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Electricity Price Outlook for November 2020

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The Office of Technical and Regulatory Analysis presents the outlook for wholesale electricity prices each month. This assessment considers trends in electricity futures markets as well as *forecasted weather, economic growth, and input fuel prices*.

Key Points in this Month's Outlook

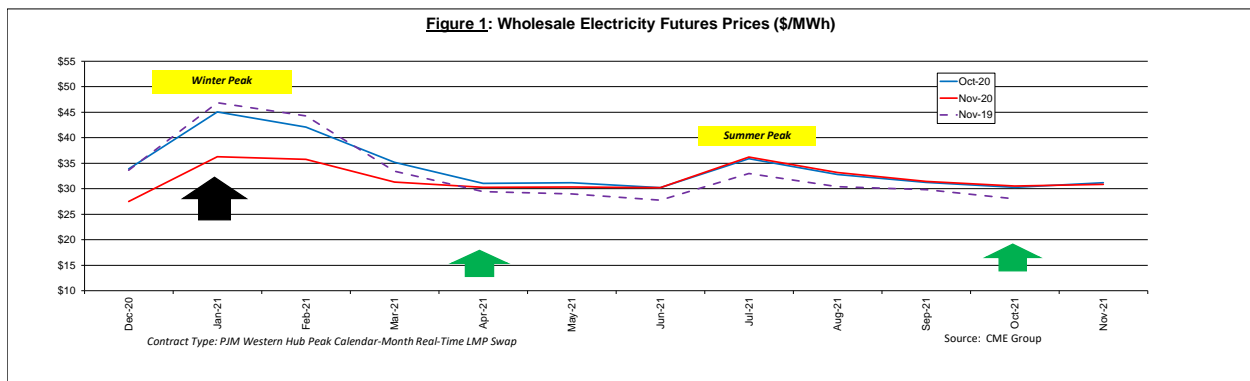
- On June 1, 2020, new, lower Standard Offer Service (“SOS”) electric rates took effect. Overall, residential customers saw an average bill decrease of 2.7 percent, while small commercial customers saw an average bill decrease of 1.1 percent.
- Plentiful natural gas in the PJM region has lowered wholesale electricity prices; however, this could change as natural gas prices are projected to rebound strongly in 2021. Natural gas now exceeds coal as a generation fuel source in the PJM region.
- **Due to COVID-19, overall electricity consumption in the United States is projected to fall by 3.6 percent in 2020 compared to 2019;** this decline is led by a 6.4 percent projected decline in retail sales to the commercial sector. EIA forecasts residential sector retail sales will increase by 2.5 percent in 2020 driven by higher summer cooling and increased working from home. EIA expects electricity consumption in 2021 will increase by 0.9% over 2020.¹

¹ November 2020 Short-Term Energy Outlook (STEO) at page 3.

Wholesale Electricity Futures Market

Contracts to deliver electricity in future months are traded for the multi-state region that is served by regional transmission operator PJM Interconnection and includes the District of Columbia. Figure 1 below shows the futures contract “price strips” through November 2021 as settled on October 14, 2020, (blue line), and on November 16, 2020, (red line).²

Because electricity cannot be easily stored, the effect of seasonal temperature changes on the price of future delivery contracts stands out sharply, with yearly peaks in the hot summer months and cold winter ones. Wholesale prices rise to incentivize high-cost generators to turn on their power plants to meet the high demand for electricity to run air conditioning on hot summer days and heating systems on cold winter days.



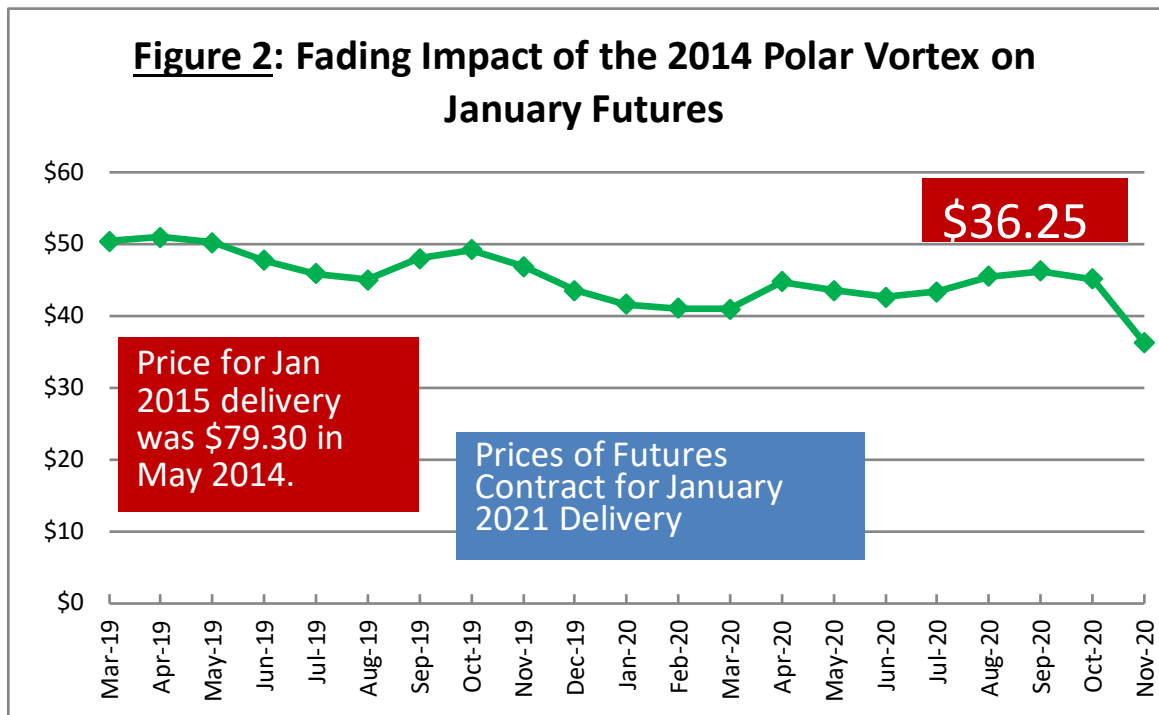
In Figure 1 above, the red line shows trading values for futures contracts on November 16, 2020, revealing that price expectations for the next six months are significantly below last year’s levels. The dashed purple line shows the trading values for the “price strip” from one year ago (November 14, 2019). Futures prices have declined since last month as investors continue to evaluate the future effects of the COVID-19 pandemic-induced economic slowdown and prospects for recovery as well as the winter weather outlook. The trend of winter prices exceeding summer prices continues.

