



ENERGY EFFICIENCY IN THE SOUTH

APPENDIX G

STATE PROFILES OF ENERGY EFFICIENCY OPPORTUNITIES IN THE SOUTH: KENTUCKY

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A Profile of Energy-Efficiency Opportunities in Kentucky

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 characterizes the opportunity for cost-effective energy-efficiency improvements in the residential, commercial and industrial sectors of Kentucky. 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 SNUG-NEMS (National Energy Modeling System).¹

With a population of 4.3 million people², the State represents about 1.5% of the U.S. population, 1.2% of the nation’s Gross Domestic Product (GDP), and 2% of U.S. energy consumption³ (Figure 1). Thus, compared to the rest of the nation, Kentucky has a higher-than-average level of energy intensity (that is, it consumes more energy per dollar of economic activity than most other states).

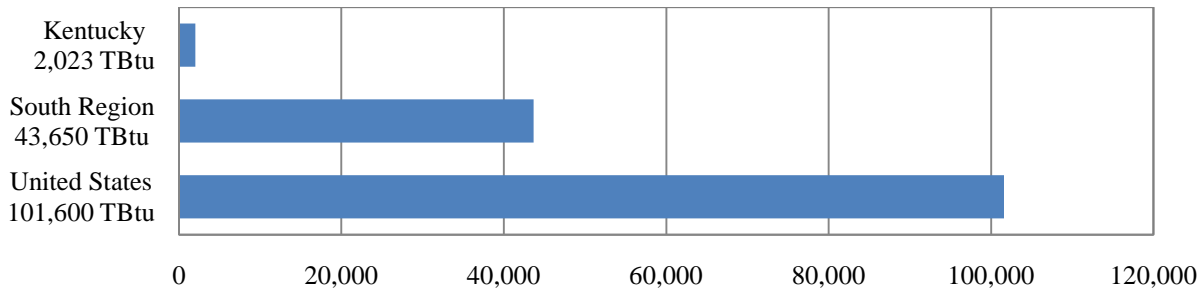


Figure 1: Energy Consumption in Kentucky, the South, and the U.S., 2007

While Kentucky’s consumption of industrial energy as a percentage of its overall energy use exceeds that of the nation and the rest of the South, its residential, commercial, and transportation energy consumption is lower (Figure 2). Much of Kentucky’s energy is used in its aluminum and petroleum industries. In addition, Kentucky ranks third in the Nation in the production of coal.

Kentucky also consumes more coal than most other states in the South. The State’s power mix is dominated by coal-generated electricity, with 93% of the State’s electricity coming from coal sources. On the other hand, it consumes relatively less natural gas, petroleum, nuclear, and renewable energy (Figure 3). Kentucky spent 1.5% of its primary energy to generate electricity to sell to adjacent states in 2007.

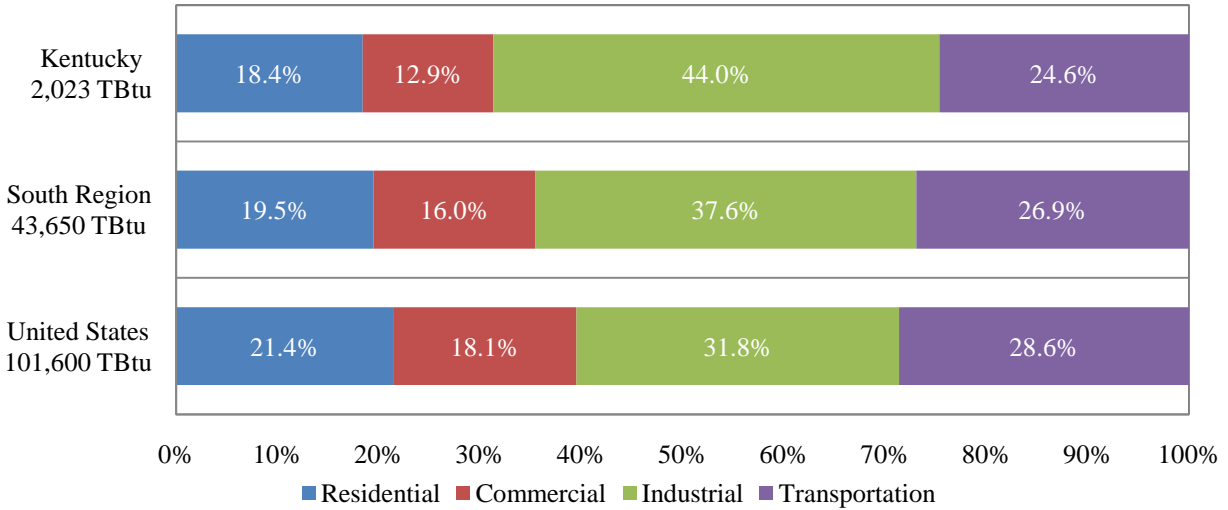


Figure 2: Energy Consumption in Kentucky, the South, and the U.S. by Sector, 2007

