

# Climbing Hubbert's Peak: The Looming World Oil Crisis

When the American Petroleum Institute met for a conference in March 1956, most of the participants probably expected to hear upbeat news. After all, back in the 1950s, the U.S. petroleum industry was humming and vibrant. The petroleum companies were producing more U.S.-generated crude oil than ever before—in excess of 7 million barrels per day.<sup>1</sup> The sky was the limit. Or so it appeared.

Then M. King Hubbert delivered his paper.

## Hubbert's Prediction

Dr. Hubbert, then age 52, was a geologist with Shell Oil Company. Officials at his company had received advance word about Hubbert's speech, and they were worried. They pleaded with him to downplay some of the paper's more controversial claims.<sup>2</sup>

But Hubbert refused and went ahead with his presentation, entitled "Nuclear Energy and the Fossil Fuels."<sup>3</sup> His theme was grim, and it disturbed many of his distinguished guests: He boldly predicted that U.S. oil production would peak somewhere around 1970, and then begin declining.

***Declines in global oil production  
are inevitable***

## Peak Oil Theory

Hubbert argued that petroleum production would follow a standard statistical "bell-shaped curve." He noted that the quantity of oil available for production in any given region must necessarily be finite, and therefore subject to depletion at some point.

Whenever a new oil field is discovered, the petroleum yield from that location tends to increase rapidly for a period of years, as drilling infrastructure is put in place and extraction activities are ramped up.

Once half of the oil field's reserves are pumped out, however, the oil source reaches its peak rate of production. Then decline sets in, with the rate of production decrease ultimately approximating a "mirror image" of the production increase rate seen in the oil field's early years.

The actual date when oil production reaches its peak depends on the number of barrels extracted from the oil field. So plugging different figures into the variables of Hubbert's equations

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can yield a range of “peak date” estimates. The end result is the same, however: Oil production crests and then rapidly declines.

### The Trajectory of U.S. Oil Production

In the years after Hubbert’s speech, U.S. oil production continued its steady upward progression. 1970 came and went. Many commentators dismissed Hubbert.

But trends are not always immediately apparent. It can take a few years of data before they become clear.

And soon enough, the statistics were indisputable: Hubbert had been dead on. U.S. oil production had in fact peaked in 1970—exactly the year he had predicted based on his “high oil inventory” estimate.<sup>4</sup>

### Repeating the Peak?

But Hubbert’s prediction went much further. He argued that his theory applied not only to the U.S. petroleum industry, but to global oil production as well.

Throughout the 1960s and 1970s, Hubbert continued to refine his theory. He eventually pre-

dicted that a peak in world oil production would occur around 2000.<sup>5</sup>

The graph in **Exhibit 1** shows a forecast that Hubbert made in the late 1960s, based on estimated world oil supplies of approximately 2,100 billion barrels. Assuming the production rates shown in this graph, the world would deplete about 80 percent of its available oil in a period of under 65 years.

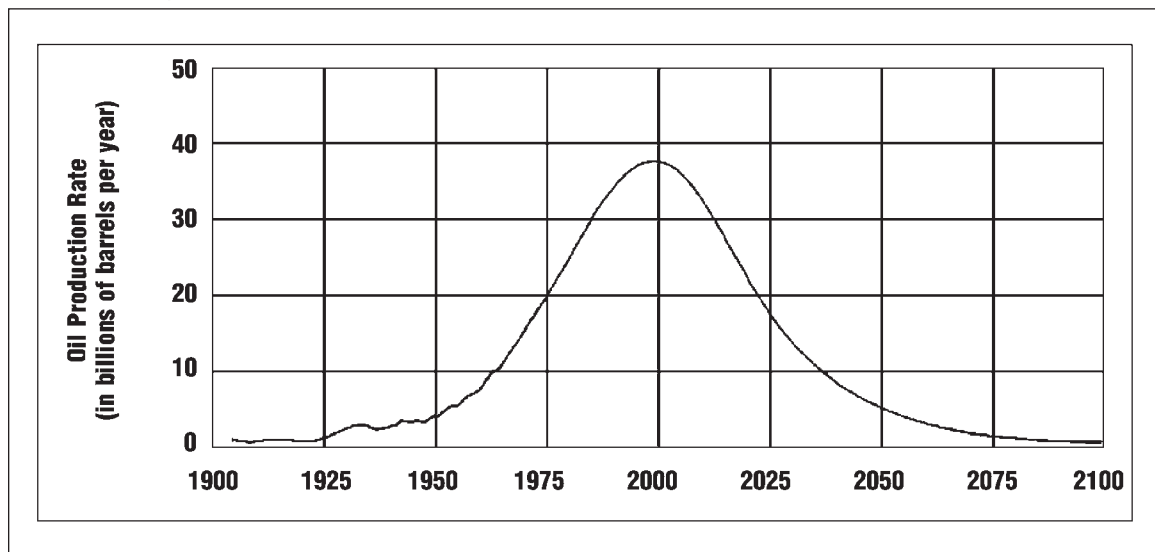
### Developments in World Oil Production

