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THE NEW ECONOMICS OF OIL

Energy, economics, and the twilight of growth

Increasing the oil supply to support economic growth will require high oil prices that will undermine that economic growth.

– David Murphy and Charles Hall

1. Introduction

There has been a fair bit of talk about the so-called 'death' of peak oil. These eulogies have been motivated primarily by the upsurge of shale oil production in the US (Maugeri, 2012), as well as the announcement that the premiere peak oil website, *The Oil Drum*, is shutting up shop (The Oil Drum, 2013). Even the notoriously left-leaning eco-journalist George Monbiot (2012) has announced: 'We were wrong about peak oil.'

But Monbiot is wrong about being wrong. For reasons outlined below, peak oil is very much alive and squeezing its hands ever more tightly around the throats of oil-dependent economies. In other words, it is not the dynamics of peak oil that are struggling to survive, but the industrial economies that are trying to ignore the implications of oil addiction in an age of declining energy returns on investment. The new economics of oil also have alarming implications for climate change, as Monbiot acknowledged, suggesting that this is a subject we dismiss at our own peril.

This chapter seeks to show that oil issues remain at the centre of global challenges facing humanity, despite recent claims of oil abundance, and that the challenges are only going to intensify in coming years as competition increases over the world's most important source of fossil energy. The main issue, however, is not

whether we will have enough oil, but whether we can afford to produce and burn the oil we have.

This chapter focuses on the problems of expensive oil; the next chapter focuses on the problems of cheap oil. In an age of price volatility, both issues need to be considered, as they raise very different economic, political, and environmental issues.

2. Is 'Peak Oil' Dead or Alive?

Peak oil, of course, does not mean that the world is running out of oil. There is a vast amount of oil left – approximately half of Earth's original endowment (Sorrell *et al.*, 2012; Maugeri, 2012). Over the last 150 years, however, we've picked the low-hanging fruit, so to speak, meaning that the remaining oil is harder to find and more expensive to extract (Murphy, 2014; Murphy and Hall, 2011a). With the age of cheap and easy oil at an end, oil companies are now drilling in thousands of feet of water, processing tar sands, and being forced into extremely inhospitable areas, such as the arctic, while at the same time major existing wells are in decline (Lyons and Ghalambor, 2007; Klare, 2012; Kopits, 2014). This is making it more difficult to increase the 'flow' of oil out of the ground.

When the rate of crude oil production cannot be increased, that represents peak oil. This situation is considered by many to signify a defining turning point in history, because oil demand is expected to increase as the world continues to industrialise (Hirsch *et al.*, 2010). The theory goes that as the supply of oil stagnates and the demand increases, the cost per barrel will rise, making the consumption of oil an increasingly expensive and debilitating addiction.

So is this theory alive or dead? Well, it's not a theory, it's a reality. Around 2005 the production of crude or 'conventional' oil stopped growing significantly and has been on a corrugated plateau ever since (see Miller and Sorrell, 2014: 6). Data from the Energy Information Administration show that between 2005 and 2012 there was only 0.3% average annual growth of crude oil production (see Heinberg, 2013: 6). Other mainstream institutions have acknowledged this plateau too, including the International Energy Agency (IEA, 2010: 6), which recently reiterated an acknowledgement of the crude oil peak through its chief economist, Fatih Birol (BBC, 2013). Global demand for oil, however, has continued to grow significantly (IEA, 2012), which has put upward pressure on the price of oil. Although there has been some price volatility in recent years, the IEA (2013: 6) notes that 'Brent crude oil has averaged $110 per barrel in real terms since 2011, a sustained period of high oil prices that is without parallel in oil market history'. The

challenge of expensive of oil is compounded by the challenge of price volatility, in ways discussed further below.

