

Electricity Price Outlook for July 2018

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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.*

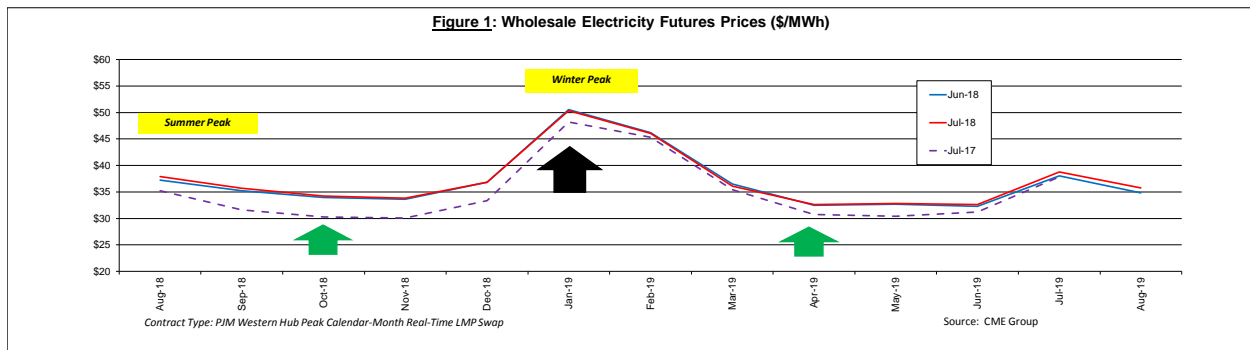
Key Points in this Month's Outlook

- On June 1st, new, lower Standard Offer Service (“SOS”) electric rates took effect: A 5.3 percent average decrease for residential customers and 4.3 percent average decrease for small commercial customers.
- Plentiful natural gas in the PJM region is keeping wholesale electricity prices stable.
- Utility investments in solar generating capacity are projected to accelerate nationwide.

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 August 2019 as settled on June 19, 2018 (blue line), and on July 10, 2018 (red line).¹

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.

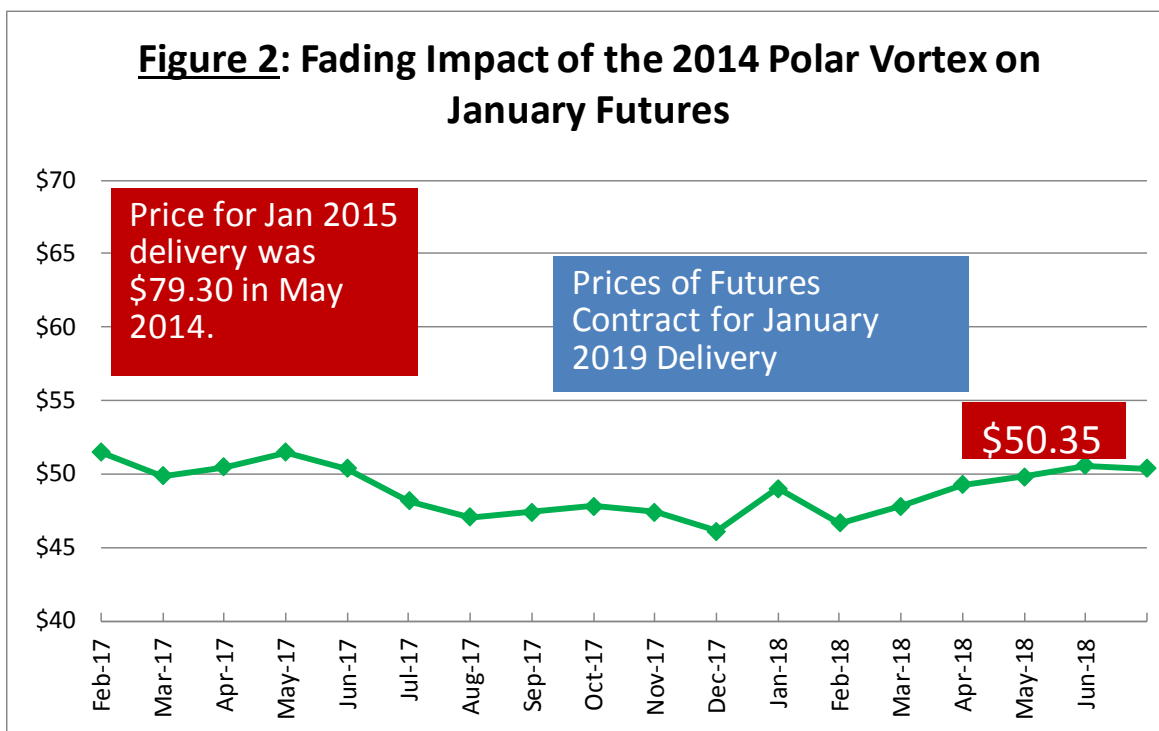


¹ See PJM Western Hub Peak Calendar-Month Real-Time LMP Swap Futures; CME Group.