Within a few years after Hubbert made his prediction about global peak oil, political events arose that affected his estimates. In particular, the 1973 oil embargo imposed by the Organization of the Petroleum Exporting Countries (OPEC) resulted in an “energy crisis” that changed the dynamics of Hubbert’s equation. By reducing oil consumption and encouraging greater energy efficiency, the embargo and its aftermath probably delayed the worldwide Hubbert’s Peak.<sup>6</sup>

### Heading into the Future

But a global peak in oil production is still inevitable, assuming Hubbert’s theory is correct.

**Exhibit 1. Projected Worldwide Oil Production**



Every oil field has its own unique Hubbert curve. Once its peak is reached, decline is unavoidable.

To see what this means in practice, look at oil production in Pennsylvania, where the U.S. petroleum industry began in the mid-nineteenth century. There are approximately 20,000 producing oil wells in the state. These wells each yield an average of only around 1/4 barrel per day. All the oil wells in Pennsylvania produce less than half as much as a single high-producing well in Saudi Arabia.<sup>7</sup>

Thousands of oil fields around the world are quickly heading toward the same fate as those in Pennsylvania. And even where production is not yet clearly in decline, petroleum may not be as plentiful as it appears.

### **Reserve Estimates: How Trustworthy Are They?**

Assumptions about the amount of oil available to be pumped are based largely on estimates of oil reserves announced by petroleum producers. But many observers suspect that producer estimates are inflated.<sup>8</sup>

These observers note that between 1980 and 1990, the “proven reserves” of many of the largest oil-producing nations suddenly and mysteriously showed a dramatic increase. For example, Abu Dhabi’s declared reserves nearly tripled in one year, from approximately 31 billion barrels in 1987 to 92 billion barrels in 1988. That same year, Venezuela’s declared reserves more than doubled, from 25 billion to over 56 billion barrels.

What could account for such sharp and massive increases in reserves? The answer may have little to do with the actual amount of oil in the ground—but a lot to do with OPEC politics.

Since 1985, OPEC has tied member countries’ production quotas to their oil reserves. Under this policy, members are allowed to

pump only the quantity of oil specified in their individual quotas, and these quotas are based on the estimated reserves that each OPEC member declares. So the higher a country’s reserve estimate climbs, the more oil it is allowed to pump—and the more revenue it can earn from petroleum sales.

This of course creates a strong incentive for OPEC states to overstate their reserves in order to gain larger production quotas. After all, the bigger the production quota, the more income the country can generate.

Kuwait was the first OPEC nation to suddenly increase its reserve estimate, which soared by over 40 percent in a single year (1984 to 1985). Within a few years, several other nations (including oil giant Saudi Arabia) responded by dramatically increasing their officially stated reserves. These developments strongly suggest that the estimated reserves of many major oil-producing nations have been greatly exaggerated.

Moreover, many OPEC members’ reserve estimates are not declining appreciably from one year to the next. This means that OPEC members are in effect claiming to discover “new” fields—year after year—that almost exactly match (and replace) the quantities of oil they are pumping out.<sup>9</sup>

If OPEC producers are in fact overstating their reserves, then the amount of oil yet to be extracted may actually be much smaller than official projections estimate. This means that the world oil “day of reckoning” may be much closer than previously thought. In fact, some peak oil critics believe that oil production by many OPEC members is already in the process of peaking.

