Is There an Impending World Oil Peak?

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1. Introduction

In 1859, right after the now-famous Colonel Drake well was drilled in Titusville, in the U.S. state of Pennsylvania, shortages of the illuminant camphene caused by the Civil War made the price of oil shoot up to $15 per barrel (more than $1,000 in today's world). By the autumn of 1861, following a reckless race for production and the 3,000-barrel-per-day Empire Well, the price had plunged to 10 cents a barrel, $7 in today's money. Four years later, newspapers in the Eastern U.S. were printing stories about running out of oil.

Predictions of the future supply of petroleum have typically been far less accurate than predictions of demand. Flawed predictions have caused public bewilderment, distrust and, more importantly, government inaction or poorly conceived reactions. A constant theme, from the very infancy of the industry at the turn of the 19th century, has been that the world is running out of oil. This worried governments in the 1930s and 1940s, and became the main focus of public discourse following the energy crisis of 1973.

It is amusing to read both optimistic and pessimistic predictions of the future of oil from people who have no clue about the basic fundamentals of the industry.

Recently, at least 10 well-known books have addressed the issue of "peak oil," and the extraordinary run-up in oil prices, experienced since 2000, is offered as an additional indicator that the world is running out of oil. Much of the peak oil rhetoric is wishful thinking from two types of individuals, many of whom are politically or ideologically tainted: environmentalists and anti-capitalists who for many, often irrational reasons want the world to run out of oil, and those who are terrified of economic dependence.

For example, in his book, "Twilight in The Desert: The Coming Saudi Oil Shock and The World Economy," Matthew Simmons broadly hints that Saudi Arabia, the "mother of all oil producers," is very close to the "twilight" of its productive life. In our earlier book "The Color of Oil," my co-author and I predicted that the world will not run out of oil for **at least** the next three centuries. For natural gas, which is rapidly becoming the fuel of choice, the scenario is even more optimistic. Even without taking into account the enormous volume of gas hydrates, the world's natural gas supply will last for at least several centuries more.

As a Petroleum Engineer of course I know that oil and gas are depletable resources and that eventually their production will peak. But peaking, which in my view will not happen for several decades and certainly not before 2030, will not be the catastrophe that some people think and for certain it does not mean that we will run our of oil as some even more ill-informed people and some parts of the press have suggested.

2. Key Features

2.1 OPEC, offshore and Russian oil

So where will oil come from then? Definitely it will not come from the continental United States or Europe. But massive quantities of oil will still come from the usual culprits, the OPEC countries and from deep to ultra-deep offshore production, which I believe will be the next El Dorado - a competitor to Saudi Arabia and other countries. There are enormous deposits in the deep offshore waters of many parts of the world. This is a multi-trillion dollar energy opportunity, yet a profound technological challenge.

Then, there is Russia, a country in a class of its own and an important reason why the peak oil advocates are "all wet". The end of the Soviet empire opened the doors for a breed of new Russian capitalists. And the local industry responded with an unprecedented surge in oil production. This new class of Russian entrepreneurs took advantage of the residual potential left over from a bloated and inefficient Russian E&P industry.

At that point, oil wells throughout Russia were significantly under-producing compared to their potential. Headcount in the industry was out of control, functioning as a welfare employment agency.

Operating costs were exorbitant. Technology, presumably a hallmark of Soviet "scientific socialism," was completely absent, and most operating practices were either grossly outdated or obsolete.

Russia's oil production increase couldn't have come at a better time for the country and the world. Oil prices increased dramatically after their slump in 1999, following the "Asian flu." Worldwide economic recovery meant that the developing world, led by China, was demanding more and more crude oil while the traditional petroleum-producing countries were barely maintain production levels.

During that time, Russia added incremental oil output, equivalent to Norway's entire output, and added more than one "Oman-equivalent" in each year. Russia's increase in oil production represented almost half of the entire world's growth in that period.

The movement was led by YUKOS, with Sibneft joining the party a bit later. It was a heady time; the country quickly became a competitive arena, with each Russian company trying to outperform the others. International stock analysts and reporters stoked the fires of competition. The former communist country began to resemble the Wild West of 19th-century America: a free for all that produced one of the world's most vital commodities to boot.

