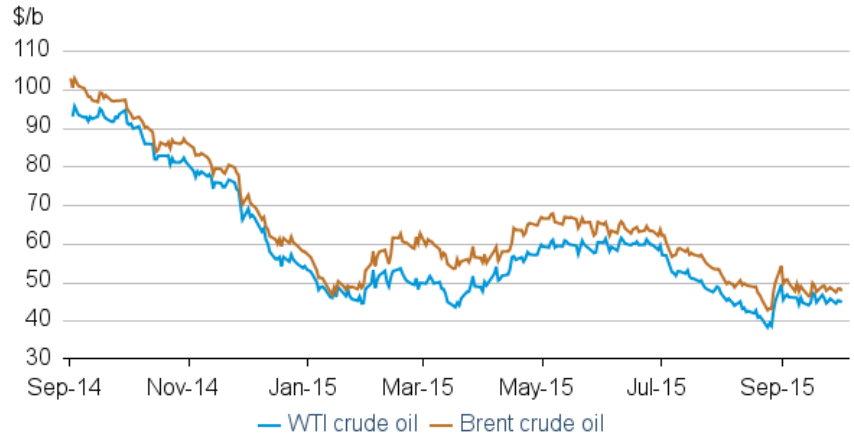
Short-Term Energy Outlook
Market Prices and Uncertainty Report

Crude Oil

Prices: Brent crude oil prices drifted lower in September and remained below $50 per barrel (b) for 20 consecutive trading days, the longest period since 2009. The North Sea Brent front month futures price settled at $47.69/b on October 1, a decline of $1.87/b since September 1 **(Figure 1)**. The West Texas Intermediate (WTI) front month futures price settled at $44.74/b on October 1, decreasing by 67 cents/b over the same time.

Figure 1. Historical crude oil front month futures prices

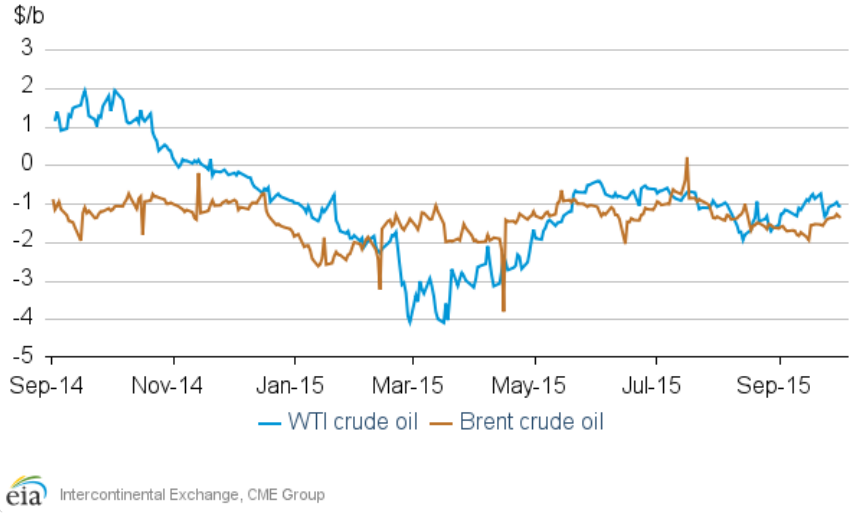


The number of operational oil rigs in the United States dropped each week in September and the latest *Petroleum Supply Monthly* showed lower year-over-year growth in U.S. crude oil production in June and July. While expectations for lower U.S. oil production provide upward price pressure, continued worries over the pace of global economic growth may be limiting potential crude oil price increases. China's official Purchasing Manager's Index (PMI) for September fell below 50, indicating contraction in the manufacturing sector, while expectations for economic growth in other non-OECD countries, particularly Brazil and Russia, also remain weak.

