

COUNTRY NOTES

The following Country Notes on Crude Oil and Natural Gas Liquids provide a brief account of countries with significant oil reserves/production. They have been compiled by the Editors, drawing upon a wide variety of material, including information received from WEC Member Committees, national and international publications.

The principal international published sources consulted were:

- *Annual Statistical Bulletin 2005, 2006*; OPEC;
- *BP Statistical Review of World Energy, 2006*;
- *Energy Balances of OECD Countries 2003-2004*; 2006; International Energy Agency;
- *Energy Balances of Non-OECD Countries 2003-2004*; 2006; International Energy Agency;
- *Energy Statistics of OECD Countries 2003-2004*; 2006; International Energy Agency;
- *Energy Statistics of Non-OECD Countries 2003-2004*; 2006; International Energy Agency;
- *Oil & Gas Journal*, various issues; PennWell Publishing Co.;

- *Our Industry Petroleum*; 1977; The British Petroleum Company Ltd.;
- *Quarterly Statistics Fourth Quarter 2006*; 2007; International Energy Agency
- *Secretary General's 32nd Annual Report, A.H. 1425-1426/A.D. 2005*; 2006, OAPEC;
- *World Oil*, September 2006; Gulf Publishing Company.

Brief salient data are shown for each country, including the year of first commercial production (where it can be ascertained).

Please note that Reserves/Production (R/P) ratios have been calculated on volumetric data (barrels): owing to differential conversion factors, R/P ratios based on tonnes would not generally equate to those based on volumes.

Algeria

Proved recoverable reserves (crude oil and NGLs, million tonnes)	2 731
Production (crude oil and NGLs, million tonnes, 2005)	86.5
R/P ratio (years)	31.6
Year of first commercial production	1950

Indigenous oil reserves are the third largest in the African region, after Libya and Nigeria. The principal oil provinces are located in the central and south-eastern parts of the country, with the largest oil field being Hassi Messaoud, which was discovered in 1956. Substantial volumes of

NGLs (condensate and LPG) are produced at Hassi R'mel and other gas fields. Algerian crudes are of high quality, with a low sulphur content.

For the present *Survey*, the levels adopted are those advised by the Algerian WEC Member Committee: 12 511 million cubic metres (78.7 billion barrels) of oil in place and 3 695 million cubic metres (23.2 billion barrels) of proved recoverable oil reserves.

Algeria has been a member of OPEC since 1969 and is also a member of OAPEC. It exported about 75% of its output of crude oil (including condensate) in 2005, mainly to Western Europe and North America.

Angola

Proved recoverable reserves (crude oil and NGLs, million tonnes)	1 221
Production (crude oil and NGLs, million tonnes, 2005)	62.3
R/P ratio (years)	19.6
Year of first commercial production	1956

Proved reserves of oil (9 050 million barrels, as quoted by *World Oil*) are the second largest in sub-Saharan Africa. *Oil & Gas Journal* has recently raised its estimate (to 8 billion barrels at end-2006); the other standard published sources all quote levels close to that of *World Oil*.

The early discoveries (from 1955 onwards) were made on land, but the greater part of Angola's oil resources lies in the coastal waters of its enclave of Cabinda and off the north-western

mainland. Major discoveries have since been made in deep water locations. Offshore exploration and production activities largely escaped disruption during the long civil war, and output has risen sharply since 2001. By far the greater part of the crude produced is exported. Angola became a member of OPEC with effect from 1 January 2007.

Argentina

Proved recoverable reserves (crude oil and NGLs, million tonnes)	300
Production (crude oil and NGLs, million tonnes, 2005)	38.5
R/P ratio (years)	7.6
Year of first commercial production	1907

In terms of oil resources, Argentina lies in the middle ranks of South American countries, with a level of reserves which exceeds those of Colombia and Peru. The main oil-producing areas are the west-central areas of Neuquén and Cuyo-Mendoza, the Noroeste area near Bolivia in the north, the southern province of Chubut and the Austral area in the far south (including Argentina's portion of Tierra del Fuego). Offshore fields have been discovered in the San Jorge basin off Chubut province and near Tierra del Fuego.

Proved recoverable oil reserves at end-2005 are reported by the Secretaría de Energía as 349.1 million m³ (2 196 million barrels), a reduction of 11.4% on the end-2004 figure. Published assessments of proved reserves tend to come out slightly higher than the official level. The estimated level of additional recoverable oil

('probable reserves') is given by the Secretaría as 153.3 million m³ (964 million barrels).

Oil output rose strongly during most of the 1990s, but a decline set in at the end of the decade: production of crude oil and condensate in 2005 was down to 705 000 b/d plus about 90 000 b/d of gas plant NGLs. The Golfo San Jorge and Neuquina basins account for the bulk of oil production. A sizeable proportion of Argentinian crude is exported (25% in 2004).

Australia

Proved recoverable reserves (crude oil and NGLs, million tonnes)	225
Production (crude oil and NGLs, million tonnes, 2005)	23.3
R/P ratio (years)	10.3
Year of first commercial production	1964

Although drilling for oil took place as long ago as 1892, it was not until well after World War II that Australia achieved oil-producer status. Since then, numerous oil fields have been discovered, notably in the following areas: Gippsland Basin (Bass Strait), off Victoria; Cooper Basin, South Australia; Eromanga and Surat Basins, Queensland; Carnarvon Basin (North-west Shelf) off Western Australia; Bonaparte Basin in the Timor Sea.

According to Geoscience Australia data as at 1 January 2005, 'remaining commercial reserves' were 113.6 giga litres of crude oil and 100.8 giga litres of condensate. With the inclusion of 117.1 giga litres of naturally-occurring LPG, total

proved recoverable oil reserves amounted to 331.5 giga litres, equivalent to 2 085 million barrels or almost 225 million tonnes.

Commercially published estimates of Australian oil reserves differ considerably from Geoscience Australia's level: *Oil & Gas Journal* quotes 1 437 million barrels and *World Oil* 4 015.

The estimated additional reserves recoverable, on the basis of Geoscience Australia's estimates of reserves that have not yet been declared commercially viable (non-commercial reserves), are as follows (in giga litres): crude oil 124.2; condensate 314.9; naturally-occurring LPG 174.8, giving a total crude plus NGLs of 613.9 giga litres or 3 861 million barrels.

Production of oil (including condensate and other NGLs) has fluctuated in recent years: in 2005 it averaged 554 000 b/d, of which crude oil accounted for 58%, condensate 22% and LPG/ethane for 20%. About 50% of Australia's total oil output in 2005 was exported, mostly to Japan and other Asian destinations, the USA and New Zealand.

Azerbaijan

Proved recoverable reserves (crude oil and NGLs, million tonnes)	950
Production (crude oil and NGLs, million tonnes, 2005)	22.4
R/P ratio (years)	42.4
Year of first commercial production	1873

This is one of the world's oldest oil-producing areas, large-scale commercial production having

started in the 1870s. During World War II the republic was the USSR's major source of crude, but then decreased in importance as the emphasis moved to Siberia. Azerbaijan's proved recoverable reserves (as reported by *Oil & Gas Journal*, OAPEC and BP) stand at 7 billion barrels, unchanged from the level quoted in the 2004 Survey.

