Forecast highlights

**Global liquid fuels**

- The April *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 during the past year and will continue to affect these patterns in the future. U.S. gross domestic product (GDP) declined by 3.5% in 2020 from 2019 levels. This STEO assumes U.S. GDP will grow by 5.6% in 2021 and by 4.2% in 2022. The U.S. macroeconomic assumptions in this outlook are based on forecasts by IHS Markit.

- For the 2021 summer driving season (April–September), the U.S. Energy Information Administration (EIA) forecasts U.S. regular gasoline retail prices will average $2.78 per gallon (gal), up from an average of $2.07/gal last summer (*Summer Fuels Outlook*). Higher forecast gasoline prices reflect higher forecast crude oil prices, higher wholesale gasoline refining margins, and higher U.S. consumption of motor gasoline. For all of 2021, we expect U.S. retail prices of regular-grade gasoline to average $2.66/gal and retail prices for all grades to average $2.78/gal, which would result in the average U.S. household spending about $480 (31%) more on motor fuel in 2021 compared with 2020.

- EIA expects U.S. gasoline consumption to rise in response to growing levels of GDP and employment. In addition, as COVID-19 vaccines are more widely distributed, we expect that driving will increase, causing gasoline consumption to rise. We forecast that U.S. gasoline consumption in 2021 will average 8.6 million barrels per day (b/d), which is up from consumption in 2020 of 8.0 million b/d but down from consumption in 2019 of 9.3 million b/d.

- Brent crude oil spot prices averaged $65 per barrel (b) in March, up $3/b from February and up $33/b from March 2020, the onset of the COVID-19 pandemic in the United States. Rising Brent prices in March continued to reflect expectations of rising oil demand as both COVID-19 vaccination rates and global economic activity have increased, combined with ongoing crude oil production limits from members of the Organization of the Petroleum Exporting Countries (OPEC) and partner countries (OPEC+). EIA forecasts that Brent prices will average $65/b in the second quarter of 2021, $61/b during the second half of 2021, and $60/b in 2022.
• EIA expects global oil inventories to fall by 1.8 million b/d in the first half of 2021. Forecast increases in global oil supply will contribute to a mostly balanced market during the second half of 2021. However, the forecast depends heavily on future production decisions by OPEC+, the responsiveness of U.S. tight oil production to oil prices, and the pace of oil demand growth, among other factors.

• EIA expects OPEC crude oil production will rise from an average of 25.1 million b/d in the first quarter of 2021 to 25.8 million b/d in the second quarter. The increase is the result of the April 1 OPEC+ announcement to begin raising production targets in May. It also reflects Saudi Arabia unwinding voluntary cuts of 1.0 million b/d between May and July. We expect OPEC crude oil production will rise to almost 27.9 million b/d in the second half of 2021.

• EIA estimates that the world consumed 96.0 million b/d of petroleum and liquid fuels in March, an increase of 4.7 million b/d from March 2020. We forecast that global consumption of petroleum and liquid fuels will average 97.7 million b/d for all of 2021, which is up by 5.5 million b/d from 2020. We forecast that consumption will increase by 3.7 million b/d in 2022 to average 101.3 million b/d. We revised growth in global liquid fuels consumption in 2021 higher from last STEO. The higher forecast is primarily a result of higher global GDP growth forecasts from Oxford Economics, which increased 0.4 percentage points from the March STEO to 6.2% for 2021.

• According to EIA's most recent data, U.S. domestic crude oil production averaged 11.1 million b/d in January 2021. We estimate that U.S. domestic crude oil production declined by 0.8 million b/d in February, mostly because of cold temperatures that affected much of the country, particularly Texas. We forecast crude oil production will average 10.9 million b/d in the second quarter of 2021 and increase to almost 11.4 million b/d by the fourth quarter of 2021. We expect U.S. crude oil production will average 11.9 million b/d in 2022. The forecast of rising U.S. crude oil production is the result of our expectation that West Texas Intermediate crude oil prices will remain above $55/b through the forecast period.

Natural Gas

• In March, the U.S. benchmark Henry Hub natural gas spot price averaged $2.62 per million British thermal units (MMBtu), which is down from the February average of $5.35/MMBtu. The Henry Hub price declined primarily because the cold weather and related high demand and market disruptions that drove prices to recent highs in February abated in March. EIA expects Henry Hub spot prices will average $2.73/MMBtu in the second quarter of 2021 and will average $3.04/MMBtu for all of 2021, which is up from the 2020 average of $2.03/MMBtu. We expect that continued growth in liquefied natural gas (LNG) exports, with only a slight corresponding increase in dry natural gas
production, will contribute to the average Henry Hub spot price rising to $3.11/MMBtu in 2022.