This is a regular monthly companion to the EIA *Short-Term Energy Outlook* (http://www.eia.gov/forecasts/steo/)
Contact: James Preciado (james.preciado@eia.gov)

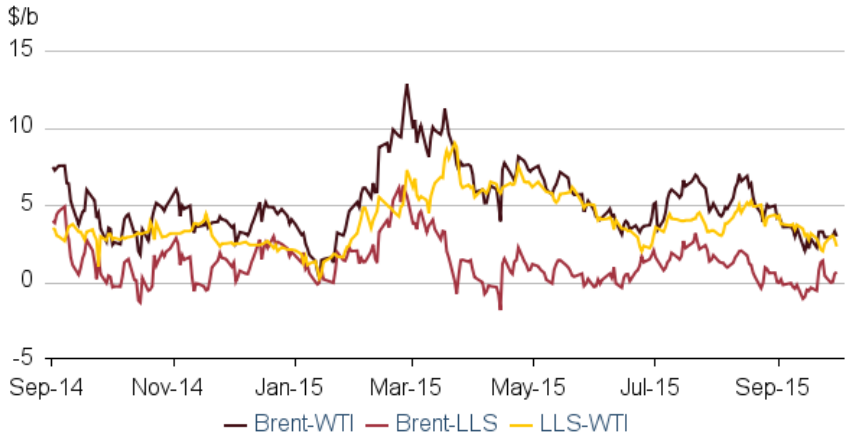
Temporary factors may be supporting both WTI and Brent front month futures prices as the discount of near-term prices compared to those for delivery three months out (contango) decreased in September. The 1st-3rd spread for WTI and Brent settled at -$1.08/b and -$1.37/b, respectively, on October 1 **(Figure 2)**. Crude oil inventories declined in Cushing, Oklahoma, the delivery point for the WTI futures contract, for the fifth week in a row, likely supporting near-term prices. North Sea production also declined in September during seasonal maintenance and may be applying upward pressure on front month prices. However, these factors may be transitory. Fall seasonal maintenance at U.S. refineries typically does not peak until October, implying demand for crude oil may decline in the near future. In the Brent market, scheduled loadings for crude oil tankers out of the North Sea in October are higher compared to September and October 2014 and could lead to stronger contango.

Figure 2. Crude oil front month - 3rd month futures price spread



North American inland crude oil prices strengthened against international benchmarks over the past month. The Brent-WTI spread decreased by $1.20/b from September 1 to settle at $2.95/b on October 1, while Louisiana Light Sweet (LLS) traded at a premium to Brent from September 4 to September 21 **(Figure 3)**. Despite the price premium, the four week average of crude oil imports into PADD 3 fell by 243,000 b/d from the end of August to the end of September. This was less than the drop in PADD 3 crude oil inputs to refineries during that time, suggesting that some crude oil imports were part of the 10.3 million barrel build in PADD 3 crude oil inventories from the week ending August 28 to the week ending September 25.

Figure 3. Historical crude oil differentials



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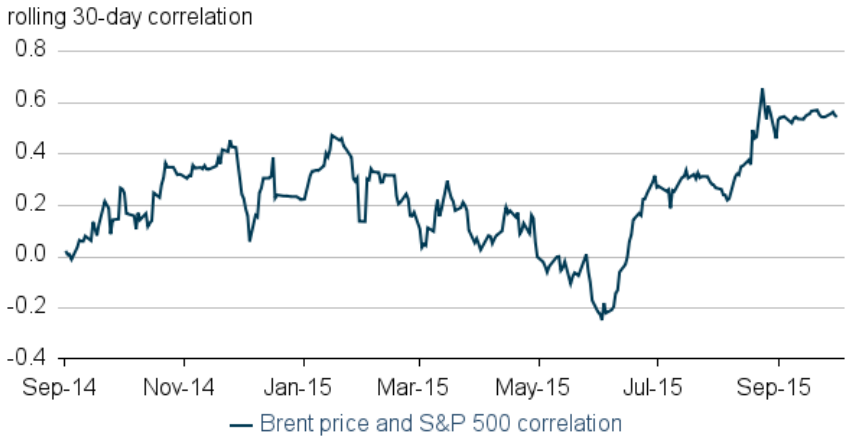
Brent crude oil and the S&P 500: The correlation between daily price movements in the Brent front month futures contract and the S&P 500 U.S. equity index moved higher in August and remained elevated in September. The 30-day rolling correlation ending October 1 was 0.54 after peaking at 0.65 on August 24 **(Figure 4)**. Measured by market capitalization, energy companies make up about 8% of the S&P 500 as of September. This explains some of the relationship between the stock index and oil prices. However, the strengthening of the relationship between Brent and the S&P 500 this past summer was closely tied to a resurgence of concerns over global economic growth influencing both markets. Japan and several emerging market economies entered into recessions, turmoil in Chinese financial markets, as well as uncertainty surrounding U.S. monetary policy all affected expectations for global economic growth, which could affect future demand for petroleum products as well as future earnings for U.S. companies.

