

The Oil Crunch Ahead

by Hugh Ebbutt

Two clearly diverging oil trends stand out. Oil demand will keep on growing relentlessly, particularly from the developing world, driven by rising populations, economic growth and desires for a better standard of living and more mobility. At the same time, the oil supply from all but a few areas is constrained and has become nearly flat. Growth in the flow of this critical resource has slowed over the last few years as increasingly complex new projects hit delays and as production declines in fields found and developed more than 30 years ago get steeper.

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Add to this fewer big new discoveries, fewer good projects in the pipeline, less access to new areas, less incentive to invest at higher cost, stiffer taxes and too few skilled people to run any more big projects effectively, and we have a problem – a rather alarming potential for severe oil shortages and resultant rises in price, perhaps as soon as 2012-2016.

Energy, mainly from coal, oil and gas, has been the basis for the world's astonishing growth and rising prosperity since the industrial revolution. The widening supply-demand gap and resulting shortfalls in available oil are likely to have a dramatic impact on how both the West and East develop – economically, socially and politically. Prices are likely to rise sharply again, hitting poorer areas hardest. Competition for scarce resources, from oil to food and water, may become extreme. How and when the crunch of the two diverging oil trends first hits will depend, in part, on unpredictable economic and political events, but its effects are likely to be profound and devastating. Both West and East will have to start dealing with the end of oil-based growth.

Consumers, energy companies and their leaders now face three serious challenges. The first is making real progress in investing to provide a lot more energy; up to 50 percent more demand is expected in the next 20 years.

The second is changing attitudes and expectations to ensure that this essential resource is used as much as 50 percent more effectively. The third is doing these while polluting and damaging the land, air and oceans a good 50 percent less. Human ingenuity works best under pressure, but in many parts of the world, real pressure is not yet apparent. Once the oil and energy gap

is upon us, we are likely to awaken to a significant, wrenching and painful transition to a new energy landscape. As in any change, there will be winners and losers.

Growing Awareness of Limits to Growth

Christophe de Margerie, CEO of Total, said in London last year that it would be hard to increase output from the current level of around 85 to 100 million barrels per day (mmb/d), let alone reach the 118 mmb/d mark that forecasters from the International Energy Agency (IEA), the Energy Information Administration (EIA) and ExxonMobil expect the world will need by 2030. Leaders from ConocoPhillips, Shell and Apache, some drawing on the National Petroleum Council's *Hard Truths* report of July of last year, have over the last few months acknowledged that supplies of "easy-to-access" oil, oil from outside the Organization of the Petroleum Exporting Countries (OPEC), and perhaps gas are unlikely to keep up with demand after 2015 and will naturally peak within the next 10 years. Though ExxonMobil, BP and others still argue that the world is neither short of oil nor likely to be anytime soon, the majors' future currently looks tough.

The CEO of Hess Corp., John Hess, added his voice at the Cambridge Energy Research Associates (CERA) conference in Houston, saying, "Oil companies, oil-producing countries and consumers need to act now to avoid the oil crisis that is coming within the next 10 years. Given the long lead times of at least five to 10 years from discovery to production, an oil crisis is coming, and sooner than most people think. Unfortunately, we are behaving in ways that suggest we do not know there is a serious problem." Few senior leaders in either oil companies or consumer governments seem willing to recognize publicly, let alone seriously address, this difficult but increasingly urgent issue.

Oil Growth Outlook

We burn through a billion barrels of oil every 12 days. Despite high and rising prices, oil production growth slowed in 2006 and 2007. Even with all the oil resources still estimated in the ground, it is proving harder to produce more barrels both quickly and affordably enough. Oil output outside OPEC has been almost flat since 2002. The seven leading majors' oil output has fallen 8 percent since 2004. After the many broken promises over recent years, investors remain wary. Many industry experts now see the non-OPEC oil high occurring before 2015 – and after that it may resemble, for any skiers, more of an icy and bumpy mogul field rather than an exhilarating and snowy cruise off an alpine peak.

Russia – previously a major engine of non-OPEC oil supply growth – recently reported its first year-on-year decline for 10 years, while production in the United States, the U.K., Mexico and other countries continues to fall. The big OPEC producers



prefer to maximize their near-term revenues with high prices and therefore have little incentive to invest in new capacity.

Most international oil companies (IOCs) are again reporting flat liquids production. Only Total delivered any growth last year – just 0.2 percent – and future growth depends on politically risky places. Five years ago, John Browne of BP forecast his company's production to grow from 3.5 to 4.5 mmb/d by the end of 2007. As it turned out, BP has so far managed less than half that output rise. Most of the IOCs have struggled to grow production at all.

