CLEER
CLEAN ENERGY ECONOMY FOR THE REGION

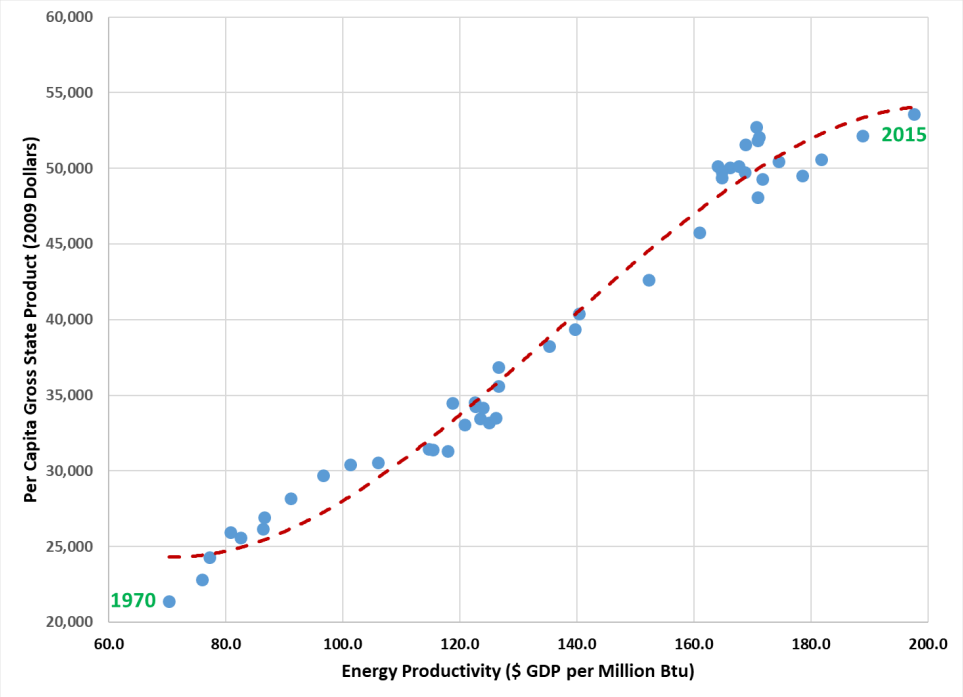
CLEAN ENERGY ECONOMICS 1

How Energy Productivity Drives Colorado's Economy

Most business and policy leaders think of energy efficiency as a good thing to pursue in order to save a few dollars on utility bills or gasoline purchases. However, emerging research indicates that a shift to energy efficiency has far more fundamental, society-wide benefits – so much so that speeding the transition should be an important part of economic and public policy goals.

A new analysis of Colorado data reveals that increased energy efficiency has been a significant driver of the state's economic development for at least the past four decades. The chart below tracks the state's economic output against its energy productivity – that is, the amount of economic output per unit of energy. The story it tells is clear and compelling: steadily increasing energy productivity has gone hand in hand with economic growth.

Exploring the Link between Energy Productivity and Colorado's Economy



Source: Economic and Human Dimensions Research Associates using the National Income and Product Accounts for Colorado published by Woods and Poole (2017) and from the U.S. Energy Information Administration (2018).

Clean Energy Economy for the Region (CLEER) works to accelerate the transition to a clean energy economy, increase energy independence, and reduce our contribution to climate change.

(970) 704-9200 | POST OFFICE BOX 428 | CARBONDALE, CO 81623
www.CleanEnergyEconomy.net

In 1970, Colorado's 2.2 million people each consumed the equivalent of 89,000 kilowatt-hours (kWh) annually to power its $48 billion economy. This included energy for all homes and offices as well as for industry and transportation. By 2015, 5.5 million Coloradans were using less energy – the equivalent of only 79,500 kWh equivalent per person – even as the economy was six times larger[1]. Correcting for population and inflation, energy productivity increased 280 percent, while per-capita economic output increased 245 percent. In short, the many forms of energy efficiency greatly helped expand the state's economic productivity.

On the flip side, the *inefficient* use of resources – materials, food, water, and especially energy – has been shown to result in an array of costs that constrain the economy. One recent journal article (Laitner 2015), for example, suggests that of all the energy consumed within the United States in 2010, only 14 percent was converted into the production of goods and services. In other words, 86 percent was wasted! Such massive waste is a drag on the economy, but also an economic development opportunity.

The concept of energy productivity adds to our understanding of economics, and is useful in weighing policy options. Most people understand that labor productivity is a major factor in GDP (Gross Domestic Product), the most common measure of economic wellbeing; the data suggests that the same is true for energy productivity.

Bottom line: Energy efficiency isn't just a feel-good measure, it's a strategic investment. We in Colorado can build a more resilient, robust and sustainable economy with a net increase in jobs, but to do so we'll need to make energy efficiency a key component of our economic development strategies.

References

[EIA] Energy Information Administration. 2018. Colorado State Energy Profile. Washington, DC: U.S. Department of Energy. http://www.eia.gov/state/data.cfm?sid=CO. Accessed January 8, 2018.

Laitner, John A. "Skip". 2015. Linking energy efficiency to economic productivity: recommendations for improving the robustness of the U.S. economy. *WIREs Energy Environ.* May/June 2015, Volume 4, 235–252. http://wires.wiley.com/WileyCDA/WiresArticle/wisId-WENE135.html. Accessed January 8, 2018.

[Woods & Poole] Woods & Poole Economics, Inc. 2017. State and County Forecasts to 2050. Washington, DC. https://www.woodsandpoole.com/index.php. Accessed January 11, 2018.

[1] Colorado's economic activity consumed a total of 677.7 trillion BTUs in 1970. As indicated, this supported both residential and commercial buildings as well as industrial and transportation energy services. All energy carriers, whether electricity, natural gas, coal, petroleum or renewable and nuclear energy resources, can be converted to heat values, or British Thermal Units (BTUs). According to the EIA, there are approximately 3,412 BTUs of heat value in a kilowatt-hour of electricity. A straightforward calculation of 677.7×10^{12} divided by the heat content of electricity suggests that total energy consumed in 1970 was an equivalent of 198.6 billion kWh. That number divided by the 2.2 million persons residing in Colorado in 1970 results in a rounded per capita energy consumption of 89,141 kWh. A similar set of calculations for 2015 suggests that per capita energy use dropped to just 79,504 kWh in that year.