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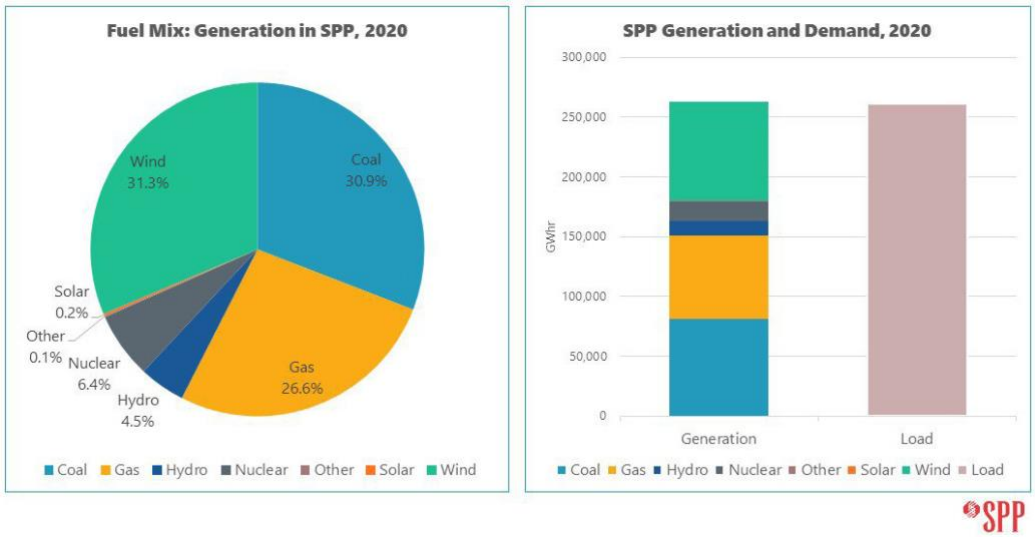
# Bad News for Coal in the Southwest Power Pool

## *Wind, Not Coal Was the No. 1 Fuel Source in 2020*

The Southwest Power Pool (SPP) announced Jan. 26 that wind surpassed coal as its primary fuel source during 2020.

**Figure 1: SPP Generation and Load in 2020**

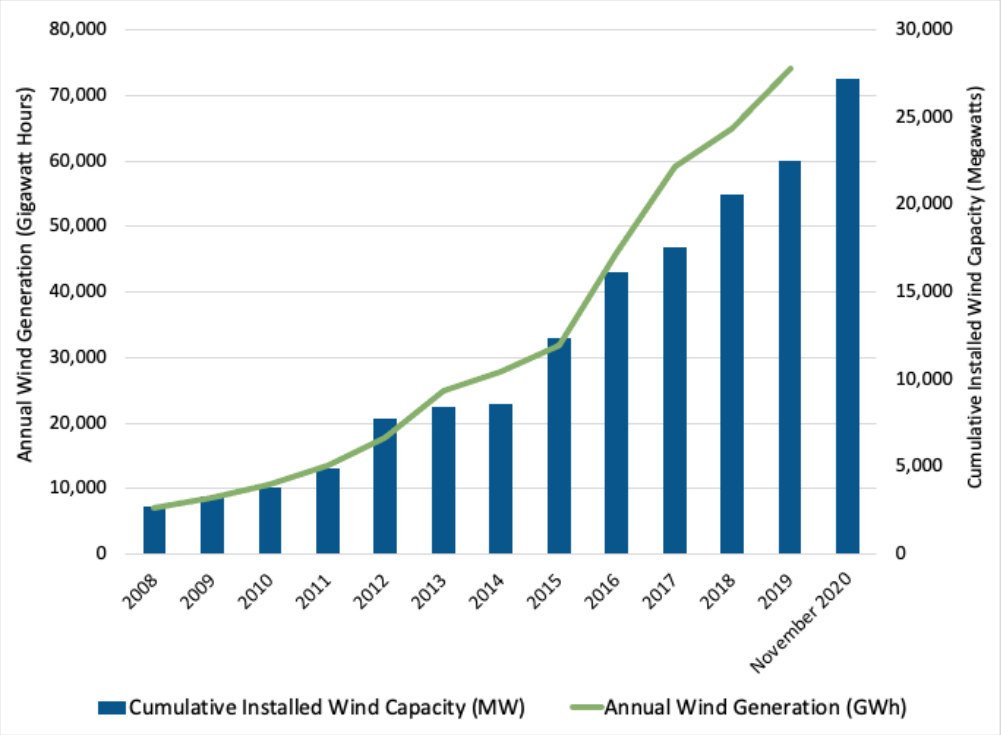



*Source: Southwest Power Pool.*

There are several reasons why this was not surprising and why wind should continue to be the No. 1 fuel source in future years.

