

The New American Energy Revolution

Reshaping Montana

BILL WHITSITT

Executive in Residence, Bureau of Business and Economic Research

The new American energy revolution is here. As with any revolution, it has shaken our assumptions. About our future economy. About our environment. About our national security. And about energy costs for our citizens. In short, it is already causing all Americans – and Montanans – to think differently about energy in our futures.

Consider that more than a few Montanans remember the 1970s with its Arab oil embargos, gasoline lines, and pervasive belief that we were literally running out of energy. Or later periods when gasoline prices were not only high, but were expected to go ever higher.

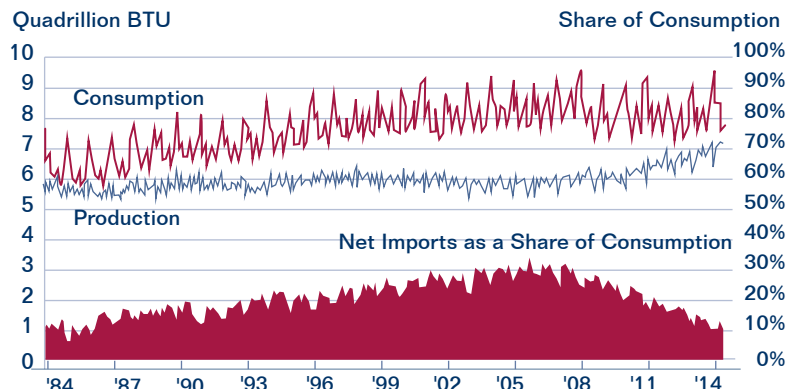
Then consider that today we in the U.S. produce some 84 percent of our primary energy supplies domestically, according to the U.S. Energy Information Administration (EIA).

Even in the most persistently problematic import area – oil – data from EIA show that our production is the highest it has been in decades. And this has contributed to our energy imports as a share of energy consumption being the lowest in 29 years (Figure 1).

Strikingly, the concept of energy independence, something viewed as more of a pipedream of presidents than a realistic goal, seems within reach.

At the same time, EIA data show that energy use per person in the U.S. has been declining (Figure 2). And consumer spending on energy as a

Figure 1
Monthly U.S. Energy Production and Consumption and Net Imports as a Share of Consumption, 1984-2014

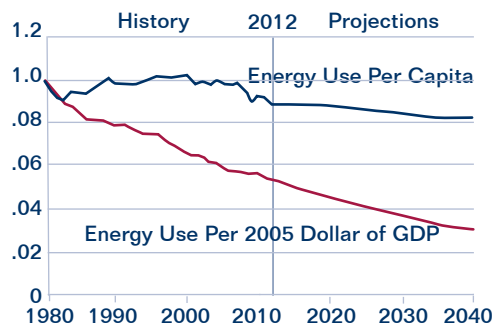


Source: U.S. Energy Information Administration.

share of disposable income continues to fall.

Driven most significantly by lower gasoline prices and increasing automobile efficiency, and by changes in home heating fuels, consumer energy spending today is a lower percentage of disposable income than the average going all the way back to 1960 (Figure 3).

Figure 2
Energy Use Per Capita and Per Dollar of GDP in the Reference Case, 1980-2040 Index 1980=1

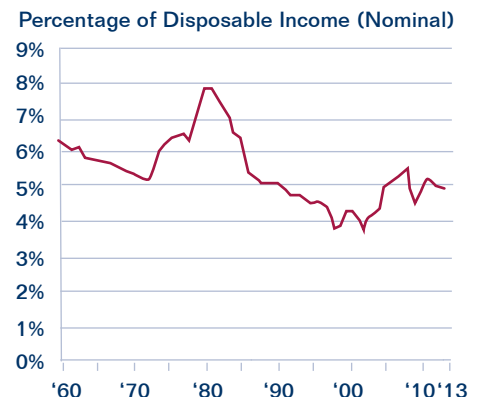


Source: U.S. Energy Information Administration.

Technology and Innovation are Creating a Revolution

So, what is at the core of this revolution? Technology. Innovation. The economics that technology and innovation improve as entrepreneurs invest, sometimes fail, and invest again. And the new practices they spawn that can lead to economic,

Figure 3
Consumer Energy Expenditures' Share of Disposable Income 1960-2013



Source: U.S. Energy Information Administration.

environmental, and other benefits for consumers, taxpayers, and society at large. In Montana we have a unique ability to watch and participate in the revolution across a wide range of sectors.

Most dramatic, although by no means the only, among sectors contributing to our new energy outlook is that of oil and natural gas.

The technology development and innovation in this sector have been astounding. Advances in high-tech geoscience have led to the ability to better “see” underground strata with seismic data, to assess the likelihood of finding hydrocarbons in identified geologic formations, and through nanoscience, understand how oil and gas move through the pores of “tight” source rocks more dense than concrete. It is these source rocks in which oil and gas had been created over hundreds of millions of years, migrating to geologic

“traps” that became the target of oil and gas explorers. But the early-2000s’ wedding of two well-known technologies – horizontal drilling and hydraulic fracturing – allowed economic production for the first time directly from those source rocks. Ongoing progress in reservoir characterization to understand how to most effectively and efficiently produce known oil and gas resources, and ongoing drilling and completion efficiency gains, are opening more oil and gas resource areas to economic production. These gains will help maintain economic production through market price fluctuations.