Worse still, most now are predicting little or no growth for the next five years, too. In BP's case, its new and more modest production target of 4.3 mmb/d by 2012 may be achievable. Exxon has not revealed its reserve replacement; ConocoPhillips' was only 29 percent after Venezuela seized its heavy oil projects; and Chevron's was only 15 percent. Shell's and BP's were both better than 100 percent. After a series of large project delays, non-OPEC supply is finally expected to grow this year. While some companies, including Shell, now forecast better long-term growth (perhaps up to yet another promised 2 to 3 percent), most remain cautious on project timing.

In reality, as we have seen over the last five years, most of the majors still have weak and costly production growth profiles five to 10 years out. Incremental non-OPEC oil supplies are unlikely to add the net extra 14-15 mmb/d over the next decade that will be necessary to meet the average annual oil demand growth of 1.6 percent seen over the last 20 years.

The Relentless Arithmetic of Field Declines

Reaching 118 mmb/d over the next 20 years now appears fairly unrealistic. The key underlying problem is rising decline rates. For many older (often bigger) fields, these declines have risen from 4-6 percent to more than 10 percent. While full production data for some maturing giant oil fields is still obscure, the overall arithmetic is pretty clear.

If we take these mature field declines at the low end of current estimates – at 4 to 6 percent a year – and apply this to less than half the current 87 mmb/d base – so 40 mmb/d of the base declining at 5 percent, this results in an estimated minimum loss of 2 mmb/d each year. Many see these declines rather higher and rising, despite belated investment in better technologies. De Margerie of Total estimates an overall decline of 5 to 6 mmb/d a year. The IEA estimates that of every \$4 now spent on upstream activities, roughly \$3 go toward countering depletion. Improved recovery offers the most impact, while enhanced oil recovery and unconventional production are likely to continue to grow relatively slowly for now.

Despite growth in the deepwater Gulf of Mexico (GoM), where a record \$6 billion plus was spent just on the last two central-area lease sales, U.S. oil production peaked way back in 1970 and has declined ever since. Mexico's production

peaked in 2004, and many other major producing areas are following a similar pattern. "Sixty percent of the world's oil production is from countries that have already peaked," John Hess warned. "Within the next few years, conventional non-OPEC production will reach a plateau."

The U.K.'s oil production started declining from its high of 2.9 mmb/d in 1999 and has continued falling at relatively unnoticed, but increasingly steep rates. For example, in summer 2006 it was more than 12 percent lower than a year before. By December 2007, despite near-record investment the year before, U.K. oil production was down another 18 percent from 12 months before, at 1.2 mmb/d – down to well under half in eight years. Despite increased activity, this looks to be an irreversible decline.

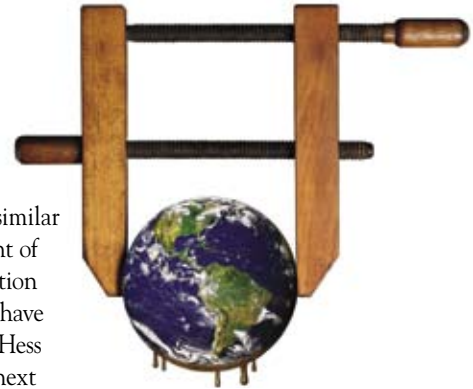
The total of all new oil production that is expected to come from existing projects – mainly from Saudi and Canadian heavy oil, plus new projects in Brazil, the GoM, Angola, Nigeria, Iraq, the Caspian and Russia – may add new flows of up to 15 mmb/d by 2016. But declines are likely to reduce the base over the same eight years by perhaps 20 mmb/d (at a modest 2.5 mmb/d lost a year) – a net 5 mmb/d loss! So we may find ourselves down to approximately 82 mmb/d available supply by then. If the oil needed to stimulate economic activity were to go on growing at 1.6 percent as before, we would need about 11 additional mmb/day. The projected oil gap by 2016 would be 98 versus 82 mmb/d, or a catastrophic 16 mmb/day short.

Prices will have to rise, probably sharply, to reduce the growth in demand, even with more liquids from gas and coal. Higher prices, where these feed through to consumers (which is not the case in China, Nigeria or Venezuela, for example), may then choke back demand and probably wider economic growth.

Energy Growth Depends on Investment and Skills

Surprisingly, the strong price signal – at \$80 to \$100 for many months now, and with demand again expected to rise further over the next 20 years – has not yet stimulated energy companies or the market to make the necessary investments. Most oil companies still seem to believe that prices much above \$60 or so are too good to be true. They see the recent run in oil prices as driven more by speculators and a weakening dollar than by fundamental supply-and-demand trends, while market traders simply – and, unfortunately, as usual – vacillate as a herd between the forces of fear and greed.