Figure 4. Brent price and S&P 500 correlation



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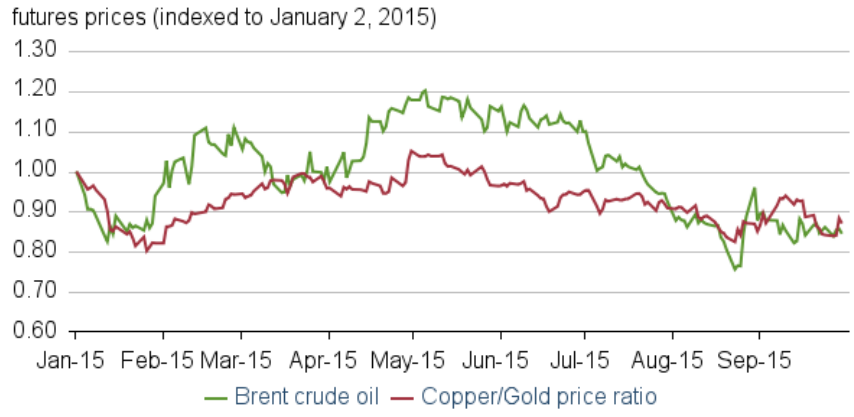
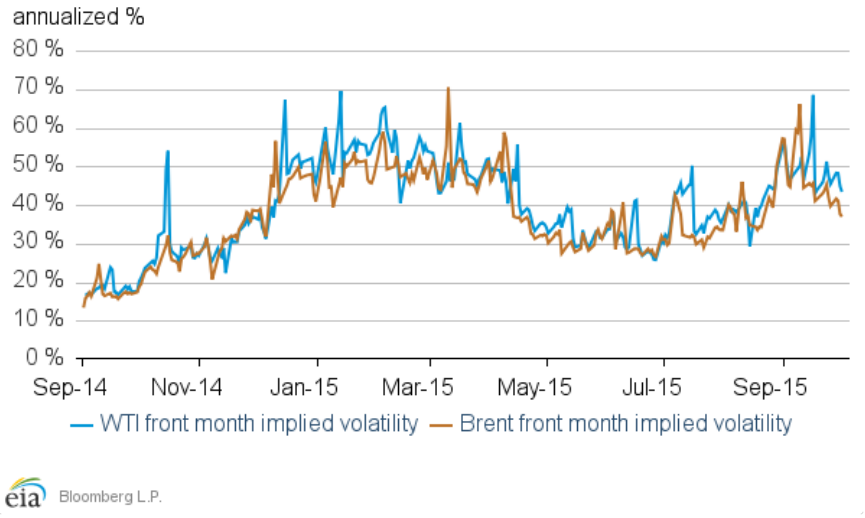
Brent and the copper-to-gold ratio: Lower expectations and higher uncertainty surrounding global economic growth were also apparent in other commodity markets, particularly metals. Demand for copper is closely associated with economic growth, especially in emerging market economies, while purchasing gold is often viewed as a hedge against general economic and market uncertainty. Taken together, the ratio of these two commodities can indicate market sentiment on global economic growth. The ratio of the front month futures price for copper to the front month futures price for gold declined from May to September **(Figure 5)**. While supply-side developments will remain important factors in crude oil price discovery, the health of the global economy and the pace of petroleum product demand growth may have an even larger effect on oil price movements.

