

OE ENERGY MARKET SNAPSHOT

National – Data Through October 2018

Office of Enforcement
Federal Energy Regulatory Commission
November 2018

2018/2019 Winter Assessment



Introduction

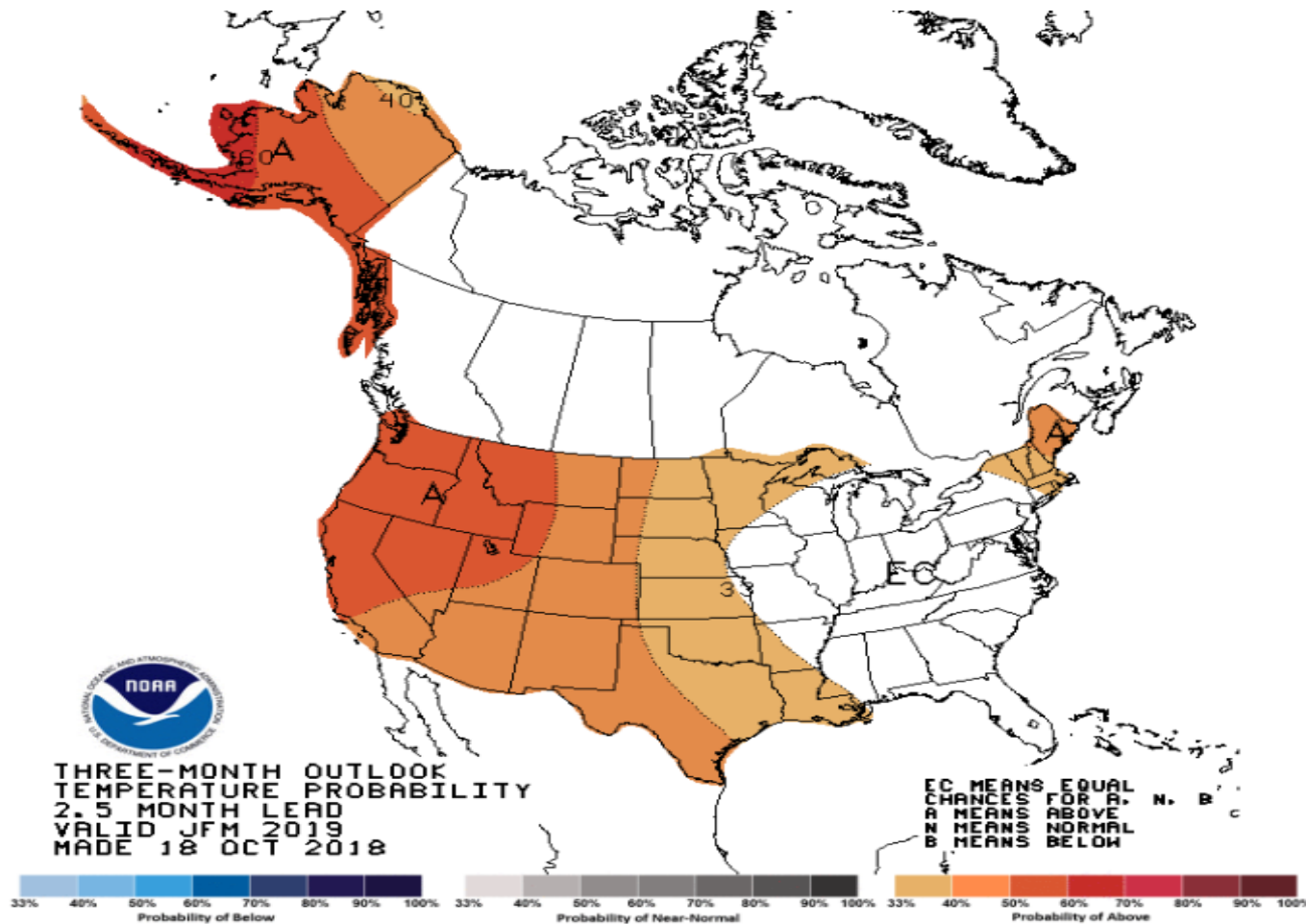
- NOAA forecasts a warmer than average winter.
- Regional pipeline constraints in New York City, Boston, and Los Angeles increase the risk of price volatility.
- Winter reserve margins exceed the reference margins this winter for all assessment areas.
- Fuel security remains an area of focus given the increasing use of natural gas-fired generation capacity.

Recap of 2018 Winter Weather Events

The Eastern Interconnection experienced cold weather during the Bomb Cyclone from December 26 to January 8.

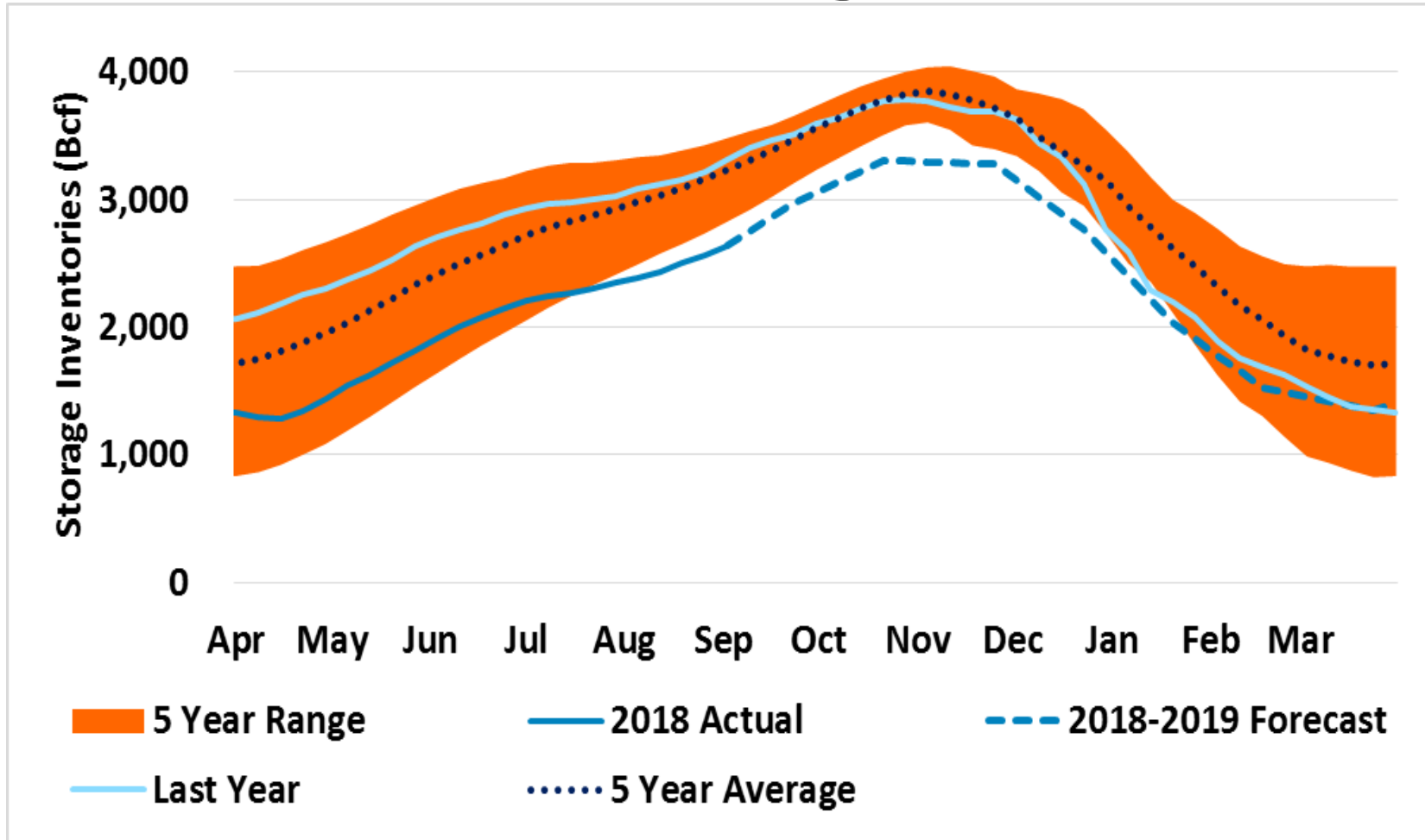
- ISO-NE, NYISO, PJM, and MISO experienced high but not record loads.
- Natural gas prices reached record levels.
- There was a notable increase in oil-fired generation.
- Generator outages contributed to tight electric supplies.
- Wholesale electricity prices were at high levels throughout this cold period.
- MISO South and SPP approached a short-term capacity shortage.

Forecasts Predict Warmer than Normal Winter



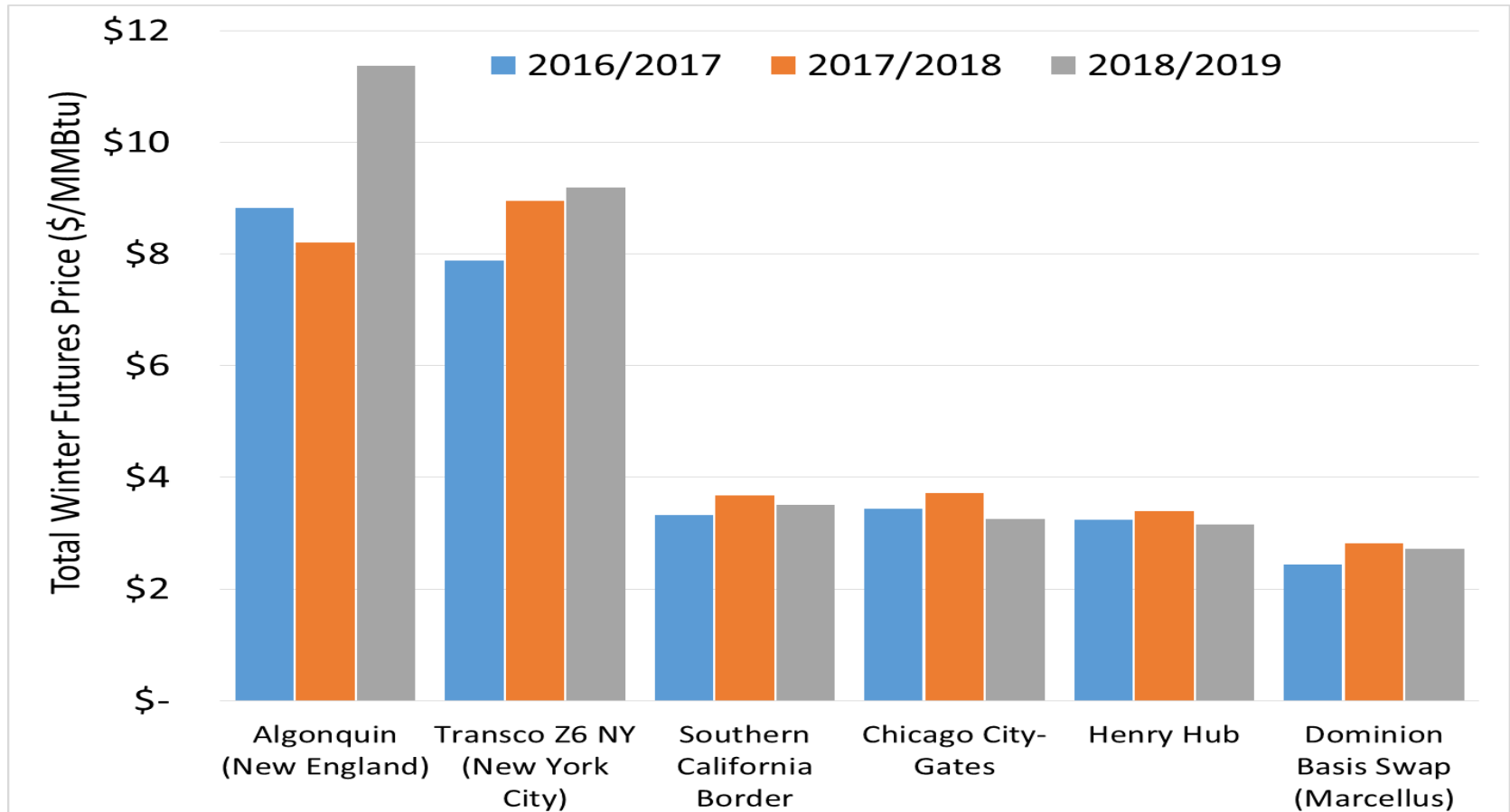
Source: National Oceanic and Atmospheric Administration

Natural Gas Storage Well Below Five-Year Average



Source: U.S. Energy Information Administration

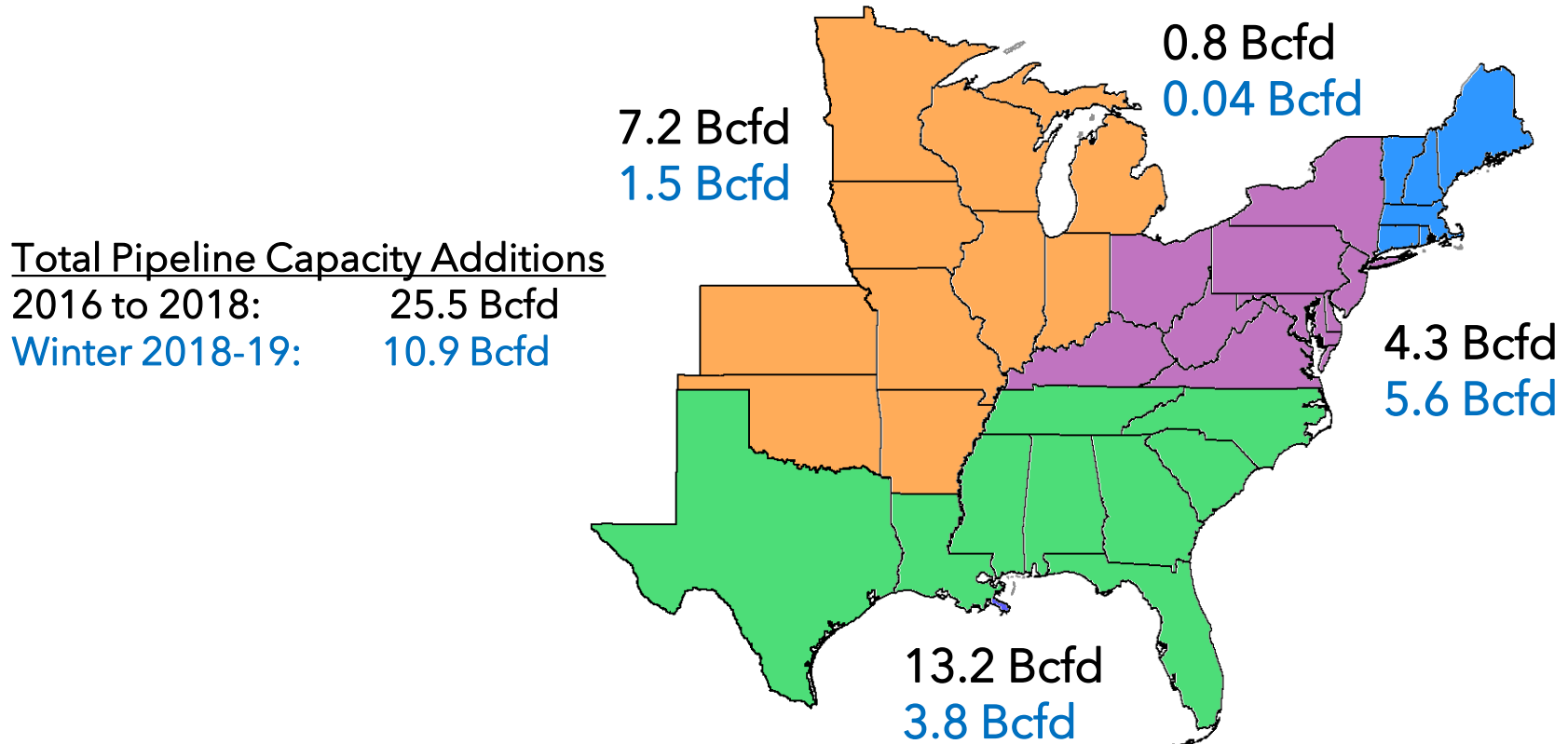
Natural Gas Futures in New England Top \$11 for 2018-2019 Winter



