Forecast highlights

Global liquid fuels

• The December Short-Term Energy Outlook (STEO) remains subject to heightened levels of uncertainty because responses to COVID-19 continue to evolve. Reduced economic activity related to the COVID-19 pandemic has caused changes in energy demand and supply patterns in 2020 and will continue to affect these patterns in the future. U.S. gross domestic product (GDP) declined by 4.4% in the first half of 2020 from the same period a year ago. GDP began rising in the third quarter of 2020, and this STEO assumes it will grow by 3.1% annually in 2021 from 2020. The U.S. macroeconomic assumptions in this outlook are based on forecasts by IHS Markit completed in early November.

• Brent crude oil spot prices averaged $43 per barrel (b) in November, up $3/b from the average in October. Brent prices increased in November in part because of news about the viability of multiple COVID-19 vaccines, along with market expectations that the Organization of the Petroleum Exporting Countries (OPEC) and partner countries (OPEC+) would delay or limit production increases planned for January 2021.

• The U.S. Energy Information Administration (EIA) expects that Brent prices will average $49/b in 2021, up from an expected average of $43/b in the fourth quarter of 2020. The forecast for higher crude oil prices next year reflects EIA’s expectation that while inventories will remain high, they will decline with rising global oil demand and restrained OPEC+ oil production. EIA forecasts Brent prices will average $47/b in the first quarter of 2021 and rise to an average of $50/b by the fourth quarter. The first quarter 2021 average is $5/b more than forecast in last month’s STEO, and the fourth quarter average is $1/b more. The higher expected first quarter prices reflect steeper expected global oil inventory draws as a result of the December 3 OPEC+ decision to limit its previously planned production increases in January 2021. EIA expects high global oil inventory levels and surplus crude oil production capacity will limit upward pressure on oil prices through much of 2021.

• EIA forecasts OPEC crude oil production will average 27.5 million barrels per day (b/d) in 2021, up from an estimated 25.6 million b/d in 2020. The increase reflects OPEC’s announced potential increases to production targets and production increases in Libya. At the December 3 meeting, OPEC and OPEC+ participants decided to limit oil production increases planned for January 2021. OPEC+ announced it will increase its
production target by 0.5 million b/d in January 2021. The group had initially planned to increase its target by 2.0 million b/d. The group will also assess the state of global oil markets and petroleum demand monthly, adjusting targets based on market conditions. EIA now forecasts OPEC crude oil production will average 25.7 million b/d in the first quarter of 2021, which is 1.7 million b/d lower than forecast in the November STEO and reflects the announced changes to OPEC+ targets and more effective assumed compliance with targets.

- EIA estimates that the world consumed 95.6 million b/d of petroleum and liquid fuels in November, which is down 6.3 million b/d from November 2019 but up from the third-quarter 2020 average of 93.5 million b/d. EIA forecasts that global consumption of petroleum and liquid fuels will average 92.4 million b/d for all of 2020, which is down by 8.8 million b/d from 2019, before increasing by 5.8 million b/d in 2021.

- EIA estimates that U.S. crude oil production was 11.2 million b/d in November, which is up from 10.9 million b/d in September (the most recent month for which historical data are available). The increase mostly reflects greater production in the U.S. Federal Gulf of Mexico after hurricane-related disruptions. EIA expects that U.S. crude oil production will decline to less than 11.0 million b/d in March 2021 mostly because of falling production in the Lower 48 states, where EIA expects declining production rates at existing wells will outpace production from newly drilled wells in the coming months. EIA expects crude oil production in the Lower 48 states will increase from 8.7 million b/d in February 2021 to 9.1 million b/d in December 2021, as drilling increases in response to rising oil prices. This increase contributes to total U.S. crude oil production reaching 11.4 million b/d in December 2021. On an annual average basis, EIA expects U.S. crude oil production to fall from 12.2 million b/d in 2019 to 11.3 million b/d in 2020 and 11.1 million b/d in 2021.