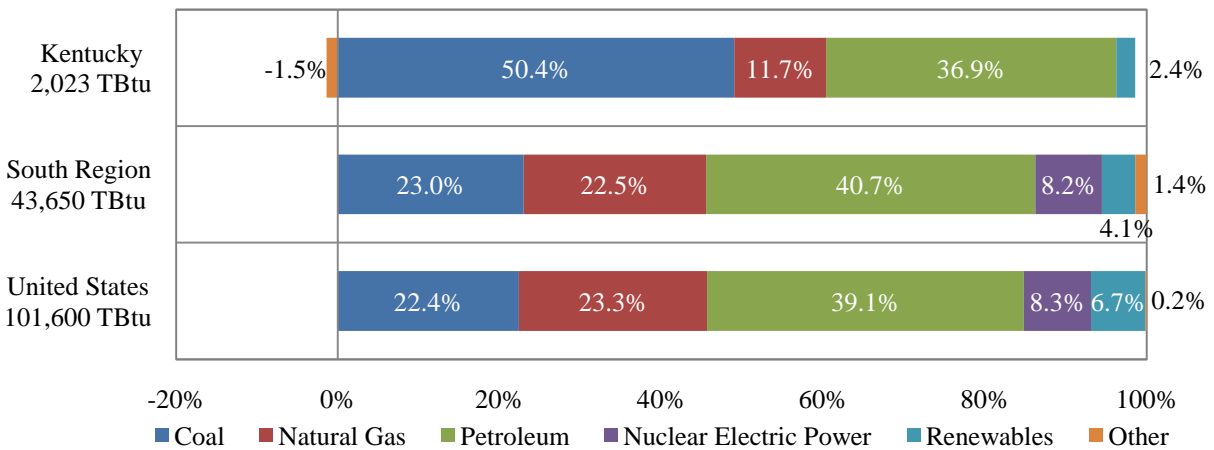


Figure 3: Energy Consumption in Kentucky, the South, and the U.S. by Fuel Type, 2007

Kentucky already has a number of energy efficiency policies in place. For example, the State supports the ENERGY STAR program to save energy and protect the environment through partnerships between private and public sectors. In 2009, Kentucky began providing a tax credit up to \$800 for ENERGY STAR qualified homes. In addition, the Kentucky Pollution Prevention Center offers energy assessment and technology services to Kentucky’s businesses and industries. In 2008, the center conducted 54 assessments that identified over \$218,000 in potential annual savings. The State’s recently released Energy Strategy sets a goal for state-supported facilities to reduce energy consumption by 25% as compared to the 2009 baseline, and unveiled an Energy Strategic Plan including a Renewable and Efficiency Portfolio Standard and an Alternative Transportation Fuels Standard.^{4, 5}

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 are needed in the State to encourage households, businesses, and industries to utilize energy more effectively. Specifically, the ACEEE study rated Kentucky 33th 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.⁶

In the *Meta-Review of Efficiency Potential Studies and Their Implications for the South*, Chandler and Brown (2009) reviewed six energy-efficiency studies that covered Kentucky. According to this meta-review, estimates of "maximum achievable" potential electricity savings range from 8-27% of projected energy consumption in 2020. Kentucky's 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.⁷

Energy Efficiency Potential by Sector

The State's total energy consumption (residential, commercial, industrial and, transportation sectors) is projected to increase 5% from 2010 to 2030. This profile describes the ability of nine energy policies to accelerate the adoption of cost-effective energy-efficient technologies in the residential, commercial, and industrial sectors of Kentucky. Altogether, these policies offer the potential to reduce Kentucky's energy consumption by approximately 11% of the energy consumed by the State in 2007 (220 TBtu in 2030) (Figure 4). With these policies, Kentucky'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).

