

The Takeaway

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The Permian Basin: A Tribute to American Innovation and Entrepreneurship

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Though politicians are quick to take credit for the recent energy renaissance in the United States, the rise of oil and natural gas in the United States can be attributed to George P. Mitchell, a former student of Texas A&M University. The Permian Basin in West Texas is a testament to his innovation and entrepreneurship, and the consequences of his innovation have produced a number of beneficiaries—some quite unexpected.

In the waning months of 2018, the United States officially passed both Russia and Saudi Arabia as the global leader in oil production.¹ Likewise, the United States stands atop the world in natural gas production, exceeding its closest rival, Russia,

by 15%.² Paradoxically, at the epicenter of this energy renaissance is the Permian Basin of West Texas—an area abandoned by the major oil companies in the 1970's as “mature” with limited future potential. Despite competing claims from politi-



WHAT'S THE TAKEAWAY?

Fracking has spurred a US energy renaissance centered in West Texas.

But there have been other quite unexpected benefits:

- To consumers from low natural gas prices
- To CO₂ emissions from displacement of coal
- To renewables struggling with intermittency

Innovation and entrepreneurship often lead to unanticipated changes and benefits.

cians, there was one man at the forefront of this energy renaissance in America—George P. Mitchell. Mitchell’s dogged determination, innovative spirit, and entrepreneurial acumen fueled this energy boom. It is a remarkable story starting with the Barnett Shale in North Texas, then moving to the Eagle Ford Shale in South Texas, and now centering on the Permian Basin of West Texas.

George Mitchell is the father of modern hydraulic fracturing (fracking) currently used in extraction of oil and natural gas from shale and other tight rock formations. Typically, these formations contain pores of hydrocarbons but little permeability to allow these trapped hydrocarbons to escape from the rock. While fracking using explosives had been around since the 1940’s, George Mitchell’s vision was to inject large volumes of water under extreme pressures mixed with sand and other chemicals to release the trapped hydrocarbons. In 1998, after 17 long years of experimenting with various combinations of pressure, water, sand, and chemicals, Mitchell’s team discovered a low-cost but highly effective way to recover the huge reserves of natural gas trapped in the Barnett Shale. The energy industry would never be the same.

When fracking is combined with horizontal drilling, another key technological development which emerged in the early 1990’s, it allows even more of the shale formations to become productive. While Mitchell claims that he never doubted that fracking would revolutionize American energy, the success of his small company, Mitchell Energy, certainly was not anticipated by Wall Street.³

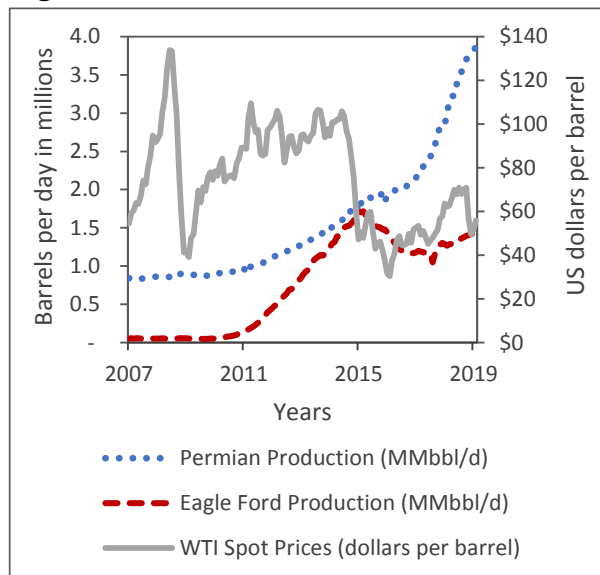
Even though fracking was first applied to produce natural gas in the Barnett Shale, this

technological revolution quickly spread to other shale formations, including the Marcellus Shale in Pennsylvania, the Eagle Ford Shale in South Texas, and elsewhere. Today, the primary beneficiary of this innovation is in oil production centered in the Permian and Delaware Basins of West Texas.

THE OBVIOUS BENEFICIARIES—WEST TEXAS WORKERS AND TOWNS

Out of the 11.9 million barrels of US oil production per day, approximately 3.5 million barrels of that comes from Texas.⁴ Oil and natural gas production in Texas are hitting levels that were once considered mythical. Indeed, oil production in the lower 48 states had peaked at 9.6 MMbbl/d in 1970 and had declined to 5.0 MMbbl/d in 2007. Then in 2007, as shown in Figure 1, oil production for both the Permian Basin in West Texas and the Eagle Ford Shale in South Texas began to rise. Following the steep decline in oil prices in late 2014, production dampened in the Eagle Ford, and elsewhere. Curiously, the Permian

Figure 1: Texas Oil Production & Prices, 2007-2019



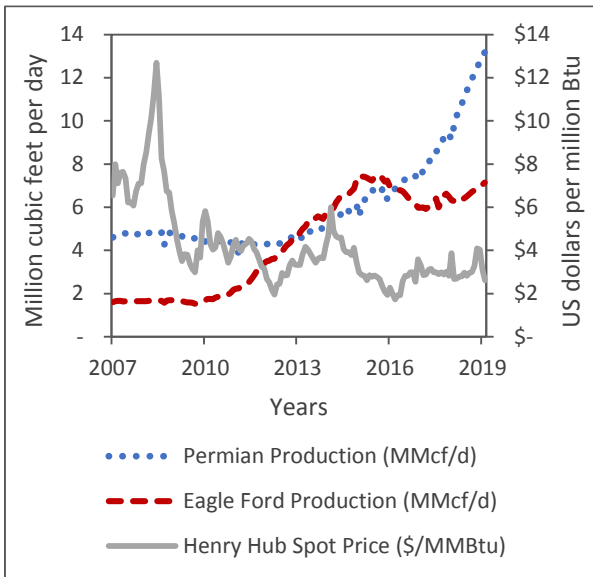
Source: US Energy Information Administration, 2019

