NGVAMERICA
Natural Gas Vehicles for America

Oil Price Volatility and the Continuing Case for Natural Gas as a Transportation Fuel

The recent decline in world crude oil prices is bringing new attention to the factors that drive the price and stability of transportation fuels. This paper provides a historical and forward-looking perspective on oil prices, as well as those for gasoline, diesel and natural gas fuels. It also discusses the variety of factors that drive the market price for these fuels. In doing so, the research examines several key questions:

- What is causing the decline in oil and petroleum prices?
- Why have oil prices declined and where is the price of oil headed over the next 12 months and in the long-term?
- Will diesel prices fall further, and are factors other than crude oil prices influencing its price?
- What is the long-term outlook for the price of all transportation fuels?
- Why do the strong economic advantages of natural gas remain solid over the long-term?
- What are the public policy issues that could benefit natural gas as a transportation fuel?

Our analysis reveals a compelling case for the continued transition to natural gas-powered vehicles (NGVs), especially among commercial and government fleets for whom transportation costs represent a significant portion of their budgets. The long-term stability and low prices for natural gas relative to oil are likely to remain for many years – perhaps even decades, based on well-documented economic models.

Volatility and short-term declines in crude oil and related gasoline and diesel prices mask the underlying long-term oil supply-demand imbalance. Ignoring this reality and deferring investment in NGVs only delays the economic benefits and long-term fuel price stability that only natural gas can deliver as a transportation fuel.

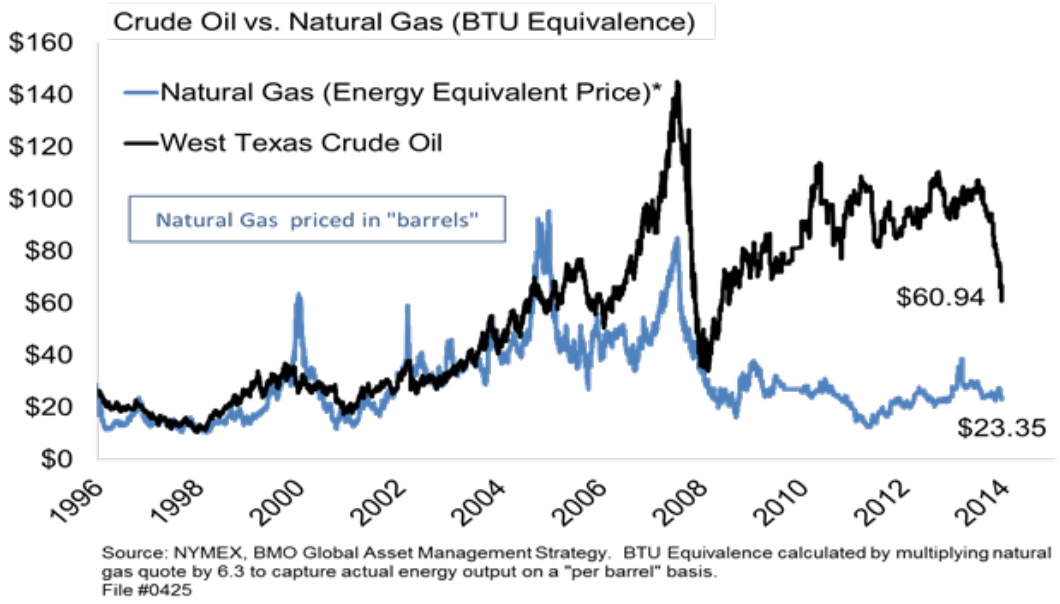
Background

The recent upheaval in international oil markets has led to a steep decline in trading prices, as reflected in the benchmark West Texas Intermediate (WTI) and Brent oil price

indices. In January of 2014, WTI closed as high as $98 a barrel but now is trading at less than $50 a barrel. 2014 oil prices peaked in June at $101 (WTI) and $111 (Brent).

