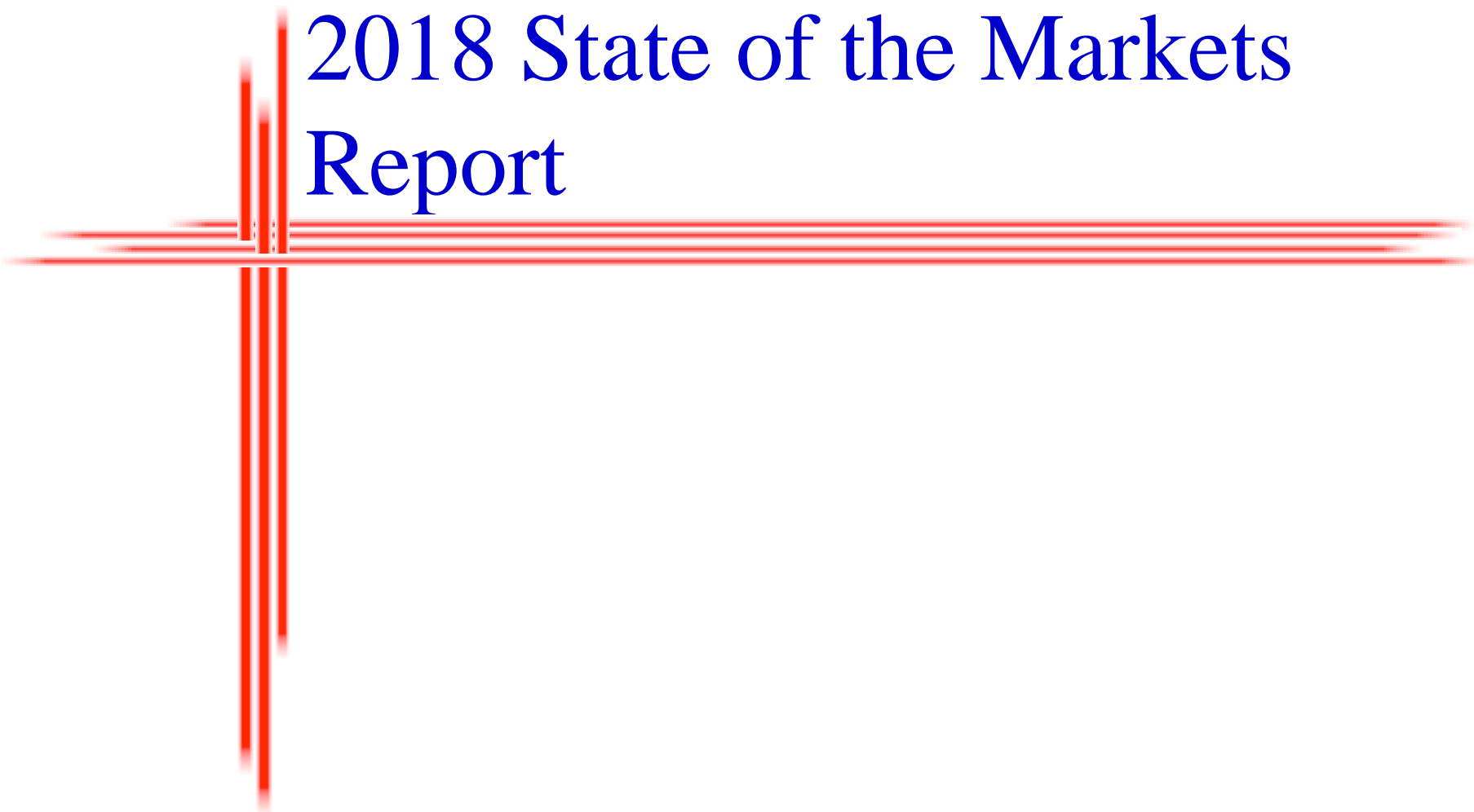


OE ENERGY MARKET SNAPSHOT

National – Data Through April 2019

Office of Enforcement
Federal Energy Regulatory Commission
May 2019

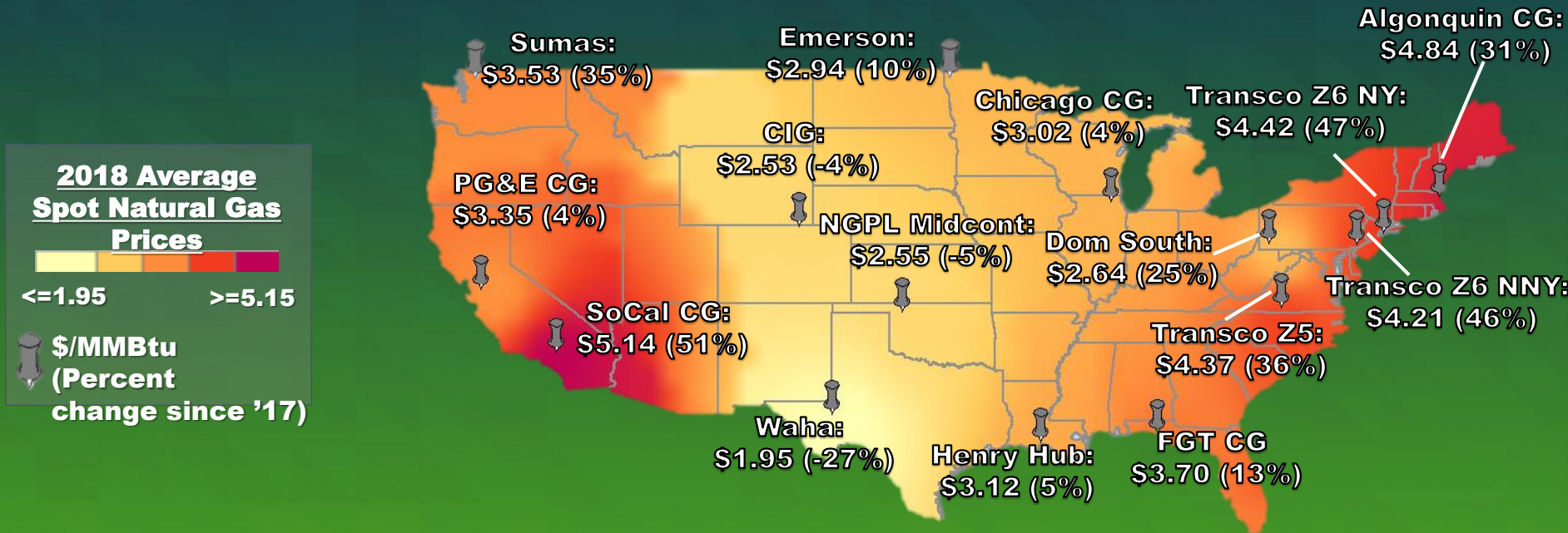
2018 State of the Markets Report



Highlights

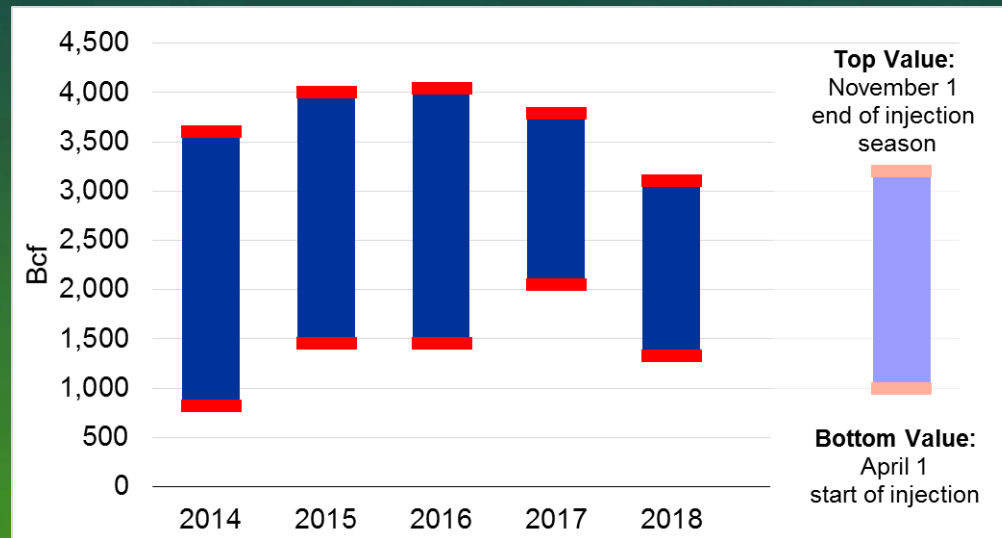
- Natural gas markets experienced record high demand and supply.
- Natural gas storage fell to a multi-year low.
- Pipeline additions helped to reduce Marcellus bottlenecks.
- Higher average prices were seen nationally for both gas and electric markets.
- Capacity additions were led by natural gas-fired and wind-powered generation.

Natural Gas Prices Increased in 2018



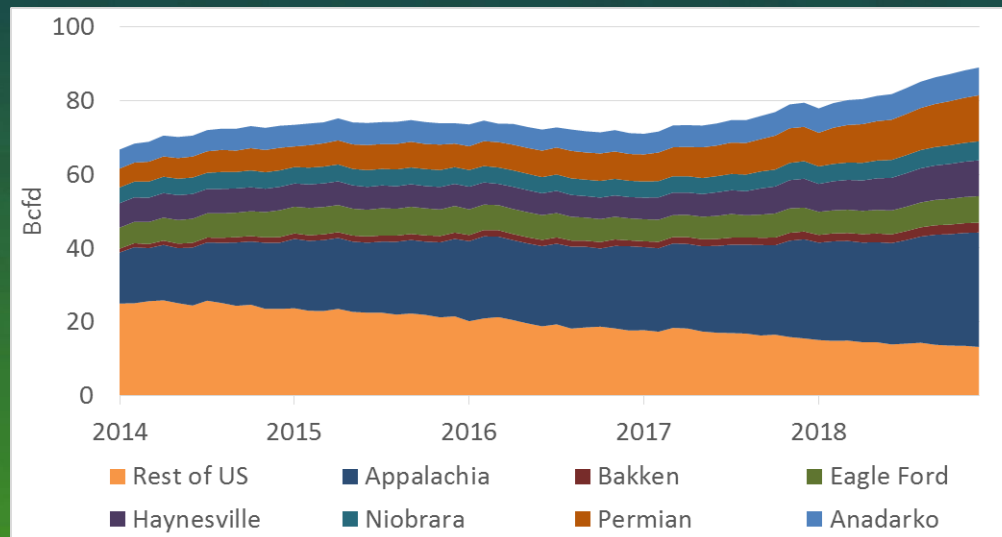
Source: S&P Global Platts

Natural Gas Storage Hit Multi-Year Low



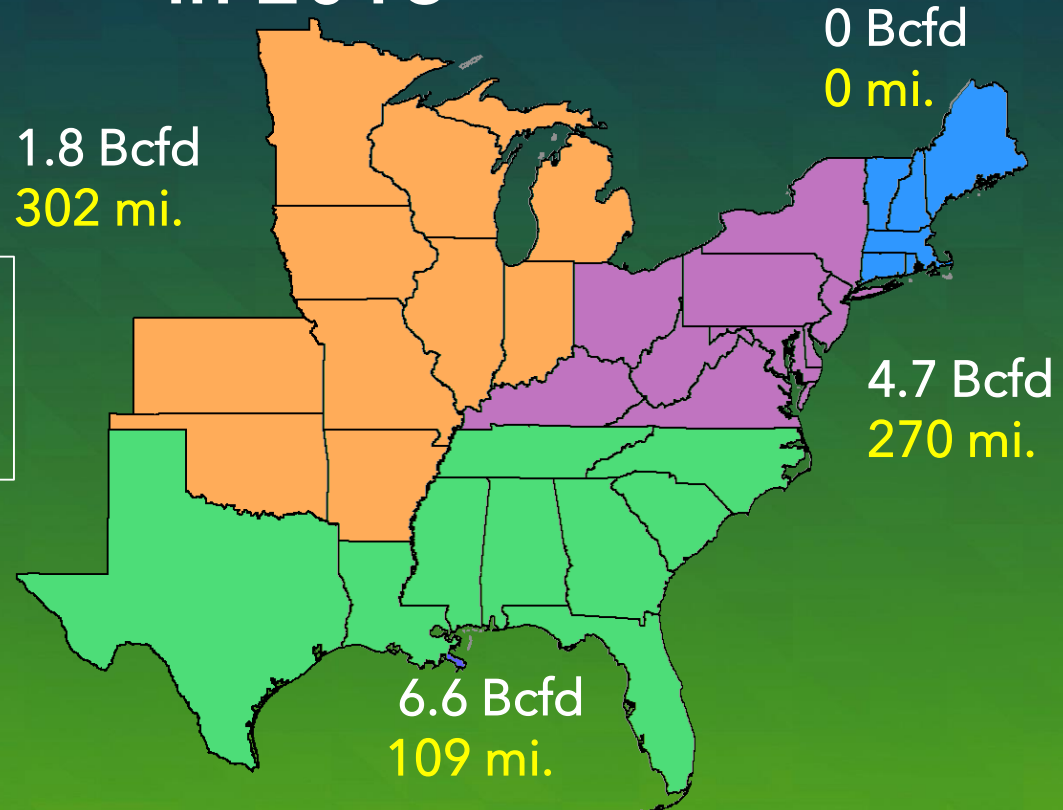
Source: EIA

Natural Gas Production Reached Record Highs in 2018



Source: EIA Natural Gas Monthly and Drilling Productivity Report; denotes average daily dry production

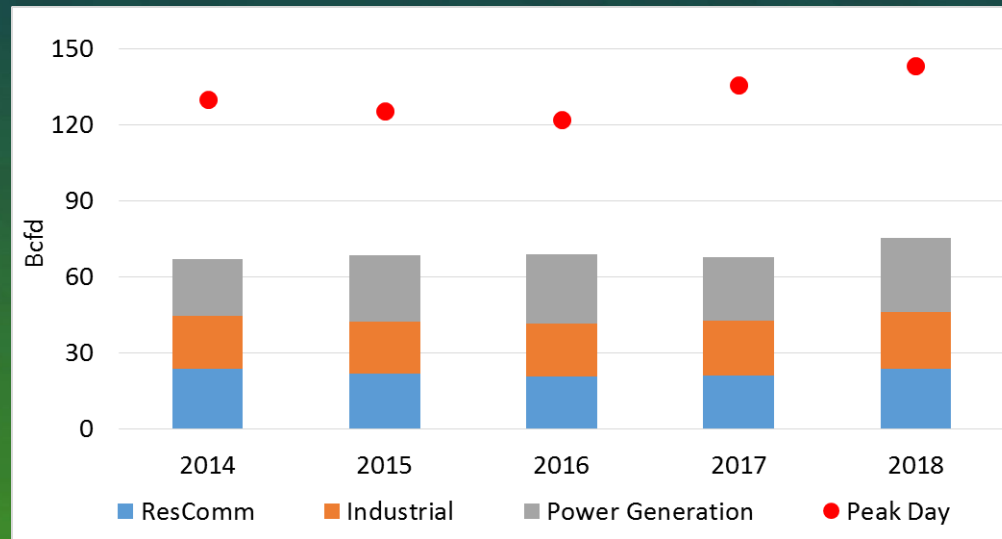
13 Bcfd of Interstate Pipeline Capacity Added in 2018



Total 2018 Gas Pipeline Infrastructure Additions
Capacity: 13.1 Bcfd
Miles: 689 mi.

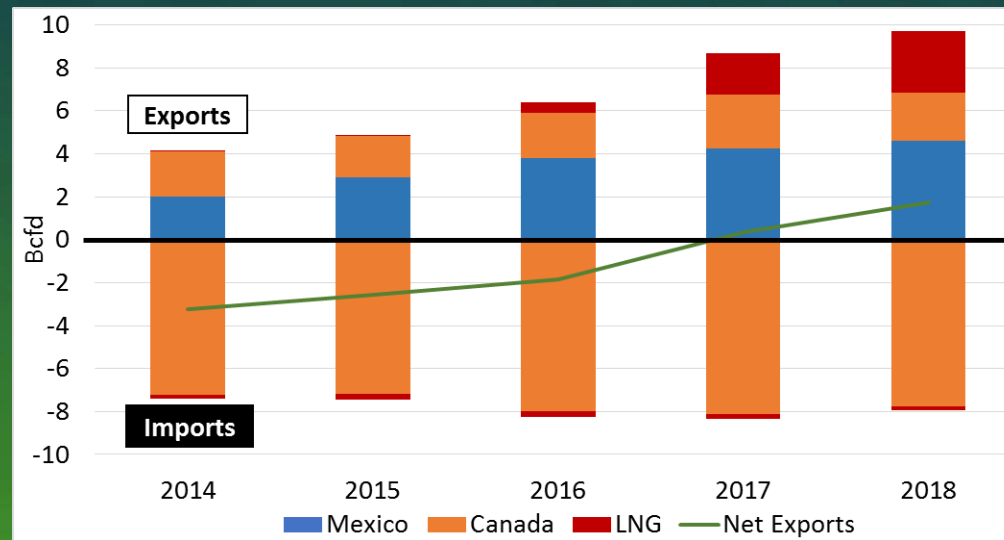
Source: Office of Energy Projects

Power Burn Drove Natural Gas Demand Increase



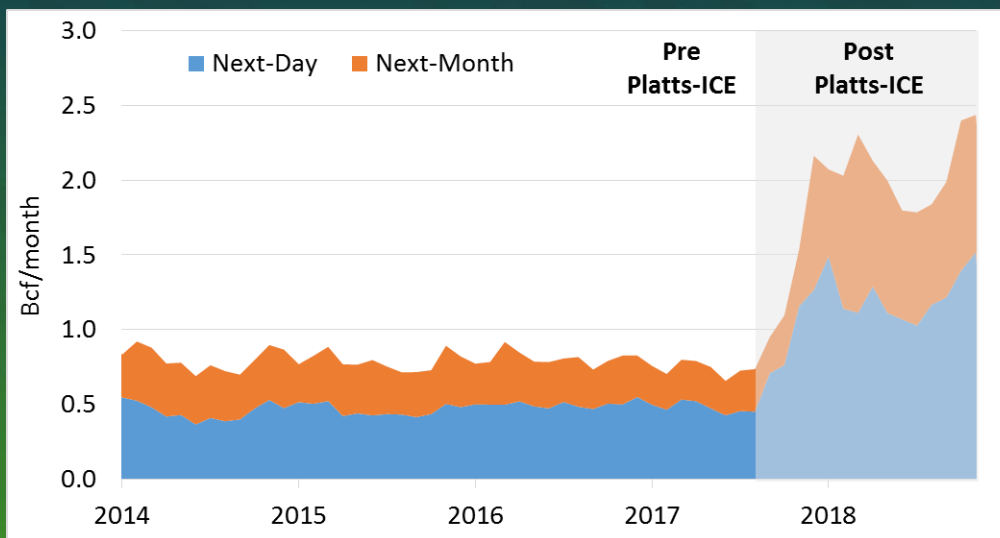
Source: EIA, Bentek Energy; bars denote average daily demand by sector

