



## *Short-Term Energy Outlook*

# Energy Price Volatility and Forecast Uncertainty<sup>1</sup>

November 9, 2010 Release

**Crude Oil Prices.** WTI crude oil spot prices averaged almost \$82 per barrel in October, about \$7 per barrel higher than the September average, as expectations of higher oil demand pushed up prices. EIA has raised the average fourth quarter 2010 WTI spot price forecast to about \$83 per barrel compared with \$79 per barrel in last month's *Outlook*. WTI spot prices rise to \$87 per barrel by the fourth quarter of next year. Projected WTI prices average \$79 per barrel in 2010 and \$85 per barrel in 2011.

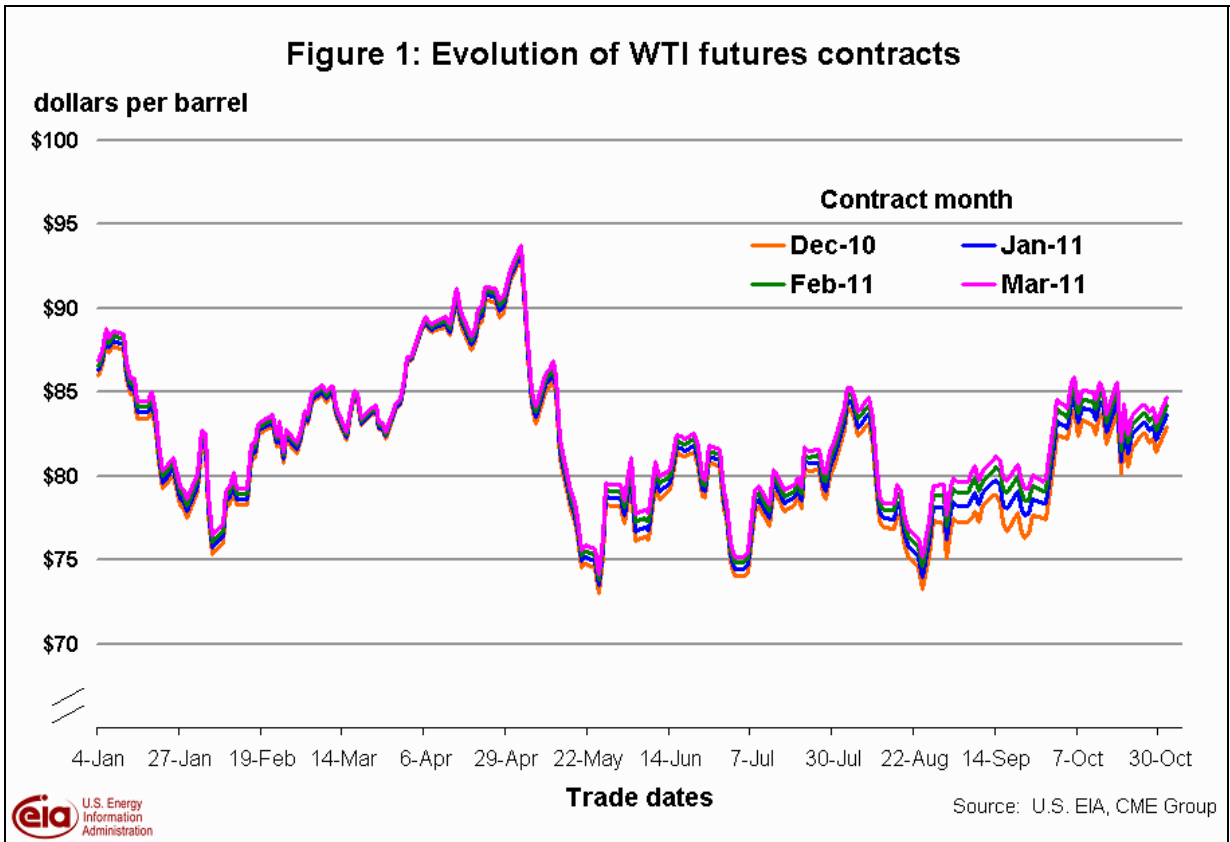
WTI futures for January 2011 delivery (for the 5-day period ending November 4) averaged \$85 per barrel, and implied volatility – a measure of price uncertainty – averaged 31 percent. This made the lower and upper limits of the 95-percent confidence interval for January 2011 contracts \$69 per barrel and \$103 per barrel, respectively, for WTI delivered in January 2011. Last year at this time, WTI for January 2010 delivery averaged \$80 per barrel and implied volatility averaged 41 percent, with the limits of the 95-percent confidence interval at \$61 per barrel and \$104 per barrel.