As a consequence of the change in oil price, gasoline and diesel fuel prices have experienced steep declines as well. At their high points in 2014, the national average price for gasoline was $3.75 (April) and for diesel was $4.01 (March). As of January 5, 2015, average prices for gasoline and diesel had dropped to $2.21 and $3.13, respectively.

The chart below shows the change in price per barrel of oil compared to the barrel price equivalent for natural gas in recent years. Most noticeable is the period in late 2008 where prices "decoupled" as U.S. shale gas exploration significantly increased and massive natural gas reserves became recoverable. It is also important to note that even with the steep decline in oil prices, a significant barrel equivalent price advantage still exits for natural gas.



Why have oil prices declined and where is the price of oil headed over the next 12 months and in the long-term?

Currently, world-oil supply is outpacing world-demand for a number of reasons, many of which are well-known and include the significant U.S. production increases associated with hydraulic fracturing. Oil supplies began to overtake demand sometime around Q1 of 2012 and have remained firmly above demand since late 2013, largely

because of economic stagnation in Europe and economic slowing in China. Demand for oil is still increasing but not as fast as was once forecasted. In short, when demand does not keep up with growing supply, prices decline.

Supply has reached historic levels, in part, spurred by recent $100 oil prices and the use of hydraulic fracturing to tap oil resources that were previously uneconomical to recover. In the past, large oil producing countries would cut back on supplies to offset declines in demand, but the Organization of Petroleum Export Countries (OPEC) has been unwilling or unable to limit production by its members. Furthermore, much of the recent growth in supply is outside of OPEC's control.

There are also a variety of geopolitical factors that some analysts believe are influencing the price of oil (e.g., some believe the Saudi's are trying to drive smaller oil producing countries and U.S. shale producers with higher costs out of the market). This analysis will leave those matters aside except to agree that world events and concerns over the stability of some oil producing countries will always play a key role in the volatility of oil supplies and pricing.

Over the long-term, oil demand is likely to increase as economic growth returns to more normal levels and economic activity picks up. As has been the case in recent years, the developing countries led by China and India will likely lead the way in driving oil demand. The developed countries, including the U.S., are not expected to experience much growth in overall levels of petroleum use.

Boom and bust in the oil industry is nothing new. In fact, since 2009, the oil markets have been fairly volatile. While it may not be possible to predict where prices will settle in the short-term, some analysts believe that the current levels could put a temporary halt on new production as producers find it difficult to justify going after new supplies with oil below $60 a barrel. There is also the likelihood that today's prices and reduced revenues will lead to consolidation in the oil industry, which could further drive down future production.

According to the International Energy Agency (IEA) and the U.S. Energy Information Administration (EIA), oil markets may turn the corner sometime in late 2015, as that is when these agencies are predicting that oil demand and supply will cross back over. These agencies also are forecasting 2015 prices in the mid- to high-$50 per barrel range. The most recent Short-Term Outlook from EIA (January 2015 SEO) pegs the

price of Brent oil at an average of $58 a barrel in 2015. That level reflects averages as low as $ $49 a barrel and a high of $67 a barrel in the latter part of the year. The WTI price of oil is expected to average $3 less than Brent for a 2015 average of $55 a barrel. For 2016, EIA's January SEO forecasts average prices of $75 per barrel for Brent oil and $71 for WTI oil.

Will diesel prices fall further and are factors other than crude oil prices influencing its price?

While it is difficult to predict when diesel fuel prices will reach bottom, there are unique factors that have contributed to its slower decline in cost at the pump as compared to gasoline. For starters, demand for diesel fuel in the rest of the world is high and is increasingly drawing supplies away from the U.S. market. The current export restrictions in place on crude oil do not extend to finished products. Thus, about one million barrels per day of U.S. diesel fuel is exported abroad where it fetches higher prices. Higher refining, marketing and distribution costs are also an issue with diesel. These factors are heavily influenced given that the diesel market in the U.S. is much smaller than the gasoline market.

