U.S. Energy Information Administration

August 2010

Short-Term Energy Outlook
Energy Price Volatility and Forecast Uncertainty[1]

August 10, 2010 Release

WTI crude oil spot prices averaged $76.32 per barrel in July 2010 or about $1 per barrel above the prior month's average, and close to the $77 per barrel projected in last month's *Outlook*. EIA projects WTI prices will average about $80 per barrel over the second half of this year and rise to $85 by the end of next year (West Texas Intermediate Crude Oil Price Chart).

Energy price forecasts are highly uncertain, as history has shown. WTI futures for October 2010 delivery for the 5-day period ending August 5 averaged $82 per barrel, and implied volatility averaged 30 percent. This made the lower and upper limits of the 95-percent confidence interval $67 and $100 per barrel, respectively.

Last year at this time, WTI for October 2009 delivery averaged $73 per barrel, and implied volatility averaged 46 percent, with the limits of the 95-percent confidence interval at $54 and $99 per barrel.

Prices and volatility started at opposite ends of the spectrum during July – the former starting low and ending higher, the latter starting high and ending lower (Figures 1 and 2).

WTI futures were under pressure early in the month following the Independence Day holiday, as market participants re-assessed the strength of crude oil and refined products demand. This followed reports of weak economic performance and concerns about the durability of the post-recession recovery globally.

[1] This is a regular monthly supplement to the EIA *Short-Term Energy Outlook.* (http://www.eia.doe.gov/emeu/steo/pub/contents.html)
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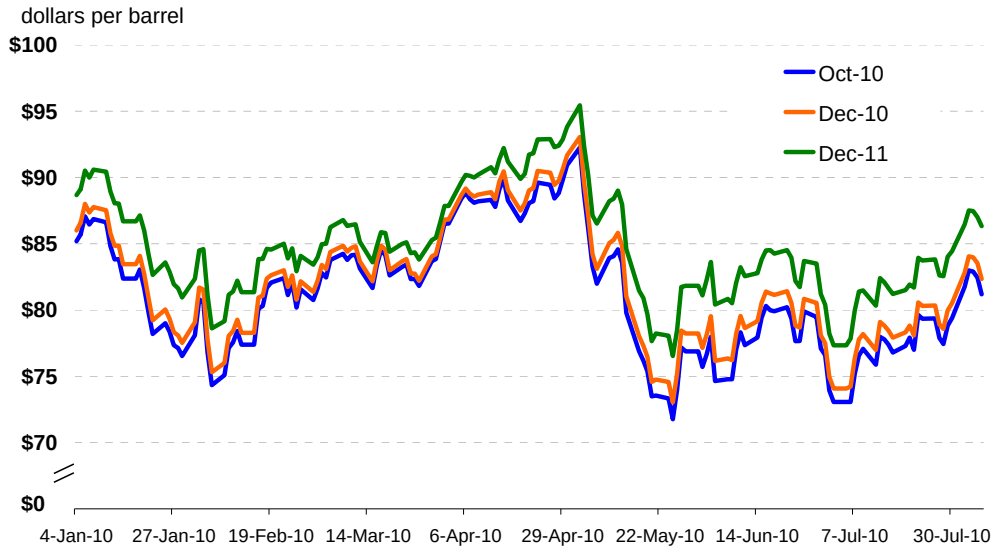
Figure 1: Evolution of WTI futures prices in 2010



