

World Oil and Gas Production

In this chapter we focus on the worlds' oil and gas major producers (OPEC and Non-OPEC) from an export perspective. We detail the dominant oil companies behind world exports as well as each country's production level, reserves and capacity.

Although, conventional oil production and reserves are globally dispersed, the highest level of concentration is primarily in the Middle East. Since the 1960's, this region averages nearly 30% of total global oil production and controls 61% of world oil reserves. OPEC itself produces 43% of world oil production and controls 75% of proved oil reserves. Of the 15 countries worldwide that produced 2 mbopd or more of total liquids for export, 7 were OPEC members¹.

The Oil is Ours

Any consideration of OPEC must begin with its' importance as a reserves holder and major oil exporter. From this perspective only producers that export more than 1 mbopd to the global markets are considered (net of any imports for national refining or consumption). Net exporters play an extremely important role in satisfying demand in global markets because their oil supplies are real exports over and above their domestic needs and therefore are known sources of future oil supply.

Every move you make

Undoubtedly, every move made by OPEC gets as much headline ink, around the world, as any Central Bank decision. It is watched by the major press agencies who have assigned some of their brightest minds to cover the decisions that usually come out from the Austrian capital. Sitting permanently as an inter-governmental organization OPEC has 11 members: Algeria, Indonesia, the Islamic Republic of Iran, Iraq, Kuwait, the Socialist People's Libyan Arab Jamahiriya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates & Venezuela. The combined population of OPEC countries is just over ½ billion people and most are dependent on oil revenues for sustaining their economies. Thus, for these countries, oil is the platform for economic, social and political growth².

OPEC currently produces about 43 per cent of the world's crude oil, but that is forecast to grow to more than 50 per cent in the next quarter of a century. OPEC has 75% of the world's oil reserves and this will enable it to expand oil production to meet the growth in demand. In order to expand OPEC output, the oil industry realises the oil price needs to remain at a profitable level. Oil producers invest billions of dollars in exploration and infrastructure (drilling and pumping, pipelines, docks, storage, refining, staff housing, etc) and a new oil field can take 3-10 years to locate and develop. Commercialisation and profitability are complex issues which are dealt with in the next Chapter³.

All OPEC countries are sensitive to oil-price fluctuations because of the large contribution oil revenues make to state coffers. As one would expect high oil prices yield larger gains in revenues from oil exports; the opposite is true is also.

Before getting into the detail of major OPEC exporters of oil, it is worth mentioning the Gas Exporting Countries' Forum (GECF). This forum made up of 15 gas-producing countries was formed in Teheran, Iran, in 2001 groups Algeria, Bolivia, Brunei, Egypt, Indonesia, Iran, Libya, Malaysia, Nigeria, Qatar, Russia, Trinidad and Tobago, the United Arab Emirates and Venezuela with a view to managing global gas reserves and providing a stable and transparent energy market. Five of these countries, Russia, Iran, Qatar, Venezuela and Algeria control nearly two-thirds of the world's gas reserves and account for 42 percent of its production. The GECF has a liaison office in Qatar which is 'formulating a gas-trading model to share knowledge of supply and demand and create a level playing field in negotiations with international operators'. It is likely that the GECF will become a Gas OPEC. Russia has

offered to permanently host the organization at the most recent meeting where Equatorial Guinea and Norway are attending the Moscow meeting as observers⁴.

Graph OPEC Oil Exports by Country

Saudi Arabia

Saudi Arabia produced a daily average of 10.4 million barrels of oil in 2007 and consumed 2.15 million bopd, it therefore exported a 8.25 million bopd.

Famous for its ability to ‘swing’ world markets into ‘equilibrium’, Saudi Arabia is commonly recognized as the world’s leading oil exporter. It sits atop a quarter of world oil reserves, a fifth of international exports and more than a tenth of total world production. It has a refining capacity of 3 million barrels per day. One of the Kingdom’s goals is to maintain sufficient spare production capacity so that it can stabilize the market in a given situation. Leaving production capacity idle and therefore forfeiting revenues is commendable on the part of Saudis. Whether such ability continues to exist and averts energy crises, resulting from supply level, will be dependent on investment in refining capacity and technology.

Geology

The Saudi Geographical Survey identifies the Phanerozoic cover as the geologic range of interest for oil and gas reserves. The Phanerozoic ranges from the Saudi Arabian Paleozoic (540-250 Ma) to the Cenozoic (65 Ma to recent) and it crops out as relatively flat beds of sedimentary rocks such as sandstone, siltstone, limestone, and evaporites (salt deposits), and volcanic rocks. The youngest deposits in the region include coral limestone and unconsolidated sand, silt, gravel, and sabkhhah, which accumulated in the sand seas of the Rub al Khali and An Nafud, deposited on to dried-up lake beds, valleys (wadis) and coastlines.

Reserves

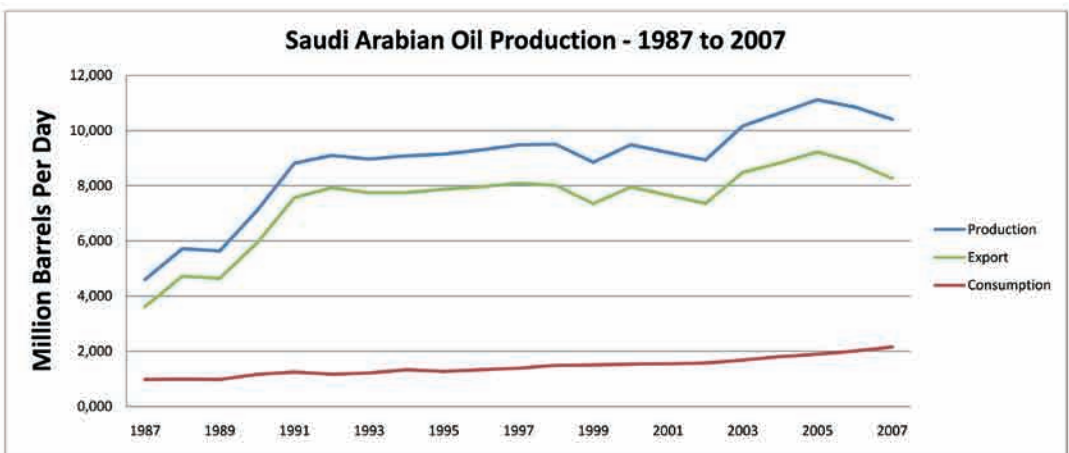
Estimates place Saudi Arabia’s proven reserves by the end of 2007 as at least 264.2 billion barrels including new finds and mega-projects listed below. This is a consensus figure based on the inclusion of probable and possible reserves based on SPE reserves criteria⁵.

Although, there has been recent speculation of a lower volume of reserves primarily due to watercut, this is a red-herring as the occurrence of increased water production and re-injection are standard reservoir conditions and secondary recovery mechanisms. This is discussed more fully in Chapter 9 Mature Fields. Based on current reserves data it is fair to day that the last barrel of oil will likely be from Saudi Arabia.

Saudi Aramco

Saudi Aramco is the modern day legacy of the Arab American Company. It is as technically sophisticated and diverse as any oil major with approximately 86 percent of its staff as Saudis and the remaining 14 percent are employees from more than 50 countries. Saudi Aramco has invested heavily in Reservoir and EP technology and runs one of the world's largest Carbonate Research Centres encompassing reservoir modelling, dynamics and visualization. Contrary to popular belief, that low-cost on-shore environments have limited technology applications, Saudi Aramco runs the latest in down-hole drilling and completions technology such as rotary steerables and high-end logging and formation evaluation tools as well as Maximum Reservoir Contact Wells. (See Chapter on Pregnant Ladies and Fishhooks) The company's flagship Research and Development Centre (R&DC) employs 350 research staff working on seismic, drilling, completion and production projects⁶.

