

Disruption in the Energy Business: What's Next?

By W. Michael Cox and Richard Alm

Peak Oil panic once gripped the world, and not all that long ago. Go back just a decade and a half, and you'll find dire warnings that oil would run out, with disastrous consequences for nearly all of the world's economies.

A surge in crude-oil prices had pushed this decades-old theory into the headlines. The West Texas Intermediate (WTI) benchmark price topped \$40 a barrel in May 2004, then climbed past \$50 in October 2004, \$60 in August 2005, \$80 in October 2007 and \$100 in March 2008. The WTI hit a jaw-dropping \$147 a barrel in July 2008.

Matthew R. Simmons, a prominent advocate of Peak Oil theory and author

of *Twilight in the Desert*, saw crude-oil production in irreversible decline, with scarcity pushing prices higher and higher. Simmons was so confident in his prediction that he made a public bet in 2004 with *New York Times* business columnist John Tierney, wagering \$10,000 that the average oil price would rise to an economy-killing \$200 a barrel in 2010.

When Simmons died in August of that year, he must have known he'd lost the bet. Oil prices never reached \$200 a barrel, never even returned to \$140. WTI did rise above \$100 from 2011 to 2013, but the benchmark has stayed below \$60 since for the past five years. It closed just above \$57 a barrel on the last day of August.

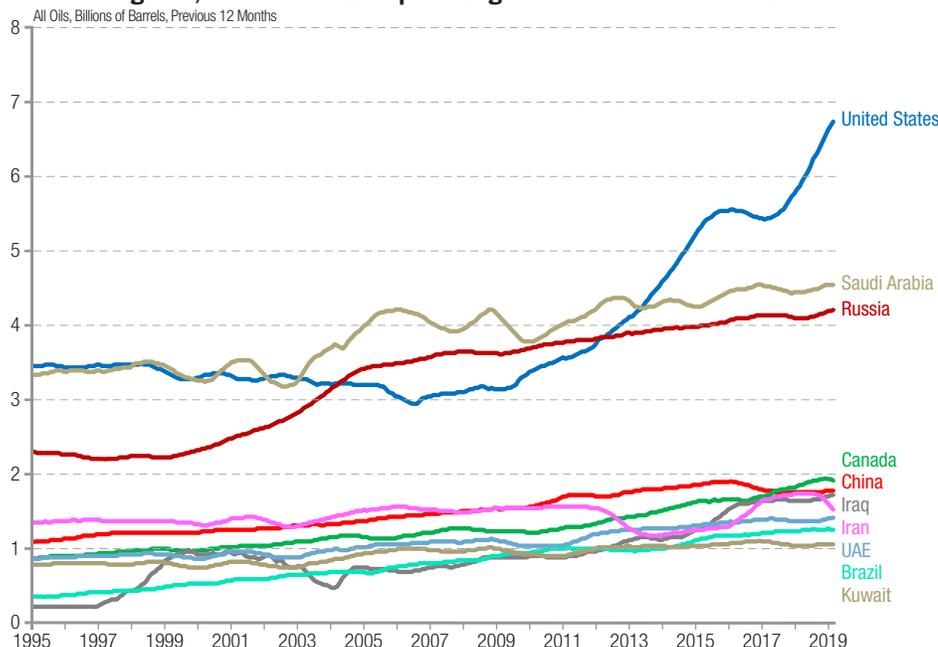
Peak Oil didn't come to pass because new crude supplies flowed onto the market and blunted the upward pressure on prices. Russia and a few other producers increased output, but the most prolific source of additional oil—by far—has been the United States. The country's oil industry pumped 3 billion to 3.6 billion barrels a year from 1995 to 2011. After that, production increased sharply, nearly doubling to nearly 6.7 billion barrels in the most recent 12-month period (see chart below). The United States passed Russia in 2012 and Saudi Arabia in 2013 on its way to becoming the world's No. 1 oil producer by a wide margin.

Peak Oil logic applied to natural gas as well, and its prices also showed an alarming upsweep in the first decade of the 21st Century. Since then, natural gas took the same path as oil, with output surging to record heights and prices falling to their lowest levels in decades. In 2011, the United States surpassed Russia as the world's top natural gas producer.

