Is The World Running Out of Oil?

By John Brodman

This is a simple question that always gains more relevance when oil demand is rising, prices are high and volatile, and conflicts in major producing areas threaten future supplies. But there is no simple answer. The world's oil reserves are a finite natural resource, so in a sense, we began running out oil when we produced the first drop. Nevertheless, given what we do know about proven, probable and potential oil reserves, running out of oil per se is not really a relevant issue during our lifetimes. However, while we may not be running out, we are approaching limits on our ability to increase oil production fast enough to meet rising world oil demand. This is the heart of the matter. Oil production from a finite resource can't go on increasing forever. It will eventually reach a peak (or plateau) and begin to decline. Experience in individual fields has shown that this usually occurs around the time when about one-half of the reserve has been produced.

A number of geologists, engineers, economists and others who have studied the issue have formed a professional society called the Association for the Study of Peak Oil (ASPO) to examine the issue in depth. Many ASPO members have tried to estimate the time when conventional world oil production will hit a peak and begin to decline. The time for some of these predicted peaks has already come and gone, and others will soon be here. Several "peak oil" proponents argue that the world is ill prepared to deal with the dire effects that a peak will inflict on oil prices, geopolitics, economic growth and the welfare of mankind.

Cumulative world oil production to date has been about 1,200 billion barrels. The world currently consumes about 32 billion barrels of oil each year, which is roughly a cubic mile. To put this into perspective, that's enough oil to cover the land area of Bogue Banks to a depth of over 215 feet.

Worldwide exploration activity has been intense in the last few decades, so that only the ultra-deep water and polar-regions remain to be fully tested. Scientific advances have made it possible to find and map prospective fields with great accuracy. Large land masses and much of the deep water can now be called barren for geologic reasons. Most of the world's petroleum basins are already identified and explored. Most of the largest oil fields in these basins have been discovered and are producing. The oil producing areas of Saudi Arabia, Kuwait, Iran, Iraq and the United Arab Emirates form a land mass about the size of Oklahoma, but they contain about 60% of the world's oil. Production is already past its peak in some of the world's oil basins.

The U.S. is the most thoroughly explored oil-producing area in the world. More oil and gas exploration and production wells have been drilled in the U.S. than in the rest of the world combined. While advances in science and technology have given us the ability to find the proverbial "needle in a haystack," today's new oil discoveries are still a proverbial "needle" compared to global demand. No one knows for sure what future discoveries will be, but new oil fields by themselves have generally not been keeping pace with annual production. Are we looking under the sofa cushions to pay the rent?

Peak oil proponents tend to believe that the world's recoverable reserves of conventional oil are more limited in nature. They also tend to discount the future contributions of unconventional oil (heavy oil, tar sands, shale oil, ultra-deep water oils, gas-related liquids, and gas-to-liquids and coal-to-liquids). While no one knows how much oil will ultimately be produced, peak proponents put the figure near 2,500 billion barrels, with about one-half of this already produced. They believe that a peak is imminent. Others put the figure closer to 3,500 billion barrels or as much as 5,000 billion barrels including unconventional oil, meaning that a peak in production is still decades away. Peak oil proponents believe that the world's oil production profile will follow a parabolic (bell-shaped) curve, increasing rapidly to a peak and declining just as fast after the peak. Others on the opposite side of the argument believe that the production profile will be asymmetrical and skewed after the peak, and look more like a plateau.

There are a lot of definitions of oil reserves. Proven oil reserves are generally "the estimated quantities of oil technically recoverable with reasonable certainty from known reservoirs under current economic conditions." This is not a static definition by any means. What was technically recoverable 20 years ago at an oil price of $15 per barrel has nothing to do with what can be recovered with today's technology at a price of $100 per barrel. In the 1960s, major oil companies were happy if they could recover 30% of the oil in place; today that number is more like 50% and still rising. Estimates of the amount of oil in a field tend to increase as understanding of the field improves and new technology is applied.

Oil reserves at the aggregate level have tended to increase over time as improved recovery techniques, reserve upgrades and extensions of existing fields, as well as new discoveries, have added more oil to reserves than we produce each year. The U.S. Geological Survey points out that the growth of reserve estimates for existing fields accounted for 86% of the total additions to U.S. oil reserves since 1950, with new discoveries accounting for the rest. According to one estimate (BP Annual Statistical Review), world proven oil reserves rose from 1,085 billion barrels at the end of 1999, to 1,333 billion barrels at the end of 2009, in spite of global cumulative production of over 290 billion barrels in those ten years.

While discoveries of oil in new fields have been falling behind, the technical and economic upgrade of the reserve estimates in existing fields has more than replaced annual oil production. Technology and higher oil prices will also promote a widening of the concept of conventional oil to gradually include unconventional oils like heavy oil, tar sands and shale oils under active development, as we are seeing in Venezuela and Canada.

While we are a long way from running out in terms of physical oil resources, the real problem is with what geologists and engineers like to call the "aboveground risk factors." Parts of the U.S. and many other countries are off-limits for oil production for political and environmental reasons. Other countries limit internal foreign investment in oil infrastructure, and others still reserve all oil development for their national oil companies. Geopolitics, war, conflict, economics and intractability in government policies could all impose severe restrictions on our ability to discover, produce and deliver additional oil.

On the other side of the equation, we can't ignore the fact that high oil prices may also create a technological breakthrough that limits future oil demand growth. Almost all of the expected future growth in world oil demand is in the transport sector (planes, trains, automobiles, trucks and ships). Hybrid vehicles, improvements in battery technology and in plug-in electric vehicles could eventually provide an alternative to oil, but the transition is likely to be slow. As former Saudi Oil Minister Sheik Yamani used to say: "the stone age didn't come to an end because of a lack of stone." With some luck, the oil era won't end because of a lack of oil.