Forecast highlights

**Global liquid fuels**

- Brent crude oil spot prices averaged $64 per barrel (b) in July, almost unchanged from the average in June 2019 but $10/b lower than the price in July of last year. EIA forecasts Brent spot prices will average $64/b in the second half of 2019 and $65/b in 2020. The forecast of stable crude oil prices is the result of EIA’s expectations of a relatively balanced global oil market. EIA forecasts global oil inventories will increase by 0.1 million barrels per day (b/d) in 2019 and 0.3 million b/d in 2020.

- EIA expects West Texas Intermediate (WTI) crude oil prices will average $5.50/b less than Brent prices during the fourth quarter of 2019 and in 2020, narrowing from the $6.60/b spread during July. The narrowing spread reflects EIA’s assumption that crude oil pipeline transportation constraints from the Permian Basin to refineries and export terminals on the U.S. Gulf Coast will ease in the coming months. In the July STEO, EIA forecast the Brent-WTI spread to average $4.00/b in 2020. The updated differential forecast reflects EIA’s revised assumptions about the marginal cost of moving crude oil via pipeline from Cushing, Oklahoma, to the Gulf Coast.

- EIA estimates that U.S. crude oil production averaged 11.7 million b/d in July, down by 0.3 million b/d from the June level. The declines were mostly in the Federal Gulf of Mexico (GOM), where operators shut platforms for several days in mid-July because of Hurricane Barry. EIA estimates that GOM crude oil production fell by more than 0.3 million b/d in July. Those declines were partially offset by the Lower 48 States onshore region, which is mostly tight oil production, where supply rose by more than 0.1 million b/d. EIA expects monthly growth in Lower 48 onshore production to slow during the rest of the forecast period, averaging 50,000 b/d per month from the fourth quarter of 2019 through the end of 2020, down from an average of 110,000 b/d per month from August 2018 through July 2019. EIA forecasts U.S. crude oil production will average 12.3 million b/d in 2019 and 13.3 million b/d in 2020, both of which would be record levels.

- U.S. regular gasoline retail prices averaged $2.74 gallon (gal) in July, up 2 cents/gal from June but 11 cents/gal lower than the average in July of last year. EIA expects that monthly average gasoline prices peaked for the year in May at an average of $2.86/gal and will fall to an average of $2.64/gal in September. EIA expects regular gasoline retail prices to average $2.62/gal in 2019 and $2.71/gal in 2020.
Natural gas

- The Henry Hub natural gas spot price averaged $2.37/million British thermal units (MMBtu) in July, down 3 cents/MMBtu from June. However, by the end of the month, spot prices had fallen below $2.30/MMBtu. Based on this price movement and EIA’s forecast of continued strong growth in natural gas production, EIA lowered its Henry Hub spot price forecast for the second half of 2019 to an average of $2.36/MMBtu. In the July STEO, EIA expected prices to average $2.50/MMBtu during this period. EIA expects natural gas prices in 2020 will increase to an average of $2.75/MMBtu. EIA’s natural gas production models indicate that rising prices are required in the coming quarters to bring supply into balance with rising domestic and export demand in 2020.

- EIA forecasts that U.S. dry natural gas production will average 91.0 billion cubic feet per day (Bcf/d) in 2019, up 7.6 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 92.5 Bcf/d.

- EIA estimates that natural gas inventories ended July at 2.7 trillion cubic feet (Tcf), 13% higher than levels from a year earlier and 4% lower than the five-year (2014–18) average. EIA forecasts that natural gas storage injections during the 2019 April-through-October injection season will outpace the previous five-year average and that inventories will rise to more than 3.7 Tcf at the end of October, which would be 16% higher than October 2018 levels and slightly above to the five-year average.

Electricity, coal, renewables, and emissions

- EIA has expanded its forecasts for electricity supply in the United States and has introduced new forecasts for wholesale electricity prices. A STEO Supplement provides more information about the changes.

- Lower costs for natural gas drive EIA’s forecast that annual average wholesale electricity prices will be lower in 2019 than last year in all areas of the United States. The forecast year-over-year declines range from -0.2% in the Southwest Power Pool (SPP) to -28% in the Electric Reliability Council of Texas (ERCOT) market.

