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Short-Term Energy Outlook Supplement: Summer 2021 Electricity Industry Outlook

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Overview

EIA is publishing this supplement with its May *Short-Term Energy Outlook* (STEO) to provide more detail about its forecasts for U.S. electricity consumption, power generation, and electricity prices during the summer of 2021 (June, July, and August). These forecasts build off of recent trends in electricity demand and supply that have been influenced by changes in market economics, regulatory policy, and consumption patterns.

Natural gas prices have generally remained low in the United States since 2015, which has led to a steady rise in the use of this fuel for electricity generation. Federal production and investment tax credits, state renewable standards, and declining construction costs for wind and solar power have led to increased generation from these energy sources.[1] Meanwhile, generation from coal has fallen as coal-fired power plants have been retired. These changes in the supply and demand of electricity have been reflected in relatively low wholesale electricity prices in recent years, although temporary constraints have still led to price spikes at certain times.

The economic slowdown in 2020 and changes in social patterns resulting from efforts to control the COVID-19 pandemic also have affected the electricity consumption and the supply of power. Although it is still too early to determine with certainty what, if any, long term impacts may affect the industry,[2] our short-term forecasts provide some perspective about trends over the next few months as the country emerges from the pandemic and things return to normal.

For summer 2021, we forecast that total U.S. retail sales of electricity to end-use customers will be 1.5% higher than last summer, primarily driven by increased demand in the commercial and industrial sectors. Our forecast of higher natural gas prices in 2021 contributes to our expectation that the electric power sector will use more coal to supply this increased summer demand, along with continued growth in renewable energy generating capacity. The higher natural gas prices are likely to lead to less generation from power plants using this fuel. Higher expected fuel costs also lead to increases in both wholesale and retail electricity prices this summer.

Demand and supply patterns for electricity are highly dependent on the realized weather, especially during the summer, so actual industry conditions in the future may differ substantially from initial expectations. The pace of recovery from the past year's COVID-19 mitigation efforts add additional uncertainty to our forecast.

[1] See related EIA *Today in Energy* articles:
"*In 2020, U.S. natural gas prices were the lowest in decades*," January 7, 2021.
"*U.S. wind energy production tax credit extended through 2021*," January 28, 2021.
"*Average U.S. construction costs for solar and wind generation continue to fall*," September 16, 2020.

[2] For additional analysis of these issues, see EIA "*Trends and Expectations Surrounding the Outlook for Energy Markets*," August 2020.

Electricity Consumption

The COVID-19 pandemic significantly affected end-use electricity consumption in 2020. Between June and August 2020, U.S. retail electricity sales across all consumption sectors totaled 1,055 billion kilowatthours (kWh), which was the lowest amount consumed since summer 2015. However, reactions to the pandemic and efforts to mitigate it affected the residential, commercial, and industrial sectors differently.

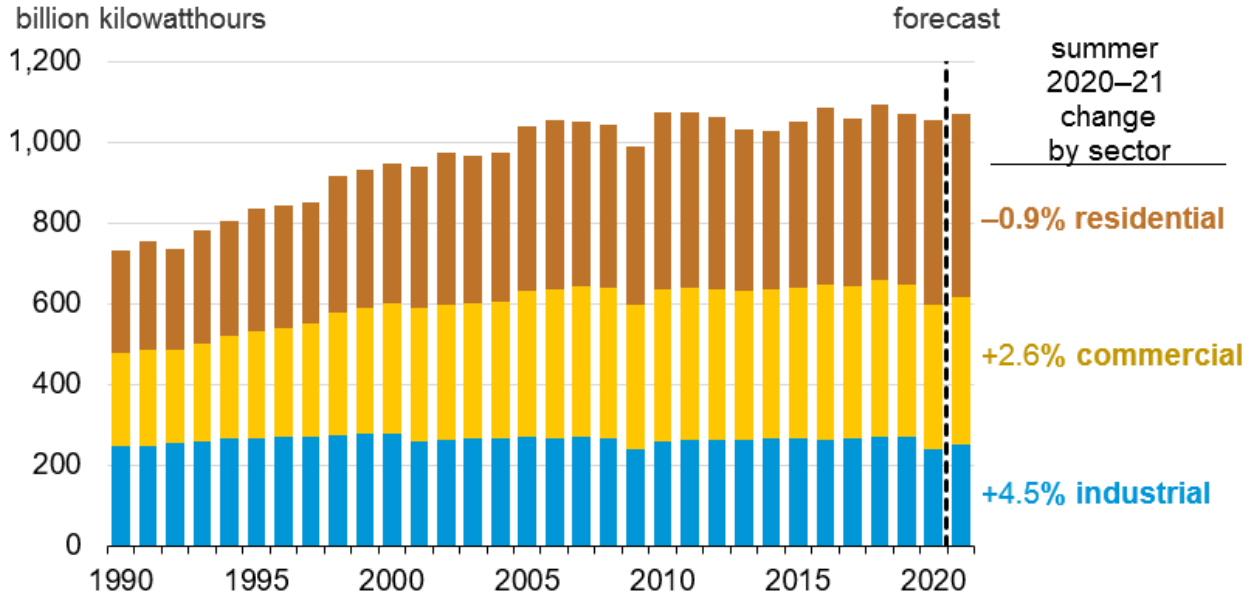
Last year's economic contraction most affected retail electricity sales to the commercial and industrial sectors.[3] U.S. gross domestic product declined by 3.5% in 2020, and most of the decline occurred during the second quarter. As a result, retail sales of electricity to the U.S. industrial sector during the summer of 2020 totaled 239 billion kWh, the lowest amount since the recession in 2009. Retail electricity sales to the commercial sector totaled 357 billion kWh last summer, which was the lowest amount since 2004. In addition to the effects of the economic contraction, electricity demand in office buildings declined because many workers in the commercial sector did not work in their offices last year, but instead worked from home because of social distancing guidelines.

