

The propaganda campaign against peaking fossil fuel production

Michael Lardelli

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Energy and civilisation

A formal definition of “energy” is “the capacity to do work”. The overwhelming majority - ~80%) of the work done in our advanced technological society (i.e. the “economic activity”) is done using the energy released by burning fossil fuels [1]. In fact, even a large part of the work done by humans themselves can be attributed to fossil fuels since 30% of all fossil fuel use is for growing, processing, distributing and cooking the food that powers human bodies [2]. Of course, food production is vital when considering the future of our nation of Australia and of world civilization.

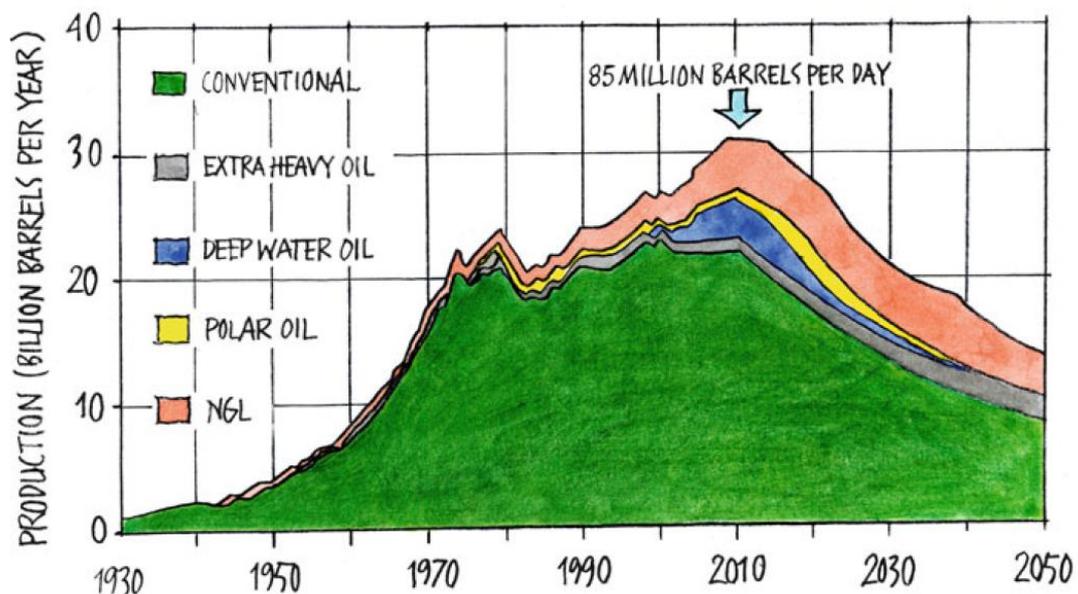
The act of people living in cities (the origin of the word “civilisation”) is only possible when farmers produce food surplus to their own needs. Only then can humans gather in concentrated groups to do something other than farming. Two thousand years ago the world’s largest city of that age, Rome, commanded an empire powered solely by the solar energy captured through agriculture and silviculture and fishing. It is sobering to remember that, without fossil fuels, the agricultural practises of that time produced such a small surplus that Rome’s “foodshed” spanned the entire Mediterranean region and beyond [3]. It is difficult to envisage how today’s swelling cities and national populations of many millions can be supported without fossil-fuelled agriculture. For this reason it is important to understand the possible future rates of fossil fuel production.

Future rates of fossil fuel production

It is energy per unit of time (“power”) that drives economic activity and permits civilization. Therefore, when considering future energy availability we must focus on possible rates of energy use rather than the ultimate amount of energy available. When considering renewable forms of energy such as solar radiation it is intuitively obvious that an upper limit exists to the rate at which this can be captured. However, it is not obvious that limits exist to the rates at which fossil sources of energy can be exploited. Nevertheless, this is what is observed. Maximum rates of fossil fuel production are the natural outcome of a human economy functioning within limits imposed by geology, the varying abundance and energy profitability (energy return on energy invested) of different fossil sources of energy and technological factors. This can be understood within the framework of what is termed “biophysical economics” as defined by Hall and Klitgaard [4] but will not be discussed further here.

