



## Short-Term Energy Outlook (STEO)

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### Forecast highlights

#### *Global liquid fuels*

- Brent crude oil spot prices averaged \$60 per barrel (b) in October, down \$3/b from September and down \$21/b from October 2018. EIA forecasts Brent spot prices will average \$60/b in 2020, down from a 2019 average of \$64/b. EIA forecasts that West Texas Intermediate (WTI) prices will average \$5.50/b less than Brent prices in 2020. EIA expects crude oil prices will be lower on average in 2020 than in 2019 because of forecast rising global oil inventories, particularly in the first half of next year.
- Based on preliminary data and model estimates, EIA estimates that the United States exported 140,000 b/d more total crude oil and petroleum products in September than it imported; total exports exceeded imports by 550,000 b/d in October. If confirmed in survey-collected monthly data, it would be the first time the United States exported more petroleum than it imported since EIA records began in 1949\*. EIA expects total crude oil and petroleum net exports to average 750,000 b/d in 2020 compared with average net imports of 520,000 b/d in 2019.
- Distillate fuel inventories (a category that includes home heating oil) in the U.S. East Coast—[Petroleum Administration for Defense District \(PADD\) 1](#)—totaled 36.6 million barrels at the end of October, which was 30% lower than the five-year (2014–18) average for the end of October. The declining inventories largely reflect low U.S. refinery runs during October and low distillate fuel imports to the East Coast. EIA does not forecast regional distillate prices, but low inventories could put upward pressure on East Coast distillate fuel prices, including home heating oil, in the coming weeks.

#### Note

\* EIA has monthly data on U.S. imports and exports of crude oil and petroleum products dating back to 1973. Annual data on net U.S. imports of crude oil and petroleum products dates back to 1949.

- U.S. regular gasoline retail prices averaged \$2.63 per gallon (gal) in October, up 3 cents/gal from September and 11 cents/gal higher than forecast in last month's STEO. Average U.S. regular gasoline retail prices were higher than expected, in large part, because of [ongoing issues from refinery outages in California](#). EIA forecasts that regular gasoline prices on the West Coast (PADD 5), a region that includes California, will fall as the issues begin to resolve. EIA expects that prices in the region will average \$3.44/gal in November and \$3.12/gal in December. For the U.S. national average, EIA expects regular gasoline retail prices to average \$2.65/gal in November and fall to \$2.50/gal in December. EIA forecasts that the annual average price in 2020 will be \$2.62/gal.
- Despite low distillate fuel inventories, EIA expects that average household expenditures for [home heating oil will decrease this winter](#). This forecast largely reflects warmer temperatures than last winter for the entire October–March period, and retail heating oil prices are expected to be unchanged compared with last winter. For households that heat with propane, EIA forecasts that expenditures will fall by 15% from last winter because of milder temperatures and lower propane prices.

### *Natural gas*

- Natural gas storage injections in the United States outpaced the previous five-year (2014–18) average during the 2019 injection season as a result of rising natural gas production. At the beginning of April, when the [injection season started](#), working inventories were 28% lower than the five-year average for the same period. By October 31, U.S. total [working gas inventories](#) reached 3,762 billion cubic feet (Bcf), which was 1% higher than the five-year average and 16% higher than a year ago.
- EIA expects natural gas storage withdrawals to total 1.9 trillion cubic feet (Tcf) between the end of October and the end of March, which is less than the previous five-year average winter withdrawal. A withdrawal of this amount would leave end-of-March inventories at almost 1.9 Tcf, 9% higher than the five-year average.
- The Henry Hub natural gas spot price averaged \$2.33 per million British thermal units (MMBtu) in October, down 23 cents/MMBtu from September. The decline largely reflected strong inventory injections. However, forecast cold temperatures across much of the country caused prices to rise in early November, and EIA forecasts Henry Hub prices to average \$2.73/MMBtu for the final two months of 2019. EIA forecasts Henry Hub spot prices to average \$2.48/MMBtu in 2020, down 13 cents/MMBtu from the 2019 average. Lower forecast prices in 2020 reflect a decline in U.S. natural gas demand and slowing U.S. natural gas export growth, allowing inventories to remain higher than the five-year average during the year even as natural gas production growth is forecast to slow.
- EIA forecasts that annual U.S. dry natural gas production will average 92.1 billion cubic feet per day (Bcf/d) in 2019, up 10% from 2018. EIA expects that natural gas

production will grow much less in 2020 because of the lag between changes in price and changes in future drilling activity, with low prices in the third quarter of 2019 reducing natural gas-directed drilling in the first half of 2020. EIA forecasts natural gas production in 2020 will average 94.9 Bcf/d.

