

Electricity Price Outlook for June 2016

By John Howley
Senior Economist

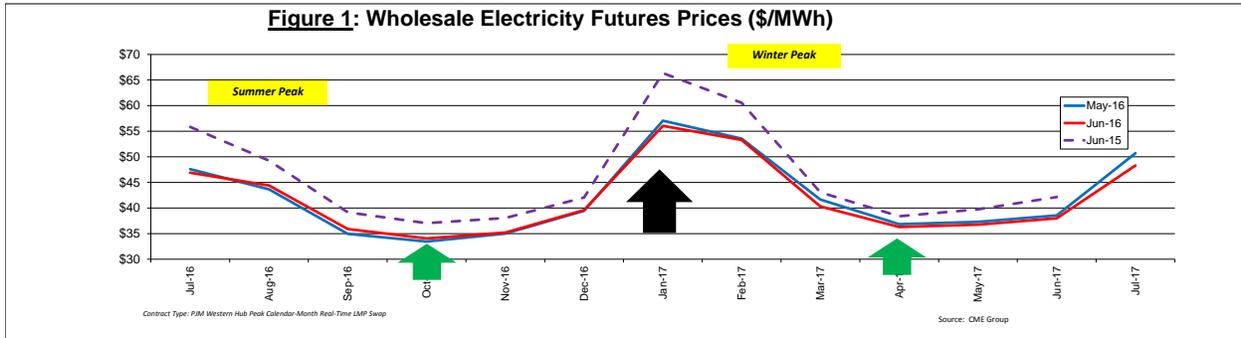
Office of Technical and Regulatory Analysis District of Columbia Public Service Commission

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.

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 July 2017 as settled on May 12, 2016 (blue line), and on June 7, 2016 (red line).

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.



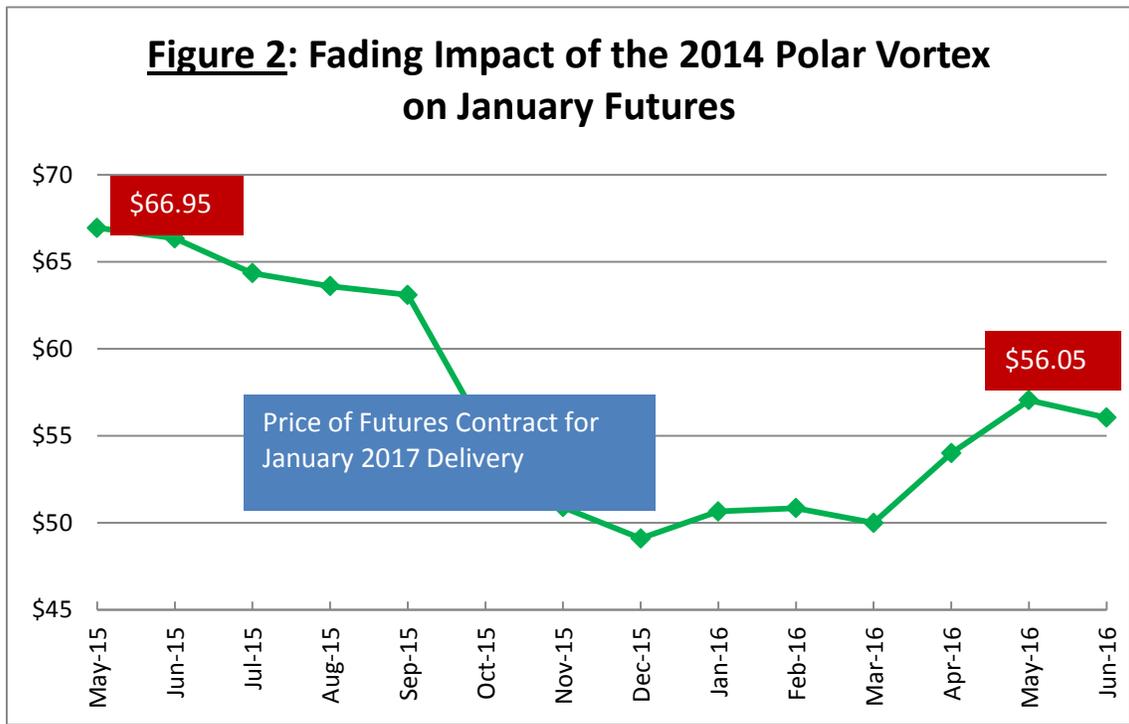
In Figure 1 above, the dashed purple line shows the trading values for the “price strip” from one year ago (June 9, 2015).¹ In other words, investor expectations of future electricity prices during all months of the coming year have changed significantly over the past year. On June 7, 2016 (red line), the market price for future electricity during January 2017 increased compared to the previous month, as indicated by the black arrow. Future contract prices are below the dashed purple line for all of the months of the year.

