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World Oil

World oil demand is surging as supplies approach their limits.

By Paul Roberts

In 2000 a Saudi oil geologist named Sadad I. Al Hussein made a startling discovery. Hussein, then head of exploration and production for the state-owned oil company, Saudi Aramco, had long been skeptical of the oil industry's upbeat forecasts for future production. Since the mid-1990s he had been studying data from the 250 or so major oil fields that produce most of the world's oil. He looked at how much crude remained in each one and how rapidly it was being depleted, then added all the new fields that oil companies hoped to bring on line in coming decades. When he tallied the numbers, Hussein says he realized that many oil experts "were either misreading the global reserves and oil-production data or obfuscating it."

Where mainstream forecasts showed output rising steadily each year in a great upward curve that kept up with global demand, Hussein's calculations showed output leveling off, starting as early as 2004. Just as alarming, this production plateau would last 15 years at best, after which the output of conventional oil would begin "a gradual but irreversible decline."

That is hardly the kind of scenario we've come to expect from Saudi Aramco, which sits atop the world's largest proven oil reserves—some 260 billion barrels, or roughly a fifth of the world's known crude—and routinely claims that oil will remain plentiful for many more decades. Indeed, according to an industry source, Saudi oil minister Ali al-Naimi took a dim view of Hussein's report, and in 2004 Hussein retired from Aramco to become an industry consultant. But if he is right, a dramatic shift lies just ahead for a world whose critical systems, from defense to transportation to food production, all run on cheap, abundant oil.

Hussein isn't the first to raise the specter of a peak in global oil output. For decades oil geologists have theorized that when half the world's original endowment of oil has been extracted, getting more out of the ground each year will become increasingly difficult, and eventually impossible. Global output, which has risen steadily from fewer than a million barrels a day in 1900 to around 85 million barrels today, will essentially stall. Ready or not, we will face a post-oil future—a future that could be marked by recession and even war, as the United States and other big oil importers jockey for access to secure oil resources.

Forecasts of peak oil are highly controversial—not because anyone thinks oil will last forever, but because no one really knows how much oil remains underground and thus how close we are to reaching the halfway point. So-called oil pessimists contend that a peak is imminent or has actually arrived, as Hussein believes, hidden behind day-to-day fluctuations in production. That might help explain why crude oil prices have been rising steadily and topped a hundred dollars a barrel early this year.

Optimists, by contrast, insist the turning point is decades away, because the world has so much oil yet to be tapped or even discovered, as well as huge reserves of "unconventional" oil, such as the massive tar-sand deposits in western Canada. Optimists also note that in the past, whenever doomsayers have predicted an "imminent" peak, a new oil-field discovery or oil-extraction technology allowed output to keep rising. Indeed, when Hussein first published his forecasts in 2004, he says, optimists dismissed his conclusions "as curious footnotes."

Many industry experts continue to argue that today's high prices are temporary, the result of technical bottlenecks, sharply rising demand from Asia, and a plummeting dollar. "People will run out of demand before they run out of oil," BP's chief economist declared at a meeting early this year. Other optimists, however, are wavering. Not only have oil prices soared to historic levels, but unlike past spikes, those prices haven't generated a surge in new output. Ordinarily, higher prices encourage oil companies to invest more in new exploration technologies and go after difficult-to-reach oil fields. The price surge that followed the Iran-Iraq war in the 1980s, for example, eventually unleashed so much new oil that markets were glutted. But for the past few years, despite a sustained rise in price, global conventional oil output has hovered around 85 million barrels a day, which happens to be just where Hussein's calculations suggested output would begin to level off.

The change is so stark that the oil industry itself has lost some of its cockiness. Last fall, after the International Energy Agency released a forecast showing global oil demand rising more than a third by 2030, to 116 million barrels a day, several oil-company executives voiced doubts that production could ever keep pace. Speaking to an industry conference in London, Christophe de Margerie, head of the French oil giant Total, flatly declared that the "optimistic

case" for maximum daily output was 100 million barrels—meaning global demand could outstrip supply before 2020. And in January, Royal Dutch Shell's CEO, Jeroen van der Veer, estimated that "after 2015 supplies of easy-to-access oil and gas will no longer keep up with demand."