America's oil and natural gas comeback unfolded as a quintessential capitalist success story, with visionary entrepreneurs taking risks with new technologies and disrupting the status quo, reaping fortunes while confounding the naysayers. It worked out quite well for the rest of us, too, by delivering lower prices for consumers, boosting the economy's growth and job creation, and raising living standards.

Whether the story will continue to play out this way isn't entirely clear. Most scientists point to fossil fuels as the prime source

In Fracking Era, U.S. Rises to Top Among World's Oil Producers



of the carbon dioxide that contributes to global warming, and governments are contemplating regulations, taxes and subsidies designed to sharply curtail the world's oil consumption by encouraging conservation, greater efficiency and expansion of solar, wind and other forms of alternative energy.

Changes in the energy market may hurry along policies to reduce the world's oil dependency. Fossil fuels' ascendancy rests on an energy density that made it the cheapest source of power for a modern economy. In just a few years, though, technological advances will make non-carbon energy sources more cost competitive with fossil fuels, particularly for generating electricity.

Peak Oil anxieties ended a decade or so ago because of industry disruptions that increased output and lowered prices. Over the next decade or so, another round of potential disruptions—some from anti-fossil fuel policies, others from changes within the energy industry—could push the world toward a new kind of Peak Oil, with the impetus for decline on the consumption side rather than the production side.

HAT TIP TO TEXAS

Peak Oil's gloomy predictions might have come true if not for George Mitchell, the CEO of a Houston-based natural-gas company that confronted declining output from its conventional wells. Looking to make its leases pay off, Mitchell Energy began to experiment with hydraulic fracturing,

Fracking emerged as a game-changer for the United States. The nation's oil deficit shrunk to 12.5 percent in 2018, with oil independence a reasonable prospect.

or fracking, in hopes of finding the right technique to release the abundant gas deposits trapped underground in shale formations.

The basic idea of fracking had been around for decades. What Mitchell's company did was find a commercially viable mix of water, chemicals and sand that, when injected into the ground, would break up the shale rock and let the natural gas flow. After years of experimenting, Mitchell Energy had its first fracking breakthrough in the Barnett Shale beneath Fort Worth and land to the west.

Fracking technology advanced rapidly in the decades following Mitchell's innovation. Horizontal drilling proved particularly important. It sent drill bits sideways as well as downward within shale formations, greatly expanding the exploration capacity of each well. Initially applied to natural gas, fracking soon found its way into oil exploration, reviving fields in terminal decline under conventional techniques.

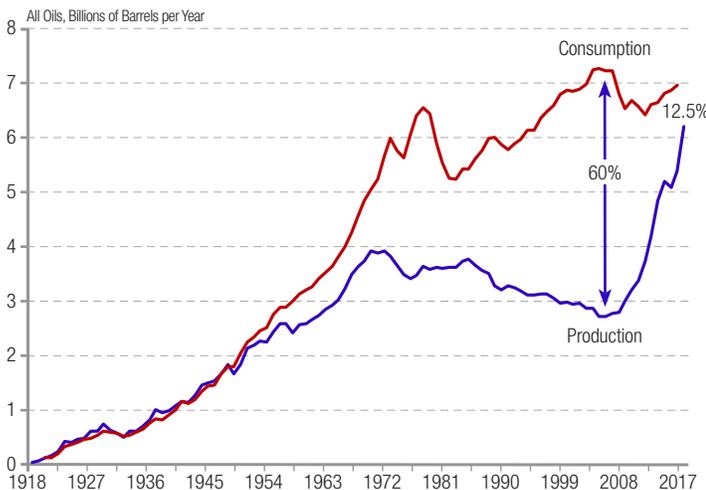
The fracking revolution swept through the energy industry. Companies like Houston's Anadarko sent hundreds of drilling rigs to

places with promising shale formations in Texas, Oklahoma, Louisiana, North Dakota and other states. Investment funds poured into exploration, allowing Oklahoma's Chesapeake Energy and other firms to spend billions to buy mineral rights in the nation's shale regions. Global energy giants like Texas-based Exxon Mobil shifted their strategies toward more domestic drilling and exploration.