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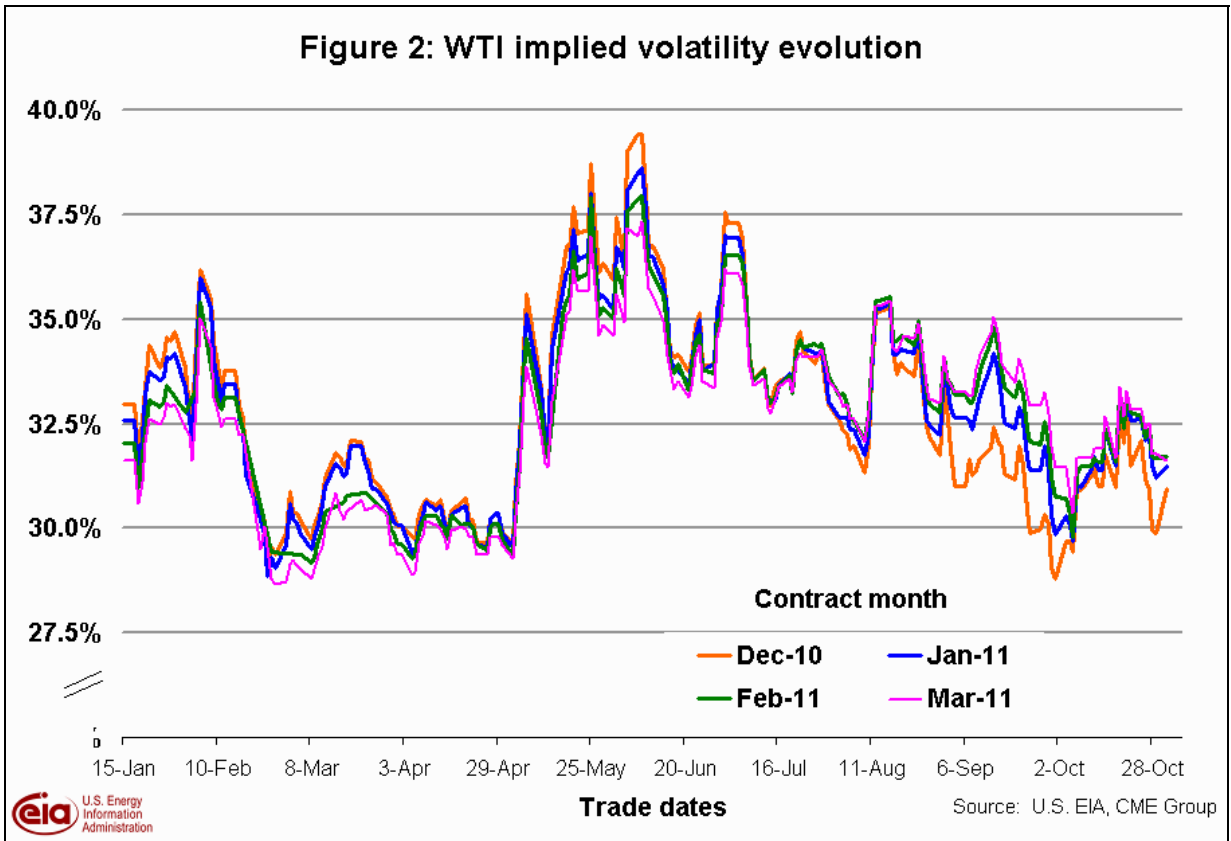
<sup>1</sup> This is a regular monthly supplement to the EIA *Short-Term Energy Outlook*.

