6 Petroleum and Violent Conflicts: Strategies for Industrialized Countries

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In a little over a century petroleum has grown into the most widely traded commodity in the world, into the source of unparalleled wealth for many, into a must-have necessity – some say, a narcotic - for others, and into one of the premier drivers of violent international conflicts around the world. The latter role is becoming the overarching one in this still new century because the Earth has already given up much of its oil riches, and narcotic users tend to become panicky when supplies run low.

Many theories have been spawned regarding petroleum in the ground and its practical availability above ground. The most successful one came from the US oil geologist Marion King Hubbert, who in 1956 predicted that US oil production would peak in 1970 and decline thereafter.

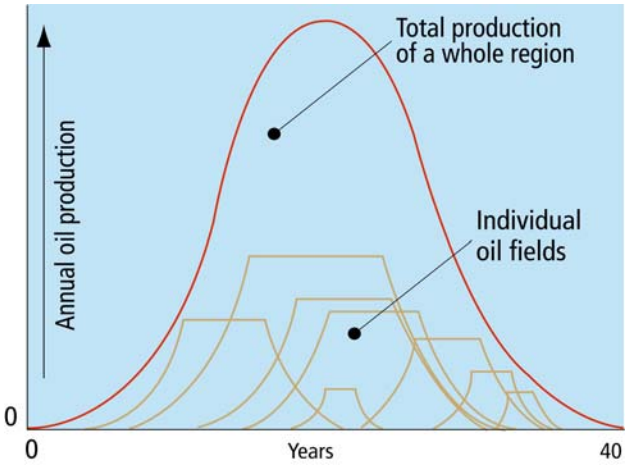

Diagram 1: Hubbert Curve[2]

The "Hubbert Curve" illustrated above demonstrates empirical experience based on geology and statistics: The practical availability of a region's oil reserves over time describes a Gaussian (Normal) Curve. Large fields are discovered first, small ones later. After exploration and initial growth in output, production plateaus and eventually declines to zero. Until 1970 Hubbert was ridiculed and denounced by the US Administration and the oil industry. However, his theories proved exactly correct; beginning in 1971 US oil production declined and has maintained this downward trend steadily.

In the 1950's Hubbert predicted that global oil production would peak around the turn of the century. OPEC's capping of output for some two decades delayed the peak somewhat compared with Hubbert's original prediction. Nevertheless, Hubbert's empirically derived forecasting methods have stood the test of time. Even today new exploration and production technologies can alter, but not undo, the limits dictated by geology. The bell-shaped output curves can be discerned both for major fields and entire regions.

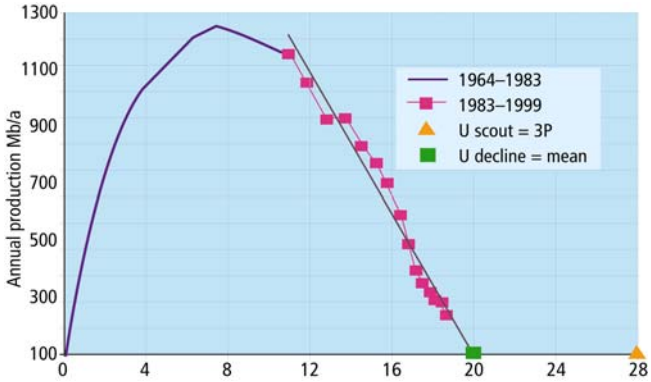

Diagram 2: Samotlor[3]

Samotlor is Russia's largest oilfield. Oil production is declining steadily despite the deployment of modern secondary and tertiary production technology.

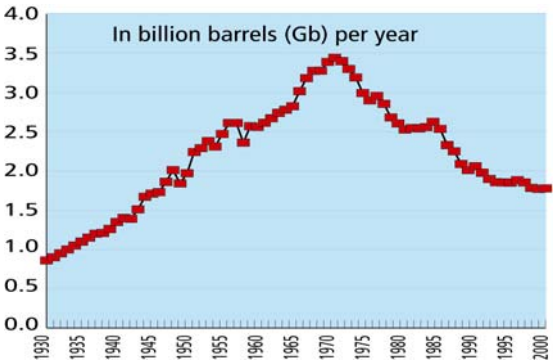

Diagram 3: US oil production (without Alaska)[4]

The same holds true for US oil output in the lower 48 States. (US-production without Alaska). The decline in output was only slowed somewhat by tapping off shore and deep-sea oil deposits in the Gulf of Mexico. A steep decline in output is also to be expected there, roughly after 2010.

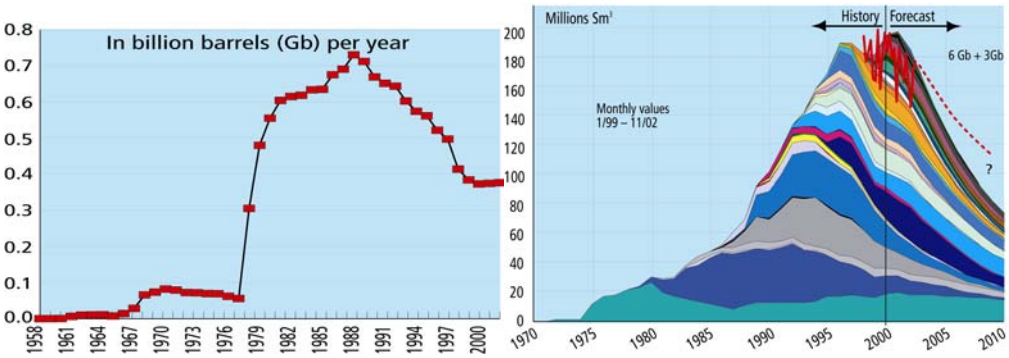

Diagram 4. Diagram 5: Oil production in Alaska[5] **and Norway**[6]

Alaska and Norway present a similar picture. Production patterns for individual oilfields are particularly well portrayed in the chart for Norway. Each of these oilfields describes its own Hubbert Curve, in which the pace of new development and the timing of the peak follow different patterns, but always end up in a steady contraction of production.