- 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 then decline slightly in 2020. EIA forecasts that the share of U.S. generation from coal will average 24% in 2019 and in 2020, down from 28% in 2018. The 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 expects electric power sector demand for coal to fall by 2% in 2020, compared with an expected decline of 15% in 2019. However, planned coal plant retirements will continue to put downward pressure on overall electricity demand for the fuel. Almost 13 gigawatts of coal-fired electricity generation capacity has retired this year or is scheduled to retire by the end of 2020, accounting for 5% of the capacity existing at the end of 2018.

- EIA forecasts that 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 maintain that position in 2020.

- EIA is improving its regional-level trend analysis by inserting a generator-level production cost model that simulates hourly generation at individual power plants. This improves our insight into generation, especially from fast-growing renewable sources like wind and solar.

- This additional granularity and the assumption that wind will return to more normal levels in 2019, after a windy first half of 2018, results in an EIA forecast that electricity generation from wind power will average 295 billion kilowatthours (kWh) in 2019 and 335 billion kWh in 2020, estimates that are 4% and 7% lower, respectively, than forecast in the July STEO. In addition, the application of hourly dispatch that better models solar incidence lowers the solar electric production forecast by 1.1% in 2019 and by 2.8% in 2020.

- EIA forecasts that, after rising by 2.7% in 2018, U.S. energy-related carbon dioxide (CO2) emissions will decline by 2.3% in 2019 and by 0.5% 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, in 2019, EIA expects U.S. CO2 emissions 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. EIA’s projected emissions decline is lower in 2020 than in 2019 because it forecasts that both heating and cooling requirements will be slightly lower than normal. At the same time, the forecast coal share of generation will remain about the same as in 2019 while the natural gas share declines. Although EIA forecasts that generation from renewables will continue to increase in 2020, a forecast decrease in nuclear power offsets 24% of the renewables’ gain.
Petroleum and natural gas markets review

Crude oil

**Prices:** The front-month futures price for Brent crude oil settled at $60.50 per barrel (b) on August 1, 2019, a decrease of $4.56/b from July 1. The front-month futures price for West Texas Intermediate (WTI) crude oil for delivery at Cushing, Oklahoma, decreased by $5.14/b during the same period, settling at $53.95/b on August 3 (Figure 1).

On August 1, Brent and WTI prices declined by more than 7% on the day following the U.S. announcement of new tariffs on China, a large decline for a single day. It followed July, a month in which Brent crude oil prices traded in a $6.36/b range, the second narrowest range during any month in the past year. The narrow trading range in July occurred amid offsetting upward and downward oil price pressures. Continued Middle East tensions presented risks of supply disruptions and higher crude oil prices. Iran seized a British tanker in the Strait of Hormuz in late July, but crude oil transit in the region has not been significantly disrupted to date. Continued demand-side concerns have generally added downward price pressure to crude oil prices this month. The International Monetary Fund recently lowered its estimates for global economic growth in 2019 and 2020. In addition, China’s gross domestic product growth for the second quarter of 2019 was 6.2%, the lowest growth rate for any quarter since estimates began in 1992. The July manufacturing Purchasing Managers’ Index for the Eurozone, China, and Japan all indicated contraction in manufacturing activity as well.

The combination of oil supply disruption risk and lower economic growth expectations creates uncertainty in the pace of global oil inventory withdrawals and prices. EIA expects Brent prices to increase to $65/b by the fourth quarter of 2019 and remain there throughout 2020. EIA’s flat crude oil price forecast recognizes that upside and downside price risks and EIA’s forecast for global oil inventory growth are currently balanced. However, given the uncertainty in the risk
factors discussed, prices could break out of the mid-$60/b range if the supply or demand concerns materialize in the coming months.

Although Brent crude oil prices stayed within a relatively narrow trading range in July, Brent’s implied volatility increased in the middle of the month before declining when the September contract expired (Figure 2). Higher implied volatility could reflect increased uncertainty among market participants about the future direction of oil prices. Although threats of supply disruptions would increase crude oil prices rapidly, emerging indications of an economic slowdown present downside price risk. Market participants could be implementing risk management strategies that purchase put and call options—financial contracts that give owners the right to sell or buy a security at a given price—to offset both downside and upside risk, which could increase the cost of hedging and push up implied volatility.

