Spring 2009

# Peak Oil: the Future of Oil and How to Prepare for It

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# PEAK OIL:

# The Future of Oil and How to Prepare for it

A thesis submitted to

Regis College

The Honors Program

in partial fulfillment of the requirements

for Graduation with Honors

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May 2009

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## Acknowledgements

I would like to thank Dr. Richard for his patience and guidance throughout the writing process, for taking the time to read my writing and offering his suggestions, and for making sure to grill me at my defense.

I would also like to thank Dr. Schmidt for reading my thesis and giving me his thoughts on it.

I would like to thank Dr. Bowie for being awesome, always.

I would like to thank my friends for listening to me rant and rave about the things in the world that I think are stupid and for their encouragement throughout this project.

I would like to thank my family first for birthing me and then for loving me.

## Introduction

My interest in Peak Oil theory was sparked by an eccentric friend of mine about two years ago. He lived next to an unusually deep lake and wanted to know if I thought it would be smart to buy up a few hundred barrels of oil and store them in his lake and then sell them later for a profit. He then proceeded to tell me that pretty soon, the production of oil would peak, decline, and all hell would break loose as the world ran out of oil.

While this individual was prone to talking about conspiracy theories regarding topics like the super-rich pulling the wool over the every-man's eyes and exploiting them financially or the *real* culprits behind the September 11th attacks, this particular theory about Peak Oil seemed particularly crazy to me. If the world was going to run out of gas, why are we using so much of it? I immediately dismissed the theory and the conversation. He rarely brought up the topic again, though I know that his interest never waned as I repeatedly caught him reading the forums at www.peakoil.com.

The internet is an awesome thing. To anyone who is every bored at any given time, the internet has the power to entertain you. At one such points of boredom I randomly decided to check out one of my friend's favorite websites and I headed to peakoil.com to look through their forums. It did not take long to be entertained. Much like my friend's ruse of buying oil and storing it for sale at a later date, I found someone

asking what people thought about buying an enormous quantity of cigarettes and storing for later. I found a letter that a newly-wed couple had written to their friends and families warning them of the pending catastrophe of peak oil. Rather than warning their friends about the diminishing supply of oil, the couple ended up unintentionally alienating their friends and causing lots of worry about the states of their mental health.

After getting a few laughs out of these general forums I started to explore the web site a little bit more. A different section of the forums caught my attention; it was labeled "Peak Oil Studies and Energy Reports." While I was expecting to find either unreliable studies or reports on why the theory of Peak Oil was bogus, I was quite surprised. The first thing I was actually a report put out by the United States Department of Energy that *confirmed* the existence of Peak Oil. Excuse me?

I was shocked at what I read. While my friend's original interpretation of Peak Oil may have been a little exaggerated and misguided, his general idea was correct. The theory of Peak Oil in a very brief nutshell is essentially the theory that after about half of the world's oil is extracted and produced, there will only be half left. As a result, production will decline and prices will skyrocket. The real kicker behind all this is that nobody knows just when it will peak. Estimates range from right now to 100 years from now. Nobody knows exactly when it will happen for a variety of reasons. For starters, nobody even knows how much oil is left in the ground or how much more there is to discover. But this is not the only cause for debate. While this is certainly important to the topic of peak oil, other political and economic factors tie in as well. Embargoes,

strikes, natural disasters, terrorism, and war could all affect the production of or the exploration for oil, which could change when peak oil occurs. The decline rates are also up in the air; after the peak, will production fall quickly or slowly? And what sort of roll will unconventional oil play? Are Canadian oil sands our savior, or are they over hyped? All of these things are valid questions that will be integral to how future oil production plays out, but these questions do not seem to have any reliable answers. There are many voices saying many different things.

And the more I researched, the more I realized that the voices were very reliable ones, instead of the voices like those crying about the Mayan calendar ending in 2012 or the voices I heard when I watched *Loose Change*. Peak oil is not an undeveloped conspiracy theory of new-age doomsayers, but a theory that has been confirmed by every organization that I have looked into. The Department of Energy, the government of China, the International Energy Association, Cambridge Energy Research Associates, even large oil and car companies such as Shell, Exxon-Mobile, Volvo, and Saab have concluded that peak oil (the peak of global oil production and its subsequent decline) will definitely occur, though estimates as to when it will occur vary wildly. The question is not whether or not peak oil will happen, but when it will happen.

However, if peak oil were to occur in the short to medium term, the resulting consequences could be disastrous. Falling economic output, decreases in the quality of transportation infrastructure, higher food costs and lower agricultural output, aggravated political instability, the subsequent rises in the probability of civil war across the globe

and resulting human rights violations and spread of disease, and a general decrease in quality of life for nearly everybody could all possibly result from peak oil.

As such, many of those who believe that peak oil will occur in the short to medium term are very concerned about the future, and argue that steps must be taken in order to prepare for such disaster. These include increasing spending on the research and development of alternative and sustainable fuels, as well as developing substitute fuels and their required infrastructure, like coal liquids, gas to liquids, heavy oil, and oil sands.

Although these steps seem very prudent given the potential consequences, garnering the support to take these steps is not an easy thing to do. With the global economy in the tank and gas prices at a relative low of $2.00/gallon, spending huge amounts of time and money on projects designed to lower gas prices in the future is not on the top of the list of worries of the average American. While this certainly makes gaining support for such projects difficult, it does not make it impossible. The key for peak oil theorists, or those who are concerned about the imminent decline of oil production, is to frame the issue on what the American public is concerned about. Your average American family right now is not concerned with gas prices, but with keeping their job so that they can provide meals for themselves and for their children.

With this in mind, the way to gain the support of the public right now is to relate issues to the current state of the economy. Rather than arguing that peak oil is a scary thing to think about because of its potential future consequences, whenever they might

occur, the way to gain attention is to focus on how the solution to the problem of peak oil is also a part of the solution to our economic crisis.

## Chapter 1: Peak Oil Theory

Peak Oil theory is based upon a theory put forth by M. King Hubbert, a geophysicist, during the fifties. The basis of this theory is that the graph of the production of any natural resource, be it coal, petroleum, natural gas, etc., over time will resemble a bell curve. According to Hubbert, "In the production of any resource of fixed magnitude, the production rate must begin at zero, and then after passing through one or several maxima, it must decline again to zero," and "although production rates tend initially to increase exponentially, physical limits prevent their continuing to do so" (Hubbert 13). In other words, the production of any natural resource begins by increasing exponentially, but eventually, because of physical limitations, must eventually decline again.

In the case of oil, extraction is small towards the beginning of an oil reservoir's life due to the limited number of oil wells in place. However, after time passes, more and more wells are drilled, thereby increasing production. The peak production of an individual reservoir occurs when approximately half of an oil reservoir's reserves have been recovered, and at this point, oil production is at its highest.

Afterwards, regardless of how much more money is invested or how many more wells are drilled into the reservoir, overall production will begin to decline. This is a result of both geological and economic factors.

The geological explanation is that pressure exists within the oil well in the forms of either natural gas or water. At the beginning of an oil field's life, there is sufficient pressure to push oil to the surface on its own. However, as this pressure dwindles, so does oil production.

There are a few methods to combat this. Oil well operators can inject water into the well or they can re-inject natural gas into the well. These two techniques, labeled as "secondary recovery" only go so far; at best, water flooding will only recover 60% of the oil in a reservoir. There are five other methods, labeled "tertiary recover methods" that operate on the same principles as secondary recovery. Tertiary recovery methods flood the oil well with steam, liquefied gasses, detergents, carbon dioxide, or even fire. All of these methods cost money and offer diminishing returns. As a result, oil flows most easily and most cheaply at the beginning of a well's life. Then, abut about halfway through its production, oil begins to flow more slowly and it becomes more and more expensive to extract, resulting in declining production, until extraction becomes so money-consuming that it becomes uneconomical to produce any more. This is the end of a well's life, a graph of the well's production during its life would roughly depict a bell curve.

