



2007

International Oil and Gas

FINANCE REVIEW

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Contents

Foreword

The energy future	1
By Claude Mandil, Executive Director, International Energy Agency	

Introduction

A new energy policy for Europe	5
By Andris Piebalgs, European Commissioner for Energy, European Commission	

Chapter 1

Security of supply: The challenge that faces us all	10
By Peter K Storm, Secretary General, IGU	

Chapter 2

Reporting reserves at fair value – a new challenge for oil & gas companies?	13
By KPMG	

Chapter 3

Investments in refining capacity: Choosing opportunities	17
By Taylor-DeJongh	

Chapter 4

LNG – a sure bet?	22
By PricewaterhouseCoopers LLP	

Chapter 5

Dispute resolution in the international oil and gas industry	27
By Debevoise & Plimpton LLP	

Chapter 6

Kyoto making waves: Opportunities in the carbon market	32
By European Climate Exchange	

Chapter 7

Prospects for foreign investment in the Russian oil & gas industry	37
By Deloitte	

Key player interview

with Royal Bank of Scotland	44
2006 – High activity across the Board	

Special feature

World Petroleum Congress: Leaving a legacy	49
By Dr Pierce Reimer, Director General, World Petroleum Council	

Contents

Country Chapters

Algeria	57
Another amendment to the hydrocarbons legislation in Algeria: Back to square one? By Gide Loyrette Nouel	
Azerbaijan	63
Oil and gas taxation in Azerbaijan By Salans	
Greece	66
Oil & gas developments in Greece: Biofuels, Natural gas By Cocalis & Psarras	
Hungary	69
Growing need for security of energy supply in Hungary By Luther, Fest & Kajli Attorneys at Law	
Ireland	73
Bringing offshore petroleum resources to market: Legal considerations By Matheson Ormsby Prentice	
Italy	77
The Italian gas market: Legislative framework and future outlook By Chiomenti Studio Legale	
Kazakhstan	81
Financing Kazakhstan's oil export infrastructure By Shell Kazakhstan Development B.V.	
The framework for oil & gas legislation in Kazakhstan By Salans	85
Latin America	88
Opportunities and challenges in financing offshore drilling rigs in Latin America By WestLB AG	
Madagascar	91
Hydrocarbons law in Madagascar By Gide Loyrette Nouel	
Mexico	95
The Mexican oil and gas industry: At the dawn of liberalisation? By López Velarde, Heftye y Soria	

Contents

Russia	101
Russian government establishes control over oil & gas development: Investors go home? By DLA Piper Rus Limited	
Spain	107
The story of the Endesa take-over bid...so far By Gomez-Acebo & Pombo Abogados	
Thailand	110
Developments in the Thai oil & gas industry By Chandler & Thong-ek	
United Kingdom	117
Good for the goose, good for the gander? Taxing the North Sea By Ernst & Young LLP	
APPENDIX	
League tables for the oil & gas project finance market from Dealogic	126
World Energy Statistics from IEA	132
International Oil & Gas Directory	148

Investments in refining capacity: Choosing opportunities

By Senake Gajameragedara, Scott Flippen, and Jennifer Yau, Taylor-DeJongh

For oil refiners, 2006 has been another banner year, as refining margins have continued their strong run from the previous year. The upswing in refinery margins followed more than a decade of worldwide decline in spare refining capacity. In the last three years, that downward trend has accelerated to a current spare capacity of less than 3 million b/d. With the International Energy Agency's recent projections of oil demand at 115 million b/d by 2030, refinery capacity must grow at more than 1 million b/d per day annually to meet this demand. Both strategic and financial investors have taken notice, and a large amount of additional greenfield refining capacity is now in the development or construction phase as a result. Not all of these investments, however, appear to be purely based on sound market considerations, and as a result investors must be prepared to conduct a rigorous analysis of any potential investment in new refining capacity.

Drivers of new refining capacity

Driving the growth in global demand are the emerging economies of China and India, with gasoline consumption projected to pick up in the automobile sector, and consumption of distillate fuels (such as diesel and heating oil) expected to increase in other segments of these economies. North America will likely continue its growth in demand, with the transportation sector a major force and gasoline as the fuel of choice for the foreseeable future.

