Forecast highlights

- The July Short-Term Energy Outlook (STEO) remains subject to heightened levels of uncertainty because mitigation and reopening efforts related to the 2019 novel coronavirus disease (COVID-19) continue to evolve. Reduced economic activity related to the COVID-19 pandemic has caused changes in energy supply and demand patterns in 2020. Uncertainties persist across the U.S. Energy Information Administration’s (EIA) outlook for all energy sources, including liquid fuels, natural gas, electricity, coal, and renewables. The STEO is based on U.S. macroeconomic forecasts by IHS Markit, which assumes U.S. gross domestic product declined by 6.4% in the first half of 2020 from the same period a year ago before rising from the third quarter of 2020 through 2021.

- Daily Brent crude oil spot prices averaged $40 per barrel (b) in June, up $11/b from the average in May and up $22/b from the multiyear low monthly average price in April. Oil prices rose in June as numerous regions worldwide began to lift stay-at-home orders and as global oil supply fell as a result of production cuts by the Organization of the Petroleum Exporting Countries (OPEC) and partner countries (OPEC+). In June, OPEC+ announced that they extended through July their period of deepest cuts that had been set to relax on July 1. EIA expects monthly Brent spot prices will average $41/b during the second half of 2020 and rise to an average of $50/b in 2021, $4/b and $2/b higher than forecast in last month’s STEO, respectively.

- The forecast of rising crude oil prices reflects EIA’s expectation of declines in global oil inventories during the second half of 2020 and through 2021. EIA expects high inventory levels and surplus crude oil production capacity will limit upward price pressures in the coming months, but as inventories decline into 2021, those upward price pressures will increase. EIA estimates global liquid fuels inventories rose at a rate of 6.7 million barrels per day (b/d) in the first half of 2020 and expects they will decline at a rate of 3.3 million b/d in the second half of 2020 and then decline by a further 1.1 million b/d in 2021.

- EIA expects annual average U.S. crude oil production to fall in 2020 and 2021 as forecast West Texas Intermediate (WTI) spot prices remain less than $50/b through 2021. EIA forecasts that U.S. crude oil production will average 11.6 million b/d in 2020 and 11.0 million b/d in 2021. These levels are 0.6 million b/d and 1.2 million b/d, respectively, lower than the 2019 average of 12.2 million b/d. EIA finalized this month’s forecast before a U.S. District Court ordered on July 6 the temporary closure of the Dakota
Access Pipeline. The operators of the pipeline have announced they will file a motion to stay the decision.

- EIA forecasts U.S. liquid fuels consumption will average 18.3 million b/d in 2020, down 2.1 million b/d from 2019. Declines in U.S. liquid fuels consumption vary across products. From 2019 to 2020, EIA expects jet fuel consumption to fall by 31% and gasoline and distillate fuel consumption to both fall by 10%. The declines reflect travel restrictions and reduced economic activity related to COVID-19 mitigation efforts. EIA expects the largest declines in U.S. liquid fuels consumption have already occurred and consumption will generally rise through the second half of 2020 and in 2021. EIA forecasts U.S. liquid fuels consumption will average 19.9 million b/d in 2021.

- EIA expects U.S. dry natural gas production to average 89.2 billion cubic feet per day (Bcf/d) in 2020, down from 92.2 Bcf/d in 2019. This 3% decrease is the result of falling natural gas prices that caused a decline in drilling activity and production curtailments. EIA expects annual average dry natural gas production in the United States will decline by 6% in 2021 to 84.2 Bcf/d. However, EIA expects production to increase during the second half of 2021 as natural gas prices in the forecast rise.

- EIA expects U.S. natural gas consumption will decline by 3% in 2020. The main driver of the decline is lower consumption in the industrial sector because of COVID-19 mitigation efforts and related reductions in economic activity. Forecast U.S. natural gas consumption declines by 5% in 2021 as a result of expected rising natural gas prices. The rising prices will reduce the use of natural gas in the electric power sector, which will more than offset increases in natural gas consumption in the industrial, commercial, and residential sectors.

- The Henry Hub natural gas spot price averaged $1.63 per million British thermal units (MMBtu) in June, the lowest inflation-adjusted price going back to at least 1989, as a result of low demand. EIA expects falling production will put upward pressure on natural gas prices through the end of 2021. EIA forecasts that Henry Hub spot prices will average $1.93/MMBtu in 2020 and $3.10/MMBtu in 2021.

- EIA forecasts working natural gas in storage will reach 4,039 billion cubic feet (Bcf) at the end of October, which would be the most U.S. natural gas in storage as of the end-of-October on record. This forecast level surpasses the previous end-of-October record of 4,013 Bcf reached in October 2016.

- EIA forecasts total U.S. coal production will decrease by 29% to 501 million short tons (MMst) in 2020. This decline largely reflects less demand for coal from the electric power sector and the coal export market. In 2021, EIA expects coal production to increase by 7% to 536 MMst because of forecast rising natural gas prices that make coal more competitive in the electric power sector.
• EIA forecasts 4.2% less electricity consumption in the United States in 2020 compared with 2019. The largest forecast decline occurs in the commercial sector, where EIA expects retail sales of electricity to fall by 7.0% this year because of COVID-19 mitigation efforts. Forecast electricity sales to the industrial sector fall by 5.6%. EIA forecasts that residential sector retail electricity sales in 2020 will be similar to 2019 as less electricity use for heating in the first quarter is offset by more consumption during the rest of the year as a result of people spending more time at home. EIA forecasts total U.S. electricity consumption will rise by 1.5% in 2021.

• EIA expects the share of U.S. electric power sector generation from natural gas-fired power plants will increase from 37% in 2019 to 41% this year. In 2021, the forecast natural gas share will decline to 36% in response to higher natural gas prices. Coal’s forecast share of electricity generation falls from 24% in 2019 to 18% in 2020 and then increases to 21% in 2021. Electricity generation from renewable energy sources rises from 17% in 2019 to 20% in 2020 and to 22% in 2021. The increase in the share from renewables is the result of expected additions to wind and solar generating capacity. The forecast nuclear share of generation averages about 21% in 2020 and will be slightly less than 21% by 2021, which is consistent with upcoming reactor retirements.

• EIA forecasts that energy-related carbon dioxide (CO2) emissions, after decreasing by 2.8% in 2019, will decrease by 12.2% in 2020 and increase by 6.0% in 2021. This forecast is highly dependent on assumptions regarding the economic impact and subsequent recovery from COVID-19 mitigation efforts. In addition to economic growth, energy-related CO2 emissions are sensitive to changes in weather, energy prices, and fuel mix.

**Global Liquid Fuels**

The disruptions to global petroleum supply and consumption as a result of COVID-19 and associated mitigation efforts have been significant. As road and air travel fell sharply when economies around the world went into lockdown in the first quarter and early second quarter of this year, global liquid fuels consumption fell more quickly than production. Based on the mismatch between production and consumption of liquid fuels, EIA estimates that global oil inventories increased by almost 1.3 billion barrels from the start of 2020 through the end of May. **Inventory accumulation** caused Brent crude oil spot prices to fall from a monthly average of $64 per barrel (b) in January to $18/b in April. In late April, when price declines were the steepest, market participants had concerns about the ability of global storage capacity to hold the quickly rising inventory.