The supply-and-demand outlooks indicate that what we have seen is probably an irreversible change. As Fereidun



Fesharaki, chairman of FACTS Global Energy, pointed out at International Petroleum (IP) week in London this past February, “We should still expect cycles, but around a higher price base.”

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Companies – majors and national champions alike – have invested too little over the last few years to provide enough energy for the world. At IP week, Larry Chorn, chief economist of Platts, assessed “a need to have spent \$350 billion in 2006 to assure adequate crude oil production in 2010, but the IEA’s estimates of total expenditures are only about \$230 billion,” he said. So the industry has underinvested by around \$120 billion in 2006 to meet our expected oil needs just two years away! Platts’ forecast is significantly less optimistic than the IEA’s and points to a need for an upstream investment exceeding \$1 trillion a year by 2016. The company concludes, “Failure on the part of producing nations and multinational oil and gas companies in this effort will lead to temporary shortages over several years, causing debilitating price spikes.” OPEC, with 85 percent of global conventional oil reserves, provides only around one-third of its production capacity, but clearly has the resource base. No one, however, is investing enough to ensure sufficient capacity to meet the world’s oil needs in the next 10 years.

A key driving factor in the apparent reluctance of the majors and the national oil companies (NOCs) to take on more projects is a real shortage of skilled people with the right

level of experience to run them. For the majors, layoffs ironically have left companies with too few experienced engineers, geologists and other specialists to carry out the big complex projects. U.S. upstream employment is down from 700,000 people in the early 1980s to 400,000 now. These decisions have contributed to the many delays and cost overruns we have seen. Some of the largest Middle Eastern expansion projects are also falling behind schedule. The problem arises from too few contractors doing too many overlapping jobs and missing deadlines.

Fewer students in key disciplines at universities and aging staff profiles provide little encouragement. As Jon Glesinger, managing director of the Energy and Natural Resources Practice at Norman Broadbent, said at IP week, “Most companies are unprepared for the huge retirement

wave that will hit them in the next few years. We are reaping what we have sowed.” We now do not have the skilled workforce to support the many energy projects – in oil, nuclear or renewables – that will be needed. In fact, no university in the U.K., for example, now runs any full first degree course in nuclear engineering. Retiring baby boomers, with their tendency to make new rules, will take with them years of institutional memory in many fields. As U.S. President George W. Bush has remarked, “It would be fantastic to put a man on the moon again, but most of the guys who know how to do it are playing golf in Florida, and none of them can remember where the blueprints are.”

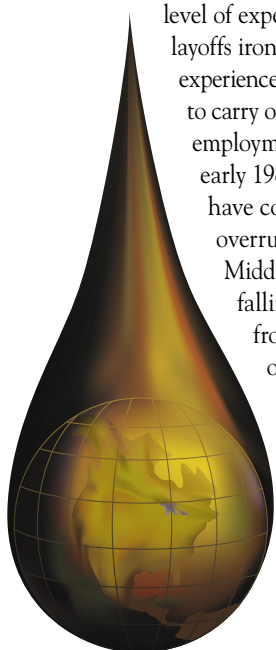
Using Energy Better

In the United States, the population (growing by nearly 3 million a year) consumes nearly its entire body weight in oil every week. At U.S. rates of consumption, this is the equivalent to each U.S. resident having 150 “energy slaves” working 12-hour shifts every day! Even at over \$100 a barrel, crude oil is pretty cheap at less than 65 cents a liter, and it is still a lot cheaper than a Starbucks coffee or a bottle of water or beer in most supermarkets. As President Bush characteristically observed in late 2007, “Oil is going up because we use too much oil, and the capacity to replace reserves is dwindling. That’s why the price of oil is going up.”

Most oil demand is for transportation fuels. “We need to improve fuel efficiency in transportation and increase investments in breakthrough technologies to make fuel cell vehicles a reality,” John Hess suggested. In the United States, there is an average fuel mileage requirement of 23.4 mpg for passenger cars and 17.7 mpg for light trucks and sport utility vehicles, “all powered by an internal combustion engine that is fairly energy inefficient, with less than 20 percent of fuel actually converted to useful energy. We need to raise this to the equivalent of 80 mpg or better,” said Hess.

In the developing countries, the investment company Goldman Sachs has estimated the number of cars may rise to 500 million in China and 600 million in India by 2050. As Hess said, “That’s 1.1 billion vehicles in two countries that three years ago had fewer than 20 million cars total – creating an overwhelming increase in the need for fuel.”