The task of meeting worldwide consumption growth also includes the challenge of configuring refineries to new environmental standards. This is especially the case in Europe, where regulations for cleaner transportation fuels have shifted demand to diesel and away from gasoline. In the US, laws in effect since the spring of 2006 require refiners to switch from MTBE to ethanol as a gasoline additive, while diesel producers face drastically lower sulphur content level requirements. A critical factor for refiners planning their investments will be not only one of deciding how much distillation capacity to build, but also whether to invest in catalytic cracking, coking, or hydro-cracking units to transform the lower grade products of the distillation process into higher-value transport fuels. The price differential between higher value transportation fuels and residual fuel oil has been growing recently, leading to increased refining margins for facilities configured to crack lower grade products.

On the supply side, commonly available crude oil inputs will be of lesser overall quality. New crude production from areas such as Russia and Central Asia, West Africa, Brazil and Saudi Arabia will be heavier and higher in sulphur and other impurities, while US and North Sea supplies of light sweet crude are being depleted. New feed stocks such as extra-heavy crude from Venezuela and synthetic crude from Canada's oil sands will compound the challenge of correctly identifying sources of crude oil supply and designing the appropriate refinery configuration.

Figure 1 tracks historic spot price for the lighter West Texas Intermediate crude and the heavier Maya crude from Mexico. The spread between the two has widened in recent years. From 1992 to 2003 the average

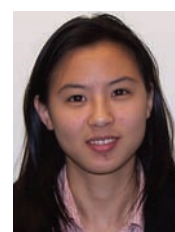
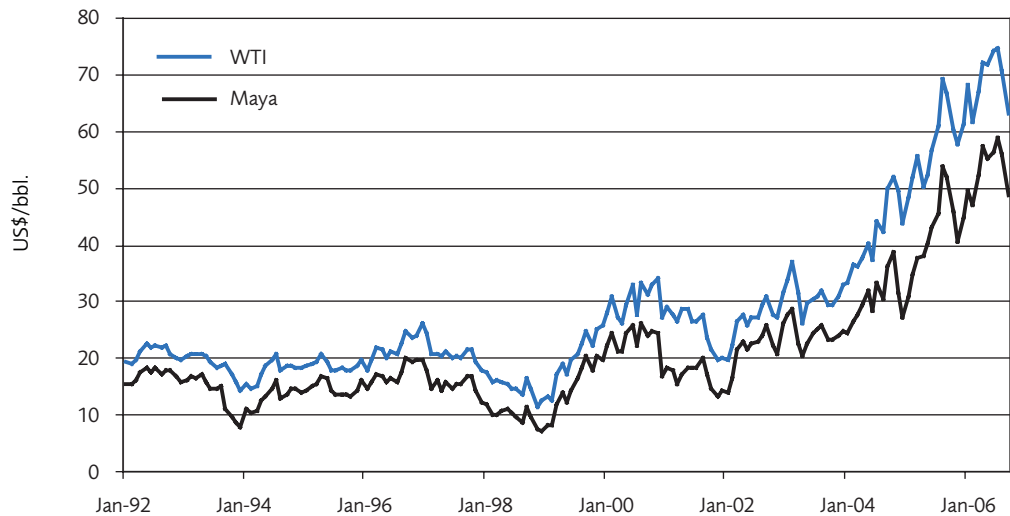