In Figure 1 above, the **dashed purple line** shows the trading values for the “price strip” from one year ago (July 19, 2017). Price expectations for summer months are above last year’s levels. Near-term investor expectations of future electricity prices are very similar to last month (**red** and **blue** lines). The futures price for January 2019 has increased little since last month (see black arrow). As can be seen in Figure 1, the trend of January (winter) prices exceeding July (summer) prices continues.

Price expectations during the “shoulder months” are above where they were a year ago. The **green arrows** (see Figure 1 above) point to the “shoulder months” of October 2018 and April 2019. 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 -- and the February 2015 cold snap -- as they form expectations about the 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 seem to be moderating and have returned to pre-Polar Vortex levels.² The most recent price for January 2019 delivery is \$50.35 – a small decrease from the previous month.



Behind these price movements lie the extraordinary demands for electricity during January 2014 when eight of the 10 highest winter demands for electricity ever recorded in the PJM region occurred. PJM set a new, all-time winter peak demand during the evening of

² The Federal Energy Regulatory Commission held a hearing about the January 2014 cold snap. The FERC Staff presentation can be found at this link: <http://ferc.gov/legal/staff-reports/2014/04-01-14.pdf>.

January 7, 2014.³ 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.⁴

Progress made by PJM in managing extreme winter peak demand was demonstrated during the most recent January 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 (Figure 5) 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.”⁵ Futures markets registered a brief uptick for the winter months that has since abated (see Figure 2 above).



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 remain flat in 2018 nationwide and a 2.7 percent increase is projected in 2019.⁶ Factors other than generation costs play a role, including the need for continued investment in transmission and distribution infrastructure.

On March 7, 2018, 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, 2018. As a result of a

³ PJM’s previous, all-time winter peak demand was 136,675 MW, on February 5, 2007. PJM GRID MEETS MONTH-LONG CHALLENGES OF COLD JANUARY; January 31, 2014; <http://pjm.com/~media/about-pjm/newsroom/2014-releases/20140131-pjm-grid-meets-month-long-challenges.ashx>.

⁴ 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>.

⁵ <http://www.pjm.com/~media/library/reports-notice/special-reports/2018/20180123-testimony-andrew-ott-to-us-senate.ashx>.

⁶ *July 2018 Short-Term Energy Outlook (STEO)*; Table 7c; <http://205.254.135.24/forecasts/steo/>.

competitive auction overseen by the Commission, on average, the rate for SOS (which consists of the generation and transmission price) for a residential SOS customer will decrease by about \$2.74 per month for the average user of 644 kWh (kilowatt hour) per month. The residential SOS customer's rate during the summer will decrease from 7.7 cents per kWh to 7.2 cents per kWh, while the winter rate will decrease from 8.2 cents per kWh to 7.9 cents per kWh. On average, the rate for small commercial SOS customers will decrease about \$5.59 per month for the average user of 1,763 kWh per month. Overall, residential customers will be subject to an average SOS rate decrease of 5.3 percent, while small commercial SOS customers will be subject to an average rate decrease of 4.3 percent.⁷

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 June 14th *El Niño* watch indicates that ENSO-neutral conditions are favored through Northern Hemisphere summer 2018, with the chance for *El Niño* increasing to about 65% during fall, and to about 70% during winter 2018-19.⁸ NOAA notes that, with ENSO-neutral conditions continuing at present, above-normal temperatures are expected in the mid-Atlantic region through the August-September-October period.⁹ The possibility of *El Niño* conditions developing means that greater-than-normal precipitation next winter is more likely.

Heating-degree days measure the demand for heating during the winter. EIA reports that heating degree days in our region are projected to be about slightly lower in 2019 than in 2018. Projected heating degree days for 2019 are one percent above the ten-year average.¹⁰

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 two percent fewer in the third quarter of 2018 compared to the ten-year average. The projection for summer 2019 is 4.7 percent lower than 2018.¹¹ The long-term warming trend continues.¹²

⁷ Formal Case No. 1017; Order No. 19290; March 7, 2018.

⁸ http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensodisc.html. "ENSO" means *El Niño Southern Oscillation*; "ENSO-neutral" means that neither *El Niño* nor *La Niña* conditions are present.

⁹ <http://www.cpc.ncep.noaa.gov/products/predictions/90day/fxus05.html>.

¹⁰ STEO, Table 9c.

¹¹ STEO; Table 9c.

¹² NOAA National Climatic Data Center; Contiguous U.S. Temperature 1896 – 2016; https://www.ncdc.noaa.gov/cag/time-series/us/110/0/tavg/1/2/1895-2017?trend=true&trend_base=100&firsttrendyear=1895&lasttrendyear=2017.

Economic Growth and Electricity Consumption

The outlook for economic activity in 2018 remains one of moderate growth. Real (inflation-adjusted) gross domestic product (GDP) is expected to increase and to continue bringing down the unemployment rate gradually. Real GDP grew by 2.3 percent in 2017 and is projected to grow by three percent in 2018 and by 2.6 percent in 2019.¹³ Economic growth is unlikely to affect electricity price trends unless it is sustained above three percent.