In contrast to the sharp drop in electricity consumption in the U.S. commercial and industrial sectors last year, residential electricity sales totaled 457 billion kWh between June and August 2020, which was the most on record for that period. Residential electricity consumption reached a record last year, partially because of the near-record warm temperatures last summer, but also because more people were working from home and generally spending more time in their homes as a result of stay-at-home orders and social distancing guidelines.

For the summer of 2021, we forecast total U.S. retail sales of electricity will be 1.5% higher than last summer. Much of this growth occurs in the commercial and industrial sectors and reflects an improving economy after the pandemic-related downturn in 2020. Based on economic forecasts from IHS Markit, we expect U.S. gross domestic product in 2021 will grow by 6.2%. We forecast that the industrial production index for businesses that use a lot of electricity will grow by 6.5% this year. These growing economic indicators greatly contribute to our forecast that retail sales of electricity to the industrial sector during June, July, and August 2021 will be 4.5% higher than last summer. However, we expect 6.3% less industrial retail electricity consumption this summer compared to summer 2019.

[3] EIA *Today in Energy* article "*Stay-at-home orders led to less commercial and industrial electricity use in April*," June 30, 2020.

Figure 1. U.S. retail sales of electricity by sector, summer (June–August) 1990–2021



Source: U.S. Energy Information Administration, May 2021 *Short-Term Energy Outlook*

Increased economic activity is also likely to boost U.S. commercial sector demand for electricity this year. We expect U.S. non-farm employment to grow by 3.1% in 2021. We forecast that U.S. retail sales of electricity to the commercial sector during the summer of 2021 will be 2.6% higher than last summer but still 3.0% lower than in 2019. Much of this increased commercial sector electricity demand will occur in businesses such as restaurants and hotels, which had limited activity last summer as a result of responses to the COVID-19 pandemic. Year-over-year growth in electricity demand by commercial office buildings is likely to be relatively muted this summer as many companies continue policies that encourage working from home.

Temperature and humidity patterns drive residential electricity demand, and nearly 90% of homes in the United States use some form of air conditioning for space cooling.[4] The National Oceanic and Atmospheric Administration forecasts that U.S. cooling degree days, a measure of summer warmth, between June and August 2021 will be 5.9% lower than last summer. The lower overall expected temperatures indicate less residential electricity demand this summer, assuming normal patterns of household electricity use. We forecast U.S. residential sector retail sales of electricity during the summer of 2021 will be 0.9% lower than last summer. The effect of lower electricity consumption because of milder summer weather is offset somewhat by an expected 1.6% increase in the number of residential electricity customers in 2021, which reflects a rebound in household formation after the economic slowdown of 2020.

In terms of the amount of electricity consumed by a typical home, we forecast electricity use per residential customer will average 1,090 kWh per month between June and August 2021, which would be 2.5% less than the summer of 2020. This forecast decline is primarily a result of our expectation that summer weather will be milder than last year. But with many people still working from home, our

[4] EIA *Today in Energy* article "*Air conditioning accounts for about 12% of U.S. home energy expenditures*," July 23, 2018.

forecast household use is higher than it would normally be. Our forecast of 1,090 kWh per month for summer 2021 is about 2% more than the average electricity used between 2015 and 2019.

Electricity usage can vary widely from household to household based on a home's location, size, efficiency, etc. Forecast summer residential electricity use per customer ranges from about 530 kWh/month in Hawaii and Alaska to an average of nearly 1,500 kWh/month in the West South Central region, which includes Texas, Oklahoma, Louisiana, and Arkansas.

Electricity Generation

During June, July, and August 2021, we forecast that the U.S. electric power sector will generate about 1,130 billion kilowatthours (kWh) at large-scale power plants, which is relatively unchanged from last summer.

