

Constellation's MARKET INTEL NEWSLETTER

Energy Market Update for Commercial & Industrial Customers

November 2018

Fuels

Natural Gas

- A very cold start to November in the Eastern half of the U.S. sent prompt-month NYMEX natural gas upward by 50%, from \$3.24 per MMBtu on November 1st to \$4.84 per MMBtu on November 14th.
- Volatile winter natural gas prices have been spurred by relatively low storage inventories (15-year low), coupled with an early arrival of winter.
- The weather will play the major role in the coming weeks as to the pricing action in natural gas.
- The latest 6-10 day weather forecast (November 27, 2018) calls for a warm-up in the east and a cooldown in the west. The latest (November 27, 2018) 8-14 day weather outlook calls for the warm-up in the east to be relatively short-lived, replaced by a return to normal winter temperatures.
- Deferred natural gas prices have held steady despite the run-up in the near-term winter: Calendar years 2020, 2021, 2022 and 2023 are all trading near \$2.65 per MMBtu, very close to their historic all-time lows (as of 1:30 EST, November 27, 2018).
- European prompt-month liquified natural gas (LNG) was \$8.66, while January traded at \$8.86 per MMBtu.
- Asian prompt-month LNG was \$9.25, and January traded at \$10.17 per MMBtu.

Coal

- PRB coal for 2019 was unchanged at \$12.30 per ton.
- CAPP for rail for 2019 was trading at \$69.95 per ton.
- 2019 API #2 Rotterdam coal was \$85.35 per ton.

Oil

- WTI prompt-month crude oil was trading at \$51.28 per barrel (November 27, 2018), down over \$12 per barrel from November 1st.
- WTI prompt-month crude oil had hit a four-year high last month (October 2018), trading just north of \$75 per barrel.
- The Trump administration has waived sanctions of Iranian oil deliveries to several countries, allowing for additional supplies to keep downward pressure on pricing.
- The Energy Information Administration (EIA) has revised its 2019 estimates for U.S. crude oil production upward to 12.2 million barrels per day, providing for some additional easing in near-term prices.
- CNN Business reports that China's economy grew at 6.5 percent in the third quarter, the slowest in a decade. A cooling Chinese economy appears to have reduced the outlook for oil demand in 2019.

Power

- Forward power prices in November for winter months (December-February) moved higher along with forward regional gas prices.
- Markets remain "backwardated" as we approach 2019, meaning there is a premium in the prompt year 2019, 2020 and 2020 to 2021, etc.

Economy

- Durable goods orders fell 4.4% in October to \$248.5 billion.
- October sales of previously-owned houses rose to a seasonally adjusted annual rate of 5.22 million, following a 3.4% decrease in September.
- The Bureau of Labor Statistics reported 250,000 nonfarm jobs in October, generally considered to be a strong performance.

Weather

- The 6-10 day outlook (from November 27, 2018) calls for a warm-up in the Eastern half of the U.S., followed by a return to normal winter temperatures in the 14-day forecast.
- The current El Niño reading is hovering around +1.3, which may introduce the possibility for a warmer-than-normal later December and early January.

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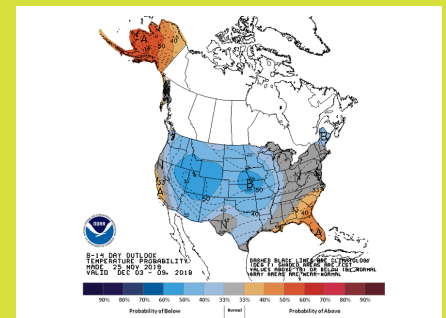
Prompt Month Settlements

	Dec. '18	30-Day Change
Nat Gas \$/mmBTU	\$4.248	+\$1.06/MMBTU
Crude Oil \$/bbl	\$51.63	-\$15.96/BBL

As of 11/29/2018.