Another important issue is the current number of U.S. refineries. In the U.S., virtually no new refineries have been built for several years and the number of operable refineries has dropped from 150 to 142 between 2009 and 2014. Moreover, refineries have several potential markets for diesel fuel other than transportation uses, since it can be used for home heating, industrial purposes and as boiler fuel. The lead up to winter has increased home heating fuel demand, particularly in the northeast, which has likely also contributed to a slower decline in diesel prices.

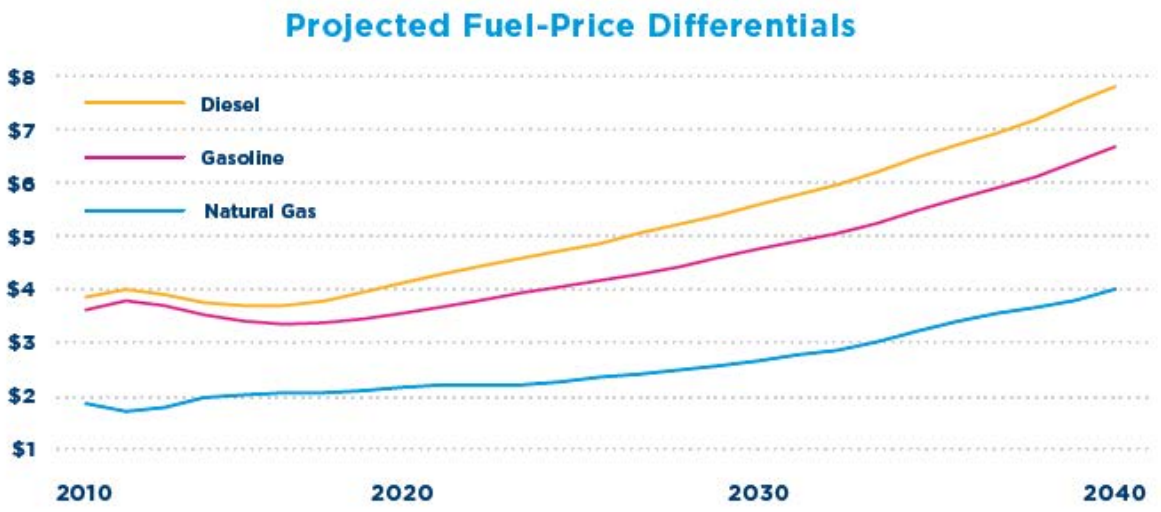
Looking toward the future, it is also expected that the market for diesel fuel will see new pressures that could lead to higher prices. These changes include increasing demand in the U.S. for diesel fuel in light-duty vehicles and, in the marine sector, a shift away from bunker fuel to ultra-low sulfur diesel (and potentially LNG). EIA also continues to forecast growing energy demand in the U.S. freight transportation sector, where diesel fuel is most widely used.

On a Btu basis, natural gas holds a strong price advantage over oil. Until the recent drop in crude oil, which most analysts agree will rebound when the current supply-demand imbalance returns to more "normal" levels, average retail natural gas fuel prices have

been 35 to 50 percent less than gasoline and diesel prices. This advantage that is expected to return and remain stable due to our nation's abundant supply of natural gas. Even with the current slump in oil prices, current average CNG prices are still $0.75 to $1 lower than diesel.

