

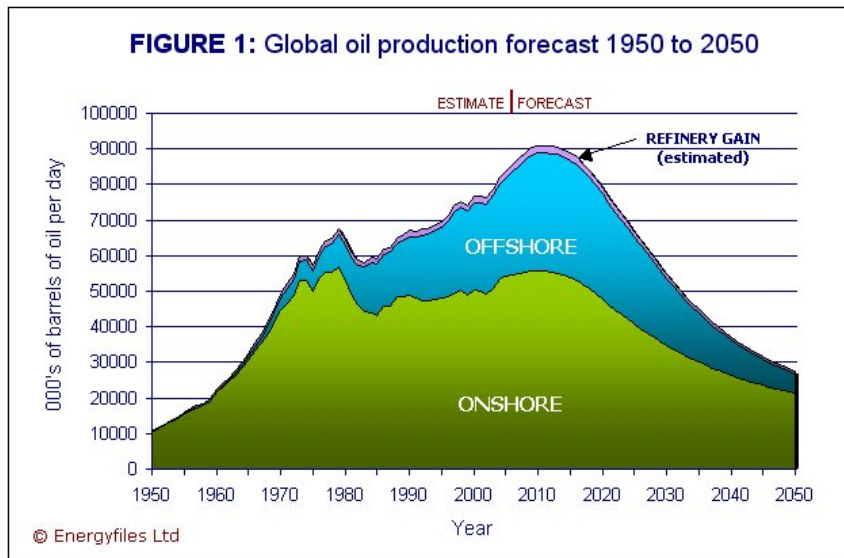
COMPREHENSIVE OIL AND GAS PROJECTIONS PUT PAID TO WHOLLY UNREALISTIC DEMAND PREDICTIONS

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Predictions that oil demand will increase to up to 120 million barrels per day by 2020 allied to automobile and airline traffic growing at extraordinary rates are futile and damaging to policy makers. Only a mix of geoscientific and engineering principles combined with economic judgement can now properly define future oil consumption levels. A data report from Energyfiles demonstrates that oil demand of over 95 million barrels per day, and probably less, will be impossible to meet.

Having predicted and witnessed the first pre-peak oil price surge Energyfiles is publishing its 10-year dataset, projecting onshore/offshore/oil/gas production, consumption and trade in every producing country of the world. These data force an immediate revision of the long-term demand forecasts of the EIA and others, and also the oil price forecasts advocated by the CEOs of Shell and BP.



Of course there is nothing new about a geologist's forecast of an imminent global oil supply peak. I have widely published **Figure 1** in various forms since 2001. Comprehensive data analysis shows that the world is near its peak and the influence of limited offshore and onshore opportunities seem immutable. What is new is that some economists are beginning to accept early signals of irreversible change, despite comforting pronouncements from oil companies and OPEC.

Oil remains vital

Together oil and gas still account for around 65% of our energy mix. Oil is valuable because it is versatile and easy to find, existing commercially in over 100 countries. It is easy to transport, through pipelines and in tankers, and can be readily transformed into useful work in simple engines. The high energy density of oil makes it the fuel of choice for automobiles and its jet fuel fraction is the only viable energy source for the airline industry.

And oil has been abundant for over a century. Many of the technologies to find and produce it from onshore reservoirs were developed early in the 20th Century and since then, with the appearance of offshore operations in the 1950s, there have been lots of new places to look. Increases in demand have easily been met by supply whilst exporters, collaborating to restrict output, have artificially created upward pressure on price allowing exploitation of expensive development options.

Data remain ambiguous and biased

There are still many ways of measuring oil and gas reserves, production and consumption. Different countries and companies use different units and splits, and there are various rules defining how numbers should be publicly recorded. The treatment of proven reserves varies, as does the inclusion of unconventional sources such as natural gas liquids. Meanwhile analysts misunderstand the time element, using reserves divided by yearly production (R/P ratio) to define years of supply remaining - a meaningless number in practical terms.