Temperature Outlook

Source: NOAA



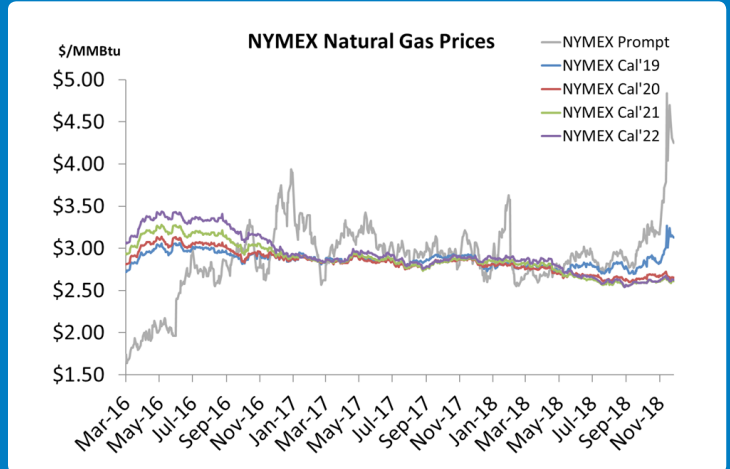
NYMEX Prompt Month Chart



Gas Report



- NYMEX prompt-month gas futures rallied over \$1/MMBtu as the market corrected for the large storage balance deficit, trading at a high of \$4.86.
- The 12-month strip increased \$0.33/MMBtu and Cal 19 also increased \$0.28/MMBtu to over \$3/MMBtu, however Cal 20-22 are still trading in the \$2.60s as the market is still valuing the rising production as a major factor.
- Storage inventories are 3,113 Bcf. The EIA reported a record withdrawal of 134 Bcf for the week ending November 16, 2018, which is the largest withdrawal on record to begin the heating season and four times the historical five-year average.
- Natural gas stocks are now 620 Bcf (-18.6%) lower than the five-year average, while the year-over-year deficit expanded to 17%.
- Natural gas production for the week that ended November 14th averaged 87 Bcf/day. Gas production increased year-over-year 9 Bcf/day. Supply is estimated to have declined week-over-week by 0.5 Bcf/day due to regional well head freeze-offs as a result of cold temperatures.
- Natural gas consumption (November 8, 2018-November 11, 2018) was 86.5 Bcf/day, a 7.6 Bcf/day increase over last year, mostly made up of an increase in residential and commercial consumption of 4.3 Bcf/day and power consumption of 2.5 Bcf/day.

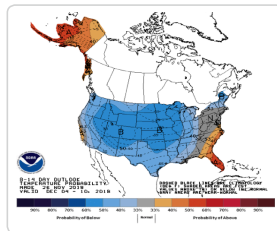


NYMEX Futures Pricing	Current Price	Last Month	M/M Change	Last Year	Y/Y Change
Prompt (Dec18)	\$4.250	\$3.170	\$1.080	\$2.810	\$1.440
Winter (Nov18-Mar19)	\$4.170	\$3.170	\$1.000	\$3.090	\$1.080
12 Month Strip	\$3.240	\$2.900	\$0.330	\$2.880	\$0.360
2019	\$3.130	\$2.850	\$0.280	\$2.880	\$0.250
2020	\$2.650	\$2.680	(\$0.020)	\$2.860	(\$0.210)
2021	\$2.610	\$2.600	\$0.010	\$2.870	(\$0.260)
2022	\$2.630	\$2.610	\$0.020	\$2.880	(\$0.260)

Temperature Outlook



- Strong blocking (caused by high pressure ridges) over the northeast Pacific and Alaska allows some Arctic air to move into the Midwest and East, but by Day 14 the models show a reversal of this pattern. The models break down the blocking over Alaska and replace it with strong storminess. This may allow mild Pacific air to flood the nation for the middle/end of December.



Source: NOAA

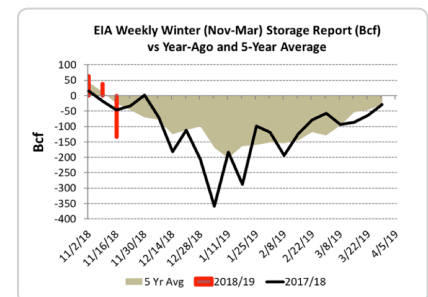
- Bottom line: Despite short-term cold, the pattern may turn warmer relatively soon.
- Our winter forecast takes many indices into consideration. Weak El Niños (water temperature anomalies between +0.5 and +1.0 degrees Celsius) tend to result in colder-than-normal winters across the Midwest, South and East, while moderate El Niños (i.e., water temperature anomalies between +1.0 and +1.5 degrees C) tend to result in colder-than-normal winters across the southern Plains, Ohio Valley, South and parts of the East. The northern tier of the Midwest and Northeast tends to come in a bit warmer.
- The current El Niño reading is hovering around +1.3, which may introduce warmer risks this winter across the North, especially for late December and part of January.
- The coldest time period this winter may occur in late January and February, very similar to our top analog winter of 2006-2007.

Storage Report



- The EIA estimates that U.S. natural gas storage inventories were 3.2 Tcf at the end of October; 16% lower than both year-ago and five-year average levels for the end of October and the lowest end-of-October level since 2005.