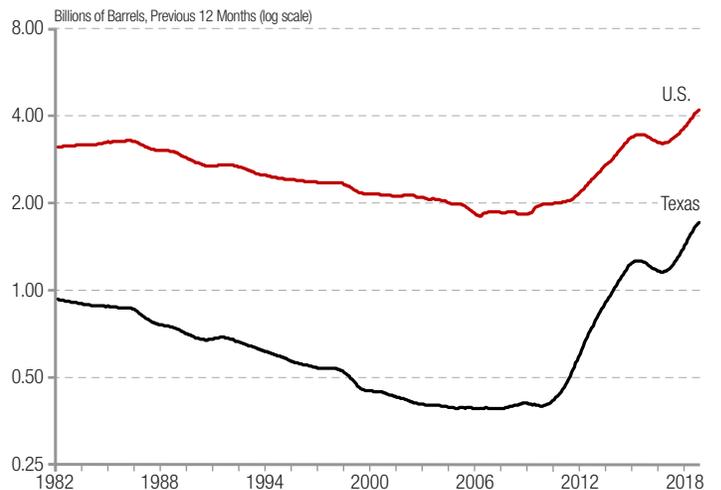
Fracking emerged as a game-changer for the United States. After the energy crisis of the early 1970s, increasing dependence on imported oil hung like a dark cloud over the economy. The gap between domestic consumption and production swelled to a record 60 percent in 2005 and probably would have continued to rise if not for the subsequent fracking boom. Because it did happen, the nation's oil deficit shrunk to 12.5 percent in 2018, with oil independence a reasonable prospect within a decade or so (*see chart below, left*).

Shale-oil formations are found in many parts of the country—the Marcellus in Pennsylvania and adjacent states, the Bakken in North Dakota and Montana,

Self-Sufficient Soon? U.S. Output Closing in on Consumption



Texas Did the Most to Pump up U.S. Oil Production



the Niobrara in Colorado and Wyoming. However, the big push toward higher U.S. oil production came from Texas (see *chart Page 2, right*). The state's share of U.S. crude-oil production had fallen to an all-time low of 19.3 percent in 2003; by 2018, it had rebounded to nearly 41 percent, just shy of the all-time high of 46 percent in 1948.

Fracking's success has meant strains for the industry. Boosting output puts downward pressure on oil and gas prices, especially in times of slack world demand. Pressures to drive down costs are constant—to make sure drilling continues to pay. Companies have responded by shifting operations to the shale formations with lowest drilling and production costs. They've also introduced cost-saving innovations both upstream and downstream, cutting the break-even oil price in half in West Texas' Permian Basin. Dismissed as played out a few decades ago, the Permian has emerged as the lowest-cost oil play and a hotbed of drilling activity. Activity in the south Texas' Eagle Ford, by contrast, has cooled after a boom driven by high prices.

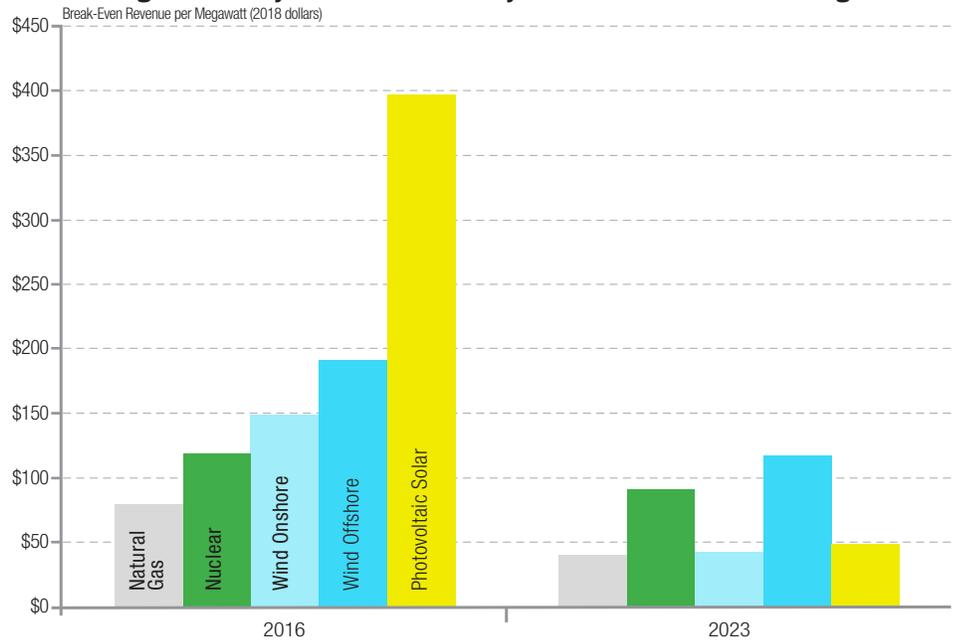
See-sawing between high and low prices isn't unusual in the energy business—i.e., it's disruptive but manageable. In coming years, disruptive forces of a different kind are likely to confront the industry.

