
TURMOIL ON THE INTERNATIONAL OIL MARKETS: GETTING USED TO PRODUCTION CAPACITY CONSTRAINTS

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INTRODUCTION

In 2008 the world experienced a prelude to the new realities of the international oil market. These new realities include a tight balance between supply and demand, the rapidly increased cost of the marginal barrel and the extreme price volatility. This price volatility has driven prices up \$50 a barrel in the space of 5 months, only to drop \$50 in 2 months after the July 14 peak of \$147 a barrel when consumers began to seriously drop out of the market and inventories were drawn down. After the extreme downward correction, the crisis on the international capital markets led to dim expectations about economic growth for the rest of the year and 2009, and this also played a role. However, prices are expected to rebound again, reflecting the fundamental upward shift of oil prices from an average of about \$70-80 a barrel to about \$110-120 a barrel.

This fundamental upward shift is due to a combination of so-called ‘underground’ and ‘above ground’ conditions. The ‘underground’ problems include the size, depth and geological complexities of new oil fields that are driving up the cost per barrel. These complex oil fields need to be taken into production, since ‘above ground’ problems limit International Oil Companies’ (IOCs) ability to access the lower-cost oil in producing countries. The ‘above ground’ problems slow the pace of development of medium-cost oil in the largest producing countries in the Middle East and Russia. Despite the expectation of a continued demand for oil, oil exporting countries are concerned about the security of demand, and adapt their development plans accordingly.

Moreover, with the increased prices of the last few years and the resulting increase in oil revenues, the management of the monetarised oil wealth has become a concern as well. The value of the dollar has been slipping and oil exporting countries tried to match this depreciation by increasing oil prices. China’s rise as an important manufacturer in the world, with the accompanying

surpluses on the balance of trade, has led to a larger Chinese claim on world oil resources. The balance of payment imbalances in the world have increased accordingly, aligning international oil market developments with the overall shift in geo-economic relations.

Although the tensions in the international economic system were also visible in the global capital and goods markets, the impact on world oil markets has elevated oil to the political and strategic agenda of many nations. In this chapter we will focus on the run-up to an oil supply-constrained world and the impact on international relations when oil consuming countries are including the supply constraints in their energy policies.

RUN UP

Global concerns about the continuous rise in oil prices have been mounting since passing the psychological \$100 threshold in January 2008. From the end of January 2008 oil prices continued to rise above the real oil price levels of the early 1980s. The recent price increases started as a result of a surge in demand from in particular China and India, which very quickly implied that the world buffer capacity had to be used to satisfy this new demand whereby the international oil market lost its flexibility to respond to short-term supply interruptions. Therefore international attention moved to the ability to adjust supply to the new demand levels.

The focus on the supply side of the international oil market intensified after the publication of the International Energy Agency's (IEA) *World Energy Outlook 2007* (WEO 2007) that made clear that some serious impediments to increased oil supply exist, which are predominantly 'above ground' issues. For the first time, the annual outlook from the usually upbeat IEA painted a grim short to mid-term outlook for the world oil supply. The WEO 2007 warned that: 'a supply-side crunch in the period to 2015, involving an abrupt escalation in oil prices, cannot be ruled out.'¹

The IEA's warning struck at the heart of the physical trade in oil. Today, we live in an 86 million barrels per day world of oil supply, matched by about the same amount of oil demand.² However, a slowdown or even a reduction in global supply growth could send prices spiralling, since demand under current high oil prices has proven to be resilient, not in the least because the bulk of the oil demand is subsidised. Although high oil prices did impact demand in the United States and other OECD countries, where subsidies are absent, demand continued to grow in other economies.

¹ International Energy Agency (IEA), *World Energy Outlook 2007* (Paris 2007) p. 43.

² IEA, *Monthly oil market report* (Paris, 13 May 2008) pp. 5 and 19.

The IEA's *World Energy Outlook 2007* expects that between 2006 and 2015 an additional gross capacity of 37.5 million barrels per day (b/d) will have to come on-stream to supply a continued resilient demand and to offset the natural rate of decline of global oil production.³ In its reference scenario, the IEA expects global oil demand to be 98.5 million b/d in 2015, up from about 86 million b/d in 2008.⁴ Yet, the IEA expects to see an additional 25 million b/d of oil production to come on-stream up until 2015, which could result in a shortfall in oil supply of about 12.5 million b/d in 2015: hence a possible future *supply-side crunch*. These expectations exclude the impact of the current economic downturn on both supply and demand expectations, which, depending on the severity, could push the run-up to a possible crunch-back in time.