**Natural Gas**

- In November, the Henry Hub natural gas spot price averaged $2.61 per million British thermal units (MMBtu), up from the October average of $2.39/MMBtu. Price increases last month were moderated by significantly warmer-than-normal temperatures, which reduced residential space heating demand for natural gas despite many remaining at home in response to the pandemic. EIA expects Henry Hub spot prices to reach a monthly average of $3.10/MMBtu in January 2021, which is down from the forecast January average price of $3.42/MMBtu in last month’s STEO. Although EIA still expects prices to increase in the coming months because of rising space heating demand and rising U.S. liquefied natural gas (LNG) exports amid declining U.S. natural gas production, the lower January price forecast reflects higher forecast storage levels this winter compared with last month’s forecast. EIA expects that monthly average spot prices will average $3.01/MMBtu in 2021, which is up from the forecast average of $2.07/MMBtu for 2020.
• U.S. working natural gas in storage ended October at almost 4.0 trillion cubic feet (Tcf), 5% more than the five-year (2015–19) average and the second-highest end-of-October level on record. EIA estimates that inventories fell by 20 billion cubic feet (Bcf) in November, compared with a five-year average November withdrawal of 103 Bcf and a forecast withdrawal of 222 Bcf in last month's STEO. The lower-than-expected withdrawal is the result of warmer-than-normal November temperatures that reduced natural gas use for space heating. However, EIA forecasts that declines in U.S. natural gas production this winter compared with last winter will more than offset the declines in natural gas consumption, which will contribute to inventory withdrawals outpacing the five-year average during the remainder of the winter season that ends in March. Forecast natural gas inventories end March 2021 at 1.6 Tcf, 15% lower than the 2016–20 average.

• EIA expects that total U.S. consumption of natural gas will average 83.4 billion cubic feet per day (Bcf/d) in 2020, down 2.0% from 2019. The decline in total U.S. consumption reflects warmer temperatures in 2020 compared with 2019 that lowered residential space heating demand for natural gas despite many staying home in response to the pandemic. EIA expects residential demand in 2020 to average 12.9 Bcf/d (down 0.8 Bcf/d from 2019) and commercial demand in 2020 to average 8.6 Bcf/d (down 1.0 Bcf/d from 2019). EIA forecasts industrial consumption will average 22.5 Bcf/d in 2020 (down 0.5 Bcf/d from 2019) as a result of reduced manufacturing activity. EIA expects total U.S. natural gas consumption will average 79.4 Bcf/d in 2021, a 4.8% decline from 2020. The forecast decline in 2021 results from rising natural gas prices that lower forecast natural gas demand in the electric power sector.

• EIA forecasts U.S. dry natural gas production will average 90.9 Bcf/d in 2020, which is down from an average of 93.1 Bcf/d in 2019. In the forecast, monthly average production falls from a record 97.0 Bcf/d in December 2019 to 87.1 Bcf/d in April 2021 before increasing slightly. EIA forecasts dry natural gas production in the United States to average 87.9 Bcf/d in 2021. EIA expects production to begin rising in the second quarter of 2021 in response to higher natural gas and crude oil prices. The increase in crude oil prices is expected to raise associated gas production from oil-directed wells in late-2021, especially in the Permian region.

• EIA estimates that the United States exported 9.4 Bcf/d of LNG in November—the most for any month on record. International spot and forward LNG prices continued to increase in late November, supported by reduced global LNG supply because of outages at LNG export plants in several countries and reported congestion at the Panama Canal, which affected westbound U.S. LNG exports to Asia. EIA expects LNG demand to continue increasing. The primary drivers of this increase are forecasts of colder-than-normal winter weather in Northern Asia and Europe and coal plant closures in South Korea that could increase demand for natural gas for power generation. EIA forecasts that U.S. LNG exports will exceed 9.5 Bcf/d from December through February and will average 8.5 Bcf/d in 2021, a 30% increase from 2020.
Electricity, coal, renewables, and emissions

- EIA forecasts that consumption of electricity in the United States will decrease by 3.9% in 2020. EIA expects retail sales of electricity in the commercial sector to fall this year by 5.9% and by 8.8% in the industrial sector. EIA forecasts residential sector retail sales will rise by 1.5% in 2020. Milder winter temperatures in early 2020 led to less residential consumption for space heating, but this effect was offset by increased summer cooling demand and increased electricity use by more people staying home in response to the pandemic. EIA forecasts total U.S. electricity consumption will rise by 1.3% in 2021. The increase in electricity consumption next year is a result of forecast colder temperatures in the first quarter compared with the same period last year, in addition to continued higher consumption as many people will still be at home more because of the pandemic.