Wind capacity and generation in the SPP has grown dramatically since 2007.

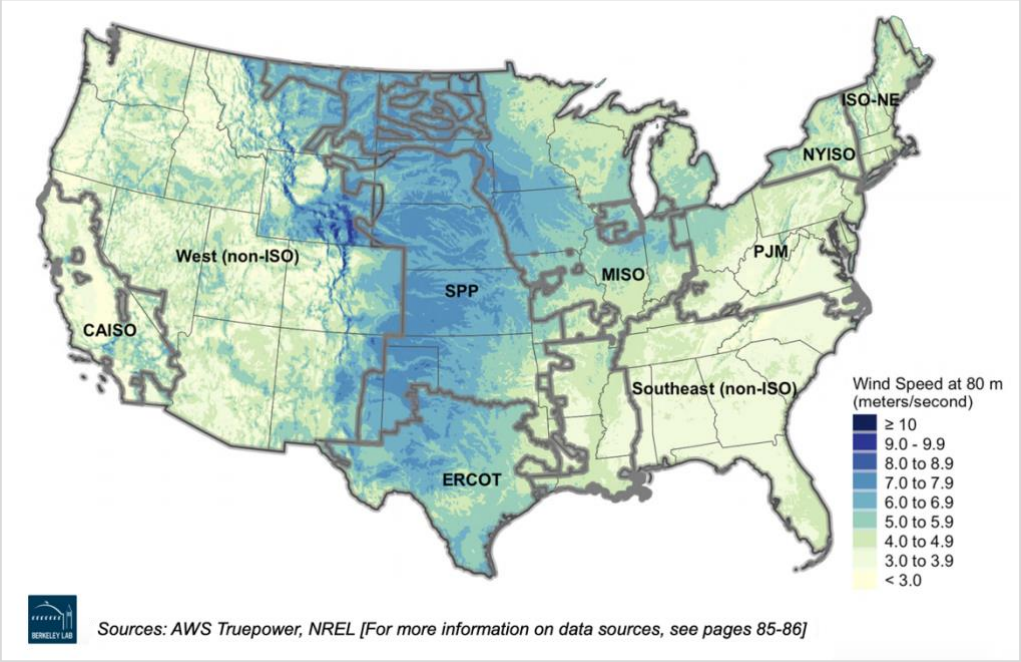
## Figure 2: Increasing SPP Wind Capacity and Generation




*Source: SPP Annual and Monthly State of the Market Reports.*

One of the primary reasons is simple geography. The SPP footprint has a high potential for wind generation given the strong wind patterns in many areas as shown in the following map. (In Figure 3, darker colors indicate higher average wind speeds.)

## Figure 3: SPP Wind Speeds




*Source: Wind Energy Technology Data Update: 2020 Edition, Lawrence Berkeley National Laboratory, p. 6.*

At the same time, the cost of adding new wind capacity in SPP declined sharply (approximately 45 percent) between 2010 and 2019. Turbine design improvements such as larger rotor diameters and higher hub heights also have led to higher capacity factors and better operational performance.[1]

Finally, the amount of the dispatchable installed wind capacity in SPP has increased from just 27 percent of wind nameplate capacity in March 2014 (when SPP began its Integrated Marketplace) to 76 percent at the end of 2019.[2] This has led to wind being on the margin (that is, setting the marginal price) in the SPP real-time market in 17 percent of time intervals in 2019, up from 4.5 percent in 2014.[3,4] This disadvantages coal and gas by leading to extremely low energy market prices and by displacing generation that would otherwise be provided by fossil-fired units. Both of these mean lower revenues for coal- and gas-fired units. It is likely that wind will be on the margin even more as more wind is added to the grid and as SPP works towards having all wind be dispatchable by October 2022.[5]

