

The End of the Petroleum Era*

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The past 100 years or so has been an era of huge economic expansion made possible by the availability of cheap energy in the form of oil. According to scientists, and the oil industry itself, this is all going to change dramatically.

The world's production of oil is expected to peak and then start declining some time between 2005 and 2010. Once the peak is passed (we may have already passed it), less and less oil will be produced with each passing year. At the same time, the world is *increasing* its use of oil by about 2% each year.

The *discovery* of new oil fields peaked in the U.S. in the 1930's. Ever since then, the number of barrels of new oil in the ground discovered each year has declined. We are finding less and less new oil with each passing year. A peak in the discovery of new oil sources is inevitably followed by a peak in the rate of oil *production*, and oil production did, in fact, peak in the U.S. in 1970 and has been declining ever since. (1) Meanwhile, U.S. oil consumption has been steadily increasing, so the difference had to be made up by increasing oil imports from outside the country. (Prior to oil production peaking in the U.S., the U.S. *exported* oil for sale to other countries every year.)

The discovery of new oil fields *worldwide* has also already peaked--in the 1960's-- and less and less new oil is being discovered each year. (2) The global peak in new oil discoveries will also be inevitably followed by a peak in oil production, just as took place with the peak in new U.S. oil discoveries being followed by the peak in U.S. production. We are now at or very near that peak in worldwide oil production. Even the oil industry itself acknowledges these facts.

Some people will respond by saying, "Yes, all this is true, but there are still billions of barrels of oil left in the ground; we have only extracted about half of all the oil that was originally available to us all over the world." This thought may be technically correct, but it overlooks some very important facts. Any time any energy source is being harvested, people always harvest the easiest portions first. If you are using wood as your source of energy, as many prior civilizations have, you will take the wood that is already lying on the ground first rather than expend the energy necessary to cut down new trees--this is simply easier. And you will cut down trees that are close to where you live first, before cutting down trees that are at a distance from you. This also makes sense--it takes a great deal of energy to haul a tree five miles so you can make use of it. The same is true of oil extraction--people have extracted the easiest oil first, the oil that was close to the surface, that was in highly liquid form, that was close to home, and so on. The oil that will be available to us in coming years is deeper in the earth, farther from where we live, will require the injection of water or steam or chemicals to get it to release from the rock or sand in which it is trapped, and so on.

Again, we may say, "Well, that's true, but that simply means that oil will become more expensive. But wages seem to go steadily upward, so we will still be able to afford it." But this looks at the cost of energy only in terms of *dollars*. It takes *energy* to produce energy: drilling an oil well requires diesel fuel to run the drilling rig; more energy is required to pump the oil, refine it, transport it. The less available the oil (the harder it is to extract), the more energy it takes to extract it.

This brings us to a very useful concept called EROEI. EROEI stands for Energy Returned on Energy Invested. Prior to 1950, when the really easy-to-get oil was being extracted in Texas, Oklahoma, and Pennsylvania, for every one barrel of oil energy invested to extract oil, we got

back about 100 barrels of new oil. This is wonderful! It didn't take that much energy to get more energy. But things have changed drastically since then. The ratio of Energy Returned to Energy Invested fell to about 40 to 1 in the 1960's, and fell again to 30 to 1 in the 1970's. In 2003 the ratio stood at about 10 to 1, and this ratio is still falling. (3) When it falls to 1.5 to one, that means that it will take 1 barrel of oil energy to get 1.5 barrels out of the ground. What happens when it reaches 1.0 to 1.0? This means that for every barrel invested we get one barrel back--our oil extraction efforts are getting us nowhere! At some point, it will cost us one barrel of oil to get 3/4 of a barrel back--we are actually losing net energy in our efforts to extract more oil. So even though there may be billions of barrels of oil still in the ground, if it costs us more energy to extract them than we get in return, that oil in the ground is totally useless to us. And the same sort of analysis also applies to the other fossil fuels, coal and natural gas. (See note (4) in References for an additional measure of how energy is becoming less available.)

With available energy shrinking, and global demand increasing by 2% per year, we are clearly on an unsustainable path. The realistic alternatives suggested by Richard Heinberg are 1) we must choose to reduce the size of our population, and 2) we must choose to reduce the individual rate of consumption (choose to live a more modest lifestyle). Making these changes will allow us to live comfortably (though not extravagantly) on the energy provided to us by renewable forms of energy such as water, solar, wind, geothermal, and perhaps wood or straw.

*The above material is developed from Richard Heinberg's book, *The Party's Over: Oil, War, and the Fate of Industrial Societies*, New Society Publishers, 2003. This book is highly recommended for achieving a better grasp of our present and future energy situation.

References: (1) p. 108, (2) p. 108, (3) pp. 124-5, (4) On page 109, Heinberg explains that until 1920, 240 barrels of oil were extracted for every foot of exploratory drilling done, and peaked at 300 barrels per foot in the 1930's. It has dropped steadily since then, and today, despite advanced technology, we are now producing less than 10 barrels of oil for every foot of exploratory drilling that is done.