- EIA expects that U.S. consumption of natural gas will average 82.9 billion cubic feet per day (Bcf/d) in 2021, down 0.4% from 2020. The decline in U.S. natural gas consumption is a result of less natural gas consumed for electric power generation because of higher natural gas prices compared with last year. In 2021, we expect residential and commercial natural gas consumption will rise by a total of 1.1 Bcf/d from 2020 and industrial consumption will rise by 1.4 Bcf/d from 2020. Rising consumption outside of the power sector results from expanding economic activity and colder temperatures in 2021 compared with 2020. We expect U.S. natural gas consumption will average 82.1 Bcf/d in 2022.

- EIA estimates that natural gas inventories ended March 2021 at nearly 1.8 Tcf, which is 2% lower than the five-year (2016–20) average. The winter of 2020–21 had more natural gas withdrawn from storage than the five-year average largely as a result of the cold February temperatures that occurred amid low natural gas production. We expect that rising natural gas production and lower natural gas consumption for power generation than in the past two summers will contribute to storage injections outpacing the five-year average in 2021. We forecast that natural gas inventories will end the 2021 injection season (end of October) at more than 3.7 Tcf, which is equal to the five-year average.

- EIA forecasts that U.S. production of dry natural gas will average 91.4 Bcf/d in 2021, which is about the same as the 2020 average. In our forecast, dry natural gas production falls to a low point of 90.8 Bcf/d in May 2021 before steadily increasing through most of the remainder of 2021, reaching a high of 92.4 Bcf/d in November 2021. The increase in production in 2021 reflects higher forecast natural gas prices as well as higher forecast crude oil prices, which we expect will contribute to more associated natural gas production, especially in the Permian region.

Electricity, coal, renewables, and emissions

- EIA forecasts that electricity consumption in the United States will increase by 2.1% in 2021 after falling 3.8% in 2020. We forecast electricity sales to the industrial sector will grow by 4.2% in 2021. We forecast that retail electricity sales to the residential sector will grow by 2.3% in 2021. This increase is primarily a result of colder temperatures in the first quarter of 2021 compared with the same period in 2020. We expect retail sales of electricity to the commercial sector will increase by 0.7% in 2021. Much of the increased electricity consumption across the sectors reflects improving economic conditions in 2021. For 2022, we forecast that U.S. electricity consumption will grow by another 1.3%.
EIA expects that the share of electric power generated with natural gas in the United States will average 36% in 2021 and 35% in 2022, down from 39% in 2020. The forecast share for natural gas declines in response to a 39% increase in the price of natural gas delivered to electricity generators from an average of $2.39/MMBtu in 2020 to $3.31/MMBtu in 2021. The higher expected natural gas prices cause the forecast share of generation from coal to rise from 20% in 2020 to 22% this year, and to 23% next year. New additions of solar and wind generating capacity contribute to our forecast that the share of U.S. generation from renewable energy sources will rise from 20% in 2020 to 21% in 2021 and to 22% in 2022. The nuclear share of U.S. generation declines from 21% in 2020 to 20% in 2021 and to 19% in 2022, reflecting the retirement of capacity at some nuclear power plants.

EIA forecasts that planned additions to generating capacity from wind and solar energy in 2021 and 2022 will contribute to increasing electricity generation from those sources. We estimate that the U.S. electric power sector added 14.5 gigawatts (GW) of new wind capacity in 2020. We expect 16.1 GW of new capacity will be added in 2021 and 5.8 GW in 2022. U.S. utility-scale solar capacity rose by an estimated 10.4 GW in 2020. Our forecast for added utility-scale solar capacity is 15.8 GW in 2021 and 14.9 GW in 2022. In addition, about 5 GW of small-scale solar (projects with less than 1 megawatt of capacity) are added annually over the 2021–22 STEO forecast.