The success of the Bakken play in North Dakota and the eastern part of our state is a direct result of these advances. Bakken oil production growth – among the most important of the nation’s tight oil plays – is shown in the second from the top band in Figure 4. It is this very recent

U.S. oil production growth, following the earlier and every-bit-as dramatic natural gas production growth, that has most led to our new national energy outlook – but that outlook is underpinned by our large U.S. and Montana coal resources, significant improvements in development and use of alternative energy forms, and improvements in energy efficiency and conservation.

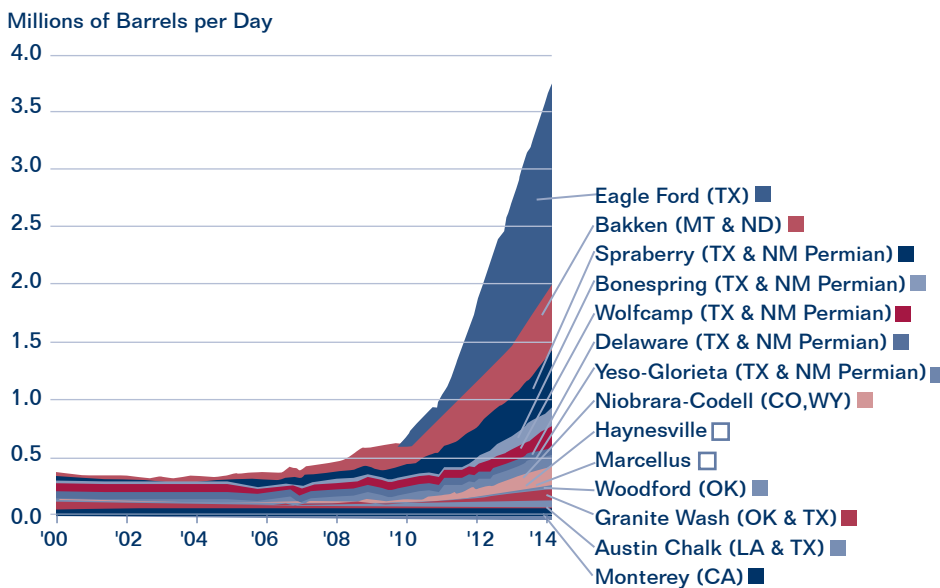
Let’s take a quick look at a few key points in each of these areas from a Montana perspective.

Benefits and Challenges of the Oil Boom

Montana is clearly seeing benefits and some challenges from oil development, and both are leading to new thinking. Economic activity in Eastern Montana related to the Bakken has arrested population declines in some counties, has provided new jobs, and has increased wage rates in even the traditionally lowest-paid labor categories. On the high-tech side, Montana Tech in Butte is a leading source of new petroleum, mining, environmental, and other engineers for industry nationwide, with graduates receiving some of the highest starting salaries.

Folks like Larry Ashcraft, a retired airline pilot in the Flathead Valley, have been bitten by the entrepreneurial bug. Larry started the Osprey Trucking Company in Sidney to haul fresh water that is critical to hydraulic fracturing sites. The water is mixed with sand and additives and carried into the ground to release oil and natural gas. The Osprey Trucking business became very valuable and was purchased by a larger company.

Figure 4
U.S. Tight Oil Production, Selected Plays



Source: U.S. Energy Information Administration derived from state administrative data collected by Drillinginfo Inc. Data are through September 2014 and represent EIA’s official tight-oil estimates, but are not survey data.

In 2013, economists estimated that there were more than 12,500 oil and gas industry-related jobs in Montana, including those in exploration and production and those like Larry's that support it, as well as those in refining, distribution, and marketing of petroleum products. An American Petroleum Institute/PWC study estimates that direct, indirect, and "induced" employment (that is, supported by income from the first two categories) may mean that some 43,000 jobs and 10 percent of Montana's economy are supported by oil and gas.

Challenges of the Bakken boom are also clear. Housing availability and costs, police and other service demands, and road maintenance are examples. The impacts that have been seen in Eastern Montana can come during early, intense-activity phases of an oil and gas play or project cycle, with effects sometimes felt before more stable production phases and related tax flows. And, although production taxes are estimated in 2013 as having been around \$226 million, there is a timing gap between activity and revenues. It takes a while to address effects in particular counties or communities, and might call for new thinking with respect to planning, cooperation, and voluntary action among companies and officials who may be able to provide resources to address interim needs.

Even the American Petroleum Institute, the leading oil and gas standards-setting body in the world, has added community engagement to its suite of operational and environmental standards and best practices for the oil and gas industry.