The development of Azerbaijan's offshore oil resources in the Caspian Sea, currently under way, is re-establishing the republic as a major oil producer and exporter. With new Caspian fields coming into production, oil output has risen year by year since 1998. The bulk of Azerbaijan's production is obtained offshore.

Brazil

Proved recoverable reserves (crude oil and NGLs, million tonnes)	1 591
Production (crude oil and NGLs, million tonnes, 2005)	84.7
R/P ratio (years)	18.8
Year of first commercial production	1940

Brazil's proved reserves feature significantly within the Western Hemisphere - not quite in the same league as the four largest producers (Venezuela, USA, Canada and Mexico), but greater than the sum of those in all other countries in South America apart from Venezuela. Most of the reserves located up until the mid-1970s were in the north-east and central regions, remote from the main centres of oil demand in the south and south-east. Discoveries in offshore areas, in particular the

Campos Basin, transformed the reserves picture.

The level of proved recoverable reserves of oil (1 871.6 million m³, equal to 11 772 million barrels) reported by the Brazilian WEC Member Committee corresponds with the figure for 'measured/indicated/inventoried reserves' published by the Ministério de Minas e Energia in its *Balanço Energético Nacional 2006* (BEN), and is 20% higher than that advised for the 2004 Survey. The standard published assessments of proved reserves are currently all in line with the reported level. Of the reserves reported by the Member Committee, 92.5% is located offshore.

Additional recoverable reserves, based on 'inferred/estimated reserves' in the BEN, are reported as 693.1 million m³ (equivalent to 4 359 million barrels or 589 million tonnes).

Oil production has followed a strongly upward trend for more than 10 years, reaching an average of over 1.7 million b/d in 2005, with 83% of Brazil's output being processed in domestic refineries.

Brunei

Proved recoverable reserves (crude oil and NGLs, million tonnes)	150
Production (crude oil and NGLs, million tonnes, 2005)	10.1
R/P ratio (years)	14.9
Year of first commercial production	1929

Although the earliest discoveries (Seria and Rasau fields) were made on land, virtually all

subsequent oil fields have been found in offshore waters. Proved recoverable reserves reflect the level of 1 120 million barrels quoted in the *OPEC Annual Statistical Bulletin 2005*.

There is now consensus among the main published sources that total oil reserves are of this order, *Oil & Gas Journal* having reduced its evaluation to 1 100 million (as at end-2006) from the 1 350 million at which it had stood since 1990.

There were nine offshore fields in production in 2005, together with two onshore fields: total output (including 14 000 b/d of natural gasoline) was 206 000 b/d, in line with the average for the previous five years. More than 90% of Brunei's oil output is exported, mostly to Japan, Thailand, South Korea and Singapore.

Canada

Proved recoverable reserves (crude oil, NGLs and oil sands, million tonnes)	2 106
Production (crude oil, NGLs and oil sands, million tonnes, 2005)	143.2
R/P ratio (years)	13.7
Year of first commercial production	1862

The levels of proved recoverable reserves adopted for the present *Survey* correspond with the 'Remaining Reserves as at 2005-12-31' reported by the Reserves Committee of the Canadian Association of Petroleum Producers (CAPP) in the *CAPP Statistical Handbook* (November 2006). Reserves comprise 828 million m³ of conventional crude oil, 196 million m³ of natural gas liquids (71 pentanes plus and

125 ethane/propane/butane), and 1 366 million m³ of oil sands and natural bitumen (973 'developed mining - upgraded and bitumen' and 393 'developed in-situ – bitumen').

Two provinces (Alberta and Saskatchewan) account for the bulk of western Canada's conventional crude oil reserves. The East Coast Offshore reserves hold 273 million m³ of crude oil. Most of the NGL reserves are located in Alberta.

Based on assessments by the National Energy Board (NEB), further quantities of crude oil, up to 794 million m³ and 244 million m³ of NGLs, are considered to be potentially recoverable. For northern Canada, probabilistic estimates of recoverable crude oil were made by the NEB. At the mean probability, 173 million m³ of crude oil is expected to be recoverable. Apart from the Norman Wells field in the Northwest Territories, there are no other crude oil developments.

The quantities of oil sands/bitumen included in Canada's proved reserves quoted above correspond with 'remaining established reserves' of 'developed non-conventional oil' at end-2005 published by CAPP in its *Statistical Handbook* and included by the Reserves Committee of CAPP in its 2005 Report.

'Established reserves' are defined by CAPP as 'those reserves recoverable under current technology and present and anticipated economic conditions, specifically proved by drilling, testing or production, plus that judgement portion of contiguous recoverable

reserves that are interpreted to exist, from geological, geophysical or similar information, with reasonable certainty'. 'Developed synthetic crude oil and bitumen reserves' are defined by CAPP as 'those recoverable from developed experimental/demonstration and commercial projects'.

While there is no consensus as to the precise level to include, it is standard practice to include Canadian oil sands/bitumen in compilations of proved oil reserves. The approach adopted for the present *Survey* reflects the practice of the CAPP Reserves Committee and is also broadly similar to that used by BP in its *Statistical Review of World Energy, 2006* and by *World Oil* in its annual compilation of Estimated Proven World Reserves. BP states that it includes 'an official estimate of Canadian oil sands under active development', whilst *World Oil* describes its data for Canada as comprising 'reserves that are recoverable with current technology and under present economic conditions'. These descriptions accord closely with the WEC definition of proved recoverable reserves.

In 2005, output of conventional crude was 217 000 m³/d, that of NGLs 102 000 m³/d and production from oil sands 158 000 m³/d. Conventional light crude oil has been declining in production for a number of years and conventional heavy crude oil is expected to show a production decline after 2007.

Canada is the world leader in the production of oil from deposits of oil sands. The estimated ultimately recoverable resource from this 'newly

conventional' supply is 55 billion cubic metres, second only to Saudi Arabia - see the chapter on Natural Bitumen.

Chad

Proved recoverable reserves (crude oil and NGLs, million tonnes)	222
Production (crude oil and NGLs, million tonnes, 2005)	9.3
R/P ratio (years)	23.8
Year of first commercial production	2003

The West African republic of Chad joined the ranks of the world's crude oil producers in July 2003, after the construction of a 1 070 km export pipeline from the oil fields in the Doba Basin of southern Chad through Cameroon to a new terminal at Kribi. The development of the Doba Basin fields (Bolobo, Komé and Miandoum) and the pipeline is handled by a consortium consisting of ExxonMobil (40%), Petronas, the Malaysian state oil company (35%), and ChevronTexaco (25%).

In 2002 recoverable reserves were stated by Esso Exploration & Production Chad, Inc. to be 'slightly more than 900 million barrels'. For the purpose of the present *Survey, Oil & Gas Journal's* estimate of 1 500 million barrels as at end-2005 has been adopted for proved reserves, as further fields have been developed and are being brought into production.

The oil offered for export is called Doba Blend. Initial supplies were typically of 24.8° API and 0.14% sulphur; after March 2004, when the

Komé field came on-stream, the blend's characteristics moved to a lower gravity (20.5° API) and a slightly higher sulphur content (0.16%).

