



Does the U.S. Really Have More Oil than Saudi Arabia?

Posted by [Robert Rapier](#) on April 4, 2012 - 11:16am

Topic: [Supply/Production](#)

The Difference Between Oil Shale and Oil-Bearing Shale

People are often confused about the overall extent of U.S. oil reserves. Some claim that the U.S. has hundreds of billions or even trillions of barrels of oil waiting to be produced if bureaucrats will simply stop blocking development. In fact, [in a recent debate](#) between Republican candidates contending for Gabrielle Giffords' recently vacated House seat, one candidate declared "We have more oil in this country than in Saudi Arabia." So, I thought it might be a good idea to elaborate a bit on U.S. oil resources.

Oil production has been increasing in the U.S. for the past few years, primarily driven by expanding production from the [Bakken Shale Formation](#) in North Dakota and the [Eagle Ford Shale](#) in Texas. The oil that is being produced from these shale formations is sometimes improperly referred to as shale oil. But when some people speak of hundreds of billions or trillions of barrels of U.S. oil, they are most likely talking about the oil shale in the [Green River Formation](#) in Colorado, Utah, and Wyoming. Since the shale in North Dakota and Texas is producing oil, some have assumed that the Green River Formation and its roughly 2 trillion barrels of oil resources will be developed next because they think it is a similar type of resource. But it is not.

Although the oil in the Bakken and Eagle Ford is being extracted from shale formations, the term shale oil has been used for over 100 years to describe a very different resource. This has led some to confusion over the differences between current production in North Dakota and potential production in Colorado. The oil in the Bakken and Eagle Ford formations actually exists as oil, but the shale does not allow the oil to flow very well. This oil is properly called "[tight oil](#)", and advances in hydraulic fracturing (fracking) technology have allowed some of this oil to be economically produced. (For more details, I discuss resources, reserves, fracking, shale gas, and oil shale in some detail in my new book [Power Plays: Energy Options in the Age of Peak Oil](#)).

The estimated amount of oil in place (the resource) varies widely, with some suggesting that there could be 400 billion barrels of oil in the Bakken. Because of advances in fracking technology, some of the resource has now been classified as reserves (the amount that can be technically and economically produced). However, the reserve is a very low fraction of the resource at 2 to 4 billion barrels (although some industry estimates put the recoverable amount as high as 20 billion barrels or so). For reference, the U.S. consumes a billion barrels of oil in about 52 days, and the world consumes a billion barrels in about 11 days.

Like the Bakken, the Eagle Ford formation in Texas consists of oil (and natural gas) in tight formations that is being accessed via fracking. The amount of technically recoverable oil in the Eagle Ford is [estimated by the U.S. Department of Energy](#) to be 3.35 billion barrels of oil.

Without a doubt, these two formations are a major factor in the current resurgence of U.S. oil production. But the Green River formation is the source of talk of those enormous oil resources -- larger than those of Saudi Arabia -- and it is a very different prospect than the tight oil being

produced in North Dakota and Texas. The oil shale in the Green River looks like rock. Unlike the hydrocarbons in the tight oil formations, the oil shale (kerogen) consists of very heavy hydrocarbons that are solid. In that way, oil shale more resembles coal than oil. Oil shale is essentially oil that Mother Nature did not finish cooking, and thus to convert it into oil, heat has to be added. The energy requirements -- plus the fact that oil shale production requires a lot of water in a very dry environment -- have kept oil shale commercialization [out of reach for over 100 years](#).

Thus, while the U.S. might indeed have greater oil *resources* than Saudi Arabia, U.S. oil *reserves* (per the [BP Statistical Review of World Energy](#)) are only about 1/10th those of Saudi Arabia. The distinction is important.

Summarizing the Definitions

To summarize, let's review the definitions for the important terms discussed here:

Oil resource -- the total amount of oil in place, most of which typically can't be recovered

Oil reserve -- the amount of oil that can be recovered economically with existing technology

Oil shale -- sedimentary rock that contains solid hydrocarbons called kerogen (e.g., Green River Formation)

Shale oil -- the oil that can be obtained by cooking kerogen

Tight oil -- liquid hydrocarbons that are obtained by hydraulic fracturing of shale formations (e.g., Bakken Formation and Eagle Ford Formation)

Conclusion: Resources are not Reserves, and Tight Oil isn't Shale Oil

It is pretty clear that at current oil prices, developments in the tight oil formations will continue. It is not at all clear that even at \$100 oil the shale in the Green River formation will be commercialized to produce oil, although a number of companies are working on it and will continue to do so. Oil shale is commercially produced in some countries like Estonia, but it is primarily just burned for power.

In order to commercially convert the oil shale into oil, a more energy efficient method of producing it must be found (or, one would have to have extremely cheap energy and abundant water supplies to drive the process). I have heard from multiple industry sources that the energy return for producing oil from oil shale is around 4 to 1 (lower than for oil sands production), and that is before refining the oil to finished products. At this sort of energy return, oil sands will continue to be a more economical heavy oil option.

Thus, my prediction is that despite having an oil shale resource that may indeed be far greater than the oil resources of Saudi Arabia (I don't think I have seen an estimate of Saudi's total oil resources), the reserve will continue to be close to zero for the foreseeable future because there are still many technical hurdles to overcome to realize a scalable, commercially viable process.

Finally, I would say that if a commercially viable process for shale oil production from the Green River formation is developed, the environmental blowback will be enormous. The production of shale oil is more energy intensive (i.e., has higher carbon emissions) than for the oil sands, it has a high water requirement in a dry climate, and it is potentially a huge new source of carbon dioxide emissions. The environmental protests that would arise in response to a growing commercial shale oil operation would make the Keystone XL pipeline protests pale in comparison.



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