Geologists are optimistic, when the truth is that realism will give a different result, whilst engineers have to be pessimistic to avoid costly mistakes. Some parts of the oil industry under-report for regulatory reasons, other parts over-report to maximise value. Governments also over-report for promotional reasons. Countries seldom update reserve estimates and the many public and private data sources give different numbers so that individuals pick the one that suits their argument.

Broadly speaking the Energyfiles data resource at least tries to be internally consistent. Produced oil volumes are those at the surface, not in the reservoir where dissolved gas means oil occupies up to 30% more space. Any production that exists as a liquid at the surface is allocated to the oil domain. Thus natural gas liquids are oil, even though they may be recovered from gas, whilst liquefied natural gases are not, since they are created from gas.

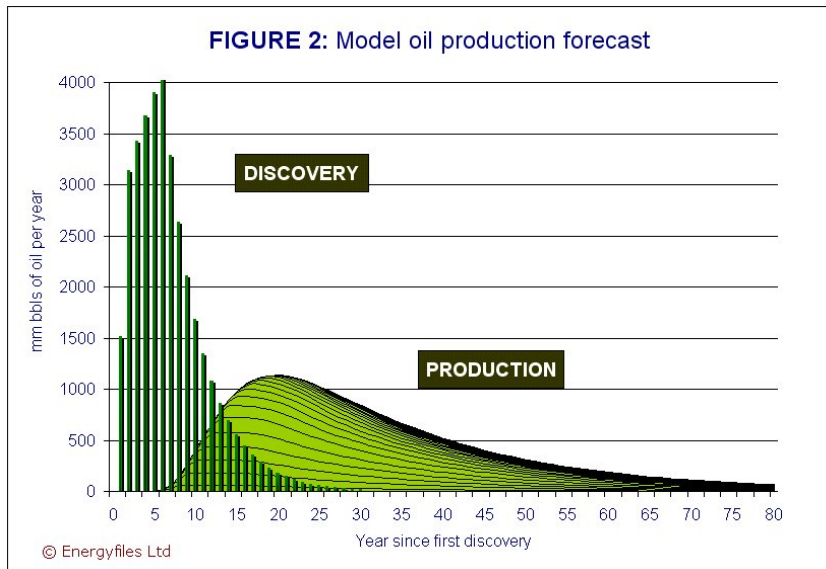
Gas production is marketed gas, including that from tight reservoirs and coal seams, sold either as pipeline gas or after conversion to LNG. Production of vented, flared and re-injected gas is not production, although re-injected gas will usually return to market if one has been created or an oil field is exhausted and so requires no more pressure support. Gas volumes increase substantially at the surface but shrink after processing as the liquids are removed, and this often leads to uncertainty in published figures.

Peak is still argued about

Production peaks in fields, basins, countries and regions. Theoretically peak occurs when 50% of recoverable oil reserves have been produced but empirical analysis of the many basins that have already peaked show that the timing is much more variable, heavily controlled by fiscal terms and infrastructure.

Offshore oil peaks are easier to define because of the rapid and consistent way full field developments proceed. Studies show that output from offshore wells declines by an average of 15% per year. Individual fields made up of a collection of wells decline less rapidly, at around 10% per year, because the best wells are worked-over and enhanced recovery projects briefly stem decline. By the same token, unless containing very few fields, sedimentary basins decline by around 5% per year as new, progressively smaller, fields are added.

Countries and regions may decline by less still if they contain many basins. Decline rates are averages and can be affected by the discovery of new provinces or plays and by technological breakthroughs that lead to a one-off jump in output. They are also affected by commercial and political circumstances, such as output restriction by OPEC. **Figure 2** is the model profile that sedimentary basins will adopt if unmodified by these effects.



Global oil supply has become geologically constrained

Exceptional demand growth in Asia, coupled with flagging levels of oil output from non-OPEC countries, has created a capacity-constrained environment in which permanent geological supply limitations are truly beginning to control price. Since 2003, and until 2010, global oil supplies will be struggling to keep up with demand leading to intermittent upward pressure on prices as the supply/demand ratio swings in and out of balance.

