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Features

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A Long-Term Energy Outlook

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Petroleum

Worldwide crude oil prices will average \$73 a barrel (b) in 2018 and \$74/b in 2019, according to the Short-Term Energy Outlook by the U.S. Energy Information Administration. In August 2018, global oil prices averaged \$73/b—about \$1 a barrel lower than in July. Prices are easing after traders bid them higher in response to the November 2017 OPEC meeting when the oil cartel's members agreed to keep production cuts through 2018.

August oil prices were almost triple the 13-year low of \$26.55/b back in January 2016; six months before that prices had been \$60/b. A year earlier, in June 2014, they had been \$100/b. There are several factors influencing the prices of oil so that it changes daily.

As background, there are two grades of crude oil that serve as benchmarks for other oil prices: West Texas Intermediate (WTI) comes from, and is the benchmark for, the United States; Brent North Sea oil comes from Northwest Europe and is the benchmark for global oil prices.

The price of a barrel of WTI oil is currently \$6/b lower than Brent prices. In December 2015, the difference was just \$2/b. That was right after Congress removed the 40-year ban on U.S. oil exports. Commodities traders also predict the price of oil in their futures contracts and they predict the WTI price could be anywhere between \$56/b and \$85/b by December 2018.

Prices have been volatile thanks to swings in oil supply. Oil prices used to have a predictable seasonal swing. They spiked in the spring, as oil traders anticipated high demand for summer vacation driving. Once demand peaked, prices dropped in the fall and winter.

So why are oil prices no longer as predictable? The answer is that the oil industry has changed in four fundamental ways.

First, U.S. production of shale oil and alternative fuels, such as ethanol, began increasing in 2015. The EIA estimates U.S. fuel production will average 10.7 million b/day in 2018. That beats the previous record of 9.6 million b/day set in 1970. Production averaged 9.4 million b/day in 2017. The EIA forecast that oil production will average 11.8 million b/day in 2019.

Why is the United States producing so much oil despite historically low prices? Many shale oil producers have become more efficient at extracting oil. They've found ways to keep wells open, saving them the cost of capping

them.

At the same time, massive oil wells in the Gulf began producing in large quantities. They couldn't stop production regardless of low oil prices. As a result, large traditional oil enterprises stopped exploring new reserves, including Exxon-Mobil, BP, Chevron and Royal Dutch Shell. It was cheaper for them to buy out the less-efficient shale oil companies than to incur the costs of exploration.

The International Energy Administration predicts that the United States will become the world's largest oil producer by 2023. The U.S. oil industry will grow enough to meet domestic demand. To do so, it must find the right balance. It must increase supply slowly enough to keep prices high enough to pay for increasing exploration.

Second, OPEC reduced output to put a floor under prices. In November 2016, its members agreed to cut production by 1.2 million b/day by January 2017. Prices began rising right after the OPEC announcement. On November 30, 2017, OPEC agreed to continue the production cuts through 2018. OPEC's cuts lowered production to 32.5 million b/day. The EIA estimates OPEC will produce 32.8 million b/day in 2018, but both figures are still higher than its 2015 average of 32.32 million b/day.

Throughout its history, OPEC controlled production to maintain a \$70/b price target. In 2014, it abandoned this policy. Saudi Arabia, OPEC's biggest contributor, lowered its price to its largest customers in October 2014—it didn't want to lose market share to its arch rival, Iran. These two countries' rivalry stems from the conflict between the Sunni and Shiite branches of Islam. Iran promised to double its oil exports to 2.4 million b/day once sanctions were lifted. The 2015 nuclear peace treaty lifted 2010 economic sanctions and allowed Saudi Arabia's biggest rival to export oil again in 2016.

Saudi Arabia also didn't want to lose market share to U.S. shale oil producers. It bet that lower prices would force many U.S. shale producers out of business and reduce its competition. It was right. At first, shale producers found ways to keep the oil pumping. Thanks to increased U.S. supply, demand for OPEC oil fell from 30 million b/day in 2014 to 29 million b/day in 2015. But the strong dollar meant OPEC countries could remain profitable at lower oil prices. Rather than lose market share, OPEC kept its production target at 30 million b/day. The lower prices caused 2016 U.S. oil production to fall to 8.9 million b/day. Less efficient shale producers either cut back or were bought out. That reduced supply by around 10%, creating a boom and bust in U.S. shale oil.