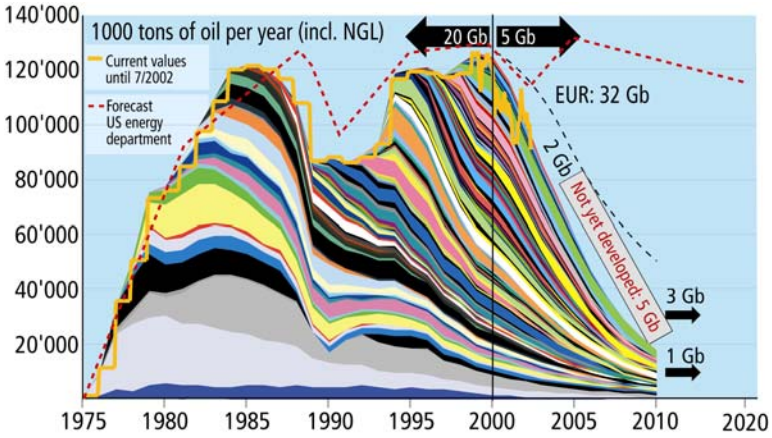

Diagram 6: United Kingdom[7]

In the case of the United Kingdom, precise data for the output of individual oil fields are well known: the dip in the middle of the picture is due to the Piper Alpha oil platform fire. The all-time peak was reached in 1999 with an average of 2.68 million barrels a day. Since then, production has diminished by 23%, or 6.0 % per annum to 2.073 mbd.[8] This figure conveys some idea of the changes to be expected when world oil production peaks. Shown in red in this picture are the optimistic production forecasts of the US Energy Information Agency (EIA). They are also frequently disseminated as such by the Paris-based International Energy Agency (IEA).

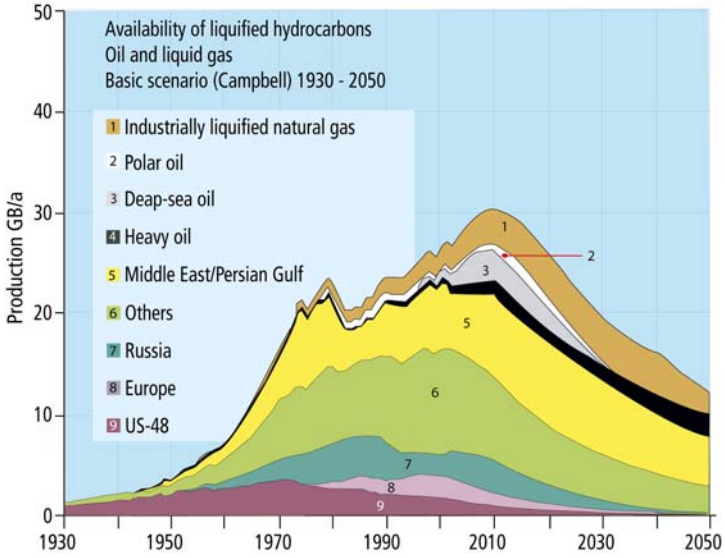

Diagram7: ASPO forecast, all liquids[9]

In the view of the "Association for the Study of the Peak of Oil and Gas" (ASPO)[10] - an association of critical oil geologists - it will be possible to increase global oil production only until roughly 2010. Thereafter, production increases from new oilfields will no longer offset production declines in old fields, let alone contribute to further growth. Given the growth in demand of 1-2% per year hitherto, stagnating oil production already poses a serious challenge.

Some increases in output will come from deep-sea oil (Gulf of Mexico, West Africa, South China), from the polar regions (Alaska, Alberta, Siberia, Sakhalin) and from the Caspian

Sea. In the "old" production zones outside the Persian Gulf region, output is declining. Globally, 27 billion barrels of oil are currently being extracted annually, whereas new finds amount to a mere 3-6 billion barrels per annum.[11] Present oil production will hardly be able to remain at this high level beyond the year 2010. Oil will indeed continue to flow for another 75 to 100 years, but in steadily declining quantities.

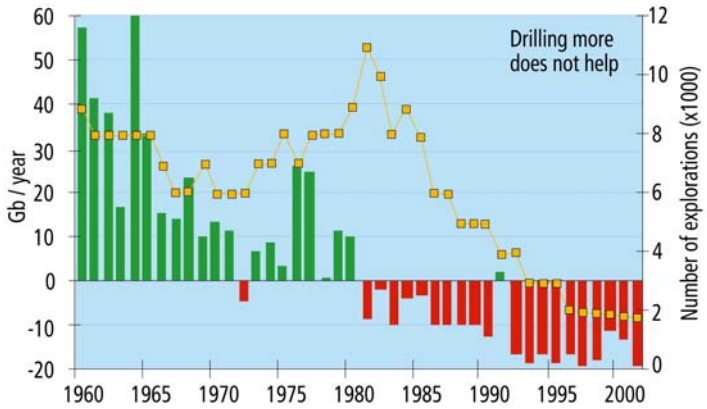

Diagram 8: Explorations (yellow line) and net increase in oil reserves[12]

It is inevitable that oil prices will start to rise significantly, but this will not lead to significant increases in production. As early as the 1970s it had already been realized that despite high real prices of over $100/b (in 2003 dollars), additional drilling could not increase the number of actual finds. Instead, for years now there has been a deficit between new oil discovery and oil consumption, which is drastically depleting real reserves.

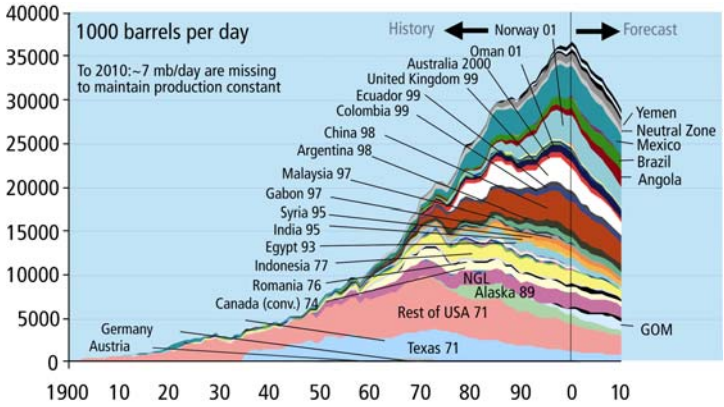

Diagram 9: Post-peak countries[13]

All the increases in production in Russia, West Africa or Alaska are not enough to compensate for the contraction in oil output in the numerous countries (mostly non-Opec) that have already passed their peak (Diagram 9). By 2010 these countries outside the Middle East OPEC countries will suffer a shortfall of some 10 million b/d, or about one-eighth of current world oil output. To maintain present world production rates this shortfall would need to be made up by additional production in the Middle East.

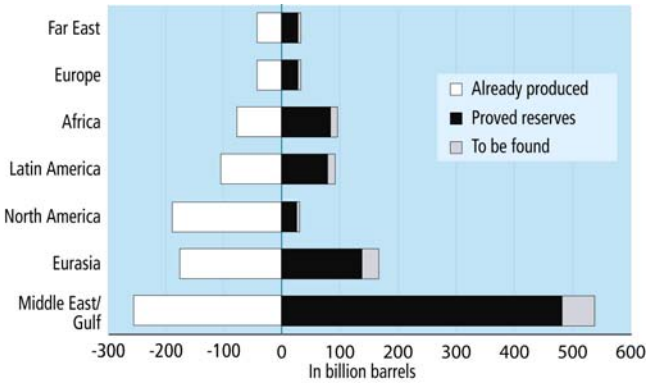

Diagram 10: Overall availability of oil by origin: already being worked, still existing reserves and expected increase in reserves by 2050[14]

The remaining reserves are distributed geographically in a highly unbalanced manner. North America, originally almost as oil-rich as Saudi Arabia, by now has nearly exhausted its oil riches. The additional reserves often alleged to be enormous in the form of shale and tar or oil sands are not equivalent to reserves of liquid oil. The extraction of oil from sands or shale consumes huge amounts of energy and causes serious environmental damage and pollution. Therefore these supposedly gigantic reserves can contribute only modestly to the overall supply --- at most 20% of North American consumption.