Price expectations during the “shoulder months” are below where they were a year ago. The green arrows (see Figure 1 on previous page) point to the “shoulder months” of October

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

2016 and April 2017. During these months, temperatures are moderate and demand can be met from inexpensive 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 2015, the price of an MWh for delivery in January 2017 closed at \$66.95. 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 2017 delivery is \$56.05 – a decrease of 1.8% from the previous month.



Behind these price movements are 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 of 141,312 megawatts during the evening of January 7, 2014.³ PJM reports that these January 2014 cold-weather events

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>.

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>.

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

On February 20, 2015, PJM set another new peak for winter demand -- 143,826 MW -- when PJM’s “forced outage” rate peaked at 13.3%. It is notable that this reduced rate of forced outage is well below the “forced outage” rate of 22.2% experienced by PJM generators on January 7, 2014.⁵ This shows that PJM has learned some lessons since the “Polar Vortex.” Investor anxiety about PJM’s capacity to meet extreme demand in the future seems to have largely abated.

Retail Residential Electricity Prices

Nationwide, the U.S. Energy Information Administration’s (EIA) *Short-Term Energy Outlook (STEO)* reports that retail residential electricity prices are not expected to increase in 2016 and a 2.5% increase is projected in 2017.⁶ Factors other than generation costs play a role, including the need for continued investment in transmission and distribution infrastructure.

On February 26, 2016, 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 will go into effect on June 1, 2016. As a result of a competitive auction overseen by the Commission, the price to compare (generation plus transmission) for a residential standard SOS customer will decrease on average by about \$3.46 per month for the average user of 640 kWh/month. The residential standard SOS customer’s summer price to compare rate will decrease from 8.7 cents per kWh to 8.0 cents per kWh while their winter rate will decrease from 8.8 cents per kWh to 8.3 cents per kWh. On average, the price to compare for small commercial SOS customers will decrease about \$18.98 per month for the average user of 2,045 kWh/month. Overall, residential standard SOS customers will face an average bill decrease of 4.1%, while small commercial customers will face an average bill decrease of 7.0%.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

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 *PJM weathered 2015 winter demand better than 2014: staff*; Platts; 20 April 2015; <http://www.platts.com/latest-news/electric-power/houston/pjm-weathered-2015-winter-demand-better-than-21320423>.

⁶ *June 2016 Short-Term Energy Outlook (STEO)*; Table 7c; <http://205.254.135.24/forecasts/steo/>.

⁷ Formal Case No. 1017; Order No. 18111; February 26, 2016.

three-month temperature outlook. The National Oceanic and Atmospheric Administration's (NOAA's) June 9th El Niño watch indicates that ENSO-neutral conditions are present and La Niña is favored to develop during the Northern Hemisphere summer 2016, with about a 75% chance of La Niña during the fall and winter 2016-17.⁸

NOAA notes that *El Niño* conditions have ceased and there is an increased probability of above-normal mean temperatures in the mid-Atlantic region through the July-August-September period.⁹ The long-term warming trend continues.¹⁰

Cooling-degree days measure the demand for air conditioning. EIA projects cooling-degree days in the Census region that includes the District of Columbia will be 8% lower in 2016 than in 2015. However, the projection for summer 2016 remains slightly above the 10-year average.¹¹

Economic Growth and Electricity Consumption

The outlook for economic activity in 2016 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. The EIA reports a real GDP growth rate of 2.4% for 2015. Real GDP is projected to grow by 1.7% in 2016 and 3.0% in 2017.¹² Slow economic growth depresses the growth of electricity sales and moderates prices of generation fuels.

