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Scale, Shale, and Why We're on the Verge of Another American Century

By

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(Outline/primary talking points for AIRA speech at Union League Club, New York City, November 17, 2014)

1. Scale.

The scope of global energy use is difficult to comprehend. Globally, we are now consuming roughly 1.5 exajoules of primary energy per day. That's equal to about 31 Saudi Arabias of daily oil output. This segment will set the table for the rest of the talk by explaining the magnitude of global energy use and in doing so, explain why hydrocarbons will continue dominating the global energy mix for decades to come.

2. Coal.

Love it or hate it, the global energy story of today is coal. Since 1973, coal use has grown faster than any other form of energy. Indeed, in absolute terms, it has grown faster than oil and natural gas consumption, and it continues to grow at a remarkable clip. Why? The world wants electricity. No other energy form is as versatile or powerful. And countries will use whatever fuel is available to get large quantities of electrons flowing.

3. The Big Fib.

Big environmental groups and lead environmentalists continually claim that we can quit using hydrocarbons over the next couple of decades and replace them with renewables. That's simply not true. In this segment, I will use simple math to show why. For instance, merely to meet the growth in global electricity demand with solar energy would require installing 15 times as much photovoltaic capacity as now exists in Germany. And that much capacity *would have to be installed every year.*

4. The Shale Gale.

Shale is the most abundant form of sedimentary rock on the planet. So why did the Shale Revolution happen here in the US? The answer: it couldn't

have happened anywhere else. The US has the rigs, the rednecks and the pipes that have enabled the Shale Gale. It also has the mineral rights that have encouraged drilling and the master limited partnerships which have provided tens of billions of dollars to the drilling, midstream, and downstream sectors. The combination of those factors has resulted in an unprecedented energy boom.

5. The Second American Century.

There is no doubt that the US faces many challenges, but it also has numerous advantages over the rest of the world. And perhaps the biggest advantage stems from cheap and abundant energy. The Shale Gale is now adding 3 percentage points to US GDP. It's also giving the US an energy-price advantage over nearly every other country on earth. Further, we are just at the beginning of the boom. The US will maintain its price advantage for decades to come. And that will spur investment in upstream, midstream, and downstream energy facilities. It will also spawn investment in myriad sectors, including fertilizer, steel, and chemicals.



How innovation in oil and gas production is giving the U.S. a competitive edge

BY **ROBERT BRYCE** *June 19, 2014 at 1:22 PM EST*



Innovations in the oil and gas industry are making production faster and cheaper and resources more plentiful. Photo of a Polycrystalline diamond compact drill bit in Canadian County, Okla., by Robert Bryce.

Editor's Note: Doomsayers have long said the end is near – [peak oil](#), food shortages, excessive borrowing; we're living beyond our means and there's only so long our economy and our planet can sustain us. But there's no reason to be such a downer, according to two of this week's authors on Making Sen\$e.

Wednesday, [we heard from Milton Ezrati](#), who argues that America can overcome its demographic challenges (an aging workforce and decades of low birth rates):

The doomsayers – and there are many – assume, incorrectly, that people will simply stand by passively while demographic trends destroy their prosperity. History shows the opposite to be true. To protect what they have, people, firms and governments almost always will do whatever is necessary.

Whatever is necessary to Manhattan Institute Senior Fellow Robert Bryce means [“Smaller Faster Lighter Denser Cheaper.”](#) Despite warnings to the contrary, he believes things are getting better because technology in nearly every industry has evolved.

This video dramatization of the book (emphasis on the dramatic) gives you a taste of his optimism:



The world will be demanding more oil than it can produce, former President Jimmy Carter

says in his archival cameo in the above montage. But it's 2014, and we haven't hit peak oil yet, says Bryce. In this post, he specifically zeroes in on the oil and gas industry to illustrate how innovation has made drilling more efficient, keeping America more competitive.

A critique of this kind of innovation thesis is to ask, well, what about human welfare — jobs, for example, or in this case, the environment, especially if, as Harvard economist Marty Weitzman has [written on this page](#), there's an economic incentive to protecting ourselves against the risk of climate change, even if we're not sure it's happening. As [Jill Lepore writes](#) in June 23's New Yorker, those are questions we often don't feel the need to address when we talk about innovation. Speaking of "innovation" instead of "progress," as we used to, she writes, "skirts the question of whether a novelty is an improvement: the world may not be getting better and better but our devices are getting newer and newer."