The most famous example of a limited fossil fuel production (exploitation) rate is the prediction by M. King Hubbert of an upper limit to petroleum (crude oil) production in the U.S.A. In 1956 Hubbert used an estimated range of the oil that could ultimately be produced from the U.S.A.'s geological sources to estimate a range of possible dates and maximum rates of oil production [5]. While derided before the event, Hubbert's modelling ultimately proved correct and the USA saw a maximum production of close to 10 million barrels per day (Mb/d) in 1970. Interestingly, in 1974 Hubbert applied his rather simplistic approach to estimating world oil production and saw a peak occurring around 1995 [6]. In more recent years, many have sought to use this inaccurate published date to cast doubt on all attempts to forecast peak oil. However, Hubbert himself explained in an interview televised in 1976 that the constraining of oil production by Saudi Arabia during the oil 1970's oil embargos would delay the peak by some years ("might extend the middle 80% [of all oil use] by about 7 or 8, 10 years maybe" [7]). That would put the peak of oil production closer to the year 2006 which is when the International Energy Agency admits that production of conventional crude oil plateaued [8].

The first scientific article on Peak Oil was published ten years ago by Kjell Aleklett and Colin Campbell [9]. In it they estimated that the rate of oil production in the period spanning 2009 to 2012 would be around 85 Mb/d. A decade ago the International Energy agency (IEA) published scenarios anticipating that oil production would reach well over 90 Mb/d. We now know that Aleklett and Campbell were correct while the IEA was not. The "fracking" boom currently underway in the USA will delay the decline in the rate of total world oil production for possibly up to five years but global oil production will certainly be in decline by 2020.



Above is a reproduction of Figure 11.4 from the book *Peeking at Peak Oil* [10] (that summarises 10 years of scientific research on peaking fossil fuels by Kjell Aleklett and his research group at Uppsala University). This figure shows the prediction for future oil production made in Aleklett & Campbell's 2003 paper in the journal *Minerals & Energy - Raw Materials Report* [9].

The March 2013 report released by Werner Zittel et al. ("Fossil and Nuclear Fuels – The Supply Outlook" [11]) is an update of a previous report on fossil fuels from 2008 that was noted for its pessimistic view of future world coal production. Since then a number of peer-reviewed scientific papers have come to similar conclusions [12, 13]. Zittel et al. currently see oil production at peak levels and expect declines within a few years. Production of natural gas is expected to peak around 2020 while coal production should peak within the next decade. Therefore, all forms of fossil fuel production should be in decline by the mid-2020s. Since the energy profitability of all fossil fuel production is steadily falling (see below) this means that peak net energy production from fossil fuels will be reached considerably earlier. Indeed, this is probably a fundamental contributing factor to the world's current, extended financial crisis (since, in the absence of increasing net energy production, economic activity cannot grow despite easy availability of money through low interest rates and "quantitative easing"). Indeed, research by Aleklett's group showed that total energy output from coal in the world's largest coal province, the USA, has been flat since 1990 [14].

Net energy production

In order to exploit fossil fuels, energy must be used to mine, process and distribute them. Energy is also required to build and maintain the physical infrastructure that allows this and to train, feed and house the humans that design and use the infrastructure. The energy produced from fossil fuel exploitation must exceed these energy inputs if there is to be an energy profit (net energy) to drive other activities of human civilization.

In order to maximise profit from investment, humans consistently exploit those resources that have lowest cost of production first. For example, the most accessible coal with the highest energy content is mined before less accessible and less energy-dense grades. As these resources deplete progressively less accessible/poorer grades of coal are mined but these require progressively more energy to be exploited. Consequently, as production of a fossil fuel peaks, the net energy from exploiting that resource is already declining and the subsequent rate of net energy decline is much more rapid than the rate of production decline. Since fossil fuels current account for approximately 80% of world primary energy production [1] and since construction of much renewable energy infrastructure is subsidised by energy from fossil fuels [e.g. 15] a rapid rate of net energy decline from fossil fuels would lead to rapid economic contraction (economic collapse).

Threats to the fossil fuel industries and their responses

The two major threats to the continued viability of the fossil fuel industries (in our current economy) are decreased public demand for their products and a decreased ability to supply them.

The main threat to demand for fossil fuels is public concern over climate change due to carbon dioxide emissions. As revealed by Suzanne Goldenberg in an article in *The Guardian*, "Secret funding helped build vast network of climate denial think-tanks" (14 Feb 2013) over \$100 million was channelled to anti-climate science groups between 2002 and 2010 from wealthy conservatives in the USA. This included funds from oil industry actors such as ExxonMobil and Charles and David Koch. As Giles Parkinson wrote after the release of the International Energy Agency's (IEA's) World Energy Outlook (WEO) report for 2012,

"Basically, the WEO data suggests, there are a trillion reasons for the global coal lobby to resist change. That's one trillion dollars each and every year – the loss in annual revenue for the coal industry if the world takes serious action to prevent global warming, rather than just continuing on in business-as-usual."

