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API Industry Outlook Fourth Quarter 2018



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Key Points

Record U.S. natural gas and oil production & exports clashing with headwinds

- **Economy:** U.S. GDP growth (3% y/y in Q3) but many emerging markets increasingly are **under duress**
- **Global oil:** EIA projects a **surplus** beginning Q4 2018 with strong supply & slowing demand growth
- **U.S. met virtually all** global oil demand growth in 2018 and solidified its position as the #1 producer
 - Record high crude oil exports and low petroleum net imports
 - Permian & Bakken infrastructure constraints added uncertainty about production and pricing
 - Record backlog of 8,500 drilled by uncompleted wells in Q4 (EIA) poises U.S. for growth in 2019
- **Natural gas: 12% y/y** production growth in Q4 2019
 - Record NGL production (4.8 mb/d in Nov.) made the U.S. natural gas industry the world's 4th largest oil producer
 - Prices rose with low stocks and cold weather, but futures below \$3 per million Btu by April 2019
 - Productivity gains and low breakeven prices suggest gas markets remain **demand-limited**



Global Economy and Oil Markets

Global economic and financial headlines – Bloomberg consensus sees slower global economic growth and a roller coaster of uncertainties

→ Global economic outlook is darkening: Kemp

Reuters

Eurozone economy grows far slower than expected in third quarter

Financial Times

→ China reports economic growth below expectations – its worst pace since the financial crisis

CNBC

China Sets Official Yuan Rate at Weakest in a Decade

The Wall Street Journal



→ The US will issue over \$1.3 trillion in new debt in 2018, the highest amount since the depths of the recession

Business Insider

→ IMF Warns of Possible Emerging-Markets Crisis

The Wall Street Journal

Pakistan Will Still Seek IMF Bailout After Saudi Support Package

Bloomberg

Experts, IMF Fear Argentina's Economic Crisis Could Affect Region

teleSUR tv

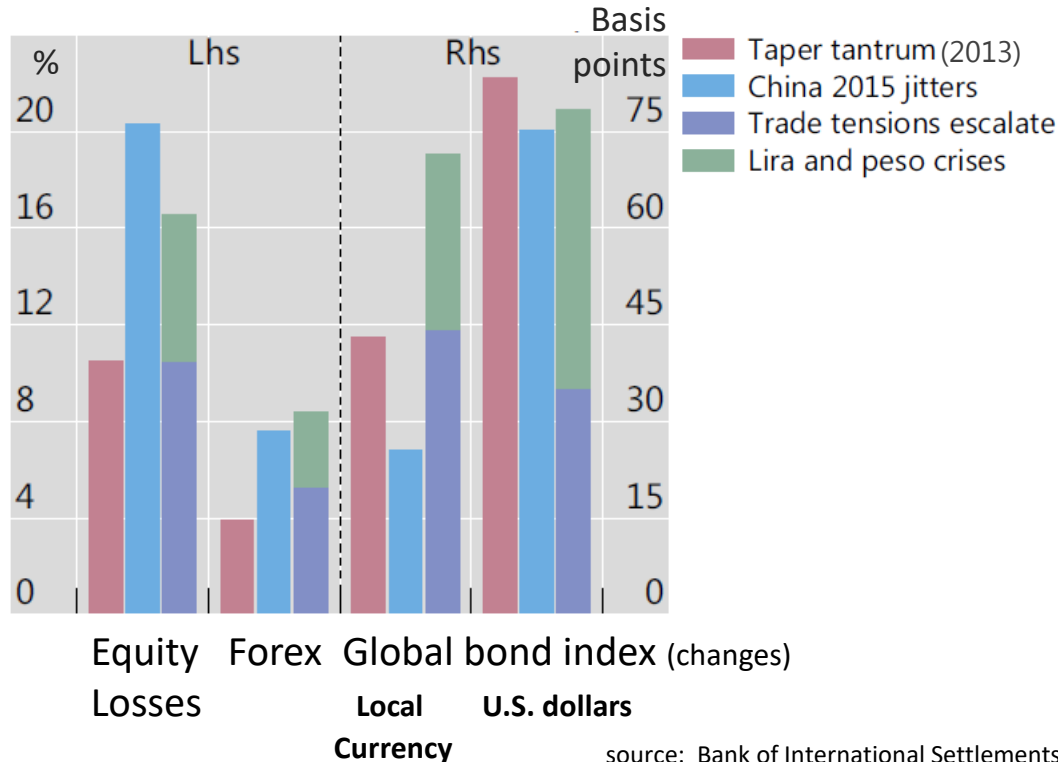
Africa's new debt crisis

Mail and Guardian

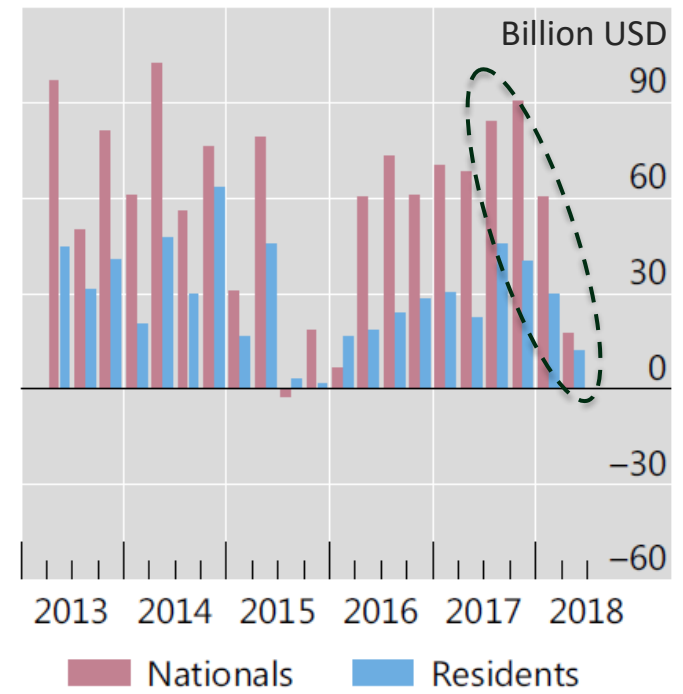
2018 financial market fallout has been on par with past episodes, but credit to emerging markets must stabilize to support growth

- Recent financial market stresses cumulatively have been similar to those in 2013 and 2015
- Investment and economic growth require healthy international debt issuances to emerging markets

Emerging market stress in 2018 Comparable to previous episodes



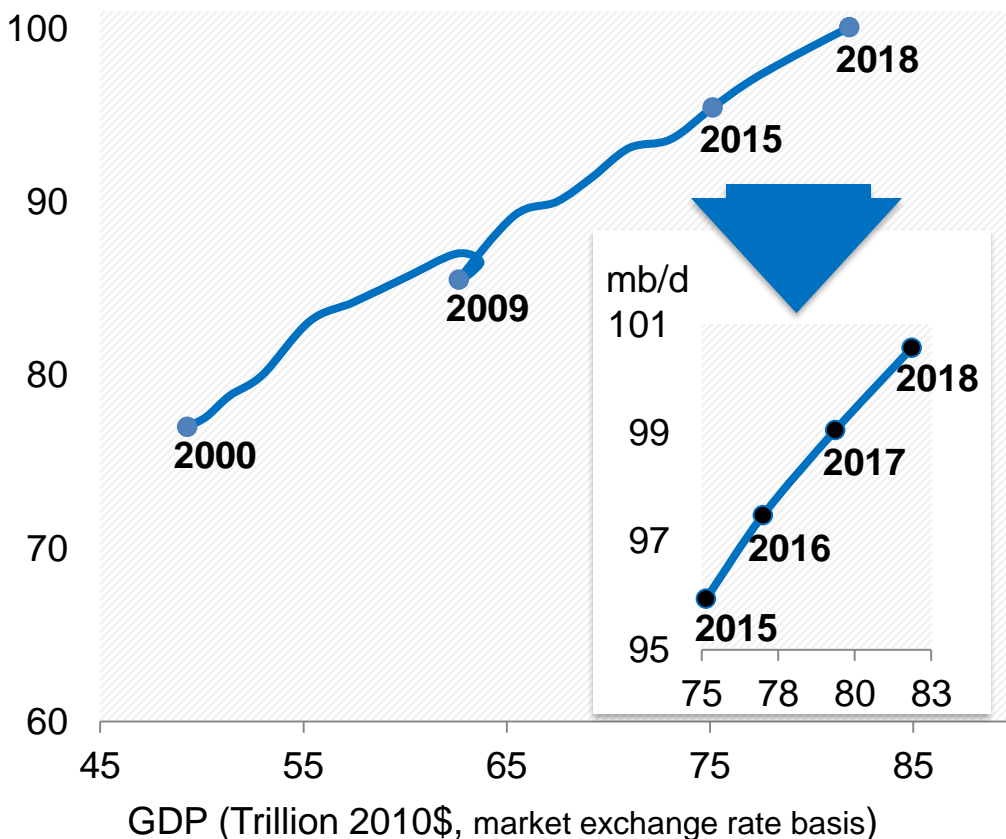
Emerging market Issuance of international debt securities