The situation in oil markets has now shifted. EIA estimates that, in June, global consumption of petroleum and other liquid fuels was up 10 million barrels per day (b/d) from April levels as economies worldwide have begun emerging from lockdown. EIA estimates global supply has fallen by 12 million b/d during the same period as a result of reduced production from OPEC+ and price-driven declines and curtailments in the United States and Canada. These changes in
EIA’s supply and demand estimates have shifted global oil markets from 21 million b/d of oversupply in April to inventory draws in June.

EIA expects global oil inventories to generally draw through the end of 2021 as EIA forecasts global oil demand will continue to recover. Although EIA’s forecast consumption of global liquid fuels of 101.1 million b/d in the fourth quarter of 2021 would still be less than during the same period of 2019, it would be 16.7 million b/d more than in the second quarter of 2020. EIA also expects global oil supply to rise in the coming quarters. However, voluntary production restraint from OPEC+ producers, along with the lingering effects of low oil prices on U.S. tight oil production, will limit increases. As a result, EIA expects global oil inventories to decline at a rate of 1.8 million b/d through the end of 2021, eliminating most of the surplus that accumulated in early 2020. These inventory draws will likely put upward pressure on oil prices, but that pressure will be partly offset by high existing oil inventories, particularly in the second half of 2020, and a large amount of spare crude oil production capacity. The trajectory of both supply and demand are highly uncertain, however, and EIA will continue to closely track incoming data and oil market drivers in the coming months and adjust our forecasts accordingly.

**Global Petroleum and Other Liquid Fuels Consumption.** In the July STEO, EIA revised its 2020 global oil consumption forecast to reflect the most up-to-date information available on the impacts of COVID-19 and associated mitigation efforts on global oil consumption.

Initial data indicate the extent of demand declines for global liquid fuels were not as significant as EIA had previously estimated. EIA estimates that consumption of global liquid fuels averaged 84.4 million b/d in the second quarter of 2020, down by 16.3 million b/d from the same period in 2019. Although these declines are the largest for any quarter on record, EIA had estimated a drop of 16.6 million b/d in the June STEO, and EIA had estimated a drop of 18.8 million b/d in the May STEO. Initial second-quarter consumption data for the United States was 0.4 million b/d more than estimated in the June STEO and consumption in Canada and Brazil were each about 0.3 million b/d higher. Those increases were partly offset by lower-than-expected liquid fuels consumption in India and China.

EIA’s most recent estimates of global oil consumption in the second quarter came in higher than in the previous forecast despite a lower assumed level of economic activity compared with previous forecasts. The July STEO’s forecast for global economic growth is based on forecasts from Oxford Economics. In the July STEO, EIA assumes global oil consumption-weighted gross domestic product (GDP) in 2020 will decline by 5.7% from 2019, compared with an assumed decline of 5.0% in the June STEO. The sharpest declines occur in the second quarter of 2020, when oil consumption-weighted GDP is estimated to have declined by 10.3% compared with the second quarter of 2019. In the June STEO, the assumed decline in second-quarter 2020 GDP was 8.6%. In 2021, EIA assumes global GDP weighted by oil consumption will grow by 6.3%.

For the full year of 2020, EIA forecasts that consumption of global liquid fuels will average 92.9 million b/d, down 8.1 million b/d from 2019. EIA forecasts that both oil-consumption weighted GDP and global liquid fuels consumption will begin increasing in the third quarter of 2020 and
will continue increasing through 2021. However, EIA expects global liquids consumption in the second half of 2020 to remain lower, by 5.8 million b/d, than the same period in 2019, which would still be an increase of 6.2 million b/d from the first half of the year. The increase in oil consumption results from a normalization of economic activity following COVID-19-related disruptions. Although EIA expects steady increases in consumption of gasoline and diesel in the second half of 2020, forecast jet fuel consumption remains weak as EIA expects the recovery in air travel to lag behind the recovery in road travel in most countries.

Annual average global consumption of liquid fuels rises in 2021 by 7.0 million b/d from 2020 levels. This increase reflects forecast GDP growth and increases in travel. However, any lasting changes to transportation and other oil consumption patterns once the effects of COVID-19 and associated mitigation efforts end present considerable uncertainty to the increase in liquid fuels consumption for 2021.

**Non-OPEC Production of Petroleum and Other Liquid Fuels.** EIA estimates that non-OPEC production of petroleum and other liquid fuels fell by 5.4 million b/d in the second quarter of 2020 from the first quarter of the year. Almost 85% of these declines came from the three largest non-OPEC producers: the United States, Russia, and Canada. U.S. declines resulted from a drop in active drilling rigs in response to low oil prices. Declines in Russia were the result of voluntary reductions resulting from the April OPEC+ agreement. In Canada, declines largely reflected a drop in activity at oil sands operations in Alberta because of low oil prices.

EIA forecasts that for 2020 as a whole, non-OPEC production will decline by 2.2 million b/d from 2019 levels. EIA expects that the second quarter marked a low point for non-OPEC production, and it will begin rising in the third quarter as oil demand increases. EIA expects production of non-OPEC petroleum and other liquid fuels to increase by 1.1 million b/d in 2021. Production in countries that have implemented voluntary cuts will generally rise in 2021 as global oil demand recovers. However, EIA forecasts production to continue to decline in the United States, where production is driven by price-sensitive shale operators.

In Russia, EIA forecasts production to decline sharply in 2020 and grow in 2021 as OPEC+ cuts limit production in 2020 and moderate in 2021. EIA expects Russia to experience the largest liquid fuels production declines in 2020 among OPEC+ producers, with forecast declines of 1.0 million b/d compared with 2019. EIA expects Russia’s liquid fuels production to rise by 0.6 million b/d in 2021.

EIA expects total production of liquid fuels in the United States to fall by 0.7 million b/d in 2020, largely as a result of reduced drilling in price-sensitive tight oil regions. EIA expects U.S. production to fall by 0.3 million b/d in 2021.

EIA expects Canada’s total liquid fuels production to fall by 0.4 million b/d in 2020. This decrease is a result of both 2019 government-ordered production cuts in Alberta that continue into 2020 and economic shut-ins because of the effect of low oil prices and falling demand for oil exports. In 2021, EIA expects Canada’s production to increase by almost 0.5 million b/d and surpass 2019 levels in the second half of the year as demand rebounds and deferred or shut-in projects come
online. EIA expects no additional Canadian production from new upstream projects to come online during the forecast period, only expansions or debottlenecking of existing projects. EIA does not expect any new Canadian pipeline capacity until the second half of 2021.

Mexico agreed to 100,000 b/d of oil production cuts under the April OPEC+ agreement. However, Mexico declined to extend cuts past June, breaking from other OPEC+ producers. Independent of the OPEC+ agreement, EIA forecasts crude oil production to decline in Mexico in 2020 and 2021 because of natural declines in mature fields. Overall, EIA expects Mexico’s annual average liquid fuels production to fall by almost 100,000 b/d in 2020 and by a similar amount in 2021.