THE COST CONUNDRUM

Fossil fuels rose as the dominant source of power in the Industrial Age. Even today, they remain entrenched, with coal, oil and natural gas accounting for just over 80 percent of U.S. energy consumption in 2018. Led by wind and solar power, however, alternative energy sources have taken big strides during the time that soaring oil and natural gas production made carbon-based power cheaper.

Governments want a transition to cleaner power, particularly for electricity generation, but when measured against fossil fuels all energy sources have their limitations. Safety perceptions bedevil nuclear power. Nowhere does the wind always blow or the sun always shine—so reliability concerns hinder wind and solar. Biomass and other technologies are still iffy at a scale required to light up cities.

Generating Electricity—Natural Gas May Soon Lose Some of Its Edge



The biggest obstacle for alternative energy has been cost. The U.S. Energy Information Administration (EIA) estimates the average revenue a utility would need to cover the cost of building and operating various types of power plants over their expected life cycle. In 2016, it required an average of \$79 to generate one megawatt of electricity with natural gas, the cleanest fossil fuel. By comparison, a megawatt cost \$119 for nuclear plants, \$149 for onshore wind, \$191 for offshore wind and \$396 for photovoltaic solar.

Looking forward to plants coming online in 2023, the EIA expects significant efficiency gains in all types of electricity generation. The megawatt cost of natural gas, rapidly replacing coal in U.S. plants, falls by almost 50 percent to an inflation-adjusted \$40. However, solar becomes 87 percent cheaper and onshore wind goes down by 71 percent.

More telling, these alternative fuels become more cost competitive with natural gas—at \$43 per megawatt for onshore wind and \$49 for solar (see *chart, above*). The narrowing cost gap will be a disruptive force for an industry already facing weak prices and public skepticism, perhaps making the recent surge in natural gas exports more important when it comes to supporting drilling and prices.

Average price projections, of course, don't account for all relevant factors that will

determine utilities' production decisions. Wind and solar, for example, await improvements in battery capacity to store power for nights, windless days and cloudy weather. Stepping outside the business arena, decisions on how to produce energy will be increasingly shaped by public policy.

INTO THE POLITICAL ARENA

Warnings about fossil fuels and global warming go back at least to the 1980s. The activists sounding the alarm in those early years would no doubt take some comfort from Matthew Simmons' vision of Peak Oil—a slow and steady decline in global fossil fuels' production, with higher prices giving non-carbon energy ample room to develop as a clean replacement.

The fracking boom put an end to Peak Oil, and the conflict between the oil and natural gas industry and environmental activists grew more intense. It continues to this day, and it will impact the availability and prices of all types of energy even more in the future. The fate of fossil fuels has become as much a matter of politics as well as markets.

In the United States and other countries, fossil fuels are Public Enemy No. 1 in fighting global warming. Countries from Europe to China have pledged to substantially reduce carbon emissions by government fiat. In a historic shift, the world's energy policies now focus less on providing abundant

power for economic growth and more on countering global warming. The energy industry can no longer count on producing as much oil as market prices might justify.

Americans are divided—on this as well as so many other issues. As the 2020 presidential election looms, many Democrats embrace a vaguely conceived Green New Deal and pledge to wean the country off oil in the next few decades. Republicans are more friendly to oil and natural gas production—so the stakes for the energy business are likely to be high in 2020.

