Remaining global resource base is healthy, says IHS report on petroleum trends

IHS Energy's Report on Petroleum Trends (1994-2003), an edited version of which appears here, provides something of a corrective to the doomsters on future world oil and gas supply and demand and a view of the underlying fundamentals that are driving the price of a barrel of oil over $50.

In terms of long-term remaining resources in the ground, IHS believes that the global resource base for hydrocarbons is still healthy and will be aided by a growth in exploration investment that is now underway. It admits that an energy 'demand crunch' does exist at the moment, and certain factors, particularly of a geopolitical nature rather than geological, are contributing to that crunch and the resulting price ramp experienced in recent weeks. Long-term, however, the analysis provides a more positive outlook than the current price environment suggests, for several reasons:

- Oil reached a new peak in production during 2003 and gas pushed past the 100 trillion cubic feet (tcf) level for the first time ever. Also, there are a number of major projects still due to come onstream, suggesting no obvious shortfalls in oil production in the short-term to 2008.
- In terms of total global resource discoveries, 2003 appears to have been a better year than 2002. Forty-six major discoveries - 100 million barrels of oil equivalent (boe) or greater - were made worldwide during 2003, an increase of five over 2002.
- Over the period 1995-2003, total resource additions resulting from resource growth in pre-1995 discoveries plus 144 billion barrels of resource additions from new-field / new-pool discoveries significantly exceeded global liquids production during the same period.
- Major discoveries are widely distributed geographically - 51 countries contributed one or more discoveries of 100 million boe or greater during the decade 1994-2003.
- A focus on coal-bed methane, heavy oil and natural gas liquids is adding to the growth in reserves supply.
- International exploration success declined from the record high of 45% successful wildcats in 2002, disrupting the upward trend in success rates seen over the decade. However, this success factor will no doubt increase as discoveries are gradually reported from wells currently classed as 'tight.' The North American new-field wildcat success rate reached a record high of 45% in 2003, significantly higher than the previous peak of 39% in 2001, partly aided by coal-bed methane drilling.
- Deepwater played an increasingly dominant role in the past decade - with a record 70% of all discoveries in 2003 being made in water depths of over 200 m and 65% of all discoveries occurring in water depths greater than 1000 m. Significant investments in deepwater E&P technologies by major international operators over the decade fuelled growth in reserves and production, which were inaccessible and uneconomic at the beginning of the period.

Remaining resources

Total worldwide liquids resources discovered through end-2003 amounted to 2285 billion barrels with cumulative production of 1020 billion barrels. The remaining resources of 1265 billion barrels imply global liquids depletion of 44.6% at end-2003. Worldwide gas resources discovered through end-2003 amounted to 9725 tcf. By end 2003, 2910 tcf of natural gas had been produced, just below 30% of the initial resource. Stated more simply, the data indicates that global consumers have used about 45% of the oil that was found worldwide before the end of 2003, and we have consumed approximately 30% of the gas that was found worldwide before the end of 2003. Future discoveries that have not yet been accounted for are likely to come as a result of continuing innovations in technology and access to areas where challenging conditions exist, including areas that are presently inaccessible due to political circumstances.

'Based on the analysis of our comprehensive global data, which is derived at the field level from relationships with governments, operators and reporting agencies, we have drawn some unique and significant conclusions.'We believe we will now see an upturn in strategic exploration investment and the report identifies a time-lagged correlation between higher oil prices and exploration activity. Overall expenditure increased significantly during the decade, despite a decline in exploration spending by the majors. The historical shift in increased expenditure was towards production, especially in deepwater, heavy oil and unconventional reservoirs. The highlight during the period included the role of international national oil companies (NOCs) and smaller independents in taking-up the exploration challenge.' Ron Mobed, president and COO of IHS Energy.