EIA expects U.S. coal production to total 585 MMst in 2021, 46 MMst (9%) more than in 2020. In 2022, we expect coal production to grow by an additional 16 MMst (3%). We expect that coal used to generate electric power will increase by 13% to 495 MMst in 2021 and by 4% to 514 MMst in 2022. The increase in coal production in 2021 will be the largest on a percentage basis in the Interior region, owing to increased domestic electricity generation. In 2022, EIA expects it will be largest in the Appalachia region, partly as a result of metallurgical coal exports rising to 54 MMst next year, up 27% from 2020 levels.

EIA estimates that U.S. energy-related carbon dioxide (CO2) emissions decreased by 11% in 2020. This decline in emissions was the result of less energy consumption related to the economic contraction resulting from the COVID-19 pandemic. In 2021, we forecast energy-related CO2 emissions will increase by about 5% from the 2020 level as economic activity increases and leads to rising energy use. We also expect energy-related CO2 emissions to rise in 2022, but by a slower rate of 2%. We forecast that after declining by 19% in 2020, coal-related CO2 emissions will rise by 13% in 2021 and by 4% in 2022.
Petroleum and natural gas markets review

Crude oil

**Prices:** The front-month futures price for Brent crude oil settled at $64.86 per barrel (b) on April 1, 2021, down from an intraday high of $71.38/b on March 8 but up from $63.69/b from March 1. The front-month futures price for West Texas Intermediate (WTI) crude oil for delivery at Cushing, Oklahoma, increased by 81 cents/b during the same period, settling at $61.45/b on April 1 (Figure 1).

![Figure 1. Crude oil front-month futures prices](image)

Monthly average Brent crude oil prices in March were the highest since late 2019. Crude oil prices in early March reached $70/b following OPEC+’s March 4 announcement that it was extending production limits through April. However, prices subsequently declined, which partly reflected slowing global oil demand growth as COVID-19 cases increased, notably in Europe.

On April 1, OPEC+ announced it would ease existing limits on production beginning in May. This announcement was generally consistent with EIA’s assumption in last month’s STEO. However, Saudi Arabia also announced they would gradually relax its voluntary 1.0 million barrel per day (b/d) cut over the May–July period. If implemented as announced, Saudi Arabia’s increase would occur more slowly than we had previously assumed. We revised our forecast for second quarter 2021 OPEC crude oil production down by 0.5 million b/d from the March STEO.

With lower production from OPEC than in the March STEO, EIA expects markets will be somewhat tighter in the second quarter than previously forecast, contributing to some upward price pressures. We forecast that the Brent crude oil price will average $65/b in the second quarter, when quarterly stock draws average 1.5 million b/d. Although that rate represents a significant draw in stocks, it is down slightly from the first quarter of 2021, when we estimated stock draws averaged 2.1 million b/d.
In the second half of 2021, EIA expects global oil markets to become much more balanced, with forecast global stock draws averaging 0.2 million b/d. From the second quarter to the third quarter, our forecast for global liquid fuels production grows by 3.2 million b/d. Of this increase, 1.9 million b/d is from OPEC. Additional supply growth in the forecast comes from Brazil, Canada, and the United States. We forecast global growth in oil demand between the second and third quarters will be 1.9 million b/d.

As global stock draws moderate, EIA expects upward price pressure on crude oil to ease. The higher crude oil price forecast reflects tighter markets through the second quarter, resulting from a slower relaxation of Saudi Arabia’s voluntary cuts than we had forecast. Stronger second-quarter inventory draws will leave global oil inventories during the second half of the year lower than previously expected. We forecast that the price of Brent crude oil will average $61/b in the second half of the year, which is $3/b higher than forecast in the March STEO. However, as recent increases in price volatility indicate, significant uncertainty remains both in market expectations and in our forecasts.

**Crude oil and inflation expectations:** The percentage difference in yields for five-year Treasury Inflation-Protected Securities (TIPS) compared with U.S. treasury bonds is often used to measure market expectations of inflation. Economic responses to the COVID-19 pandemic resulted in a dramatic decline in demand for goods, significantly reducing petroleum and other commodity prices in early 2020. Because crude oil and other commodity prices are inputs to other sectors of the economy, changes in crude oil prices can also affect inflation expectations. The TIPS-Treasury spread decreased to a monthly average of 0.7% in March 2020, reflecting low inflation expectations as a result of lower prices and economic contraction *(Figure 2)*.