Geopolitical instability in oil-rich regions of the world also pushes prices high (Klare, 2012), with recent developments in Libya, Syria, and Iraq being but the latest manifestation of this dynamic. Even if people reject the geological concerns over oil supply, the very real threat of ongoing geopolitical disruptions gives all oil importing nations a reason to prepare for supply disruptions (see Blackburn, 2014). This is especially so, as noted by the IEA, given that in coming years the world will come to rely increasingly on a small number of producers, mainly in the Middle East and Northern African regions where oil is shipped along 'vulnerable supply routes' (IEA, 2011: 3). It is also worth bearing in mind that the price spikes from the oil crises of 1973 and 1979, both of which induced recessions, were driven not by geology but geopolitics. It would be naïve to think that further crises could not arise, especially as competition over existing supplies continues to intensify (see Hiscock, 2012; Klare, 2012).

The upward pressure on price over the last decade has changed the economics of several sources of unconventional oil, making them more financially viable to produce when once they were not. For example, the main reason shale oil was not produced historically was because the costs of getting it out of the ground and refining it were significantly more than the market price for oil (Heinberg, 2013).

But with oil averaging above US$100 per barrel in recent years – price volatility notwithstanding – producers are more likely to be able to make money producing shale oil and other unconventional oils, even though their energy and economic return on investment (EROI) is considerably lower than conventional oil (Murphy, 2014; Murphy and Hall, 2011b). The fact that unconventional oil is much more carbon-intensive than crude oil (Hansen and Kharecha, 2008) – exacerbating an already intractable climate problem (IPCC, 2013) – does not seem to trouble oil producers or most politicians.

Driven by a decade of sustained high prices, this new production has meant that the total oil production (conventional plus unconventional oil) has been able to meet increasing global demand, even though conventional oil has shown almost no growth in recent years. Because total oil production has increased to meet demand, many commentators have declared that 'peak oil' is dead. These declarations, however, are based on a misunderstanding.

The current oil production situation does not debunk but rather confirms the peak oil argument. The peak oil position – at least, the most coherent iteration of its varieties – holds that when conventional oil reaches a plateau (and eventually declines), this

will lead to an increase in price; but price increases make unconventional oils more financially viable, thus increasing their production and delaying a decline in overall production of liquid fuels. This is what we are seeing today (Brecha, 2013; Sorrell *et al.*, 2012; Miller and Sorrell, 2014).

The key factor in understanding the implications of peak oil, therefore, has less to do with total oil production, or even total reserves. Rather, it is inextricably linked to the price of oil. The peak oil school always argued that oil dependent economies would suffer when the growth of conventional oil slowed and the price of oil increased. This scenario is playing out before our very eyes. In short, the economics of peak oil are very much alive and well – just ask the struggling global economy (Tverberg, 2012).

3. Is the Shale Boom a Bubble?

Before looking more closely at the economic implications of expensive oil and declining EROI, it is worth noting that there is a serious question over whether there is even much money to be made producing shale oil, despite all the hype, or whether, by contrast, there is currently a shale 'boom' that may all-too-soon go 'bust'. Although mainstream media and institutions are reporting on the 'new age' of US oil and gas (IEA, 2012), and even going so far as to claim that the US will soon be energy independent (Citigroup, 2012), evidence suggests that such claims lack foundation.

David Hughes, for example, has conducted the most rigorous and comprehensive examination to date on shale holdings in the US – based on data for 65,000 wells – and his conclusions are strikingly at odds with popular perception. While he acknowledges that shale production provides some 'breathing room' (Hughes, 2013: *iii*), he insists that optimistic claims that the US is heading for energy independence are 'entirely unwarranted based on the fundamentals' (Hughes, 2013: *iv*; see also, Hughes, 2014). Richard Heinberg's new book reviews the evidence and is similarly critical, likening the so-called shale revolution to 'snake oil' (Heinberg, 2013).