This trend of a bell-shaped production curve has been well documented not only in the case of oil reservoirs, but also individual oil wells and even entire countries. As such, the production of individual oil wells within a country can be added up to give the total production of a country. The United States and other countries have seen their peak and decline in oil production. As far as we know, the peak in world oil production has

not occurred; however, excluding deepwater oil fields, 54 of the 64 largest oil producing nations in the world have currently reached peak oil production (Committee of Energy and Commerce, 34).

In 1956, Hubbert used his knowledge of existing oil reserves in the United States and a simple equation[1] relating time with production to create a model to predict the peak of oil production in the United States. As you can see in fig. 1A, with two slightly different projections he put the date of peak oil production in the United States at 1965, as well as offering a best case scenario that put the date at 1970. The United States indeed reached its peak in 1970.

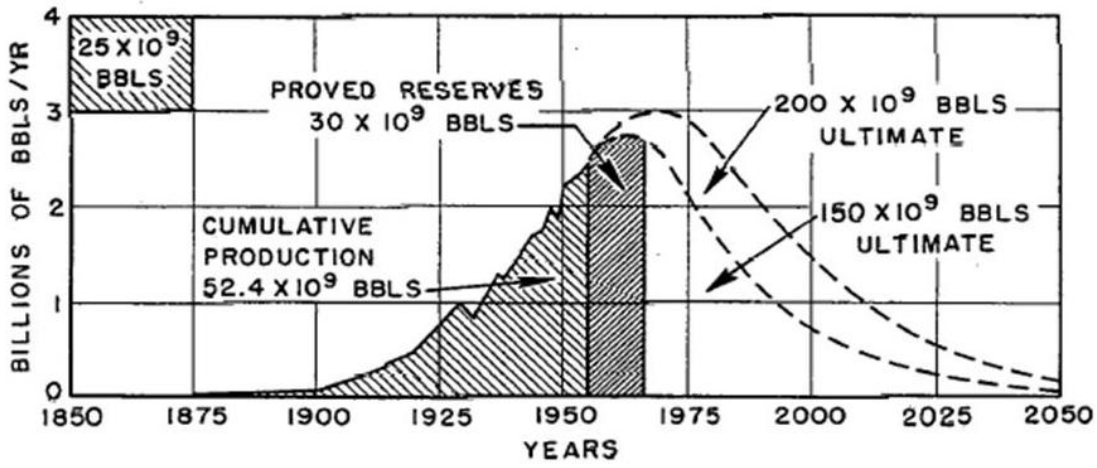
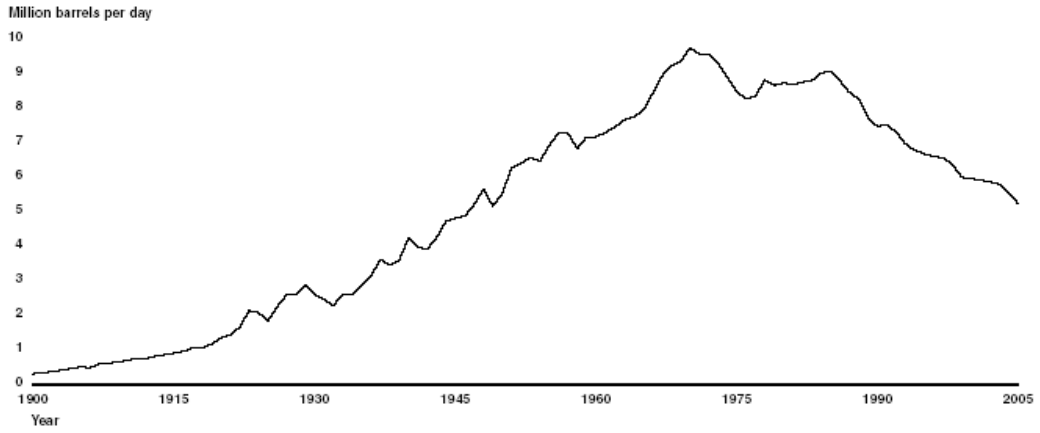



Figure 1A – Ultimate United States crude-oil production based on assumed initial reserves of 150 and 200 billion barrels.

[1] I am not a calculus expert. For the actual equation, see Hubbert's work.

Figure 1: U.S. Oil Production, 1900-2005



## Chapter 2: Uncertainties

Critics of Hubbert's model point out that it is too simplistic to be of any use in forecasting future oil production. For example, Leonardo Maugeri's book *The Age of Oil* points out that Hubbert's curves do not take into account "political decisions affecting production, change of habits affecting consumption, price trends and technological evolutions affecting both production and consumption, and so on" (204). This is absolutely correct; there are very important variables that make predicting when and what a peak in oil production will look like a nearly impossible task.

A Government Accountability Office report succinctly lists four key uncertainties that complicate the predicting peak oil (when oil production reaches its maximum and subsequently levels off). These four uncertainties are "the amount of oil throughout the world; technological, cost, and environmental challenges to produce that oil; political and investment risk factors that may affect oil exploration and production; and future world demand for oil" (GAO 12). This list matches up exactly with Maugeri's criticisms of Hubbert's model and is worth exploring further.

The amount of oil in the ground is almost comically uncertain. For example, companies that are owned by OPEC countries are not subject to the same laws and resulting liability standards as companies that are traded on the US stock exchange. As such, they have little incentive to accurately report their oil reserves. The reserves

estimates of Kuwait offer a perfect example. The GAO reports that "reserves estimates in Kuwait were unchanged from 1991 to 2002, even though the country produced more than 8 billion barrels of oil over that period and did not make any important new oil discoveries" (14). Unfortunately, this lack of confidence in OPEC's stated reserves is particularly problematic because about 80% of worldwide oil reserves lie within OPEC countries (15).

Even the amount of oil outside of OPEC's grasp is open to debate because there is still oil left to be discovered. The United States Geological Survey publishes oil resources estimates, which are different from proved reserves in that they estimate the world's total oil resource base, rather than what has been proven and what is economically feasible to produce (GAO 16). However, these USGS numbers are criticized for being both too low and too high. One of the flaws of the USGS estimates is that they are estimating how much oil is in places that have not been sufficiently explored. In some cases, data for these estimates is even used that is up to 25 years old (16). The USGS numbers also exclude non-conventional oil resources, such as oil sands, coal liquids, and heavy oil, which are a topic of hot debate themselves.

Cost and environmental issues complicate forecasting peak oil as well. The differing types of enhanced oil recovery options (EOR), the secondary and tertiary methods mentioned earlier, can be very costly. Depending on oil prices, these methods may or may not be economically beneficial to pursue. Also, they can be potentially damaging to the environment, which could raise concerns and barriers to their use. Oil in

hard to reach locations, especially deep and ultra-deep water reservoirs, can be very costly and potentially damaging to the environment (GAO 18).

Political uncertainties also create problems for forecasting a peak in oil production, and unfavorable political conditions could even create a peak in spite of the capacity for greater supply. Wars, coups, and labor strikes in oil producing nations have the ability to constrain production and exploration. The GAO report states that Iran, Iraq, Nigeria, and Venezuela, which possess nearly one third of the world's oil reserves, also possess high levels of political risk. The Cambridge Energy Research Associates (CERA), whose prediction will be discussed later, qualifies its prediction with the existence of a number of above ground risks (Committee on Energy and Commerce 61). Resurging nationalism, which increases turmoil within a country, thereby increases the risks for both national and international oil companies. Violence and insecurity, which we can see today in Nigeria, can also negatively impact production capacity.

