



ENERGY EFFICIENCY IN THE SOUTH

APPENDIX G

STATE PROFILES OF ENERGY EFFICIENCY OPPORTUNITIES IN THE SOUTH: WEST VIRGINIA

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April 13, 2010

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Energy Efficiency in the South: The Energy Efficiency Opportunity Profile for West Virginia¹

The economic recession, climate change concerns and rising electricity costs have motivated many states to embrace energy efficiency as a way to create new local jobs, lower energy bills and promote environmental sustainability. With this surge of interest in energy efficiency, policymakers are asking: “how much energy can be saved?” This profile addresses the opportunity for energy efficiency improvements in the residential, commercial and industrial sectors of West Virginia. It draws on the results of a study of *Energy Efficiency in the South* conducted by a team of researchers at the Georgia Institute of Technology and Duke University. The study presents primary and in-depth research of the potential for energy-efficiency improvements, using a modeling approach based on the EF-NEMS (National Energy Modeling System).¹

With a population of 1.8 million people,² the State represents about 0.6% of U.S. population, 0.4% of the nation’s Gross Domestic Product (GDP), and 0.8% of U.S. energy consumption (Figure 1).³ Thus, compared to the rest of the nation, West Virginia has a higher than average level of energy intensity.¹

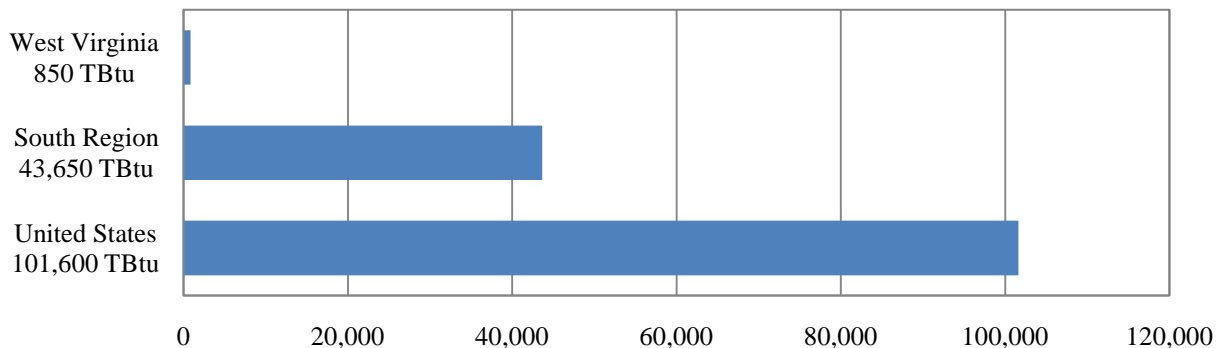


Figure 1: Energy Consumption in West Virginia, the South, and the U.S., 2007³

West Virginia’s use of industrial energy as a percentage of its overall energy consumption exceeds that of the nation and the rest of the South. On the other hand, its residential, commercial, and transportation energy consumption is lower (Figure 2). West Virginia’s per capita energy consumption is ranked 8th nationally.³

West Virginia is a net exporter of energy and consumes more coal than the rest of the nation (Figure 3). In fact, the State is the largest exporter of interstate electricity within the country.

¹ Energy intensity is the ratio of the state’s energy consumption to its Gross State Product (GSP).

West Virginia is also the second in coal production nationally and generates about 98% of its electricity from coal.⁴