- EIA expects the share of U.S. electric power sector generation from natural gas will increase from 37% in 2019 to 39% this year. In 2021, the forecast natural gas share declines to 34% in response to a forecast increase in the price of natural gas delivered to electricity generators from an average of $2.44/MMBtu in 2020 to $3.38/MMBtu in 2021 (an increase of 39%). Coal’s forecast share of electricity generation falls from 24% in 2019 to 20% in 2020 and then returns to 24% in 2021. Electricity generation from renewable energy sources rises from 18% in 2019 to 20% in 2020 and to 21% in 2021. The nuclear share of U.S. generation remains close to 20% through the forecast period.

- In 2020, EIA expects U.S. residential electricity prices to average 13.1 cents per kilowatthour, which is 0.8% higher than the average electricity price in 2019. Annual changes in regional residential electricity prices this year range from 0.4% lower in the South Atlantic region to 3.7% higher in the Pacific region.

- EIA forecasts that planned additions to wind and solar generating capacity in 2020 and 2021 will contribute to increasing electricity generation from those sources. EIA expects the U.S. electric power sector will add 23.0 gigawatts (GW) of new wind capacity in 2020 and 9.5 GW of new capacity in 2021. Expected utility-scale solar capacity rises by 12.8 GW in 2020 and by 14.0 GW in 2021.

- EIA forecasts U.S. coal production to total 521 million short tons (MMst) in 2020, a 26% decline from 2019. Forecast coal production rises to 624 MMst in 2021, a 20% increase from 2020 levels. EIA expects coal production to grow because of increased coal demand from the electric power sector amid higher natural gas prices in 2021.

- EIA expects that U.S. energy-related carbon dioxide (CO2) emissions, after decreasing by almost 3% in 2019 from the previous year’s level, will decrease by 11% in 2020. This decline in emissions is the result of less energy consumption related to slowing economic growth in response to the COVID-19 pandemic. EIA expects emissions from coal will be down 19% from 2019 and emissions from petroleum will be down 13% from 2019. In 2021, EIA forecasts that energy-related CO2 emissions will increase by 6% from the 2020 level as the economy recovers and energy use increases.
Petroleum and natural gas markets review

Crude oil

**Prices:** The front-month futures price for Brent crude oil settled at $48.71 per barrel (b) on December 3, 2020, an increase of $9.74/b from November 2, 2020. The front-month futures price for West Texas Intermediate (WTI) crude oil for delivery at Cushing, Oklahoma, increased by $8.83/b during the same period, settling at $45.64/b on December 3 (Figure 1).

In late November, crude oil prices reached their highest levels since early March, before responses to COVID-19 affected worldwide economies. Prices for crude oil as well as other risk assets such as equities and industrial metals all increased in response to optimism following the announcement of the efficacy of several COVID-19 vaccine candidates, and the price increase likely reflects solidified market expectations for economic recovery during 2021. This optimism came despite record highs in daily cases of COVID-19 during November, which is slowing the recovery in transportation demand in the near term, particularly in Europe and regions of the United States.

The meeting on December 3 between members of the Organization of the Petroleum Exporting Countries (OPEC) and partner countries (OPEC+) resulted in a change to their production cuts beginning in January 2021. The group had initially planned to raise production by 2.0 million barrels per day (b/d) in January 2021 but will instead raise production by 0.5 million b/d. In addition, the group will assess the state of global oil markets and petroleum demand monthly, adjusting production targets based on prevailing oil market conditions. The U.S. Energy Information Administration (EIA) assumes the OPEC+ group will be highly compliant with this agreement in early 2021. EIA forecasts crude oil production from OPEC to average 25.7 million b/d in the first quarter of 2021, a 1.7 million b/d reduction from the November STEO. Partly because of EIA’s forecast of more restrained OPEC+ production in 2021, EIA forecasts tighter oil markets next year, particularly in the first quarter. EIA now forecasts first-quarter 2021 global oil

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**Figure 1. Crude oil front-month futures prices**

Source: CME Group and Intercontinental Exchange, as compiled by Bloomberg L.P. Note: WTI = West Texas Intermediate.
inventory draws to average 1.8 million b/d, which is 1.0 million b/d more than previously forecast.

The combined effect of lower supply expectations from OPEC+ countries as well as firmer market expectations for a recovery in global oil demand is contributing to higher prices for near-term oil deliveries relative to prices for delivery further in the future. The five-day moving averages for the Oman crude oil 1st–3rd spread approached 50 cents/b in late November, and Brent’s spread settled at -4 cents/b on December 3. The WTI spread also increased, but by less than the other crude oils (Figure 2).