- EIA expects U.S. liquefied natural gas (LNG) exports to average 4.7 Bcf/d in 2019 and 6.4 Bcf/d in 2020 as three new liquefaction projects come online. In 2019, three new liquefaction facilities—[Cameron LNG](#), [Freeport LNG](#), and [Elba Island LNG](#)—commissioned their first trains. Natural gas deliveries to LNG projects [set a new record in July](#), averaging 6.0 Bcf/d, and increased further to 6.6 Bcf/d in October, when new trains at Cameron and Freeport began ramping up. Cameron LNG exported its first cargo in May, Corpus Christi LNG’s newly commissioned Train 2 in July, and Freeport in September. Elba Island plans to ship its first export cargo by the end of this year. In 2020, Cameron, Freeport, and Elba Island expect to place their remaining trains in service, bringing the total U.S. LNG export capacity to 8.9 Bcf/d by the end of the year.

#### *Electricity, coal, renewables, and emissions*

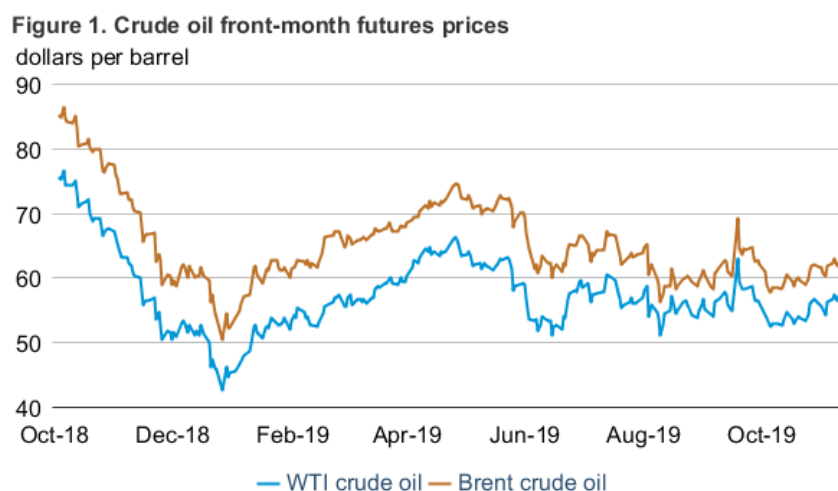
- EIA expects the share of U.S. total [utility-scale electricity generation](#) from natural gas-fired power plants will rise from 34% in 2018 to 37% in 2019 and to 38% in 2020. EIA forecasts the share of U.S. electric generation from coal to average 25% in 2019 and 22% in 2020, down from 28% in 2018. 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, down from almost 8% in 2018. Wind, solar, and other nonhydropower renewables provided 9% of U.S. total utility-scale generation in 2018. EIA expects they will provide 10% in 2019 and 12% in 2020.
- EIA expects total U.S. coal production in 2019 to total 698 million short tons (MMst), an 8% decrease from the 2018 level of 756 MMst. The decline reflects lower demand for coal in the U.S. electric power sector and reduced competitiveness of U.S. exports in the global market. EIA expects U.S. steam coal exports to face increasing competition from Eastern European sources, and that Russia will fill a growing share of steam coal trade, causing U.S. coal exports to fall in 2020. EIA forecasts that coal production in 2020 will total 607 MMst.
- EIA expects U.S. electric power sector generation from renewables other than hydropower—principally [wind](#) and solar—to grow from 408 billion kilowatthours (kWh) in 2019 to 466 billion kWh in 2020. In EIA’s forecast, Texas accounts for 19% of the U.S. nonhydropower renewables generation in 2019 and 22% in 2020. California’s forecast share of nonhydropower renewables generation falls from 15% in 2019 to 14% in 2020. EIA expects that the Midwest and Central power regions will see shares in the 16% to 18% range for 2019 and 2020.