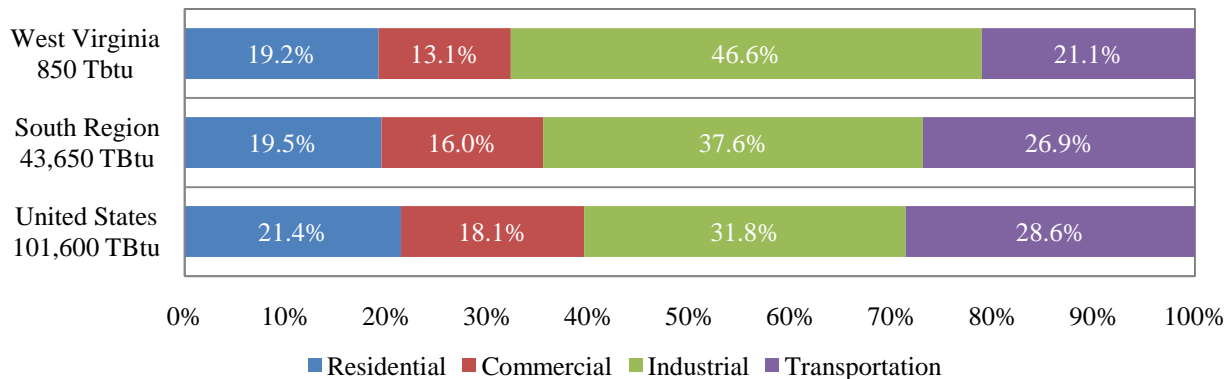


Figure 2: Energy Consumption in West Virginia, the South, and the U.S. by Sector, 2007³

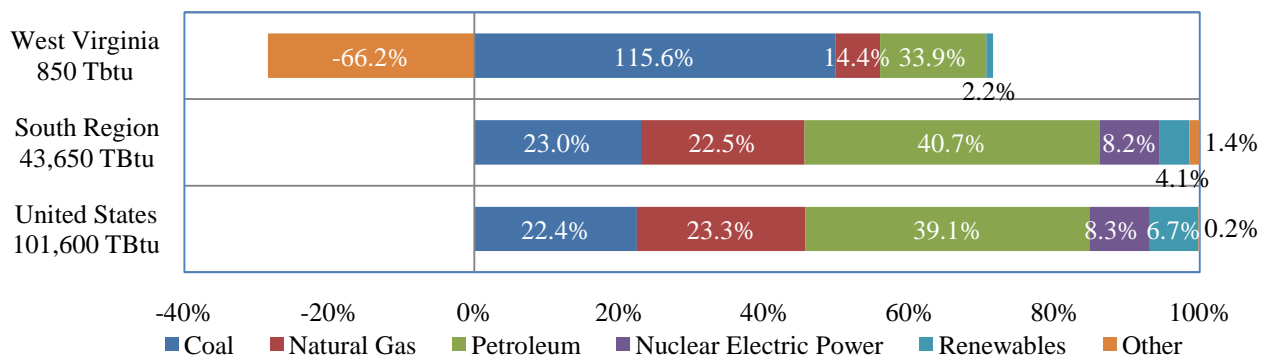


Figure 3: Energy Consumption in West Virginia, South, and U.S. by Fuel Type, 2007³

West Virginia’s “Alternative and Renewable Energy Portfolio Standard” requires 25% of retail electricity to be generated from alternative and renewable energy by 2025. Energy efficiency can meet the full requirement.⁵ West Virginia was also the first state in the country to have an Industries of the Future program, which focuses on industrial energy-efficiency and has been the model for more than 20 other such programs nationwide. Also, net metering provisions are being updated to allow industrial CHP installations to sell power back to the grid. More state initiatives are described in recent Southern States Energy Board and National Association of State Energy Officials publications.^{4, 6}

Nevertheless, the *2009 State Energy Efficiency Scorecard* from the American Council for an Energy Efficient Economy (and other studies of the State and region) suggests that additional policy initiatives could be implemented in the State to encourage households, businesses, and industries to utilize energy more effectively. Specifically, the ACEEE study rated West Virginia 45th of the 50 states and DC for its adoption and implementation of energy-efficiency policies. This score is based on the state’s performance in six energy efficiency policy areas: utility and

public benefits, transportation, building energy codes, combined heat and power, state government initiatives, and appliance efficiency standards.⁷