U.S. Position As Net Exporter of Natural Gas Grew in 2018



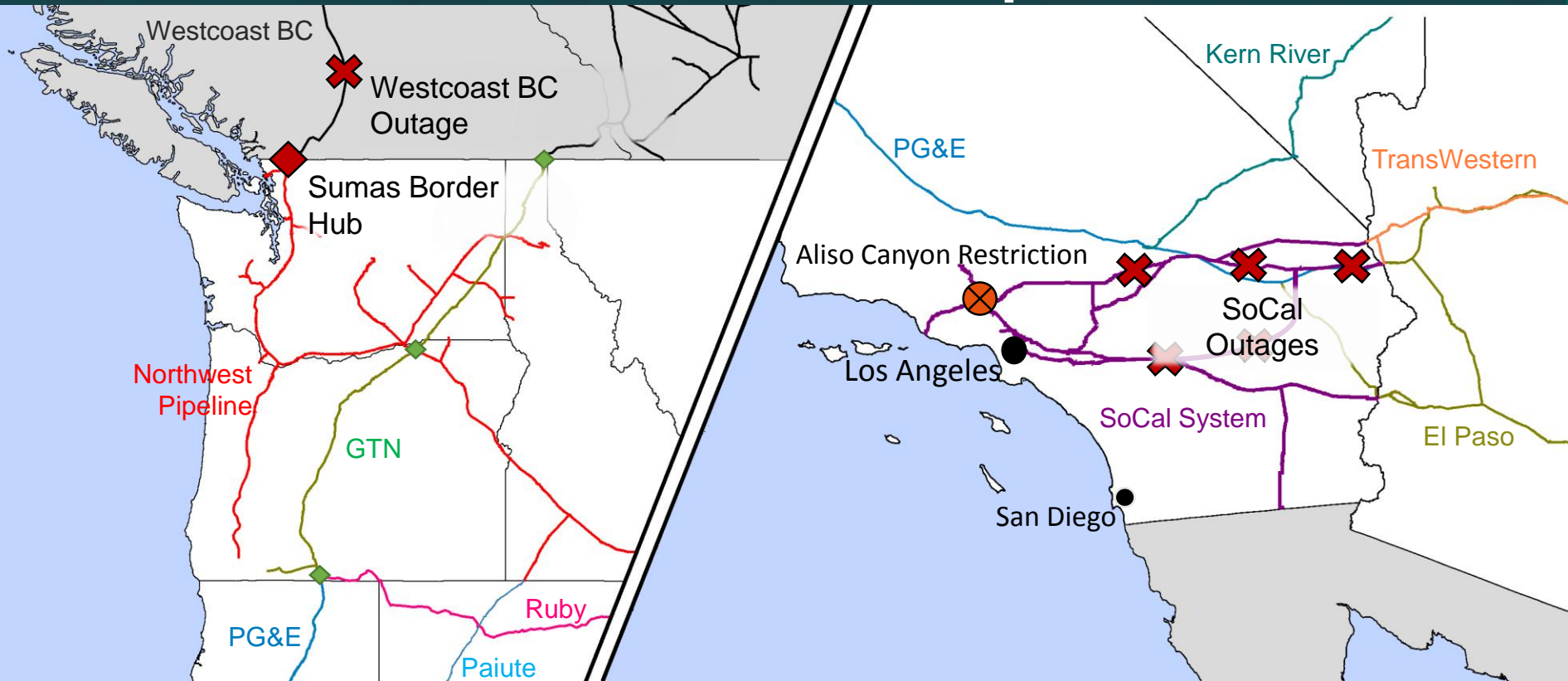
Source: U.S. Energy Information Administration; denotes average daily imports and exports

Reported Index Volumes Nearly Doubled



Source: S&P Global Platts

Natural Gas Pipeline Outages Had Electric Market Impacts



Source: Ventyx Velocity Suite

Day-Ahead Power Prices Generally Increased

Average Annual DA On-Peak Prices

Nodal Prices: \$/MWh
(2018)

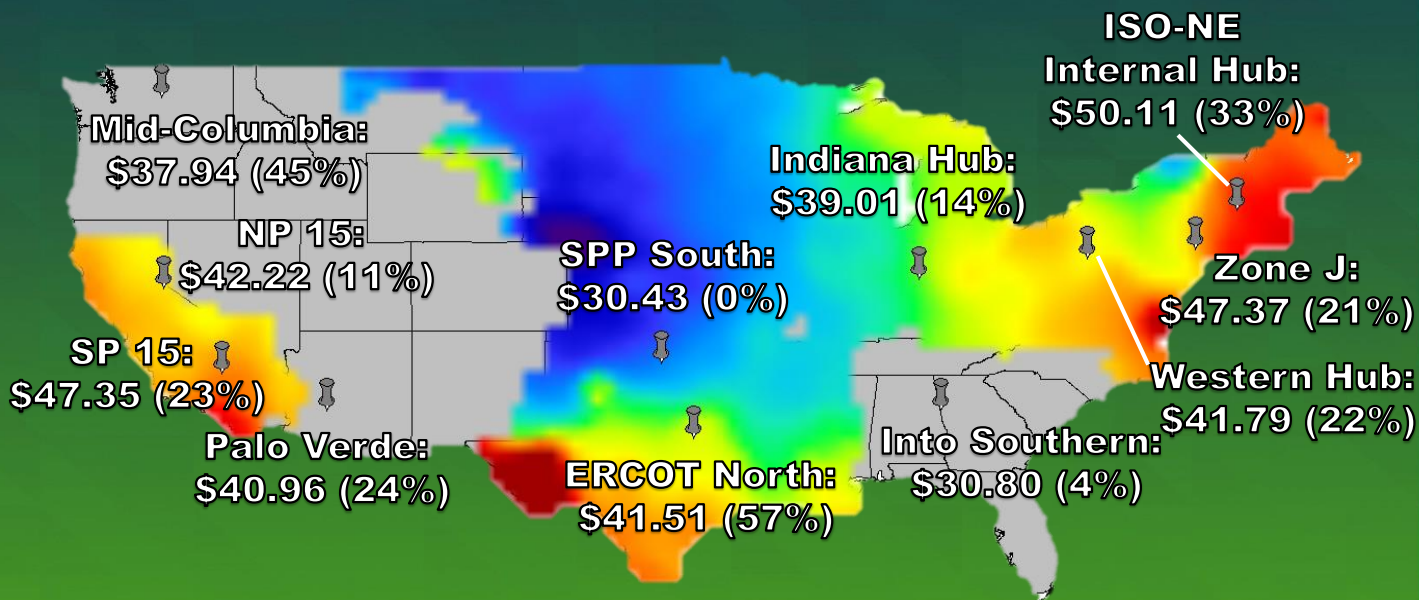


<=2 >=5

5 Hub Prices: 5

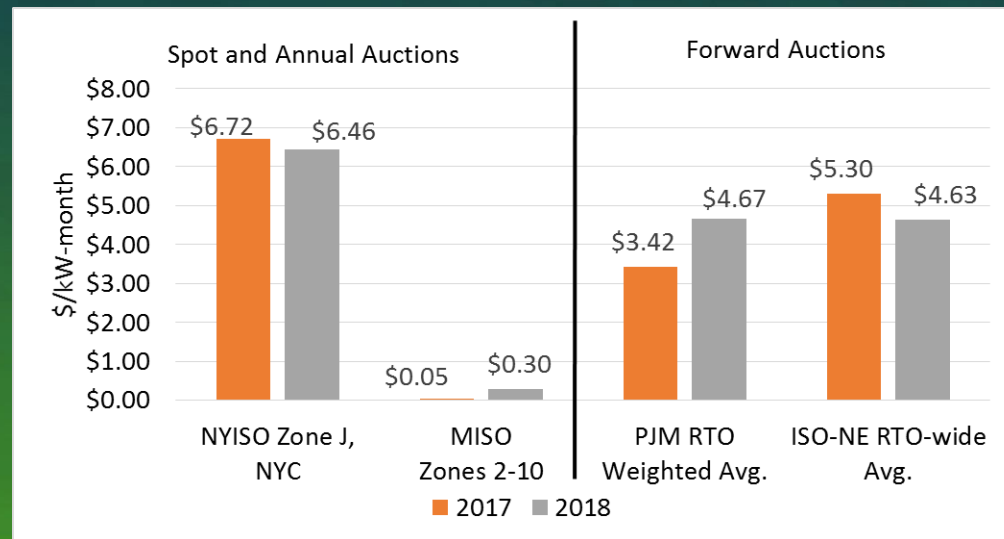
\$: \$/MWh (2018)

=: Percent
change since '17



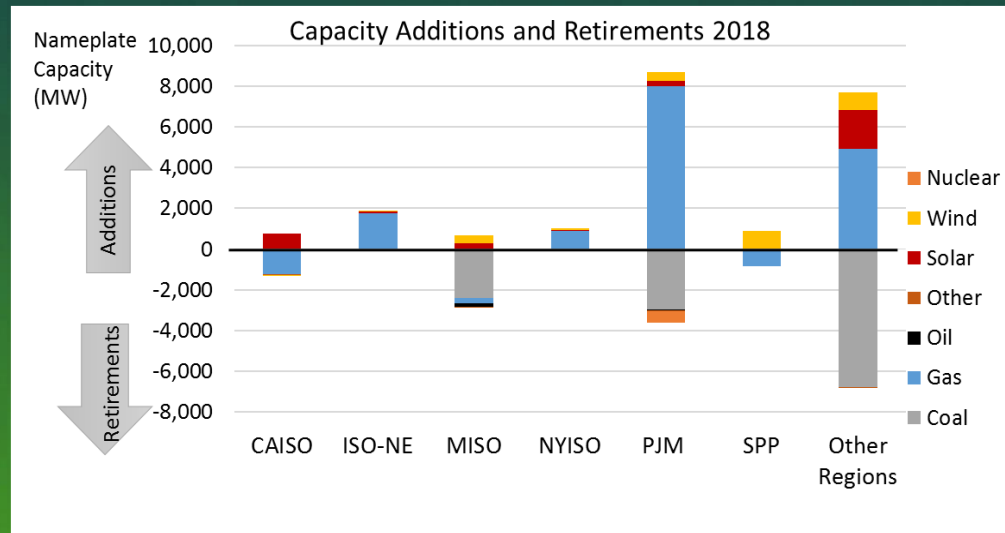
Source: Nodal prices from ABB Velocity Suite. ISO hub prices from SNL's ISO Day-Ahead On Peak Prices data. Mid-Columbia, Palo Verde, and Into Southern prices from SNL's S&P Global Market Intelligence Day-Ahead - Annual On Peak Prices data.

Capacity Market Prices Held Steady



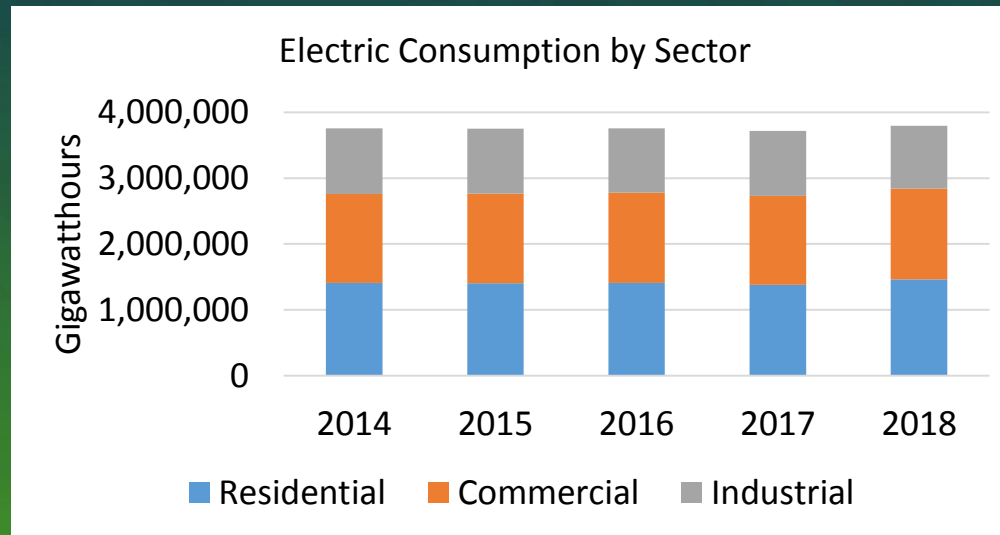
Source: ISO/RTO webpages

Most Generation Capacity Additions Were Natural Gas & Solar



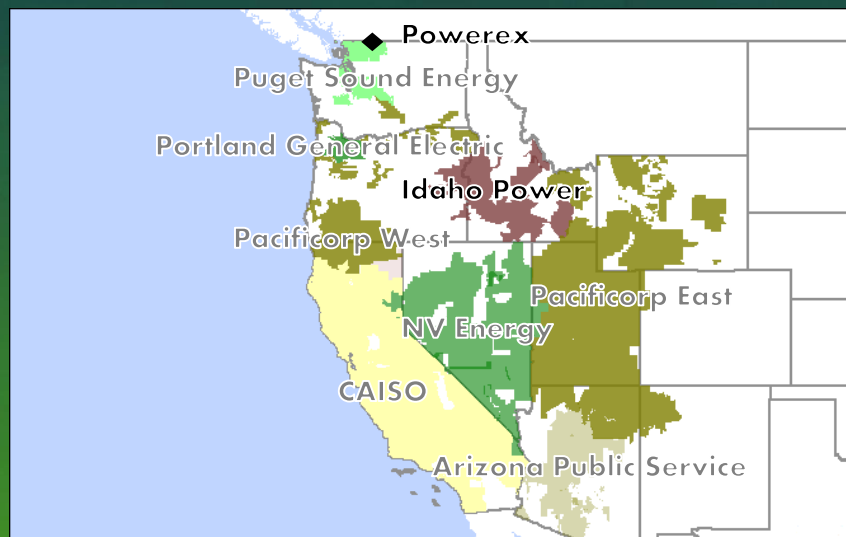
Source: EIA- Form 860M. Data do not cover additions or retirements in Alaska or Hawaii.

Electricity Demand Remained Steady



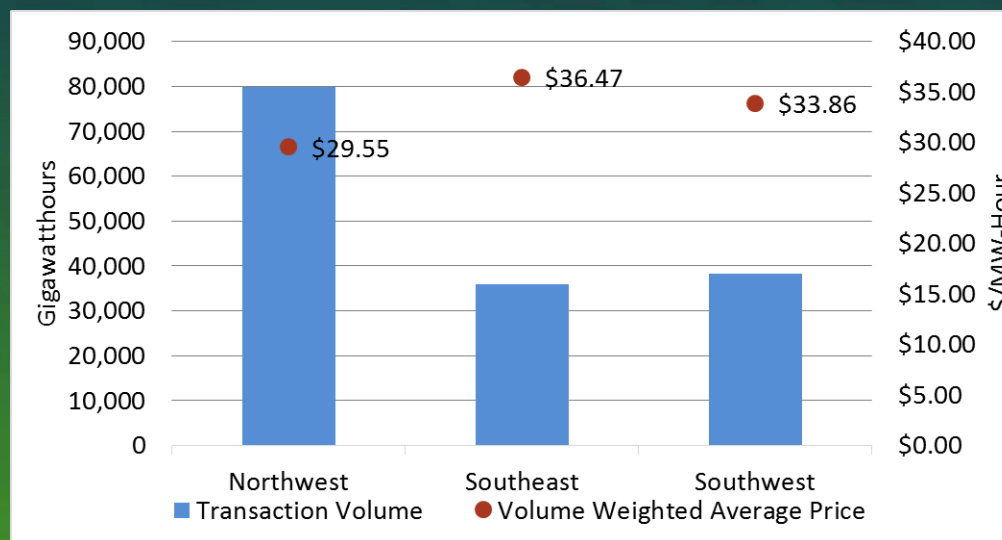
Source: EIA Forms 826 & 861

The Western Energy Imbalance Market Continued to Evolve



Source: Derived from ABB Velocity Suite.