Price expectations during the “shoulder months” are also below where they were a year ago. The green arrows (see Figure 1 above) point to the “shoulder months” of April 2021 and October 2021. During these months, temperatures are moderate, and demand can be met from less expensive generation like nuclear and wind.

The green line in Figure 2 (below) illustrates how investors have responded to the unusually cold winter weather experienced during the “Polar Vortex” of January 2014, the February 2015 cold snap, and January 2019 -- as they form expectations about the

² See PJM Western Hub Peak Calendar-Month Real-Time LMP Swap Futures; CME Group.

price of electricity in coming winter months. In May 2014, the price of a MWh for delivery in January 2015 closed at \$79.30. Investors' fears about the risk of January generation outages have moderated and returned to pre-Polar Vortex levels. The most recent price for January 2021 delivery is \$36.25 – a 19.5 percent decrease from the previous month and a 22.6 percent decrease from one year ago.



PJM reports that these January 2014 cold-weather events resulted in an unusually high level of “forced outages” of generators serving the PJM system; this created a “shortage effect” that drove wholesale prices temporarily higher.³

Progress made by PJM in managing extreme winter peak demand was demonstrated during January 2018 when usage achieved levels within the “PJM Top Ten Winter Peaks” (see figure below). PJM President Andy Ott told the U.S. Senate Committee on Energy and Natural Resources on January 23, 2018, that “Preliminary data shows that overall forced outages during the peak demand hour of the recent cold snap were about half what they were during the Polar Vortex.”⁴

³ See PJM; “Generation Forced Outages for January 6-8, 2014”; <http://www.pjm.com/~media/documents/reports/20140109-january-2014-cold-weather-peaks-and-generator-outages.ashx>.

⁴ <http://www.pjm.com/~media/library/reports-notice/special-reports/2018/20180123-testimony-andrew-ott-to-us-senate.ashx>.



Jan. 5 Cold Weather Update

Retail Residential Electricity Prices

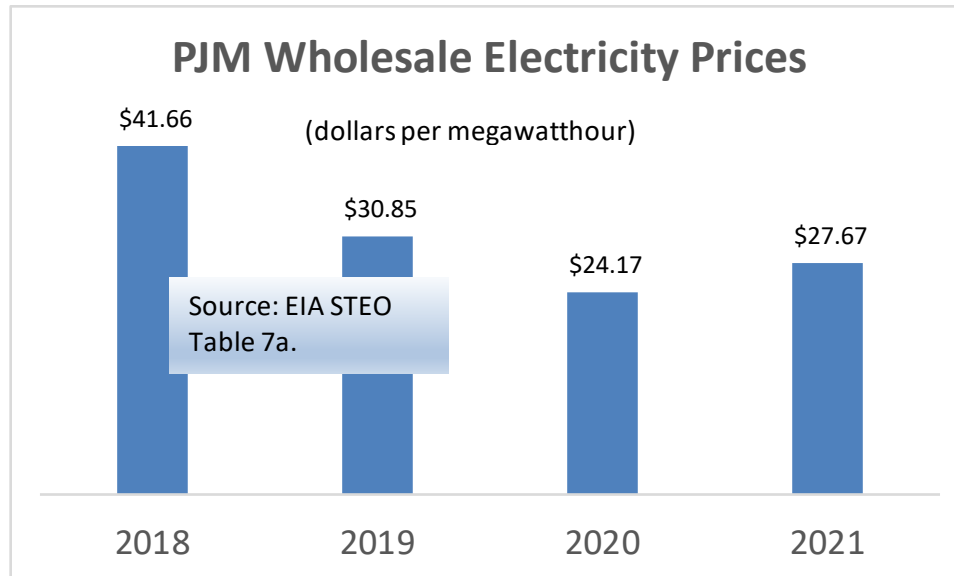
The U.S. Energy Information Administration’s (EIA) *Short-Term Energy Outlook (STEO)* reports that retail residential electricity prices are expected to increase by 0.7% in 2020 nationwide and a 1 percent increase is projected in 2021.⁵ Factors other than generation costs are included in the prices reported by EIA, including the costs of continued investment in transmission and distribution infrastructure.

On March 18, 2020, the Public Service Commission of the District of Columbia approved the results of the annual competitive auction for new electric generation rates for default service, called Standard Offer Service or SOS, which went into effect on June 1, 2020. As a result of a competitive auction overseen by the Commission, on average, the rate for SOS (which consists of the generation and transmission price) for a residential customer will decrease by about \$1.98 per month for the average user. On average, the rate for small commercial SOS customers will decrease about \$2.71 per month for the average user. Overall, residential customers will see an average bill decrease of 2.7 percent, while small commercial customers will see a bill decrease of 1.1 percent.⁶

The figure below shows the overall trend of prices in the PJM wholesale market where SOS generation is sourced, including EIA’s projection for 2021.

⁵ November 2020 Short-Term Energy Outlook (STEO); Table 7c; <http://205.254.135.24/forecasts/steo/>.

⁶ Formal Case No. 1017; Order No. 20311; March 18, 2020.



The following sections provide a brief discussion of some of the factors affecting this month’s outlook, including the three-month weather forecast, the overall economic outlook, and the prices of fuels used in power generation.

Weather Outlook

Sea-surface temperatures in the equatorial Pacific Ocean influence weather patterns across North America; these so-called *La Niña/El Niño* conditions are the primary factor in the three-month temperature outlook which, in turn, impacts investor expectations about future electricity prices.