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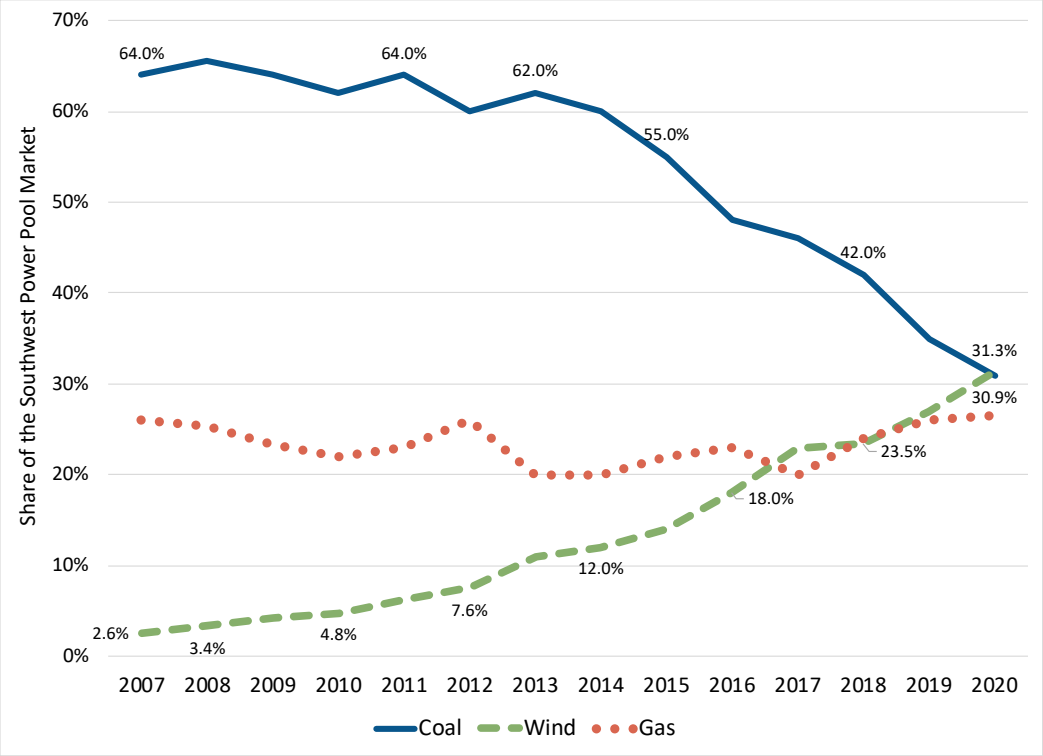
[1] Lawrence Berkeley National Laboratory. Wind Energy Technology Data Update: 2020 Edition. August 2020, pp. 36, 54, 55.
[2] Southwest Power Pool. SPP 2019 State of the Market Report. May 11, 2020, p. 43.
[3] *Ibid*.
[4] More than one unit in SPP -can be marginal during a given period as during congested periods, the market is segmented into a number of sub-areas, each with its own marginal resource(s). Fall 2020 SPP State of the Market, at page 8.
[5] At the same time that the hours that wind is the marginal fuel have been increasing, coal's time on the marginal has been declining, from about 50 percent in 2015 to approximately 30 percent in 2019.

While wind generation in SPP has been increasing, the generation from coal-fired units in the region has been dropping in response both to the greater availability of low-cost wind power and low natural gas prices that have made gas-fired units more competitive. For example, total generation by coal-fired units in SPP fell by more than 30 percent between 2011 and 2019.[6] The average coal unit capacity factor in SPP also dropped from 71 percent in 2011 to 55 percent in 2019.[7] The median coal unit capacity factor similarly declined from 73 percent in 2011 to 50 percent in 2019.[8]

The changing amount of generation from wind and coal has dramatically altered the fuel mix in the SPP. While wind's market share has grown steadily from 2.6 percent in 2007 to 31.3 percent in 2020, coal's share has fallen from 64.0 percent in 2007 to 30.9 percent in 2020. The decline in coal's market share has been particularly pronounced since 2013.

## Figure 4: Changing SPP Fuel Mix




*Source: SPP Annual and Monthly State of the Market Reports.*

[6] S&P Global Market Intelligence. EIA Form 923.
[7] A unit's capacity factor is a ratio of a unit's actual energy during a given period (say a month or a year) to its maximum possible energy output during the period if it had run at 100 percent power at all hours. The higher the unit's capacity factor the better. Conversely, the lower the capacity factor, the lower the amount of electricity it produced during the period.
[8] S&P Global Market Intelligence, *op. cit.*

Coal's market share would have been substantially lower than shown in Figure 4 but for the practice of self-commitment that allows plant owners to schedule the generation from their own facilities. Self-commitment alters the generators selected to serve demand and essentially allows the designated units to jump to the front of the supply curve. The self-committed units are designated as "must-run" by SPP's dispatch engine.