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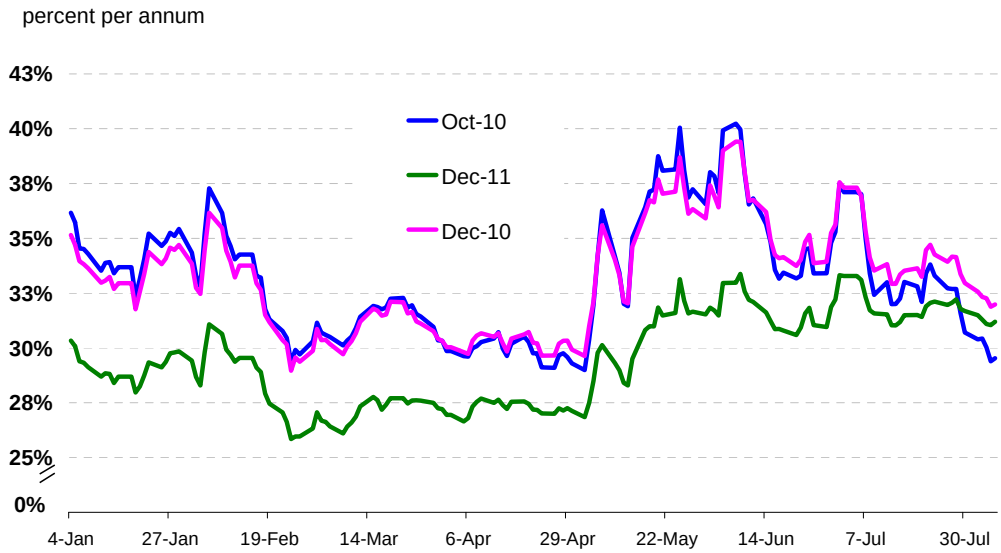
Source: U.S. EIA, CME Group

Figure 2: Evolution of WTI implied volatilities in 2010



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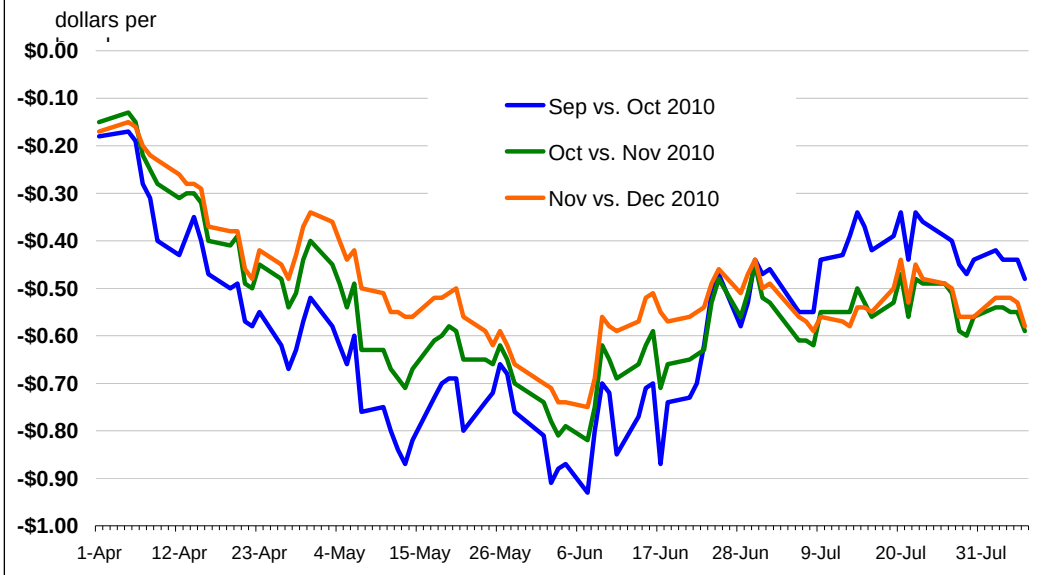
Source: U.S. EIA, CME Group

