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Oil Sands Update

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'Silent disruption' limiting oil supply

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Recent increases in the price of oil result largely from a collision of demand growth with what might be called a "silent disruption" to world-wide supply.

Like past constrictions to the delivery of crude oil and oil products, the current phenomenon has raised prices as much by lowering expectations for future supply as by immediately removing physical volumes from the market. Unlike past disruptions, this one lowers expectations not by way of a single event, such as a war or natural disaster, but rather through a series of mostly geopolitical developments that together impede investment.

The combined effects of those developments, important among which is a surge in resource nationalism, have lowered expectations for global oil supply during 2005-10 by 2.5-4.5 million b/d (see table).

The crude price

In 2008, the cost of crude oil—combined with federal and state taxes—has accounted for 90-93% of the price of gasoline at the pump in the US (based on West Texas Intermediate prices plus 50¢/gal of federal, state, and sales taxes).

So why are crude prices so high?

Over the last 10 years, the world oil market has clearly experienced an unprecedented number of new and sustained impediments to upstream development, including unilateral contract renegotiation, nationalization, lack of investment by national oil companies, restrictive access to resources, and war and civil strife.

Many of these factors, along with technical challenges in bringing new oil fields online, have also reduced excess production capacity among members of the Organization of Petroleum Exporting Countries. At the same time, global oil demand has

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grown robustly (see figure).

When the events highlighted in the figure occur, not only does the world oil market lose existing production, but expectations on the availability of future supplies are revised downward.

A recent or perhaps recurring trend is resource nationalism, wherein host nations change the terms of their contracts with international oil companies (IOCs) that are developing indigenous oil and gas resources. Encouraged by the swift escalation of oil prices in recent years, this trend is now spreading rapidly. Venezuela's 2007 nationalization plan led to a significant decline in investments and even the expulsion and banning of ExxonMobil from the country. Foreign direct investment in 2007 declined by about 50% compared with the yearly average during 2003-06. Rising oil prices have emboldened governments to take a greater share of the revenue of projects, agreements for which were negotiated when oil prices were substantially lower. Production at Kazakhstan's 13 billion bbl Kashagan oil field was delayed for several years as the operators faced a series of technical obstacles. The delay in bringing the field into production was one of several reasons the Kazakh government gave for renegotiating the 2005 contract.

Many explanations for these actions are advanced, including that existing production contract terms do not permit a fair distribution of the good fortune of rising prices. Even in Canada and the US, investors are not immune from attempts by their respective legislative bodies to change previously agreed-upon contract terms.

Operating companies, with some notable exceptions, have had little choice but to accept these new terms to protect residual value in their projects as existing legal alternatives are either too cumbersome or present further risks to remaining operations in the host country.

The longer-term consequences of these unilateral actions are much more than a redistribution of revenue. These actions are likely to result in further