China

Proved recoverable reserves (crude oil and NGLs, million tonnes)	2 212
Production (crude oil and NGLs, million tonnes, 2005)	180.8
R/P ratio (years)	12.2
Year of first commercial production	1939

The first significant oil find was the Lachunmia field in the north-central province of Gansu, which was discovered in 1939. An extensive exploration programme, aimed at self-sufficiency in oil, was launched in the 1950s; two major field complexes were discovered: Daqing (1959) in the north-eastern province of Heilongjiang and Shengli (1961) near the Bo Hai gulf.

As the Chinese WEC Member Committee was unable to contribute any data for the present *Survey*, oil reserves are based upon published material. The major sources appear to be approaching a degree of consensus: *World Oil*, OPEC and BP all quote a level in the vicinity of 16 billion barrels, whilst *Oil & Gas Journal* has reduced its estimate from 18.25 billion at end-2005 to 16 billion at end-2006. OAPEC quotes 18.25, possibly echoing OGJ's earlier figure.

China's oil reserves are by far the largest of any country in Asia: oil output is on a commensurate scale, with the 2005 level accounting for about

40% of the regional tonnage. China exported 8.1 million tonnes of its crude oil in 2005.

Colombia

Proved recoverable reserves (crude oil and NGLs, million tonnes)	197
Production (crude oil and NGLs, million tonnes, 2005)	27.0
R/P ratio (years)	7.3
Year of first commercial production	1921

Initially, oil discoveries were made principally in the valley of the Magdalena. Subsequently, other fields were discovered in the north of the country (from the early 1930s), and in 1959 oil was found in the Putamayo area in southern Colombia, near the border with Ecuador. More recently, major discoveries have included the Caño Limón field near the Venezuelan frontier and the Cusiana and Cupiagua fields in the Llanos Basin to the east of the Andes. However, the remaining proved reserves have been shrinking since 1992, and are now at a very low level in relation to production (R/P ratio of only 7.3), on the basis of data published by the Unidad de Planeación Minero Energético (UPME) of the Ministerio de Minas y Energía, in its *Boletín Estadístico 1999-2005*. UPME remarks that oil reserves decreased at an average rate of 7.4% per annum between 1998 and 2005, owing largely to declines in the Caño Limón and Cusiana fields. However, it has high hopes of finding further reserves, with the promotion of new areas on the part of the state company Ecopetrol and the Agencia Nacional de Hidrocarburos.

Colombia's oil production grew strongly between 1994 and 1999, increasing by about 80% over the period: 2000, however, displayed a sharp contraction, and output has continued to fall year by year.

Congo (Brazzaville)

Proved recoverable reserves (crude oil and NGLs, million tonnes)	269
Production (crude oil and NGLs, million tonnes, 2005)	13.1
R/P ratio (years)	20.6
Year of first commercial production	1957

The proved recoverable reserves shown above reflect the end-2005 level of 'proven crude reserves' (1 905 million barrels) published by *World Oil* in September 2006. By way of contrast, *Oil & Gas Journal* had reported a constant level of 1 506 million barrels of proved oil reserves for over ten years up to and including end-2005, but its most recent assessment gives a figure of 1 600 million for end-2006.

After becoming a significant oil producer in the mid-1970s, Congo (Brazzaville) is now the fourth largest in sub-Saharan Africa. Most of the fields in current production are located in coastal waters. The average quality of oil output has improved over the years, aided by the coming on-stream of Elf's deep-water Nkossa field. The bulk of oil production is exported.

Denmark

Proved recoverable reserves (crude oil and NGLs, million tonnes)	170
Production (crude oil and NGLs, million tonnes, 2005)	18.4
R/P ratio (years)	9.3
Year of first commercial production	1972

Denmark's proved recoverable reserves are the fourth largest in Europe (excluding the Russian Federation). The Danish Energy Authority (DEA) does not employ the terms 'proved' and 'additional' reserves, but uses the categories 'ongoing', 'approved', 'planned' and 'possible' recovery. The figure for proved reserves (203 million m³ or 1 277 million barrels) reported by the DEA to the Danish WEC Member Committee has been calculated as the sum of 'ongoing' and 'approved' reserves, while the figure for additional reserves has been calculated as the sum of 7 million m³ 'planned' reserves and 47 million m³ 'possible' reserves. The reserve numbers are the expected values in each category.

All the oil fields discovered so far are located in the North Sea. Out of 23 fields or areas with reserves in the ongoing/approved category, four (Dan, Gorm, Halfdan and South Arne) account for 83% of the total volume.

Assuming an average future recovery factor of 24%, the proved amount in place corresponding

to the ongoing/approved reserves of 203 million m³ is 846 million m³ (approximately 5.3 billion barrels); beyond these quantities is an estimated additional amount in place of 146 million m³ (918 million barrels), of which 54 million m³ (340 million barrels) is deemed to be recoverable.

The principal fields in production in 2005 were Halfdan, Dan, South Arne, Gorm and Skjold, which together accounted for 80% of national oil output. About three-quarters of Danish crude is exported, chiefly to other countries in Western Europe.

Ecuador

Proved recoverable reserves (crude oil and NGLs, million tonnes)	719
Production (crude oil and NGLs, million tonnes, 2005)	27.6
R/P ratio (years)	26.1
Year of first commercial production	1917

The early discoveries of oil (1913-1921) were made in the Santa Elena peninsula on the south-west coast. From 1967 onwards, numerous oil fields were discovered in the Amazon Basin in the north-east of the country, adjacent to the Putamayo fields in Colombia: these eastern (Oriente) fields are now the major source of Ecuador's oil production.

The level of proved reserves shown above has been derived from *World Oil's* end-2005 figure of 5 145 million barrels, as the corresponding level (4 630) reported by *Oil & Gas Journal*, the previous data source for Ecuador, appears low

in comparison with *World Oil* and other published sources (OPEC 5 060; BP 5 100).

Ecuador's oil output was running at a record level in 2005, with crude oil averaging 532 000 b/d over the year, plus a small amount of NGLs. About 70% of crude production is exported, the rest being refined locally.

Egypt (Arab Republic)

Proved recoverable reserves (crude oil and NGLs, million tonnes)	495
Production (crude oil and NGLs, million tonnes, 2005)	33.9
R/P ratio (years)	14.7
Year of first commercial production	1911

Egypt has the sixth largest proved oil reserves in Africa, with over half located in its offshore waters. According to the Egyptian WEC Member Committee, Egypt's crude oil reserves were 2.9 billion barrels (408 million tonnes) at the end of 2005, together with 0.8 billion barrels (87 million tonnes) of NGLs (condensates and LPG). The main producing regions are in or alongside the Gulf of Suez and in the Western Desert.

Egypt is a member of OAPEEC, although crude oil exports account for only about 3% of its production, having fallen considerably in recent years. Total oil output (including condensate and gas-plant LPGs) has been gradually declining in recent years. In 2005 crude oil production was 28.5 million tonnes (554 000 b/d), condensate production was 4.2 million tonnes (104 000 b/d), and LPGs from gas-processing plants amounted to 1.2 million tonnes (38 000 b/d).

Equatorial Guinea

Proved recoverable reserves (crude oil and NGLs, million tonnes)	245
Production (crude oil and NGLs, million tonnes, 2005)	17.6
R/P ratio (years)	13.9
Year of first commercial production	1992

The Alba offshore condensate field was discovered in 1984 near the island of Bioko, a province of Equatorial Guinea, by the American company Walter International. In 1996, four years after Alba was brought into production, Mobil and its US partner United Meridian began producing from Zafiro, another offshore field. Output built up rapidly in subsequent years: crude oil production in Equatorial Guinea averaged some 355 000 b/d in 2005.

