Think "Peak Oil" Is a Discredited Idea?

by Michael T. Klare

Among the big energy stories of 2013, "peak oil"—the once-popular notion that worldwide oil production would soon reach a maximum level and begin an irreversible decline—was thoroughly discredited. The explosive development of shale oil and other unconventional fuels in the United States helped put it in its grave.

As the year went on, the eulogies came in fast and furious. "Today, it is probably safe to say we have slayed 'peak oil' once and for all, thanks to the combination of new shale oil and gas production techniques," declared Rob Wile, an energy and economics reporter for *Business Insider*.

Before obits for peak oil theory pile up too high, let's take a careful look at these assertions. Fortunately, the International Energy Agency (IEA), the Paris-based research arm of the major industrialized powers, recently did just that—and the results were unexpected. While not exactly reinstalling peak oil on its throne, it did make clear that much of the talk of a perpetual gusher of American shale oil is greatly exaggerated. The exploitation of those shale reserves may delay the onset of peak oil for a year or so, the agency's experts noted, but the long-term picture "has not changed much with the arrival of [shale oil]."

The IEA's take on this subject is especially noteworthy since its assertion only a year earlier that the US would overtake Saudi Arabia as the world's No. 1 oil producer sparked the "peak oil is dead" deluge in the first place. Writing in the 2012 edition of its *World Energy Outlook*, the agency claimed not only that "the United States is projected to become the largest global oil producer" by around 2020, but also that with US shale production and Canadian tar sands coming online, "North America becomes a net oil exporter around 2030."

...the talk of a perpetual gusher of American shale oil is greatly exaggerated.

That November 2012 report highlighted the use of advanced production technologies—notably horizontal drilling and hydraulic fracturing ("fracking")—to extract oil and natural gas from once inaccessible rock, especially shale. It also covered the accelerating exploitation of Canada's bitumen (tar sands or oil sands), another resource previously considered too forbidding to be economical to develop. With the output of these and other "unconventional" fuels set to explode in the years ahead, the report then suggested, the long-awaited peak of world oil production could be pushed far into the future.

The release of the 2012 edition of *World Energy Outlook* triggered a global frenzy of speculative reporting, much of it announcing a new era of American energy abundance. "Saudi America" was the headline over one such hosanna in the *Wall Street Journal*. Citing the new IEA study, that paper heralded a coming "US energy boom" driven by "technological innovation and risk-taking funded by private capital." From then on, American energy analysts spoke rapturously of the capabilities of a set of new extractive technologies, especially fracking, to unlock oil and natural gas from hitherto inaccessible shale formations. "This is a real energy revolution," the *Journal* crowed.

But that was then. A recent edition of *World Energy Outlook*, published in November 2013, was a lot more circumspect. Yes, shale oil, tar sands, and other unconventional fuels will add to global supplies in the years ahead, and, yes, technology will help prolong the life of petroleum. Nonetheless, it's easy to forget that we are also witnessing the wholesale depletion of the world's existing oil fields, and so all these increases in shale output must be balanced against declines in conventional production. Under ideal circumstances—high levels of investment, continuing technological progress, adequate demand and prices—it might be possible to avert an imminent peak in worldwide production, but as the latest IEA report makes clear, there is no guarantee whatsoever that this will occur.

Inching toward the peak

Before plunging deeper into the IEA's assessment, let's take a quick look at peak oil theory itself.

As developed in the 1950s by petroleum geologist M. King Hubbert, peak oil theory holds that any individual oil field (or oil-producing country) will experience a high rate of production growth during initial development, when drills are first inserted into an oil-bearing reservoir. Later, growth will slow, as the most readily accessible resources have been drained and a greater reliance has to be placed on less productive deposits. At this point—usually when about half the resources in the reservoir (or

...increases in shale output must be balanced against declines in conventional production.

country) have been extracted—daily output reaches a maximum or "peak" level and then begins to subside. Of course, the field or fields will continue to produce even after peaking, but ever more effort and expense will be required to extract what remains. Eventually, the cost of production will exceed the proceeds from sales, and extraction will be terminated.