YUKOS' performance during the period was amazing, doubling from 800,000 to 1,600,000 barrels per day. More remarkable, this happened while the company's E&P headcount was dropping from 22,000 to 14,000 and the number of active wells was plunging from nearly 14,000 to just over 7,000. This was possible because the average rate per well increased four fold to 260 barrels of oil per day. New well drilling was slashed to just 300 wells per year, the reserves-to-production ratio was halved to 20, and proven reserves grew by 31 percent - or 3.5 billion barrels - to 14.9 billion barrels.

But, alas, the Russian oil production miracle was not to continue for both political reasons and the gross re-Sovietization enacted by the Vladimir Putin government.

2.2 What will happen in the long-term future?

The now-famous Hubbert's peak of oil production is not just a theory. It is a fact. But it may never actually come to fruition, because it implies that all potential oil in place is active. We know that this is not and has never been true in the United States, the most mature petroleum environment of all and an obvious laboratory for such studies. Alaska, starting in 1976, managed to provide a huge upward trend from Hubbert's presumed earlier decline. But what should be expected in the future, with the obvious contribution from ultra-deep offshore, the log-normal distribution (bell shaped curve) of Hubbert's theory becomes a series of prolonged peaks, a so-called "fractal" distribution. It will take a very long time en route to the final decline as long as new areas (such as deep and ultra deep offshore) are added.

It is not only these additions to oil reserves that will dull and dampen Hubbert's peak for the world. This is the ongoing, economy-shaping and technology-generating transition to natural gas, which is a historical imperative that has little to do with environmentalist sloganeering. The de-carbonization of fuels is a process that started 200 years ago, from wood, to coal, which fueled the Industrial Revolution, to oil (unquestionably the fuel of the 20th century), and now, full throttle towards natural gas. The use of natural gas will be dictated by technological evolutions, perhaps revolutions, requiring more refined fuels, the miniaturization of our engines and the so-called "distributed energy." But, contrary to common misconception, hydrogen for fuel cells will have to come from hydrocarbons - first and foremost natural gas. The most cumbersome and yet potentially rewarding inroad for natural gas will be its contribution to transportation, either directly or indirectly through the electrification of this sector of the economy.

While world energy demand will increase by 50 percent over the next 20 years, oil and gas share is slated to increase from 61 percent to about 67 percent. In spite of all the rhetoric on alternative energy sources, sunshine may be free, but solar energy is very expensive. Natural gas will command a market share that is practically unthinkable today.

One of the most important emerging issues is the burgeoning energy demand of China, a country that is now the second-largest oil consumer and has experienced a 150 percent increase in the last decade. China's energy demand surpassed that of Japan a few years ago. The country's energy future will become a very compelling influence on world energy geopolitics very soon.

2.3 What about OPEC?

OPEC is not what it used to be. It no longer has the power it once wielded to manipulate the market. The organization's excess capacity has dropped from a demonstrable surplus of over 10 million barrels per day, more than a decade ago, to almost nothing. This represents OPEC's current production capacity "behind the valve," or the oil they can turn on and off at will.

It takes huge re-investment to maintain production capacity and massive exploration and production budgets to sustain and replace lost and declining production. My own study suggests that Venezuela needs to reinvest $4 billion per year for oil production to be sustained. The Hugo Chavez government has been allocating only $2 billion. This was one of the reasons for the conflict in Venezuela (the U.S.'s largest oil

supplier) between the government and the technocrats of its national oil company, PDVSA. The situation in Venezuela does not bode well for future oil supplies.

Optimism about the transition from oil to natural gas as the premier fuel for the world economy stems from the fact that there is an abundant supply of natural gas around the world, and it is also a far more diverse supply. There are three dozen countries that are legitimate potential suppliers of world-class volumes of natural gas. This will further de-emphasize OPEC. For the United States and Europe, it will considerably reduce major geopolitical vulnerabilities, directly related to the Middle East, where one finds five of the six countries in the world with over 75 billion barrels of oil reserves.

2.4 Energy geopolitics

Much of the current petroleum situation and prices are related more to geopolitical issues than to the physics of production and reserves.

A new axis is rising - the "axis of energy militants." This small but strategically important group of energy producers has only one desire: to increase already high oil prices and make as much cash as possible by tightening supplies.