But, to Bryce, this innovation *is* about progress. "Today, people are living longer, freer, healthier lives than ever before in human history," his video says. Meanwhile, solutions for making the world a better place — Bryce reserves special critique for Bill McKibben's calls to dramatically reduce hydrocarbon consumption in his book and his [Wall Street Journal op-ed](#) — are thrown about a bit too easily. Bryce is skeptical of so-called soft renewable energy sources like wind and biofuels that, he fears, won't leave nearly enough energy to exceed a "starvation diet."

However, innovations in the oil and gas industry, he points out, have induced foreign investment in the U.S. and stimulated the economy, while cheaper energy has boosted GDP and brought jobs to some Rust Belt towns. He details more below.

And for additional doses of optimism, check out Making Sen\$e posts from Charles Morris ("[Comeback: Why the U.S. sits at the brink of a new boom](#)") and Joel Kurtzman ("[America unleashed: Why we'll be number one once more](#)").

– [Simone Pathe](#), Making Sen\$e Editor

In April, at a conference in San Antonio, an official from ConocoPhillips made an aggressive prediction: he said that by the [end of 2014](#), oil production in Texas could hit 3.4 million barrels per day. That figure seems inflated given that the latest data from the [Texas Railroad](#)

[Commission](#) shows that in March, oil production was about 2 million barrels per day.

But the important issue here isn't identifying the precise production number. Instead, it's acknowledging the trend. U.S. oil production – along with domestic natural gas output – is soaring. And here's the remarkable part of this story: few people, if any, saw this coming.

Indeed, back in 2005, Lee Raymond, who was then the CEO of Exxon Mobil, declared that “gas production has peaked in North America.” The numbers tell a remarkably different story. In 2013, the U.S. produced [a record 24.3 trillion cubic feet](#) of gas, an increase of about 35 percent since Raymond made his claim back in 2005.

What happened? The oil and gas industry innovated. Over the past century, oil and gas drilling has gone from a business dominated by wildcatters armed with a hunch and a prayer to one that is more akin to the precision manufacturing that dominates aerospace and automobiles. Today, drilling rigs are so good that they can punch holes in the earth that are two miles deep, turn the drill bit 90 degrees, drill another two miles horizontally, and arrive within a few inches of the target.

The ongoing innovation in the oil and gas sector is happening because the U.S. has more companies working to find and deliver oil and gas than any other country in the world. [More than 6,000 independent](#) oil and gas companies are now operating in the U.S. In addition, there's a similar number of companies providing services to those independent producers, supplying them with everything from drill bits to diesel fuel. In all, there are roughly 12,000 different companies in the oil and gas sector whose very existence depends on finding better ways to do things. To be more specific, they are trying to make their products and processes smaller, faster, lighter, denser and cheaper.



ROBERT BRYCE
Author of *Power Hungry*

Yes, that's the title of [my new book](#). In the book, I show how the never-ending push to do more with less is propelling iconic American companies like Ford and Intel as well as smaller upstart companies like Kenya's Safaricom. But I also put the spotlight on the U.S. oil and gas industry because it provides so many strong examples of

innovation.

Among the most innovative is Tulsa-based Helmerich & Payne, which has been a leader in the development and deployment of the AC top-drive drill rig. First used in offshore drilling operations, Helmerich & Payne's leaders saw that the AC top-drive — which puts the rig's main drive mechanism onto the mast of the rig instead of on the rig's floor — could result in major efficiency improvements for companies drilling on land in shale and other formations.

The AC top-drive consolidates the rig's drive and hoist mechanism into one unit. That allows the automation of several mundane processes that used to require human intervention. Although many of the operations on the rig still must be handled by roughnecks, a bank of computers monitor key data points such as rotational speed on the bit and drilling and flow rates. The computers feed that data into an automated drilling-control system which keeps the optimum amount of weight on the drill bit and keeps it spinning at optimal speed. Add in the rig's ability to use longer sections of drill pipe and its modular design — which allows it to be transported more quickly than older rig designs — and it's easy to see how companies are able to drill more wells and do so faster and cheaper.

In addition to better drilling rigs, numerous other technologies, ranging from better drill bits and seismic techniques to more powerful pumps and nanotechnology, are allowing the oil and gas sector to accelerate the drilling process.

Faster drilling has allowed U.S. companies to produce oil and gas more cheaply. That can be seen by looking at Southwestern Energy, a Houston-based company that has pioneered the development of the Fayetteville Shale in Arkansas. Between 2007 and 2012, the company's per-well costs in the Fayetteville Shale have stayed fairly constant, at about \$3 million per well. But over that same time frame, Southwestern reduced the number of days needed to drill a well from 17 to just seven. Better yet, the initial production rate on the wells being drilled has [more than tripled](#).