CONVERGING DEMAND AND SUPPLY, DIVERGING INVESTMENT

The IEA's expectations of a crunch have been echoed by captains of industry from major IOCs. In October 2007, Total's CEO Christophe de Margerie put the world highest possible oil output at 100 million b/d overall, much below the IEA's expected level of 116 million b/d. He stated that the industry: '[have] been, all of us, too optimistic about the geology. Not in terms of reserves but in terms of how to develop those reserves: how much time it takes, how much realistically you need.'⁵ In addition Jeroen van der Veer, CEO of Royal Dutch Shell, expected severe constraints in oil and gas supply within seven years when he stated in 2008: 'Shell estimates that after 2015 supplies of easy-to-access oil and gas will no longer keep up with demand.'⁶

Up until recently the IEA expected that global demand would be matched by an equal amount of production that will increasingly have to come from countries in the Middle East and North Africa (commonly referred to as MENA countries⁷).⁸ However, these demand-based forecasts of the global oil supply have come under increased scrutiny. In response to these criticisms, the IEA's chief economist, Fatih Birol, indicated that the IEA will have to adjust the (WEO 2007) reference scenario of world oil output of 116 million b/d in 2030, to a more modest maximum output of 100 million b/d in 2030.⁹ In addition, the IEA

³ IEA, *supra* n. 1, p. 84.

⁴ *Ibid.*, p. 80.

⁵ Ed Crooks, 'Total chief warns on oil output', *The Financial Times* (31 October 2007).

⁶ Carl Mortished, 'Shell chief fears oil shortage in seven years', *Times Online* (25 January 2008).

⁷ Most important producers from the MENA countries are: Iran, Iraq, Kuwait, Qatar, Saudi Arabia, United Arab Emirates, Algeria, Egypt and Libya.

⁸ IEA, *World Energy Outlook 2005* (Paris 2005) p. 53.

⁹ Neil King JR. & Peter Fritsch, 'Energy watchdog warns oil-production crunch', *The Wall Street Journal* (22 May 2008).

embarked on a study for the *World Energy Outlook 2008* (WEO 2008) that aims to formulate a supply-based scenario.¹⁰ This scenario would bring the IEA scenarios more into line with global industry expectations (as mentioned above), and international criticism of the IEA's demand-based models.¹¹

The outlook of a continued tight oil market is largely due to a slow response from the international oil industry (national [NOCs] as well as international oil companies [IOCs]) to bring sufficient supplies on-stream to compensate for declining oil-producing mature fields.¹² When discussing why future oil supply would be limited to 100 million b/d, Mr de Margerie stated that this limit was not because of a lack of oil in the ground, but that: 'the industry had also "misunderstood" that resource-rich countries would want to preserve some of their best oil fields for the future, while offering smaller and more difficult fields to foreign investors.'¹³ This statement gives an insight into one of the fundamental flaws in the global oil market: even though the oil market is increasingly global in terms of consumption, it is increasingly fragmented in terms of investment.¹⁴

Despite the large amount of criticism directed at the IEA and its scenarios, the central role of MENA countries in our future oil supply is universally undisputed. This central role of the MENA countries has everything to do with their abundant hydrocarbon endowment. The MENA countries possess 61% of the known world oil reserves and 50% of the known gas reserves.¹⁵ Apart from plentiful MENA reserves, they are also relatively easy (cheap) to develop. MENA countries could therefore, in theory, expediently supply the medium-cost oil which the market needs. Yet, the MENA reserves are usually developed by NOCs from the respective MENA countries, and have different priorities when it comes to the pace of developing such resources. Not only do the investments in the oil industry compete with other sectors of the economy, but these investments are also increasingly balanced against the performance of surplus oil funds.

As a consequence IOCs are destined to develop production portfolios that are increasingly dominated by high-cost barrels, and the IOCs consequently require substantial global oil prices to recoup these costs. In a response to the drop in oil prices since July 2008, Mr de Margerie stated that major high-cost

¹⁰ IEA, *supra* n. 1, p. 84.

¹¹ King & Fritsch, *supra* n. 9.

¹² Coby van der Linde, Wilbur Perlot & Femke Hooegeven, 'Tomorrow's mores: The future geopolitical system and the structure of the international oil market', *Politica Exterior* (Madrid 2006) p. 1.

¹³ Crooks, *supra* n. 5.

¹⁴ 'Energy Watch', Goldman Sachs (20 February 2008).

¹⁵ IEA, *supra* n. 8, p. 56.

oil projects were at risk when the oil price would drop beneath the \$90 mark.¹⁶ As a result global capital markets can only invest (via IOCs) in high-end expensive oil projects that will carry a great risk premium to develop under continued volatile market conditions. International capital will not have access to develop the more lucrative medium-cost oil that can provide considerable relief to world markets and ensures a rate of return on investment even if markets remain volatile.

The current oil price is determined by the marginal cost of supply (e.g., the cost of the last barrel that can be produced profitably, which is about \$80 for high-cost oil developed by IOCs), while supply and demand fundamentals, a short-term risk premium and long-term scarcity considerations account for the remainder of the oil price.¹⁷ The continued volatility in the oil price will find its origin in supply-demand fundamentals and short-term risk premiums, while long-term scarcity could drive up prices in the long run. Below we will discuss the geopolitics of medium-cost oil to alleviate supply constraints, while we will then continue to discuss other sources of volatility, i.e., short-term risk premiums.