For the industrial countries to maintain oil consumption at the customary levels requires massive increases in Middle Eastern oil output. An important non-technical factor comes into play here: Islam. Of the roughly 1,000 billion barrels of conventional oil reserves remaining, two-thirds are located in Muslim countries, 260 billion barrels in Saudi Arabia alone, compared with 22 billion barrels in the USA. The continuation of its extravagant energy consumption makes the US dependent on the economic and political dynamics of the Islamic world. The actual on-going supply of oil is not just a matter of the size of reserves but is driven by the price levels and by policy decisions regarding what is a desirable output today versus tomorrow. Add to this the difficulty of accurately determining the scale of oil reserves there. In the OPEC countries the methodology for estimating oil reserves is a well-guarded government secret. When expectation for prices are turning higher, some countries tend to restrict output in order to ensure bigger oil revenues in the future.

Given the still low real prices of oil and the existing upside potential, many countries have an interest in restricting output and assuring the local population a bigger share in oil income. This is a prime motive of recent riots in Nigeria and Bolivia, of the policies of the Venezuelan President Hugo Chavez, and of shut-off of oil exports by guerrillas in Iraq.

The inability of the USA, to change their wasteful *American Way of Life* in favor of a sustainable lifestyle is the chief reason for US aggression and occupation in the Middle East and Central Asia. Naturally, it is also about oil company profits, the interests of the US automotive industry and the imperialist aims of the Israeli Government (annexation of West Bank, Gaza Strip and Golan Heights). But the inner circle within the US government that sets the agenda mainly is composed of former oil industry executives and this is what is sparking the conflict between the West and the Islamic countries.

Under George W. Bush the word "terrorist" has become the code for Islam, for a religion with over one billion believers. Since its very beginnings, Islam has pursued strong social

objectives and has developed its own moral code aimed at preventing extreme poverty among its own people. It is therefore no chance matter that Osama bin Laden's declared demands include higher oil prices ("144 dollar a barrel") and the withdrawal of the US army from Islamic countries.

Conflict between East and West will in future revolve increasingly around oil prices. For many years following the collapse of the OPEC cartel in 1985, prices fluctuated between $15 and $20, corresponding to 10-15 US cents/liter, a very low level in real terms. For decades oil was two to four times cheaper than Coca Cola!

A new situation has been developing since the year 2000, however. As a direct outcome of declining production in the North Sea and Alaska and due to rising demand from Asia, OPEC has regained price leadership and - as in the 1973-85 period - is now using its quota decisions to set the band for oil prices.

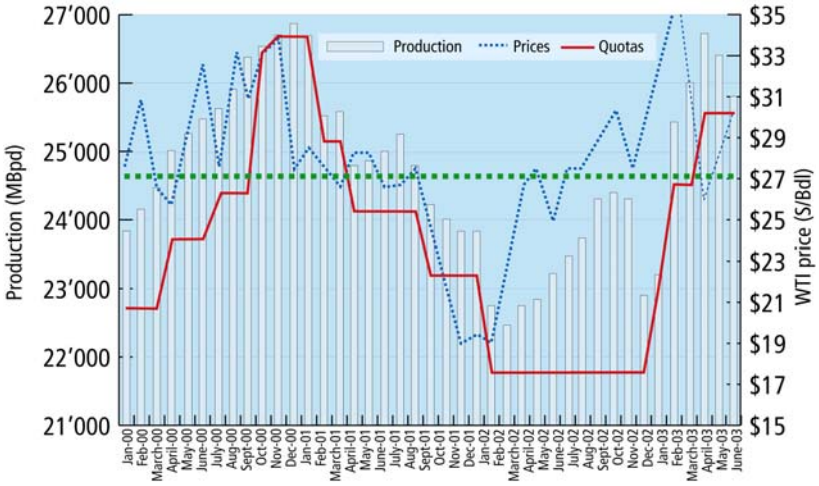

Diagram 11: OPEC production quotas and oil price trends[15]

Thanks to the new quota discipline, the price range has been gradually raised from a 1999 low of $10 to more than $30. This means that the oil bill has more than doubled for the wasteful US and other importing countries. The price decline that many oil analysts had expected in the aftermath of the Iraq war has not materialized. Instead, the official Opec price range was quietly raised from $22-28 to $28-35/b during the 2003/2004 winter, partly to offset the lower value of the US-dollar.

Terrorist attacks on export pipelines and local resistance against occupying forces in Iraq have been highly successful in at least two ways, 1) by directly interrupting the flow of oil, and 2) by deterring fresh investments in the oil infrastructure. And, most likely, the US has lost appetite for new armed incursions into oil-lands, for example Iran or Saudi Arabia, because such ventures would certainly reduce, rather than increase the flow of oil to the industrialized world. It would be no surprise if oil prices surpassed $50/b by early 2005. As a consequence, efforts to improve energy efficiency and to tap renewable sources of energy are taking on greater importance in oil importing countries.

These higher oil prices mean new and enormous money transfers from the first world to the Middle East and to Russia, improving the economic base in many medium-size oil-producing countries, which in turn tends to increase the demand for oil and natural gas of the local populations in those countries. The new oil market conditions also are enabling many countries better to protect themselves from US imperialist influences. It is no chance

matter that in awarding its latest natural gas concessions, Saudi Arabia considered oil companies from China, Italy and Russia, but not from the USA. This greater self-confidence is reflected in some OPEC member's demands for payment of its oil invoices in Euros or in other currencies more solid than US dollars.