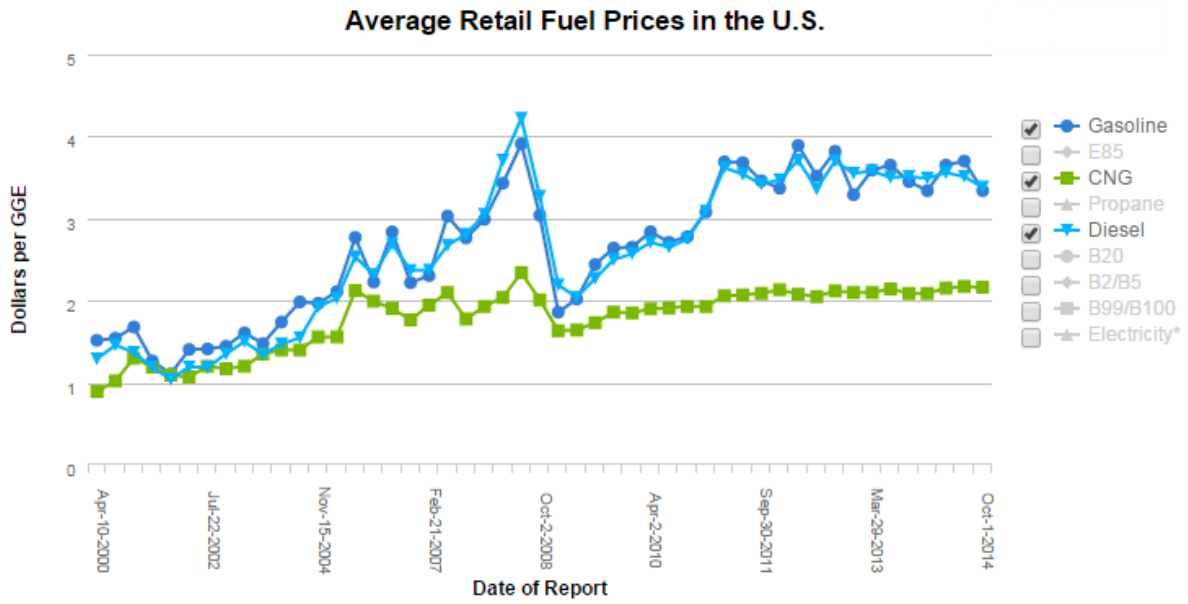
What is the long-term outlook for the price of all transportation fuels?

EIA's Annual Energy Outlook (AEO) is a widely accepted source for long-term transportation fuel price information. For many years, the AEO has shown natural gas transportation fuel prices well below those forecasted for gasoline and diesel fuel. The AEO 2014 table below shows that natural gas prices are expected to remain relatively low and stable, while other fuels that already begin at higher prices, continue to trend upward.



Source: U.S. Energy Information Administration (2014)

Similarly, historical data collected by the U.S. Department of Energy's Clean Cities Program, shown below, clearly demonstrate that natural gas transportation fuel prices have been competitive with gasoline and diesel, and have become even more competitive since the "de-coupling" of oil and natural gas commodity prices in late 2008. Natural gas pricing also has been more stable, which is attractive to fleet operators who budget over the long-term and make conversion decisions based on both the economics and consistency of fuel prices.