EIA expects a number of other non-OPEC producers will experience notable production declines in 2020, including India, Azerbaijan, Kazakhstan, Colombia, Malaysia, and Egypt. Forecast annual average declines in each of these countries range between 50,000 b/d and 100,000 b/d.

The only non-OPEC countries where EIA expects production will grow significantly in 2020 are Brazil and Norway. EIA expects Brazil’s production of petroleum and other liquid fuels to grow by 0.2 million in 2020 b/d and by 0.3 million b/d 2021. On April 1, Brazil’s national oil company, Petroleo Brasileiro, S.A. (Petrobras), deepened its production cuts to 0.2 million b/d for 2020. Weeks after this announcement, Petrobras reversed these cuts as demand for crude oil exports remained strong. In addition, EIA now expects the P-70 floating, production, storage, and offloading vessel (FPSO) in Brazil to start production in the second half of 2020, bringing on additional volumes. The P-70 was originally scheduled to begin producing in the first half of 2020, before it was damaged in a storm in February 2020. This expected new supply growth offsets planned heavy maintenance for the second half of 2020. EIA also estimates Brazil’s biofuels production was lower in the first half of 2020 than previously estimated because of reduced ethanol demand related to COVID-19 mitigation efforts combined with weak ethanol prices relative to sugar prices that caused sugar cane millers to shift toward more sugar production.

Despite voluntary production cuts announced in April 2020, EIA expects production growth in Norway during 2020 and 2021. Norway’s Ministry of Petroleum and Energy enacted unilateral production cuts on the Norwegian continental shelf, which will limit production of crude oil from June to December 2020. These cuts limit growth in total liquids production in 2020 to less than 0.3 million b/d. After the expiration of production limits, EIA forecasts production growth of 0.1 million b/d in 2021. Phase 1 of the Johan Sverdrup field came online in October 2019 and reached production of more than 0.4 million b/d in early 2020 before the government production cuts took effect. The Johan Sverdrup field will drive most of the production growth in Norway in 2020 and 2021.

**OPEC Production of Petroleum and Other Liquid Fuels.** On June 6, 2020, OPEC+ announced that they were extending through July the large production cuts for May and June originally announced in April 2020. In addition, OPEC+ producers reconfirmed the remaining cuts under
the April agreement that extend into 2022. EIA assumes that participating OPEC+ countries are broadly complying with the May–July cuts.

EIA forecasts OPEC crude oil production will fall below 22.5 million b/d in July, a 7.9 million b/d decline from April. If OPEC production declines to forecast levels in July, it would be the group’s lowest level of crude oil production since November 1991. After July, EIA expects OPEC will continue to limit production, but to a lesser degree as cuts are relaxed, global oil demand rises, and compliance lessens. With increases in forecast global oil demand growth in 2021, EIA assumes that OPEC members will further increase production in the face of large oil supply/demand imbalances that lead to large stock drawdowns and rising oil prices. EIA forecasts that OPEC crude oil production will average 29.2 million b/d in 2021, up 3.2 million b/d from 2020 but about the same as 2019 levels.

Venezuela, Libya, and Iran are not subject to the OPEC+ agreement. EIA expects Venezuela’s production to continue falling throughout the forecast period. Production declines accelerated following the imposition of new sanctions by the United States government on Rosneft Trading in mid-February. In addition, the decline in global oil demand following the onset of the COVID-19 pandemic further reduced the demand for Venezuela’s oil. Much of Venezuela’s exports had been used for in-kind loan payments to China; however, the decline in oil demand from China in 2020 as a result of COVID-19 mitigation efforts further reduced outlets for Venezuela’s oil production.

Libya’s crude oil production fell in the first half of 2020 after the January closure of five export terminals in eastern Libya and the pipelines connecting the El Sharara and El Feel oilfields to those terminals. By May 2020, Libya’s crude oil production averaged 80,000 b/d, down from 1.2 million b/d at the end of 2019. With the ongoing civil war in Libya, EIA does not expect production to increase until late 2020. However, that forecast is very uncertain as the timing of any settlement or resolution in Libya’s civil war is not possible to forecast. Once currently shuttered export terminals and oil fields reopen, EIA expects that Libya will boost production to near-capacity in a relatively short time despite low oil prices.

EIA expects that crude oil production in the Neutral Zone shared between Saudi Arabia and Kuwait, which resumed in March 2020, will increase to full production levels in 2021, following a one-month hiatus in June 2020. However, EIA assumes that increases in Neutral Zone production will be offset elsewhere, as Kuwait and Saudi Arabia reduce production at other fields in response to the OPEC+ cuts.

EIA estimates that OPEC production of other liquids will decline to 4.8 million b/d on average in 2020, down from 5.4 million b/d in 2019. The 2020 decrease in production of other liquids is the result of less associated liquids production stemming from a reduction in crude oil production because of the OPEC+ cuts. The decrease in production of other liquids in 2021 is the result of less expected condensate output in Iran.

EIA expects that OPEC surplus crude oil production capacity, which averaged 2.5 million b/d in 2019, will average 5.7 million b/d in 2020, peaking during the third quarter of 2020 at 7.9 million
b/d before declining to 3.1 million b/d on average in 2021. The forecast 2020 annual level would mark the first time since 2002 that surplus capacity averaged at least 5 million b/d and would be the highest level since the mid-1980s. The fluctuations in surplus capacity are a direct result of crude oil production changes in response to the OPEC+ agreement. These estimates do not include additional capacity that may be available in Iran but is offline because of U.S. sanctions on Iran’s oil sales.

**Global Petroleum Inventories.** A faster recovery of global oil demand and steeper declines in global oil production than EIA had forecast in previous outlooks mean inventory builds during the first five months of 2020 were not as large as previously expected. EIA now estimates that implied global oil inventory growth (measured as the difference between estimated global liquid fuels demand and production) averaged 8.4 million b/d from January through May. This level of growth implies oil inventories stood almost 1.3 billion barrels higher at the end of May than they did at the start of the year. In the June STEO, EIA had estimated builds of more than 1.4 billion barrels during this period.

EIA now forecasts that global petroleum inventory builds will average 1.7 million b/d in 2020, compared with the 2.2 million b/d inventory build EIA had forecast in the June STEO. EIA estimates that global inventories began declining in June. Forecast petroleum inventory draws average 3.3 million b/d for the second half of 2020 and 1.1 million b/d in 2021. As a result, EIA expects that commercial crude oil and other liquid fuels inventories held within the Organization of Economic Cooperation and Development (OECD), which peaked at an estimated 3.3 billion barrels in May, will decline to 3.0 billion barrels by the end of 2020. By the end of 2021, the inventory builds that occurred in 2020 will have disappeared, and OECD commercial inventories will fall below 2.9 billion barrels, a level last seen at the end of February 2020.

**Crude Oil Prices.** Brent crude oil spot prices averaged $40/b in June, up $11/b from May and up $22/b from the multiyear lows from April. Prices rose as OPEC+ producers agreed to extend the deepest production cuts through July and as indications that many locations previously under lockdown orders were increasing liquid fuels demand. Given supply reductions and rising demand, EIA estimates that global oil inventories declined in June for the first time since December 2019. This decline followed five months in which global oil inventory builds averaged 8.4 million b/d, which caused crude oil prices to drop sharply. Because EIA expects global oil demand to exceed supply in the second half of 2020, and continue to exceed through the forecast period, EIA expects crude oil prices to rise through the end of the forecast. However, existing inventory levels, significant OPEC surplus production capacity, and uncertainty about the trajectory of oil demand will likely limit upward crude oil price movements, particularly in the third quarter of 2020.

