

United States Oil and Gas Markets: A Scenario for Future Strong Inter-fuel Competition

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Energy markets are going through a period of unprecedented volatility which has its roots as far back as 1997 following the Asia financial crisis. This volatility has been characteristic of both world oil and North American natural gas markets, but is the product of different set of forces for the two markets. Oil has been driven by OPEC discipline, rising demand and fears of supply disruption. Natural gas prices have been driven by rising demand in North America and stable to declining regional production levels.

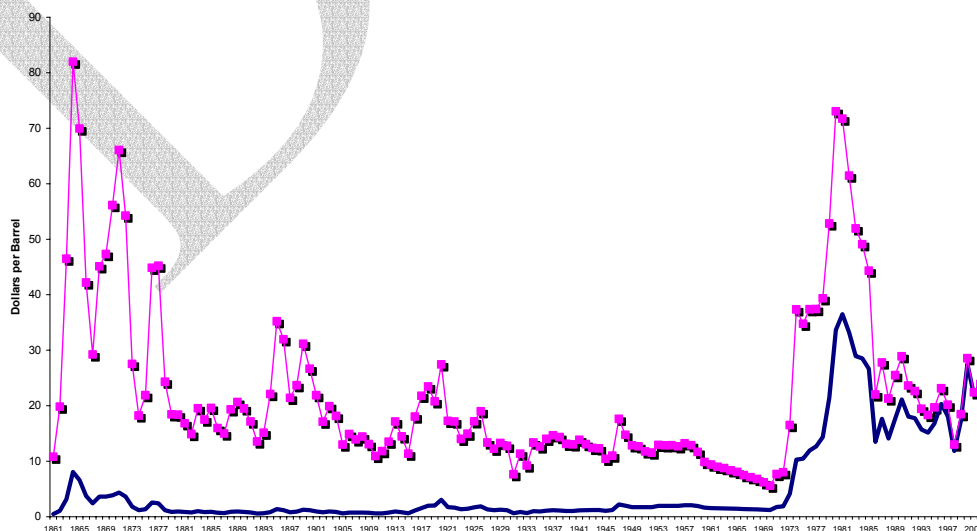
Despite the greater degree of volatility, both the world oil and the North American gas markets appear set to remain at a higher price playing field for the next several years. While oil prices are likely to recede from the recent very high levels experienced in the first half of 2004, North American natural gas prices are likely to remain much higher than the prices experienced prior to 2000 and higher relative to oil prices. The emerging price dynamic between oil and gas in North America will reshape the demand for oil and gas and potentially have an important impact on the future energy market in the US.

The Volatile Crude Oil Market

The crude oil market has been very volatile over the past few years with prices in 1999 having been the lowest since the early 1970s (in real dollars) to the highest price since the late 1970s (real dollars) early in 2004 (Figure 1: Historic World Crude Oil Prices). Several factors caused this volatility.

- OPEC over production in late 1997 and early 1998 as oil demand in Asia skidded to a halt and drove prices low.
- OPEC production discipline since 1999.
- Non-OPEC production growth slowed in 1999 after the price collapse the prior year.
- Since 2002, the rate of global oil demand growth has recovered and is gaining at a relatively robust pace, particularly driven by the recent strength in Asia.
- Rising anxieties in the markets stemming from political uncertainties in some major producing areas and the threat of terrorism.