Basic economic theory states that higher prices on goods spurs innovation and technology. Many critics of peak oil point out that high gas prices point to this principle. The problem with believing that high prices will result in new exploration and production technologies ,as far as conventional oil goes, is that it has not happened in the past. The advents of practical 3-D seismic, economic horizontal drilling, and improved geological understanding did not prevent the United States from falling production (Hirsch 17). While technology in unconventional oil sources and alternative energies can certainly do their parts in delaying a peak in oil production, the Hirsch report concludes that "Higher prices and improved technology are unlikely to yield dramatically higher conventional oil

production" (Hirsch 17). While improved technologies in the fields of alternative energies and con-conventional oil resources can affect the timing of a peak in oil production, improved technologies in oil production will not be able to prevent a peak and a decline.

The final uncertainty that the GAO lists is the uncertainty of future demand. Less demand for oil will result in less production, which would thereby influence the timing of a peak in oil production. The demand of consumers is what drives the production of anything in a capitalistic economic system. Today's youth in America is famously environmentally friendly, and a continuation of this trend will undoubtedly result in the sale of more fuel efficient vehicles. In fact, one survey showed that environmental friendliness was one of the top three things that define a car as "cool" to Generation Y (McKenney). The same study showed that 80% of the consumers were even willing to pay more for environmentally friendly vehicles.

Even outside of environmentally conscious consumers, increasing gas prices can also drive demand for fuel efficient vehicles up, while simultaneously decreasing demand for less efficient vehicles like SUVs and pickups. Indeed, we can already see this happening today. GM's Chevy Volt, a car that will be able to drive forty miles on electricity rather than gas, has been garnering much media attention.

Government policy is also able to affect oil demand, and government policy of any democratically run government will depend on its constituents. Just as consumers can demand more fuel efficient cars, constituents can demand government policy that can

affect a peak in oil production. Policies that mandate efficiency standards and encourage the development of alternative energies can influence future oil demand.

All in all, Maugeri's criticisms of Hubbert's peak oil model are valid in that there are too many uncertainties involved in predicting a peak in global oil production. However, these criticisms do little to invalidate the overall theory that the well-documented trend of a rise, peak, and decline of production of an oil reservoir, and thus a similar rise, peak and decline of a sum of oil reservoirs, does not exist. The uncertainties involved in predicting the future of oil do not negate the curve of production, but they only serve to distort it in a number of ways and to the extent that trying to guess at the timing and shape of it is not only difficult, but also yields drastically different numbers depending on the data and assumptions used.

Just because predicting when peak oil will occur is a difficult proposition does not mean that nobody has attempted to do so. It just means that resulting conclusions are wildly different among the different organizations that have tried to put a date on peak oil, and that the uncertainties discussed above make these predictions little more than educated stabs into the dark.

The Cambridge Energy Research Associates (CERA) is one organization that has dutifully taken up this challenge, and its results are more optimistic than many of the other organizations and individuals that have attempted to put a date on peak oil. One of the reasons for this optimism is that it includes non-conventional sources of oil, such as natural gas liquids, heavy oils, and ultra deepwater oil. Including these sources of oil in addition to conventional oil, CERA predicts a peak in production sometime after 2030.

Additionally, CERA asserts that the peak will not be an isolated peak followed by a decline in production as Hubbert and others have posited, but will look much more like "an undulating plateau, followed by a long, slowly declining profile" (Committee 54).

Of course, just like there is uncertainty about the amount of oil in the ground, there is uncertainty about how much of other resources are in the ground as well. This leads me to conclude that just as any estimate as to when the peaking of conventional oil will occur is inherently flawed in that unverifiable data is being used. CERA's guess (though of course it may be true) is also inherently flawed in that it includes unverifiable data involved in not only conventional oil, but in unconventional oil sources as well.

CERA's analysis, as well as the analysis of many other parties, was presented before the Senate in December of 2005. During this presentation, speakers of differing opinions on peak oil got together and hashed a few things out. Though CERA reports a much more optimistic view of petroleum production in the future, it is interesting to its own opinions on the report. Robert Esser, the senior Director and Consultant of Global Oil and Gas Resources at CERA, notes that their projection of a plateau and slow decline as opposed to a peak and sharp decline is not meant to give any confidence to people. When asked if he "did not mean for us to take comfort in the thought that it might be an undulating plateau," he replied by saying, "It is certainly not" (Committee 83). Even according to CERA's projections, an eventual plateau of oil production will still cause problems because there will still not be enough oil being produced to satisfy demand, even if production peaks three decades from now.

Additionally, Esser qualifies CERA's studies by saying that, "We feel pretty comfortable out ten years or so. But once we get beyond that, then we are guessing" (Committee 83). This is because of uncertainties about Middle East oil fields and political risks. Still, Esser asserts that "the world is not running out of oil imminently, or in the medium term," and that the undulating plateau should be expected about three or four decades from now (Committee 52).

Interestingly, the editor of *Petroleum Review* in the United Kingdom did an analysis using the same data that CERA did, though he used differing decline rates. He came up with very different results: while CERA had projected an increase in production and even a drop in oil prices before 2010, this other analysis came to a differing conclusion with the same data. This goes to further underscore the idea that putting a date on peak oil is not an easy thing to do by anyone. Even with the same data sets, different people draw differing conclusions.

Kenneth Deffeyes, a retired Shell geologist and author of Hubbert's Peak, puts the date much, much sooner than CERA. Rather than CERA's prediction of around 2030, or 2020 at the soonest, Deffeyes believes that peak oil is actually currently occurring. Though I am somewhat oversimplifying, Deffeyes' conclusion is that with an eventual cumulative production of 2.1 trillion barrels of oil and a lead time of 21 years between discovery and production, oil production should have begun peaking in 2003 (148). However, he does make sure to qualify this number, saying that (as was noted earlier) the revision of OPEC's reserves "may or may not reflect reality" and that OPEC's production capacities is information that is unavailable to us (149). As such, Deffeyes writes that he

"honestly does not have an opinion as to the exact date" of peak oil, though his website explores the possibility that our current financial crisis was caused by the onset of peak oil.

The International Energy Agency, or IEA, publishes a yearly energy outlook, and the most recent one proves to be very interesting in that it estimates the year of peak oil to be beyond 2030, though the rationale behind this claim is dubious, sometimes even by their own admission. The executive summary states that "[estimates of remaining proven reserves of oil and NGLs] have almost doubled since 1980. This is enough to supply the world with oil for over 40 years at current rates of consumption" (41). On the surface this sounds perfectly well and good, but the next sentence states that "most of the increase in reserves has come from revisions made in the 1980s in OPEC countries." These revisions come from countries who do not allow independent auditors to examine these claims and who have a stake in what the numbers say. Additionally, if the numbers were incorrect before the 1980's, why should we trust them to be correct now? Finally, the summary states that, "this is enough to supply the world with oil for over 40 years *at current rates of consumption."* Consumption has not stayed constant, but has increased, and the way things are going, this increase in consumption will continue.

The summary goes on to say that "Only a third of recoverable conventional oil resources, which include initial proven and probable reserves from discovered fields, reserves growth and oil that has yet to be found has been produced up to now. Undiscovered resources account for about a third of the *remaining* recoverable oil, the largest volumes of which are thought to lie in the Middle East, Russia and the Caspian

region. Non-conventional oil resources, which have been barely developed to date, are also very large. Between 1 and 2 trillion barrels of oil sands and extra-heavy oil may be ultimately recoverable economically."