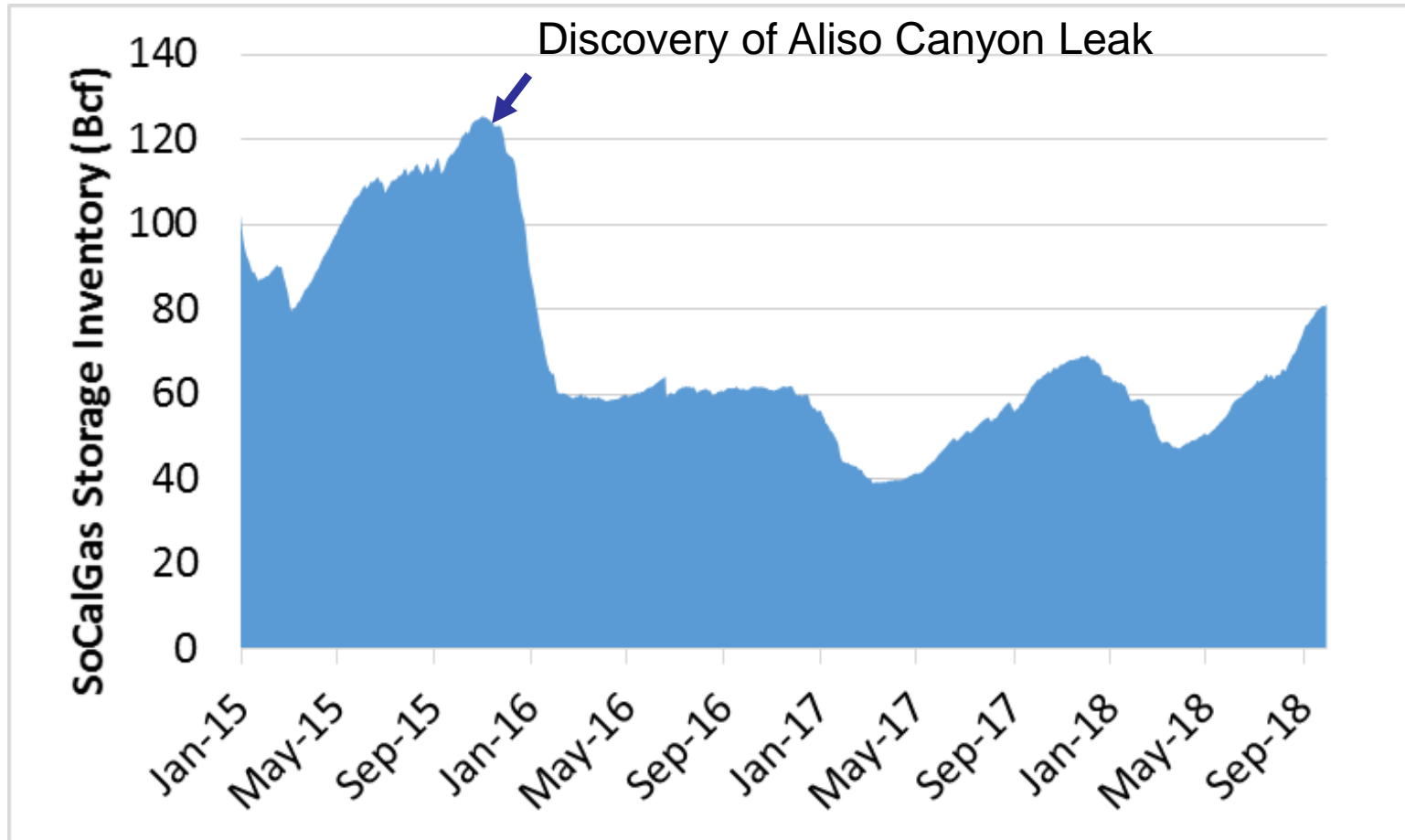
Source: InterContinental Exchange

Futures prices are the average January and February contract price of each year as of Oct. 1.

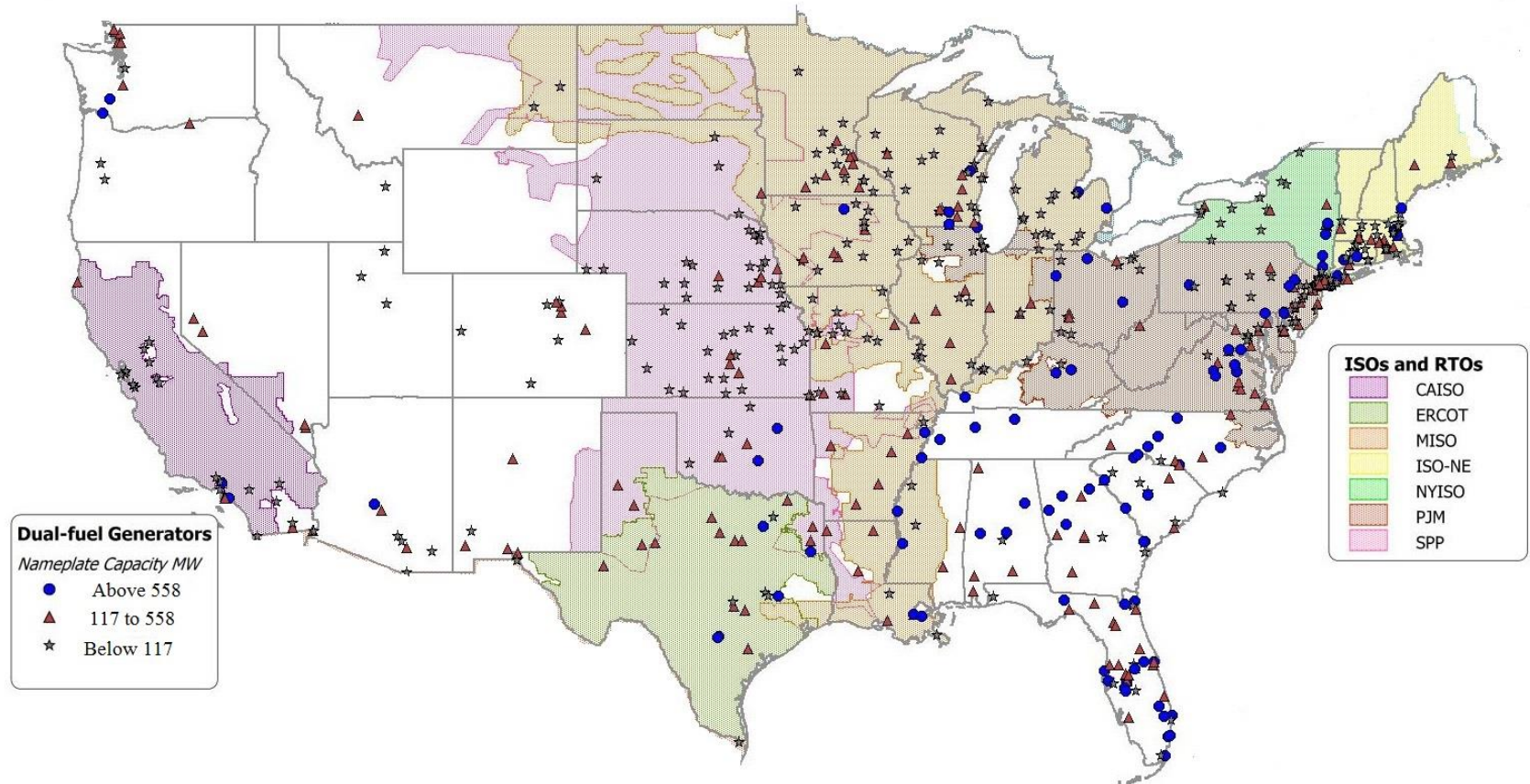
11 Bcfd of New Capacity Expected Online This Winter



Gas Infrastructure Restrictions May Stress California Energy Markets

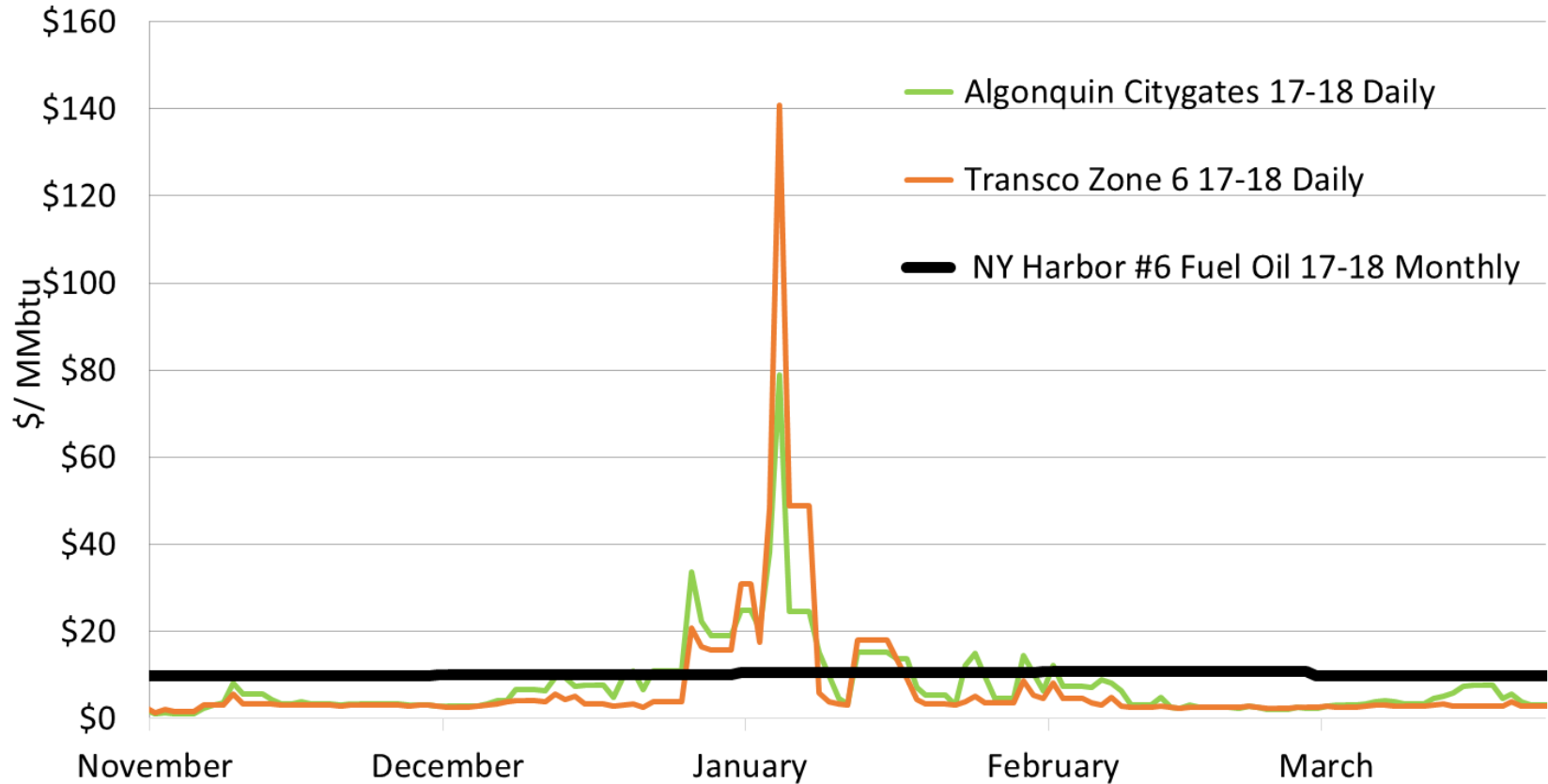


Most Gas-Oil Switching Occurs in the Eastern Interconnection



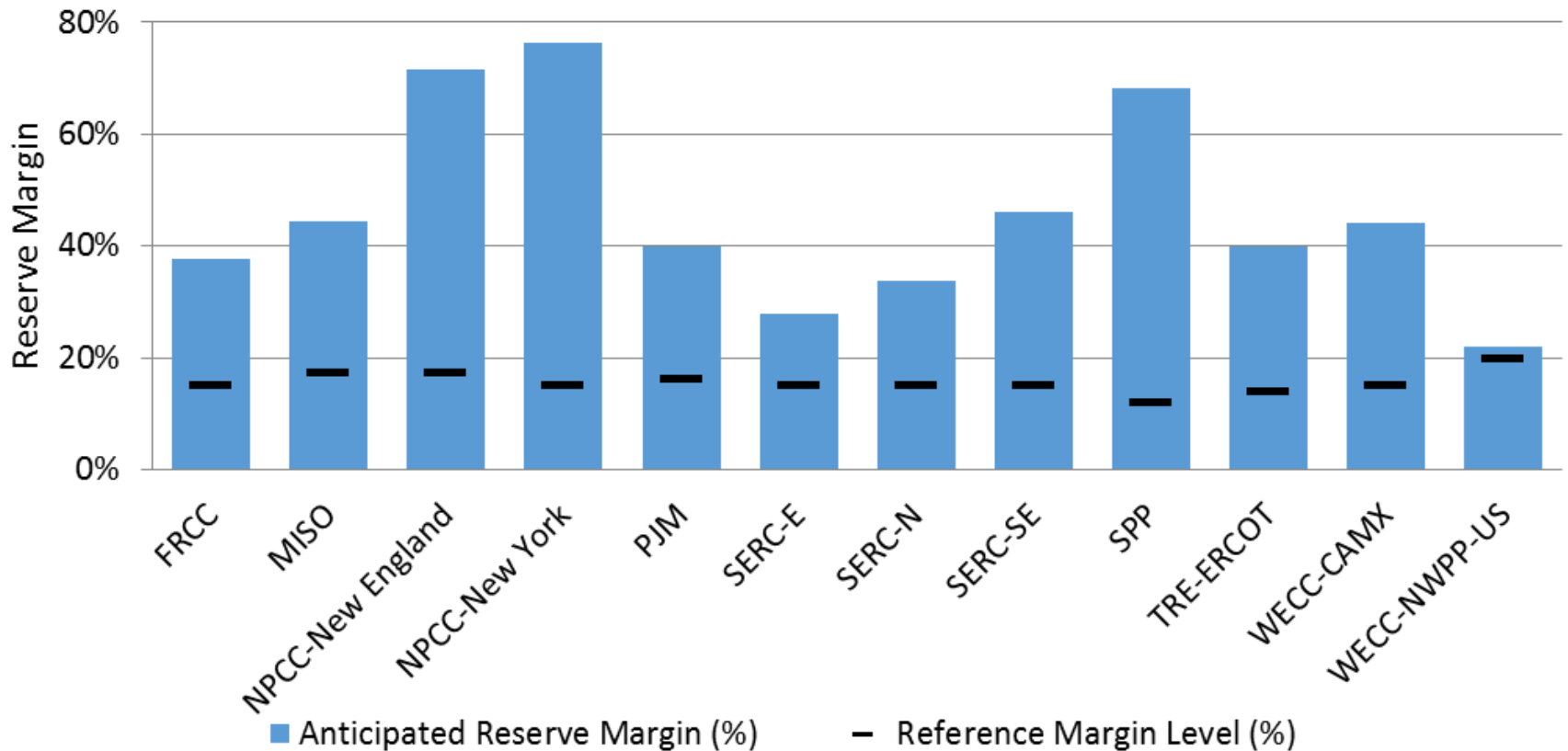
Sources: Derived from ABB Velocity Suite data.

