

Peak Oil: A Conclusive Approach

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Abstract

In this paper, we will try to draw attention towards the fact that 'Oil is a Finite Resource' regardless of whether the Peak Oil production occurs or not, or when it occurs. Hence, the need of the hour is to design appropriate strategies to prepare for the mitigation of the effects of peak oil, which will occur at sometime or the other and consequently curb the effects of environmental degradation due to heavy usage of fossil fuels. This paper is an elaborate analysis of this concept and its consequences which will help the readers to absorb the necessity to identify the various impacts of peak oil on world economy and social vulnerabilities; like transportation, land use, housing, social and health services etc and the necessity to relinquish the complete dependence on petroleum that would require a shift from the usage of oil while preparing to adapt to the change through gradual re-organization of social institutions, changes in lifestyles etc. Through this gradual shift we'll be able to save our environment as well as save our planet from getting locked into dangerous warming.

Introduction

Oil is the lifeline of this contemporary era as it majorly fuels the world's transportation and holds extensive importance in production of various components crucial for modern society. According to the recent statistical data from Organization for Economic Co-operation and Development (OECD)/ International Energy Agency (IEA) (Timing and future consequences of the peak of oil production' by Pedro de Almeida, Pedro D. Silva -2011), the fossil energy contributes about 84.1% of the total commercial energy consumed around the world, out of which crude oil has a large share of 34%. Also, if we consider transportation sector alone then crude oil contributes 94.1% of the total energy used in this sector. This is the extent of our dependence on oil. Going by the statistics, it is expected that the world oil demand will grow at a high rate.

In this paper we deal with the impending danger of world conventional oil shortage in coming future. The ability of the world oil producers to produce high-quality cheap and economically extractable oil on demand is deteriorating. Years of research and analysis reflects that the rate of producing oil is reaching the maximum level possible which, all agree, may infuse a big trouble: The Peak Oil- a catastrophic event that will unleash an era of peril and disruptions on the economies of every country.

Although there are researchers who claim, based on oil economics, that the theory is inconsistent and uncertainties in the theory prevail due to poor data and other intriguing factors that lead to dissatisfactory assertions. However, in spite of these ambiguities, geologists have no doubt that it will happen and we must to prepare for the worst and for the generations to come.

The biggest challenge that will keep haunting our efforts is that the public assumes that inexpensive oil will be available essentially forever. Hence there's a need for a 'peak oil' forecast be made, regardless of when it will actually occurs, so that will alert the petroleum industry and the consumers, to the problems and allow for a redeployment of resources.

The combined study on global warming and peak oil will help the producers as well as the consumers to focus on finding and improving upon the alternative sources of energy which include solar energy, wind energy, nuclear energy etc and the Unconventional resources—shale gas and liquids, coal bed methane, tight gas, complex gas etc.

Peak Oil: History & Perception

Peak Oil is said to be the phase when the world oil production rate reaches its maximum limit and thus afterwards it starts declining. The problem of Peak Oil production was brought into focus by a geophysicist named Marion King Hubbert in his presentation: Nuclear Energy and the Fossil Fuels at Shell Development Company, Exploration and Production Research Division, Houston, TX, 1956. He predicted that the oil production in USA will reach its peak in around 1970s. In his paper he also formulated his standard approach for the estimation of natural production of oil and hypothesized that all rates of oil production follow a bell-shaped curve, as shown in Figure 1, and thus, will eventually peak and then decline. Based on his technique, attributed to the bell-shaped curve fitting to the classical production and to the Ultimately Recoverable Reserves (URR), he predicted, in 1971, that if the patterns of production, supply and demand remain the same then the world may face the problem of Peak Oil by 2000.

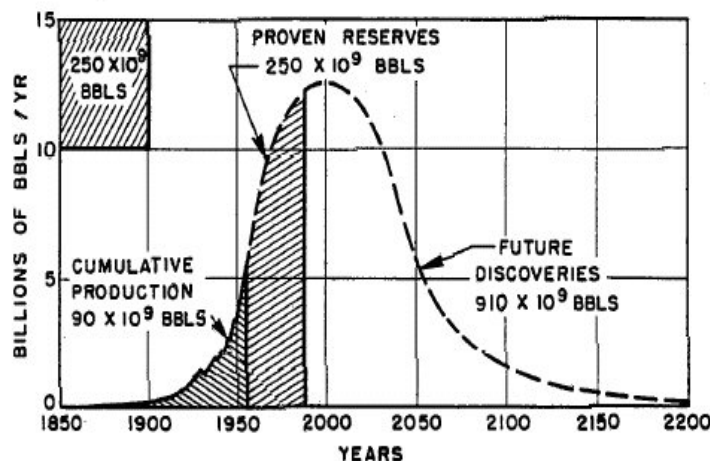


Figure 1. World crude-oil production, Marion King Hubbert:
Nuclear Energy and the Fossil Fuels, 1956