To be sure, veteran oilmen like de Margerie and van der Veer don't talk about peak oil in a geologic sense. In their view, political and economic factors above ground, rather than geologic ones below, are the main obstacles to raising output. War-torn Iraq is said to have huge underground oil reserves, yet because of poor security, it produces about a fifth as much as Saudi Arabia does. And in countries such as Venezuela and Russia, foreign oil companies face restrictive laws that hamper their ability to develop new wells and other infrastructure. "The issue over the medium term is not whether there is oil to be produced," says Edward Morse, a former State Department oil expert who now analyzes markets for Lehman Brothers, "but rather how to overcome political obstacles to production."

Yet even oil optimists concede that physical limits are beginning to loom. Consider the issue of discovery rates. Oil can't be pumped from the ground until it has been found, and yet the volume discovered each year has steadily fallen since the early 1960s—despite dazzling technological advances, including computer-assisted seismic imaging that allows companies to "see" oil deep below the Earth's surface. One reason for the decline is simple mathematics: Most of the big, easily located fields—the so-called "elephants"—were discovered decades ago, and the remaining fields tend to be small. Not only are they harder to find than big fields, but they must also be found in greater numbers to produce as much oil. Last November, for example, oil executives were ecstatic over the discovery off the Brazilian coast of a field called Tupi, thought to be the biggest find in seven years. And yet with as much as eight billion barrels, Tupi is about a fifteenth the size of Saudi Arabia's legendary Ghawar, which held about 120 billion barrels at its discovery in 1948.

Smaller fields also cost more to operate than larger ones do. "The world has zillions of little fields," says Matt Simmons, a Houston investment banker who has studied the oil discovery trend. "But the problem is, you need a zillion oil rigs to get at them all." This cost disparity is one reason the industry prefers to rely on large fields—and why they supply more than a third of our daily output. Unfortunately, because most of the biggest finds were made decades ago, much of our oil is coming from mature fields that are now approaching their peaks, or are even in decline; output is plummeting in once prolific regions such as the North Sea and Alaska's North Slope.

Worldwide, output from existing fields is falling by as much as 8 percent a year, which means that oil companies must develop up to seven million barrels a day in additional capacity simply to keep current output steady—plus many more millions of barrels to meet the growth in demand of about 1.5 percent a year. And yet, with declining field sizes, rising costs, and political barriers, finding those new barrels is getting harder and harder. Many of the biggest oil companies, including Shell and Mexico's state-owned Pemex, are actually finding less oil each year than they sell.

As more and more existing fields mature, and as global oil demand continues to grow, the deficit will widen substantially. By 2010, according to James Mulva, CEO of ConocoPhillips, nearly 40 percent of the world's daily oil output will have to come from fields that have not been tapped—or even discovered. By 2030 nearly all our oil will come from fields not currently in operation. Mulva, for one, isn't sure enough new oil can be pumped. At a conference in New York last fall, he predicted output would stall at 100 million barrels a day—the same figure Total's chief had projected. "And the reason," Mulva said, "is, where is all that going to come from?"

Whatever the ceiling turns out to be, one prediction seems secure: The era of cheap oil is behind us. If the past is any guide, the world may be in for a rough ride. In the early 1970s, during the Arab oil embargo, U.S. policymakers considered desperate measures to keep oil supplies flowing, even drawing up contingency plans to seize Middle Eastern oil fields.

Washington backed away from military action then, but such tensions are likely to reemerge. Since Saudi Arabia and other members of the Organization of Petroleum Exporting Countries control 75 percent of the world's total oil reserves, their output will peak substantially later than that of other oil regions, giving them even more power over prices and the world economy. A peak or plateau in oil production will also mean that, with rising population, the amount of gasoline, kerosene, and diesel available for each person on the planet may be significantly less than it is today. And if that's bad news for energy-intensive economies, such as the United States, it could be disastrous for the developing world, which relies on petroleum fuels not just for transport but also for cooking, lighting, and irrigation.

Husseini worries that the world has been slow to wake up to the prospect. Fuel-efficient cars and alternatives such as biofuels will compensate for some of the depleted oil supplies, but the bigger challenge may be inducing oil-hungry societies to curb demand. Any meaningful discussion about changes in our energy-intensive lifestyles, says Husseini, "is still off the table." With the inexorable arithmetic of oil depletion, it may not stay off the table much longer.