

Impact of COVID-19 on the US Energy Industry

February/March Assessment

PREPARED BY

Josh Figueroa
Tess Counts
Frank Graves
Bob Mudge
Shivangi Pant



THE **Brattle** GROUP

Purpose and Caveats

This report provides a broad compilation and assessment of the implications of COVID-19 for electric and natural gas utilities. It reflects an expedited review of many sources of information, with public health, economic, and industry data changing considerably day by day. The goal is to make a broad overview of energy industry implications available in one document, rather than to offer a detailed forecast or opinion. Data sources are considered reliable but have not been independently validated by Brattle. Doubtless, some important sources of information have been overlooked.

The pandemic has already had obvious and devastating effects on healthcare, education, business activity, and employment. Observers including government agencies, academic institutions, credit rating agencies, and banks are projecting even more acute impacts in the near term, potentially resulting in lasting damage to the US economy.

Against this backdrop, we summarize recent developments in energy commodity spot and forward pricing, electricity demand, and financial markets, and we consider select implications for utilities as and if the pandemic persists in time. A key insight of the exercise is that, as of the end of March 2020, relative to the depth of impact on the health system and employment there has only been a dampened or, more likely, lagged visible effect of COVID-19 on utility industry market conditions, partly owing to the essentiality of utility service.

However, this lagged effect cannot be counted on to last indefinitely or even far into the near term. Thus, this report forms only the first installment of a continuous monitoring program, which we intend to update periodically.

This assessment reflects the perspectives and opinions of the authors and does not necessarily reflect those of The Brattle Group's clients or other consultants.

Agenda

Section 1: Executive Summary

Section 2: COVID-19 Path and Macroeconomic Projections

Section 3: Energy and Financial Sector Impacts

- Oil & Gas prices
- Electricity loads, prices, and utility revenues
- Regulatory reactions
- Financial impacts on valuations, interest rates, risk

Section 4: Potential Implications for Specific Utility Issues

Frame of reference: We have treated February 1, 2020, as the beginning of the significant influence of COVID-19 on the US economy. Energy data has not been weather-normalized, so we use (where relevant) the average of a few years' prior history for comparison.

1. Executive Summary

High-Level Impacts to the Economy

COVID-19 has quickly led to dramatic changes in the economy and energy markets. While the impacts of the virus are expected to peak in mid-April, health experts project the impacts from the virus will persist for many months, until either we develop widely available treatments or herd immunity proliferates.

Most economists expect very sharp near-term impacts to GDP with recovery occurring by late 2020/ early 2021. The duration and severity of economic impacts depend on how long COVID-19 persists, as well as how readily consumers and businesses can rebound from the current impacts of social distancing.

The pandemic has led to a record rise in unemployment with an estimate of at least 10% of the workforce currently unemployed; economists estimate a peak unemployment rate of 15-30%.

High-Level Impacts to Energy Sectors

OPEC conflicts plus demand reductions have led to a **50–80% drop in crude oil prices** (depending on grade) through March; the recent OPEC+ production cut agreement will help to rebalance the market, but storage limitations could become a significant problem for the next couple of months.

Natural gas prices have fallen by an average of 20% since early February, likely due more to seasonal warming than to COVID-19 impacts.

Summer-to-winter natural gas spreads at Henry Hub have doubled due to lower near-term demand and expected lower associated gas production, creating risks for those hedging gas prices.

From the beginning of February this year to the end of March, there have been **electric load declines of 3–11%** across most of the US, but with a bit less than half of the reduction likely attributable to COVID-19.

Peak power price forwards for the rest of 2020 have decreased between \$2.40–\$4.50/MWh from February to April, but this is not distinguishable from normal seasonality and other causes.

High-Level Impacts to Utility Finance

Cost of capital has been affected in several ways, likely increasing due to:

- 1) Increased spread between utility vs. government bonds (despite lower T-bond rates)
- 2) Increase in overall volatility
- 3) Increased utility business risk
- 4) Possible clientele effects in securities ownership

Demand reductions from social distancing and likely ongoing consumer anxieties will create revenue shortfalls for most utilities that may not be recovered by existing decoupling.

COVID-19-induced reductions in LMPs and energy demand from the shuttered economy will undermine revenues for most generation, and could be especially problematic for merchant baseload (e.g., coal, nuclear, some renewables).

Many states have ambitious targets for distributed energy resource (DER) adoption over the next few years that are often far above extrapolations of recent past adoption. COVID-19 could make those a lower priority, as well as less economical for a while.

Potential electrification growth (e.g., from EV adoption) may be delayed as a result of reduced fossil fuel prices and reduced consumer wealth.

2. COVID-19 Path and Macroeconomic Projections

Economy-Wide Drop and Recovery?

Disease Outlook

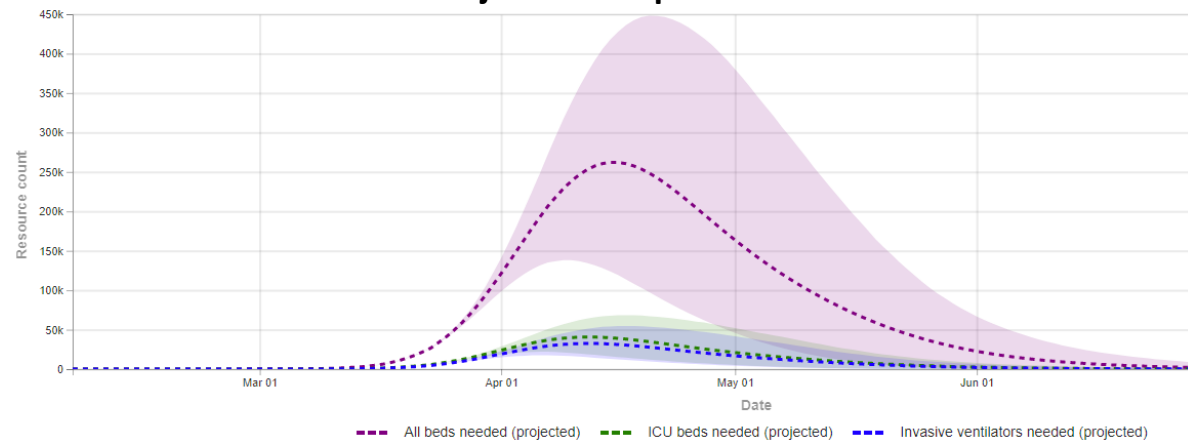
As of the beginning of April, University of Washington IHME predicts that April 15 will be the peak day for COVID-19 resource use (ventilators, beds, etc.), but large amounts of resources will be continually needed and in short supply through the beginning of the summer.

Number of COVID-19 Related Deaths for States with High Exposure

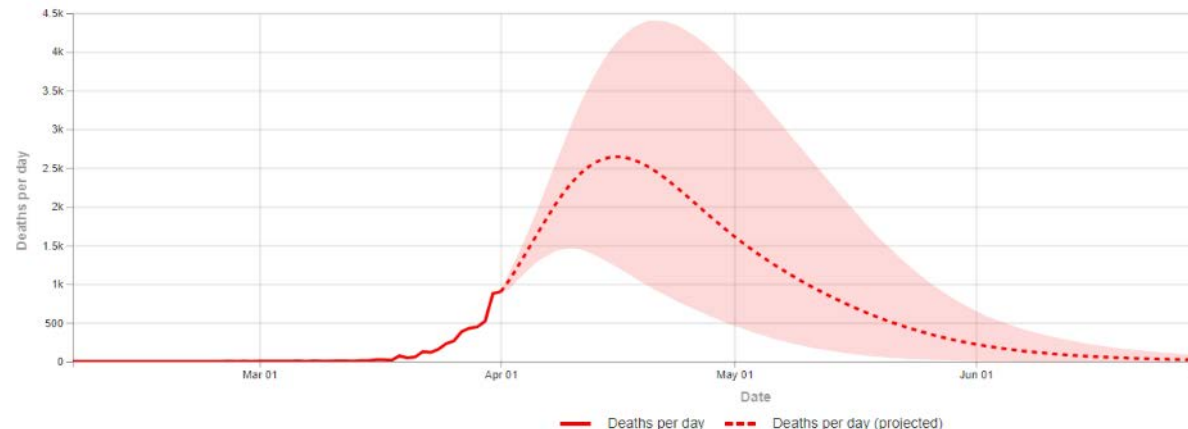
	Peak Day (Number of Deaths)	Number of Deaths on a Peak Day	Total Projected Deaths by 8/4
California	April 26	119	5,068
Illinois	April 20	109	3,386
Maryland	April 19	138	2,326
Massachusetts	April 17	100	2,381
New York	April 10	855	16,261
Virginia	April 22	59	1,401
US Total	April 16	3,130	81,766

Source: IHME.¹ See sources slides for more details.

Projected Lifespan of COVID-19 in US



Number of COVID-19 Related Deaths in US



Source: IHME.¹

Economy-Wide Drop and Recovery? Macroeconomic Outlook

Strategic impacts on utilities will depend on how long the COVID-19 negative economic impact persists; most economists are projecting a very deep drop in Q2 and Q3, then positive growth in the latter half of 2020.²

In addition to the following projections, S&P, as of March 19, anticipates a global recession in 2020, with a 6% contraction in the US during Quarter 2 before a recovery in the second half of the year³

St. Louis Fed expects, as of April 9, to see 30% unemployment and a 50% reduction in Q2 gross GDP.⁴

Illustrative Possible Q2 GDP Decline by Major Sectors

Sector	2019 GDP share	Assumed Q2 Decline	Implied Q2 GDP Loss
<i>Decreasing Sectors</i>			
Manufacturing	11.0%	-50.0%	-5.5%
Construction	4.1%	-66.0%	-2.7%
Retail	5.5%	-45.0%	-2.5%
Mining, incl. O&G	1.5%	-50.0%	-0.7%
Finance	7.6%	-10.0%	-0.8%
Rest of Private Economy	42.8%	-20.0%	-8.6%
<i>Increasing Sectors</i>			
IT and comm'n	7.7%	+5.0%	+0.4%
Health	7.6%	??	??
Fed & Local Governments	12.3%	+19.0%	+2.3%
Total			-18.0%

*Assumes 25% of the \$2Tr CARES package spent in Q2.

Sources: Various industry analyses, with BEA 2019 GDP share values.

GDP Projections

		Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Annual Average 2020	Annual Average 2021
JP Morgan - 03/27	[a]	-1.1%	-8.4%	-6.5%	5.4%	-1.2%	7.7%	6.2%	5.5%	-5.3%	4.5%
Morgan Stanley Base - 04/03	[b]	0.4%	-11.3%	-7.6%	-4.6%	-2.1%	11.8%	7.7%	4.8%	-5.5%	5.3%
Morgan Stanley Bull - 04/03	[c]									-1.4%	5.2%
Morgan Stanley Bear - 04/03	[d]									-10.7%	1.2%
Goldman Sachs - 04/05	[e]	-9.0%	-34.0%	19.0%	12.0%	7.5%	6.0%			-3.0%	
Bank of America - 04/02	[f]	-0.3%	-9.2%	-9.9%	-4.3%	-0.5%	9.9%	11.0%	4.7%	-6.0%	6.1%

Economy-Wide Drop and Recovery?

Goldman Sachs Detailed View

Goldman Sachs (GS) April 5 report projects a 34% reduction in GDP in Q2, with a recovery beginning in Q3 2020, but much is in flux and unknown. This outlook is about 13% worse in Q2 than was projected a week ago.