Source: <http://www.hubbertpeak.com/hubbert/1956/1956.pdf>

Though it has been 14 years since then, when he predicted that Peak Oil production will occur, his theory is widely accepted by the majority which believes that a day will come when the production and supply will not be enough to satisfy the growing demand. When it will occur is a matter of rigorous research now-a-days, however, geologists do claim that it will occur sooner than later.

Denials in Peak Oil

While there are those who believe that peak oil is near, there are many who disagree with the 'dim concept of an imminent peak' in oil production and with the idea that oil will "run out" soon thereafter. Many claim that the peak oil believers put forth arguments and assertions which are not based on a plausible and precise interpretation of available data. Hubbert's technique has also been questioned as it fails to appreciate the fact that the estimated data for recoverable reserves expands and undergoes substantial changes eventually with time. It also underestimates the evolving technological advances which are playing a very significant role in catching up with the exponentially growing demand for oil energy. Both sets of arguments regarding the Peak Oil give way to a very controversial and confusing situation for the beginners in study of Peak Oil. So, here is a conclusive approach that we will be applying to help them understand the essentialities of the concept of Peak Oil.

It has taken over a century and a half for the mankind to develop the crude oil exploration and production techniques so as to raise the production to an extent such that the growing demands, posed by the world population explosion and economic progress, can be met smoothly. Rather than the development of the alternative energy options, the technological advancements over the period have made us almost completely dependent on oil. Also the efficiency and convenient handling of crude oil has made it the single most important energy source of the age.

However here follows the hard truth that fossil oil formation is very slow in human terms and thus is regarded as a non-renewable resource. Also this high dependence on this fossil fuel is adversely affecting our environment posing a stringent problem of global warming.

Current Scenario

Coming to a simple question, "What an individual, a community, a nation wants today?" It's Growth, Development, quality living and being Independent!

It's not difficult to say that everyone today wants to live life in the best way possible and for that a country's economy plays an important role. For an economy to grow it must be appropriately equipped with sufficient energy options that will give it an edge over the others. The developed countries today like USA, Japan or the ones striving to catch pace with the developed ones so fast like China, all have one thing in common. In recent years they have been among the highest consumers of energy resources exploiting fossil fuels at a very high rate for their development. Non-OECD countries, especially China and India, are rapidly catching pace, increasing their energy consumption rate. According to BP Energy Outlook 2035 published in January 2014, from 2002 to 2012, the world has observed the highest energy consumption rate in terms of volume in the history. And this growth in energy consumption is expected to increase in the coming future.

Countries are also facing a high pressure of ever increasing population which will certainly require more energy for their prolonged survival. According to data published in 'World Population 2300' by UN Department of Economic and Social Affairs, Population Division in 2004, world population is expected to rise from 6.1 billion in 2000 to 8.9 billion in 2050. This is a very alarming situation, certainly not good for the economy. Today whatever be the price hike in oil, its consumption doesn't go down. This shows that how much the world is dependent on oil.

This would not be of that much concern if the rate of discoveries of oil reserves were following the same trend as the rate of consumption. Demand for oil is increasing but not the discovery. A reason that can justify this might be our approach to the Peak Oil production phase.

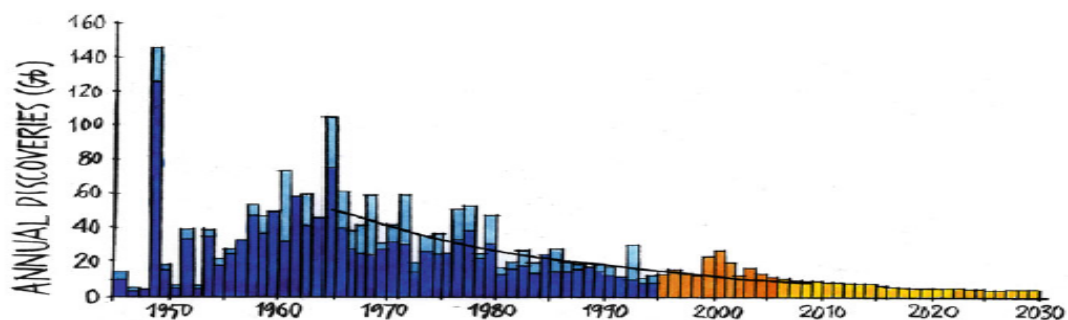


Figure-2: Exponential decrement in Annual Oil discoveries, Robelius, F.: Giant oil fields—the highway to oil: giant oil fields and their importance for future oil production. Uppsala Dissertations from the Faculty of Science and Technology, ISSN