Northwest Led Daily and Hourly Transactions in Bilateral Markets



Source: Derived from Electric Quarterly Reports (EQR)

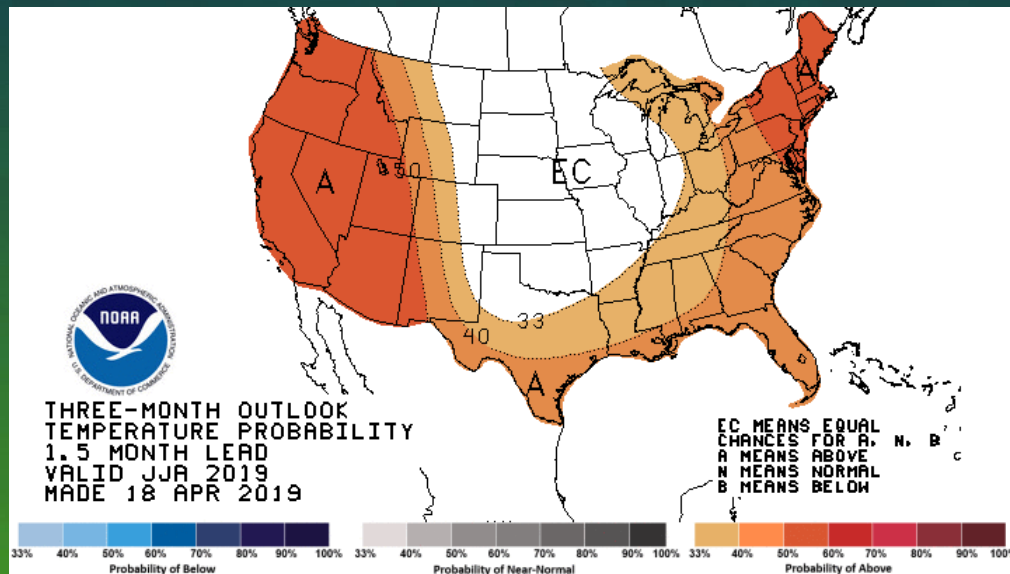


Summer 2019 Reliability and Energy Market Assessment

Highlights

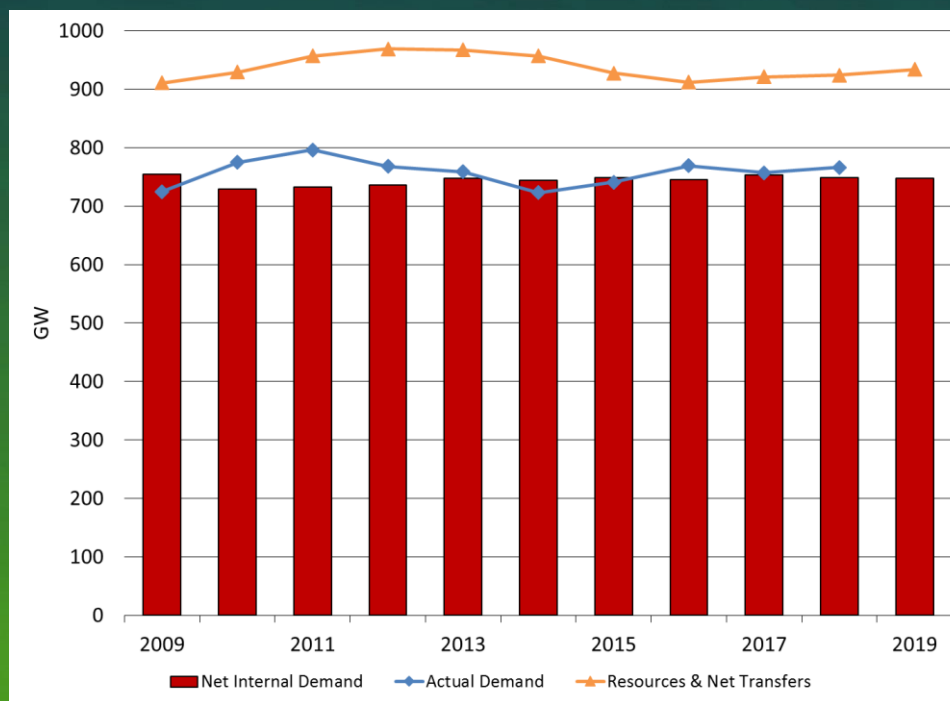
- Higher than average temperatures are expected in the West, South and East.
- Reserve margins are expected to be adequate in all regions except ERCOT.
- Aliso Canyon natural gas storage inventories remain an item of interest for electric reliability within the Western Interconnection.
- Natural gas futures price movements are mixed when compared to 2018 summer levels.
- Battery storage and wind and solar capacity will exceed previous summer levels.
- New LNG export capacity will drive natural gas demand growth.
- High natural gas injections are predicted to return storage to average levels.
- High hydroelectric power production is expected in California but below-average levels are expected in the Pacific Northwest.

Summer Temperatures Expected to be Above Normal



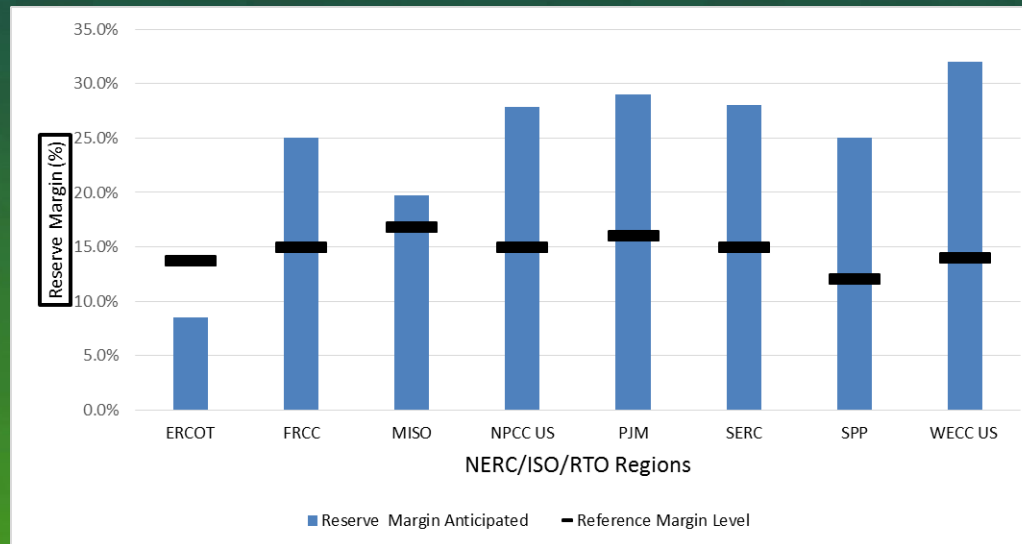
Source: National Oceanic and Atmospheric Administration

Modest Growth of Forecast Generation Capacity



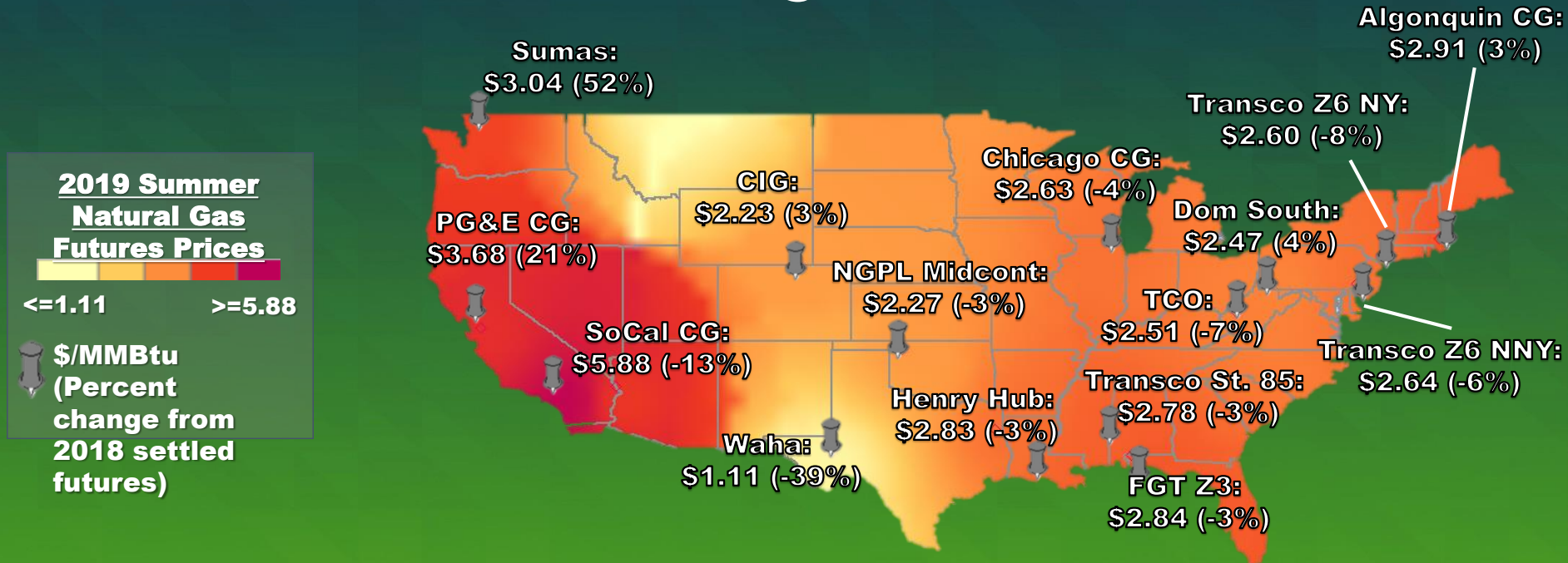
Source: North American Electric Reliability Corporation

Reserve Margins Adequate in All Regions Except ERCOT



Source: North American Electric Reliability Corporation

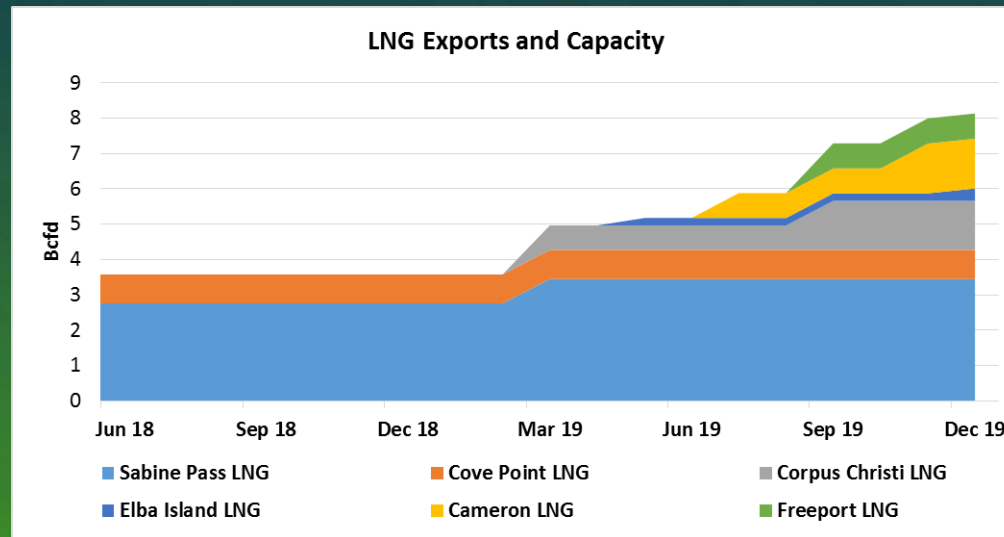
Summer 2019 Natural Gas Futures Price Changes Mixed



Source: InterContinental Exchange

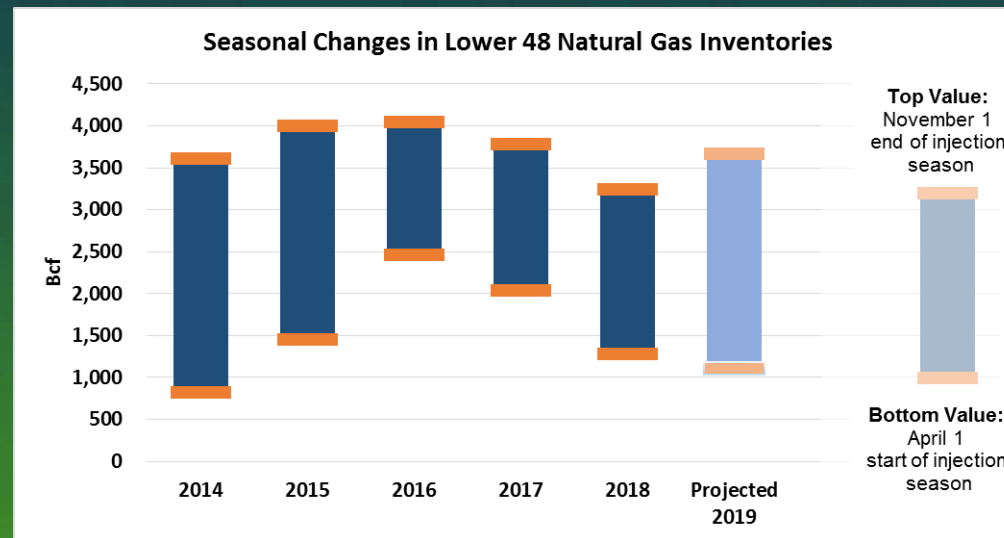
Note: Summer futures prices are the average July and August futures contract hub price added to the Henry Hub for April 1, 2019.

LNG In-Services Drive Demand Growth



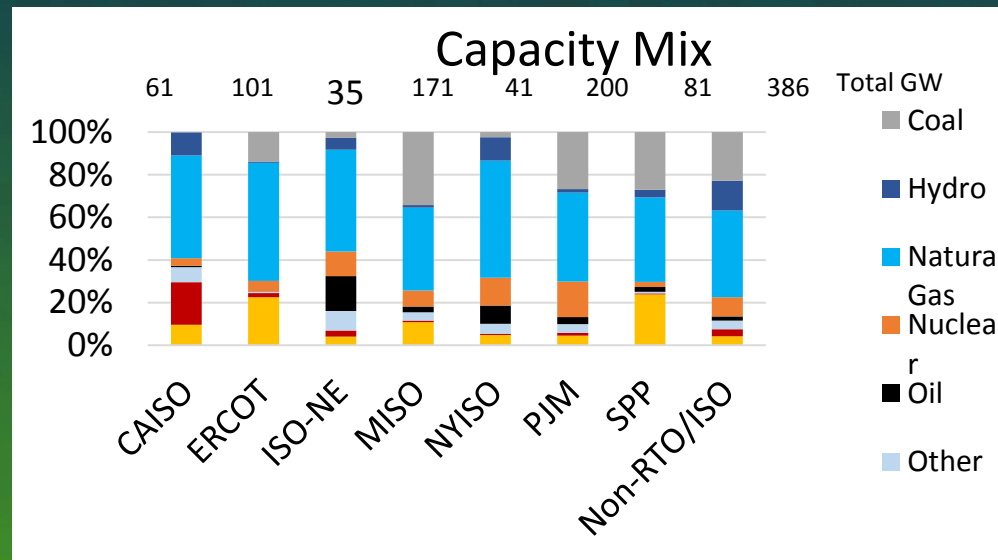
Source: S&P Global, Inc. forecasts as of March 20, 2019

Natural Gas Storage to Return to Average Levels

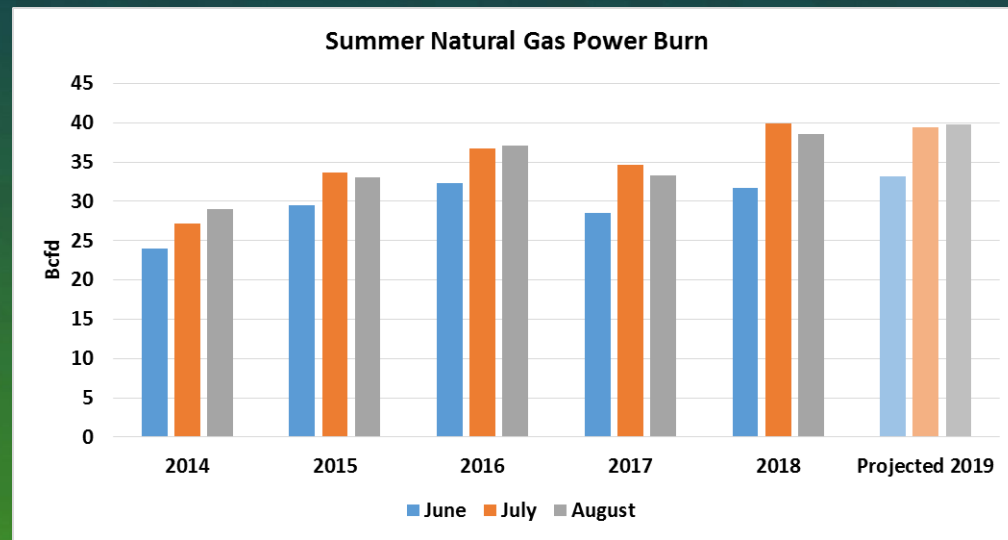


Source: U.S. Energy Information Administration

Natural Gas Has the Highest Share of Generation Capacity

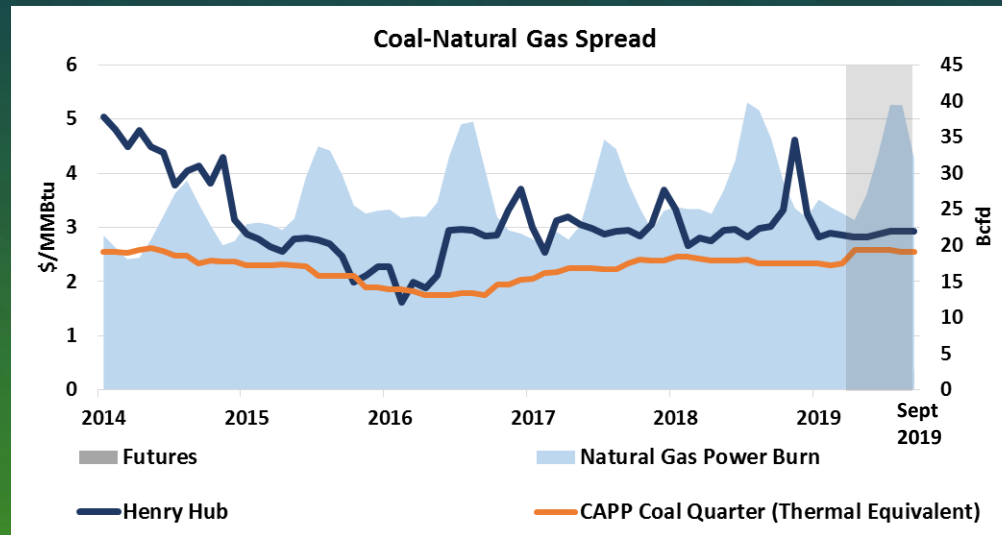


Power Burn Expected to Increase



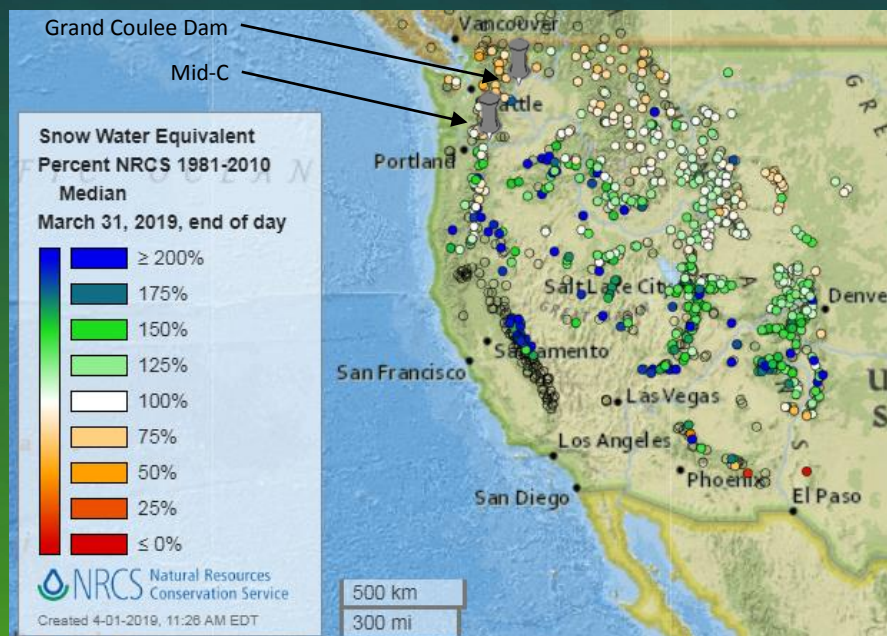
Source: U.S. Energy Information Administration