An imminent decline in the ability to "produce" fossil fuels following peaks in production threatens not only the future income of fossil fuel companies but also their ability to find investment funds for future production. According to the IEA's 2011 WEO report [16], almost \$20 trillion must be invested in oil and gas energy supply infrastructure between 2011 and 2035 to ensure supply. That is approaching \$1 trillion per year. Governments also fear the concept of peak oil since a belief in future scarcity might wipe out confidence in economic growth, disrupt stock markets and cause economic contraction before the inevitable contraction that reduced energy production itself would bring.

The main tactic used by the fossil fuel industry to avoid discussion of peaking production is to focus on the size of apparent resources. The idea it promotes is that remaining fossil fuel resources far exceed those that have already been consumed. While this is debatable it is also misleading since peak oil / gas / coal refers to peak *rates* of production, not the size of remaining resources or apparently economically producible reserves.

A rather tragic example of the propaganda campaign to suppress the idea of peaking oil production is a discussion paper published in June 2012 by Leonardo Maugeri of the Belfer Center for Science and International Affairs under the moniker of Harvard University's John F. Kennedy School of Government. The paper, "Oil: The Next Revolution: The Unprecedented Upsurge of Oil Production Capacity and What It Means for the World" dismissed peak oil concerns and predicted a possible future glut of oil production [17]. Unfortunately (for the author and Harvard University) the paper is riddled with simplistic and serious arithmetic errors and confusions of terms. These are well summarised in an article by the English energy journalist David Strahan, "Oil Glut Forecaster Maugeri Admits Duff Maths" [18]. Nevertheless, the publication online of this paper without peer-review led to widespread and rather triumphant dismissal of peak oil concerns. Most famously, the British environmental columnist George Monbiot responded to Maugeri's paper with an opinion piece, "We were wrong on peak oil. There's enough to fry us all: A boom in oil production has made a mockery of our predictions. Good news for capitalists – but a disaster for

humanity". Maugeri's deeply flawed report remains available at the Belfer Center website.

Inaccurate energy forecasts by the IEA

The main actor opposing peak oil concerns remains the IEA that was established in 1974 by the OECD nations to advise them on energy policy after the oil supply crises of 1973. Despite finally admitting that the peak of conventional oil production occurred in 2006 [8] the IEA continues to provide scenarios for increasing world oil production in coming decades based on unrealistic assumptions of rates of future oil discovery and production. Re-analysis of the IEA's own data with imposition of realistic (but still very optimistic) discovery and production rates shows a future of decline rather than increase [19]. The ongoing decline in conventional oil production is currently masked by a recent minor upsurge in production of unconventional oil production such as "shale oil" in the USA [20]. However since conventional oil represents the great bulk of current crude oil production – and will for decades to come – it is only a question of when the decline in conventional production overtakes incremental increases in unconventional oil. An analysis by geologist Dr David Hughes predicts that production of US shale oil should rapidly decline before 2020 [21].

The IEA's failure to provide realistic assessments of future world oil production has serious geopolitical consequences since many governments defer to this authority for guidance on future energy trends. IEA assurances of continuing increases in oil production are seen by governments as justification for not engaging in the drastic measures required to ameliorate the effects of oil supply decline (for example, as recommended in 2005 by Hirsch et al. [22]). This behaviour by the IEA appears to be the result of political pressure from the USA. A 2009 article in The Guardian newspaper carried these comments from an IEA whistle blower [23],

"The IEA in 2005 was predicting oil supplies could rise as high as 120m barrels a day by 2030 although it was forced to reduce this gradually to 116m and then 105m last year," said the IEA source, who was unwilling to be identified for fear of reprisals inside the industry. "The 120m figure always was nonsense but even today's number is much higher than can be justified and the IEA knows this.