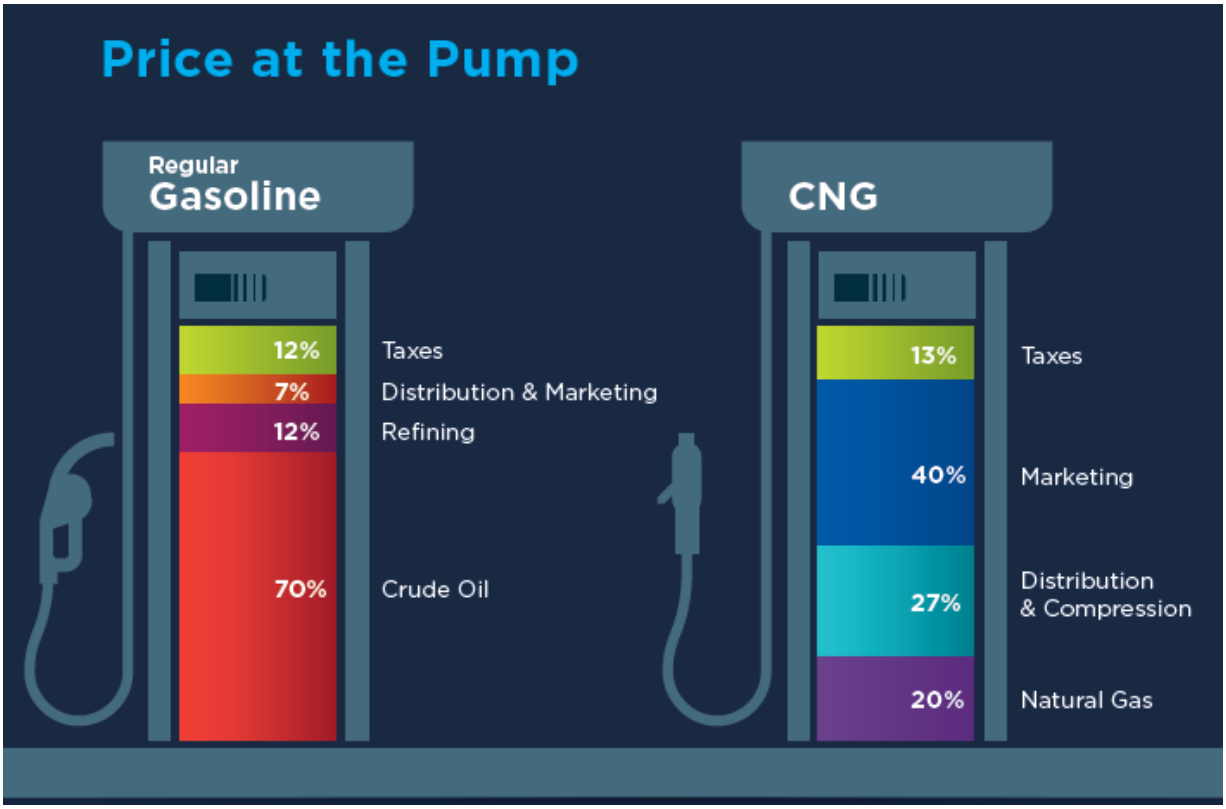
Consumers, businesses, fleets and governments who have yet to make the switch to natural gas, but are enjoying today's lower petroleum prices, should consider that switching to natural gas will allow them to enjoy comparable prices with significantly more stability over the long run.

Why do the strong economic advantages of natural gas remain solid over the long-term?

Analysts continue to be bullish on the ability of the U.S. to develop and deliver economically priced natural gas for decades to come. Natural gas wellhead prices have been relatively stable since about 2009, and forecasted prices have natural gas at about $2 per diesel gallon equivalent through at least 2025. That stability and price outlook demonstrates the clear economic advantage of natural gas and should give confidence to fleets and governments that are making long-term transportation decisions in a period of fickle oil markets.

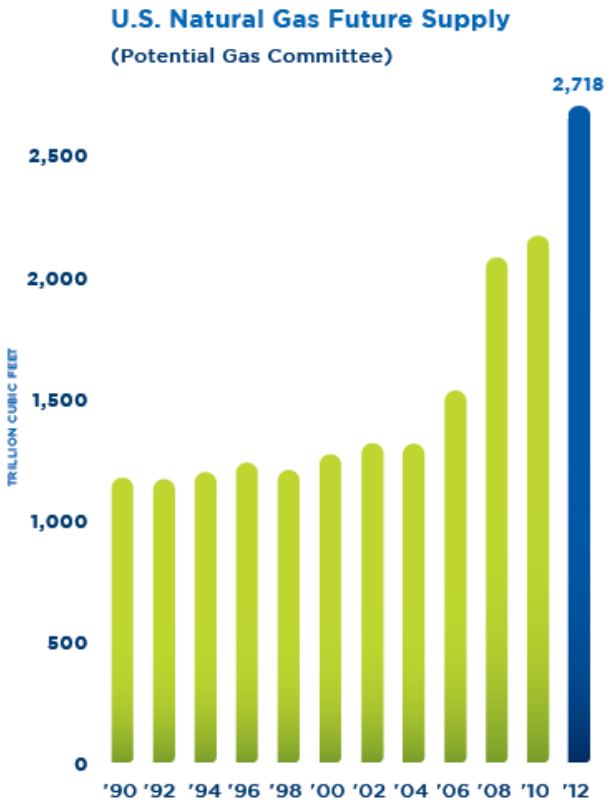
Another key factor in assessing the long-term stability of transportation fuel prices is the cost of the commodity as a portion of its price at the pump. Market volatility and commodity price increases have a much larger impact on the economics of gasoline and diesel fuel prices than they do for natural gas. As shown below, as much as 70 percent of the cost of gasoline and 60 percent of diesel fuel is directly attributable to the commodity cost of oil, while only 20 percent of the cost of CNG is part of the commodity