One need not, however, rely solely on such critics as Hughes and Heinberg, respectable though their analyses may be (see also, Leggett, 2013). Strong messages have started to emerge even from within the oil and gas industry, to the effect that shale is not proving to be the energy 'saviour' that it was hoped to be even a few years ago. If it was once assumed, for example, that shale *gas* production was going to lessen the oil supply challenges (for example, by shifting transport fuels from oil to gas), voices from within the

industry suggest this does not seem to be a very promising or reliable strategy (see leaked emails and documents compiled in the *New York Times*, 2014). In 2012 the CEO of Exxon Mobil, Rex Tillerson, commented on what the shale boom has done for his company, saying 'we are all losing our shirts today. We're making no money. It's all in the red' (Krauss and Lipton, 2012). In 2013, Exxon Mobil's quarterly profits were down a remarkable 57% (Gilbert, Scheck, and Fowler, 2013).

Similarly, Royal Dutch Shell has just written down its shale holdings by $2.07 billion, which helped push the company's second quarter earnings down 60% from a year earlier, as reported in the *Wall Street Journal* (Gilbert, Scheck, and Fowler, 2013). Even while the oil price was placed over $100 per barrel, *The Economist* (2013a) speculates that 'the day of the huge integrated international oil company is drawing to a close'. These are hardly intimations of a new 'golden age' in oil and gas production (IEA, 2012; Inman, 2014), despite increases in US production in recent years. After all, it is no good having vast technically recoverable resources if producing them is uneconomic. Furthermore, any fall in the price of oil – perhaps due to a further downturn in an already struggling global economy or short-term gluts – could also make some currently profitable shale holdings unprofitable, which soon enough would reduce shale production (see, e.g., Carroll and Klump, 2013; see also, Ch. 8). Even the IEA has reduced its enthusiasm for US shale, with chief economist Fatih Birol telling the *Financial Times* that shale represents 'a surge, rather than a revolution' (Makan and Hume, 2013). Indeed, a recent IEA 'Medium Term Market Report' indicates that the US 'surge' may level off as early as 2016 (see Mushalik, 2014). Given that US oil growth in recent years has disguised a production drop in the rest of the world (see Mushalik, 2013a), this imminent plateau in US production is significant.

Closer to home, the Australian Petroleum Production and Association's own *Oil & Gas Gazette* reported in June 2013 that the 'shale gale is little more than hot air', that '… the whole shale oil and gas game still looks like a net negative cash flow business', and that production has been driven '…not by any notion of ongoing profitability of the business' (Strachan, 2013: 4). While the future of the shale boom remains an open question, the fact that industry insiders are already expressing doubts about its long-term significance suggests that shale is not an energy source our economies should be relying on to meet ongoing supply.

Given that shale oil production is, in fact, currently doing the most to meet growing oil demand, any shale oil 'bust' is likely to have significant implications for an already strained oil market. Such a bust would also expose the stagnating production around the

rest of the world, which is currently disguised (to the uncritical observer) by shale production gains (see data sources presented in Mushalik, 2013a). But even if there is no bust, as such, what seems beyond dispute is that the era of cheap and easy oil (averaging $20-25 historically) is over, owing primarily to the crude oil peak. Readers may recall the words of the Chevron advertisement from 2005, which noted 'the age of easy oil is over' (see Dodson and Sipe, 2008: 33).

A further reason to believe the price of oil will continue to face upward pressures over the long term is the fact that global *demand* for oil is expected to keep growing significantly. Much of this demand is coming from places like China and India, where energy intensive industrialisation is escalating at extraordinary rates, and where cheap cars are opening the door for hundreds of millions of new drivers who will need fuel. Naturally this increase in global demand is putting growing pressure on oil supply around the world.

The fact the consumption of oil in the US has gone down in the last few years is not a sign that 'peak oil' has been negated by 'peak demand' (*Economist*, 2013b), but that peak oil has increased the price of oil so much that ordinary consumption practices have become unaffordable, suggesting 'demand destruction' is a more appropriate term than 'peak demand'. Given the close link between energy and economic growth (see, e.g., Ayers and Warr, 2009) this demand destruction has economic implications.