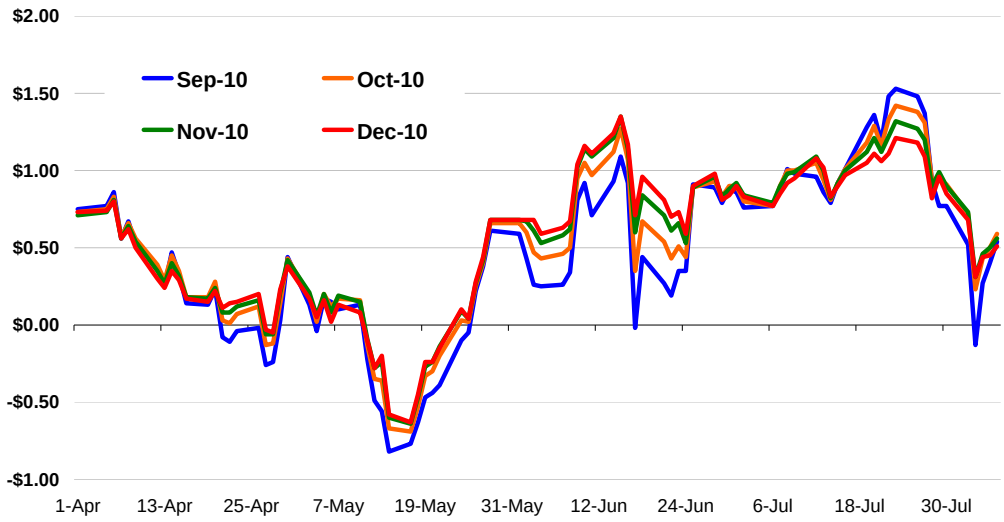
However, the narrowing of the spread between September and October WTI prices throughout the month (i.e., intermonth, or "timespreads") indicated refiners were drawing down crude oil in storage to meet current and expected refined product demand during the summer driving season (Figure 3). Analyst reports of U.S. oil demand approaching 20 million barrels per day, a post-recession high, and Chinese demand in June at approximately 9 million barrels per day were consistent with this view.

Figure 3: WTI prompt time-spreads



Strong WTI-Brent spreads, which reflect, in part, demand for WTI relative to other crudes priced off North Sea Brent, also indicated that refiner demand for light, sweet crude oil in the U.S. mid-continent was strong (Figure 4) relative to European demand during the month. Toward the end of the month, there was an apparent build in storage and imports that suggested to analysts refiners were taking precautions to move crude oil to inland storage ahead of possible hurricane activity. Additionally, analyst reports also suggested the firming of the WTI timespreads incentivized holders of floating storage to sell those barrels into the domestic on-shore market in the U.S. Gulf. Lastly, reports of production cuts in the North Sea Buzzard field toward month's end strengthened Brent prices, which narrowed WTI-Brent spreads.

Figure 4: WTI - Brent spreads



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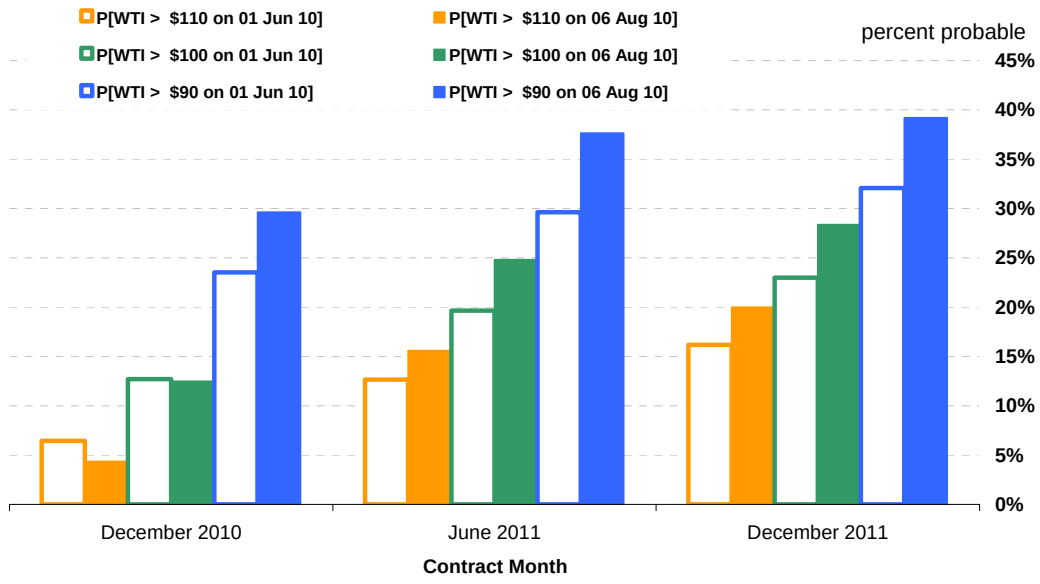
Source: U.S. EIA, CME Group