Conventional logic used to say that oil-producing countries do not want to cause a world economic recession. The danger posed by the axis of energy militants – Venezuela, Iran and, increasingly, Russia under President Vladimir Putin – is that they could not care less. These militants hardly have real functioning economies whose workings would be adversely affected by a recession. For these militants, if America and the West get their comeuppance, so much the better.

Ever since the 1973 Arab oil embargo, a few countries and societies, "abysmal failures to absorb modernity," have become emboldened and outright arrogant with oil money. Their governments' corruption is covered up by welfare giveaways; their societies' ineptitude and poverty are presented to the populace, and often to outsiders, as strength.

Militancy always accompanies surging oil revenues. Venezuela is run by a Fidel Castro wannabe. Hugo Chavez, whose frequent pronouncements are often bracketed between the whimsical and the insane, is a man of empty populism, clearly propped up by oil money and appealing to an unfortunate Latin American predilection**:** the anachronistic male equivalent of Eva Peron. He may often be outrageous, but he is at least consistent.

Chavez would be an amusing figure were it not for the fact that Venezuela is one of the world's largest petroleum suppliers. Even more crucial, Venezuela owns one of the largest retailers and refiners, Citgo.

Under Putin, Russia, which gets more than half of its revenues from oil, has moved towards a clear path of what amounts to re-Sovietization, and has degenerated into the same dysfunctional and corrupt economy that has become a tradition in petroleum-rich countries.

And then there is Iran.

Iran has not wavered in using oil for what it perceives as its national emancipation and international posture. This was true in the 1950s under Mohammad Mossadegh, and it was true when the Shah ruled Iran. It's true now, too, under the Islamic Republic. In the current climate of energy volatility, the furor over Iran's nuclear ambitions is just another misplaced U.S. and European policy. That country's militancy will be far more costly and detrimental to the oil consuming countries than its nuclear development.

2.5 The Middle East

The world's supply of oil today, and in the foreseeable future, still comes almost singularly from the Middle East. Saudi Arabia is in a class by itself, by far the world's largest exporter of oil, with a capacity, after massive investment, to increase supply far beyond past levels.

3. Conclusions

Energy is vital to the standard of living of the world. We are not "wasting energy," as it is frequently repeated by well-meaning people from both the left and the right. Obviously, a rich country will use more energy per capita than a poor country. But what is missed in such arguments is that the use of energy generates wealth.

Even more problematic is the pervasive confusion about sources of energy and their lack of interchangeability. For example, we use essentially no oil for electricity generation (all electrical power comes from coal, nuclear and natural gas) while all transportation fuel comes from oil. So, a couple of examples that fly in the face of repeated public pronouncements and pleas: 1) raising air-conditioning thermostats in the summer by 10 degrees will not conserve practically any oil and 2) an oil importing major nation cannot talk about "energy independence" without addressing the transportation issue.

I am prudently optimistic about the world energy situation, but I never lose sight of the importance of energy abundance and energy security to our economy and our way of life. Energy wealth has replaced industrialization as the national characteristic that separates rich nations from poor nations. So, while I do

not think there will be impending oil or energy shortages (market forces will take care of that), governments and people must not interfere with the proper functioning of the market lest they cause irreparable harm to the world economy.

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Speaker's Biography

Michael J. Economides is a Professor at the Cullen College of Engineering, University of Houston, USA, and the Managing Partner of a petroleum engineering and petroleum strategy consulting firm. His interests include petroleum production and petroleum management, a particular emphasis on natural gas, natural gas transportation, LNG, CNG and processing, economics and geopolitics. He is also the Editor-in-Chief of the *Energy Tribune*. Previously he was the Samuel R. Noble Professor of Petroleum Engineering at Texas A&M University and served as Chief Scientist of the Global Petroleum Research Institute (GPRI). Prior to joining the faculty at Texas A&M University, Professor Economides was the Director of the Institute of Drilling and Production at the Leoben Mining University in Austria. Before that, Dr. Economides worked in a variety of senior technical and managerial positions with a major petroleum services company. Publications include authoring or co-authoring of 11 professional textbooks and books, including "The Color of Oil" and 200 journal papers and articles. Economides does a wide range of industrial consulting, including major retainers by national oil companies at the country level and by Fortune 500 companies. He has had professional activities in over 70 countries. In addition to his technical interests, he has written extensively in wide circulation media in a broad range of issues associated with energy, energy economics and geopolitical issues. He also appears regularly as a guest and expert commentator on national and international television programs.