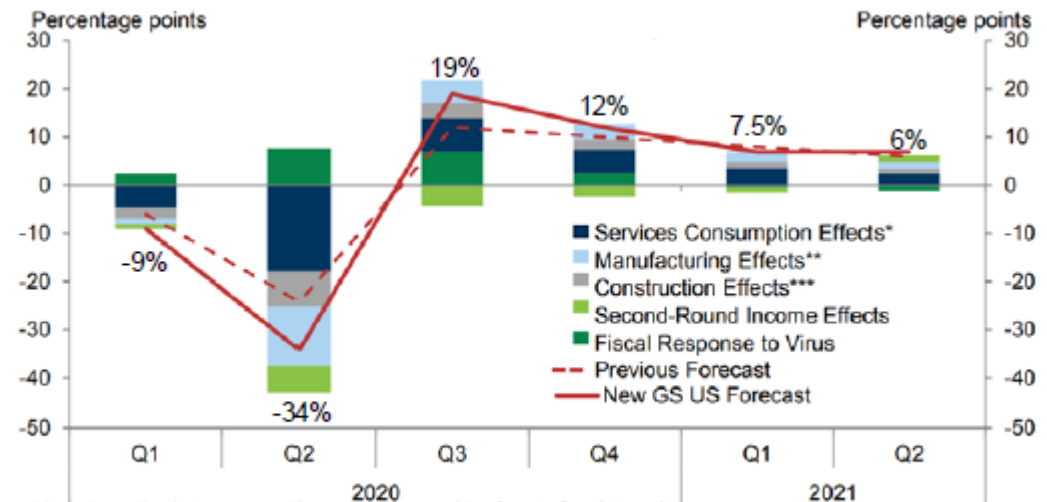
GS expects the unemployment rate to peak at 15% (compared to maximum unemployment in 2009 at 10.2% and about 24.5% during the Great Depression).⁴

Decline in US Real GDP Q2 Forecast (April 5 vs. March 27 Reports)

Services Consumption Effects	-6.3%
Manufacturing Effects	-3.5%
Construction Effects	-3.0%
Second-Round Income Effects	-1.0%
Fiscal Response to Virus	0.8%

Source: Goldman Sachs, April 5, 2020.²

Quarter-on-Quarter Change in US Real GDP



3. Energy and Financial Sector Impacts

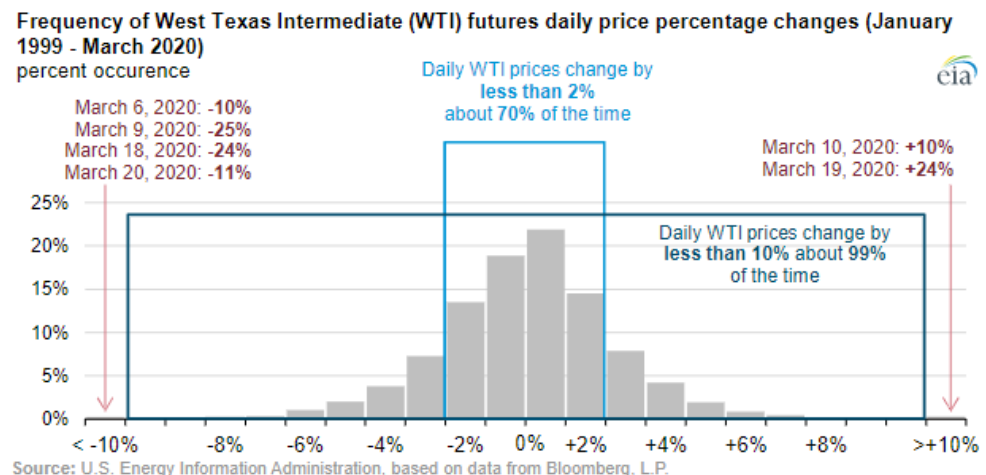
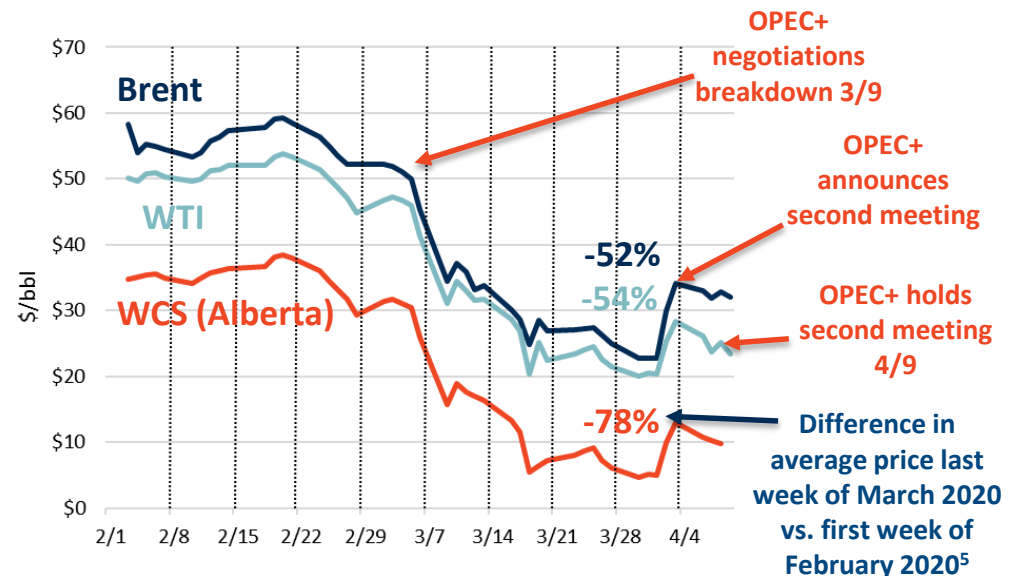
Oil & Refined Products – Spot prices

Global oil prices have declined massively as a result of the breakdown of OPEC+ negotiations in March and COVID-19-induced decreased demand.

- Crude prices dropped 50-80% since the beginning of February⁵
- Historically, a 10% decrease in oil prices has resulted in about a 0.2% decrease in US GDP per year.⁶

Size of daily oil price swings in March were tail events, larger than have ever occurred in last 20 years⁷

On April 12, OPEC+ finalized an agreement to cut production by 9.7 million bbl/d –which is only about half or less of the demand reduction thus far.⁸



Oil Futures

Since the beginning of February, oil futures have dropped for all future years, but particularly in the near-term.

WTI and Brent curves have dropped on average 20%⁹

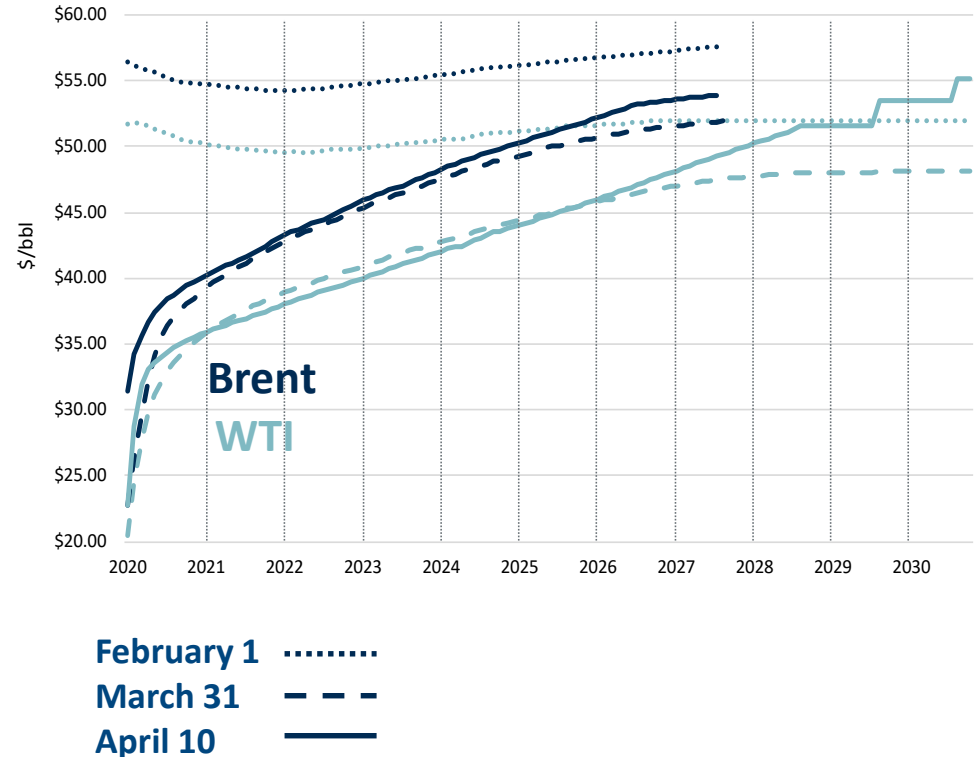
- Prompt month contracts have dropped approximately 66%, due to production-cut tensions and long term COVID demand reductions
- Concerns about available storage capacity are also suppressing very near-term prices. Daniel Yergin notes this could cause spot oil prices to go to zero by early summer¹⁰

International political stability may be affected:

- According to Aramco, Saudi Arabia has a marginal cost around \$10/bbl but full-funding breakeven around \$80/bbl¹¹
- Russia's Finance Ministry says it can survive \$25-\$30/bbl for several years¹²
- According to Fed. Reserve Bank of Dallas, US shale breakeven is around \$48-\$54/bbl¹³

Oil and gas companies are facing increasing risk of bankruptcy

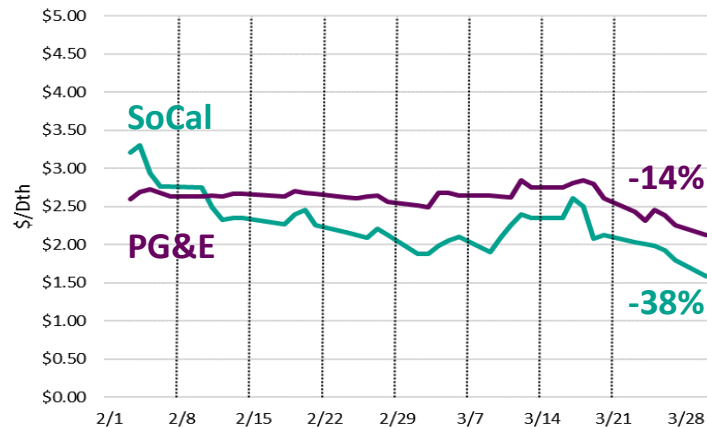
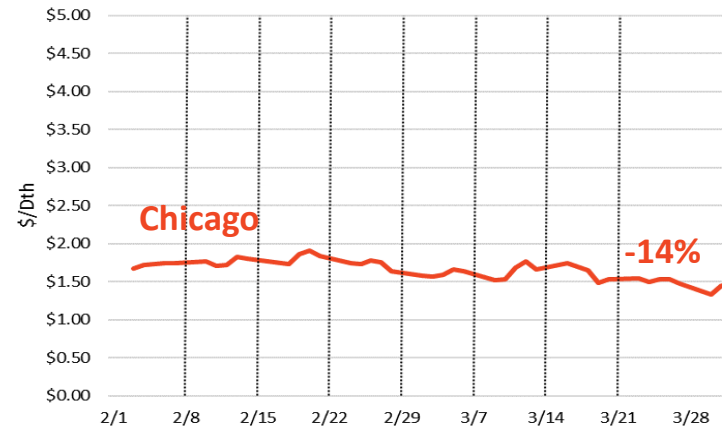
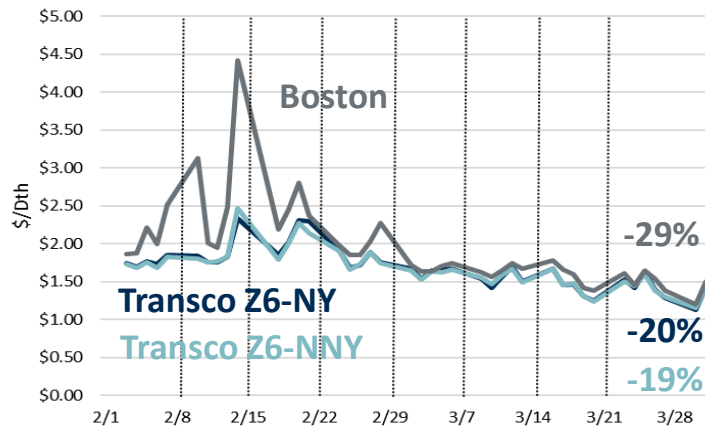
- Whiting Petroleum filed for bankruptcy on April 1 due to high debt obligations and low oil prices



Natural Gas Spot Prices – Demand Regions

Demand-region spot prices for gas have decreased by roughly 20% over the past two months, much less than oil.

This is partly due to warmer temperatures rather than COVID-19 (see next slide).



Difference in average price last week of March 2020 vs. first week of February 2020¹⁴

SoCal experienced the largest drop

Weather

Warmer seasonal (and year-on-year) weather across most of the country confounds the unbundling of COVID-19-driven natural gas and electric price changes.