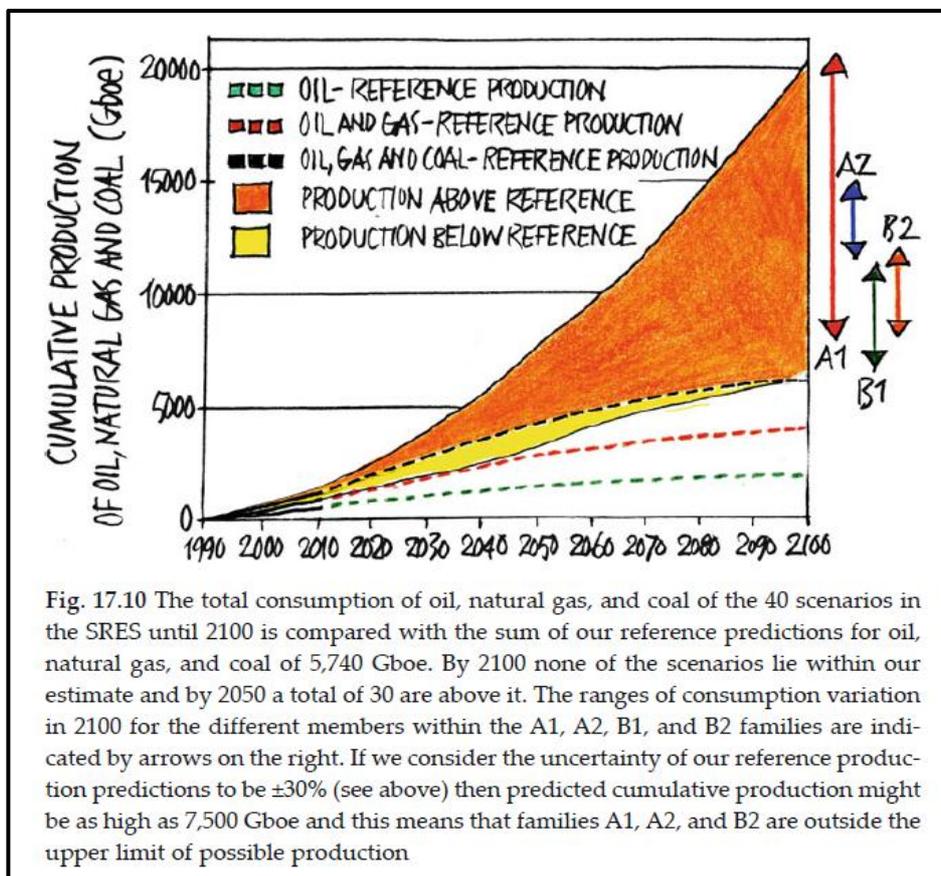
"Many inside the organisation believe that maintaining oil supplies at even 90m to 95m barrels a day would be impossible but there are fears that panic could spread on the financial markets if the figures were brought down further. And the Americans fear the end of oil supremacy because it would threaten their power over access to oil resources,"

Climate Change and Fossil Fuel Peaks

Imminent peaking and decline of fossil fuel production will fundamentally influence our response to climate change in two ways. It will both limit the amount of CO₂ it is possible to put into the atmosphere and limit our ability to

built the non-fossil energy infrastructure required to maintain any semblance of our current civilization.

Numerous peer-reviewed papers have now discussed that fossil fuel production limits restrict possible global warming according to current models. [Examples include papers by 12-13, 24-27] In Chapter 17 of *Peeking at Peak Oil* [10] Aleklett discusses how warnings by Peak Oil scientists regarding the IPCC's climate change scenarios have been ignored. Many of the IPCC's high emission scenarios described in the IPCC's Special Report on Emission Scenarios (SRES) published in 2000 assume continued fossil fuel combustion at or above current rates for the rest of this century and beyond. This is simply unrealistic. In fact, according to calculations by Aleklett's group, by 2100 all of the 40 SRES scenarios would require burning of more fossil fuel than they consider it likely will be produced (See Figure 17.10 from *Peeking at Peak Oil* reproduced below – note that “families” are groups of scenarios and “Gboe” is gigabarrels of oil equivalent).



The relative unwillingness of the world to accept peak fossil fuel forecasts compared to the widespread (though incomplete) acceptance of the reality of climate change may be due to an arrogant and irrational belief in humans' ability to overcome ultimately any physical limits. Thus, if humanity suffers due to an unwillingness to grapple with climate change it will have been, nevertheless, a choice we made of our own free will. In contrast, the idea that humanity's achievements might be limited by forces beyond our control – such as limits to available net energy – is currently unacceptable.

The Australian Government's failure to address Peak Oil

In the past decade, a number of political figures have demonstrated an awareness of the threat to Australia's food and economic security posed by peak oil. Indeed, as early as 2004 the then Australian Deputy Prime Minister warned of,

"... the very real prospect that at some stage in the next few short years global production may very well peak and it may be hard to increase it further at a time when countries like China, of course, are looking for a lot more fuel and even in places like Australia our dependence on oil, on petrol and transportation continues to increase."

However, in 2008 Tony Abbott, (currently Australia's Prime Minister), stated he was unconcerned about Peak Oil on the basis of the neoclassical economics argument that higher prices would bring on increased supply [28].

The current leader of the Australian Greens, Christine Milne, was active in the Senate in 2009 pushing for an investigation into this issue. As reported in Queensland's Courier-Mail of 20 November 2009 [29],

"... on Wednesday Greens deputy leader Christine Milne noted in the Senate that: "Neither the former Howard government nor the Rudd Government implemented the first recommendation of the 2007 Senate Rural and Regional Affairs and Transport Committee report into Australia's future oil supply and alternative transport fuels."