Market participants lowered slightly their expectation WTI prices will exceed $100 per barrel by December 2010, but have increased the chances of seeing this level breached by next summer (Figure 5). The probabilities in Figures 5 are cumulative normal densities derived from futures and options prices (see Appendix II of Energy Price Volatility and Forecast Uncertainty). They show the likelihood market participants attached to various price outcomes.

Figure 5: Probabilities for higher near-term WTI prices



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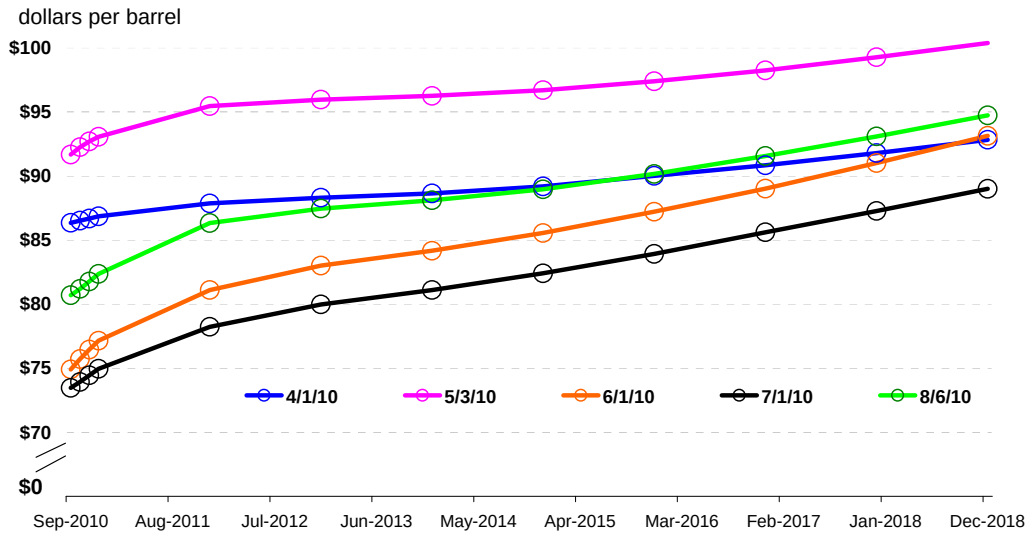
Source: U.S. EIA, CME Group

Price strength in July was not restricted to the front of the forward curve. Deferred WTI futures contracts rose, albeit at a slower rate than the front of the curve, during the course of July (Figure 6).

