

Energy security in Europe

Oil production in Europe is starting to decline but will the rest of the world make up the difference? asks the energy supply expert, *Dr Michael R Smith*.

Europe is a region that possessed just 5% of the world's oil reserves before extraction started – the smallest volume of all the seven geographic regions – but it has still witnessed almost constant growth in output since Romania brought its first oil field onstream nearly 150 years ago.

However Europe can currently produce only around 40% of the oil it burns, consuming over 20% of global annual production. The region depends on imported low cost oil to fuel economic growth – oil that makes up a substantial part of global needs as shown in **Figure 1**. Fortunately, the world has easily been able to meet demand to date. Outside of periods of disruption –

usually caused by war – global supplies have been abundant, amply satisfying shortfalls in indigenous supply.

Yet, there is no doubt that global supplies are depleting. Current discovery runs at around 10bn barrels of new oil each year, but last year use was over 26bn barrels. Despite this, many argue that there is plenty of undiscovered oil remaining – especially if you take into account potential reserves growth in which extra volumes of recoverable oil are proven up in producing fields.

Furthermore, new giant fields in the Caspian Sea, offshore West Africa and in the Gulf of Mexico, together with developments in the Middle East

and potentially in Alaska, and new extra-heavy oil mines in Canada and Venezuela, seem to confirm that European oil needs can be satisfied for years to come, barring global political crises.

In fact, the world has produced just under half the oil that has already been found – around 970bn barrels. The reserves/production ratio (R/P), which does not include yet-to find reserves, is around 38 years at current rates. Given that the world's estimated total original endowment of oil reserves, including yet-to-find, is around 2,200 bn barrels – confirmed by estimates made by many experts over a period of 30 years (as shown in Figure 2) – the world has well over a 1,000bn barrels of reserves left. Thus, if you include all conventional oil, we seem to be able to meet demand for around 46 years.

Illusory perceptions

Unfortunately, reserves growth and reserves/production ratio are terms that are grossly misleading. Reserves growth is an illusion. Although apparent reserves attributed to the world's portfolio of discovered oil fields have, for a variety of reasons, increased year on year, this is mostly a function of conservative or false reporting in the past. Recovery factors have indeed improved in some fields, but only in those with difficult reservoirs that hold only a small proportion of global reserves. The bulk of reserves additions must be backdated to the date of discovery to get a true discovery profile. Total reserves estimates have remained largely unchanged.

Whilst there are many new fields waiting to be found, especially offshore, there is scant chance of finding more than a few dozen substantial accumulations. In fact, 60% of the world's oil is located in just a few giant fields found before 1970. Without many more giants it is impossible to add substantially to oil reserves and in the last 20 years there has been a massive decline in giant field discovery rates.

Even in our last major frontiers – the deep waters of the Gulf of Mexico and West Africa, and the Caspian Sea – new discoveries are now, on average, much smaller than they were just a few years ago. Figure 3 shows a truer estimate of annual reserves additions. We already know where nearly all our undiscovered oil is located – none of it is cheap and it is still insignificant compared to the Middle East.