What is less widely appreciated, however, is the fact that huge increases in consumption are occurring *within oil exporting nations* (e.g., in Russia and the nations in OPEC) (see, e.g., Rubin and Buchanan, 2007; Heinberg, 2011). This rise in consumption is making it more difficult for those nations to maintain existing exports, for obvious reasons. As consumption grows within oil exporting nations, and as production stagnates, there is a great incentive for those exporting nations to keep more oil for themselves, which means that the OECD nations, for example, should not assume that they are going to get the same proportion of global oil production as they do presently. Indeed, as a result of the crude oil peak, exports also seem to have peaked around 2006 (see data sources presented in Mushalik, 2013b). Since internal supplies of most importers are also declining (Hirsch *et al.*, 2010), this gives rise to a situation where most importers and exporters are wanting more oil, while they are also facing stagnating or decreasing production. This is the 'oil crunch' that is likely to define the 21st century, a crunch that is in fact in the process of unfolding in the form of increased competition, increased production costs, and ultimately, price volatility caused by expensive oil.

But can the world economy afford expensive oil?

4. The New Economics of Oil

The economic significance of the crude oil peak is clearest when we 'do the maths'. In what follows, I briefly unpack the economic implications of the price of oil rising from its historical average of around $25 per barrel[9] to an average of around $105 per barrel in recent years. I use the US as a test case, and then move on to the global situation. (Again, the following chapter considers the implications of the price of oil falling, which raises a very different but intimately related set of problems.)

The following type of analysis could be repeated for all nations, with particular significance for oil importing nations. Even allowing for different assumptions regarding the price of oil, the essential conclusion is difficult to deny: due to the minimal growth of crude oil production, there is now upward pressure on the price of oil as EROI declines, and this is having a debilitating effect on oil-dependent economies, especially oil importing nations, as the peak oil school predicted. Here are some figures:

The US currently consumes 18.605 million barrels of oil per day (mbpd) (EIA 2013a), with net imports of 7.412 mbpd (EIA, 2013b). If crude oil production had continued growing at historic rates and prices had remained at the historic price of $25 per barrel, this would mean that the US today would be spending $465 million on oil every day, or $170 billion per year. At $25 per barrel, the US expenditure on net oil imports would be $185 million per day, or $68 billion per year. These figures are still high, but remember, these calculations are based on cheap oil.

At the price of around $105 per barrel, however, the US is spending a total of $2 billion per day on oil, or the equivalent of $713 billion per year. With respect to oil imports alone, the US is currently spending $778 million per day, or $284 billion per year. The critical point is the *difference* between these two scenarios, because that arguably represents the economic implications of the crude oil peak. Put otherwise, if crude oil had not peaked and the price of oil remained at around $25 per barrel, the US would be spending around $1.5 billion *less* per day on oil, or $543 billion *less* per year. Most importantly, however, the US would be spending almost $600 million *less* per day on oil imports, or $216 billion *less* per year.

I highlight the import costs, in particular, because that is money that is being sucked out of the US economy – or any oil importing economy. The extent of imports means that these figures

[9] For historical data on the price of oil, see http://www.wtrg.com/prices.htm, accessed 10 September 2013.

are hugely significant. Surely the US economy would be doing much better today (at least, growing faster) if it did not have to send out of the country, due to the rise in oil prices in recent years, an extra $600 million every day on oil imports. What would the US look like today if it had an extra $600 million *every day* to spend on renewable energy, schools, hospitals, or public transport?

Even leaving the issue of imports to one side, however, the increase in overall oil expenditure would have, and is having, an impact of its own, because this increased oil expenditure is drawing money away from the rest of the economy. Overall, were it not for the price increase, the US would have an extra $1.5 billion per day to spend in the broader economy, or $543 billion per year. Instead, all that money is being spent on expensive oil, which is distorting the economy (Kerschner *et al.*, 2013; Murphy, 2014; Kopits, 2014). Is it any wonder oil-dependent economies are struggling to grow their economies? Could it be that expensive oil signifies the twilight of industrial growth, as we have known it?