![Figure 2. Crude oil implied volatility](image)

**Brent and copper-to-gold ratio**: Lower economic growth expectations have likely reduced crude oil prices during the past three months. Similar to crude oil prices, metals prices also appear to signify reduced market expectations for global economic growth. Copper is an industrial metal used in many economically sensitive sectors, such as construction and industrial production, whereas gold is a precious metal with little industrial use but is often considered a safe-haven asset. When copper prices rise relative to gold prices, it could indicate expectations of increased economic growth, but a falling ratio can indicate expectations of a slowdown in industrial and economic activity. When indexed to the beginning of 2019, both Brent crude oil prices and the copper-to-gold ratio peaked in April and have since declined (Figure 3). The rolling 60-day correlation between Brent crude oil prices and the copper-to-gold ratio reached a 3-year high in March 2019, and it has exhibited a positive correlation since February of 2018. When price series exhibit high correlation, it means the prices are generally responding to the same information, in this case demand-side factors. Fundamental economic and oil market data can be lagged for several months, and so commodity price levels and changes can provide real-time information about the economy.
Energy high yield corporate bonds: Bond yields for companies with a credit rating lower than investment grade, called high yield bonds, have increased for energy companies by more than those for the broader market. An increase in bond yields, measured by a higher option adjusted spread (OAS) to U.S. government bonds, reflects more default risk and could increase the cost of borrowing for some oil producers. The Bloomberg Barclays high yield energy bond OAS increased 73 basis points since July 1, settling at 6.42% on August 1 (Figure 4). Although profitability for many publicly traded U.S. oil exploration and production companies increased in recent years, the first quarter of 2019 was the first time since the third quarter of 2016 that cash flow from operating activities declined on a year-over-year basis. Lower cash from operations could require some companies to increase debt to pay for capital expenditures, but the increase in the OAS means energy companies’ borrowing costs will likely increase. In addition, because energy high yield bond spreads are increasing more than the broader market, it could indicate investors perceive the sector as more risky than other sectors of the economy and further increase borrowing costs for energy companies.
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 $1.75 per gallon (gal) on August 1, down 18 cents/gal since July 1 (Figure 5). The RBOB–Brent crack spread (the difference between the price of RBOB and the price of Brent crude oil) decreased by 7 cents/gal to settle at 31 cents/gal during the same period.

The gasoline crack spread came within 1 cent of the five-year (2014–18) monthly average of 38 cents/gal in July, the closest it has come to the five-year average since February 2018. Factors contributing to the return to the five-year average likely include lower crude oil prices and the effects of the June 21 closure of the Philadelphia Energy Solutions (PES) refinery on the East Coast. The price effects of the refinery closure were likely strongest during the first half of the
month; trade press indicates that rising East Coast prices prompted an increase in imports from Europe. Gasoline inventories in the central Atlantic region—the region directly affected by the closure—fell 9% from the week ending June 21 to the week ending July 12. EIA forecasts gasoline consumption to peak in August this year at 9.72 million barrels per day (b/d). August was the peak month for gasoline consumption in 4 out of the past 10 years.

**International gasoline crack spreads:** The gasoline crack spread based on spot New York Harbor gasoline prices and Brent crude oil prices—often used as an indicator of refining margins—was one cent higher than the five-year average, while gasoline crack spreads in other regions of the world remained lower than their respective five-year averages for July (Figure 6). The Northwest Europe gasoline–Brent spot price crack spread averaged 25 cents/gal in July, 3 cents/gal higher than the 2018 average for July but 4 cents/gal lower than the five-year average. The Singapore gasoline–Dubai/Oman spot price crack spread averaged 16 cents/gal in July, 10 cents/gal lower than the five-year average for the month. The July 2019 monthly average Singapore gasoline crack spread was the lowest of the three regions for the fifth consecutive year. Before 2015, the Singapore gasoline crack spread had regularly been among the highest in the world as the regional market experienced increasing demand with limited supply. China then began to allow more crude oil imports in 2015 and increased its export quota for petroleum products starting in 2016. China’s legal and commercial policy changes combined with significant capacity expansions in Asia’s refining sector likely contributed to a structural decline in refining margins.

![Figure 6. International gasoline crack spreads](image)

**Ultra-low sulfur diesel prices:** The ultra-low sulfur diesel (ULSD) front-month futures price decreased 10 cents/gal from July 1 to settle at $1.85/gal on August 1. The ULSD–Brent crack spread (the difference between the price of ULSD and the price of Brent crude oil) increased 1 cent/gal to settle at 41 cents/gal during the same period (Figure 7).
The average monthly distillate crack spread rose higher than the five-year range for the first time since September 2017, likely in response to the PES closure. In addition, higher crack spreads contributed to record-high distillate production for July, levels more typical of seasonally high winter production. The record levels of production occurred as refiners shifted yields toward distillate fuel. EIA estimates that distillate fuel yields at U.S. refineries averaged 29.6% in July, the highest for any July on record. In both 2019 and 2020, EIA expects refiners to continue increasing distillate yields, which, combined with rising refinery runs, is expected to lead to record levels of distillate production in both years. EIA expects high U.S. distillate production to support rising U.S. distillate fuel exports to help satisfy global demand for low-sulfur bunker fuel that meets new maritime fuel specifications that come into effect in January 2020.