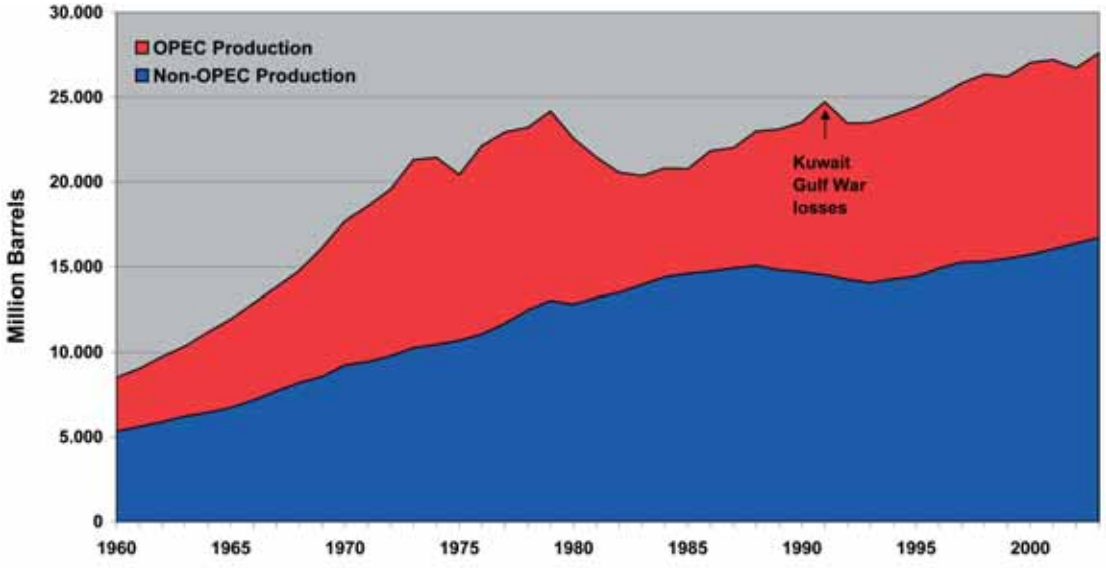

Figure 1 *World annual liquids production 1960-2003*

Overall production levels

Liquids

World liquids production (including condensate, natural gas liquids, oil sands and Orimulsion production, but excludes processing gains from refineries) reached another peak in 2003. According to IHS Energy's estimates, daily liquids production in 2003 averaged 75.5 million barrels, an increase of 3.2% from 2002 and 1.4% higher than the previous peak in 2001.

Non-OPEC liquids production reached a new peak at 45.7 million barrels per day (b/d), an increase of 1.9% over 2002 (Figure 1). OPEC country production accounted for 39.5% of the global liquids total, higher than the 38.8% achieved in 2002. Nevertheless, the 2003 OPEC share was lower than the period 1993 to 2001, throughout which OPEC share exceeded 40%, and remains well below the OPEC countries' production share in the 1970s when they regularly produced more than 50% of the world's liquids. At 29.9 million b/d of all liquids, OPEC country production was still well short of the record production of 31 million b/d achieved in 2000.

Compared with 2002, the most dramatic regional increase came from the Former Soviet Union (+13.0%) on the back of a 14.6% increase in Russian production. Production from Saharan Africa rose by 8%, largely as a result of increased OPEC country production. Middle East production growth of 7.7% is also attributable to OPEC increases. The increase might have been greater but for cutbacks in production in Iraq following the second Gulf war. Production from North America rose slightly, natural field declines being offset by a 140,000 b/d increase in production from Canadian oil sands.

Non-conventional liquids production from Canadian oil sands and Venezuela's Orinoco is estimated to have grown by 11% in 2003 to 1.28 million b/d, representing 1.7% of world production

By contrast, four regions produced less in 2003 than in 2002. Although production declined in both Argentina and Colombia, the major decrease in Latin America came from Venezuela, as a result of political unrest.

Gas

In 2003, natural gas production exceeded 100 tcf for the first time. Global gas production showed an increase of 3.4% above 2002. Gas production grew in all regions except North America, which saw a minor decline of less than 0.2%, a slight increase in US production being insufficient to offset the decline in production from Canada.

The greatest regional increase (23%) came from Sub-Saharan Africa where Nigerian production was boosted by full-year production from Nigeria LNG train 3, which had come online in November 2002. Similarly, in Latin America, the 6% increase in production was largely attributable to the first full year of production from Trinidad's Atlantic LNG train 2 and the start-up of train 3 in April 2003. Increased production from Qatar and Saudi Arabia contributed significantly to a 13.8% increase in natural gas production from the Middle East.

Major discoveries

In terms of resource discoveries, 2003 appears to have been a better year than its immediate predecessor. A total of 46 major discoveries (100 million boe or greater) were made during the year, five more than in 2002. The largest discovery, Iran's giant Lavan gas-condensate find, was made in a Palaeozoic reservoir beneath Lavan (Sheykh Sho'eyb) Island. Lavan's recoverable gas resources are estimated at more than 6 tcf.

Although Lavan was the only billion boe discovery made in 2003, eight other giant discoveries in excess of 500 million boe were made, three in Brazil

and one each in Angola, China, Malaysia, Sudan and Vietnam. The Chinese and Vietnamese discoveries were of gas-condensate and the remaining six were oil-dominant. In all, the 46 major discoveries accounted for more than 9.5 billion barrels of liquids and almost 24 tcf of gas. This exceeds the 2002 total from major discoveries by some 2 billion boe.