In spite of the recent surge in its oil income, stabilization funds and foreign investments, Saudi Arabia is seeking to diversify its industrial and financial base beyond petroleum and has initiated several knowledge and industry based projects such as the King Abdullah University of Science and Technology and Jizan⁷.

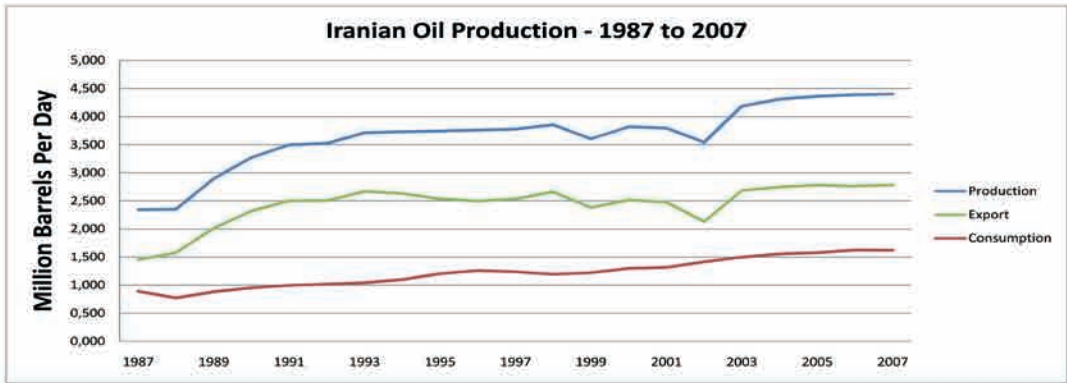


Iran

Iran produced 4.4 million barrels of oil daily through 2007. It made net oil exports of 2.78 million barrels of oil daily considering that Iranian domestic oil consumption was 1.62 million barrels daily⁸.

Iran's oil and gas sector is dominated by the National Iranian Oil Company (NIOC). Foreign companies are active in Iran and include, Gazprom, JNOC, Petronas, Hydro and Total. Oil and Gas ventures are subjected to 'buy-back' arrangements whereby

ownership is retained by the Iranian state. NIOC has made several large discoveries notably the Azadegan field which is yet to be developed and has recoverable reserves of 9 billion bbls. Other noteworthy fields include Ferdowsi (30.6 billion bbls), Moud (6.63 billion bbls), Zagheh (1.3 billion bbls), Bangestan (600 million bbls) and Kushk. Iran relies heavily on oil export revenues for approximately 80% of total export earnings and 40% of the government budget⁹.



Venezuela

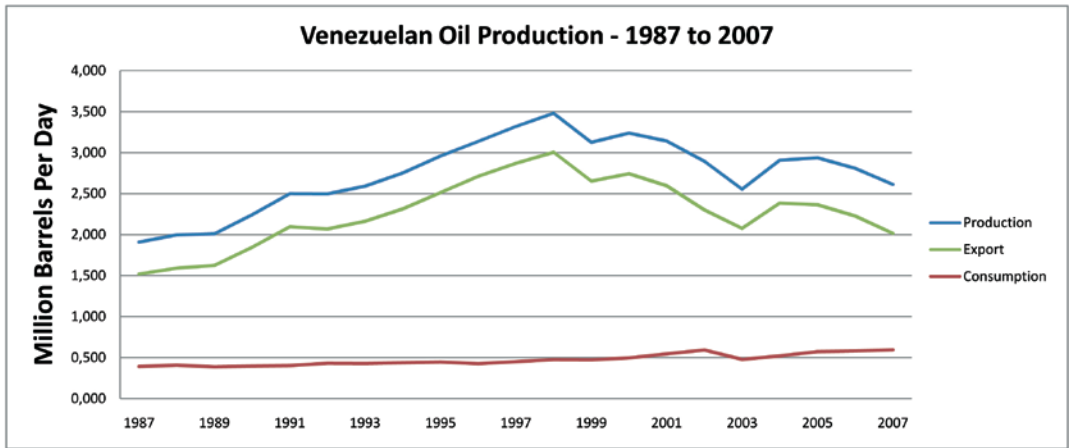
Venezuela produced 2.63 million barrels of oil per day in 2007 and consumed 596,000¹⁰ mbopd, therefore exporting 2.03 mbopd¹¹.

Petróleos de Venezuela S.A., or PdVSA is the state-owned oil company of the Bolivarian Republic of Venezuela. It is responsible for the majority of oil production in Venezuela, although IOCs such as Conoco, Chevron and Petrobras are present they must work with PdVsa.

The country is split into two oil provinces: Maracaibo in the West, and the ‘Oriente’ (Spanish for East), both of which share the same prolific source rock. Oil accumulations are found in Cretaceous limestones and in overlying Tertiary sandstones. The East Venezuela Basin is asymmetrical with a long, gently-dipping, southern flank. Oil has migrated up this flank to shallow depths where it has been weathered and generated sizeable heavy oil and bitumen deposits at depths of 500 to 1500 m along the Orinoco River¹².

Oil export revenues are important for Venezuela, as much as 45% of Government revenues come from oil¹³.

Based on company figures PdVSA aims to raise the country's crude oil production capacity to 5.5 mbd by 2010¹⁴.

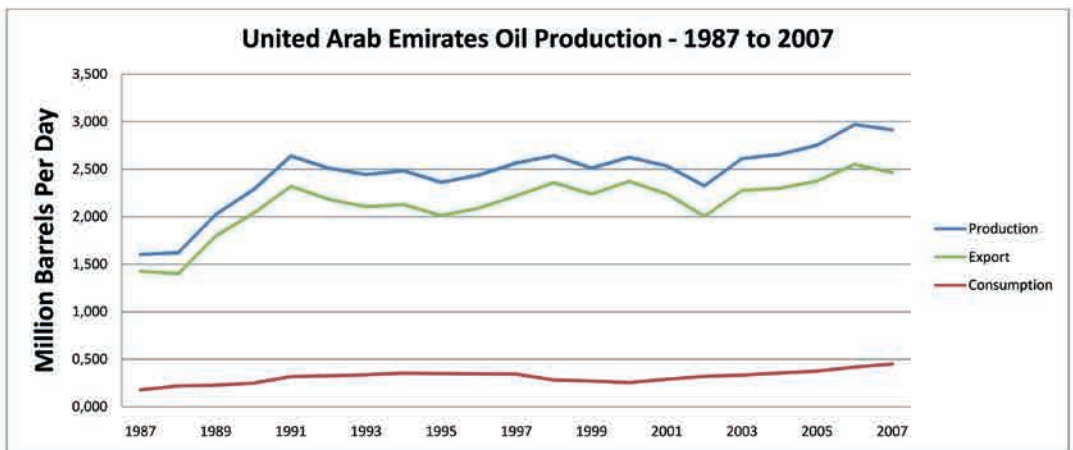


UAE

The United Arab Emirates produced 2.9 million barrels of oil per day in 2007 and consumed 0.45 mbpd therefore exporting a total of 2.45 mbpd¹⁵.

The Abu Dhabi National Oil Company (ADNOC) is the major oil and gas producer in the United Arab Emirates. It is responsible for all operations in Abu Dhabi and owns the Abu Dhabi Company for Onshore Oil Operations (ADCO) which operates in onshore and shelf waters in the Emirates.

