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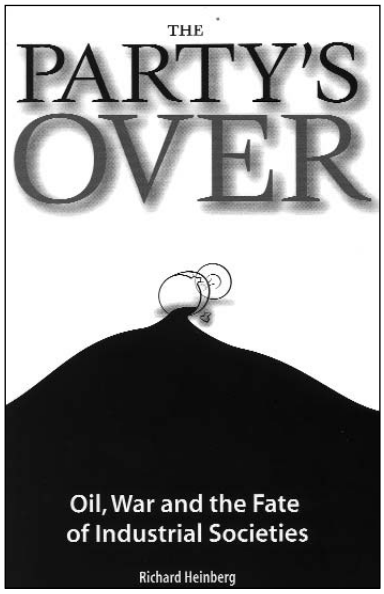
Black Gold –A Series On Oil

Fossil Fuels: Feast and Famine ~ *John Carlton*

'Thank heavens there is lots of oil.' After all, we even put out forest fires with it. Not directly of course, but through the engines of water bombers, helicopters, bulldozers, buses, trucks, chainsaws and on and on. If nothing else, warming summers with more and bigger fires illustrate again our absolute dependence on oil, and the extent to which it is woven into the fabric of society. Oil is the biggest, the best, and the most loved of all energy sources. It is easy to pump and to ship, and we know an awful lot about where it is and how to get it. Transportation runs on oil largely to the exclusion of all else, and indirectly it is used in one way or another to mine or manufacture all other sources of energy.



But is there really that much left? We are used to being told that the oil supply is for practical purposes unlimited, and if it ever falters, we will have alternatives waiting in the wings. However there are appearing diverging viewpoints from some surprising sources. Interestingly, none of these people have anything to do with either Greenpeace or the Fraser Institute. They are an increasingly vocal body of very senior geophysical scientists, economists, and bankers who have worked for decades within the oil industry. They include consultants to governments on energy resources, and heads of a variety of international organizations and think tanks. Methodology varies, and debate continues around details, but the conclusion is that the day when oil ceases to be an unrestrictedly available energy source is much closer than we have been given to believe. Further, there really are no alternatives that will work the way we need them to.

There is no conspiracy suppressing this information, no wild-eyed website ranting about Armageddon, just knowledgeable people collecting their data and publishing. An excellent compendium of these conclusions, as well as contrary arguments is: *The Party's Over: Oil, War and the Fate of Industrialized Societies* by Richard Heinberg, a faculty member at New College of California. It is Heinberg's book that I am summarizing in this review, of our energy sources, current and future, real and imagined, starting with oil and gas.

Finding It & Getting It Out

Until the early 1980s new discoveries easily outstripped production, and production easily kept up with demand. However, real cracks in the world oil supply started to appear in 1970 when US production reached its peak. By 2000, US production had fallen to half that peak. Similarly, world production is expected to peak sometime between now and 2015 and by 2050 will drop to about a third of its present level. Demand has however increased exponentially and this trend can be expected to continue, despite the most optimistic of conservation measures.

Supply figures tend to be pessimistic, especially when it comes to more oil. The thirty years between 1950 and 1980 were a period of enormous discovery, but since that time, the discovery curve is pretty much dead flat. Although the huge Shaybah field in Saudi Arabia, entered production in 2000, it was actually discovered in the 1970s, and this is true of pretty much all 'new' huge fields. There are also many examples of huge fields discovered in the '60s that peaked in the '70s, and are in decline. The Samatlor field in Siberia and Prudhoe Bay in Alaska are typical, presently producing only 16% of their peak production. The North Sea, Britain's winning lottery ticket for the last thirty years, peaked in 1998, and Britain is again a net oil importer.

The only 'elephant' field actually discovered since 1985 is the recently found basin in Khazakstan. This is despite the oil industry crawling all over the planet and drilling wherever there is any chance of discovery no matter how difficult or uneconomical it may be to bring a well to production. In fact we are finding only one new barrel of oil for every three or four

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we consume. A huge amount of oil is burnt looking for more oil, to the extent that exploration worldwide is presently burning one barrel for every four it discovers. This means that a quarter of every barrel we find is in effect burnt before it gets out of the ground, and these ratios are getting worse.