Figure 1: West Texas Intermediate vs. Maya Spot Price



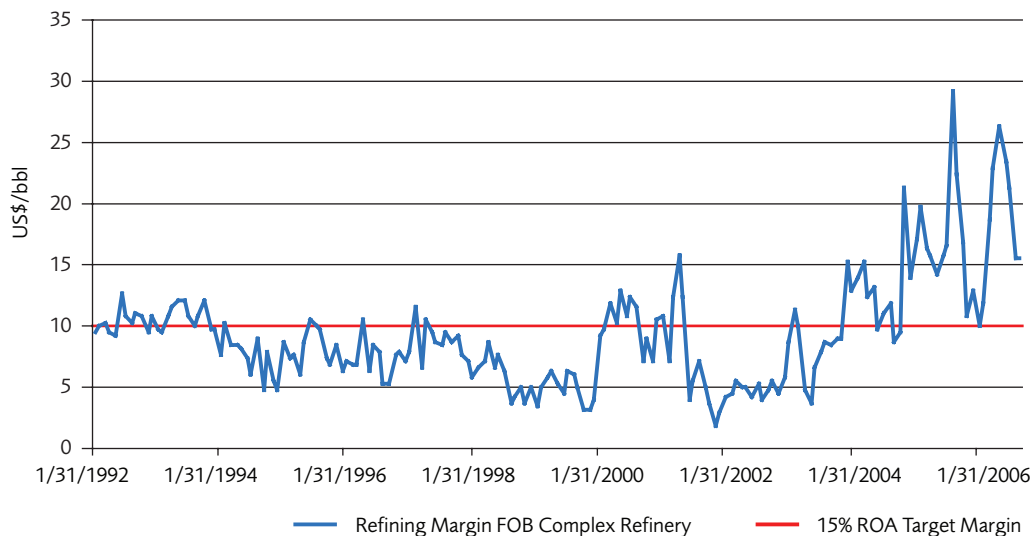
Source: Bloomberg

differential was around US\$5.40/bbl; however from the beginning of 2004 through the first three quarters of 2006, Maya crude traded at an average discount of just over US\$14.00/bbl. Crack spreads at refineries that can process heavier feed stocks benefit greatly from the discounted price at which these grades have been trading relative to lighter crude oils.

These are some of the factors that have driven crack spreads to near historic highs this past summer, especially in the US and northwest Europe. However,

while recent refining margins are bullish, the long-term, rather than the immediate, is what matters when planning investments that take many years to develop and construct. For example, an investment in a 250,000 b/d refinery and an estimated capital expenditure of US\$3.2bn would require a refining margin of approximately US\$10.00/bbl on a real basis to cover operating costs and achieve a 15% average ROA. As Figure 2 shows, refining margins have not always been able to provide this level of return.

Figure 2: Historical refining margins versus 15% ROA target



Source: Bloomberg and TDJ Estimates

Given market dynamics such as the global tightness in refining capacity, it seems unlikely that refining margins will return to the levels seen in the late 1990s. It is equally unlikely that real refining margins will remain above US\$15/bbl, or even US\$10/bbl, for extended periods of time, *on a global level*. However, given regional market differences and barriers to entry such as regulatory/environmental hurdles, a careful study may show that a strategically located refinery with the necessary commercial backing can provide strong investor returns. For example, proximity to market is an important factor in a refinery's competitiveness because, in general, greater economies of scale can be achieved in bringing crude oil to the refinery than in bringing refined product to the market. From a logistics standpoint, crude pipelines tend to be larger than refined product pipelines and deliver greater volumes to a single location. The same applies for ocean transport; crude (dirty) tankers are much larger than refined product (clean) tankers and thus achieve better transportation economics. A refinery located close to its market can capture this transportation differential, adding support to its refining margins.

In the current environment, not all refinery investments appear to be taking such a strategic approach. High energy prices have provided many petroleum companies with excess balance sheet capacity. At the same time natural resource-rich governments are actively seeking infrastructure investments that will increase domestic value added and add jobs to the local economy. This combination has led to some announcements regarding new refining capacity that do not always seem to have a clear view of how that capacity fits into the market. Projects such as these will be the first to be squeezed if refining margins return closer to historical levels. However, disciplined investments based on a full understanding and mitigation of the complex risks a refinery faces will be better positioned to survive cyclical downturns and take full advantage of upswings.