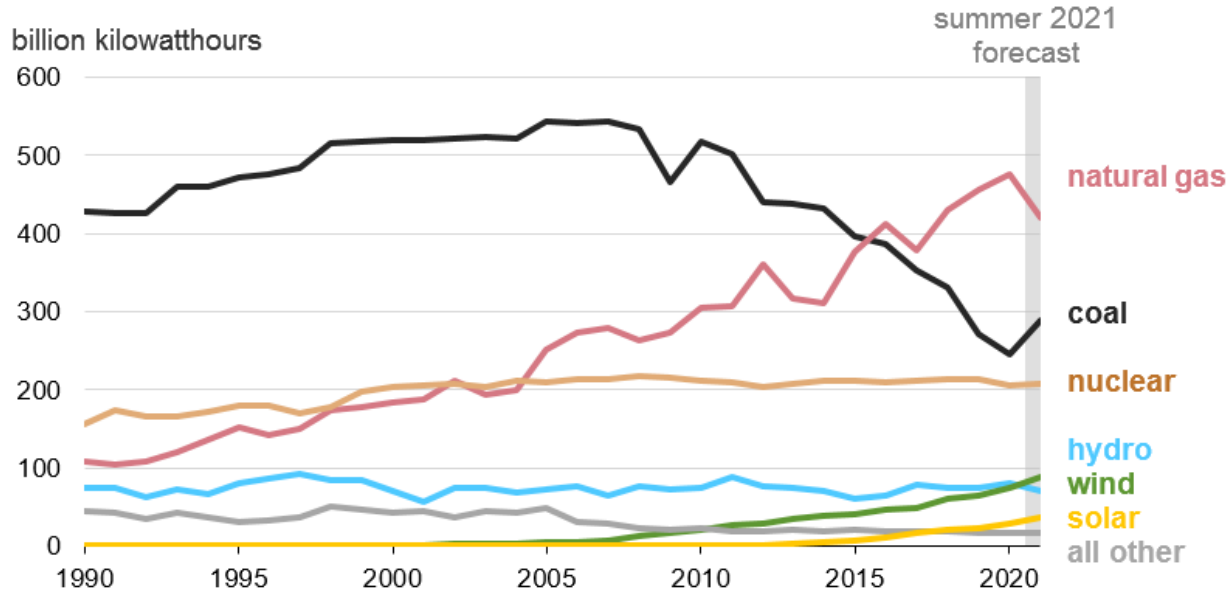
Changing market economics and available generating capacity are likely to alter some of the recent trends in the electric power sector's mix of energy sources for power generation this summer. One of the most important drivers of these trends is the price of natural gas since that fuel has the largest share of overall generating capacity. Between 2016 and 2020, the annual cost of natural gas delivered to electric generators averaged $2.39–$3.55 per million British thermal units (MMBtu). In contrast, the cost of delivered natural gas averaged $4.73–$9.04/MMBtu between 2005 and 2009.

The low natural gas fuel prices in recent years have led to changes in the day-to-day patterns of dispatching power plants along with a longer-term shift in the mix of capacity available to produce power. According to EIA's *Preliminary Monthly Electric Generator Inventory*, the United States had an estimated 485,000 megawatts (MW) of natural gas-fired generating capacity at the end of 2020, which is a 10% increase from the end of 2015. In contrast, about 23% of U.S. coal-fired generating capacity has been retired since 2015. We estimate U.S. coal power generation capacity totaled 216,000 MW at the end of 2020.[5]

The changing mix of fuels used for electricity generation reflects these trends in fuel costs and generating capacity additions. Summer natural gas-fired generation in the electric power sector rose from 250 billion kWh during the summer of 2005 to 476 billion kWh during summer 2020, which represents an increase in generation share from 22% to 42% during that time period. Meanwhile, generation from coal-fired power plants had fallen by more than half from its summer 2005 level of 543 billion kWh to 245 billion kWh by the summer of 2020, representing a decline in generation share from 48% to 22%.

[5] EIA *Today in Energy* article "*As U.S. coal-fired capacity and utilization decline, operators consider seasonal operation*," September 1, 2020.

Figure 2. U.S. electric power sector generation by fuel, summer (June–August) 1990–2021



Source: U.S. Energy Information Administration, May 2021 *Short-Term Energy Outlook*

We expect that recent trends in the U.S. generation mix will likely reverse slightly in 2021, primarily as a result of higher expected costs for natural gas in power generation. The forecast U.S. cost of natural gas delivered to electric generators averages $3.13/MMBtu this summer, which is 46% higher than summer of 2020 and close to the price during summer 2018. We expect higher natural gas prices in 2021 because increases in non-power-sector natural gas demand will likely outpace relatively slow growth in natural gas production in our forecast.

Higher fuel costs for natural gas-fired power plants this year means that those plants will be dispatched for electricity generation less often, while coal-fired power plants will likely be dispatched more often. We forecast U.S. electric power sector generation from natural gas during the summer of 2021 will total 420 billion kWh, accounting for 37% of total generation and down from 42% last summer. Forecast U.S. coal-fired generation rises to 289 billion kWh this summer. This is an increase in generation share from 22% last summer to 26% this summer.