It's risky to draw straight lines from political campaigns and pledges to policy. Support for curtailing fossil fuels might weaken if alternatives can't deliver on their promises and carbon taxes and other

restrictions threaten living standards and jobs. When push comes to shove, short-run economic concerns often take precedence over long-term policy goals.

Even if the United States lags on policy, the oil and gas industry faces a challenging future, where low market prices persist, governments become more antagonistic and competing energy sources emerge

cleaner and cheaper. The upshot: Continual disruption in the energy business—one jolt after another, or even all at once. For investors, this triple whammy makes energy more risky, but no less so than in the days of Peak Oil. Adapting and adjusting are part of the U.S. industry's DNA, and ingenuity and flexibility may once again save the day for America's oil and gas producers.



Michael Cox

W. Michael Cox is founding director of the William J. O'Neil Center for Global Markets and Freedom at Southern Methodist University's Cox School of Business. A former Dallas Fed chief economist, he is economic advisor to MPACT Financial Group.



Richard Alm

Richard Alm is writer in residence at the William J. O'Neil Center for Global Markets and Freedom at Southern Methodist University's Cox School of Business.

CHARTING THE ECONOMY

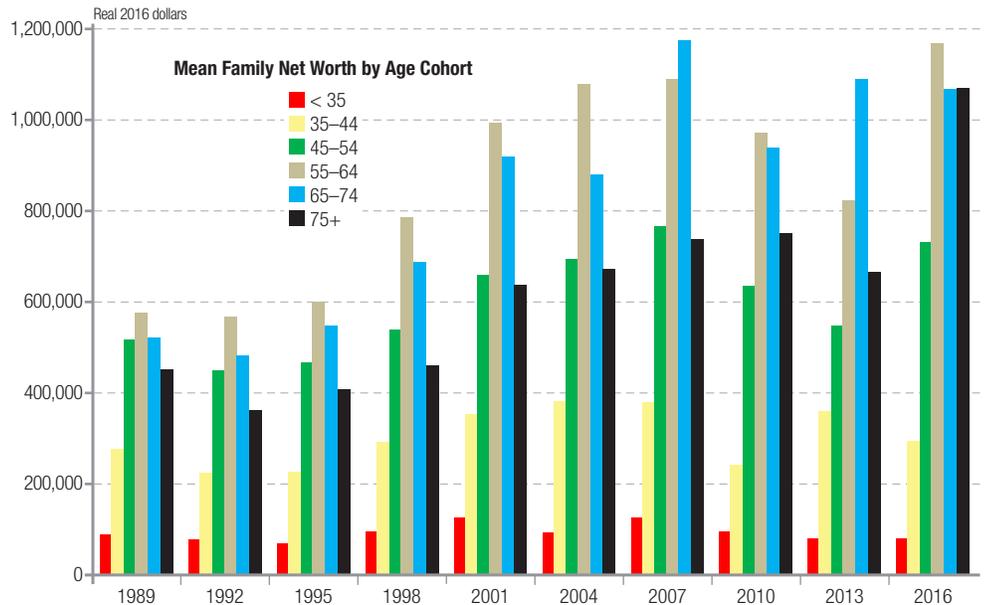
Older American Families Grew Richer over the Past 3 Decades

Over the past few decades, family wealth has shifted steadily toward older Americans.

Accumulating financial assets is less of a priority for young people. Measured in 2016 dollars, average net worth for families headed by someone under age 35 was \$87,400 in 1989 (red bars). By 2016, this cohort's worth declined to \$76,000.

By contrast, older Americans are doing better than ever financially. The 55- to 64-year-old group was the richest in the latest survey. Its average net worth was \$1.16 million in 2016, compared with \$574,300 in 1989 (tan bars). Financial conditions also improved significantly for the next two older cohorts—ages 64 to 74 (blue) and over age 75 (black).

Longer and healthier lives, the democratization of wealth-building through 401K and other employee savings plans, improved financial management and a rapidly rising stock market have all contributed to today's older Americans doubling the net worth of their counterparts just 30 years ago.



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