Another way to think of all this is in terms of oil expenditure as a proportion of GDP. In 2012, the GDP of the US was approximately $15 trillion. If the US were paying historic average prices for oil, total oil expenditure would only be 1.13% of GDP. However, at the price of $105, total oil expenditure would be 4.75% of GDP. In other words, over the last decade or so, the costs of expensive oil have absorbed an extra 3.62% of GDP.

These figures are worrying, especially if oil continues to increase in price as global demand grows, exports decline, production costs increase, and overall production slows. James Hamilton (2011) has shown that 10 of the last 11 recessions in the US were preceded by high oil prices. By way of comparison with the figures above, Hamilton (2011: 5) notes, 'in 2008, the U.S. consumed 7.1 billion barrels of oil at an average price of $97.26/barrel, for an economic value of $692 billion, or 4.8% of GDP.' We all know how the US economy looked in 2008-2009, in the midst of the global financial crisis, and the analysis above suggests that oil expenditure in the US is getting dangerously close to the level at which it could induce another recession (Murphy, 2014; Murphy and Hall, 2011a-b).

Even if expensive oil does not induce recession, it seems clear that expensive oil makes growth very difficult, and this provides some grounds for thinking that we are entering the twilight of growth globally (Heinberg, 2011). The above analysis, after all, can be repeated for the world as a whole, producing figures that are equally sobering. The world currently consumes around 90 million barrels of oil per day (IEA, 2012), and if each barrel were $25, that would be a global oil expenditure of $2.25 billion per day. At $105,

however, the world spends $9.45 billion per day on oil, or $3.5 trillion per year. This is a difference of $7.2 billion every day, an extra cost to the global economy which is largely a result of crude oil having peaked. It lacks credibility to pronounce the death of something that is costing the global economy $7.2 billion per day – or $2.6 trillion extra per year. If people had listened to the warnings of the peak oil school, we could have broken our addiction to oil by now and had this money to spend on other things. Unfortunately, oil expenditure continues to grow. At the same time, the peak oil school, in good health, is strangely pronounced dead.

As these figures show, peak oil as a concept and phenomenon is alive and well, and placing an ever tighter stranglehold on the global economy. The global economy struggles to withstand the economic impacts of high oil prices, primarily because so much trade is now international and therefore dependent on oil for the transportation (and production) of goods. When oil prices get so high that the economy cannot function – which seems to be what happened in 2008 when oil reached $147 per barrel – the economy struggles to grow, and this reduction in economic activity means a reduction in oil demand, leading to a fall in the price of oil (Heinberg, 2011). This fall in price is what happened after the Global Financial Crisis hit in 2008 (Rubin, 2012), and it is what happens whenever the demand for oil is reduced because of economic recession. Low oil prices, however, then aid economic recovery, but as economies recover from recession and begin to grow again, this puts more demand pressure on stagnating oil supplies, and the cycle repeats itself. This is what Murphy and Hall (2011b: 52) call the 'economic growth paradox: increasing the oil supply to support economic growth will require high oil prices that will undermine that economic growth'.

In short, as oil production slows or stagnates, oil prices may continue to increase until they reach an economic breaking point, crashing or destabilising economies, which would lead to a crash in oil prices; the low oil prices would then facilitate economic recovery, which puts more demand pressure on oil, leading prices to rise till economic breaking point, and so on and so forth. This cycle of bust-recovery-bust is what we may face in coming years and decades, and ultimately economic contraction is what we may have to prepare for. The world is unlikely to escape this unhappy cycle until it transitions beyond a growth-based economy and breaks its addiction to oil (see Alexander, 2012; Alexander, 2014).