The National Oceanic and Atmospheric Administration’s September 10th *El Niño* watch indicates that *La Niña* conditions are likely to continue through the Northern Hemisphere winter 2020-21 (~95% chance during January-March) and into spring 2021 (~65% chance during March-May).⁷ NOAA notes that above-normal average temperatures are favored in the mid-Atlantic region through the December-January-February period.⁸ NOAA also expects below normal precipitation during the next three months in the mid-Atlantic region.

⁷ http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.html. “ENSO” means *El Niño Southern Oscillation*; “ENSO-neutral” means that neither *El Niño* nor *La Niña* conditions are present.

⁸ <http://www.cpc.ncep.noaa.gov/products/predictions/90day/fxus05.html>.

Heating-degree days measure the demand for heating during the winter. EIA reports that heating degree days in our region are projected to be 3.2 percent lower in 2021 than in 2020. Projected heating degree days for 2021 are 12 percent lower than the ten-year average.⁹

Cooling-degree days measure the demand for air conditioning during the summer. EIA projects cooling-degree days in the Census region that includes the District of Columbia will be about 1.8 percent higher in 2021 than the ten-year average. The projection for summer 2021 is 7.7 percent lower than 2020.¹⁰ The long-term warming trend continues.¹¹

Economic Growth and Electricity Consumption

The outlook for economic activity in 2020 remains one of negative growth. Real (inflation-adjusted) gross domestic product (GDP) grew by 2.2 percent in 2019 and is projected to decline by 3.6 percent in 2020 and grow by 3.7 percent in 2021.¹² These figures reflect the impact of the COVID-19 pandemic-induced economic slowdown which cannot be projected with certainty. Economic growth is unlikely to affect electricity price trends positively unless it is sustained above three percent; on the other hand, any negative growth will have a moderating impact of electricity prices, as is the case presently.

EIA forecasts that nationwide residential electricity sales (measured in millions of kilowatt hours per day) will increase by 2.5 percent in 2020, followed by a 1.4 percent increase in 2021. Nationwide electricity sales for all sectors will decrease by 3.7 percent in 2020, with a 1.3 percent increase projected in 2021.¹³

Fuel Prices

In recent years, the cost of fuels for electricity generation has been restrained, except for petroleum-based fuels where the market remains volatile in both directions. This moderate trend is driven by historically low natural gas prices and moderate economic growth. *In response to the economic dislocation caused by the COVID-19 pandemic, the cost of natural gas for generation approached the \$2 level in 2020 and is projected to rebound strongly to average over \$3.50 in 2021.*¹⁴

⁹ STEO, Table 9c.

¹⁰ STEO; Table 9c.

¹¹ NOAA National Climatic Data Center; [Contiguous U.S. Temperature 1896 – 2018](#).

¹² STEO; Table 1.

¹³ STEO; Table 7b.

¹⁴ STEO, Table 7a.

Petroleum

The outlook for international crude oil prices has dimmed recently along with growth expectations in the wake of the COVID-19 pandemic.¹⁵ Travel restrictions, an economic slowdown and a Saudi-Russia oil price war are factors driving crude oil prices lower.¹⁶ OPEC and Russia are negotiating an extension of their output cuts with an uncertain outcome.¹⁷

EIA warns that the uncertainty in its energy price forecasts has increased significantly due to the pandemic conditions, particularly for petroleum. Brent crude oil prices averaged \$40 per barrel in October, a decrease of \$1 per barrel from the average in September. Brent crude is forecast to average \$44 per barrel and \$47 per barrel in 2021, compared to an average of \$64 per barrel in 2019.¹⁸ EIA expects retail gasoline to average \$2.15 per gallon in 2020 and \$2.22 in 2021 (compared to \$2.60 per gallon in 2019).¹⁹

As a result of lower oil prices, U.S. shale oil producers have cut back on drilling which impacted domestic output of both crude oil and natural gas. Annual U.S. crude production peaked at 12.9 million b/d in November 2019, and then fell to 10.0 million b/d in May 2020 for a 22 percent decline in six months. Crude production increased to 10.6 million b/d in August. EIA projects an average rate of production of 11.4 million barrels per day in 2020 (a significant cut from EIA's pre-pandemic forecast of 13 million b/d). In 2021, EIA projects production averaging 11.1 million b/d (which still surpasses the pre-shale record of 9.6 million b/d in 1970).²⁰

The latest *Monthly Drilling Productivity Report* from the EIA shows a drop in crude oil output and a decline in gas production in the U.S. shale-producing basins surveyed (see Figure 3 below).²¹ Output in shale regions depends on high rates of drilling activity which investors are no longer willing to finance as generously as they have in the past; cutbacks were already visible in 2019.²² Figure 3 illustrates how shale oil and gas production have declined in the past six months; the latest contraction appears to have halted and an uncertain recovery in output continues.

¹⁵ "Commodities Fall Alongside Global Stocks with Coronavirus Spreading," *Wall Street Journal*; January 23, 2020.

¹⁶ "U.S. oil prices plunge to lowest level in 18 years;" *Wall Street Journal*; March 18, 2020.

¹⁷ "OPEC+'s Lose-Lose Equation;" *Wall Street Journal*; December 1, 2020.