The Company produces oil from five main fields: Asab, Bab, Bu Hasa, Sahil and Shah. The Zakum Development Company (ZADCO) is responsible for oil development and production from the Upper Zakum field. It also operates Umm Al

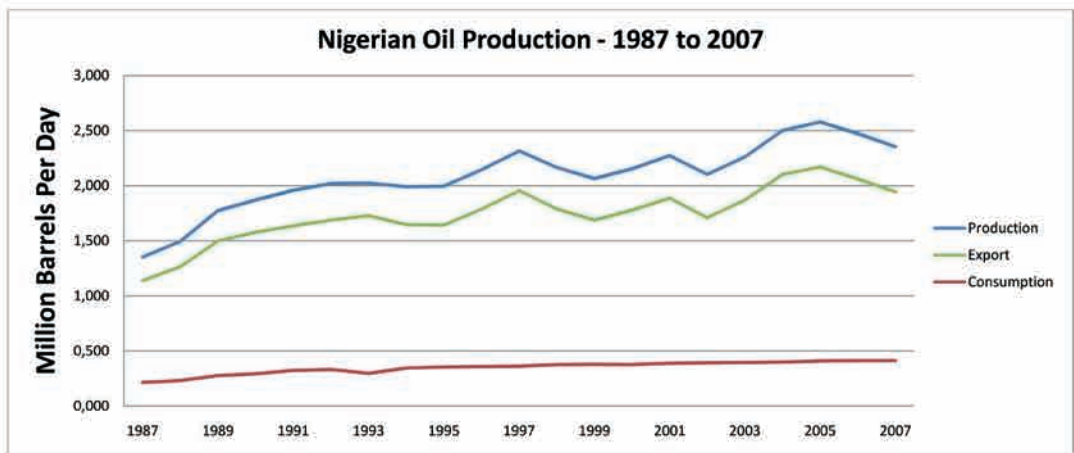


Dalkh and Satah on behalf of its partners. There is also National Drilling Company (NDC) for Onshore and Offshore Drilling. As with other OPEC countries, relatively strong oil prices and revenues in recent years have helped to significantly improve the UAE's economic, trade, and budgetary situations¹⁶.

The UAE economy is relatively diversified and is in transition from a purely oil based economy having moved increasingly towards services such as tourism, banking, re-exports, information technology, etc. Privatization has moved ahead relatively quickly, and the country has set up various Free Zones to encourage foreign trade and investment. These moves have helped to moderate the effects of fluctuating oil prices (and revenues)¹⁷.

Nigeria

Nigeria produced 2.36 million barrels of oil per day in 2007 and is estimated to have consumed 0.4 mbopd, hence exporting approximately 1.96 mbopd¹⁸.



Most of Nigeria's crude oil production, comprising 10 major crude streams (including condensate), is light sweet crude, API grades 21-45, with a low sulphur content. Nigeria's marker crudes on the International oil market are Bonny Light and Forcados. Numerous fields are known across the Niger Delta, and some of the more marginal fields have become the focus of redistribution debate favouring private local companies¹⁹.

Nigeria's oil and gas industry is funded through joint ventures (JVs), with the National Petroleum Corporation as a major shareholder and each oil company holding a share. The largest JV is operated by Shell Petroleum Development Company

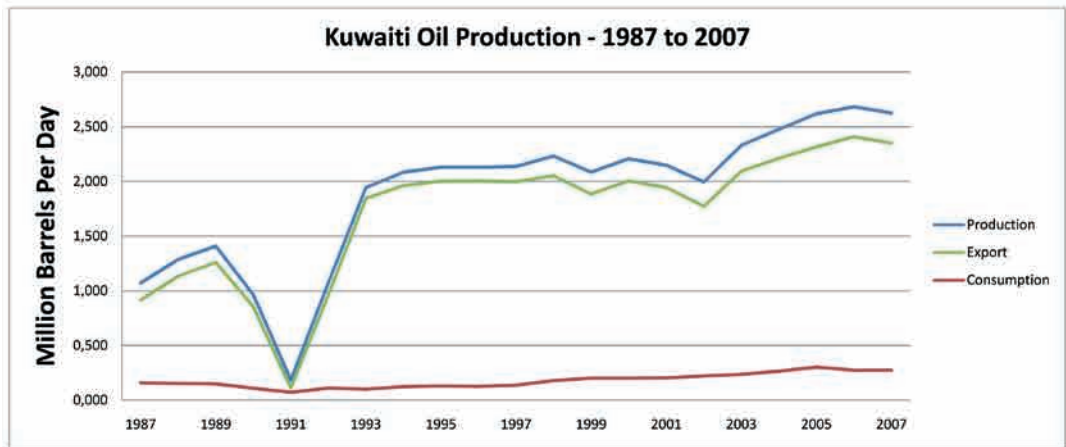
(SPDC), producing nearly half of Nigeria's crude oil, with average daily output of approximately 1.1 million barrels per day (bbl/d). Other IOC in JVs with the NPC, include ExxonMobil, Chevron, ConocoPhillips, Total and Agip. The remaining funding arrangements comprise of production sharing contracts (PSCs), which are mostly confined to Nigeria's deep offshore development program.

A number of the oil companies prospecting in the offshore blocks in the Niger Delta, have built up considerable deepwater experience in the Gulf of Mexico, and indeed in the Gulf of Guinea (particularly in Angola), and in the North Sea. Technology developments have reduced the cost of exploration and production, although profitability is reckoned at levels exceeding 5,000 barrels per day per well.

A number of major discoveries have been recorded with Shell's Bonga and Chevrans' Agbami field both estimated to hold 1 billion barrels each. These successes have turned the focus of Nigerian exploration into deep waters which remains a highly prospective area²⁰.

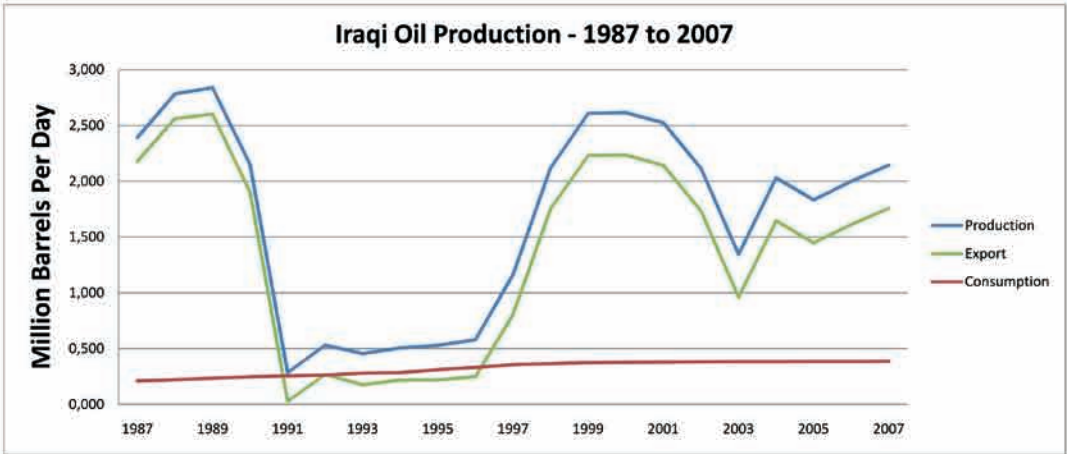
Kuwait

Kuwait produced 2.62 million barrels of oil per day in 2007 and consumed 0.28 mbopd allowing it to export 2.34 mbopd.



