

The Peak Oil Crisis, A Geologist's Perspective

If oil is a finite resource, the world production will reach a peak at some point in time and then start to decline. But how do we know that oil is a finite resource? There has been enough exploration for oil around the world to discover that oil occurs only in a relatively small set of geological conditions. There are seven required conditions according to Kenneth S. Deffeyes in his book Beyond Oil, The View from Hubbert's Peak.

1. Organic rich sedimentary rock. Less than 1% of all the sedimentary rock on the earth contains more than 5% organic material.
2. A depth of more than 7,500 feet to have the 175 degree temperature to create the hydrocarbon molecules in crude oil.
3. A depth of less than 15,000 feet so that the hydrocarbon molecules are not destroyed by excess heat.
4. Because oil is lighter than water it tends to migrate toward the surface of the earth. A geological structure such as a salt dome, anticline, fault or even a meteorite crater needs to trap the oil.
5. Rock, such as sandstone, dolomite or limestone, with significant porosity needs to be the host rock to form a reservoir for the oil.
6. The pore spaces of the rock need to be connected (termed permeability), so the oil has enough space between the grains of the rock.
7. There needs to be a cap rock or impermeable layer between the oil bearing rock and the surface. Often these are shale, fine grained mudstone or halite (salt) layers.

Without any one of these conditions, there is no oil.

The point at which the world's oil production is the maximum has become known as peak oil from the predictions made by M. King Hubbert in 1956. The production of oil in the world follows a "bell shaped curve". It is the point at which the world's production of conventional oil reaches a peak after which production begins to decline, i.e. the top of the curve. While they are not sure when this worldwide peak will occur, Geologists have no doubt that this will happen. Predictions range from 2006 to 2025 or later.

"If the actions—rather than the words—of the oil business's major players provide the best gauge of how they see the future, then ponder the following. Crude oil prices have doubled since 2001, but oil companies have increased their budgets for exploring new oil fields by only a small fraction. Likewise, U.S.

refineries are working close to capacity, yet no new refinery has been constructed since 1976. And oil tankers are fully booked, but outdated ships are being decommissioned faster than new ones are being built."

Mark Williams M.I.T.'s TechnologyReview.com

Please note that the peak occurred in the United States in 1970-1971, just as predicted by Hubbert in the 1960s.

Once production starts to decline, the gap between the demand and the supply will grow. If one assumes a 5% annual growth in the gap between the demand and supply, then ten years after the peak, we would need to substitute nearly one half the oil that we use today. That is roughly 10 to 15 million barrels per day.

Another quote (from [Out of Gas](#), David Goodstein) puts this into perspective:

"In fact, if we put our minds to it, we could start trying to kick the fossil fuel habit now, protecting the planet's climate from further damage and preserving the fuels for future generations as the source of chemical goods. Ninety percent of the organic chemicals we use - pharmaceuticals, agricultural chemicals, plastics - are made from petroleum; there are better uses for the stuff than burning it up. To make such an about-face will require global political leadership that is both visionary and courageous. It seems unlikely that we will be so lucky."

The issue of Peak Oil is similar to the issue of terrorism, in the sense that it will not go away. As our supply of oil becomes more critical, the vulnerability to attack increases dramatically. Our supplies (ships, pipelines and oil rigs), on-loading and off-loading ports and refining facilities become critical targets.

One way of decreasing our vulnerability is to decrease our dependence on oil in a variety of ways. The less dependent we are as a society the less damage a disruption in the supply will cause. One of the ways we can start to become less dependent on oil is to educate ourselves about the problem and learn about potential solutions. There is much more that can be done beside buying a new \$25,000 hybrid car (which is not a bad step if you can afford it).

Terrorism and Peak Oil

John Abraham, Risk Management Solutions, Inc., made the following comment about the terrorists that we are facing today:

"Terrorists are using logic to trade off how they're going to accomplish their goal, which is to create chaos."

While our water supplies are potential targets, so are our energy supplies. Everything from our electrical transmission lines to our refineries and oil off-loading facilities. As noted in the Hirsch Study,

"Oil prices have traditionally been volatile. Causes include political events, weather, labor strikes, infrastructure problems, and fears of terrorism...The factors that cause oil price escalation and volatility could be further exacerbated by terrorism. ... For example, in the summer of 2004, it was estimated that the threat of terrorism had added a premium of 25 - 33 percent to the price of a barrel of oil.¹¹⁸ As world oil peaking is approached, it is not difficult to imagine that the terrorism premium could increase even more."

Further, the peak oil crisis might well be exacerbated by the threat of terrorism (as noted in the Hirsch Study):

- World oil production peaking is occurring now or will happen soon.
- Middle East reserves are much less than stated.
- Terrorism stays at current levels or increases and concentrates on damaging oil production, transportation, refining and distribution.
- Political instability in major oil producing countries results in unexpected, sustained world-scale oil shortages.
- Market signals and terrorism delay the realization of peaking, delaying the initiation of mitigation.
- Large-scale, sustained Middle East political instability hinders oil production.
- Consumers demand even larger, less fuel-efficient cars and SUVs.
- Expansion of energy production is hindered by increasing environmental challenges, creating shortages beyond just liquid fuels.

The following study of the peak oil crisis was done in February 2005. It gives a good analysis of the problem and possible mitigation:

PEAKING OF WORLD OIL PRODUCTION: IMPACTS, MITIGATION, & RISK MANAGEMENT, Robert L. Hirsch, SAIC, Project Leader, Roger Bezdek, MISI, Robert Wendling, MISI

As a geologist, I have known about peak oil since my days at the University of Arizona about the time that King Hubbert came out with his calculations. I am dismayed that the

leadership of the United States has not listened to technical experts and redirected energy policy since my college days.

H. Court Young, geologist, author and publisher

Promoting awareness through the written word

<http://www.hcourtyoung.com>

<http://www.tmcco.com>

©May 2007