The increasing crude oil price spreads reflect both the global oil inventory drawdown since June 2020 as well as expectations for increasing demand and continued stock draws in the coming months. Higher Oman crude oil price spreads, which generally reflect Middle Eastern crude oil exported to Asia, could reflect increasing demand and refinery runs from China, India, or other Asian countries. China’s National Bureau of Statistics reported that crude oil refinery runs in China reached an all-time high of 14.1 million b/d in October. Based on data from India’s Ministry of Petroleum & Natural Gas, EIA estimates that India’s total petroleum consumption was 4.6 million b/d in October 2020, the most of any month since February.

**Petroleum products**

**Gasoline prices:** The front-month futures price of reformulated blendstock for oxygenate blending (RBOB, the petroleum component of gasoline used in many parts of the country) settled at $1.26 per gallon (gal) on December 3, up 21 cents/gal from November 2, 2020 (Figure 3). The RBOB–Brent crack spread (the difference between the price of RBOB and the price of Brent crude oil) decreased by 2 cents/gal to settle at 10 cents/gal during the same period.
The gasoline crack spread started November at a six-month low of 12 cents/gal and traded within a 5-cent range during the month, the narrowest range for any month in 2020. The month’s average crack spread of 12 cents/gal was within the five-year (2015–2019) range and was down 5 cents/gal from October 2020. The crack spread decrease likely reflects higher inventories and lower consumption than in October. In this STEO, the U.S. Energy Information Administration (EIA) estimates gasoline inventories increased by 7.4 million barrels (3.3%) from October, which is slightly higher than the average five-year increase of 2.7% from October to November. EIA estimates November gasoline consumption averaged 8.2 million barrels per day (b/d), a decrease of 3.2% from October.

**International gasoline crack spreads:** Gasoline crack spreads in both Europe and Asia declined to historically low levels, based on the Eurobob–Brent crack spread for Europe and the Singapore gasoline–Dubai crack spread for Singapore. The European monthly average gasoline crack spread was less than 1 cent/gal, and Singapore’s was -1 cent/gal in November. Meanwhile, the RBOB–Brent crack spread averaged 12 cents/gal for the month. Although the RBOB–Brent crack spread was 6 cents/gal less than the five-year average, it remained high relative to the crack spreads for Europe and Singapore, which were 14 cents/gal and 22 cents/gal less than their five-year averages, respectively (Figure 4).
Although U.S. gasoline crack spreads are less than their five-year average, gasoline crack spreads in Europe and Singapore have decreased more relative to their five-year averages. In Europe, especially high gasoline inventories likely explain the greater decrease. Gasoline inventories at the Amsterdam-Rotterdam-Antwerp hub for the week ending November 19 were at their highest November level in more than 10 years and were 68% higher than the same week a year ago. In Asia, crack spreads have decreased more than U.S. crack spreads because China increased refinery runs to 14.1 million b/d in October, up 5% from a year ago. In contrast to China, U.S. refiners have maintained low refinery runs and gasoline production levels. Furthermore, according to trade press, China exported record levels of gasoline in October, increasing product supplies throughout Asian markets.

**Ultra-low sulfur diesel prices:** The ultra-low sulfur diesel (ULSD) front-month futures price for delivery in New York Harbor settled at $1.39/gal on December 3, 2020, up 28 cents/gal from November 2, 2020 (Figure 5). The ULSD–Brent crack spread (the difference between the price of ULSD and the price of Brent crude oil) increased by 5 cents/gal to settle at 23 cents/gal during the same period.
The average ULSD–Brent crack spread in November increased to 21 cents/gal, up 4 cents/gal from October 2020 but down 23 cents/gal from last November. EIA estimates that distillate consumption increased from October to November by 0.1 million b/d (2.6%) to 4.0 million b/d. If confirmed by monthly data, it will mark the fifth consecutive month of distillate consumption increases. In addition, since August, distillate consumption has increased by 0.4 million b/d. As distillate production has decreased to their lowest levels since 2009 in October and November, according to EIA estimates, demand has been increasingly met by distillate inventories, which have fallen by 32.8 million barrels since August 2020, the largest three-month decrease since March 2003.