Source: [Alekkett K.: Peaking at Peak Oil, Reserves Growth, Page 50](#)

Figure 2 shows the exponential decrement in Annual Oil discoveries till 2030. This extrapolation shows how we people now and in the coming future will be facing the problem of acute shortage of oil. During 1960s, actual oil discoveries were around 56 billion barrels of oil per annum and consumption rate was around 10 Billion barrels per annum only. It was then expected that there were sufficient amount of reserves available and there is no threat of any kind of oil shortage. However, today's scenario is totally different. Now economists should not think that we have unlimited supply of oil.

On the other hand, excessive use of Oil is also degrading the environment. Global warming is one of the major environmental concerns now-a-days. Drastic climatic changes, increased rates of melting of polar ice caps, ozone layer depletion etc are the adverse effects of global warming which call for an immediate attention and comprehensive action. Recently assembled data on greenhouse gas emissions clearly establishes the fact that the oil and natural gas sectors are emitting greenhouse gases to an alarming and unbelievable extent, causing pollution. Figure 3 shows world CO₂ emission due to burning of fossil fuels from 1751-2012. There is a drastic increase in emission after successive years. If one scrutinizes the current statistics of global oil consumption, he/she can very well deduce how critical the situation is. Hence, no matter whether the peak oil approaches or not, what holds the paramount importance is to limit greenhouse emissions and address climate change, establish stronger pollution controls on oil and gas operations and preferably shifting from the sole usage of oil to other sources of energy that involve lesser carbon and green-house gases emission.



Figure: Global Carbon Emission, EPI from BP; CDIAC; USGS
 Source: www.earthpolicy.org/indicators/C52

We don't know exactly when the peak oil production will occur but we surely do know that some time or the other we will run short of oil. As we will tend towards the peaking, there will be an unparalleled rise in social, political and economic costs and efforts made to mitigate the effects will be futile. The transition will be difficult, time consuming and expensive. Hence, it's better to start now than never.

Battling with the Situation

It's sooner better than later to find and develop alternate energy sources as transitioning is a must and it will surely take time. Some of the ways to face the situation that have gained attention recently are as follows.

1. Enhanced Oil Recovery (EOR) Techniques

Conventional recovery methods (Primary and secondary recovery) used worldwide are not much efficient and approximately 1/3rd (33 %) of the total oil in the reservoir can be produced through them. With this ever increasing oil demand and with fewer discoveries of new oil reserves it is necessary that the production from these declining reservoirs must increase. To tackle this problem various Enhanced Oil Recovery Techniques are being used today. These are broadly classified into Chemical, Thermal and Miscible EOR Techniques. According to the information provided by ENI S.p.A (Italian Multinational Oil and gas Company) on their website, an increase of 1% of Oil Recovery Rate will add approximately 35-50 billion barrels of oil, equivalent to 1 to 2 years of world oil production. EOR techniques can improve the recovery factor by 20% - 30%. Hence, one can imagine how important role EOR Techniques can play in fulfilling the world oil demand.

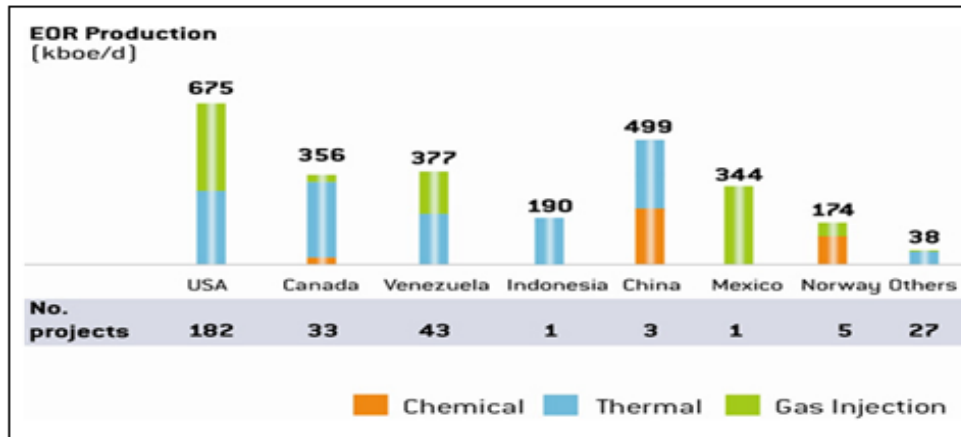


Figure-4: Ongoing EOR projects with their production rate, (available on ENI S.p.A website)