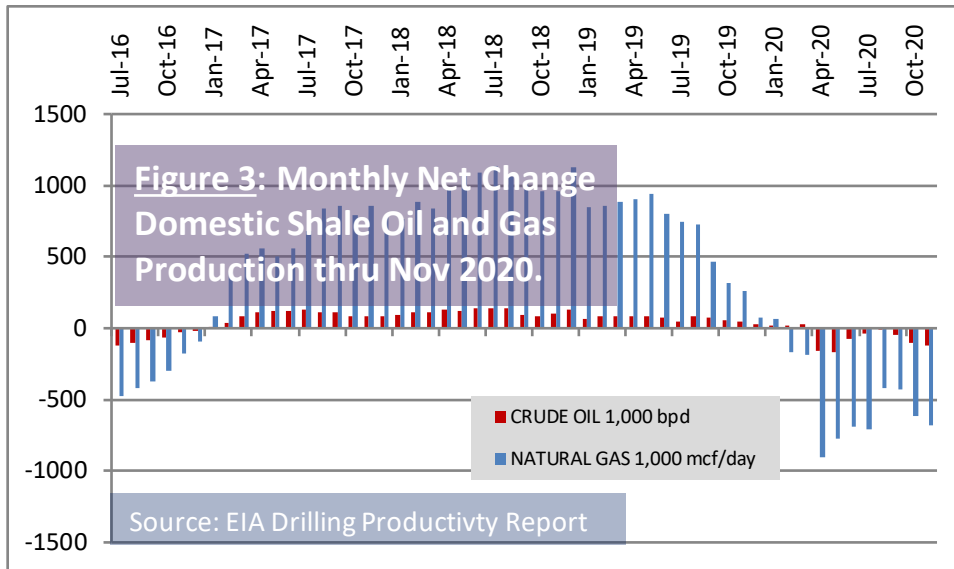
¹⁸ STEO, page 1. The "North Sea Brent Crude" is the key contract for setting the price of crude oil in international markets.

¹⁹ STEO, Table 2.

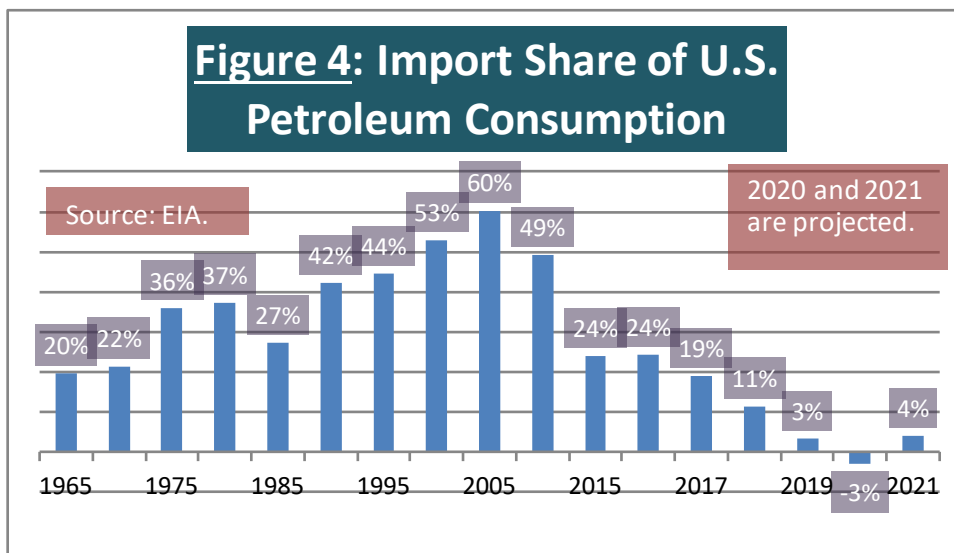
²⁰ STEO, pages 1 and Table 4a.

²¹ See EIA's monthly *Drilling Productivity Report*; <http://www.eia.gov/petroleum/drilling/pdf/dpr-full.pdf>.

²² "Schlumberger Plans U.S. Pullback as Shale Oil Drillers Struggle;" *Wall Street Journal*, January 17, 2020.



Net liquid fuel imports to the United States peaked at over 60 percent of domestic supply in 2005 and then fell to three percent in 2019 – the lowest level since 1970; this represented a major shift in the structure of world oil markets.²³ EIA projects the net import share to fall below zero in 2020. However, EIA projects a reversal of this trend in 2021, with net imports of petroleum increasing.²⁴ See Figure 4 below.



Only time will tell whether high domestic petroleum output will continue to moderate the price of crude oil; recovery of global demand will also be an important factor

²³ STEO; Table 4a. EIA Monthly Energy Report; July 2018; Table 3.1; <http://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf>.

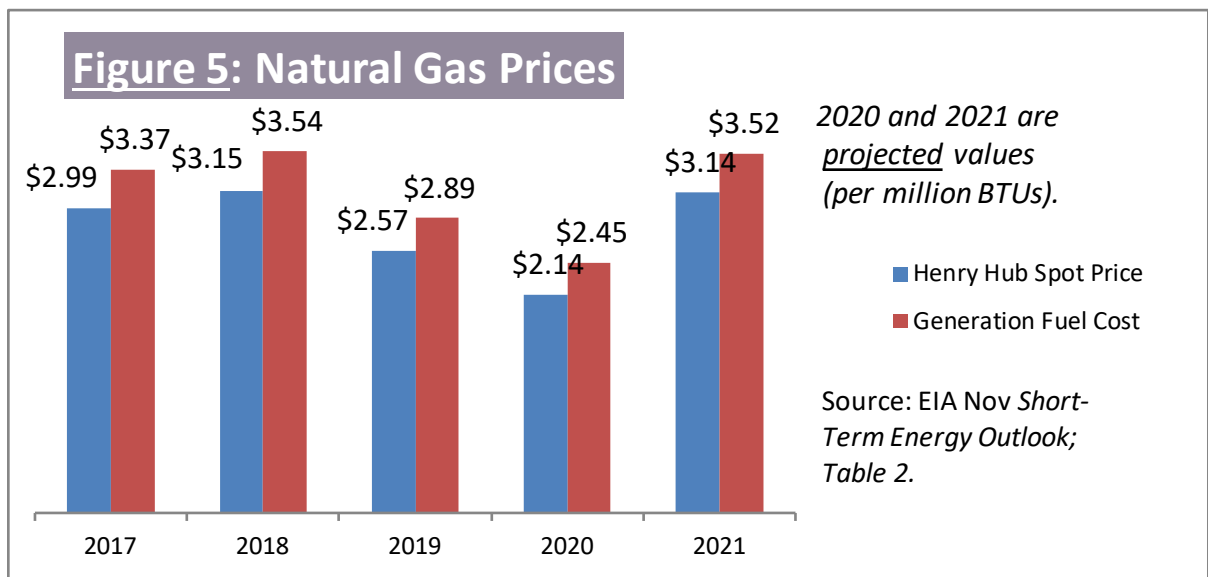
²⁴ STEO, Table 4a.

