Short-Term Energy Outlook (STEO)

Forecast highlights

Global liquid fuels

- Brent crude oil spot prices averaged $59 per barrel (b) in August, down $5/b from July and $13/b lower than the average from August of last year. EIA forecasts Brent spot prices will average $60/b in the fourth quarter of 2019 and $62/b in 2020. EIA forecasts that West Texas Intermediate (WTI) prices will average $5.50/b less than Brent prices in 2020.

- EIA forecasts that global liquid fuels consumption will increase by 0.9 million barrels per day (b/d) in 2019, down from year-over-year growth of 1.3 million b/d in 2018. The slowing liquid fuels demand growth reflects EIA’s assumption (based on forecasts from Oxford Economics) of decelerating growth in global oil-weighted gross domestic product (GDP). EIA expects that global liquid fuels demand will increase by 1.4 million b/d in 2020 as a result of an expected increase in global GDP growth.

- EIA forecasts U.S. crude oil production will average 12.2 million b/d in 2019, up by 1.2 million from the 2018 level. Forecast crude oil production then rises by 1.0 million b/d in 2020 to an annual average of 13.2 million b/d. The slowing rate of crude oil production growth reflects relatively flat crude oil price levels and slowing growth in well-level productivity.

Natural gas

- The Henry Hub natural gas spot price averaged $2.22 per million British thermal units (MMBtu) in August, down 15 cents/MMBtu from July. This summer, prices have declined amid rising natural gas production, despite high levels of both natural gas exports and consumption in the electricity generation sector. Based on recent price movements and EIA’s assessment that natural gas production will be sufficient to meet expected demand and export levels at a lower price than previously forecasted, EIA lowered its Henry Hub spot price forecast for 2020 to an average of $2.55/MMBtu, 20 cents/MMBtu lower than the August forecast.

- EIA forecasts that U.S. dry natural gas production will average 91.4 billion cubic feet per day (Bcf/d) in 2019, up 8.0 Bcf/d from 2018. EIA expects monthly average natural gas production to grow in late 2019 and then decline slightly during the first quarter of 2020 as the lagged effect of low prices in the second half of 2019 reduces
natural gas-directed drilling. However, EIA forecasts that growth will resume in the second quarter of 2020, and natural gas production in 2020 will average 93.2 Bcf/d.

- Natural gas storage injections have outpaced the five-year (2014–18) average so far during the 2019 injection season as a result of rising natural gas production. At the beginning of April, the natural gas inventory injection season started with working inventories 28% lower than the five-year average for the same period. By the week ending August 30, working gas inventories were 82 billion cubic feet (Bcf), or 3%, lower than the five-year average of 3,023 Bcf. EIA forecasts that natural gas storage levels will be 3,769 Bcf by the end of October, which is slightly higher than the five-year average and 16% higher than October 2018 levels.

Electricity, coal, renewables, and emissions

- EIA expects the share of U.S. total utility-scale electricity generation from natural gas-fired power plants will rise from 34% in 2018 to 37% in 2019 and 38% in 2020. EIA forecasts that the share of U.S. generation from coal will average 25% in 2019 and 22% in 2020, down from 28% in 2018. EIA’s forecast nuclear share of U.S. generation remains at about 20% in 2019 and in 2020. Hydropower averages a 7% share of total U.S. generation in the forecast for 2019 and 2020, similar to 2018. Wind, solar, and other nonhydropower renewables together provided 10% of U.S. total utility-scale generation in 2018. EIA expects they will provide 10% in 2019 and 12% in 2020.

- EIA forecasts generally lower wholesale electricity prices in 2019 compared with 2018. The lower forecast prices reflect lower natural gas fuel costs. In the first half of 2019, the average U.S. cost of natural gas delivered to power generators was 9% lower than the same period in 2018. EIA expects the delivered cost of natural gas during the second half of 2019 to be 31% lower than last year. Forecast electricity prices in the southeast are less than 1% lower than 2018, while prices in New England are 28% lower.

- EIA forecasts that U.S. coal production in the second half of 2019 will be 328 million short tons (MMst), or 59 MMst (15%) less than in the second half of 2018. EIA expects that coal exports will continue to fall during the projection period as international demand for U.S. coal is dampened by high Atlantic freight costs in the near term and increased uncertainty in the metallurgical coal market in the longer term. EIA forecasts that U.S. coal consumption will total 593 MMst in 2019 and 548 MMst in 2020, a decline of 14% in 2019 and 8% in 2020.