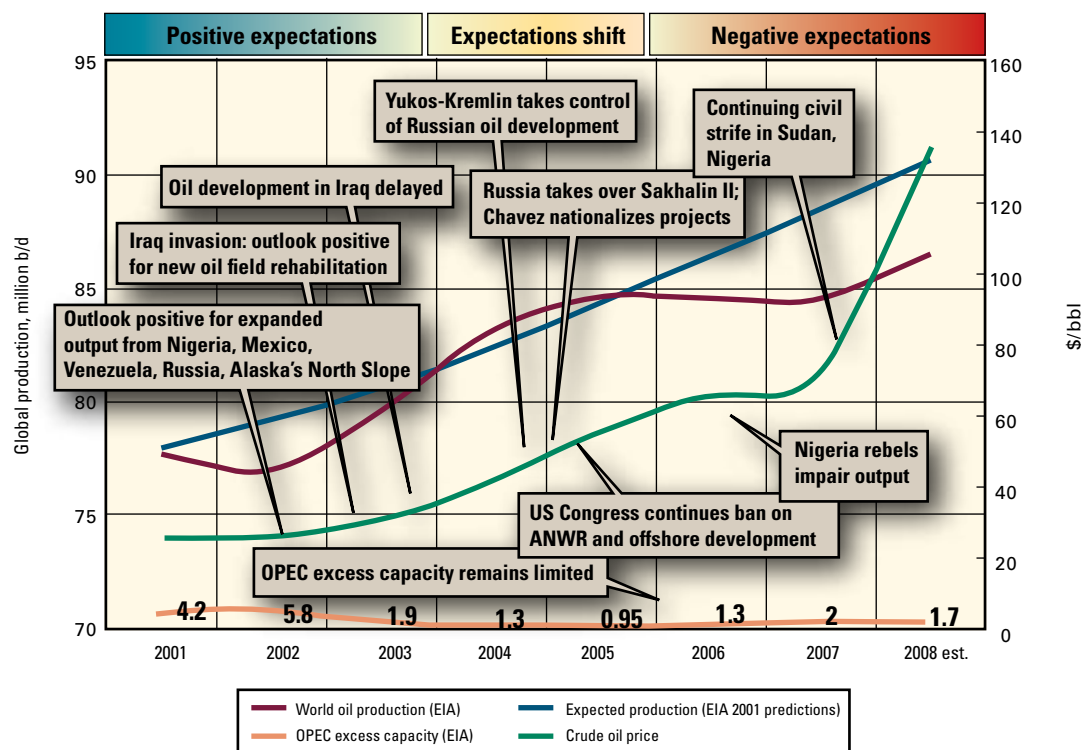
EVENTS THAT LED OIL MARKETS FROM POSITIVE TO NEGATIVE EXPECTATIONS

Country	Era of positive expectations <i>Outlook in general (but not always) is positive (1998-2004)</i>	Era of negative expectations <i>Outlook in general (but not always) is negative (after 2004)</i>	Lost production* <i>Oil market production losses between the two eras, both from base level output and expected new output</i>
Iraq	Produced 2.4 million b/d 1999-2002. The US invasion in 2003 offered promise of rapid investment in Iraqi oil sector as economic sanctions were removed.	Turmoil in Iraq drops output to 1.8 million b/d in 2003-06. Investment in field rehabilitation and new fields postponed.	Lost production between eras, 600,000 b/d, plus unrealized additional output from postponed investment and inability to perform field rehabilitation.
Nigeria	Production rose to 2.4 million b/d from 2.1 million b/d during 2000-05, with expectations of achieving up to 4 million b/d by 2010 commonly accepted prior to 2005.	Civil strife and attacks on oil infrastructure has hurt production and investment. Oil production declined in both 2006 and 2007 (2.11 million b/d) after 2.4 million b/d in 2005.	500,000-700,000 b/d due to shut-in production, political instability, and fighting, plus unrealized additional output from postponed investment.
Venezuela	In 2002 oil production surpassed 3 million b/d, and showed growth potential after several years of relatively consistent production.	A strike at yearend 2002 at PDVSA sent production into a nosedive. As of 2007 the country had recovered to slightly less than two thirds of 2002 peak production. Recent nationalization has hurt investment, furthering Venezuela's production difficulties and growth potential.	About 800,000 b/d decline in output, not restored after 2002-03 strike, plus loss of previously expected output expansion after 2007 nationalizations, due to likely fall-off in investment.
Russia	Russian production skyrocketed during 1999-2005, to 9.51 million b/d from 6.31 million b/d. Privatization of Russia's energy industry brought in western investment and more-efficient production and management methods. Output was projected at 10 million b/d by 2006 and expected to grow to 12 million b/d by 2010.	Renationalization of Russian oil companies, most notably Yukos in 2004, scared off investment and slowed production growth. Russia failed to reach 10 million b/d production as of January 2008 but has seen slight growth over the past few years. Russia's major fields in Western Siberia remain in decline; Eastern Siberia is not yet producing oil.	Near-term loss of output from renationalization 200,000-400,000 b/d. Longer term loss unknown, but could be substantial, and loss in annual output over next 10 years may be as much as 1 million b/d.
Sudan	A peace treaty signed in 2005 to end the country's civil war was expected to allow for development of previously inaccessible fields. The Sudanese government said in 2005 production would reach 600,000 b/d by 2006. Oil reserves were in the billions, rather than the previously known 560 million bbl of proved reserves.	Fighting has continued and rebel groups launched recent attacks against oil facilities in Sudan, mostly run by Chinese companies. Production has yet to reach 600,000 b/d and has fallen about 200,000-250,000 b/d short of expectations over the past few years, but grew to 570,000 in 2007. New production slow to come online as many new fields remain inaccessible due to fighting, and many western countries have launched divestment initiatives.	200,000-250,000 b/d of additional output not realized, investment outlook remains limited, and access to known reserves has declined.
Argentina	During 1991-98 Argentina's crude oil production grew by 80% to 917,000 b/d. After 2 years of slight decline, production picked up again in 2001.	During the 2 years following 2001, production remained constant. In 2004 Argentina nationalized the country's oil industry and created state oil company Enarsa. Enarsa has been poorly funded by the government.	State company, Enarsa controls all oil projects; oil production has been declining since 2004 and dropped below 800,000 b/d in 2007.
