



The Oil Outlook

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Since 2009, oil production in the United States has increased from 5 million barrels a day to more than 9 million barrels a day in 2014 in a world market where total global crude production runs around 78 million barrels a day. This increase in production in the United States has been enough to tip the market into over-supply by 500,000 to as much as 2 million barrels a day. The dynamic oil market of North America, however, has not been matched by the rest of the world because their geology cannot generate the same economics with the new fracking techniques. The vast reserves off the coast of Brazil have been reduced to a dream. Except for Saudi Arabia, the rest of the world's oil production has continued to decline, even when oil was above \$100 a barrel. As such, the current low oil price environment is likely to remain until the production outside of OPEC falls, which is beginning to happen.

It was rumored a few years ago that Saudi Arabia's production was peaking, but this was proven to be false since they are currently at peak output of about 10+ million barrels a day. It is interesting that as the price of oil cracked last fall, Saudi Arabia announced they would increase production into a weak market, as opposed to their normal behavior of defending the price with cutbacks. The purpose of OPEC is to maximize oil revenues for its members by attempting to get the best price possible for their finite oil reserves. The long-term strategy is to restrict production enough to defend a price that is not quite high enough to encourage large increases in production outside of OPEC. The only members that are financially sound enough to adjust oil production to defend the price are Saudi Arabia, Kuwait and the UAE. In this light, it is unusual to see Saudi Arabia push further increases in production and price cuts to capture market share during a major price decline. The objective is to take out U.S. oil production by making marginal wells unprofitable. This only emphasizes the OPEC problem brought on by rapid growth in U.S. production. Because the drilling economics have changed dramatically with the technology, it has become clear over the past half-dozen years that the world equilibrium price is no longer above \$100 a barrel.

The production increases by Saudi Arabia have put financial pressure on marginal U.S. producers forcing U.S. production to flatten. Since oil shale has a steep decline curve the first year, year-two production is typically around 40 percent of the first year. After that, there seems to be a 10 percent yearly decline. Therefore, it is one year after the drilling slowdown that the real impact of less drilling will be felt. U.S. production should start to decline in the second half of 2015. The Saudis have forced WTI oil prices to around \$60 a barrel and expect that level to be roughly the average price for a while. There are still many U.S. fields that are quite economic at \$60 a barrel, but many are not. No one knows how U.S. drilling will go with this lower price,

and the Saudis are pegging oil at \$60-ish just to find out. The bigger picture is that world production outside OPEC and North America was in a solid decline before the price decline so one would expect that trend to continue or even accelerate. The IEA projects production outside of the United States and OPEC to be down 300,000 barrels per day in 2016.

This behavior by OPEC ensures that the United States cannot soon become self-sufficient in oil. Each time the higher price justifies a lot of drilling, the increase in supply brings the price back down. One could speculate that over a 10 to 20 year period, the United States may displace other world oil producers and eventually become self-sufficient in oil. In the meantime, Saudi Arabia will attempt to discover what price is sustainable while throttling U.S. production to prevent oversupply.

Adding to the dynamic mix which could stifle U.S. production growth is the environmental issues of fracking. The biggest concern is the water supply in aquifers. The fracking mix is water, sand and chemicals, which combine to enable splitting (fracking) of hard, less porous rock. At issue is whether these chemicals and the gas and oil released in the rock seeps into the water table. It is so controversial that New York state has banned fracking for natural gas in the state. Most wells are drilled and fracked way below the water table, which tends to be down about 1,000 feet vs. more than 5,000 feet for the hydrocarbons. Shallow wells above 5,000 feet have a problem with pressure needed to force the gas and oil up the well. However, there are some water tables that are deep, and some oil companies have fracked at shallow depths close to the water table. The best legislation to protect the water table would be to disallow fracking within 2,000 feet of a water table. Large fracks typically only go several hundred feet from the well bore and should not pose a threat to the water table at that distance. In addition, companies are now reinforcing the well bore with added cement in the areas that are drilling through water tables to further protect from any potential leakage out of the well. These concerns can be solved by regulation against fracking within a few thousand feet of a water table.

The more troubling environmental issue is centered on the disposal of the fracking water. Once a well is fracked, the high pressure from deeper depths backflows the fracking fluid out of the well, and it is gathered and removed in trucks. Some companies drill a disposal well, and they then pump used fluid from a few nearby production wells deep into the earth. Some states like Pennsylvania have had restrictions on disposal wells. Pennsylvania companies have trucked waste water from fracking to northeast Ohio where disposal wells until recently had no restrictions. The result of the heavy volume fracking fluid going into one well created many small earthquakes in the region. Seismic events have been many times normal activity. Statistically, the odds of this being a coincidence is almost nil. Earthquakes are definitely created by high volumes of fracking fluid being disposed at a single site. Some geologists, however, believe that the measured tremors are greatest near the surface since this activity is not created deep in the earth like natural ones. Nevertheless, the governor of Ohio has shut down this disposal well area, and other states such as Oklahoma have seen similar problems. This is something to be monitored, and there are oil companies that treat fracking fluid as it comes out of the ground in order to strip out the fracking chemicals. Chemical fluid reclamation can be a

solid solution. Since this problem seems to occur where there are heavy volumes of disposal water in one site, as well as perhaps in an area with fragile geology, careful monitoring and fracking chemical reclamation are clear solutions.

The U.S. national policy is to wean ourselves of oil altogether except for uses such as plastics, chemicals and lubricants. In promoting the transition to renewables, fuel cells and more efficient use of fossil fuel, it is not desirable to have low oil prices. This discourages development to non-oil solutions. The country also is realizing that the fossil fuel age will end before we run out of oil. The political shift recognizing this has made oil exports more probable than at any time since the oil embargo of the 1970s. Oil exports, or less net imports, would be a huge financial boom to the United States, and it will continue to increase if conditions enable the slow increase in domestic oil production. If Saudi policy is to keep pressure on U.S. producers with \$60 oil, over time the world production will continue to decline and U.S. production can displace the rest of the world. It is worth noting that oil demand grows roughly 1 million barrels per day annually. This eventually could create a situation with high oil prices, accelerating the transition to alternative sources, while enabling the United States to approach self-sufficiency in oil. We expect the Saudis to keep the pressure on oil until the world market is balanced. Our sources say this should happen in a year at current levels or longer if oil prices are able to remain well above \$60. A good working assumption is oil to reach \$75 to \$80 in 2017 and remain there for several years.