EIA forecasts that residential electricity sales (measured in kWh) will increase by 4.6 percent in 2018, followed by a one percent decrease in 2019. Nationwide electricity sales for all sectors will increase by 2.2 percent in 2018 with slight decrease projected in 2019.¹⁴

Fuel Prices

In recent years, the cost of fuels for electricity generation has been restrained, with the exception of 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. *The cost of natural gas for generation is projected to remain below the \$4 level in 2018 and 2019.*¹⁵

Petroleum

Rising global crude oil production has halted the rise in Brent market prices for the moment.¹⁶ North Sea Brent crude averaged \$74 per barrel in June, a decrease of three dollars from the May average. Brent crude is forecast to average \$73 per barrel in the second half of 2018 and \$69 in 2019 compared with an average of \$54 per barrel in 2017.¹⁷

Retail gasoline averaged \$2.89 per gallon in June, a drop of one cent from May. EIA expects retail gasoline average to decline to \$2.83 in September and average \$2.77 for all of 2019.¹⁸

U.S. shale oil producers continue to raise their production, acting as a countervailing force to OPEC. EIA estimates that U.S. crude oil production averaged 10.9 million barrels per day (b/d) in June, an increase of 100,000 b/d from May. EIA reports that domestic crude oil production averaged 9.4 million b/d in 2017 and projects 10.8 million b/d in 2018 – up from 8.9 million b/d in 2016 and surpassing the 1970 record of 9.6 million b/d. EIA forecasts that 2019 crude oil production will average 11.8 million b/d.¹⁹ The latest *Monthly Drilling Productivity*

¹³ STEO; Table 1.

¹⁴ STEO; Table 7b.

¹⁵ STEO, Table 7a.

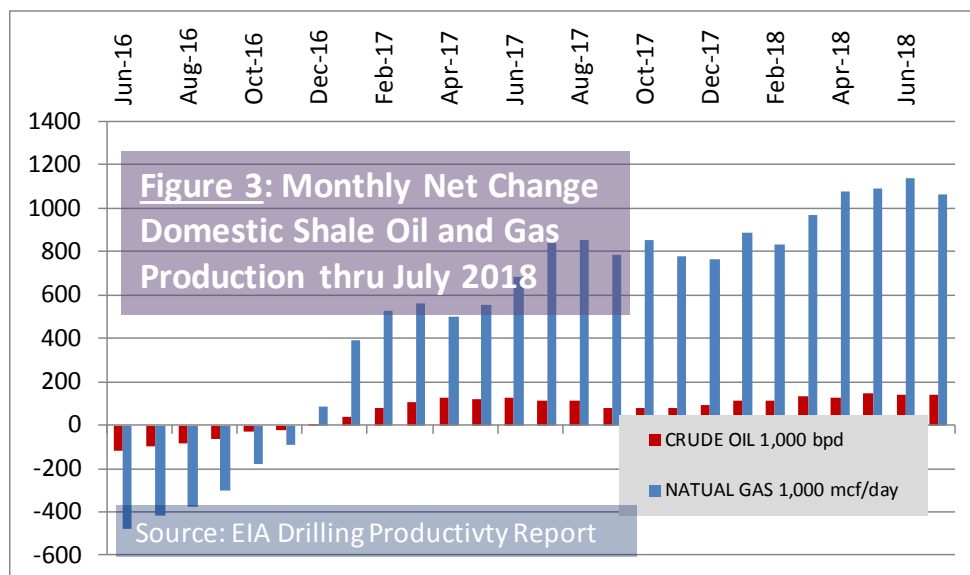
¹⁶ “Oil Prices Decline, Weighed Down by OPEC”, Russia Output,” *Wall Street Journal*; July 31, 2018.

¹⁷ STEO, page 1. The “North Sea Brent Crude” is the key contract for setting the price of crude oil in international markets.

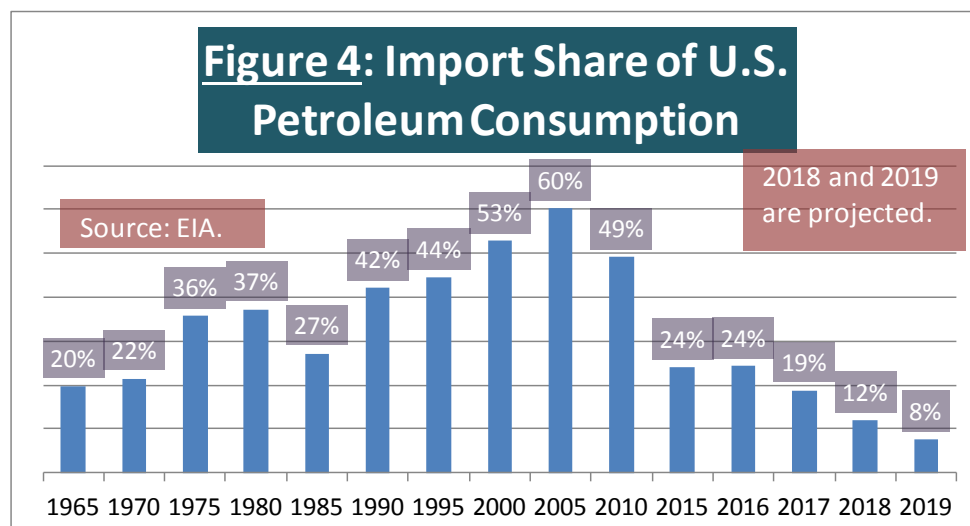
¹⁸ STEO, page 1.