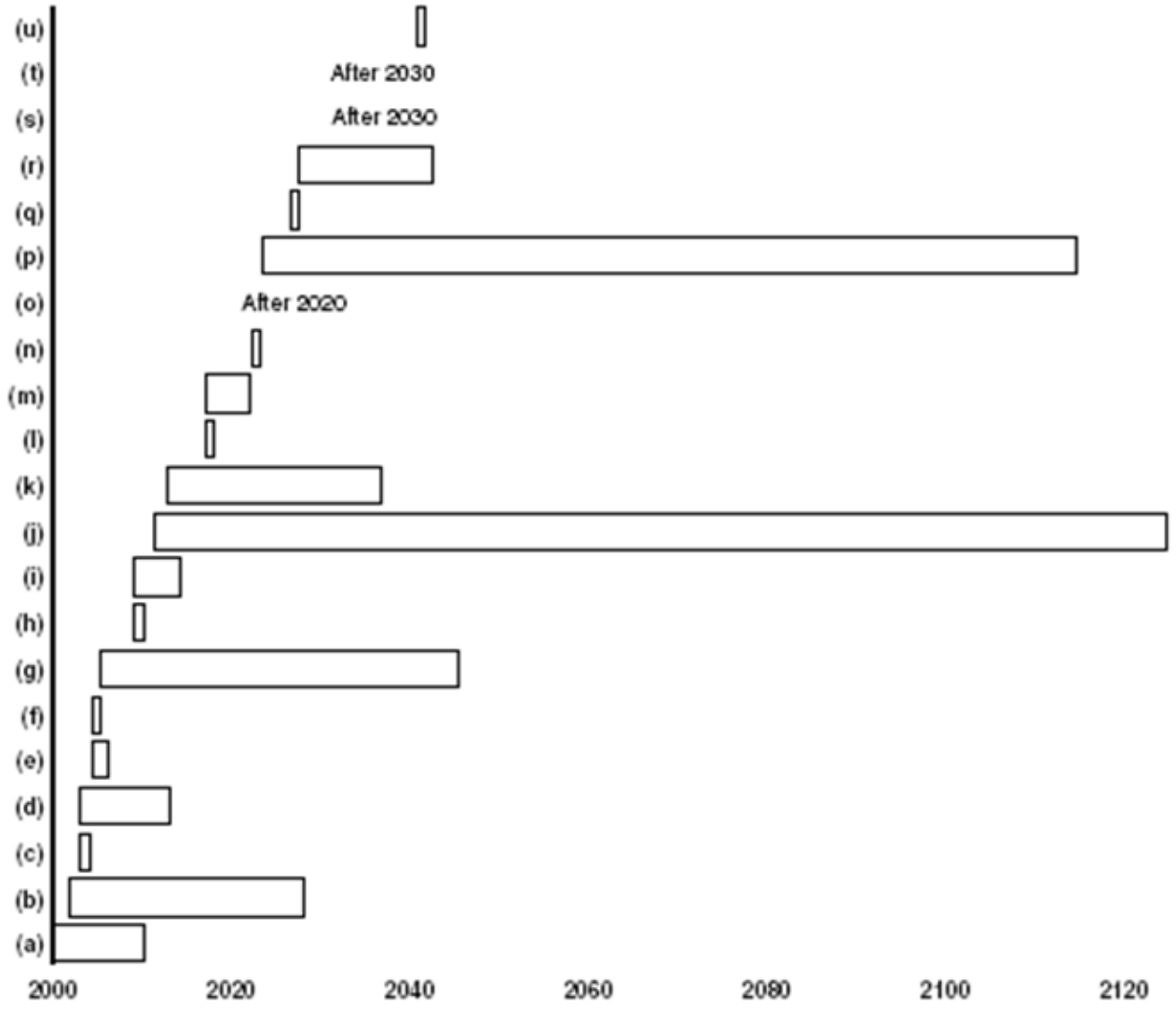
This all sounds fine at first, but a careful analysis reveals a picture that is not so optimistic. While "only" a third of the world's proven and "probable" oil reserves have been produced to date, oil production peaks and begin to decline after about half has been produced. So though roughly 33% percent of the world's oil has been produced, the problems really begin after we have produced about 50%. Also, this assumes that we still have about one third of the world's oil to be discovered, largely in the Middle East, Russia, and Caspian Region. I have already pointed out that trusting the numbers from the Middle East is not a prudent thing to do, and that production from the Middle East and Russia will probably be affected by geopolitical factors in the future. Warfare in the Middle East has constrained production in the past, and this scenario is not unlikely in the future. Just recently Russia cut of the supply of gas to Eastern Europe, demonstrating that Russia is not necessarily a safe bet either.

Additionally, the claim about oil sands and heavy oil needs to be examined as well. Just how much oil can be produced from Canadian oil sands is a topic that is open to debate. Though CERA concluded that large amounts of liquid fuels can be produced from these sources, but there are certainly people who disagree. Kjell Alekett and the University of Uppsala studied the Canadian oil sands that are often cited as a huge potential resource in the future, and concluded that "even the crash program for production of oil from Canadian oil sands will yield only a limited amount of oil," and

that if production should rise over 6 billion barrels per day, which might be possible by 2040, "a couple of nuclear power plants" would be required to generate the necessary energy. (Committee 31). On the surface, the IEA's energy report looks optimistic, but analyzing what they say brings up a number of questions about the legitimacy and accuracy of their prediction.

All in all, most credible agencies who have studied peak oil agree that peak oil will happen eventually, though estimates on when it will happen differ wildly. Oil companies Shell and Exxon Mobil put the date at around 2030, while a study by Volvo puts the date between 2005 and 2015 (for a graph of estimates of the timing of peak oil, see figure 2). Knowing that peak oil exists important, but unfortunately it would be a mistake to trust any one individual or organization on when it might occur. Congressman Ralph Hall likens our knowledge of peak oil to a pilot whose instruments have all gone out – not knowing where we are going nor how we are getting there (Committee 89).

Figure 2 Key Estimates of the Timing of Peak Oil




Source: GAO study.

Studies listed in Appendix I.

## Chapter 3: Consequences

The potential results of peak oil could be disastrous. Economic consequences include both rising inflation and unemployment. For a quick example, one need only to look at the unemployment and inflation of the world economy during the oil shocks of the 1970's and 1980's, which most peak oil theorists, who believe that peak oil will arrive in the short or medium term and advocate policies to curb its effects, point to in order to establish their argument. Between the years of 1973 and 1982, the United States experienced an 8.7% rate of inflation, a 7% unemployment rate, and only a 0.9% growth in GDP (Krugman).

The Hirsch Report claims that "higher oil prices result in increased costs for the production of goods and services, as well as inflation, unemployment, reduced demand for products other than oil, and lower capital investment," though it does little to explain how or why higher oil prices do these things (28).

The first two claims, that increased costs for the production of goods and services, as well as inflation, are really the same thing. The textbook reason that jumps in oil prices can have this effect is because oil is integral in the transportation and production of both goods and services, an increase in oil causes in increase in the costs of goods and services, which is then passed from the company to the consumer. Just as rising prices in

steel and other metals would drive up the cost of a car (or anything else made of predominantly metal), rising gas prices results in price increases across the board.

Because production now costs more, selling is less profitable and firms will sell less, so production must be cut back. On top of inflation induced by higher input costs, these higher costs also lead to economic stagnation and unemployment. At least, that is what a textbook would say (Mankiw 463).