EIA forecasts that residential electricity sales (measured in kWh) during 2016 will decrease by 1.6% and rebound by 2% in 2017. Nationwide electricity sales for all sectors will increase by 1.7% in 2017.¹³

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. Natural gas prices have returned to 2012 lows, with little increase expected in 2016 and 2017.

⁸ *La Niña* conditions imply colder-than-normal temperatures and more frequent hurricanes for the Middle Atlantic states. http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.html.

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

¹⁰ NOAA National Climatic Data Center; Contiguous U.S. Temperature 1896 – 2013; <http://www.ncdc.noaa.gov/temp-and-precip/time-series/index.php?parameter=tmp&month=4&year=2012&filter=12&state=110&div=0>.

¹¹ *STEO*; Table 9c.

¹² *STEO*; Table 1.

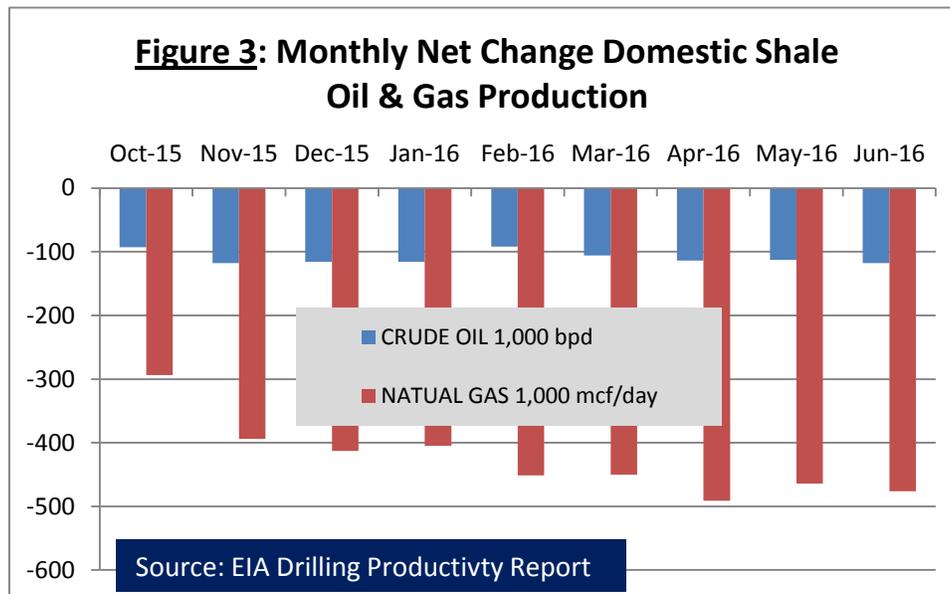
¹³ *STEO*; Table 7b.

Petroleum

North Sea Brent crude spot prices averaged \$47 per barrel in May, an increase of \$5 from the April average. Brent crude is forecast to average \$43 per barrel in 2016 and \$52 per barrel in 2017.¹⁴

Slowing demand projections have combined with a shift in policy by Saudi Arabia, the world's largest petroleum exporter, to drive crude prices lower. As the oil price has dropped, high-cost domestic oil and gas production has declined. EIA projects that domestic crude oil production will decrease from 9.2 million barrels per day (b/d) in the first quarter of 2016 to an average of 8.1 million b/d in the third quarter of 2017. This is well below the monthly production peak of 9.7 million mbd in April 2015.¹⁵

The future trend of domestic crude oil output is uncertain; the latest *Monthly Drilling Report* from the EIA shows oil and natural gas output falling in the U.S. shale-producing basins surveyed (see Figure 3).¹⁶