¹⁹ STEO, page 1 and Table 4a.

Report from the EIA shows oil and natural gas output increasing in the U.S. shale-producing basins surveyed (see Figure 3 below).²⁰



Net liquid fuel imports to the United States peaked at over 60 percent of domestic supply in 2005 and then fell to 19 percent in 2017 – the lowest level since 1970; this represents a major shift in the structure of world oil markets.²¹ EIA projects the import share to fall even further -- to 12 percent in 2018 and eight percent in 2019.²² See Figure 4 below.



Only time will tell whether the recent increase in output will moderate the price of crude oil. The abandonment of the Joint Comprehensive Plan of Action by the United States means

²⁰ See EIA's monthly *Drilling Productivity Report*; <http://www.eia.gov/petroleum/drilling/pdf/dpr-full.pdf>.

²¹ STEO; Table 4a. EIA Monthly Energy Report; July 2018; Table 3.1;

<http://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf>.

²² STEO, Table 4a.

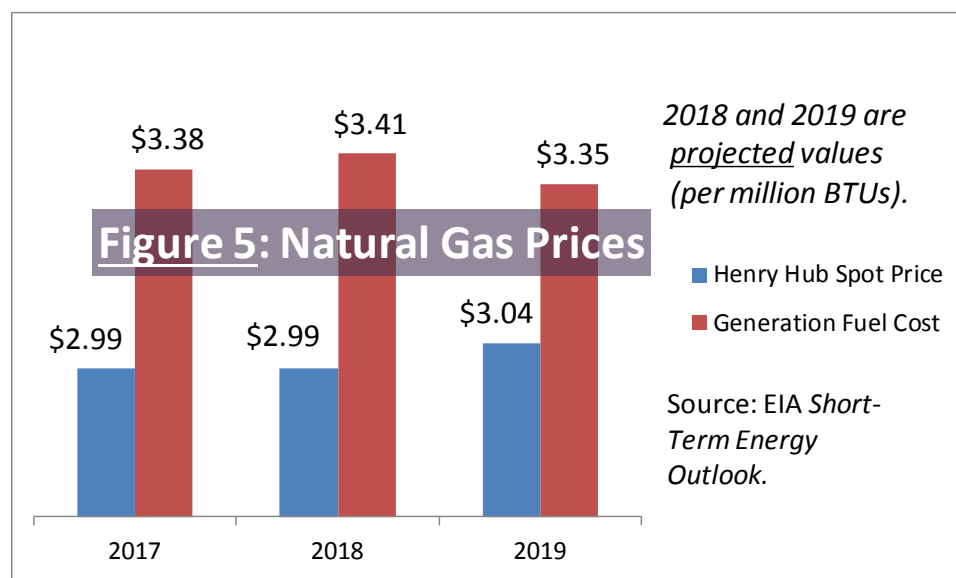
that Iranian output may decline further, creating upward pressure on the price of crude oil. Oil price increases will continue to be moderated by continuing growth in domestic production.²³

Petroleum fuels made up 0.2 percent of the PJM fuel mix during the twelve months ending in May 2018.²⁴ (See Figure 6 on page 10 below.)

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).²⁵ Recently, the spot price has recovered from the lows reached in early 2012 when it briefly touched \$2 per MMBtu.

Natural gas prices in the spot market result from the interaction of trends in domestic production, growing gas-fired generation, and expected winter heating needs; growing natural gas exports may impact prices in the future. Record domestic production offset rising exports and above-average usage. EIA expects Henry Hub spot prices to average \$2.99/MMBtu for all of 2018 and \$3.04 in 2019.²⁶



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 projects that the cost of natural gas for power generation will increase by one percent in 2018 followed by a decline of two percent in 2019.²⁷

²³ STEO, Tables 3b and 3c; page 4.