EIA expects Brent crude oil prices to average $41/b during the second half of 2020 and $50/b during 2021, reaching $53/b by the end of 2021. However, this price path reflects global oil consumption of 96.0 million b/d during the second half of 2020 along with relatively strict compliance to announced OPEC+ production cuts, both of which are uncertain. Also, the degree
to which the U.S. shale industry responds to the recent relative strength in oil prices compared
with their recent lows in April will affect the oil price path in the coming quarters.

Global economic developments and numerous uncertainties surrounding the ongoing COVID-19
pandemic in the coming months could push oil prices higher or lower than the current STEO
price forecast. Uncertainty also remains regarding the duration of, and adherence to, the
current OPEC+ production cuts. Lastly, the U.S. tight oil sector continues to be dynamic, and the
ability of producers to adjust to an especially volatile pricing environment in the face of
significant reductions in drilling activity in recent months could affect both current crude oil
prices and expectations for future prices.

EIA forecasts West Texas Intermediate (WTI) crude oil prices will average about $3/b less than
Brent prices in 2020 and $4/b in 2021. This price discount is based on EIA’s assumption that the
current reduced discount of WTI to Brent of $2/b on average in June reflects significant declines
in U.S. crude oil production and reduced available volumes of U.S. crude oil for export to distant
markets relative to other global benchmarks. As the global market adjusts to reduced demand
and production levels, EIA expects the spread to return to $4/b by the end of 2020 based on the
relative cost of exporting U.S. crude oil from the Cushing distribution hub to Asia, compared
with Brent crude oil from the North Sea.

U.S. Liquid Fuels

**Consumption.** Consumption of U.S. liquid fuels fell in early 2020 as a result of reduced travel
because of COVID-19 and associated mitigation measures. Consumption of liquid fuels in the
United States reached its low point in April at an average of 14.7 million barrels per day (b/d),
down 5.4 million b/d from April 2019. Initial data show consumption increased to 16.1 million
b/d in May and to 17.5 million b/d in June as states relaxed restrictions. EIA expects
consumption will continue increasing in the second half of the year as economic activity
increases.

EIA forecasts that U.S. consumption of petroleum and other liquid fuels will average 18.9 million
b/d in the second half of 2020, up from an average of 17.7 million b/d in the first half of the
year. EIA forecasts that annual consumption in 2020 will average 18.3 million b/d, down 2.1
million b/d from 2019. On a volumetric basis, almost half of the decrease in 2020 of U.S.
consumption of liquid fuels is reduced gasoline use. On a percentage basis, however, jet fuel
consumption declines the most (-31%) in 2020 from 2019, followed by residual fuel oil (-20%),
gasoline (-10%), and distillate (-10%). EIA forecasts U.S. consumption of liquid fuels will recover
to 19.9 million b/d in 2021.

EIA forecasts that U.S. jet fuel consumption will decline by 540,000 b/d from 2019 to average
1.2 million b/d in 2020. Estimated consumption fell to 660,000 b/d in the second quarter of
2020, and EIA expects it to rise to 1.4 million b/d in the fourth quarter. EIA’s forecast
consumption continues rising in 2021, and averages 1.5 million b/d for the year, remaining less
than the 2019 consumption level of 1.7 million b/d.
U.S. motor gasoline consumption in the forecast averages 8.3 million b/d in 2020, down 1.0 million b/d (10.3%) from 2019 consumption levels. The annual declines are largely the result of travel disruptions and COVID-19 mitigation efforts that occurred predominantly in the first half of 2020. In the second half of 2020, gasoline consumption is supported by a forecast increase in employment and is expected to rise from an average of 7.8 million b/d in the first half of 2020 to 8.8 million b/d in the second half of the year. EIA assumes employment levels continue to grow in 2021, driving gasoline consumption up 0.8 million b/d from 2020 levels to average 9.1 million b/d in 2021.

U.S. consumption of distillate fuel in the forecast averages 3.7 million b/d in 2020 and 3.8 million b/d in 2021, down from 4.1 million b/d in 2019. Distillate consumption in the forecast is less affected on a percentage basis by COVID-19 mitigation efforts than jet fuel consumption, decreasing a forecast 10.1% in 2020 compared with 2019. Distillate consumption is driven by economic activity and by freight movements and is more likely affected by slowing economic growth than by travel restrictions themselves. Distillate fuel is also used in activities that are less directly affected by restrictions, such as for diesel engines of heavy construction equipment and as heating oil both for space heating in buildings and industrial heating. The restrictions may have indirectly affected these uses over time as a result of reduced economic activity that eventually led to a decrease in consumer spending for all goods. Diesel fuel is also used in oil and natural gas drilling operations, which have decreased significantly. U.S. gross domestic product reached an estimated low in the second quarter of 2020, and EIA assumes it will increase throughout the forecast, driving the recovery in distillate consumption.

EIA forecasts that U.S. consumption of hydrocarbon gas liquids (HGL) will decline by 110,000 b/d in 2020 to an average 3.0 million b/d in 2020 and increase to 3.3 million b/d in 2021. The decline in HGL consumption in 2020 is driven by an exceptionally warm first quarter that depressed propane consumption for space heating, followed by COVID-19 related mitigation measures, which depressed demand for HGLs as a petrochemical feedstock and for other end uses. The forecast decline in propane, butanes, and natural gasoline consumption is partially offset by an increase in the use of ethane as a feedstock for additional petrochemical capacity expected to come online in 2020 and 2021. EIA forecasts ethane consumption will increase by 110,000 b/d in 2020 and by a further 160,000 b/d in 2021.

**Crude Oil Supply.** EIA estimates that annual U.S. crude oil production will average 11.6 million b/d in 2020, down 0.6 million b/d from 2019 as result of a drop in drilling activity and production curtailments related to low oil prices. This 2020 production decline would mark the first annual decline since 2016. EIA expects production to decline slightly through the first half of 2021 and then to generally increase for the rest of 2021 as prices and economic conditions become more favorable for oil drilling.

EIA estimates that U.S. crude oil production in June averaged 11.0 million b/d, down 1.9 million b/d from the record level reached in November 2019. The declines occurred because producers quickly curtailed production and reduced drilling activity in response to falling prices. As of July 2, Baker Hughes reported the fewest active drilling rigs in the United States in their records,
which date back to 1987. Adding to the June drop in U.S. crude oil production were declines in the Federal Gulf of Mexico (GOM) stemming from shut-in production in response to Tropical Storm Cristobal.

In July, EIA expects U.S. oil production to increase to 11.4 million b/d as production returns in the GOM. EIA also expects small increases in crude oil production in the Lower 48 states and Alaska in July as operators respond to recent oil price increases.