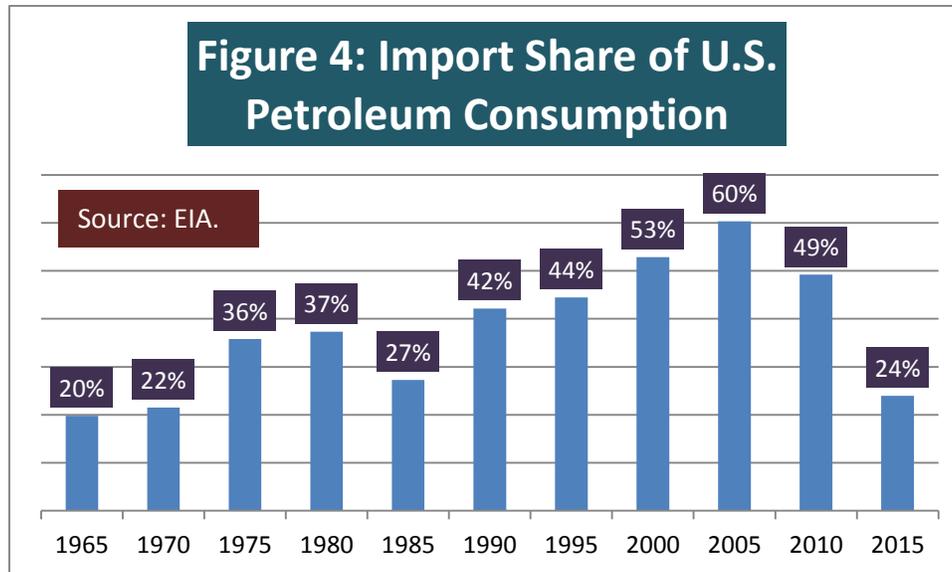


Net liquid fuel imports to the United States peaked at over 60% of domestic supply in 2005 and then fell to 24% in 2015 – the lowest level since 1970; this represents a major shift in the structure of world oil markets.¹⁷ See Figure 4 below.

¹⁴ STEO, page 1. The “Brent Crude” is the key contract for setting the price of crude oil in international markets.

¹⁵ STEO, page 6.

¹⁶ See EIA’s monthly *Drilling Productivity Report*; <http://www.eia.gov/petroleum/drilling/pdf/dpr-full.pdf>.



EIA expects that the retail price of gasoline during the 2016 summer driving season (April to September) will average \$2.27, down 36 cents from last summer. EIA forecasts that gasoline prices will average \$2.13 for all of 2016 and \$2.27 in 2017.¹⁸

The future trend of prices remains uncertain, because of slowing Asian demand and instability in the Middle East and North Africa. EIA reports that unplanned outages in crude production, affecting non-OPEC as well as OPEC countries, averaged 3.7 million barrels per day (mpd) in May--a significant increase from the previous month. Most of the increase was caused by wildfires in Canada that disrupted production in the Alberta tar sands. EIA reports that Iranian oil production is increasing in the wake of the international agreement to lift economic sanctions on that country.¹⁹

Petroleum fuels made up 0.2% of the PJM fuel mix during the twelve months ending in April 2016.²⁰ (See Figure 4 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).²¹ Recently, the spot price has returned to the lows last seen in early 2012 when it briefly touched \$2 per MMBtu.

¹⁷ EIA *Monthly Energy Report*; June 2016; Table 3.1; page 49; <http://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf>.

¹⁸ *STEO*; pages 1 and 7.

¹⁹ *STEO*, page 3.

²⁰ See PJM System Mix by Fuel; <https://gats.pjm-eis.com/gats2/PublicReports/PJMSystemMix/Filter>.

²¹ EIA; *2011 Annual Energy Outlook*; page 115.

Natural gas prices in the spot market are expected to remain below \$3/MMBtu (million British thermal units) through December 2016:

The Henry Hub natural gas spot price averaged \$1.92/MMBtu in May, unchanged from the average price in April. Through the 2015-16 winter, prices remained relatively low because of lower demand as a result of warmer-than-normal temperatures, record inventory levels, and production growth. EIA expects prices will gradually rise through the summer, as demand from the electric power sector increases, but forecast prices remain lower than they were last summer. Monthly average Henry Hub spot prices are forecast to remain lower than \$3/MMBtu through the end of 2016. Forecast Henry Hub natural gas prices average \$2.22/MMBtu in 2016 and \$2.96/MMBtu in 2017.²² [Emphasis added.]

