

# Oil Supply and Demand

*Following the military intervention in Iraq, it is taking longer than expected for Iraqi exports to make a comeback on the market. Demand is sustained by economic growth in China and in the United States. OPEC is modulating production to prevent inventory build-up. Prices have stayed high despite increased production by non-OPEC countries, especially Russia.*

Before reviewing the situation for 2003, we might look back to a few landmark events in previous years.

## Before September 11, 2001

Following a period in 1998 when prices remained low due to the “Djakarta effect”—it was in Djakarta that, in November 1997, OPEC decided to raise quotas, going counter to the trend—crude prices rose from \$10/bbl in February 1999 to \$25 in December of the same year. This upswing was the result when OPEC countries enforced a quota reduction policy jointly with non-OPEC exporters (Oman, Norway, Mexico and Russia).

In 2000, prices continued to escalate: inventory was particularly low, despite growth in production. Price’s increase was sustained by economic recovery and magnified by refinery bottlenecks and an unusual shortage of finished products in the United States.

At year-end 2000 and in 2001 (before September 11), non-OPEC countries and Iraq boosted output while OPEC brought its quotas down to keep the crude price in the \$22-28 range targeted by the organization.

## 2001 after September 11 and 2002

The terrorist attacks perpetrated on September 11 led to a slowdown in American growth and a reduction of air traffic.

Demand slackened, the crude price fell and the price of the OPEC basket stood at \$17.50/bbl in early November 2001. In December, OPEC decided to cut its quotas by 1.5 Mbbbl/day, effective January 2002, after obtaining the cooperation of Mexico, Norway and Russia (however, Russia’s involvement in this agreement was mere window-dressing).

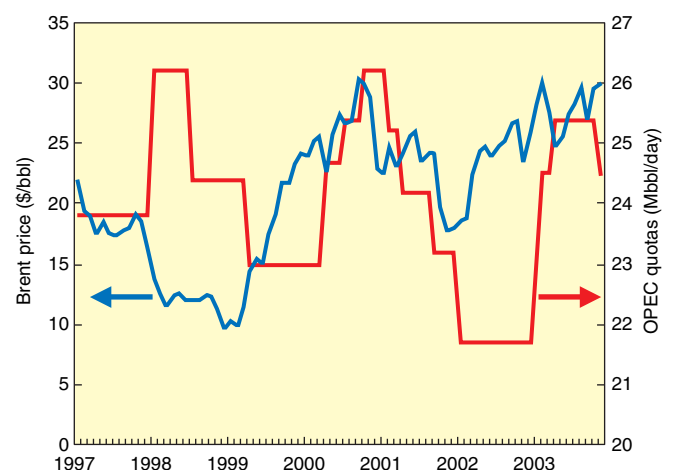
This helped prices rally. However, in 2002, crude prices varied more according to geopolitical uncertainties than the fundamentals of supply and demand.

Starting in February 2002, armed intervention in Iraq seemed imminent. Most oil market analysts thought that high crude prices were primarily due to a “war-risk premium”, usually estimated to be in the \$3-6 range or even \$8/bbl. The premium fluctuated, depending on the news concerning the mission of the UN inspectors and Israeli-Palestinian tensions. It persisted despite repeated assurances by the leaders of OPEC and Saudi Arabia, who undertook to cover the shortfall in the event of a shutdown or decrease in Iraqi production.

Meanwhile, on December 2, a general strike was called in Venezuela by the adversaries of President Chavez. From November to December, the decline in crude exports averaged over 2 Mbbbl/day.

In the final analysis, OPEC production in 2002 was 1.9 Mbbbl/day less than in 2001. As a result, the crude inventory in OECD countries was especially low, lower than in December 2000. In fact, it reached the lowest level in five years.

Fig. 1 Brent price and OPEC quotas



## 2003

This year, the most important event was the American intervention in Iraq. We might also note that the shortfall in

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Iraqi and Venezuelan production was covered, as announced, by surplus capacity kept well maintained by Saudi Arabia and a few of its partners.