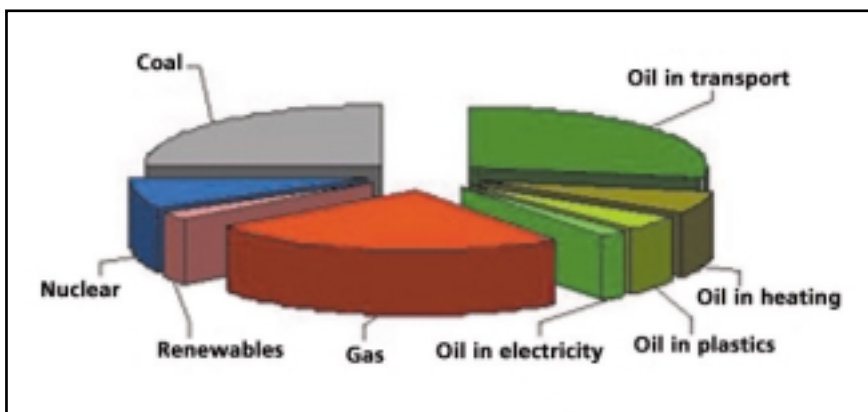


Figure 1: Global energy mix

Source: *The Energy Network*

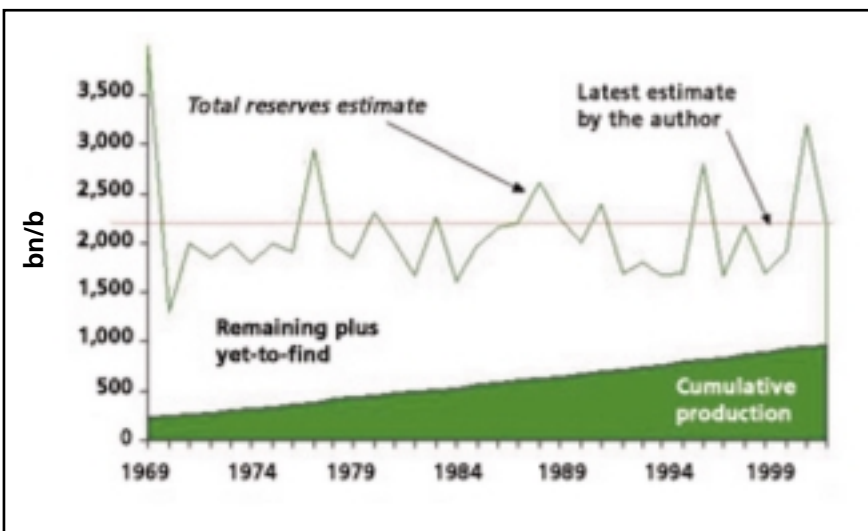


Figure 2: Historic reserves estimates

The term reserves/production ratio is also an illusion. Never mind that demand is rising in parallel with global population, the reserves/production ratio (which, owing to so-called reserves growth, has hardly changed in 30 years), disguises the true critical point – the year of peak production when available supply cannot meet global demand.

Oil will never run out, but there will be critical years, not so far away, when we want more oil than we can immediately get. But in an environment of oversupply – even when demand has been growing rapidly – the critical years have not normally been a concern to those who set the price of oil.

Critical years

There is now no question that oil production, freely extracted from a sedimentary basin, rises to a peak at a roughly steady rate as new fields come onstream, then begins to decline at a roughly steady rate as the first fields begin to deplete and the last few are unable to make up the difference. Increased prices and the presence of infrastructure and technology, both of which lower costs, will stretch decline out in the latter years but will fail to reverse it.

There are 56 countries in the world where production is already in decline and all but a few special exceptions empirically prove that peak year production occurred when between 40% and 60% of total reserves had been extracted. Analysis of cumulative production, remaining reserves and yet-to-find reserves in the remaining producing countries, using the 56 as models, provides the approximate year in which these will also begin to decline. The summed data provides the global peak production year.

The dawning of a global peak is, however, disguised by the actions of Opec – the only organisation over the last 40 years that has conserved oil. Off and on since 1960, Opec has exerted direct control on the world's production levels, making demand fluctuate in a rather unpredictable way. Whilst attempting to keep the oil price higher than market forces would permit, Opec has delayed the global peak year and it is very likely it will continue to do so for as long as it can.

Short-term gluts and shortfalls influence the oil price, in turn influencing global demand. So, to account for the actions of Opec, global peak year must be estimated as a function of different fixed demand levels. As shown in Figure 4, it is estimated that, at a 1% demand growth, global peak will be reached in 2016.