For Hubbert and his followers, the rise and decline of oil fields is an inevitable consequence of natural forces: Oil exists in pressurized underground reservoirs and so will be forced up to the surface when a drill is inserted into the ground. However, once a significant share of the resources in that reservoir has been extracted, the field's pressure will drop and artificial means—water, gas, or chemical insertion—will be needed to restore pressure and sustain production. Sooner or later, such means become prohibitively expensive.

...the cost of production will exceed the proceeds from sales, and extraction will be terminated.

Peak oil theory also holds that what is true of an individual field or set of fields is true of the world as a whole. Until about 2005, it did indeed appear that the globe was edging ever closer to a peak in daily oil output, as Hubbert's followers had long predicted. (He died in 1989.) Several recent developments have, however, raised questions about the accuracy of the theory. In particular, major private oil companies have taken to employing advanced technologies to increase the output of the reservoirs under their control, extending the lifetime of existing fields through the use of what's called "enhanced oil recovery," or EOR. They've also used new methods to exploit fields once considered inaccessible in places like the Arctic and deep oceanic waters, thereby opening up the possibility of a most un-Hubbertian future.

In developing these new technologies, the privately owned "international oil companies" (IOCs) were seeking to overcome their principal handicap: Most of the world's "easy oil"—the stuff Hubbert focused on that comes gushing out of the ground whenever a drill is inserted—has already been consumed or is controlled by state-owned "national oil companies" (NOCs), including Saudi Aramco, the National Iranian Oil Company, and the Kuwait National Petroleum Company. According to the IEA, such state companies control about 80% of the world's known petroleum reserves, leaving relatively little for the IOCs to exploit.

To increase output from the limited reserves still under their control—mostly located in North America, the Arctic, and adjacent waters—the private firms have been working hard to develop techniques to exploit "tough oil." In this, they have largely succeeded: They are now bringing new petroleum streams into the marketplace and, in doing so, have shaken the foundations of peak oil theory.

Those who say that "peak oil is dead" cite just this combination of factors. By extending the lifetime of existing fields through EOR and adding entire new sources of oil, the global supply can be expanded indefinitely. As a result, they claim, the world possesses a "relatively boundless supply" of oil (and natural gas).

Peak technology

In place of peak oil, then, we have a new theory that as yet has no name but might be called techno-dynamism. There is, this theory holds, no physical limit to the global supply of oil so long as the energy industry is prepared to, and allowed to, apply its technological wizardry to the task of finding and producing more of it. Daniel Yergin, author of the industry classics, *The Prize* and *The Quest*, is a key proponent of this theory. He recently summed up the situation this way: "Advances in technology take resources that were not physically accessible and turn them into recoverable reserves." As a result, he added, "estimates of the total global stock of oil keep growing."

From this perspective, the world supply of petroleum is essentially boundless. In addition to "conventional" oil—the sort that comes gushing out of the ground—the IEA identifies six other potential streams of petroleum liquids: natural gas liquids; tar sands and extra-heavy oil; kerogen oil (petroleum solids derived from shale that must be melted to become usable); shale oil; coal-to-liquids (CTL); and gas-to-liquids (GTL). Together, these "unconventional" streams could theoretically add several trillion barrels of potentially recoverable petroleum to the global supply, conceivably extending the Oil Age hundreds of years into the future (and in the process, via climate change, turning the planet into an uninhabitable desert).

What is true of an individual field or set of fields is true of the world as a whole.

But just as peak oil had serious limitations, so, too, does techno-dynamism. At its core is a belief that rising world oil demand will continue to drive the increasingly costly investments in new technologies required to exploit the remaining hard-to-get petroleum resources. As suggested in the 2013 edition of the *World Energy Outlook*, however, this belief should be treated with considerable skepticism.