Narrow Coal-Natural Gas Spread Promotes Diverse Generation



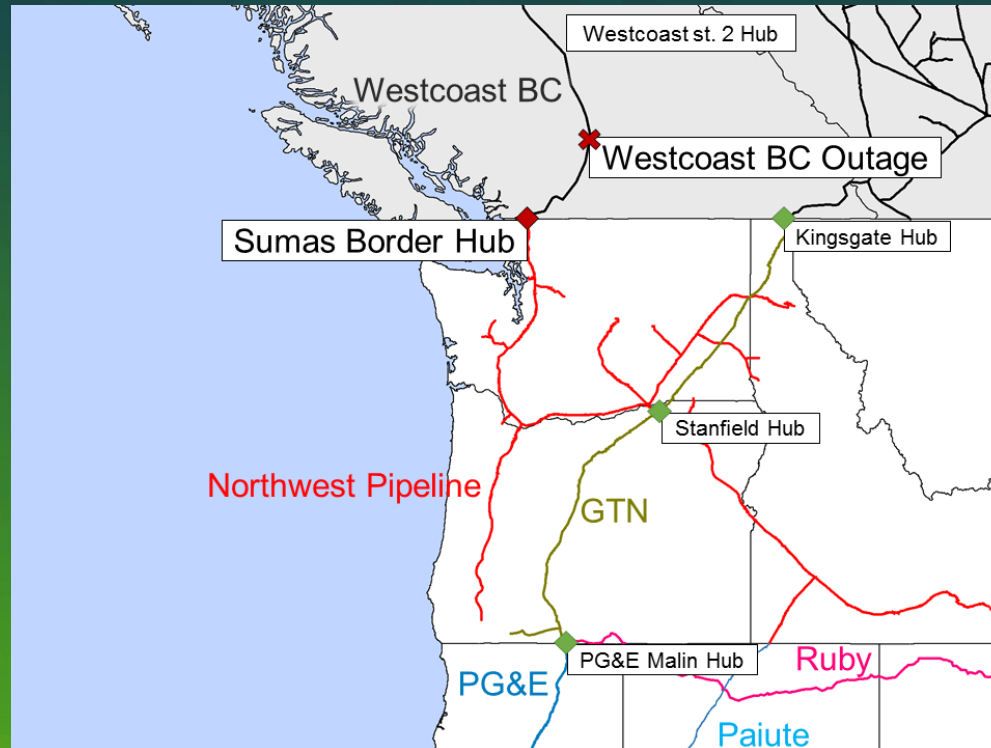
Source: U.S. Energy Information Administration, S&P Global Market Intelligence, CME Group

Strong Hydro Expected in California but Moderate in Other Western States



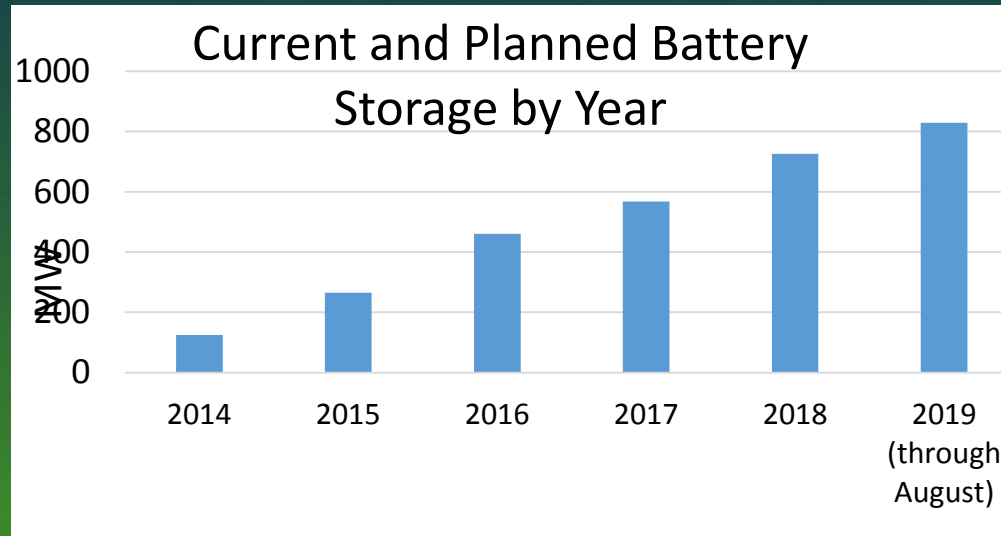
Source: Natural Resources Conservation Service, US Department of Agriculture

Import Restrictions to Affect Pacific Northwest



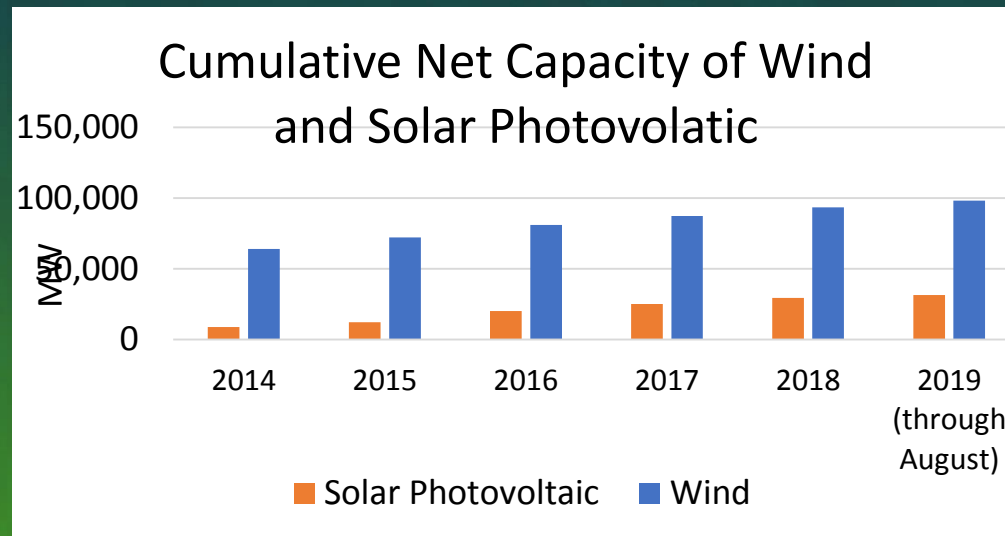
Source: ABB Velocity Suite

Battery Storage Capacity Continuing to Grow through the Summer



Source: US Energy Information Administration Form 860M

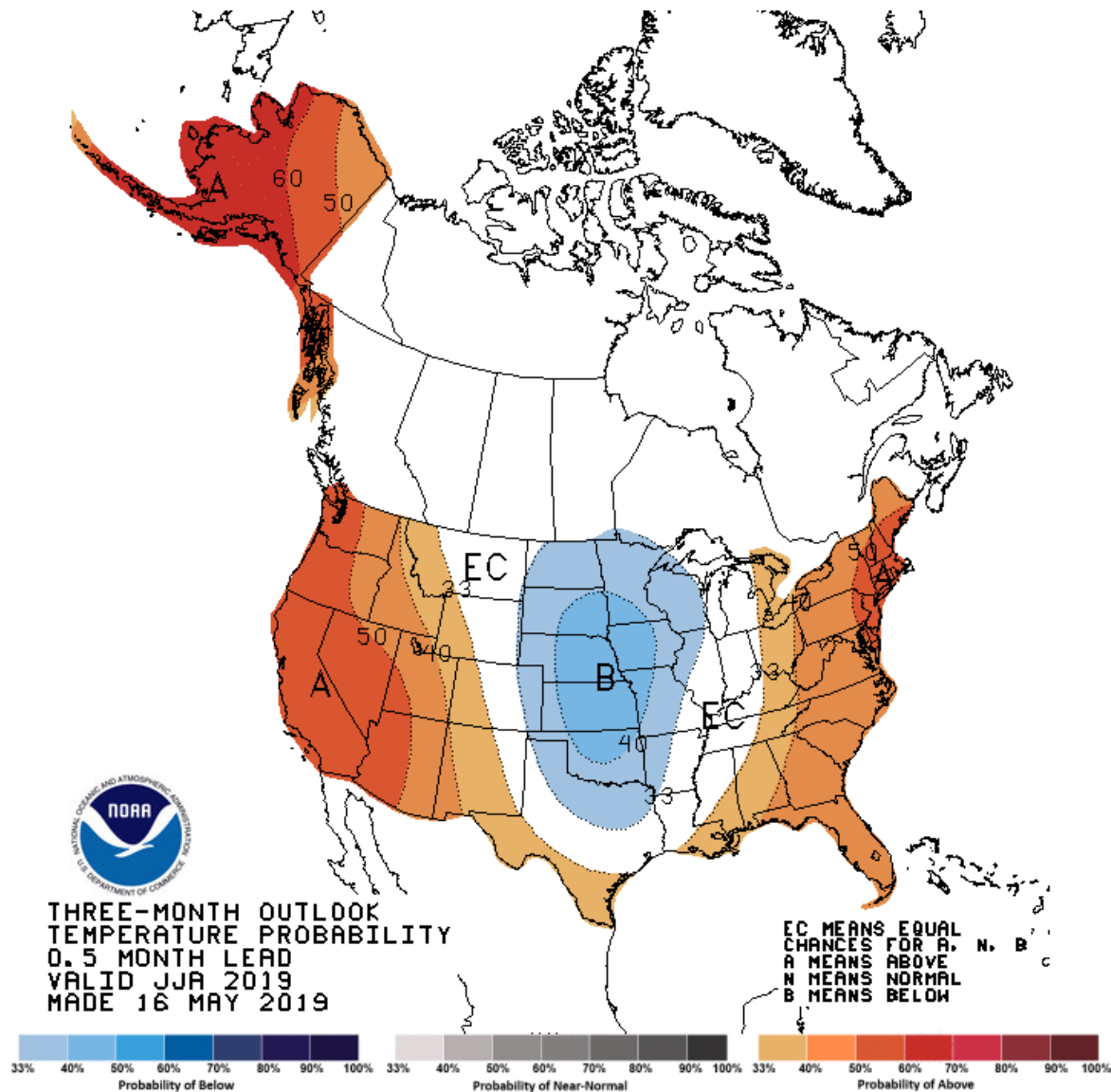
Wind & Solar Capacity Continue Increasing



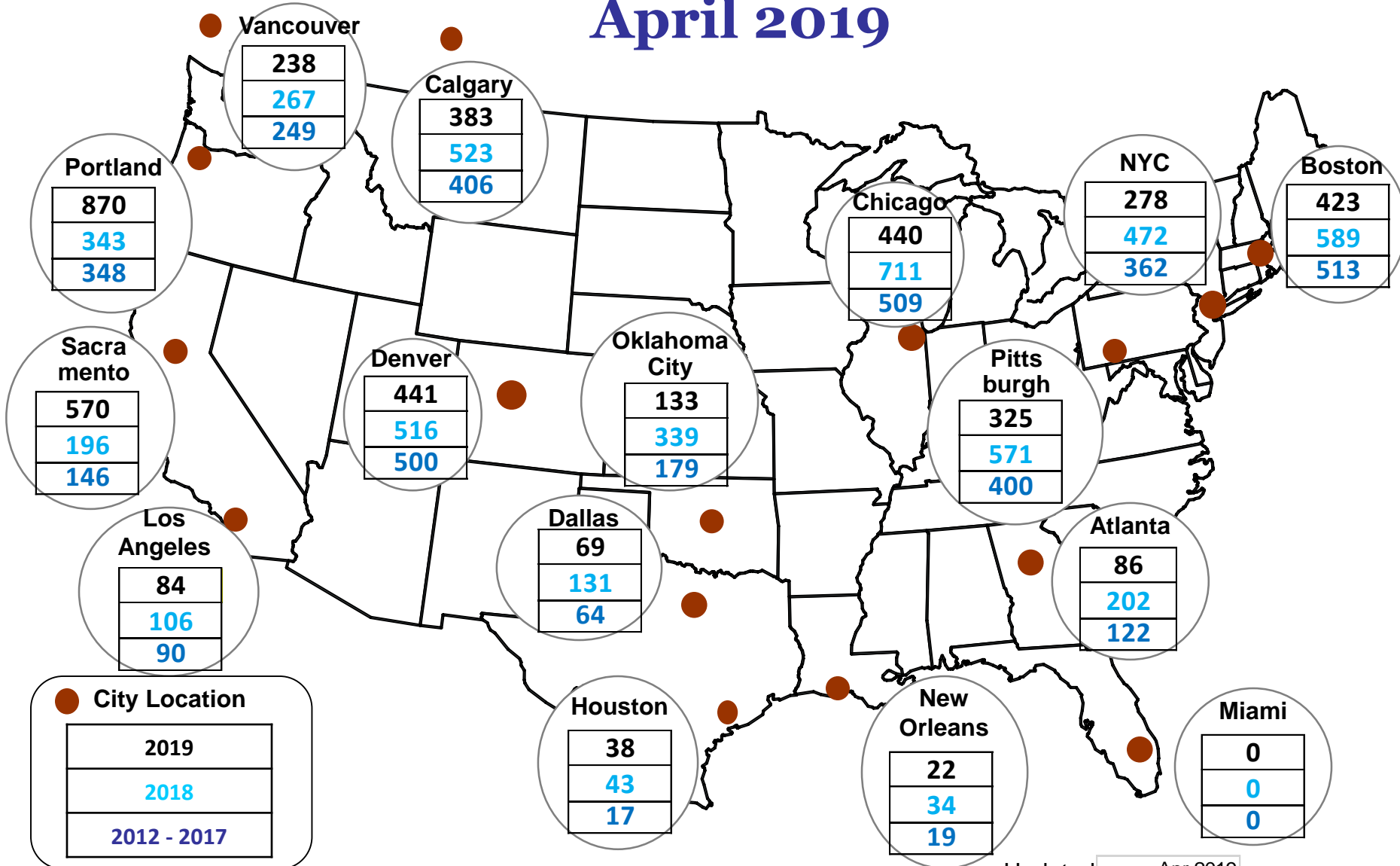


National Slides

NOAA June 2019 Through August 2019 Outlook



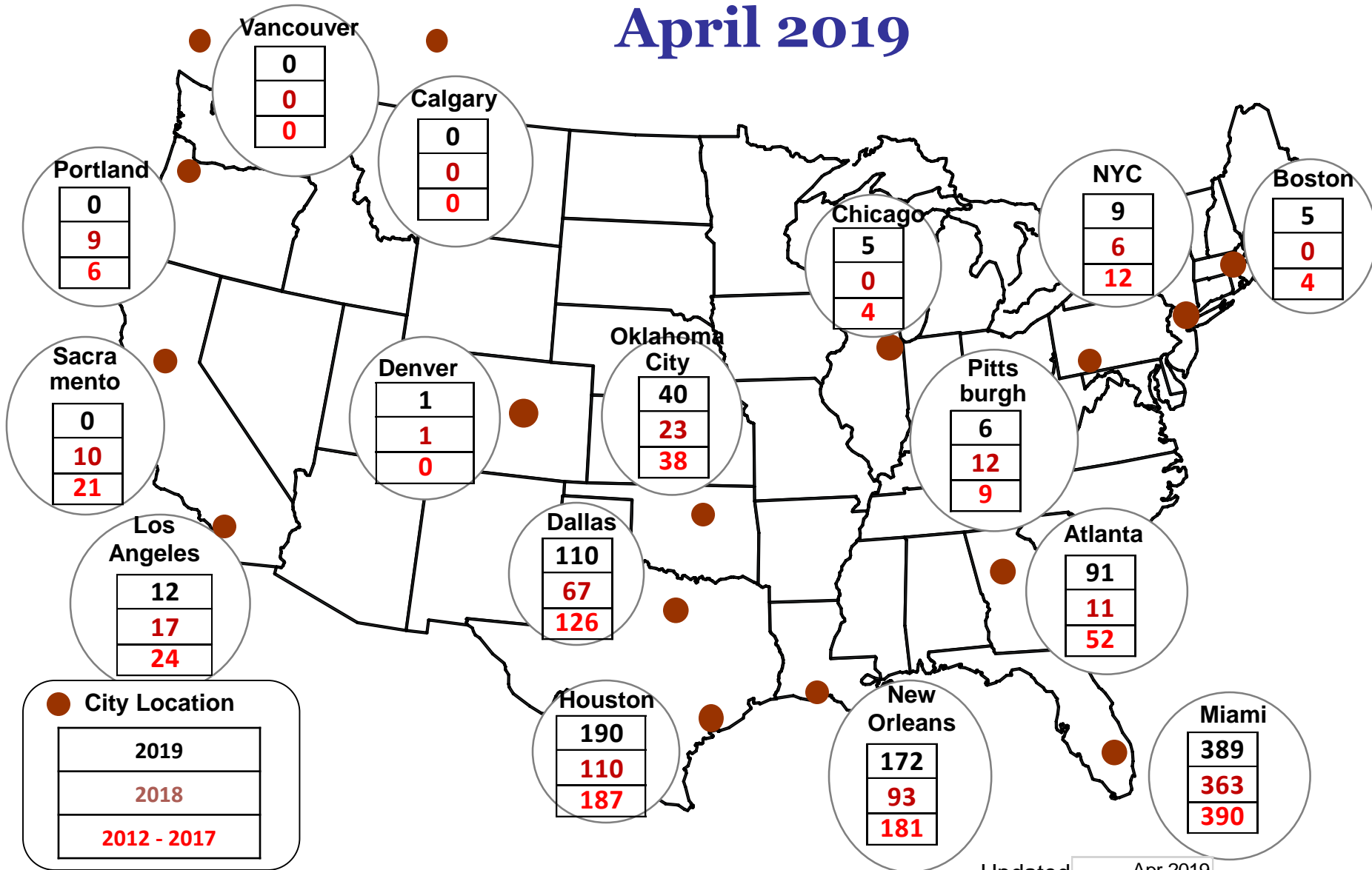
Cumulative HDDs by City April 2019



Source: Bloomberg Weather (daily data summed)