GEOPOLITICS OF MEDIUM-COST OIL

With international capital increasingly locked out of medium-cost oil investment opportunities (leaving them exposed to the current volatile price conditions) NOCs will become increasingly responsible for investment in substantial medium-cost oil production capacity to satisfy world oil demand. In the past, some of these companies have been responsible for managing spare capacity, notably Saudi Arabia, the United Arab Emirates and until 1990 Kuwait, thus providing the market with crucial flexibility. This flexibility could return temporarily in the face of a global economic downturn, but it is unlikely that these NOCs will willingly create an excess capacity in the future.

NOCs from the major producer countries do not necessarily share the economic goals of the consumer countries (lower energy prices to foster economic growth in the centres of energy consumption), nor can they always afford to create excess capacity that helps to balance world markets. Some member countries of the Organization of Petroleum Exporting Countries (OPEC) are experi-

¹⁶ Carola Hoyos, 'Oil price fall puts projects at risk', *The Financial Times* (12 September 2008).

¹⁷ Jan Hein Jesse & Coby van der Linde, *Oil turbulence in the next decade: an essay on high oil prices in a supply constrained world* (The Hague, Clingendael International Energy Programme 2008).

encing difficulties in maintaining production levels, such as Venezuela and Nigeria. Only a country such as Iraq can expand its production capacity substantially due to past underutilization. Other countries are becoming more interested in conservation. As a prime example of resource holders preserving their finite resources for the future is considered the recent declaration by the King of Saudi Arabia, in which he stated that any new found reserves will be preserved for future generations.¹⁸

Although NOCs differ according to size, function, organization, competence and relationship to the state, NOCs are dominant in global oil production with more than 77% of world oil reserves under their direct control.¹⁹ IOCs have direct access to about 7% of world oil reserves, while they had access to about 85% in the 1970s.²⁰ NOCs from MENA producer countries are instrumental for their national governments in achieving their domestic political and economic goals, and they are therefore often vital for domestic regime legitimacy.²¹ Hence NOCs' decision-making and the resulting investment in oil production reflects an effort to balance social and political objectives with commercial imperatives, as opposed to IOCs where commercial imperatives dominate decision-making.²² Therefore despite high oil prices NOCs will not necessarily increase oil output, or invest more in future exploration and production, because their priorities are with their countries' long-term gradual economic development.

In addition, the main MENA producers are also members of the OPEC that tries to coordinate global oil supply.²³ The exploration of resources and especially the production of resources for the world market are capped for OPEC member states, that have to limit production to their respective quotas. These individual quotas result in a small amount of spare capacity currently estimated to be 2.5 million b/d (mostly held by Saudi Arabia and the United Arab Emirates). The spare production capacity available is usually comprised of very heavy grades of crude oil that are difficult to process (due to refining constraints) and

¹⁸ Carola Hoyos, 'Saudis put oil capacity rise on hold', *The Financial Times* (21 April 2008).

¹⁹ 'The changing role of National Oil Companies in international energy markets', *Baker Institute Policy Report 35* (Houston 2007) p. 1.

²⁰ 'Report of IOCs' demise greatly exaggerated', *47 Petroleum Intelligence Weekly*, No. 8 (25 February 2008).

²¹ Joe Barnes & Matthew E. Chen, *NOCs and U.S. foreign policy* (Houston, The James A. Baker III Institute for Public Policy 2007) p. 3.

²² *Ibid.*

²³ In addition to the major MENA producing countries, Saudi Arabia, Iraq, Iran, Kuwait, the United Arab Emirates, Qatar, Libya, and Algeria, OPEC members also include the major producing countries of Venezuela, Nigeria, Angola, Ecuador and Indonesia (although Indonesia is a net importer of petroleum and will leave OPEC in 2008) together controlling nearly 75% of global proven oil reserves.

are therefore less in demand on the world market.²⁴ The IEA expects OPEC's spare capacity to erode to minimal levels by 2012.²⁵

Although the current high oil prices have increased international political pressure on OPEC to release more oil on the market, OPEC members have so far been reluctant to do so when oil prices were approaching \$100 per barrel once more. Only Saudi Arabia increased its production in July 2008 to calm the markets but in the September 2008 OPEC meeting it was decided to adhere to the original production quota once again. OPEC members argued that supply was meeting demand, and that the rise in prices was partly a consequence of speculation and a lack of refining capacity, not of market fundamentals.²⁶

OPEC has been very cautious in reading the market signals in order to avoid the mistake made in 1997 when the cartel released 2.5 million b/d to mitigate rising oil prices just as the Asian financial crisis surfaced. The Asia crisis slowed global economic growth which resulted in a drop in the oil price to \$10.²⁷ The current credit crisis and the expected impact on world demand are feeding the oil producing countries' reluctance to increase supply. In addition, the climate agenda that has recently gained considerable traction in OECD economies, most notably the EU, is further feeding reluctance to invest in oil production. This 'insecurity of demand' is currently withholding investment for a possible 8-10 million b/d of future medium-cost oil production in major resource-holder states.²⁸ Moreover, the OPEC member states are content with price levels at around \$100 a barrel, partly because some of the more vocal members, most notably Venezuela, need a fairly high oil price in 2008 and 2009 to maintain their external balance.²⁹