However after 2010 declining oil supply, matched by permanently rising prices, will begin to have a negative effect on oil consumption throughout the world. The effect of a capacity-constrained environment on the economies of countries will differ depending on their level of development, location, dependence on imported oil, and availability of other raw energy materials and/or infrastructure to produce fuel alternatives from coal, nuclear power, hydroelectricity, solar power, wind farms, biomass etc, and especially from gas.

Right now gas is the only viable alternative

Gas too is a versatile fuel, and is even more widespread. It has an advantage over oil in that it is ready to burn without refining, although processing is necessary if the valuable liquids are to be recovered. Furthermore gas burns relatively cleanly so that environmental regulations favour its use for heat and power in populated regions.

However gas is less dense and bulkier to move and to store and has been used only in regions accessible by pipeline. It is unsuitable for use in automobiles except when expensively converted into a liquid or fuel substitute such as electricity or hydrogen. As a result large quantities of gas located in remote oil fields have had to be wasted through flaring and venting. With the advent of an LNG industry, a global gas market is now developing, which is kick-starting new local and regional gas markets, allowing the commercialisation of undeveloped or wasted gas accumulations. Gas is substituting for oil wherever it can.

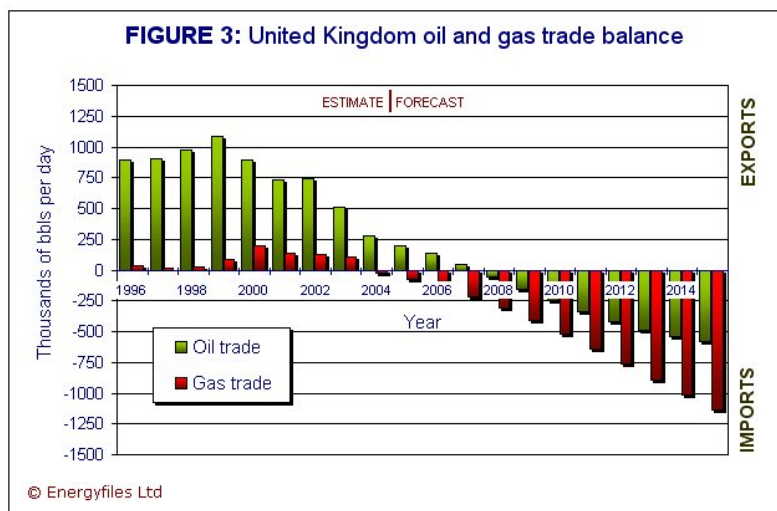
For example Europe has become dependent on gas to fuel its electricity and domestic markets. But gas as a substitute for oil in transport will be used only after massive investment in infrastructure, which takes time to install and may not immediately be cost-effective. Moreover northern Europe will rely on Russian gas to top up indigenous output and sufficient supplies are unlikely to be developed in time.

TABLE 1: Russia consumption and trade data

RUSSIA		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Consumption																
Oil mm bbl/day		2.46	2.48	2.50	2.57	2.63	3.15	3.19	3.22	3.25	3.28	3.30	3.32	3.33	3.34	3.34
Gas bcm/year		373	389	393	402	412	422	433	444	455	466	476	483	490	497	505
Gas mm bbl/day		6.42	6.70	6.77	6.93	7.10	7.28	7.46	7.65	7.84	8.04	8.20	8.32	8.44	8.57	8.70
SUM mm bbl/day		8.88	9.18	9.27	9.50	9.73	10.43	10.65	10.87	11.09	11.31	11.49	11.64	11.78	11.91	12.04
Oil trade mm bbl/day		4.60	5.22	6.04	6.71	6.78	6.44	6.65	6.92	7.05	6.95	6.79	6.49	6.13	5.79	5.48
Gas trade bcm/year		170	167	186	187	180	176	178	172	171	168	163	162	164	167	168
Gas trade mm bbl/day		2.92	2.87	3.20	3.22	3.10	3.03	3.07	2.97	2.94	2.90	2.81	2.79	2.82	2.87	2.90
SUM mm bbl/day		7.52	8.09	9.24	9.93	9.88	9.47	9.72	9.89	9.99	9.85	9.60	9.28	8.95	8.66	8.38

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Projections in **Table 1** show that Russia will actually have less gas to export westwards over the next decade, especially as China enters the gas import market. Output will only pick up after 2015 as new volumes appear in the Arctic so it is hardly surprising that the UK is anxiously looking for new gas sources to fill its supply gap as shown in **Figure 3**.