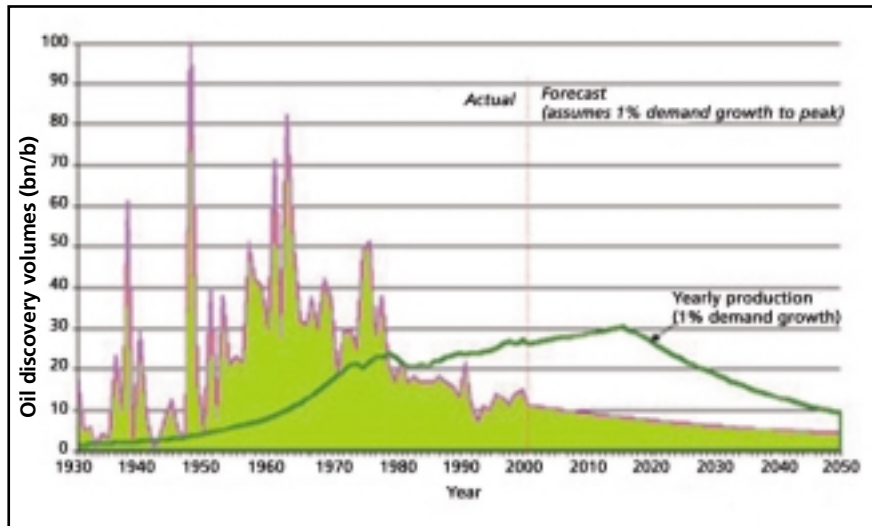


Figure 3: Approximate backdated discovery rate, 1930–2050

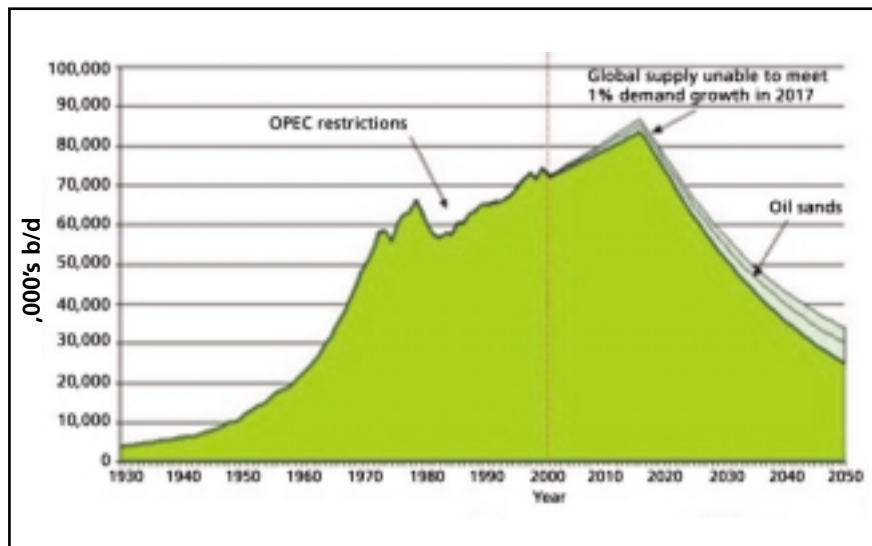


Figure 4: World oil production, 1930–2050, assuming 1% demand growth

Well past peak		Near peak	
Albania	(1982)	Denmark	
Austria	(1955)	Norway	
Bulgaria	(1969)	UK	
Croatia and Serbia	(1981)		
Czech and Slovakia	(1996)		
France	(1988)		
Germany	(1968)		
Greece	(1984)		
Hungary	(1984)		
Italy	(1997)		
Netherlands	(1986)		
Poland	(1909)		
Romania	(1976)		
Spain	(1983)		
		Far from peak	
		Faeroes Islands	

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Note: Does not include Former Soviet Union (FSU) countries.

Table 1: Peak oil production capacity in Europe

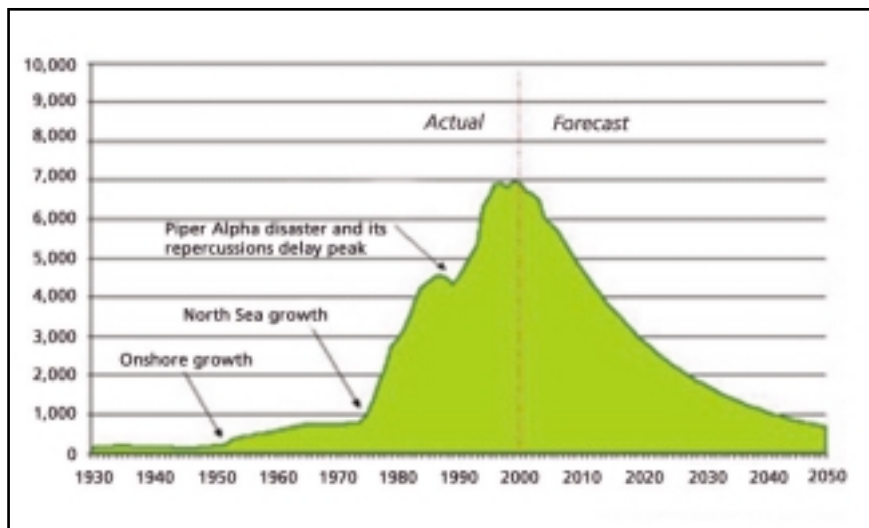


Figure 5: European oil production, 1930-2050

Of course the data are critical. This analysis is the culmination of a lengthy independent audit and grass-roots analysis of cumulative production, discovered remaining reserves, yet-to-find reserves and depletion rates in all 95 oil producing countries. The generated profiles are valuable predictive assets for policy and strategy formulation in the energy supply industries, as well as for governments and major energy users in the automobile, rail, airline and shipping industries.