The U.S. electricity industry has also made significant investments in new generating capacity from renewable energy sources, especially solar and wind, as a result of declining capital costs and policies that encourage development of those technologies. As of the end of February 2021, which is the most recent capacity data available, wind power turbines accounted for 118,500 MW of generating capacity in the United States, which is 63% more than at the end of 2015. Generating capacity at large-scale solar photovoltaic projects has nearly quadrupled since 2015 to 48,000 MW. As a result of this new capacity, summer generation from renewable energy sources grew from 88 billion kWh in 2005 (an 8% share) to 195 billion kWh in 2020 (a 17% share).

Renewable energy sources generally have lower operating costs than fossil fuel-fired power plants, so they are dispatched to supply electricity when the resources are available. We expect renewable energy

sources will generate more electricity this summer than last summer, primarily because of the newly installed wind and solar generating capacity.

In our current forecast, U.S. generating units that use renewable energy sources, other than hydropower, will produce 138 billion kWh of electricity this summer, which will account for 12% of total U.S. generation, up from a 10% generation share last summer. In addition to our expectation of growth in renewable generation by the electric power sector, we expect that small-scale solar photovoltaic systems in the United States will generate about 16 billion kWh this summer, up 21% from last year.

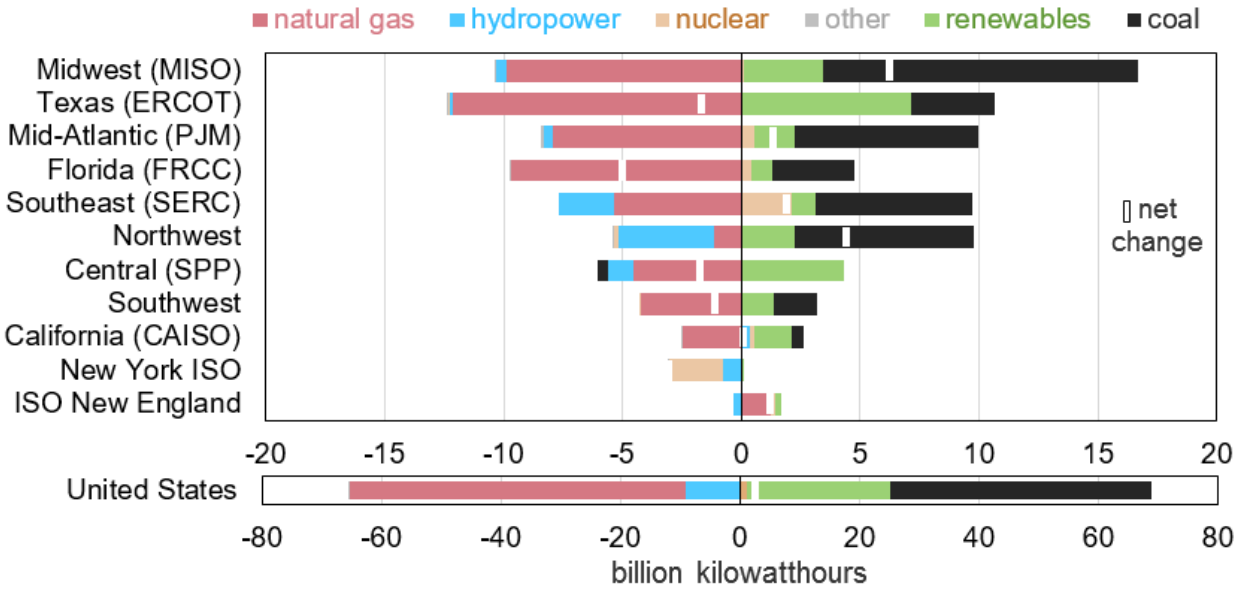
Generation in the United States from conventional hydropower during the summer of 2020 totaled 81 billion kWh, which was the most in any summer since 2011. The increase in hydropower was a result of higher-than-normal spring runoff in the western United States. We forecast that generation from hydropower this summer will total 71 billion kWh in the United States, based on water supply projections from the National Oceanic and Atmospheric Administration.[6] This generation level would represent about 6% of total U.S. electric power sector generation, slightly lower than the hydro generation share last summer.

Because U.S. nuclear reactors had more unplanned outages than usual, there was less nuclear generation than average in the United States last summer.[7] Some reactors are currently undergoing refueling, but only one reactor is on an extended unplanned outage, and we expect it should be back online by early summer. Forecast U.S. nuclear generation between June and August 2021 totals 207 billion kWh, which would be similar to last summer. Although two U.S. nuclear reactors have retired within the last twelve months, we expect that the lost generation from the retired capacity should be offset by a return to more normal operations at all other existing reactors.

[6] EIA *Today in Energy* article "*Mixed water supply conditions expected to affect hydropower outlook in Pacific Northwest*," April 8, 2021.

