Past Oil Forecasts, and the "Limits to Growth" Message

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One of the reasons that people, ‘oil experts’ in particular, are disinclined to believe the serious situation forecast by current global oil depletion calculations is their conviction that virtually all past oil forecasts have been wrong, particularly those made in the 1970’s. This view sees the present calculations as just another example of ‘crying wolf’.

On examination, it turns out that most reputable oil forecasts made in the 1970’s were substantially correct.

Oil forecasts from the 1970’s mostly fit into one of four classes.
- General, non-quantitative, fears of global supply scarcity, based on the experience of shortages that occurred during the oil shocks.
- Predictions of global oil exhaustion in 30 years or so (‘oil running out’), based on the then proven oil reserves of about 30 years’ worth of current production.
- Predictions of oil global exhaustion in a much shorter timescale, based on the then proven oil reserves (or some assumed larger amount), but with growth rising rapidly exponentially, as had been the case until fairly shortly before the shocks.
- Predictions that global oil production would reach a peak (very different to oil exhaustion) around the year 2000.

It was this fourth view that characterised the forecasts from all reputable organisations at the time (for example, Esso, Shell, the UK Dept. of Energy, the US Congress, the World Bank), and which was also reflected in virtually all textbooks and monographs on energy published at the time (for example, ‘Only One Earth’. Ward & Dubos.)
1972, for the UN Conference on the Human Environment, Stockholm; or ‘The Global 2000 Report to the President’, 1982.)

This fourth, ‘production peaking’, forecast was based on:
- the then well-accepted estimate for the world’s conventional oil ‘ultimate’ (i.e., original endowment of recoverable oil), of roughly 2000 Gb;
- the knowledge that global production peak would not occur until something like half of this, 1000 Gb, had been used;
- the knowledge that only ~300 Gb had been consumed at that date;
- the assumption that production would follow an ‘unrestricted’ logistic (‘Hubbert’) production profile.
On this basis, the global midpoint was calculated to lie around the year 2000, (a precise calculation giving the date as 1996).

In the event, global demand was substantially curtailed by the price rises of the oil shocks, and an unrestricted logistic profile was not followed; with the result at the estimate of conventional ultimate of around 2000 Gb (still to-day, for this purpose, the best estimate to use) simply moves the global conventional oil production peak to around 2010.

Thus to-day’s oil depletion calculations are, in quantitative terms, essentially exactly the same warnings about the wolf’s approach (i.e., the peak in the global production of conventional oil) as were made by reputable organisations in the 1970’s.

These are warnings it would therefore be wise to heed.

The paper will also address subsequent forecasts, such as BP’s ‘Oil Crisis Again ..’, and the failure of that company’s more recent ‘Big Field Forecast’; as well as analysing the calculations in the Club of Rome’s famous ‘The Limits to Growth’ study.

[ R.Bentley, March, 2002 ]
THE ASSESSMENT AND IMPORTANCE OF OIL DEPLETION  
by Colin J. Campbell

The Association for the Study of Peak Oil “ASPO” has three important missions: 
1. to study the endowment of oil in Nature;  
2. to model its depletion taking into account economics and technological factors; and 
3. to raise awareness of depletion so that governments and the public at large can plan accordingly.

The starting point is petroleum geology. A geochemical breakthrough in the 1980s 
gave insight into the generation of oil, explaining that the bulk of the world’s oil 
comes from a few epochs of extreme global warming. Oil was preserved only in 
certain well-understood geological settings. The World has now been so extensively 
explored that virtually all the prolific areas have been identified.

Understanding depletion is simple. Production starts after discovery and ends when 
the resource is exhausted, reaching a peak in between at about the half-way mark. Production has to mirror earlier discovery after a time-lag. Discovery peaked in the 
USA in 1930, followed forty years later by the corresponding peak of production. Discovery in the North Sea peaked in 1974 but advances in technology reduced the 
time-lag to just twenty-seven years. The same eternal pattern is being enacted from 
country to country. The fact that World discovery peaked in 1964, means that peak 
production is now imminent. Each year since 1981, we were finding less than we 
consumed.

The status of depletion depends on how much has been found and when was it found. The resulting discovery trend can be confidently extrapolated to show what is left to 
find and produce. These are simple questions but are difficult to answer because of 
ambiguous definitions and lax reporting practices. Despite the efforts of vested 
interests to obscure, deny and confuse, technical evidence gives a clear picture of 
depletion. Production from the North Sea is set to decline at about 6% a year, meaning 
that Europe’s indigenous supply will have halved in about ten years. World peak is 
likely around 2010, but could come sooner with higher demand from economic 
recovery.

Gas is less depleted than oil, but has a very different depletion profile. Whereas oil 
production declines slowly towards exhaustion, gas, being more mobile, can be 
produced at a high level for a long time but faces an abrupt unannounced terminal 
decline.

Economic theory was built on the experience of the Industrial Revolution, which in 
turn relied on a cheap and abundant flow of energy, first from coal and later from oil
and gas. Man was perceived to be master of his environment. But now rising population and dwindling resources have reversed the relationship. The imminent decline in the world’s supply of oil, which currently provides 40% of traded energy, calls for a radical change the economic principles on which the World is run, with far-reaching political consequences.