Kuwait Petroleum Corporation (KPC) was founded in 1980 with the Government of Kuwait as its sole owner. It owns most of the oil and gas concerns in Kuwait such as the Shuaiba, Al Ahmadi and Mina Abdulla refineries. It is a shareholder, along with BP of the Kuwait Oil Company (KOC) which produces approximately 2 mbopd. KOC aims to increase production by developing more of the country's light oil and gas reserves in the Jurassic and Paleozoic formations respectively²¹.

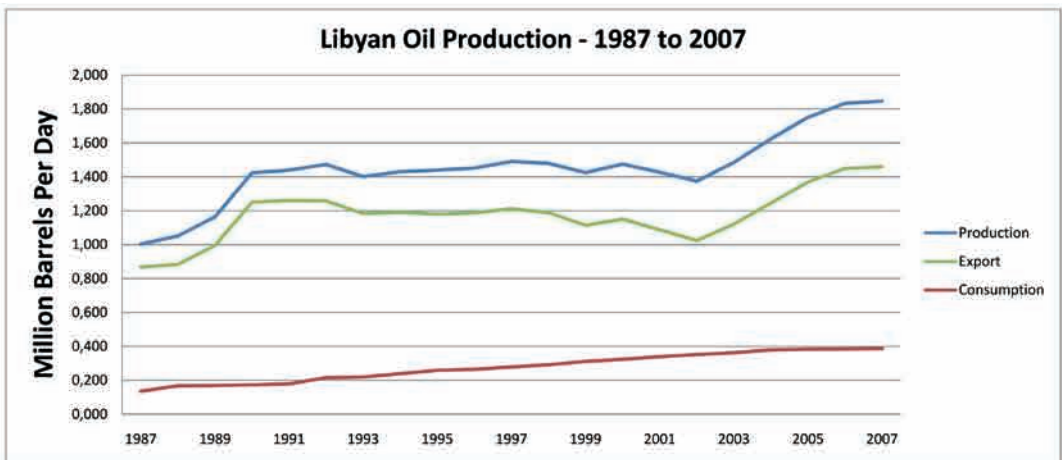
Iraq



Iraq's oil production has dropped severely since 2000 from 2.61 mbopd to a low in 2003 of 1.34 mbopd. However, Iraq's oil production has regained capacity and it is worth noting that Iraqi E&P costs are amongst the lowest in the world and given the application of commonly available technology, the country has the potential to produce at far higher levels.

During 2007, Iraq produced 2.145 million barrels of oil per day and is estimated to have consumed 0.38 mbopd. It is therefore estimated that Iraq exported 1.76 mbopd²². Iraq has 115 billion barrels of proven oil reserves, placing it third world-wide after Saudi Arabia and Iran. Oil production in Iraq is concentrated in two oilfields, Rumaila that has 663 producing wells and Kirkuk that has 337 producing wells.

Libya



Libya produced 1.85 mbopd and is estimated to consume 0.30 mbd hence exporting 1.5 mbopd in 2007²³.

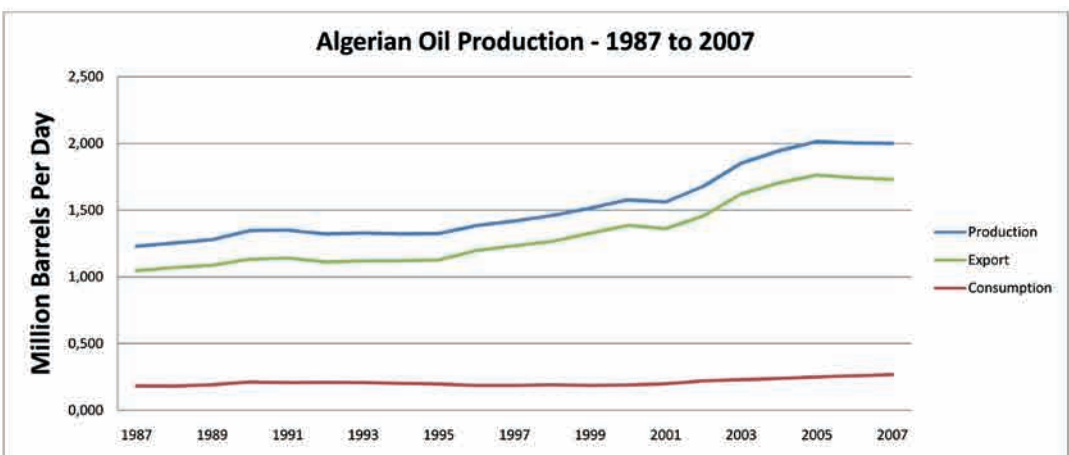
Exploration onshore is concentrated in the Sirte, Murzuq and Ghadames basins as well in the areas of Kufra and Cyrenaica.

Among Libya's largest onshore fields are the Amal Field and the Gialo field both with reserves of over 4 billion barrels of oil. Other large fields occur in the Sarir complex in southern Cyrenaica in the southeastern margin of the Upper Cretaceous-Tertiary Sirte basin which is one of the most highly productive oil-basins in North Africa²⁴.

The majority of Libya's oil and gas is found onshore in three geological trends of the Sirte Basin. In the West known fields are Samah, Beida, Raguba, Dahra-Hofra and Bahi; the north-centre of the country with the giant oilfields of Defa-Waha and Nasser and also the large Hateiba gas field and an easterly trend containing Sarir, Messla, Gialo, Bu Attifel, Intisar, Nafoora-Augila and Amal²⁵.

In early 2005, Libya held its first round of licenses with Occidental, Woodside Petroleum, the UAE's Liwa and Petrobras gaining licenses. The country continues to attract foreign investment and now has a relatively diverse EP sector.

Algeria



In 2007, Algeria produced 2.0 mbopd and consumed 0.27 mbopd leading to exports of 1.73 mbopd. Additionally Algeria is an established LNG exporter serving European and US markets.

The petroleum sector is dominated by the national oil company Sonatrach owned by the Algerian government. Through its subsidiaries, the company has a domestic monopoly on oil production, refining, and transportation. But upstream activities are open to foreign companies, which must work in partnership with Sonatrach, with the company in question usually holding majority ownership in production-sharing agreements. The most notable of which are Anadarko, BHP, BP and Repsol²⁶.

Algeria's Saharan Blend oil is a preferred sweet and light crude approximately 46 deg API. As of 2007, Algeria had 160 trillion cubic feet (Tcf) of proven natural gas reserves.

Hassi Messaoud is the country's largest oilfield and is owned by Sonatrach with average production of 0.350 mbd of sweet and light 46° API crude. The Hassi Messaoud complex is reckoned to hold 6 billion barrels and is expected to provide approximately 0.7 mbd over the next five years. Sonatrach also operates the Hassi R'Mel field, which produced 0.18 mbd of 46.1° API crude.

Anadarko produces approximately 0.5 mbd from Hassi Berkine and Ourhound fields in eastern Algeria and is also developing further assets.

Add GRAPH OPEC v Non-OPEC World Oil Production

Major non-OPEC producer countries are the United States, Russia, Mexico, China, Canada and Norway. However, the focus here should be on producers that make significant oil exports after allowing for their national consumption. For example, in 2007 the US produced 6.9 mbopd (8% of world crude oil) and China produced 3.7 mbopd (4.8% of world crude oil)²⁷. However, these countries consume far more than they produce. In 2007, oil consumption for the US was 20.7 mbopd and for China 7.89 mbopd, making these two countries the world's largest net oil importers. In the case of Canada oil produced was 3.30 mbopd and consumption was 2.30 mbopd making net exports 1.0 mbopd in 2007²⁸.