However, if this were true, then the opposite would be true as well. Just as jumps in oil prices would make everything more expensive and cause stagflation, oil price crashes would make everything cheaper and cause an economic boom. History shows us that this is not the case. Instead, oil shocks seem to produce recessions not because of increases in manufacturing costs, but because oil volatility produces trepidation when buying large items that depend on energy (Hamilton). Cars are the obvious example; when gas jumps to $4 per gallon, people are less willing to buy SUVs. Even beyond the desire for a more fuel efficient car when prices are up, people want to see prices stabilize before making a big purchase, be it an SUV or a hybrid. And even beyond cars, there are a wealth of items where the price of energy is important to a decision. Housing materials, appliances, and electronics are just a few examples.

With this in mind, the importance of confidence in energy price stability, or a lack thereof, becomes apparent. Certainty or uncertainty about future prices and supply drives down demand for an array of goods and services. Even without the inflationary effect of high input prices of manufactured goods, volatile oil prices can shake consumer

confidence and cause them to hold off from buying. With this in mind, we can see how political events that do not directly affect the flow of oil, like the mere threat of war or terrorism, can lead to anxiety or fear of what might happen to prices in the future, which then influence potential buyers of big ticket items to hold off on their purchases.

And, if peak oil theorists are correct in their forecast of 4-8% declines in oil production, volatile oil prices are sure to be present. Even within the past few years, we have witnessed a fairly high degree of oil volatility. Just in the past few months we have seen oil rise to a national average of over $4/gallon, or $147/barrel, down to below $40/barrel (Avro). It is currently back on the rise, and industry experts tend to agree that the present low oil price will only be a temporary reprieve from the prices we saw towards the middle of 2008. This is why people are interested in buying an oil supertanker just to store oil; they are looking to buy oil right now while it is cheap because they expect to sell the oil in the near future when prices go back up.

The oil shocks of the 70's and 80's strongly exhibited the rise of inflation and drop in productivity discussed above. As peaking approaches, the inelastic demand of oil and the short supply of it will result in even higher average prices and even more price volatility, which in turn generate higher inflation, a lack of confidence, and reduced economic growth rates.

Although nowadays the GDP of the United States is less dependent on oil – less oil is needed to produce 1$ of GDP – recent oil price hikes have still seen negative effects on the U.S. economy. After Iraq invaded Kuwait in 1990, the S&P 500 feel by nearly

15%, and after 9/11 attacks, the Dow Jones fell by about the same amount. These effects were largely a result of market psychology. Just as I mentioned earlier how oil prices can jump due to a lack of confidence in supply, rising oil prices trigger fears of inflation amongst market participants (Westcott 6).

The Westcott Report, a study of the potential global effects of a sustained price of $120/barrel of oil, points out that stock market capitalization is much higher now, and consumers tend to spend between 3-5% of their stock market wealth each year. Assuming they spend 4% of this wealth, the 25% decline in stock value resulting from sustained oil prices at $120/barrel would result in a global reduction in spending of $400 billion. Roughly another $400 billion would be lost because of the negative impact of demand after a huge rise in household energy bills (Westcott 6).

Similar to the Westcott Report, Oil Shockwave was a study done on the potential impacts that terrorism directed towards oil infrastructure could have on the U.S. economy. Assuming a sudden 4% decline in global oil supply, could result in a 177% increase in the price of oil per barrel. This would put the economy into a deep recession and millions of jobs would be lost (shockwave 7). Coincidentally and unfortunately, peak oil theorists believe that after reaching the peak, declines in oil production will likely be between 4-8%.

Additionally, the shocks of the 70's and 80's were only temporary, and this temporariness has had unfortunate effects on the mindset of both policymakers and the general public. The visible and often times disruptive cycle of the oil market, which has

had very volatile tendencies in the past, has led to the thinking that whenever oil prices rise, they will eventually be accompanied by a drop, and then another subsequent rise. While this is typical of any market, the oil market has a much more exaggerated history of this cycle, and it is generally felt that the problem will always eventually take care of itself. The initial panic at the realization that oil did not grow on trees gave way to the complacency in the fact that prices might jump, but they have always fallen afterwards.

In the situation of peak oil, this sort of thinking can be very dangerous. Assuming that the problem will take care of itself can only lead to a delay in action, which is already likely because of the large amount of effort and time needed for successful mitigation. Any more delay will certainly, according to peak oil theorists, only make the onset of peak oil and its effects even more devastating.

While these economic consequences are extremely dire, there are a number of other consequences of peak oil as well, some of which will only exacerbate the problems listed above.

Transportation infrastructure is very dependent on the availability of cheap oil. Richard Heinberg, author of *The Party's Over*, notes that road-building machines run on oil, and asphalt itself incorporates large quantities of oil. As a result of peak oil, road building will not be able to continue, and even existing roads will suffer because of the greater costs that will be required to repair them.

Unfortunately, the United States will suffer more from the increase of costs of transportation infrastructure than most other developed countries because of its history

with the automobile. High rates of car ownership in the United States have strongly affected patterns of urban development, which in turn have created a dependency on the automobile. For example, American cities and suburbs are very spread out and lack efficient mass transit systems that are commonly used by the people. Countries that have already established public transportation will be better able to cope with the event of peak oil simple because these systems require far less fuel than automobiles. And while it will be possible for American cities to build mass transit systems in the future, if they wait until oil production is declining, it will be much more expensive to do so.

Though Heinberg states that transportation infrastructure as a whole, and especially America's, will suffer as a result of peak oil, he does little to explain if this is significant, and why or why not. To be blunt, it is very significant. Improvements in transportation infrastructure manifest themselves by encouraging economic development. Effective transportation infrastructure, like well-maintained roads, reduces shipping costs between areas. These lower costs can the manifest themselves in lower prices for consumers. Of course, the opposite is true as well. Poor roads and ports increase costs, making goods both coming to and from areas with poor infrastructure more expensive. In the scenario of peak oil, where after a few years roads begin to deteriorate, transportation costs will rise universally, further encouraging inflation.

The national security of the United States and every other country will be put at more risk as a result of peak oil because of the simple fact that the planes, ships, and trucks of the military run on oil. The Navy has realized the risks posed not by peak oil,

but simply the risks to fuel sources from natural disasters and terrorist threats. The Naval Research and Advisory Committee in 2005 recommended that the Navy become independent from reliance on foreign oil by 2020. This recommendation was then endorsed by the Assistant Secretary of the Navy for Research, Development and Acquisition. While this recommendation does not specifically mention peak oil, the risks that are being avoided are the same risks posed by peak oil -- natural disasters and terrorism have the potential to damage oil infrastructure, thereby reducing its supply.

Food production and agriculture will take a hit from peak oil. Just as building and repairing transportation infrastructure is very oil dependent, so are the modern methods of industrial agriculture. Heinberg writes that "tractors and other farm machinery burn diesel fuel or gasoline; nitrogen fertilizers are produced from natural gas; pesticides and herbicides are synthesized from oil; seeds, chemicals, and crops are transported long distances by truck; and food is often cooked with natural gas and packaged in oil derived plastics before reaching the consumer." Such a substantial reliance on oil for food production (as well as an erosion of transportation infrastructure) would increase the price of food dramatically. While the rich will still be able to take rises in food prices in stride, the poor will not be able to do so as easily.

The tragic result of increasing costs of food is that those who will be unable to afford it would starve to death, and this is much more likely in poorer, undeveloped countries. At present, developing countries are having a hard enough time of feeding themselves, which can be seen through the numerous riots during the past few years from

Bangladesh to Haiti. Higher fuel prices coupled with struggling financial markets, rising demand, and a supply that has been and will continue to be reduced by global climate changes will result in higher prices for food across the globe, which will be especially problematic for poorer nations.