The output of major reserve holders in the MENA and OPEC countries will continue to be a complex balance between their state's, NOCs' and OPEC's objectives.³⁰ These different social and political objectives from different interconnected actors are making the amount of investment in medium-cost oil production capacity, and the eventual oil delivered to market, very uncertain. In any event, the delay between investment decisions and actual oil production will continue to constrain production growth beyond 2015. It is therefore very

²⁴ Grant Smith, 'IEA Says Lower OPEC Capacity to Keep Market "Tight"', *Bloomberg* (1 July 2008).

²⁵ King & Fritsch, *supra* n. 9.

²⁶ 'Interview Opec's Abdullah al-Badri', *47 Petroleum Intelligence Weekly*, No. 19 (12 May 2008).

²⁷ Jad Mouawad, 'OPEC to lift output modestly', *The New York Times* (12 September 2008).

²⁸ Jesse & Van der Linde, *supra* n. 17, p. 10.

²⁹ 'The Floor Price for OPEC States', *Goliath* (17 March 2008). Available at: <<http://goliath.ecnext.com/>>.

³⁰ Barnes & Chen, *supra* n. 21, p. 7.

likely that under continued (subsidized) demand growth, and the decline rates of current oil fields, the global oil market will continue to be a 'sellers' market with very limited spare capacity to compensate for sudden supply disruptions. In addition, price volatility will also increase, which could further accentuate existing geopolitical tensions about the security of supply and demand.

SHORT-TERM RISK PREMIUMS AND PRICE VOLATILITY

As a result of the continued tightness in the international oil market and a lack of spare capacity, the international oil price will be susceptible to relatively minor incidents that can have a large effect on oil prices and therefore on the consuming economies. Although the causes of disruptions in global oil supply could be as various as the locations where they occur, from natural causes, to maintenance, to violence, the tight market circumstances increase the vulnerability to risks related to producer and transit government (domestic and regional) policies. Also non-political short-term risks related to 'force majeure' incidents could trigger volatile prices and increase the insecurity of supply in global oil markets.

Force majeure: stuff can go wrong...

Force majeure is a common clause in contracts that essentially frees both parties from liability or obligations when an extraordinary event or circumstance beyond the control of the parties to the contract occurs. Oil companies can invoke 'force majeure' when accidents occur that are triggered by weather-related incidents, rebel attacks or industrial unrest. These 'force majeure' events have contributed to several of the major supply disruptions in recent history. The most recent ones are related to the rebel attacks and other problems on oil installations in Nigeria or the Nigerian offshore, reducing supplies by up to 1 million barrels per day since 2005.³¹ The impact of a supply disruption is determined by the level of inventories in consuming countries, the duration of the disruption and the spare capacity that is available on the world market.³² At the presentation of the *2007 Oil Security Report*, the IEA stated that member states held 4.1 billion barrels (or 122 days worth of imports) in oil stocks.³³

³¹ Peter Richter, 'Nigeria attacks disrupt oil flow', *Los Angeles Times* (29 June 2008).

³² IEA, *Oil supply security: emergency response of IEA countries 2007* (Paris 2007) p. 18.

³³ *Ibid.* p. 12.

Table 1. Major oil supply disruptions³⁴

Year	Incident	Supply loss (mb/d)
2008	Hurricane Gustav/Ike	0.7
2005-2008	Nigerian Delta Crisis	0.7 – 1.0
2005	Hurricane Katrina/Rita	1.5
2003	War in Iraq	2.3
2002-2003	Venezuelan Strike	2.6
2001	Iraqi oil export suspension	2.1
1991	Iraqi invasion of Kuwait	4.3
1981	Outbreak of Iran-Iraq war	4.1
1979	Iranian Revolution	5.6
1973-1974	Arab-Israeli war and Arab oil embargo	4.3
1967	Six-day war	2.0
1957	Suez crisis	2.0

As OPEC's spare capacity has dwindled from its historic peak of nearly 5 million b/d in 2000 or 4.6% of world demand to current levels of about 2.3 million b/d (2-3% of world demand), smaller and quite localised incidents in producing regions can have disproportionate consequences for the world economy. Generally speaking, three 'force majeure' incidents come to the forefront that have plagued global oil supply in recent years (see Table 1). First of all, hurricane Katrina that struck the southern coast of the United States in 2005; apart from a shut-down in crude oil production, Katrina also wreaked havoc on refining capacity on the US Gulf coast, which caused a release of product stock to compensate for refinery outages. In response, the IEA member countries released a total of 59.5 million barrels of crude oil and products from their strategic stocks on the world market.³⁵ In 2008, the impact of hurricanes Ike and Gustav is almost as large, with 700,000 barrels of production shut in (or about half of the production in that region) and three refineries, with a capacity of about 700,000 b/d, that are still closed.³⁶

³⁴ Ibid., p. 19; and CIEP analysis.

