



The World Bank Group

Upstream Oil and Gas: Securing Supply

Background Paper

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Summary

Steadily rising oil prices have raised questions about whether enough investments are being made in upstream oil and gas to meet rapid demand growth in emerging economies. The percentage of global petroleum reserves open to full access by all companies has declined in the last several decades and this trend is expected to continue, heightening concerns. How to strike a balance between the desire of many oil-rich countries for sovereign control on the one hand and maximizing investment efficiency and production in the long run is a challenge that merits careful consideration. Uncertainties about security of demand have been cited by petroleum producers as a barrier to greater investment. Assessment of future demand has been hampered by distortions in both petroleum and alternative fuel markets, including subsidies and other forms of government support that cannot be justified on a commercial basis or on account of poorly priced externalities. The urgent need to tackle climate change will also affect demand for fossil fuels in the coming decades. Reforms and a move to properly capture externalities that are not fully reflected in market prices today will go a long way toward better assessment of future demand as well as long-term sustainability in the energy sector.

While world economy and many other factors that affect investment levels in oil and gas are beyond the control of individual governments and investors, governments can take steps to minimize uncertainty. They include providing potential investors with access to existing geological and geophysical data; strengthening macroeconomic and fiscal stability; improving transparency and the rule of law; promoting contract stability; and signing and ratifying relevant international conventions. Minimizing policy-induced uncertainties that affect demand will also help address producers' concern about security of demand.

Advances in technology can greatly help increase supply. Capacity building in emerging petroleum producers (though these are small players on a global level) can help address concerns about sovereign control as well as proper management of petroleum resources. Public scrutiny and acceptance of petroleum wealth management will help build support for efficient operation of the sector and benefit producers in the long run.

¹ This paper is a product of the staff Oil, Gas, and Mining Policy Unit of the World Bank. The findings, interpretations, and conclusions expressed in this paper do not necessarily reflect the views of the Executive Directors of the World Bank or the governments they represent. The World Bank does not guarantee the accuracy of the data included in this work.

Introduction

World oil prices have surged since the beginning of 2004, and more recently the OPEC basket price has risen 80 percent since the beginning of 2007. Robust growth in demand for oil in emerging economies, driven in part by rapid motorization; the inability of producers to increase production at the same pace for a variety of reasons rather than mounting physical scarcity of oil in the ground; and, some argue, speculation explain the price rises in the last four years. During price downturns in the 1980s and 1990s, oil producers cut back on hiring and investment. Ancillary service companies and industry contractors scaled back or shut down in response. Reversing the current shortage of equipment and engineers takes time, the latter illustrating the need for capacity building. Many industry analysts forecast continuing high oil prices for the foreseeable future. Demand management on the consumption side, and ensuring adequate investment on the supply side to ensure efficient production, are important for balancing supply and demand as well as sustainable energy use in the coming decades. This note addresses some of the issues that should be considered in order to promote steps in upstream oil and gas that will maximize production of hydrocarbons and enhance efficiency in the long run.

Investment Access

On the supply side, there are broadly two types of investment climate: one in which every company is given full and equal access under competitive market conditions, and another in which some are given preferential treatment or exclusive rights. The latter is rising in importance. The “seven sisters,” now numbering four after consolidation—ExxonMobil, Chevron, BP, and Royal Dutch Shell—produce about 10 percent of the world’s oil and gas and hold 3 percent of reserves. The “new seven sisters,” coined by the Financial Times a year ago—Saudi Aramco, Gazprom, China National Petroleum Corporation, National Iranian Oil Company, Petróleos de Venezuela S.A., Petrobras, and Petronas—control almost one-third of the world’s oil and gas production and more than one-third of its total oil and gas reserves.¹ The new seven sisters are all fully or partially state-owned, and some have exclusive rights in their home countries. These statistics highlight changing dynamics in the global oil and gas industry.

Markets with Full Access

Where full access is given to every oil company and competitive market conditions prevail, what is increasingly referred to as governance promotes and sustains investment in a given country in the long run: transparency; legal, fiscal, and contractual frameworks that are clear, stable, in line with internationally accepted standards and practice, and strike a reasonable balance between the interests of the government and investors; and adherence to due process. Flexible fiscal and contractual terms that are responsive to project profitability will facilitate development of projects with varying risk, are less likely to lead to a situation where either the government or the contractor would want to renegotiate following large price upswings or downturns, and ultimately are likely to maximize production.