Northeast Dual-Fuel Generators Hedge Gas Volatility



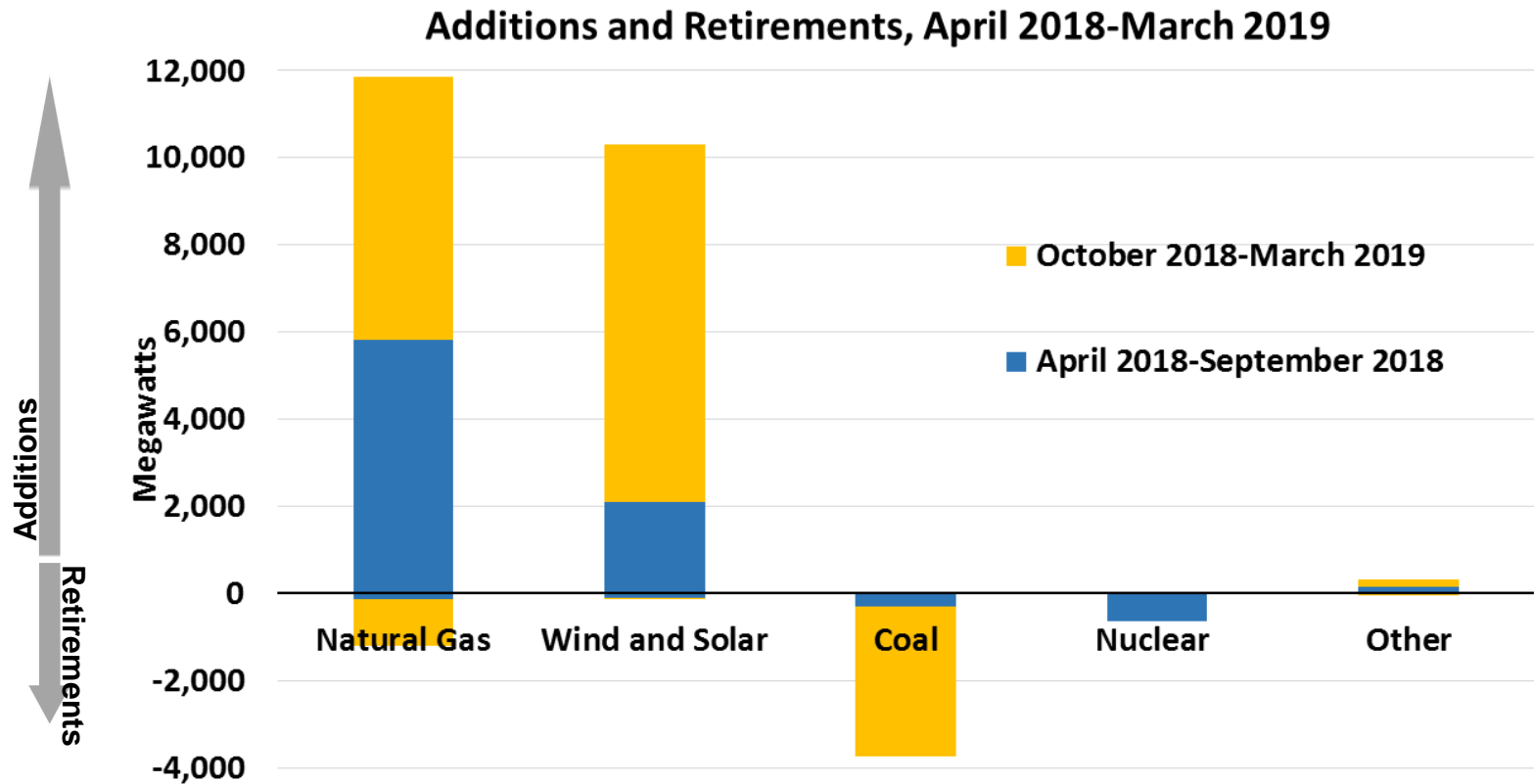
Sources: Platts Gas Daily Indices; Bloomberg, EIA
Fuel Oil prices are Month Ahead Bloomberg Fair Value Prices

Anticipated Reserve Margins Meet Reference Margins in All Regions



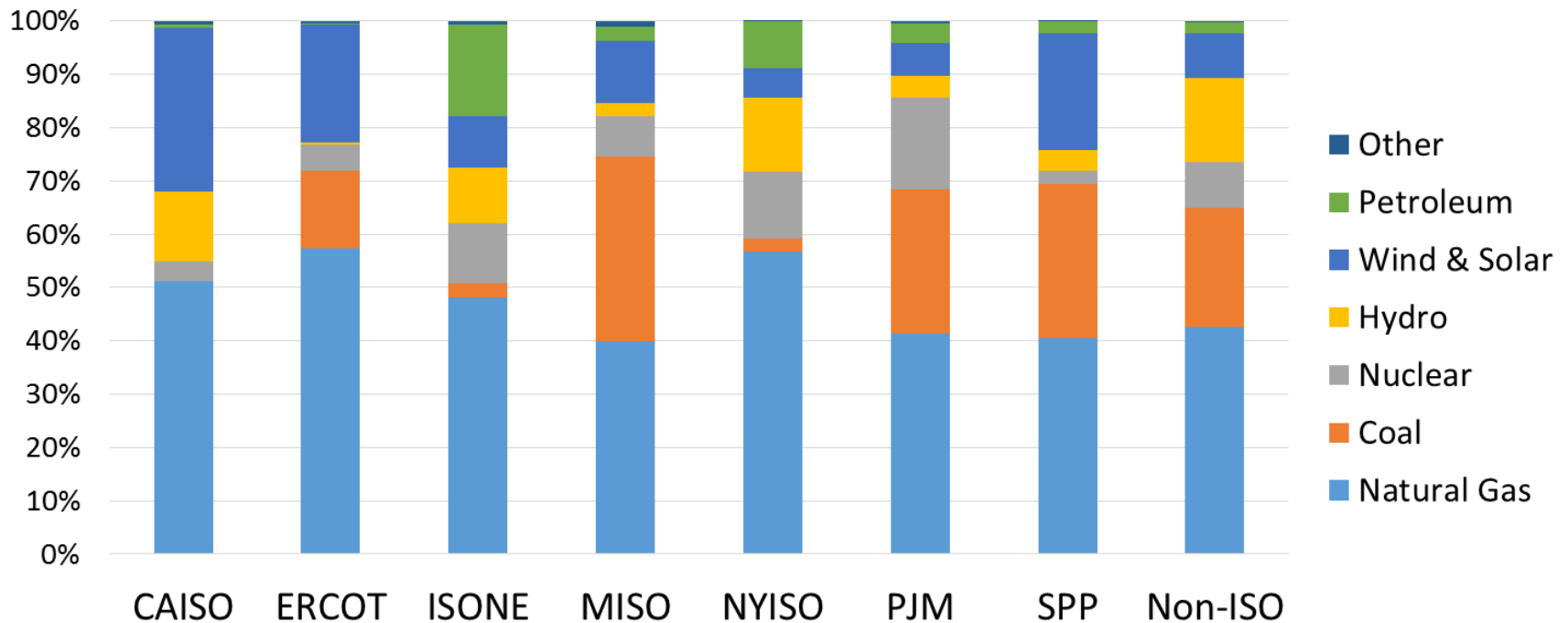
Note: WECC and NPCC includes U.S. portion only

New Plants and Retirements Continue Shift Toward Natural Gas and Renewables



Natural Gas Has a High Share of Capacity in RTO and Non-RTO Regions

Generation Capacity Mix



Source: Resource to BAA mappings are as reported by EIA in Form 860M, June 2018.

Note: Percentages based on net winter capacity; excludes AK, HI, and resources that do not report a BAA. Includes resources with status of operating and standby.

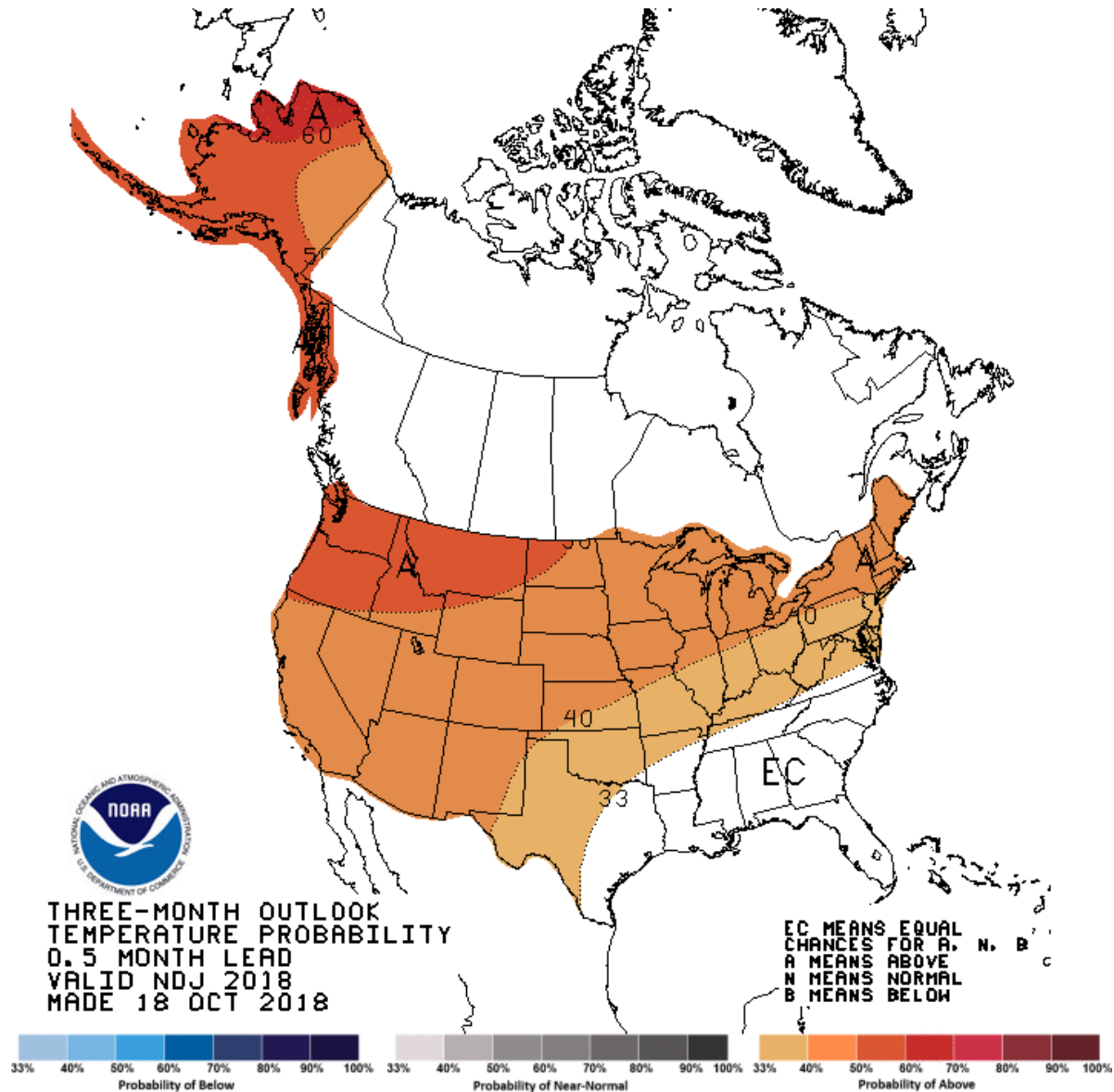
ISO-NE's Capacity Market Was Modified in Response to Fuel Delivery Issues

- Dependence on natural gas for power generation continues to increase.
- Pipeline capacity is limited and frequently operates at maximum capacity during cold weather.
- New England has limited natural gas storage capacity.
- Price responsive demand is fully integrated into the daily energy market.
- Pay-for-performance capacity market incentives take effect, replacing the Winter Reliability Program.