- Falling temperatures and an increase in heating demand for most of the Lower 48 lead to the first withdrawal of the season for the report week ending November 16th. The EIA reported a 134 Bcf withdrawal, significantly larger than market consensus of 113 Bcf and the range of 105-122 Bcf.
- The 134 Bcf withdrawal was over three times greater than last year's 42 Bcf draw and over five times greater than the five-year average of 25 Bcf.
- The withdrawal widened the underground storage deficit; total storage stands at 3,113 Bcf or 620 Bcf (17%) below year-ago levels and 710 Bcf (19%) below the five-year average.
- In addition to concerns around total underground inventories, regional storage levels are below five-year minimum levels, and strong demand during December, February and March could leave storage levels critically low this April.
- Low storage inventories are a key support factor for the start of winter, but in its most recent Short-Term Energy Outlook (STEO), the EIA projects storage to finish March 2019 at 1.447 Tcf, just above the 1.35 Tcf seen last year.



Bulls vs. Bears



Bulls

Natural Gas

- Cold winter temperatures in the Eastern half of the U.S.
- Above-average withdrawals from natural gas storage.
- Oil prices below \$50 per barrel.

Crude Oil

- Trade deal is struck with China.
- Iran oil export sanctions increase.
- The Organization of the Petroleum Exporting Countries (OPEC) announces further production cuts.

Bears

Natural Gas

- A prolonged winter warm-up in key consuming regions.
- Higher crude oil prices (i.e., prices for WTI move above \$70 per bbl).
- Below-average withdrawals from natural gas storage.

Crude Oil

- Continued and increasing trade concerns with China.
- U.S. dollar strengthens.
- Global GDP shows growing weakness.

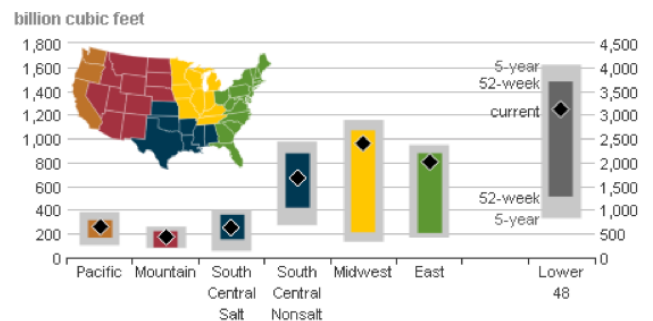
Natural Gas Specific Topics and Updates

Underground Storage by Regional Capacity

The EIA classifies Lower 48 storage into five regions (i.e., East, Midwest, South Central, Mountain and Pacific), while breaking down South Central into salt and non-salt dome capacity.

- All regions started Winter 2018/2019 below their five-year average and are anywhere from 58% of capacity utilization for the South Central to 81% of capacity utilization for the East.
- The South Central region is starting with the biggest storage deficit of -24% below year-ago levels while the East is at -10% below year-ago levels.

Underground working natural gas storage summary as of November 16, 2018



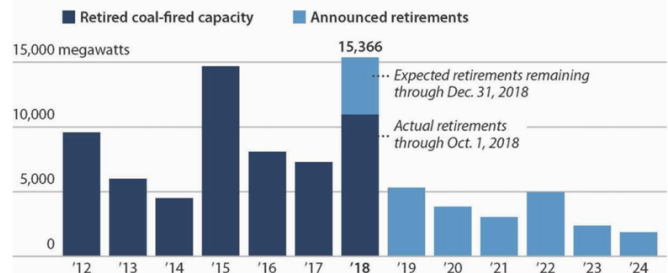
Source: The Energy Information Administration (EIA)

Coal-Fired Generation Retirements Lift Gas Demand

- 2018 will likely see the largest level of coal-fired retirements since 2015 when many generators were required to comply with new EPA rules on emissions or shut down.
- The main driver of coal retirements now is a combination of low natural gas prices and growing renewable capacity that is subsidized by the Federal Government Production Tax Credit.
- An additional 36 GW of coal will likely retire by 2024, further reducing coal's market share from its current 30% of U.S. power supply, down from 50% in 2007.

Coal-Fired Electric Generation Retirements

2018 is likely to tally a record level of coal-fired capacity retirements, two-thirds of which were only announced in 2017, and new announcements keep adding to the list of closures expected over the next six years.



Sources: EIA; S&P Global; IEEFA research (2017-2024)

Source: The Energy Information Administration (EIA)