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## **Growing Oil Consumption and Lower Exports by Producers**

The problem is made worse by growing rates of oil consumption in many countries around the world—including petroleum-producing nations themselves. A recent article in the *New York Times* noted, “The economies of many big oil-exporting countries are growing so fast that their need for energy within their borders is crimping how much they can sell abroad, adding new strains to the global oil market.”<sup>10</sup> The article went on to add:

Experts say the sharp growth, if it continues, means several of the world’s most important suppliers may need to start importing oil within a decade to power all the new cars, houses and businesses they are buying and creating with their oil wealth.

### **A study of the peak oil question commissioned by the U.S. Department of Energy (DOE) paints a sobering picture of the problem—and the level of effort needed to address it.**

Indonesia has already made this flip. By some projections, the same thing could happen within five years to Mexico,

the No. 2 source of foreign oil for the United States, and soon after that to Iran, the world’s fourth-largest exporter.<sup>11</sup>

### **A “Solution” to Peak Oil?**

Many who dismiss peak oil predictions—particularly economists—argue that improved technologies and higher oil prices will solve any oil supply problems that may arise.

But many petroleum geologists tend to view the situation differently. They point out that traditional economic incentives may not work when the underlying problem is a natural resource

shortage. Higher prices cannot make oil appear if it does not exist. Moreover, feverish oil drilling in areas of mediocre potential and other “last-minute” efforts are unlikely to provide a “lifeboat” once worldwide peak oil arrives.

## **DOE’s Peak Oil Analysis**

A study of the peak oil question commissioned by the U.S. Department of Energy (DOE) paints a sobering picture of the problem—and the level of effort needed to address it. The study resulted in a report entitled “Peaking of World Oil Production: Impacts, Mitigation, and Risk Management.”<sup>12</sup>

The report’s executive summary opened with an ominous sentence: “The peaking of world oil production presents the U.S. and the world with an unprecedented risk management problem.”<sup>13</sup> Among the key conclusions outlined in the report were the following:

- World oil production will peak, although experts differ on exactly when the peak will arrive.
- Peak oil will have a severe impact on the U.S. economy.
- Peak oil is a “unique challenge,” something the world has never before faced. The authors note, “Previous energy transitions (wood to coal and coal to oil) were gradual and evolutionary; oil peaking will be abrupt and revolutionary.”
- The main problems created by peak oil will be concentrated in the transportation sector, which relies primarily on petroleum-derived liquid fuels for which there are no readily available substitutes.
- The mitigation efforts needed to avert severe impacts from worldwide peak oil could take decades. These efforts will involve replacing “vast numbers of liquid fuel consuming vehi-

cles” and building “a substantial number of substitute fuel production facilities.” The authors state, “There will be no quick fixes. Even crash programs will require more than a decade to yield substantial relief.”

- Demand for oil can be reduced through higher oil prices and tighter efficiency requirements. But such reductions will not be sufficient to meet the peak oil challenge. Large quantities of substitute fuels will also have to be produced.
- Peak oil “presents a classic risk management problem” that necessitates careful planning and well-timed mitigation efforts.
- Government intervention will be needed.
- Mitigation efforts are crucial to averting major economic difficulties. The authors note, “Without mitigation, the peaking of world oil production will almost certainly cause major economic upheaval. However, given enough lead-time, the problems are solvable with existing technologies.”<sup>14</sup>

The authors note that the “obvious conclusion” from their overall analysis “is that with adequate, timely mitigation, the costs of peaking can be minimized. If mitigation were to be too little, too late, world supply/demand balance will be achieved through massive demand destruction (shortages), which would translate to significant economic hardship.”<sup>15</sup>

## Concluding Thoughts

As the DOE study makes clear, it is time to seriously and honestly acknowledge the severity of the global peak oil emergency. An international program is needed to develop global energy alternatives—something along the lines of the United States’ “crash program” to put a man on the moon in the 1960s. Numerous alternative technologies are already available for

implementation. All we need are the requisite funds and the determination to act.

The longer we wait, the worse the impact of peak oil will be. We can only imagine how many people will soon be asking, “Why didn’t anyone do something about this crisis years ago?”

## Notes

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13. Ibid., at p. 4.
14. Ibid., at pp. 64–66.
15. Ibid., at p. 59.

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