There should be unambiguous assignment of responsibilities in a petroleum sector law to different parties and, more specifically, clear separation of administrative responsibilities (given to government ministries and agencies) from the commercial operation of petroleum companies. Where there is a national oil company, its role and responsibilities should be clearly spelt out in the law.

In open markets, competitive licensing is the common practice in the industry today and enhances the chances of attracting the most qualified investors. A rigorous pre-qualification of companies is an important step. Technical and financial qualifications should be carefully examined to ensure that those invited to submit bids possess the level of competence necessary to undertake the project. Open-door licenses, which are issued as a result of individual negotiation, should generally be limited to attracting investors in risky frontier areas where competitive licensing may not be cost-effective.

That international oil companies have limited access to hydrocarbon reserves around the world has implications for future supply. The great majority of “easy oil” is out of their reach. International oil companies are forced increasingly into high-cost, high-risk investments: deep offshore, complex accumulations, and other high-cost conventional petroleum reserves, and nonconventional resources. The world has vast nonconventional resources, but production costs are higher than for conventional hydrocarbons and they also present serious environmental challenges. As a result, larger investments will be needed in the coming years for a given level of production.

Restricted Access

Some governments of hydrocarbon-rich countries have restricted access by international oil companies and reserved their petroleum resources for their own national oil companies; this interest in retaining sovereignty remains strong. National oil companies differ in size, corporate culture, constraints they operate under, benefits they enjoy, and the level of technical and managerial expertise, with some behaving no differently from international oil companies. Others do not yet have some of the technical expertise possessed by other companies. A majority of future reserves will likely be found in countries with restricted access. The issue from the point of view of ensuring supply is under what conditions restricting access is likely to adversely affect the country’s ability to develop its petroleum resources efficiently, and where restricted contractual terms are offered, whether it is possible to have terms that allow equitable sharing of risk and reward between the government and private sector companies.

To the extent that restricting access could reduce competitive pressure and full adoption of the latest advances in technology, the question is how capital and skills can best be made available without compromising the government’s sovereignty. The challenge is to create an environment whereby the oil companies that do have access still face the right incentives and the equivalent of competitive pressure which normally results in continuous efficiency improvement.

In some cases, policies restricting access present the government with the trade-off between sovereign control and availability of adequate skills. While access to adequate

financing might have been a problem in the past, that is no longer generally the case in this high-price environment (except where the national oil company depends on another part of the government for its budget).

A concern that has been expressed is that national oil companies in countries with restricted access are not investing adequately to maintain current production or expand supply capacity. In some cases there is a plan to invest, but investment targets are not met because of constraints in specialist capabilities. Failure to invest to maintain current production is almost always not a result of a policy decision but of problems in the industry or in the country at large.

To the extent that investments in increasing capacity are seen to be inadequate, more investments are generally not made because of fear of overcapacity. In the OPEC countries, it is unlikely that oil prices will fall below their cost of production. But no one wants to invest in surplus capacity that may remain shut in for years, if not decades. Not investing adequately could result in any one of the following scenarios:

- Oil prices rise further. This could even mean that not investing provides a better return than investing, or it could mean that the incremental supply capacity from the (forgone) investment would have boosted the country's petroleum revenue further (depending on the sensitivity of world oil prices to changes in global supply).
- The initial rise in energy prices leads to a global recession, lowering demand, and eventually lowering oil prices. The oil shocks of the 1970s and 1980s are generally regarded as falling in this category.
- Higher energy prices lead to more concerted efforts aimed at making alternative sources of energy economic, eventually leading to lower demand for oil and gas. This has led to expressions of concern, particularly by OPEC members, about ensuring security of demand.

Security of Demand

High oil prices and oil price volatility are harmful to the economy and damaging especially to the poor. Prospects of continuing high prices have strengthened the resolve of many governments to seek alternatives to oil and gas. Reducing dependence on oil in the transport sector presents the greatest challenge in this regard. The two options available—remaining with liquid fuels and switching to liquid biofuels or synthetic fuels made from gas, coal, or biomass; and shifting to non-liquid fuels such as gaseous fuels or electricity—require further cost reductions and technology breakthroughs for application on a wide scale.

Government Support

Bioethanol, biodiesel, and other forms of non-conventional energy are often cited as examples of alternative energy that threaten security of demand for oil. Questions about security of demand in turn are said to deter investment in upstream oil and gas. A general upward trend in world oil prices will naturally lead to a search for alternatives. The question is not whether such a search for alternative fuels is fair, but what the role of government support should be.