In 2018, global oil demand grew at about half the rate of GDP

Global oil demand versus real GDP

Million barrels per day (mb/d)



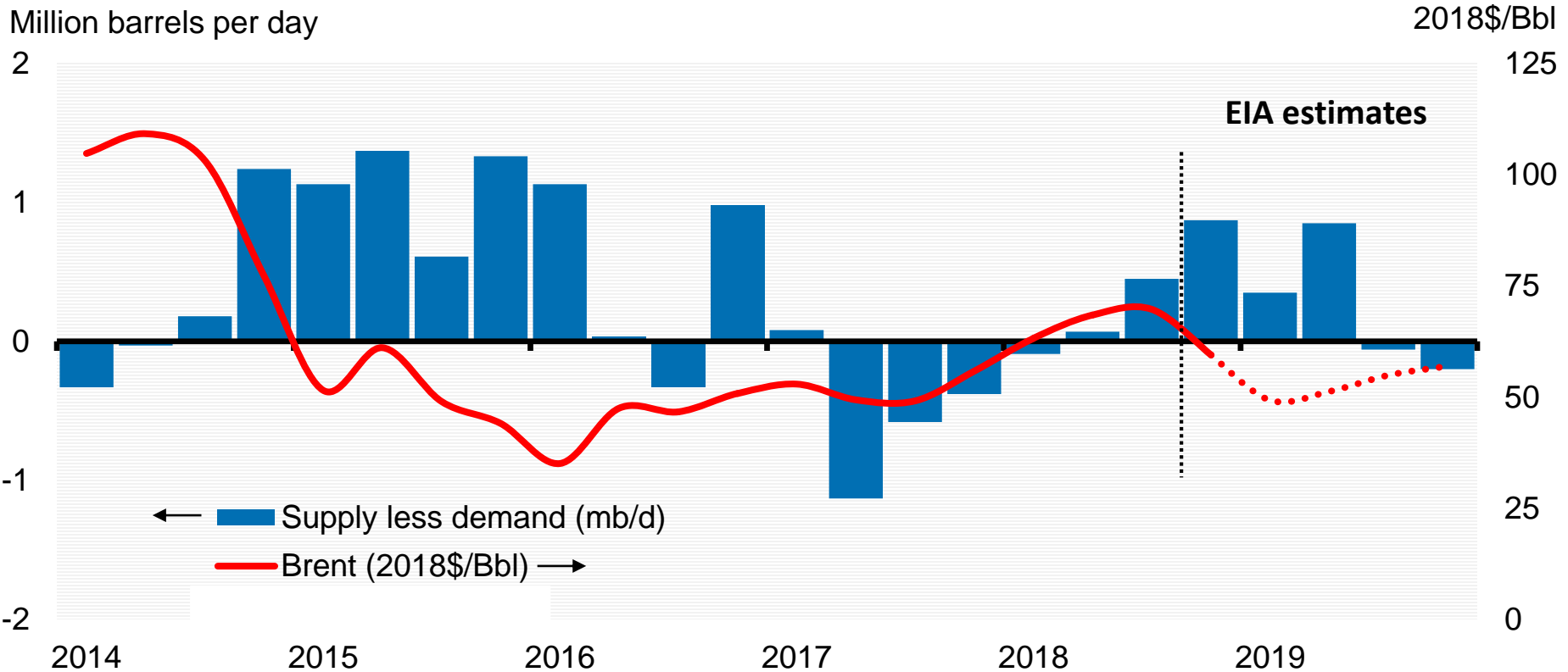
- ▶ **Milestone:** In Q3 2018, global oil demand eclipsed 100 mb/d
- ▶ 2018 global GDP estimated to have risen 3.2% y/y (market exchange rate basis)
- ▶ 2018 global oil demand up 1.5% y/y
- ▶ Global oil demand responsiveness to GDP growth – elasticity of 0.49 – declined slightly in each year since 2015

sources: EIA STEO (Dec. 2018), Bloomberg, IMF, API calculations

EIA suggests the global oil market has reverted to a surplus

- ▶ EIA estimates global oil demand growth to slow in 2019 and be met almost entirely by the U.S.

EIA global supply/demand estimates as of December 2018

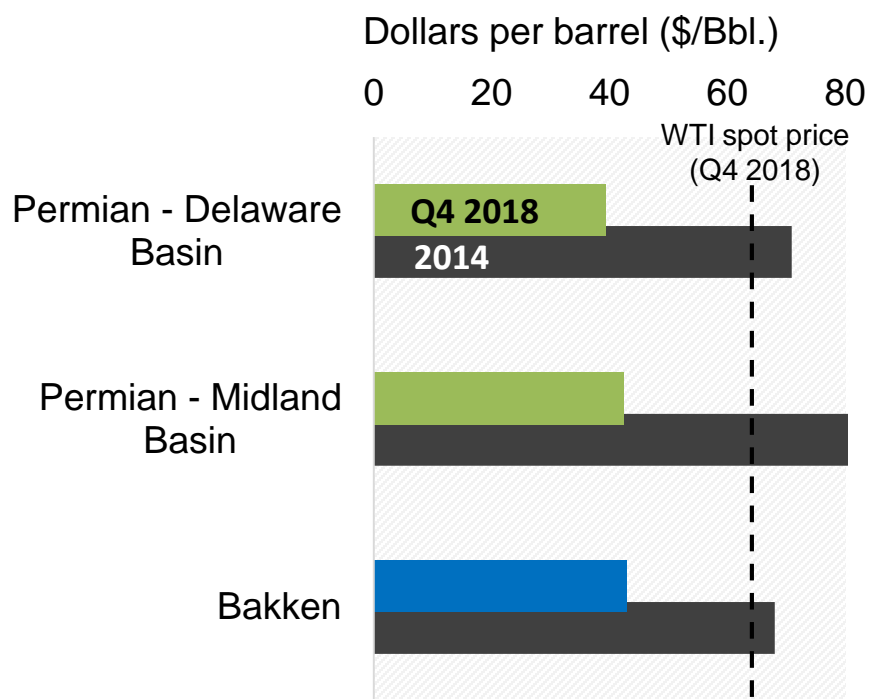


sources: EIA STEO (December 2018), Bloomberg

Permian basin and Bakken formation have led cost improvements and production growth

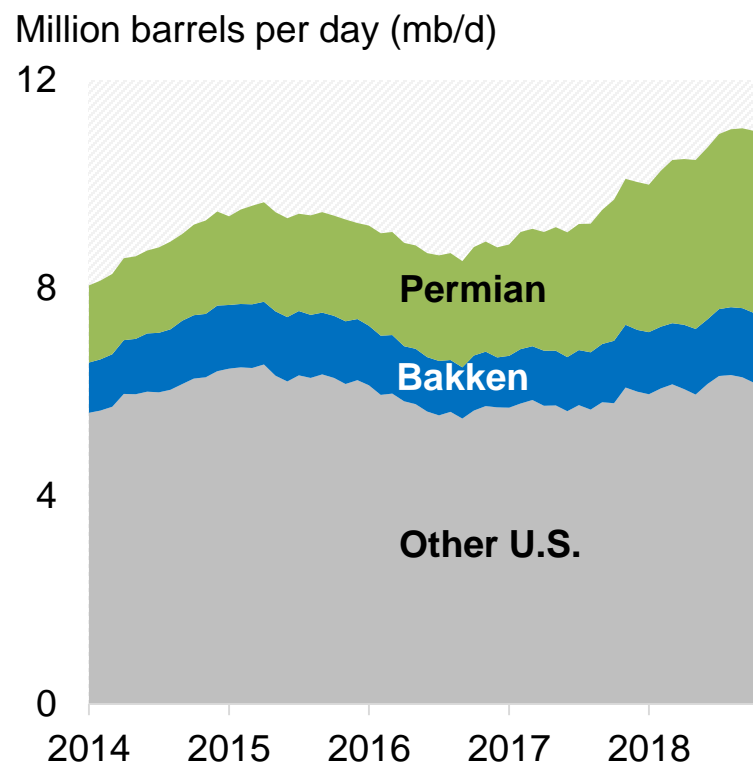
As U.S. oil breakevens improved, the Bakken formation and Permian basin production grew