Source:http://www.eni.com/en_IT/innovationtechnology/technological-answers/maximize-recovery/maximize-recovery.shtml

2. Time for the Unconventional

Bitumen and extra heavy oil from oil sands, Oil produced from oil shale, Oil produced from natural gas by GTL methods (gas-to-liquids) and Oil produced from coal by CTL methods (coal-to-liquids) are some of the widely considered unconventional oil. There have been many environmental issues associated with their production. One of them is the report coming from Canada where extra heavy oil from oil sands has been produced leading to water contamination.

Comparing with the current production rate and demand of oil (with consumption rate of 91,331 thousand barrels per day as per BP: Statistical review of world energy-2014) and the expected increase in future, the unconventional oil reserves will provide a temporary replacement for the conventional oil but will not be able to avoid the peak oil phase. It will just delay it by some time until oil reserves get depleted. Figure 5 shows the daily production rate of the unconventional oil.

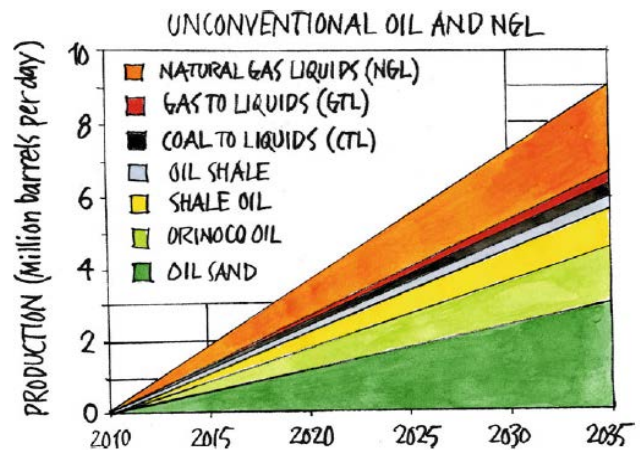


Figure-5: Mitigation curves for unconventional oil production and NGL

Aleklett K.: Peaking at Peak Oil, Unconventional Oil, NGL, and the Mitigation Wedge, Page 118

Talking about unconventional gas reserves, Shale Gas and Coal Bed Methane are the gas resources which have recently dominated gas production mainly in US and Canada. Other countries are also focusing on development of these unconventional gas fields. Shifting towards more use of gas is a good idea to minimize the use of oil. This replacement is also favorable to the environment as burning of gas leads to very less amount of carbon emission as compared to the oil.

3. Renewable sources

Wind, Solar and Biomass are the popular renewable energy resources being used today. Their major contribution is in electricity generation. Their participation in supplying fuel for Transportation is very less. Transportation is the area where the highest percentage of oil products (gasoline, diesel) is used. Therefore there is a need to develop the renewable energy sources at a greater rate so that at least after a decade or two they can contribute more in likes of solar/electrical cars etc. Developing

these sources require a large amount of investment and energy. Hence, it will be crucial how government and its authorities take further step in this area.

Economic production, easy to store and use and high energy output makes oil the best contender than the other sources. So to reduce this dependency on oil along with shifting to alternative resources we must improve upon technology and focus more on R&D work. Technological developments will help a lot and will certainly make our way easy to adopt these alternatives.

Conclusion

Whether Peak oil is a myth or a reality still remains a blur. However, what is known for sure is, oil will come to an end someday. This will lead to high pricing of oil leading to economic instability. Hence, why to wait until the end when we are also aware of the fact that it is causing harm to the planet. We have to realize that it's a high time now. Our target must be to minimize the usage of oil as much as we can. For this it's important that the common people become aware of how our present is and what is coming in future. Alternative resources alone cannot solve the problem. We have to make changes in our lifestyle, use the resources wisely and try to conserve the energy. For this, government intervention is must and reformation of rules and regulations is required. Mitigation will surely require sufficient amount of time. Therefore, to bring over a greater change we must start with the smaller bits.

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