- EIA forecasts that, after rising by 2.7% in 2018, U.S. energy-related carbon dioxide (CO<sub>2</sub>) emissions will decline by 1.7% in 2019 and by 2.0% in 2020, partially as a result of lower forecast energy consumption. In 2019, EIA forecasts less demand for space cooling because of cooler summer months; an expected 5% decline in cooling degree days from 2018, when it was significantly higher than the previous 10-year (2008–17) average. In addition, EIA also expects U.S. CO<sub>2</sub> emissions in 2019 to decline because the forecast share of electricity generated from natural gas and renewables will increase, and the share generated from coal, which is a more carbon-intensive energy source, will decrease.

## Petroleum and natural gas markets review

### Crude oil

**Prices:** The front-month futures price for Brent crude oil settled at \$62.29 per barrel (b) on November 7, 2019, an increase of \$3.40/b from October 1. The front-month futures price for West Texas Intermediate (WTI) crude oil for delivery at Cushing, Oklahoma, increased by \$3.53/b during the same period, settling at \$57.15/b on November 7 (Figure 1).



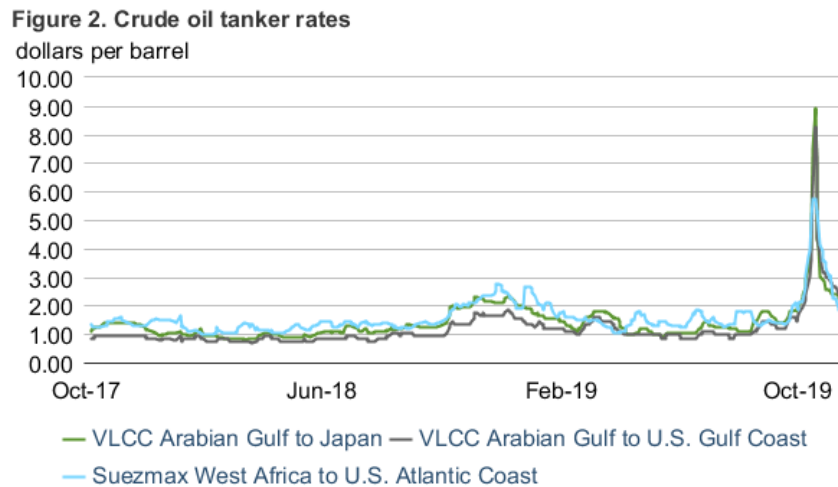
 CME Group and Intercontinental Exchange, as compiled by Bloomberg L.P.; WTI=West Texas Intermediate

Crude oil markets traded in a relatively narrow range in October following heightened volatility in September stemming from the attack on [Saudi Arabian crude oil processing facilities](#). A number of indications suggest that some of the supply- and demand-side risks that affected oil market participants in the third quarter have begun to diminish. Saudi Arabian production has returned to pre-attack levels. In addition, some of the expectations for lower economic growth-related oil demand during the past year may be receding and appear to be providing near-term support to crude oil prices at levels slightly higher than \$60/b. Some economic activity remains slower than in recent history—Chinese third-quarter gross domestic product growth, for

example, was the slowest rate since at least 1992—yet, other economic indicators improved compared with those of a few months ago. Manufacturing Purchasing Manager’s Indexes (PMI) increased in both [China](#) and the [United States](#), and [employment growth](#) in the United States continues to support domestic gasoline consumption, which EIA estimated to be at a seasonal record-high level in October. In addition, the U.S. Federal Reserve and other central banks recently signaled a more accommodating monetary policy, including lower interest rates, which could stimulate capital expenditures or other investment spending.

U.S. commercial crude oil and other liquids inventories declined by 0.4 million barrels per day (b/d) in October. EIA estimates that global inventories increased by 0.8 million b/d in October as inventory builds in other regions—some of which was likely the result of Saudi Arabia refilling stocks that it withdrew following the September production outage—offset the draws in the United States. EIA forecasts that fourth-quarter 2019 inventories will increase by more than 0.2 million b/d, followed by further inventory builds in the first half of 2020 that will put moderate downward pressure on crude oil prices. EIA’s price forecast for 2020 is mostly unchanged from the October STEO; Brent and WTI are forecast to average \$60/b and \$55/b, respectively.

**Tanker rates:** Freight rates for [chartering crude oil tankers](#) reached the highest levels in more than 10 years on certain routes in early October because of U.S. sanctions on Chinese shipping. The cost of chartering a Very Large Crude Carrier (VLCC), a vessel with about 2 million barrels of capacity, from the Arabian Gulf to Japan increased to almost \$9/b on October 14, and the cost for chartering a VLCC from the Arabian Gulf to the U.S. Gulf Coast increased to more than \$8/b (**Figure 2**). These two charter routes averaged \$1.34/b and \$1.14/b, respectively, from January through September.