Dramatically better energy efficiency would help to solve another critical challenge the world faces – pollution and climate change caused by coal and oil use. As an unusual late snow briefly halts another warm U.K. spring, modeling studies indicate northern polar waters could be ice-free each summer by 2013 – just five years away. This could, of course, be good news for Canada and Russia. Meanwhile, other scientists have found that climate change is causing the tropics to widen, with possible impacts on the global food supply. Satellites tell us that three huge Antarctic glaciers the size of Texas are now sliding



faster into the ocean. Warm water seems to be undercutting the ice and lubricating its flow. Other nearby glaciers are accelerating too, and if this part of the western Antarctic were to lose its ice, the sea would rise by 1.5 meters worldwide. If meltwater from the surface were to leak down through fissures lubricating the base, as already observed in Greenland, a massive ice slide into the Atlantic could set off an enormous tidal wave, probably dwarfing that of Boxing Day 2005 and swamping those living on low-lying Atlantic coastal areas.

Much higher energy prices or a sudden acute crisis may be the catalyst we need to use a lot less energy more effectively and from new sources, thereby cutting pollution of all kinds. A big dilemma is whether to raise green taxes, as the Thatcher government did with the U.K. fuel escalator, intended to make consumers feel more of the true cost of the energy they burn and the pollution they cause, or whether to subsidize or hardly tax fuel to energize a country's economy to grow (and therefore use energy) even faster – as in the United States and China. Despite much rhetoric, green taxes in the U.K. have fallen under the Blair-Brown governments. In the face of truck drivers' blockades and supply disruptions eight years ago, these administrations lacked the courage to maintain the fuel escalator or to enact real incentives for change ever since.

History tells us that some good forward thinking usually beats sticking one's head in the sand. For example, we need real progress on nuclear replacement, perhaps doubling capacity at existing sites, and on big renewable energy projects, and both need a much clearer and more stable investment framework. So far, the market and its speculators have not been able to price any of the intangibles of oil, coal or nuclear waste sensibly. More widely, setting good fuel or energy efficiency standards for cars, SUVs, real trucks and other energy-intensive appliances and goods, reinforced by fair, revenue-neutral green levies rather than stealth taxes, may be good first steps forward. Awareness and education are already changing many consumers' and electors' hearts and minds on the long-term dangers of pollution (from plastic fragments to CO₂) and of wasting key resources.

Oil Supply Shortfalls by 2016

To revisit our two diverging oil trends: Demand is likely to continue growing rapidly until high prices choke it back, while supply is constrained and stalling. How long can our energy-intensive world rely on a growing oil supply to fuel our economic growth, mobility and current lifestyles? If we keep on our present "business as usual" course, a serious energy gap seems likely sometime between 2012 and 2016.

Oil and other energy prices will rise. Perhaps \$200 oil may soon not be so unrealistic. Without proper forward thinking and good alternatives, even as prices rise further, some less-fortunate users in poorer regions are likely to experience real physical oil supply shortages well before other energy options, including

nuclear, coal and better large-scale renewable sources, are ready. And we risk losing some of the comforts and luxuries we now take for granted. As most scalable new energy sources are unlikely to be ready until 2020 or later, big consumer countries will increasingly scramble and clash to secure diminishing resources to keep their economies growing. Shortages may cause civil unrest as well as regional tensions.

A near-term economic slowdown and oil price fall later in 2008 may delay this for a year or two and effectively prolong the current, slightly unreal sense that there is, in fact, no energy problem. Most governments and parts of the energy industry still seem to be in "institutionalized denial." When the crunch hits, oil prices will rise to unprecedented levels. This crisis, especially if not properly planned for, will trigger profound and painful shifts of power and money from oil consumers to producers, from IOCs to NOCs, and from the United States to other parts of the world.

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We will have to change how we are provided and use energy – more radically, much more quickly and on a greater scale than we thought possible just a few years ago. We have the technology and capability to reduce the highly wasteful way we use oil and energy overall. We just need the motivation, education and proper incentives to make this happen, perhaps recognizing the legacy benefits of taking a slightly less hedonistic, selfish or short-term outlook. In the end, most are remembered not for what they did for themselves, but for what they did for others. Reducing our enormous amounts of needless waste offers by far the most promising near-term and sustainable solution for the generations to come.

As higher price expectations and the threat of shortages stimulate more investment in new energy projects and in the people to make these happen, forward-thinking energy companies – and a few, more farsighted governments of highly energy-dependent countries – have the chance to seize the day. Some already are doing so. These first movers are investing, before most others and before the costs of entry and of inaction rise further, to develop more diverse and sustainable energy supplies for 2015 and beyond. ♦

Hugh Ebbutt is an upstream energy consultant based in London. Originally an explorer with BP, he has worked in E&P with Chevron and Hess and as a vice president with CRA International. He also led Arthur D. Little's Upstream Energy group in Houston.