Consequently, after stripping out domestic consumption significant non-OPEC* net oil exports lie in the hands of 4 countries - Russia, 7.28 mbopd, Norway 2.34 mbopd, Mexico 1.45 mbopd and Kazakhstan 1.27 mbopd.

Considering net exports the importance of OPEC exports becomes strikingly clear as 10 of the world's major oil exporters (more than one million barrels per day) belong to OPEC a total which is roughly double of the combined Non-Opec exports^{29,30,31}.

Non Opec & Opec Major Net Exporters of Oil 2007

Non-OPEC oil production has risen in the past few years, notably from Russia which briefly displaced Saudi Arabia as the world's foremost crude oil producer in 2006 and from rising exports from Central Independent states such as Kazakhstan³². It is recognized, however, that only Saudi Arabia retains existing spare capacity to meet predicted total world oil demand growth over the next five years. Other areas such as Offshore West Africa (Angola) and Offshore East Brazil are increasing production with Brazil reaching a narrow margin of self-sufficiency in April 2006, but neither is likely to make a major impact on world oil exports over the next decade especially considering the high costs associated with these deepwater developments³³.

A wider OPEC?

It is often reported that the ripples of OPEC decisions are always most keenly felt by consumers 'at-the-pump' in importing countries. However, OPEC decisions can equally affect oil exporting countries. OPEC decisions can influence oil price changes (other things remaining equal), which can affect the revenues realized by oil exporters. This has been noted by certain non-OPEC countries which may see certain advantages of some degree of co-ordinated production policies with OPEC.

* More than one million barrels per day per country.

Russia and Norway are two examples, though they have not always actually carried out co-ordination.

While the stated volumes of non-OPEC production (or export) restrictions have usually been small, the participation of these non-member countries can lead to accentuated effects as market analysts attribute value to such actions and can lead even greater cohesion with OPEC in restricting output. In this way, the effect of wider co-ordination with OPEC policies is not often recognized. (Ref 8) High or increasing oil prices since 2000, however, have led non-OPEC to maximize production rather than restricting output. Whether intended or not, since 2000 there have been similar actions from OPEC and Non-OPEC exporters. Since 2003, Mexico, Norway, Russia, Oman, and Angola have all pushed to maintain or increase production in the high price environment. However, the peak prices of mid 2008 of USD 147 and the subsequent collapse of oil prices to USD 35 by the end of 2008 has prompted dramatic production cuts from OPEC as well as participation as an 'observer' within OPEC meetings. However, in the event no production cuts were announced by Russia.

World Oil Consumption

Of the 85.22 million bbl/d of oil consumed worldwide in 2007, OPEC countries together consumed approximately 7.6 million bbl/d, which again shows their importance in sustaining production. Of the world's top ten oil consumers in 2007, only Russia has significant net oil exports. The remaining top consumers are listed

Graph - World Oil Consumption Net Oil Imports 2007

as the world's largest oil importers, with the exception of Brazil, which reached oil self-sufficiency in April 2006³⁴.

Estimates of proven oil reserves vary but the essential fact remains that of most the world's proven oil reserves are held by OPEC. According to OPEC statistics world proven reserves are 1.15 trillion barrels of proven reserves, of which OPEC holds 0.9 trillion barrels³⁵. According to BP's statistical review world proved reserves are 1.2 trillion barrels, of which 0.9 trillion are held by OPEC³⁶ and 0.30 trillion are held by non-OPEC. According to the EIA which bases its figures on the Oil and Gas Journal, total reserves are 1.3 trillion of which 0.85 trillion are held by OPEC³⁷. The remaining reserves are split between Russian, FSU and Canada.

Non-OPEC reserves include Canadian unconventional reserves which have higher production costs³⁸. In the future, the inclusion of unconventional oil reserves for other countries may positively affect OPEC member Venezuela, as well as non-OPEC countries such as Canada, Brazil and Australia. The reserves of Non-OPEC countries are being depleted more rapidly than OPEC reserves. Non-OPEC reserves-to-production ratio - an indicator of how long proven reserves would last at current production rates - is approximately 26 years for non-OPEC. OPEC reserves-to-production is 73 years based on 2007 crude oil production rates. Combining the longer reserves life and the high net oil exports figures, it is clear to see just how important OPEC production is over the long term³⁹.

Refinery Capacity

Countries that have high petroleum demand tend to have large refinery capacities due to proximity to end consumers. Exemplifying this, the United States has the highest refinery capacity in the world, with 20% of world crude oil refinery capacity (17.59 mbopd of a total 87.91 mbopd).

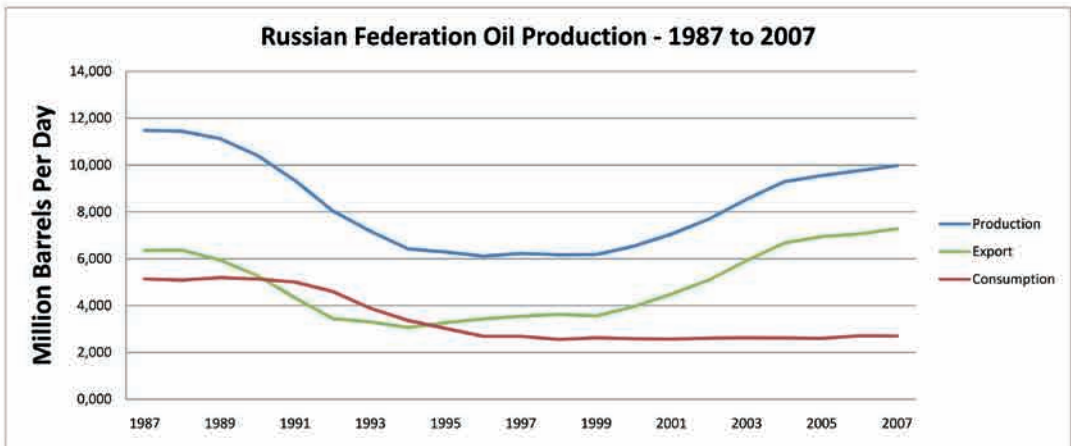
Russia's refinery capacity stands at an estimated 5.58 mbopd. Japan (4.56 mbopd) and China (7.5 mbopd) are the only remaining countries with refinery capacities exceeding 3 mbopd. (Ref 14) There are several countries that are important to world trade in refined petroleum products despite very low (or non-existent) levels of crude oil production. For instance, Caribbean nations (including U.S. and European territories) have very limited oil production (233,000 bopd in 2007), but refinery capacity of about 2.6 mbopd. Much of this refined product is exported to the United States⁴⁰.

Review of major Non-OPEC Oil Exporters

Russia

Russia produced 9.98 mbopd in 2007 and consumed 2.7 mbopd in the same period. The country therefore exported 7.28 mbopd during 2007 making it the second largest oil exporter after Saudi Arabia.

After the break-up of the Soviet Union in the early 1990s, the nature of the Russian oil industry changed dramatically. From being geographically dispersed and technically fragmented with numerous state-owned entities, the State set about vertically integrating these companies in the likeness of IOC. Behind the scenes inter-related forces were at work. Former Soviet Union states such as Kazakhstan became sovereign nations and were developing their respective oil and gas industries rapidly and independently. These FSU had succeeded in attracting and retaining oil and gas investment capital. The Russian government acted to restructure its own industry not only to attract investment but also to integrate its national oil companies so that they could compete both at home and overseas. It also acted to counter market volatility by channeling windfall oil revenues into a stabilization fund that came into effect in 2004⁴¹.