Breakeven prices for selected oil plays*



*Half cycle breakevens assuming 10% discount factor and play-specific costs
source: BTU Analytics (Dec. 2018)

U.S. oil production by play type

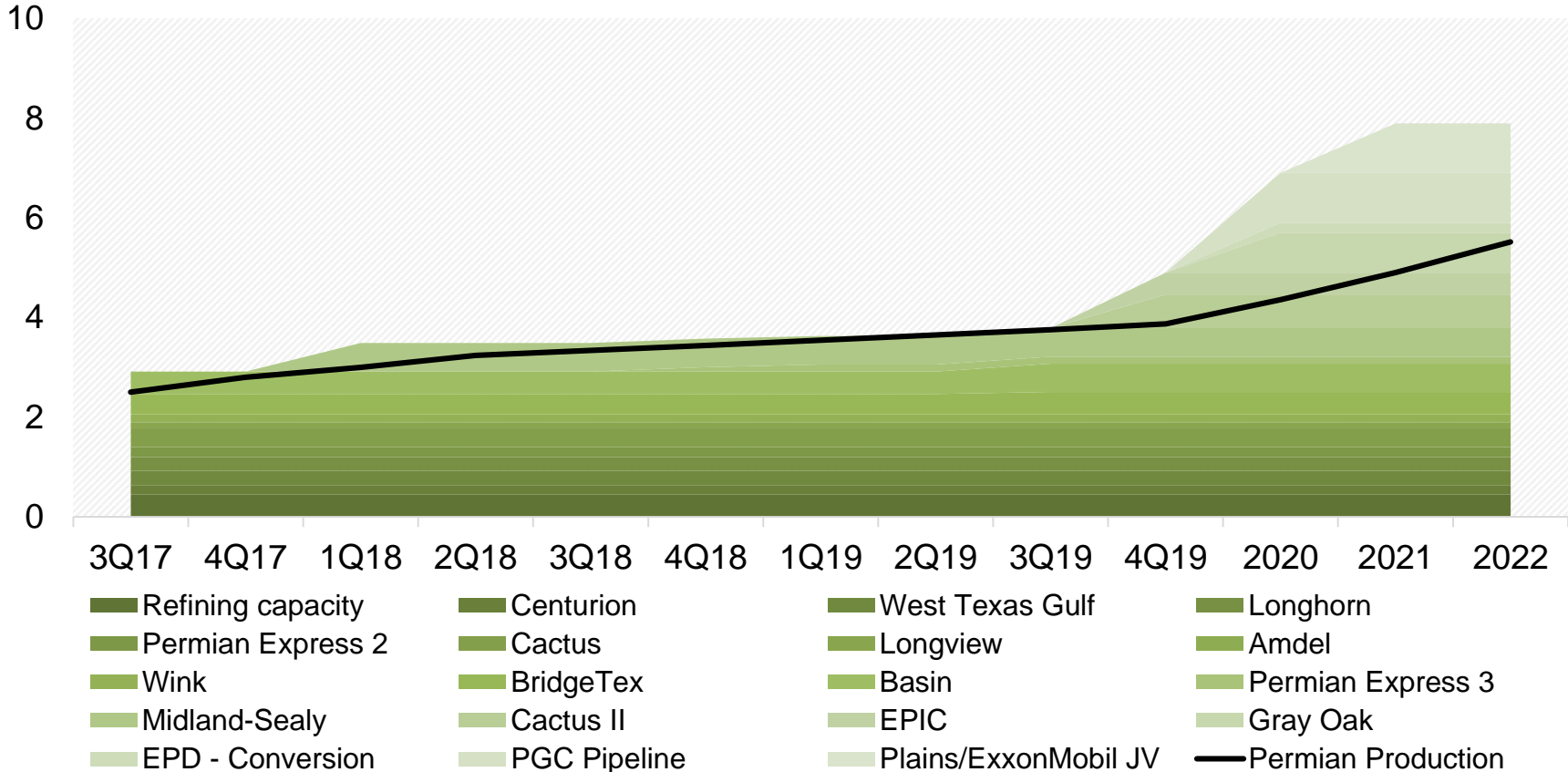


source: EIA Drilling Productivity Report

As Permian crude oil pipelines hit capacity limits, uncertainty about production and price differentials has increased

- ▶ Cactus II and Gray Oak permitting underway. Increased rail and trucking egress in the interim
- ▶ EIA reported Permian drilled but uncompleted (DUC) wells up 77% y/y to nearly 3,900 in October

Million barrels per day (mb/d)

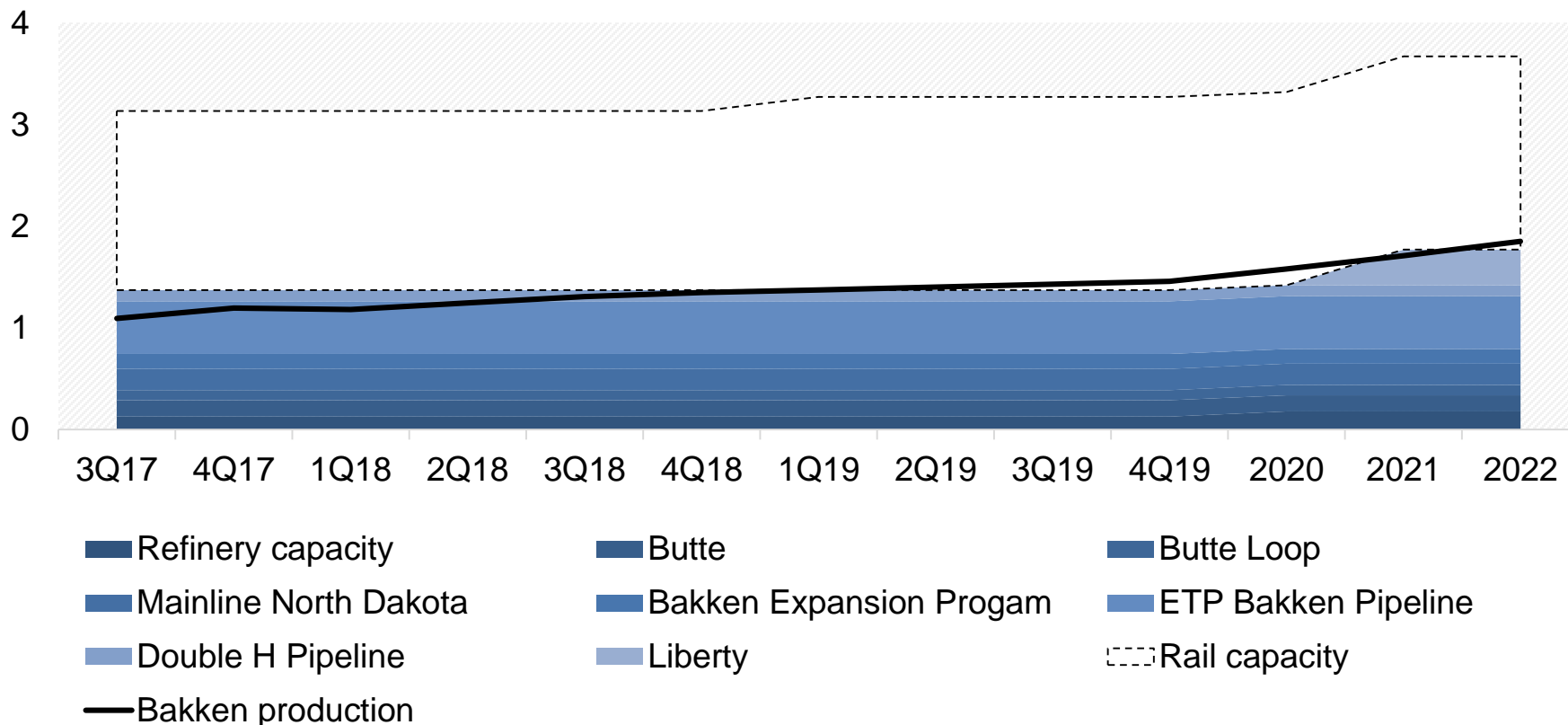


source: Bloomberg

Bakken egress also currently pushes regional infrastructure limits and has raised production and pricing uncertainty