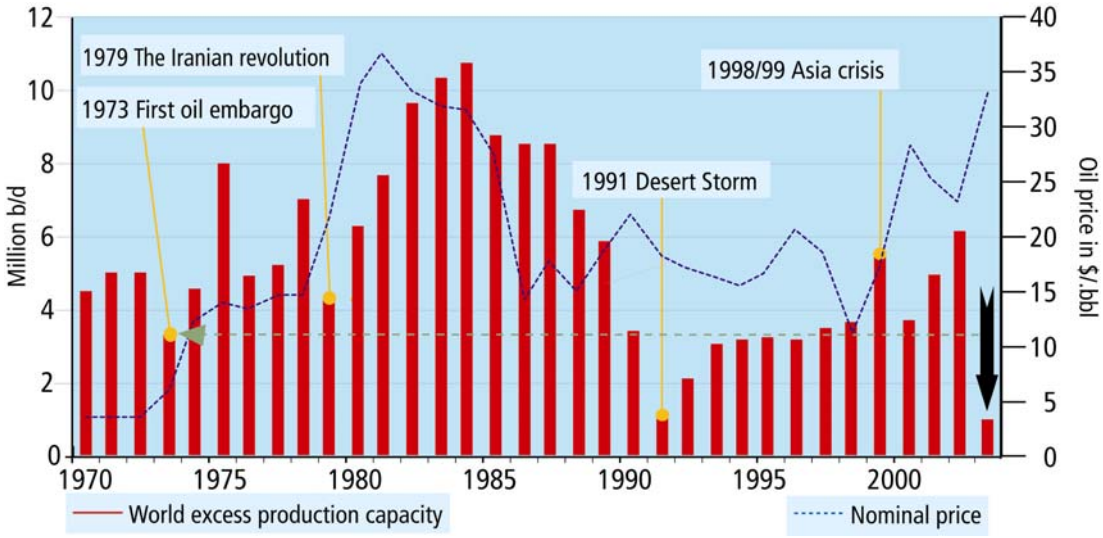

Diagram 12: Oil price and excess production capacity[16]

The pincer movement of rising demand and dwindling reserves means that even relatively minor events such as strikes, a fire in a large refinery, or political unrest even in second-tier exporting countries can trigger major price upturns. The cushion of huge, readily accessible, reserves has shrunk to an all-time low during the Iraq war, some 1 million barrel/day or barely more than 1% of overall world consumption, and less than 2 million barrels in early 2004.[17]

On March 7, 2003 ARAMCO, the Saudi national oil company announced that with an output of 9.2 million barrels per day the Company was at near-full capacity.[18] Since then the Saudis' output has dropped by 0.7 million b/d. Accordingly the country has only limited mobilizable reserves, and many of the older super-giant oil fields such as Ghawar are in natural decline so that maintaining (not to mention lifting) their output entails ever greater costs.

This is the more remarkable as Saudi Arabia and some smaller Gulf States are the focus of the West's supply expectations for the coming decades.

International Energy Agency forecasts, regularly published in "World Energy Outlook", do merit closer scrutiny in this respect. After all, the IEA is the authoritative OECD-branch that advises OECD governments and makes long-term recommendations to political players. Statements by this government-funded institution in Paris are taken as the "truth" in the energy ministries of many industrialized nations. IEA-"Reference Scenarios" in fact assume that oil production will increase steadily by 1.6% per annum until 2030, without massive increase in prices: *"Resources of conventional crude oil and NGLs are adequate to meet the projected increase in demand to 2030, although new discoveries will be needed to renew reserves. The importance of non-conventional sources of oil, such as oil sands and gas-to-liquids, is nonetheless expected to grow, especially after 2020"*[19]

For many years now IEA puts forward the assumption that oil prices will stay low: *"Crude oil prices are assumed to remain flat until 2010 at around $21 per barrel (in year 2000 dollars) – their average level for the past 15 years. They will then rise steadily to $29 in 2030."*[20]

This forecast is extremely unrealistic, for the current oil price is already above $30/b.

Simple oil industry statistics (e.g. from the BP Statistical Review of World Energy) readily reveal that a large number of oil-producing countries have suffered declining outputs for years, even decades. These dismal results occurred even though new oil discoveries came along from time to time.

According to the IEA forecast to 2020, production will rise from 76 million b/d in 2000 to 100 million b/d in 2020 (and to even higher levels thereafter).

However, take into account the trends in the countries with already declining output (black) or with outputs starting to decline by 2005 (white) and you will get a measure of what the Persian Gulf producers (grey) have to accomplish to meet the IEA forecast for 2020:

1. They must produce at least at the yearly rate attained in 2000, that is, at roughly 23 million b/d.
2. They must compensate for the production shortfalls of post-peak countries, for example the UK, USA, Mexico, China or Norway. This calls for an output of an additional 19 million b/d.
3. Lastly, they must produce the oil needed to satisfy the predicted growth in consumption --- a staggering 30 million b/d by 2020.[21]

Summarizing then, daily output by Persian Gulf producers must roughly triple from 23 million to 73 million b/d in order to maintain consumption patterns and price levels predicted by the IEA.

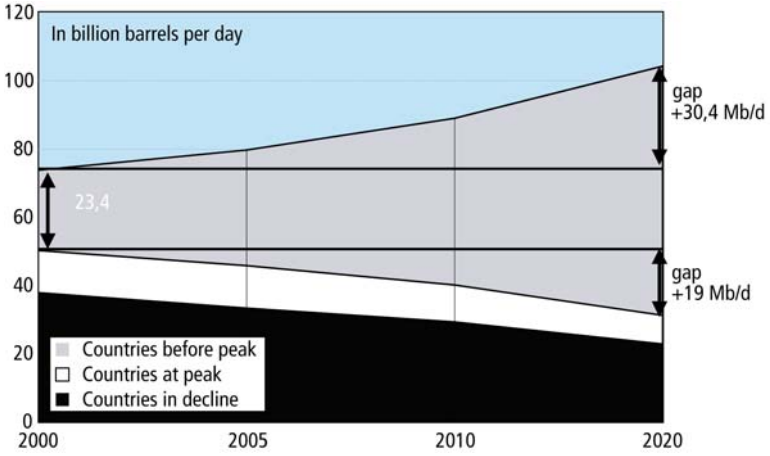

Diagram 13: International Energy Agency oil consumption prospects and the origin of supposed supplies[22]

According to the IEA's forecast of 2020 oil consumption oil production would have to rise by 50 million b/d. This represents a six-fold increase in Saudi Arabia's present-day production, and this offers a sort of yardstick for asking: Is this at all reasonable? Even comparing this increase with the present-day production levels of the entire Middle East we

wind up with the question: Can this geographic area really triple its output within the span of 15 years especially when considering the unavoidable delays encountered in adding new oil production facilities? From this follows naturally the question: Are the IEA's prospects grounded in reality or do they reflect an agenda for influencing the future? Indeed, the IEA is government-financed, suggesting impartiality, but this organization seems to be strongly influenced by the oil and gas industries and, in earlier days, by the nuclear industry. This can be recognized easily by anyone who comes into direct contact with IEA representatives or with their many publications.