[7] EIA *Today in Energy* article "*U.S. nuclear capacity outages were 35% higher in summer 2020 than 2019*," September 18, 2020.

Figure 3. Forecast year-over-year change in summer electricity generation by fuel, 2020–2021



Source: U.S. Energy Information Administration, May 2021 *Short-Term Energy Outlook*

The general patterns of electricity generation during summer 2021 will be relatively similar across different regions of the country (STEO electricity regions are shown in Figure 5). Electricity generation from renewable energy sources, other than hydropower, is likely to increase in all regions this summer as a result of the construction of new generating capacity over the past year.

We expect the largest increases in generation of U.S. non-hydro renewables this summer will occur in the Texas (ERCOT), Central (SPP), and Midwest (MISO) electricity supply regions. Wind generating capacity in Texas grew by 2,400 MW, an increase of 9%, from February 2020 to February 2021. During the same period, Texas added 2,500 MW of utility-scale solar capacity, an increase of 93%.[8] This new solar and wind capacity drives our forecast that renewable energy sources will contribute 28% of the total Texas electricity generation during summer 2021 compared with 21% last year.

The electric power sector in the Midwest and Central electricity supply regions has been rapidly expanding its fleet of wind-powered generating units in recent years. Between February 2020 and February 2021, wind capacity increased by a total of 9,000 MW in the Midwest and Central regions, which accounts for nearly 60% of the total wind capacity added in the United States over the past year. These wind capacity additions will have the most impact in the Central region, where we expect renewable energy sources will account for 36% of the region's total summer 2021 generation, which is an increase from 31% during the summer of 2020. In the Midwest region, our forecast of the share of renewables generation grows to 13% in the summer compared with 11% last summer.

Our forecast increase in natural gas fuel costs and in renewables generation are both likely to lead to reduced summer generation from natural gas-fired power plants in most areas of the country compared with last year. The relative decline in natural gas-fired generation will be most evident in the Texas and

[8] EIA *Today in Energy* article, "*Texas likely to add record utility-scale solar capacity in the next two years*," April 21, 2021.

Midwest regions. For Texas, we forecast natural gas-fired generation between June and August 2021 will total 47 billion kWh, down from 59 billion kWh last summer. This decrease corresponds to a reduced natural gas generation share in the region from 52% during summer 2020 to 42% this summer. Some of this decline in Texas natural gas generation is caused by higher natural gas prices and is offset somewhat by an increase in coal generation share that rises from 17% to 20%. Most of the decline can be attributed to the rapid growth in renewables generation, which we forecast to increase from a share of 21% in 2020 to 28% in 2021.

Forecast natural gas-fired generation in the Midwest region falls from 58 billion kWh in summer 2020 to 48 billion kWh in summer 2021, accounting for a decline in generation share from 34% to 27% compared with summer 2020. Midwest coal-fired generation increases by a similar amount (with its generation share rising by 6 percentage points), indicating that much of the expected reduction in Midwest natural gas-fired generation this summer can be attributed to higher natural gas costs, which in turn make coal-fired units more competitive to dispatch for generation. We forecast that natural gas-fired generation in New England will rise by 8% this summer to offset reduced nuclear generation in the Northeast resulting from the recent retirement of the last reactor at the Indian Point Energy Center in New York.[9]

We expect coal-fired generation will rise in most areas of the country because forecast natural gas prices will be significantly higher than last summer. The largest forecast increases in coal-fired generation occur in the Midwest, which also has the largest expected increase in overall electricity demand. Increased coal generation in the Southeast and Mid-Atlantic regions will mostly offset expected reductions in natural gas-fired generation.

Electricity Prices

Many factors can affect wholesale electricity prices, but the level of hourly electricity demand and the cost of fuel for power generators are particularly important. We expect both of these factors to increase this summer compared with summer 2020. As a result, we forecast that average wholesale electricity prices will be higher in most areas of the country. Forecast summer peak-hour wholesale prices range from an average of $21 per megawatthour (MWh) for the ERCOT North price hub in Texas to an average of $45/MWh in California's CAISO SP-15 zone.