³⁵ Ibid., p. 28.

³⁶ U.S. Energy Information Administration Website: <<http://tonto.eia.doe.gov/oog/special/hurricanes/gustav.html?featureclicked=1&>>.

Another ‘force majeure’ situation is the continued unrest in the Niger Delta where rebel attacks and sabotage have severely hindered onshore oil production. Despite a rise in offshore supplies to compensate for the onshore fall in production, strikes by oil field workers have further limited production, causing a total shut-in of production of about 1 million b/d for the foreseeable future.³⁷ Strikes by oil industry employees have had dire consequences for global oil supply in the past, the prime example being the strike at Venezuela’s state oil company PDVSA in 2002-2003. Not only did the strike (aimed at the Chavez government) result in the temporary loss of about 2.6 million b/d on the world oil market, it also resulted in the laying off of about 11,000 of its experienced employees which continues to hinder the development of Venezuela’s oil production.³⁸

As shown in Table 1, most of the large supply disruptions on the global oil market were due to circumstances beyond the control of oil companies. Except for natural disasters, other ‘force majeure’ disruptions (rebel attacks, labour strikes) are all intimately related to host government policies that could cause or prevent any future supply disruptions. Especially resource-holder government domestic policies are an important factor (albeit interdependent with other factors) that limit or stimulate world oil supply.

Who owns what?: host government policies to strengthen public ownership of resources

Although host government policies can influence the development of resources through a broad range of policies (or a lack thereof, since unrest in Nigeria can be contributed to a lack of wealth distribution policies from the central government), three specific issues come to the fore when considering the opportunity for oil companies to invest in oil production in resource-holding states.

Firstly, access restrictions for oil companies to develop reserves. Currently, about 75% of proven conventional oil reserves are outside the realm of foreign direct investments. After 1991 access to global reserves temporarily increased due to the collapse of the Soviet Union and the chaotic privatization that ensued in the Russian Federation. However, as the developed OECD economies expected that states from the Former Soviet Union (FSU) would integrate into the liberalized world economy with a well functioning open and transparent oil market, they were in for an unpleasant surprise.³⁹ Since 2003, the Russian gov-

³⁷ Richter, *supra* n. 31.

³⁸ David R. Mares & Nelson Altamirano, *Venezuela’s PDVSA and world energy markets; corporate strategies, its behaviour and influence* (Houston, The James A. Baker III Institute for Public Policy 2007) p. 6.

³⁹ Van der Linde, Perlot & Hoogeveen, *supra* n. 12, p. 1.

ernment has initiated a crackdown on foreign-owned oil projects in Russia, in order to establish state energy giants that could further develop the Russian economy and society.⁴⁰ In the first months of 2008, Russian oil production has not grown for the first time since Vladimir Putin became president. Therefore, doubts have arisen as to the sustainability of oil production in Russia in the coming years. Experts point at the unwillingness of the remaining private oil companies to invest, as they build up war chests and pay out dividends to shareholders in anticipation of the government's next move. In addition, the large state oil producers are also building up war chests to fund further takeovers and are paying off debts created by takeovers in the past. Under these circumstances no funds for investment in oil production are available, especially since the government has also increased its windfall profit tax to boost its own coffers.

The uncertainty that resource nationalism has created for further investment is in the Russian case fuelled by increased taxes on oil revenues. The continued and relentless rise in global oil prices makes governments eager to increase their share of the oil revenues.⁴¹ Venezuela serves as a prime example of a major producing country that is trying to increase oil revenues despite a decline in oil production. The national assembly in Venezuela has recently imposed a new tax on the export of oil which should boost government revenues to about \$9 billion.⁴² In addition, other producing countries (like Kazakhstan) have strengthened their tax regime in order to increase the government's share of petroleum revenues.

The rising oil prices have also affected tax regimes in the upstream sectors in major consuming countries. Most notably in the United States where a fierce debate has erupted as to whether IOCs are entitled to manufacturing tax credits in the face of substantially higher oil prices. Democrats in the US Congress have started efforts to reduce these tax credits by some \$18 billion, arguing that these are no longer necessary since oil prices have risen nearly ten fold since the legislation was developed in the 1990s. Industry executives have stated that a shift in tax legislation could discourage further investment in US oil production, limiting future oil output.⁴³ The underlining message was that businesses will invest in (high-cost) oil production when they have a long-term viable busi-

⁴⁰ Harley Balzer, 'Vladimir Putin on Russian energy policy', *The National Interest* (November 2005). Available at: <<http://www.nationalinterest.org/Article.aspx?id=10884>>.

⁴¹ Alex Forbes, 'Scramble for assets goes global', *Petroleum Economist* (February 2008) p. 4.

⁴² Venezuela strengthened its export tax to about 50% levy when the Brent benchmark is at an 70 USD average, and a 60% levy when Brent prices hit an 100 USD monthly average. *Petroleum Intelligence Weekly* (21 April 2008).