Figure 5. Brent front month prices and Copper to Gold front month price ratio



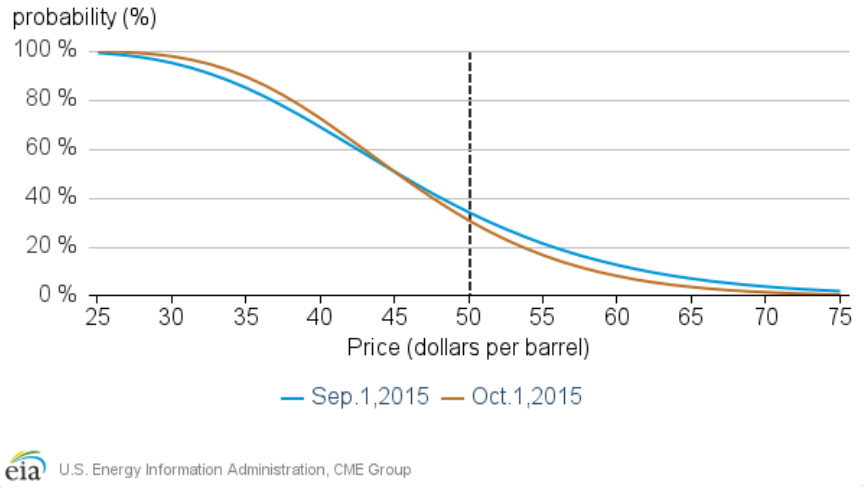
Volatility: Crude oil implied volatility remained elevated in September because of uncertainty on both the supply and demand sides of the market. The front month implied volatility for Brent and WTI futures contracts averaged 46.6% and 49.8%, respectively, in September, 7.2 and 8.9 percentage points, respectively, above August averages **(Figure 6)**.

Figure 6. Crude oil implied volatility



Market-Derived Probabilities: The January 2016 WTI futures contract averaged $46.09/b for the five trading days ending October 1 and has a 31% probability of exceeding $50/b at expiration. The same contract for the five trading days ending September 1 had a 34% probability of exceeding $50/b **(Figure 7)**. Because Brent prices are higher than WTI prices, the probability of Brent futures contracts expiring above the same dollar thresholds is higher.

Figure 7. Probability of the January 2016 WTI contract expiring above price levels



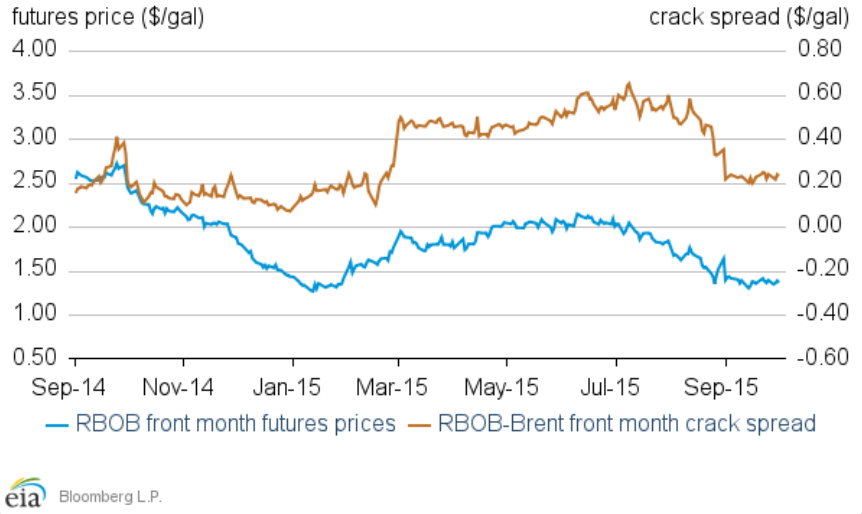
Petroleum Products

Gasoline prices: The reformulated blendstock for oxygenate blending (RBOB, the petroleum component of gasoline) front month futures price declined 3 cents per gallon (gal) from September 1 to October 1, settling at $1.37/gal **(Figure 8)**. The RBOB-Brent

crack spread increased slightly by 2 cents/gal over the same period and settled at 23 cents/gal.

