000 wind turbines with a combined capacity of 89,379 megawatts operating in 41 states, Guam and Puerto Rico.
- Texas is the dominant state in installed cumulative wind power capacity with 22,799 installed megawatts. Filling out the top five list is Oklahoma at 7,495 megawatts, Iowa at 7,312 megawatts, California at 5,686 megawatts and Kansas at 5,110 megawatts of installed capacity.

OIL AND GAS FIELD SERVICES (3)

- Hydraulically fractured horizontal wells have accounted for most of all new wells drilled and completed since late 2014.
- In 2016, hydraulically fractured horizontal wells accounted for 69% of all oil and natural gas wells drilled in the United States and 83% of the total linear footage drilled.
- As of 2016, about 670,000 of the 977,000 producing wells were hydraulically fractured and horizontally drilled.

(1) Solar Energy Industries Association.
 (2) American Wind Energy Association.
 (3) U.S. Energy Information Administration.

FACTOIDS: LITTLE-KNOWN FACTS AND STATS

STORAGE AND TERMINALS (1)

- Most existing natural gas storage in the United States is in depleted natural gas or oil fields that are close to consumption centers. Conversion of a field from production to storage duty takes advantage of existing wells, gathering systems and pipeline connections. Depleted oil and natural gas reservoirs are the most commonly used underground storage sites because they are widely available.

PIPELINES

- The U.S. has the largest amount of oil and natural gas pipelines of any country in the world. (2)
- The use of pipe for oil transportation started soon after the drilling of the first commercial oil well in 1859 by Edwin Drake in Titusville, Pennsylvania. (3)

TRUCKERS (4)

- In 2016, 10.55 billion tons of freight (primary shipments only) were transported by trucks, representing \$738.9 billion in gross freight revenues.
- It takes more than 3.468 million heavy-duty Class 8 trucks and over 3.5 million truck drivers to move 10.55 billion tons of freight annually.

(1) U.S. Energy Information Administration.

(2) American Petroleum Institute.

(3) Pipeline 101.

(4) American Trucking Association.

JORDAN KNAUFF & COMPANY

ENERGY LOGISTICS & DISTRIBUTION TEAM



G. COOK JORDAN, JR.

Managing Principal
Office (312) 254-5901
cj@jordanknauff.com



DAVID A. KAKAREKA

Vice President of Transaction Management
Office (312) 254-5907
dkakareka@jordanknauff.com



LORI A. CALLAWAY

Vice President of Research and Publications
Office (312) 254-5914
lcallaway@jordanknauff.com



BLAKE F. BRESLAU

Senior Analyst
Office (312) 254-5906
bbreslau@jordanknauff.com

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.



200 West Madison Street, Suite 980
Chicago, Illinois 60606-3414
tel: (312) 254-5900 ■ fax: (312) 254-5999
web: www.jordanknauff.com

MEMBER FINRA, SIPC

These materials were prepared for informational purposes from sources that are believed to be reliable but which could change without notice. Jordan Knauff & Company shall not in any way be liable for claims relating to these materials and the firm makes no warranties, express or implied, or representations as to their accuracy or completeness or for errors or omissions contained herein. Legal, accounting and tax restrictions, transaction costs and changes to any assumptions may significantly affect the outcome and suitability of the various scenarios described. This information is not intended to be construed as tax, legal or investment advice and may not be suitable for a given individual's circumstances. A consultation with one's own tax, legal, investment and other advisors to determine suitability should be undertaken. These materials do not constitute an offer to buy or sell any financial security or participate in any investment offering or deployment of capital.

ENERGY EQUIPMENT & INFRASTRUCTURE ALLIANCE



TOBY MACK
President and Chief Executive Officer
(202) 870-7715
tmack@eeia.org



MARTI DE GRAAF
*Executive Vice President and
Chief Operating Officer*
(312) 806-0664
mdegraaf@eeia.org

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.



601 Pennsylvania Avenue NW
Suite 900
Washington, DC 20004
(202) 870-7715
info@eeia.org ▪ www.eeia.org