Peak Oil Theory

Leah Fusco

Introduction

When oil was first discovered in 1859 it had few uses. As time progressed, it became more and more integrated into society; society became increasingly restructured around oil so that today we are unarguably dependent upon it. This dependence has continuously been an area of concern, specifically following the oil crises of the 1970's. Individuals and groups began to question how long our oil would last and what we would do when it ran out. Many proposed answers to this question, however, due to the political and economic importance of oil, it is nearly impossible to determine who is correct and how much longer we can continue our current oil dependent way of life.

One method that has been used to estimate the future of oil supplies is the ratio of reserves to production (R/V), or dividing the total reserves of oil (the amount of oil that can be extracted from known fields) by the amount being used. Using this approach, it is typically estimated that we have between 40 and 100 years worth of oil left (Goodstein 2004: 29). The range is due to the complicated and contentious nature of estimating total reserves. Estimates are usually a compilation of individual field reserve estimates provided by oil companies and governments, both of which may have political motivations for either inflating or deflating their numbers. Also complicating the matter is that reserves can be calculated using a variety of methods (Campbell and Laherrere 1998).

The ratio of reserves to production is often used by oil companies because it allows them to divide use by reserves and to act as if production will remain constant. This approach, however, is contested by those who adhere to the theory of peak oil. This theory maintains that we should not be worried about when oil supplies completely run out, but rather, when oil production peaks (when world oil production is at its highest). After this point, they state, production will slow and oil prices will rise. This theory takes more into account than simply the total amount of oil known to exist and includes predictions about the cost of production at different stages of a reservoir's life as well.

Hubbert's peak

The theory of peak oil is based on the work of Hubbert M. King, who successfully predicted peak oil production in the lower 48 states of the United States. King received his Ph.D. from the University of Chicago, taught geophysics at Columbia University, worked for the American Petroleum Corporation, the United States Geological survey and Shell Oil Company. He studied petroleum reserves and production patterns (Heinberg 2003: 88) and in 1956 predicted that oil production in the U.S. would peak between 1966 and 1972. Despite the dismissal of Hubbert's theory by many, both inside and outside of his field, Hubbert's prediction proved correct: oil production in the U.S. peaked in 1970.

Hubbert's theory is based on a bell shaped curve of the discovery and production of oil. The bell shape for discoveries is derived from the observation that oil discoveries grow exponentially at first, peak, and then decline. This is because at first oil is very easy

to find, thus discoveries rise rapidly. However, as more of these easy to find reservoirs are discovered, further reservoirs become harder to find and the rate of discovery slows.

Production also follows a bell shaped curve. After oil is discovered, production increases steadily because oil is easy and cheap to reach. However, as more of the oil in a reservoir is extracted, it becomes harder, more time consuming and expensive to extract. Thus, production increases at first, reaches a peak (the point at which the maximum amount of oil is being produced), and then declines. Peak oil production usually takes place at the halfway point in production, when half of the oil in the well has been extracted (Heinberg 2003:88). Hubbert also observed that oil production parallels oil discovery, except that it is a few decades behind because oil is not produced immediately after it is discovered. Thus, David Goodstein states that, "…the rate of discovery predicts the rate of extraction" (Goodstein 2004: 28). The bell shape that Hubbert used is not only applicable to oil extraction. In fact, it has also been observed with regard to other natural resources, such as coal, copper and oil in the lower 48 states (Goodstein 2004: 30).

Hubbert made his predictions about the United States by studying the rates of discovery in the lower 48 states and graphing what he found. Because he knew that oil discoveries would eventually create a bell shape, he was able to finish the graph and estimate the total amount of oil existent in the U.S. Using this number, he could then predict when production would peak; he knew that production would peak when half of the reserves had been produced. His total reserves estimate included a high and low, thus he predicted that oil production in the U.S. would peak between 1966 and 1972. U.S. Oil production peaked in 1970.

After Hubbert

Because Hubbert was correct about the peak of oil in the U.S., many have subsequently adopted his methods in order to predict when world oil production will peak. Despite the fact that reserve estimates are a contentious issue, many using Hubbert's methods have come up with similar estimates.