![Figure 2. Crude oil and inflation expectations](chart)

Increasing crude oil and other commodity prices over the summer of 2020 contributed to increasing inflation expectations through the end of August, and the TIPS-Treasury spread
increased from 0.8% in May to 1.6% in August. Since then, however, inflation expectations have increased at a faster pace than crude oil prices. Rising prices of non-energy commodities, combined with fiscal and monetary stimulus in response to the COVID-19 pandemic increased inflation expectations more rapidly than crude oil prices over the summer. In addition, reports of supply bottlenecks for various goods may have also contributed to higher inflation expectations. By December 2020, the TIPS-Treasury spread increased to 1.9%, before increasing higher than 2% in January 2021, averaging 2.3% in February and 2.5% in March. On March 16, the TIPS-treasury spread reached its widest point since July 2008. Improved demand outlooks because of the distribution of the COVID-19 vaccine as well as continued fiscal and monetary stimulus has further contributed to rising prices across most commodities and higher inflation expectations.

**WTI options open interest ratio:** The put-to-call WTI open interest ratio decreased in March, suggesting a change in market expectations around future crude oil prices, and potentially hedging against future crude oil price increases. The monthly aggregate put-to-call open interest ratio for WTI crude oil options decreased in March to 0.63, down from 0.75 in February and the lowest for any month since July 2017 (Figure 3). The decrease was driven by an increase in call option open interest compared with small changes in put options from February. The total number of call option contracts increased from 0.96 million contracts in February to 1.17 million contracts in March, while the number of put option contracts increased from 0.72 million in February to 0.75 million in March.

![Figure 3. Monthly average aggregate WTI option open interest ratio](image)

**U.S. oil company debt and equity issuance:** Since September 2020, debt and equity issuance has increased in all but one month, suggesting that increasing crude oil prices are encouraging U.S. crude oil producers to raise money to refinance debts, resume drilling activities, or purchase acreage. In March 2021, debt and equity issuance announcements among publicly traded independent U.S. exploration and production companies totaled $4.4 billion, the highest since...
August 2020 and higher than the five-year (2016–20) median of $2.4 billion (Figure 4). In addition, low interest rates have lowered the cost of issuing debt and have likely contributed to the recent growth in debt and equity issuance. The federal funds rate, which affects interest rates across the market, has been held at a target of 0.00%–0.25% since March 2020, according to the Federal Open Market Committee. In addition, the Moody’s seasoned AAA corporate bond yield, which represents average bond yields for investment grade companies, averaged 2.70% in February, which is less than the 2011–20 average of 3.78%. Lastly, energy sector corporate bond yields for companies with a rating lower than investment grade are also at multi-year lows. Although primarily a result of higher crude oil prices, high capital availability for U.S. producers also supports EIA’s forecast for U.S. crude oil production to increase from 10.7 million b/d in first-quarter 2021 to 12.2 million b/d by fourth-quarter 2022.

![Figure 4. Announced debt and equity issuance among U.S. oil companies](image)

Source: Evaluate Energy

**Petroleum products**

**Gasoline prices:** The front-month futures price of RBOB (the petroleum component of gasoline used in many parts of the country) settled at $2.02 per gallon (gal) on April 1, up 8 cents/gal from March 1 (Figure 5).
The RBOB–Brent crack spread (the difference between the price of RBOB and the price of Brent crude oil) increased by 5 cents/gal to settle at 48 cents/gal during the same period. On March 12, the crack spread closed at 50 cents/gal, the highest since August 31, 2017. The average RBOB–Brent crack spread increased by 19 cents/gal from February to reach 44 cents/gal in March. The increase reflected a decline in refinery production of gasoline, stemming from refinery shutdowns on the U.S. Gulf Coast early in the month as a result of severely cold weather. The drop in refinery production caused gasoline inventories to end March at the lowest March level since 2014. In addition, higher gasoline crack spreads were the result of the seasonal shift to producing summer-grade gasoline, which is more expensive to produce.

EIA estimates that gasoline inventories decreased to 228.2 million barrels, a 3.4 million barrel draw from February (1.4%). The draw was a result of a combination of a decrease in production resulting from unplanned refinery outages that began during February’s cold spell in Texas and an increase in consumption. We estimate gasoline production of 9.2 million barrels per day (b/d) in March, 5% less than the five-year (2016–20) average for March. Meanwhile, we estimate gasoline consumption increased 0.5 million b/d (7%) from February. We forecast gasoline inventories to remain lower than the five-year average for the remainder of the year, which may support continued higher-than-usual crack spreads. We forecast that gasoline refining margins will average 45 cents/gal from April through September, the summer driving season, which is 5 cents/gal higher than the five-year average over this period.