ASPO has a critical role to play in alerting governments to the reality of the situation, and in raising general awareness, so that the public will give governments the mandate for action. The issue cannot be left to market forces alone. Much can be done to ameliorate the tensions of transition, and in finding sustainable solutions. New policies are needed now because technical solutions have long lead times and the adjustments will be difficult.
U.S. Energy Policy Issues  
By Matthew R. Simmons  
President, Simmons & Company International

The issue of the world’s future decline rates will have an enormous impact on the United States’ energy future, simply because we use more oil and gas than any other country in the world. Not only is this depletion issue critical to understanding America’s domestic oil and gas supplies, but it also helps us identify regions of the world on which we need to rely to insure a steady and growing supply of imported oil and natural gas.

The U.S. is also the first country to experience a major depletion surprise. This occurred in 1970 or 1971 when we finally peaked as the world’s leading oil producer, just as M. King Hubbert predicted we would. Once the U.S. reached its peak production rate (which occurred before the advent of Alaskan or deepwater oil) we produced over 9.5 million barrels per day. Years later, this same region’s production had fallen to just under 7 million barrels per day, despite a quadrupling in oil well completions. Today, this region’s oil production has fallen to only 3.5 million barrels per day. When production peaks, the declines follow regardless of how intensively one drills additional wells.

The USA is experiencing a similar unsettling pattern in its natural gas supply, which comes almost 30 years after our oil surprise.

For almost a decade U.S. natural gas completions averaged about 9,000 per year. In 1999, the USA completed 10,200 new gas wells. This number rose by 50% in 2000, and in 2001 we completed nearly 20,000 wells. However, daily supply of natural gas stayed flat. Now drilling has declined by over 40%. There are signs that the U.S. production base is about to take a steep dive. This will come as a great shock to even most natural gas producers because of the lack of knowledge and data indicating the relentless and growing declines in so many key-producing regions of our country.

How the U.S. energy policy needs to address these issues is the subject of my intended remarks during this important forum.
RUSSIAN OIL AND GAS: A REALISTIC ASSESSMENT
by Ray Leonard
VP Exploration and New Ventures
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An open evaluation of Russian Oil and Gas Reserves has not been possible until recently for several reasons. In the Soviet Union, hydrocarbon resources were a strategic asset and as such, a state secret that could only be guessed at from the outside. Other organizations, such as the CIA and IEA made educated guesses but from an ideological point of view; Soviet reserves were a threat from a security and market supply standpoint and were perhaps minimized. The only firm evidence came from Soviet production of oil, reaching 12 MMBO/D in the late 1980s or about 20% of the world production. Either the reserve numbers were wrong or the Soviet Union was depleting its reserve base at an accelerated rate of about 8% per year. The accelerated rate was the view of the CIA and seemed to be supported by the collapse in production from 1990-1995 to 6 MMBO/D. However, in the late 1990’s production began to rise again, reaching 8 MMBO/D in 2001. YUKOS has predicts that production will continue to rise to 14 MMBO/D by 2010, 75% in Russia and the rest in the Caspian region. What is the basis for this prediction? This presentation will focus on Russia, as the projected rise in Caspian production is well documented and will happen based on projects already planned without the necessity of any new exploration success. The Russian evaluation is based on three factors; the current booked reserves, the production level of the reserves and oil remaining to be found.

Russian Reserves: In the Soviet Union (and now Russia) after discovery and delineation, each oilfield was analyzed by the State Reserves Committee to calculate geological and recoverable reserves. The Categories A, B and C1 represented proven reserves. This was based on a proposed and approved development plan. The plan was based on existing technology, but with no economic “filter.” In recent years, Russian oil firms offering market shares have used internationally recognized auditing firms to estimate their reserves. In the case of the four largest oil firms, the audited amount averaged about 80% of the State Reserves Committee approved number. Including Russian majors, independents, condensate from Gasprom, state reserves and reserves of foreign companies operating in Russia, proven reserves are 100-110 billion barrels, or 80-90 billion if the 80% factor is taken into account. International convention usually takes a 50% reduction factor in counting probable (C2) reserves. Therefore, the Russian total of 30-40 Billion probable would add an additional 10-15 billion. More detailed calculations are being made to refine the number, but 90-105 billion barrels is a reasonable estimate of Russian reserves.

Production Level: The production levels prior to the 1990’s were not based upon economic factors. As such, they probably do not conform to many models developed for production in the rest of the world. The production of 12 MMBO/D in the late 1980’s was based upon centralized planning, utilizing development programs with inefficient technology. The precipitous drop in production from 1990-1994 was due to a complete lack of investment but with a continuation of the old technology. The recent increases are a result of investment and application of modern technology. YUKOS provides an example; utilizing efficient drilling and production techniques, new wells produce three times the Russian industry average. Production has increased from 850,000 BOPD in 1999 to 1.3 MMBOPD at present. YUKOS reserves (audited by Miller-Lents)
are 12 billion barrels. This indicates a reserve/production ratio of 25 years. Usual RP ratios for western companies are 10-15 years. By continuing to utilize western technology, YUKOS can increase production to 2.5 MMBO/D. Given that 53% of YUKOS reserves are undeveloped, this is an achievable number. Other Russian companies are discovering the same thing; utilization of modern technology will dramatically increase production. Predicted production of 10.5 MMBO/D with existing proven reserves in 2010 is actually a conservative estimate.