Although gasoline consumption plus exports in September were 0.16 million b/d above the five-year range, and even as a series of unplanned refinery maintenance occurred in PADD 2 during the fall refinery maintenance period, gasoline inventories still built over the past month. Total U.S. motor gasoline inventories rose 8 million barrels from August to September, compared to an average 1 million barrel rise in the past five years. U.S. net production of finished motor gasoline set a new five-year high in September, and imports of total motor gasoline in September were the highest since September 2010. Gasoline supplies were able to meet robust demand, helping to stabilize gasoline prices.

Figure 8. Historical RBOB futures prices and crack spread

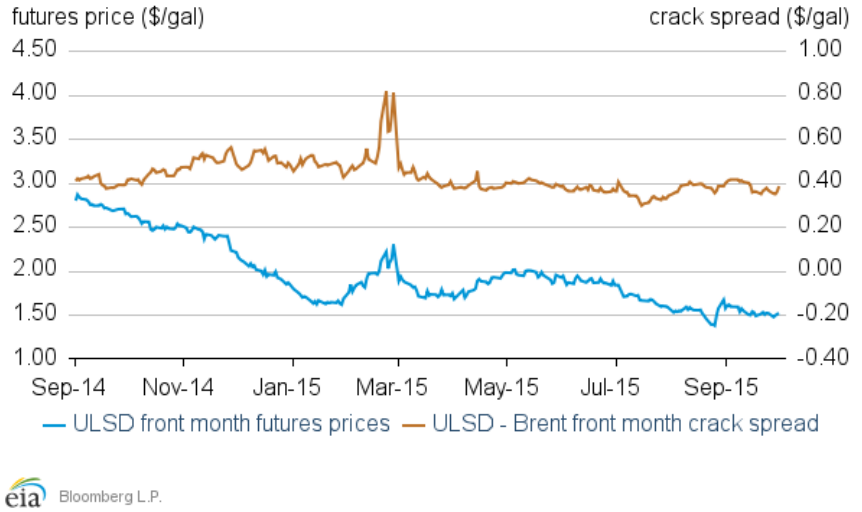


Ultra-Low Sulfur Diesel prices: The front month futures price for the New York Harbor Ultra-Low Sulfur Diesel (ULSD) contract decreased 6 cents/gal from September 1 to settle at $1.52/gal on October 1 **(Figure 9)**. The ULSD-Brent crack spread decreased slightly by 1 cent/gal over the same period to settle at 38 cents/gal.

Monthly data on U.S. distillate consumption show that consumption declined year-over-year in May and June while showing virtually no change in July, with weakness in manufacturing data possibly affecting distillate demand. During the May to July period, manufacturing indexes released by the Institute for Supply Management for the Chicago region and those released by the Dallas and Kansas City regional Federal Reserve Banks showed weak or contracting manufacturing sectors. Since then, other regional manufacturing indexes, including those released by the New York, Philadelphia, and Richmond Federal Reserve Banks, began to show declining activity as well, indicating that weakness in manufacturing may extend into the third quarter of 2015.

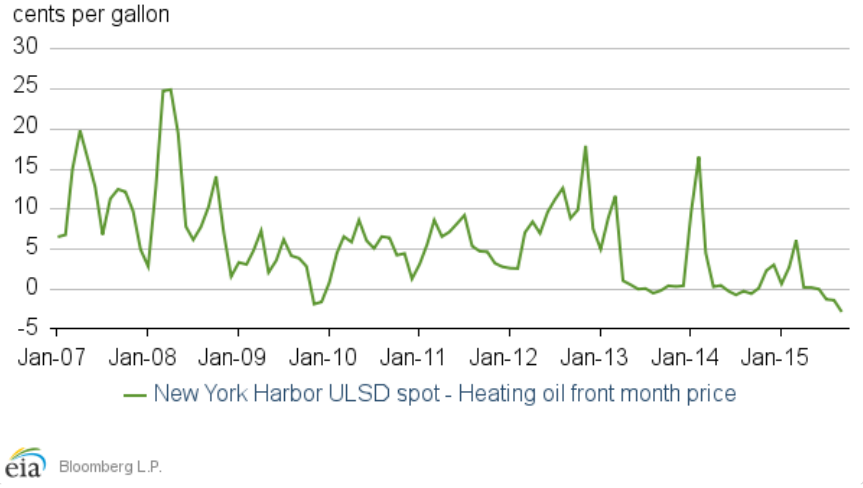
In addition, demand for U.S. distillate exports seems to have tapered off slightly in recent months. Monthly data shows that distillate exports in June and July were within the five-year range for the first time this year. This coincided with growing concerns about global growth and increasing distillate supply in the international market.