⁴³ Stephen Hargreaves, 'Congress, critical of tax breaks, lays into oil execs', CNNmoney.com (1 April 2008).

ness case and a long-term predictable tax regime to match. Fiscal stability continues to be of great importance for future oil output, especially in mature producing regions where the marginal cost of an extra barrel of oil is substantially higher.

Recently producer countries have focussed on environmental policies either to minimize the environmental impact of oil production or to pursue alternative political agendas. Government policies to mitigate environmental impacts of oil production can prohibit the development of resources, or substantially increase costs to develop resources. At the same time environmental laws can be used to break up existing agreements (most notably Production Sharing Agreements). The Shakalin II example is a case in point. The lead operator in the development company, Royal Dutch Shell, was effectively forced by the Russian government to hand over its controlling share, after months of discussions over environmental ‘infractions’. However, as soon as the handover had occurred, the Russian government’s environmental concerns seem to have disappeared. In short: environmental legislation can obstruct, delay or increase the costs of investments in global oil production.

MITIGATING VOLATILITY: RISING PRICES

Short-term supply disruptions are increasingly caused by either ‘force majeure’ incidents or producer countries’ government policies. The only volatility mitigating strategies for consumer nations that could be adopted on the supply side is an even further expansion of high-cost oil production, since medium-cost oil continues to be off-limits. This will involve investments in output in reasonably stable political environments, such as tar-sand development in Canada, the Outer Continental Shelf (OCS) development in the United States, deep offshore in Brazil, or extensive (and expensive) usage of Enhanced Oil Recovery (EOR) techniques in currently producing regions such as the North Sea. However, in doing so oil companies will continue to run into a large array of interdependent factors that will facilitate or prohibit investments to increase global output. These ‘above ground’ investment risks might not affect IOCs and NOCs equally, but the aggregated global impact on the industry will be the same, i.e., higher costs, increased delays and lower global output.

Industry cycle: investing in future output, while mitigating a constrained past

To expand future oil production the petroleum industry has to gear up across the board, not only to increase drilling capacity, but also to be able to transport and

refine and to eventually sell petroleum to consumers. Since considerable time is needed to address the overall shortages in the petroleum industry, soaring costs for the use of existing equipment and expertise are a direct consequence. Most notably a lack of drilling capacity has sent prices for drilling rigs through the roof. Since 2002 the monthly rates for deepwater rigs have gone up from \$125,000 to \$600,000 for long-term contracts.⁴⁴

Despite the current high oil prices that have developed over the past few years, the global oil industry still needs to adapt after years of underinvestment, to increase global oil production. Alleviating shortages in equipment, expertise and raw materials is hampered by rising cost inflation that will continue to obstruct an expedient build-up of industry capacity. Cost inflation has risen due to the fact that the raw materials, equipment and expertise needed for the expansion of the industry's capacity are bought on an international market where the petroleum industry has to compete with other industries that need these resources as well. For example: although 75 ultra deepwater rigs have been ordered (to be delivered between 2008 and 2011), the shipbuilding industry is suffering from the same shortages in raw materials, personnel and energy that plague the construction sector as a whole. In response prices for new drilling vessels have risen from about \$100 million to about \$500 million in the last year.⁴⁵

Due to the large restructuring of the oil industries in the 1990s, an entire generation of petro-professionals was lost when they were forced to pursue careers in other sectors. To make matters worse, the number of academic departments in petro-technical areas has shrunk, reducing the number of available academic professionals even further. As a result, the current petro-workforce is ageing and in need of replacement as over half are to retire within a decade.⁴⁶ In response to the increased demand for expertise and the lack of supply thereof, global wages have increased in the petroleum industry. Currently in the United States a petroleum engineer will have a higher starting salary than an Ivy League graduate going to Wall Street (although that is under today's financial market conditions perhaps not such a big feat).⁴⁷ The global shortage in petroleum engineers has called on those countries with a surplus in graduates (i.e., China and Indonesia) to offset the need for engineers. Although engineers from other sectors are also recruited, the petroleum industry's public image is also an ob-

⁴⁴ Jad Mouawad & Martin Fackler, 'Dearth of ship delays drilling of offshore oil', *The New York Times* (19 July 2008).

⁴⁵ Ibid.

⁴⁶ Mark Anderson & Hilary Dayton, 'Human resources', Working Document of the NPC Global Oil and Gas Study (Washington D.C. 2007) p. 2. Available at: <http://downloadcenter.connectlive.com/events/npc071807/pdf-downloads/Study_Topic_Papers/23-TTG-Human-Resources.pdf>.

⁴⁷ Daniel Yergin, 'Oil has reached a turning point', *The Financial Times* (27 May 2008).

stacle to alleviate the labour shortages.⁴⁸ As a result labour costs within the petroleum industry will remain high in the future, thereby exacerbating the overall cost inflation for petroleum development.