Future Potential: Large portions of Russian sedimentary basins are unexplored. Lack of technology to explore offshore, limited investment in the past ten years and poor infrastructure in frontier basins are factors. Reviewing discovery curves for productive basins, a range of 30-40 billion barrels for future discoveries can be supported. Several offshore basins, such as the Kara Sea and Pechora Sea are extensions of existing producing trends, increasing that range. YUKOS is currently making a systematic analysis of discovery curves. It is likely that this study will result in a prediction of 40-50 billion barrels to be found by exploration in Russia.

Up to this point, only on Russian oil reserves have been discussed. However, it is accepted that Russian gas reserves are approximately equivalent to the total gas reserves of the Middle East. Furthermore, the Kara and Barents Seas are largely unexplored and predicted to contain several hundreds of trillion cubic feet of gas. With the predicted peaking of oil production in the 2010-2020 time period the shift to natural gas will necessitate significant production increases from Russian fields in East Siberia, Northwest Siberia and the offshore. While the inefficiency in exploring for and producing oil in Russia is disappearing, gas is several years behind as the breakup of the monopoly Gasprom is only starting. With open competition and adequate investment, current production of 20 TCF/Year can be doubled, with a particular increase in shipments by pipeline to the Far East. While Russian oil and gas reserves do not solve the essential problem of oil depletion, they will push back the “day of reckoning” giving the world more time to develop alternate sources of energy.
A MIDDLE EAST VIEW OF THE GLOBAL OIL SITUATION
by A.M. Samsam Bakhtiari.

Seen from a Middle Eastern perspective, the present global oil situation can be summarised within five major and inescapable trends:

(1) The world's supergiant and giant oil fields are dying off;
(2) There are no more major frontier regions left to explore besides the earth's poles;
(3) Production of non-conventional crude oil has been initiated at great costs --- in Venezuela's Orinoco belt, Canada's Athabasca tar sands and ultra-deep waters;
(4) Even OPEC's oil production has its limits;
(5) No major primary energy rival can possibly take over from oil and gas in the medium term.

Adding up these five trends, one can envision a global oil crunch at the horizon --- most probably within the present decade. Unfortunately, however, the general public will not heed such a rational vision. And, even if it did, it would be loath to respond to the implied threat. In its defence, it should be said that many actors are constantly and consistently reassuring it: the press (even parts of the specialised press), most politicians, some international institutions, a couple of major oil companies and naturally OPEC.

But this can only last until petrol stations post 'empty', natural gas supplies are suddenly shunted and, eventually, the lights go off.

An Overview of US Hydrocarbon Supply
and the Possible Impact of New Alaskan Reserves
by Jeremy Gilbert (Formerly Chief Petroleum Engineer, BP)

The paper will summarize the historical record of hydrocarbon discovery in the United States and emphasize that for conventional oil both discovery and production rates have peaked. Comments will be made on the situation relating to gas discovery and production. The significance of the discovery of the major Alaskan fields at Prudhoe Bay and Kuparuk will be discussed and the history of Prudhoe Bay in particular will be used to assess the potential for new technology to bring about ‘reserves growth’ in existing fields. The potential of the essentially unexplored Alaskan National Wildlife Reserve (ANWR) to counteract in the declines in production from the ‘Lower’48 states will be assessed. It will be concluded that the US has no possibility of being self-sufficient in oil supply without radical cuts being made in oil demand.
The Western geopolitics of energy supply: a short-sighted approach to the global energy shift
Susanne Peters, Giessen University, Germany.

We are currently in the middle of a third energy shift: from the coal to the fossil fuel era towards a sustainable energy regime. But instead of acknowledging this inevitable fact and prepare for the transition to the post-fossil era with a regime based on alternative energy, the US and EU/European politicians rely on the short-sighted policy approach of defining energy supply crises as a “risk” and “threat” which have to be dealt with by security policy procedures. While this is not a new phenomenon for US foreign policy where energy has traditionally been viewed as a “vital national security interest”, in the European context a geopolitical approach to energy is a further constituent in the build up of the European Union’s identity as a regional power bloc with an independent foreign and security policy. Western geopolitical concern of energy supply is manifest in three spheres which will be discussed in more detail in the paper: short-term energy supply crises, the question of pipeline security, as well as the danger of nationalization of energy investment by Western investors in North Africa and the Middle East. In the concluding section the West’s military power projection towards the Southern shores of the Mediterranean and the Middle East will be discussed, as manifest in recent European endeavors to militarize the Western Mediterranean and NATO’s claim for out-of-area actions in this region.