- ▶ The Bakken crude oil price differential versus West Texas Intermediate (WTI) crude increased to nearly \$15.00 per barrel in November from less than \$2.00 per barrel through Q3 2018 (Bloomberg)

Million barrels per day (mb/d)

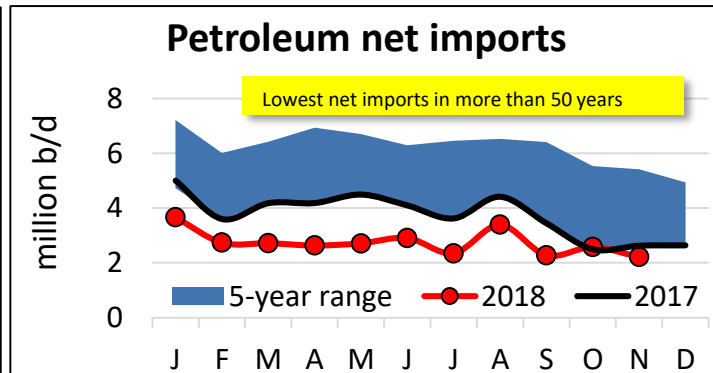
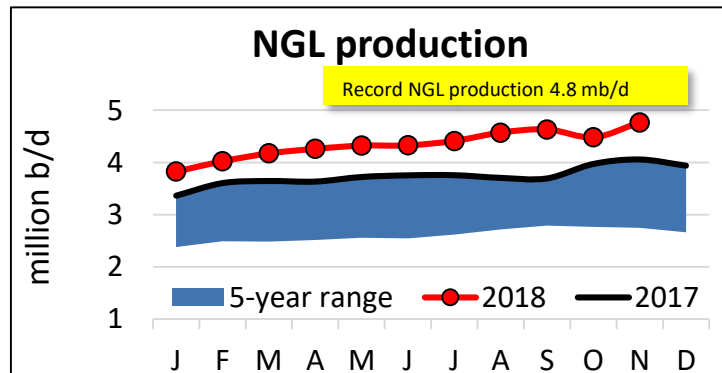
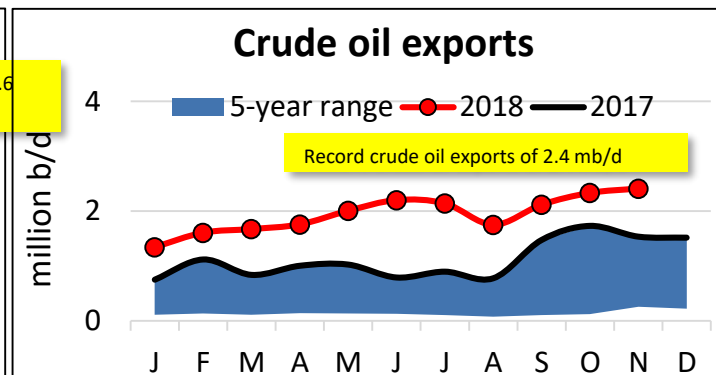
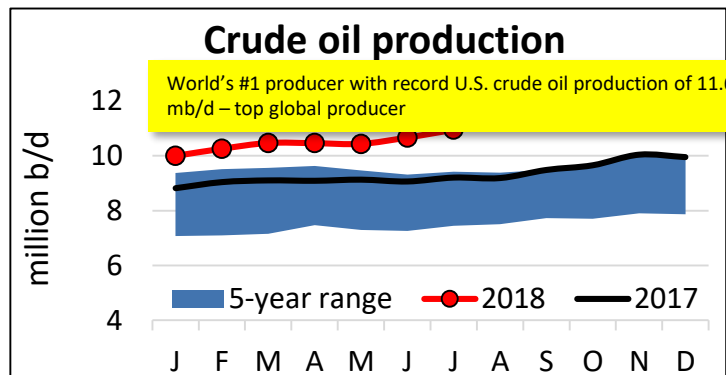


source: North Dakota Pipeline Authority and RBN Energy (2018)

Continued record-setting U.S. natural gas and oil industry production depends on global demand growth and international trade relations

U.S. natural gas and oil industry records in November 2018:

- Oil production 11.6 million barrels per day (mb/d) and natural gas liquids (NGL) production (4.8 mb/d)
- Crude oil exports (2.4 mb/d) and lowest petroleum net imports (2.2 mb/d) in more than 50 years
- Refinery throughput for the month of November (17.3 mb/d) and year-to-date (17.3 mb/d); and,
- Largest crude oil inventory accumulation for the month of November



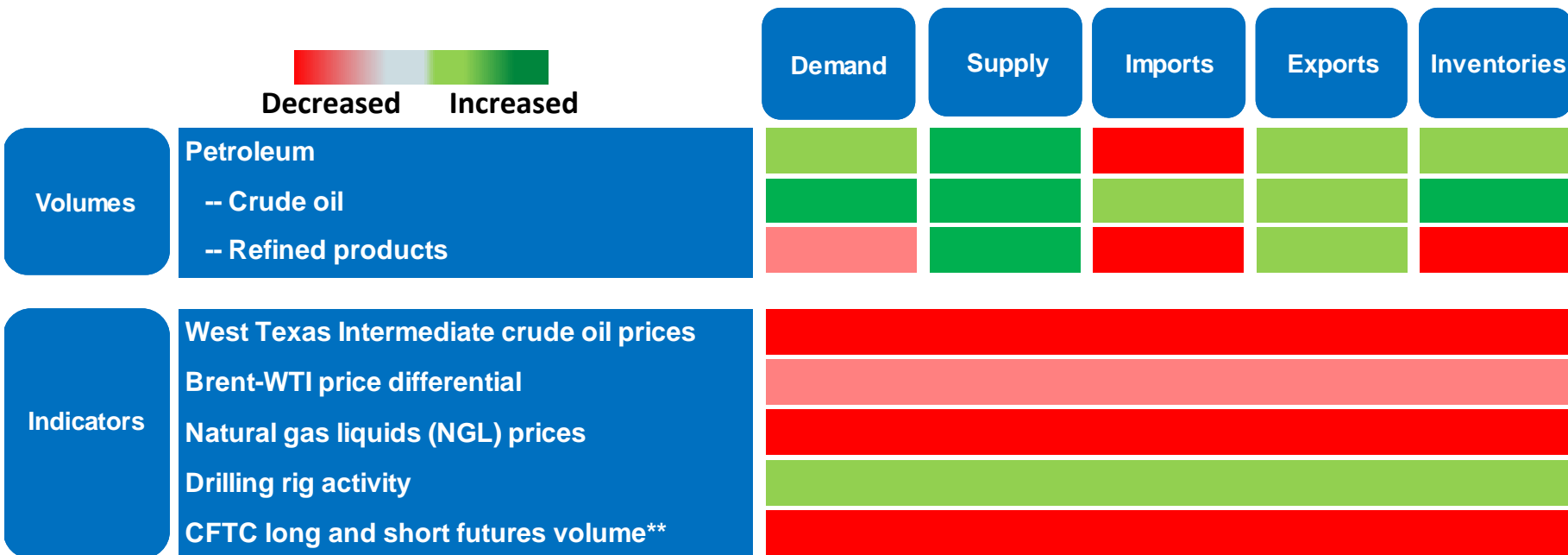
With growing exports, petroleum net imports fell to 2.2 million barrels per day in Q4

Monthly Statistical Report heat map – November 2018

Highlights for November 2018, compared with October 2018

- ▶ Prices of crude oil and refined products fell as supply (with record production) exceeded demand and petroleum inventories increased to within 3.4 percent of the maximum over the past 5 years
- ▶ Drilling remained up for the month despite record 8,500 backlog of drilled but uncompleted wells

Heat map of monthly percentage changes – November 2018 compared with October 2018*