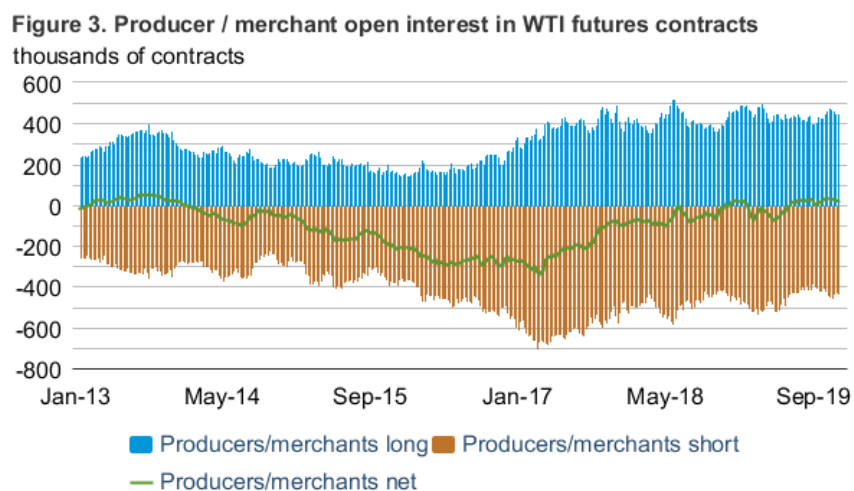


Bloomberg L.P.; VLCC=Very Large Crude Carrier

[Trade press](#) reports that, because of U.S. sanctions imposed on certain subsidiaries of Chinese shipping firm COSCO, shippers and other trading firms canceled bookings scheduled for early October for all vessels operated by COSCO amid high uncertainty about which vessels were sanctioned. The disruption contributed to not only higher rates for VLCC charters globally but

also for smaller alternative charter vessels such as Suezmaxes (vessels with about 800,000 to 1 million barrels of capacity). Although tanker rates declined in late October, a sustained increase in shipping rates could affect crude oil exports in regions that have higher transportation costs, in turn affecting crude oil prices. For example, WTI prices would likely decline relative to Brent because WTI travels from Cushing, Oklahoma, to the U.S. Gulf Coast via pipeline before it can load for export. Brent, on the other hand, can load on tankers at its production area. However, the short-term spike in rates in October is unlikely to have a sustained effect on the Brent–WTI spread, which EIA forecasts will remain at \$5.50/b in 2020, unchanged from the October STEO.

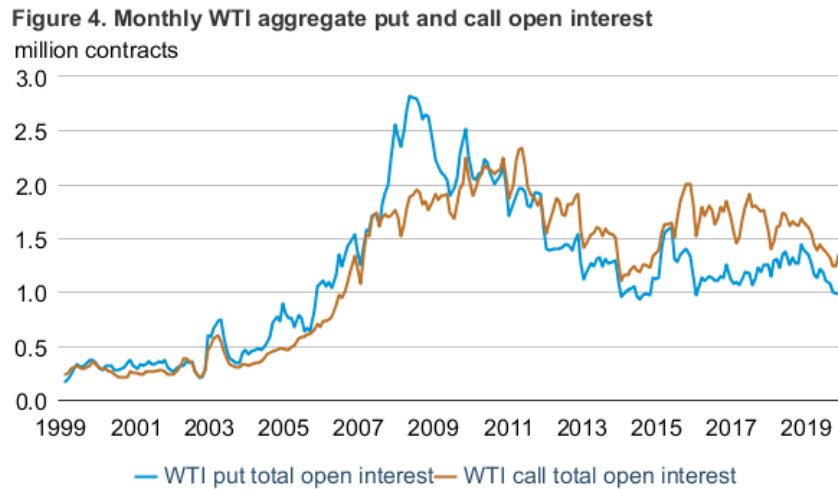
**Producer/merchant open interest:** Producers, merchants, refiners, and other physical market participants in the WTI crude oil market have been net long for the WTI futures contract since June 2019 (Figure 3). Historically, these traders are net short as a group because most physical market participants are sellers of crude oil, and the value of selling a futures contract short increases if crude oil prices decline. A long position increases in value when crude oil prices increase. The flip to a net long position has been primarily a result of a decrease in gross short positions—which declined by 233,000 contracts since the all-time high net short positions in February 2017 through November 5—but gross long positions also increased 126,000 contracts during this period. Several factors could be contributing to the net long position of the producer/merchant category, including a reduction in the quantity of future crude oil production that oil producers are hedging. Similarly, refiners or other end users could be increasing long positions amid uncertainty regarding the January 2020 transition to low-sulfur fuel oil shipping regulations, which could contribute to higher premiums of light, sweet crude oils such as WTI. Although EIA incorporates a base level of producer hedging when forecasting U.S. crude oil production, a reduction in hedging activity among producers should not significantly affect the forecast growth in U.S. crude oil production.