Among the principal challenges to the theory are these:

1. Increasing technology costs: While the costs of developing a resource

normally decline over time as industry gains experience with the technologies involved, Hubbert's law of depletion doesn't go away. In other words, oil firms invariably develop the easiest "tough oil" resources first, leaving the toughest (and most costly) for later. For example, the exploitation of Canada's tar sands began with the strip-mining of deposits close to the surface. Because those are becoming exhausted, however, energy firms are now going after deep-underground reserves using far costlier technologies. Likewise, many of the most abundant shale oil deposits in North Dakota have now been depleted, requiring an increasing pace of drilling to maintain production levels. As a result, the IEA reports, the cost of developing new petroleum resources will continually increase: up to $80 per barrel for oil obtained using advanced EOR techniques, $90 per barrel for tar sands and extra-heavy oil, $100 or more for kerogen and Arctic oil, and $110 for CTL and GTL. The market may not, however, be able to sustain levels this high, putting such investments in doubt.

Tough oil reserves are located in problematic areas...an estimated 13% lies in the Arctic.

2. Growing political and environmental risk: By definition, tough oil reserves are located in problematic areas. For example, an estimated 13% of the world's undiscovered oil lies in the Arctic, along with 30% of its untapped natural gas. The environmental risks associated with their exploitation under the worst of weather conditions imaginable will quickly become more evident—and so, faced with the rising potential for catastrophic spills in a melting Arctic, expect a commensurate increase in political opposition to such drilling. In fact, a recent increase has sparked protests in both Alaska and Russia, including the much-publicized September 2013 attempt by activists from Greenpeace to scale a Russian offshore oil platform—an action that led to their seizure and arrest by Russian commandos. Similarly, expanded fracking operations have provoked a steady increase in anti-fracking activism. In response to such protests and other factors, oil firms are being forced to adopt increasingly stringent environmental protections, pumping up the cost of production further.

... for the moment, we are on a highway to hell.

3. Climate-related demand reduction: The techno-optimist outlook assumes that oil demand will keep rising, prompting investors to provide the added funds needed to develop the technologies required. However, as the effects of rampant climate change accelerate, more and more policies are likely to try to impose curbs of one sort or another on oil consumption, suppressing demand—and so discouraging investment. This is already happening in the United States, where mandated increases in vehicle fuel-efficiency standards are expected to significantly reduce oil consumption. Future "demand destruction" of this sort is bound to impose a downward pressure on oil prices, diminishing the inclination of investors to finance costly new development projects.

Combine these three factors, and it is possible to conceive of a "technology peak" not unlike the peak in oil output originally envisioned by M. King Hubbert. Such a techno-peak is likely to occur when the "easy" sources of "tough" oil have been depleted, opponents of fracking and other objectionable forms of production have imposed strict (and costly) environmental regulations on drilling operations, and global demand has dropped below a level sufficient to justify investment in costly extractive operations. At that point, global oil production will decline even if supplies are "boundless" and technology is still capable of unlocking more oil every year.

Peak oil reconsidered

Peak oil theory, as originally conceived by Hubbert and his followers, was largely governed by natural forces. As we have seen, however, these can be overpowered by the application of increasingly sophisticated technology. Reservoirs of energy once considered inaccessible can be brought into production, and others once deemed exhausted can be returned to production; rather than being finite, the world's petroleum base now appears virtually inexhaustible.

Does this mean that global oil output will continue rising, year after year, without ever reaching a peak? That appears unlikely. What seems far more probable is that we will see a slow tapering of output over the next decade or two as costs of production rise and climate change—along with opposition to the path chosen by the energy giants—gains momentum. Eventually, the forces tending to reduce supply will overpower those favoring higher output, and a peak in production will indeed result, even if not due to natural forces alone.

Such an outcome is, in fact, envisioned in one of three possible energy scenarios the IEA's mainstream experts lay out in the latest edition of *World Energy Outlook*. The first assumes no change in government policies over the next 25 years and sees world oil supply rising from 87 to 110 million barrels per day by 2035; the second assumes some effort to curb carbon emissions and so projects output reaching "only" 101 million barrels per day by the end of the survey period.