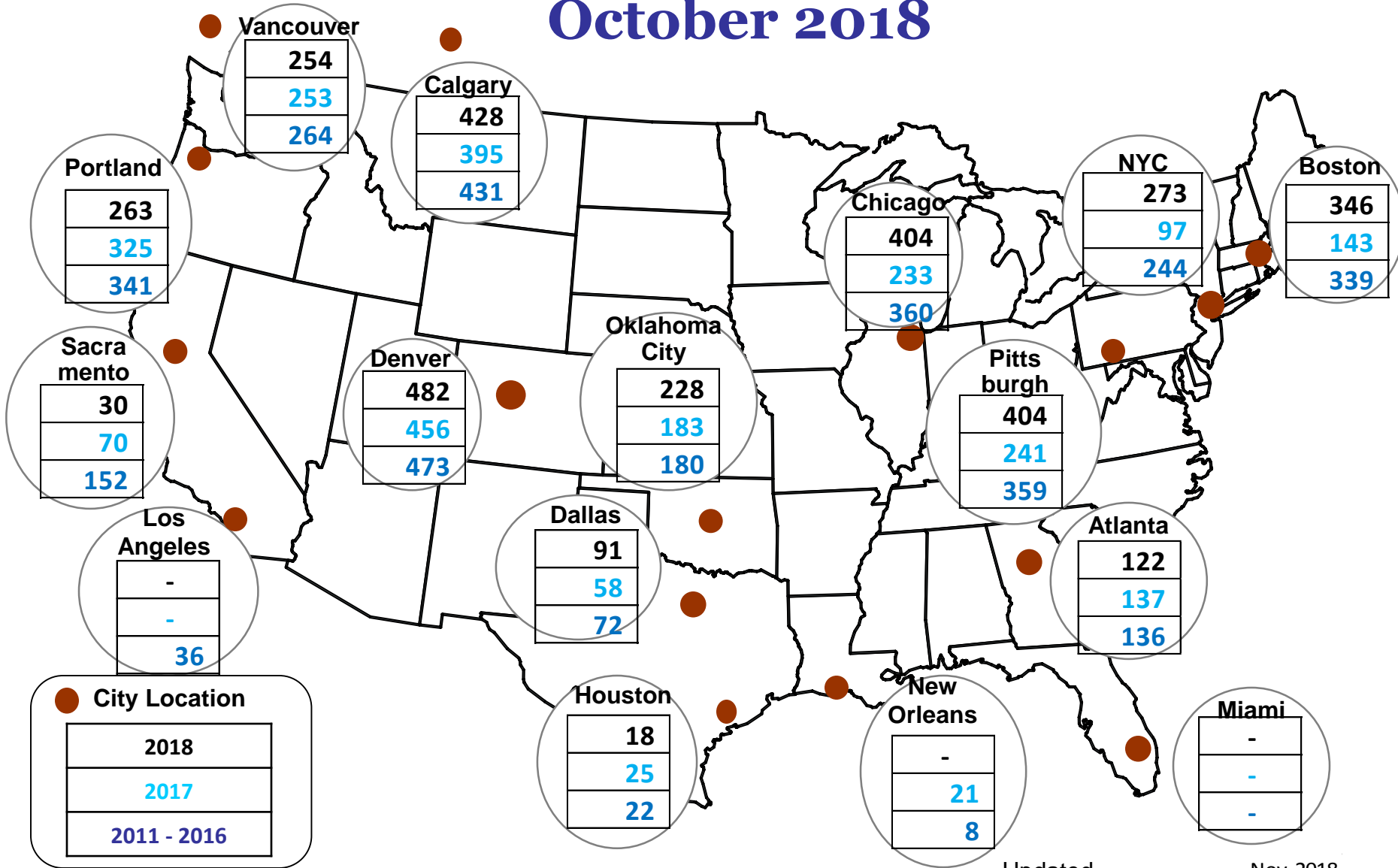


National Slides

NOAA November 2018 Through January 2019 Outlook

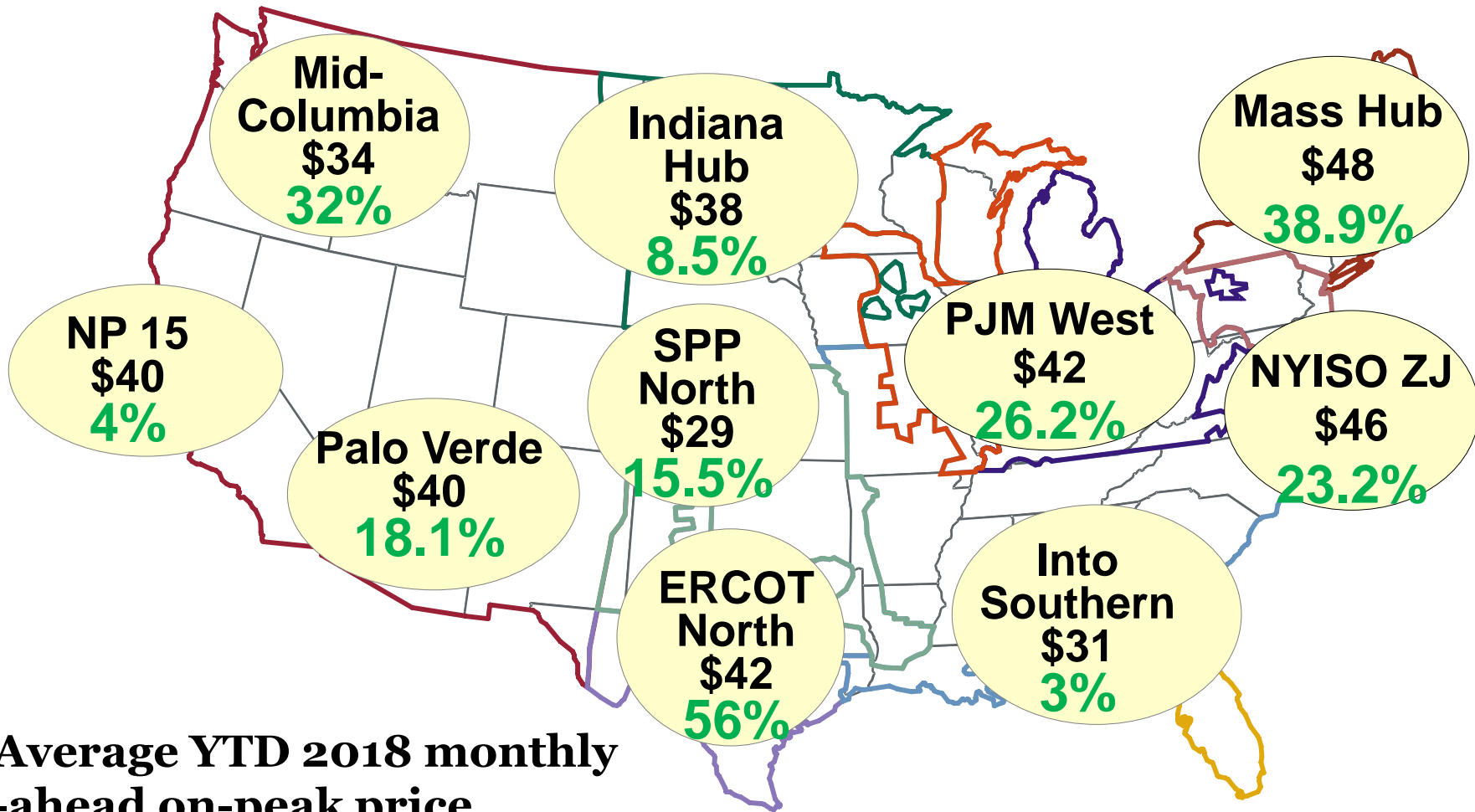


Cumulative HDDs by City October 2018



Source: Bloomberg Weather (daily data summed)

2018 Spot Power Prices (\$/MWh)

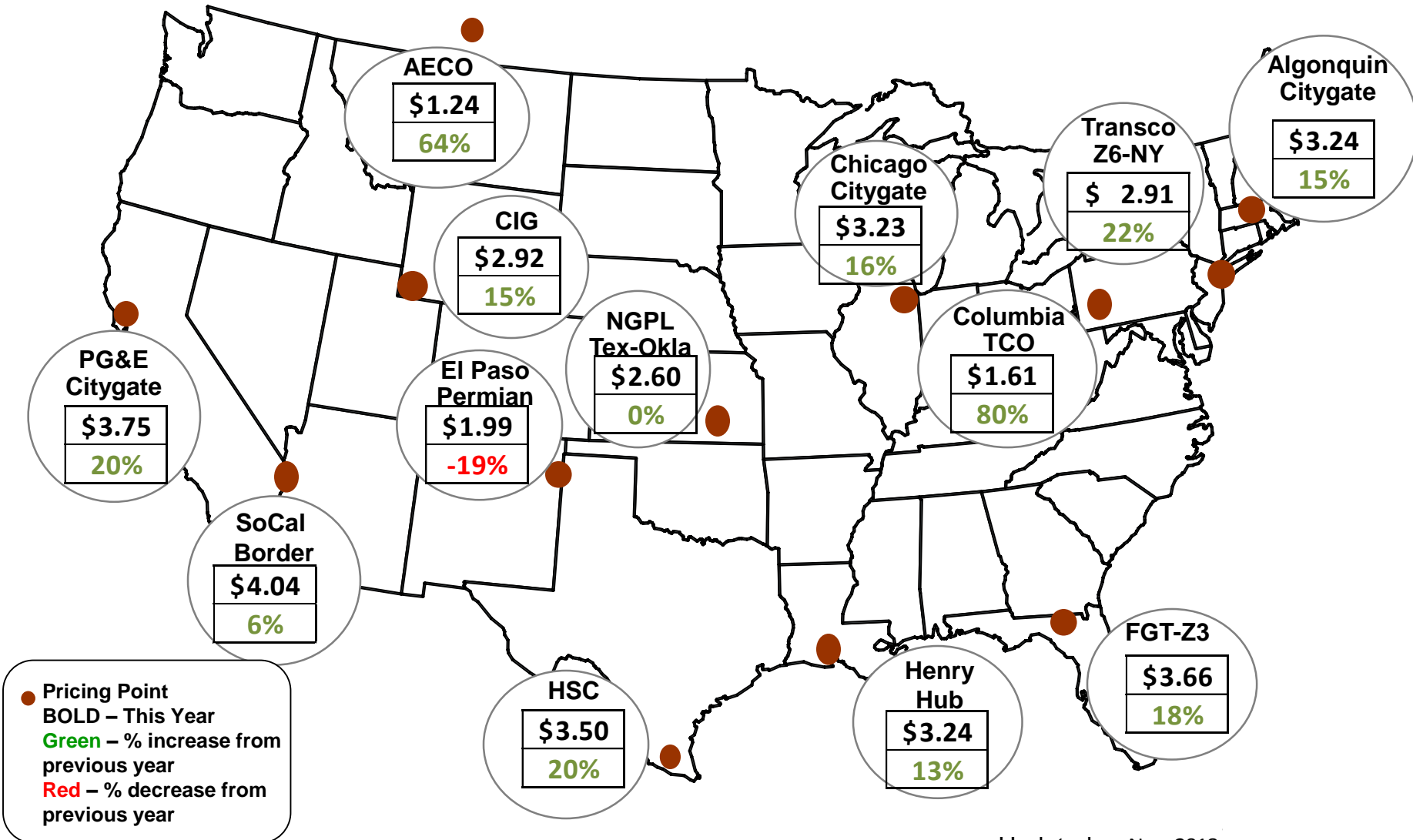


\$ = Average YTD 2018 monthly day-ahead on-peak price

% = Percent increase from 2017 YTD

Source: RTO/ISO data and SNL Day-ahead Prices

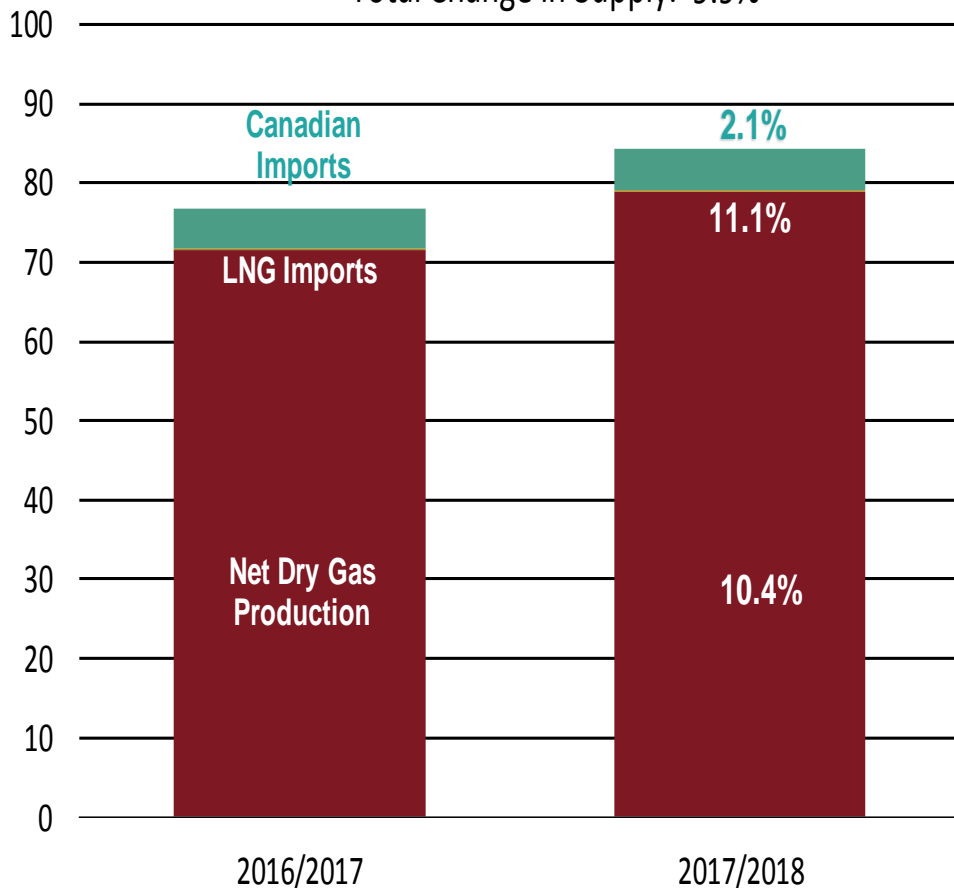
Spot Natural Gas Prices Average (\$/MMBtu) October 2018