Although the volume of self-committed megawatts has declined in SPP in recent years, a 2019 SPP analysis found almost half of the total megawatts committed between March 2014 and August 2019 were self-committed. As SPP explained: "In other words, nearly half of the energy produced [during the period March 2014 to August 2019] was from a [generating unit] that was not selected by the day ahead market's centralized unit commitment process."[9]

SPP's analysis found that by far the largest source of self-committed capacity has been from coal-fired generators. According to SPP, "coal self-committed megawatts generally [exceeded] the size of the second largest fuel type by a factor of four to one."[10] SPP also found that "units that are self-committed generally have much higher capacity factors than those that are market committed."[11] For example, SPP data shows that the capacity factors of self-committed coal-fired units between 2015 and 2019 were roughly double what the amounts would have been if the units had been subject to market commitment.[12]

Finally, the SPP is awash in excess capacity, with a reserve of 31 percent above the actual peak load in 2019.[13] This is far more than the 12 percent capacity (reserve) margin the SPP Planning Criteria provide for. As the SPP 2019 State of the Market Report noted "the substantial incoming—and projected—new capacity, primarily wind, and the projected low rates of load growth are likely to exacerbate this situation absent significant amount of generator retirements."[14] The report also noted that "significant excess capacity imposes inefficiencies on the market. When such excess capacity exists, functioning competitive markets sends signals mainly through (low) energy prices, incentivizing the exit [that is, the retirement] of that capacity."[15]

There are several reasons to expect that coal's market share will continue to decline.

First, significantly more renewable resources (wind, solar and battery storage) can be expected to be added to the grid in coming years. For example, as of late January of this year, SPP's Active Generator Interconnection queue included almost 90 gigawatts (GW) of new renewable resources with 8.8 GW of new battery storage, 35.6 GW of new solar and 45 GW of new wind. Only a small portion of the proposed

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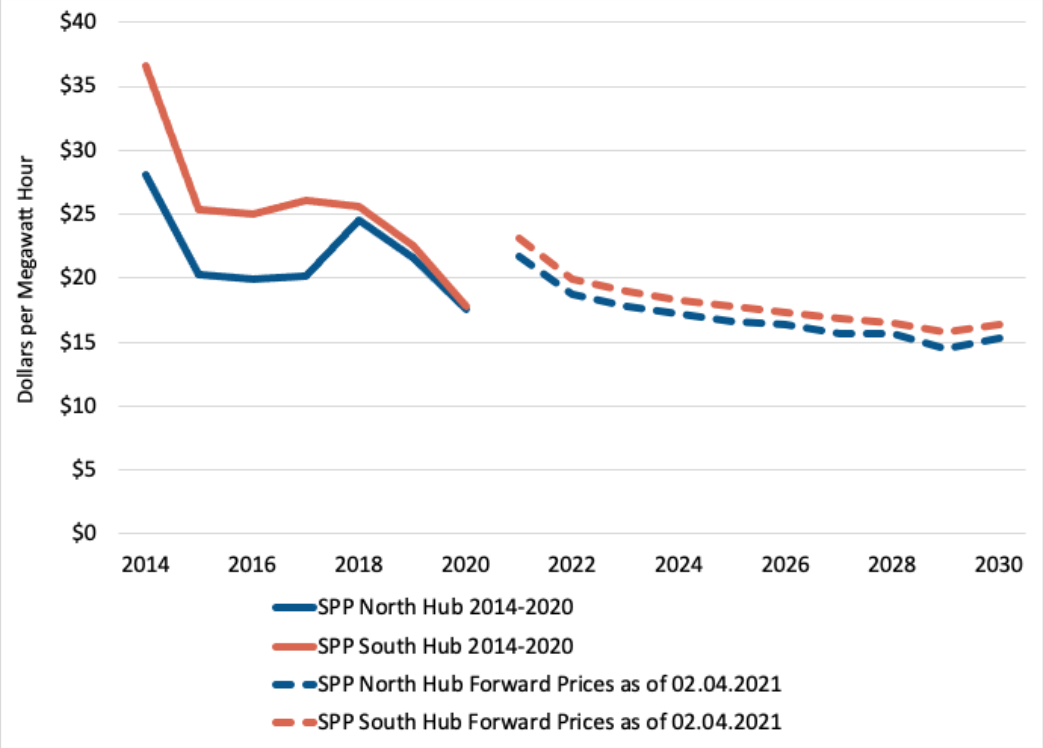
[9] Southwest Power Pool. Self-committing in SPP Markets: Overview, impacts and recommendations. December 2019, p. 16.
[10] Southwest Power Pool, *op. cit.*, p. 18.
[11] Southwest Power Pool, *op. cit.*, p. 1.
[12] Southwest Power Pool, *op. cit.* , Figures 4-10 and 411, pp. 25-26
[13] Southwest Power Pool. SPP 2019 State of the Market Report. May 11, 2020, p. 225.
[14] *Ibid*.
[15] *Ibid*.