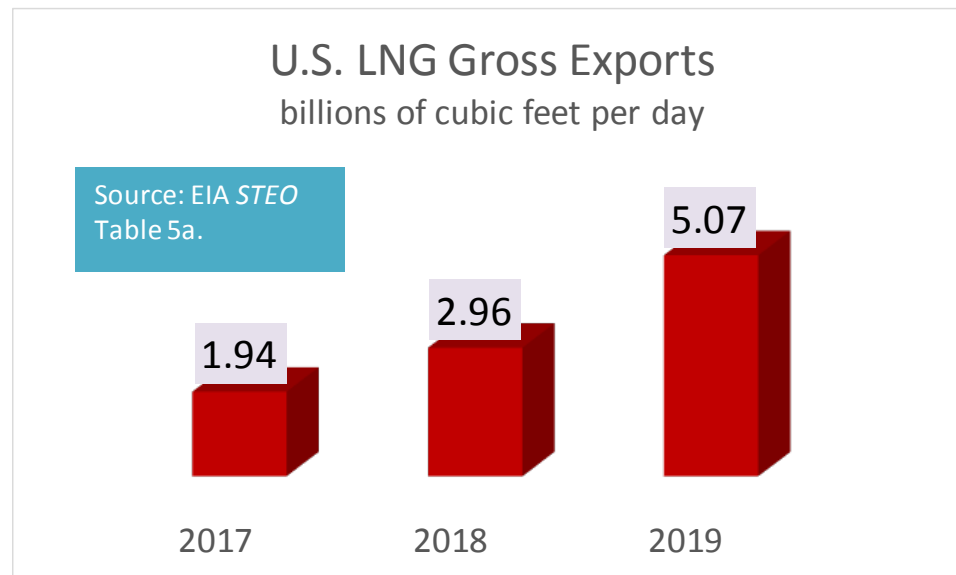
²⁴ See PJM System Mix by Fuel; <https://gats.pjm-eis.com/gats2/PublicReports/PJMSystemMix/Filter>.

²⁵ EIA; 2011 Annual Energy Outlook; page 115.

²⁶ STEO; page 2.

²⁷ STEO; Table 7a.

U.S. liquefied natural gas (LNG) export capacity is growing. Sabine Pass LNG (Texas) began export operations in February 2016; and commercial exports from Dominion Energy’s Cove Point LNG in Maryland have begun.²⁸ EIA reports that Cove Point utilized 94 percent of its capacity in May. Natural gas liquefaction capacity from all projects currently under construction is projected to expand rapidly. EIA expects exports to grow faster than domestic production, possibly putting modest upward pressure on natural-gas prices; EIA projects 1.94 billion cubic feet per day of LNG exports in 2017, 2.96 in 2018, and 5.07 in 2019.²⁹ *EIA says it expects the that the United States will have total liquefaction capacity of 9.6 Bcf by the end of 2020.*³⁰



Regional variations in natural-gas prices are also a factor that influences 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.³¹

The impact of inexpensive natural gas can be seen easily in PJM price trends. “Figure 7” (below) shows the monthly and annual average load-weighted LMP for 1999 through 2017.³² Annual averages LMP has declined since natural-gas prices peaked in 2008. January price spikes have not recurred since 2015, despite extreme winter cold in 2018.

²⁸ U.S. Cove Point LNG terminal begins commercial LNG deliveries; *Reuters*; April 16, 2018. <https://www.reuters.com/article/us-dominion-covepoint-lng/u-s-cove-point-lng-terminal-begins-commercial-lng-deliveries-data-idUSKBN1HN1JX>.

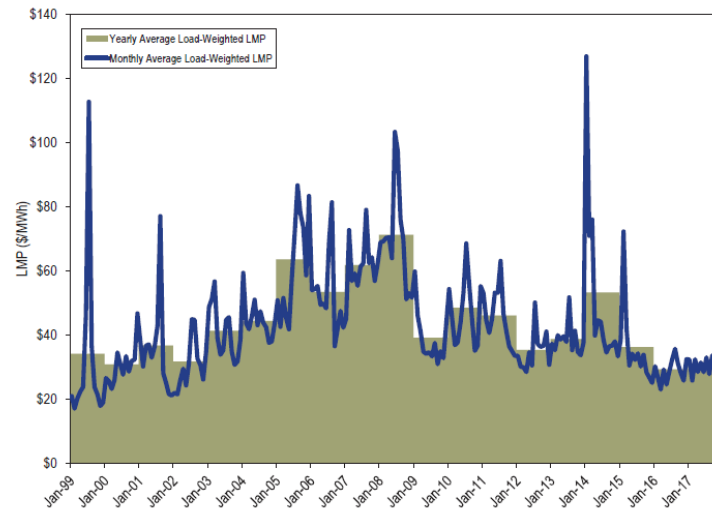
²⁹ See Table 5a and <https://www.eia.gov/naturalgas/weekly/#jm-trends>. “Bcf/d” is billion cubic feet per day.

³⁰ STEO at pae 11.

³¹ “Power Plants Bloom Even as Electricity Prices Wilt,” *Wall Street Journal*, eцемber 28, 2017.

³² Independent Market Monitor; *2017 State of the Market Report for PJM Volume One*; page 24.

Figure 7 PJM real-time, monthly and annual, load-weighted, average LMP: 1999 through 2017



Natural gas accounted for 28.3 percent of the PJM fuel mix during the twelve months ending in May 2018, a significant increase from 16.4 percent in June 2014.³³ (See Figure 6 below.)