Figure 6: WTI futures term structure evolution

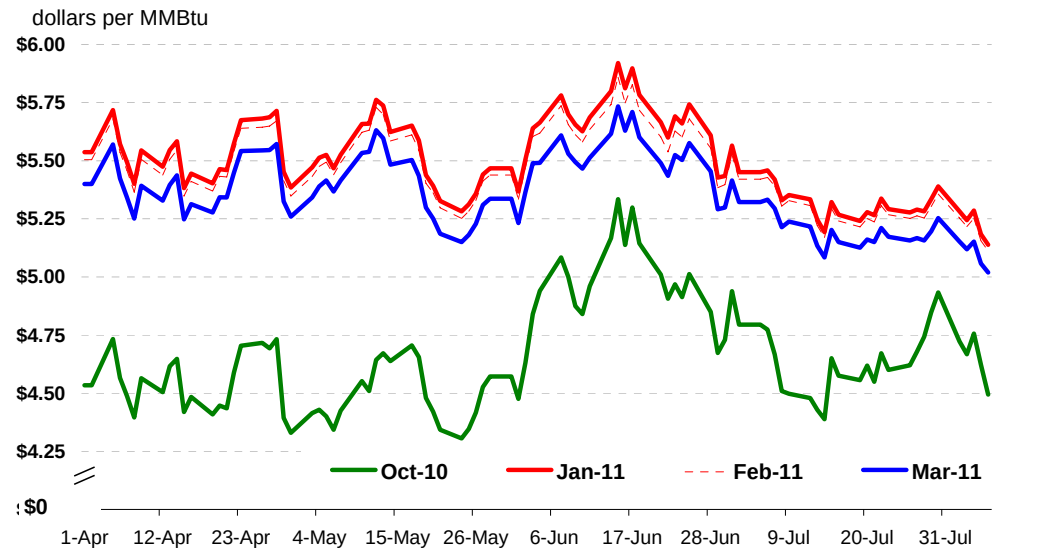


U.S. Natural Gas Prices. The Henry Hub spot price averaged $4.63 per MMBtu in July, $0.17 per MMBtu lower than the average spot price in June (Henry Hub Natural Gas Price Chart). The forecast price for the second half of 2010 averages $4.66 per MMBtu, about the same as last month's *Outlook*. A small decline in U.S. production and increased consumption are projected to lead to higher prices in 2011; the projected Henry Hub spot price averages $4.98 per MMBtu.

Uncertainty over future natural gas prices is lower this year compared with last year at this time. Natural gas futures for October 2010 delivery for the 5-day period ending August 5 averaged $4.74 per MMBtu, and the average implied volatility over the same period was 51 percent. This produced lower and upper bounds for the 95-percent confidence interval of $3.26 and $6.89 per MMBtu, respectively. At this time last year the natural gas October 2009 futures contract averaged $4.17 per MMBtu and implied volatility averaged almost 81 percent. The corresponding lower and upper limits of the 95-percent confidence interval were $2.33 and $7.44 per MMBtu.

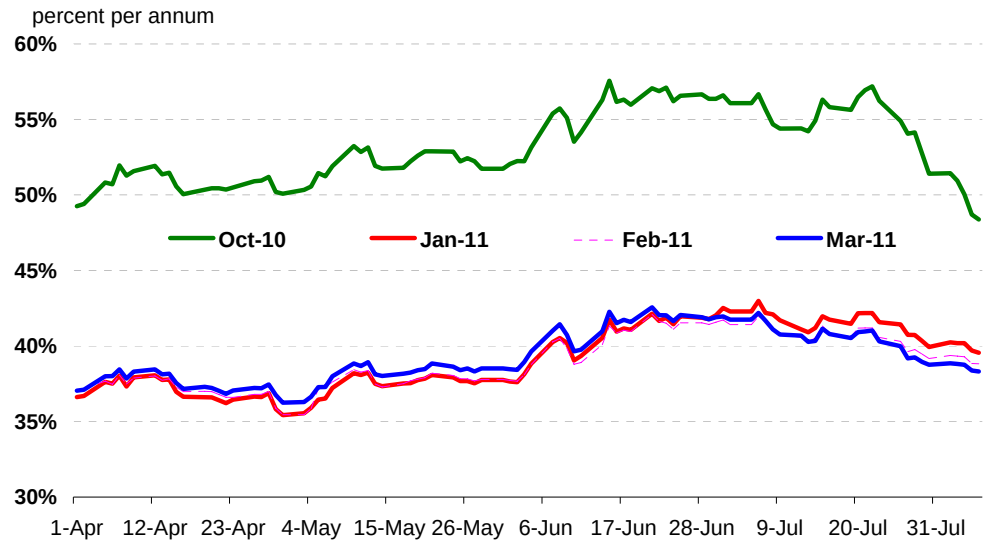
Natural gas prices moved higher in July, as storage injections and hurricane threats bolstered demand for prompt delivery. However, as August got underway, prices weakened (Figure 7).