One group that has been vocal on the peak oil debate is the Association for the Study of Peak Oil (ASPO). This group has worldwide branches with members including scientists and academics working on peak oil issues. Colin J. Campbell, a geologist and the founder of ASPO, and Jean H. Laherrere predicted that oil production would peak before 2110 (par 5). Dr. Roger Bentley, the secretary of the Association for the Study of Peak Oil and Gas believes the peak will be between 2010 and 2020. Ken Deffeyes, a geologist at Princeton and the author of *Hubbert's Peak: The Impending World Oil Shortage*, predicted that the peak would take place on Thanksgiving 2005. Chris Skrebowski, editor of the Energy Institute's Petroleum Review estimates the peak will come in 2008. Despite the different numbers available and methods used, many agree that the peak is not far off. In support of this argument, Bentley points out that of the approximately 100 oil producing countries of the world, 64 have already peaked (Harrison 2006: par 8). Dr. Jeremy Legget, once a geologist for an oil company and now the CEO of a solar company, suggests the importance of the fact that the world has not discovered more oil than it has produced in a year for more than 25 years. Major oil finds are also declining: while there were 16 discoveries of oil fields of 500 million barrels or more in 2000, there were none in 2003 (Harrison 2006: par 9).

Important to note is the fact that the date of peak oil production can only be estimated since the exact date will depend on future oil demand. While we do not know what this will be, we do know past and current demand, as well as what is expected in the future. As of 2005 the world consumed 84 million barrels of oil each day, a number that the U.S. Energy Information Administration is predicating will rise to 103 million barrels a day by 2015 (Lynch 2005: par 8). One factor contributing to this expected increase is related to the effort to raise living standards for the world's poor. In order to do this, traditional economics tells us that GDP must increase and this is something that requires oil. Kjell Aleklett argues that doubling the world's GDP may be necessary to raise the level of life for the poor people of the world, and that, "…if past economic development patterns are followed, doubling GDP will require doubling global oil production" (2006: par 12). Two counties that are quickly developing are China and India. Amos Nur of Stanford University states that these two countries will contribute heavily to future increases in demand for oil, particularly because personal automobiles are becoming more and more popular. He states that if they start using oil even at half the level that the U.S. does per capita it would lead to world demand increasing 96% (2006: par 7).

While the U.S. government's policies do not address peak oil, the issue has arisen in U.S. Government. The US Department of Energy published a report in which peak oil is discussed (Hirsch et. al 2005). The authors state that peak oil will have serious social and political impacts if it is not addressed at least a decade before the peak takes place. In December 2005, The U.S. House of Representatives Committee on Energy and Commerce subcommittee on Energy and Air Quality also held a hearing with the purpose of understanding peak oil theory. Among its witnesses were Robert Hirsch, one of the authors of the Department of Energy report, and Kjell Aleklett, a professor at Uppsala University in Sweden and president of ASPO.

Representing the more skeptical side of the debate at these hearings was Robert Esser of Cambridge Energy Research Associates (CERA). This firm has estimated that peak oil will be at some point after 2020 (Lynch 2005: par 11). It also states that oil supplies will be greater than demand until at least 2010 (Lynch 2005: par 10). This will be possible, they claim, because unconventional oil production will increase in the future. The firm also argues that, rather than a sharp peak, oil production will plateau for a while before it declines.

Another well known skeptic is Michael Lynch, president of the Massachusetts-based Global Petroleum Service Consultancy and advisor to the U.S. government, who claims that peak oil theorists have no idea what they are talking about and that they are manipulating data for their own purposes. He argues that just because oil production has peaked and begun to decline in a country does not mean that it cannot rise again. He has also argued that it is demand that controls production and not geology (Motavalli 2006: par 39).

Others on the skeptical side make arguments that the peak can be pushed further forward as oil production is increased. This increase will be a result of new oil discoveries as well as better technology that will allow us to extract more oil from each field. (Blackhurst 2006: Par 17). The International Energy Agency supports this view, and in its 2005 World Energy Outlook stated that production would increase and any peak would not occur until after 2030. At a climate change conference in Montreal, IEA head Claude Mandil stated that, "We don't share the tenets of the peak oil theory. We feel

that they underestimate technological developments. For many decades to come there is no geological problem."(Bailey 2006: par 17).