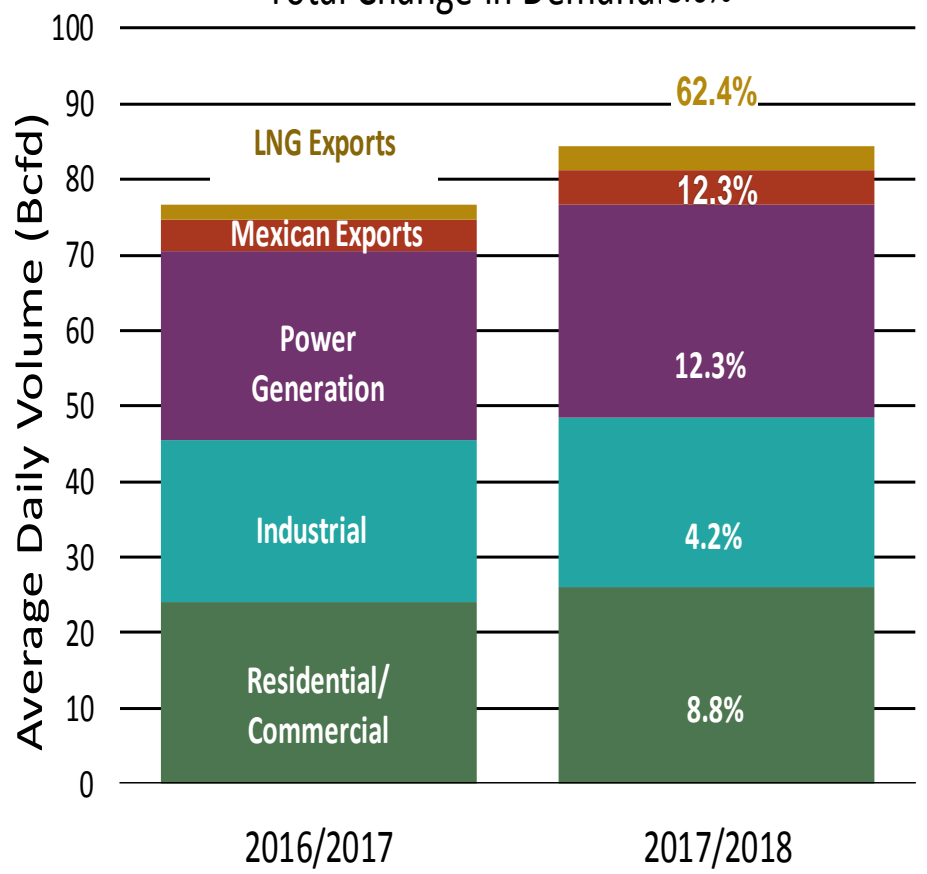
U.S. NG Supply and Demand

November 2016 – October 2017 vs November 2017 – October 2018

US Natural Gas Supply
Total Change in Supply: 9.9%

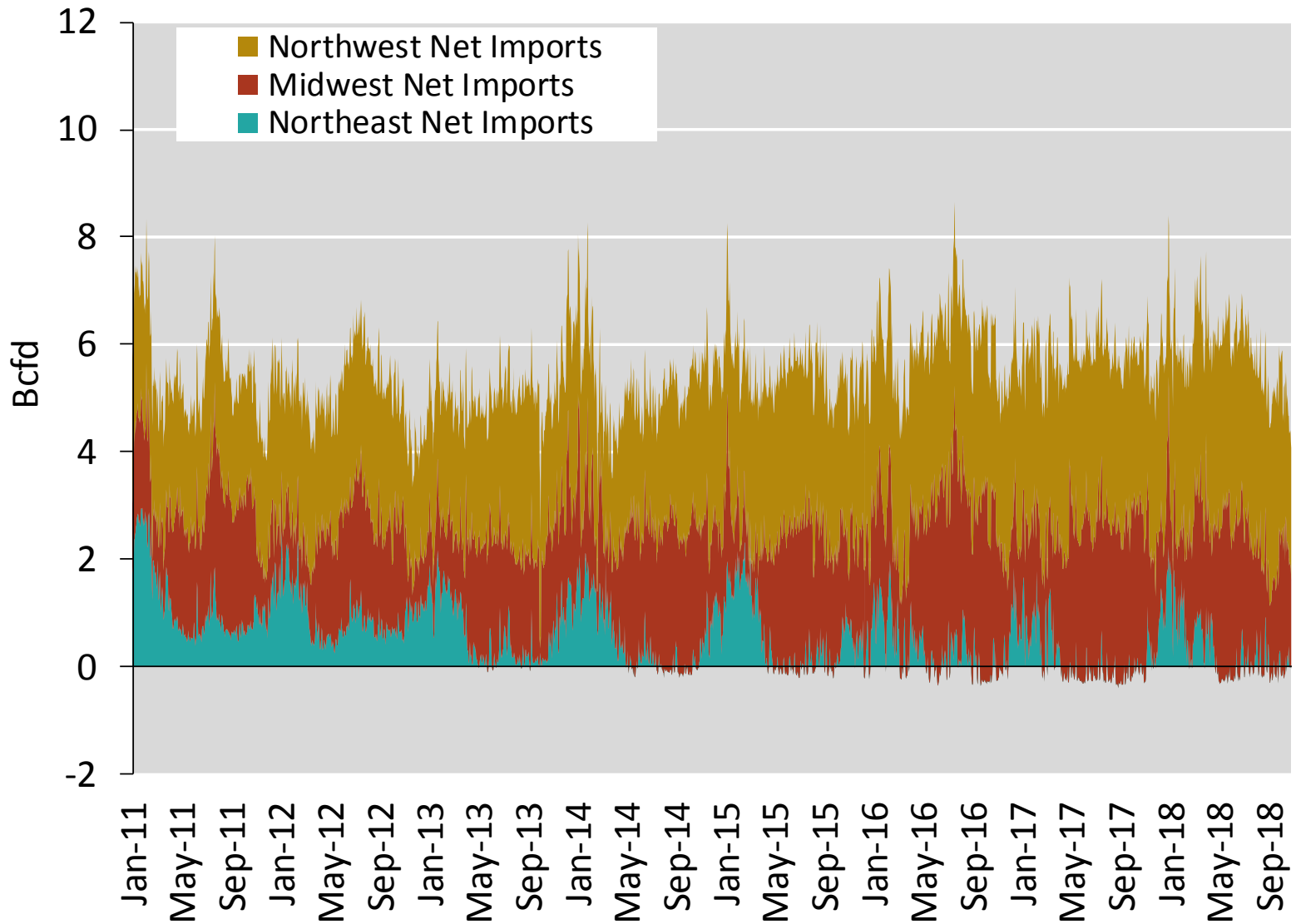


US Natural Gas Demand
Total Change in Demand: 8.6%

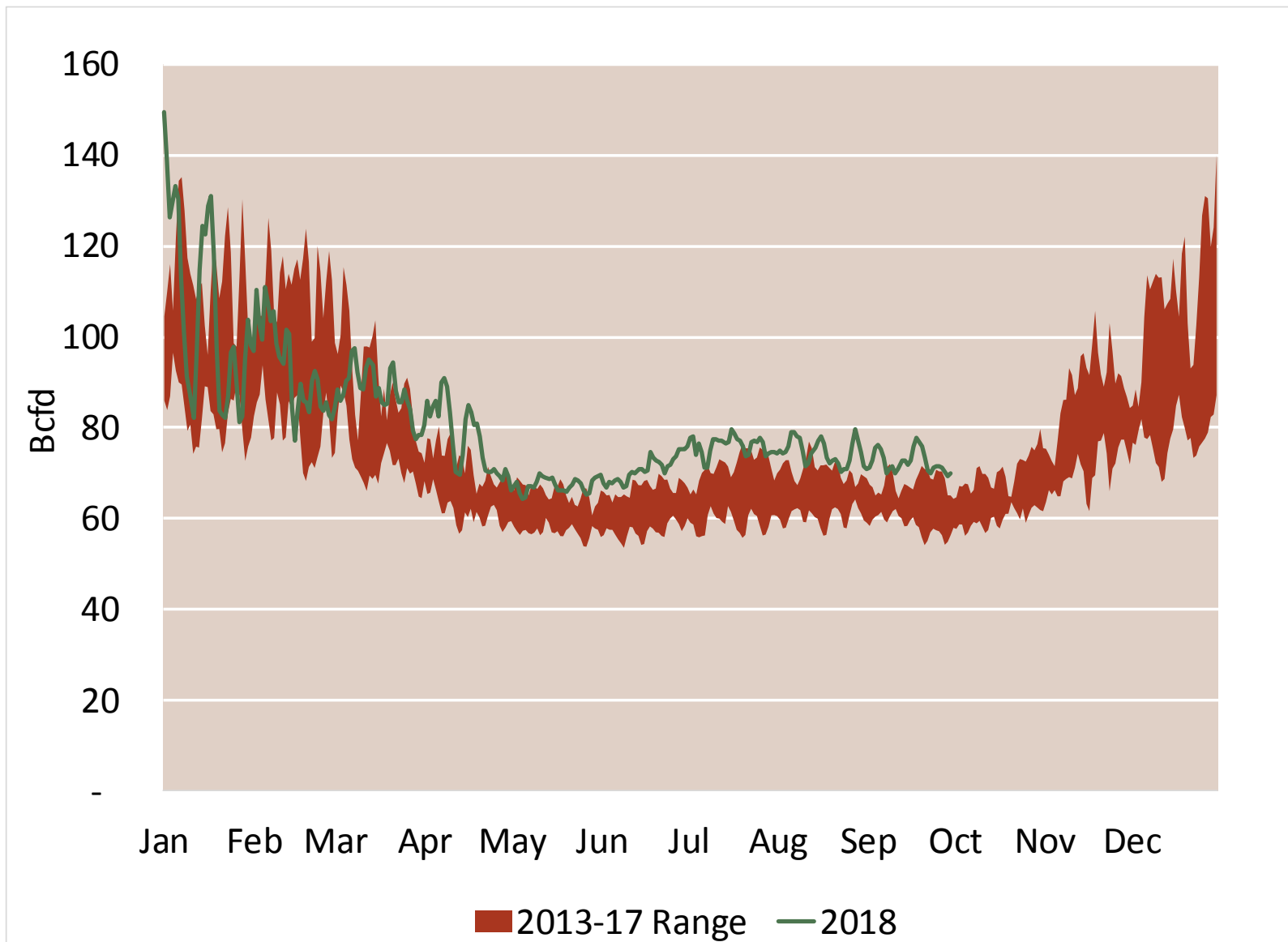


Note: Balance includes all amounts not attributable to other categories.
Source: Derived from Bentek Energy data

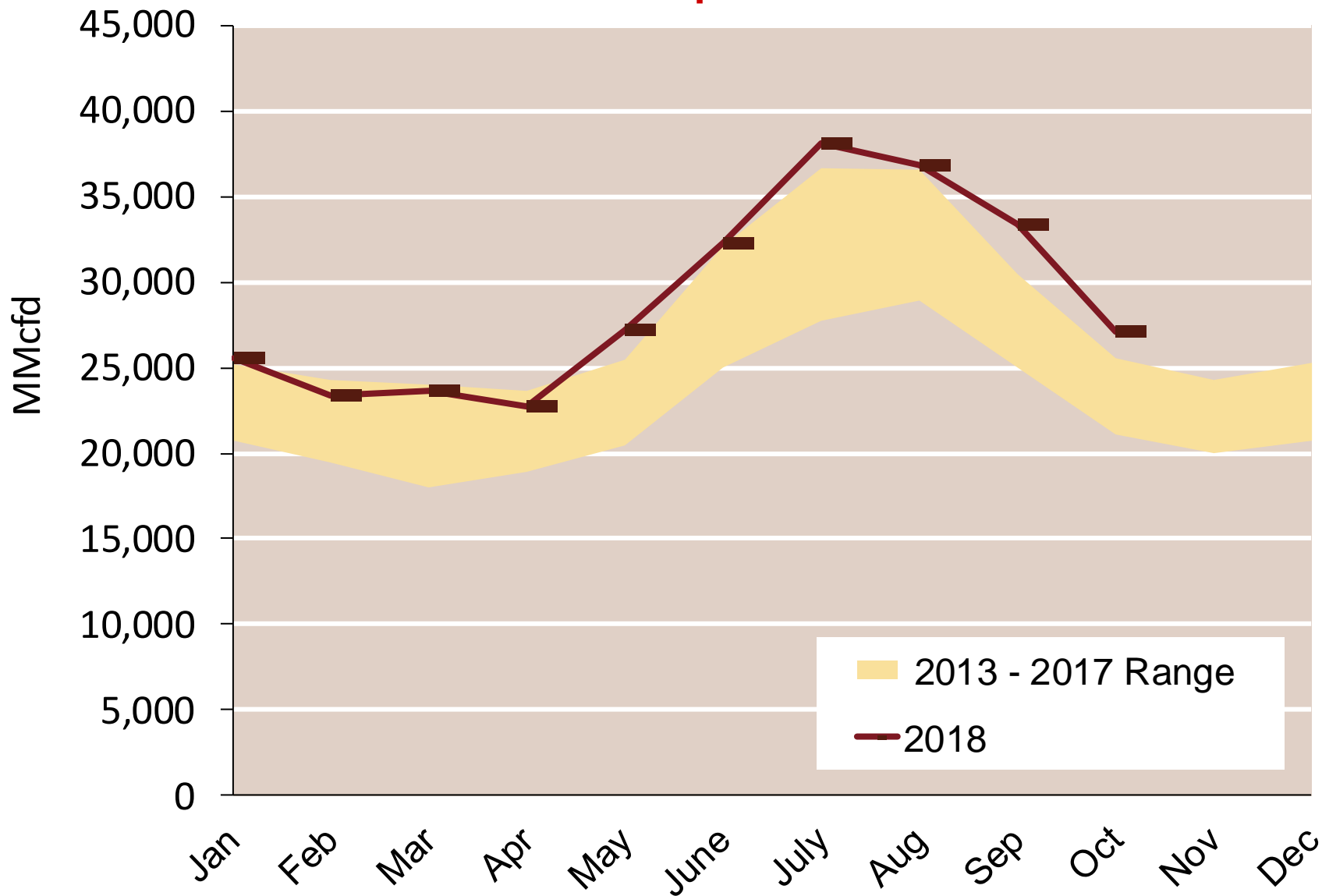
Regional Imports from Canada



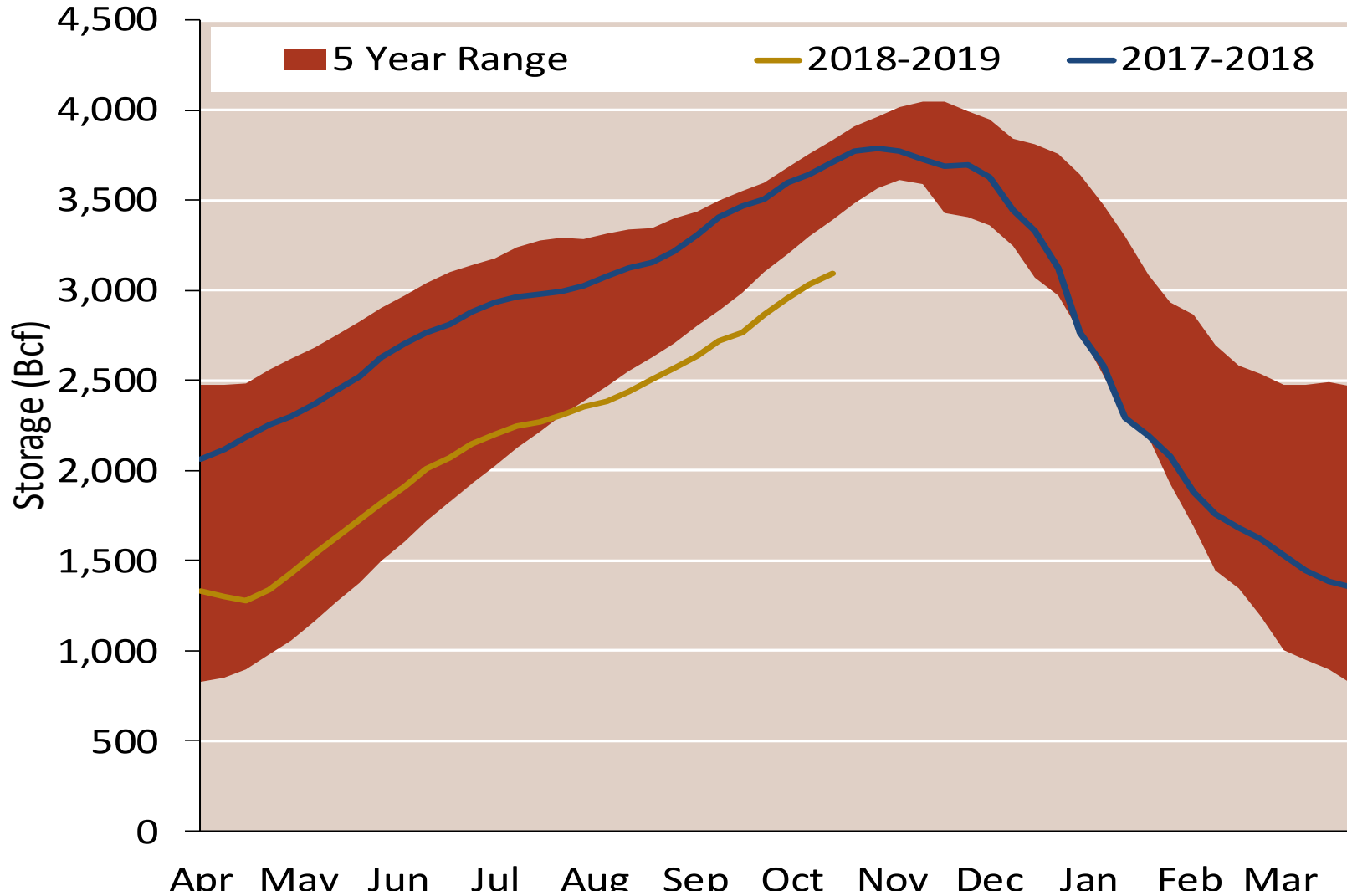
Total U.S. Natural Gas Demand All Sectors