Great Lakes Electric Summary: Customer Takeaways

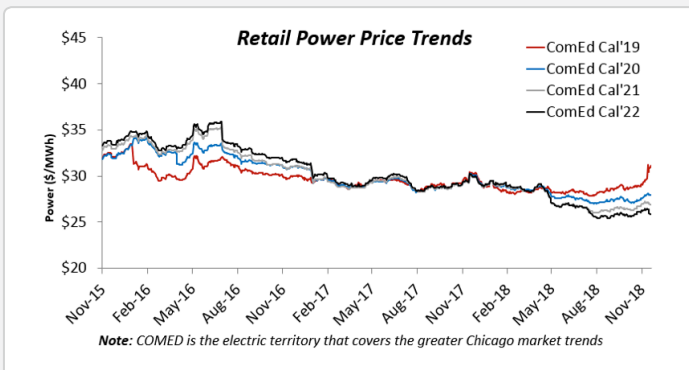


- 2019 forward power prices have staged a sharp rally this month led by the winter strip, which has been influenced by a colder-than-expected November, colder revisions to December forecasts and the lowest natural gas storage inventories since 2005. Cal 19 forward power prices in the Midwest markets are now 12%-26% above prior market lows.
- Bullish near-term fundamentals have had a muted impact on longer-term forward prices, with prices for 2021-2022 delivery still trading within 6% of market lows. Extending contract terms into these outer years can mitigate the 2019 budget impact of this month's energy price rally.
- A colder-than-expected-start to the heating season has caused a 6% increase in day-ahead index power prices month-over-month. On average across the Midwest, day-ahead prices have jumped nearly 30% compared to the same month a year ago due to colder weather and higher natural gas prices.
- With storage inventories at historically low levels, energy buyers should be prepared for index and forward power price volatility this winter, especially if colder-than-normal weather continues into the peak winter months.

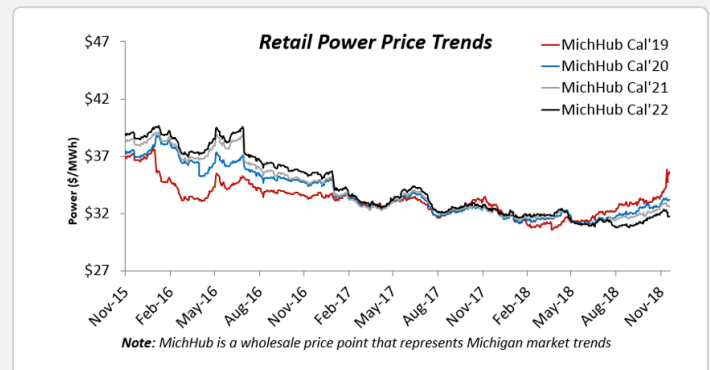
Great Lakes Retail Power Price Trends

% Change in Forward Power	ComEd 2019-2020	ComEd 2021-2022	Mich Hub 2019-2020	Mich Hub 2021-2022	AEP-Day 2019-2020	AEP-Day 2021-2022	Ameren 2019-2020	Ameren DAY 2021-2022
Year-over-Year	-3%	-13%	6%	-1%	9%	-3%	5%	-3%
Month-over-Month	5%	1%	4%	0%	6%	2%	4%	0%
Year-to-Date	0%	-10%	8%	0%	12%	-1%	8%	-1%
Compared to All-Time Low	8%	3%	12%	4%	20%	6%	12%	4%