For the purposes of the present *Survey*, the level of proved reserves published by *World Oil* (1 805 million barrels) has been adopted; *Oil & Gas Journal* has increased its assessment from 12 million barrels at end-2005 to 1 100 million at end-2006.

Gabon

Proved recoverable reserves (crude oil and NGLs, million tonnes)	294
Production (crude oil and NGLs, million tonnes, 2005)	11.7
R/P ratio (years)	25.1
Year of first commercial production	1961

Extensive oil resources have been located, both on land and offshore. In terms of proved recoverable reserves, Gabon ranks third largest in sub-Saharan Africa. The level of proved recoverable reserves adopted for the present *Survey* is that quoted by *World Oil* (2 146 million barrels). *Oil & Gas Journal* retained a level of 2 499 million barrels from 1997 to 2005, but reduced it to 2 000 million at end-2006.

Gabon was a member of OPEC from 1975 to 1995, when it withdrew on the grounds that it was unfair for it to be charged the same membership fee as the larger producers but not to have equivalent voting rights.

In recent years over 90% of Gabon's oil output has been exported, mainly to the USA.

India

Proved recoverable reserves (crude oil and NGLs, million tonnes)	786
Production (crude oil and NGLs, million tonnes, 2005)	36.3
R/P ratio (years)	21.7
Year of first commercial production	1890

Within a proved amount in place of 1 652 million tonnes, the amount of proved recoverable reserves (as at 1 April 2005) reported for this *Survey* is 786 million tonnes, of which 410 million tonnes is located offshore. Onshore reserves have risen by 13.3% from the 332 million tonnes (as at 1 April 2002) reported for the 2004 *Survey* to 376 million tonnes, whereas offshore reserves are virtually unchanged. Data

for 1 April 2006 published by the Ministry of Petroleum & Natural Gas show further growth in onshore reserves to 387 million tonnes and a sharp drop in offshore, down 10% to 369 million tonnes.

For more than 60 years after its discovery in 1890, the Digboi oil field in Assam, in the northeast of the country, provided India with its only commercial oil production: this field was still producing in 2005, albeit at a very low level. Since 1960 numerous onshore discoveries have been made in the western, eastern and southern parts of India; the outstanding find was, however, made in offshore waters in 1974, when the Mumbai High oil and gas field was discovered. In 2005-2006 offshore fields provided almost 65% of national oil output.

Total production of oil (including gas-plant liquids) has fluctuated in recent years within a range of 36-38 million tonnes per annum. In 2005, India produced (in million tonnes) 32.5 crude oil, 1.4 natural gasoline and an estimated 2.4 gas-plant LPG, all of which was used internally.

Indonesia

Proved recoverable reserves (crude oil and NGLs, million tonnes)	570
Production (crude oil and NGLs, million tonnes, 2005)	54.0
R/P ratio (years)	10.6
Year of first commercial production	1893

The first commercial discovery of oil was made in north Sumatra in 1885; subsequent

exploration led to the finding of many more fields, especially in southern Sumatra, Java and Kalimantan.

Proved recoverable reserves at end-2005 have been based on published data, and reflect the consensus view of *Oil & Gas Journal*, OAPEC, OPEC and BP, at a level of 4 300 million barrels. *World Oil*, while ostensibly excluding NGLs, quotes a significantly higher figure at 5 025 million barrels.

In 2004 Indonesia exported over 40% of its output of crude oil and condensate, as well as about half of its production of gas-plant LPGs. The bulk of its oil exports are consigned to Japan, the Republic of Korea, Australia and China. It has been a member of OPEC since 1962.

Iran (Islamic Republic)

Proved recoverable reserves (crude oil and NGLs, million tonnes)	17 340
Production (crude oil and NGLs, million tonnes, 2005)	204.9
R/P ratio (years)	90.5
Year of first commercial production	1913

The first commercial crude oil discovered in Iran was at Masjid-i-Sulaiman in 1908. Further exploration in the next two decades resulted in the discovery of a number of major oil fields, including Agha Jari and Gach Saran. Fields such as these confirmed Iran in its role as a global player in the oil industry.

After many years as a major oil producer, the country's oil resources are still enormous: proved reserves, as reported for the present *Survey* by the Iranian WEC Member Committee, comprise 101.19 billion barrels of crude oil plus 36.30 billion barrels of NGLs. The total reported reserves of 137.49 billion barrels are almost identical to those quoted by BP and close to those given by other standard published sources (131.50-136.27). Approximately 11.5% of the proved reserves of crude and 54% of the NGLs are located offshore.

Iran was a founder member of OPEC in 1960. In 2005, about 60% of Iran's crude oil output of 3.9 million b/d was exported, mostly to Europe and Asia.

Iraq

Proved recoverable reserves (crude oil and NGLs, million tonnes)	15 478
Production (crude oil and NGLs, million tonnes, 2005)	89.5
R/P ratio (years)	> 100
Year of first commercial production	1927

Crude oil deposits were discovered near Kirkuk in northern Iraq in 1927, with large-scale production getting under way in 1934-1935 following the construction of export pipelines to the Mediterranean. After World War II more oil fields were discovered and further export lines built. Proved reserves, as quoted by OAPEC, OPEC and all the other standard published sources, remain at 115 billion barrels, third after

Saudi Arabia and Iran in the Middle East, and indeed in the world.

Iraq was a founder member of OPEC in 1960 and it is also a member of OAPEC. According to provisional data published by OPEC, crude oil exports amounted to almost 1.5 million b/d in 2005, with 55% destined for the USA and 27% for Western Europe.

Italy

Proved recoverable reserves (crude oil and NGLs, million tonnes)	106
Production (crude oil and NGLs, million tonnes, 2005)	6.1
R/P ratio (years)	17.3
Year of first commercial production	1861

Like France and Germany, Italy has a long history of oil production, albeit on a very small scale until the discovery of the Ragusa and Gela fields in Sicily in the mid-1950s. Subsequent exploration led to the discovery of a number of fields offshore Sicily, several in Adriatic waters and others onshore in the Po Valley Basin.

The Italian WEC Member Committee reports that proved recoverable reserves at end-2005 were 106 million tonnes (equivalent to some 744 million barrels). It also estimates that the additional amount of oil in place is in the order of 400-2 700 million barrels (say, 60-380 million tonnes).

Total oil output (including minor quantities of NGLs) in 2005 was at a record annual level.

Kazakhstan

Proved recoverable reserves (crude oil and NGLs, million tonnes)	5 013
Production (crude oil and NGLs, million tonnes, 2005)	62.6
R/P ratio (years)	80.1
Year of first commercial production	1911

Kazakhstan's oil resources are the largest of all the former Soviet republics (apart from the Russian Federation). For the purposes of the present *Survey*, the level of Kazakhstan's proved recoverable reserves is based on the figure of 39 600 million barrels published by BP in its *Statistical Review of World Energy, 2006*. Other published estimates have yet to catch up with this level, although *Oil & Gas Journal* has jumped from 9 billion barrels at end-2005 to 30 billion at end-2006.