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 774 million short tons (MMst) in 2017, six percent higher than in 2016. EIA expects that coal production will be flat in 2018 followed by a 3.5 percent decrease in 2019.³⁴

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 \$2.08 per MMBtu in 2017 and forecasts \$2.10 per MMBtu in 2018 and \$2.09 in 2019.³⁵

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.³⁶ Coal represented 31.1 percent of the PJM fuel mix during the twelve months ending in May 2018, down from a recent high of 45.2 percent in June 2014.³⁷ As noted above,

³³ See PJM.

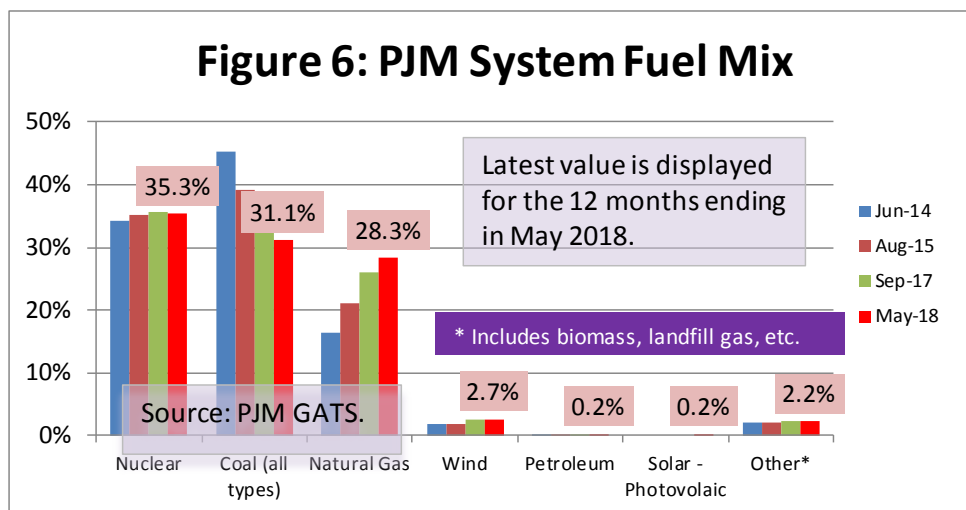
³⁴ STEO; Table 6. Historical data can be found at http://www.eia.gov/totalenergy/data/annual/pdf/sec7_9.pdf. See also The Brattle Group; Coal Plant Retirements: Feedback Effects on Wholesale Electricity Prices; November 2013; http://www.brattle.com/system/news/pdfs/000/000/584/original/Coal_Plant_Retirements_-_Feedback_Effects_on_Wholesale_Electricity_Prices.pdf.

³⁵ STEO; Table 7a.

³⁶ 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.

³⁷ See PJM.

the natural gas share of PJM generation is rising, in line with national trends. Coal remains just behind nuclear as a share of the PJM fuel mix. (See Figure 6 below.)

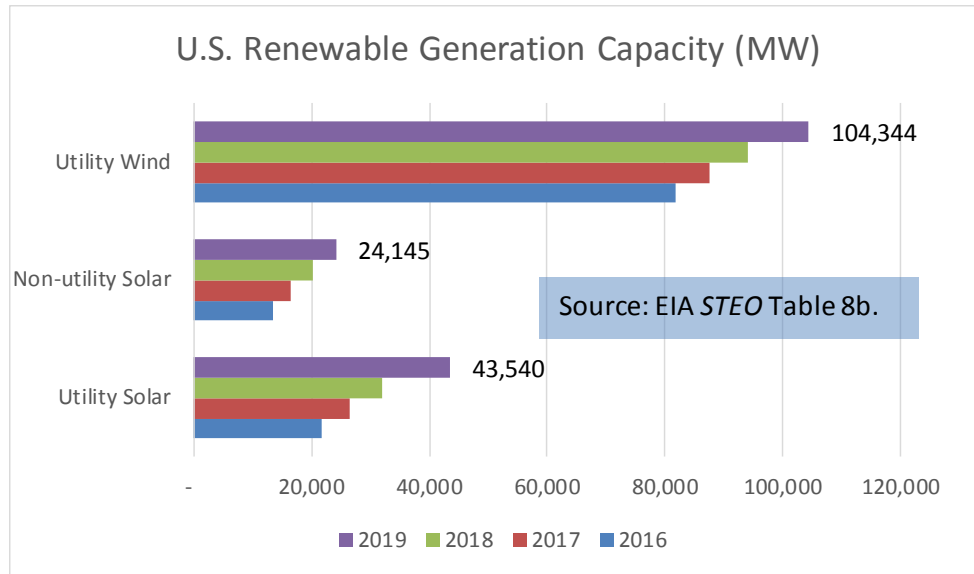


Across the United States, coal generation plants are being retired and new natural gas-fired generation plants are being built, mirroring trends in the PJM region. EIA projects that the natural gas share of electricity generation nationwide will rise from 24 percent in 2010 to 32 percent in 2017, rising to 35 percent in 2019. Coal's share of generation averaged 30 percent in 2017, down from 45 percent in 2010.³⁸ EIA's forecasted generation shares for coal and natural gas are very sensitive to the natural-gas price forecast.