For decades now the IEA's coded message has been: "*continue as usual, nothing can happen, build your airports and highways, ignore renewables and the Kyoto Agreement, for there will be enough oil, gas, coal, nuclear.*" The IEA's real mandate however is precisely to protect consumer countries from over-dependence on petroleum and to guarantee secure energy supplies at modest prices. The IEA has always interpreted this mandate as though it were only about tapping new countries with oil deposits and mobilizing the required capital. Yet even if the world still were blessed with bountiful oil reserves, the IEA's tone and statements deserve to be questioned on three critical levels:

- The IEA avoids identifying the origin of the future oil supplies. Enormous estimates are based on "unidentified reserves" – reserves that it is hoped will still be found as prices rise modestly, but whose existence can be identified neither technically nor geographically.
- The IEA advocates the exploitation of so called unconventional oil reserves (tar sand oil, shale oil), yet overlooks considerations regarding the ratio of energy investment to energy return from these new sources. In the case of oil sands and oil shale deposits in Canada and Venezuela, the energy in/ energy out is rather poor and cost overruns are common.[23] Large quantities of natural gas are needed to extract unsatisfactory quantities of oil. Moreover, this extraction process destroys landscapes and leads to enormous emissions of CO_2, and this is similarly unattractive as burning more coal.
- The IEA seems to ignore the influence of suppliers on the price of oil. Better quota control and the inevitable exhaustion of their finite reserves will encourage exporting countries to drag out production over time in the hope of getting better prices and of prolonging the flow of revenue from their diminishing resource. [24]

The unrealistically low price estimations by the IEA ($15-$25/b even when actual prices have fluctuated between $10 and $70/b) distort policy-making around the world. Scenarios based on a variety of price levels would inevitably foster efforts toward improving energy efficiency and utilizing renewable energy sources, These would be the logical next step in contrast to considering imperialistic and even military means for gaining control of the last oil-rich areas.

In addition to its hopes for continued plentiful supplies of petroleum the IEA is banking on the expansion in the use of liquefied natural gas (LNG). Gas production in the major consuming countries such as the USA, Canada, and the UK is in steep decline, making these countries increasingly dependent on supplies from politically unstable regions abroad. Reserves of gas are believed to exceed those of oil. However, because of the need for liquefaction (by freezing it to -161° Celsius) for ocean surface transport and the need for far more costly tankers and pipelines, gas is a less convenient commodity than oil. Moreover, ship-borne LNG is viewed as particularly vulnerable to terrorist attacks.

The price of much gas purchased under time-defined contracts is linked to the price of oil. As a consequence gas offers only limited economic insulation from the vagaries of oil prices, and this linkage also extends to some extent to the price of electricity because gas turbines by now are a significant factor in the generation of electricity. In the OECD countries domestic supplies of natural gas are expected to decline sharply after 2010, thus contributing to the likelihood of energy-related conflicts.

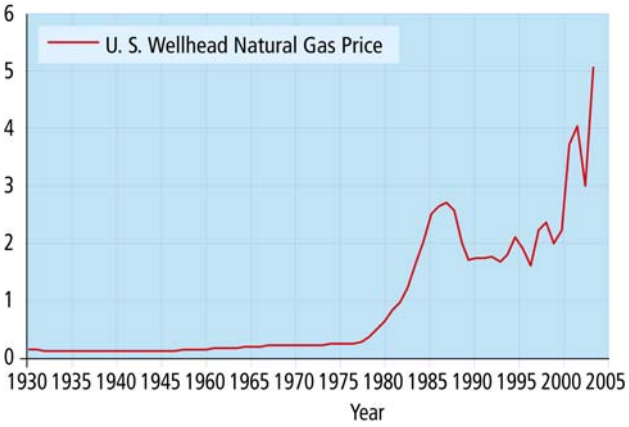

Diagram 14: Natural Gas prices in the US 1930-2000[25]

OECD countries currently import roughly 70% of their oil needs and this proportion will increase further. A growing number of erstwhile oil exporters are becoming oil importers. Such will be the case of Indonesia, the United Kingdom, Denmark, Argentina, Colombia and Mexico in the coming years.

The share of oil in overall energy consumption is between 40 and 45 per cent and that of natural gas some 25%. Gas is believed to be "abundant" for another 60 years from now. A doubling of yearly natural gas consumption over the next 10 to 15 years will cut the ratio of resource-to-production to less than half of its present level, a mere 30 years. This will dramatically affect the perceived supply security and will sharpen and broaden the conflict over energy supply. And it will involve not only numerous smaller supplier countries but also "the big players": Russia, Mid East OPEC, China, and the western industrial countries.

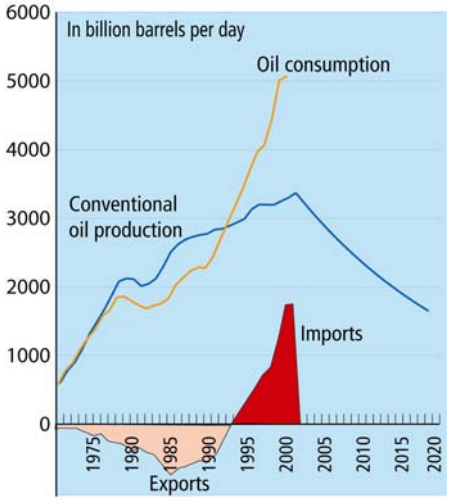

Diagram 15: China: From oil exporter to one of the biggest importers[26]

China dramatically influences the tensions surrounding the international supply of petroleum. Until 1993 China exported oil, but by 1994 its rapidly growing requirements forced it to import in sharply increasing quantities. By the end of 2003 domestic production began its inexorable decline. This, in tandem with burgeoning growth in consumption, is driving up China's imports with no letup in sight.

The situation is similar in India.

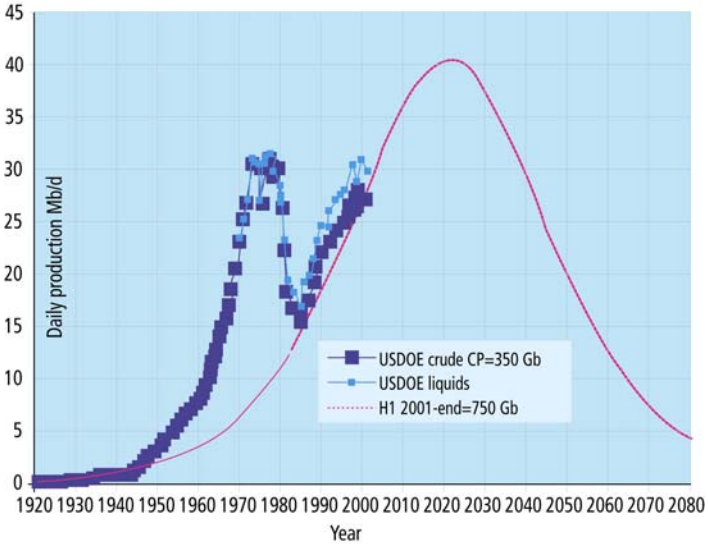

Diagram 16: Estimated possible production increases in the Persian Gulf [27]

Many major oil deposits in the Persian Gulf area remain untapped. Jeran Laherrère, a leading ASPO oil geologist, estimates that their exploitation could add 10 million b/d, corresponding to roughly 2% in increased *worldwide* consumption for about another 6 years. Others are more cautious.[28]

Yet even if these estimates are in the ballpark the first signs of shortages will appear as early as 2010, and neither the other OPEC countries nor Russia will be in a position to offset the growing shortfalls.