Figure 9. Historical ULSD futures price and crack spread



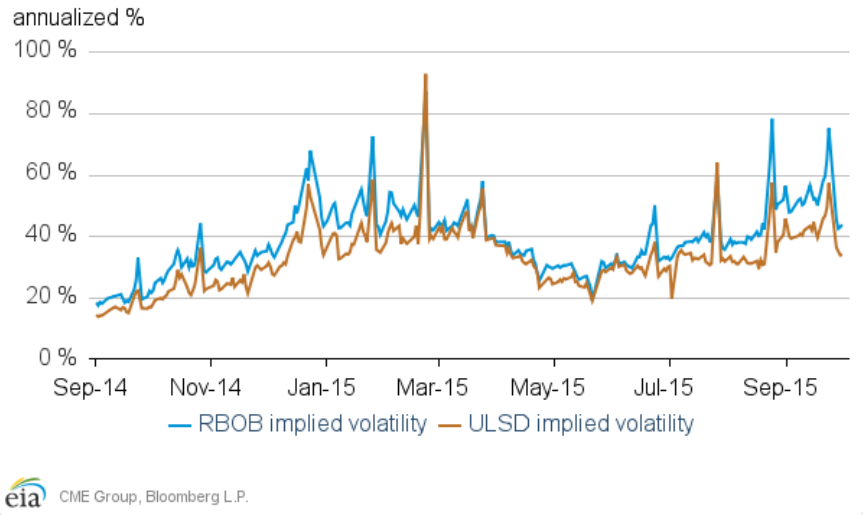
Price declines in the ULSD futures market also extended to the spot market. In September, the average spread between New York Harbor spot and front month futures prices for ULSD was -3 cents/gal **(Figure 10)**, the largest discount on record. In PADD 1B, distillate stocks rose consistently from February to September, reaching 36.2 million barrels as of September 25, 3 million barrels above the five-year range. Growing inventory levels in PADD 1B are putting downward pressure on ULSD spot prices and may indicate a lack of demand for distillate regionally before the traditional heating season begins.

Figure 10. New York Harbor ULSD spot - Heating oil front month price



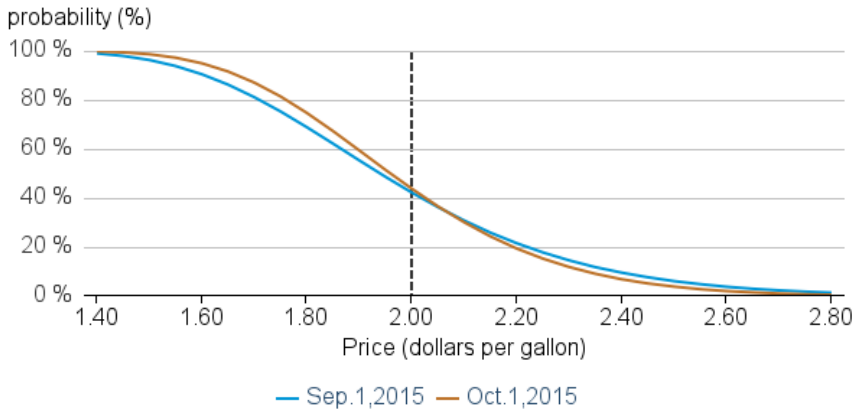
Volatility: Implied volatility for the RBOB and ULSD front month futures contracts rose along with the implied volatility of crude oil, before declining at the end of September to 43.8% and 34%, respectively, on October 1, 12.6 and 11.7 percentage points, respectively, below September 1 **(Figure 11)**. The average implied volatility for RBOB in September was at the highest level since April 2009.