Chandler and Brown reviewed South Carolina’s energy-efficiency studies in the *Meta-Review of Efficiency Potential Studies and Their Implications for the South* (2009). Potential electricity savings range broadly from 10-27% from projected energy consumption in these studies. West Virginia’s overall energy-efficiency potential would be higher than this range with the implementation of all cost-effective opportunities, but the number of studies with such estimates is limited.⁸

Energy Efficiency Potential by Sector

The State’s total energy consumption (residential, commercial, industrial, and transportation sectors) is projected to increase 20% from 2010 to 2030. This profile describes the ability of nine energy policies to curb this growth in energy use by accelerating the adoption of cost-effective energy-efficient technologies in the residential, commercial, and industrial sectors of West Virginia. Altogether, these policies offer the potential to reduce West Virginia’s energy consumption by approximately 11% of the energy consumed by the State in 2007 (97 TBtu in 2030) (Figure 4). With these policies, West Virginia’s energy consumption could drop to below its 2010 levels by 2030. For complete policy descriptions, refer to *Energy Efficiency in the South* by Brown et al. (2010).

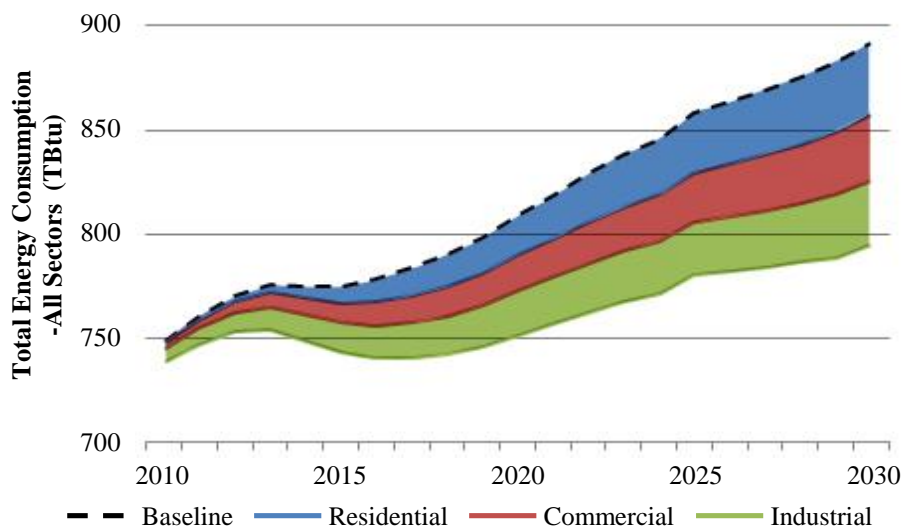


Figure 4: Energy Efficiency Potential in West Virginia

(Note: The baseline includes projected transportation sector consumption, as well as residential, commercial and industrial consumption.)

The commercial and residential sectors offer the greatest energy efficiency potential in West Virginia (Figure 5). In 2020, savings from all three sectors is about 7% (58 TBtu) of the total

energy consumed by the State in 2007. Electricity savings constitute 47 TBtu of this amount. With these policies, the electricity generated by more than one 500-MW power plant in 2020 and almost three such power plants in 2030 could be avoided.⁹