Today, several Russian oil companies compete globally and the stabilization fund is believed to be worth almost \$60 billion - approximately 7.5 percent of the country's GDP. Russian policy mirrors the resource control has been to increase the state's influence in the oil and gas industry. Taxes on oil exports have been raised significantly and private oil companies complain that the higher export taxes are hindering efficient allocation of profits into exploration and development⁴².

The decision to develop Shtokman without foreign partners is a signal as strong as any of Russia's move toward nationalization and emergence as an independent energy power. IOCs such as Chevron, ConocoPhillips, Total and Norwegian companies Statoil and Hydro were excluded from the development and this came as a surprise as it was commonly thought that partnership with a foreign company would occur, especially one with technical expertise in the harsh conditions of the Barents Sea⁴³.

Major Russian oil companies that have majority state holdings are Rosneft, Gazprom, Transneft and Rosgas. Other privately owned companies such as Lukoil are locally owned while TNK is a BP owned venture and Sakhalin Energy which is a consortium of major oil companies.

Rosneft

According to SPE criteria for the proved oil and gas reserves, Rosneft is the world's second largest oil company. Rosneft's EP efforts have been growing steadily and were strengthened by the acquisition of Yuganskneftegaz (ex-Yukos) which established the Company's proved oil and gas reserves at 21.69 billion boe in 2007 (including gas condensates and gas). Rosneft is also the world's seventh largest producer in comparison to publicly traded oil companies and Russia's second largest producer. Average daily output in 2007 was 2 mbopd⁴⁴.

Central to Rosneft's cash flow and portfolio is Yuganskneftegaz, which represents approximately two thirds of the Company's annual oil production and over 70% of its proved SPE oil reserves. Purneftegaz is Rosneft's second largest production asset with large non-associated natural gas reserves at the Kharampur field, it is likely to increase in importance as Rosneft seeks to further monetize its gas reserves. Additional exploration in the Timano-Pechora oil province and expanded export capacity at the Arkhangelsk terminal have helped Rosneft grow⁴⁵.

Rosneft holds more than a third of total Sakhalin offshore oil and gas resources, and while still at the early stages of exploration, the Sakhalin-3, Sakhalin-4 and Sakhalin-5 projects (Rosneft ownership of 49.8%, 51% and 51%, respectively). Rosneft holds a 20% stake in the Sakhalin-1 project, which is currently being developed under a Production Sharing Agreement (PSA) implemented in 1996 with ExxonMobil and Sodeco of Japan (and, since 2001, with India's ONGC). Sakhalin-1 began oil and gas production in late 2005 and is anticipated to experience substantial growth over the next several years⁴⁶.

Rosneft's also holds interests in Eastern Siberia, in the form of the Vankor field in Krasnoyarsk and with TNK-BP, the Verkhnechonsk field in the Irkutsk.

Other resources on the Black Sea shelf and Sea of Azov and the Kurmangazy structure in Kazakhstan Rosneft's could help the company's future plans for growth. Rosneft's operations changed at the end of 2004 after a US\$9.3 billion purchase of a controlling interest in Yuganskneftegaz, (formerly Yukos) one of Russia's largest oil and gas producers⁴⁷.

Gazprom

In 2007 GazpromNef't's oil production was **33 million tons**. It comprises nearly half a million shareholders with the Russian Federation controlling a majority of 50.002%. According to the company it employs some 300,000 people in different operations⁴⁸. Gazprom and its producing subsidiaries hold more than 40 oilfield exploration and development licenses in the West Siberian petroleum basin, as well as in Omsk and Tomsk in Chukotka. It acquired Sibneft which has 80% of its reserves concentrated in Noyabrsk with four large fields - Sugmutskoje, Sutorminskoje, Vyingapurovskoje and Sporyshevskoje - accounting for nearly 50% of Sibneft's reserves. Sibneft was also active in Upstream oilfield services - It is active in the Geophysical arena through OJSC Noyabrskneftegazgeophysica - a geophysical services company that offers borehole logging, perforation and seismic data preparation⁴⁹. During recent years Sibneft has spun-off several service companies that were formerly production divisions including Service Drilling Company LLC and Well Workover Service Company LLC. These service companies compete with other Russian and international drilling and service contractors, providing drilling and well work over services⁵⁰.

Gazprom - Natural Gas

Russia has the largest natural gas reserves in the world 1.58 trillion cubic feet (Tcf). Accordingly, in 2007 Russia was the world's largest natural gas producer (58.8 Bcf), as well as the world's largest exporter (16.3 Bcf)⁵¹.

However, Russia's natural gas infrastructure needs updating and it's natural gas industry has not experienced the success of its oil industry, with limited growth in gas production and consumption⁵².

Three major fields in Western Siberia--Urengoy, Yamburg, and Medvezh'ye comprise more than 70% of Gazprom's total natural gas production, but these fields are

now in decline. Although the company projects increases in its natural gas output between 2008 and 2030, most of Russia's natural gas production growth will come from independent gas companies such as Novatek, Itera, and Northgaz. Barents Sea Exploration of the Russian Barents Sea began in the 1970's and to date discoveries in the area consist of 10 significant gas and condensate fields, as well as a total of 125 identified fields or potential structures. Total reserves are estimated between 10 and 5 trillion cubic metres⁵³.

The largest deposit is the Shtokman (Shtockmanovskoye) gas and condensate field, discovered in 1988, with total reserves of 3 trillion cm, and with estimated recoverable reserves (C1+C2) of 2.5 trillion cubic m. Gazprom plans to develop the Shtokman field on its own and expects it to become the resource base for export of gas to Europe through the Nord Stream pipeline currently under construction⁵⁴. The energy resources of north-west Russia remain largely unexploited. The total hydrocarbon resources of the Russian Arctic shelf are estimated at about 100 billion tons of oil equivalent (toe). The natural gas reserves in north-west Russia form the most important strategic energy resource in the region. Estimates placed on Barents Sea reserves vary from 5 trillion cm to 2 trillion cm. In any event, these reserves offer a major supply contribution to European energy needs. In addition, it is expected that there are also oil deposits in the eastern and northern areas of the Barents Sea. Furthermore, the so-called "grey zone", formed by the sea boundary claims of Norway and Russia, is considered a promising gas or oil province Oil Resources in North-West Russia

The Timan-Pechora oil and gas region has estimated total oil resources of over 4,800 million tons, of which over 1,400 million tons is estimated to be recoverable. The Republic of Komi has 520 million tons of oil resources. Perhaps the most significant deposit found in the Pechora Sea is the Prirazlomnoye oil field, with estimated reserves of 56-62 million tons. The licence for the development of the field is held by JSC Rosshelf, and the Australian company BHP is participating in the development of this field. The exploration of Barents Sea oil resources is still at an early stage⁵⁵.

The Timan-Pechora province is considered the third most important oil producer of the Russian Federation, and there is a significant development potential in the area. If the above-mentioned oil reserves are compared world-wide, they are equivalent to Norway's North Sea reserves. However, most of the approximately 200 fields in the region are quite small. Gas reserves are rather small compared to, e.g., the Barents Sea reserves, which means that they are mainly of local importance⁵⁶.