Figure 7: NG price history: Oct 2010, 1Q2011 season

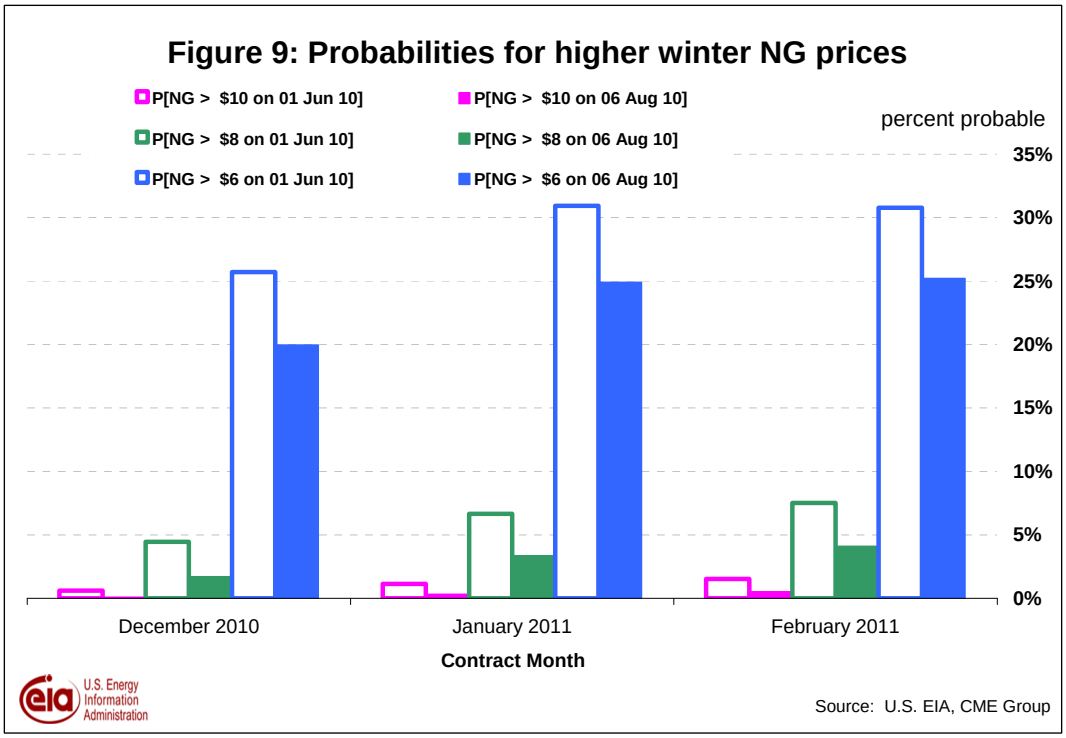


Implied volatility for options on October-delivery natural gas futures, which typically have the highest level of price uncertainty attached to them, fell over the course of July as prices rose (Figure 8). October marks the end of the gas injection season, which starts in April. This contract also prices during September, which is typically the peak month for hurricane activity. (Implied volatility measures market participants' expectations for the variability of prices during the delivery month. Technically, it is the expected standard deviation of percent changes in a particular contract's price between the time an option's price is observed and the time the option ceases trading).

Figure 8: NG implied volatility for Oct 2010, 1Q2011



As the injection season winds down, market participants are keeping the likelihood of prices exceeding $6 per MMBtu during the December – February period at roughly 1-in-4, or 25 percent (Figure 9).



As with the crude oil probabilities, the natural gas probabilities are cumulative normal densities (see Appendix II of Energy Price Volatility and Forecast Uncertainty). EIA uses market-based parameters derived from futures and options prices to calculate these densities.