Heating Degree Days by Census Region¹⁵

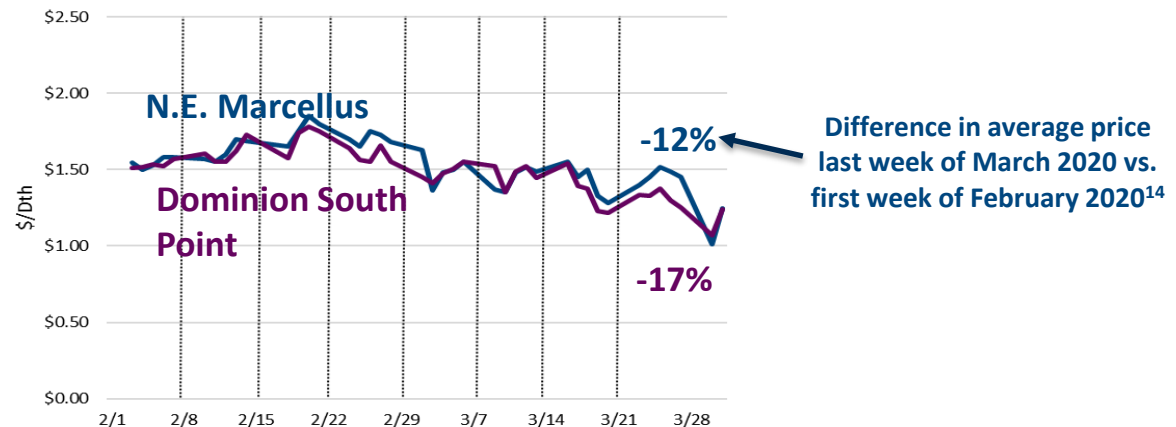
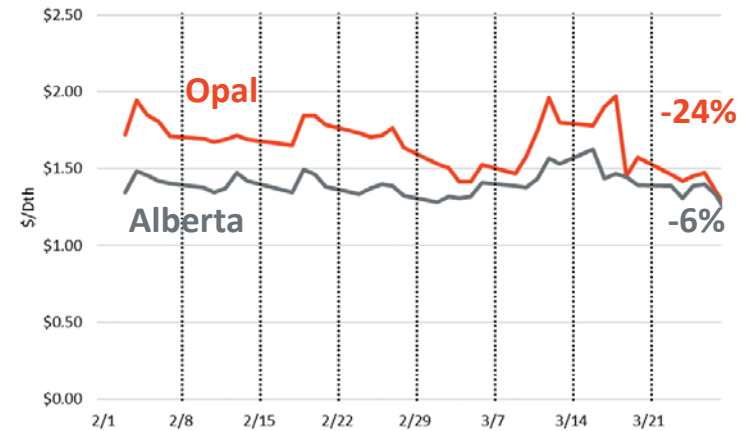
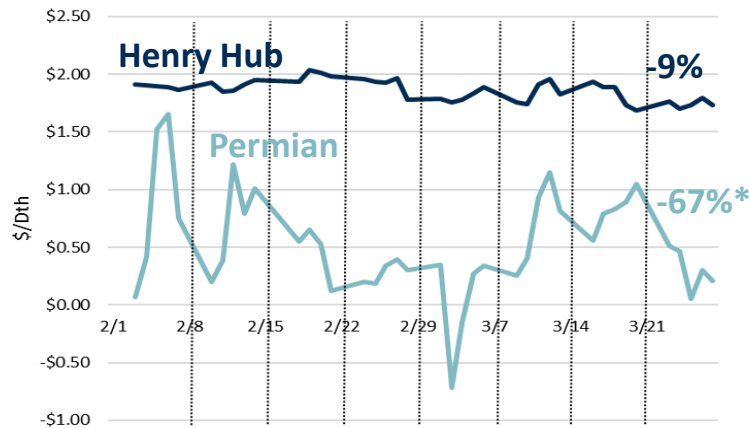
Region	States	Week Ending March 21, 2019	Week Ending March 21, 2020	Normal (1981-2010 Average)	Change from Week Ending March 21, 2019	Changes from Normal
New England	CT, ME, MA, NH, RI, VT	189	168	196	Warmer	Warmer
Middle Atlantic	NJ, NY, PA	174	145	181	Warmer	Much Warmer
E.N. Central	IL, IN, MI, OH, WI	196	176	190	Warmer	Warmer
W.N. Central	ND, SD, NE, KS, MN, IA, MO	191	194	189	No Change	No Change
South Atlantic	DE, FL, GA, MD, NC, SC, VA, DC, WV	115	59	105	Much Warmer	Much Warmer
E.S. Central	KY, TN, MS, AL	122	61	99	Much Warmer	Much Warmer
W.S. Central	OK, AR, TX, LA	78	39	59	Much Warmer	Warmer
Mountain	MT, ID, WY, NV, UT, CO, AZ, NM	160	162	154	No Change	No Change
Pacific	AK, CA, HI, OR, WA	72	130	88	Much Colder	Much Colder
United States		145	133	143	Warmer	Warmer

Note: Heating Degree Day (HDD) = 65 – average high and low daily temperature
Normal is 1981-2010 average HDDs from NOAA Climate Prediction Center.

Unpacking weather from COVID-19 effects could be important for designing new cost recovery mechanisms for utilities.

Natural Gas Spot Prices in Supply Regions

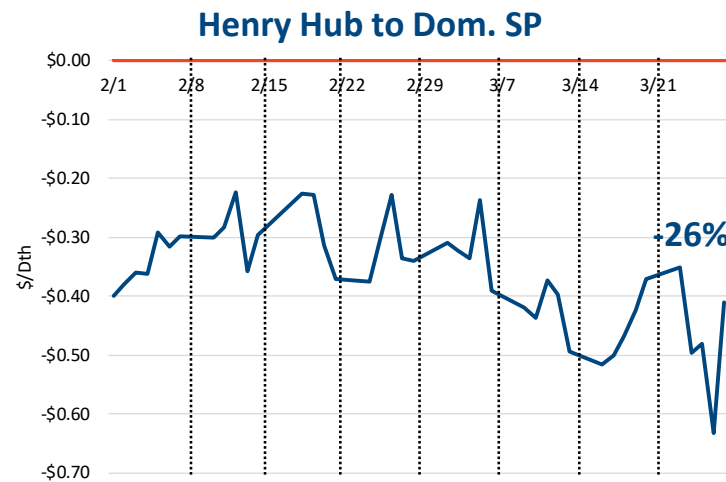
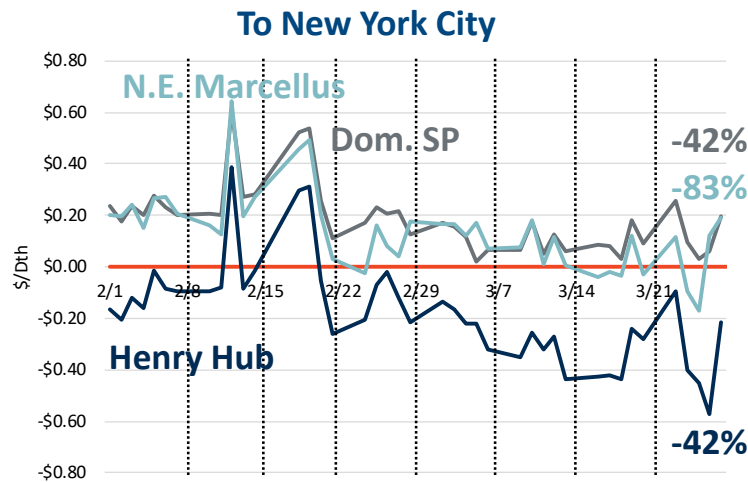
Gas prices in supply-heavy regions (Permian, Alberta, Opal, Marcellus) have not fallen as much as in demand-centered regions (latter partly due to basis prices falling – see next slide).



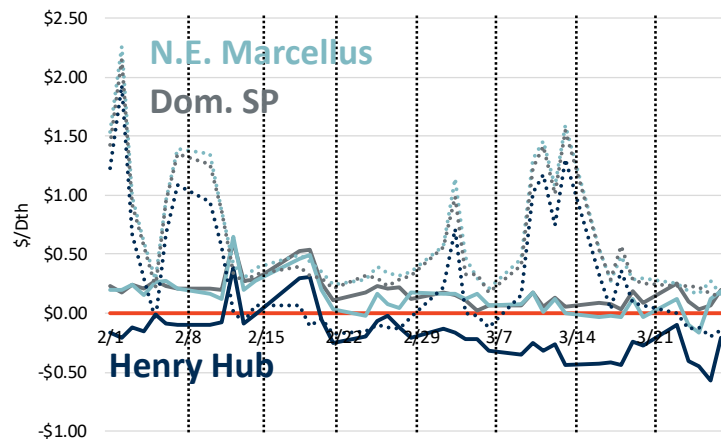
*Permian weekly average decreased 67% from \$0.88/Dth during the first week of February to \$0.29/Dth during the last week of March

Natural Gas – Basis Differentials

Basis differences have fallen significantly in the past two months — but not distinguishably from a normal springtime effect.



Difference in average price last week of March 2020 vs. first week of February 2020¹⁴



Graph at left is same as NYC above it, with solid lines showing the most recent data. Dotted lines for past three-year averages show seasonal variations as large or larger due to weather and pipeline dynamics.

Natural Gas – Summer/Winter Spreads

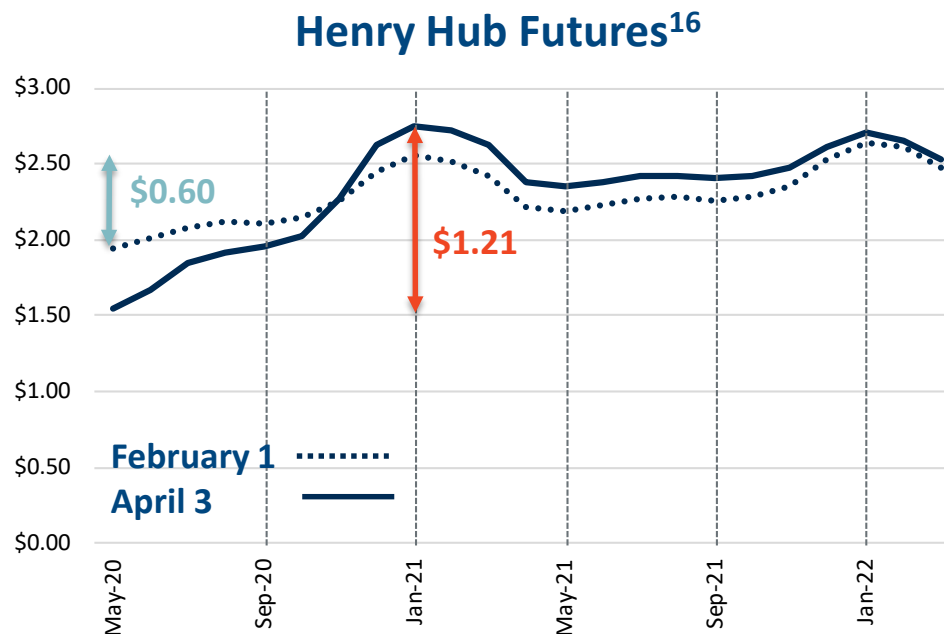
The seasonal spread between summer and winter gas prices has doubled compared to beginning of February, due to expected decrease in associated gas production along with lower near term demand.

Summer/Winter 2020 Gas Spreads:

- Feb 1: \$0.60
- April 3: \$1.21

But same spread remains relatively unchanged for Summer/Winter 2021, increasing by \$0.10

Instability in spreads could impact hedging risks

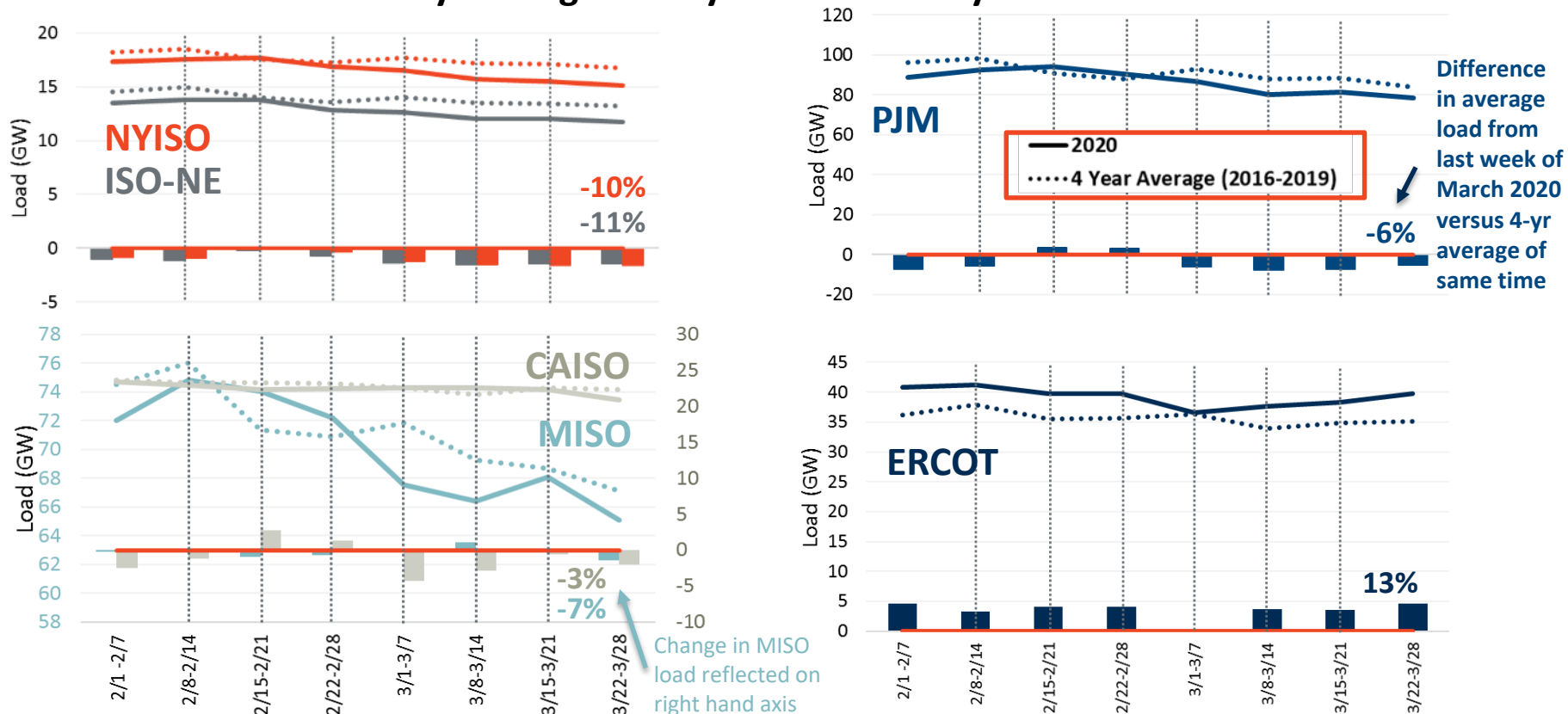


Associated gas accounts for 12% of total US gas production¹⁷

Impact on Regional Electric Loads

Compared to the average of the past 4 years (for approximate weather normalization) there has been a *3 to 11% load reduction in the last week of March 2020 perhaps due to COVID-19* across many of the ISOs (with the exception of ERCOT, which has increased but had not begun social distancing until March 31).¹⁸

Weekly Average Hourly Load: February – March¹⁹



Note: Most demand reductions likely fall in peak hours, which accounts for approximately 50% of hours and the majority of energy consumption, so the impact on peak hours is likely greater than the all-hours estimated decreases above.