The Complex Research Center at the University of New Hampshire calculates that by 2005, the energy required to explore for, drill for, put into production, transport, and market the output from new wells within the US will exceed the energy that the wells produce. Production figures outside the US are similarly affected as oilfields reach peak production. Most have done so already, and new discoveries tend to be smaller and more difficult to exploit. At the start of the oil boom in the 1930s, one barrel of oil, or energy equivalent invested, produced over a hundred barrels of oil in return. This figure in overall use has dropped to a present level of a little less than one for ten, and it is falling rapidly.

How Much Is Left?

Oil reserve figures tend to be exaggerated, or at least reported as optimistically as possible. This occurs everywhere from exploration investment prospectuses to within OPEC, where production is limited to a percentage of known capacity. Revisions of total reserves by OPEC members in 1986 and 1987 effectively doubled their known reserves, from 1250 Billion Barrels (Gbo) to 2400 Billion Bbls, in turn doubling their permitted production. This was a purely paper revision and did not reflect a single major discovery in any of their territories.

Half Full Or Half Empty

So where did the rest of the oil go, the inexhaustible reserves that we were told about?

Several things have to be understood in looking at reserve figures. The official UN reserve figure for Saudi oil, for example, is 81 years. The crucial point is that this figure represents the time when the well runs bone dry, no more at all. It does not mean the length of time that oil will flow the way it does now. Using the same figures, and apart from Iraq and Iran, which will by then be close to dry, all the rest will be long gone. We do not have anything like the eighty years that this figure superficially suggests. Imagine what the world will be like at this point. One way or another, dependency on the very last oily rag will be long past.

Not an artificial and politically driven supply crunch like the one of the '70s, but a real one when there simply cannot be as much oil produced as is demanded by the market. Its date is variable, depending on economic pressures. In a robustly oil-burning economy this may be as early as 2006. In a recession damped economy, it may be delayed to about 2010, and in a full blown depressed economy as far as 2020.

Whether this will be because the world, and particularly the western democracies, has re-arranged itself into a saner and less energy-dependent society, or whether it will be simply a case of 'last man standing' is in a sense irrelevant. The oil era will be over.

Now try to imagine the world in forty years, halfway to this point. We will by then be on a very obvious downhill slide, and witness to a variety of economic and social events, the extent and nature of which will reflect the wisdom of world policies set in place in the immediate future, or the lack of such wisdom.

Common sense would say that the best way to push this date into the really distant future is to put in place policies that dramatically change the way that we use energy, particularly changing our dependence on all fossil fuels. Sadly, such policies would result in lifestyle changes that no politician could espouse and hope to be elected by a gluttonously consumptive electorate. Given present US foreign policy, it is easy to predict ongoing chaos and wars fought using the remaining oil to claim the very last. As a friend of mine said recently, with more than a hint of irony, 'Just how did our oil get hidden under all that sand, anyway?'

Other Fossil Fuel Sources of Energy

Two other sources of oil and one of gas need to be considered that despite existing in huge quantities, when looked at carefully, are not as rosy as they would seem.

The first is 'Shale Oil.' This is actually not shale, nor is it oil. It is rock, containing a solid organic, 'Kerogen.' To turn this into anything useful it needs to be first mined, in enormous quantities, then transported, and then heated to 900°.F, when hydrogen, principally an oil based product, is added and very toxic waste in even larger quantities is required to be disposed of. The process also uses a huge amount of water, another commodity with its own problems of supply. Many major oil companies have tried and failed to economically produce even crude products economically, let alone a small part of the enormous conventional oil requirement. The amount of oil required to extract petroleum from rock makes it part of the problem, not part of the solution.