in the future course of prices. Petroleum fuels supplied less than one percent of the PJM generation during 2019.²⁵

Natural Gas

Natural gas prices are significantly below 2008 levels when the Henry Hub price averaged \$8.94 per one million British Thermal Units (MMBtu).²⁶ Recently, the spot price has headed in the direction of the lows reached in early 2012 when it briefly touched \$2 per MMBtu – EIA reports it fell below \$2.25 during the second and third quarters of 2020.²⁷

Natural gas prices in the spot market result from the interaction of trends in domestic production, growing gas-fired generation of electricity, and expected winter heating needs; expanding natural gas exports may impact prices in the future. Record domestic production has offset rising exports and above-average usage. EIA expects Henry Hub spot prices to average \$2.16/MMBtu in 2020 and \$3.19 in 2021.²⁸ *Natural gas prices are now projected to remain at or below 2018 levels through 2021.*



The Henry Hub spot price is more volatile than the cost of natural gas actually paid by electricity generators where long-term contracts and hedging are typically involved. EIA reports that the cost of natural gas for power generation fell below \$2.25 in 2020 and projects a sharp rise to \$3.52 in 2021.²⁹

²⁵ STEO; Table 7d.

²⁶ EIA; 2011 Annual Energy Outlook; page 115.

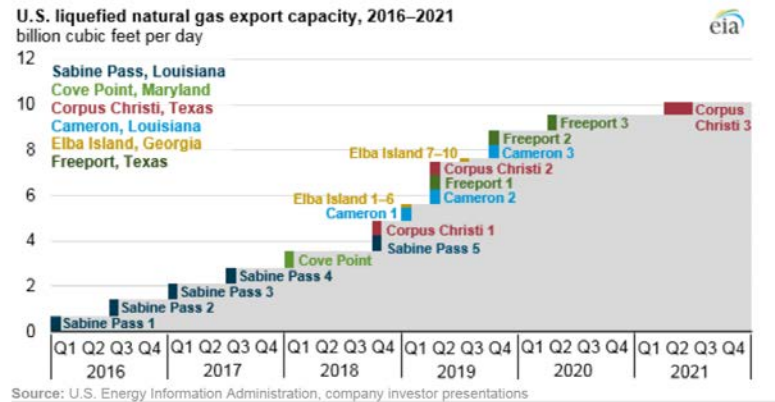
²⁷ STEO; Table 2.

²⁸ STEO; page 2.

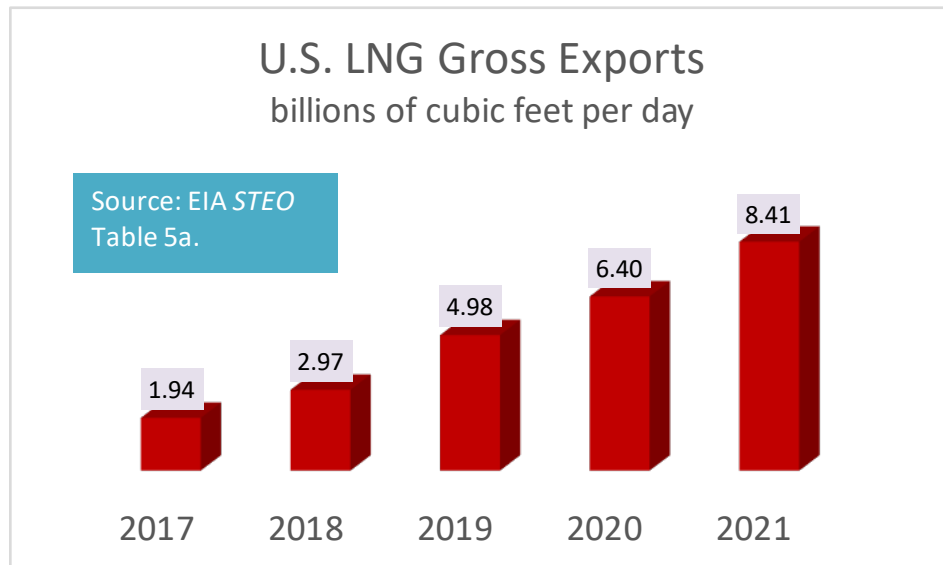
²⁹ STEO; Table 7a.

EIA expects exports to grow faster than domestic production, eventually putting modest upward pressure on natural-gas prices; EIA expects LNG export capacity to grow through 2021.³⁰

U.S. liquefied natural gas export capacity to more than double by the end of 2019



The gap between projections for LNG export capacity (above) and projected gross export amounts (below) suggests that not all the new capacity under construction is currently committed by supply contracts.



The global LNG market is depressed globally, however projected exports remain healthy.³¹

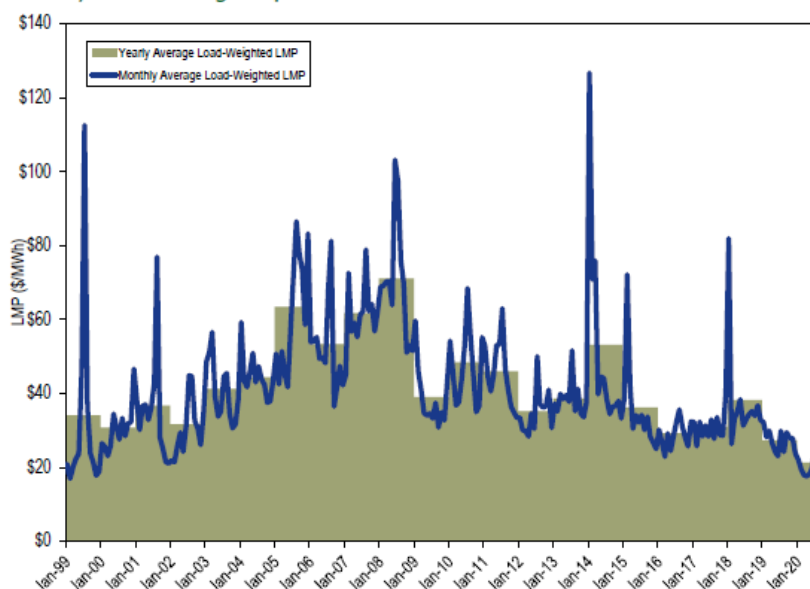
³⁰ See Table 5a and <https://www.eia.gov/todayinenergy/detail.php?id=37732>. “Bcf/d” is billion cubic feet per day.