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 decline by 14% in 2016 followed by an increase of 29% in 2017.²³

Natural gas accounted for 24.7% of the PJM fuel mix during the twelve months ending in April 2016, an increase from 16.4% in June 2014.²⁴ (See Figure 4 below.) Although natural gas fuels less than one quarter of total generation in PJM, it has a dominating influence on wholesale electricity price in the PJM wholesale market as shown by “Figure 8” below.²⁵

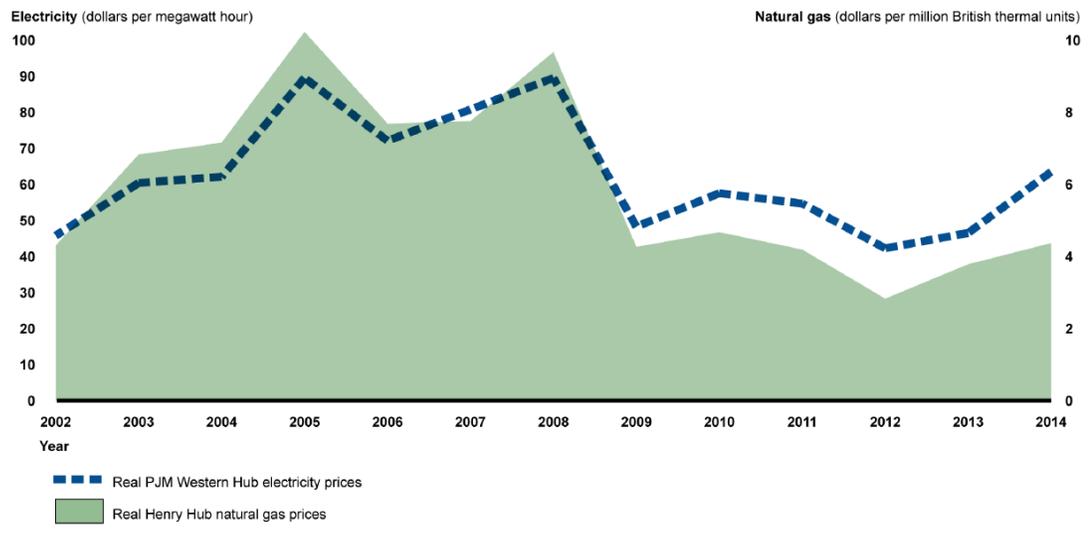
²² STEO; page 9. “Henry Hub” refers to a distribution hub on the natural gas pipeline system in Erath, Louisiana. It is used as the pricing point for natural gas futures contracts traded on the New York Mercantile Exchange.

²³ STEO; Table 7a.

²⁴ See PJM.

²⁵ U.S. Government Accountability Office; *Electricity: Generation Mix has Shifted, and Growth in Consumption has Slowed, Affecting System Operations and Prices*; GAO-15-524; May 2015; page 33; <http://www.gao.gov/assets/680/670545.pdf>.

Figure 8: Real Annual Average Henry Hub Natural Gas Prices and PJM Western Hub Wholesale Electricity Prices, 2002–2014



Source: GAO analysis of SNL Financial and Energy Information Administration data. | GAO-15-524

EIA reports that average, on-peak prices in the PJM day-ahead power market averaged about \$30 per megawatthour (MWh) in February, or 66% lower than average wholesale prices in February 2015.²⁶

Coal

Nationwide, coal consumption in electric power generation has not returned to the peak level of 2007. Coal has been displaced by natural gas, wind and nuclear in electricity generation. EIA reports that coal consumption in the electric power sector is forecast to decline by 10% in 2016 as a result of mild winter weather and competition from natural gas. The full effect of the implementation of the Mercury and Air Toxics Standard by the EPA is expected to be felt in 2016 when more coal plants are retired. However, EIA expects the impact of coal plant retirements to be offset by the impact of higher natural gas prices in 2017, resulting in a 4% rebound in coal consumption for power generation.²⁷

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 \$2.23 per MMBtu in 2015 and forecasts \$2.18 per MMBtu in 2016 and \$2.20 in 2017.²⁸