Oil Sands

Oil sands follow shale oil with ultimately little superiority, Ralph Klein notwithstanding. Yes, there is an enormous amount of oil in the Alberta tar sands, maybe even more than we have used so far from all sources, and it is in North America, and can be had without political interference, let alone invasion. The downside is again the ratio of energy-in to energy-out. Syncrude produces 200,000 barrels of oil a day by mining 400,000 tons of sand a day. Oil is washed from the sand with hot water, and naphtha, another high end oil product, is added. After mining the sand, heating the water, pumping the waste, and so on, the results are discouraging.

After all the bills are paid, it presently takes two barrels worth of energy to get three barrels out, or a ratio of 0.66 to one. Conventional oil by comparison is 13 times better than this, at 8.6 to one, although this is down from the 20 to one ratio of the

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1970s, and is still falling. The Syncrude plant is huge, with an enormous pond holding nearly three barrels of non-recoverable sludge and wastewater for each barrel of oil recovered, and this is just one plant. To replace the current use of crude oil worldwide would require 350 such plants with a waste pond the size of Lake Ontario, if similar in depth and other parameters. Oil sands will become a greater part of future energy resources as other sources decline, and it is reasonable to assume some improvement in the technology, but not even the most optimistic ostriches think the big problem can be solved by sticking their heads into Alberta's sands.

Natural Gas

Natural gas completes the list of petroleum-based fossil fuels and is in many ways very attractive. So attractive in fact that demand is increasing faster than supply and its problems parallel those of oil. Natural gas is used to make nitrogen fertilizer by the Haber-Bosch process and is thus tied directly to food production, and Canadian fertilizer plants are already starting to close due to declining gas supply. Gas is also used directly for a variety of domestic applications, as well as being a possible replacement for oil in general transportation, excluding aviation. It is also, through propane, the source of polypropylene, the backbone of the plastics industry.

Although electrical utilities are building gas-fired generating plants as fast as possible, they have little alternative, and all are concerned by the long term gas supply picture. Mexico has ceased to export any gas to the US, where reserves are demonstrably declining. In 1999 more than 6,400 wells were drilled in Texas, and production was only just maintained. This compares to 4,000 wells the year before. By the end off 2001, the industry drilled 24,000 new wells with only a slight increase in overall production. Huge reserves of gas do exist in the Middle East, but these will benefit countries within reach of pipelines more than they will benefit the US, since ocean transport of natural gas brings its own problems. It must be cooled to minus 260ºF, to liquefy it and requires especially built LNG ships to carry it to especially equipped ports. The proposed one metre diameter Alaska pipeline will deliver less than 2% of projected US use by 2020 assuming demand is unaffected by decreasing oil supply in the interim.

US gas production also peaked in 1970 and has been flat since 1985 at about a third of the 1970 level, despite massive investment in exploration. Some new fields are being discovered, but not faster than existing gas fields are declining. Like oil, many 'new' fields are really older discoveries that due to depth and other technical reasons were uneconomical at the prices of the day. Since transportation problems leave the US much more dependent on its own resources it is likely that declining gas reserves, will actually increase pressure on oil and coal to replace gas. Again, gas may be as much part of the problem as part of the solution.

A lovely example of the complexity of the gas/oil equation is last week's news that a significant number of the gas wells under Alberta's tar sands have had to be shut off because declining pressure in the gas reservoir is making it more difficult to recover the oil-laden sand. This despite its being the very gas that was in large part burnt to provide at least some of the energy used to extract the oil from the sand.

To close the discussion on oil, there are at least two quotes of irresistible relevance from Heinberg's book. The first is from Matthew Simmons, an thirty five year investment banker to the energy industry, and a lifetime Republican, (no tree-hugger he) who said in a speech to the American Association of Petroleum Geologists in 2001: 'A simple check of the facts reveals that every scrap of spare energy [production] capacity around the globe is now either gone, or just about to disappear.' And this piece of current Saudi vernacular: 'My father rode a camel. I drive a car. My son flies a jet airplane. His son will ride a camel.'

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