Another contributing factor to rising cost inflation in the petroleum industry is the so-called 'credit squeeze' following the US sub prime mortgage crisis. As a result the international cost of investment capital has increased due to banks' reduced willingness to extend credit. Although this reduced willingness has not influenced the availability of credit for petroleum industries, banks do want a higher return on their capital. The international financial markets are thereby contributing to the cost inflation in the petroleum industry. As a consequence of these capacity constraints in raw material, labour and financial markets inflationary pressure on resource development will remain high for the oil industry as a whole (both NOCs and IOCs).

Pipeline infrastructure constraints: how to get oil to markets?

As a result of soaring costs, oil pipelines are also turning out to be more expensive than expected. The construction of a pipeline is a complex and capital-intensive process. The construction is undertaken by international consortia of multinational companies that finance, construct and operate the pipeline. A pipeline is capital intensive, has low flexibility (once constructed the flow of oil is unchangeable) and requires a large scale of operations.⁴⁹ In some particular cases this complexity directly obstructs the development of oil reserves, especially when combined with unwilling transit countries that seek to increase their share revenues from oil flowing through their countries.

As a prime example of continued complexity surrounding the development of oil pipelines and the consequences for oil development in a potential oil province is the CPC pipeline (operated by the Caspian Pipeline Consortium). The development of the Caspian oil basin, long touted as an important alternative for OPEC oil production on the world market, has been severely hindered by a lack of capacity to deliver oil to the world market. Despite the development of extra pipeline capacity via China and Turkey, the expansion of the main export route via Russia has remained cumbersome. The CPC pipeline that has to deliver Kazakh oil to the world market is run by a consortium, half of which consists of governments and the other half of IOCs.⁵⁰

⁴⁸ Anderson & Dayton, *supra* n. 46.

⁴⁹ R.H. Dekmejian & H.H. Simonian, *Troubled waters: The geopolitics of the Caspian region* (London 2001) p. 34.

⁵⁰ Governments: Russia (24%), Kazakhstan (19%), Oman (7%); Private Companies: Chevron (15%), ExxonMobil (7.5%), Lucarco (12.5%), Rosneft-Shell (7.5%), AGIP (2%), BG (2%), Orix (1.75%), and Kazakhstan pipeline ventures (1.75%). The Omani government has recently

The pipeline's capacity reached the targeted 560,000 b/d in 2005. An agreed increase in capacity would then expand capacity to 1,350,000–1,600,000 b/d by 2015.⁵¹ However, negotiations on the expansion of the CPC pipeline have been stalled by the Russian government. This has led the TengizChevroil consortium to postpone the additional investments to ramp up production in the Kazakh Tengiz oil field until 2008-2009.⁵² Despite some recent progress on the expansion of the CPC pipeline, the lack of export capacity has forced Kazakhstan to seek exports via the Caspian Sea into the BTC Pipeline.⁵³ These investments will take many years to materialize into export capacity and additional oil supply to world markets. The lack of infrastructure capacity and their slow development can therefore severely limit world oil supply.

Sector maturity: approaching the limits of possibilities?

The rise in oil prices has been accompanied by a steep increase in development costs. In order to manage costs increasing pressure is being exerted on existing energy infrastructure. Increasing oil prices make investments in further oil field development with additional Enhanced Oil Recovery (EOR) techniques profitable, which causes drilling platforms, pipelines and other infrastructure to be utilised for longer than they were originally designed for. As a result outages in infrastructure may more frequently hamper global oil production. The shut-down of a pipeline at BP's Prudhoe Bay oil fields in August 2006 initially resulted in the loss of about 400,000 b/d of oil supply to world markets (approx. 8% of US total oil production). Although the shut-down was overcome fairly quickly (resulting in an average loss of 27,000 b/d for the third quarter that year), it did result in BP's commitment to replace all pipelines to ensure future operations.⁵⁴ To mitigate the effects of wear and tear on supply, additional investments will have to be made to keep infrastructure running; this will increase the costs of oil production in addition to general cost inflation.

A second result of increased oil prices in conjunction with rising resource nationalism in major producing countries is the opening up of increasingly re-

announced that it would sell its share to the Russian government, increasing Russian influence but keeping the balance between public and private.

⁵¹ *CPC-brochure*, Caspian Pipeline Consortium (5 June 2007). Available at: <http://www.cpc.ru/_press/documents/cpc_a4_0303_en.pdf>.

⁵² 'Kazakhstan oil output and export data dramatize need for Trans-Caspian outlets'; online: <<http://www.kogiguk.com/News/Archive/2007/Jan/Article3044.htm>> (13 February 2007).

⁵³ *47 Petroleum Intelligence Weekly*, No. 24 (16 June 2008) p. 7.