Figure 1
World Crude Oil Prices



Source: BP, PIM, EIA

— Nominal Price — Constant 2002 Price

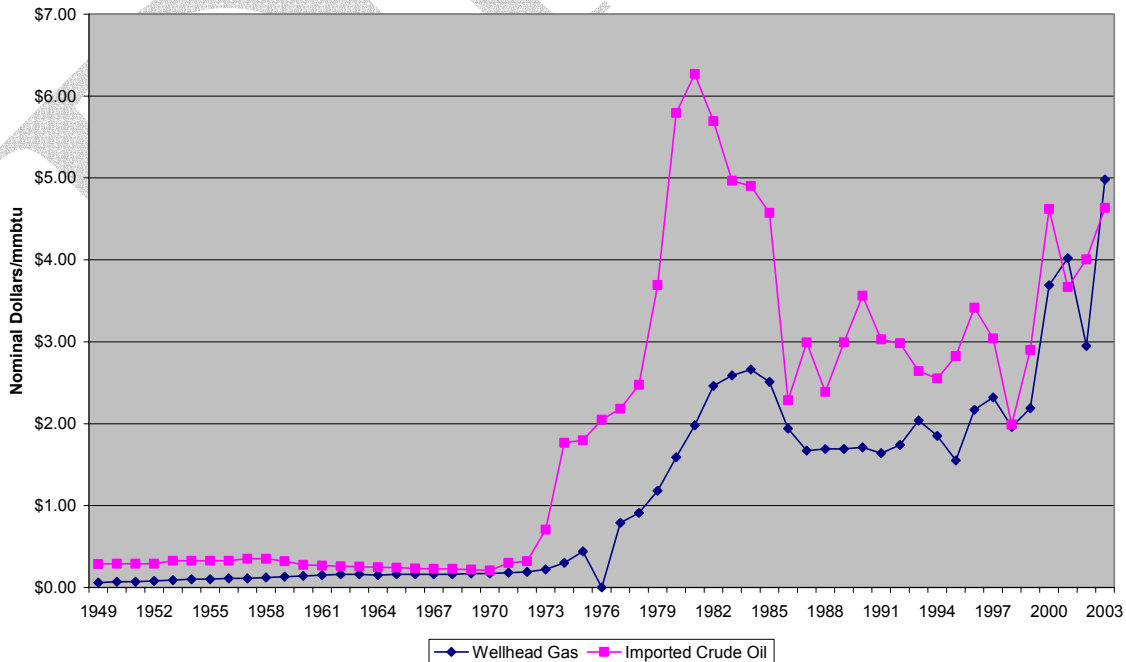
It is clear that these factors will continue to influence prices in the years to come as they have in the past few years and continue to cause oil price volatility with prices ranging from \$25 to \$35 per barrel. While higher than the average price level most of the 1990s, this price level is still well below the levels of second quarter 2004.

A Shift in the North American Natural Gas Market

Up until the late 1990s, natural gas production capacity in North America exceeded demand. As a result, the industry experienced several periods of very low natural gas prices with production occasionally being shut in to balance the market, particularly during low demand years, such as warm winters when there were large amounts of gas left in storage after the peak season. However, production has leveled off and demand growth led by the rise in natural gas demand for electric power generation absorbed essentially all of the spare capacity by the late 1990s. Historically, seasonal production fell short of the peak seasonal demand requirement with storage additions during low demand periods augmenting supply to meet peak demand. Recently, total annual North American production has been unable to meet total annual demand, a situation that will continue well into the future. The growing imbalance will be met with liquid natural gas (LNG) imports and demand destruction. With the end of spare annual average capacity, North American gas prices have been fundamentally shifted to a much higher playing field than experienced for much of the past 25 years (Figure 2: U.S. Hydrocarbon Prices). Over the next several years, natural gas prices in the United States should be expected to average in the \$5.00 to \$7.00 per million btus range at Henry Hub.

- Natural gas demand in North America continues to grow, but growth may slow as a result of higher prices.
- Incremental natural gas supplies are high cost, with long lead times and strong political challenges.
 - LNG faces the issue of siting of import facilities.
 - Arctic gas requires new and long pipelines to bring gas to market.
- Mature domestic natural gas production has leveled off and is not expected to keep pace with demand growth.

**Figure 2
US Hydrocarbon Prices**



Historically, gas was inexpensive in North America because the potential to produce was greater than demand. In 1999, North America began consuming more gas than could be produced, a trend that is expected to continue. As a result, prices have risen to reflect the alternate supply cost and the price level at which demand switches to an alternative source of energy or is shut down. What has happened in the natural gas market in North America is similar to the oil market of the early 1970s. Thirty-five years ago, the United States was a net exporter of oil. As demand continued to grow, domestic production did not keep pace. This set the stage for oil prices in the United States to be set by imported crude oil rather than domestically produced crude oil, and the first real price increase since the end of World War II. Since then, with the advent of OPEC controlling marginal world oil supply and continued robust world demand growth, oil prices have been sustained in a higher price playing field than that of the 1930s through the 1960s.

In nominal terms, oil and gas prices are at the highest levels in North America in history. In real dollars, oil prices are still well below the levels of the late 1970s and 1980. Gas prices are at record high levels in real dollar terms. The markets and industry and consumer behavior at present were shaped by the historic relationship between oil and gas prices. As relative prices between oil and gas have now changed for the foreseeable future, it should be expected that the market and industry and consumer and behavior would also change in response to this new price relationship. This change is already underway.

Sustained Inversion of Oil and Gas Prices

The premise of this paper is based on a scenario of a sustained inversion of oil and gas prices. This is not a difficult premise to buy into given the trends in relative oil and gas prices over the last three or four years and the market fundamentals which have been dramatically different from the previous several decades. Shaping the market environment of the next several years will be the following key factors and assumptions:

- Today's higher oil and gas prices are the result of factors other than the global resource base limits. There are strong demand and limited regional supply growth, global politics, regulation, policies, events and psychology.
- In addition, the resource base remains abundant globally – resource scarcity is not on the horizon
- Oil and gas demand will continue to grow in the United States and worldwide. The rate of growth will be more affected by economic growth than by prices.
- North America will become increasingly dependent on imported oil and natural gas.