Kazakhstan	After the fall of the Soviet Union, Kazakhstan opened its borders to oil and gas exploration. A major discovery was made in the Caspian Sea of an estimated 13 billion bbl. Production from this field, Kashagan, was expected to begin in 2005 with a consortium of foreign oil companies and Kazakhstan's KazMunaiGaz.	The government has implemented several restrictions against foreign oil companies over the past several years as it seeks to strengthen control of its energy resources. It currently is renegotiating the Kashagan deal it made several years ago with the consortium of foreign oil companies.	Most of the Kashagan oil output delay is due to technical problems. Difficult to determine future loss from government-forced renegotiation of contracts, but may result in chill on investment levels for new resources.
US	Opening the Arctic National Wildlife Refuge (ANWR) to development—it has an estimated 10.4 billion bbl of crude reserves—was the major part of President George W. Bush's energy policy when he took office in 2000.	Legislation that would allow drilling in Arctic National Wildlife Refuge (ANWR) has failed to be passed by Congress. Attempts at new offshore exploration have seen similar fates. In August 2007, US courts revoked Shell's right to drill three exploration wells in the Beaufort Sea near ANWR.	Depending on when ANWR leasing would have occurred, loss in domestic production could be substantial, the exact amount is unknowable as the prospect has not been drilled, but it could be as much as 1 million b/d had leasing occurred 10 years ago.
Canada (Alberta)	Canada has the second largest crude oil reserves in the world, 179.2 billion bbl, behind only Saudi Arabia. It is estimated that about 95% of those reserves are located in Alberta's oil sands deposits.	In 2007 the Alberta government introduced new royalty rates, which will increase the government's take by an additional 15%. Alberta has already seen a loss of investment that will hinder future production in the region. In 2007, oil and gas land sales were down over 50%.	Several companies, including Canada Natural Resources, Nexen, and Imperial Oil have announced reduced investment in the area. Loss of output is unknown, but rising royalty rates likely will curtail future output growth.
Bolivia	In 1999-2006 natural gas production, a major part of Bolivia's economy, grew by nearly 400% to 466 bcf.	Nationalization of state energy resources in 2006 by President Evo Morales and the subsequent loss of foreign investment and management caused production growth to diminish. The government announced that it will be unable to meet contractual export requirements to Argentina and Brazil in 2008.	Lost production and exploration due to significant decline in investment. Loss of new production is unknown, but is likely to be substantial over the next 5 years.
Mexico	During 1995-2004 Mexican production increased to 3.85 million b/d from 3.08 million b/d. In September 2004, the EIA predicted production of 4 million b/d in 2005.	Mexico's production has been in decline since 2004. The 4 million b/d predicted for 2005 never materialized. Instead output dropped to 3.78 million b/d. Only 3.53 million b/d were produced in 2007, and 3.39 million b/d are expected to be produced in 2008. Some analysts believe Mexico's oil output has peaked, but the more serious problem is that Pemex, Mexico's state-owned oil monopoly, does not have the funds needed for exploration and development of new fields.	Much of Mexico's lost production comes from lack of funding for Pemex. Pemex's budget is subject to approval by the Mexican Congress. Pemex operates on a very tight budget, large debt service, and no legal authority to bring in outside investors. We estimate lost of Mexican supply to the world market in 2005-10 to be at 500,000 b/d and possibly more.