Figure 11. RBOB and ULSD implied volatility



Market-Derived Probabilities: The January 2016 RBOB futures contract averaged $1.33/gal for the five trading days ending October 1 and has a 44% probability of exceeding $1.35/gal (typically leading to a retail price of $2.00/gal) at expiration. The same contract for the five trading days ending September 1 had a 42% probability of exceeding $1.35/gal **(Figure 12)**.

Figure 12. Probability of January 2016 retail gasoline exceeding different price levels at expiration



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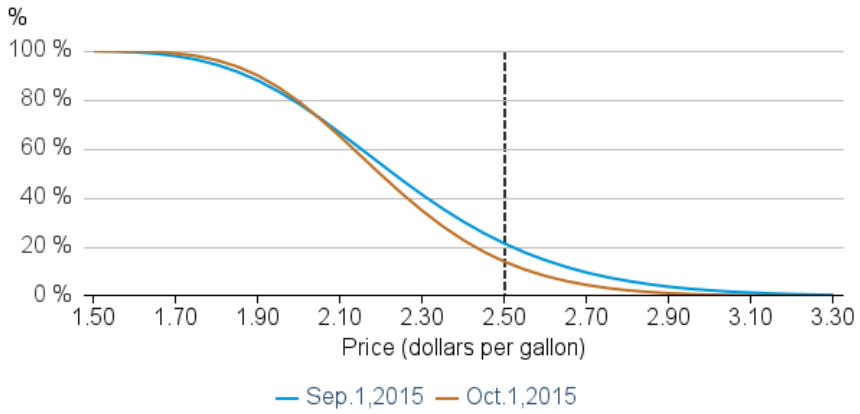
The January 2016 ULSD futures contract averaged $1.57/gal for the five trading days ending October 1 and has a 14% probability of exceeding $2.50/gal at expiration. The same contract for the five trading days ending September 1 had a 21% probability of exceeding $2.50/gal **(Figure 13)**.

Figure 13. Probability of the January 2016 ULSD contract exceeding different price levels at expiration



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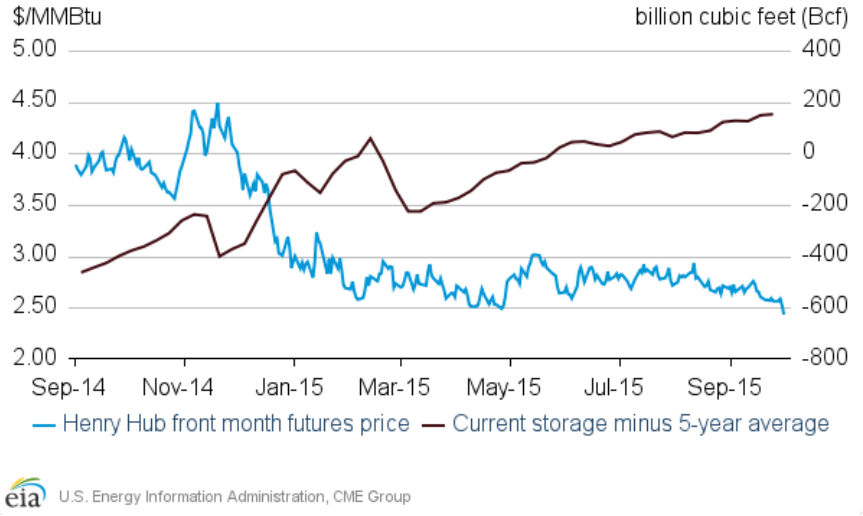
Natural Gas

Prices: The front month Henry Hub futures price declined 27 cents per million British thermal unit (MMBtu) since September 1, settling at $2.43/MMBtu on October 1 and marking the lowest price of the year **(Figure 14)**. Natural gas inventories remain above year-ago levels and continue to build at a faster pace than the five-year average. For the week ending September 25, U.S. natural gas working storage was 3.54 trillion cubic feet