Transneft Russia needs to expand export capacity for its oil and gas in order to monetize growing production. However, crude oil exports via pipeline are under the jurisdiction of Russia's state-owned Transneft. The Transneft system cannot meet export needs with an excess of approximately 3 million barrels of its total 7 million barrels transported by road, rail and river routes⁵⁷. This means substantial investments must be made to ensure growing levels of production can reach markets, especially foreign ones.

Several Proposed Oil Pipeline Routes and Pipeline Expansion Projects are planned including the Baltic Pipeline System (BPS) which carries crude oil from Russia's West Siberian and Timan-Pechora oil provinces westward to the newly completed port of Primorsk in the Russian Gulf of Finland (see map)⁵⁸.

Sakhalin Island

Several IOCs entered into production sharing agreements (PSAs) to develop the resources in Sakhalin Island, Okhotsk Sea. (See Chapter 8 Extreme E&P)

Oil reserves in the area are estimated at around 14 billion barrels, and natural gas reserves at approximately 2.6 Trillion cm⁵⁹.

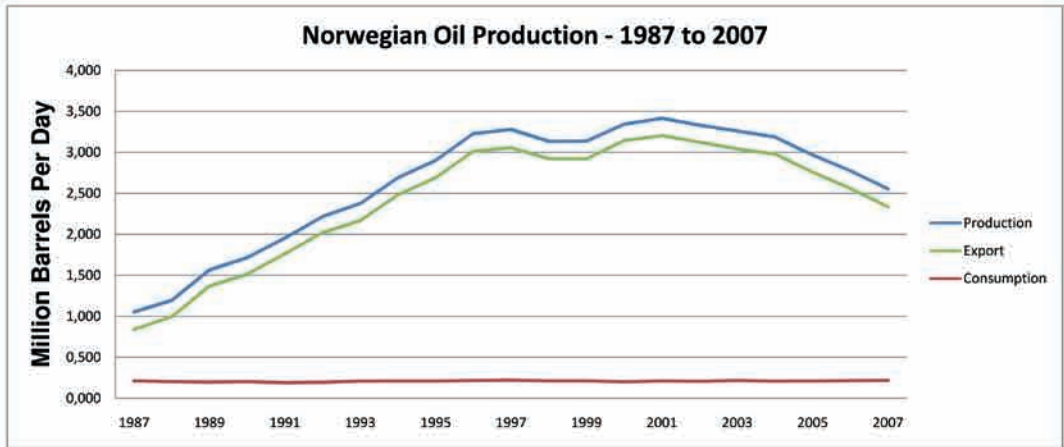
The Sakhalin I project was led by Exxon Neftegas, in conjunction with consortium members SODECO, ONGC Videsh, Sakhalinmorneftegaz, and RN Astra. The Sakhalin II project was developed by Shell, Mitsubishi, and Mitsui, and entails the development of Russia's first LNG facility, to be built on the southern tip of the island. Sakhalin II will also be used to supply natural gas to the United States, Korea and Japan in 2008. Sakhalin III-VI are North and South East of Sakhalin Island and are at the planning stages of development⁶⁰.

Norway

Norway had 8.2 billion barrels of proven oil reserves at the end of 2007, the largest in Western Europe. Norway's oil reserves are located offshore on the Norwegian Continental Shelf (NCS), which is divided into the North Sea, the Norwegian Sea and the Barents Sea⁶¹.

Oil and Gas Exports

Norway produced 2.56 mbopd in 2007 and consumed 221,000 bbl/d in the same period. The country therefore exported 2.34 mbopd during 2007. Norway has



significantly increased its Natural gas production; in 2007 it produced 8.7 bcf and consumed 0.4 bcf⁶².

The United Kingdom is the largest importer of Norway's oil and gas having imported 814,500 bopd from Norway, or 34 % of Norway's 2007 total exports.

In contrast to its maritime neighbour, the UK, Norway's government holds a dominant stake in the oil sector and controls 66.42% StatoilHydro. (The remainder of shares owned international institutional and private stockholders)⁶³.

StatoilHydro itself holds more than 80 percent of Norway's oil and gas production. Additionally, Norway's government owns approximately 40 percent of the country's total oil production through the State Direct Financial Interest (SDFI). State-owned Petoro administers these ownership interests, while Statoil is responsible for managing actual production from SDFI assets⁶⁴.

International oil companies do have a sizeable presence in the NCS, but they must act in partnership with StatoilHydro. The largest private oil producers in Norway are ConocoPhillips, ExxonMobil, and BP. Petoro is the state limited company which is responsible for managing, on behalf of the government, the State's direct financial interest (SDFI)⁶⁵.

While the state has the ownership of the SDFI's assets, Petoro acts as the licensee in production licenses, pipelines and land-based plants on behalf of the government. The primary objective of Petoro's administration of the SDFI portfolio is to achieve the highest possible income for the State. The SDFI arrangement involves the state

paying a share of all investments and operating costs in projects which corresponds to its direct financial interest. On the same terms as the other owners, the government then receives a matching share of revenues from the sale of production and other income sources.

The licensees, and in particular the operator, are responsible for developing discoveries which are made within the boundaries of a license. Should there be need for research and technology development to overcome technological challenges in developing the discovery, the tax system provides favourable conditions to ease the burden of such efforts. Relevant expenditures on research are fully deductible against the special tax and there is a special tax scheme aimed at stimulating research and development in industry (“Skattefunn”). Due to the nature of oil exploration and production in the NCS, the region has traditionally been accessible only by international oil majors. Because of harsh weather and operating conditions, projects in the NCS require sizable initial investments. Further, the structure of Norway’s petroleum taxes means that smaller, marginal fields often are not profitable. Finally, stringent environmental, safety, and labour regulations further increase operating costs⁶⁶.

Technology Development

In addition, the Ministry funds petroleum related research programs which are administered by the Norwegian Research Council. The two most important programs are called Petromaks and Demo 2000. Petromaks deal with basic and applied research and Demo 2000 covers the demonstration/application of new technology. The main aim of both programs is to increase value creation on the Norwegian Continental Shelf and to increase the export of Norwegian oil and gas technology. The Ministry has also established OG 21, “Oil and Gas in the 21st Century”, which provides overall guidance on priorities for the public research and technology programs, as well as for related activities in universities, research institutes and industry through a comprehensive national R & D strategy. The OG 21 board consists of members from oil companies, the supply industry, research institutions and academia. The implementation of the OG 21 strategy is largely based on the activities of the Petromaks and Demo 2000 programs and on joint industry projects⁶⁷.

As with any development project on the Norwegian Continental Shelf, the Ormen Lange and Snøhvit developments have been driven by commercial interests. The Ministry’s role in development projects is to coordinate the administrative procedures

and approval processes, ensuring that the projects comply with sound resource management practice, as well as balancing all interests with regard to value creation, environmental concerns and the fisheries. With regard to Snøhvit, minor tax regime adjustments were made to facilitate the development of the LNG projects⁶⁸.

Production

The bulk of Norway's oil production occurs in the North Sea, with smaller amounts in the Norwegian Sea. In 2007 LNG production of the Snøhvit field is scheduled to commence which has brought development to Hammerfest. Most of the Barents is unexplored and activity in the Barents Sea will always be subject to high costs associated with a harsh offshore area and environmental concerns as the seas have abundant fish stocks and are considered unpolluted. The Barents Sea is likely to contain oil and gas reserves, the question remains one of delineation. To this end, the Norwegian government has restarted licensing in the Barents Sea and companies such as Statoil and Norsk Hydro are looking keenly to what some consider as a new frontier for the Norwegian Petroleum Industry⁶⁹.