Government support in the form of differentiated fuel taxation, voluntary targets, or mandates (such as a minimum share of wind in power generation) should reflect externalities that are not fully captured in market prices. Local and global environmental externalities—contamination of air, water, and soil; and greenhouse gas emissions—are two obvious examples. Some areas of the energy and agriculture (in the case of biofuels) sectors benefit from distortions that could even be said to amplify, rather than properly account for, externalities. For example, direct and indirect policy-induced price distortions greatly affect the financial attractiveness of bioethanol and biodiesel production and trade. The resulting price distortions are large, and the forward and backward links with other price-distorted markets are strong, this when greenhouse gas emission benefits of biofuels are increasingly questioned.ⁱⁱ Similarly, many countries subsidize petroleum fuels, electricity, or both. Lower energy prices increase demand, although lower prices have in some cases led to unsustainable commercial operation of energy companies and rationing of energy and, in the case of liquid petroleum fuels, black markets with much higher prices. Subsidized petroleum fuel prices also lead to out-smuggling, artificially inflating demand in the subsidizing country.

These distortions in both the petroleum and alternative energy sectors make it difficult to judge their net impact on demand for oil. Uncertainties about future demand affect not only investment in upstream oil and gas, but also in refining. Because end-users consume refined products and not crude oil, what affects consumer behavior is refined product prices. To the extent that refining capacity is tight in some parts of the world—no new refineries have been built in the United States since 1976—there will be upward pressure on refined product prices. Rising construction costs, concerns that the economic growth of emerging markets may falter, and mandates for biofuels in a growing number of countries are all seen by investors to increase risks associated with investing in refining.

Against this backdrop, it is important to minimize policy-induced uncertainties and address domestic and border distortions in the energy and related markets. What is known is that these distortions all too often lead to inefficient allocation of resources, inefficient use or even waste of subsidized energy, out-smuggling, black marketeering, and other forms of commercial malpractice. Tackling and eventually eliminating these distortions, and properly accounting for externalities—ideally through differentiated taxation coupled with environmental and other regulations—remain a critical challenge in the coming decades.

Welfare Impact of Higher Prices

One consequence of the move to diversify out of gasoline and diesel to liquid biofuels is a rapid increase in the use of food crops, contributing to sharp rises in food prices—not only of maize and vegetable oils from which biofuels are made, but also of wheat which competes for cropland with maize and some oilseeds. Increased costs of production from high fertilizer and energy prices, and rapid demand growth for food in developing countries, have also contributed to food price increases. The double impact of higher food and energy prices has affected all consumers, and particularly the poor. In the face of high and volatile oil prices and rising food prices, governments are tempted to intervene

and sometimes institute bad policies. How best to develop coping strategies merits careful consideration.^{iii,iv}

Reducing Energy Intensity

Future growth in demand for oil will come largely from developing countries, especially in the transport sector where many countries are reaching or have reached the threshold per capita income level above which motor vehicle ownership rises sharply. A number of large economies in the developing world also subsidize petroleum fuels, reducing incentives for fuel conservation. Eventual phase-out of fuel subsidies will dampen demand somewhat, but that will likely be more than offset by rising income.

Governments are increasingly responding to concerns about energy security and higher energy prices with measures designed to restrain demand and reduce energy intensity—through efficient pricing, efficiency standards, and provision of affordable and attractive public transport, to mention just three examples. The countries belonging to the Organisation for Economic Co-operation and Development (OECD) have made substantial progress in reducing energy intensity in the last few decades. It is important that all countries—and especially large, non-OECD countries—continue in their efforts to achieve comparable or even greater energy intensity reductions. Aside from energy security, another driver for reducing energy intensity is climate change.

Climate Change

To the extent that high oil and gas prices are leading to steps to improve energy efficiency and demand management, policies to improve energy security also achieve climate change objectives. China, for example, has set a target of reducing energy intensity per unit of gross domestic product by 20 percent in 2006–2010 and increasing renewable energy's share of total primary energy supply from 7 percent in 2006 to 15 percent in 2020.^v

But policies for low-carbon economic growth are not perfectly aligned with policies designed purely to enhance energy security. Even if oil prices were to fall, the urgency of reducing carbon intensity remains because of serious concerns about climate change. Global policies for a lower-carbon trajectory will call for reducing the intensity of all fossil fuel use; shifting out of gas to coal in power generation in response to rising hydrocarbon prices may ease energy security concerns in the near term but will adversely affect environmental sustainability. Low-carbon growth strategies include added efforts to diversify away from fossil fuels to renewable energy. While fossil fuels will likely remain primary energy sources in the medium term, their long-term prospects will depend in part on the economic viability of carbon capture and storage technologies and of alternative renewable energy.