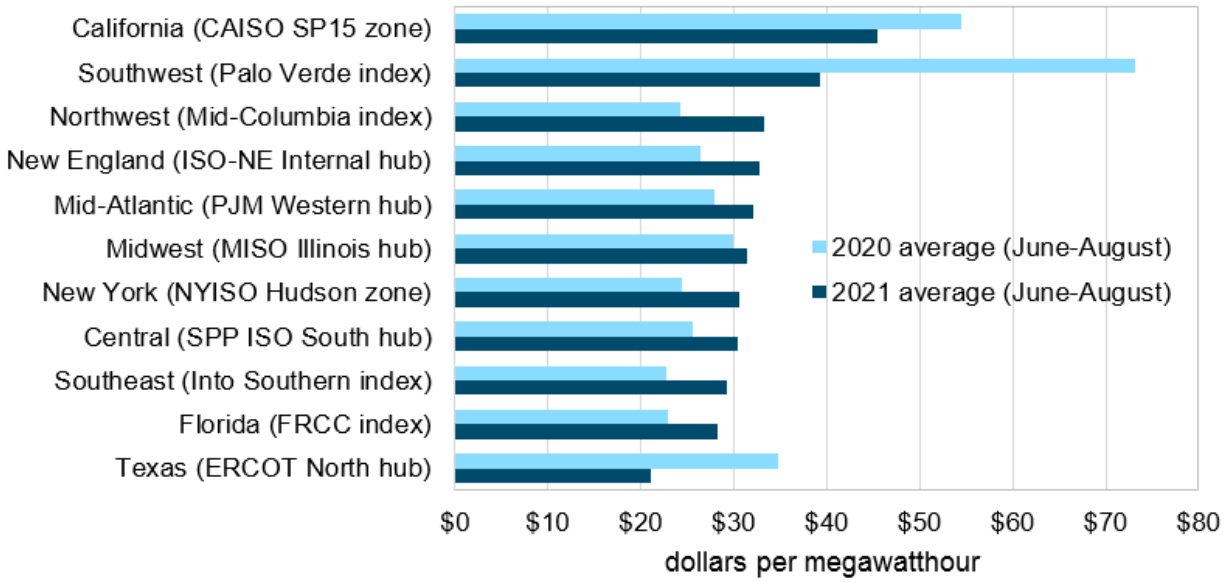
Our wholesale price forecasts provide information about expected trends in the cost of electricity based on market conditions and regulatory structure for the various regions; however realized prices can be extremely volatile, and average price forecasts can be very uncertain.[10] Electricity prices can spike when electric power systems become constrained, such as under conditions of extremely high peak-hour loads or unexpected outages of generating capacity. The most recent example occurred in Texas's ERCOT market in February 2021 when hourly electricity prices spiked to a preset maximum of $9,000/MWh and stayed at that level for an extended period.[11] These high peak-hour prices at the ERCOT North hub

[9] EIA *Today in Energy* article "*New York's Indian Point nuclear power plant closes after 59 years of operation*," April 30, 2021.
[10] For detail on wholesale price projection methodology, see EIA "*Short-Term Energy Outlook Supplement: Expanded Forecasts for Wholesale Electricity Prices and Electricity Generation & Fuel Consumption*," August 2019
[11] EIA *Today in Energy* article, "*Average Texas electricity prices were higher in February 2021 due to a severe winter storm*," May 7, 2021.

contributed to a $1,800/MWh average price for the month. Such extreme scenarios are difficult to foresee.

Although we expect average wholesale electricity prices to be higher this summer in most areas of the country, the relative increase in prices varies. Our forecast average summer price at the MISO Illinois hub in the Midwest region is 5% higher than summer 2020 (averaging $31/MWh), but summer prices in the Northwest region rise by 38% (to $33/MWh). We expect summer 2021 wholesale electricity prices in Texas, California, and the Southwest to be lower than last year, as forecast wholesale prices return to more normal levels after prices spiked in some areas of the western United States in August 2020.

Figure 4. Average peak-hour wholesale electricity prices, summer (June–August) 2020–2021



Source: U.S. Energy Information Administration, May 2021 *Short-Term Energy Outlook*

Retail electricity prices are generally less volatile than wholesale electricity prices, but they often depend on the same drivers, especially the cost of fuels for generating electricity. In particular, the expected rise in natural gas prices in 2021 is likely to lead to higher electricity prices for most retail customers. In many areas of the country, retail electricity prices are regulated by state commissions, meaning that changes in electricity supply costs can take time to translate to changes in retail rates.

We forecast the U.S. residential electricity price will average 13.6 cents per kilowatthour (kWh) between June and August 2021, up 2.4% from summer 2020, while the forecast commercial sector price averages 11.3 cents/kWh (up 3.8%) and the industrial sector price averages 7.2 cents/kWh (up 2.3%). The forecast year-over-year increases in summer retail electricity prices would be the largest since 2008 for the commercial sector and the largest since 2013 for the industrial sector.

Electricity prices for specific utilities and retail distribution companies can vary widely, depending on the cost of the electricity they supply and other costs such as investment in new generation or transmission infrastructure. We expect the increases in retail residential electricity prices will vary from an increase of

1.2% in the South Atlantic region to a 4.6% increase in the West North Central region (Figure 6 includes a map of STEO retail electricity regions, which correspond to census divisions).