* Boldest colored increases and decreases reflect changes vs. prior month that are in the top or bottom quartile for the past five years

** CFTC long/short open interest comparisons based on month versus same month in prior year

sources: API Monthly Statistical Report, EIA, CFTC, Baker Hughes

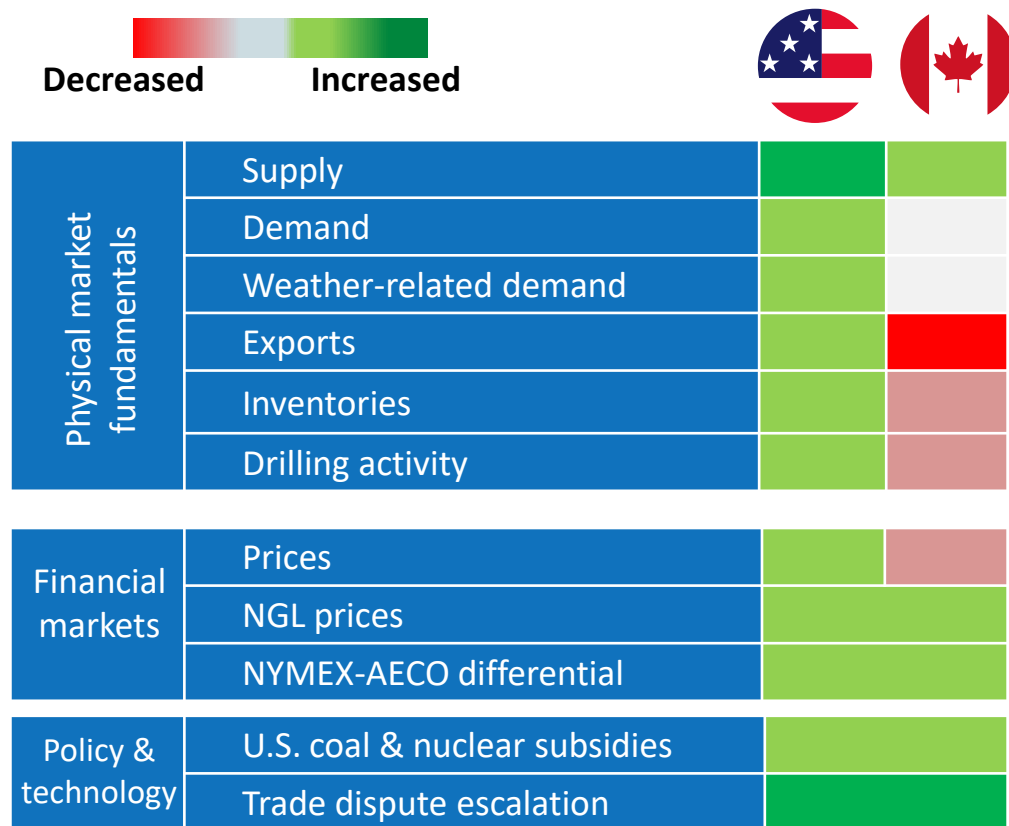


Natural Gas

Near-term U.S. prices recently have risen on winter seasonality and relatively lower gas inventories than one year ago

- ▶ Divergence between near-term seasonal and long-term structural views

Heat map of percentage changes in Q4 2018 compared with Q4 2017



Q4 highlights

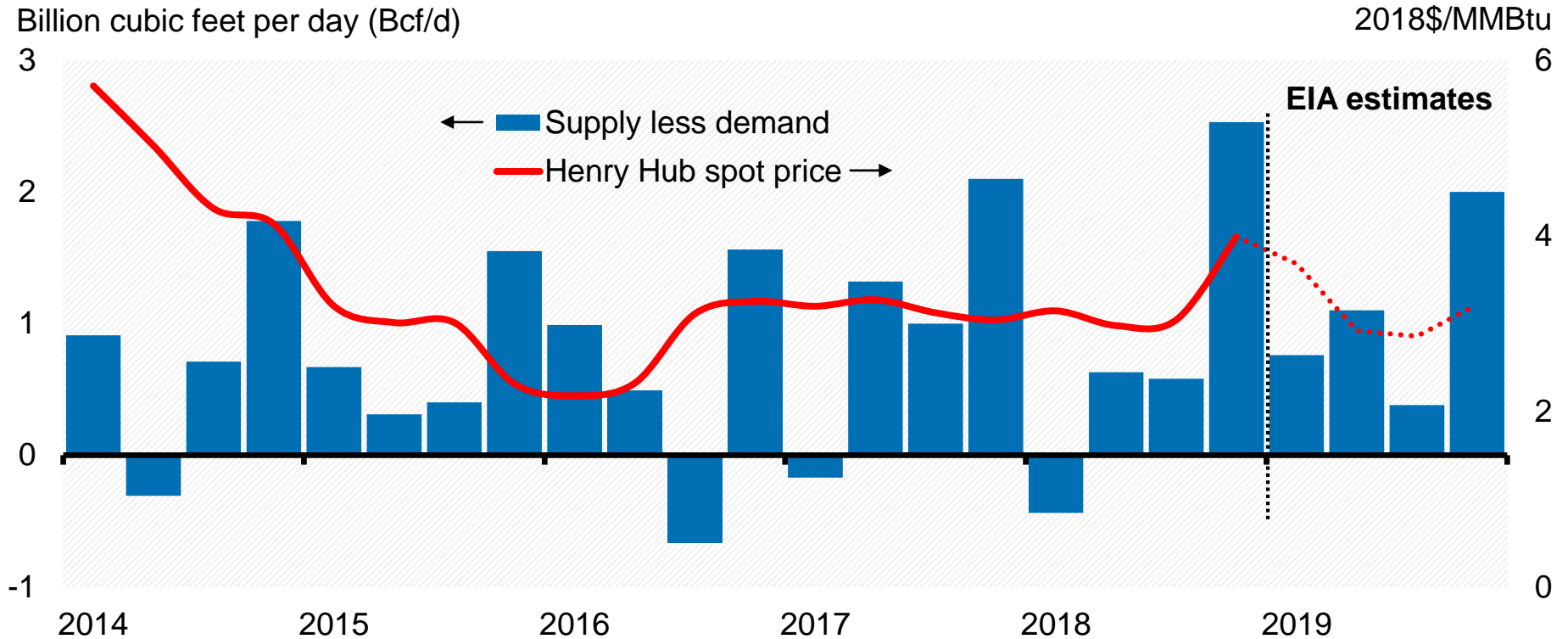
- ▶ Q4 2018 projected market growth of **12.4% y/y** (EIA)
- ▶ U.S. LNG exports **3.3 bcf/d** (vs. 2.6 bcf/d in Q4 2017)
- ▶ Futures prices reflect lower inventories and cold winter expectations
- ▶ Policies threaten subsidies
- ▶ China tariff on U.S. LNG

sources: EIA, Bloomberg, Baker Hughes, National Energy Board, Canadian Gas Association

Despite a winter seasonal price spike, EIA projects a surplus in Q4 and throughout 2019

➤ EIA sees sideways price movement

EIA supply/demand estimates as of December 2018

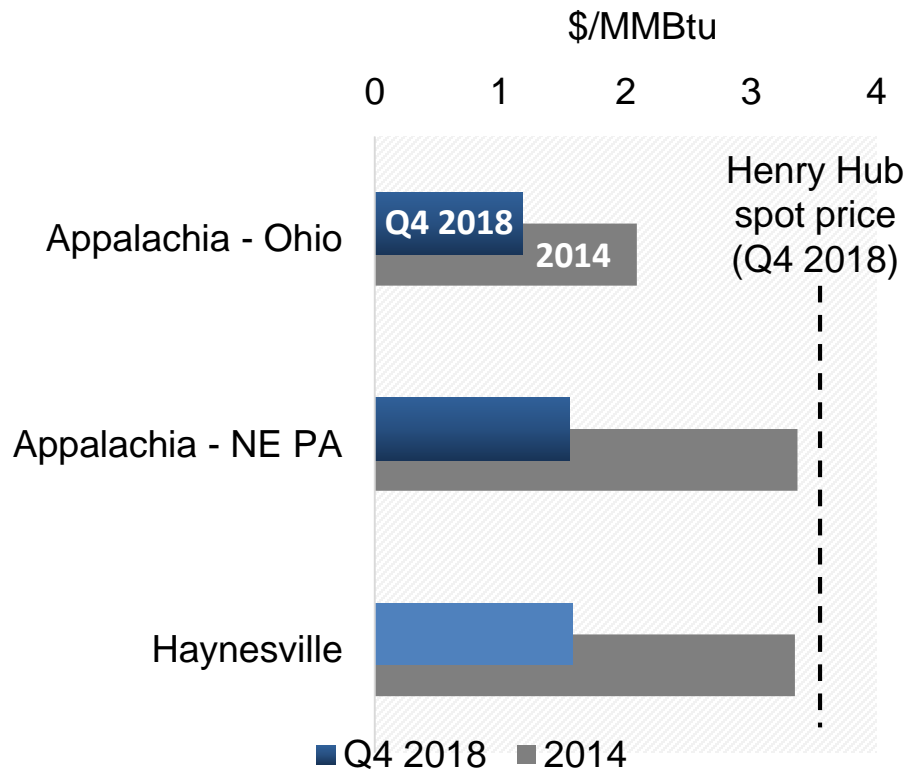


source: EIA STEO (December 2018)

Drilling specifically for natural gas has become increasingly predominant and cost-effective in the U.S.