## Demand

Growth slowed in 2002 (by about 400,000 bbl/day), but demand rallied in 2003. Most forecasts predicted an increase in 2003, which turned out to be greater than expected. According to an IEA estimate for the entire year, the increase amounted to 1.3 Mbbbl/day, while the US Department of Energy issued an estimate of 1 Mbbbl/day.

Different factors were responsible for this uptrend. Economic growth in China has accounted for over one-third of the increase in demand for 2003; in 2002, it represented two-thirds of the increase. Chinese consumption is reaching the level of Japan's one and is likely to exceed it in 2004. The economy started to grow again in the United States: by the third quarter, it was posting growth that, on an annual basis, would translate into a rate of 8.2%. By autumn, the economy was creating jobs.

Higher consumption was also due to specific economic factors. In the Northern Hemisphere, especially North America, the winter of 2002-2003 was colder than usual. This prompted a rise in demand amplified by very high natural gas prices in the United States. Gas demand, which had been rising steadily, was also driven up by the cold winter conditions, while production was topping out. Prices soared, peaking at \$9/MBtu. Fuel oil was used to replace natural gas for industrial purposes and electricity production.

At the same time, an unusual number of nuclear power plants were shut down in Japan. These were not planned maintenance shutdowns; the plants were taken out of operation because of fears relative to their safety. The dates at which they would be brought back onstream were repeatedly postponed. In November, most had not yet been restored to service, so Japan had to rely more heavily on thermal power plants burning crude or fuel oil.

In the transport sector, kerosene consumption was affected when air traffic fell in the wake of events in the Middle East and the outbreak of atypical pneumopathy. Finally, demand was sustained by a rise in the level of strategic reserves in the United States and several Asian countries, including China.

## Iraqi Production

Iraqi production was estimated to be about 2.5 Mbbbl/day in January and February, with exports standing at 1.7 Mbbbl/day. In early April, after the military intervention, the production installations themselves seemed to be still intact. Relatively

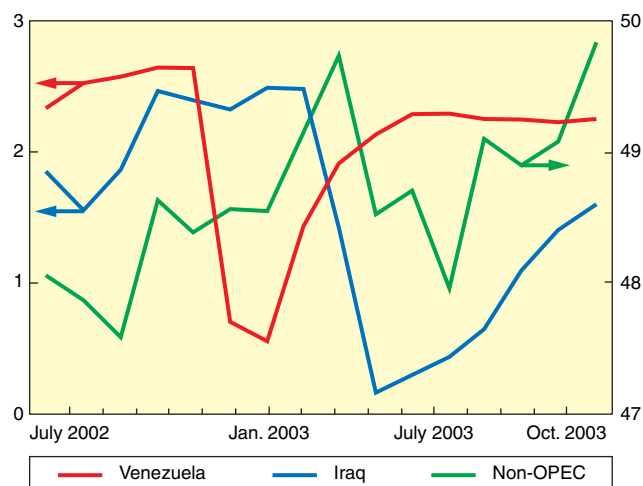
optimistic forecasts were made to the effect that exports would resume quickly. Following many instances of equipment theft (including electrical systems, computer systems and valves), acts of sabotage (e.g. of the Kirkuk-Ceyhan oil pipe) and a general deterioration of security, these forecasts had to be revised. These factors were obstacles to the recovery of production and exports (cf. Figure 3 in the paper on Iraq).

## Non-OPEC Production

After an increase of 1.4 Mbbbl/day in 2002, non-OPEC output kept rising in 2003 and may reach 0.7 to 1 Mbbbl/day for the year, depending on the source (1 Mbbbl/day according to the IEA and the DOE). This includes an increase of 0.8 Mbbbl/day in Russian production due to better corporate governance, capital investment encouraged by high prices and greater reliance on Western technologies and service suppliers, especially Yukos; Yukos and Sibneft accounted for over 40% of Russian growth.