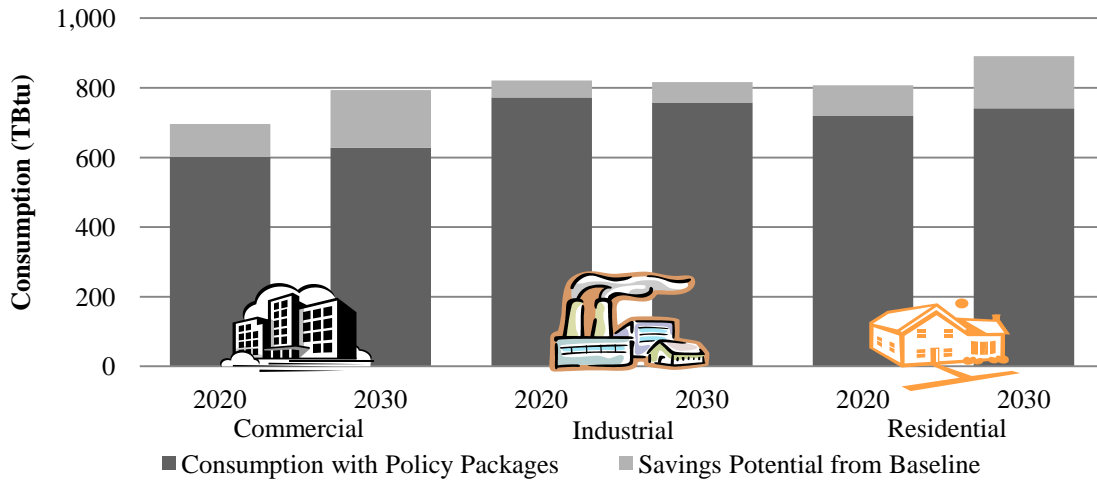


Figure 5: Energy Efficiency Potential by Sector in West Virginia, 2020 and 2030

Residential Sector

Four residential energy efficiency policies were examined: more stringent building codes with third party verification, improved appliance standards and incentives, an expanded Weatherization Assistance Program, and retrofit incentives with increased equipment standards. Their implementation could reduce West Virginia’s projected residential consumption by about 11% (19 TBtu) in 2020 and 17% (34 TBtu) in 2030 (Figure 6).

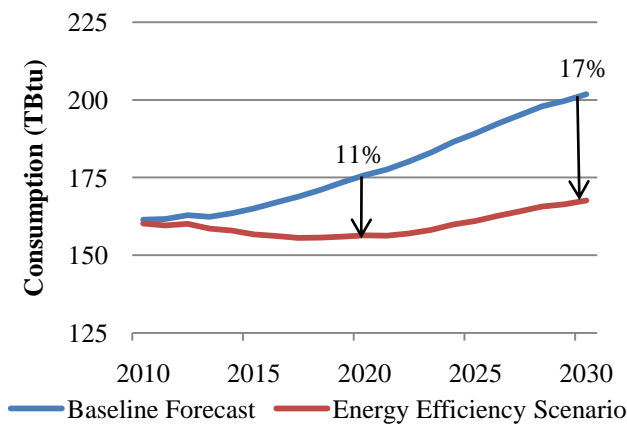


Figure 6: Residential Sector Savings

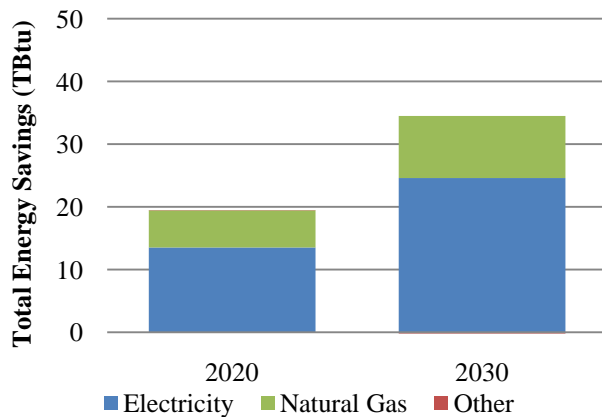


Figure 7: Residential Sector Savings by Fuel Type

In 2020, the residential energy required by about 88,200 West Virginian households could be avoided or about \$340 per household. The principal energy savings are from electricity, but

significant natural gas savings could also occur (Figure 7). With these policies, growth in residential energy consumption could be reduced over the next two decades.