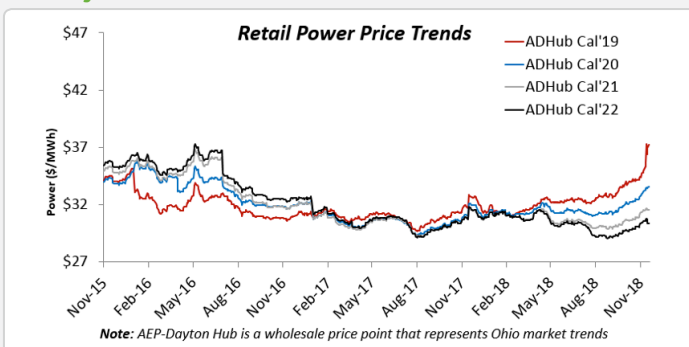
ComEd



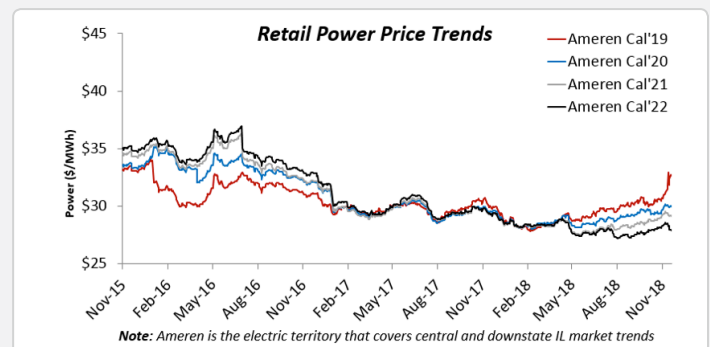
Mich Hub




AEP-Dayton Hub



Ameren



Mid-Atlantic Electric Summary: Customer Takeaways

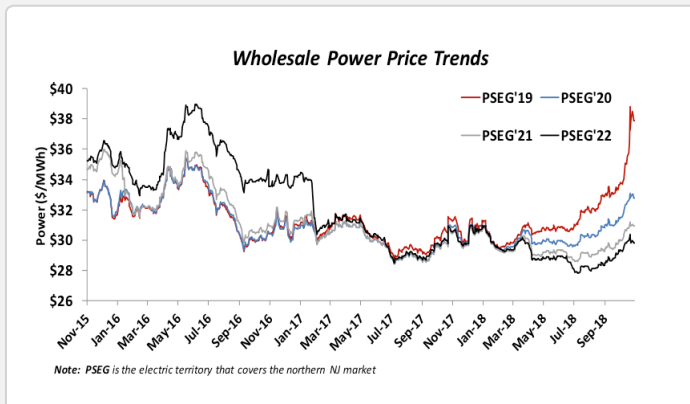
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 • NYMEX natural gas prompt-month futures have skyrocketed over the past month, surging over \$1.50/MMBtu to as high as \$4.93/MMBtu on November 14th. Early cold in November has further widened an already significant gas storage deficit that continues to strike fear into a market that has expressed concerns of a shortage this winter. As a result, most PJM forward prices have increased considerably, particularly for 2019 and 2020 electricity delivery.
- PJM forward energy prices, through 2023, are up about +11% over the past month for 2019, while 2020-2023 are up about +2%, on average. Compared to historical lows for each calendar year, the current prices for 2019 and 2020, respectively, are +33% and +17% higher than the lowest that they have ever traded, while the average percentage increase for 2021-2023 is up +2% from the lows for that period of time.
- Day-ahead index prices in PJM were, on average, +24% higher for the month of October of this year compared to those prices for the same month in 2017. The easternmost zones of PJM showed the highest year-over-year increase with most averaging over a +30% increase, while the more congested zones in PJM, such as BGE and PEPSCO, came in much lower with the appreciation over the past year averaging only +12%.

Mid-Atlantic Retail Power Price Trends

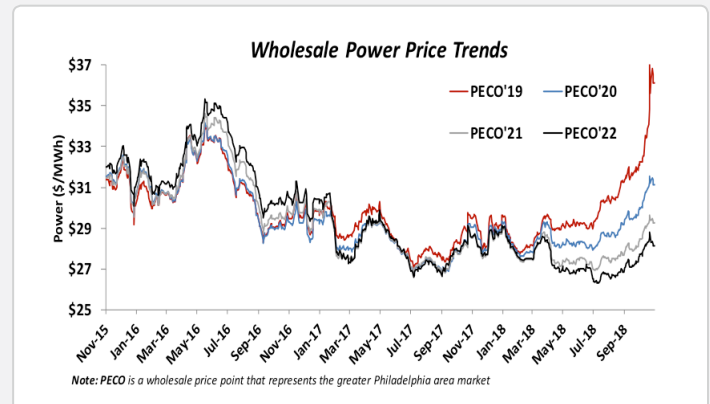
24-Month Fwd Trading Range	PSEG 2019-2020	PSEG 2021-2022	PECO 2019-2020	PECO 2021-2022	APS 2019-2020	APS 2021-2022	BGE 2019-2020	BGE 2021-2022	PPL 2019-2020	PPL 2021-2022
vs High (\$/MWh)	-\$0.61	-\$3.06	-\$0.70	-\$2.35	-\$0.59	-\$0.65	-\$0.58	-\$2.46	-\$2.07	-\$0.64
vs Low (\$/MWh)	\$6.77	\$2.26	\$6.73	\$2.19	\$7.24	\$2.83	\$7.49	\$2.56	\$5.47	\$6.58
vs High (%)	-2%	-9%	-2%	-8%	-2%	-2%	-1%	-6%	-5%	-2%
vs Low (%)	24%	8%	25%	8%	25%	10%	23%	8%	20%	24%

Index Pricing	AECO	APS	BGE	DPL	DUQ	JCPL	PEPCO	PPL	PSEG	MetEd	PECO	Penelec
Oct '17	\$23.69	\$29.69	\$32.39	\$29.75	\$29.70	\$24.38	\$31.92	\$23.54	\$26.17	\$23.97	\$23.90	\$27.71
Oct '18	\$31.58	\$34.55	\$36.48	\$38.27	\$36.38	\$31.84	\$35.69	\$31.44	\$31.70	\$31.32	\$30.77	\$33.41
Year-over-Year % Change	33%	16%	13%	29%	23%	31%	12%	34%	21%	31%	29%	21%