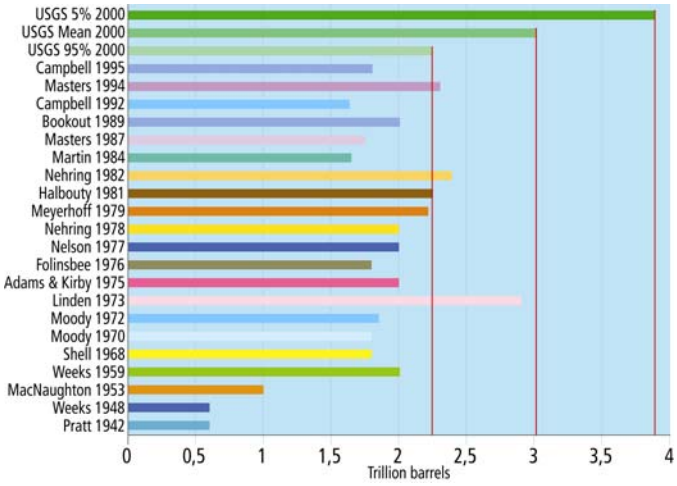

Diagram 17: Estimates of overall conventional oil resources[29]

All the previously cited production trends conform to the Hubbert Curve and to the opinions of many oil geologists: The 900 billion barrels of oil produced so far slightly exceed one-half of the output expected from conventional oil deposits over their lifetime. Hubbert's empirical observations virtually dictate that stagnation and declines in output will follow. It may well be possible to partially offset this decline by using other liquid hydrocarbons from unconventional sources, but these sources are not comparable to the low hanging fruit of conventional petrol.

The coming crisis is being kept in the closet by oil exporters and importers so as not to upset and alert consumers unduly. The oil industry has little interest in spurring consumers to turn to alternative fuels and to more energy-efficient technologies. "Let's not upset the apple cart just now, we can keep this banquet going for many more years", seems to be the leitmotif. There is no credible public organization providing consumers with analytical data regarding the real situation of oil and gas reserves.

The downplaying of the slowly gathering crisis reflects the desire for keeping financial institutions less than fully informed. The oil business is a highly capital-intensive industry. Billions are needed annually for new exploration, for bringing new fields online, and for laying the pipelines and improving harbor installations to bring this liquid to market. Keeping the bankers and the bourses happy is a sensible objective.

Published data on reserves are the means for doing that. Large reserves assure stability of supply; so lets make the estimates generous. Who can claim the figures are inflated? When that becomes evident years later the bankers who fell for them are probably retired and the estimators as well. This doesn't always work as Shell Oil experienced in early 2004. Shell caused a furore in investment circles by downgrading its reported Reserves by 20%, namely 2.7 Gb for oil and 7.2 Tcf for gas, causing the shares to fall in value by about 10% in three days. In the wake of this disclosure the CEO and other top executives were forced out.[30]

In some regard, oil companies and OPEC countries have shared interests, akin to drug farmers and drug dealers. A switch to other energy sources would harm OPEC, as it would endanger demand as well as profits for oil companies. Generous estimates of reserves by members of OPEC for long have served another underlying purpose. OPEC's production quotas are parceled out among its members partly on the basis of a member's "proven" reserves. Large reserves entitle a large production quota. When all members resort to this padding the positive effect on an individual member's quota shrinks and the total reserves of the cartel --- on paper --- balloon. This can make the coming crisis worse when everyone discovers that "there is less oil in the ground then we thought" (or reported).

Are oil-importing countries powerless in the face of the impending crisis? Not entirely. Reducing the consumption of fossil energy not only wards off shortages and reduces the oil bill but lessens problems of air pollution and global warming and of dependence on uncertain supplies from distant countries.

We should therefore reduce dependence on oil and natural gas in good time and change over to sustainable energy systems. With a good energy policy, OECD countries can contribute substantially to defusing national problems and international conflicts. The most immediate and the cheapest way is to increase the productivity of energy within the importing countries themselves, in other words, improving the so-called energy efficiency.

Buildings, households, and vehicles waste, collectively, enormous quantities of energy. That's where a few percentage points reduction in waste goes a long way. The *Minergy*

standard in Switzerland enables cutting power consumption for new buildings in half while at the same time ensuring better building quality and reduced air pollution.

Energy taxes are a major tool for reducing imports of fossil fuels. Relatively high energy taxes reduce OPEC's leeway for slapping on arbitrary price increases. Environmental tax policies can be similarly helpful. The added labor and capital used for improving energy efficiency is kept within the domestic economy rather than shipped abroad to pay for foreign oil and gas.

Major reductions in energy usage are subject to substantial time lags. Despite attractive incentives the changeover can take decades. Taking positive steps early is one way of limiting or avoiding the "stranding" of investments in older plants, infrastructure and equipment as rising energy costs render them unprofitable. The US is peculiarly vulnerable to major increases in energy costs because of the general energy inefficiency of its buildings, the automobile-centered personal transportation system, the wide distribution of settlements with its resulting long commuting travels. A major oil crisis may well cause the stranding of enormous investments in US physical plants, industrial equipment, and commercial buildings and may put downward pressure on the price of residences located far from work places.

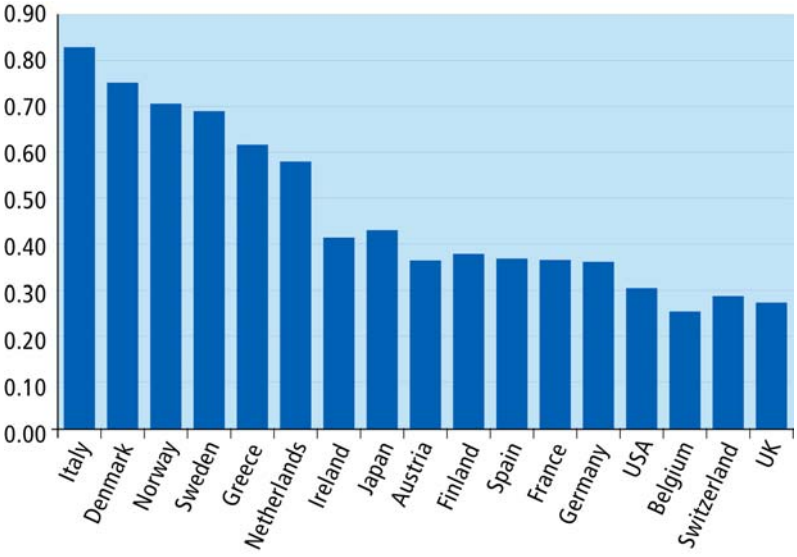

Diagram 18: International comparison of fuel oil prices[31]

Switzerland is by no means one of the environmentally leading countries in Europe. Quite the contrary. Our country is thwarting climate policy with its extremely low taxes on fossil energy such as fuel oil and petrol and is inflicting billions worth of fiscal damage to neighboring countries through fuel tourism. Switzerland is the country with the highest income and the lowest petrol and fuel oil prices in Western Europe.