Given the high levels of distillate production, EIA estimates U.S. distillate inventories at the end of July were 8.3 million barrels more than month-ago levels, a larger-than-average build for July and the largest month-over-month increase since December 2018. This build brought distillate inventories to 3.9 million barrels below the five-year average. Hurricane Barry likely contributed to inventory builds in the Gulf Coast in mid-July because it slowed distillate exports and restricted port operations.

**Natural Gas**

**Prices:** The front-month natural gas futures contract for delivery at the Henry Hub settled at $2.20 per million British thermal units (MMBtu) on August 1, a decrease of 6 cents/MMBtu from July 1 (Figure 8). Both natural gas futures and spot prices fell despite hotter-than-normal weather for July. U.S. cooling degree days (CDD) averaged 7% higher than normal for July. As a result of the hot temperatures, EIA estimates that natural gas consumption for power generation reached a record high in July. The high demand, combined with a short period of shut-in natural gas production in the Gulf of Mexico in mid-July because of Hurricane Barry,
likely contributed to a slower pace of inventory injections. July injections into natural gas storage sank the lowest to the five-year (2014–2018) average since March 2019, when injections were below average. EIA estimates that working natural gas inventories surpassed 2.7 trillion cubic feet (Tcf) in July 2019, 4% lower than the five-year average. This difference to the five-year average was the smallest since November 2017, which may have contributed to the front-month natural gas futures price remaining low.

Money manager positions: As of the week of July 30, 2019, the number of future short positions that money managers reported holding for NYMEX natural gas contracts had remained higher than long positions since May 21, 2019, the longest time since August 23, 2016 (Figure 9). The money manager category of the Commitments of Traders reports, published weekly by the Commodity Futures Trading Commission, include fund managers that conduct organized futures trading on behalf of clients, and they are not involved in physical commodity trading as their business activity. A short position indicates expectations of lower prices and a long position indicates the opposite. On November 13, 2018, money managers’ net long positions reached a record high when colder-than-normal weather reduced natural gas inventories to about 700 billion cubic feet lower than the five-year (2013–17) average. In 2019, however, increases in natural gas production contributed to record injections into natural gas storage for the three-month period from April through June. Even though the pace of injections slowed in July, EIA forecasts annual dry natural gas production to continue increasing in 2019 and in 2020, helping to bring inventories back to the five-year average and likely lowering price expectations.
International prices: The average monthly U.S. natural gas futures price at Henry Hub has decreased every month since November 2018, and international natural gas prices fell by even more during this time (Figure 10). The decline in international natural gas prices has been driven by rising liquefied natural gas (LNG) supplies and slowing demand. The natural gas spot price at the U.K.’s National Balancing Point (NBP) fell 49% from the beginning of 2019 to August 1, despite record-high temperatures in July. Prices for the Asian LNG spot price benchmark Japan/Korea Marker (JKM) fell by 52% during the same period. Decreasing international natural gas prices and fluctuating exchange rates have narrowed the price spreads between U.S. Henry Hub prices and NBP by 63% and between Henry Hub and JKM by 65% since the start of the year. EIA expects LNG exports to continue to rise in 2019 and in 2020 as new liquefaction plants come online. However, the narrowing price spreads may challenge the competitiveness of U.S. LNG exporters after adding the cost of liquefaction and transport.
Notable forecast changes

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- EIA forecasts that West Texas Intermediate (WTI) crude oil prices will average $5.50/b lower than Brent prices from the fourth quarter of 2019 through the end of 2020. In the July STEO, EIA forecast this differential to be $4.00/b. The wider forecast Brent-WTI differential reflects EIA updated assumptions about the marginal cost of transporting crude oil via pipeline from Cushing, Oklahoma, to the U.S. Gulf Coast.

- EIA forecasts natural gas spot prices at Henry Hub to average $2.36 per million British thermal units (MMBtu) in the second half of 2019, which is 14 cents/MMBtu lower than expected in the July STEO.

- For more information, see the detailed table of STEO forecast changes.