Osprey Trucking Company

Environmental Issues

Also on the environmental front, as states have primary oil and gas regulatory responsibility, they have stepped forward dramatically to take their places in the revolution. States including Montana and others across the nation, have created the States First initiative of the Interstate Oil and Gas Compact Commission and Ground Water Protection Council to continuously improve and share their own best practices for regulations, enforcement capability, and resources, and addressing of public concerns. They have adopted a national Web-based FracFocus registry (www.FracFocus.org) for tracking what fluids, sand, and additives go into wells that have hydraulic fracture treatments. Begun for voluntary postings — with more than 700 companies having made 85,000+ disclosures — FracFocus is now used for required information posting by Montana and a number of other states. As new issues and concerns arise, states have on-the-ground

responsibility and expertise to focus on them.

In addition to following industry standards and evolving rules and regulations, companies are initiating innovative practices that better protect the environment while increasing conservation and efficiency. Where and when possible, more water re-use and recycling reduces both water demand itself and the need to transport it. Likewise, multiple wells drilled from the same locations can reduce surface effects and increase drilling efficiency. Even small things can make sense and matter, like installing new technology valves and using new operating practices that have helped reduce production-related methane emissions by 40 percent since 2006.

Coal

In addition to being the source of half of Montana's electricity generation, coal continues to be the dominant form of energy produced in Montana, with the state's having one

quarter of the nation’s recoverable reserves. Here technology and innovation have allowed efficient and more environmentally friendly production and use, contributing an estimated \$30,000 in state revenue for every trainload of coal shipped to users or export terminals outside Montana. Today’s reclamation standards for Eastern Montana’s surface mines were not even imagined when federal and Montana regulation was ramped up in the early 70s. With increased concerns about carbon emissions from coal and other fossil fuels, the Montana State University-directed Big Sky Carbon Sequestration Partnership has drilled its first well in the Kevin Dome in Northern Montana as part of its research project to obtain and re-inject CO2 into the earth to study geologic and geochemical factors affecting its long-term storage. This, along with use of CO2 for enhanced oil recovery already underway in the state, is an exciting and key subject if Montana coal is to fulfill its future potential in meeting energy needs.

Renewables

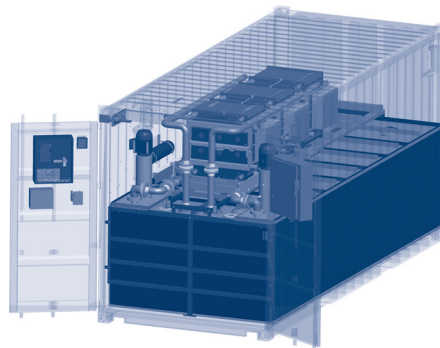
Renewables also provide growing components of our energy revolution. The EIA projects that by 2040 renewable contributions to our nations’ electricity-generating capacity will have grown 24 percent (second only to the 73 percent growth in gas-fired generation). In Montana, more than 40 percent of our electricity is generated by hydropower facilities. But Montana also saw an increase in wind generation capacity of 32 percent in 2013 alone, according to EIA. Today 6 percent of the state’s electricity is generated by wind turbines.



F.H. Stoltze Land & Lumber Co.

Other renewable energy projects, from algae-to-methane to wood bark/sawdust/shavings-to-heat-and-power ones are underway. Projects like F.H. Stoltze Land & Lumber’s cogeneration one, providing process steam and heat as well as an average of 60,000 kilowatts of power daily to the commercial electricity grid, are moving Montana toward meeting its 15 percent 2015 Renewable Energy Resources Standard.

And the technology work continues. ViZn Energy of Columbia Falls, for example, is developing new large-capacity, scalable batteries that will be critical as distributed energy projects and micro-grids become more a part of our future. They, and utilities, all need to be better able to balance supply and demand with increased reliance on intermittent wind and solar power.



ViZn Energy of Columbia Falls

Efficiency and Conservation

Efficiency and conservation improvements continue their steady contributions as well to the optimistic energy future all of us can appreciate. As we saw at the beginning of this article, consumers nationwide are benefiting today by using less – and less expensive – energy. In Montana, the Department of Environmental Quality estimates that energy efficiency gains in the electricity sector, for example, have averaged some 3.5 percent annually in recent years.

Finally, a few words about what may be some of the most exciting Montana engagement with the new energy revolution: the contributions we’re making in the leading edges of new thinking and new action. I’ve mentioned just a few examples of what our Montana universities are doing to help us understand and lead in this new energy world. But there is much more that could be explained. Like the Montana Tech/UM/MSU joint Ph.D. program in materials for energy storage, conversion, and conservation that could lead to a graduate developing the next generation of wind turbine blades, or corrosion-resistant pipe for transporting and disposing of toxic wastes. Or the community colleges that are preparing their students to be the next energy employees in a broad range of fields.

All this should inspire not only optimism about our energy future and how it is reshaping Montana and the ways we think about energy. It should also reaffirm the excitement we see and feel everyday about our state’s ability to lead in this important and dynamic arena. 15