Deepwater dominates

Perhaps the most notable feature of the major 2003 discoveries was the dominance of deep-water success, with a record 70% of all major discoveries being made in water depths of greater than 200 m and 65% in water depths greater than 1000 m. This was also reflected in the distribution of resources with 64% of all resources being located in deepwater, the first time deepwater has accounted for more than 60% of the resources of 100 million+ boe finds (Figure 2).

The major discoveries of the past decade have a wide geographic distribution. A total of 51 countries contributed one or more discoveries of 100 million boe or greater, with 13 countries accounting for gross resources in excess of 5 billion boe. Liquid resources of greater than 5 billion barrels each were found in seven countries: Angola, Kazakhstan, Iran, Brazil, Nigeria, USA, and Saudi Arabia (in descending order of liquid volume discovered).

Natural gas resources of over 5 billion boe each were found in seven countries: China, Iran, Australia, Indonesia, Norway, Bolivia, and Egypt (in descending order of gas volume discovered). Only in Iran were resource additions in excess of 5 billion boe made for both liquids and gas.

Total resources

Liquid new-field resource additions of some 13.9 billion barrels were the fifth highest of the past decade but only replaced 50% of production. Only three non-OPEC countries – Kazakhstan, Angola and Brazil – have replaced their liquids production by new resource discoveries over the past five- and 10-year periods (see table), though Malaysia has replaced its production over the past five-year period.

Natural gas resource additions of 68 tcf were marginally greater than in 2002, but replaced only 67% of gas production. For the past three years discovered gas resources have failed to replace natural gas production.

Exploration performance

International exploration success declined from the record high of 45% successful wildcats in 2002, but will doubtless increase as discoveries are gradually reported from wells currently classed as 'tight.' The North American new-field wildcat success rate reached a record high of 45% in 2003, significantly higher than the previous peak of 39% in 2001.

'Looking out over the longer term, production from the Former Soviet Union has been relatively stable over the past decade, but it is likely to rise as new pipelines are constructed in the Caspian region and the LNG schemes for the Sakhalin area, and possibly the Arctic, are developed. North American production peaked in 2001, and the declining trend may well continue unless Arctic gas from both Alaska and Canada can be brought to market. In Europe, the UK, the world's fourth-largest gas producer, has entered a gas production decline in 2003, but this will likely be offset by increased production from Norway's Ormen Lange super-giant gas field and Snøhvit LNG development by 2007-2008.' Ken Chew, vice president of industry performance and strategy, IHS Energy.

In 2003, 1130 new-field wildcat wells were completed internationally, a 10% increase on the depressed level of