Most of the republic's oil fields are in the north and west of the country. Output of oil more than doubled between 1999 and 2005 to over 62 million tonnes (1 356 000 b/d), including 11.7 million tonnes (338 000 b/d) of NGLs, condensate and LPG. In 2004, exports accounted for 86% of the republic's oil production.

Kuwait

Proved recoverable reserves (crude oil and NGLs, million tonnes)	13 679
Production (crude oil and NGLs, million tonnes, 2005)	130.1
R/P ratio (years)	> 100
Year of first commercial production	1946

Note: Kuwait data include its share of Neutral Zone.

The State of Kuwait is one of the most oil-rich countries in the world: it currently ranks fourth in terms of the volume of proved reserves. Oil was discovered at Burgan in 1938 and commercial production commenced after World War II. Seven other oil fields were discovered during the next 15 years and output rose rapidly. Kuwait was one of the founder members of OPEC in 1960 and is also a member of OAPEC.

The level of proved recoverable reserves adopted for the present *Survey* is 101.5 billion barrels, as quoted by OAPEC, OPEC and BP, (and by *Oil & Gas Journal* for end-2006). *World Oil* gives a slightly lower figure: 100.875 billion barrels.

Kuwait's crude production in 2005 averaged 2.64 million b/d, of which 1.65 million b/d, or 62%, was exported. The main markets for Kuwaiti crude were Japan, other Asian countries, North America and Western Europe.

Libya/GSPLAJ

Proved recoverable reserves (crude oil and NGLs, million tonnes)	5 350
Production (crude oil and NGLs, million tonnes, 2005)	80.1
R/P ratio (years)	66.7
Year of first commercial production	1961

With proved oil reserves of 41 464 million barrels, Libya accounts for 32% of the total for Africa. The majority of the known oil reservoirs

lie in the northern part of the country; there are a few offshore fields in western waters near the Tunisian border. The crudes produced are generally light (over 35° API) and very low in sulphur.

The level of proved reserves adopted for the present *Survey* is based upon data published by OPEC in its *Annual Statistical Bulletin 2005*, and is some 6% higher than the level quoted by OAPEC in its 2005 *Annual Report* and by BP and *Oil & Gas Journal* (although the latter publication quotes 41 464 for end-2006). *World Oil* gives a lower figure (34 050) for reserves of crude oil (excluding NGLs).

Libya joined OPEC in 1962 and is also a member of OAPEC. It exported about 77% of its oil output in 2005, almost all to Western Europe.

Malaysia

Proved recoverable reserves (crude oil and NGLs, million tonnes)	365
Production (crude oil and NGLs, million tonnes, 2005)	36.8
R/P ratio (years)	9.9
Year of first commercial production	1913

Oil was discovered at Miri in northern Sarawak in 1910, thus ushering in Malaysia's long history as an oil producer. However, it was not until after successful exploration in offshore areas of Sarawak, Sabah and peninsular Malaysia in the 1960s and 1970s that the republic really emerged as a major producer.

Proved reserves, as reported by *Oil & Gas Journal*, remained in the vicinity of 4 billion barrels from the early 1990s to end-2001, when they were reduced to 3 billion barrels, a level retained for end-2005. OPEC quotes the same level and *World Oil* a slightly lower figure (possibly reflecting its policy of excluding NGLs), whereas BP's assessment is substantially higher, at 4 200 million barrels.

After following a rising trend since 2001, crude oil production fell by 8.5% in 2005; however condensate output rose sharply to a new peak. In 2004, over 50% of Malaysian crude oil production was exported, chiefly to Thailand, the Republic of Korea, Indonesia, Japan and India.

Mexico

Proved recoverable reserves (crude oil and NGLs, million tonnes)	1 847
Production (crude oil and NGLs, million tonnes, 2005)	187.1
R/P ratio (years)	10.0
Year of first commercial production	1904

Mexico's massive oil resource base has given rise to one of the world's largest oil industries, centred on the national company *Petróleos Mexicanos* (Pemex), founded in 1938.

The Mexican WEC Member Committee has reported proved recoverable reserves (at end-2005) of 11 814 million barrels of crude oil and 1 857 million barrels of NGLs, which correspond with the 'proved reserves' given by Pemex in its *Informe Estadístico de Labores 2005*. Pemex

quotes its proved reserves (in terms of millions of barrels), as: crude oil 11 813.8, condensate 537.9 and gas-plant liquids 1 318.8. In addition to these 'proved' oil reserves (totalling 13 670.5), 'probable' reserves are given as 12 857.2 and 'possible' reserves as 10 907.6.

Within Mexico's total oil reserves of 37.4 billion barrels, the North zone accounts for 39.0%, the Marine Northeast for 38.7%, the South zone for 13.4% and the Marine Southwest for 8.9%. As regards its proved reserves, 69% of the crude oil, 78% of the condensate and 33% of the gas-plant liquids are located in offshore waters.

Commercial oil production began in 1904 and by 1918 the republic was the second largest producer in the world. The discovery and development of oil fields along the eastern coast of the country - in particular, the offshore reservoirs off the coast of the state of Campeche - have brought annual production up to its present level. In 2005 oil output comprised 3 333 tb/d crude oil, 89 tb/d condensate and 338 tb/d gas-plant liquids; exports of crude totalled 1 817 tb/d, of which some 78% was consigned to the USA.

Nigeria

Proved recoverable reserves (crude oil and NGLs, million tonnes)	4 823
Production (crude oil and NGLs, million tonnes, 2005)	125.4
R/P ratio (years)	38.5
Year of first commercial production	1957

Nigeria's proved oil reserves are the second largest in Africa, after those of Libya. The country's oil fields are located in the south, mainly in the Niger delta and offshore in the Gulf of Guinea. Nigeria has been a member of OPEC since 1971.

Published assessments of Nigeria's proved recoverable reserves (as at end-2005) are now close to consensus, after divergences in earlier years. For the purposes of the present *Survey*, the level of 36 220 million barrels reported by OPEC (*Annual Statistical Bulletin 2005*) has been adopted. Other published sources quote very similar figures, within a narrow range (35 876 to 37 175). The latest OPEC level for Nigerian reserves is some 15% higher than its comparable assessment for end-2002, as used in the 2004 *Survey*.

Nigeria exported much the greater part of its crude oil output in 2005, to a wide spread of regions throughout the world, and imported the bulk of its refined product requirements.

Norway

Proved recoverable reserves (crude oil and NGLs, million tonnes)	1 202
Production (crude oil and NGLs, million tonnes, 2005)	138.2
R/P ratio (years)	8.8
Year of first commercial production	1971

Starting with the discovery of the Ekofisk oil field in 1970, successful exploration in Norway's

North Sea waters has brought the country into No. 1 position in Europe (excluding the Russian Federation), in terms of oil in place, proved reserves and production.

On the basis of data published by the Norwegian Petroleum Directorate (NPD), total oil reserves at end-2005 amounted to 1 230 million m³ (approximately 1 034 million tonnes) of crude oil, 138 million tonnes of NGLs and 47 million m³ (about 30 million tonnes) of condensate. In addition to the quoted proved amount, the NPD reports 'contingent resources', defined as 'discovered quantities of petroleum for which no development decision has yet been made', and 'potential from improved recovery': together these represent 585 million m³ (492 million tonnes) of crude oil, 47 million tonnes of NGLs and 41 million m³ (26 million tonnes) of condensate – a total additional recoverable resource of 565 million tonnes. Over and above these amounts, there are estimated to be 'undiscovered resources' of 1 160 million m³ (975 million tonnes) of crude oil and 340 million m³ (218 million tonnes) of condensate.