Why peak oil is significant

Aside from political interferences there have been few problems meeting the rising demand for oil. This, it is argued, will change on the other side of the peak. Once peak oil has been reached, supply will begin to decline and prices will increase. These price increases will be exacerbated by the fact that demand is expected to continue to increase in the future. Thus, while oil will not suddenly run out and leave us with nothing to put in our tractors and cars, we will be less able to conduct our everyday activities as the price of oil increases. Heinberg states that, “When the global peak in oil production is reached, there will still be plenty of petroleum in the ground- as much that will be ultimately recoverable as has been extracted from 1859 to the present, or roughly one trillion barrels (by most estimates). But every year from then on, it will be difficult or impossible to find and pump as much oil as the year before” (168).

One of the primary ways that oil price increases will be felt is with regard to transportation. Chris Skrebowski, believes that after peak oil occurs we will move into "a land without maps where we are all likely to be poorer" (Harrison 2006: Par:3). Transportation will be too expensive and thus we will not need maps because we will be unable to travel very far. For one thing, individual transportation will become more expensive. This is especially problematic because our society is structured around the use of cars, and in many cases they have become a necessity. However, as the price of gas increases, only the wealthier people will be able to afford them. This would be disastrous for those who cannot afford to live near their work (and who are probably the people unable to afford higher gas prices). Air transport will also decline due to its heavy reliance on oil. Heinberg suggests that only the very rich will be able to afford air travel, and that the commercial airlines will have to shut down, thus leaving the military as the only group that has access to air travel (174). This will have serious impacts on the economy, especially in tourist-dependent areas. James Kunstler, author of *The Long Emergency*, argues that rail transportation may be the only feasible mode of transportation. However, if it is not revitalized, we may not even have that (Phillips 2006: par 13).

Another implication of increased oil prices is a rise in the cost of food. Part of this would be due to higher transportation costs; in the current globalized world, food travels hundreds or thousands of miles from its origin to where it is consumed. Another factor that would cause food prices to increase has to do with the way agricultural production takes place on a large scale. Heavy machinery used on large farms consumes a lot of oil, and industrial pesticides are petroleum based. Thus, it will become more expensive, and possibly impossible to continue producing food with industrial agriculture. It could be argued that this would be a good thing because we will consume more locally grown and organic foods. However, this could not happen without starting prior to the crisis; as it stands, our society is not structured to have self-sufficient communities. Those places that once were self-sufficient have been drawn into the world economy and no longer have the infrastructure in place to produce all of their own food.

According to peak oil theorists, these are all possibilities if we continue our current oil dependent way of life and do not prepare for the other side of the peak. The

peak will not come upon us suddenly and unexpectedly. Goodstein states that, “The followers of King Hubbert may or may not be correct in their quantitative predictions of when the peak will occur. Regardless of that, they have taught us a very important lesson. The crisis will come not when we pump the last drop of oil but rather when the rate at which oil can be pumped out of the ground starts to diminish…Any way you look at it, the problem is much closer than we previously imagined” (Goodstein 2004: 37). Regardless of whether peak oil theorists are correct, we know that oil will not last forever, thus it seems prudent to start preparing now by putting more attention on alternative energy sources.

Bibliography

Aleklett, Kjell. 2006. "***Oil***: A Bumpy Road Ahead." *World Watch* 19:10-12.

Bailey, Ronald. 2006. "Peak Oil Panic." *Reason* 38.

Blackhurst, Chris. 2006. "Is this the end of oil?" in *Evening Standard*. London.

Campbell, C.J. 2002. *The Essence of Oil & Gas Depletion*: Multi-Science Pyblishing Company.

—. 2005. *Oil Crisis*. Essex: Multi-Science Publishing.

Campbell, Colin J. and Jean H. Laherrere. 1998. "The End of Cheap Oil." *Scientific American* 278.

Deffeyes, Kenneth. 2001. *Hubbert's Peak: The Impending World Oil Shortage*. Oxford: Princeton University Press.

Goodstein, David. 2004. *Out of Gas: The End of the*. New York: W.W. Norton & Company.

Harrison, Michael. 2006. "Bracing the world for the day when the oil runs out." in *The Independent*. London.

Heinberg, Richard. 2003. *The Party's Over: Oil, War and the Fate of Industrial Societies*. Gabriola Island: New Society Publishers.

Hirsch, Robert L, Roger Bezdek, and Robert Wendling. 2005. "Peaking of World Oil Production: Impacts, Mitigation, &Risk Management." The United States Government, Department of Energy.

Lynch, David J. 2005. "'Running out of oil' is an old fear." in *Dessert News*. Salt Lake City.

Phillips, Paul. 2006. "The American Empire Meets Peak Oil." *Canadian Dimension* 40.