



Sigma Summaries

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Cedar Point Met its Match

The last two years have provided a lot of fireworks in the energy markets as evidenced by crude oil futures rising from \$31 on 12/31/03 to a high of \$70 on 9/01/05. The reasons for the rapid acceleration in price are varied. Some of these causes were established over the last several decades. Others became more acute in 2005 such as foreign governments becoming more aggressive in securing supply for their growing populations as well as the disruptive shock of two category 5 hurricanes in the United States.

Today's high oil price reflects a lack of spare production capacity that has resulted from the recent acceleration of demand. Over the last two decades we have seen an erosion of the excess capacity that was created after the two oil price shocks in the 1970's. Importantly, the lack of adequate re-investment throughout the 1980's and 1990's has created a world with an aging production base in which decline rates have gained in significance. Capital flowing into the energy markets has been on the rise during the last few years and we expect this trend to continue.

The tenuous situation with natural gas was thrown into focus in 2005 with the destructive effect of hurricanes Katrina and Rita on the

gulf coast. Natural gas production in North America has been straining for many years to maintain adequate supply for the growing demand from industrial and individual customers. The shock of the hurricanes in 2005 shot natural gas prices to \$15 per thousand cubic feet in September from \$6 to \$7 earlier in the year. The shock highlights the importance of developing new sources to meet the growing demand including liquified natural gas (LNG) and more complex production from tight gas, shale gas and coal bed methane.

As we exit the roller coaster ride of 2005, what are the important lessons learned that will affect energy markets and investors over the next several years? First, we should recognize that we will likely continue to live in and invest in a volatile energy world for many years to come. Global politics will play a larger role in the future in affecting energy prices. The aggressive actions by foreign governments like China and India to secure energy resources, as well as increased speculative interests by investment banks and hedge funds, illustrate how any imbalances will lead to more price volatility. It should also be remembered that oil and gas prices, being commodities, could also move down as well as up if the

scales shift in a different direction (less demand or sharp increases in capacity).

Second, the days of complacency toward energy policy, conservation, and NIMBY (Not In My Back Yard) are likely to be exchanged for more debate and actions toward solving our growing energy issues. The terrible events surrounding hurricanes Katrina and Rita have already awakened many policy makers, as well as concerned individuals and energy company managements, to talk about more effective solutions to these issues. Hopefully, windfall profit taxes are not the only solution put forward by policy makers to alleviate the current supply situation. More cooperation and legislation by governments to open access to prospective oil and gas basins as well as a more realistic view toward long-term energy efficiency is necessary. A broader view toward energy solutions including alternative sources and even nuclear now seems appropriate.

Finally, as mentioned earlier, capital expenditures throughout the energy patch have been trending higher the last several years. According to oil service giant **Schlumberger**, overall spending in exploration and production increased by 60%

between 2000 and 2004 to an estimated \$161 billion. We believe increased capital spending focused on technology is essential to maintaining production in older, mature oil and gas fields as well as the complex projects in the deep waters of the world.

A great deal of progress has been made in the development of stranded gas resources with huge investments in LNG and NGL (Natural Gas Liquids) facilities. We believe it is likely that increased infrastructure investment toward technology will help reduce the cost of bringing stranded gas to the market.

We have also seen an increase in spending directed toward unconventional hydrocarbons, be they heavy oil, shale gas or coal bed methane. These sources require more complex technology solutions and increased assistance from the best oil service firms. The contribution of technology will continue to accelerate and make dramatic changes in the economics of hydrocarbon production.

Technology is certainly the principal reason that oil sands or tar sands are getting more attention today as a viable source of oil. Companies as large as **ExxonMobil**, **Royal Dutch Shell** and **ChevronTexaco** along with **Imperial Oil**, **Syncrude** and **Suncor** have been investing for years to develop improved extraction technologies to bring this heavy molasses to the market. The Canadian province of Alberta is estimated to contain between 1.7 and 2.5 trillion barrels (according to the Canadian Government) of this heavy oil. Of that, an estimated 300 billion barrels are recoverable using today's technology.