Although Norway's recoverable reserves are 2.4 times those of the UK, its oil output in 2005 was only about 65% higher than that of the UK. Following 16 years of unremitting growth, Norwegian oil production levelled off in the late 1990s and since 2001 has been on a gently downward trend. The groups of fields with the largest output of crude oil in 2005 were Ekofisk, Troll, Grane, Snorre, Gullfaks, Heidrun and

Asgard. Nearly 90% of Norwegian crude oil production was exported in 2005, mostly to Western European countries, the USA and Canada.

Oman

Proved recoverable reserves (crude oil and NGLs, million tonnes)	746
Production (crude oil and NGLs, million tonnes, 2005)	38.5
R/P ratio (years)	19.4
Year of first commercial production	1967

In a regional context, this is one of the less well-endowed Middle East countries but its proved reserves are, nevertheless, quite substantial (5.51 billion barrels at end-2005, according to OAPEC). Other published sources of reserves data generally concur.

Three oil fields were discovered in the north-west central part of Oman in the early 1960s; commercial production began after the construction of an export pipeline. Many other fields have subsequently been located and brought into production, making the country a significant oil producer and exporter; it has, however, never joined OPEC or OAPEC. Production levels steadily increased over the years but peaked in 2001, subsequently falling to an average of 780 000 b/d in 2005. A high proportion of Oman's crude oil output is exported, mainly to Japan, Southeast Asia and China.

Papua New Guinea

Proved recoverable reserves (crude oil and NGLs, million tonnes)	31
Production (crude oil and NGLs, million tonnes, 2005)	2.2
R/P ratio (years)	14.0
Year of first commercial production	1992

Five sedimentary basins are known to exist in PNG. Most exploration activity, and all hydrocarbon discoveries to date, have occurred in the Papuan Basin in the southern part of the mainland. After many campaigns of exploration (starting in 1911), the first commercial discoveries were eventually made during the second half of the 1980s. Commercial production began in 1992 after an export pipeline had been built.

The level quoted for proved recoverable reserves reflects *Oil & Gas Journal's* unchanged estimate of 240 million barrels. The oil exported is a blend called Kutubu Light (45° API). Output in 2005 averaged 47 000 b/d.

Peru

Proved recoverable reserves (crude oil and NGLs, million tonnes)	117
Production (crude oil and NGLs, million tonnes, 2005)	4.9
R/P ratio (years)	26.5
Year of first commercial production	1883

Peru is probably the oldest commercial producer of oil in South America. The WEC Member

Committee reports that proved recoverable reserves at end-2005 consisted of 382.9 million barrels of crude oil and 695.4 million barrels of NGL, reflecting data published by the Ministerio de Energía y Minas, and equivalent in rounded terms to 52 and 65 million tonnes, respectively. The reported total of 1 078 million barrels corresponds quite closely with the levels published by *World Oil* and BP, but *Oil & Gas Journal* comes out somewhat lower at 930 million barrels, despite having raised its assessment substantially from the 323 million barrels it had quoted for end-2002.

The Ministerio de Energía y Minas also quotes (in million barrels) 'probable reserves' of 438.1 crude and 294.3 NGL, and 'possible reserves' of 5 418.1 crude and 384.1 NGL.

For many years oil production was centred on the fields in the Costa (coastal) area in the northwest; from about 1960 onwards the Zocalo (continental shelf) off the north-west coast and the Selva (jungle) area east of the Andes came into the picture. In 2005 the Selva fields accounted for 73% of total oil output, the Costa fields for 17% and the Zocalo for nearly 10%. Production of crude oil has for some time followed a gently downward slope, but output of NGLs has recently been growing rapidly.

Qatar

Proved recoverable reserves (crude oil and NGLs, million tonnes)	1 852
Production (crude oil and NGLs, million tonnes, 2005)	45.8

R/P ratio (years)	40.6
Year of first commercial production	1949

In regional terms, Qatar's oil resources are relatively small, its strength being much more in natural gas. In the 1930s interest in its prospects was aroused by the discovery of oil in neighbouring Bahrain. The Dukhan field was discovered in 1939 but commercialisation was deferred until after World War II. During the period 1960-1970, several offshore fields were found, and Qatar's oil output grew steadily. It joined OPEC in 1961 and also became a member of OAPEC.

The level of proved recoverable oil reserves (15 207 million barrels) retained for the present *Survey* is that quoted by OPEC in its *Annual Statistical Bulletin 2005*. Currently BP and OAPEC (both in slightly rounded form) and *Oil & Gas Journal* all concur with OPEC's assessment, but *World Oil* is one-third higher at 20 346 million barrels.

Qatar is a major producer of NGLs: its 2005 output was more than 9 million tonnes (262 000 b/d). Exports of crude oil and NGLs are consigned very largely to Japan, the Republic of Korea and other Asia/Pacific countries.

Romania

Proved recoverable reserves (crude oil and NGLs, million tonnes)	53
Production (crude oil and NGLs, million tonnes, 2005)	5.3
R/P ratio (years)	9.8
Year of first commercial production	1857

Despite being one of Europe's oldest oil producers, Romania still possesses substantial oil resources. The Romanian WEC Member Committee, quoting the National Agency for Mineral Resources, reports that within a proved amount of crude oil in place of 1 947 million tonnes, plus a corresponding figure of 11 million tonnes for NGLs, recoverable reserves are 52.1 million tonnes of crude plus 0.6 million tonnes of NGLs. The estimated additional amounts in place (in million tonnes) are given as approximately 124 and 2, respectively, with recoverable amounts of 62 and 0.4.

The principal region of production has long been the Ploesti area in the Carpathian Basin to the north-west of Bucharest, but a new oil province has come on the scene in recent years with the start-up of production from two offshore fields (West and East Lebada) in the Black Sea. Within the figures of proved recoverable reserves given above, the amounts located in offshore waters are 1.6 million tonnes of crude oil and 0.2 million tonnes of NGLs. In national terms, oil output (including NGLs) has been slowly contracting since around 1995.

Russian Federation

Proved recoverable reserves (crude oil and NGLs, million tonnes)	10 027
Production (crude oil and NGLs, million tonnes, 2005)	470.2
R/P ratio (years)	21.3

The Russian oil industry has been developing for well over a century, much of that time under

the Soviet centrally planned and state-owned system, in which the achievement of physical production targets was of prime importance. After World War II, hydrocarbons exploration and production development shifted from European Russia to the east, with the opening-up of the Volga-Urals and West Siberia regions.

As the Russian WEC Member Committee was unable to supply up-to-date assessments of hydrocarbon reserves, for reasons of confidentiality, the level of proved recoverable reserves adopted for the present *Survey* is based on the figure of 74 400 million barrels published by *World Oil* and BP. *Oil & Gas Journal* has retained its estimate of 60 billion barrels for both end-2005 and end-2006, whilst OAPEC has opted for an intermediate level of 72 160 million barrels.

Production levels in Russia advanced strongly from the mid-1950s to around 1980 when output levelled off for a decade. After a sharp decline in the first half of the 1990s, oil production levelled off again, at around 305 million tonnes/yr, until an upturn starting in 2000 brought the total up to 470 million tonnes in 2005. Russia exports more than half of its oil production.