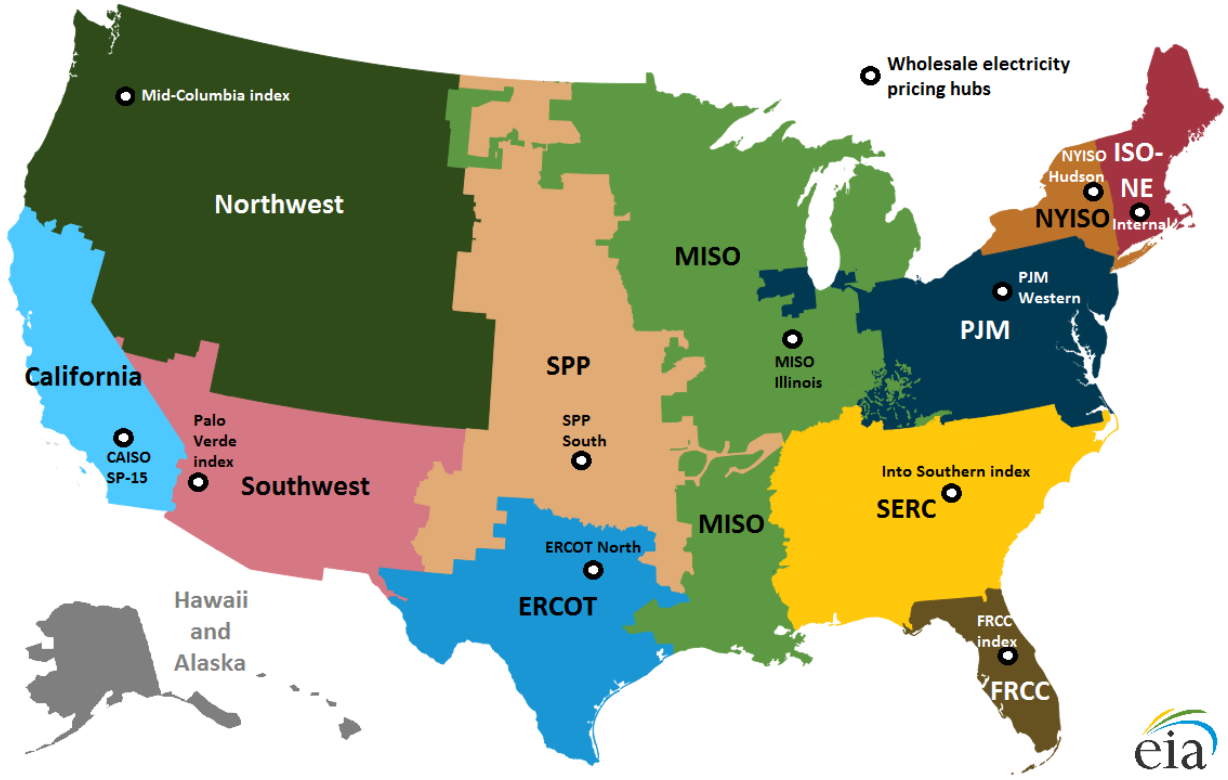
Although we forecast residential electricity prices to be higher this summer throughout the United States, lower-than-expected average electricity use may, in some cases, offset the effect of higher prices on some household electricity bills. We forecast the typical residential customer's summer electricity bill will be relatively similar to last summer; our estimate of average expenditures from June through August 2021 totals $445 (Table 1). Year-over-year changes in average summer residential electricity expenditures vary from a forecast decline of 3.6% in the Mid-Atlantic and Mountain regions to a forecast increase of 4.3% in the West North Central region.

Table 1. Average Summer Residential Electricity Usage, Prices and Expenditures

	2016	2017	2018	2019	2020	Forecast 2021	Change from 2020
United States							
Usage (kWh)	3,327	3,126	3,264	3,135	3,352	**3,269**	-2.5%
Price (cents/kWh)	12.77	13.14	13.15	13.29	13.28	**13.60**	2.4%
Expenditures	$425	$411	$429	$417	$445	**$445**	-0.1%
New England							
Usage (kWh)	2,108	1,986	2,132	2,030	2,295	**2,148**	-6.4%
Price (cents/kWh)	18.34	19.25	20.17	20.71	20.72	**21.45**	3.6%
Expenditures	$386	$382	$430	$420	$475	**$461**	-3.0%
Middle Atlantic							
Usage (kWh)	2,549	2,328	2,458	2,437	2,667	**2,472**	-7.3%
Price (cents/kWh)	15.90	16.39	16.36	16.17	16.14	**16.78**	4.0%
Expenditures	$405	$382	$402	$394	$430	**$415**	-3.6%
East North Central							
Usage (kWh)	2,902	2,585	2,811	2,646	2,941	**2,807**	-4.5%
Price (cents/kWh)	13.08	13.43	13.32	13.51	13.34	**13.69**	2.6%
Expenditures	$380	$347	$374	$357	$392	**$384**	-2.1%
West North Central							
Usage (kWh)	3,302	3,039	3,284	3,025	3,280	**3,272**	-0.2%
Price (cents/kWh)	12.85	13.41	13.32	13.16	13.04	**13.64**	4.6%
Expenditures	$424	$408	$438	$398	$428	**$446**	4.3%
South Atlantic							
Usage (kWh)	4,147	3,852	3,892	3,895	4,054	**3,987**	-1.6%
Price (cents/kWh)	11.79	12.09	11.87	12.12	12.01	**12.15**	1.2%
Expenditures	$489	$466	$462	$472	$487	**$485**	-0.4%
East South Central							
Usage (kWh)	4,413	4,038	4,303	4,158	4,300	**4,358**	1.4%
Price (cents/kWh)	10.93	11.36	11.19	11.50	11.31	**11.62**	2.7%
Expenditures	$482	$459	$481	$478	$486	**$507**	4.2%
West South Central							
Usage (kWh)	4,605	4,362	4,625	4,353	4,486	**4,470**	-0.4%
Price (cents/kWh)	10.58	10.80	10.87	11.28	11.25	**11.58**	2.9%
Expenditures	$487	$471	$503	$491	$505	**$518**	2.5%
Mountain							
Usage (kWh)	3,437	3,384	3,423	3,281	3,589	**3,387**	-5.6%
Price (cents/kWh)	12.04	12.24	12.20	12.13	12.17	**12.43**	2.2%
Expenditures	$414	$414	$418	$398	$437	**$421**	-3.6%
Pacific							
Usage (kWh)	2,097	2,193	2,193	1,982	2,206	**2,153**	-2.4%
Price (cents/kWh)	16.00	16.35	17.05	17.08	17.29	**17.84**	3.2%
Expenditures	$336	$359	$374	$339	$382	**$384**	0.7%