(<http://www.eia.doe.gov/emeu/steo/pub/contents.html>)

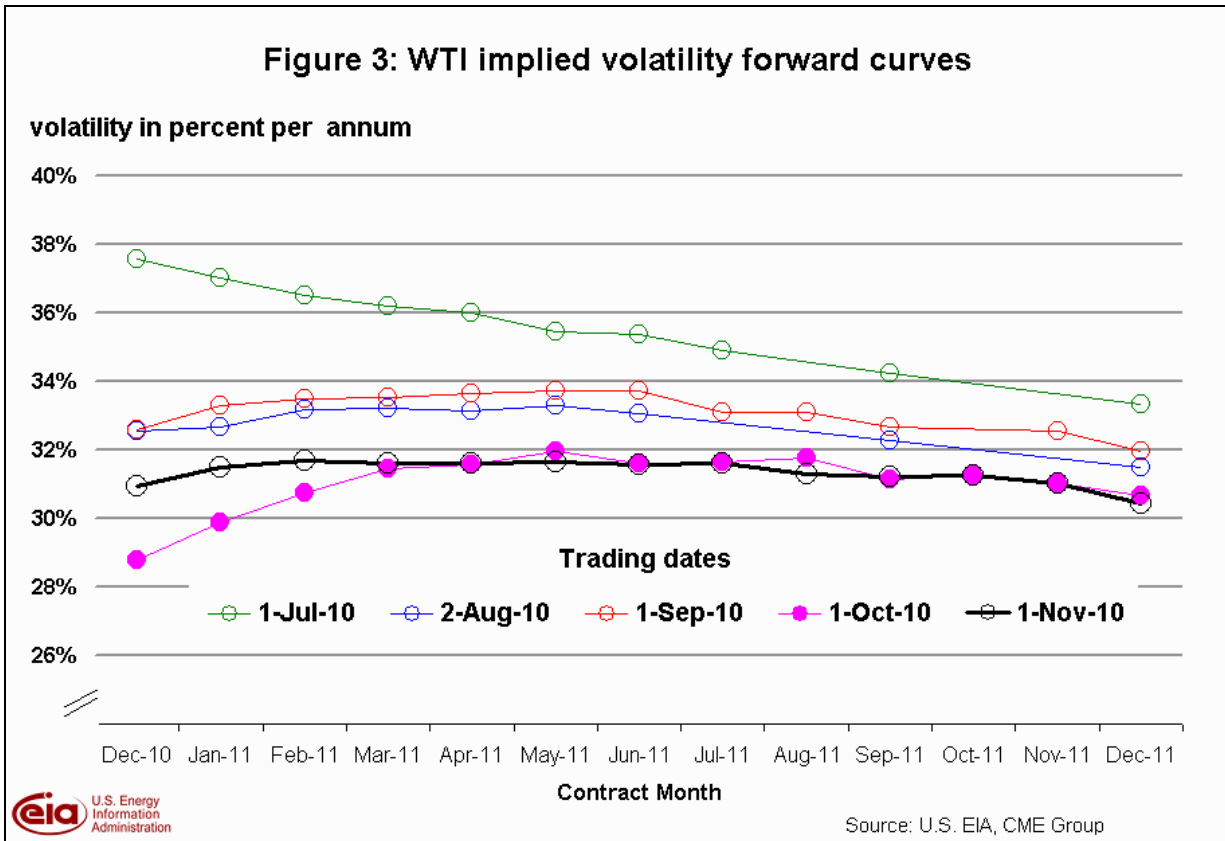
Contact: Bob Ryan (Robert.Ryan@eia.doe.gov)