- EIA forecasts that utility-scale renewable fuels, including wind, solar, and hydropower, will collectively produce 18% of U.S. electricity in 2019 and 19% in 2020. EIA expects that annual generation from wind will surpass hydropower generation for the first time in 2019 to become the leading source of renewable electricity generation and that it will maintain that position in 2020.
• EIA expects electric power sector generation from renewables other than hydropower—principally wind and solar—to grow from 409 billion kilowatthours (kWh) in 2019 to 467 billion kWh in 2020. In EIA’s forecast, Texas accounts for 19% of the U.S. nonhydro renewables generation in 2019 and 21% in 2020. California has a share of 15% in 2019 and 14% in 2020. Regionally, the Midwest and Central power regions each have shares in the 16% to 17% range of the U.S. generation total from renewables other than hydropower.

• EIA forecasts that, after rising by 2.7% in 2018, U.S. energy-related carbon dioxide (CO2) emissions will decline by 2.5% in 2019 and by 1.0% in 2020. In 2019, EIA forecasts that space cooling demand (as measured in cooling degree days) will be lower than in 2018, when it was 13% higher than the previous 10-year (2008–17) average. In addition, EIA expects U.S. CO2 emissions in 2019 to decline because the forecast share of electricity generated from natural gas and renewables is increasing while the forecast share generated from coal, which is a more carbon-intensive energy source, is decreasing.
Petroleum and natural gas markets review

Crude oil

Prices: The front-month futures price for Brent crude oil settled at $60.95 per barrel (b) on September 5, 2019, an increase of $0.45/b from August 1. The front-month futures price for West Texas Intermediate (WTI) crude oil for delivery at Cushing, Oklahoma, increased by $2.35/b during the same period, settling at $56.30/b on September 5 (Figure 1).

Global economic indicators continued to decline, contributing to oil price declines and volatility. Manufacturing Purchasing Managers’ Indices (PMIs)—which can serve as a leading indicator for economic growth—from several countries for August showed a contraction in manufacturing activity. PMI reports remained mixed for the United States, with the IHS Markit PMI still showing slight expansion, although at the lowest level since September 2009, while the U.S. Institute for Supply Management’s PMI showed contraction for the first time since 2016. Reports on trade negotiations between the United States and China also contributed to daily movements in global crude oil prices. On August 23, WTI prices fell by 2% when China announced a 5% tariff on its imports of U.S. crude oil, the first time U.S. crude oil was included in Chinese tariffs. However, Chinese imports of U.S. crude oil have decreased in 2019 year-to-date compared with 2018, and China has imported more from other countries, including Saudi Arabia.

EIA is reducing its 2019 Brent crude oil price forecast to $63/b, which is $2/b lower than in the August STEO. The lower 2019 price forecast largely reflects recent global crude oil price fluctuations and lower forecast global oil demand growth. EIA has revised its expected global oil demand growth down to 0.9 million barrels per day (b/d) in 2019, 0.1 million b/d lower than the August forecast. Lower expected oil demand growth mainly reflects lower forecast gross domestic product growth and lower forecast demand from countries in the Organization for Economic Cooperation and Development. If realized, 2019 would be the first year when demand
growth is less than 1.0 million b/d since 2011. EIA expects that annual average Brent prices will slightly decrease in 2020 to $62/b, which is $3/b lower than EIA’s August STEO forecast.

Notwithstanding the decline in overall price levels in August, several factors specific to the WTI market contributed to a narrowing of the Brent–WTI futures price spread since late July 2019. The Brent–WTI futures price spread settled at $4.79/b on September 5, a decrease of $1.70/b since August 1 (Figure 2). On August 19, the price spread decreased to $3.60/b, the narrowest spread since March 2018. Crude oil prices in the Permian region increased during this period with the addition of two pipelines mid-month that reduced takeaway constraints to the U.S. Gulf Coast. The Cactus II crude oil pipeline added an estimated 670,000 b/d, and the EPIC Midstream natural gas liquids pipeline—repurposed to deliver crude oil—added about 400,000 b/d of capacity. The pipeline additions between the Permian and the U.S. Gulf Coast reduced the need for crude oil to first transit through Cushing, lowering the cost of transportation to refineries and export terminals on the U.S. Gulf Coast. Cushing crude oil stocks decreased by 10 million barrels from the third week in July through August 23, likely as a result of less crude oil flowing to the storage hub from the Permian region. EIA expects the spread to widen slightly from the lows seen in mid-August, as regional markets rebalance and the spread settles closer to the new pipelines’ tariff from the Permian Basin to the Gulf Coast.