However, increased food prices are only one reason that developing countries will be hit harder than developed countries. Developing countries will feel the effects of peak oil more harshly than developed countries because oil is much more essential to them and they use it less efficiently. It is more essential because generally, less developed countries rely much more heavily on energy intensive manufacturing for income than do developed countries, and they have less sophisticated technology that would increase efficiency in this type of manufacturing. On average, developing countries use more than twice as much oil to produce a unit of output (Hirsch 30). Unfortunately, these problems are only made worse by the facts that increases in oil import costs can destabilize trade balances and increase inflation, while unsophisticated financial institutions are more likely to react poorly.

Additionally, the U.S. Army Corps of Engineers bluntly tells us that, "Oil wars are certainly not out of the question" (Fournier). Thomas Homer-Dixon, author of *Environment, Scarcity, and Violence*, tells us that, "Among scholars of international security, it has been conventional wisdom for some time that critical scarcities of natural resources can produce war" (138). He cites the work of Arthur Westing, who created a list of twelve conflicts in the 20th century in which access to natural resources was

involved. In ten of these, access to oil or minerals was an issue. A world of persistent oil shortages will also be a world of escalated national conflict as nations attempt to gain control of this precious resource.

Violence on a subnational level could also increase. Homer-Dixon describes how an economic crisis, like the global crisis that will likely develop in the event of chronic oil shortages, writes that, "A protracted economic crisis squeezes tax revenues and weakens all state institutions, including the bureaucracy, judiciary, police, and military; meanwhile, cutbacks and lower salaries encourage corruption within the civil service. The state becomes more unable to meet the demands of competing elites or the grievances of a rapidly growing population. . . Opportunities for popular protest and rebellion therefore increase" (163). If peak oil were to occur before the world had an alternative source of fuels, the resulting economic crisis could easily cause states across the globe to deal with the problems described above, though they will be more difficult in developing countries where deep-seated rivalries among ethnic groups already exist.

These problems would not be restricted just to the directly affected countries. The institutional breakdown described above can easily increase the chances of violence, and Homer-Dixon goes on to write that, "states confronting internal turmoil often become extremist, authoritarian, militarized, and abusive of human rights," and that "If a number of developing countries evolve in the direction of hard regimes, the military and economic interests of rich countries would be directly threatened" (167). Peak oil will not only threaten the economies of developed and underdeveloped countries alike, but the

political situation resulting from a drawn out economic downturn in already weakened states can produce violence within a state, can produce regimes aggressive to other states, and can produce regimes that are unwilling to negotiate on issues of critical concern to the national community (167). This, of course, is in addition to the increased chance of national resource wars and all of the other negative consequences of peak oil discussed in this chapter.

## Chapter 4: How the US Ought to Prepare

To combat the effects of peak oil to the extent that peaking production has no effect on the global economy, experts say that a crash program to mitigate the effects would need to be implemented a full twenty years before a peak. Unfortunately, mobilizing the kind of support needed to combat such a controversial problem with such a misty potential date a full twenty years in advance is certainly not an easy thing to accomplish in a democratic country such as our own. However, many proponents of peak oil theory point to Chinese officials, who believe that peak oil will occur around the year 2012. As a result, they have been taking action in securing oil supplies for themselves, such as attempting to buy Unocal above market price and making huge investments and procurement deals around the globe (Committee 49).

But what exactly would a crash program entail? The Department of Energy's report on peak oil goes into great detail in looking at options that can save or substitute fuels. Given their set of criteria (52), the five options that the DoE believes to be commercially viable and widely applicable are enhanced oil recovery (EOR), coal liquefaction, fuel efficient transportation, conversion of heavy oil and oil sands,

and gas-to-liquids (GTL) [1]. Many other options were not considered for a variety of reasons, mostly because their lack of commercial viability at the time. Coal shale liquefaction, biomass, and hydrogen cells were not taken into account in this study as they are currently not able to be widely and efficiently produced without technological advances. While these advances certainly hold potential for the future, they cannot currently be counted on to supply energy.

In order to enact changes in all five of the areas that the DoE examined, it was determined that significant lead times were required to have any sort of effect on fuel consumption. Because of the construction times and large capital expenditures required in the processes of coal liquids, heavy oil and oil sands, EOR, and GTL, these processes cannot begin to have an effect on the supply of liquid fuels until after a few years, and even after that their impacts begin on a small scale. Savings from hybrid fuels also requires a number of years to begin to have an impact because of the slow replacement rate of cars on the road. Because of these lead times and small initial impacts, many years are required before the listed technologies can begin to have an impact on the global supply of oil.

It is prudent to note that in the United States, the construction of the facilities needed for coal liquids, heavy oil, and GTL requires an exhausting period of site

[1] The criteria used for selecting viable non-conventional sources are that the option must produce substitute fuels compatible with existing equipment, must be capable of liquid fuels savings or production on a massive scale, must include technology that is commercial or near commercial, must be inherently energy efficient to the extent that greater than 50% of process energy input is contained in the clean liquid fuels product, and must be environmentally clean by 2004 standards.

selections, environmental reviews, and public commenting periods that, as the DoE writes, "can cause the construction of even a single, relatively innocuous, urgently needed facility to easily take more than a decade" (46). Other countries, such as China, are able to bypass these time consuming requirements and bring about construction much more quickly. As a result, there is a very real potential that the U.S. could find itself in an economically unattractive situation where it exports its natural wealth of coal to have it then converted to liquid fuels and subsequently imported back into the U.S.

Regardless of what countries are or are not producing substitute fuels, the DoE estimates that a lead time of roughly twenty years is required to bring substitute fuels production up to a level that can satisfy world demand after peak oil occurs. This is qualified by the note that a two percent rate of decline of conventional oil production was used to come to this conclusion, while some analysts believe that decline rates between 3-8 percent are more probable. Additionally, while a twenty year lead time may ward off an oil shortfall, a ten year period still leaves a shortfall for roughly a decade after peak oil, and waiting until after the fact to enact a crash program would leave the world with a significant fuel shortfall for more than twenty years.

Just as predicting peak oil is difficult due to uncertain variables, so too is predicting the amount of time necessary for developing non-conventional oil sources. The EIA writes that predicting these times "will depend in part on the rate at which technological advancement, operating in concert with world oil market economics, accelerates large-scale development of unconventional sources of crude" (Wood).

Charles Maxwell writes that it would take "many years" before non-conventional resources are ready for use, and adds that some of these sources "cannot yet be utilized without changing public opinion on the environmental consequences or changing the technology to avoid pollutants" (Maxwell).

This underscores the necessity of taking action long before peak oil becomes a problem, especially considering that many peak oil theorists believe that peaking world oil production will occur within the next two decades. If this group is correct in estimating that peak oil could occur within twenty years, it may already be too late to completely prevent the risks that are associated with peak oil. Even when taking into account CERA's prediction that peak oil will not occur until 2020 at the earliest, and more probably around 2030, the world would need to implement a crash program right now or within the next few years in order to completely ward off oil shortages. The EIA agrees with this mindset, saying that its analysis "shows that [peak oil] will be closer to the middle of the 21st century than to its beginning. Given the long lead times required for significant mass-market penetration of new energy technologies, this result in no way justifies complacency about *both* supply-side and demand-side research and development" (Wood). As such, we do not have a minute to lose in beginning the process of mitigating the future consequences.

The potential severity of the problem necessitates more than just the implementation of existing technology. In addition to the steps listed by the DoE, the Energy Committee of the Royal Swedish Academy of Sciences encourages increasing

resources for R&D of non-fossil fuel alternatives and sustainable uses of energy. Such research could potentially solve current scientific problems with things like hydrogen fuel cells or improve conservation efforts, which may substantially decrease the demand for fossil fuels. In order to prevent a global problem, global cooperation is required, and technically advanced countries have a particular responsibility for solving the problem of peak oil.