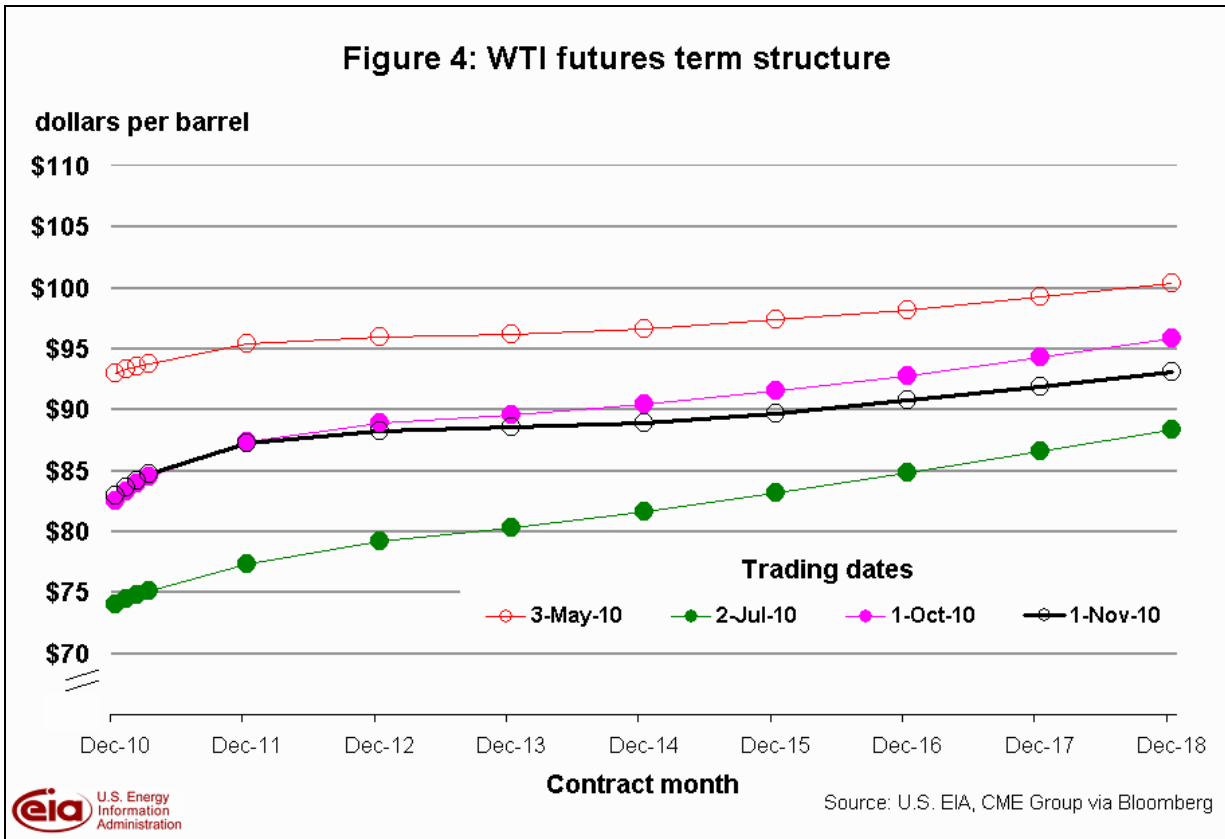
WTI implied volatility, which measures market participants' expectation of price variability in the future, initially followed prices higher at the beginning of October, but, as the month progressed, fell back to just above the 30-percent level in the front of the curve, as futures prices stayed range-bound (Figure 2).