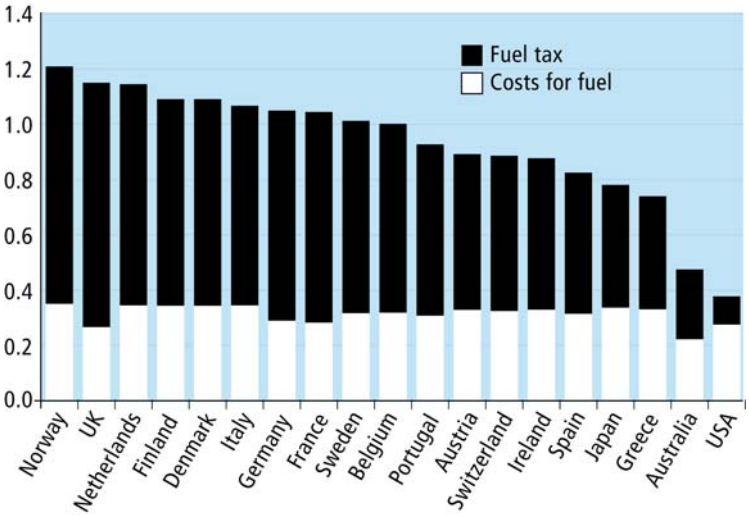

Diagram 19: International comparison of petrol prices[32]

Higher prices of fossil fuels improve the competitive standing of public transport and could boost energy efficient motor vehicles.

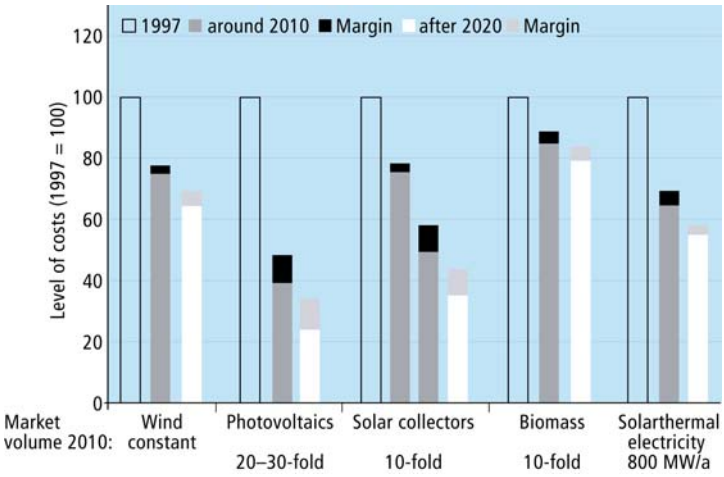

Diagram 20: Price reduction potential of renewable energy[33]

Renewable energies hold enormous potential and are showing a distinct trend toward diminishing costs. Reducing the use of conventional energy in favor of alternative renewables does not lead to a worsening of the quality of life, but rather to an improvement. Energy prices in Europe and Japan are higher than in the US and per capita energy consumption is only one-half the level of the US. However, Europeans and Japanese do not suffer a quality of life inferior to Americans'. On the contrary, life expectancy - perhaps the most reliable yardstick for the quality of life - is higher than for Americans. Moreover, the damaging aspects of motorized vehicle traffic - congestion, noise, air pollution and crime - are lower than in the US.

If we press ahead with the serious development of renewables we can in time cover Switzerland's needs, as well as those of any other industrialized nation, and given a longer time horizon, the needs of all energy consumers worldwide. The first step involves freeing ourselves from the analyses and recommendations of the International Energy Agency (IEA). This organization and its related international and national organizations (e.g. IAEA,

the US DOE EIA) are the unquestioned record holders in peddling defective forecasts and recommendations.

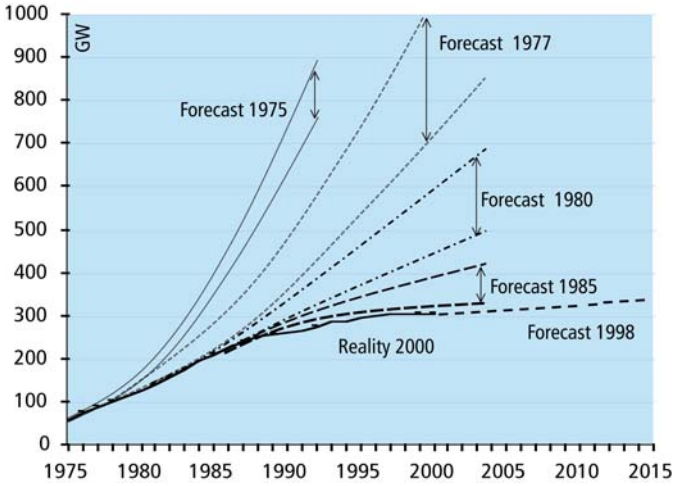

Diagram 21: Nuclear power industry forecasts and real trends (nuclear energy production capacity in gigawatts)[34]

In the 1970s and 80s they were champions of nuclear power propaganda. And their perspective turned out to be entirely wrong. Today they ignore all signs of resource exhaustion, climate change and of the substantial progress toward use of renewable energy. They repeat the same errors they made for decades:

- Misestimating reserves.
- Misestimating the production costs of conventional techniques.
- Ignoring cost reductions for renewable forms of energy.
- Benign neglect of environmental impacts.

In the eyes of the IEA the share of renewable energy will barely increase over the next 30 years. The quality of the IEA's forecast is downright disastrous with respect to the role of wind energy. The steadily dropping costs of wind power installations and the resulting rise in the return on investment in them is consistently ignored. In its World Energy Outlook 1998 the IEA predicted that by 2020 a total of 45 GW of wind power capacity would be installed. The reality is that by 2003 the installed capacity already reached 39 GW, and the 2020 goal of 45 GW will be attained in 2004.[35]

Since 1993, the wind power market has expanded tenfold to over $7 billion. At good locations, new wind power plants now are cheaper than new oil, coal or nuclear-based power, and (in Europe) it costs the same as power from gas, in the US even less. The economic and ecological profile of wind power is remarkable: investment costs of less than 1$/watt, short building times (2-20 weeks), winter and summer production peaks (depending on location), global availability, no emissions, no fuels and disposal costs and steadily falling generation costs thanks to increasingly efficient installations. Wind power is fully immune to oil and gas price fluctuations. Wind hedging is gaining in importance on the US power market where US gas supply system is collapsing.