Saudi Arabia

Proved recoverable reserves (crude oil and NGLs, million tonnes)	34 550
Production (crude oil and NGLs, million tonnes, 2005)	526.2
R/P ratio (years)	65.6
Year of first commercial production	1936

Note: Saudi Arabia data include its share of Neutral Zone, together with production from the Abu Safa oilfield (jointly owned with Bahrain).

The Kingdom has been a leading oil producer for more than 40 years and currently has by far the world's largest proven reserves of oil: at end-2005 these represented about 22% of the global total. The first major commercial discovery of oil in Saudi Arabia was the Dammam field, located by Aramco in 1938; in subsequent years the company discovered many giant fields, including Ghawar (1948), generally regarded as the world's largest oil field, and Safaniyah (1951), the world's largest offshore field.

Whilst not displaying an exact consensus, current published assessments of Saudi Arabia's proved oil reserves at end-2005 fall within a narrow bracket: namely (in billions of barrels), *World Oil* 262.175, BP 264.200, OPEC 264.211, OAPEC (as used in this *Survey*) 264.310. and *Oil & Gas Journal* 266.81 (262.300 at end-2006).

Saudi Arabia was a founder member of OPEC and also of OAPEC. It exports about three-quarters of its crude oil output; major destination regions are Asia, North America and Western Europe.

Sudan

Proved recoverable reserves (crude oil and NGLs, million tonnes)	864
Production (crude oil and NGLs, million tonnes, 2005)	17.5

R/P ratio (years)	49.4
Year of first commercial production	1992

Several oil fields, including Heglig and Unity, were discovered in south-central Sudan in the early 1980s but terrorist action forced the companies concerned to withdraw. Other foreign companies started to undertake exploration and development activities some 10 years later. Most published sources quote Sudan's proved recoverable reserves at end-2005 as lying within a narrow range: (in millions of barrels) OPAEC 6 320; BP 6 400; *World Oil* 6 402 (adopted for the present *Survey*) and OPEC 6 405. The one exception is *Oil & Gas Journal*, which showed only 563 million barrels for reserves at end-2005, but has increased them to 5 billion barrels as at-end 2006.

Commercial production from the Heglig field began in 1996, since when Sudan has developed into an oil producer and exporter of some significance, a key factor being the construction of a 250 000 b/d export pipeline to the Red Sea. Sudan's oil production in 2005 averaged 355 000 b/d.

Syria (Arab Republic)

Proved recoverable reserves (crude oil and NGLs, million tonnes)	335
Production (crude oil and NGLs, million tonnes, 2005)	20.6
R/P ratio (years)	16.3
Year of first commercial production	1968

After many years (1930-1951) of unsuccessful exploration, oil was eventually found in 1956 at Karachuk. This and other early discoveries mostly consisted of heavy, high-sulphur crudes. Subsequent finds, in particular in the Deir al-Zor area in the valley of the Euphrates, have tended to be of much lighter oil.

The Syrian WEC Member Committee reports that proved recoverable reserves are 391 million m³ (2 459 million barrels). This level looks rather more convincing than the obviously very rounded estimates given by published sources: *Oil & Gas Journal* 2 500; *World Oil*, OPEC and BP 3 000 and OPAEC 3 150.

National oil output has declined fairly sharply in recent years, to 414 000 b/d in 2005, of which about half was exported. Syria's principal customers for its crude oil in 2005 were Germany, Italy and France; it is a member of OPAEC.

Thailand

Proved recoverable reserves (crude oil and NGLs, million tonnes)	51
Production (crude oil and NGLs, million tonnes, 2005)	10.8
R/P ratio (years)	6.8
Year of first commercial production	1959

Resources of crude oil and condensate are not very large in comparison with many other countries in the region. The data reported by the Thai WEC Member Committee for the present *Survey* show proved reserves of oil as 192

million barrels of crude oil and 261 million barrels of condensate. Just over three-quarters of the crude reserves and virtually all of the condensate reserves are located in Thailand's offshore waters. Data on reserves of other NGLs were not provided; consequently the calculated reserves/production ratio shown above is based on crude-plus-condensate production data.

The estimated additional amounts in place are reported as 195 million barrels of crude and 451 million barrels of condensate, of which the recoverable reserves are 119 and 293 million barrels respectively, implying recovery factors of 0.61 for crude and 0.65 for condensate.

Total output of oil (crude oil, condensate and other NGLs) has more than doubled since 1999, with an average of about 264 000 b/d in 2005. Exports of crude oil have risen sharply in recent years, averaging nearly 66 000 b/d in 2005.

Trinidad & Tobago

Proved recoverable reserves (crude oil and NGLs, million tonnes)	81
Production (crude oil and NGLs, million tonnes, 2005)	8.3
R/P ratio (years)	9.9
Year of first commercial production	1908

The petroleum industry of Trinidad has passed its centenary, several oil fields that are still in production having been discovered in the first decade of the 20th century. The remaining recoverable reserves are small in regional terms, at 615 million barrels, as reported by the

Trinidad & Tobago WEC Member Committee. Whilst *World Oil* quotes an identical figure, BP shows 800 and *Oil & Gas Journal* has 990 for end-2005 but only 728 for end-2006.

The oil fields that have been discovered are mostly in the southern part of the island or in the corresponding offshore areas (in the Gulf of Paria to the west and off Galeota Point at the south-east tip of the island).

After ten years of moderate oscillation around a mean level of 112 000 b/d, output of crude oil rose sharply to 126 000 b/d in 2005; condensate output was also well up at 18 000 b/d. Production of gas-plant NGLs began in 1991 and averaged about 27 000 b/d in 2005. Over 40% of Trinidad's crude output is exported.

Turkmenistan

Proved recoverable reserves (crude oil and NGLs, million tonnes)	74
Production (crude oil and NGLs, million tonnes, 2005)	9.5
R/P ratio (years)	7.8
Year of first commercial production	1911

This republic has been an oil producer for nearly a century, with a cumulative output of more than 5 billion barrels. According to *Oil & Gas Journal*, proved reserves are 546 million barrels, unchanged since the 1998 edition of the SER. Known hydrocarbon resources are located in two main areas: the South Caspian Basin to the west and the Amu-Darya Basin in the eastern half of the country. After growth averaging nearly

12% per annum from 1995 to 2003, oil output (including NGLs) fell by around 5% over the two years that followed.

United Arab Emirates

Proved recoverable reserves (crude oil and NGLs, million tonnes)	12 555
Production (crude oil and NGLs, million tonnes, 2005)	129.0
R/P ratio (years)	97.4
Year of first commercial production	1962

The United Arab Emirates comprises Abu Dhabi, Dubai, Sharjah, Ras al-Khaimah, Umm al-Qaiwain, Ajman and Fujairah. Exploration work in the three last-named has not found any evidence of oil deposits on a commercial scale. On the other hand, the four emirates endowed with oil resources have, in aggregate, proved reserves on a massive scale, in the same bracket as those of Iran, Iraq and Kuwait. Abu Dhabi has by far the largest share of UAE reserves and production, followed at some distance by Dubai. The other two oil-producing emirates are relatively minor operators.