EIA’s forecast of a small increase in tight oil production in July is a result of expectations that some producers will reduce curtailments as oil prices have increased. EIA forecasts that the effect of reduced curtailments will be relatively short lived, and then the effects of less drilling take back over and cause production to fall. As a result, EIA expects that production declines in the tight oil basins of the Lower 48 states will resume after July. Although crude oil prices have increased, they are not high enough to encourage a significant recovery in drilling. Typically, crude oil price changes lead to changes in crude oil production in tight oil basins after about six months. However, current market conditions forced U.S. producers to curtail production more quickly as the WTI spot price dropped to less than $20 per barrel (b) in April and remained less than $40/b during most days in June. With EIA’s West Texas Intermediate (WTI) crude oil price forecast averaging $39/b during the second half of 2020, EIA expects onshore production in the Lower 48 states decline from 9.0 million b/d in July 2020 to 8.5 million b/d in April 2021. EIA finalized this month’s forecast before a U.S. District Court ordered on July 6 the temporary closure of the Dakota Access Pipeline beginning in early August. Energy Transfer, the operators of the pipeline, have announced they will “file a motion to stay this decision and if not granted, to pursue a stay and expedited appeal with the Court of Appeals.” Depending on the outcome, a closure could affect oil prices and wellhead economics during the forecast period, particularly in Bakken region of North Dakota. EIA will incorporate any relevant information related to the pipeline’s status in its August STEO.

EIA expects some growth in U.S. crude oil production to resume in mid-2021 as oil prices increase. However, EIA’s forecast WTI prices remain lower than $50/b through 2021, and with an uncertain capital environment growth could be limited. EIA expects crude oil production in the Lower 48 states to increase to 8.7 million b/d in the fourth quarter of 2021 and total U.S. crude oil production to increase to 11.1 million b/d; both would be lower than June 2020 levels. Forecast annual average U.S. crude oil production in 2021 is 11.0 million b/d.

**Hydrocarbon Gas Liquids Supply.** EIA forecasts natural gas plant production of HGLs to increase by 70,000 b/d in 2020 and by 110,000 b/d in 2021, despite the forecast decline in natural gas production. Declines in the production of propane and butanes at natural gas processing plants in 2021, resulting from less natural gas production, will be more than offset by increased ethane production. EIA forecasts higher rates of ethane recovery at natural gas processing plants to increase to meet growing demand for ethane as a petrochemical feedstock in the United States and abroad between 2020 and 2021.
**Liquid Biofuels.** COVID-19 related reductions in economic activity in general and demand for liquid fuels in particular have had significant effects on U.S. biofuels markets that are expected to persist throughout the STEO forecast period. EIA still expects that current targets in the Renewable Fuel Standard (RFS) program will primarily impact biomass-based diesel production and net imports, which help to meet multiple RFS targets for biomass-based diesel, advanced biofuel, and total renewable fuel, but those impacts will be outweighed by COVID-19 disruptions during 2020.

U.S. biodiesel production fell by 7% from 2018 to 2019, averaging an estimated 112,000 b/d last year. EIA expects biodiesel production will again decrease by nearly 2% to average 110,000 b/d in 2020 before increasing by 21% to average 133,000 b/d in 2021, driven largely by increasing RFS targets and the renewal of the biodiesel production tax credit through 2022.

U.S. net imports of biomass-based diesel increased by 32% to an average 20,000 b/d in 2019, driven primarily by growth in renewable diesel imports, and EIA expects them to increase further to an average of 24,000 b/d in 2020 and 39,000 b/d in 2021. Increased net imports of biomass-based diesel are driven primarily by increased volumes of renewable diesel imported to meet both California Low Carbon Fuel Standard requirements and the rising RFS targets.

As a result of limited demand growth and oversupply, **U.S. ethanol producers experienced weakening operating margins**, and ethanol production fell for the first time in seven years in 2019, down 2.0% from 2018 to an average of 1.03 million b/d. In 2020, ethanol producers have seen even weaker margins and have significantly curtailed production in response to dramatic decreases to domestic motor gasoline demand. As a result, EIA forecasts that persistent reductions in domestic gasoline demand and limited higher-blend ethanol growth potential will result in ethanol production remaining lower than 2019 levels throughout the STEO forecast. EIA expects ethanol production to average 0.90 million b/d in 2020, 12% less than in 2019, and to average 1.00 million b/d in 2021, which would still be 2% lower than the 2019 level.

U.S. ethanol consumption averaged 948,000 b/d in 2019, and EIA forecasts significant decreases to average 836,000 b/d in 2020 and 919,000 b/d in 2021, driven by persistent COVID-19 related demand impacts. This level of consumption results in the ethanol share of total gasoline, which was an estimated 10.1% in 2018 and 10.2% in 2019, to be 10.1% on average during 2020 and 2021. This stable ethanol share assumes that growth in higher-level ethanol blends is limited by a combination of lower gasoline prices reducing incentives for increased ethanol blending and limited consumer demand for higher levels of ethanol blending beyond 10% of gasoline (E10).

**Product Prices.** Travel reductions related to COVID-19 mitigation efforts have resulted in sharp reductions in crude oil prices and demand for liquid fuels in the United States during the second quarter of 2020, which have significantly reduced prices for gasoline and diesel fuel during the same period. U.S. retail prices for regular-grade gasoline averaged $1.94 per gallon (gal) during the second quarter of 2020 and diesel retail prices averaged $2.43/gal, down about 47 cents/gal from the first quarter of 2020 for both fuels.
The U.S. gasoline and diesel price declines largely reflect a drop in crude oil prices. Refinery margins, after falling significantly as gasoline and diesel demand fell quickly in March and April, have increased recently as refiners have reduced runs. EIA expects petroleum product prices will rise as crude oil prices rise in the coming quarters. However, EIA generally expects U.S. average gasoline prices to remain near $2/gal until March 2021.

Refinery wholesale gasoline margins in the United States (the difference between the wholesale price of gasoline and the price of Brent crude oil) averaged 21 cents/gal in April 2020 before increasing to 30 cents/gal in June. This level in June was 8 cents/gal less than the average for the same time last year and 18 cents/gal less than the five-year (2015–19) average for June. EIA expects the U.S. refinery wholesale gasoline margin will average 31 cents/gal in 2020 and 30 cents/gal in 2021.

EIA expects the retail price of regular gasoline in the United States will average $2.06/gal during the third quarter of 2020, 59 cents/gal lower than at the same time last year. EIA expects the U.S. monthly regular retail gasoline price will increase from an average of $2.08/gal in June to $2.10/gal in July before falling to $2.00/gal in September 2020. The U.S. regular gasoline retail price, which averaged $2.60/gal in 2019, is forecast to average $2.11/gal in 2020 and $2.23/gal in 2021.

Regional annual average forecast prices for 2020 range from a low of $1.83/gal in the Gulf Coast region—Petroleum Administration for Defense District (PADD) 3—to a high of $2.77/gal in the West Coast region (PADD 5).

The retail price of diesel fuel in the United States averaged $3.06/gal in 2019, which was 13 cents/gal lower than in 2018. EIA forecasts that the diesel price will average $2.52/gal in 2020 and $2.59/gal in 2021. EIA expects that sharp reductions in forecast global economic activity and high levels of diesel inventories will keep diesel refinery margins lower during the forecast period. Diesel refinery margins based on Brent crude oil averaged 20 cents/gal in June 2020, which was 18 cents/gal lower than the five-year average for June and the lowest monthly average since June 2009. They averaged 43 cents/gal in 2019. EIA expects diesel refinery margins will average 33 cents/gal in 2020 and 38 cents/gal in 2021.