Impact on Regional Electric Loads

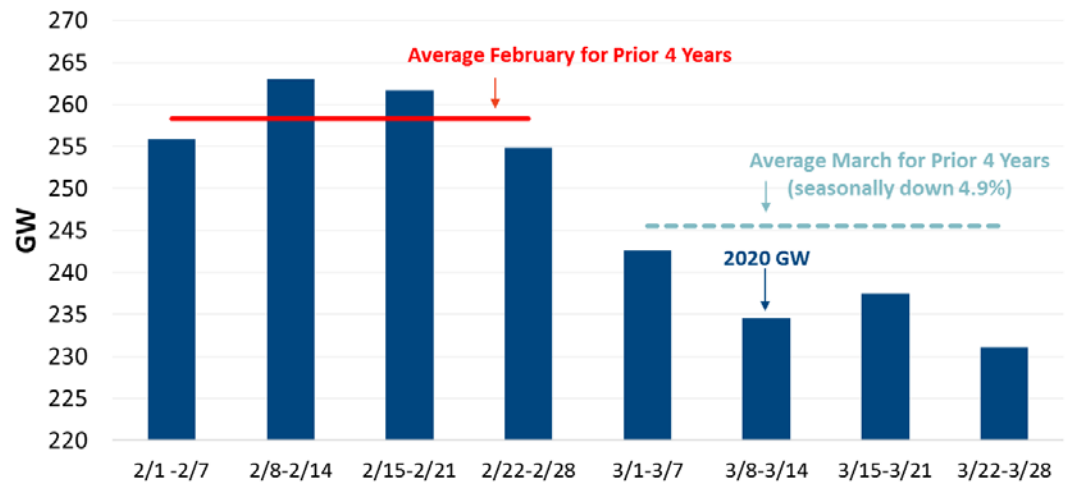
March 2020 average hourly load for six major ISOs* dropped 8.7% compared to February.

- However, 4.9% of this—nearly 60%—can be attributed to seasonal factors observed in prior years
- The remaining 3.8% could be attributable to COVID-19
- It may be that the full force of COVID-19 is not yet being felt

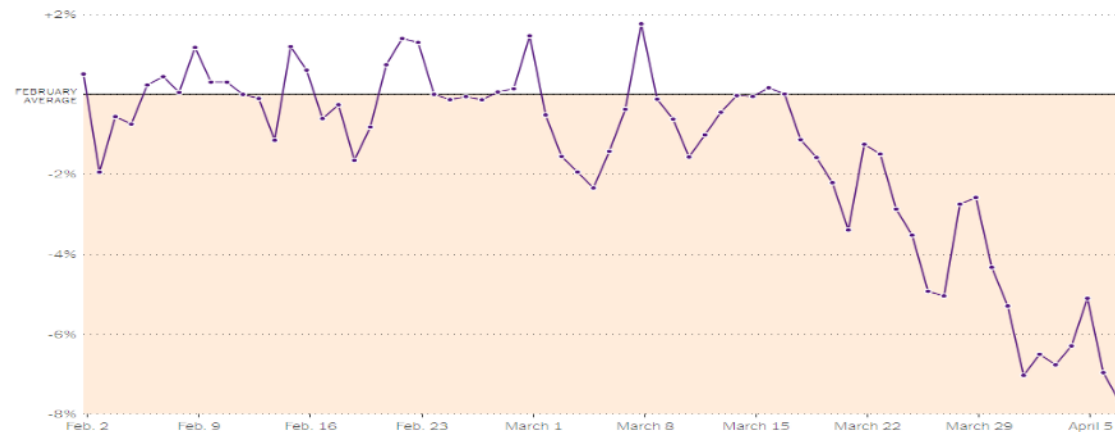
Our estimates align with a recent study conducted by U. of Chicago professor, **Steve Cicala**, at right:

*CAISO, MISO, ISO-NE, NYISO, PJM, ERCOT; collectively these represented approximately 50% of total US load in February and March 2019.^{21,22}

**Electricity Load* in February and March 2020
Relative to February Load for Prior 4 Years (2016-2019)¹⁹**



US Percent Reduction in Load Demand²⁰



Source: The New York Times, University of Chicago

ISO Comments on COVID-19 Impacts

As of the beginning of April, ISOs have not discussed in detail their COVID-19 impacts or concerns, but to the extent they have shown analysis, their estimates are similar to ours.

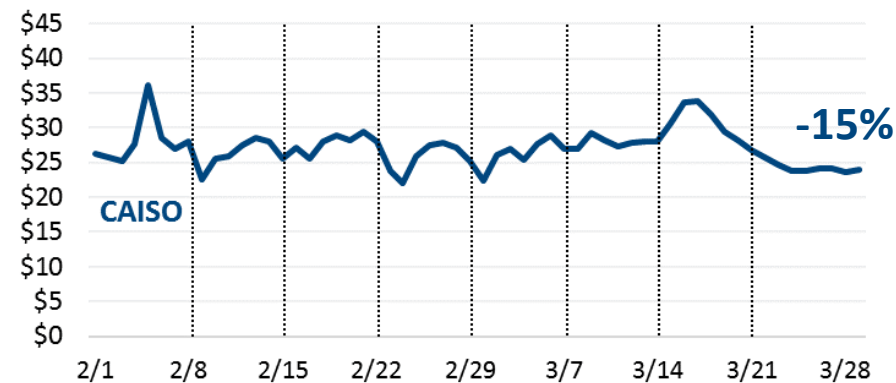
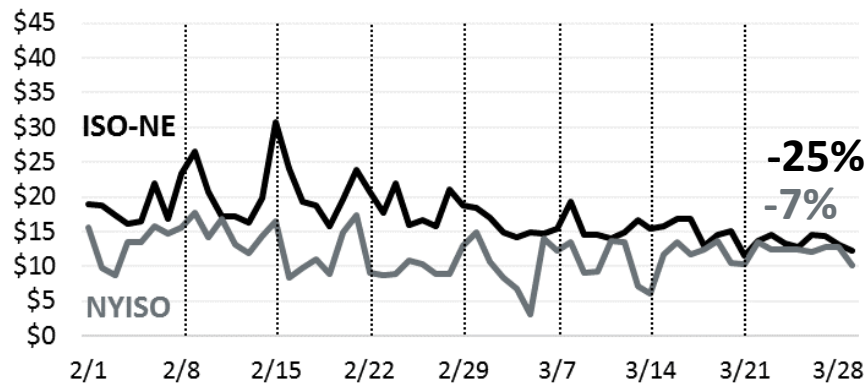
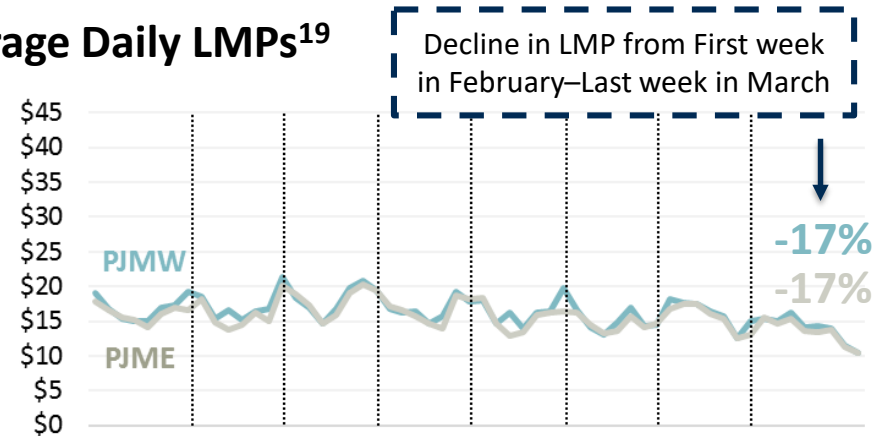
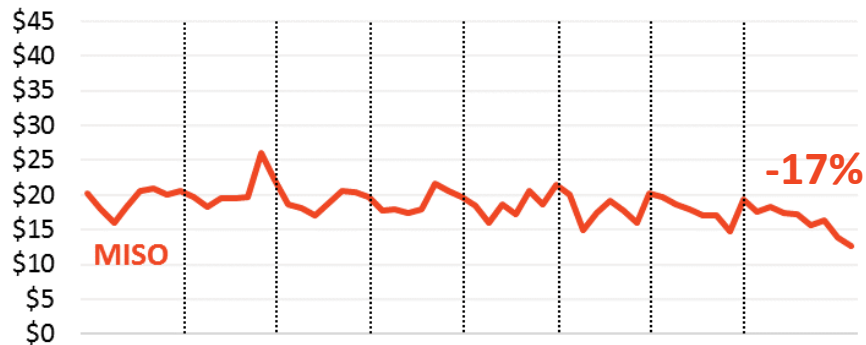
Estimates of Load Reduction due to COVID-19^{23,24,25,26,27,28}

PJM	PJM reports an average 8% drop in load experienced compared to 5 year historic average; days resemble snow days, with later peaks and flatter curves
CAISO	Average load decline of 4-5%; lower peaks: morning peak down 6-7%, midday peak down 4-5%, evening peak down 23%
ERCOT	ERCOT estimates 2% load reduction due to COVID-19, stabilizing by last two weeks in March (despite an estimated 4% increase in load - Bloomberg)
MISO	MISO reports 3.8% load decline since March 22
ISO-NE	ISO-NE reports 3-5% load reduction in average March load profile
NYISO	Bloomberg estimates 7% load decline in week of March 19 compared to BAU
SPP	SPP reports a 4%-6% load decline, compared to previous years
New York City	E&E estimates 12% decrease for workweek of March 23 compared to last year; EPRI predicts a general 10-20% reduction in load
U.S. Overall	EIA predicts 3% decrease in energy sales -4.7% for commercial sales -4.2% for industrial sales -0.8% for residential sales EIA and NYT predict renewable power generation will increase (+11%), which is lower than previous growth estimates

Impact on Spot Electricity Pricing

Daily LMPs have fallen since February across several ISOs, shown below (not normalized: partly weather, partly COVID-19).

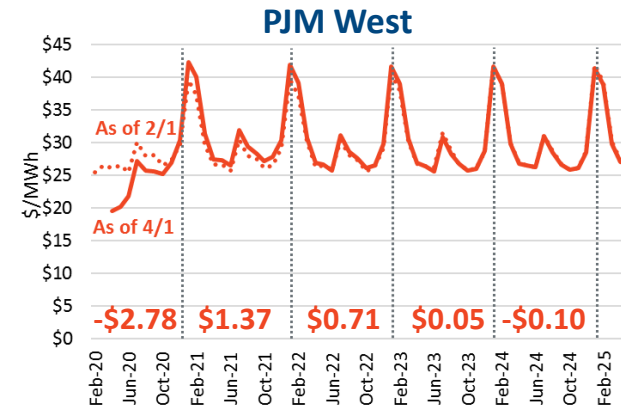
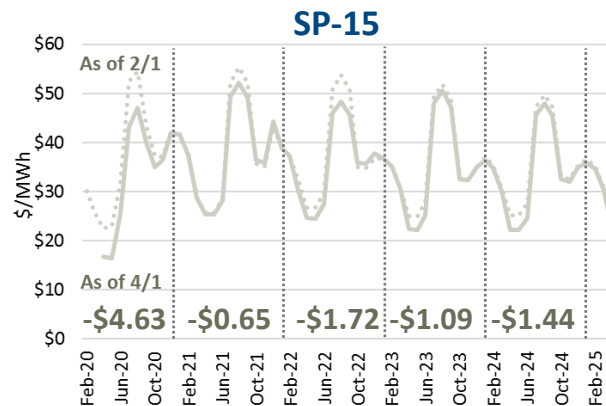
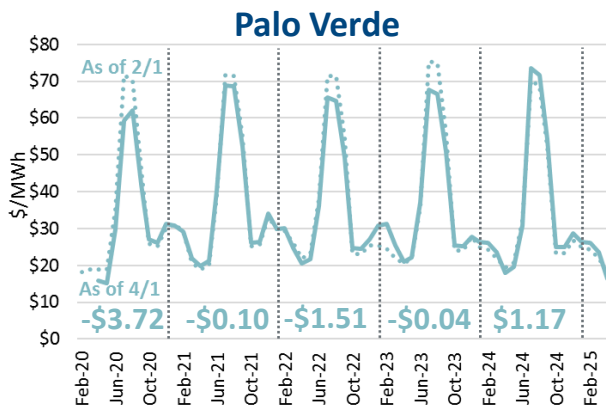
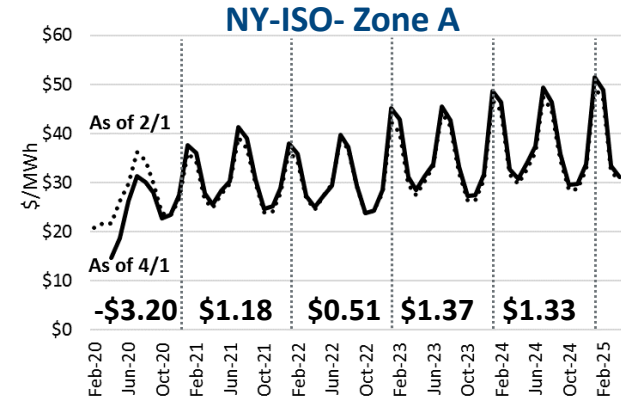
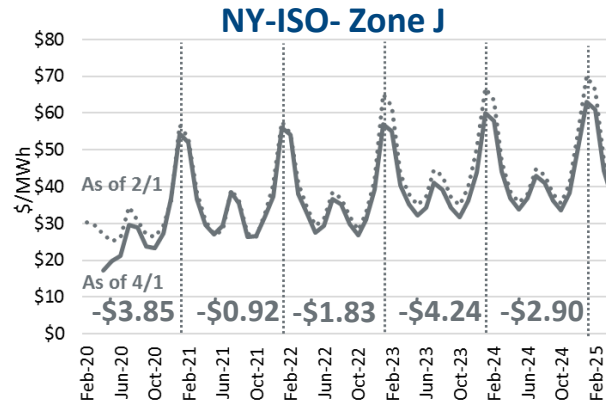
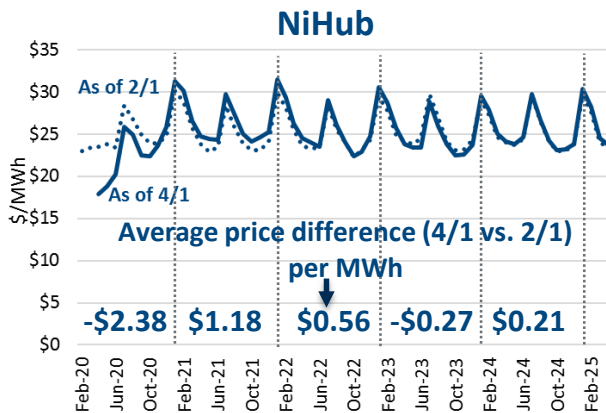
Day Ahead Average Daily LMPs¹⁹