Canadian production was also up (Athabaskan tar sands) by 0.15 Mbbbl/day under the impetus of crude prices. The same can be said of Khazakstan (up 0.1 Mbbbl/day). On the other hand, North Sea output continued to fall (-0.25 Mbbbl/day).

Fig. 2 Crude production in Mbbbl/day



Source: IEA

## OPEC Production and its Impact on Prices

At year-end 2002, we noted that inventory was very low, with a strike causing a drop in Venezuelan production. Facing a price surge, OPEC decided in January to raise its quotas by 1.5 Mbbbl/day. As of February, the quotas totaled 24.5 Mbbbl/day, not including Iraq.

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OPEC significantly boosted first-quarter production, especially Saudi Arabia, whose output exceeded 9.5 Mbbbl/day in the second half of March and in April. Anticipating an Iraqi shortfall, it had built up stocks of about fifty million barrels and chartered additional tankers to increase exports to the United States, starting in February. This also made it possible to cover the shortfall in Nigerian exports following the conflicts appearing in mid-March.

As we can see, Saudi Arabia and OPEC met the market supply commitments that they had undertaken, especially thanks to the surplus capacity that Saudi Arabia keeps carefully maintained.

The day before the military intervention in Iraq, and on the day itself, prices fell. This was predictable and had generally been anticipated, recalling the outbreak of the first Gulf War, when the price per barrel plummeted \$10/bbl between the day on which war broke out and the day after the air strikes began. This corresponds to the elimination of uncertainty, hence of the “war-risk premium”.

At the end of April came overproduction, or the risk thereof. OPEC decided to officialize part of the margin by which it had exceeded its quotas. On June 1, OPEC set a quota of 25.4 Mbbbl/day and revised production downwards in May and June.

Late in September, prices were falling and approaching \$25/bbl. OPEC decided to cut its quotas by 0.9 Mbbbl/day, effective November 1. This decision came as a surprise. Most market-watchers took it as confirmation that OPEC no longer considered \$25/bbl as a mid-range price, but as a lower limit. It was said that the price band should be reevaluated to offset the erosion of the dollar. Moreover, it seemed that Saudi Arabia needed a price of \$25 to balance its budget, and the United States did not make any vigorous protest. This decision can also be viewed as proactive. With Iraqi production making its comeback, all forecasts called for an abundant supply by the end of winter. Quotas would inevitably have to be cut by 2004 at the latest, so OPEC preferred to anticipate this eventuality.

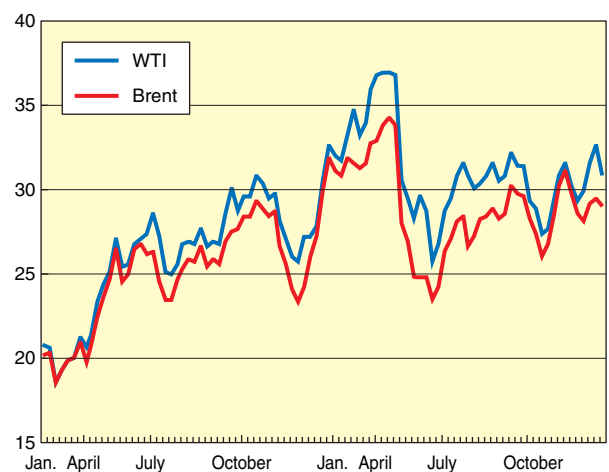
Finally, in 2003, the price trend went counter to most forecasts, which predicted a decrease assuming that Iraqi exports would make a quick comeback.

## Price Trend Factors

We have mentioned the factors that promoted high prices in 2003: the slow rate of recovery shown by Iraqi production and exports and the policy implemented by Saudi Arabia and OPEC. Saudi Arabia practiced very tight export management and thereby slowed inventory building. Inventory volume is a

key variable on the oil market, and analysts and traders keep a close eye on related statistics. The level of inventory is a natural indicator for the supply-demand equilibrium. Falling inventory may indicate that the supply is down, or even the risk of a shortage. As specialists well know, it may also reveal sound management by operators, which have every interest in keeping stocks as low as possible when prices are in “backwardation” and to fill their tanks in “contango”<sup>(1)</sup> periods.