U.S. Natural Gas Consumption for Power Generation



EIA National Storage Inventories

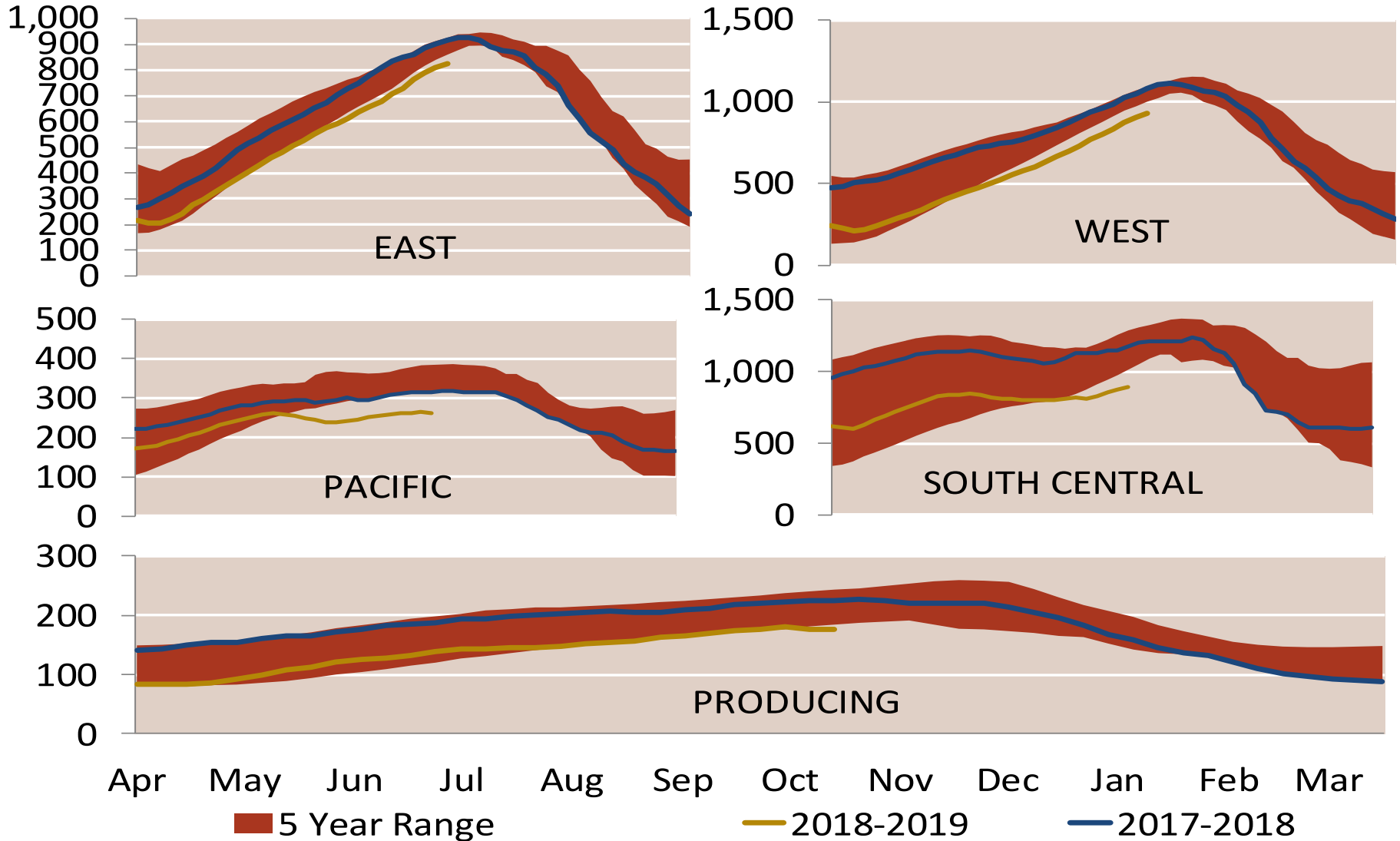


Notes:

Source: Derived from Bloomberg Data

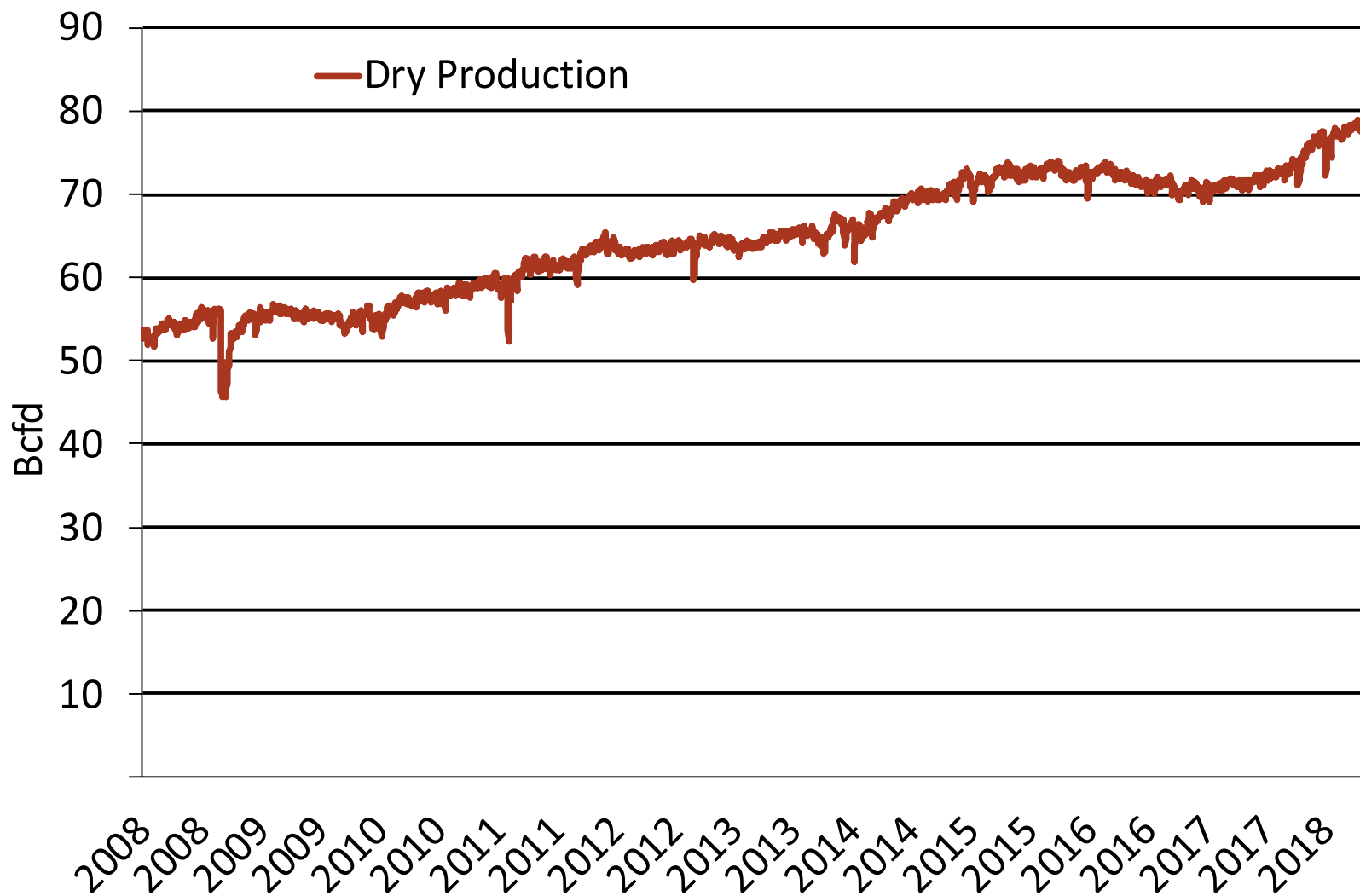
Updated Nov-2018

EIA Regional Storage Inventories



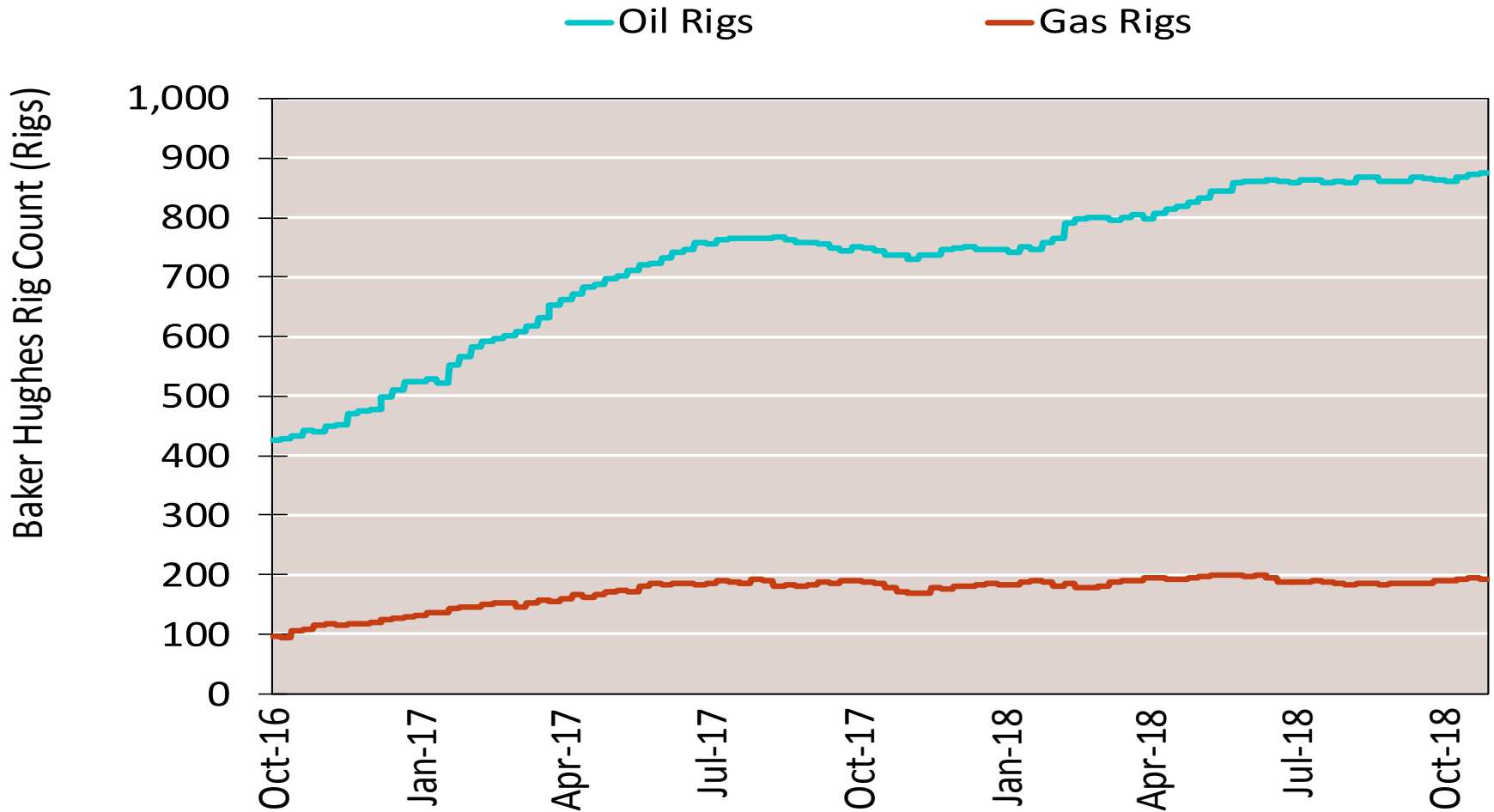
Not

Monthly U.S. Dry Gas Production – Lower 48 States



Note: Prior to July 2010, chart was derived from a combination of EIA and Bentek Energy data
 Source: Derived from Bentek Energy data

Rigs by Type

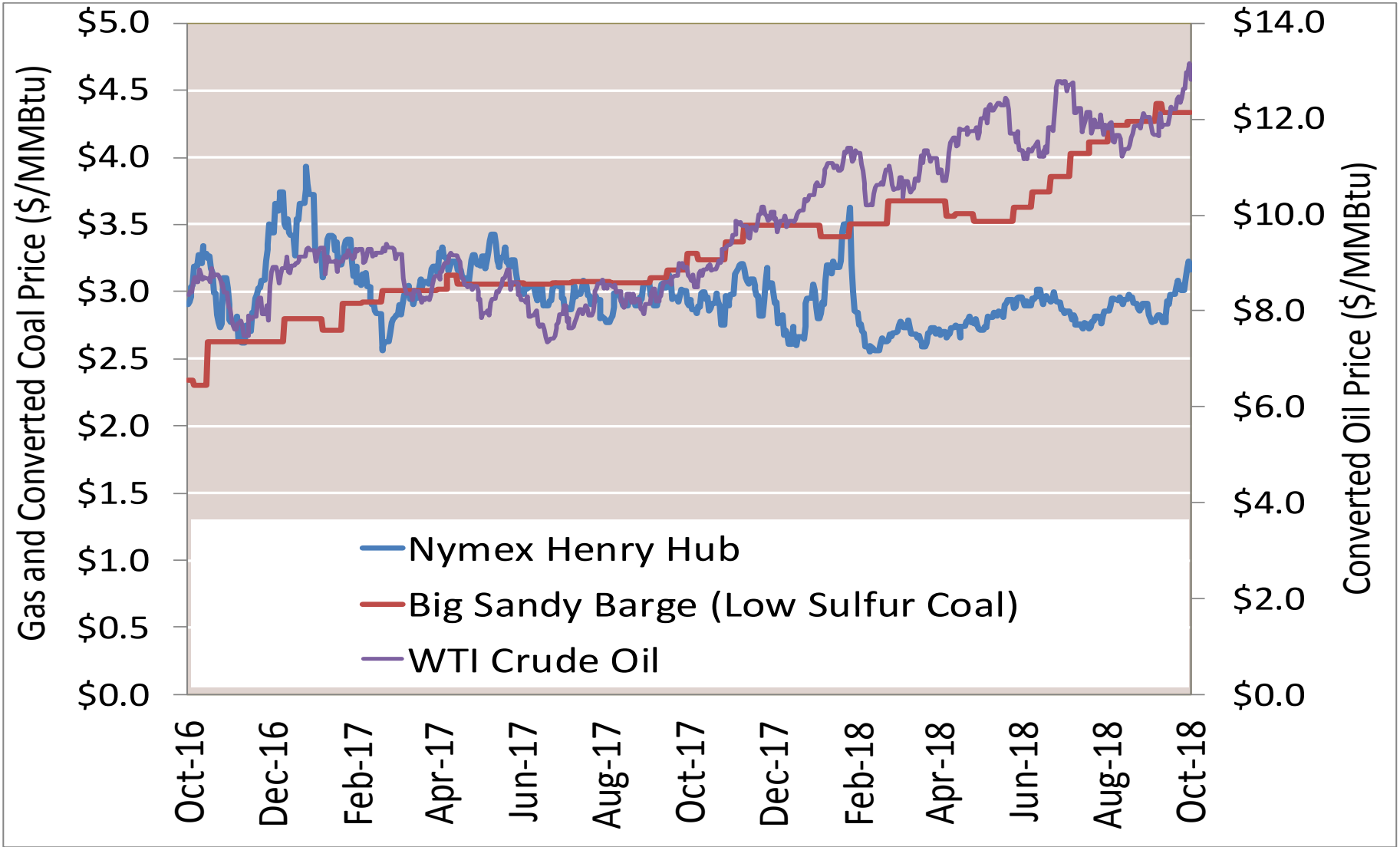


Notes:

Source: Derived from Bloomberg data

Updated Nov-2018

Competing Fuels

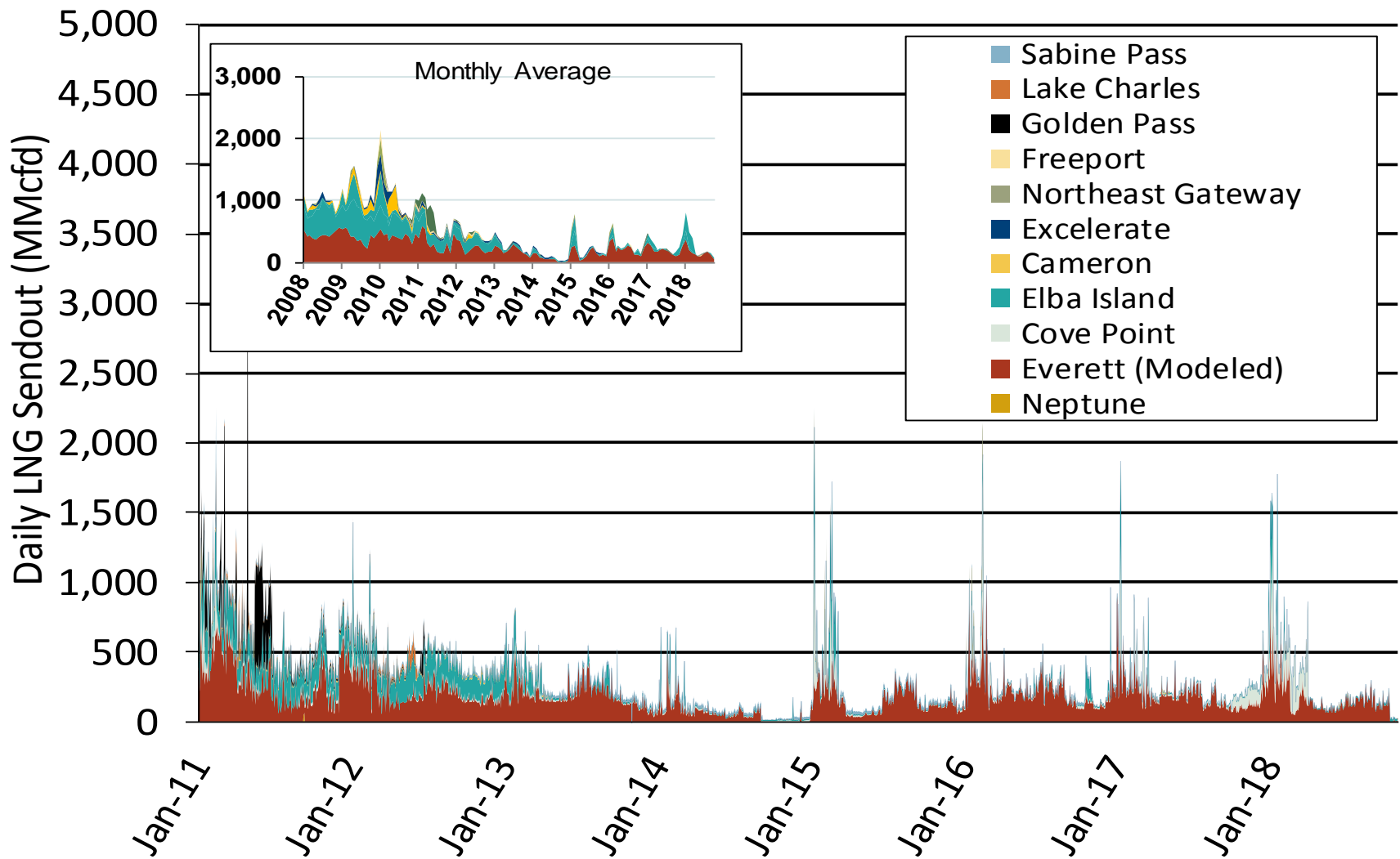


Notes:

Source: Derived from Bloomberg data

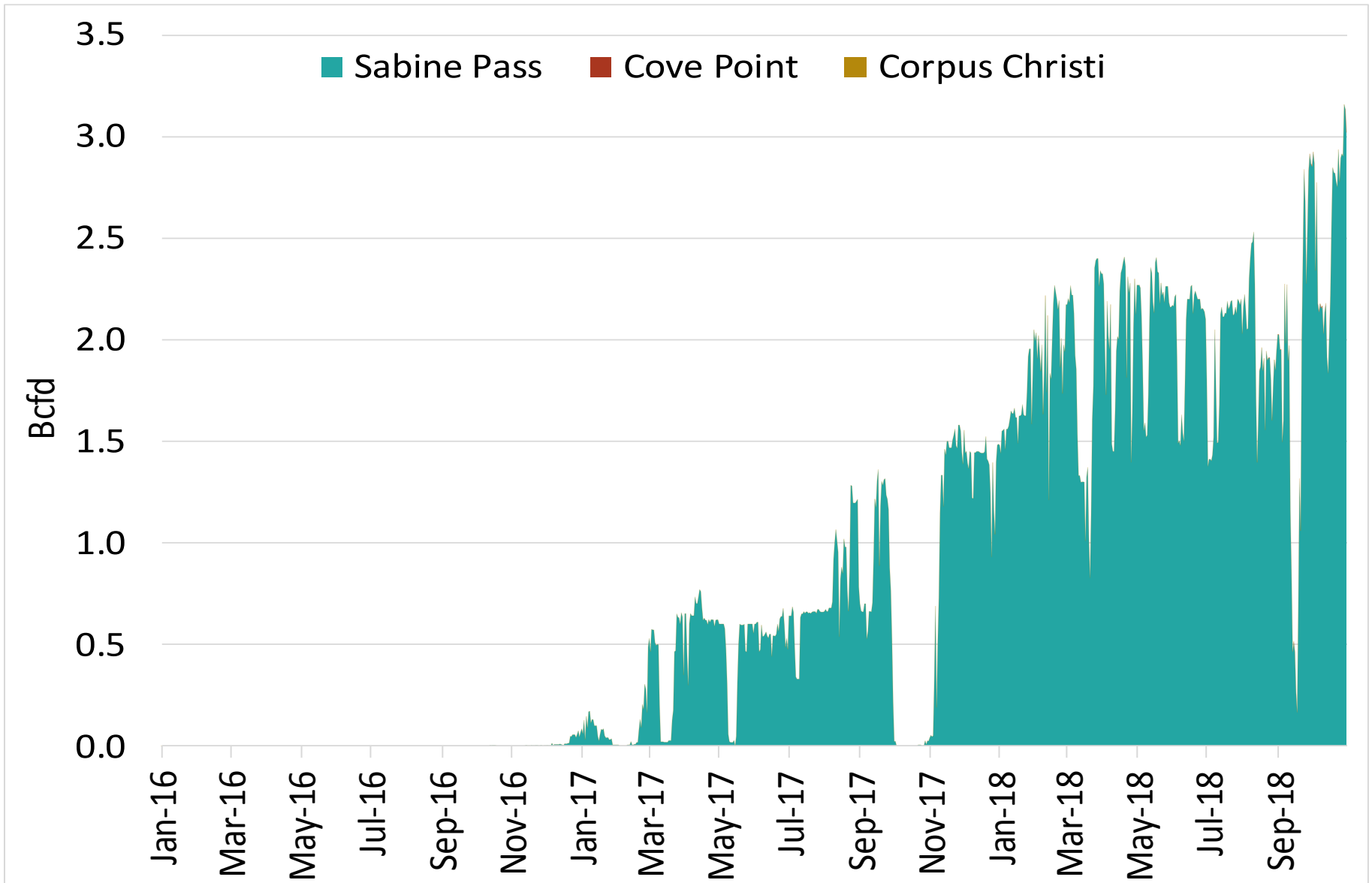
Updated Nov-2018

Daily Gas Sendout from Existing U.S. LNG Facilities



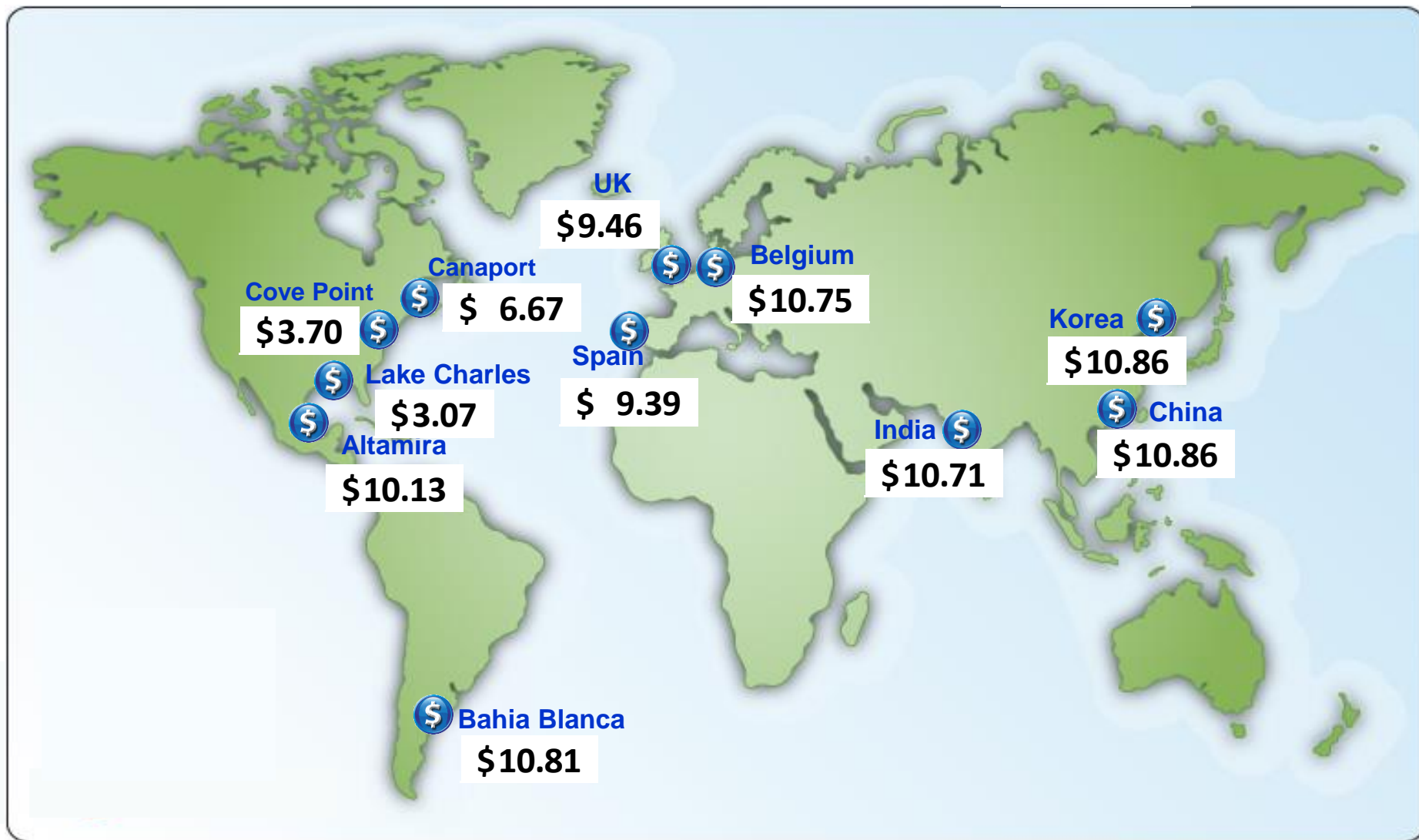
Notes: Everett data includes flows onto the AGT and TGP interstate lines, plus estimates of flows to the Mystic 7 power plant, Keyspan Boston Gas, and LNG trucked out of the terminal. Excludes flows to the Freeport LNG which flows via intrastate pipelines and flows to the Mystic 8 and 9 power plants.

Daily LNG Exports



Source: Derived from Bentek Energy data

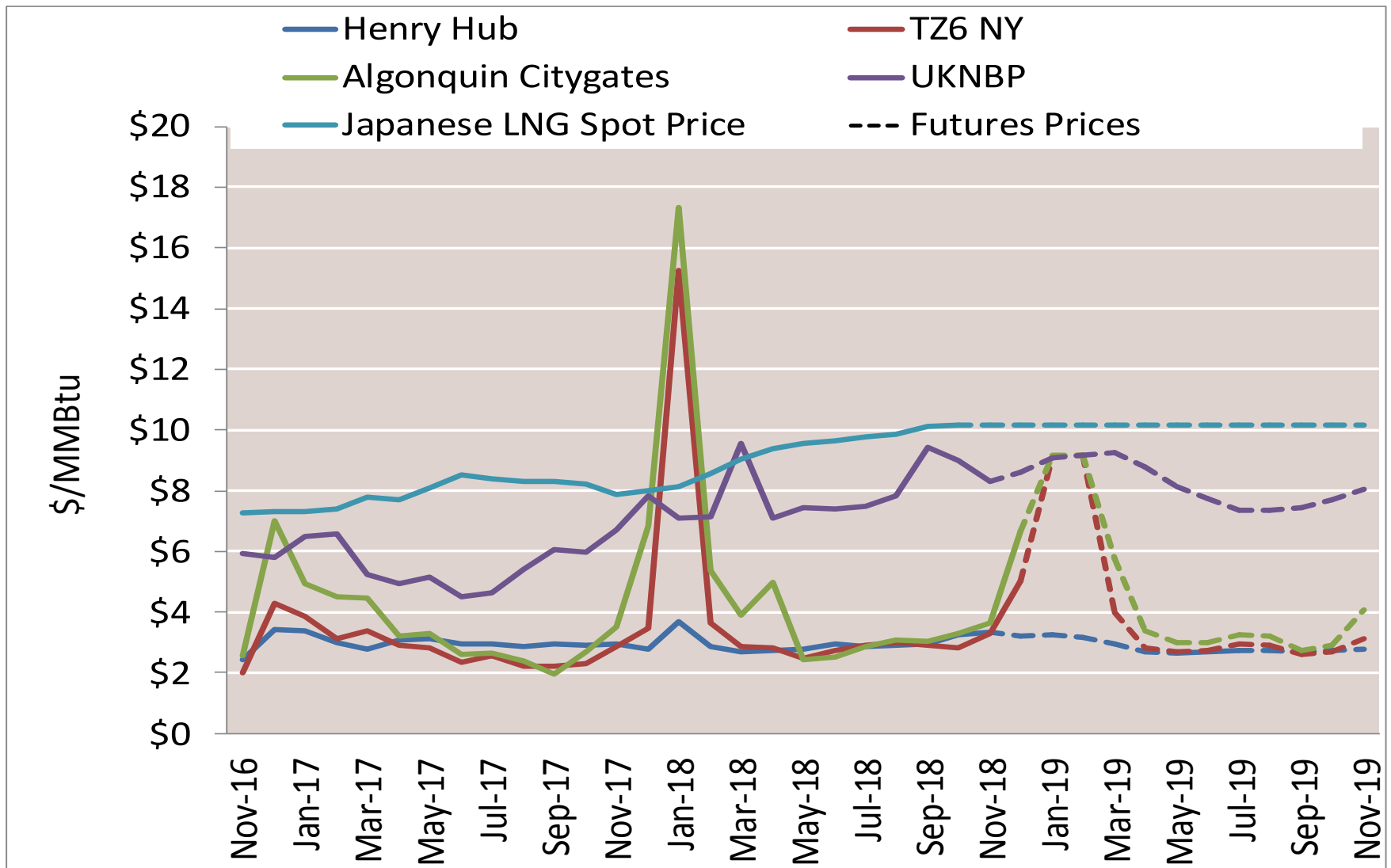
World LNG Estimated Landed Prices: Oct-18



Source: Waterborne Energy, Inc. Data in \$US/MMBtu

Note: Includes information and Data supplied by IHS Global Inc. and its affiliates ("IHS"); Copyright (publication year) all rights reserved. Landed prices are the monthly average of weekly trades from the prior month.