Renewables

EIA reports that solar capacity is growing rapidly nationwide, with utility-scale solar expected to grow by 100 percent from 2016 to 2019. At that rate, utility-scale solar will be more than one percent of electricity generation capacity in 2018. Wind capacity is growing rapidly across the country as well, increasing by 27 percent during 2016-2019.³⁹

³⁸ STEO;page 14.
³⁹ STEO; Table 8b.



Nationwide, EIA projects that generation of electricity from nonhydropower renewables will provide more than 10 percent in 2018 and reach 11 percent in 2019.⁴⁰ Wind may generate more electricity than hydropower source for the first time in 2019. Generation from utility-scale solar is projected to rise by 44 percent between 2017 and 2019.⁴¹

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 8-7” below.⁴²

Table 8-7 Solar renewable standards by percent of electric load for PJM jurisdictions: 2018 to 2029

Jurisdiction with RPS	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Delaware	1.75%	2.00%	2.25%	2.50%	2.75%	3.00%	3.25%	3.50%	3.50%	3.50%	3.50%	3.50%
Illinois	0.78%	0.87%	0.96%	1.05%	1.14%	1.23%	1.32%	1.41%	1.50%	1.50%	1.50%	1.50%
Maryland	1.50%	1.95%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Michigan	No Minimum Solar Requirement											
New Jersey	3.20%	3.29%	3.38%	3.47%	3.56%	3.65%	3.74%	3.83%	3.92%	4.01%	4.10%	4.10%
North Carolina	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%
Ohio	0.18%	0.22%	0.26%	0.30%	0.34%	0.38%	0.42%	0.46%	0.50%	0.50%	0.50%	0.50%
Pennsylvania	0.34%	0.39%	0.44%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Washington, D.C.	1.15%	1.35%	1.58%	1.85%	2.18%	2.50%	2.60%	2.85%	3.15%	3.45%	3.75%	4.10%
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											

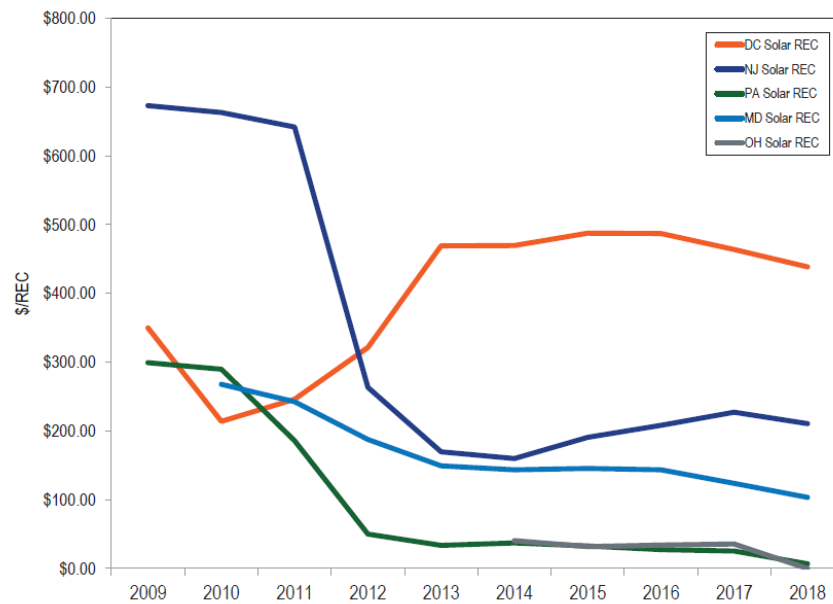
⁴⁰ STEO at page 2.

⁴¹ STEO at Table 8b.

⁴² Independent Market Monitor; *Q1 2018 State of the Market Report for PJM* (May 10, 2018); page 341.