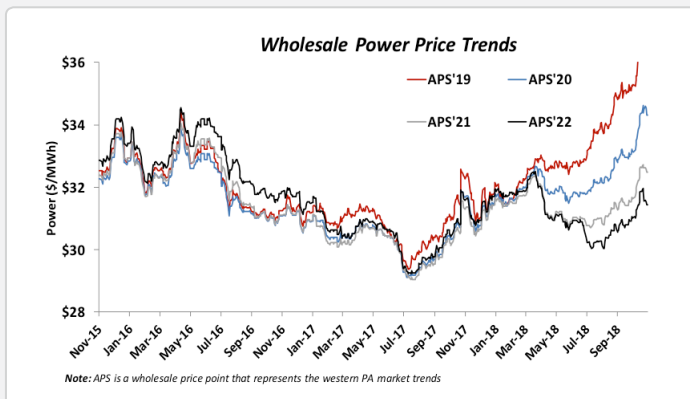
PSEG



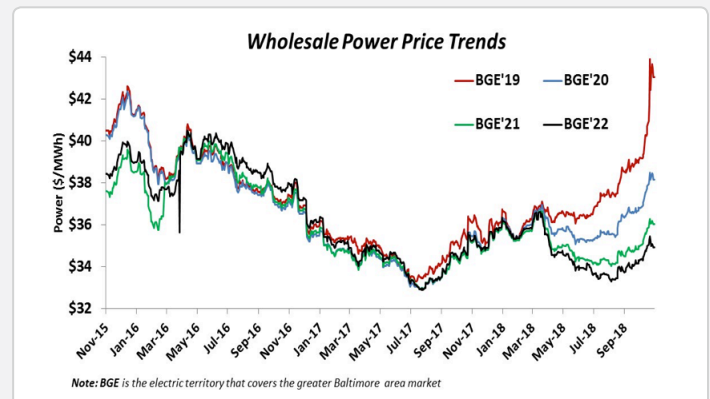
PECO



APS



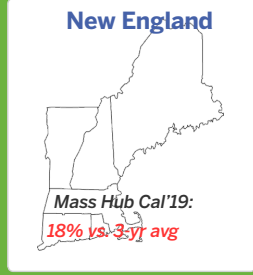
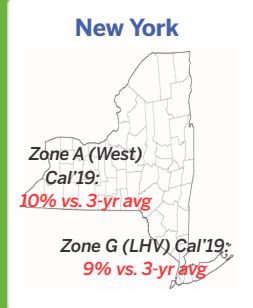
BGE



Northeast Electric Summary: Customer Takeaways



- Two initiatives created and approved by ISO-New England (ISO-NE) in place for this coming winter to mitigate risks against fuel supply constraints are:
 - A 21-day forecast to be utilized by generators to better prepare for fuel inventory needs.
 - A new Energy Market Opportunity Costs (EMOC) forecast will calculate the opportunity cost for resources to use fuel at present or potentially hold off on burning the fuel for higher-priced hours later in the period.
- On November 6th, ISO-NE submitted to the Federal Energy Regulatory Commission (FERC) a filing for the qualification of the Forward Capacity Auction 13 (power year June 2022 – May 2023).
- Term power forwards (Cal 20-23) for New England have moved up ~6% since September 1st while Cal 19 has seen a 15% jump, with a majority of the move happening in early November when medium-term temperature outlooks turned decidedly colder.
- Downstate New York Zones (G&J) have seen approximately the same Cal 19 increase (~15%) while the out-term years (2020-2023) have increased only ~3.5% since the end of summer.



Northeast Retail Power Price Trends

3-Year Price Trend	New England Mass Hub 2019	New England Mass Hub 2019	New England Mass Hub 2021	New England Mass Hub 2022	New England Mass Hub 2023	New York Zone J 2019	New York Zone J 2020	New York Zone J 2021	New York Zone J 2022	New York Zone J 2023
Current Price vs 3-Year Average	18%	11%	9%	7%	6%	9%	-1%	3%	6%	8%
Current Price vs 3-Year Maximum	0%	0%	-4%	-10%	-16%	-1%	-12%	-12%	-12%	-9%
Current Price vs 3-Year Minimum	23%	18%	17%	15%	15%	17%	7%	11%	16%	20%

