



THE GEOPOLITICS OF ENERGY PROJECT

The U.S. Shale Oil Boom: Potential Impacts and Vulnerabilities of an Unconventional Energy Source

BOTTOM LINES

- **Increased Shale Oil Production may Significantly Alter the U.S. Energy Outlook:** The United States may produce five million barrels of shale oil per day by 2017 and may become the largest global oil producer with up to 16 million barrels of oil (shale, conventional, LNG, and biofuels) per day in just a few years.
- **U.S. Shale Oil Production has Unique Characteristics:** The nature of shale oil production makes it particularly suited for the United States' industrial, financial, demographic, and geologic landscape. These same characteristics make the expansion of the shale phenomenon to other parts of the world improbable – at least in the short term.
- **Sustained Shale Oil Production Requires Dramatic Drilling Intensity:** No other country in the world has ever experienced even a fraction of the overall U.S. drilling intensity for oil and gas. Shale oil wells exhibit their peak production rates during the first weeks of operation then dramatically decline. Oil companies intensively drill for new wells that offset the loss of production from older wells.
- **Production will be Price Sensitive:** There are two scenarios depending on oil prices: If the price of oil holds steady or slightly decreases, production could still reach 5mbd by 2017; if the oil price drops to below \$65 per barrel, production could drop off substantially.
- **The U.S. will Still Import Oil from the Middle East:** Conventional wisdom says that if the United States drops its oil imports to 25 percent of demand, the oil will come from North American sources. This scenario is price dependent. If the marginal price of oil drops, the cheapest oil will be from the Middle East, and oil from Venezuela and Canada will be more expensive.

This policy brief is based on the discussion paper “The Shale Oil Boom: A U.S. Phenomenon” by Leonardo Maugeri, published by the Belfer Center in June 2013.

INCREASED SHALE OIL PRODUCTION MAY SIGNIFICANTLY ALTER THE U.S. ENERGY OUTLOOK

An analysis of more than 4,000 shale wells along with the activities of one hundred oil companies involved in shale oil exploitation suggests that the United

States may become the largest global oil producer in just a few years. The large resource size – and the ability of the industry to develop it through steady improvements in technology and cost – may dwarf earlier forecasts. The largest U.S. shale oil formations seem capable of sustaining increased production, with a total capability of more than 100,000 producing wells versus around 10,000 of actual producing wells today. Improvements in knowledge of geology and drilling technology may prolong the productivity of shale formations well after 2030.

SHALE OIL PRODUCTION IN THE UNITED STATES HAS UNIQUE CHARACTERISTICS

The United States is uniquely situated for shale oil development, with more than 60 percent of the global availability of drilling rigs. Ninety-five percent of U.S. drilling rigs can perform horizontal drilling that, together with hydraulic fracturing, is essential to liberate shale resources. No other country or area of the world has even a fraction of this drilling capacity and building up this power would require several years. There are other factors that will make the global replication of a U.S. style shale boom difficult, including an lack of private mineral rights in most countries, as well as the absence of the U.S. independent companies whose guerilla-style operational mindset has proven essential to the exploitation of shale formations that, unlike conventional oil and gas fields, require companies to move on a micro-scale, on multiple micro-objectives, and flexibly leverage short-term opportunities. The combination of vast geologic supply of shale oil and low population density in these areas allows for intense, sustained production unique to the United States.

SUSTAINED SHALE OIL PRODUCTION REQUIRES DRAMATIC DRILLING INTENSITY

The dramatic drilling intensity of shale oil and gas will likely become the number one obstacle to expand shale activity in densely populated areas of the United States or the world. The U.S. shale oil boom requires bringing as many wells as possible on line, due to the dramatic decline in production that follows the early months of activity with each new well. For example, by December 2012 it took about ninety new producing wells per month just to maintain North Dakota's Bakken-Three Forks (the largest U.S. shale oil play) oil production of 770,000 barrels per day. In 2012, the United States completed 45,468 oil and gas wells and brought 28,354 of them online – compared to 3,921 wells completed in the rest of the world, excluding Canada. This drilling intensity will most likely be sensitive to a sudden dip in oil prices, resulting in a rapid downward shift in U.S. shale oil production.

PRODUCTION WILL BE PRICE SENSITIVE

Even if oil prices steadily decrease over the next few years – from \$85 per barrel in 2013 to \$65 per barrel in 2017 – the United States might reach a shale oil production of about 5mbd by 2017. More than 90 percent of this potential output will come from three big formations: Bakken-Three Forks in North Dakota, and Eagle Ford and the Permian Basin in Texas. It is comparatively easy to stop shale oil production as opposed to conventional oil – especially offshore. Conventional oil production requires a high upfront cost and wells have a long production life (30 years). Shale oil is quick and relatively cheap to start up and has continual costs and a short production life (1 year). New wells come on line all the time and can be brought off line if the price of oil falls.

THE U.S. WILL STILL IMPORT OIL FROM THE MIDDLE EAST

The U.S. shale oil boom may have paradoxical consequences in terms of U.S. energy security by endangering traditionally safe sources of U.S. oil imports such as Canada and Venezuela. It will also affect the oil production of several African countries (Nigeria, Angola, Libya, Algeria) that, in turn, will have to find room for their production in other export markets. This will create additional strains within the Organization of Petroleum Exporting Countries (OPEC), whose ability to manage an oil production capacity that is growing much faster than demand will rely almost exclusively on the will of Saudi Arabia to increase its unused production capacity. International sanctions against Iran, which impede the country's ability to export a significant part of its oil, are easing a situation that would otherwise create the conditions for a short-term drop in oil prices.

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RELATED RESOURCES

Maugeri, Leonardo. "Oil: The Next Revolution." Discussion Paper 2012-10, Belfer Center for Science and International Affairs, Harvard Kennedy School, June 2012.

Bailey, Jonathan and Lee, Henry. "North American Oil and Gas Reserves: Prospects and Policy" Discussion Paper 2012 - 11, Belfer Center for Science and International Affairs, Harvard Kennedy School, July 2012.

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ABOUT THE GEOPOLITICS OF ENERGY PROJECT

The Geopolitics of Energy Project explores the intersection of energy, security, and international politics. The project, launched in 2011, aims to improve our understanding of how energy demand and supply shape international politics—and vice versa. It also endeavors to inform policymakers and students about major challenges to global energy security and, where possible, to propose new ways of thinking about and addressing these issues. The project focuses both on conventional and alternative energies, as both will influence and be influenced by geopolitical realities.

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