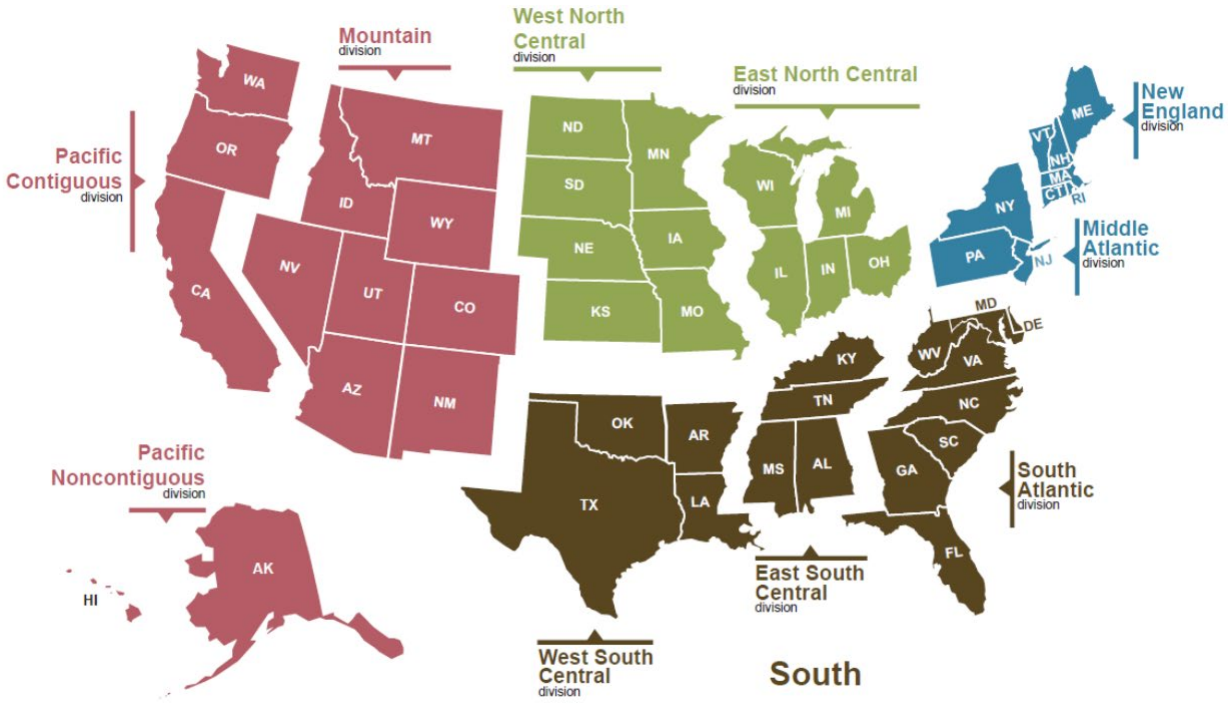
Source: May 2021 *Short-Term Energy Outlook*. EIA Form-861 and Form-861M databases.
Note: kWh = kilowatthours. All data cover the three-month period of June, July, and August of each year. Usage amounts represent total summer residential retail electricity sales per customer. Prices and expenditures are not adjusted for inflation.

Figure 5. *Short-Term Energy Outlook* (STEO) electricity supply regions



Source: U.S. Energy Information Administration

Figure 6. *Short-Term Energy Outlook* (STEO) retail electricity regions (census divisions)



Source: U.S. Energy Information Administration