Exploration and Production

Norwegian oil production rose dramatically from 1980 until the mid-1990s, remained flat since then (see chart) and has now started to decline. For example, during the first 6 months of 2005, Norway's oil production averaged 2.95 mbopd, in 2007 the average figure was 2.55 mbopd. As North Sea fields continue to mature, Norwegian oil production will focus on mature fields, though it is expected that new developments in the Barents Sea will offset some of this decline.

One of the largest oil fields in Norway is the Troll complex operated by StatoilHydro. Other important fields include Ekofisk (ConocoPhillips), Snorre (StatoilHydro), Oseberg (StatoilHydro), and Draugen (Shell). ConocoPhillips, ExxonMobil and BP operate oilfields in Norway. There is a great emphasis on increasing production from existing projects, including the incorporation of smaller satellite fields that will take advantage of existing infrastructure⁷⁰.

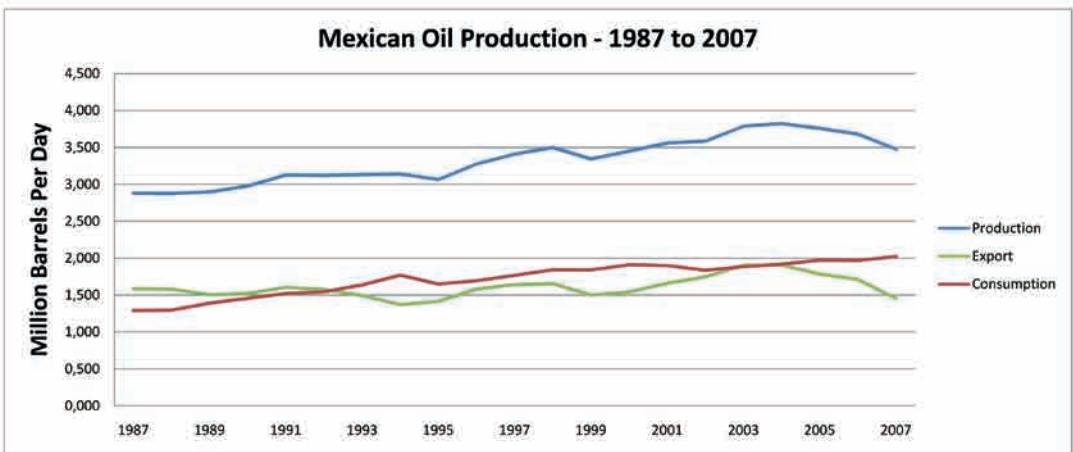
However, as is the case with the United Kingdom, many oil majors have begun to withdraw from the NCS in order to pursue projects in high-growth regions. StatoilHydro have begun to sell NCS interest in order to pursue projects in Latin America and Africa.

Mexico

Pemex (Petróleos Mexicanos) was created as a result of the 1938 Mexican President Cardenas' nationalization of the oil industry.

Today, the company is responsible for all petroleum production in Mexico which is 3.48 mbopd (2.02 mbopd consumption) and 4.5 bcf of gas production (5.2 bcf consumption). The United States is the destination of over 70% of Mexico's 1.46 mbopd exports⁷¹.

A highly prospective area for Mexico are the waters of the 'Gulf of Mexico' which to date have only been developed with the US territorial. Mexico's reservoirs are mostly high permeability limestone reservoirs while US tend to be lower permeability sandstones. This in part accounts for the higher average Pemex production well rates of approximately 6000 bopd per well. The onshore Burgos Basin on the Mexico-U.S. border shares similar gas prone characteristics with its onshore South Texas neighbours⁷².



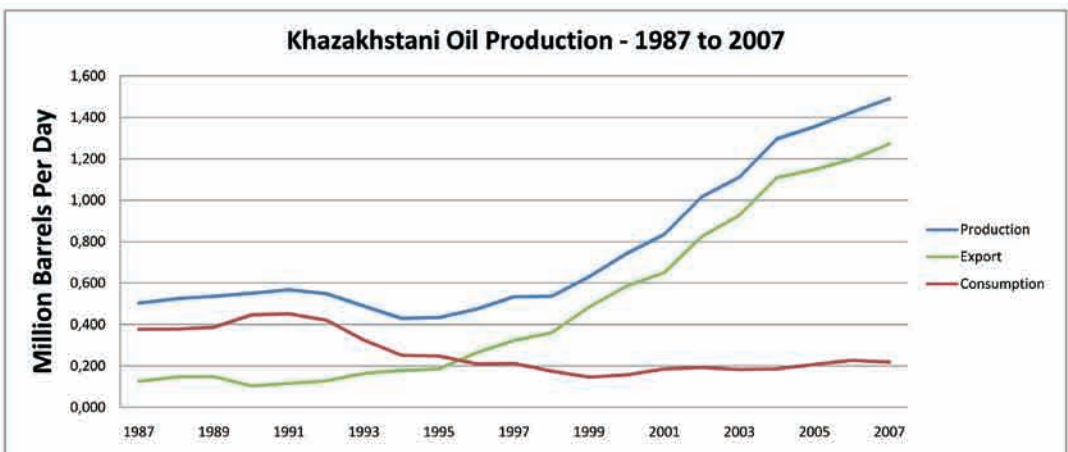
Mexico must prove its deeper GOM trends and in recent times has issued new discoveries such as Noxal. It has been said that it could be a difficult and longwinded task for Mexico to develop its own deepwater expertise; but this argument fails to recognize that many service provisions could be made by service and supply companies rather than oil companies. However, by bringing in reputed deepwater companies the best development strategies could be applied to the GOM Mexican deepwaters.

Kazakhstan

The Caspian Sea contains six separate hydrocarbon basins and has attracted much foreign investment as most of its oil and natural gas reserves are undeveloped and unexplored with notable exception of Kashagan, which is the flagship project in the North Caspian Sea. High prospectivity is the cause of interest in the Caspian Sea region but for net oil exports Kazakhstan alone is relevant. Although Azerbaijan and Turkmenistan are worth noting for future production growth⁷³.

Kazakhstan produced 1.49 mbopd in 2007 and consumed 219,000 bbl/d in the same period. The country therefore exported 1.27 mbopd during 2007.

Proven Kazakhstan oil reserves are 39.8 billion barrels (defined as oil and natural gas deposits that are considered 90% probable) and gas reserves are (67.2 Tcf). The figure for the Caspian sea is much higher but is split between several states. Kazakhstan's reserves are very much a work-in-progress as the country is relatively unexplored and untapped. Even relatively high profile Kashagan does not have any final proven oil reserves figures as it is still undergoing appraisal and exploration well drilling. After Russia, Kazakhstan was the largest oil-producing republic in the Soviet Union and has successfully attracted foreign investment in its oil sector to increase oil production to 1.49 mbopd in 2007, most of which came from two large onshore fields (Tengiz, and Karachaganak) and the offshore complex of Kashagan which is still under appraisal and first oil is not expected before 2011. The Tengiz oil field is estimated to contain recoverable oil reserves of 6-9 billion barrels. The Kashagan complex has an unitisation agreement that covers the Kalamkas, Aktoty and Kairan blocks⁷⁴. North Caspian Operating Company (partners include ExxonMobil, Shell,



Total, Eni, ConocoPhillips, Inpex and National Oil Company KazMunaiGas) is developing the Kashagan complex. The field was discovered in June 2000, when the first exploration well (KE-1) was drilled with 13 billion tonnes of oil potentially recoverable with the use of gas re-injection⁷⁵.