Updated

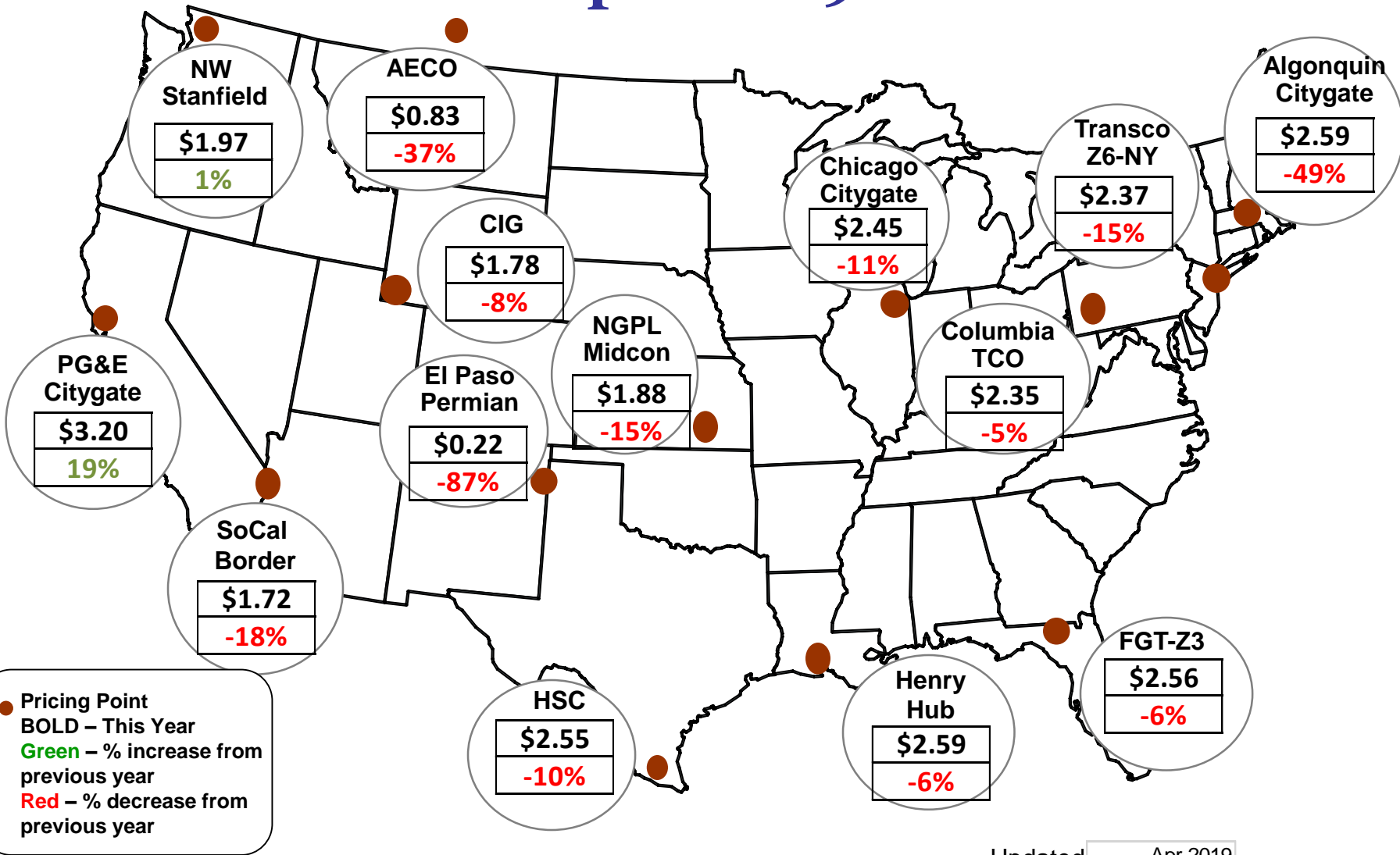
Cumulative CDDs by City April 2019



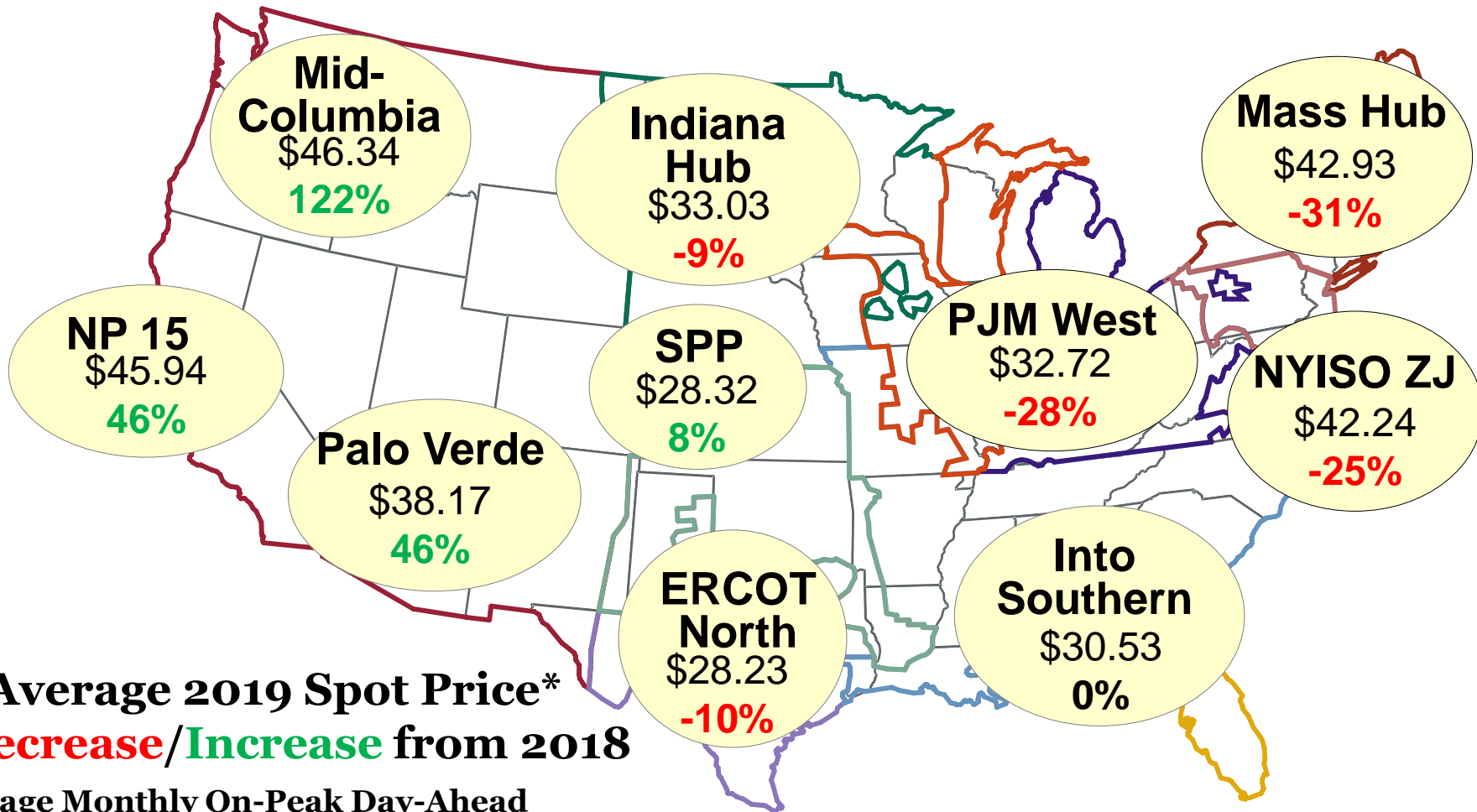
Source: Bloomberg Weather (daily data summed)

Updated Apr-2019

Spot Natural Gas Prices Average (\$/MMBtu) April 2019



2019 Spot Power Prices (\$/MWh)



\$ = Average 2019 Spot Price*
% Decrease/Increase from 2018

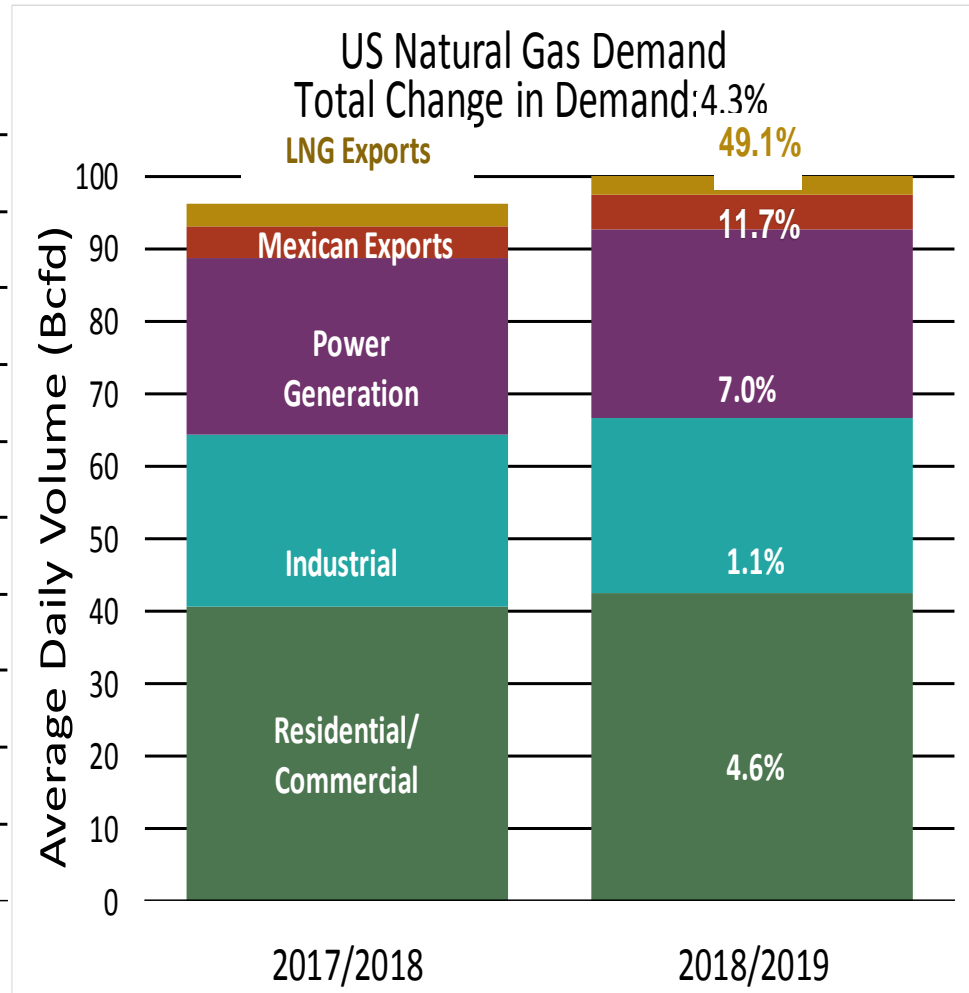
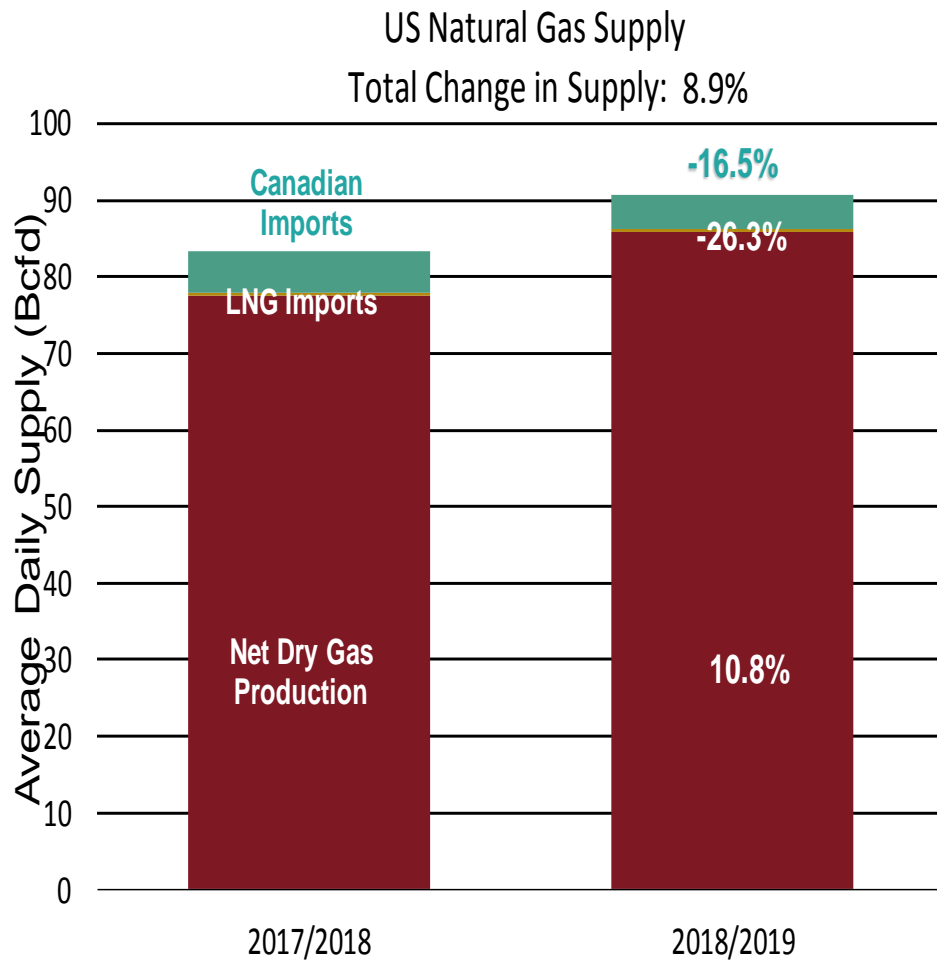
*Average Monthly On-Peak Day-Ahead
 from January to April

SPP Price is an average of the North and South Hubs

Source: S&P Global Intelligence and ISO/RTO Data

U.S. NG Supply and Demand

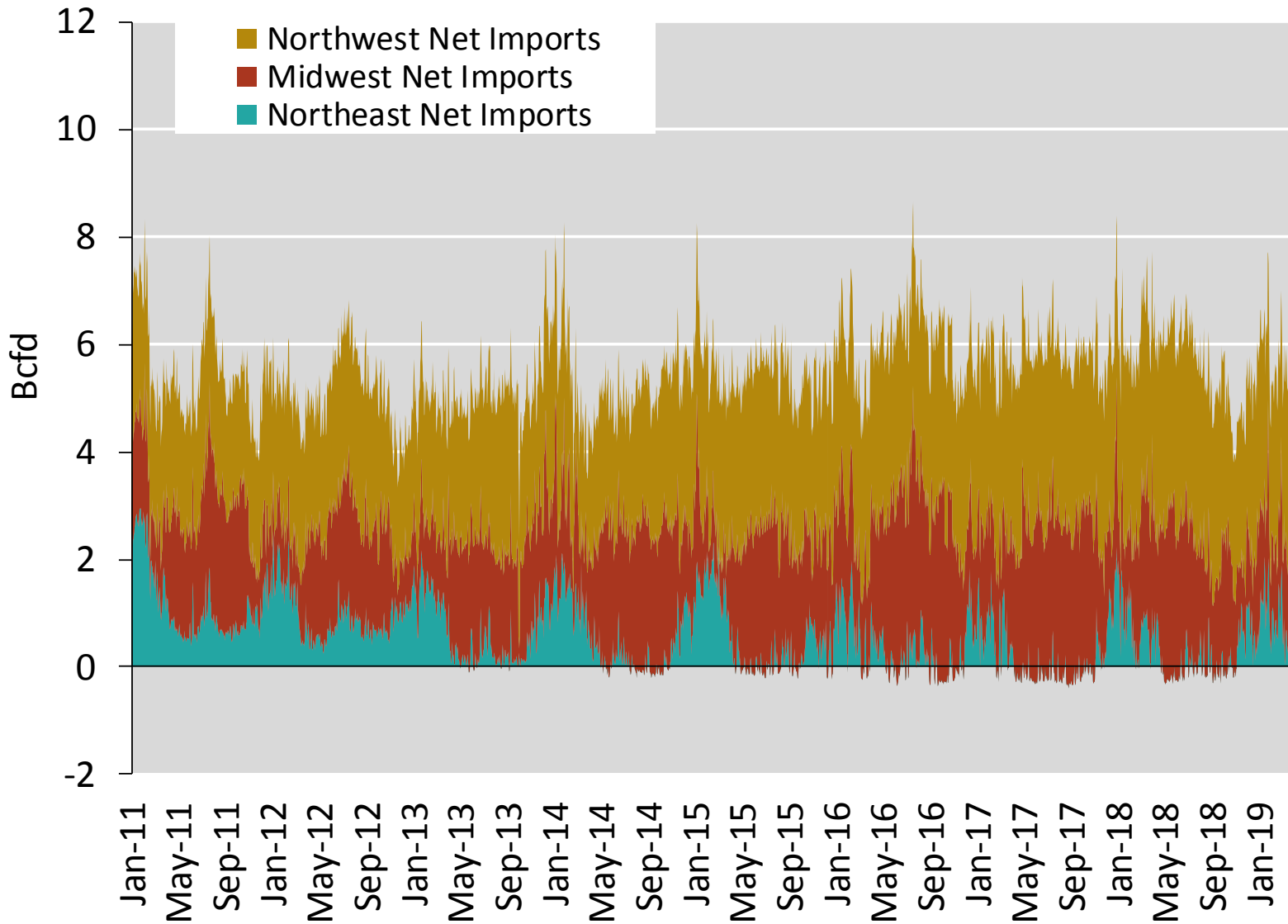
November 2017 – March 2018 vs November 2018 – March 2019



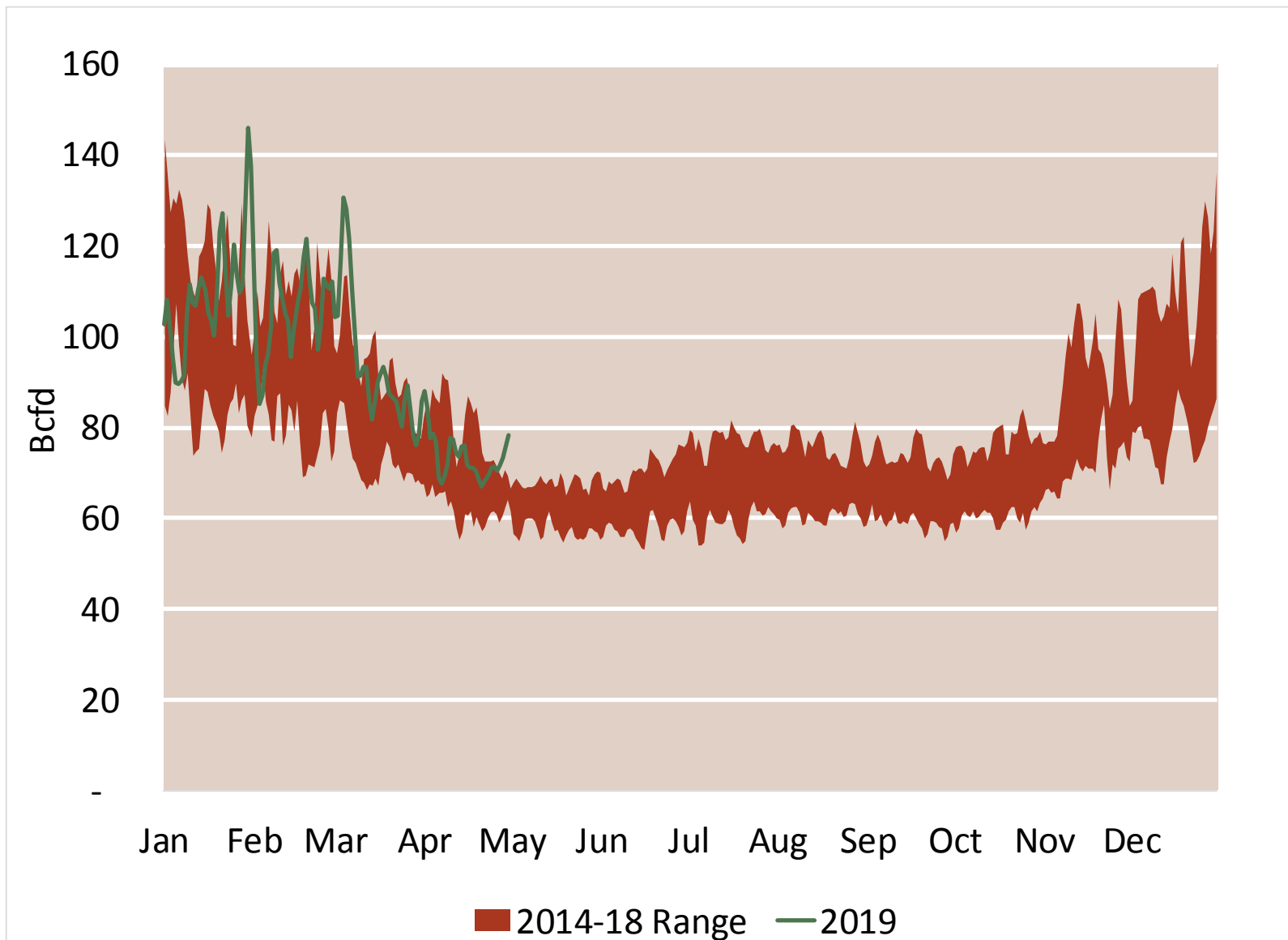
Note: Balance includes all amounts not attributable to other categories.