⁵⁴ 'BP 2006 results' Press conference, 24 October 2006. Available at: <http://www.bp.com/liveassets/bp_internet/globalbp/STAGING/global_assets/downloads/B/bp_third_quarter_2006_press_briefing_transcript_q_and_a.pdf>.

mote regions (like the Arctic) to oil exploration and production by IOCs and NOCs. An example is the development of the huge (an estimated 13 billion barrels of recoverable reserves) Kashagan oil field in the Caspian Sea that must face some of the most inhospitable conditions in the world. The IOCs developing Kashagan have to face extreme offshore conditions in a landlocked sea with shifting ice, and temperatures of -35°C in the winter (and 40°C in the summer), while the reservoir itself is under extreme pressure (about 500 times the surface pressure) and filled with noxious hydrogen sulphide gas.⁵⁵ As a result of these extreme weather, geological and geographical conditions the costs of full development have recently been revised upwards to \$136 billion from \$57 billion.⁵⁶ As a result of this cost explosion the Kazakh government has increased its share in the development consortium, thereby increasing its oil revenues from an earlier stage onwards.⁵⁷ Kashagan is expected to reach a peak production of 1.5 million b/d in 2019, with early oil in 2013.

As Kashagan was discovered in 2000 and peak production will not be reached until 19 years later, it shows that the speedy development of these major reserves in difficult conditions can be extremely costly and requires considerable time-spans. The recently discovered ultra-deep offshore Tupi oilfield off the coast of Brazil was heralded as a major find. Tupi is considered to contain between 5 and 8 billion barrels of oil and part of a sub-salt complex in the Santos basin.⁵⁸ The field was discovered nearly 5,000 meters below the ocean floor in about 2,100 meters of water which makes for a total exploration depth of more than 7,000 metres. In addition, considerable finds have been announced in the Jupiter section of the Santos basin, at equal depths. Although the Brazilian NOC Petrobras considers early oil from the Tupi field to be possible by 2011, it will take considerable time to bring both fields into full production.⁵⁹

The incredible depths at which these new resources are located, the very low temperatures and the extreme pressure mean that development is made extremely difficult and expensive. The Tupi oilfield is estimated to cost anything between

⁵⁵ Guy Chazan, 'In Caspian, big oil fights ice, fumes, Kazakhs', *Dow Jones Newswire* (28 August 2007).

⁵⁶ Isabel Gorst, 'Caspian lesson for oil giants', *The Financial Times* (3 September 2007).

⁵⁷ The Kashagan Production Sharing Agreement stipulates that companies are allowed to recoup their investments before any revenue goes to the host government; hence the Kazakh government wanted to increase its share in the developing consortium to ensure more speedy revenues from oil production.

⁵⁸ 'What lies beneath: is there really an ocean of oil off Brazil?', *The Economist* (18 April 2008). Available at: <http://www.economist.com/daily/news/PrinterFriendly.cfm?story_id=11043022>.

⁵⁹ Izundu Uchenna, 'Petrobras to start Tupi oil development by 2011', *Oil & Gas Journal* (17 January 2008). Available at: <http://www.redorbit.com/news/business/1218926/petrobras_to_start_tupi_oil_development_by_2011/index.html#>.

\$100 and \$200 billion to develop.⁶⁰ The total sub-salt off-shore Campos basin development is expected to cost anything between \$600 billion and \$1 trillion.⁶¹ However, even these broad estimates are very preliminary and subject to considerable change as cost inflation might continue to rise.

As oil companies will venture into deeper and more inhospitable terrain, the technology and skills necessary to extract resources will continue to be put to the test. This will require huge-scale investment projects with multiple partners that are increasingly difficult to manage, due to their sheer size and project complexities, as is clearly exemplified in the case of Kashagan. As the petroleum industry is looking to increase world oil production it runs into a large array of obstacles that increase the price of the last barrel produced. This will raise the floor of the oil price even further, increasing the long-term oil price, but hopefully mitigating its volatility.

CONCLUSION

The various industrial, geopolitical, and financial factors described above continue to dominate, to a large extent, the availability of oil on the world market. As the 'above ground' turmoil continues to be very diverse and geographically widespread, supply is likely to remain tight for the years to come. The global oil market and economy will continue to feel the spill-over effects of local and regional short-term risks (e.g., high and volatile prices for energy and oil in particular). Due to the small, various and local nature of these crises they are very difficult to predict and to avoid.

Any serious attempt by the developed economies and other net oil consumers around the world to mitigate these risks will be futile unless spare capacity is created to make the world oil market more resilient to short-term disruptions. The available medium-cost oil needs to be unlocked and made available for the international market. To achieve this, the oil producing countries' claim for security of demand will need to be addressed. In addition, the expansion of oil production capacity can only be realized by increasing high-cost oil production, but this would also require the confidence that the oil price stays above the inflated cost levels. Of course the current crisis in the international capital markets could cause the global economy to slow down, thereby reducing the immediate pressure on oil supplies. When the resource-holding states and their NOCs

⁶⁰ Anna Driver, 'Brazil's Tupi seen a bonanza for oil service companies', *Reuters* (11 March 2008).

⁶¹ 'Petrobras in need of a capital idea', 47 *Petroleum Intelligence Weekly*, No. 39 (29 September 2008) p. 3.

look at the current slowdown of the world economy their reluctance to invest might increase. All we can hope for is that the recession can buy us time to prevent an oil crunch and that this time will be wisely used.