Commercial Sector

The implementation of appliance standards and retrofit policies in West Virginia’s commercial sector could reduce projected energy consumption in 2020 by approximately 13%, and by 20% in 2030 (Figure 8). In 2020, the commercial sector could save about 17 TBtu , which is equivalent to the amount of energy that 490 Wal-Mart stores spend a year. Each business in West Virginia could save \$65,400 on average.¹⁰ The principal energy savings are from electricity, with significant natural gas savings (Figure 9). The rapid growth of commercial energy consumption forecast for West Virginia could be constrained to modest growth with these two energy efficiency policies.

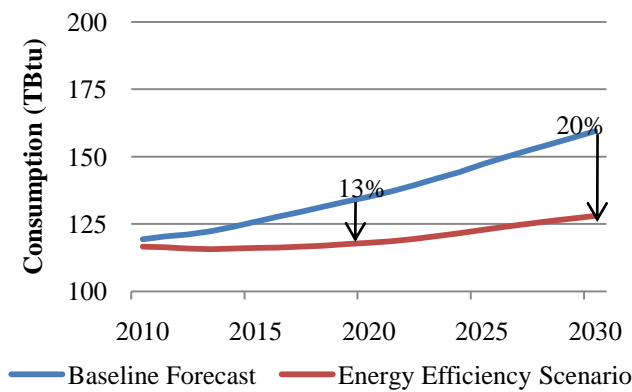


Figure 8: Commercial Sector Savings

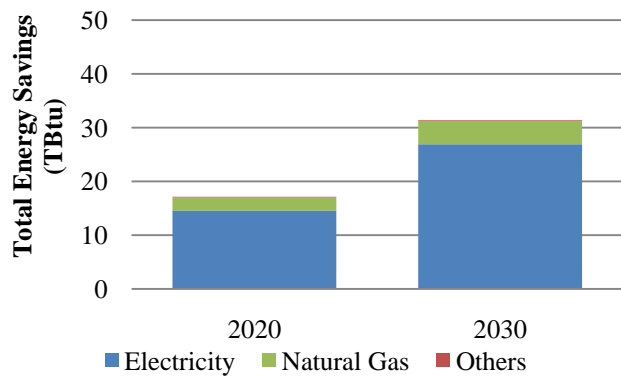


Figure 9: Commercial Sector Savings by Fuel Type

Industrial Sector

The implementation of plant utility upgrades, process improvements, and combined heat and power policies in West Virginia’s industrial sector can reduce projected consumption by about 10% (21 TBtu) in 2020 and 15% (31 TBtu) in 2030 (Figure 10). The industrial energy required by about 31 average industrial facilities is avoided in 2020, or about \$115,000 per industrial facility. The principal energy savings are from electricity and natural gas (Figure 11). These three energy efficiency policies could significantly reduce the growing consumption of industrial energy over the next two decades.

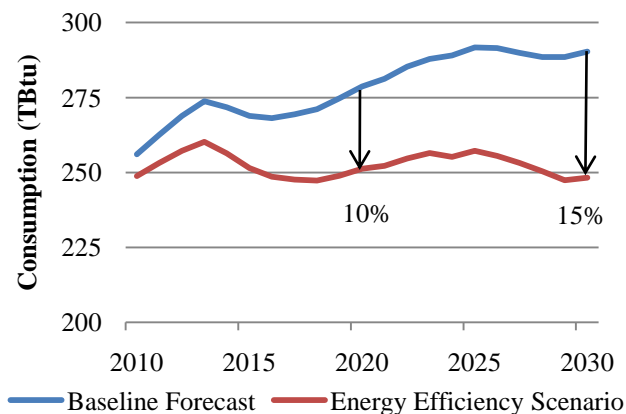


Figure 10: Industrial Sector Savings

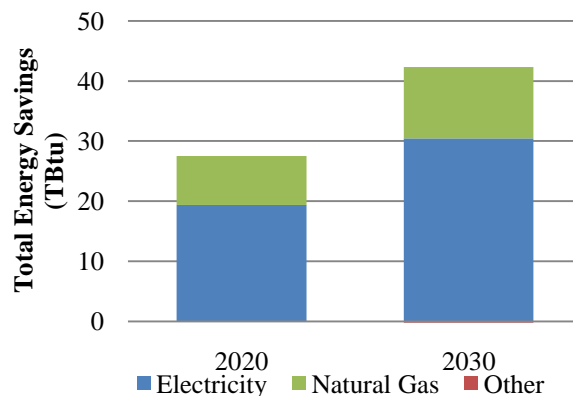


Figure 11: Industrial Sector Savings by Fuel Type

Efficient Technology Opportunities

The projected energy efficiency potential can be realized through an array of new and existing technologies. *Energy Efficiency in the South* enumerates a number of these.