**Natural Gas**

**Natural Gas Consumption.** Consumption of natural gas in the United States averaged an estimated 85.0 billion cubic feet per day (Bcf/d) in 2019, and EIA expects U.S. consumption will decrease by 2.6 Bcf/d (3.1%) in 2020 before decreasing by an additional 3.7 Bcf/d (4.5%) in 2021.

The largest natural gas consuming sector in the United States is the electric power sector. EIA estimates that electric generation will consume an average 31.9 Bcf/d in 2020, which is 2.9% more than in 2019 because of new natural gas-fired electric generation capacity and competitive natural gas prices. EIA forecasts power sector consumption of natural gas to decline by 14.3% in 2021, which reflects increased competition from renewable sources and from coal.
Growth in renewable sources of electricity generation is a result of continuing renewables capacity additions. EIA’s forecast of higher natural gas spot prices in 2021 compared with 2020, makes natural gas less competitive compared with coal for use in power generation.

EIA expects combined U.S. residential and commercial natural gas consumption will average 21.8 Bcf/d in 2020, down 6.8% from 2019, primarily because of warmer-than-average temperatures in the first quarter of 2020 that reduced demand for space heating. Based on forecasts by the National Oceanic and Atmospheric Administration (NOAA), EIA assumes a cooler summer with 7.2% fewer heating degree days (HDD) across the United States in 2020 compared with 2019. EIA expects natural gas consumption in the residential and commercial sectors to increase by 1.6% in 2021, based on a forecast increase in U.S. HDD of 4.0% in 2021.

EIA forecasts U.S. consumption of natural gas by the industrial sector will decline by 6.2% in 2020. Most of this 2020 decrease is the result of less manufacturing activity following COVID-19 mitigation efforts. EIA forecasts industrial sector natural gas consumption to rise by 2.6% as economic growth supports renewed manufacturing activity.

**Natural Gas Production and Trade.** EIA estimates that U.S. production of dry natural gas averaged 89.9 Bcf/d in the second quarter of 2020, down 6.1 Bcf/d (6.3%) from the fourth quarter of 2019. The declines are the result of a sharp drop in drilling activity because of low natural gas and crude oil prices and because of production curtailments. EIA expects dry natural gas production to continue to decline through the end of 2020. Forecast dry natural gas production in the United States averages 89.2 Bcf/d in 2020, down 3.0 Bcf/d (3.2%) from 2019. Natural gas production declines the most in the Permian region because of a drop in drilling activity and low crude oil prices reduce associated natural gas output from oil-directed wells.

In 2021, EIA expects dry natural gas production to decline by 5.0 Bcf/d (5.6%) from 2020. EIA forecasts the low point in natural gas production to occur in the second quarter of 2021 at an average of 83.3 Bcf/d, which would be down 12.7 Bcf/d (13.2%) from the fourth-quarter 2019 peak. However, toward the second half of 2021, as Henry Hub prices rise and economic conditions become more favorable, EIA expects dry natural gas production to increase, reaching 85.6 Bcf/d in the fourth quarter of 2021.

EIA forecasts net natural gas exports will rise to average 6.1 Bcf/d in 2020 and 7.5 Bcf/d in 2021. Because of rising liquefied natural gas (LNG) and pipeline exports, the United States has been a net exporter of natural gas since the second quarter of 2017. EIA estimates that gross exports of U.S. LNG averaged 5.0 Bcf/d in 2019. EIA expects LNG exports will increase to 5.4 Bcf/d in 2020 and 7.3 Bcf/d in 2021.

In 2020, U.S. LNG liquefaction capacity continues to expand. In May 2020, the third train at Freeport LNG in Texas began commercial operations. Later this summer, the third train at the Cameron LNG export facility in Louisiana and three of Elba Island’s small-scale moveable modular liquefaction system units are expected to come online in Georgia, bringing U.S. total liquefaction export capacity to 8.9 Bcf/d of baseload (10.1 Bcf/d peak).
U.S. LNG exports averaged 7.7 Bcf/d through the first four months of 2020, but declined by 17% between April and May. A mild winter and COVID-19 mitigation efforts have led to declining global natural gas demand and high natural gas inventories in Europe and Asia, reducing the need for LNG imports. Historically low natural gas and LNG spot prices in Europe and Asia have reduced the economic viability of U.S. LNG exports, which are highly price sensitive. In the summer 2020, more than 70 LNG export cargoes from the United States were canceled for June and July deliveries, and more than 40 cargoes were canceled for August deliveries. In comparison, 74 cargoes were exported from the United States in January 2020.

EIA estimates that as a result of these cancellations, U.S. LNG exports averaged 3.6 Bcf/d in June and forecasts that they will average 2.2 Bcf/d in July and August 2020, implying a 25% utilization of LNG export capacity. EIA expects U.S. LNG exports to increase beginning in September and average 7.1 Bcf/d from December 2020–February 2021 as global natural gas demand gradually recovers.

U.S. natural gas exports to Mexico by pipeline have also increased as more infrastructure has been built to transport natural gas both to and within Mexico. U.S. pipeline exports to Mexico averaged 5.3 Bcf/d in the first quarter of 2020, an increase of 9% compared with the same period in 2019. Exports to Mexico should continue to increase as more natural gas-fired power plants come online in Mexico and more pipeline infrastructure within Mexico is built. EIA expects gross U.S. pipeline exports to Mexico and Canada to average 7.9 Bcf/d and 8.3 Bcf/d in 2020 and 2021, respectively.

U.S. net natural gas pipeline imports from Canada decreased from 2019 to 2020, continuing a trend that began in 2008. This decrease in net imports is expected to continue as Appalachian production growth displaces some imports of Canadian natural gas to U.S. Midwest markets.

**Natural Gas Inventories.** As of June 26, 2020, U.S. working gas inventories were 3,077 Bcf, 30% more than the year-ago level and 18% more than the five-year (2015–19) average level. A warmer-than-normal winter led to the smallest total storage withdrawal since the 2015–16 winter, and inventories at the end of the winter heating season on March 31 were 18% more than the five-year average. Weekly storage injections so far during the April–October injection season have been close to the five-year average rate as falling production has been offset by falling demand from the industrial sector and LNG exports. EIA expects declining natural gas production will cause injections to fall short of the five-year average later in the summer. However, because of the high starting point for inventories during this injection season, EIA forecasts inventories will reach a record 4,039 Bcf by the end of October, which would be 8% more than the five-year average for that time period.

**Natural Gas Prices.** Henry Hub spot prices averaged $1.63 per million British thermal units (MMBtu) in June, down 12 cents/MMBtu from May and the lowest inflation adjusted monthly average price since at least 1989. Currently, the effects of reduced natural gas demand are outweighing the effects of falling U.S. natural gas production and are contributing to low natural gas prices. EIA expects that these conditions will largely persist in the coming months, keeping
the third quarter average price at $1.65/MMBtu. However, EIA expects general upward price pressures to emerge later in 2020 as demand for natural gas increases and production continues to decline, particularly in the fourth quarter when space heating demand rises. EIA forecasts that the Henry Hub spot price will average $2.46/MMBtu in the fourth quarter of 2020, bringing the 2020 annual average to $1.93/MMBtu. EIA expects the Henry Hub price will average $3.10/MMBtu in 2021 as falling natural gas production levels continue to exert upward price pressures.

