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Oil: Caveat empty

By Alfred J. Cavallo

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Without any press conferences, grand announcements, or hyperbolic advertising campaigns, the Exxon Mobil Corporation, one of the world's largest publicly owned petroleum companies, has quietly joined the ranks of those who are predicting an impending plateau in non-OPEC oil production. Their report, *The Outlook for Energy: A 2030 View*, forecasts a peak in just five years.



In the past, many who expressed such concerns were dismissed as eager catastrophists, peddling the latest Malthusian prophecy of the impending collapse of fossil-fueled civilization. Their reliance on private oil-reserve data that is unverifiable by other analysts, and their use of models that ignore political and economic factors, have led to frequent erroneous pronouncements. They were countered by the extreme optimists, who believed that we would never need to think about such problems and that the markets would take care of everything. Up to now, those who worried about limited petroleum supplies have been at best ignored, and at worst openly ridiculed.

Meanwhile, average consumers have taken their cue from the market, where rising prices have always been followed by falling prices, leading to the assumption that this pattern will continue forever. In truth, the market price of crude oil is completely decoupled from and independent of production costs, which average about \$6 per barrel for non-OPEC producers and \$1.50 per barrel for OPEC producers. This situation has nothing to do with a free market, and everything to do with what OPEC believes will be accepted or tolerated by the United States. The completely affordable market price--what consumers pay at the gasoline pump--provides magisterial profits to the owners of the resource and gives no warning of impending shortages.

All the more reason that the public should heed the silent alarm sounded by the ExxonMobil report, which is more credible than other predictions for several reasons. First and foremost is that the source is ExxonMobil. No oil company, much less one with so much managerial, scientific, and engineering talent, has ever discussed peak oil production before. Given the profound implications of this forecast, it must have been published only after a thorough review.

Second, the majority of non-OPEC producers such as the United States, Britain, Norway, and Mexico, who satisfy 60 percent of world oil demand, are already in a production plateau or decline. (All of ExxonMobil's crude oil production comes from non-OPEC fields.) Third, the production peak cited by the report is quite close at hand. If it were twenty-five years instead of five years in the future, one

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might be more skeptical, since new technologies or new discoveries could change the outlook during that longer period. But five years is too short a time frame for any new developments to have an impact on this result.

Also noteworthy is the manner in which the *Outlook* addresses so-called frontier resources, such as extra-heavy oil, "oil sands," and "oil shale." The report cites the existence of more than 4 trillion barrels of extra heavy oil and "oil sands"--producing potentially 800 billion barrels of oil, assuming a 20-25 percent extraction efficiency. The *Outlook* also cites an estimate of 3 trillion barrels of "oil shale." These numbers have figured prominently in advertisements that ExxonMobil and other petroleum companies have placed in newspapers and magazines, clearly in an attempt to reassure consumers (and perhaps stockholders) that there is no need to worry about resource constraints for many decades.

However, as with all advertisements, it's best to read the fine print. ExxonMobil's world oil production forecast shows no contribution from "oil shale" even by 2030. Only about 4 million barrels of oil per day from Canadian "oil sands" are projected by 2030, accounting for a mere 3.3 percent of the predicted total world demand of 120 million barrels per day. What explains this striking disconnection between the magnitude of the frontier resources and the minimal amount of projected oil production from them? Canadian "oil sands" are actually deposits of bitumen (tar), which are the result of conventional oil degradation by water and air. Tar sands are of a completely different character than conventional oil deposits; making tar sands usable is a capital-intensive venture that requires special procedures such as heating to separate the tar from the sand, mixing the tar with a diluting agent for pipeline transport, and constructing specially equipped refineries for processing.

The most serious constraint, though, is natural gas supplies. Production of oil from tar sands requires between 400 and 1,000 cubic feet of natural gas per barrel of oil produced, depending on the extraction method used. Natural gas production, despite a near doubling of drilling activity, is flat or decreasing both in Canada and in the United States--which has prompted prices to triple over the past few years. Given these high gas prices, it almost makes more sense just to sell the natural gas directly rather than use it to produce oil from tar sands.

Extracting oil from the 3 trillion barrels of oil shale cited in the *Outlook* presents its own challenges. The term "oil shale" is also quite misleading, since there is no oil in this mineral, but rather an organic material called kerogen, which is a precursor of petroleum. To extract oil, the shale (typically between 5 and 25 percent kerogen) must first be mined, then transported to a plant where it is crushed, then heated to 500 degrees Celsius, which pyrolyzes, or decomposes, the kerogen to form oil. After processing, most of the shale remains on the surface in the form of coarse sand, so large-scale mining operations will produce immense amounts of waste material. An estimated 1-4 barrels of water are required for each barrel of oil produced, both for cooling the products and stabilizing the sand waste. To satisfy these water requirements, petroleum companies once contemplated diverting the Columbia River--a feat that can be excluded today on political and environmental grounds.

With non-OPEC oil production reaching a plateau and frontier resources not viable, ExxonMobil proposes that increased demand be met in two ways. The first is greater fuel efficiency. (That alone should convey the seriousness of this report: When have you ever heard a petroleum company make a plea for vehicles that use *less* gas?) New cars in the United States are expected to go 38 miles on a gallon of gas in 2030, instead of the current value of 21 miles per

gallon. This goal is actually quite modest, as new cars sold in Europe since 2003 already achieve 35 miles per gallon.

The other way ExxonMobil believes demand will be satisfied is from vastly and rapidly increased OPEC production: "After 2010, the call on OPEC increases quickly, requiring OPEC to add more than 1 MBD [million barrels per day] of capacity every year," notes the *Outlook*. "OPEC's resources are large enough to achieve this rate of expansion, and we expect that investments will be made in a timely manner."

This assessment is somewhat ominous. OPEC has not expanded production capacity much at all recently. Moreover, such production increases are only possible from Iraq, Saudi Arabia, Kuwait, and the United Arab Emirates. For these countries, and indeed for most OPEC members, petroleum and petroleum products are their only significant export. As such, they have a vested interest in obtaining the best possible price for their non-renewable resources. OPEC nations would be quite unlikely to increase production as rapidly as needed unless compelled to do so. To put this shortfall in perspective, in 2003 Algeria produced 1.1 million barrels per day; a new Algeria would need to be brought on line in the Persian Gulf each and every year beyond 2010 just to keep up with the projected increase in demand. Consequently, once non-OPEC production reaches a peak, conventional world oil production could peak shortly thereafter, and prices (never explicitly mentioned in the *Outlook*) would rise in accordance with the laws of supply and demand.

What all this means is that the petroleum industry is approaching a turning point. Conventional petroleum production will soon--perhaps in five years, ten at best--no longer be able to satisfy demand. For their part, American consumers would do well to take a cue from their Western European counterparts, who enjoy a comfortable lifestyle despite a per capita use of petroleum that is half of that in the United States. The sooner the United States begins this transition away from oil, the easier it will be. That's a far more attractive option than trying to squeeze oil from stone.

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