Fig. 3 Variations in the Brent and WTI prices in 2002 and 2003



When prices are high—and they have been since 2000—“backwardation” generally inhibits inventory building. But the consequence of low inventory is to increase sensitivity to various factors, including supply shortages involving refined products or logistics infrastructure. Everybody remembers the spring of 2000, when bottlenecks appeared in the American refining industry. In 2003, there were also price movements due to the refining situation, although they had less of an effect than in 2000. In January and February, part of the crude price hike could be attributed to fears that the American refining cycle was out of synch, just like in 2000. These fears sprang from the fact that product inventory was low, due to inadequate refining margins that finally rose in February and March.

In 2003, refining problems sporadically pushed up crude prices. In mid-August, refineries on the East Coast were paralyzed by a power failure. In October, the difficulties of a Louisiana refinery aggravated the risks of a gasoline shortage.

When stocks are low and most operators function on a just-in-time basis, logistics problems can also have significant

(1) The market is said to be in “backwardation” when the anticipated value of the price on future market is lower than the current spot price. The reverse situation is described as “contango”.

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impacts. For instance, the (relative) price peak occurring in late November can be explained by a short supply of gasoline on the American market. This shortage was due to crude off-loading problems in the Gulf of Mexico, a slowdown in the Colonial Pipeline flowrate and the fact that a cargo of gasoline was blocked in New York Harbor after a leak was detected.

Here, we might remark that “boutique fuels” in the United States have proliferated. In other words, the composition of gasoline varies from region to region. The need to produce and distribute products of different grades significantly decreases the fluidity of commerce while increasing price volatility. For 2004, fears have arisen relative to the ban of MTBE in three states (California, Connecticut and New York).

The last factor to be covered here is the speculative behavior of hedge funds. In less than ten years<sup>(2)</sup>, they have doubled in number, with a fourfold increase in the capital that they manage. In addition, it would seem that, more than in the past, they prefer very short-term objectives and faster reactions. Although the existence of this type of operator improves market liquidity, most analysts now consider that their buying and selling positions aggravate price volatility (as they probably did in early November), when they assign high values to specific risks (e.g. a cold winter).

Increasingly, analysts consider fund positions, like inventory statistics, to be key indicators of market trends. Quick to integrate fundamentals, observing that OPEC is defending a price of \$25 as a lower limit rather than a mid-range price, they seem ready to buy whenever prices are likely to slip below this value. The effect of their actions may support those taken by OPEC.

### The Outlook for 2004

In 2004, demand should be stimulated by persistent economic growth in Asia, especially China, as well as by confirmed job-generating growth in the United States. In North America, the natural gas market should not be as tight, with less incentive to turn to natural gas-fuel oil replacement products. Uncertainty still surrounds several questions: how far growth will rebound in Japan, how fast Japanese nuclear power plants will come back onstream, how bad the winter will be and what impact prices will have. According to forecasts made by prominent organizations, demand could rise by between 1.1 and 1.3 Mbbbl/day in 2004. Growth might be lower than in 2003, when it was sustained by non-recurrent phenomena.

Non-OPEC supply is expected to keep rising. Production by the ex-USSR could be up by 0.6 to 0.8 Mbbbl/day, even

though the most profitable capacity development projects were carried out in the past. This is assuming that export capacity will be developed as planned, and that business at Yukos will not be unduly disturbed by the arrest of its chief executive, Mr. Khodorkovsky. Forecasts are also up for Angola, Brazil, the Gulf of Mexico and North America.

In 2004, therefore, the increase in non-OPEC production could exceed that of demand. This being said, predictions vary significantly: 1.45 Mbbbl/day (IEA), 1.3 Mbbbl/day (DOE), 1.25 Mbbbl/day (OPEC), 0.9 Mbbbl/day (Petroleum Economics Ltd) and only 0.75 (Barclays).