 U.S. Commodity Futures Trading Commission, Commitment of Traders Report; WTI=West Texas Intermediate

**Options activity:** Activity in the WTI options market reflects similar trends as the reduction in short positions among producer/merchants in the futures markets. Total put option open

interest for WTI declined to 978,000 contracts in October, the lowest level since December 2015, and was a 32% year-over-year decline (**Figure 4**). A *put option* gives the owner the right, but not the obligation, to sell the underlying futures contract for a specific price by a certain time and increases in value when crude oil prices decline. A *call option* is similar but instead gives the owner the right to buy an underlying futures contract, and it increases in value when crude oil prices increase.

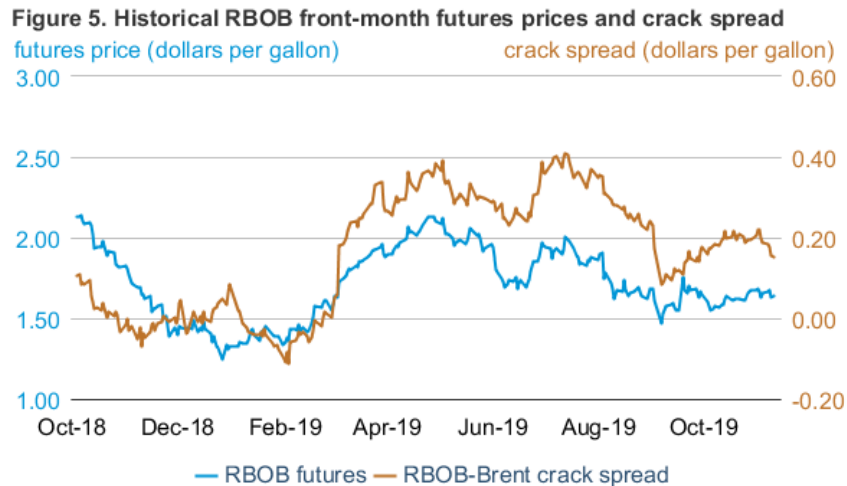



eia CME Group, Bloomberg L.P.; WTI=West Texas Intermediate

Producers tend to use options as a hedging tool in addition to selling short futures contracts, and the reduction in *put contract open interest* suggests that producers decreased hedging activity during the past year. Although *WTI total call open interest* also declined during the past year, it increased in October from September by 99,000 contracts. Some of the recent increase in *call open interest* could be for similar reasons that producer/merchant longs are increasing—to hedge upside price risk for light, sweet crude oil ahead of low-sulfur fuel oil regulations—but it also could be from the increased geopolitical risk following last month’s attack on Saudi Arabian oil infrastructure.

## 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 \$1.64 per gallon (gal) on November 7, up 6 cents/gal since October 1 (**Figure 5**). 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 15 cents/gal during the same period.



 CME Group, as compiled by Bloomberg L.P., RBOB=reformulated blendstock for oxygenate blending