Emerging residential products can provide greater energy savings without sacrificing performance. For instance, currently available heat pump water heaters can cut annual energy costs for water heating up to 62%.¹¹

Opportunities for commercial energy efficiency may be obtained through technologies like the geothermal heat pump (ground-source heat pump), which can reduce energy consumption by up to 44% when compared to air-source heat pumps and by up to 72% when compared to electric resistance heating with standard air-conditioning equipment. Though the installation cost is higher, the long lifetime of 20-25 years ensures energy bill saving benefits over time.¹²

Super boilers, which represent over 95 percent fuel-to-steam efficiency, can be implemented in the industrial sector. This technology is able to improve heat transfer through the use of advanced firetubes with extended surfaces that help achieve a compact design through reducing size, weight, and footprint. The advanced heat recovery system combines compact economizers, a humidifying air heater, and a patented transport membrane condenser.¹³

These technologies are illustrative. Please refer to *Energy Efficiency in the South* by Brown et al. for additional technology descriptions and examples.

Economic and Financial Impacts

The nine energy efficiency policies evaluated in *Energy Efficiency in the South* could reduce energy costs for West Virginia consumers and could generate jobs in the State (Table 1). Residential, commercial and industrial consumers could benefit from total energy savings of \$0.9

billion in 2020 (\$0.5 billion of which is specific to electricity), and \$1.6 billion in total energy savings in 2030. In comparison, West Virginia spent \$1.8 billion on electricity in 2007.¹⁴

Using an input-output calculation method from ACEEE – with state-specific impact coefficients and accounting for declines in employment in the electricity and natural gas sectors – we estimated that West Virginia would experience a net gain of 5,000 jobs in 2020, growing to 6,700 in 2030. In comparison, there were 70,600 unemployed residents of West Virginia at the end of 2009.¹⁵

While the South's economy would grow more rapidly as a result of the energy-efficiency policies, Kentucky's Gross State Product would grow by \$12 million less in 2020, and by \$28 million less in 2030. This change is a small fraction of the West Virginia's \$45 billion economy; the loss is due to the lower-than-average economic multiplier associated with energy-efficiency manufacturing and construction activities in West Virginia.¹⁶

Table 1: Economic and Employment Impacts of Energy Efficiency

Indicator	2020	2030
Public Sector Policy Financial Incentives (in million \$2007)	193	299
Private Sector/Household Productive Investment (in million \$2007)	92	105
Change in Electricity Costs (in million \$2007)	-492	-931
Change in Natural Gas Costs (in million \$2007)	-\$92	-\$137
Annual Increased Employment (ACEEE Calculator)	5,000	6,700
Change in Gross State Product (in million \$2007)	-12	-28

Conclusions

The energy efficiency policies described in this report could set West Virginia on a course toward a more sustainable and prosperous energy future. If utilized effectively, the State's substantial energy-efficiency resources could reverse the long-term trend of ever-expanding energy consumption. With a sustained and concerted effort to use energy more wisely, West Virginia could create new job opportunities and reduce its environmental footprint.

For more information on the methodology and results for the South, please see *Energy Efficiency in the South* by Brown et al.¹

Acknowledgements

This study project is funded with support from the Energy Foundation (www.ef.org), the Kresge Foundation (www.kresge.org) and the Turner Foundation (www.turnerfoundation.org). The support of these three foundations is greatly appreciated.

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