It's the third trajectory, the "450 Scenario," that should raise eyebrows. It assumes that momentum develops for a global drive to keep greenhouse gas emissions below 450 parts per million—the maximum level at which it might be possible to prevent global average temperatures from rising above 2° Celsius (and so cause catastrophic climate effects). As a result, it foresees a peak in global oil output occurring around 2020 at about 91 million barrels per day, with a decline to 78 million barrels by 2035.

It would be premature to suggest that the 450 Scenario will be the immediate roadmap for humanity, since it's clear enough that, for the moment, we are on a highway to hell that combines the IEA's first two scenarios. Bear in mind, moreover, that many scientists believe a global temperature increase of even 2˚ Celsius would be enough to produce catastrophic climate effects. But as the effects of climate change become more pronounced in our lives, count on one thing: The clamor for government action will grow more intense, and so eventually we're likely to see some variation of the 450 Scenario take shape. In the process, the world's demand for oil will be sharply constricted, eliminating the incentive to invest in costly new production schemes.

The bottom line: Global peak oil remains in our future, even if not purely for the reasons given by Hubbert and his followers. With the gradual disappearance of "easy" oil, the major private firms are being forced to exploit increasingly tough, hard-to-reach reserves, thereby driving up the cost of production and potentially discouraging new investment at a time when climate change and environmental activism are on the rise.

Peak oil is dead! Long live peak oil!

Michael T. Klare is a professor at Hampshire College and author, most recently, of *The Race for What's Left.*

Note

See also, Why the Peak Oilers are still right, by Richard Heinberg, http://grist.org/climate-energy/why-the-peak-oilers-are-still-right/

Latin America:

Why We Need an Immediate Moratorium on Gold Mining

by Eduardo Gudynas

Gold mining has become a scourge that afflicts most Latin American countries. In some places, a few giant transnational corporations operate. In others, hundreds or even thousands of people crowd into jungle rivers or the guts of mountains for a few grams of gold. The big corporations insist they use the latest technologies, promote economic growth and provide jobs, while small-scale informal and illegal mining is associated with pollution, violence and poverty.

In fact, the two forms of mining are both devastating. Large-scale gold mining operations have all kinds of serious territorial and environmental impacts, and the oft-repeated promises of excellence in technology and management have proven false. Pascua Lama, a gigantic mining operation located in the Andean highlands between Argentina and Chile, has repeatedly promised that it would be an example of environmental responsibility. The reality was different, and in the face of their poor management and failure to comply, a Chilean court fined the corporation and suspended its operations.

Gold mining is also an extremely inefficient extractive industry. Among the top 50 global producers, the average extraction rate is five grams of gold for a ton of rock removed. Given this, no one should be surprised that it is an activity involving drastic environmental impacts.

Small-scale mining has the same problems. In several Amazonian sites in Colombia, Brazil, Ecuador and Peru, activities take place in the midst of social and environmental desolation. In regions such as the Madre de Dios in southern Peru, it has become one of the principal causes of destruction of the Amazon basin and local violence. As gold mining advances, it leaves a deforested jungle and highly polluted water and soil.

…the average extraction rate is five grams of gold for a ton of rock removed.

To think that activities are only carried out by individuals or families is an illusion. Gold mining on any scale ends up involving hundreds of thousands of people, resulting in added and multiplied impacts. The image of an isolated man bent over, panning gold from the sand of the riverbed is a thing of the past in many localities. Huge dredging machinery appears from nowhere in remote corners of Amazonia. Furthermore, the growth of informal and illegal gold mining is possible only because it has become involved with the formal markets, and the gold extracted can end up with the big mining corporations.

In spite of this, many people defend the mining industry in general, and gold mining in particular. Projects are presented as economic blessings and successful exports. It would appear that the need for gold has assumed an enormous importance for human welfare and development, and that this justifies all this destruction.

Is this true? Does gold have uses that are indispensable for our quality of life or necessary for some key industrial use? If we do not export gold, will