"This recommendation was that Geoscience Australia, ABARE and Treasury reassess both the official estimates of future oil supply and the "early peak" arguments and report to the government on the probabilities and risks involved, comparing early mitigation scenarios with a business-as-usual approach.

"She called on the government to "develop a national plan to respond to the challenge of Peak Oil and Australia's dependence on imported foreign oil". The motion was defeated 31 votes to six."

Andrew McNamara was the Minister for Sustainability, Climate Change and Innovation in the Queensland State Labor government from 2007 to 2009. He was well known for his concerns regarding Peak Oil and population growth although his speaking on these issues was restricted during his tenure. A conversation that I had a number of years ago with Kate Ellis, the Australian Labor Party member for the federal seat of Adelaide, indicated that Andrew McNamara had been very active in distributing information on these topics within the Labor Party. Nevertheless, the Rudd/Gillard/Rudd federal Labor government of 2007-13 took little action that could be regarded as increasing Australia's fuel and food security. On the contrary, it accelerated the already high

levels of immigration that had been put in place by the preceding Howard government.

In light of the above, it came as a great surprise to those concerned with Peak Oil when it was revealed that a detailed draft report on peaking world oil production had been prepared by the Australia's Bureau of Infrastructure, Transport and Regional Economics (BITRE) within the federal Department of Infrastructure, Transport, Regional Development and Local Government. The 436 page draft report, "Report 117: Transport energy futures: long-term oil supply trends and projections", analysed past and forecast production for individual oil producing nations or regions to build up a cumulative picture of world production [30]. It concluded that a peak of world oil production would most likely be seen before 2020. The report was sent out for a form of peer-review by (presumably) other organisations with interests in this area in 2009. Upon receipt of the reviews, BITRE withdrew the draft report rather than modifying it for eventual release. In May 2013 I made a request under Freedom of Information legislation to see the reviewers' comments on the withdrawn report (and these are now available at the Departmental website [31]). There appears to be little in the comments that would justify abandoning the report other than from one reviewer apparently aligned with the IEA. Notably, that reviewer stated,

Generally speaking, the paper considers, 'The main constraints on production are geological in nature', which stands in contrast to the IEA's long-held position that it is rather above-ground factors that are likely to constrain oil supplies in the short to medium-term. ... Also given its use of data, the paper would seem to be too heavily dependent on sources from 'peak oil' proponents. ... Thus the paper seems to start from a given assumption, namely that 'peak oil' is inevitable, before searching for supportive evidence.

This curious comment (that apparently rejects the finite nature of oil resources and the existence of geological constraints) should be read in the light of our earlier comments on the greater accuracy of oil production forecasts by "peak oil proponents" and the failure of previous IEA forecasts. Indeed, one of the other two reviewers of the withdrawn report (apparently from Germany's Federal Institute for Geosciences and Natural Resources) commented,

"I agree with you that peak production will be reached around 2020 which corresponds with our position".

Australia's significant and increasing fuel insecurity

In February 2013, NRMA Motoring and Services released a report, *Australia's Liquid Fuel Security*, prepared by retired Air Vice-Marshal John Blackburn AO [32]. The report warned that Australia has become increasingly dependent on imported oil since our own oil production peaked in 2000. In particular, our transport sector is overwhelmingly dependent on oil rather than other energy sources and we now rely greatly on shipments of transport fuel from refineries

in Singapore (that will become increasingly dependent on oil from Middle Eastern nations). A disruption to oil flow from the Middle East (for example due to a military conflict that closes the Strait of Hormuz) could relatively rapidly have severe impacts on the delivery of fuel, food and pharmaceuticals to Australian retailers due to the low stocks of fuel held by Australia. Indeed, Australia is currently notable for holding well below its OECD-mandated “90-day net oil import stockholding obligations”.

In the longer term, Australia’s agricultural production is also very dependent on oil for both diesel fuel and provision of agricultural chemicals. Disruptions or simply decreases in the availability of liquid fuels to the Australian economy threaten both food production and delivery at a time when population growth is rapidly increasing our domestic consumption of Australia’s agricultural surplus. Indeed, statistics from the Australian Bureau of Agricultural and Resource Economics (ABARE) clearly show that, in drought years (such as 2006/7) Australia only produces enough grain to cover 1.6x current consumption – and that is under the currently prevailing conditions of sufficient liquid fuels [33]. Increasing Australia’s population in the face of imminent fuel shortages and climate change cannot be a pathway to food security.

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