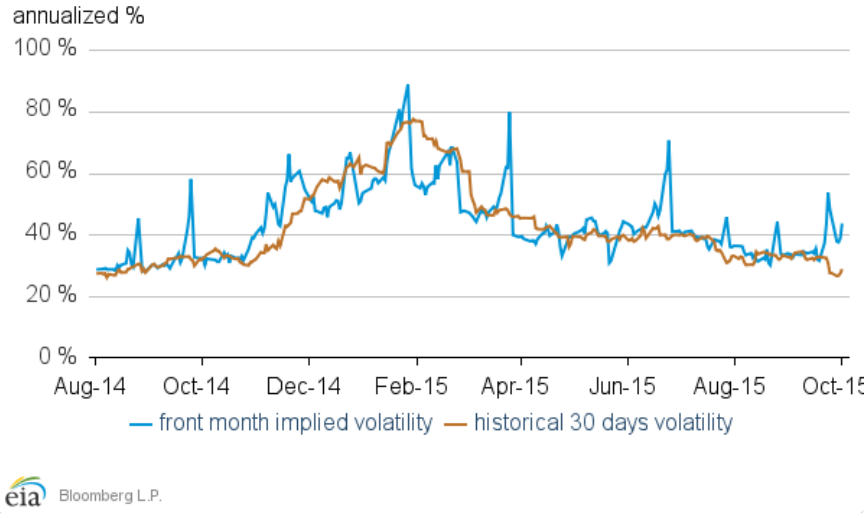
(Tcf), 152 billion cubic feet (Bcf) above the five-year average. Lower prices and higher inventory levels are likely encouraging additional natural gas consumption in the electricity sector, with Bentek Energy estimating a 15% increase in natural gas used for power generation in the United States compared to last year.

Figure 14. U.S. natural gas prices and storage



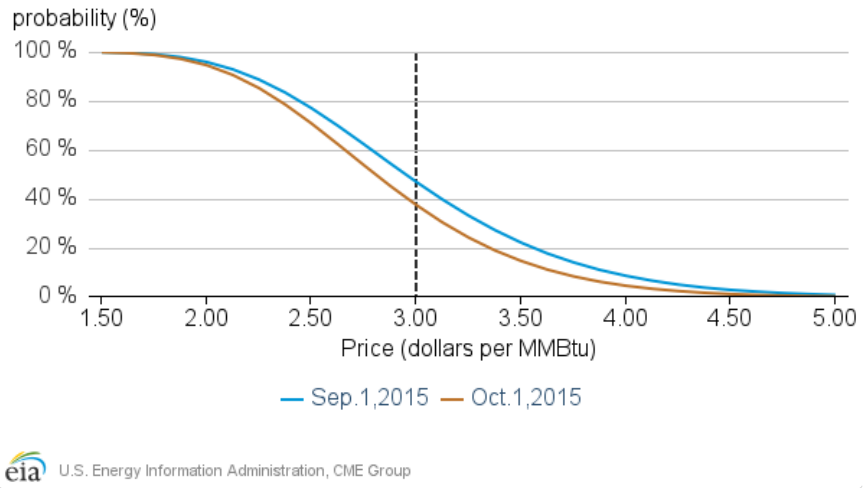
Volatility: The implied volatility for the front month Henry Hub futures contract rose 10 percentage points since September 1 to settle at 43.7% on October 1 **(Figure 15)**. Part of the reason for the increase was the front month contract rolling to November delivery, which marks the beginning of the winter heating season and the potential for higher price volatility. The historical 30-day volatility declined 4 percentage points to settle at 28.8%.

Figure 15. Natural gas historical and implied volatility



Market-Derived Probabilities: The January 2016 Henry Hub futures contract averaged $2.87/MMBtu for the five trading days ending October 1 and has a 38% probability of exceeding $3.00/MMBtu at expiration. The same contract for the five trading days ending September 1 had a 47% probability of exceeding $3.00/MMBtu **(Figure 16)**.

Figure 16. Probability of the January 2016 Henry Hub contract expiring above price levels



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