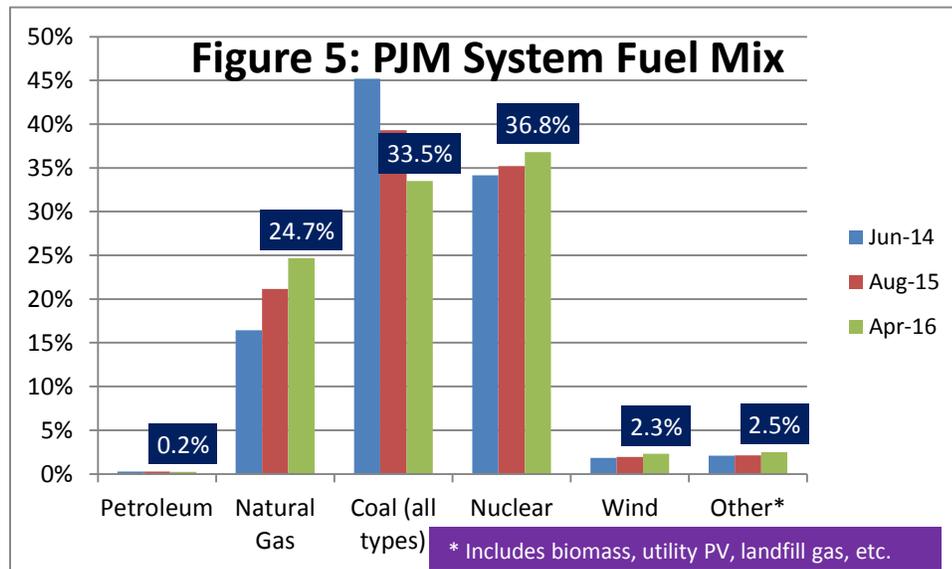
In the PJM wholesale market that serves the District of Columbia, the cost of natural gas is a more important factor than coal in setting the overall level of wholesale market prices for

²⁶ March *STEO*; page 10.

²⁷ *STEO*; pages 10-11. 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.

²⁸ *STEO*; Table 7a.

electricity.²⁹ (See “Figure 8” above.) Coal represented 33.5% of the PJM fuel mix during the twelve months ending in April 2016, down from a recent high of 45.2% in June 2014.³⁰ As noted above, the natural gas share of PJM generation is rising, in line with national trends. Furthermore, coal has slipped behind nuclear as a share of the PJM fuel mix for the first time. (See Figure 4 below.)

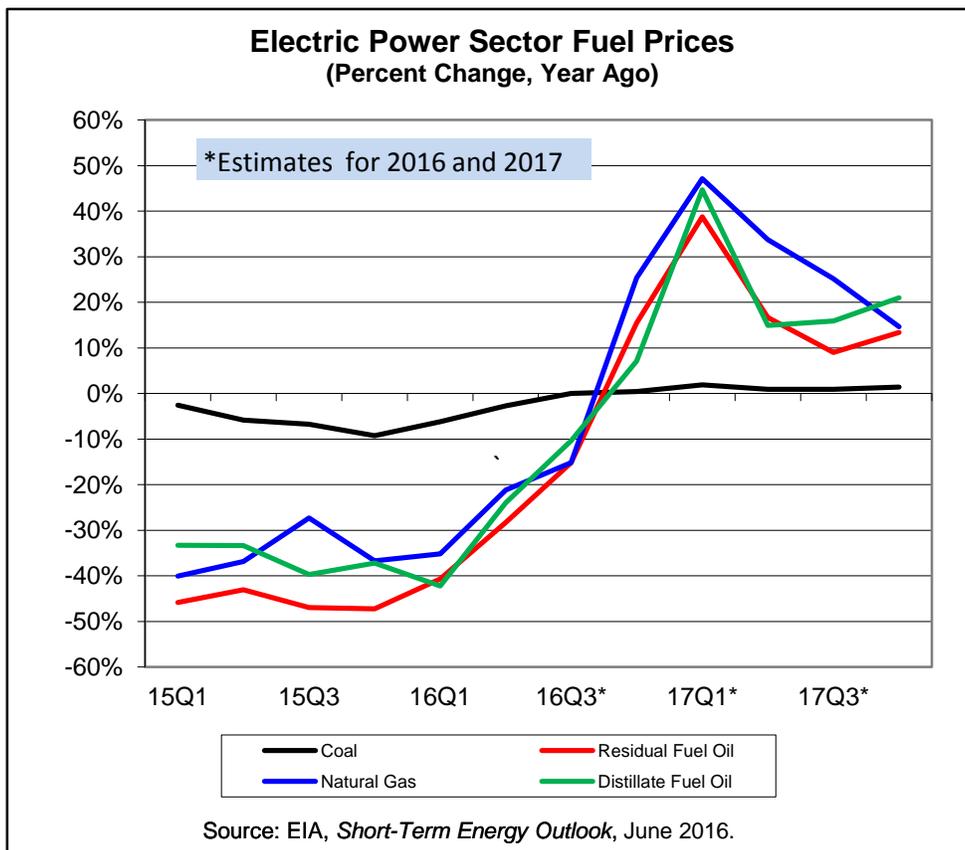
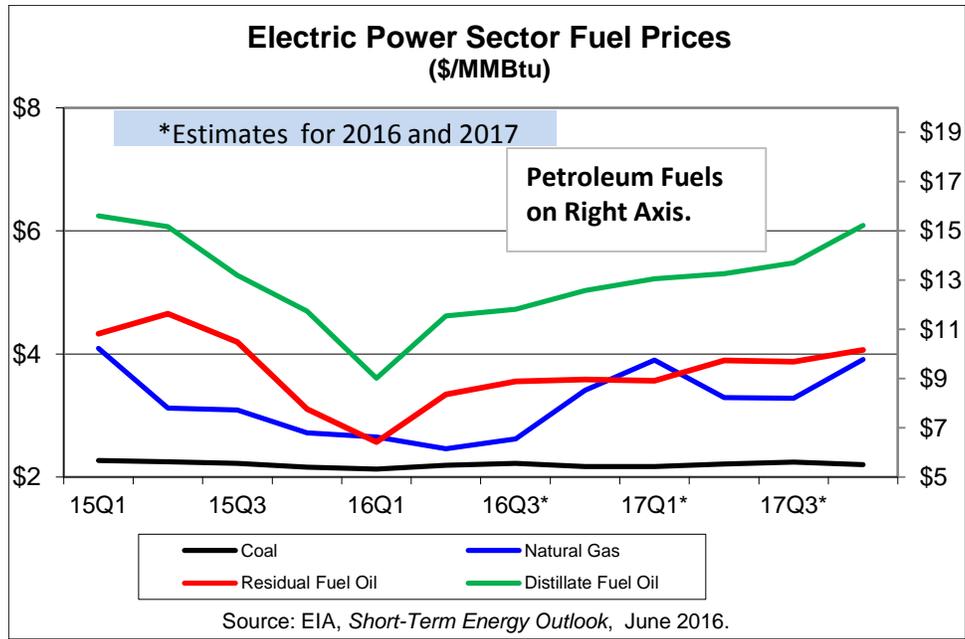