There isn't any inherent reason why gas should be priced cheaper than oil – from a quality perspective it should be priced at a premium. Gas burns cleaner, costs less to transform from its raw material state to a salable product and burns more efficiently in many applications today.

The View Forward – The Effect of the New Oil/Gas Price Relationship

Given the possibility that natural gas prices could be above oil prices more frequently and for longer periods of time, the markets are potentially creating a growth opportunity for oil. If gas prices remain above oil, oil demand will grow faster in sectors where it has been stagnant or declining for much of the last couple of decades.

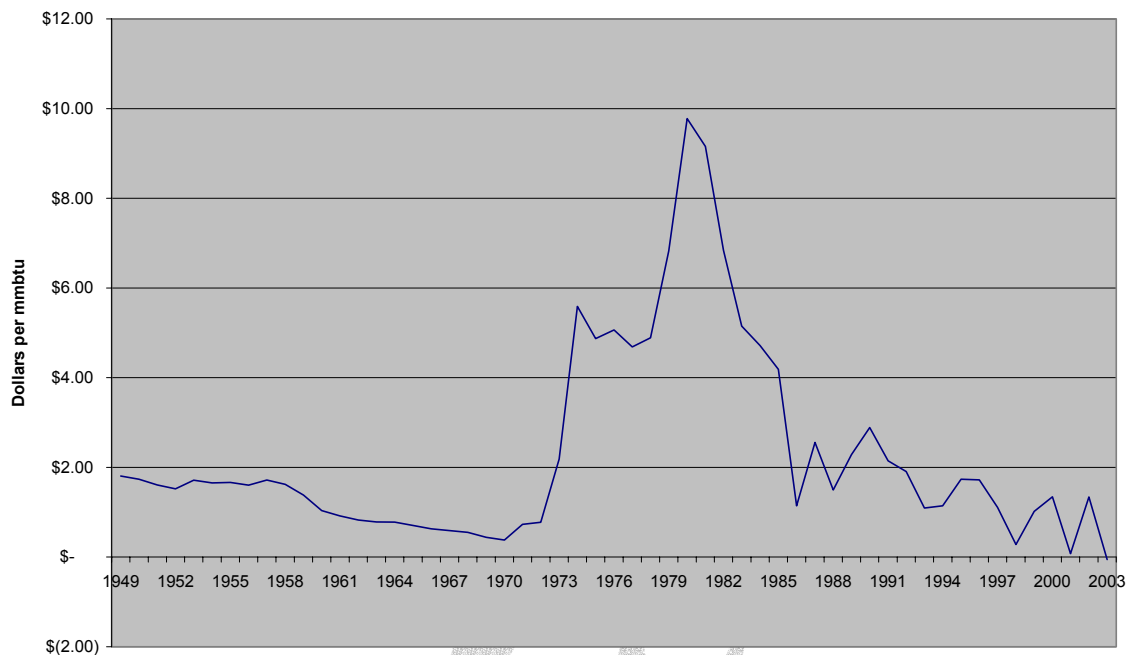
Historically, oil and gas have been in competition with each other at all levels of the demand chain or more precisely, natural gas has displaced oil in most bulk energy uses due to its lower cost (Figure 3: U.S. Imported Crude Oil minus Wellhead Natural Gas Prices). In general, oil has lost ground to natural gas in all sectors except transportation over the last 25 – 30 years:

- Residential lost about 10% share.
- Commercial lost about 13%.
- Industrial lost about 3%.
- Power generation lost about 14%.

While oil lost share to natural gas in stationary markets in the United States, oil's share of total energy demand has stayed relatively constant at about 27%. Growth in transportation demand has been offset by the decline in other sectors.

The focus of the downstream oil industry has been to make transport fuels because there have been no viable substitutes for oil and are no discernible ones on the horizon. While the refining industry has made

Figure 3
US Imported Crude Oil minus Wellhead Gas Prices



huge investments to continue to meet environmental regulations associated with fuel quality and emissions, it has not invested in improving the means to supply the stationary fuels markets as a result of historically lower cost natural gas and the higher value of transportation fuels. The petroleum fuels supplied to stationary markets can generally be characterized as either transport fuels used in stationary applications or as by-product fuels such as residual fuel oil and heating oil.

With the oil/gas price inversion a possible sustained feature of the North American markets in the future, the question is: Will the downstream oil industry begin to turn to the stationary markets as a growth business? And will customers begin to look to oil as part of their long-term fuel strategy? Competitive markets and rational economic behavior suggests that the answer to these questions is yes.