Planned capacity additions

The *Petroleum Economist's* annual refinery construction survey predicts that 8.9 million b/d of new capacity, currently in either the construction or planning phases, have a high likelihood of coming to fruition¹. A large amount of this capacity is targeted for 2011, and if all of



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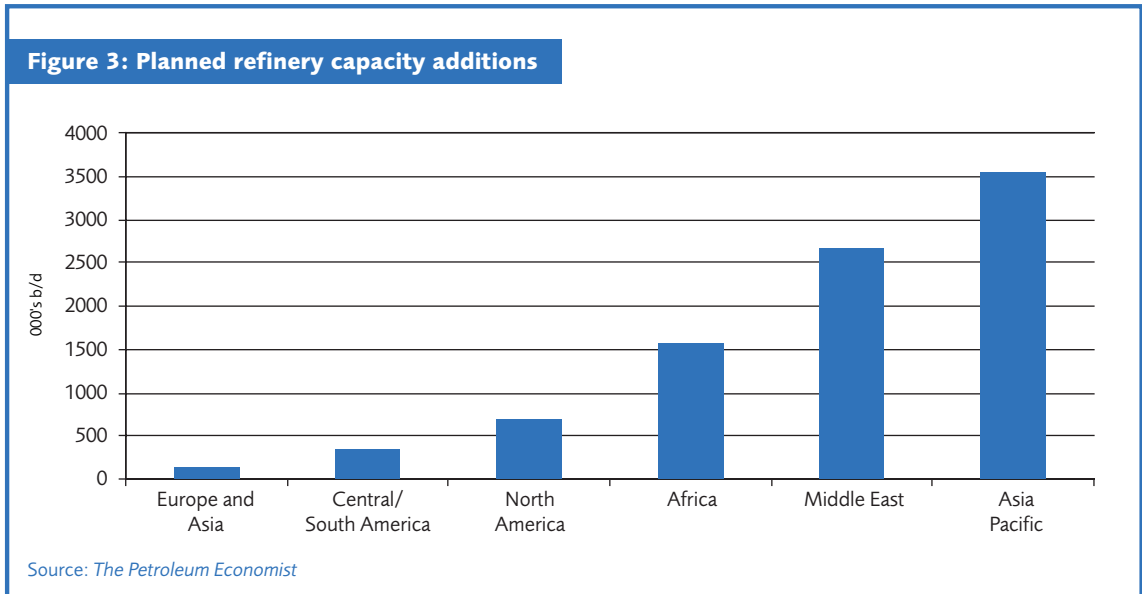
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it is realised it would represent a 10.4% increase in new capacity from end-2005. Approximately 85% of the new capacity will be located in the Asia-Pacific region, the Middle East, or Africa.

Sponsorship of these projects is dominated by NOCs. NOCs moving into this space include both those in traditional oil exporting countries hoping to capture downstream margins and NOCs in net oil importing countries that are investing to meet their countries' future energy needs. In the latter group China and India stand out as particularly active, with five new refineries in the planning or construction phase in China (in addition to a joint venture in Algeria) and three in India. India also has three substantial expansion projects planned.

In terms of where greenfield and expansion projects will be located, the Asia-Pacific region will see the largest increase in refining capacity – 40% of the world total. A 2006 Wood-Mackenzie study estimates that half the capacity buildup will come from the expansion of existing sites. China, India and Thailand have seen the most expansions and greenfield projects planned. Some forecasters see a possible glut in India while not enough refining capacity growth in China.

The projections for the Middle East include 30% of new capacity globally, with a focus on export refineries designed to meet higher fuel quality requirements in different markets. Such exported-oriented projects are planned in Saudi Arabia and Kuwait, along with proposed complexes in Iran and Egypt.

Projects that may be realised in Africa include two or three refineries likely located in Algeria, Libya or

Morocco targeting Mediterranean markets. A small number of expansions have been planned for Latin America, including a new refinery in Brazil built in conjunction with Venezuela. Russia's ageing refining capacity remains heavily under-utilised. Efforts are likely to concentrate on upgrading plants to increase higher-value distillate production, such as the announced upgrade for a Black Sea refinery.

Europe and the US, though large centres of demand, are less active with new investments. These markets present serious barriers to entry, in the form of environmental and other regulatory hurdles, for the development of new grassroots refineries. A strategically located project that is able to overcome these hurdles and reach start of commercial operations would have a high probability of success.