Enabling Role of Technology

Technical advances can be harnessed to optimize production and increase ultimate petroleum recovery. Strengthening research and development is crucial. Enhancing

recovery efficiency is one way of increasing economically recoverable reserves. Worldwide, oil recovery stands at 30–35 percent of oil in place, while industry experts are hopeful that this could be increased significantly through technical advances. Maximum reservoir contact wells, intelligent well completions, and miscible hydrocarbon gas flooding are some of the ways in which production and recovery efficiency improvements have been achieved in the industry. Increasing adoption of advanced technologies industry-wide would help strengthen supply potential.

Capacity Building

Many emerging oil producers wish to see more productive activities managed by local companies but lack engineers. Capacity building to train more local engineers would also help address the concern that the country's petroleum assets not be simply "handed over" to foreign companies. Capacity building also applies to government ministries in charge of the petroleum sector. Establishing, monitoring, and enforcing legal, fiscal, contractual, and—increasingly—environmental frameworks take skills that emerging oil producers often lack. Assistance from donors and governments of established oil producers could contribute to such capacity building.

Public Acceptance of Petroleum Revenue Utilization

There is a vast literature on whether petroleum wealth has been beneficial in the long run, and under what conditions it could result in "the paradox of plenty" rather than be a blessing. In the extreme, misuse of petroleum wealth could contribute to civil strife, and eventual disruption to the production of the very resources that gave rise to the windfall income. Disruptions to oil production in Nigeria illustrate that failure to build political consensus on how to share and spend petroleum revenue could not only disrupt the producing country's economy, but have repercussions in the global oil market at large.

Public acceptance is enhanced by transparency and consultation. To that end, more than twenty countries are participating in the Extractive Industries Transparency Initiative (EITI), a coalition of governments, companies, civil society groups, investors, and international organizations. The EITI aims to strengthen governance in resource-rich countries through the verification and full publication of company payments and government revenues from oil, gas and mining.^{vi} But management of petroleum wealth involves more than properly accounting for receipt of revenue. To address the entire chain, from production to final expenditure, the World Bank at the African Union summit in January 2008 announced "EITI ++," which builds upon the EITI by expanding it both "downstream and upstream."

Upstream of revenue collection, the EITI ++ will help equip governments to assess how best to share risk and reward and manage licensing rounds. This includes strengthening the rule of law, promoting contract stability, and other issues discussed earlier. Downstream, the EITI ++ will help governments with macroeconomic aspects: expenditure smoothing in the face of volatile and unpredictable petroleum revenue, economic diversification to reduce over-reliance on hydrocarbons, tackling appreciation of local currency (which makes exports less competitive), how much to spend now and

how much to save because of a lack of absorptive capacity, and whether to save for the time when petroleum resources are eventually exhausted. Ensuring social and environmental sustainability of natural resource development is another aspect of the EITI ++.^{vii}

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ⁱ Financial Times. 2007. "The new seven sisters: oil and gas giants that dwarf the west's top producers." March 12.

ⁱⁱ Masami Kojima, Donald Mitchell, and William Ward. 2007. "Considering Trade Policies for Liquid Biofuels." ESMAP Renewable Energy Special Report 004/07. http://siteresources.worldbank.org/INTOGMC/Resources/Considering_trade_policies_for_liquid_biofuels.pdf.

ⁱⁱⁱ Robert Bacon and Masami Kojima. 2006. "Coping with Higher Oil Prices." ESMAP 323/06. www.esmap.org/filez/pubs/372007122243_CopingWithHigherOilPrices_323-06.pdf.

^{iv} Robert Bacon and Masami Kojima. Forthcoming. "Coping with Oil Price Volatility." The World Bank.

^v Kejun Jiang, Xiulian Hu, Xianli Zhu, Amit Garg, Kirsten Halsnaes, and Qiang Liu. 2007. *Balancing Development, Energy and Climate Priorities in China—Current Status and the Way Ahead*. UNEP Risoe Centre on Energy, Climate and Sustainable Development, Roskilde, Denmark.

^{vi} www.eitransparency.org/.

^{vii} Robert B. Zoellick. 2008. "Remarks at the African Union Summit." www.worldbank.org.