European supplies

Europe has now produced around 50bn barrels of oil. Before extraction, Norway and the UK possessed 75% of Europe's total original reserves, mostly located in the North Sea. Besides Norway and the UK, only Denmark has a significant volume of reserves (also in the North Sea), whilst Romania, the only other important producer in Europe, peaked back in 1976 and is now in serious decline.

After years of intense exploration and production activity the region is past peak, having produced 57% of its estimated reserves endowment. Table 1 shows just how mature Europe's oil industry is. Only three of its 20 oil producing countries are not in decline, while Faroese potential has yet to be proved. Overall, the region peaked in 1999.

Europe now needs to import around 60% of its oil needs, mainly from Russia and the Middle East, and it will need to increase imports by around 2%/y just to maintain demand at current levels. Norway and, to a lesser extent, the UK are exporters – but these are massively outweighed by the import requirements of Germany, France, Italy and Spain, as well as many of the other smaller EU countries. Clearly Europe will have major

supply problems to contend with when world oil supplies tighten during the next decade. (See Figure 5.)

European vulnerability

From the beginning of the 20th century European oil demand has always been met and there has been a downward pressure on prices. Economies have boomed, demand has increased and, like any commodity, increasing demand has been met by increasing investment and lower costs through better technology. However, once global peak oil production is reached, new oil supplies will be unavailable to meet demand. By the middle of the next decade extracting sufficient oil to satisfy a fairly modest 1% global demand growth will be physically impossible.

Notwithstanding political risk, a global production capacity peak in the next decade will have serious implications for European energy security well before the actual event. Not only will supplies be struggling to keep pace as Opec countries use up their spare production capacity, but also, once the world recognises that a global peak is imminent, there will be early increases in price that will severely hamper economic growth. Furthermore, shortfalls will lead to competition for supply with the US and the Asia-Pacific, inflation, recession and international tension.

Increasing use of Russian gas for power and heat may offset part of Europe's shortfall. The other alternatives such as LNG, heavy oil sands in Canada and Venezuela, gas-to-liquids (GTL) projects, renewables, coal and nuclear power are generally more expensive and have long lead times. Some are environmentally questionable and mostly are, as yet, ineffective as oil substitutes in transport.

European governments are very con-

cerned with environmental threats but it is perhaps surprising that they are not more concerned with improving energy conservation and efficiency in response to supply threats as well. It may be that most European governments and their advising organisations are unaware of an impending global supply squeeze, and this is partly due to the rather optimistic view held by many US geologists and international energy agencies on the future potential of the world to yield more oil.

But lack of opportunity has already forced the major oil companies – who should know the problem better than most – to focus on expensive deep-water projects, cut costs, campaign for the release of protected areas, tinker with alternatives and forge mergers and alliances. Fewer oil companies are already looking for less oil. Of course, with the stock market to think about they don't talk about decline and neither does the International Energy Agency (IEA).

Perhaps under a global scenario of rising prices a new stable energy mix could be achieved with massive conservation, alternative fuels and energy efficiency improvements. However the length of the transition and who suffers least depends on how soon ameliorating measures are implemented by governments and the energy-using industries.

Feeling the pinch

There is insufficient space here to offer policy options and strategies but, suffice it to say, by the middle of the next decade it will not only be Opec that will be rationing oil.

At least a first step for European governments and concerned organisations must be to fully understand the problem and determine just where the world's oil will be coming from over the next 20 years, how much of it will be available and who will want it.

Oil-poor Europe will feel the pinch more than most unless remedial strategies are implemented very soon indeed. ●

All figures courtesy of the author.

A full, independent and detailed analysis of oil supply, sources, substitutes and price, together with a supply forecast to 2050 for every country and region in the world is contained in a commercially available report. Please contact the author at glow@lineone.net for more information.