

CHANGES IN ENERGY PRODUCTION, EMPLOYMENT, AND BUSINESSES BETWEEN 2001-2010

By Don E. Albrecht, Stephan J. Goetz, and Scott Loveridge

Two factors are dramatically changing the energy industry in the United States. First, concerns about climate change and overreliance on energy imports produced policies to reduce domestic energy consumption and increase U.S. energy production. Changes in federal regulations are playing out unevenly across the nation in terms of how they affect employment. Second, U.S. fossil fuel production is benefiting from new technologies. Specifically, horizontal drilling and hydraulic fracturing (fracking) makes it economically feasible to produce natural gas and “light tight” oil from shale formations. These developments are driving changes in where and how energy is produced and the number and location of energy related jobs. Total energy consumption in the U.S. declined slightly over the past decade despite a growing population. The economy now uses less energy per dollar of Gross Domestic Product (GDP) than in earlier times. Renewable energy production increased by more than 50 percent between 2000 and 2011, but still makes up less than 10

percent of total energy production. The source and location of fossil fuel production has changed, creating shifts in energy-related employment patterns (Figures 2-5). Currently, coal and natural gas production is sufficient to cover domestic needs. This is not true of petroleum or crude oil, where consumption far exceeds production resulting in extensive imports.

COAL

Coal production in the U.S. declined by about seven percent between 2000 and 2011 (Figure 1) despite relatively plentiful and cheap coal resources. Coal produces more pollution and greenhouse gasses per unit of energy generated than nearly any other energy source. Very likely the key for future coal use is development of carbon capture and storage, or other “clean coal” technologies that allow cost effective use of coal while protecting the environment. Primary coal production and employment is located in Appalachia in the East and in the mountain states in the West (Figures 2 and 3). For several decades, coal production

and thus coal industry employment has been shifting from Appalachia to the West because of its lower sulfur content. Western coal production is more reliant on surface mining techniques that are cheaper and require a smaller work force. Thus, Wyoming has less than half as many employees in the coal industry as

Now the nation’s leading coal producer, Wyoming produced 42 percent of the total in 2010 with West Virginia and Kentucky the second and third most productive coal-producing states.

Kentucky while producing four times as much coal. Now the nation’s leading coal producer, Wyoming produced 42 percent of the total in 2010 with West Virginia and Kentucky as the second and third most productive states.

PETROLEUM

The amount of petroleum produced in the United States between 1970 and 2000 declined by 35 percent as major oil fields were depleted, leading to the need for extensive oil imports (Figure 1). Between 2001 and 2010, oil production declined by 42 percent in Alaska with depletion of the Prudhoe Bay oil fields. Despite declines in Alaska, U.S. oil production stabilized in the past decade as a result of horizontal drilling and hydraulic fracturing. These technologies made it economically feasible to produce “light tight” oil from shale formations in North Dakota and Montana. As a result of fracking, North Dakota oil production increased from 29 million barrels in 2003 to 153 million barrels in 2012 and increased employment in the oil and gas industries in the state by 28 percent. In 2005, only 32.9 percent of the petroleum consumed in the U.S. was produced in this country. Because of increased production and improved conservation and efficiency, by 2011, the

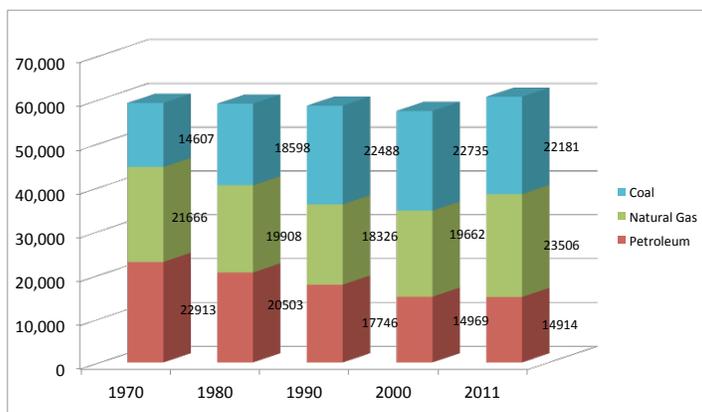


Figure 1. U.S. Coal, Natural Gas, and Petroleum Production in BTUs, 1970-2011.