Considerations for investors

Recent high energy prices have created a lot of liquidity within the oil and gas sector. Both strategic and financial investors are seeking ways to redeploy some of this capital, and recent high margins have focused a good deal of attention on the refining industry. However, at the project level, investing in a refinery is a decision that must be considered carefully. The refining industry has historically been a very competitive business, and refiners (independent refiners especially) face the risk of margin squeeze. It is therefore essential that investments in new refining capacity be focused on assets that are likely to sustain a competitive advantage over the duration of investment.

As mentioned earlier, not all proposed refinery projects take this approach. Some sponsors' investment decision making can be significantly influenced by considerations other than return on investment, for example the creation of skilled employment. Projects that are driven more by meeting the specific needs of a target market tend to proceed more carefully because of greater investment criteria and constraints. Developing a refinery project is both high cost and high risk. Permitting, feasibility studies, front end engineering and design, and down payments on long lead items often mean development budgets of a hundred million dollars or more. Successfully investing equity in developing a refinery depends primarily on the ability of developers to identify, allocate, and adequately mitigate all of the major development period risks.

This analysis has some parallels to a traditional project financing, mainly because the value of the project to investors is directly related to the probability of realising the project's future cash flows. In order to be comfortable investing equity at an early stage, investors must be certain that each element of risk – such as regulatory risk, feed stock supply risk, commercial risk, operating risk, and so forth – is being adequately managed and mitigated over the development period. Of course, these risks do not need to be mitigated to the degree that would be necessary to raise construction financing on a limited-recourse basis, but, at a minimum, a creditable plan of action to manage each risk is required.

Some development risks can require greater effort for successful mitigation than others. One such risk is the development of off-site infrastructure. A grassroots refinery may require significant investment in off-site infrastructure such as power generation, crude oil pipelines and refined product pipelines. Depending on the location and scale of the refinery, off-sites can be significant projects in and of themselves. For a variety of reasons, it may not always be advantageous, or possible, to have a single sponsor undertake the entire effort. Large off-site, infrastructure may therefore require the expertise and resources of third-party sponsors. This presents a dilemma to both the sponsors of the primary project, the refinery, and the sponsors of the off-site project(s) – neither project can advance without some degree of confidence that the other will go forward as well. The solution is to align the interests of both parties as tightly as possible. This can be accomplished in a

number of ways, including equity swaps between projects or contractual arrangements that share risk by establishing milestones and incentives or penalties related to the progress of each party.

Overall, each risk associated with the project must be identified and managed in order to attract investment. This disciplined approach will pay dividends however, not only when investing development capital, but also when the time comes to raise construction financing. The focus on building a strong commercial structure from the earliest development stages lays a solid foundation for the project financing structures that will likely be used to raise the bulk of the project's capital requirements.

Conclusion

High oil prices, changes in environmental regulations and limited refining capacity have created a bonanza of high refining margins for oil refiners. The response has been a flurry of activity in the refining industry and numerous announcements regarding major investments in refining capacity. In the long term, there is a need for new capacity. However, investment decisions should not be predicated on the assumption that today's refining margins will last forever. Instead, investors interested in stakes in new refining capacity must carefully consider the proposed refinery's competitive position in its target market and analyse each and every risk associated with developing that specific project. A well-disciplined approach will lead to investments in assets that will maintain profitability even in lower margin environments.

Note:

¹ "Profits boom on strong demand." *The Petroleum Economist*. Vol. 73, No. 9. September, 2006. pp. 8-12.

Senake Gajameragedara, Vice President, Scott Flippen, Associate, and Jennifer Yau, Analyst, Taylor-DeJongh, 1101 17th Street NW, Suite 1220, Washington DC 20036, US.

Tel: +1 202 775 0899 Fax: +1 202 775 1668

Emails: senakeg@taylor-dejongh.com

sflippen@taylor-dejongh.com

jyau@taylor-dejongh.com

www.taylor-dejongh.com