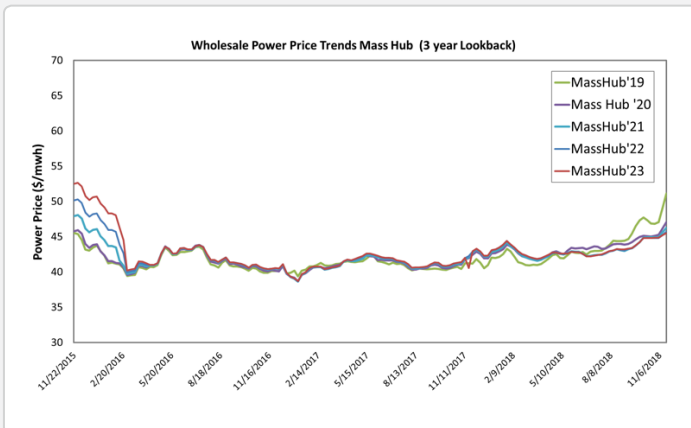
New York Zone A



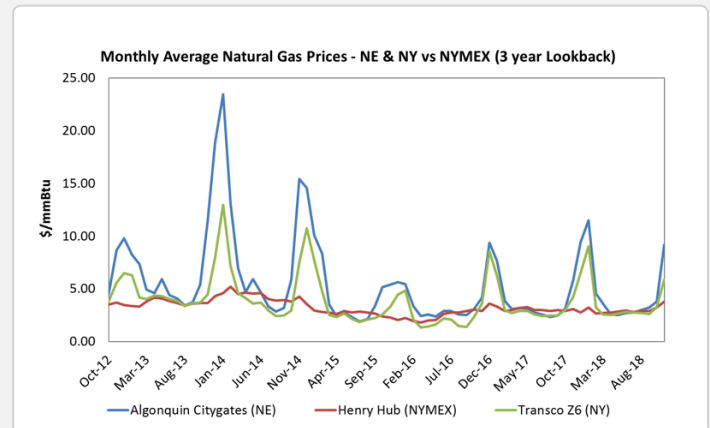
New York Zone G



Mass Hub



NE & NY v.s. NYMEX



Texas Electric Summary: Customer Takeaways

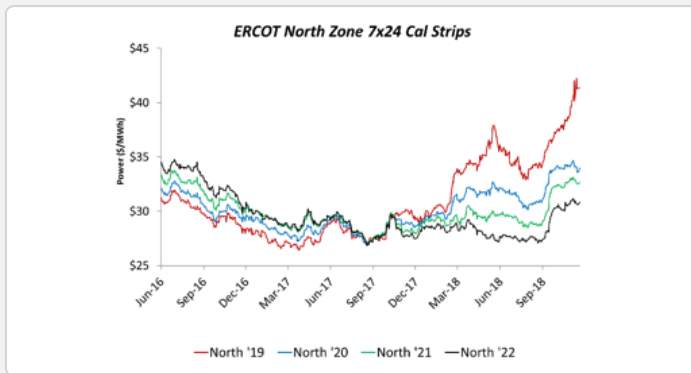


- ERCOT's Independent Market Monitor, the Brattle Group, released a study on the economically optimal reserve margin (EORM) which was determined to be 9%, and Market Equilibrium margin was determined to be 10.25%.
- The Public Utility Commission of Texas is holding additional public meetings in December to decide on changes to the calculation of the Operational Reserve Demand Curve (ORDC) for Summer 2019, which is driving forward power prices for 2019-2022 higher.

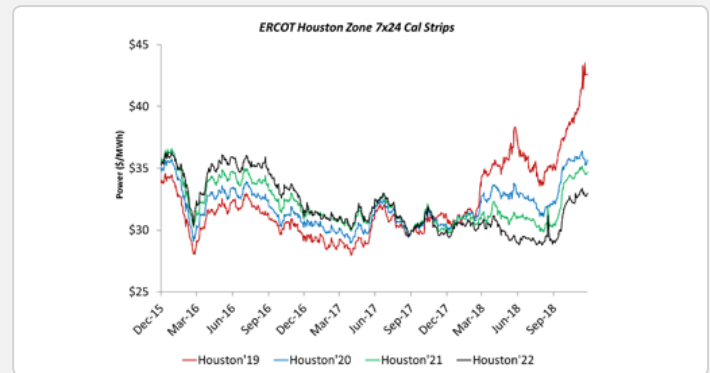
Texas Retail Power Price Trends

% Change in Forward Power	Houston 2019-2020	Houston 2021-2022	North Zone 2019-2020	North Zone 2021-2022	South Zone 2019-2020	South Zone 2021-2022	West Zone 2019-2020	West Zone 2021-2022
Year-over-Year	27%	13%	28%	13%	26%	12%	26%	11%
Month-over-Month	3%	1%	3%	1%	3%	1%	3%	1%
Year-to-Date	30%	7%	31%	5%	30%	6%	26%	-2%
Compared to All-Time Low	37%	15%	41%	17%	36%	14%	40%	18%