*Estimated loss of supplies to the world market, 2005-10, would be 2.5-4.5 million b/d. In the end, the estimate of lost production is just that, an imprecise estimate. In many respects, the lost opportunities from these unfortunate events may be more significant as producers lose opportunities to evaluate and extend new technology and gain information that could enhance future exploration in the region in question.

Sources: Energy Information Administration, USGS, Upstream Online, Oil and Gas Journal, Institute for Energy Policy (Moscow), EPRINC

EVENTS LEADING TO NEW EXPECTATIONS



reductions in investment in the exploration and development of petroleum resources, an arena in which there is a growing consensus that the industry is already “effort-constrained.”

Russia’s attempts at resource nationalism may have come at an inopportune time. Foreign investment has suffered over the past several years as its western fields are in decline. Output has now dropped for 5 months in a row, and strife at TNK-BP has intensified.

Projects that present relatively high technical thresholds, extraordinary project completion risks, and very long lead times to initial production may now be unable to attract adequate capital to go forward.

This trend in unilateral contract changes, combined with growing limitations on access to resource development, and in many cases unrealistic terms for new projects, is all adding to the so-called peak-oil problem, which is now more about constraints above the ground than below. In a kind of

perfect storm of bad luck, the resurgence in resource nationalism has been supplemented by civil strife and armed conflicts in several important producing regions in the world.

The world oil market has been subject to considerably more turmoil than that generated by the resurgence in resource nationalism—armed attacks in Nigeria and Sudan are relevant examples of the rebel activity and civil strife that have caused and continue to bring to the world reduced oil market output—and more importantly, expectations that new opportunities to expand production must be postponed.

Role of expectations

Ultimately, prices in the world oil market are set by the fundamentals of supply and demand. However, crude oil prices at any given moment reflect a wide range of considerations that go well beyond immediate conditions in the market.

Important among these consider-

ations are expectations about future conditions and events including world demand, technological advances, availability of skilled workers, accessibility of supplies, replacement cost of new supplies, technical and political risk, war, and terrorism, among others. In many cases, the immediate loss in output from any number of unexpected events has much less effect on the world market than the resulting shift in expectations about the ability to expand output over the next 5-10

years.

Major shifts in the price of crude oil since the early 1970s can be explained in part (perhaps largely) by major shifts in expectations about future output. For example, the important consequence of the 1973-74 Arab oil embargo was the structural shift in the ownership and control of the vast resources of the Persian Gulf region. The embargo, by changing expectations about future production levels from the major Middle East oil producers, brought about a sustained increase in the value of oil.

The second oil price shock, in 1979, can be seen in a similar light, as the Iranian revolution also sent a signal that the region was in for a period of instability and that the prior view that future output from Iran and Iraq would expand substantially was no longer likely. In both cases, prices were affected by changing expectations about future production levels.

The subsequent fall in oil prices in the mid-1980s can be linked to a fun-

Constraints in worldwide refining capacity

The US currently consumes about 20.5 million b/d of petroleum and produces about 8.5 million b/d, including natural gas liquids and processing gains. Its remaining supply is provided via imports of crude oil and petroleum products plus about 700,000 b/d of ethanol.

However, ethanol is not petroleum, and it presents some unique challenges to the transportation fuels division of the industry. It is relatively more expensive to transport as it has no access to the US products pipeline network, operates at two thirds the btu value of conventional gasoline, and consumes substantial volumes of transportation fuels in the production of its main feedstock, corn.

Rising world demand for transportation fuels, particularly middle distillates, have grown at a much faster rate

than additions to refinery capacity. The world refining industry, therefore, is operating at very low levels of excess capacity; furthermore, existing capacity is not well matched to the recent high growth in demand for middle distillates. This creates an environment producing periodic spikes in the price of transportation fuels. For example, US refining capacity is 4 million b/d below effective available capacity (3 million b/d below nameplate capacity). As a result, the US must import diesel fuel and gasoline components—historically 10% of consumption—from foreign refineries.