generating capacity in the active interconnection queue is gas-fired. Although not all the proposed renewable capacity in the queue is likely to be added, the policies of the new Biden administration can be expected to support adding more renewable capacity to the grid and retiring existing fossil-fired units.

Second, natural gas prices are expected to remain low for the foreseeable future. That means that gas-fired units will continue to displace generation that would otherwise be produced at coal-fired units, to the extent that this generation is not already displaced by renewable capacity.

Third, the combination of low gas prices and the large amounts of new dispatchable wind that has been added to the SPP grid has led to extremely low energy prices, a situation that the market expects will continue for the foreseeable future.

**Figure 5: SPP Energy Market Prices**




*Source: S&P Global Market Intelligence.*

SPP's Market Monitoring Unit (MMU) which prepares its annual and monthly State of the Market Reports, has concluded that "market revenues do not support going forward costs for coal revenues."[16] Given that energy market prices are expected to remain low for the foreseeable future, as can be seen in Figure 5, it is hard to see how coal unit owners will be able to justify the continued operation of their plants. This will be true even for coal unit owners like investor-owned utilities and cooperatives that generally can pass the full cost of producing power to their

[16] Southwest Power Pool. 2019 SPP State of the Market Report. May 11, 2020, p. 3.

customers—even if that is much higher than the price of buying the same power in the SPP competitive wholesale markets.

Fourth, SPP's coal fleet is aging, with one-third of remaining coal units more than 40 years old (more than 5 percent is older than 50) and 86 percent more than 30 years old.[17] This is important because older plants tend to cost more to operate and maintain and are less reliable, according to analyses by the U.S. Department of Energy's Argonne National Laboratory and the National Energy Technology Laboratory. Coal plant heat rates increase with plant age, while plant availability declines.[18] Heat rate is a measure of a power plant's efficiency in generating electricity; a higher heat rate means a plant is less efficient. In general, power plants tend to become less efficient as they age. Plant availability measures the percentage of operating hours in which a plant was available to generate power, and plants tend to become less available to generate power as they age, in part because they tend to have more unanticipated problems and unplanned outages.

Finally, SPP so far has generally avoided the wave of coal unit retirements that has swept the rest of the country. Fewer than 4 GW of coal-fired capacity in SPP has been retired since 2014. However, as the 2018 SPP State of the Market Report noted:

> *A recent wave of generator retirements, particularly of coal-fired generation, has been widely observed through the country. The SPP market should be expected to follow this trend because of excess capacity, aging fleet, and cost disadvantages of certain types of generation technologies vis-à-vis the prevailing market prices.*[19]

[17] S&P Global Market Intelligence. EIA Data.
[18] Department of Energy. Staff Report to the Secretary on Electricity Markets and Reliability. August 2017, p. 155.
[19] Southwest Power Pool. 2018 SPP State of the Market Report. May 11, 2020, pp. 9-10.

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# About the Author

## David Schlissel

David Schlissel, Director of Resource Planning Analysis for IEEFA, has been a regulatory attorney and consultant on electric utility rate and resource planning issues since 1974. He has testified as an expert witness before regulatory commissions in more than 35 states and before the U.S. Federal Energy Regulatory Commission and Nuclear Regulatory Commission. He also has testified in state and federal court proceedings concerning electric utilities. His clients have included regulatory commissions in Arkansas, Kansas, Arizona, New Mexico and California. He has also consulted for publicly owned utilities, state governments and attorneys general, state consumer advocates, city governments, and national and local environmental organizations. Schlissel has undergraduate and graduate engineering degrees from the Massachusetts Institute of Technology and Stanford University. He has a Juris Doctor degree from Stanford University School of Law.