Thanks to companies like Helmerich & Payne, Southwestern, and many others, the U.S. now has a price advantage for natural gas that is second to no other country on the planet, with the possible exception of Qatar. Over the past two years or so, U.S. natural gas prices — measured at the Henry Hub in Louisiana — have averaged about \$4 per million BTU. In the



An AC top-drive rig owned by Helmerich & Payne in Canadian County, Okla. The lower part of the 800-horsepower drive mechanism can be seen above the workers' heads. Photo by author Robert Bryce.

European Union, that same 1 million BTUs of gas will cost two to three times as much. In Japan, it will cost three to four times as much. European steelmakers now pay about [twice as much for electricity](#) and four times as much for natural gas as steel producers operating in the U.S.

Cheaper energy is attracting tens of billions of dollars of foreign investment to the U.S. Last year, an Egyptian company, Orascom, began construction on a new \$1.8 billion fertilizer plant in Iowa. Last June, Vallourec, a French company, opened a new steel mill in Youngstown, Ohio, a Rust Belt town that has seen many of its industrial jobs evaporate over the past few decades. Vallourec's investment in the new steel mill: \$1.1 billion. Sasol, a South African company, is [spending \\$21 billion](#) on a new gas-to-liquids facility in Lake Charles, Louisiana. The project is believed to be the single largest foreign investment in U.S. history.

Late last year, BASF, the giant German industrial company, estimated that it could save nearly [\\$700 million per year](#) in energy costs if it were to relocate all its plants to the U.S. That clearly will not be happening, but it is indicative of the energy-cost advantage that the U.S. now enjoys. And that advantage is attracting more investment from BASF. The world's biggest chemical maker by sales, BASF doubled the amount of capital that it invests in the U.S. In 2010, the company was investing about \$500 million per year in the U.S. By 2013, that figure had jumped to \$1 billion per year, and BASF expects to continue its annual investments at that level through 2017.

Cheaper energy is not only attracting foreign investment dollars, it's also stimulating the economy. Last fall, Wallace Tyner, an energy economist at Purdue University, along with two of his Purdue colleagues, estimated that the shale revolution was adding some \$473 billion per year to the U.S. economy, or [about 3 percent of GDP](#).

It's not difficult to imagine what the economy would look like today without that extra 3 percentage points of GDP. In 2013, according to the Bureau of Economic Analysis, the U.S. economy [grew by 2.6](#)

The punchline here is readily apparent: despite myriad warnings about "peak oil" and the end of hydrocarbons, the

[percent](#). Subtract the 3 percent being added by the surge in oil and gas now being produced from shale, and it's clear that current unemployment numbers would be far higher than they are today.

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The punchline here is readily apparent:

despite myriad warnings about “peak oil” and the end of hydrocarbons, the U.S. is now leading the world in natural gas production and it may soon even eclipse Russia and Saudi Arabia in oil production. And those increases are a direct result of the oil and gas sector's desire for smaller, faster, lighter, denser, cheaper ways of doing things.

In 1929, the economic historian Abbott Payson Usher wrote, “The limitations of resources are relative to the position of our knowledge and of our technique.” He continued, explaining that the perceived limits of available resources “recede as we advance, at rates that are proportionate to the advance in our knowledge.”

The history of the oil and gas sector is one of advancing knowledge and increasing resource availability. And those advances are giving the U.S. a significant economic advantage over the rest of the world that will endure for many years to come.

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Bio for author/journalist Robert Bryce

(Approx. 175 words)

Robert Bryce is one of America's most prominent journalists. A senior fellow at the Manhattan Institute for Policy Research, his articles on energy and other topics have appeared in a myriad of publications ranging from the *Wall Street Journal* and *New York Times* to *National Review* and *Counterpunch*.

Bryce has given over 200 invited and keynote lectures to groups of all kinds, including the Marine Corps War College, University of Calgary, American Petroleum Institute, and Melbourne's Institute of Public Affairs. He has also appeared on dozens of television and radio programs ranging from PBS and NPR to Fox and CNN.

He's the author of five books on energy covering everything from Enron's bankruptcy to the digitization of drilling technology and the future of batteries. In 2010, he published *Power Hungry: The Myths of "Green" Energy and the Real Fuels of the Future*. In May 2014, he published *Smaller Faster Lighter Denser Cheaper: How Innovation Keeps Proving the Catastrophists Wrong*.

An apiarist, he lives in Austin, Texas, with his wife, Lorin, and their three children.