Kjell Aleklett, one of the members of the Swedish Academy of Science, writes that "Animals that face food shortages have a hard time adjusting and usually their populations decline. Some believe that we as human beings will face a similar situation. I can't accept that. As human beings we can think and come up with ideas, and I believe we can find solutions. The road will be bumpy, and many people will be hurt, but when we arrive at the end of this road, it must be as a sustainable society." The world's consumption of oil is unsustainable, and if those who believe that peak oil is near are correct, then our ideas and solutions need to implemented as soon as possible in order to prevent dire consequences for the world.

This sentiment is echoed by others, such as Robert Hirsch and Congressman Roscoe Bartlett, who compare the preparation needed to ensure a smooth transition away from oil to the mobilization towards war in World War Two (Committee 23, 74). Extensive change is necessary, not only in the United States, but the world as a whole, to prepare. Appropriate policy and legislation changes must be made in order to implement

a crash program to deal with peak oil, just as crash programs were enacted in order for the Allies to defeat Nazi Germany during World War Two.

## Chapter 5: How to Make Peak Oil Salient to the Public

The previous pages have pointed out that though guessing at the timing of peak oil is an extremely difficult proposition that is fraught with uncertainty, if the world is not prepared well in advance, there will be a smorgasbord of consequences. These include rising inflation, falling economic output, decreases in the quality of transportation infrastructure, higher food costs and lower agricultural output, aggravated political instability, the subsequent rises in the probability of civil war across the globe and resulting human rights violations and spread of disease, and a general decrease in quality of life for nearly everybody. Because of these consequences and the length of time required to avoid them, Robert Hirsch argues that the globe needs to take action as soon as humanly possible. However, in order to enact any changes in government policy, the voters must be interested in creating a change. In other words, the specter of peak oil must weigh heavily enough on the minds of the American people for them to actually care enough to demand that the changes proposed by Robert Hirsch be enacted. According to Judith M. Layzer, author of *The Environmental Case,* "for leaders and rank-and-file legislators, the primary constraint on their desire to address an issue is its *salience* – that is, the extent to which the public cares about it" (Layzer 10). Without this salience, little can be expected to be done in advance.

One reason that this issue is not currently salient enough is that the date of peak oil is so nebulous. Some believe that it has already passed, some believe that it is occurring or will occur in the very near future, and others believe that it will not happen for decades to come. Without the immediate threat or the presence of a crisis, people can not be expected to be concerned enough to demand changes in policy. If nobody knows when peak oil will happen, people will not be concerned enough to deal with the possibility that it will happen tomorrow, because it could also happen fifty years from now.

Additionally, the shape of the peak is also largely debated. CERA predicts an undulating plateau of oil production, followed by a very gentle decline, while others are convinced that a peak in global oil production will be much sharper and decline at a rate between 4-8%. Just as a misty peak oil date prevents peak oil from being salient in the minds of voters, so too does the debated shape of the peak. Not only can people not be expected to worry about a problem with a wildly uncertain date, but even when that date comes the degree of the effects is also not currently well understood.

Current low oil prices also prevent the issue of peak oil from being salient to the American public. When gasoline was above $4 per gallon last summer, people were really starting to worry about the future of gas prices because their wallets were being hit so hard at the pump. This is evident as Robert Hirsch was even interviewed on CNBC. The media, an important actor and barometer of what is salient to the public, was actually discussing peak oil openly. At this time, the issue was salient because consumers were

very worried about their economic futures in the face of skyrocketing oil prices. But now that oil prices have dropped so significantly, so too has the amount of people concerned about future oil prices.

In order for an issue to be salient, it often requires an immediate crisis, such as the current financial crisis we have on our hands. Last summer people were concerned with the crisis of paying an arm and a leg every time they wanted to fill up their gas tanks. People were worried. Now, people are demanding policy changes in the American government because unemployment is a very scary and real possibility for many Americans. It is much more scary and real than the ghost of high oil prices.

As such, it is likely that peak oil will not be an issue that voters are concerned with until the consequences have begun to manifest themselves. Unfortunately, because of the nature of peak oil, by the time that its consequences are apparent it will be far too late to mitigate them significantly. The infrastructure required to produce sufficient alternative fuels after a peaking of oil production will take a great deal of time and effort to put into place. This simply cannot happen overnight, and unless America is prepared for it, the consequences will be dire.

However, that is not to say that nothing at all will be done to alleviate the consequences. In lieu of high gas prices the past few years, consumer demand had shifted dramatically towards more fuel efficient car designs. American car companies have been responding to changing consumer demand by introducing more hybrids and electric vehicles to the market. Recent and upcoming auto shows, like the Detroit Auto

Show, the Geneva Motor Show, and the AJC Auto Show exemplify this trend as major automakers unveil various hybrids and electric vehicles. And while some of the models shown may not be at all practical, the number of hybrids and electric vehicles at the show point to the idea that auto manufacturers are starting to get serious about alternative fuels. Ford is promising to sell a pure battery run van in 2011, followed by a car in 2012 (Carney). Honda unveiled its new Insight, Toyota its third generation Prius, Chrysler its electric Town & Country, and French firm MDI even revealed a car powered by compressed air. Auto companies are clearly taking alternative fuels seriously in today's market.

Or would that be yesterday's market? Obama's initiatives to raise fuel efficiency standards and to replace government vehicles with hybrids, as well as consumer demands for fuel efficient vehicles like hybrids and electric vehicles are also subject to the notion of salience. With wild swings in fuel prices, what is salient in the minds of consumers also swings. For instance, according to MSNBC, "the U.S. market share for small and fuel-efficient vehicles, which rose to 25 percent in the summer as gas prices spiked, already has returned to the pre-summer level of about 15 percent." G.M.'s vice chairman laments these swings in prices and salience as he says, "Every six months we get called stupid for having the wrong products" (Ulrich). Because gas prices are prone to such wild fluctuations, consumer demand fluctuates as well, causing problems for automakers.

In addition to affecting consumer demand, these gas price fluctuations affect what is salient to voters. However, the difference between consumer demand and constituent

salience is that those who wish for the government to take steps in preparation for peak oil can do very little to directly shift consumer demand, but they are able to reframe the issue of peak oil to make it salient in the eyes of voters even in the face of low oil prices. Obama's administration offers an example of this with his drive to construct rail systems in the United States.

The Obama Administration issuing money to support and construct more rail lines in the United States. The administration announced on March 13th that in addition to the $8 billion fund already in the stimulus package to create high-speed rail lines around the country, Amtrak would be receiving $1.3 billion to renovate trains and stations, improve safety systems, and provide more passenger capacity (Milligan).

Though Obama did not directly mention the issue of peak oil in his support for these projects, although they certainly will help conserve gasoline in the future. Instead, the administration argues that train travel can ease travel congestion, reduce the nation's dependence on oil, cut pollution, and create jobs (Rogers). Under the funding to Amtrak alone, the administration says that as many as 6000 jobs can be created or retained (Milligan). It is important to notice what the politicians are saying about these projects; they mention environmentalism, oil dependence and price, and especially job creation.

If people like Robert Hirsch want to see large scale action taken in order to mitigate the effects of peak oil, they will need to understand that in order to gain political support, they need to frame the issue away from peak oil itself. As discussed earlier, peak oil is not an issue that is salient to enough voters to gain the political support

required for the action that Robert Hirsch calls for. And while it is doubtful that anything except the crises caused by the peaking of oil production will create enough support to enact the extreme measures of Hirsch, the issue can be reframed in order to gain more support than what exists currently.

Instead of talking of peak oil directly, advocates for fuel conservation measures and for the development of alternative fuels need to take heed of what Obama's team has done with their support of rail systems. In the current economic climate, nobody is worried about high gas prices because gas prices are currently relatively low and because people are too busy worrying about keeping their jobs. The administration has stressed the fact that the money included for rail systems in the stimulus bill and the money given to Amtrak will create jobs.