Federal Reserve Chairman Alan Greenspan has said that oil markets might stay turbulent "for some time to come," but he predicted that, "high prices will spur the use of cheaper alternatives well before the world's oil reserves are depleted". Full projections show that gas is an alternative but not without a recognition that the transport industry must change direction. Increasing investment in public electrified systems is essential whilst reduction in aircraft and automobile numbers is inevitable over the longer term.

And the oil price will surge again and again

At such a critical time, with oil and gas uniquely important to the health of the global economy, it is important to take an integrated look at production, consumption and price using facts not assertions. Lord Browne of BP has said that oil prices are likely to remain above \$40 a barrel but only until new supplies come onstream in a few years.

Albert Bressand, a vice president of Shell, proposes a long-term price range in the \$30 to \$40 range, whilst the CEO of Shell said in June that energy demand in the next 30 years will grow faster than in the past three decades. Meanwhile the head of commodity research at Goldman Sachs recently said, "the real problem is a lack of refining capacity."

Careful forecasts of oil supply data do not support such speculations. True projections are consistent with rapidly rising prices after 2010 accompanied by painful conservation. Sufficient new supplies will not come onstream to replace the depletion of existing fields, especially those old giants responsible for around 65% of global supply.

Of course not everyone is sanguine. My own **"World Oil Supply Report"** now in its 3rd edition, and published by Douglas-Westwood, has long forecast oil price surges. Its 0% to 3% demand scenario has recently been reproduced by the Economics, Industry & Finance Ministry of the French Government. The Ministry comments on the likelihood of a production plateau, a subject seldom brought up by government ministries and never by financial departments.

Demand forecasts above 95 mm bbls per day are untenable

In developed countries oil consumption has already been driven lower by high taxes and environmental regulations. Growth in private automobile use and air travel, albeit with better fuel economy, has had the opposite effect so that overall oil consumption has been near flat. However in developing countries a wealthier population who covet a Western standard of living has driven consumption much higher.

Projections demonstrate that it is no longer appropriate to accept glib demand forecasts from oil companies, financial institutions and governments that predict, with wishful thinking, ever-growing demand levels. Such forecasts, divorced from reality, fail to take account of tight supply conditions and rising prices. We will be unable to produce oil at these rates without unbelievable step changes in technology. Consumption will only grow as much as supply will let it. Policy makers who believe unfettered demand forecasts will make bad decisions.

After 2010 upward pressure on price will be permanent with oil supply limitations seriously subduing demand. When the price of oil is significantly higher, people will know oil to be a more valuable commodity and their behaviour will adjust to a restructured fuel economy. They will be looking at alternatives, but primarily they will be looking at painful conservation and global competition for resources.

What does global competition mean? The economist Irwin Stelzer writing in the UK wrote, "So Bush is in trouble. At least for now, he can do nothing to get the producing countries to bring down the price of oil." And he went on, "...and, if he can bring himself to it, a quiet word with the Saudis and Kuwaitis about the consequences for them of the withdrawal of the American shield that protects them from Saddam." Of course that was 4 years ago, a couple of months before 9/11. Bush did manage to bring himself to it but with a much more radical solution.

Extra information for readers: **"Oil and Gas 2006: Global ten-year projection"** is a quantitative survey of production, consumption and trade. Each dataset is a 10-year historic and 10-year projected production, consumption and trading series for every country and region in the world, split into oil/gas and onshore/offshore where appropriate. Charts graphically demonstrate trends, along with brief descriptions. The report contains over 275 pages, 500 figures and 250 tables and covers 129 countries and regions. Contact: email: admin@energyfiles.com web: www.energyfiles.com