Regaining a measurable share of the stationary market may not be as easy for the oil industry as it was to lose it. Recent high gas prices have caused the North America gas market to begin reflecting the cost of imported replacement gas and the cost of shutting down consumption. The new relative price playing field will allow oil to compete with natural gas rather than retreat from it. Thus far, the existing economic fuel switching has been brought on line. However, there are limits to the amount of natural gas demand that can be switched to oil without further investment on the part of consumers or the oil industry.

Investments will be needed in:

- Infrastructure
- Refining
- Emissions technologies
- New product development
- Market based solutions

Changes in Energy Industry Structure Ahead

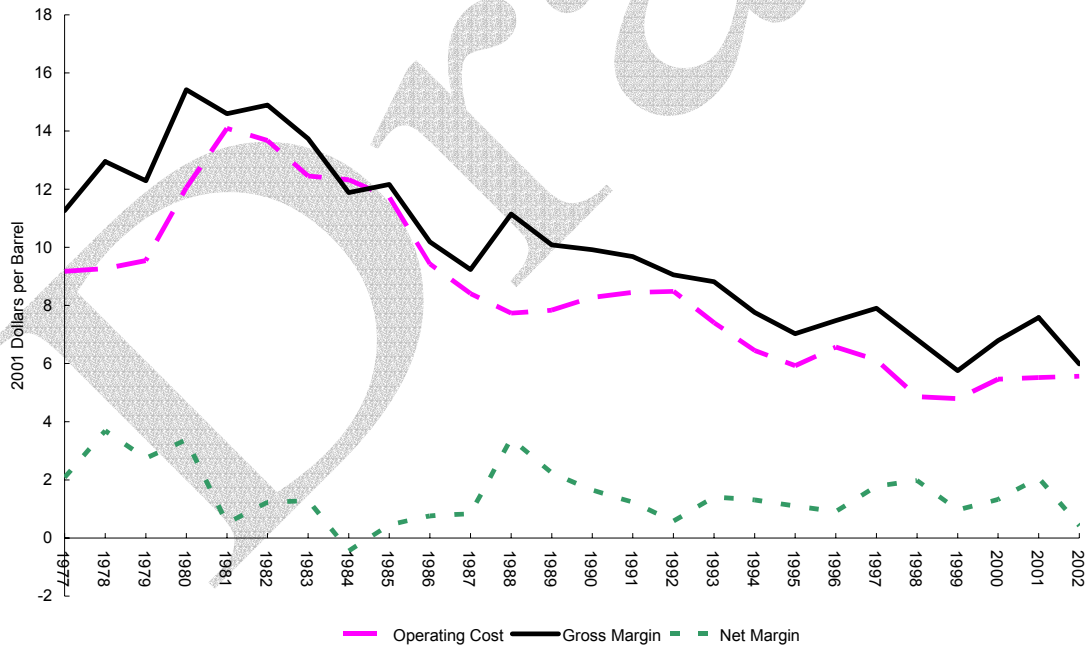
As the energy industry responds to the new pricing dynamic, the North American energy industry should be expected to change and adapt to the new environment. In the past decade, market forces have transformed the energy industry:

- Super majors have evolved from the merger of former competitors.
- International power companies have emerged from de-regulation in Europe and the U.S.
- U.S. refining has been transformed by the emergence of large independent refining companies.
- Master Limited Partnerships dominate U.S. midstream industry.

The current structure of the energy industry represents a transformation from what existed a decade ago, and is the product of the market environment of the last 20 years. It is likely that what is now underway in the market will have far greater implications for the future structure of the industry than past forces.

While it is unclear what the structure of the industry will be a decade from now, there are some things that can be predicted based on historical experience. The need to remain competitive will continue drive the industry and, thus, an overall reduction in costs is likely. Companies will continue to drive for economies of scale, the number of players and facilities in the United States will continue to contract and those that remain will be larger. However, historically, cost reductions have been passed through to the consumer very quickly. Figure 4 shows how in the United States downstream oil industry reductions in operating costs have led to a parallel reduction in gross margins, the result being relatively constant net margins in real dollars.

US Refining and Marketing Margins



While traditional players will likely be driven to rationalize, the emerging market dynamics around the oil and gas price interface and the likely creation of new technology will cause the entrance of new market players. These new entrants increasingly center their operations on providing energy and related services to broaden their customer base and leverage expertise and infrastructure.

The changing oil and gas price dynamic in the United States over the next several years should be expected to result in adjustments in consumer demand for energy goods and services. As in the past, the industry will respond by delivering these products and services at low cost. Global factors will likely result in continue volatility in the prices U.S. consumers pay for oil and gas. However, the emerging trend of relative prices for oil and gas, whereby oil and gas are more competitive on an energy equivalent basis will cause consumers to demand – and receive—new services and sources of energy from the industry.

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