**Coal**

**Coal Supply.** Initial data show U.S. coal production was 113 million short tons (MMst) in the second quarter of 2020, down 37% from the same period a year ago. Coal production has declined primarily because of falling electric power sector demand for coal amid low natural gas prices. As a result of COVID-19 mitigation efforts, some coal mines have either been idled or shut down. Steam coal production has been more affected by lower demand from the domestic electric power sector, but metallurgical coal production has been more affected by falling demand for U.S. exports. EIA expects that U.S. coal production will be 501 MMst in 2020, down 29% from 2019. EIA’s forecast coal production rises 7% in 2021 to 536 MMst, driven primarily by a recovery in Western region production.

**Coal Consumption.** EIA expects U.S. coal consumption to decline by 28% in 2020 as a result of a decline in coal use for electricity generation, which is the effect of both lower overall electricity generation and low natural gas prices that make coal less competitive as a generation fuel. The largest drops in coal use for power generation occur in the Midwest, Southeast, and mid-Atlantic. However, EIA forecasts that U.S. coal consumption will rise by 21% in 2021 largely because of an expected increase in natural gas prices that will cause some coal-fired generation units to become more economic to dispatch.

**Coal Trade.** EIA forecasts that U.S. coal exports will decrease in 2020 by 32% to 63 MMst. U.S. Atlantic ports, which are the primary outlet for U.S. coal exports, are seeing decreased demand because of the global economic slowdown. Based on an assumed increase in global coal demand in 2021, EIA expects U.S. coal exports to increase by 7% next year. EIA expects increases in 2021 to be limited because of less demand for U.S. coal in India. India, the top destination for U.S. exports, has decreased consumption of both steam and coking coals by nearly 50% this year. India has also opened up domestic mining options to private companies.

**Coal Prices.** EIA estimates the delivered coal price to U.S. electricity generators averaged $2.02 per million British thermal units (MMBtu) in 2019, which was 4 cents/MMBtu lower than in 2018. EIA forecasts that coal prices will decrease in 2020 to $1.98/MMBtu and increase in 2021 to $2.04/MMBtu.

**Electricity**

**Electricity Consumption.** EIA forecasts that consumption of electricity in the United States, including direct use of electricity by combined-heat-and-power plants, will decline by 4% in 2020.
and then grow by 1% in 2021. This decline in expected consumption reflects significant changes in electricity consumption patterns resulting from efforts to mitigate COVID-19. These mitigation and reopening efforts are currently evolving, which introduces heightened uncertainty into the STEO’s electricity forecasts.

Most of EIA’s expected decline during 2020 occurs in the commercial and industrial sectors. EIA forecasts that retail sales of electricity to the U.S. commercial sector will be 7% lower than in 2019. Commercial electricity demand was slightly lower in the first quarter of 2020 compared with 2019 as a result of mild winter temperatures. The stay-at-home orders in the late spring months especially affected commercial businesses such as restaurants, hotels, and similar establishments because they were required to cease operations. In addition, many office employees worked from home instead of their normal workplaces. EIA’s most recent survey data indicate that commercial retail electricity sales in April 2020 were 11% lower than in April 2019. EIA estimates similar year-over-year declines have occurred in May and June. The relaxing of stay-at-home orders will likely result in slowed growth in electricity consumption in the commercial sector, but social distancing guidelines that remain in place will likely keep consumption less than 2019 levels.

Retail sales of electricity to the industrial sector have generally been declining over the past 10 years. However, the economic slowdown resulting from COVID-19 mitigation efforts has intensified declines in electricity sales in recent months. Although retail sales of electricity to the U.S. industrial sector during the first quarter of 2020 were slightly higher than the same period in 2019, EIA estimates industrial electricity consumption during the second quarter of 2020 was 8% lower than for the same period last year. EIA expects similar year-over-year declines through the end of the year, leading to a forecast annual decline of 6% in U.S. retail industrial electricity sales during 2020.

Residential electricity consumption during the first quarter of 2020 was 6% lower than for the same period last year as a result of milder winter temperatures. Since late March, the residential sector has generally been consuming more electricity as a result of stay-at-home orders and social distancing guidelines related to COVID-19. U.S. retail sales of electricity to the residential sector in April 2020, when most states had implemented stay-at-home guidance, was 8% higher than in April 2019. Some of this year-over-year increase was likely a result of increased electricity use for heating because the April temperatures were generally colder than in April 2019, but it is likely the increase in consumption was also a result of people spending more time in their homes. EIA assumes this extra use of electricity related to COVID-19 mitigation efforts will decrease gradually through the third quarter of 2020. EIA forecasts 2020 annual residential electricity sales will be essentially the same amount as in 2019.

In 2021, assumed increases in economic activity drive EIA’s forecast that residential electricity sales will grow by 1% and commercial electricity sales will grow by 3%. EIA expects industrial electricity consumption in 2021 to remain essentially flat as some manufacturers boost production while others increase the efficiency of their electricity usage.
**Electricity Generation.** EIA’s expectation for less electricity demand overall drives the forecast of a 5% decrease in U.S. electric power sector generation during 2020 compared with 2019. Electric power sector generation in the forecast increases by 1% in 2021.

Coal-fired electricity generation has been the energy source most affected by the reduction in electricity demand resulting from COVID-19 mitigation measures. EIA estimates that U.S. electric power sector coal generation was 314 billion kilowatthours (kWh) during the first half of 2020 compared with 467 billion kWh during the first half of 2019. Coal-fired generation has been falling faster than the overall level of electricity demand as a result of competition from other energy sources. In particular, the cost of natural gas has fallen to its lowest levels in 25 years. In addition, significant levels of new generating capacity using renewable energy sources have been added. EIA expects the share of total U.S. generation from coal-fired power plants will average 18% in 2020 compared with 24% in 2019.

Although the cost of natural gas for power generation has been relatively low for the past few years, recent prices have fallen even farther. EIA expects the cost of natural gas delivered to electric generators in 2020 will average $2.05 per million British thermal units, which would be 29% below the 2019 average and the lowest annual price since 1995. These sustained low prices drive EIA’s forecast that natural gas-fired power generators will supply 41% of total U.S. electricity generation in 2020, up from 37% in 2019. Most of the projected increase in natural gas-fired generation occurs in the midwestern and eastern regions of the United States.

EIA also expects generation from renewable energy sources will increase in 2020. Slightly higher precipitation levels in the Pacific Northwest drive EIA’s forecast that conventional hydroelectric generation will provide 8% of total U.S. generation in 2020, compared with 7% last year. Most of the expected increase in generation from renewables is a result of new solar and wind generation capacity additions. EIA expects the generation share from renewable energy sources other than hydropower will increase to 13% in 2020 compared with 11% in 2019.