³¹ “Global Glut Keeps a Lid on Natural-Gas Prices;” *Wall Street Journal*; May 28, 2020.

Regional variations in natural-gas prices also impact regional wholesale electricity markets like PJM – influenced by local gas production and the availability of gas pipeline transportation capacity. The *Wall Street Journal* reports that plentiful natural gas in the Appalachian region has fueled an expansion of gas-fired generation and depressed electricity prices in the PJM wholesale market.³² This is confirmed in a brief analysis from EIA: *Natural-gas fired plants are being added and used more often within the region served by PJM Interconnection*. EIA explains that gas-fired capacity has been growing in the region and that gas-fired generation has a rising “capacity factor” which combine to increase megawatt hours generated by natural gas.³³

The long-term impact of inexpensive natural gas can be seen easily in PJM wholesale electricity price trends. “Figure 3-26” (below) shows the monthly and annual average load-weighted LMP for January 1999 through September 2020.³⁴ Annual average LMP has declined since natural-gas prices peaked in 2008. (Note the January price spike in 2018, the result of extreme winter cold.)

Figure 3-26 Real-time, monthly and annual, load-weighted, average LMP: January 1999 through September 2020



Natural gas accounted for 36.8 percent of the PJM generation fuel mix during 2019 and is projected to rise to 39.6 percent in 2020.³⁵

³² “Power Plants Bloom Even as Electricity Prices Wilt,” *Wall Street Journal*, December 28, 2017.

³³ U.S. EIA; *Natural gas fired plants are being added and used more in PJM Interconnection*; October 17, 2018. <https://www.eia.gov/todayinenergy/detail.php?id=37293>.

³⁴ Independent Market Monitor; *2020 Q3 State of the Market Report for PJM (November 12, 2020)*; page 154. LMP means “locational marginal price” which refers to the price-setting methodology used in PJM’s wholesale electricity market.

³⁵ STEO; Table 7d.

Coal

Coal has been displaced by natural gas, wind, and nuclear in electricity generation. Nationwide, coal consumption in electric power generation has not returned to the peak level of 2007. EIA estimates that coal production was 705.3 million short tons (MMst) in 2019, it is projected to fall by 26 percent to 520.6 million short tons in 2020 and increase by 20 percent in 2021 as natural gas prices rebound.³⁶

EIA reports that the delivered price of coal for power generation peaked at \$2.39 in 2011. EIA estimates the delivered price of coal averaged \$2.01 per MMBtu in 2019, and forecasts \$1.94 per MMBtu in 2020 and \$2.04 in 2021.³⁷

In the PJM wholesale market that serves the District of Columbia, the cost of natural gas is a more important factor than coal in setting the overall level of wholesale market prices for electricity.³⁸ Coal represented 23 percent of the PJM generation fuel mix during 2019, falling to 19 percent in 2020.³⁹ As noted above, the natural gas share of PJM generation is rising, in line with national trends. Coal has fallen to third place behind nuclear and natural gas a share of the PJM fuel mix.

Across the United States, coal generation plants are being retired and new natural gas-fired generation plants are being built, mirroring trends in the PJM region. EIA projects that the natural gas share of electricity generation nationwide was 37 percent in 2019 and increase to 39 percent in 2020. Coal's share of generation will fall to 20 percent in 2020, down from 24 percent in 2019.⁴⁰ EIA's forecasted generation shares for coal and natural gas are very sensitive to the natural-gas price forecast: if natural-gas prices rebound in 2021 as EIA expects, then coal's share of generation could rise at the expense of natural gas,

Renewables

Nationwide, EIA projects that all non-hydropower renewables accounted for 10.2 percent of electricity generation in 2019 and may reach 14.5 percent in 2021.⁴¹ Wind generated more electricity than hydropower for the first time in 2019.

³⁶ STEO; Table 6. Historical data can be found at http://www.eia.gov/totalenergy/data/annual/pdf/sec7_9.pdf. See also The Brattle Group; Coal Plant Retirements: Feedback Effects on Wholesale Electricity Prices; November 2013; http://www.brattle.com/system/news/pdfs/000/000/584/original/Coal_Plant_Retirements_-_Feedback_Effects_on_Wholesale_Electricity_Prices.pdf.

³⁷ STEO; Table 7a.

³⁸ EIA reports prices for coal as delivered under long-term contracts that are less volatile than the spot prices reported for other fossil fuels. See Table 6, STEO.

³⁹ STEO; Table 7d.

⁴⁰ STEO; Table 7d.

⁴¹ STEO; Table 7d.