Middle distillates, including diesel fuel, have been growing at much higher rates than gasoline. Until new worldwide refining capacity is added to improve the output of middle distil-

lates, the world can expect to continue facing a market where gasoline remains heavily discounted to diesel fuel.

Although both gasoline and diesel prices are very high, the price of gasoline has been attenuated by the large volumes of coproduced gasoline components on the world oil market. As European and Asian refining centers attempt to maximize output of middle distillates, they have no choice but to also produce gasoline components which are often sold into the US market.

The decline in the value of the US dollar also has increased the cost of imports, but EPRINC is reluctant to speculate whether there is a direct causal relationship between the two. This is a complex and esoteric issue involving trade flows and monetary policy which is better addressed by analysts other than EPRINC.

damental shift in medium-term expectations about demand (as consuming countries engaged in fuel substitution and conservation) and to Saudi Arabia's becoming no longer willing to restrict output to protect the price structure.

From the 1980s until the 1999 oil price recovery, OPEC was unable to limit (or had collectively been unwilling to agree to a strategy of limiting) sufficient volumes of oil production to obtain price levels that were substantially above long run replacement costs. Part of the problem with OPEC is that it collectively does not and cannot arrive at a consensus on long-term production strategy because of the divergent long-term interests of its membership.

Prices surge

Since mid-2004 the price of oil has risen dramatically as the world oil market also has faced a perfect storm of bad luck. Resource nationalism has run rampant, harming near-term output, and shifting expectations on future production.

World oil prices initially rose to \$30/bbl from about \$10/bbl. While this was substantially above the levels experienced in the 1990s, it reflected some combination of rising demand and increased difficulty in replacing reserves as producers moved to technically more challenging environments, having produced much of the "easy" oil. The supply outlook was generally positive, with output rising to keep pace with growing global demand.

Expectations about rising investment in oil and gas development in Nigeria, Russia, Sudan, Venezuela, the US, and many other places soon turned into an environment where projects were postponed, access to resources was denied or postponed, or contract terms were changed. Within a few years, an era of positive expectations during 2000-04 evolved into an era of negative expectations, and the bad news keeps on coming.

Superimposed on this supply situation have been rising incomes in China, India, and other parts of the developing world.

In these economies, too, demand is rising rapidly for middle distillates, particularly diesel fuel.

The figure and table show the forces that have brought about much of the shift in expectations about production. Note that by early 2005 historic forecasts of production growth by the US Energy Information Administration and others were unrealized. Combined with falling OPEC excess capacity, this shrinking of expectations about future production helped drive crude oil prices upward.

Effects of disruption

The oil market is highly integrated, and a disruption somewhere in the market is a disruption everywhere.

The silent disruption described here results not from a single event but from events at several production centers. This production is missing from the market, and the subsequent higher prices are imposing substantial costs on the US economy and US consumers.

In the period described in the figure

as the “Era of positive expectations,” buyers and sellers reasonably expected that oil supplies would grow from major producing regions. These additions to output did not occur, largely because of problems above the ground and not below. The problems in the upstream market have been amplified by constraints in refining capacity (see sidebar).

Oil prices of course could be expected to rise in response to demand growth and the rising costs of new supplies. But current price increases reflect a failure of the world petroleum market to deliver new supplies from fields that could easily do so within the current (or even a lower) price structure.

US policies that have restricted opportunities to expand conventional supplies from Alaska and prospective offshore and onshore provinces in the Lower 48 have contributed to this high-price environment, along with civil strife in Nigeria, delays in new OPEC capacity, and resource national-

ism in Venezuela.

Many observers have argued that these higher prices provide benefits in the forms of demand reduction, new conservation initiatives, and acceleration of incentives for moving the US to the fuels of the future. Whether this is a cost-effective approach for the US economy depends on whether current prices are in fact approaching the long-run backstop price: i.e., the price where alternative fuels, conservation, unconventional supplies, etc., are so plentiful that the price of oil can rise only modestly if at all.

Our perspective is that the current price structure is not sustainable. But failure to provide access to conventional fuels may mean the transition to a lower and more-realistic price level may also involve unnecessary economic pain. ♦

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