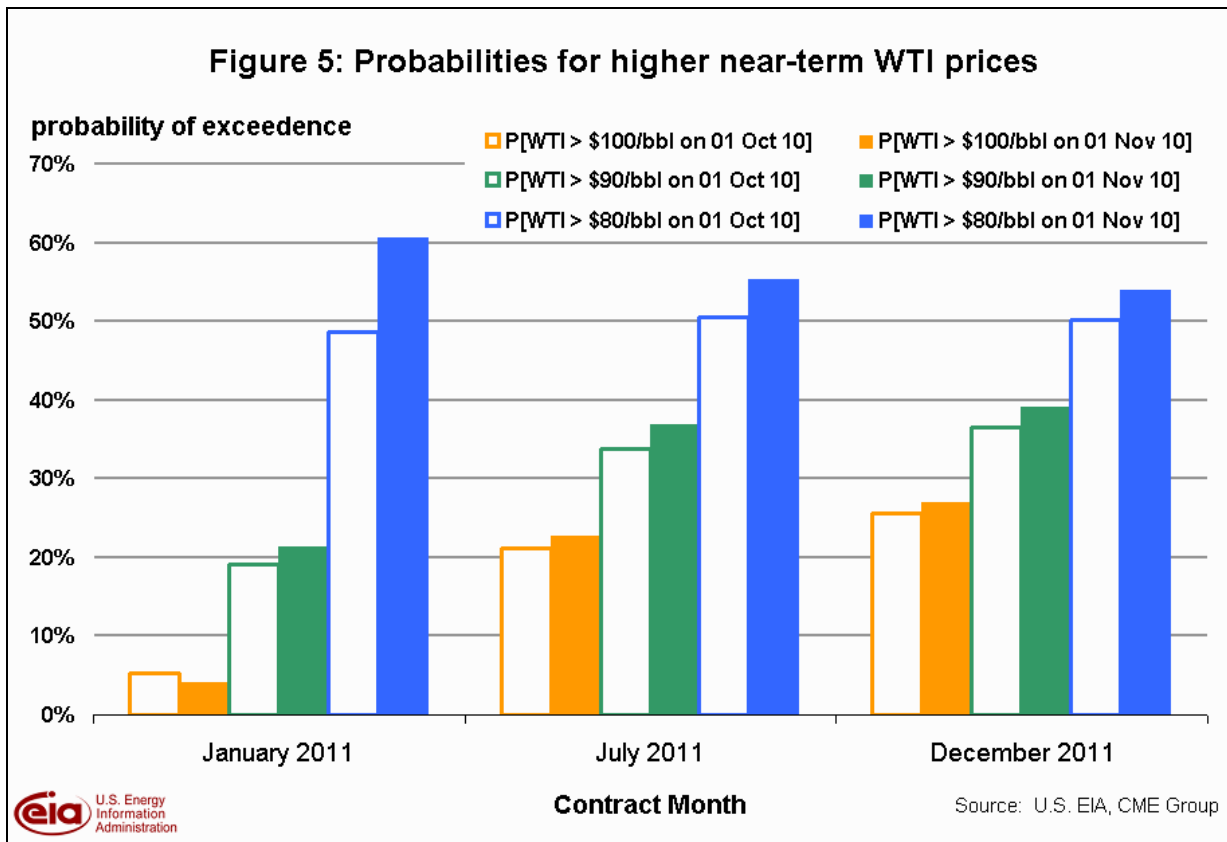
Across the forward volatility curve extending to December 2011, market participants raised their implied volatility estimates slightly in the front of the curve, and generally left them unchanged from April to December 2011 (Figure 3).



The WTI forward price curve through 2018 was slightly lower on November 1 than it had been on October 1 (Figure 4), following the large gains registered in September. During October market participants awaited the U.S. Federal Reserve’s much-anticipated Quantitative Easing 2 – the so-called QE2, and the outcome of mid-term elections on November 2.



Average volatilities over the five-day period ended November 1, 2010, were slightly higher than for the five-day period ended October 1; therefore EIA’s probability assessment for higher prices in 2011 increased slightly (Figure 5). Based on the implied volatilities, the likelihood that the NYMEX contract price for WTI will exceed \$100 per barrel next year rose to 23 percent and 27 percent, respectively, for delivery in July 2011 and December 2011. These probabilities are based on the cumulative normal densities derived from market expectations using futures and options prices. (See Appendices I and II of EIA’s October 2009 [Energy Price Volatility and Forecast Uncertainty](#) article for discussion of how these probabilities are derived.)