Five nuclear reactors retired in 2019 or are scheduled to retire before the end of 2021. EIA expects the electric power sector will generate 794 billion kWh in 2020, down from 809 billion kWh last year. The forecast level of U.S. nuclear generation corresponds with a generation share of 21%.

In 2021, rising natural gas prices and continued additions of renewable generating capacity drive EIA’s forecast for the U.S. electricity generation fuel mix. EIA forecasts the U.S. average delivered cost of natural gas in 2021 will rise to $3.43 per million Btu. These higher natural gas prices cause the forecast share of generation from natural gas-fired power plants to decline to 36% in 2021 from 41% in 2020. Conversely, coal-fired power plants become more economically competitive, and EIA forecasts the U.S. coal generation share in 2021 will average 21% compared with 18% in 2020. Nonhydro renewables provide a forecast share of 15% in 2021, up from an expected share of 13% this year.

**Renewables Capacity.** After adding 5 gigawatts (GW) of capacity in 2019, EIA forecasts 13 GW of utility-scale solar photovoltaic (PV) capacity will be added in 2020 and 11 GW more will be
added in 2021. Fewer capacity additions in 2021 takes into consideration some effects of the Investment Tax Credit (ITC) phase-down. Based on the latest available data that EIA has received, the impact of COVID-19 on PV capacity in development is limited; therefore, the forecast for utility-scale PV capacity additions in 2020 and 2021 is only slightly lower than the forecast in the January STEO.

EIA also expects a total of 9 GW of small-scale solar PV capacity will be installed during 2020 and 2021, mostly in the residential sector. EIA expects small-scale solar to continue to grow, although at a slower pace than the level forecasted in the January STEO. Various state and federal policies support EIA’s forecast solar capacity growth, including California’s requirement that all new home construction has rooftop solar panels beginning this year. The National Renewable Energy Laboratory (NREL) estimates that 15% of detached single-family homes in California currently have solar PV systems.

**Electricity Prices.** EIA expects wholesale electricity prices throughout the United States will be lower in 2020 than they were in 2019, reflecting the lower cost for natural gas as a fuel for power generation and less overall electricity demand. The expected declines in wholesale electricity prices range from 11% lower at the Midcontinent Illinois hub to an expected decline of 53% at the ERCOT North hub in Texas, where prices spiked during some hours in 2019.

EIA forecasts the U.S. retail electricity price for the residential sector will average 13.1 cents per kWh in 2020, which is 1.2% higher than the average retail price in 2019. These higher retail prices reflect the power industry’s increased expenditures for generation and transmission infrastructure during the past few years. Forecast residential prices rise by an additional 1.2% in 2021.

**U.S. Economic Assumptions and Energy-Related Carbon Dioxide Emissions**

The STEO is based on macroeconomic forecasts by IHS Markit (for the United States). EIA used the June 2020 version of the IHS Markit macroeconomic model with EIA’s energy price forecasts as model inputs to develop the economic forecasts in STEO.

Using the IHS Markit model, EIA assumes U.S. real gross domestic product (GDP) will decline by 8.2% in 2020 and grow by 5.1% in 2021, compared with 2.3% growth in 2019. EIA assumes that total industrial production will decrease 14.9% in 2020 and increase 1.4% in 2021, compared with 0.9% growth in 2019. In the forecast, nonfarm employment, which grew by 1.4% in 2019, decreases by 7.0% in 2020 and will increase by 4.9% in 2021.

**Energy-Related Carbon Dioxide Emissions.** After decreasing by 2.8%—150 million metric tons (MMMmt)—in 2019 EIA forecasts that energy-related carbon dioxide (CO2) emissions will decrease by 12.2% (624 MMMmt) in 2020 and increase by 6.0% (268 MMMmt) in 2021. This forecast is highly dependent on assumptions regarding the economic impact and subsequent recovery from COVID-19. In addition to economic growth, energy-related CO2 emissions are sensitive to changes in weather, energy prices, and fuel mix.
The relative prices of coal and natural gas are especially important in determining the fuel mix for electricity generation because these substitutes for one another in the generation dispatch order. Because natural gas typically has a 30% advantage in terms of generation efficiency, even when coal prices are slightly lower on a dollars-per-MMBtu basis, natural gas generation will be dispatched first since it would have a lower dollars-per-MWh cost.

In 2020, EIA forecasts natural gas prices for electric generators to decline by 29% to $2.05/MMBtu, while forecast coal prices decline by 2% to $1.98/MMBtu. This price pattern shifts more electricity generation toward natural gas. However, in 2021 EIA expects natural gas prices for the power sector to increase by 67% to $3.43/MMBtu and coal prices to increase by 3% to $2.04/MMBtu, leading to an 11% decline in natural gas generation and a 22% increase in coal generation. This fuel shift contributes to a 164 MMmt increase in coal emissions in 2021, which more than offsets the 78 MMmt decline in natural gas CO2 emissions. Petroleum-related CO2 emissions are forecast to decline by 12% (279 MMmt) in 2020 as vehicle miles traveled (VMT) decline by 11% because of restricted travel and work-from-home orders.

Notable forecast changes

- EIA forecasts Brent crude oil spot prices will average $41 per barrel (b) in 2020 and $50/b in 2021 and West Texas Intermediate spot prices will average $38/b in 2020 and $46/b in 2021. All of these prices are $2/b higher than forecast in the June STEO. The higher price forecast largely reflects lower expected global oil inventory builds during the first half of 2020.

- This STEO incorporates the extension of May and June supply reductions from OPEC+ through July. Largely as a result of this extension, EIA expects global production of crude oil and other liquid fuels to average 90.8 million barrels per day (b/d) in the third quarter of 2020, 1.1 million b/d lower than forecast last month.

- Based on a forecast of higher crude oil prices, EIA expects U.S. production of crude oil to average 11.0 million b/d in 2021, up 0.2 million b/d from last month’s forecast. The U.S. crude oil production forecast for 2020 is mostly unchanged.

- EIA expects U.S. consumption of petroleum and other liquid fuels will average 18.3 million b/d in 2020 and 19.9 million b/d in 2021. Those forecasts are almost 0.3 million b/d and 0.5 million b/d more, respectively, than in the June STEO. The main driver of the higher forecast in both years is more expected gasoline consumption. EIA raised its forecast for U.S. gasoline consumption after incorporating the IHS Markit macroeconomic forecast that shows higher expected employment levels over the next 18 months. EIA also raised its forecast for hydrocarbon gas liquids (HGL) consumption based on incoming data. April HGL consumption in the Petroleum Supply Monthly was more than EIA’s estimate from the June STEO, which indicates higher utilization rates at ethane-fed petrochemical plants than previously expected.
• EIA’s forecast Henry Hub natural gas spot price averages $2.05 per million British thermal units (MMBtu) in the second half of 2020, down from a forecast of $2.26/MMBtu last month. The lower price forecast in this STEO reflects EIA’s reduction in forecast U.S. liquefied natural gas (LNG) exports during the third quarter of 2020.

• EIA expects U.S. LNG exports will average 2.6 billion cubic feet per day (Bcf/d) in the third quarter of 2020, down 1.0 Bcf/d from the last forecast as a result of low global demand for natural gas.

• For more information, see the detailed table of forecast changes