Source: Derived from *Bentek Energy* data

Regional Imports from Canada

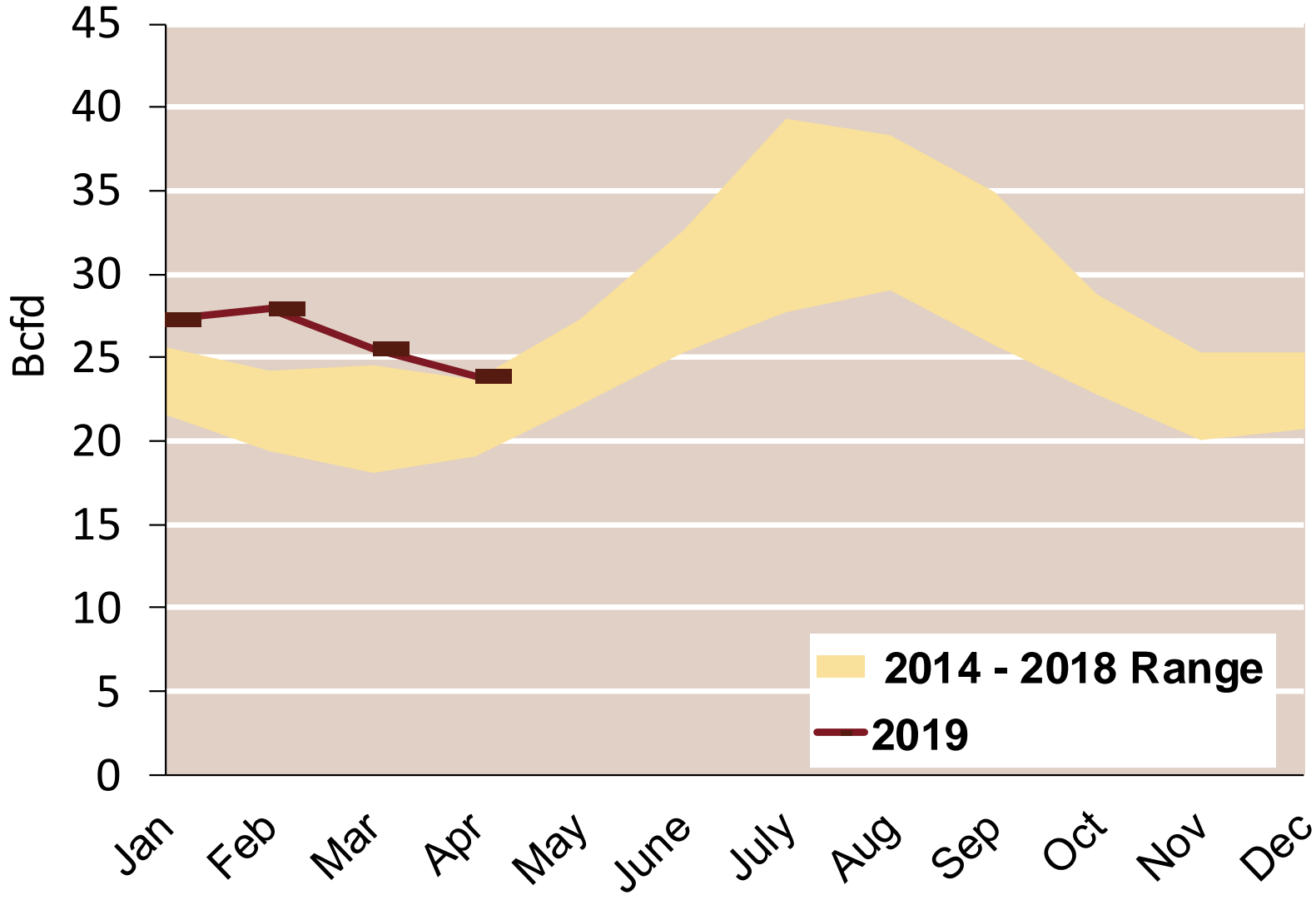


Total U.S. Natural Gas Demand All Sectors

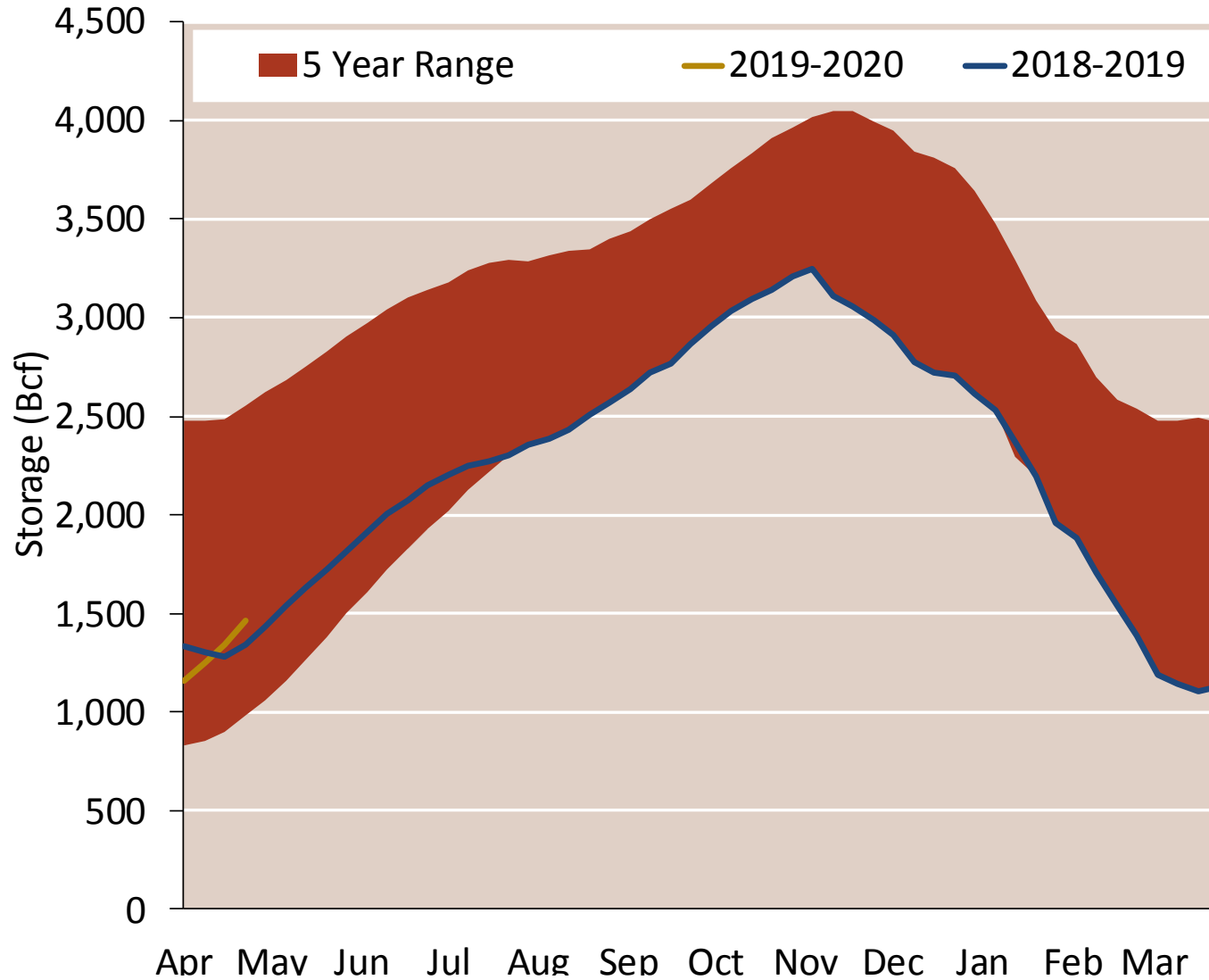


Source: Derived from Bentek Energy data, derived from interstate pipeline flow and modeled data.

U.S. Natural Gas Consumption for Power Generation



EIA National Storage Inventories

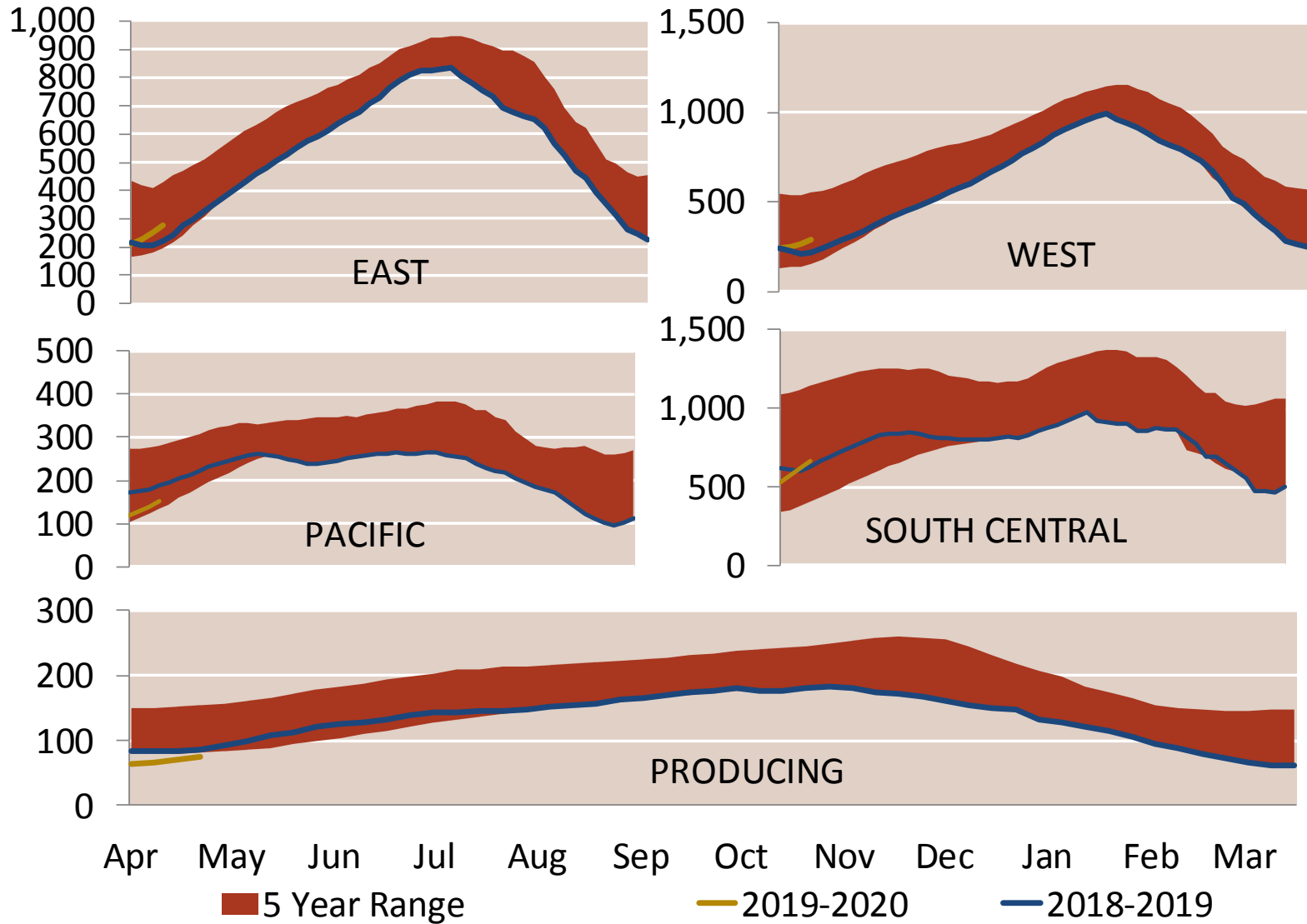


Notes:

Source: Derived from Bloomberg Data

Updated Apr-2019

EIA Regional Storage Inventories

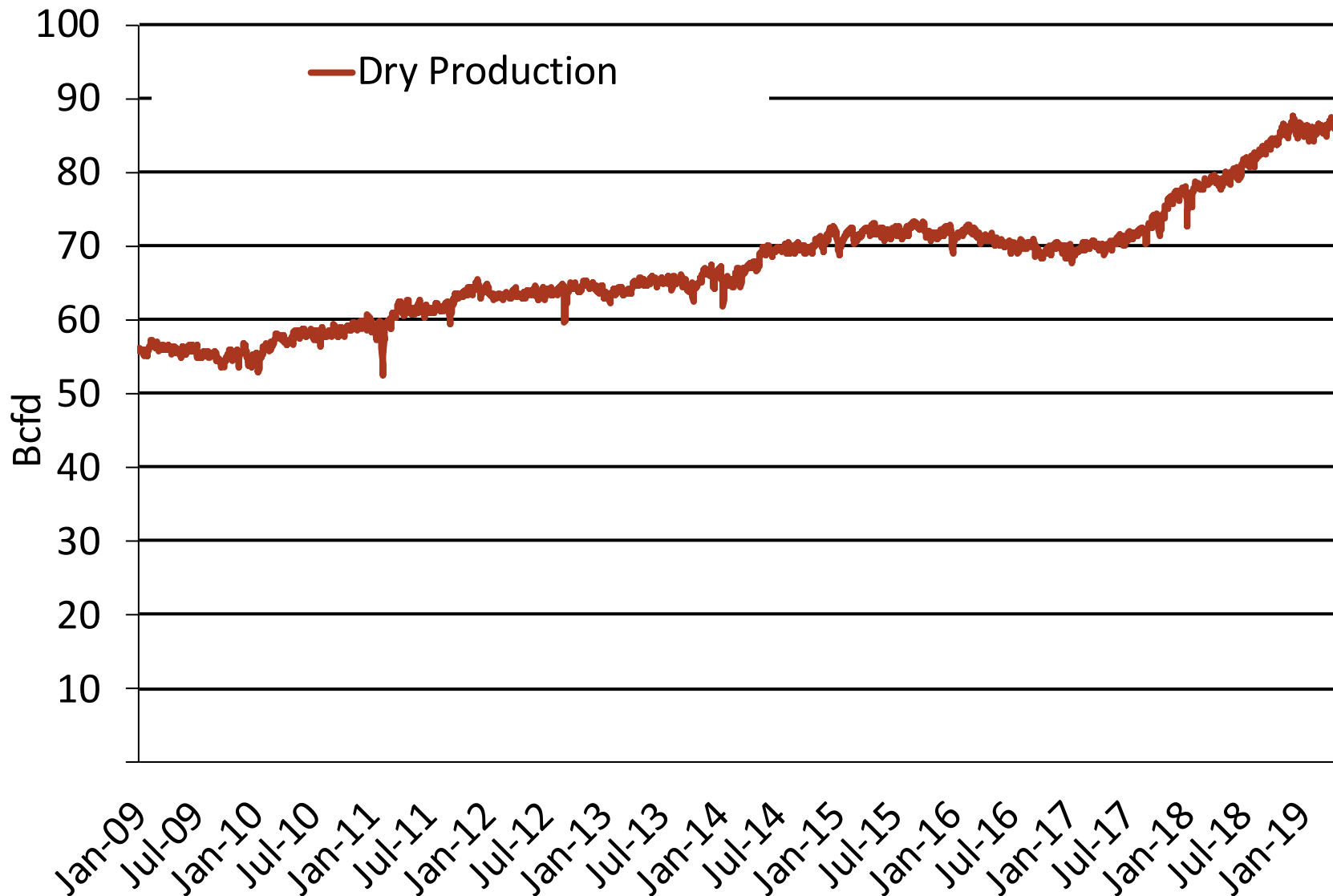


Notes:

Source: Derived from Bloomberg Data

Updated Apr-2019

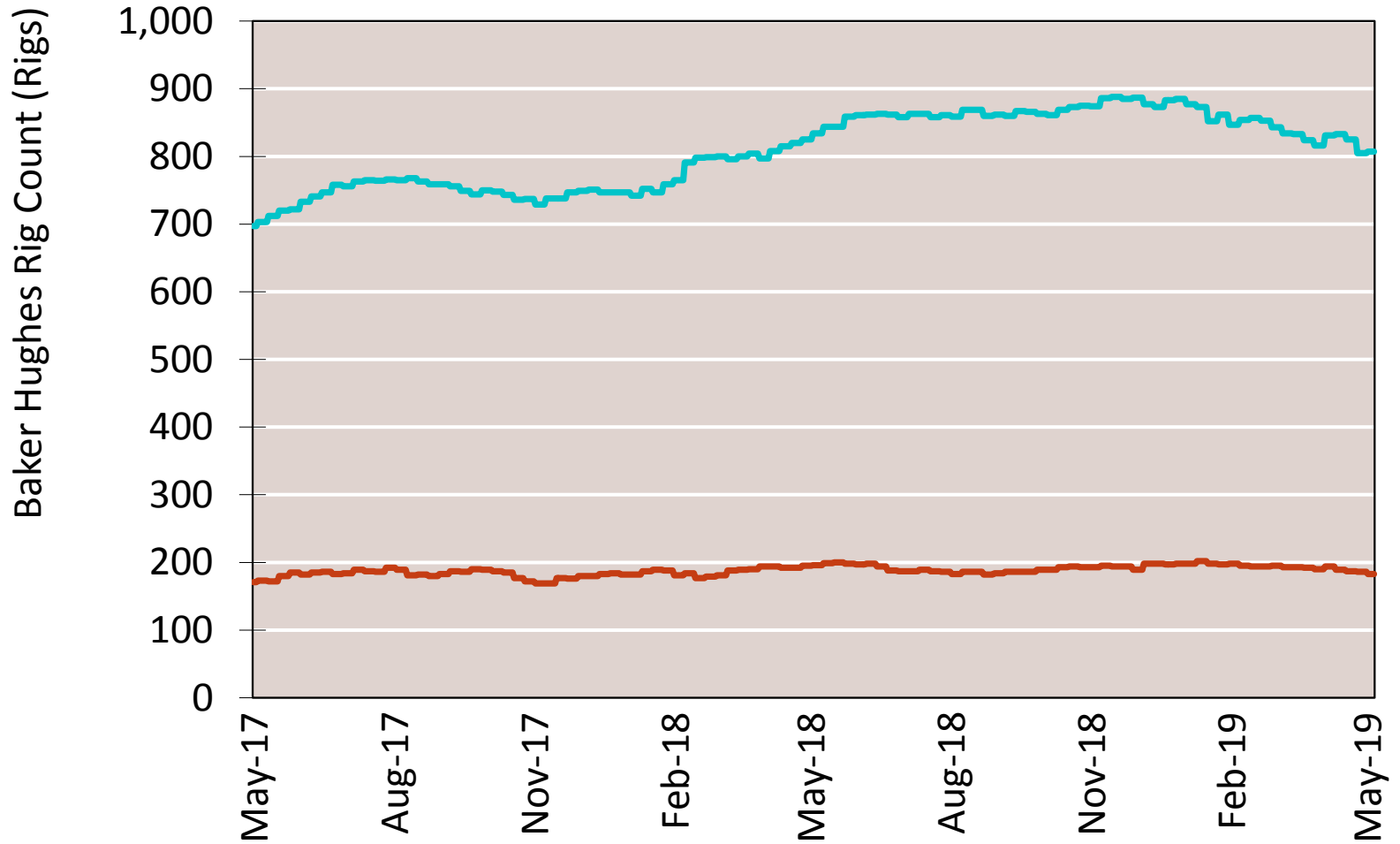
Monthly U.S. Dry Gas Production – Lower 48 States



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

Oil Rigs Gas Rigs

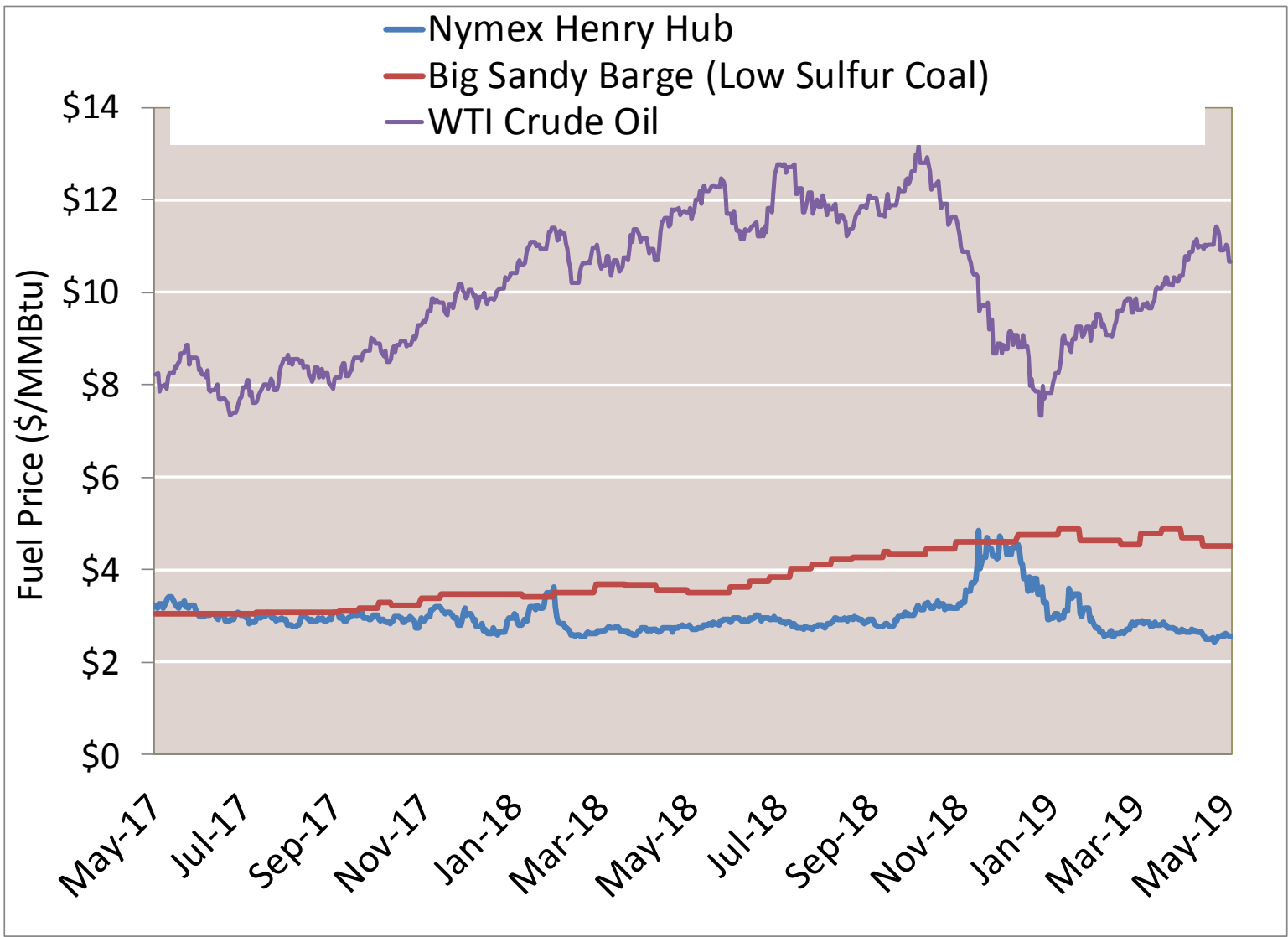


Notes:

Source: Derived from Bloomberg data

Updated Apr-2019

Competing Fuels

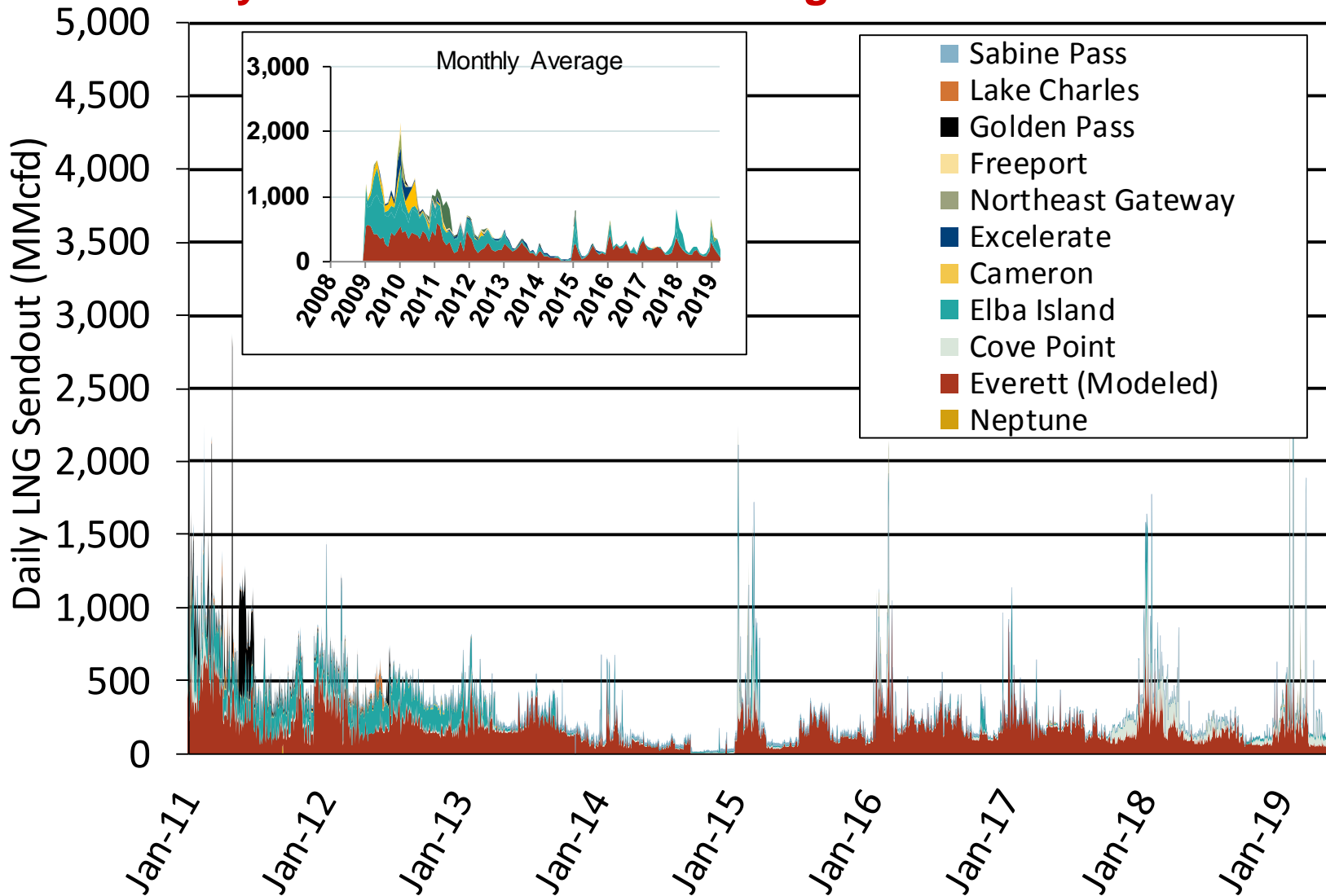


Notes:

Source: Derived from Bloomberg data

Updated Apr-2019

Daily Gas Sendout from Existing U.S. LNG Facilities

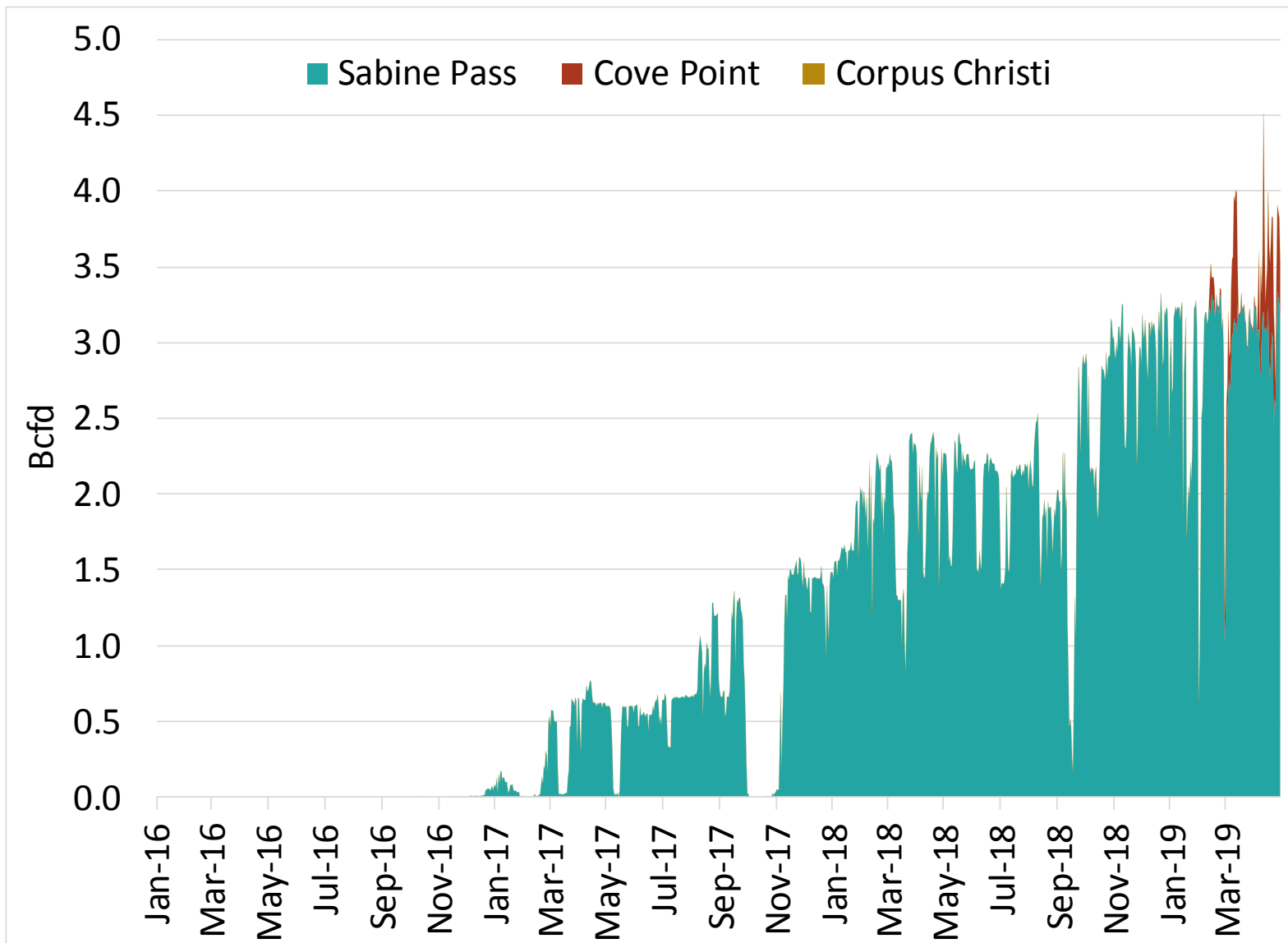


Notes: Everett data includes flows onto the AGT and TGP interstate lines, plus estimates of flows to the Mystic 7 power plant, Keyspan Boston Gas, and LNG trucked out of the terminal. Excludes flows to the Freeport LNG which flows via intrastate pipelines and flows to the Mystic 8 and 9 power plants.