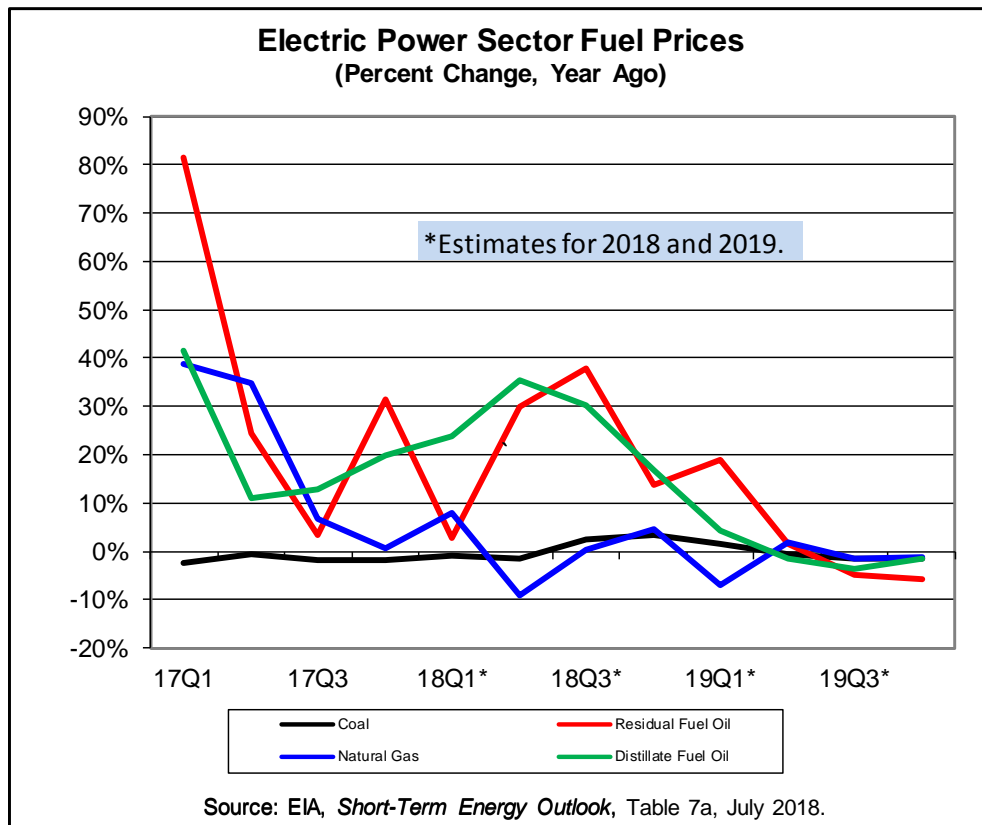
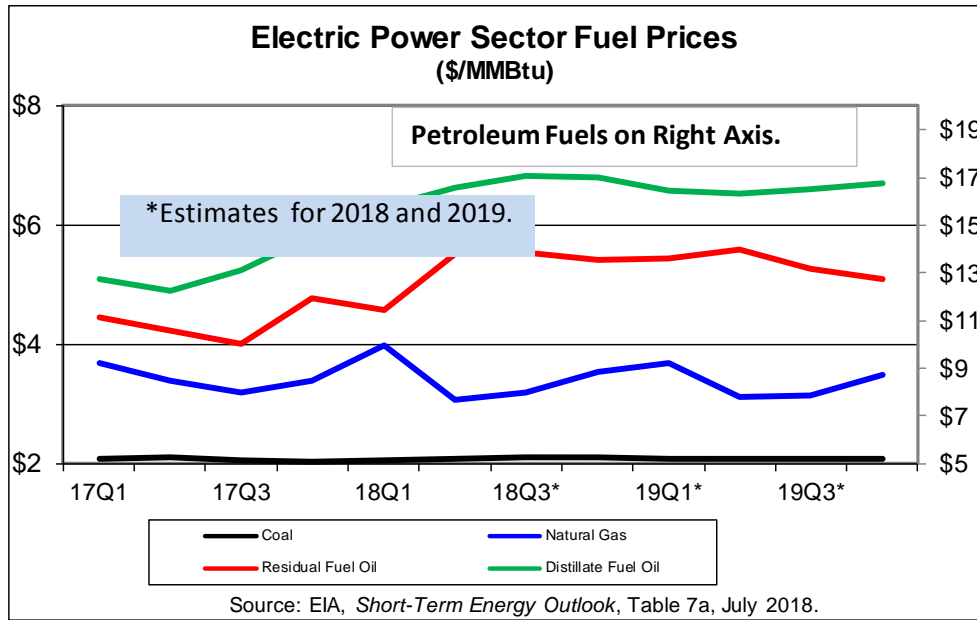
Prices for Solar Renewable Energy Credits (“SRECs”) are much higher in the District of Columbia than in neighboring jurisdictions, as can be seen in “Figure 8-7” below.⁴³

Figure 8-7 Average SREC price by jurisdiction: January 2009 through March 2018



⁴³

Independent Market Monitor; *Q1 2018 State of the Market Report for PJM* (May 10, 2018); page 342.



Wholesale Electric Market Assessment Information

Price of Electricity Futures Contracts for June 19 and July 10, 2018

Twelve Month NYMEX Strip Components⁴⁴

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

	Jun-18	Jul-18
Aug-18	\$ 37.20	\$ 37.90
Sep-18	\$ 35.25	\$ 35.70
Oct-18	\$ 33.95	\$ 34.25
Nov-18	\$ 33.60	\$ 33.85
Dec-18	\$ 36.85	\$ 36.85
Jan-19	\$ 50.55	\$ 50.35
Feb-19	\$ 46.20	\$ 46.05
Mar-19	\$ 36.50	\$ 36.10
Apr-19	\$ 32.50	\$ 32.60
May-19	\$ 32.65	\$ 32.80
Jun-19	\$ 32.25	\$ 32.60
Jul-19	\$ 38.05	\$ 38.80
Aug-19	\$ 34.85	\$ 35.75

PEPCO DC Zone Locational Marginal Price (Hourly Integrated LMP for the hour ending 1600)⁴⁵

July 09, 2018: **\$112.80**

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>.

⁴⁵ <http://oasis.pjm.com/system.html>.