Reduced net exports of distillate have provided an additional supply source. EIA estimates net exports of distillate fuel were 0.6 million b/d in November, the lowest level for November since 2010 (Figure 6). EIA data for the week ending November 27 show that four-week average distillate imports were 60% higher than the five-year average and four-week average exports were 20% lower than the five-year average. In addition to increased distillate consumption, the widening spread between the ULSD front-month futures price and European distillate spot price is likely contributing to the increase in net imports. The spread in November averaged 13 cents/gal, the highest monthly average since December 2017. The high spread has facilitated imports of distillate on the East Coast (Petroleum Administration for Defense District—PADD–1). Weekly EIA estimates the week ending November 27 showed East Coast distillate imports of 575,000 b/d, the highest for any week since the week ending February 5, 2010.
Natural Gas

Prices: The front-month natural gas futures contract for delivery at the Henry Hub settled at $2.51 per million British thermal units (MMBtu) on December 3, which is down 74 cents/MMBtu from November 2 (Figure 7). The warmest November since 2001 lessened concerns of a tight natural gas market this winter and helped lower prices.

The U.S. Energy Information Administration (EIA) estimates that natural gas inventories declined by 20 billion cubic feet (Bcf) in November, the smallest November draw since 2015. Compared with November 2019, lower natural gas consumption because of warmer temperatures helped to moderate the seasonal decline in inventories in November, even with lower natural gas production and higher liquefied natural gas (LNG) exports. Natural gas production decreased 7.1 Bcf per day (Bcf/d) from November 2019, and U.S. LNG exports rose to a record high in
November, up 3.0 Bcf/d from November 2019. Despite lower production and higher LNG exports, natural gas inventories remain 281 Bcf (8%) higher than the five-year (2015–19) average.

**Natural gas consumption and heating degree days:** U.S. heating degree days (HDD) in November were 21% less than the 2010–19 average (and 30% less than in November 2019), which contributed to an estimate of the lowest natural gas consumption in November since 2017 (Figure 8). EIA forecasts that consumption in the commercial sector fell 29% from November 2019, in the residential sector by 25%, and in the power generation sector by 6%. Even though temperatures in November 2020 were the warmest since 2001, estimated consumption in 2020 still remained higher than in any previous November except 2018 and 2019 because the size of the overall natural gas market in the United States has increased. Much of this growth has been in the industrial and electric power sectors. Considering the longer-term trends, EIA estimates that U.S. natural gas consumption for the full year 2020 increased 56% compared with 2010 in the electric power sector and 21% in the industrial sector. In addition, responses to COVID-19 in 2020 that have resulted in more people working, attending school, and spending more time at home have likely contributed to greater residential consumption relative to the level of HDD. Compared with the five-year average, residential consumption per HDD increased 11% in November 2020 (Figure 9).

![Figure 8. November natural gas consumption and heating degree days](image)

Sources: U.S. Energy Information Administration and National Oceanic and Atmospheric Administration
Notable forecast changes

- The U.S. Energy Information Administration (EIA) updated its *International Energy Statistics* (IES) database during November to include 2018 data for petroleum consumption from countries outside of the Organization for Economic Cooperation and Development. The *Short-Term Energy Outlook* (STEO) uses IES for its historical global liquid fuels consumption and production data. Based on this IES update, EIA reports that global liquid fuels consumption averaged 100.4 million barrels per day (b/d) in 2018, 0.2 million b/d lower than estimated in the November STEO. This lower historical baseline for 2018 carries through to estimates and forecasts for 2019 through 2021. EIA now estimates global liquid fuels consumption averaged 101.2 million b/d in 2019, which is 0.3 million b/d less than estimated in the November STEO. EIA forecasts global liquid fuels consumption will average 92.4 million b/d in 2020 and 98.2 million b/d in 2021.

- EIA forecasts OPEC crude oil production will average 27.5 million b/d in 2021, which is 1.0 million b/d lower than previously forecast. The reduction in the forecast reflects EIA’s updated assumptions about OPEC production and compliance following the group’s December 3 meeting at which OPEC and partner countries announced they were limiting production increases planned for January 2021 to 0.5 million b/d from the previously announced 2.0 million b/d.

- EIA forecasts Henry Hub natural gas spot prices will average $3.01 per million British thermal units (MMBtu) in 2021, which is down from a forecast of $3.14/MMBtu in the November STEO. The lower forecast reflects EIA’s expectation of higher inventory levels during 2021 compared with last month’s forecast.
This report was prepared by the U.S. Energy Information Administration (EIA), the statistical and analytical agency within the U.S. Department of Energy. By law, EIA's data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government. The views in this report therefore should not be construed as representing those of the U.S. Department of Energy or other federal agencies.