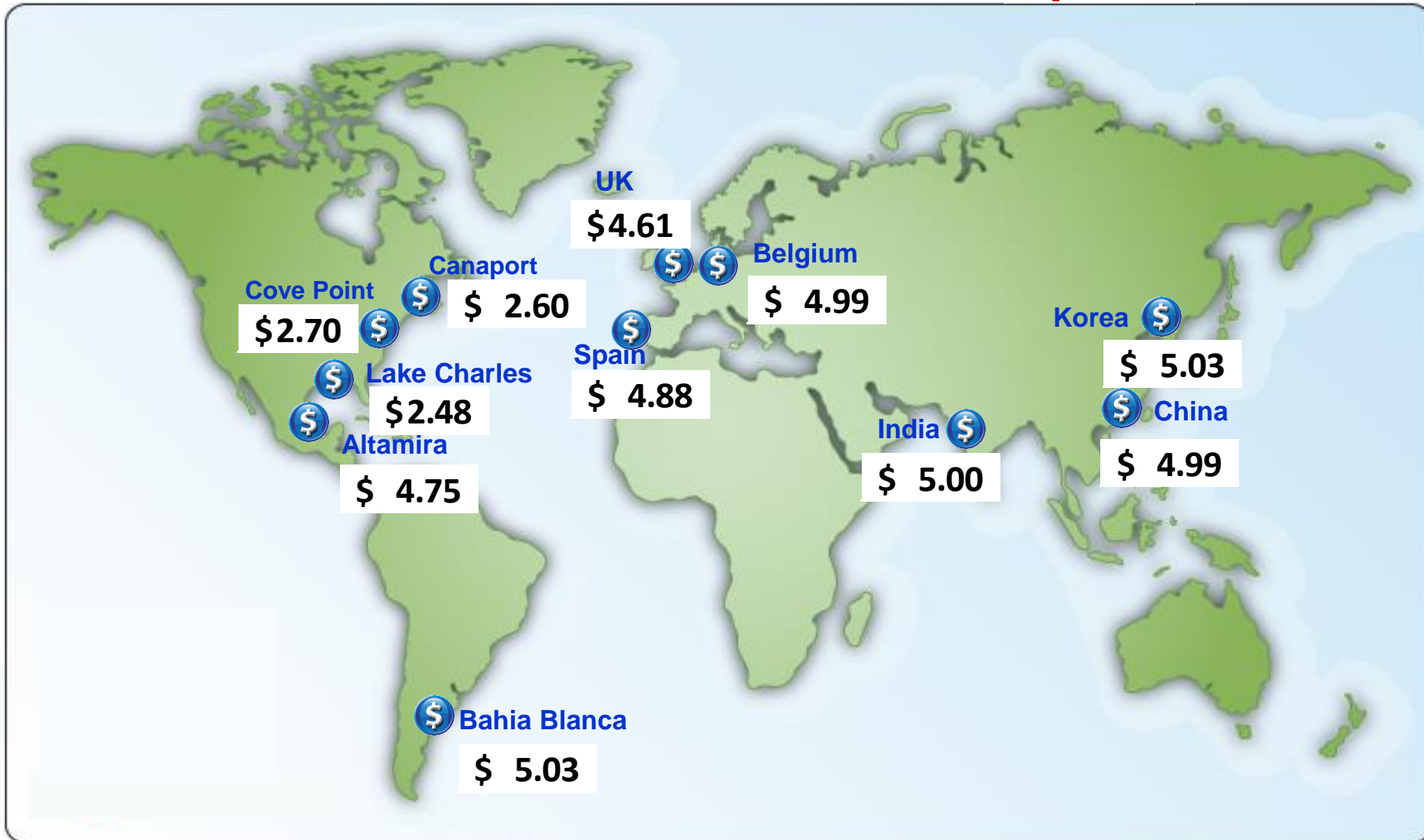
Source: Derived from Bentek Energy data

Updated Apr-2019

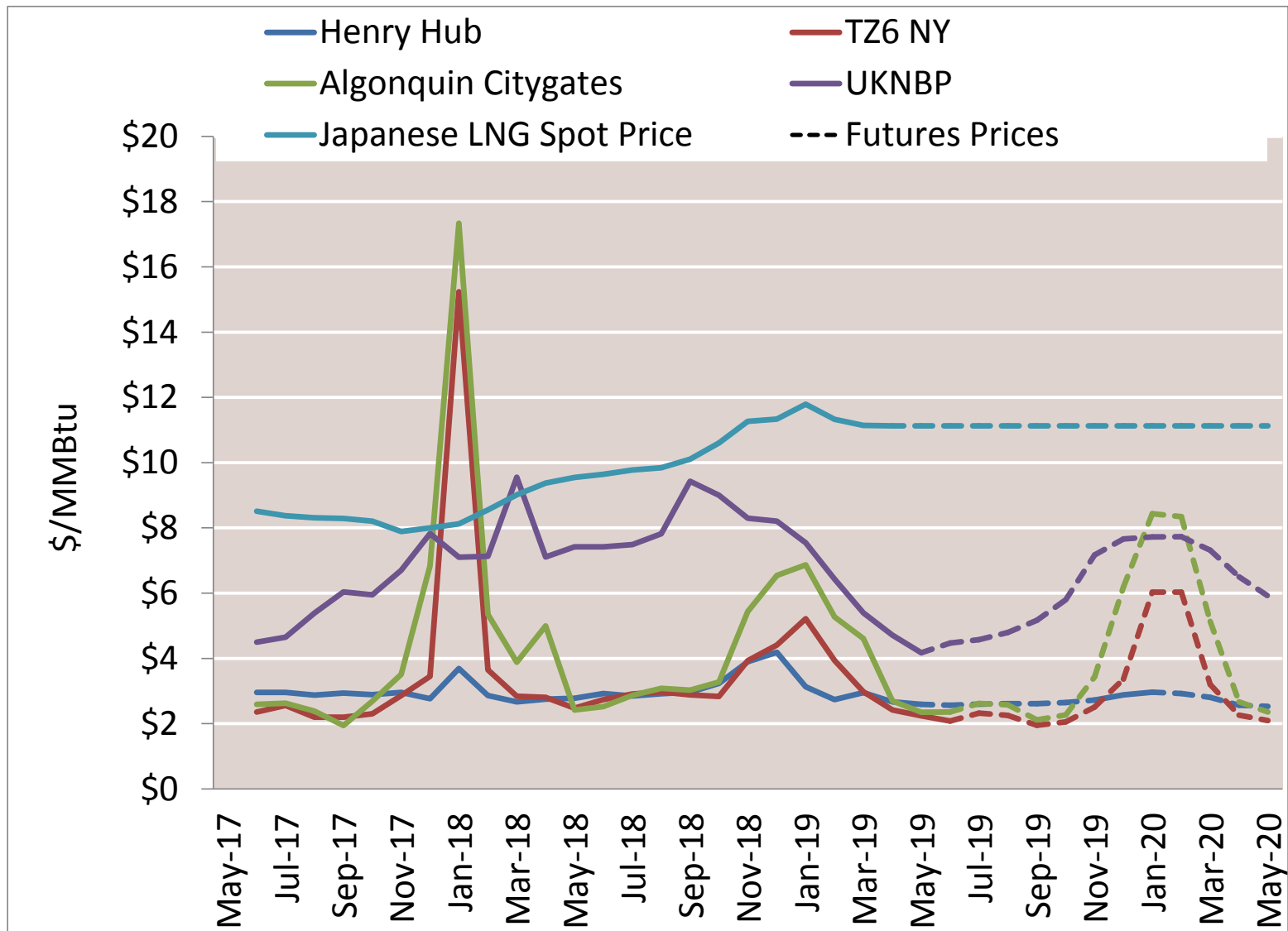
U.S Exports of LNG



World LNG Estimated Landed Prices: Apr-19



Historical and World Gas Futures Prices

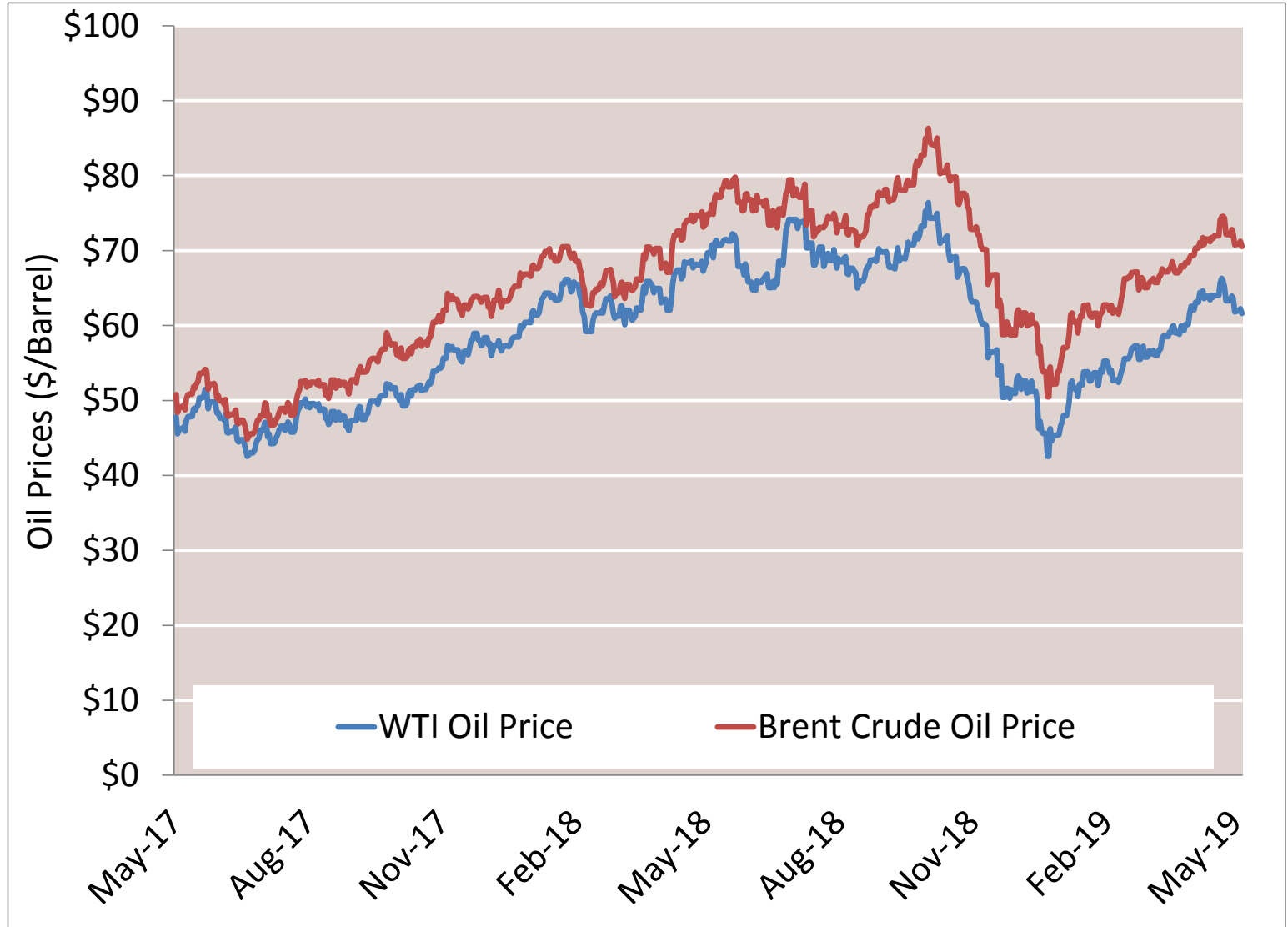


Notes:

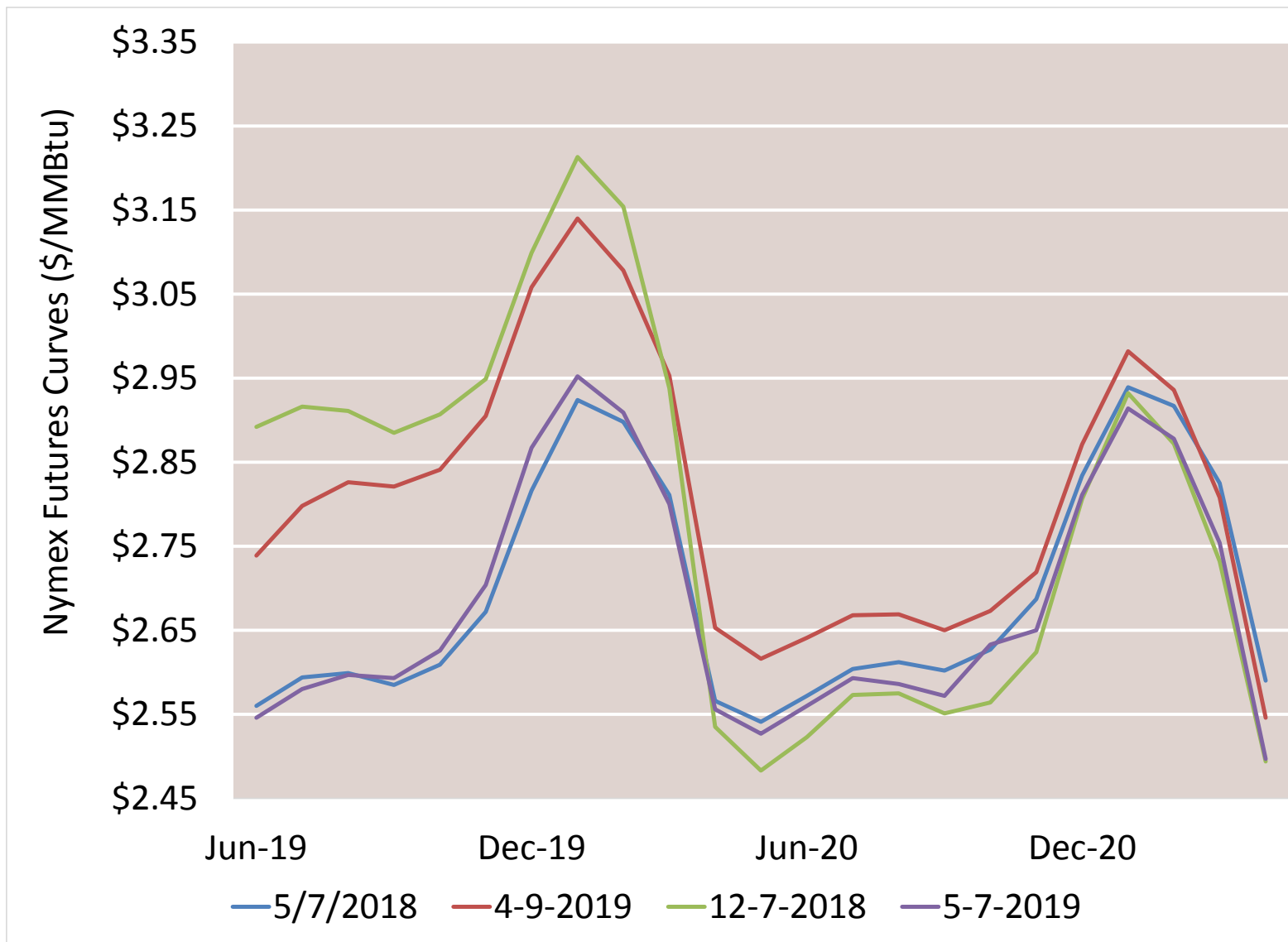
Source: Derived from Bloomberg data

Updated

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

Natural Gas Activities in March 2019

Status	No. of Projects	Storage Capacity (Bcf)	Deliverability (MMcf/d)	Capacity (MMcf/d)	Miles of Pipeline	Compression (HP)
Pipeline						
Placed in Service	2			484	1	12,500
Certificated	1			205	1	53,068
Proposed	3			523	35	0
Storage						
Placed in Service	0	0.0	0.0			0
Certificated	0	0.0	0.0			0
Proposed	1	1.0	0.0			0
LNG (Import & Export)						
Placed in Service (Export)	2	10.1	2,840.0			0
Certificated (Import/Export)	0	0.0	0.0			0
Proposed (Import/Export)	0	0.0	0.0			0

Natural Gas Activities through March 31, 2019

January through March 31, 2018

Status	No. of Projects	Storage Capacity (BCF)	Deliverability (MMcf/d)	Capacity (MMcf/d)	Miles of Pipeline	Compression (HP)
Pipeline						
Placed in Service	4			3943.5	1.4	282,400
through March 31, 2018	2			980.0	34.1	62,760
Certificated	7			1129.2	61.3	107,081
through March 31, 2018	16			3251.5	242.4	121,015
Storage						
Placed in Service	0	0.0	0.0			0
through March 31, 2018	0	0.0	0.0			0
Certificated	1	0.0	79.0			0
through March 31, 2018	1	0.3	125.0			0
LNG (Import & Export)						
Placed in Service (Export)	2	10.1	2840.0			0
through March 31, 2018	1	0.0	825.0			0
Certificated (Import/Export)	1	8.2	1414.0			0
through March 31, 2018	0	0.0	0.0			0

Electric Generation Highlights

New Generation In-Service (New Build and Expansion)

Primary Fuel Type	March 2019		January – March 2019 Cumulative		January – March 2018 Cumulative	
	No. of Units	Installed Capacity (MW)	No. of Units	Installed Capacity (MW)	No. of Units	Installed Capacity (MW)
Coal	0	0	0	0	0	0
Natural Gas	11	943	16	1,482	16	987
Nuclear	0	0	0	0	3	30
Oil	0	0	2	5	8	18
Water	0	0	4	29	5	18
Wind	3	239	15	1,011	16	1,789
Biomass	0	0	0	0	3	3
Geothermal Steam	0	0	0	0	2	34
Solar	6	11	59	1,155	163	1,579
Waste Heat	0	0	0	0	0	0
Other *	1	0	4	0	8	5
Total	21	1,193	100	3,682	224	4,463

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

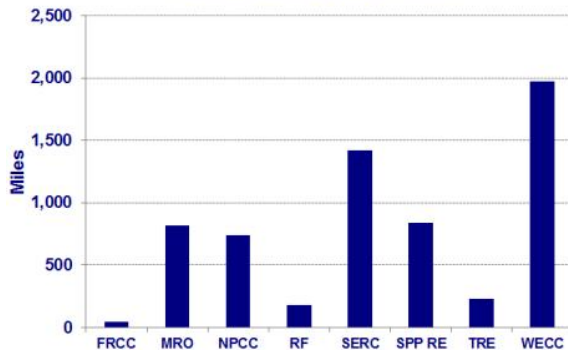
* "Other" includes purchased steam, tires, and miscellaneous technology such as batteries, fuel cells, energy storage, and fly wheel.

Electric Transmission Highlights

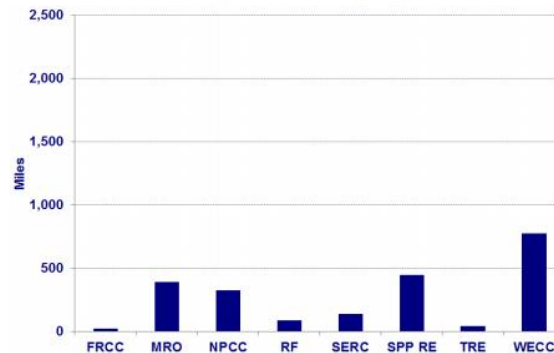
Voltage (kV)	Transmission Projects Completed				Proposed Transmission Projects In-Service by April 2021	
	March 2019	March 2018	January – March 2019 Cumulative	January – December 2018 Cumulative	High Probability of Completion	All
	Line Length (miles)					
≤230	0.0	28.0	20.0	392.3	532.1	1,748.0
345	165.0	169.8	165.0	819.3	960.0	2,845.0
500	0.0	0.0	7.4	69.4	738.0	1,662.0
Total U.S.	165.0	197.8	192.4	1,281.0	2,230.1	6,255.0

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

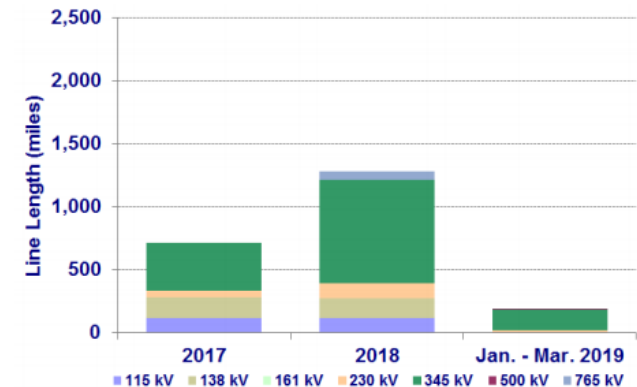
All Transmission Projects with a Proposed In-Service Date by April 2021



Transmission Projects with a High Probability of being completed by April 2021



New Transmission Projects by Voltage



Installed Generating Capacity and Proposed Additions

Total Available Installed Generating Capacity

	Installed Capacity (GW)	% of Total Capacity
Coal	259.05	21.68%
Natural Gas	529.22	44.29%
Nuclear	107.98	9.04%
Oil	39.75	3.33%
Water	100.44	8.41%
Wind	98.17	8.22%
Biomass	16.11	1.35%
Geothermal Steam	3.84	0.32%
Solar	38.10	3.19%
Waste Heat	1.36	0.11%
Other*	0.78	0.07%
Total	1,194.78	100.00%

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

Proposed Generation Additions and Retirements by April 2022

Primary Fuel Type	All Additions		High Probability Additions		Retirements	
	No. of Units	Installed Capacity (MW)	No. of Units	Installed Capacity (MW)	No. of Units	Installed Capacity (MW)
Coal	1	17	1	17	54	14,641
Natural Gas	236	62,895	115	30,475	108	10,171
Nuclear	12	11,481	4	4,800	9	9,052
Oil	17	730	6	37	22	1,067
Water	222	14,996	79	942	21	527
Wind	534	100,129	137	25,105	1	239
Biomass	58	617	24	461	30	142
Geothermal Steam	18	913	6	280	0	0
Solar	2,506	81,595	529	12,927	5	2
Waste Heat	3	34	2	29	0	0
Other *	110	453	34	7	1	2
Total	3,717	273,860	937	75,080	251	35,843

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.