Power Price Forwards in Last 2 Months

At ISO hubs, average peak forward prices for rest of 2020 dropped between \$2.40-\$4.50/MWh from February to April, but have not systematically fallen for 2021 and beyond.

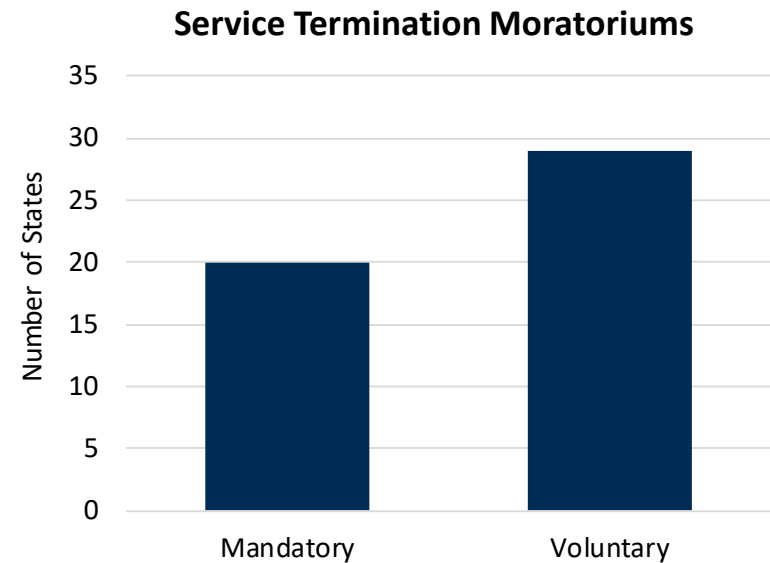
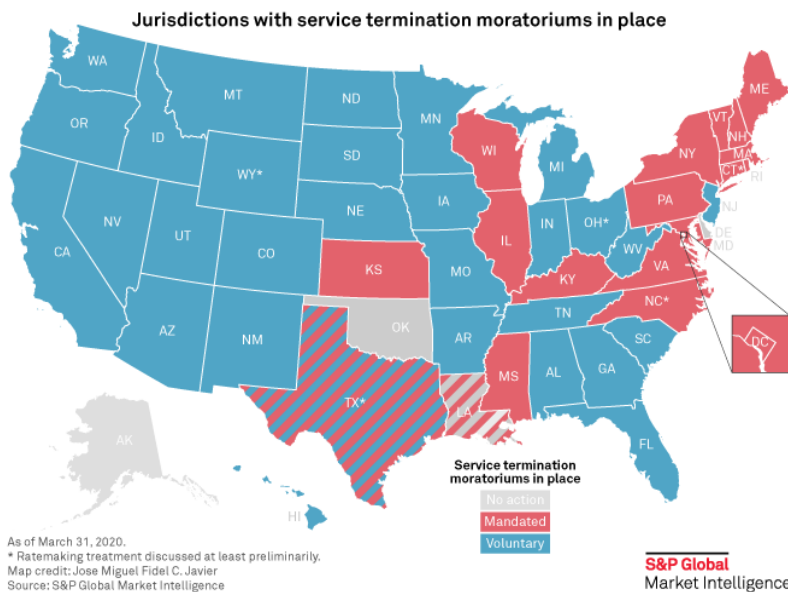
Peak Power Price Forwards (February 2020-2025)²⁹



State Regulations Protecting Customers

The majority of states have mandatory or voluntary suspensions of utility shutoffs as of the end of March.

Utility Shutoff Regulations in Response to COVID-19³⁰

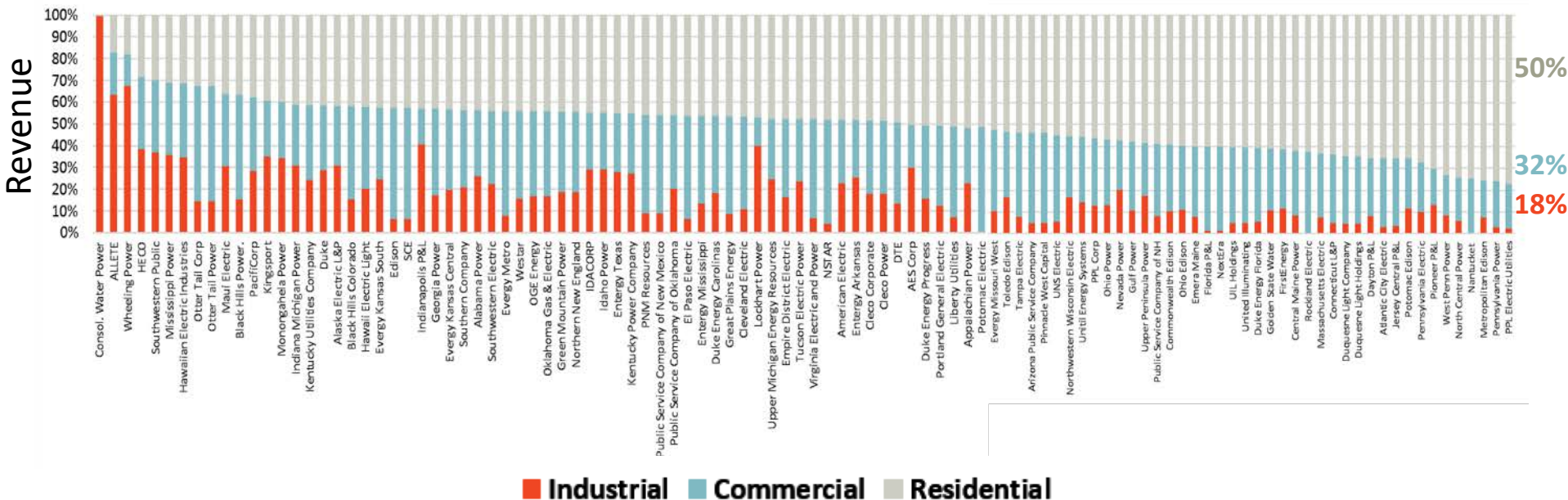


Utilities' Customer Class Revenue Mix

The biggest load reductions from COVID-19 are likely to be in C&I customers, but

- C&I tends to have more fixed charges, potentially lessening the revenue impacts from reduced demand; however, they are not as often decoupled, unlike residential customers
- In contrast, residential customers, representing only 39% of load but 50% of revenues, may be more impactful on lost fixed cost recovery due to volumetric charges – and decoupling may overlook COVID-19 reductions

2018 Revenue Breakdown by Customer Class (R vs. C&I)³¹



Note: Sample contains all electric (only) utilities as of 2018.

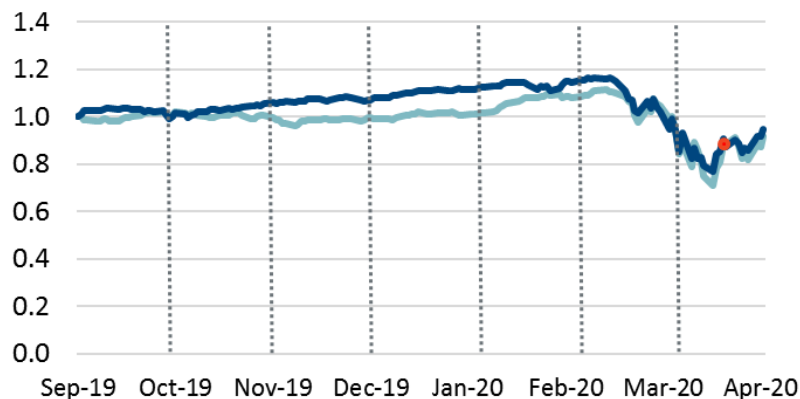
Financial Impacts – Utility Stock Prices

Altered financial conditions affect utility cost of capital, liquidity, hedging, perhaps capex programs, and IRP expansion timing or choices.

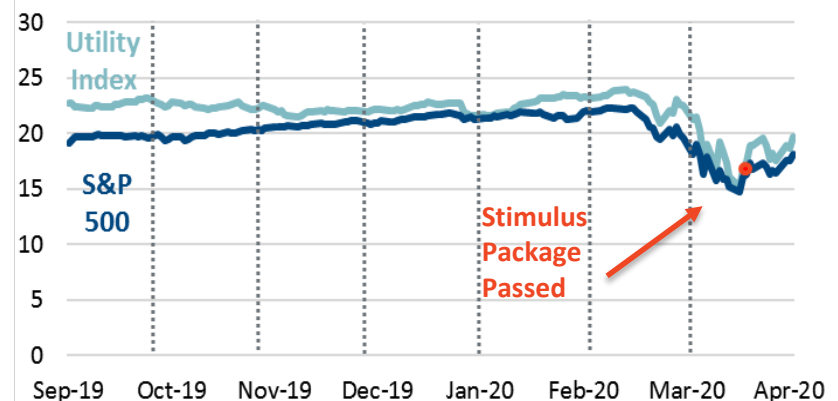
Perhaps surprisingly, utility stock prices have fallen almost as much as the overall market since the beginning of March.

- Utilities had a slightly lower decrease (10.9%) versus the S&P 500 (11.0%) from 3/2 to 4/8
- In general, values for all sectors of the economy have moved more in parallel than normally
- May also suggest some investors question utilities' ability to recover lost revenues

Historical Stock Prices



Historical P/E Ratios



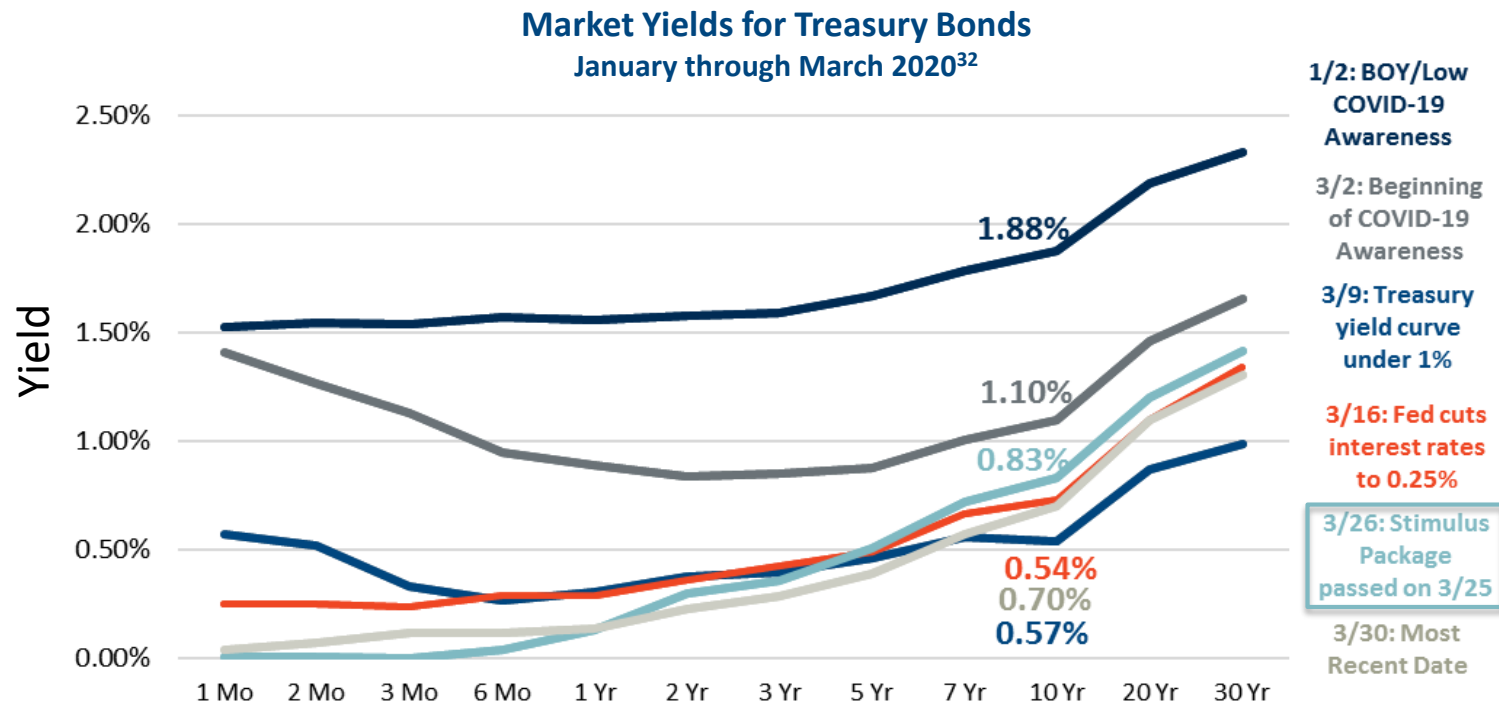
Note: S&P Utility Index includes electric, gas, and water utilities.