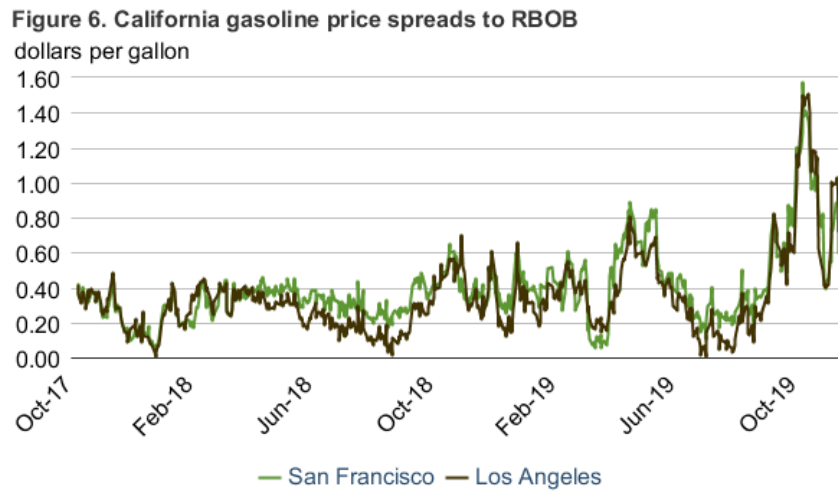
The monthly average RBOB–Brent crack spread of 20 cents/gal for October was the first time crack spreads averaged more than the rolling five-year monthly average since January 2018. One factor likely supporting gasoline crack spreads is high U.S. gasoline consumption, which EIA estimates was almost 9.4 million barrels per day (b/d) in October. If confirmed in monthly data, this level would be an **all-time high for the month of October**. This estimate follows EIA’s most recent *Petroleum Supply Monthly*, which showed August consumption levels were the highest for any month on record. Higher consumption likely contributed to larger than average inventory withdrawals in motor gasoline stocks. U.S. total motor gasoline stocks declined by 12.1 million barrels in October, more than the five-year (2014–18) average October decline of 6.7 million barrels. U.S. gasoline stocks ended October 1% lower than the five-year average, supporting gasoline crack spreads during the season that generally has the **lowest crack spreads of the year**.

**California gasoline:** Although California wholesale and retail prices are typically **higher than the rest of the United States**, several refinery problems, in addition to a generally tight market, recently contributed to rising gasoline prices in the state. Both the Los Angeles CARBOB (California Reformulated Blendstock for Oxygenate Blending) and San Francisco CARBOB reached premiums of more than \$1.50/gal to the NYMEX RBOB futures contract in October (**Figure 6**). These were the highest monthly average price spreads to NYMEX RBOB since 2015 in Los Angeles and since 2006 in San Francisco, the year the RBOB contract began trading.

California is generally isolated from other refinery centers in the United States, and its unique gasoline specifications further limit what types of gasoline it can import from other countries. Refinery **gross inputs** in the West Coast—**Petroleum Administration for Defense District (PADD) 5**—declined to the lowest level in nearly three years for the week ending September 27, 2019, reflecting several planned and unplanned refinery outages in the region and contributing to low gasoline supply in California. Although price premiums briefly returned to less than 50 cents/gal in late October, continued issues affecting startups at some refineries contributed to rising



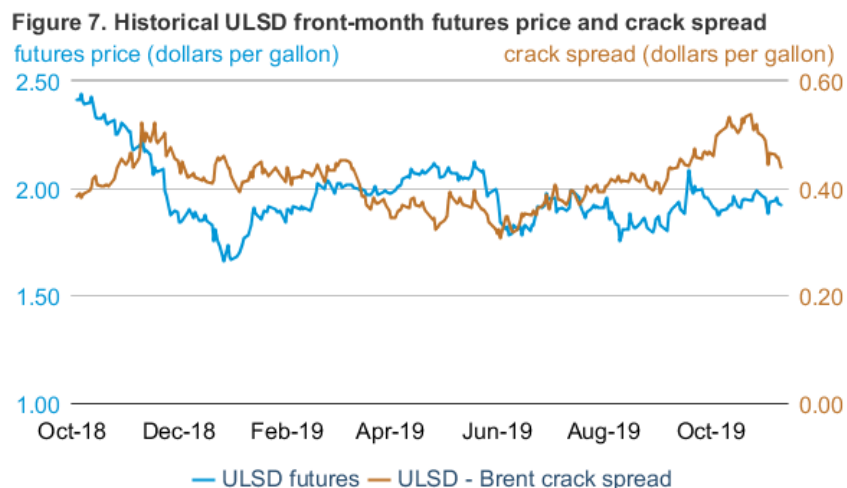
prices in early November, and price premiums settled at 73 cents/gal in Los Angeles and 60 cents/gal in San Francisco as of November 7.



 CME Group, Bloomberg, L.P.; RBOB=Reformulated Blendstock for Oxygenate Blending

The wholesale price increases have caused rising West Coast retail gasoline prices. The average price of regular-grade retail gasoline in the West Coast, including California, in October was \$3.64/gal. Given the limited recent refinery restarts and wholesale price declines, EIA forecasts retail prices in the region will average \$3.44/gal in November and \$3.12/gal in December. However, the retail price forecast depends on sustained increases in refinery runs in the region, a notable uncertainty given the recent restart issues.