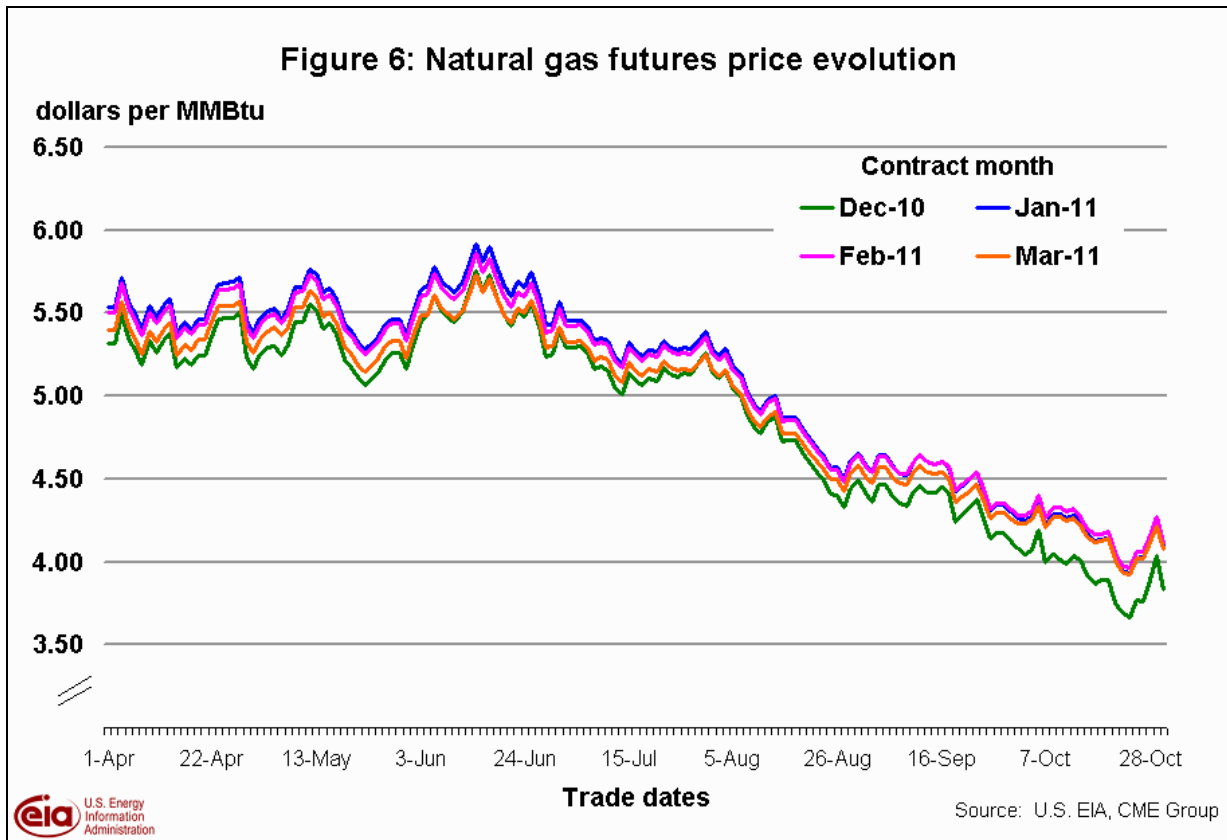


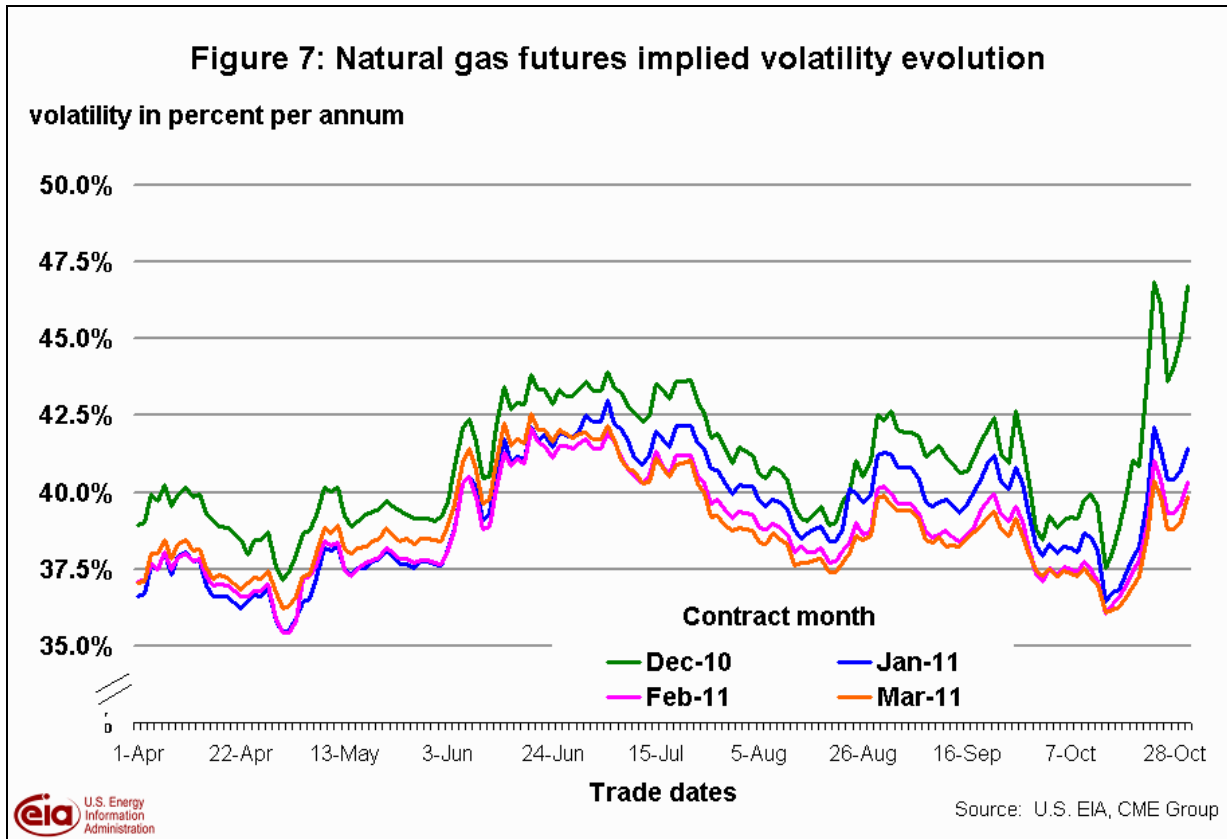
**U.S. Natural Gas Prices.** The Henry Hub spot price averaged \$3.45 per million Btu (MMBtu) in October, \$0.43 per MMBtu lower than the average spot price in September. The decline in prices over the past two months was partly the result of high production, mild weather, and the absence of significant hurricane activity in the Gulf of Mexico, all of which contributed to the large inventory build. Projected Henry Hub prices rise to \$4.22 per MMBtu in January 2011 because of the increase in winter space-heating demand. EIA has lowered the average 2011 Henry Hub price forecast from last month's *Outlook* by \$0.27 per MMBtu, to \$4.31 per MMBtu, based on the upward revisions in the domestic production and inventory forecasts.

Uncertainty over future natural gas prices is slightly higher this year compared with last year at this time. Natural gas futures for January 2011 delivery (for the 5-day period ending November 4) averaged \$4.13 per MMBtu, and the average implied volatility over the same period was 41 percent. This produced lower and upper bounds for the 95-percent confidence interval for January 2011 contracts of \$3.06 per MMBtu and \$5.59 per MMBtu, respectively. At this time last year, the natural gas January 2010 futures contract averaged \$5.20 per MMBtu and implied volatility

averaged 35 percent. The corresponding lower and upper limits of the 95-percent confidence interval were \$3.52 per MMBtu and \$7.67 per MMBtu.