Basin appears impervious to Saudi Arabia’s efforts to rein in fracking by driving down oil prices.⁵

The towns of West Texas are bustling with economic activity bringing prosperity to the cities and its residents. In May of 2018, the Permian Basin city of Midland proudly announced that it had reached \$4 million in sales tax revenue in that month alone—a 30% increase from the previous May!⁶ That is matched by an unemployment rate in the Midland/Odessa area that averaged 2.35% in 2018, compared to the national average of 4.0%. From 2010-2018e, the labor force in Midland/Odessa increased by 32%.⁷

The success continues for natural gas production in Texas, as Figure 2 illustrates. Since 2007, the Permian Basin has seen an 186% rise, while the Eagle Ford has enjoyed a 346% increase in natural gas production. That growth has positioned Texas to become a global hub for liquefied natural gas exports.⁸

Figure 2: Texas Natural Gas Production & Prices, 2007-2019



Source: US Energy Information Administration, 2019

THE UNEXPECTED BENEFICIARIES

Electricity and Gas Customers: Looking again at Figure 2, you can see that Henry Hub natural gas prices are currently sitting at around \$2.84 per million Btu, much lower than the nearly \$7.00 price in 2007. Fracking has unleashed enormous quantities of low-cost natural gas. These lower prices provide good news for utility bills. For example, from 2010 to 2018, Chicago homeowners using primarily natural gas experienced a 17% price reduction for home heating after adjusting for inflation. In addition, cheap natural gas has helped electricity prices in general to decline in real terms over much of the United States. In Houston from 2010 to 2018, the inflation adjusted price of electricity fell by 25%.⁹

Environment: While much is made of the negative environmental consequences of fracking, on balance the environment is a big winner. Natural gas power plants emit about 40% of the amount of carbon dioxide (CO₂) that coal plants emit. The fracking revolution has allowed natural gas prices to decline so dramatically that natural gas powered plants are cheaper than coal powered plants. Data from the US Energy Information Administration (EIA) shows that in 2018, US energy-related CO₂ emissions were actually 12% lower than their 2007 levels, despite GDP growth of 19%. The EIA mainly attributes the drop to the switch to natural gas in electric power generation. In 2007, coal fired power plants made up 48% of the fuel share compared to natural gas’s 21% share. Natural gas now sits at a 33% share, while coal’s share has decreased to 30%.¹⁰ Thanks to Mitchell, the United States has been making significant progress in reducing carbon emissions.

Renewables: One normally thinks that electricity generated by fossil fuels is a direct competitor to renewables. Curiously, the opposite is true in the case of natural gas. Renewable fuel sources such as wind and solar are more attractive because of cheap natural gas power plants. For the days that the wind does not blow or the sun does not shine, low-cost natural gas powered combined-cycle power plants can be quickly powered on to fill in the gaps between the supplies from renewables and consumer demand. Easier to power up and down than coal or nuclear plants, natural gas can help renewables achieve an even larger share of US electricity generation.¹¹ In Texas, where wind energy leads the nation with 15% of generation,¹² cheap natural gas is relied on when renewable supplies run low.

Thanks to George Mitchell's fracking innovation, there have been numerous beneficiaries. So the big takeaway is that innovation and entrepreneurship often lead to quite unanticipated changes. Just as today's beneficiaries were unknown at the time of the innovation, future beneficiaries of new innovations are certainly unknown to us today.

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Notes:

¹Plante, M.D., & Patel, K. (2019, February). Dallas Fed Energy Survey suggests oil price drop won't cause sector collapse in 2019. Federal Reserve Bank of Dallas. <https://www.dallasfed.org/research/economics/2019/0214>

²US Energy Information Administration, 2019.

³The father of fracking. (2013). <https://www.economist.com/business/2013/08/03/the-father-of-fracking>

⁴US Energy Information Administration, 2019.

⁵Griffin, J. (2018). The Saudi 2014 gambit: A counterfactual analysis. *Mineral Economics*, 31(1), 253-261.

⁶Windahl, G. (2018). Midland sales tax revenue breaks records. <https://www.cbs7.com/content/news/Midland-sales-tax-revenue-breaks-records-482991911.html>

⁷US Department of Labor, Bureau of Labor Statistics, 2019.

⁸Chapa, S. (2018). Texas now an exporter of LNG. <https://www.houstonchronicle.com/business/article/Texas-now-an-exporter-of-LNG-13458987.php>

⁹US Energy Information Administration, 2019.

¹⁰Popovich, N. (2018, December 24). How does your state make electricity? *The New York Times*. <https://www.nytimes.com/interactive/2018/12/24/climate/how-electricity-generation-changed-in-your-state.html>

¹¹Lefton, S.A., & Hilleman, D. (2011, August 1). Make your plant ready for cycling operation. *Power Magazine*. <https://www.powermag.com/make-your-plant-ready-for-cycling-operations>

¹²Popovich, N. (2018, December 24).

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