This point about breaking our addiction to oil deserves some brief elaboration, because it raises the spectre of what Tom Murphy (2011) has called the 'energy trap'. In order to break the addiction to oil, economies dependent on oil will need to invest huge amounts of money and energy in building new social and economic infra-

structures that are not so heavily dependent on oil (e.g., efficient public transport systems to incentivise people to drive less, organic food systems, renewable energy systems, etc.). But since this transition has not yet seriously begun, the necessary investment of money and energy is going to be required at a time when money and energy are scarcer than they have been in recent decades. This places us in the 'energy trap'. Politicians are going to have a short-term incentive *not* to invest extra money and energy in new infrastructure, since people will already be feeling the pinch of high oil prices. This means that there will be very little or no surplus money and energy to direct towards the necessary infrastructure projects. But while passing the buck, so to speak, will provide some short-term relief for people and politicians, it only delays the inevitable need for that new infrastructure. A delay only exacerbates the problem, however, since the necessary investment will then need to come later, at a time when energy and money are scarcer still, the price of oil is probably even higher, and the time frame for change is tighter.

When oil gets expensive, everything dependent on oil gets more expensive, like transport, mechanised labour, industrial food production, plastics, among many other things. This pricing dynamic sucks discretionary expenditure and investment away from the rest of the economy, causing debt defaults, economic stagnation, recessions, or even longer-term depressions. That seems to be what we are seeing around the world today, with the risk of worse things to come (Tverberg, 2012). This should provide us all with further motivation to rapidly decarbonise the economy, not only because oil has tended to be painfully expensive in recent years, but also because the oil we are burning is getting more carbon-intensive. I, for one, can think of many better things on which to spend $2.6 trillion dollars per year – things such as renewable energy, bike lanes, better public transport, and organic food production (Heinberg and Lerch, 2010).

The maths of peak oil suggest that we have entered a new era of energy and economics, one in which expensive oil is going to make it increasingly difficult for oil dependent economies to grow their economies. After two centuries of sustained economic growth, this surely marks a significant turning point in history, but little attention is being given to this issue at the macroeconomic and political levels. Where are the politicians acknowledging this issue and giving it due public attention?

In the absence of a robust understanding of these issues, most economists and politicians around the world are still crafting their policies based on flawed, growth-based thinking, not recognising that the new economics of energy mean that the growth model,

which assumes cheap energy inputs, is now dangerously out-dated. The climatic implications of exploiting unconventional oils make the maths more worrying still (McKibben, 2012; Hansen and Kharecha, 2008). Granted, we are not running out of oil any time soon, but there will come a time when we run out of economically cheap, environmentally affordable oil, and, in fact, it seems that time is already upon us.

5. Conclusion

Peak oil turned out to be a more complex phenomenon than theorists originally anticipated. It has not been experienced as a precise 'moment' or 'event', but rather as a dynamic interplay between various forces that have provoked some adaptive adjustments (such as demand destruction or increased investments) in incremental and multidimensional ways. There may never be a 'shock moment' of peak oil's arrival; instead, peak oil may continue to play out as a gradual, unplanned transition to a new set of energy and consumption patterns that are less oil dependent, giving rise to social, economic, and ecological impacts that no one can predict with any certainty. The evolving interrelationship of geological, geopolitical, economic, cultural, and technological variables has continued to surprise analysts – both the 'cornucopians', who claim there is nothing to worry about, and the 'doomsayers', who think collapse is imminent, as well as everyone in between. No doubt there will be more twists still to come in this energy tale. But what seems clear is that the consequences of peak oil are not going away.

Whether the next twist arrives in the form of a new war or financial crisis, a new technology, a bursting shale bubble, or perhaps a radical cultural shift away from fossil fuels in response to climatic instability, intellectual integrity demands that analysts continue to revise viewpoints as further evidence continues to arrive. This issue is too important to be governed by ideology.

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