**Ultra-low sulfur diesel prices:** The ultra-low sulfur diesel (ULSD) front-month futures price increased 2 cents/gal from October 1 to settle at \$1.92/gal on November 7. The ULSD–Brent crack spread (the difference between the price of ULSD and the price of Brent crude oil) decreased 6 cents/gal to settle at 44 cents/gal during the same period (**Figure 7**).

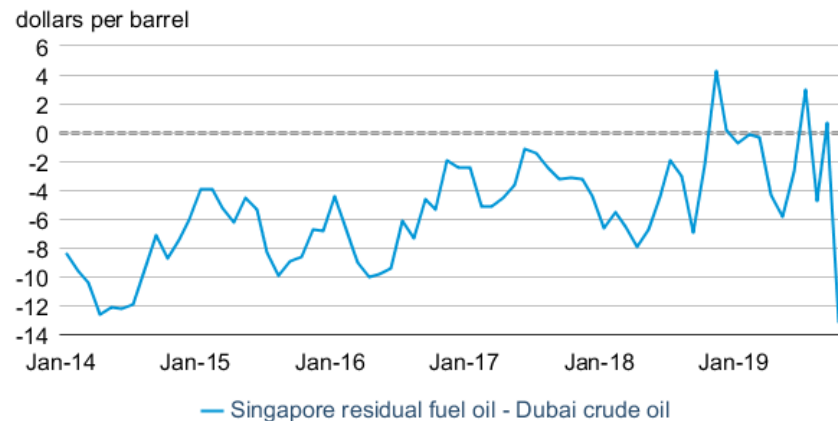


eia CME Group, as compiled by Bloomberg L.P., ULSD=ultra-low sulfur diesel

EIA estimates that distillate fuel oil inventories ended October 9.9 million barrels lower than September levels, the largest single month draw since October 2018. Higher demand and lower production likely contributed to the draw. Distillate fuel oil consumption increased by 0.4 million b/d (9.4%) between September and October and was 2.5% higher than the five-year (2014–18) monthly average. Seasonal factors also contributed to the draw. October distillate production declined because of fall refinery maintenance, and consumption increased because of the peak of the harvest season as well as the start of the winter heating season. EIA expects distillate production and consumption to increase in 2020. EIA expects production to increase by 8.1% from 5.2 million b/d in 2019 to 5.6 million b/d in 2020, and consumption to increase by 1.2% from 4.10 million b/d to 4.15 million b/d during the same period.

**International residual crack spreads:** Prices for high-sulfur residual fuel oil—a petroleum product primarily used in maritime shipping—fell sharply in October. In Singapore—the world’s largest market for maritime fuel—the monthly average price of the 3.5% sulfur fuel oil contract fell 24.5% from \$62.36 per barrel (b) in September to \$47.07/b in October. During the same period, prices for Dubai crude oil—the benchmark crude oil for the Singapore market—fell 2.5%, from \$61.71/b to \$60.19/b. As a result, the October crack spread fell to -\$13.12/b. Although the crack spread is typically negative, it had been generally increasing since about 2014 and was occasionally positive (**Figure 8**).