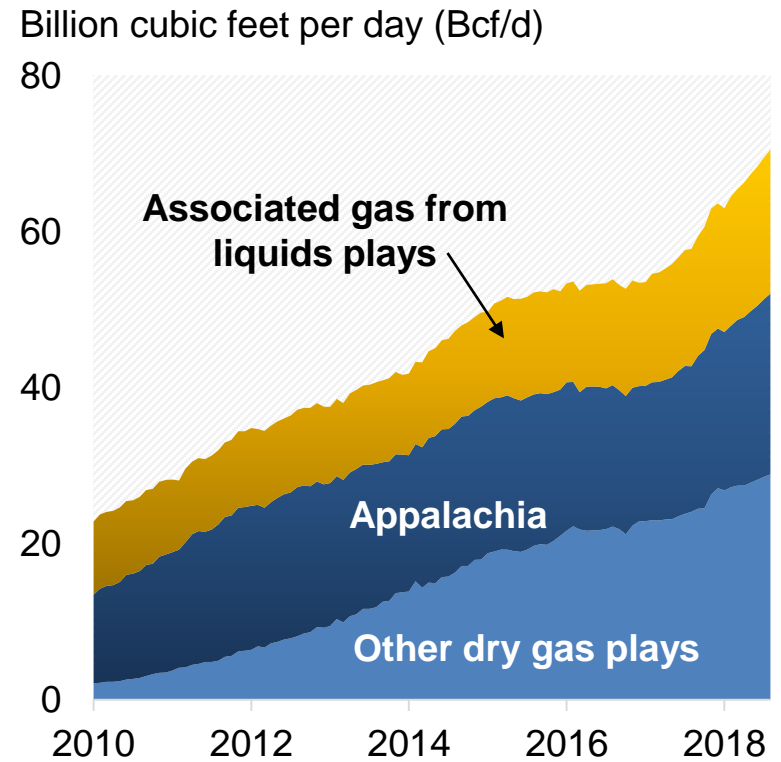
- With strong productivity gains, the burden to keep the energy renaissance going shifts to the market potential for natural gas demand

Breakeven prices for selected gas plays*



*Half cycle breakevens assuming 10% discount factor and play-specific costs source: BTU Analytics (Dec. 2018)

U.S. gas production by play type



source: EIA Drilling Productivity Report

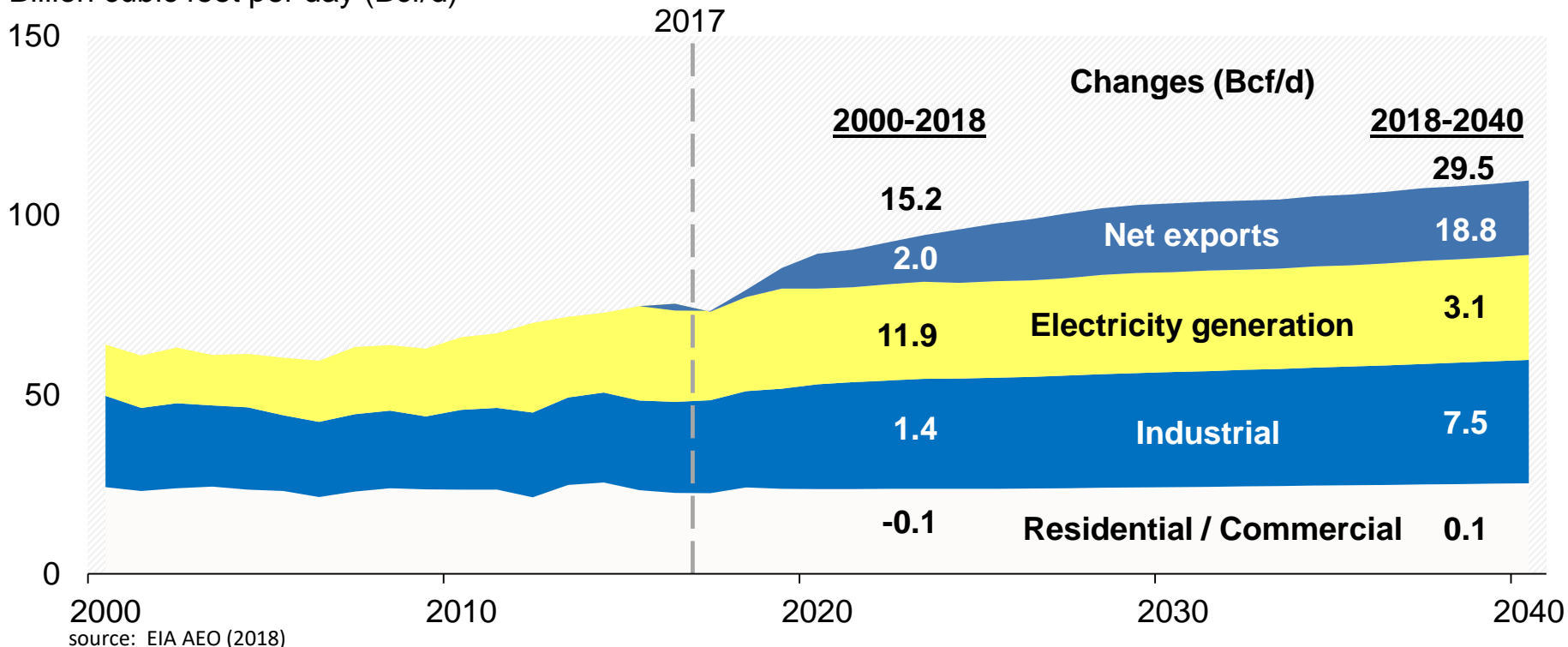
Natural gas into power generation and LNG exports are key uncertainties in EIA's outlook

➤ Industrial and export-driven gas demand growth are essential to meet the U.S. supply potential

U.S. natural gas supply / demand outlook

EIA Reference case

Billion cubic feet per day (Bcf/d)

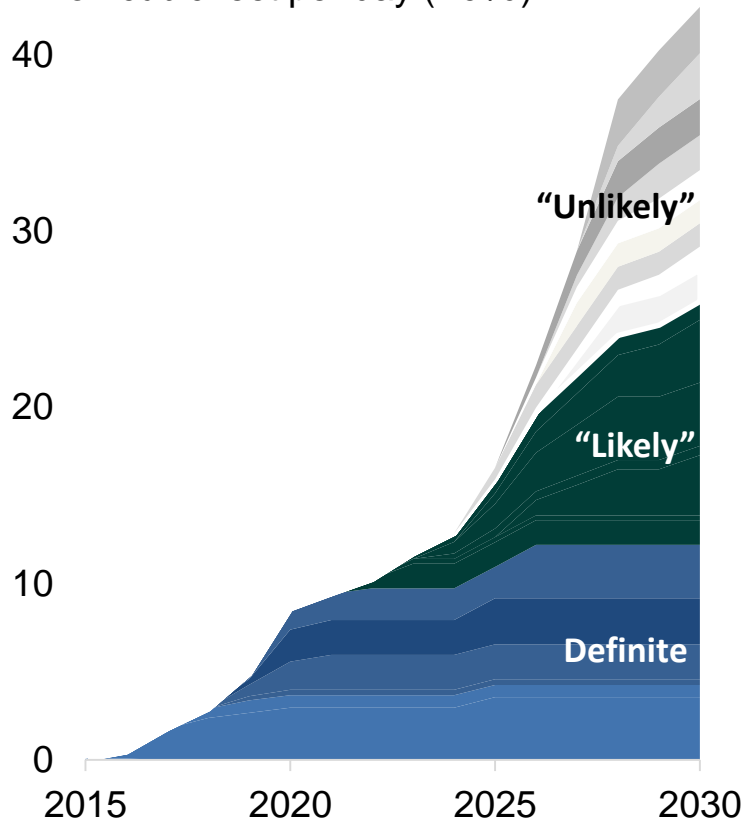


As LNG projects compete to serve global markets, Bloomberg's "definite" and "likely" projects largely fill anticipated market growth