Furthermore, the production of condensates and non-conventional petroleum by OPEC countries, not counted in the quotas, is also still on the upswing.

Finally, a number of OPEC countries are developing production capacity (Algeria, Iran, Libya and Nigeria). Iran's reserves have been revised upwards to 135%. It has been said that Iraq will reach its prewar production level by next summer. Of course, uncertainties remain. Despite the official data, it is taking a long time to solve the problems in Venezuela; clashes might break out in Nigeria again; the prevailing insecure climate in Iraq has jeopardized equipment renovation projects; and a nuclear capability controversy has arisen in Iran.

According to most hypothetical scenarios, the ten OPEC countries, not including Iraq, are likely to lose market share. It will be difficult for some of them to accept another quota reduction, which will probably be necessary. The key question will then be whether the organization can preserve a united front, and to what extent Saudi Arabia will agree to cover the shortfall. It did in 2003 and can continue to do so in the short term, thanks to windfall earnings, but only within certain limits. Most analysts think that the factors promoting a price decrease (forecast for 2003) could win out in 2004. At any rate, OPEC should find itself in a less comfortable position.

### Long-Term Prospects

In the next few years, two matters will be crucial: first, the continued increase in production by non-OPEC countries, especially Russia; secondly, the development of Iraq's production capacity (see the paper on Iraq). Depending on what happens in these two areas, a loss of market share by OPEC countries, not including Iraq, could make it more difficult to decide to reduce quotas and maintain discipline. In the medium term, prices could start to descend, unless the prevalent feeling on the market is that world production is peaking.

(2) Source: Société Générale.

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Here, we might recall the uncertainties surrounding the long-term availability of oil and gas, a topic already covered in several papers for Panorama 2003. Optimists like Mr. Adelman of M.I.T. and Mr. Lynch remark that past predictions concerning the depletion of world resources have always been proven wrong. For instance, at the end of the 19th century, total coal reserves were estimated to be equivalent to twenty years of production, as measured at the time. They trust in technological progress and the industry's ability to find new resources through innovation. They believe that only a small portion of total resources, most of which are still unknown to us, has been depleted.

On the other hand, speaking through the Association for the Study of the Peak of Oil (ASPO), the pessimists feel that the quantities of oil already produced will represent half of the world's ultimate recoverable reserves by about 2010. They expect that world oil production will inevitably start to decline at about this date. Their analysis is based on the fact that the yield of a mature zone can be represented by a Hubbert curve. This is a bell curve named after K. Hubbert, the geologist who, in the 1950s, correctly predicted that US production would peak in about 1970. They also point out that, for a number of years, new discoveries have accounted for less than one-third of world reserve replacement and that one cannot go on indefinitely reevaluating reserves discovered in the past: over time, the production curve will eventually duplicate the curve of new discoveries.

An intermediate point of view emerges in the ultimate reserve estimates issued by the US Geological Survey. If one

were to draw a Hubbert curve based on these estimates, it would show production topping out between 2020 and 2030. Various scenarios, such as those done by Shell and by P.R. Bauquis (formerly director of strategy at Total), are based on this assumption.

In the last two hypothetical cases, prices could reach very high levels when it is generally realized that depletion is near. The production curve would not form a regular bell curve. The price effect would give rise to energy-saving measures and the use of replacement energies, which would curb demand and promote new oil and gas production projects. It would also accelerate the use of non-conventional petroleum and methods of obtaining motor fuels from natural gas, and perhaps from coal, with sequestration of CO<sub>2</sub>. Another issue besides availability must be considered: the timetable for the capital investment needed, as illustrated by the recent gas supply difficulties in the United States.

According to Morris Adelman, prices are the result of a race between the depletion of known reserves and technical progress. In recent years, the latter has been running out front. It is our hope that this situation continues, making it possible to access the resources needed for economic development while preserving environmental quality. That is the challenge facing the oil industry as well as research and development organizations like IFP.

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