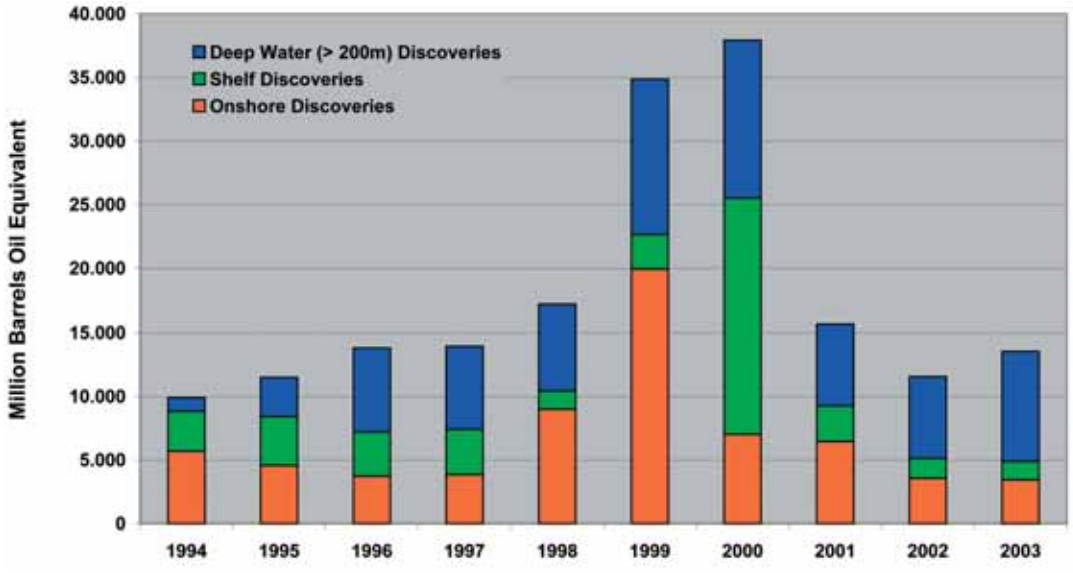

Figure 2 *Resources by location 1994-2003*

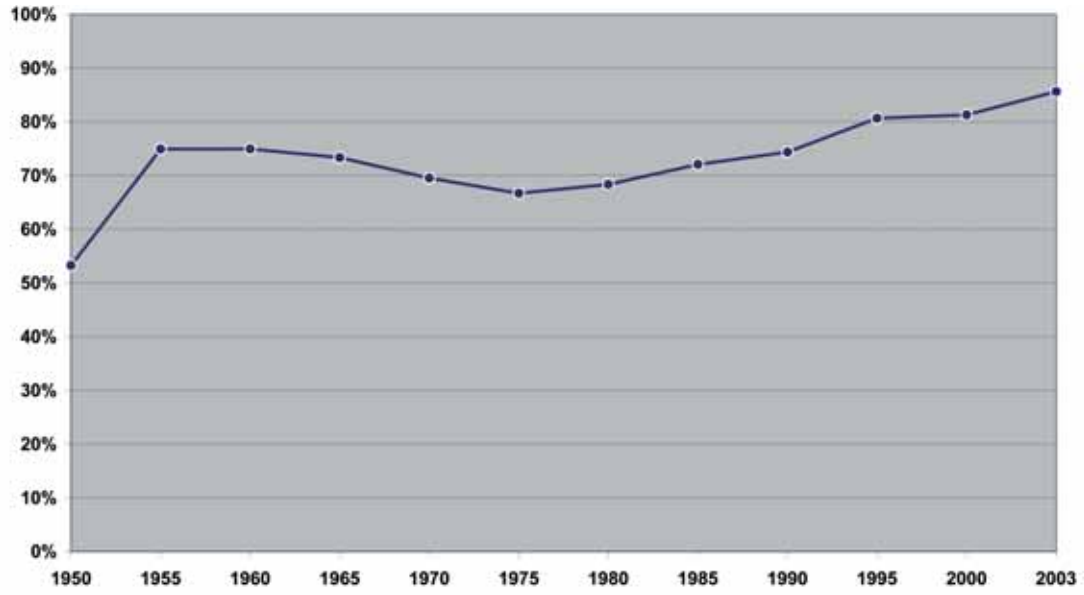

Figure 3 *Percentage of total discovered resources on-stream at end period*

2002 and slightly above the average for the period 1994-2003. North American new field wildcat drilling increased by 6% to 1584 wells, but remained 8% below the average for the decade.

Decline focus

Analysis of company drilling activity indicates that new field wildcat (NFW) drilling by the large international players, in particular those major companies that participated in mergers in the period 1999 to 2000, has declined significantly from 2000 onward. The relatively flat level of total international NFW drilling during the past four years indicates that smaller companies have occupied some of this exploration niche. The decline in international wildcat exploration by the large, internationally-active companies reflects a consistent trend during the past six years for these companies to spend a decreasing amount of their exploration and development budgets on exploration and also to spend a higher proportion of those exploration budgets in North America.

Oil production explained

There is a clear reason why oil production has not yet peaked and global depletion has not yet kicked in. Up to the end of the 1970s (with the exception of the post-war boom in the early 1950s), the industry discovered more resources than it brought on stream. Not only did the industry discover more but, up to and including the early 1970s, it tended to discover substantially more than the cumulative resources of the fields that were brought into production during each period. In other words, the gap between discovered resources and developed resources widened in absolute terms, reaching a peak of 860 billion boe of undeveloped resources by 1980. As Figure 3 shows, between 1950 and 1975 it also widened in percentage terms.

In addition to the existence of this gap between discovered resources and developed resources, the climb in production can be explained by other sources of production including 1) the development of previous discoveries that are now available due to political change or political opening (the Caspian region, for example); 2) unconventional heavy oil projects (in Canada and Venezuela) and 3) gas-related liquids (condensates and NGLs).

Changing expenditiure trends

While total expenditure increased during the decade, exploration expenditure as a proportion of total exploration and development (E&D) expenditure (excluding property acquisitions) has decreased from 26.8% of all E&D expenditure in 1998 to only 18.7% in 2003. Secondly, the proportion of exploration expenditure incurred outside North America has also dropped, from 66.0% in 1998 to 58.5% in 2003.

However, the report does identify a link between higher oil prices and increased exploration activity with a time delay of 12 months. Therefore, we should be entering a period where companies are revisiting their strategic exploration investments.

The report on world petroleum trends is available through a subscription to IHS Energy's Petroleum Economics and Policy Solutions (PEPS) on-line service. It provides a comprehensive 10-year summary of major country, regional and global trends in oil and gas exploration and production activity including: discovered resource estimates; liquids and gas production; wildcat, appraisal and development drilling; licensing activity; 2D and 3D seismic activity. For non-subscribers, the entire report is available separately for purchase from IHS Energy (sales@ihsenergy.com).