**Market-derived probabilities:** Based on futures and options prices, the market-derived probability of the June 2021 RBOB futures contract expiring higher than $2.00/gal was 45% on April 1, and the probability of it expiring higher than $2.10/gal was 32% (Figure 6). At the beginning of March, the market-derived probability of the June 2021 RBOB contract expiring at more than $2.00/gal was 39%, and the probability of the same contract expiring at more than $2.10/gal was 29%. In recent years, RBOB futures contracts have averaged about 90 cents/gal.
less than the U.S. average regular retail gasoline price because the price of retail gasoline includes taxes, distribution, and marketing costs. Therefore, futures and options prices as of April 1 suggest about a 32% probability U.S. average retail gasoline prices could be at $3.00/gal or higher following the expiry of the June RBOB contract.

**Ultra-low sulfur diesel prices:** The front-month futures price for ultra-low sulfur diesel (ULSD) for delivery in New York Harbor settled at $1.83/gal on April 1, up 1 cent/gal from March 1 (Figure 7). The ULSD–Brent crack spread (the difference between the price of ULSD and the price of Brent crude oil) decreased 2 cents/gal and settled at 29 cents/gal during the same period.

![Figure 6. Probability of June 2021 RBOB expiring above different price levels](image)

![Figure 7. Historical ULSD front-month futures price and crack spread](image)
The continuation of below-average ULSD–Brent crack spreads was likely a result of higher production and the lowest U.S. distillate net exports since January 2010. The higher production and lower net exports contributed to our estimate that U.S. distillate inventories increased by 5.5 million barrels (4%) from February, and likely provided downward pressure on the crack spread. The average daily crack spread decreased to 29 cents/gal in March, 1 cent/gal lower than in February, and the lowest average daily crack spread for March since 2017.

**Natural Gas**

**Prices:** The front-month natural gas futures contract for delivery at the Henry Hub settled at $2.64 per million British thermal units (MMBtu) on April 1, 2021, which was down 14 cents/MMBtu from March 1, 2021 (Figure 8).

Natural gas futures prices averaged $2.62/MMBtu in March, a decrease of 29 cents/MMBtu from the February average, which was the highest monthly average since January 2019. EIA estimates March natural gas withdrawals were 62.3 Bcf, 65% less than the five-year (2016–20) average for March. The low March withdrawals partly reflected a decrease in natural gas demand. We estimate that natural gas consumption in March decreased to 84.4 billion cubic feet per day (Bcf/d), down 24.6 Bcf/d (23%) from February’s record levels and the lowest consumption for March since 2017. We expect prices will rise from March levels and the Henry Hub spot price will average $2.86/MMBtu for the final three quarters of 2021. We forecast higher prices will result from relatively low, albeit rising, U.S. natural gas production compared with previous years amid increases in U.S. natural gas exports.
Notable forecast changes

- EIA forecasts that Brent crude oil prices will average $62/b in 2021 and $60/b in 2022. The forecast for both years is $2/b higher than in the March STEO. The higher forecast reflects larger draws from global oil inventories in 2021, particularly in the second quarter, than previously expected, which will reduce global oil inventory levels through the forecast period. The larger draws are the result of lower expected OPEC crude oil production in the second quarter of 2021.

- EIA forecasts U.S. crude oil production will average 11.0 million b/d in 2021 and 11.9 million b/d in 2022. Compared with the March STEO, those forecasts are 0.1 million b/d and 0.2 million b/d lower, respectively. We are forecasting lower production despite higher expected crude oil prices (about $2/b higher in both 2021 and 2022) because we now forecast that rig activity in producing areas outside the Permian—such as Bakken, Eagle Ford, and Anadarko—will be lower than previously expected.

- This STEO incorporates EIA’s changes to its reporting of biofuels data. In STEO Table 4a, renewables and oxygenate production includes pentanes plus, oxygenates (excluding fuel ethanol), and renewable fuels. Beginning with January 2021 data, renewable fuels includes biodiesel, renewable diesel, renewable jet fuel, renewable heating oil, renewable naphtha and gasoline, and other renewable fuels. For December 2020 and prior, renewable fuels includes only biodiesel. Additionally, we are now reporting product supplied (a proxy for consumption) of renewable fuels excluding fuel ethanol. In STEO Table 4a consumption data, these data will be included in the “other oils” category.

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.