▶ Bloomberg anticipates about 20 Bcf/d of U.S. LNG export capacity by 2030

North American LNG projects

Billion cubic feet per day (Bcf/d)



source: Bloomberg New Energy Finance (December 2018); amended for FID on LNG Canada Trains 1-2. Bold indicates a status update from Q3 2018.

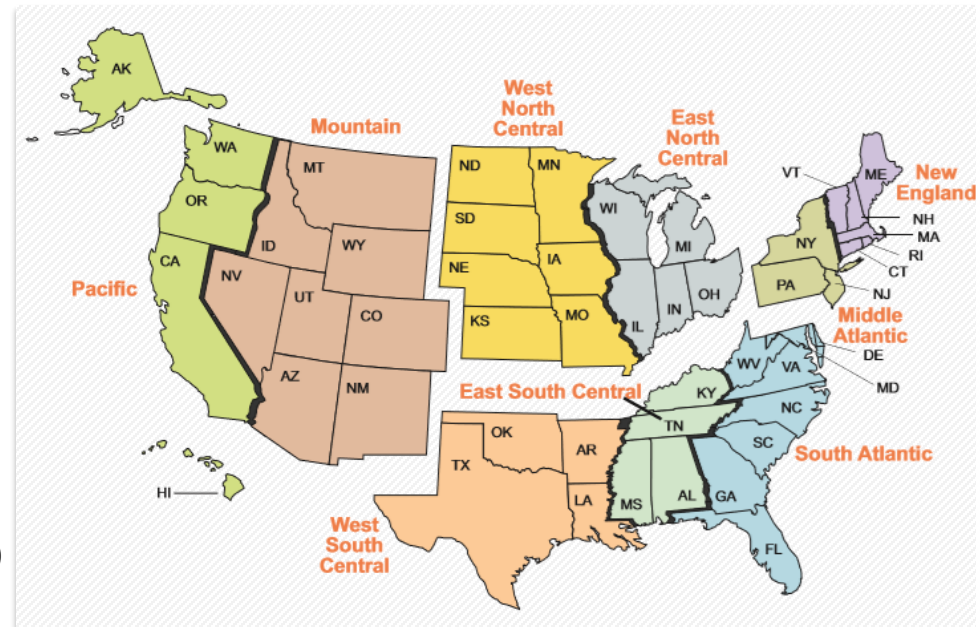
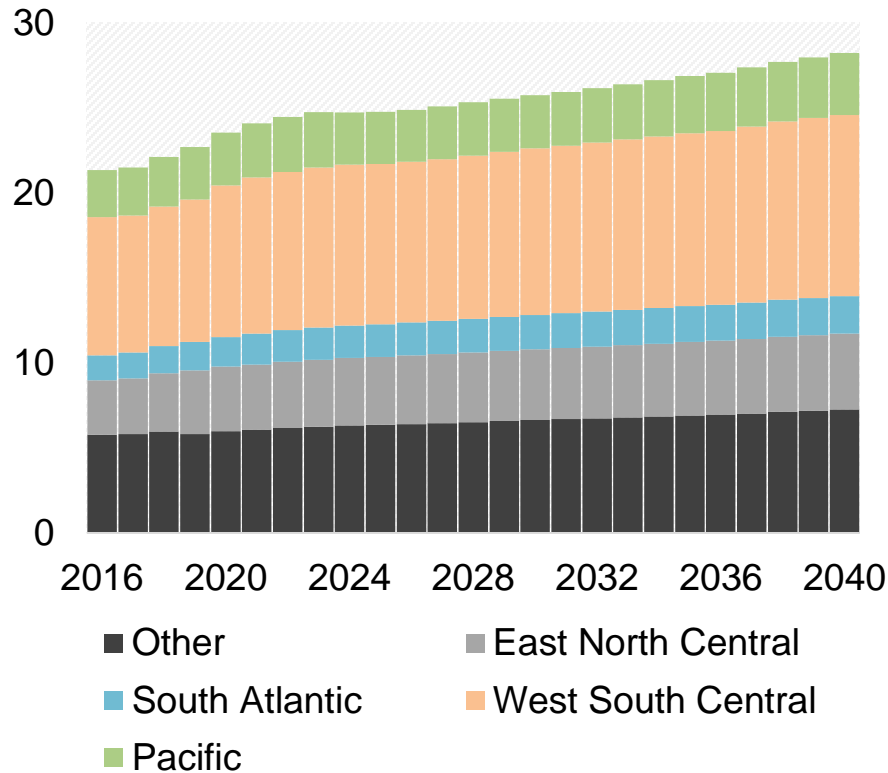
Plant name	Bloomberg view of likelihood	Final Investment Decision (FID) Status	2030 capacity (Bcf/d)
LNG Canada Tr. 3-4	Unlikely	Planning FID	1.6
Corpus Christi Mod. 1-7	Unlikely	Under regulatory review	3.0
Plaquemines	Unlikely	Planning FID	2.6
Freeport LNG Train 4	Unlikely	Under regulatory review	0.7
Alaska LNG	Unlikely	Planning FID	2.6
Golden Pass	Unlikely	Planning FID	2.1
Lake Charles	Unlikely	Planning FID	2.0
Delfin FLNG	Unlikely	Planning FID	1.7
Kitimat LNG	Unlikely	Planning FID	1.3
Goldboro LNG	Unlikely	Planning FID	1.3
Rio Grande LNG Tr. 3-6	Unlikely	Under regulatory review	2.4
Monkey Island (SCT&E)	Unlikely	Under regulatory review	1.6
Port Arthur LNG	Unlikely	Under regulatory review	1.8
Magnolia LNG	Likely	Planning FID	1.1
Rio Grande LNG Tr. 1-2	Likely	Planning FID	1.2
Driftwood	Likely	Planning FID	3.6
Texas LNG	Likely	Planning FID	0.5
LNG Canada Tr. 1-2	Likely	FID taken	1.6
Woodfibre LNG	Likely	FID taken	0.3
Sabine Pass Tr. 6	Likely	Planning FID	0.6
Calcasieu Pass	Highly Likely	Planning FID	1.4
Corpus Christi Tr. 1-3	In operation/definite	Under construction	1.8
Freeport LNG Tr. 1-3	In operation/definite	Under construction	2.0
Cameron LNG	In operation/definite	Under construction	2.0
Elba Island	In operation/definite	Under construction	0.3
Cove Point	In operation/definite	Operational	0.7
Sabine Pass Tr. 1-5	In operation/definite	Operational (Tr. 1-4); Construction (Tr. 5)	3.6

U.S. industrial natural gas demand growth should be regionally concentrated

- ▶ About two-thirds of EIA's projected industrial natural gas demand growth (2018-2040) occurs in West South Central (33%), East North Central (14%), Pacific (10%), and South Atlantic (8%)

U.S. industrial natural gas demand by region

Billion cubic feet per day (Bcf/d)