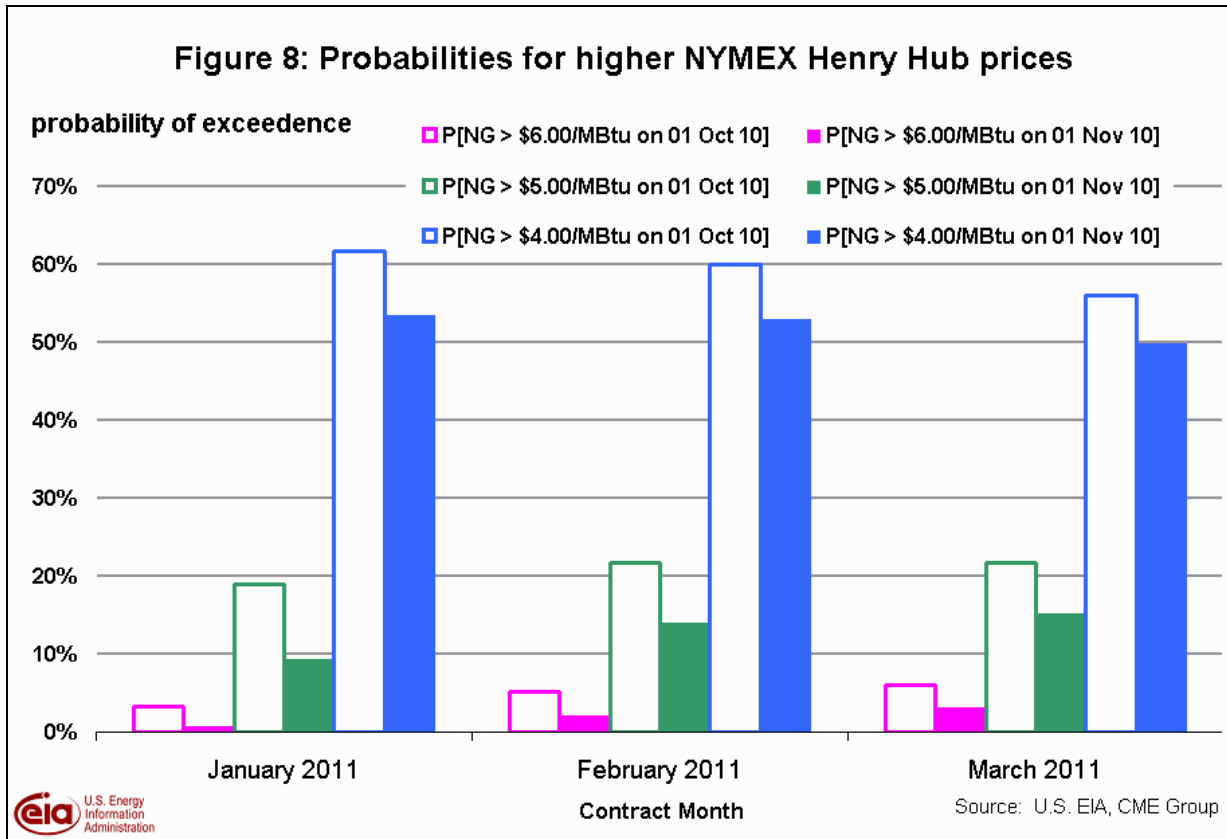
Natural gas futures prices declined below \$4 per MMBtu in mid-October (Figure 6), which was accompanied by a spike in the options' implied volatility (Figure 7).





The effect of sharply lower prices during October dominated higher implied volatilities leading to reduced probabilities that prices would exceed specified threshold values during the first quarter of next year (Figure 8). By November 1, natural gas market participants were expecting a less-than-15-percent chance wholesale prices at Henry Hub would exceed \$5 per MMBtu each month during the first quarter of 2011, compared with a greater than one-in-five chance (more than 20 percent) at the beginning of October.





These natural gas probabilities are cumulative normal densities, which are generated using market-based inputs provided by futures and options markets – i.e., futures prices and implied volatilities. (See Appendices I and II of EIA’s October 2009 [Energy Price Volatility and Forecast Uncertainty](#) article for additional discussion).