![Figure 2. Brent-WTI futures price spread](image)

**Crude oil and inflation expectations**: Changes in crude oil prices affect market participants’ expectations of future rates of inflation because energy is a significant input into other areas of the economy. Lower crude oil prices have a deflationary effect because petroleum products are a primary variable cost for businesses and consumers. Recent decreases in Brent crude oil prices have coincided with a decrease in inflation expectations, as measured by the difference in yield between the five-year Treasury rate and five-year Treasury Inflation-Protected Securities (TIPS). The five-year TIPS-Treasury spread decreased from 1.47% on August 1 to 1.35% as of September 5, and crude oil prices remained relatively flat during the same time (Figure 3). Relatively flat inflation growth was an important factor in the Federal Reserve Board’s decision to decrease...
interest rates, which the Board decided to do for the first time since 2008 in the Federal Open Market Committee meetings in July. Since the Board’s meeting, the market has continued to price in inflation expectations lower than 2%, which is the Board’s inflation target.

**Figure 3. Crude oil and inflation expectations**

![Crude oil and inflation expectations graph](image)

*Historical 30-day volatility:* Unlike implied volatility, which is a calculated measure derived from options prices, historical volatility measures the magnitude of daily changes in closing prices for a commodity during a given time in the past. WTI 30-day historical volatility increased from August 1 to September 5, increasing from 38.7% to 45.1% (Figure 4). In 2019, historical volatility peaked at 59.4% in January, as WTI crude oil prices increased from large price declines in December because of supply-side uncertainty following an extension of the production agreement by producers in the Organization of the Petroleum Exporting Countries (OPEC) and several non-OPEC producers (OPEC+). The mid-August increase in volatility is likely related to demand-side uncertainty as well as the addition of two pipelines out of the Permian Basin. The volatility of copper futures prices has been lower than volatility of WTI prices because copper futures prices almost solely respond to demand-side concerns rather than supply-side uncertainty. In general, the industrial metal is used in many economically sensitive sectors, such as construction and industrial production, and lower prices may indicate expectations of a slowdown in industrial and economic activity. The volatility in the S&P 500 Index, which includes a basket of companies across many industries, was greater than the volatility of copper in late August, possibly in response to global trade concerns and slowing demand.
Market-derived probability: From the beginning of August to the first week of September, the probability that the December 2019 WTI crude oil futures contract will expire above $60/b decreased slightly. The probability that was calculated using futures and options data indicates WTI futures prices have a 25% chance of reaching $60/b at expiration as of September 5 (Figure 5). The probability of reaching $60/b was at 34% on August 1.

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 $1.55 per gallon (gal) on September 5, down 20 cents/gal since August 1 (Figure 6). The RBOB–Brent crack spread (the difference between the price of RBOB and the price of Brent crude oil) decreased by 21 cents/gal to settle at 9 cents/gal during the same period.
The crack spread declined throughout August and then fell further at the beginning of September, when the front-month contract rolled to October delivery, which reflects winter grade gasoline that is cheaper for refineries to produce. The August monthly average gasoline crack spread declined to lower than the five-year (2014–18) range after increasing to the five-year average in July for the first time this year. U.S. gasoline inventories decreased in August despite what EIA estimates would be record high gasoline production if confirmed by monthly data. In addition, gasoline imports into the East Coast increased after the Philadelphia Energy Solutions refinery closed in June, reaching 0.8 million barrels per day (b/d) for the four weeks ending August 30, 22% higher than the five-year average.

**Butane prices:** In each of the past three months, butane spot prices averaged 49 cents/gal (Figure 7), the lowest monthly average prices in 17 years. U.S. butane inventories in May 2019 (the latest data available) reached 48 million barrels, 12 million barrels higher than the five-year average. Butane produced through natural gas processing was 418,000 b/d in April and May 2019, the highest level ever recorded. Lower prices have provided incentives to export butane as well as input more butane into refinery processing. In April, the United States exported 331,000 b/d of butane, the highest amount ever. In November and December 2018, butane refinery inputs of 363,000 b/d were also the highest on record. Blending butane into gasoline is one of its major uses. During the summer months, however, the amount that can be blended is limited by lower vapor pressure specifications. The limited refinery use contributed to the rising inventory levels and low prices during this past summer.
The ultra-low sulfur diesel (ULSD) front-month futures price increased 4 cents/gal from August 1 to settle at $1.89/gal on September 5. The ULSD–Brent crack spread (the difference between the price of ULSD and the price of Brent crude oil) increased 2 cents/gal to settle at 44 cents/gal during the same period (Figure 8).