**Figure 8. Monthly average crack spread, Singapore residual fuel oil - Dubai crude oil**

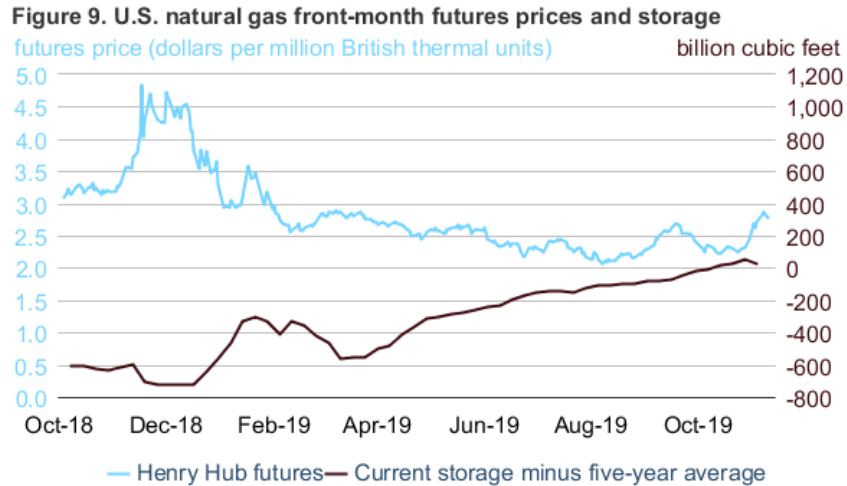


eia Thomson Reuters Refinitiv

The recent decline in high-sulfur residual prices is likely related to the upcoming change in International Maritime Organization (IMO) specifications on sulfur levels in bunkering fuel (IMO 2020). EIA forecasts that use of high-sulfur residual fuel oil for bunkering fuel will decline as demand shifts to lower sulfur alternatives, resulting in continued downward pressure on the price of high-sulfur residual fuel oil. Slowing demand for the bunkering fuel and recent price fluctuations associated with the September attacks on Saudi Aramco could also help to explain the recent volatility in the price for high-sulfur residual fuel oil, and by extension, the crack spread. The crack spread has fluctuated between an annual high of \$17.52/b on September 17 and a low of -\$16.47/b less than a month later.

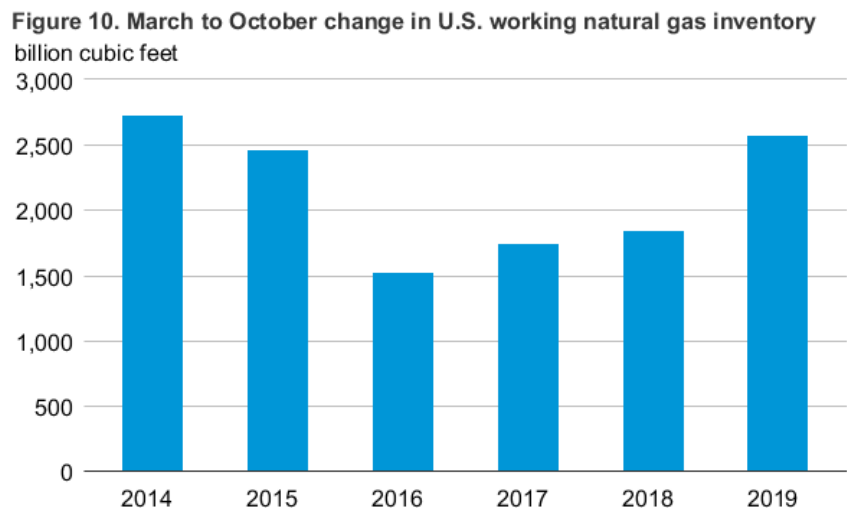
## Natural Gas

**Prices:** The front-month natural gas futures contract for December delivery at the Henry Hub settled at \$2.77 per million British thermal units (MMBtu) on November 7, up 49 cents/MMBtu from October 1 (Figure 9). Natural gas futures prices traded in a narrow range for most of October, then rose substantially at the end of the month after weather forecasts indicated much colder temperatures for early November. However, despite the increase at the end of October, the monthly average front-month futures price was the lowest for any October since 1998. Storage injections that were higher than the five-year (2014–18) average helped to keep prices low. Weekly storage injections began this year during the week ending March 29, and in 29 of the 32 reports this year (through the one for the week ending November 1), injections exceeded each week’s previous five-year average. The strong injections of natural gas into storage brought inventory levels back to more than the five-year average on October 11, 2019, for the first weekly report since September 2017.



eia U.S. Energy Information Administration, CME Group, as compiled by Bloomberg L.P.

**Natural gas inventories:** Injections of natural gas into U.S. storage from the end of March to the end of October 2019 totaled 2.6 trillion cubic feet, the most on record since 2014 (**Figure 10**). Even though consumption of natural gas for power generation and exports of liquefied natural gas each averaged record-high levels for the April through October period, production increases allowed for the near-record storage injections. U.S. natural gas production surpassed 90 billion cubic feet per day (Bcf/d) for the first time in April 2019 and increased to an estimated 95 Bcf/d in October, averaging 8 Bcf/d more than in 2018 through the period from April to October. However, EIA forecasts that monthly U.S. natural gas production will remain nearly unchanged from the current level through 2020, averaging 95 Bcf/d for the year.



eia U.S. Energy Information Administration, Short-Term Energy Outlook

## Notable forecast changes

- For more information, see the [detailed table of STEO forecast changes](#).

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