cost of natural gas. This is key in understanding the volatile price swings of petroleum-based fuels compared to the stability of natural gas.



Proven, abundant and growing domestic reserves of natural gas are another influence on the long-term stability of natural gas prices. The recent estimates provided by the independent and non-partisan Colorado School of Mines' Potential Gas Committee have included substantial increases to domestic reserves. The U.S. is now the number one producer of natural gas in the world.

Finally, even with today's lower oil prices, natural gas as a commodity is one-third (3:1) the cost of oil per million Btu of energy supplied. More recently, the price of oil has exceeded natural gas by a factor of 4:1 and as much as 8:1 when oil was $140 a barrel and natural gas was trading at $3 per million Btu. Perhaps most relevant is that the fluctuations in these comparisons have been almost totally based on the volatility of oil prices. As the earlier tables clearly demonstrate, natural gas pricing has been relatively consistent and stable and is projected to be for decades to come.



Policy Factors to Consider

Environmental regulations have increasingly influenced product offerings from U.S. vehicle and engine manufactures to require more complex controls to reduce gasoline and diesel emissions. Some regulations, such as new lower-sulfur limits on gasoline, have yet to take effect and therefore have not yet affected refineries. In the future, these regulations will affect refineries and increase the price of gasoline and diesel. In some cases, these policies have helped promote the superior emissions benefits of natural gas.

Federal policy and, more recently, state policies have also influenced the market for alternative fuels by providing incentives and removing economic barriers. Many states now provide tax incentives to assist fleets in purchasing natural gas vehicles and also to encourage the development of fueling stations. Numerous states also provide lower fuel tax rates to encourage increased use. Given the desire to encourage the use of alternative fuels, many of these policies likely will continue to remain in place and in some cases expand in the near-term.

The Congress may also extend various incentives or enact new policies to address inequities that would encourage more natural gas fuel use in vehicles. It is possible that legislation to help alternative fuels could be part of the highway excise tax reauthorization next year or part of a major rewrite of the tax code if that occurs. While it is too soon to assess how the new Congress will address issues that are important to the industry, there are strong advocates for fuel diversity and those who clearly view natural gas as the backbone of greater energy security.

Conclusion

- History shows that the recent decline in world crude oil prices and related gasoline and diesel prices are likely to be short-lived. Oil prices will increase as the world economy rebounds.

- Diesel fuel is influenced by a variety of other factors that will likely keep upward pressure on prices over the long run.

- On a Btu basis, natural gas still has a 3:1 price advantage over oil. At the pump, average CNG prices are currently $0.75 to $1 lower than diesel.

- The long-term stability and low prices for natural gas relative to oil are likely to remain for many years – perhaps even decades – based on well-documented economic models.

- The long-term nature of fleet asset management suggests that it is prudent to continue to invest in transportation fuel portfolio diversification by transitioning more vehicles to natural gas. Fleets that have already made the investment in vehicles and infrastructure will continue to benefit from the stability of natural gas prices and their continuing economic advantage.

- State and federal policymakers are likely to continue to promote fuel diversity and policies that encourage use of natural gas as a transportation fuel on the road to energy security.