Source: Bloomberg, data as of April 8, 2020.

Treasury Yields

Recent treasury yields are at historic lows, with most of the change in March.

- Somewhat steeper yield curve after 3/26 \$2.1 trillion congressional authorization
- Current 10-year yields at 83 basis points well below the 2020 BCEI forecast as of March 10, 2020.



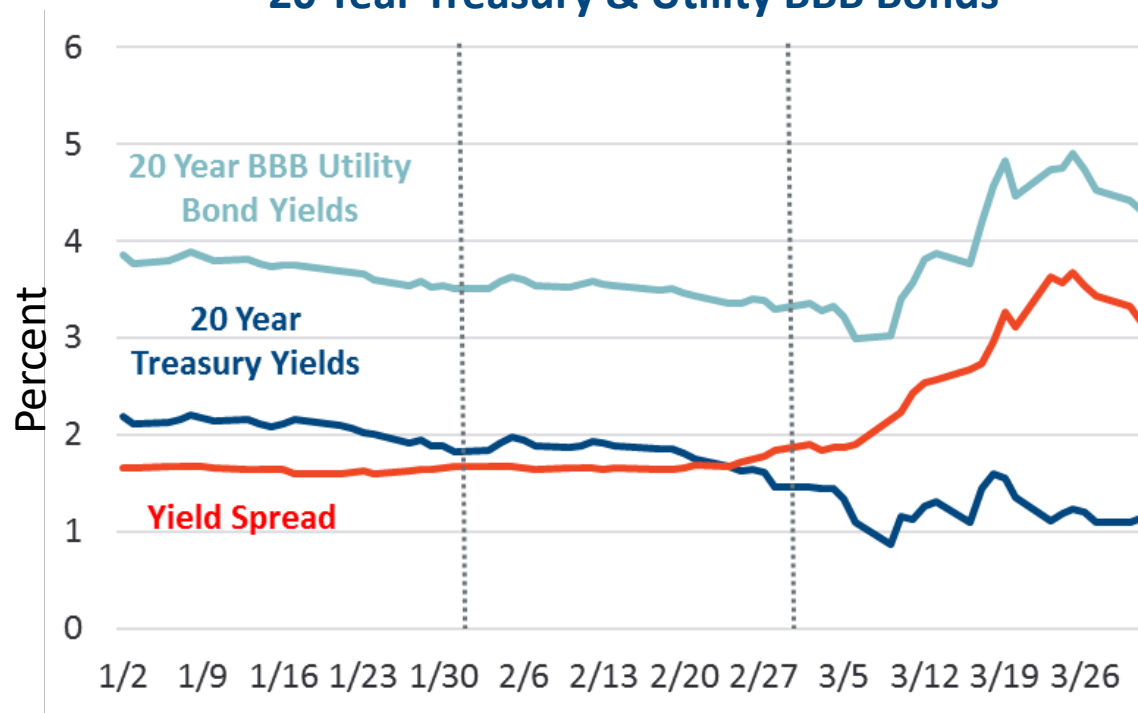
Corporate vs. Fed Bond Credit Spreads

Credit spreads between 20-year treasury and utility BBB bonds have increased 67%, from 160 to 270 bps, since beginning of March:

- Relatively flat spreads in January and February 2020
- Widening spread driven by both the decrease in treasury bills and a significant mid-March increase in BBB bond yields
- Due to higher spreads, some utilities have foregone planned debt issuances, though NEE, Dominion, and others have issued recently.

On April 2, S&P Global Ratings downgraded the outlook for North American utilities from “stable” to “negative” due to COVID-19 risk.³³

**Credit Spread between
20 Year Treasury & Utility BBB Bonds**



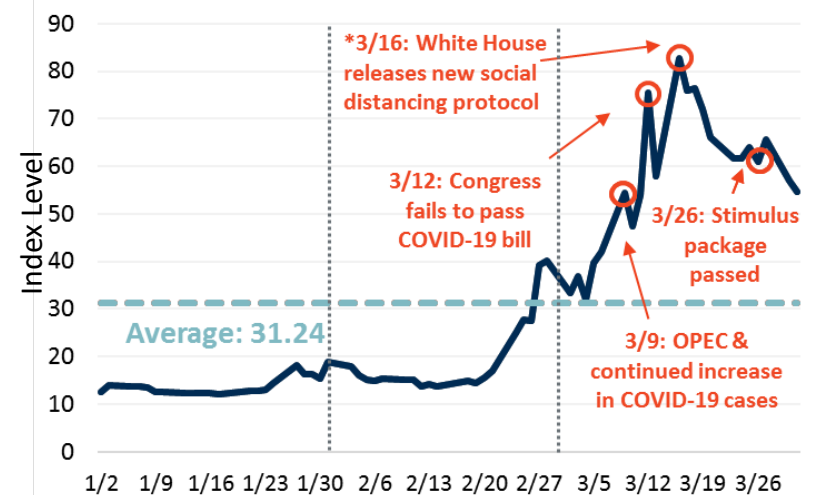
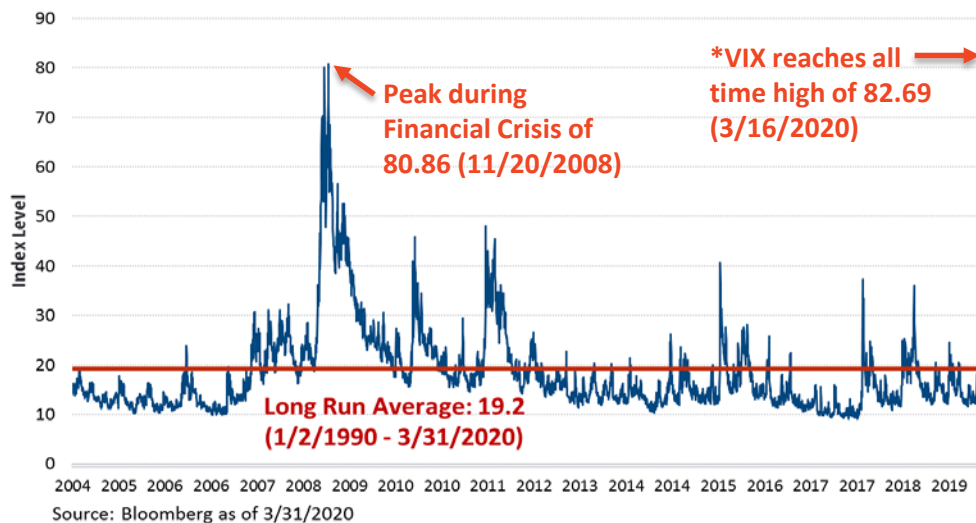
	Treasury Bonds			Utility BBB Bonds			Spread		
	10 Year	20 Year	30 Year	10 Year	20 Year	30 Year	10 Year	20 Year	30 Year
January Average	1.8%	2.1%	2.2%	2.9%	3.7%	3.7%	1.1%	1.6%	1.4%
February Average	1.5%	1.8%	2.0%	2.7%	3.5%	3.5%	1.2%	1.7%	1.5%
March Average	0.9%	1.3%	1.5%	3.0%	4.0%	4.0%	2.1%	2.7%	2.5%
% Difference	-50.5%	-39.2%	-34.3%	3.2%	7.9%	9.0%	86.6%	67.0%	75.3%

Market Volatility

Volatility in the market has increased since the beginning of March, reaching a VIX all-time high of 82.69 on March 16.

- Cost of capital may be correlated with VIX

VIX Historic Index Levels



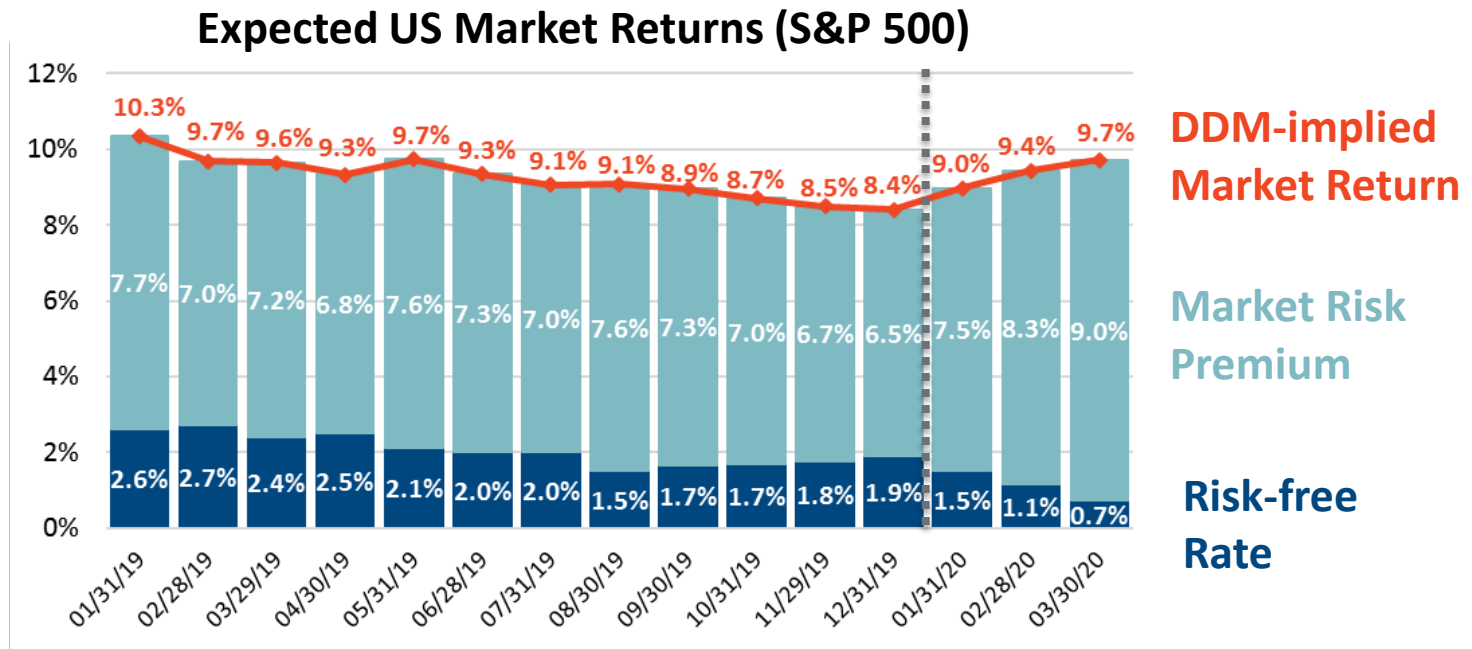
	Dot Com, 9/11 2000 - 2002	Hurricane Katrina 2003 - 2006	Financial Crisis 2008-2009	Post-Crisis 2009 - 2012	Modern Era 2013 - 2019	COVID-19 Mar-20
VIX Index Average	25.4	14.9	35.1	22.7	14.9	57.8
Utilities as % of S&P 500	6.8%	6.4%	6.2%	6.2%	5.5%	5.5%

Source: Bloomberg, data as of 3/31/2020.

Market Trends

Implied expected market returns have been rising steadily since the beginning of 2020, indicating an increase in the MRP.

- The growth in MRP outweighs the decrease in the (10-year) risk-free rate, which has been cut in half since the beginning of 2020.
- Bloomberg's most likely *underestimates* increased cost of equity as it only considers dividend paying stocks; Barclays estimates increased market cost of equity by 100-400+ bps to about 13%.³⁴



Source: Bloomberg, data as of 3/31/2020.

Note: Market return estimated by Bloomberg with a forward-looking Dividend Discount Model

Risk-free rate is based on 10-year U.S. Treasury yield.

Based on approx. 70% equity capital structure

4. Potential Implications for Specific Utility Issues

Utility Cost of Capital & Risk Management

Cost of capital has been affected in several ways:

- 1) Shift in term structure of gov't bonds
- 2) Increase in overall volatility
- 3) Increased utility business risk
- 4) Possible clientele effects in securities ownership

Term structure: Compared to two months ago, the near term (1-yr T-bond) risk-free rate is down about 125 basis points, while the 20-yr is down about 100 basis points.