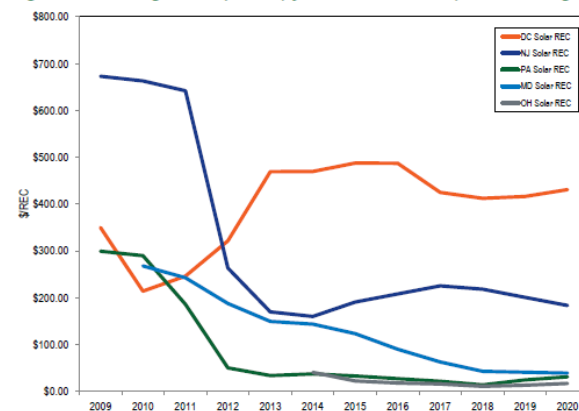
Renewable Portfolio Standards (“RPS”) enacted by many states are stimulating the rapid growth of solar in the PJM market. This stimulus will intensify as scheduled increases will raise the RPS for solar in coming years, as shown in “Table 8-13” below.⁴²

Table 8-13 Solar renewable standards by percent of electric load for PJM jurisdictions: 2020 to 2030¹⁴⁶

Jurisdiction with RPS	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Delaware	2.25%	2.50%	2.75%	3.00%	3.25%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%
Illinois (RECs)	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	4,000,000
Maryland	6.00%	7.50%	8.50%	9.50%	10.50%	11.50%	12.50%	13.50%	14.50%	14.50%	14.50%
Michigan	No Minimum Solar Requirement										
New Jersey	5.10%	5.10%	5.10%	4.90%	4.80%	4.50%	4.35%	3.74%	3.07%	2.21%	1.58%
North Carolina	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%
Ohio	No Minimum Solar Requirement										
Pennsylvania	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Washington, D.C.	2.18%	2.50%	2.60%	2.85%	3.15%	3.45%	3.75%	4.10%	4.50%	4.75%	5.00%
Jurisdiction with Voluntary Standard											
Indiana	No Minimum Solar Requirement										
Virginia	No Minimum Solar Requirement										
Jurisdiction with No Standard											
Kentucky	No Renewable Portfolio Standard										
Tennessee	No Renewable Portfolio Standard										
West Virginia	No Renewable Portfolio Standard										

Prices for Solar Renewable Energy Credits (“SRECs”) are much higher in the District of Columbia than in neighboring jurisdictions, as can be seen in “Figure 8-5” below.⁴³

Figure 8-5 Average SREC price by jurisdiction: January 2009 through September 2020



146 The Illinois solar standard currently requires 2 million RECs from solar photovoltaic projects energized after June 1, 2017. Illinois Public Act 099-0906, June 1, 2017.
 147 Solar REC average price information obtained through Evomarkets, <<http://www.evomarkets.com>> (Accessed October 21, 2020).

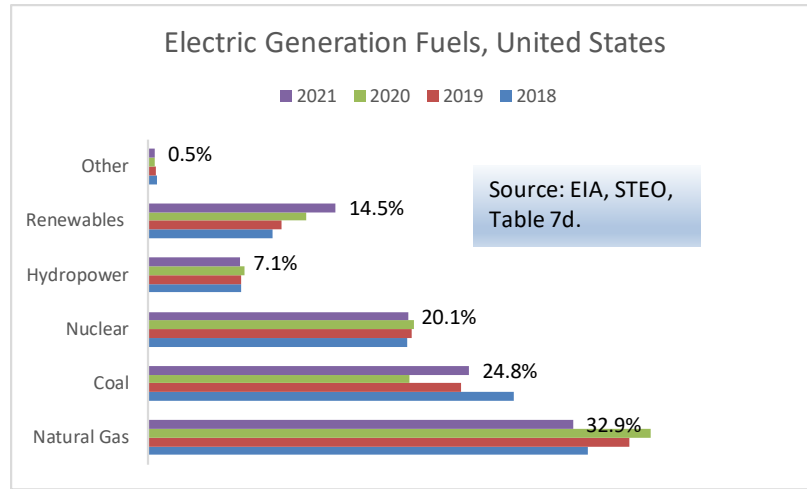
Trends in Generation Fuel Mix

EIA’s monthly *Short-Term Energy Outlook* includes forecasts of the fuel sources for electricity generation (natural gas, nuclear, renewables, and so forth). Nationwide, the share generated from renewables is projected to increase. EIA projects an increase in

⁴² Independent Market Monitor; 2020 Q3 *State of the Market Report for PJM* (November 12, 2020); page 397.

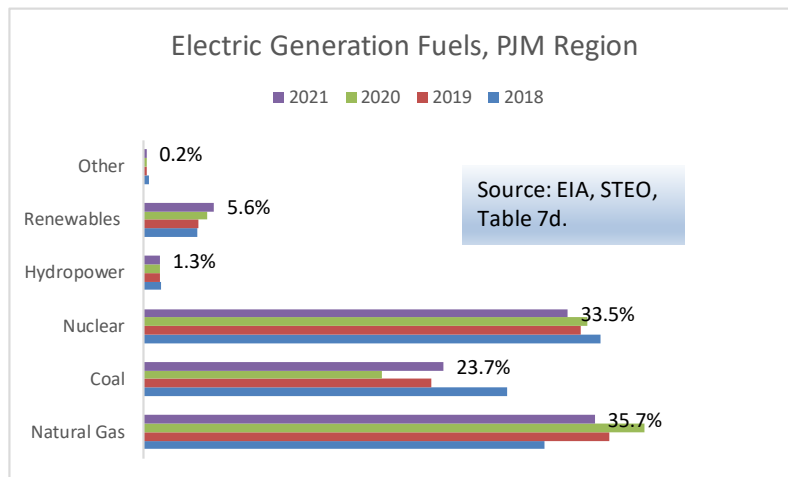
⁴³ Independent Market Monitor; 2020 Q3 *State of the Market Report for PJM* (November 12, 2020); page 397.

coal's share in 2021 because EIA is projecting natural gas prices to increase. Hydro and nuclear are not adding capacity so their shares remain relatively stable.