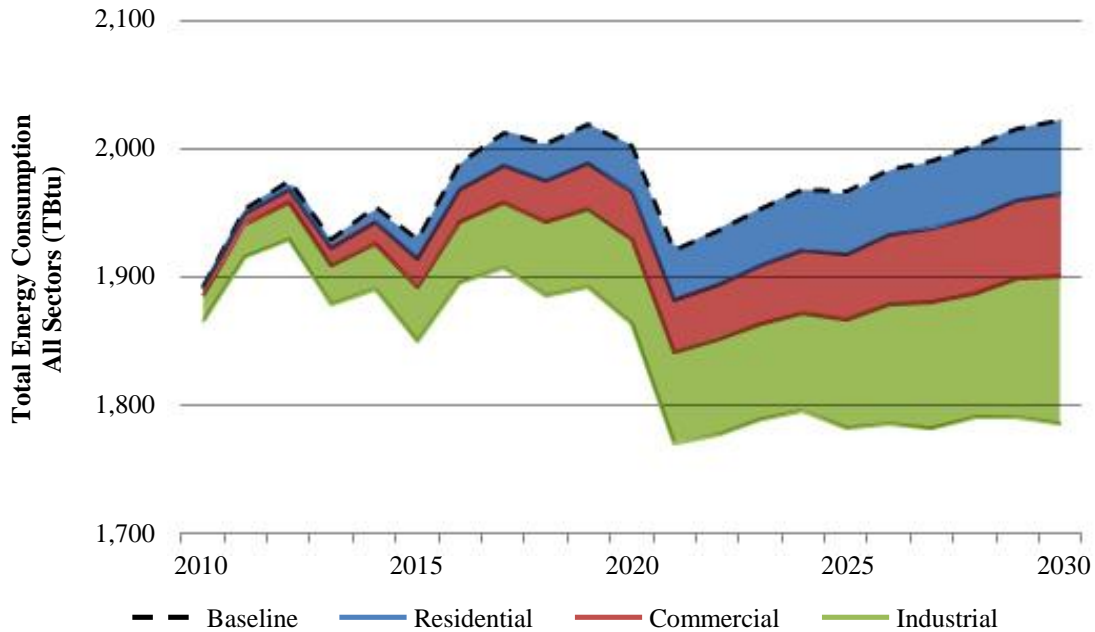


Figure 4: Energy Efficiency Potential in Kentucky¹⁶

The commercial and residential sectors offer the greatest energy efficiency potential in Kentucky (Figure 5). In 2020, savings from all three sectors is about 7% of the total energy consumed by the State in 2007 (140 TBTu). The energy efficiency savings from the three sectors decreases the total projected consumption for the state by 7% in 2020 and 11% in 2030. With these policies, the electricity generated by four 500-MW power plants in 2020 and six such power plants in 2030 could be avoided.⁸

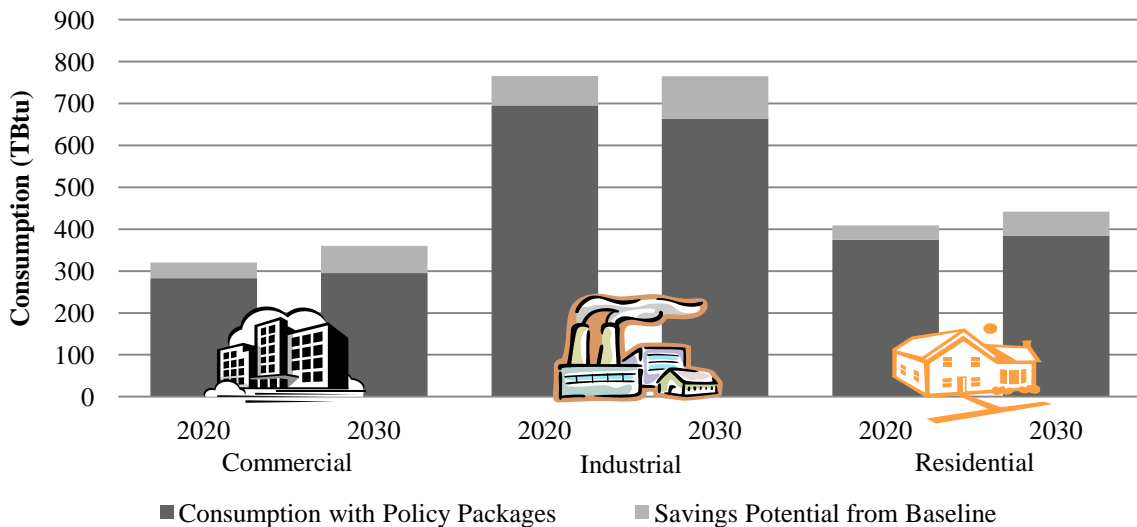


Figure 5: Energy Efficiency Potential by Sector in Kentucky, 2020 and 2030

Residential Sector

Four residential energy-efficiency policies were examined: more stringent building codes with third party verification, improved appliance standards and incentives, expanding the Weatherization Assistance Program, and retrofit incentives and increased equipment standards. Their implementation could reduce Kentucky’s projected residential consumption by about 9% (35 TBtu) in 2020 and 13% (58 TBtu) in 2030 (Figure 6).