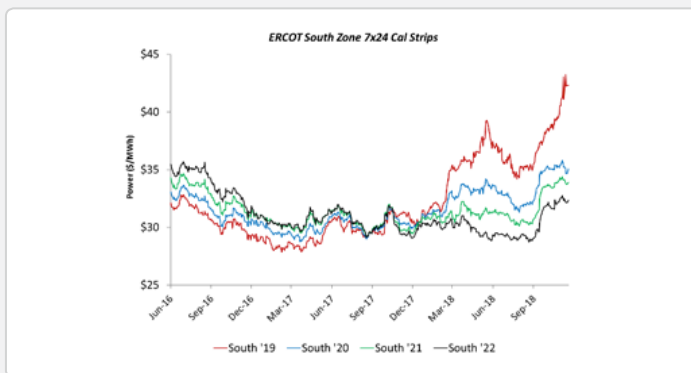
ERCOT North Zone



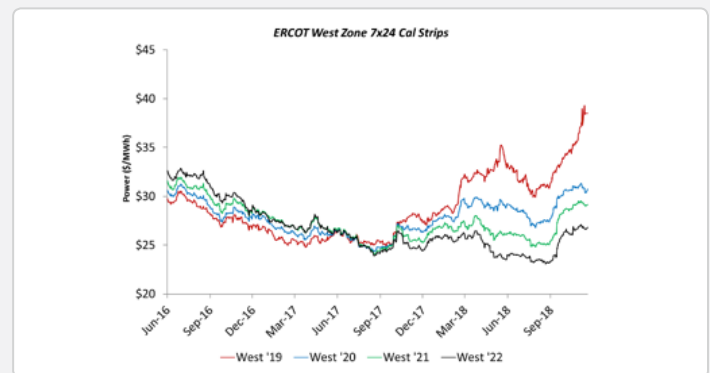
ERCOT Houston Zone




ERCOT South Zone



ERCOT West Zone



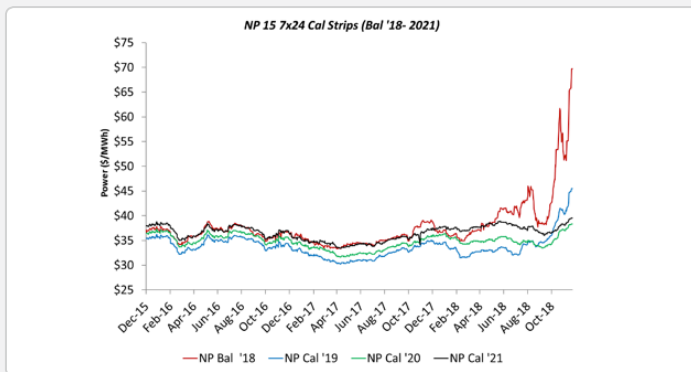
California Electric Summary: Customer Takeaways

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 Enbridge's 36-inch BC Pipeline in British Columbia was repaired two weeks ahead of schedule, bringing flows back up to 0.9 Bcf/day. Flows at Sumas into Washington state should rise to ~1.3 Bcf/day by early December 3rd-7th.
- SoCal Gas system pipeline capacity will face its first test of cold weather the week of December 3rd -7th but there is 0.05 Bcf/day of scheduled maintenance that week, further straining available supplies.
- CA Reservoirs are entering Winter 2018/2019 either at or below historical averages, but precipitation levels are now forecast to be above normal.

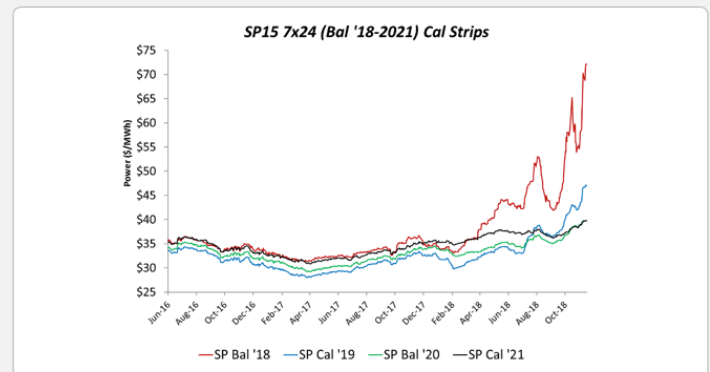
California Retail Power Price Trends

% Change in Forward Power	NP Cal 2018	NP Cal 2019	NP Cal 2020	NP Cal 2021	SP Bal 2018	SP Cal 2019	SP Bal 2020	SP Cal 2021	Mid Cal 2019	Mid Cal 2020	Mid Cal 2021
Year-over-Year	81%	31%	7%	6%	100%	43%	18%	14%	41%	13%	14%
Month-over-Month	23%	10%	4%	3%	21%	10%	3%	3%	7%	3%	4%
Year-to-Date	88%	31%	6%	4%	106%	43%	15%	11%	43%	13%	13%
Compared to All-Time Low	109%	50%	21%	18%	130%	68%	36%	29%	60%	22%	20%

NP 15 7x24 Note: Bal '18 reflects (Nov-Dec '18)



SP 15 7x24



Mid C 7x24



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