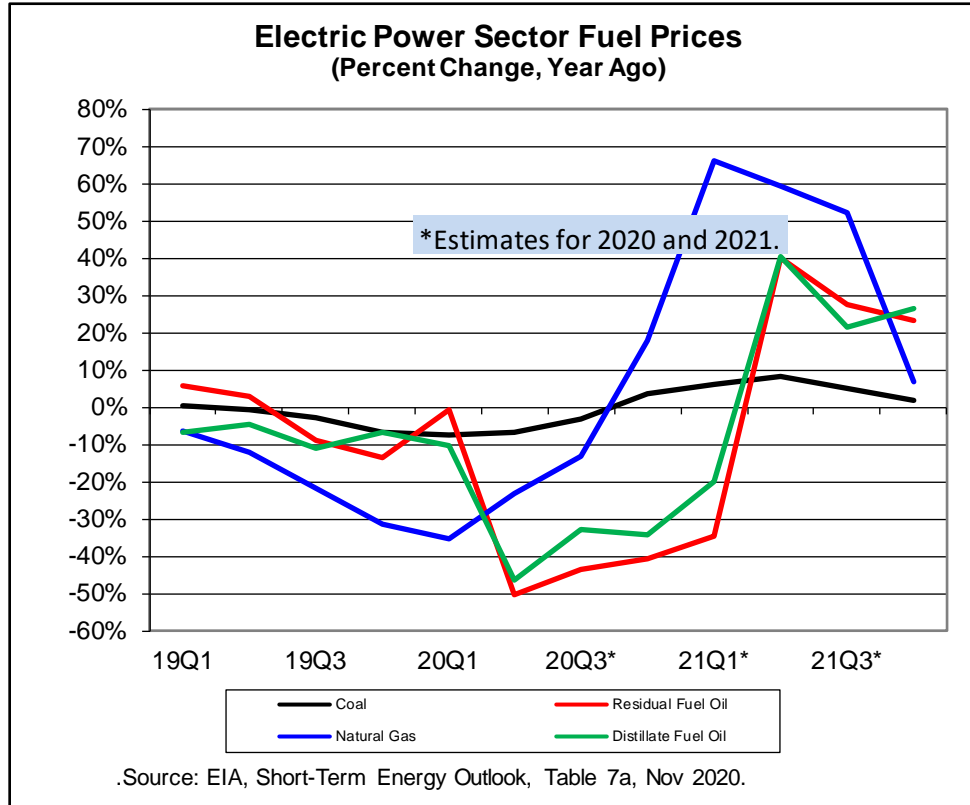
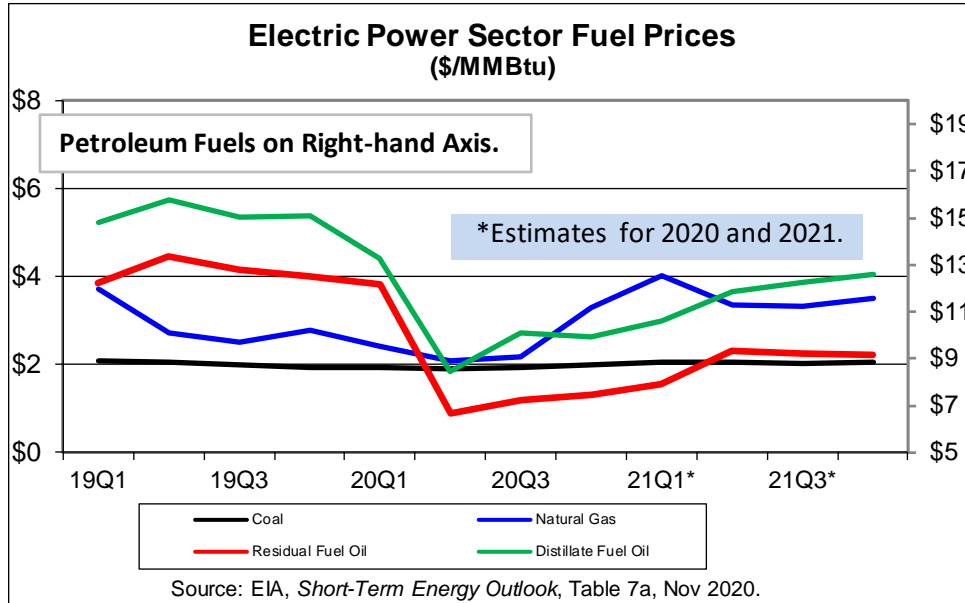
EIA provides the same information for individual wholesale market regions such as PJM (see below). PJM reflects the national trends with some differences.

- Renewables are a smaller share of the generation mix in the PJM region compared to the nation as a whole; their share is also growing more slowly than in the nation.
- The natural-gas share is growing in PJM and is projected to be larger than the U.S.-wide share by 2021.
- Coal will be a smaller share of PJM generation than nationwide by 2021.
- PJM has much less hydro capacity than the U.S. overall.



Trends in Generation Fuel Prices

Nationwide trends in generation fuel prices are displayed in the figures below. The declining outlook for natural-gas prices in 2020 followed by a rebound in 2021 stands out clearly.



Wholesale Electric Market Assessment Information

Price of Electricity Futures Contracts for October and November 2020

Twelve Month NYMEX Strip Components⁴⁴

\$/MWh (for \$/kWh, divide by 1000)

	Oct-20	Nov-20
Dec-20	\$ 33.85	\$ 27.50
Jan-21	\$ 45.05	\$ 36.25
Feb-21	\$ 42.05	\$ 35.75
Mar-21	\$ 35.20	\$ 31.30
Apr-21	\$ 31.05	\$ 30.25
May-21	\$ 31.20	\$ 30.35
Jun-21	\$ 30.20	\$ 30.20
Jul-21	\$ 35.90	\$ 36.20
Aug-21	\$ 32.80	\$ 33.15
Sep-21	\$ 31.25	\$ 31.45
Oct-21	\$ 30.25	\$ 30.50
Nov-21	\$ 31.15	\$ 30.85
Dec-21	\$ 33.50	\$ 33.40

The above are wholesale energy prices only. Transmission and distribution rates are not included.

Weather Forecast

1. Current for next few days to one week:

<http://www.cnn.com/Weather/>

<http://home.accuweather.com/>

2. National Oceanic and Atmospheric Administration, Climate Prediction Center Outlook:

<http://www.cpc.ncep.noaa.gov/>

⁴⁴ <http://www.cmegroup.com/trading/energy/electricity/pjm-western-hub-peak-calendar-month-real-time-lmp.html>.