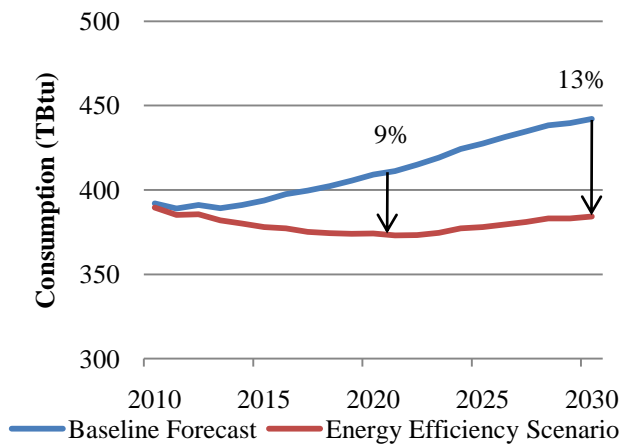


Figure 6: Residential Sector Savings

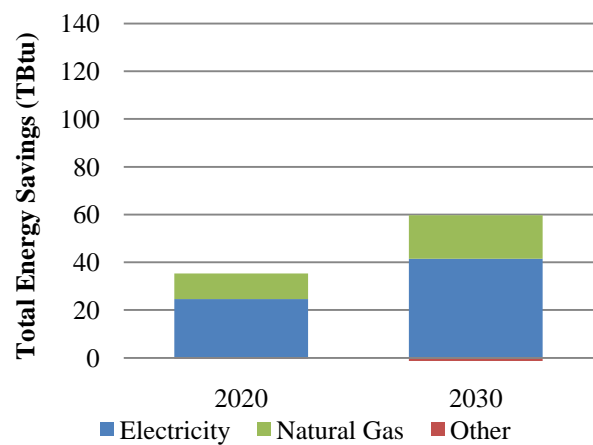


Figure 7: Residential Sector Savings by Fuel Type

In 2020, the residential energy required by about 160,000 Kentuckian households could be avoided or about \$240 per household. The principal energy savings are from electricity, but significant natural gas savings could also occur (Figure 7). With these policies, residential energy consumption could remain largely unchanged over the next two decades.

Commercial Sector

The implementation of appliance standards and retrofit policies in Kentucky’s commercial sector could reduce projected energy consumption in 2020 by about 12%, and by about 18% in 2030. In 2020, the commercial sector could save about 38 TBtu, which is equivalent to the amount of energy that 1,100 Wal-Mart stores spend a year. Each retail establishment in Kentucky could save \$18,000 on average.⁹ The principal energy savings are from electricity, with natural gas and other fuels providing additional savings (Figure 9). The rapid growth of commercial energy consumption forecast for Kentucky could be constrained to only modest growth with these two energy efficiency policies.