Historical and World Gas Futures Prices

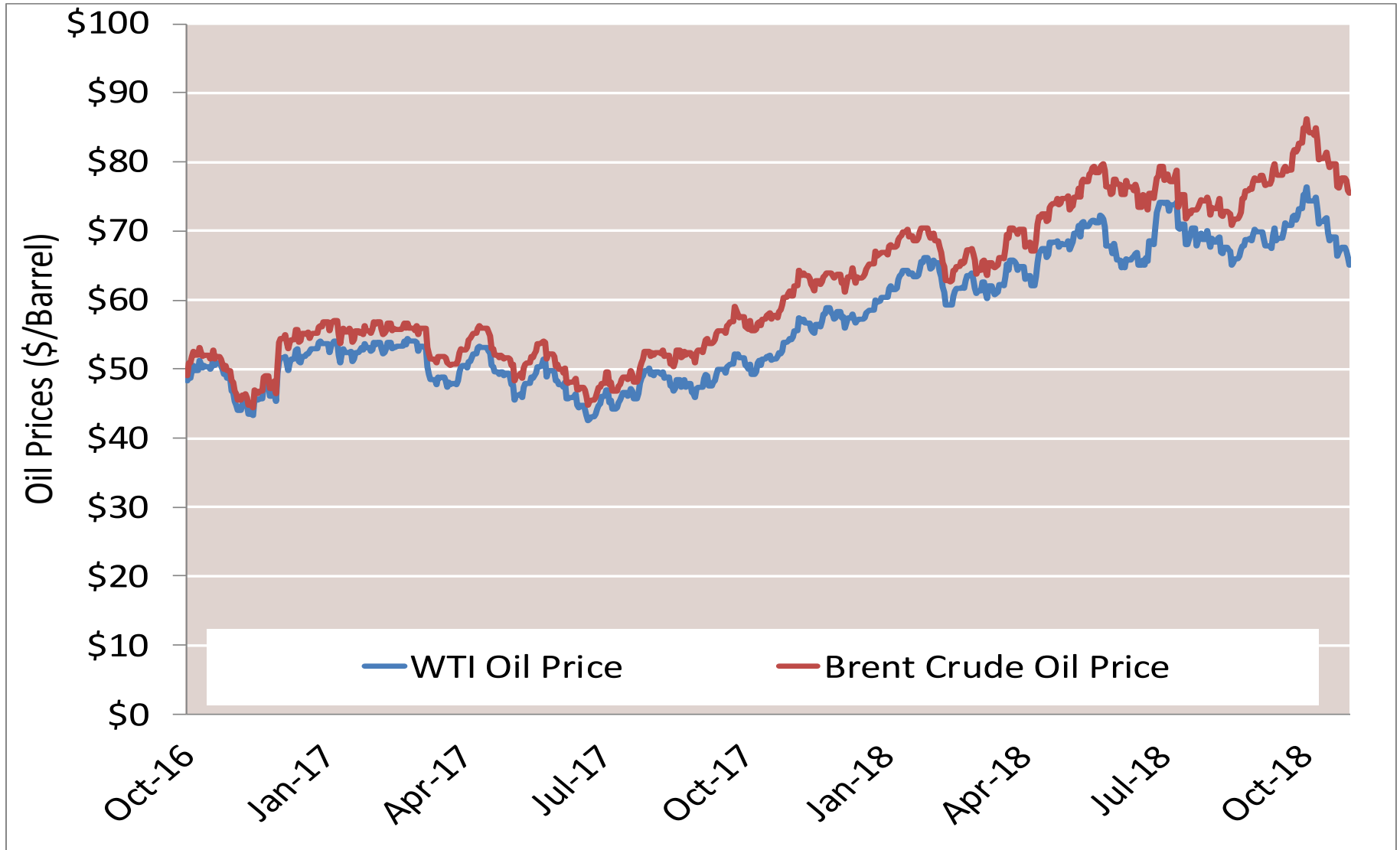


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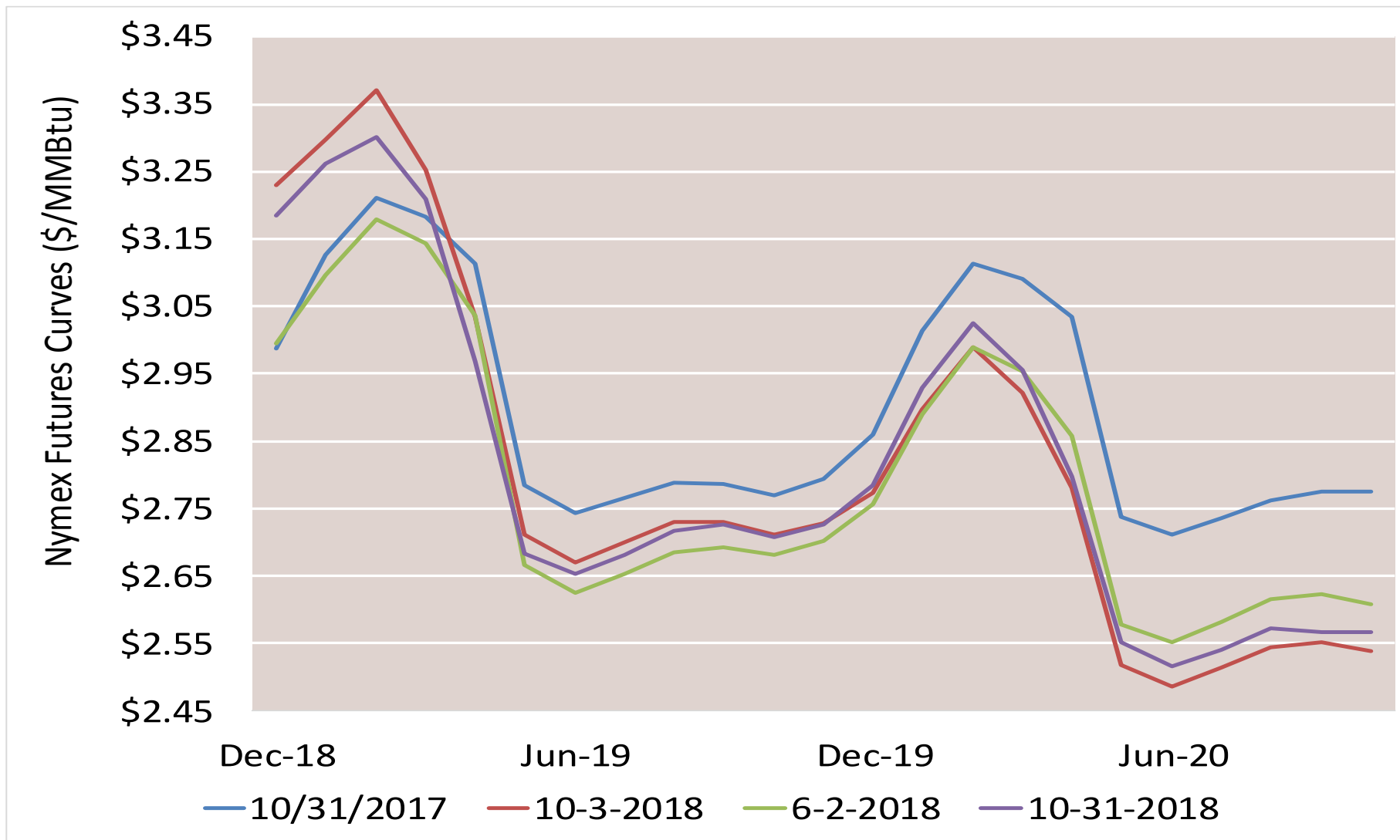
Source: Derived from Bloomberg data

Updated Nov-2018

WTI vs Brent Crude Oil Price



Nymex Futures Curves



Infrastructure Report

Office of Energy Projects Energy
Infrastructure Update

<http://www.ferc.gov/legal/staff-reports.asp>

(see “Energy Infrastructure” tab)

Natural Gas Highlights

Status	No. of Projects	Storage Capacity (Bcf)	Deliverability (MMcf/d)	Capacity (MMcf/d)	Miles of Pipeline	Compression (HP)
Pipeline						
Placed in Service	1			0	5	0
Certificated	3			254	3	3,000
Proposed	1			14	19	0
Storage						
Placed in Service	0	0	0			0
Certificated	0	0	0			0
Proposed	0	0	0			0
LNG (Import & Export)						
Placed in Service (Export)	0	0	0			0
Certificated (Import/Export)	0	0	0			0
Proposed (Import/Export)	0	0	0			0

Natural Gas Activities through September 30, 2018 January through September 30, 2017

Status	No. of Projects	Storage Capacity (BCF)	Deliverability (MMcf/d)	Capacity (MMcf/d)	Miles of Pipeline	Compression (HP)
Pipeline						
Placed in Service through September 30, 2017	10 18			4,716.2 5,295.9	105.5 478.0	183,800 312,429
Certificated through September 30, 2017	42 27			8,682.1 14,923.1	643.0 1,556.1	284,095 1,039,667
Storage						
Placed in Service through September 30, 2017	0 1	0.0 7.5	0.0 600.0			0 9,500
Certificated through September 30, 2017	4 1	3,600.3 0.0	152.0 10.0			0 0
LNG (Import & Export)						
Placed in Service (Export) through September 30, 2017	1 2	0.0 0.0	825.0 793.0			0 0
Certificated (Import/Export) through September 30, 2017	0 0	0.0 0.0	0.0 0.0			0 0

Electric Generation Highlights

New Generation In-Service (New Build and Expansion)

Primary Fuel Type	September 2018		January – September 2018 Cumulative		January – September 2017 Cumulative	
	No. of Units	Installed Capacity (MW)	No. of Units	Installed Capacity (MW)	No. of Units	Installed Capacity (MW)
Coal	0	0	4	10	0	0
Natural Gas	0	0	68	12,110	79	11,100
Nuclear	0	0	1	4	1	102
Oil	0	0	11	18	18	53
Water	0	0	10	33	12	215
Wind	3	363	32	2,747	55	4,615
Biomass	0	0	11	66	25	265
Geothermal Steam	0	0	2	21	1	18
Solar	9	339	310	3,043	433	3,450
Waste Heat	0	0	2	80	1	220
Other *	1	0	18	5	24	1
Total	13	702	469	18,137	649	20,039

Sources: Data derived from Velocity Suite, ABB Inc. and The C Three Group LLC. The data may be subject to update.

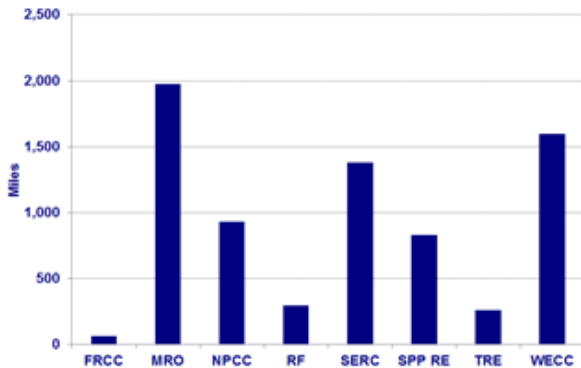
* "Other" includes purchased steam, tires, and miscellaneous technology such as batteries, fuel cells, energy storage, and fly wheel.

Electric Transmission Highlights

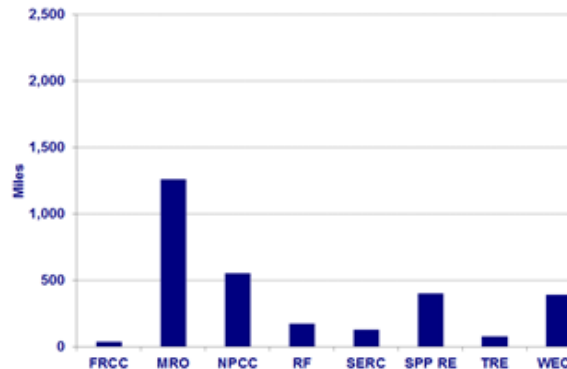
Voltage (kV)	Transmission Projects Completed				Proposed Transmission Projects In-Service by October 2020	
	September 2018	September 2017	January – September 2018 Cumulative	January – September 2017 Cumulative	High Probability of Completion	All
	Line Length (miles)					
≤230	0.0	6.0	231.7	329.3	762.3	2,076.5
345	0.0	0.0	413.2	218.5	1,882.6	4,030.6
500	0.0	0.0	69.4	0.0	371.0	1,227.4
Total U.S.	0.0	6.0	714.3	547.8	3,015.9	7,334.5

Sources: Data derived from Staff Database and U.S. Electric Transmission Projects ©2018 The C Three Group, LLC.

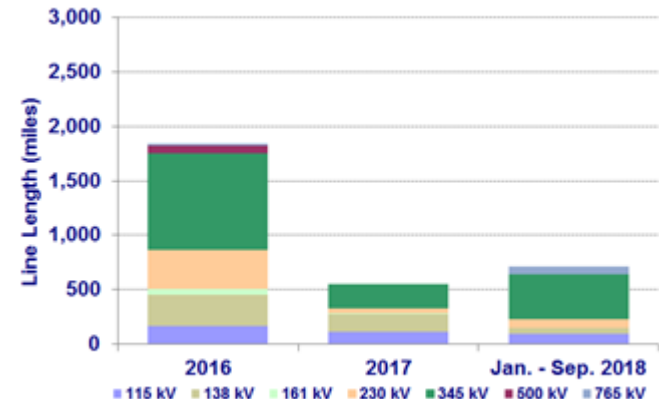
All Transmission Projects with a Proposed In-Service Date by October 2020



Transmission Projects with a High Probability of being completed by October 2020



New Transmission Projects by Voltage



Installed Generating Capacity and Proposed Additions

Total Available Installed Generating Capacity

	Installed Capacity (GW)	% of Total Capacity
Coal	268.17	22.55%
Natural Gas	522.59	43.95%
Nuclear	107.66	9.05%
Oil	41.67	3.50%
Water	100.49	8.45%
Wind	91.67	7.71%
Biomass	16.26	1.37%
Geothermal Steam	3.79	0.32%
Solar	34.63	2.91%
Waste Heat	1.38	0.12%
Other*	0.78	0.07%
Total	1,189.09	100.00%

Proposed Generation Additions and Retirements by October 2021

Primary Fuel Type	Additions		Retirements	
	No. of Units	Installed Capacity (MW)	No. of Units	Installed Capacity (MW)
Coal	1	17	74	19,255
Natural Gas	291	79,351	112	11,945
Nuclear	8	8,021	8	8,040
Oil	18	728	22	166
Water	252	14,896	19	633
Wind	494	89,880	1	50
Biomass	57	593	24	124
Geothermal Steam	22	1,076	0	0
Solar	2,020	61,623	5	2
Waste Heat	6	96	0	0
Other*	88	690	0	0
Total	3,257	256,971	265	40,215

Sources: Data derived from Velocity Suite, ABB Inc. and The C Three Group LLC. The data may be subject to update.

Sources: Data derived from Velocity Suite, ABB Inc. and The C Three Group LLC. The data* "Other" includes purchased steam, tires, and miscellaneous technology such as batteries, fuel cells, energy storage, and fly wheel, subject to update.