But is this sustainable as the new normal, or is it a transitional anomaly?

- Many economists forecasting only a recession for Q2 and Q3, with relatively rapid growth thereafter
- Bluechip economist's early March forecast is for a term structure more like 2 months ago for 2021, and they forecast growth in 10 yr. treasury yields from 2022 to 2026

Market price of risk (MRP, etc.): VIX is way up, as are spreads between corporate bonds and Treasuries, and correlation of all sectors has increased – consistent with Bloomberg's DCF estimates of rising MRP

- DCF measures of MRP correlated with VIX; currently getting MRP around 9.0%, vs. 7.0% only 6 months ago
- Utility short term betas perhaps higher (bigger value share of market, increased cross-asset correlations, increased risk of non-payment due to broader economic conditions)?
- ATWACC should be up from combined debt and equity premiums

Utility business risk: Sales more macro-sensitive than in the past, potentially increasing betas; hedging of assets and energy procurement more difficult with unstable volatility

Clientele for utility stocks: Possibly a shift towards high dividend, required-services stocks like utilities (lowering their required return)

- Due to low returns on fixed income securities and some degree of recession resilience
- But so far, no strong evidence of a shift favoring utilities (except for higher P/E relative to market since end of 2018) brattle.com | 33

Decoupling Limitations

Demand reductions from distancing economy and continuing anxieties (until most tested and/or a vaccine) will create revenue shortfalls for most utilities.

Can decoupling mitigate the impacts?

Not every utility has decoupling, and sometimes where it is in place, it is partial (e.g., weather only):

- As of March 2020, 44% of electric utilities and 54% of gas utilities have some degree of decoupling or similar lost revenue mechanism³⁵
- There are often caps on how completely or rapidly utilities can recover lost revenues through rates
- Utilities may want to establish COVID-19 demand and revenue loss model and mechanism for additional capital recovery

Decoupling is usually limited to deferred recovery from the same customer class that caused the variance

- Thus utilities cannot pass C&I shortfalls on to residential customers, or vice versa
- If recession is deep and customer classes are slow to recover economically, the normal balancing account amortization may be too onerous
- May need to amortize balances more slowly than they were accrued, e.g., a few months' shortfall spread over a few years of recovery

But, reduced overall customer usage (lower bills) and reduced upstream costs (lower charges for fuel, market electricity) will offset some of the burden of recovering fixed costs.

Baseload Generation Viability

COVID-19 induced reductions in LMPs and energy demand from shuttered economy will undermine revenues for most generation – especially problematic for merchant baseload (coal, nuclear, some renewables)

Market energy prices falling a few \$/MWh could cut inframarginal rents for some plants in half or to nearly zero.

- A coal plant operating with a \$25/MWh variable cost in a \$35/MWh all-hours market loses 10% of fixed cost recovery per \$1/MWh market price
- Potential lack of storage for natural gas could create a more rapid drop in that fuel price, further driving down LMPs

Highly uncertain longer term effects matter more than short term (unless plants barely viable for next few months).

- But could see slow recovery and new habits in consumers (like happened after 2008) with less propensity to spend and travel
- Could reduce peak capacity needs, hence capacity prices in ISO markets

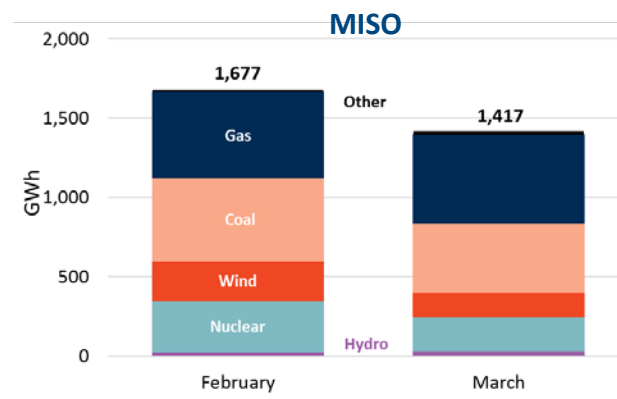
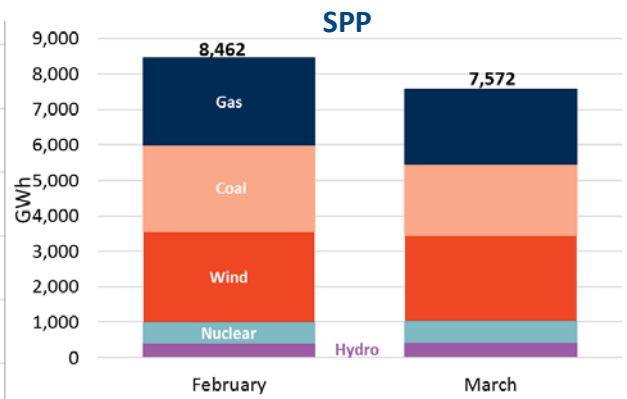
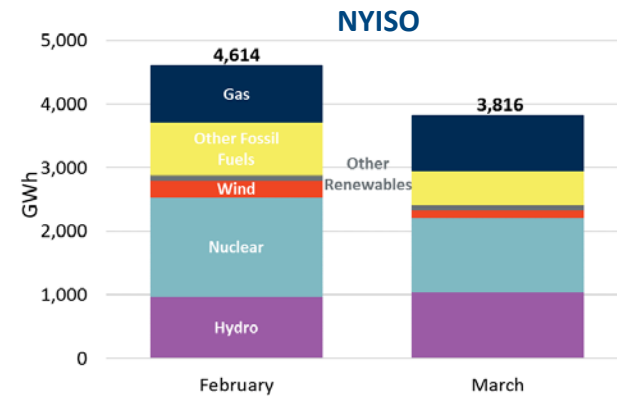
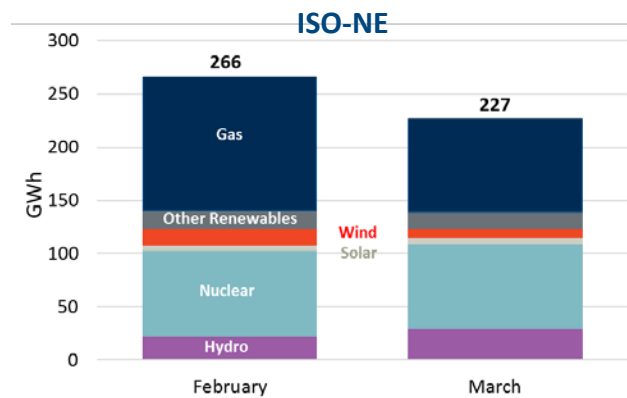
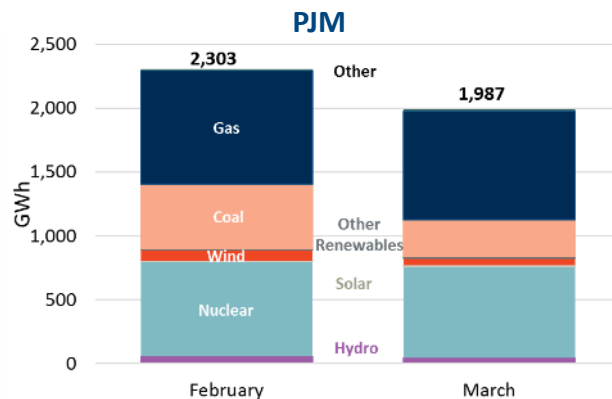
Public policy enthusiasm for ZECs and other support mechanisms – may be on hold for a bit, due to state fiscal concerns?

Generation Impacts

EIA projects COVID-19 impacts on electricity will cause a 4.9 GW delay or cancellation of previously planned capacity expansions through September 2020.³⁶

Seasonal and COVID-19 effects of reduced generation in the spring have mostly fallen on natural gas and coal plants.

Generation by Fuel Type (GWh)^{37,38,39,40,41}



DERs and Electrification

Many states have ambitious targets for DER adoption over the next few years that are far above extrapolations of recent past adoption. COVID-19 will probably make those a lower priority and less economical for a while.

NYT and EIA still show net growth in renewables in 2020, but slower than was projected previously this year^{26,27}

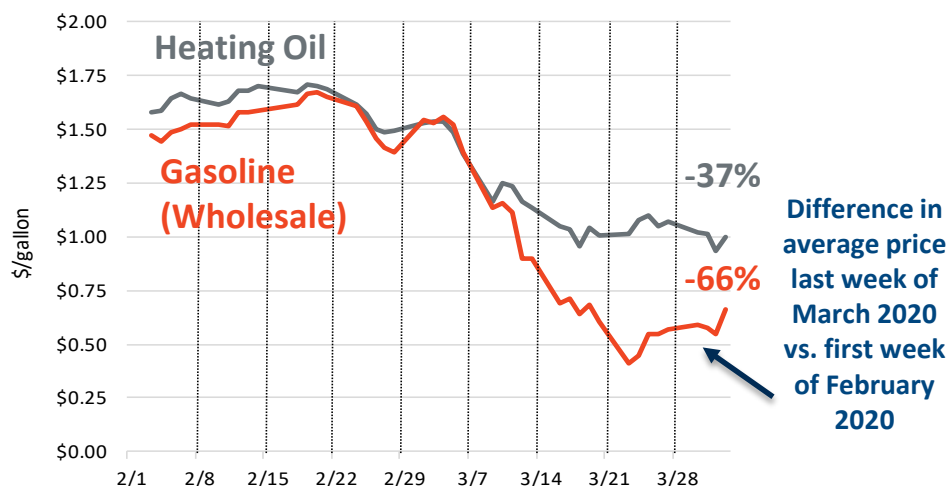
- COVID-19 disruptions to state legislative processes (24 states have reduced or shutdown their legislatures for the virus) may push back renewable energy goals and subsidies, though those could in some instances become more favored as impetus for new jobs⁴²
- Low fossil fuel costs make DER savings smaller or less plausible
- Environmental concerns less of a priority than health infrastructure and personal or community economic rebuilding for consumers?
- Consumers more risk averse about capital intensive outlays and long term commitments (for years to come)?
- Tolerance for utility (or personal) investments with mostly social net benefits (rather than direct savings) may go down.
- But, tax breaks could be directed at renewable energy resources as a source of increased employment
- And climate change is weakly associated with greater risk of pandemics (mostly from tropical diseases spreading to temperate areas).

Gasoline Prices: Possible Effects on EVs?

As of the end of March, wholesale gasoline has fallen from about \$1.50/gallon to about \$.50, but retail gasoline prices have not changed as much.

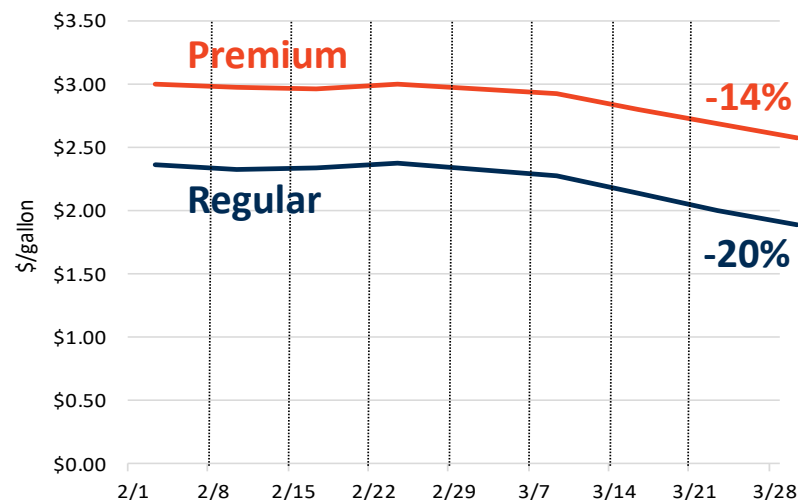
- On average, US EV owners incur \$485 in fuel costs compared to \$1,117 spent for fueling ICE vehicles, a comparative price advantage that could be lessened with declining gasoline prices.⁴³
- Traffic volumes are down approximately 41% nationwide and 35-62% in major US cities.^{44, 45}

Wholesale Oil Products⁵



Source: S&P Market Intelligence, as of April 3, 2020.

Retail US Gasoline⁴⁶



Source: EIA, as of April 3, 2020

A bigger cause of reduced EV adoption may be consumers' reduced wealth from exhausting their savings during shutdown.

Concluding Remarks

This overview has been meant to provide empirical context for understanding how the COVID-19 pandemic is and may continue to affect the energy industries. We do not offer it for forecasting purposes. We will update it periodically and post the refreshed versions to our website, along with sending notifications to any interested parties who have found it useful and would like to follow it over time. We would also be happy to arrange video conversations with parties or groups who would like a deeper discussion and comparison with their own perceptions of the energy market outlook.

Prepared By



Frank Graves
Principal, Boston

Frank is a principal and co-founder of The Brattle Group with expertise in most aspects of long term utility planning, ratemaking and finance. Recently he has focused on financial and operating implications for utilities, their customers, and energy markets of heightened use of distributed energy resources and strong decarbonization goals, as well as resiliency to extreme “black swan” events.



Bob Mudge
Principal, Wash. D.C.

Mr. Mudge consults on matters concerning utility financial restructuring, credit requirements, rate design, valuation, and cost of capital. He has provided expert testimony before federal and state courts, utility and environmental regulators in the U.S. and Canada, and multiple arbitration venues. Recently, Mr. Mudge was a co-author of Brattle “white papers” on the financial implications of wildfires for California utilities.