The UAE's proved oil reserves at end-2005 are quoted by OAPPEC as 97.8 billion barrels, a level virtually unchanged since 1990. According to OPEC, quoting the same total figure, Abu Dhabi accounts for 94.3% of proved reserves, Dubai for 4.1%, Sharjah for 1.5% and Ras al-Khaimah for 0.1%.

Total crude output (including a considerable amount of production offshore) amounted to

about 2.75 million b/d in 2005, of which the bulk was exported, almost all to Japan and other Asia/Pacific destinations. The UAE has been a member of OPEC since 1967 and is also a member of OAPPEC.

United Kingdom

Proved recoverable reserves (crude oil and NGLs, million tonnes)	516
Production (crude oil and NGLs, million tonnes, 2005)	84.7
R/P ratio (years)	6.1
Year of first commercial production	1919

Proved recoverable reserves are stated by the Department of Trade and Industry in *UK Oil and Gas Reserves* (September 2006) to be 516 million tonnes at end-2005. This figure compares with the United Kingdom's cumulative oil production of some 3 090 million tonnes.

In addition, there are estimated to be 300 million tonnes of 'probable reserves', with 'a better than 50% chance of being technically and economically producible', and a further 451 million tonnes of 'possible reserves', with 'a significant but less than 50% chance of being technically and economically producible'.

Total output of crude oil and NGLs increased from about 92 million tonnes/yr in 1989-1991 to an all-time high of 137 million tonnes in 1999, since when production has tended to decline. The UK exported 64% of its total oil output in 2005; 64% of such exports were consigned to EU countries and 26% to the USA.

United States of America

Proved recoverable reserves (crude oil and NGLs, million tonnes)	3 691
Production (crude oil and NGLs, million tonnes, 2005)	313.3
R/P ratio (years)	11.9
Year of first commercial production	1859

The United States has one of the largest and oldest oil industries in the world. Although its remaining recoverable reserves are dwarfed by some of the Middle East producers, it is the third largest oil producer, after Saudi Arabia and the Russian Federation.

Proved reserves at end-2005, as published by the Energy Information Administration of the US Department of Energy in December 2006, were 21 757 million barrels of crude oil and 8 165 million barrels of NGLs. Compared with the levels at end-2002, crude reserves are 4.1% lower and those of NGLs up by 2.1%. The 920 million barrel net decrease in crude reserves was the result of 3 065 from extensions and discoveries in old and new fields, plus revisions and adjustments of 1 444, minus crude production of 5 429. The comparable figures for NGLs (also in millions of barrels) are 2 487 from extensions and discoveries, plus 101 net revisions, etc. less 2 417 production, giving a net increase of 171 in proved reserves.

Crude oil production in 2005 was 5 178 000 b/d and that of NGLs (including 'pentanes plus') was 1 717 000 b/d. The USA exported 41 000 b/d of crude oil in 2005, almost all to Canada.

Uzbekistan

Proved recoverable reserves (crude oil and NGLs, million tonnes)	70
Production (crude oil and NGLs, million tonnes, 2005)	5.5
R/P ratio (years)	12.8

Although an oil producer for more than a century, large-scale developments in the republic mostly date from after 1950. The current assessment published by *Oil & Gas Journal* shows proved reserves as 594 million barrels, a level unchanged since 1996. Oil fields discovered so far are located in the south-west of the country (Amu-Darya Basin) and in the Tadjik-Fergana Basin in the east.

Total oil output (including NGLs) followed a rising trend for about 10 years from 1988, since when the trend has been moderately negative, more sharply so in 2004 and 2005. All of Uzbekistan's production of crude and condensate is processed in domestic refineries or used directly as feedstock for petrochemicals.

Venezuela

Proved recoverable reserves (crude oil and NGLs, million tonnes)	11 269
Production (crude oil and NGLs, million tonnes, 2005)	154.7
R/P ratio (years)	72.9
Year of first commercial production	1917

The oil resource base is truly massive, and proved recoverable reserves are easily the

largest of any country in the Western Hemisphere. Starting in 1910, hydrocarbons exploration established the existence of four petroliferous basins: Maracaibo (in and around the lake), Apure to the south of the lake, Falcón to the north-east and Oriental in eastern Venezuela. The republic has been a global-scale oil producer and exporter ever since the 1920s, and was a founder member of OPEC in 1960.

The level adopted for end-2005 proved recoverable reserves of crude oil and natural gas liquids is 80 012 million barrels, as given by OPEC in its *Annual Statistical Bulletin 2005* (published 2006). *Oil & Gas Journal*, OPAEC and BP all quote figures in the region of 79 700; OGJ has moved up to the OPEC level of 80 012 for its end-2006 assessment. The only exception to the general consensus is *World Oil*, which quotes 52 650 million barrels, a figure that would exclude NGLs and probably extra-heavy oil.

According to *Petróleo y Otros Datos Estadísticos 2004*, published in October 2006 by the Ministerio de Energía y Petróleo about 58% of national oil output in 2004 came from the Oriental Basin, 39% from the Maracaibo, 3% from the Apure and a minimal proportion from the Falcón Basin. Of total crude oil output of 3 143 000 b/d in 2004 (including condensate and bitumen for Orimulsion® (registered trade mark belonging to Bitúmenes Orinoco S.A.)), 1 774 000 b/d (56.4%) was exported, the bulk of which being consigned to North and South America: the United States took nearly 57% of Venezuela's crude exports.

Vietnam

Proved recoverable reserves (crude oil and NGLs, million tonnes)	413
Production (crude oil and NGLs, million tonnes, 2005)	19.1
R/P ratio (years)	21.7
Year of first commercial production	1986

During the first half of the 1980s oil was discovered offshore in three fields (Bach Ho, Rong and Dai Hung), and further discoveries have since been made. For the present *Survey*, proved recoverable reserves (3 100 million barrels) have been derived from BP's latest published assessment (*Statistical Review of World Energy, 2006*). *World Oil* shows 1 345 million barrels, whilst a third source (*Oil & Gas Journal*) continues to quote a level of only 600 million barrels, which would imply an unrealistically low R/P ratio of 4.2. Production of crude oil (averaging 34° API) began in 1986 and rose steadily until 2004, but fell by about 8% the following year. At present all output is exported.

Yemen

Proved recoverable reserves (crude oil and NGLs, million tonnes)	384
Production (crude oil and NGLs, million tonnes, 2005)	19.8
R/P ratio (years)	19.3
Year of first commercial production	1986

After many years of fruitless searching, exploration in the 1980s and 1990s brought a

degree of success, with the discovery of a number of fields in the Marib area, many yielding very light crudes. Oil discoveries have been made in two other areas of the country (Shabwa and Masila) and Yemen has evolved into a fairly substantial producer and exporter of crude.

The level of proved recoverable reserves quoted by OAPEC has remained at 4 billion barrels for the past 13 years. *Oil & Gas Journal* gave the same level for end-2005 but has reduced its estimate to 3 billion as at end-2006. BP, in its *Statistical Review of World Energy, 2006*, quotes 2 900 million barrels. For the purposes of the present *Survey*, the latest assessment by *World Oil* – 2 970 million barrels – has been adopted.

Total output in 2005 was 422 000 b/d (including 22 000 b/d of NGLs). About three-quarters of Yemen's crude production is exported, largely to Singapore, Japan, the Republic of Korea and other Asia/Pacific destinations.