ULSD prices remained higher than RBOB from May to August for the second consecutive year. Even though distillate consumption declined in August to below the five-year range, exports increased and production declined, helping to keep inventories lower than the five-year average. Distillate exports increased to 1.5 million b/d for the four weeks ending August 30, which, if confirmed by monthly data, would be the highest monthly amount in 2019 and the third-largest on record. EIA estimates that production declined in August compared with July 2019. The production decline was also the largest year-on-year decrease since September 2017.
EIA estimates that distillate inventories ended August 11 million barrels lower than the five-year average.

**Natural Gas**

**Prices:** The front-month natural gas futures contract for delivery at the Henry Hub settled at $2.44 per million British thermal units (MMBtu) on September 5, an increase of 23 cents/MMBtu from August 1 (Figure 9). Natural gas futures prices declined early in August, reaching $2.07/MMBtu on August 5, the lowest price since May 26, 2016, as continued increases in production contributed to inventory gains. As of September 5, natural gas storage injections equaled or exceeded the five-year (2014–18) average in all but two weeks in the 2019 injection season that began in April.

Henry Hub spot prices increased in the second half of August, and EIA forecasts that prices will average $2.44/MMBtu in the fourth quarter of 2019 and $2.55/MMBtu in 2020. EIA estimates that natural gas production increased to a record-high 92.2 billion cubic feet per day (Bcf/d) in August but expects that production will level off, averaging 93.2 Bcf/d in 2020. However, EIA forecasts that liquefied natural gas (LNG) exports, estimated at 3.9 Bcf/d in August, will continue to rise through the forecast, averaging 6.4 Bcf/d in 2020. EIA expects that continued growth of LNG exports combined with flattening production will provide support for natural gas prices through the forecast.

**Ethane prices:** On July 31, 2019, ethane spot prices declined to the lowest point on record (Figure 10). Although prices increased in August, the monthly average prices for June through August were the lowest recorded for those months. Ethane inventories rose to 56 million barrels in May 2019 (the latest data available), 14 million barrels more than the five-year average and less than 3 million barrels lower than the November 2017 record high in EIA’s data series, which starts in 2010. The low prices during the summer months indicate that inventories likely have remained high. Ethane produced through natural gas processing continues to increase. Every
month since September 2016 has set a production record for that month. Consumption and exports have also increased, but ethane production grew at a faster rate in the first five months of 2019. Although ethane is usually more expensive than natural gas, ethane prices have been lower than natural gas futures prices for more than half of the days from June 1 to September 5. Low ethane prices could make extraction from the natural gas stream cost prohibitive for natural gas processors. Processors will likely leave ethane in the natural gas stream—behavior known as “ethane rejection”—to the extent possible while still meeting the specifications for dry natural gas distribution.

![Figure 10. Natural gas futures and ethane spot prices](image)

**Notable forecast changes**

- EIA forecasts that global liquid fuels consumption will increase by 0.9 million barrels per day (b/d) in 2019, which is 0.1 million b/d lower than forecast in the August STEO. It also marks the seventh consecutive month in which EIA has lowered its 2019 consumption outlook, after EIA had forecast growth of 1.5 million b/d for the year in the January 2019 STEO. The downward revisions reflect successive reductions in EIA’s assumption (based on forecasts from Oxford Economics) of global gross domestic product growth for 2019.

- EIA forecasts natural gas spot prices at Henry Hub to average $2.55 per million British thermal units (MMBtu) in 2020, which is 20 cents/MMBtu lower than expected in the August STEO.

- Because of the delayed release of EIA’s *Petroleum Supply Monthly* (PSM) data for June 2019, historical monthly petroleum data in this STEO end one month earlier than standard, in May 2019. This delay does not materially affect the September STEO forecast. The June data will be incorporated into the October STEO.
For more information, see the detailed table of STEO forecast changes.