The potential of wind power indeed is enormous: On an offshore area of 200 km x 200 km equipped with two 5-MW turbines per km^2 it would be possible to produce the amount of electricity consumed by the European Union (EU-15). The Danes, Germans and British are feverishly developing offshore wind farms, which promise a clean, inexhaustible and over

the long run very cheap power supply from the North and Baltic Sea and similar locations. In the long run, a full replacement of conventional energy by renewables is possible and will not bear greater costs than today's energy system.[36]

Wind power, solar power, geothermal energy and steady improvements in energy efficiency can do much to defuse conflicts over oil. But still, additional non-technical measures must come from the industrialized countries:

- Review of NATO Statutes: discontinuing the out-of-area strategy for securing energy resources such as oil, natural gas, raw materials, etc.
- Reform the IEA to make it into more of a self-help organization for energy security and conflict resolution.
- Re-establish an IRENA, an International Renewable Energy Agency.
- Generate independent oil production and reserves statistics.
- Develop a Marshall Plan for renewable energy with low-interest loans and a high degree of investor security for renewable energy projects.

Defusing resource-based conflicts will call for greater cooperation with OPEC instead of imperialist wars. Supplier-consumer relations must be strengthened by:

- Steering export quantities - fair trade agreements.
- Clarifying the rights of producing countries.
- Sharing the financial benefits with areas where production is located.
- Agreeing on an environmentally and socially sustainable rate of extraction.

Lastly, resource policies and climate policies must be linked:

- Creating an international court of arbitration to deal with legal issues surrounding oil extraction and rights, with local population enjoying their own inalienable rights.
- Instituting an internationally binding "minimal fossil resources tax", to be raised over time, coordinated by WTO-institutions.
- Linking the Kyoto Agreements to the WTO framework (sanctions/import duties for countries with inadequate consumption or production standards).

Notes

[1] Revised paper presented at the swisspeace annual conference on the theme "Adding Fuel to the Fire? The Role of Petroleum in Violent Conflicts", on October 30, 2003. The author is a lecturer in practical environmental policy at Basel university and member of the Parliamentary Committee on Environment and Energy (UREK).
[2] The diagram is from: Rudolf Rechsteiner: Grün gewinnt – Die letzte Ölkrise und danach (Orell Füssli Verlag AG, Zurich 2003).
[3] Jean Laherrere: Forecasting future production from past discovery, OPEC and the global energy balance: towards a sustainable energy future, Vienna Sept. 28–29, 2001.
[4] Data: US-Energy Information Agency.
[5] Data: US-Energy Information Agency.
[6] Werner Zittel, LB-Systemtechnik GmbH: Analysis Of the UK Oil Production, A contribution to ASPO (Association for the Study of Peak Oil), Extended version, Ottobrunn, 22nd February 2001, p.7; Production numbers since 1/99 (red line): International Petroleum monthly, January 2003 www.eia.doe.gov/emeu/ipsr/t11b.xls.
[7] Werner Zittel, LB-Systemtechnik GmbH: Analysis Of the UK Oil Production, A contribution to ASPO (Association for the Study of Peak Oil), Extended version, Ottobrunn, 22nd February 2001 p.9, Yearly data (yellow line): International Petroleum monthly, January 2003 http://www.eia.doe.gov/emeu/ipsr/t11b.xls.

[8] US-Energy Information Agency: International Petroleum Monthly, Oil Production, February 2004.
[9] K. Aleklett and C.J.Campbell The Peak And Decline Of World Oil And Gas Production, Uppsala 2003, www.peakoil.net.
[10] http://www.peakoil.net.
[11] ASPO-Newsletter Nr. 39, March 2004, chapter 331.
[12] Colin J. Campbell: The assessment and importance of oil depletion, Powerpoint Presentation, Aspo-Workshop 2002, Uppsala; http://www.isv.uu.se/iwood2002.
[13] Werner Zittel, Jörg Schindler: The imminent peak of Oil Production, Graphs, Berlin 2003.
[14] Graph by Colin Campbell cf. ASPO homepage.
[15] Raymond James' Energy "Stat of the week", July 21, 2003.
[16] A. F. Alhajji and James L. Williams¨ Measures of Petroleum Dependence and Vulnerability in OECD Countries, originally published in the Middle East Economic Survey (MEES 46:16, April 21, 2003).
[17] International Energy Agency: Oil Market Report February 2004, p. 15.
[18] In a similarly unspectacular manner, the Texas Railroad Commission had announced in 1972 that US oil production had peaked. Thereafter it declined steadily.
[19] IEA: World Energy Outlook 2002 p. 97.
[20] International Energy Agency: World Energy Outlook 2002, Paris 2002.
[21] The distinction of after peak/ at peak follows Colin J. Campbell: Ölwechsel (with Frauke Liesenborghs, Jörg Schindler, Helga Roth und Werner Zittel), Deutscher Taschenbuch Verlag, München 2002.
[22] Diagram from Rudolf Rechsteiner: Grün gewinnt – Die letzte Ölkrise und danach, Zürich 2003.
[23] See Patrick Brethourand and Brent Jang: Record cost overrun hits Syncrude, Globe and Mail, Mar. 4, 2004: "Syncrude Canada Ltd. has unveiled the biggest cost overrun in the history of the oil sands, with its owners saying Thursday that its latest expansion will cost $7.8-billion — nearly double the original estimate."
[24] "The payoffs to OPEC are relatively insensitive to faster output growth; aggressive output expansion yields slightly lower payoffs than just maintaining current market share. Analysis of intra-OPEC decisions between the core countries and the others suggests a similar conclusion: these two groups are engaged in a constant-sum game. Thus, the significant increases in OPEC output projected by IEA and DOE are implausible." Dermot Gately: OPEC's Incentives for Faster Output Growth, The Energy Journal 2004, Vol. 25, Number 2.
[25] http://www.oilnergy.com/1gnymex.htm#6mo.
[26] Data from BP Statistical Review of World Energy, June 2003.
[27] Jean Laherrère: Modelling future liquids production from extrapolation of the past and from ultimates, Uppsala Aspo workshop May 23, 2002 S.12.
[28] See ASPO Newsletter No. 39, p. 2, new base-case scenario 2004 by Colin Campbell.
[29] Graph: Colin J. Campbell.
[30] Aspo Newsletter Nr.38, Chapter 316, Feb. 2004.
[31] IEA: Energy Prices and taxes, Paris 4/2002.
[32] IEA: Energy Prices and taxes, Paris 4/2002.
[33] Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit: Klimaschutz durch Nutzung erneuerbarer Energien, Berlin 1999. S.220.
[34] Campbell: Ölwechsel, München 2002, S.216.
[35] Werner Zittel from Ludwig Bölkow Systemtechnik first discovered this flawed perspective of IEA. I owe him much gratitude for help and inspiration in many aspects.
[36] Cf. Gregor Czisch, Least-Cost European/Transeuropean Electricity Supply Entirely with Renewable Energies, ISET 2004, http://www.iset.uni-kassel.de/abt/w3-w/projekte/Eur-TranseurElSup.pdf.