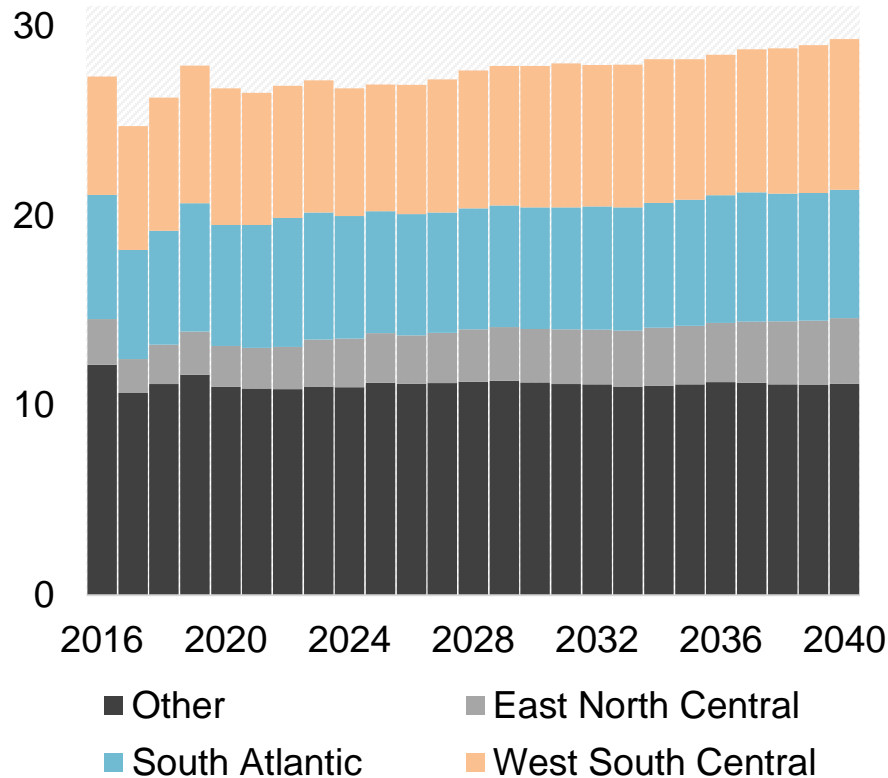
source: EIA AEO (2018)

EIA projects U.S. natural gas demand growth in power generation to occur mainly in three regions

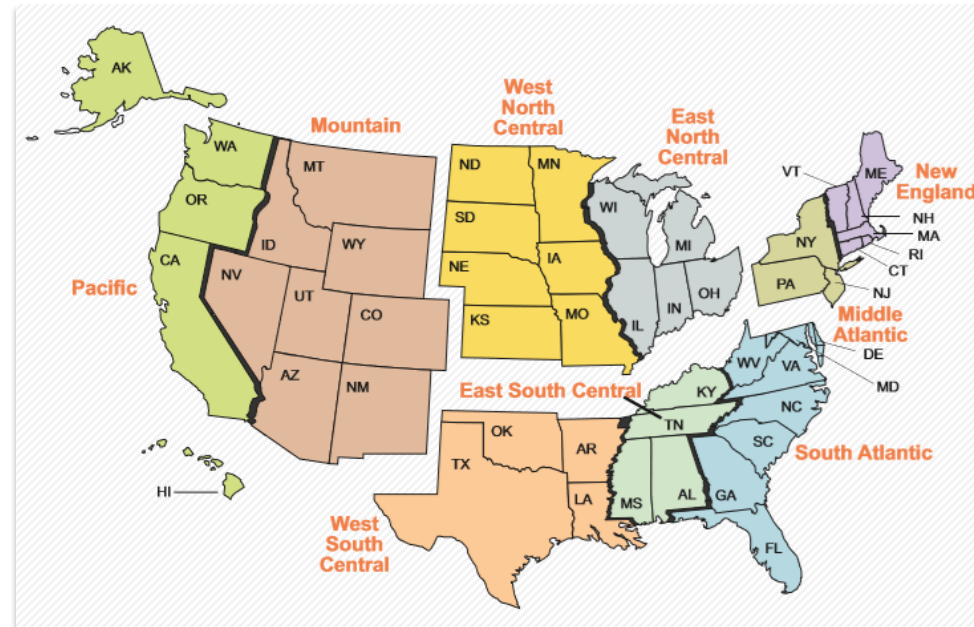
- EIA projects (2018-2040) the East North Central, West South Central and South Atlantic regions to account for most demand growth, while the Pacific's demand decreases by 35%

U.S. power generation natural gas demand by region

Billion cubic feet per day (Bcf/d)

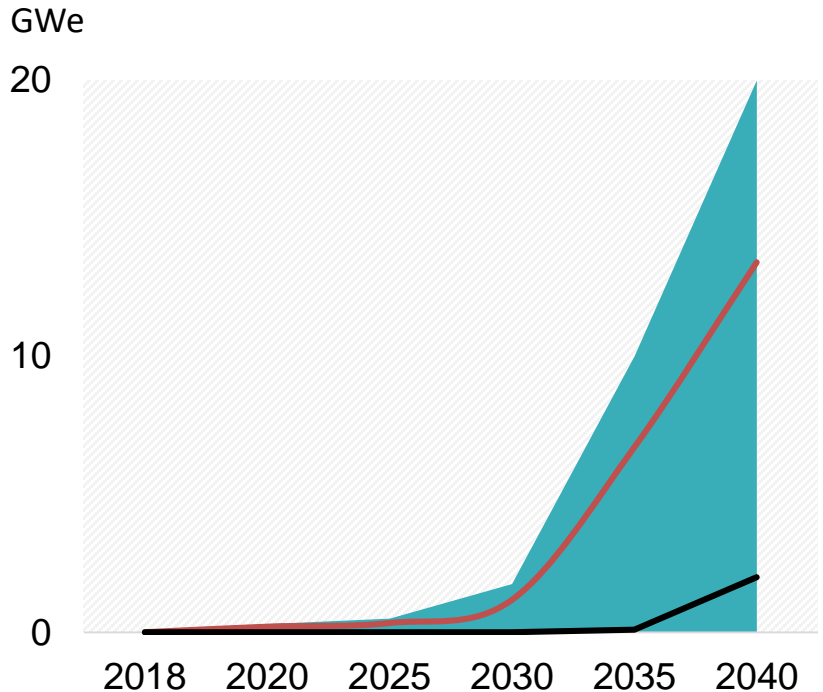


source: EIA AEO (2018)



The hype of battery storage appears overstated nationwide, but could be material in the Southeast region

Projected grid storage growth scenarios

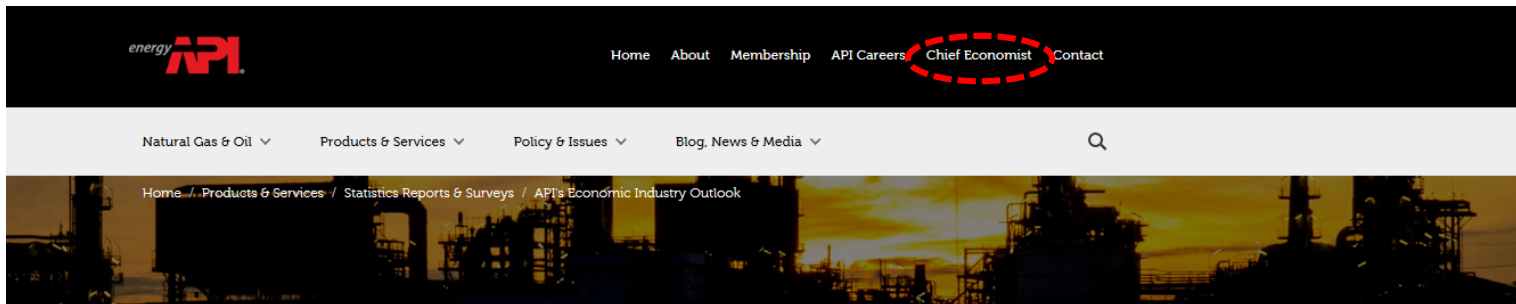


- Low battery cost / high gas price - Nationwide
- Low battery cost / high gas price - Southeast
- All other scenarios - Nationwide

source: EIA AEO (2018)

- Recent study by OnLocation uses EIA's NEMS power model to analyze scenarios for utility-scale battery storage improvements
- Assumes conducive market conditions for battery storage
- Most aggressive battery storage penetration possible in a low gas resource (high price) scenario
- The Southeast region is the only one with material new power capacity additions and storage potential

Resources: Chief Economist's section at www.api.org



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Dean Foreman (left) and podcast hosts

The API Industry Outlook, developed by API's Chief Economist, Dr. R. Dean Foreman, is a quarterly report that provides an overview of the natural gas and oil industry as it relates to the U.S. and global economies.

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