This is the kind of rhetoric that peak oilers need to use and understand in order to gain the necessary political support. People are not concerned by a theory of peak oil with an uncertain date and an uncertain shape. People are concerned with making enough money to pay their bills and to put food on the table. According to Layzer, "to attract sympathizers, advocates define problems strategically in ways they think will resonate with a majority of the public" (Layzer 5). Efforts to mitigate the effects of peak oil can gain salience and resonate with the public if peak oil doomsayers can tap into the immediate concerns of the public. By relating the potential future crisis of peak oil to the current economic crisis, those who are concerned about peak oil can connect their

concerns with those who are concerned about having a job to pay the bills in today's abysmal economy.

If oil production does end up peaking in the next twenty years, it is likely that America will not be in an ideal situation. The large-scale crash program that Robert Hirsch calls for would not be implemented until significant effects of peak oil were being felt. Hirsch himself likens his crash program to the changes that America went through upon entering World War II. However, this does not mean that nothing can or will be done. Indeed, car companies are becoming more and more serious about fuel efficiency and alternative fuels. Additionally, Obama is advocating policies that can save fuel in the future, though he is not doing so within the frame of peak oil. Instead, he is doing so by framing the issue in a way that people can relate to in today's economic climate. Rather than focusing on the amount of fuel that can be saved in the future, Obama discusses how rail systems are able to create jobs and how these systems can help rebuild America. When framed in this manner, the construction of rail systems becomes much more salient to voters, and peak oil theorists need to learn this lesson from Obama. The mitigation of the potential consequences of peak oil can happen in this country, but it must be approached from a direction that the average citizen can relate to.

## Conclusion

As much as I hate to admit that my friend was right that peak oil may be a very big problem for the world in the future and that I was wrong in dismissing the idea as crazy, after doing the appropriate research I have found that peak oil is not just a crazy theory, but one that it is grounded in fact. There is little doubt that peak oil will happen; the question is not whether it will happen but when it will happen. Unfortunately, there is not an agreed upon answer to this problem.

There are simply too many variables that are currently unknown to come to a definitive conclusion as to when oil production will peak. Even the most basic geological limitations, how much oil there is in the ground and where to find it, are not completely known. Estimates vary widely depending on whose analysis you are looking at. However, geologic limitations are not the only variables in predicting peak oil. In addition to geologic factors, there are a number of above ground factors as well. Political risks, economic and environmental concerns, and future demand for oil can all affect the rate of oil production. Because of this list of uncertainties, predicting the date of peak oil requires that a great number of assumptions be made, which then introduce the possibility of error into the forecasts.

In the event that peak oil occurs before the world has sufficient substitute fuel systems in place, the consequences are potentially very severe. During the 1970's, America experienced its first oil shock, during which inflation and unemployment skyrocketed while economic growth stagnated. This experience is indicative of what would happen as a result of peak oil, though in the past oil prices have eventually dropped back down to more normal levels after an oil shock. This will not happen if oil production continually declines year after year. Where past oil shocks have been temporary, it is highly likely that oil shocks stemming from peak oil will have much longer term effects.

Aside from economic risk, peak oil poses significant political risks as well. Because oil is utilized heavily in modern industrial agricultural practices, higher oil prices will also translate into higher food prices. In 2009, food riots were common across the globe. Even higher food prices as a result of higher fuel prices (and possibly the increased growth of biofuels in place of food) would undoubtedly prompt more riots and cause greater hardships for people already struggling to sustain themselves.

Fortunately, there are ways to mitigate the effects of oil shortages, though they are expensive and time consuming. The supply of substitute fuels can be augmented through the use of non-conventional sources of oil, namely tar sands, heavy oil, coal liquification, and liquid natural gas. These sources of fuels all require capital and time intensive investments in infrastructure. While this makes them unattractive, they have the capability of producing significant amounts of fuel given enough lead time.

Demand for oil can simultaneously be decreased by the use of more efficient vehicles, alternative energy vehicles, and the implementation of effective systems of public transportation. Just as steps to increase the supply of oil are expensive and time consuming, so too are the steps to decrease demand. Producing more efficient vehicles and more alternatively fueled vehicles requires significant investments by auto-makers, and even after these investments have been made, older vehicles on the road will be replaced slowly. Effective systems of public transportation can also reduce oil consumption, though here in the United States, these systems need to be put into place.

The major obstacle in accomplishing both supply and demand side fixes is the lack of public support. Public support of the creation of policies that would mitigate the effects of peak oil is lacking simply because the public is not worried about peak oil. The misty date, the debated shapes that it will take, current low oil prices, and the non-immediacy of the problem are all reasons that the public is not concerned with peak oil, despite the potentially disastrous consequences of not being prepared in advance.

Though the general public is currently unconcerned with the specter of peak oil, those who are concerned can still accomplish their goals of changing policy with the intent of mitigating the effects of peak oil. They can do this by taking their spotlight off of peak oil and putting it on to what the public *is* concerned about: the economy. The construction of non-conventional oil infrastructure and public transportation systems are significant opportunities for job creation. In a recession that is being compared with the Great Depression, people will be much more likely to advocate changes that are

perceived to aid the economy than changes that are perceived to aid a highly uncertain theory that has little bearing on the present state of affairs. As such, peak oil theorists need to reframe the issue of preparing for a peak in global oil production by focusing on how policy changes that abate the consequences of peak oil are also policy changes that are salient to the general public.

My research in peak oil has been very alarming to me. Few people that I talk to have ever heard about peak oil, and even fewer seem concerned at all, so at the moment it does not seem likely that much will be done in order to prepare for declining oil production. If peaking does in fact occur in the near future, the consequences are dire, and even if it does not happen for another twenty years, there are still steps that need to be taken right now in order to prepare. While it is certainly nice to see Obama pushing for rail systems and enacting stricter efficiency standards, I believe that more needs to be happening. Unfortunately, I doubt that more will be accomplished because of the lack of political support, and even political opposition to construction of infrastructure to support non-conventional sources of fuel. As my last chapter argues, in order to gain more public support, peak oil theorists are better off framing the issue on other issues that are more salient, rather than focusing on an issue that nobody really cares about.

Writing this thesis has also taught me much about economics, politics, and specifically the oil market. Growing up watching gas prices climb from less than $2.00 to over $4.00, and then tumble back down to $2.00 has piqued my interest in the way the oil market works. For a market that has such an effect on people's lives, I don't believe

that enough people really understand how it works. Understanding where our money spent on oil goes, how it affects other countries, and why prices are so volatile has really opened my eyes to a little understood but very significant topic to the way our economy functions. After researching ways for peak oil theorists to have a larger impact on policies, I have also learned about the way politics in our country work.

Unfortunately, I have been disappointed with my findings. Capitalism and democracy are wonderful tools for accomplishing the will of consumers and the electorate. In the case of oil, it appears to me that consumers and voters are simply not informed enough or do not care enough to make more responsible decisions about what they buy and what matters to them in the voting booth. The concept of taking a finite resource, pumping it into engines and burning it, and basing our economy is incredibly short-sighted. Growing substitute fuels instead of food, buying it from politically unstable and unfriendly countries is even worse. Though I hope that action is taken to mitigate the effects of peak oil and I am excited to see some of these taking place, I think that a crisis will have to take place in order for people to *really* care about peak oil. It seems a shame that my recommendation for action is that peak oil theorists need to focus on a problem that people actually care about instead of the real issue at hand, which people should care about. Again, capitalism and democracy are great for accomplishing the will of the people, but I just wish that the will of the people was less short-sighted and more responsible.

# Appendix I

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