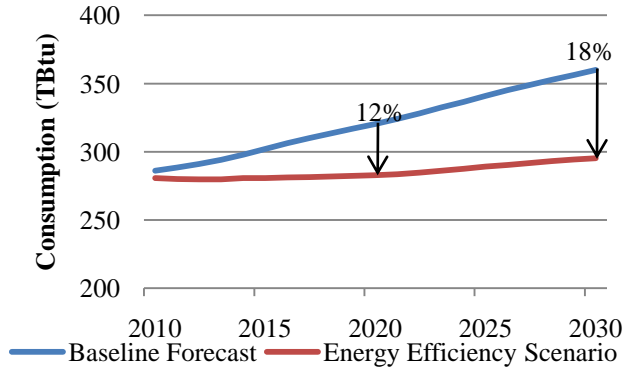


Figure 8: Commercial Sector Savings

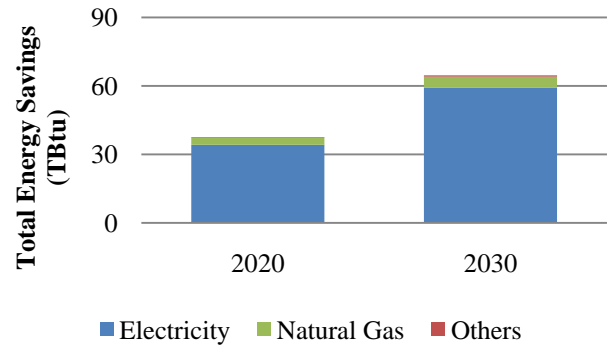


Figure 9: Commercial Sector Savings by Fuel Type

Industrial Sector

The implementation of plant utility upgrades, process improvements, and combined heat and power policies in Kentucky’s industrial sector can reduce projected consumption by about 9% (70 TBtu) in 2020 and 13% (102 TBtu) in 2030 (Figure 10). The industrial energy required by approximately 100 average industrial facilities is avoided in 2020, or around \$127,000 per industrial facility. The principal energy savings are from electricity, but significant natural gas savings could also occur, especially in 2020 (Figure 11). These three energy efficiency policies could significantly reduce the growing consumption of industrial energy over the next two decades and drop the state’s consumption to below its 2010 levels.

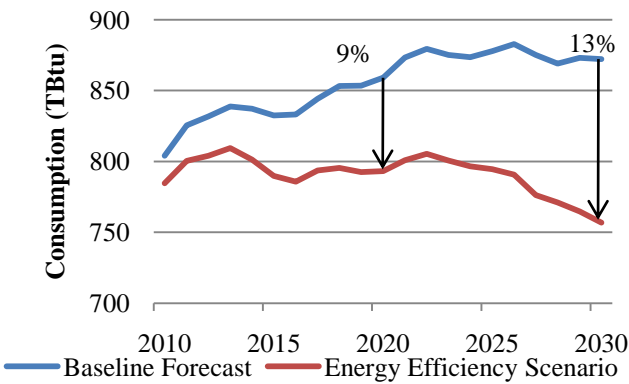


Figure 10: Industrial Sector Savings

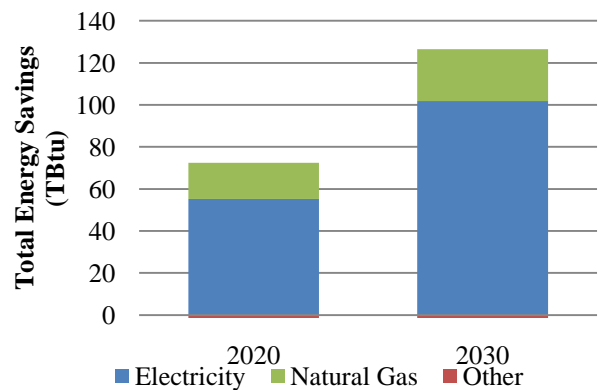


Figure 11: Industrial Sector Savings by Fuel Type

Efficient Technology Opportunities

The projected energy-efficiency potential can be realized through an array of new and existing technologies. *Energy Efficiency in the South* describes a number of these.¹⁰

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 from 62% and pay back upfront costs within three years.

Opportunities for commercial energy efficiency may be obtained through technologies like the geothermal heat pump (ground-source heat pump), which normally has higher energy efficiency than air-source heat pumps. It 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.¹¹

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.¹²

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* would reduce energy costs for Kentucky consumers and would generate jobs in the State (Table 1). Residential, commercial and industrial consumers could benefit from total energy savings of \$1.2 billion in 2020 (\$0.8 billion of which is specific to electricity), and \$2.2 billion in total energy savings in 2030. In comparison, the State spent \$5.3 billion on electricity in 2007.¹³

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 Kentucky would experience a net gain of 10,600 jobs in 2020, growing to 14,300 in 2030. In comparison, there were 219,700 unemployed Kentuckians at the end of 2009.¹⁴

As is true for the South at large, the policies would also lead to an increase in Kentucky's economic activity. Specifically, its Gross State Product would increase by an estimated \$17 million in 2020 and \$52 million in 2030. This change is a small fraction of the Kentucky's \$152 billion economy.¹⁵

Table 1: Economic and Employment Impacts of Energy Efficiency

Indicator	2020	2030
Public Sector Policy Financial Incentives (in million \$2007)	338	521
Private Sector/Household Productive Investment (in million \$2007)	330	349
Change in Electricity Costs (in million \$2007)	-825	-1,496
Change in Natural Gas Costs (in million \$2007)	-358	-628
Annual Increased Employment (ACEEE Calculator)	10,600	14,300
Change in Gross State Product (in million \$2007)	17	52

Conclusions

The energy efficiency policies described in this profile could set Kentucky 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, Kentucky could grow its economy, create new job opportunities, and reduce its environmental footprint.

For more information on the methodology used to derive this state profile, please see *Energy Efficiency in the South*.

Acknowledgements

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