One of the most important extraction-related achievements is the implementation of a technique called hydrotransport. Developed by **Syncrude**, it involves mixing oil sands with water to create slurry, which is transported via a pipeline to the extraction plant. This technique saves energy by eliminating conveyors. The process also begins the separation of the oil from the sand while en route at a greatly reduced water temperature, saving more energy.

Syncrude is a joint venture among several Canadian energy companies including **Imperial Oil Resources** (that is 70% owned by **ExxonMobil**). Each participant has a specified undivided ownership interest in the assets of the **Syncrude** Project. **Imperial Oil Resources** has a 25% interest. Planning is under way for a new **Imperial Oil** and **ExxonMobil Canada** oil-mining project, which could have the lifetime potential to yield 4.4 billion barrels of oil.

Along with the oil sand development in Canada, the top exploration and production companies are using technology to exploit tight gas, shale gas and coal bed methane. Companies such as, **XTO Energy**, **Anadarko Petroleum**, **Devon Oil and Gas** and **Chesapeake Energy** are exploiting their technology expertise in significant exploration regions such as the Barnett Shale in Texas, the Powder River Basin in Wyoming and the tight gas basins like the Arkoma and the San Juan in the Southwest United States.

These effective oil and gas producers have been successful in adding to their reserve base while managing their finding costs. Controlling

finding and development costs will be a major differentiator going forward in determining which of these exploration and production companies will deliver sustainable returns.

Increased technology innovation is also playing a crucial role in the leading oil service companies in the world. Throughout the last decade, a great deal of attention has been placed on the development of 3D seismic (now 4D with ongoing real-time processing) and horizontal drilling on reducing finding and development costs. These achievements have masked other remarkable technologies such as deep-water exploration, continued increases in reservoir recovery factors, as well as the aforementioned cost effective recovery of heavier crude and growing production of unconventional gas.

The leading energy service companies such as **Schlumberger**, **Halliburton** and **BJ Services**, continue to pursue enhanced productivity solutions that reduce drilling costs and save time. In 2005, **Schlumberger** experienced strong demand for its next-generation Drilling and Measurements Scope logging-while-drilling services, which offer improved drilling efficiency and enhanced formation evaluation. The best energy service companies today are defining their niches where they can command an industry leading position.

For example, **Schlumberger** has introduced a new Axia lifting service that helps get the oil to the surface. The Axia lifting service for wells equipped with electrical submersible pumps enables optimized

performance through well management. Axia features a new generation pump with built-in sensors, surface power and communications infrastructure, and remote surveillance and control equipment together with access to remediation and diagnostic services. **Schlumberger** technicians help producers use the real-time data to make decisions targeted at optimizing productivity.

This advance in technology innovation has led to a much more sophisticated industry than we experienced during the last several decades. Service companies react faster to market mechanisms affecting price that are much better defined today. As a result, investment decisions are made with a lot more care and attention than they were in the past. Hedging and derivatives play a greater role in offsetting risk.

The leading service companies are developing integrated project management business models that enable them to execute complex client projects successfully through the application of management, engineering and technology. These new business models focus on delivering field development, field rehabilitation, production management, well construction, and water management that are tailored to the needs of each project. The service companies hope that these new business models will reduce the traditional cyclicality.

Looking beyond the more traditional exploration and production companies and major service companies, we will monitor, research and likely invest in more energy related companies in the future such as gas pipelines, refineries, offshore and domestic drilling companies, coal producers

and nuclear based utilities. This expansion of our so-called farm club for new investment opportunities is warranted due to the serious nature of our global energy issues.

In summary, the underlying conclusions of the roller coaster oil and gas markets over the last two years suggest that we must focus on underlying fundamentals that suggest more capital and technology will be needed to solve our energy problems over the next several decades. Politics, hurricanes, wars and possible recessions will make our investment challenge a good one.

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