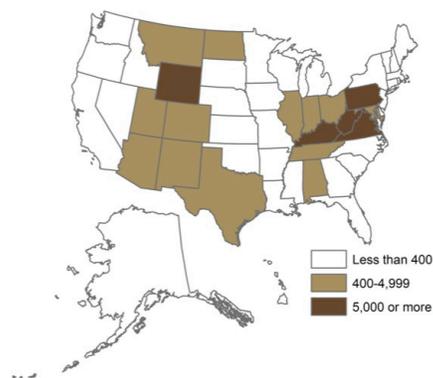


Figure 2. Employment in Coal Industry by State, 2011.

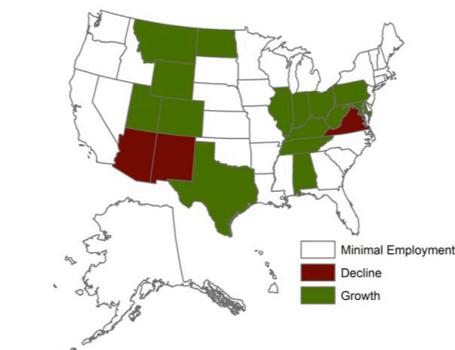


Figure 3. Employment Change in Coal Industry by State, 2001-2011.

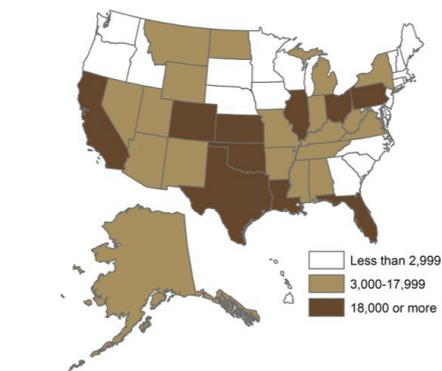


Figure 4. Employment in Oil and Gas Industries, 2011.

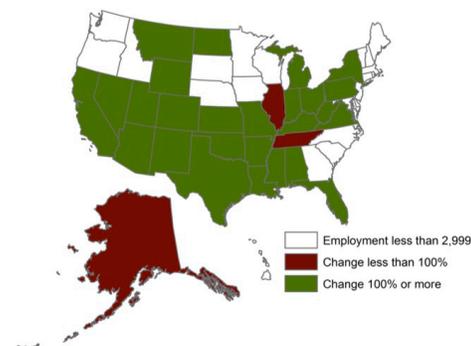


Figure 5. Employment Change in Oil and Gas Industries, 2001-2011.

U.S. produced 42.3 percent of the petroleum consumed.

NATURAL GAS

Fracking is also greatly impacting the natural gas industry. A decade ago, virtually all natural gas production came from conventional wells with no production from shale formations. By 2011, nearly 30 percent of all natural gas production was from shale formations. With increased production from shale formations, total natural gas production increased by 20 percent between 2000 and 2011 (Figure 1). Natural gas production and employment has moved from conventional gas fields to shale formations (Figures 4 and 5). Currently, the highest-producing shale formations are in Louisiana, Texas, Pennsylvania, and Arkansas. In Pennsylvania, gas production increased by 900 percent between 2001 and 2010, and employment in oil and gas industries increased by 125 percent.

POLICY IMPLICATIONS

Technical change and environmental policy are driving a rapid shift in where and how U.S. energy is produced. Energy policy must take these shifts into consideration while continuing to encourage reduction of pollutants and greenhouse gasses through conservation, increasing renewable energy production, using cleaner energy sources, and investing in technological developments that support these strategies. U.S. energy policy must also aim for achieving U.S. energy independence through conservation and production of energy sources that are available within the nation's boundaries. States and localities experiencing the current energy bonanza need

to consider how best to channel the new revenue streams into sustained prosperity. Models such as the Iron Range Resources Rehabilitation Board, which sets aside a portion of current earnings for industry support, site clean-up, and local economic diversification, could be considered by state and local policymakers. Policymakers in new energy areas could also consider energy-consuming industrial development (such as some types of manufacturing) as an alternative to export markets in an era where domestic natural gas prices are in decline.²

ABOUT THE AUTHORS

Don E. Albrecht, Director
Western Rural Development Center
Utah State University

Stephan J. Goetz, Director
Northeast Regional Center for Rural
Development
The Pennsylvania State University

Scott Loveridge, Director
North Central Regional Center for Rural
Development
Professor, Department of Agricultural,
Food, and Resource Economics
Michigan State University