Third, foreign exchange traders drove up the value of the dollar by 25% in 2014 and 2015. Since all oil transactions are paid in U.S. dollars, the strong dollar helped cause some of the 70% decline in the price of petroleum for exporting countries. Most oil-exporting countries peg their currencies to the dollar. Therefore, a 25% rise in the dollar offsets a 25% drop in oil prices.

Fourth, global demand has grown more slowly than anticipated. It only rose to 93.3 million b/day in 2015, from 92.4 million b/day in 2014, according to the IEA. Most of the increase was from China, which now consumes 12% of global oil production. Since its economic reforms slowed its growth, global demand growth may continue to slow down.

Oil production will rise until 2020, when shale oil production will level off at around 12 million b/day. Shale will make up 65% of U.S. oil production. By 2022, the United States will become a net energy exporter, exporting more than it imports. This is a very big deal since the U.S. has been a net energy importer since 1953.

By 2025, the average price of a barrel of Brent crude oil will rise to \$85.70/b (in 2017 dollars, which removes the effect of inflation). By 2030, world demand will drive oil prices to \$92.82/b. By 2040, prices are expected to rise to \$106.08/b (again in 2017 dollars). By then, the cheap sources of oil will have been exhausted, making it more expensive to extract oil.

Natural gas

Natural gas inventories have been low compared with the five-year (2013–17) average during most of 2018. The low inventory levels reflect high residential and commercial consumption in early 2018 and growth in both liquefied natural gas and pipeline exports over the past year.

High natural gas use for electric power generation during July and August also likely slowed the pace of inventory injections. EIA estimates that working gas in underground storage at the end of August totaled 2,606 billion cubic feet (Bcf), which is 577 Bcf, or 18%, lower than the five-year average at the end of August.

The end of October is typically considered the end of the natural gas storage injection season, although injections often occur into the first weeks of November. The EIA forecasts that inventories will rise to 3,308 Bcf at the end of October, which would be the lowest end-of-October natural gas inventory level since 2005.

Despite low inventory levels, price increases have been moderate. Significant month-over-month production growth in 2018 helped keep futures prices lower than \$3/million British thermal units (MMBtu) for most of the summer. Total U.S. dry natural gas production reached an estimated 82.2 Bcf per day in August. Implied volatility, which is based on futures and options, has also remained low, indicating lower expectations by market participants for large price increases in the near future.

Dry natural gas production in the United States was 82.2 Bcf per day in August, up 0.7 Bcf/day from July. Dry natural gas production is forecast to average 81.0 Bcf/day in 2018, up by 7.4 Bcf/day from 2017 and establishing a new record high. Natural gas production is expected to continue to rise in 2019 to an average of 84.7 Bcf/day.

U.S. natural gas inventories will total 3.3 trillion cubic feet (Tcf) at the end of October. This level would be 13% lower than the 2017 end-of-October level and 14% below the five-year (2013–17) average for the end of October, while also marking the lowest level for that time of year since 2005.

Henry Hub natural gas spot prices are expected to average \$2.99/MMBtu in 2018 and \$3.12/MMBtu in 2019. NYMEX futures and options contract values for December 2018 delivery that traded during the five-day period ending September 6, 2018, suggest a range of \$2.31/MMBtu to \$3.77/MMBtu encompasses the market expectation for December Henry Hub natural gas prices at the 95% confidence level.

The U.S. natural gas industry has changed dramatically as a result of technological advancements that have resulted in increasing domestic production, especially from shale resources. These new supplies of natural gas have resulted in lower prices, reduced price volatility and expectations of increasing demand.

Natural gas use for electricity generation is expected to grow, in part due to the expected retirement of some coal-fired generation capacity. Industrial consumption of natural gas is also expected to increase due to a resurgence of petrochemical plants, especially in the U.S. Gulf Coast.

Low domestic prices relative to the prices available in world markets are also leading to proposals to export natural gas as LNG. The emergence of shale gas in abundance has profoundly changed the market for natural gas in the U.S. in recent years and perhaps for the foreseeable future. **GT**

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