Josh Figueroa
Associate, Boston

Josh is an associate focused on economic and financial topics in the energy sector with expertise in energy markets, infrastructure development, and mergers & acquisitions. Prior to joining Brattle, Mr. Figueroa worked for Con Edison Transmission leading acquisition and development of electric and natural gas transmission assets. Mr. Figueroa has an MBA from NYU’s Stern School of Business.



Tess Counts
Research Analyst, Boston

Tess is a research analyst with a focus on utility financial analysis, cost of capital, and resiliency. She has expertise in Brattle’s system dynamics models of long term electric distribution opportunities and risks, as well as in distressed asset valuations and California wildfire risk assessment. Her background is in economics from Wesleyan University.

Sources

- 1: Institute for Health Metrics and Evaluation. "COVID-19 Projections." Accessed April 3, 2020. <https://covid19.healthdata.org/projections>
- 2: Goldman Sachs, "S&P 500 Trumps Gold", April 5, 2020.
- 3: S&P Global, "North American Regulated Utilities Face Additional Risks Amid Coronavirus Outbreak", March 19, 2020, accessed March 20, 2020. https://www.spglobal.com/ratings/en/research/articles/200319-north-american-regulated-utilities-face-additional-risks-amid-coronavirus-outbreak-11388268?mkt_tok=eyJpIjoiWXpsak9ERmlOVE0yWXpNNSIsInQiOiJxcnN3aDRvQVlpRkRkPQWtaQUpxNXRab3ZhVk1aSzBEVjg0XC9kK1VPK3A4cmp1UHN2MlkrdmtKa3BsSkNaK0YycU9lem1oWEp2MUI5aVNWQzhsa0NYWjNldmhZW512dytlaithK2hmdGhPeFY0ZXF6ZlVseW56a0Ntd3pxTENVVWsfQ%3D%3D
- 4: Khalid, Amrita, "Coronavirus could leave 30% of US workers jobless, Fed official says", *Quartz*, March 22, 2020. Accessed April 8, 2020. <https://qz.com/1823251/coronavirus-could-leave-30-percent-of-us-workers-jobless-fed-pres-says/>
- 5: Oil & Refined Products Summary, February 1, 2020 through April 3, 2020. Accessed April 3, 2020. S&P Global Market Intelligence, <https://platform.marketintelligence.spglobal.com/web/client?auth=inherit#markets/OilSummary>
- 6: Congress of the United States Congressional Budget Office, "The Economic Effects of Recent Increases in Energy Prices," p. 5. Accessed March 31, 2020, <https://www.cbo.gov/system/files?file=2018-10/07-21-energy-dist.pdf>; Nathan S. Balke, Stephen P.A. Brown, "Oil supply shocks and the U.S. economy: An estimated DSGE model," *Energy Policy* 116(5) (May 2018): 357-372.
- 7: U.S. Energy Information Agency. *Oil market Volatility Is At An All-Time High*, by Jesse Barnett, Jeff Barron, Washington D.C., March 27, 2020, accessed March 27, 2020.
- 8: Ryan Dezember, Vipal Monga, "North America's Oil Industry Is Shutting Off the Spigot," *The Wall Street Journal*, April 13, 2020, accessed April 13, 2020, https://www.wsj.com/articles/north-americas-oil-industry-is-shutting-off-the-spigot-11586770200?mod=hp_lead_pos5.
- 9: Oil & Refined Products Futures, February 1, 2020, March 31, 2020 and April 3, 2020. Accessed April 3, 2020. S&P Global Market Intelligence, <https://platform.marketintelligence.spglobal.com/web/client?auth=inherit#markets/commoditiesChart>
- 10: Daniel Yergin, "The Oil Collapse," *Foreign Affairs*, April 2, 2020, accessed April 6, 2020, <https://www.foreignaffairs.com/articles/2020-04-02/oil-collapse>.
- 11: Radmilla Suleymanova, "Can the world's top oil producers save a crashing market?," *Al Jazeera*, April 8, 2020, accessed April 10, 2020, <https://www.aljazeera.com/ajimpact/world-top-oil-producers-save-crashing-market-200407211121731.html>.

Sources

- 12: Gabrielle Tétrault-Farber, Andrew Osborn, “Russia can weather oil prices of \$25-30 for 6-10 years – ministry”, *Reuters*, March 9, 2020. Accessed April 10, 2020. <https://www.reuters.com/article/russia-finmin/russia-can-weather-oil-prices-of-25-30-for-6-10-years-ministry-idINKBN20W1IP>
- 13: Federal Reserve Bank of Dallas, “Breakeven Oil Prices Underscore Shale’s Impact on the Market”, May 21, 2019, Accessed April, 9, 2020. <https://www.dallasfed.org/research/economics/2019/0521>
- 14: SNL Day-Ahead Natural Gas Prices - Daily, February 1, 2020 through March 31, 2020. Accessed April 3, 2020. S&P Global Market Intelligence, <https://platform.marketintelligence.spglobal.com/web/client?auth=inherit#markets/commoditiesChart>
- 15: American Gas Association, “Heating Degree Day Summary”, p. 2, Accessed March 31, 2020, <https://www.aga.org/contentassets/60804ee0c68a4071bd2207187159f2c3/weeklyregionalhdd.pdf>
- 16: S&P Global Market Intelligence, SNL Natural Gas Forwards & Futures, February 1, 2020, March 31, 2020, and April 3, 2020. Accessed April 3, 2020. S&P Global Market Intelligence, <https://platform.marketintelligence.spglobal.com/web/client?auth=inherit#markets/commoditiesChart>
- 17: U.S. Department of Energy, *Today In Energy: Associated Gas Contributes to Growth in U.S. Natural Gas Production*, by Emily Geary, Jack Perrin, U.S. Energy Information Administration, Washington D.C., 2019. Accessed March 31, 2020. <https://www.eia.gov/todayinenergy/detail.php?id=41873>.
- 18: *The Dallas Morning News*, “Texas Gov. Greg Abbott allows only ‘essential services’ statewide, closes schools until May 4, March 31, 2020. Accessed April 9, 2020. <https://www.dallasnews.com/news/public-health/2020/03/31/texas-gov-greg-abbott-extends-social-distancing-measures-through-april-30-closes-schools-until-may-4/>
- 19: Velocity Suite, data as of 03/31/2020. Accessed April 1, 2020.
- 20: Quoctrung Bui and Justin Wolfers, “Another Way to See the Recession: Power Usage is Way Down,” *The New York Times*, April 8, 2020, accessed April 10, 2020, <https://www.nytimes.com/interactive/2020/04/08/upshot/electricity-usage-predict-coronavirus-recession.html>.
- 21: S&P Global Market Intelligence, Monthly Generation, February 2020 and March 2020. Accessed April 13, 2020. S&P Global Market Intelligence, <https://platform.marketintelligence.spglobal.com/web/client?auth=inherit#industry/monthlyGeneration>
- 22: EIA, Electric Power Monthly, “Table 1.1 Net Generation by Energy Source: Total (All Sectors), 2010-January 2020”, March 24, 2020. Accessed April 13, 2020. https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_1_01
- 23: Behr, Peter, “A Warning Sign? N.Y. lockdown jolts electricity demand”, April 6, 2020, Accessed April 6, 2020. *E&E News*. <https://www.eenews.net/energywire/2020/04/06/stories/1062798303>

Sources

- 24: Bank of America Securities, “North American Utilities & IPPs,” April 2, 2020. <https://ieefa.org/wp-content/uploads/2020/04/North-American-Utilities-and-PNM-04022020-BofA.pdf>
- 25: PJM, “Operating Committee: COVID-19 Load Impacts, 5-Year Historical Load Comparison,” April 6, 2020, Accessed April 6, 2020. <https://www.pjm.com/committees-and-groups/committees/oc.aspx>
- 26: Morawski, Bridget, “Coronavirus may cause power demand dive, slow renewable capacity growth.” S&P Global Market Intelligence, April 7, 2020. Accessed April 8, 2020. <https://platform.marketintelligence.spglobal.com/web/client?auth=inherit&overridecdc=1&#news/article?id=57947192&KeyProductLinkType=6>.
- 27: Penn, Ivan, “Oil Companies are Collapsing, but Wind and Solar Energy Keep Growing.” *The New York Times*, April 7, 2020. Accessed April 8, 2020. <https://www.nytimes.com/2020/04/07/business/energy-environment/coronavirus-oil-wind-solar-energy.html>.
- 28: Walton, Robert, “Clearer picture of coronavirus-driven grid load declines emerges in US after weeks of lockdowns”, *Utility Dive*, April 9, 2020. Accessed April 9, 2020. <https://www.utilitydive.com/news/clearer-picture-of-coronavirus-driven-grid-load-declines-emerges-in-us-afte/575777/>
- 29: S&P Global Market Intelligence, Peak Power Price Forwards, February 1, 2020. Accessed April 2, 2020. S&P Global Market Intelligence. <https://platform.marketintelligence.spglobal.com/web/client?auth=inherit#markets/commoditiesChart>
- 30: Federico, Lillian, “State Regulators Take 1st Steps to Address COVID-19 Costs to Utilities.” S&P Global (March 2020). Accessed April 2, 2020. <https://platform.marketintelligence.spglobal.com/web/client?auth=inherit#news/article?id=57823563&KeyProductLinkType=24>
- 31: S&P Global Market Intelligence, Utility Revenues by Customer Class, December 13, 2018. Accessed April 2, 2020. S&P Global Market Intelligence. <https://platform.marketintelligence.spglobal.com/web/client?#office/screener>
- 32: US Department of Treasury. 2020. “Daily Treasury Yield Curve Rates.” Accessed April 2, 2020. <https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yieldYear&year=2020>
- 33: S&P Global Market Intelligence, “20: S&P Global Market Intelligence, S&P lowers North American utilities outlook to negative on coronavirus risk,” April 2, 2020, Accessed April 3, 2020, <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/s-p-lowers-north-american-utilities-outlook-to-negative-on-coronavirus-risk-57886477>.
- 34: Barclays Capital, Inc., “Cost of Equity Analysis,” March 28, 2020.
- 35: S&P Global Ratings, “Use of Adjustment Clauses as of November 2019”, accessed March 30, 2020, <https://platform.marketintelligence.spglobal.com/web/client?auth=inherit#news/docviewer?id=55409057>.

Sources

- 36: Ryan, Joe, "Virus May Nix 39% of Projects to Build New U.S. Power Plants," *Bloomberg L.P.*, April 8, 2020. Accessed April 9, 2020. <https://news.bloomberglaw.com/environment-and-energy/covid-19-seen-canceling-up-to-39-of-new-u-s-power-generation>
- 37: Independent System Operator New England. 2020. "Daily Generation by Fuel Type." Accessed April 2, 2020. <https://www.iso-ne.com/isoexpress/web/reports/operations/-/tree/daily-gen-fuel-type>
- 38: Midcontinent Independent System Operator. 2020. "Generational Fuel Mix (xlsx)." Accessed April 2, 2020. [https://www.misoenergy.org/markets-and-operations/real-time--market-data/market-reports/#nt=%2FMarketReportType%3ASummary%2FMarketReportName%3AGeneration%20Fuel%20Mix%20\(xlsx\)&t=10&p=3&s=MarketReportPublished&sd=desc](https://www.misoenergy.org/markets-and-operations/real-time--market-data/market-reports/#nt=%2FMarketReportType%3ASummary%2FMarketReportName%3AGeneration%20Fuel%20Mix%20(xlsx)&t=10&p=3&s=MarketReportPublished&sd=desc)
- 39: The New York Independent System Operator Inc. 2020. "Real-Time Fuel Mix." Accessed April 2, 2020. <http://mis.nyiso.com/public/P-63list.htm>
- 40: PJM Interconnection LLC. 2020. "Generation by Fuel Type." Accessed April 2, 2020. https://dataminer2.pjm.com/feed/gen_by_fuel
- 41: Southwest Power Pool. 2020. "GenMixYTD." Accessed April 2, 2020. <https://marketplace.spp.org/pages/generation-mix-historical>
- 42: Tomich, Jeffrey, " 'Ground to a halt.' State closures put clean energy on ice." *E&E News*, April 3, 2020. Accessed April 3 2020. <https://www.eenews.net/stories/1062771629>
- 43: *Forbes*, "Electric Vehicles Cost Less than Half as Much to Drive", January, 14, 2018, <https://www.forbes.com/sites/jeffmcmahon/2018/01/14/electric-vehicles-cost-less-than-half-as-much-to-drive/#5818ea153f97>
- 44: INRIX, "INRIX U.S. National Traffic Volume Synopsis: Issue #2 (March 21-27, 2020)," March 30, 2020. Accessed April 6, 2020, <https://inrix.com/blog/2020/03/covid19-us-traffic-volume-synopsis-2/>.
- 45: Fraser Shiling, David Waetjen, "Special Report: Impact of COVID-19 on California Traffic Accidents", April 1, 2020, Accessed April 6, 2020, <https://inrix.com/blog/2020/03/covid19-us-traffic-volume-synopsis/>.
- 46: U.S. Department of Energy, U.S. Energy Information Administration, *Weekly Retail Gasoline and Diesel Prices*, Accessed April 3, 2020. https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm.

THE POWER OF **ECONOMICS**

brattle.com

THE **Brattle** GROUP