Across the United States, coal generation plants are being retired and new natural gas-fired generation plants are being built, mirroring trends in the PJM region. On an annual basis, EIA projects that the natural gas share (34.4%) of electricity generation nationwide will exceed that of coal (29.9%) in 2016 for the first time.³¹ This represents a dramatic change as illustrated by the fact that as recently as last year, EIA did not project natural gas to surpass coal in electricity generation until after 2040.

²⁹ 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*.

³⁰ See PJM.

³¹ *STEO*; page 10.



Wholesale Electric Market Assessment Information

Price of Electricity Futures Contracts for May 12 and June 9, 2016

Twelve Month NYMEX Strip Components³²

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

| | May-16 | Jun-16 |
|--------|----------|----------|
| Jul-16 | \$ 47.60 | \$ 46.90 |
| Aug-16 | \$ 43.65 | \$ 44.40 |
| Sep-16 | \$ 34.95 | \$ 35.90 |
| Oct-16 | \$ 33.45 | \$ 34.05 |
| Nov-16 | \$ 35.00 | \$ 35.20 |
| Dec-16 | \$ 39.45 | \$ 39.60 |
| Jan-17 | \$ 57.05 | \$ 56.05 |
| Feb-17 | \$ 53.55 | \$ 53.30 |
| Mar-17 | \$ 41.65 | \$ 40.30 |
| Apr-17 | \$ 36.85 | \$ 36.30 |
| May-17 | \$ 37.30 | \$ 36.75 |
| Jun-17 | \$ 38.55 | \$ 38.00 |
| Jul-17 | \$ 50.70 | \$ 48.30 |

PEPCO DC Zone Locational Marginal Price (Hourly Integrated LMP for the hour ending 1600)³³

June 7, 2016: **\$26.90**

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/>

³² <http://www.cmegroup.com/trading/energy/electricity/pjm-western-hub-peak-calendar-month-real-time-lmp.html>.

³³ <http://ftp.pjm.com/pub/account/lmpgen/lmpgpost.html>.