



ENERGY EFFICIENCY IN THE SOUTH

APPENDIX G

STATE PROFILES OF ENERGY EFFICIENCY OPPORTUNITIES IN THE SOUTH: OKLAHOMA

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A Profile of Energy-Efficiency Opportunities in Oklahoma

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 Oklahoma. 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 about 3.6 million people,² Oklahoma represents about 1.2% of U.S. population, 0.9% of the nation’s GDP, and 1.6% of U.S. energy consumption (Figure 1). Thus, compared to the rest of the nation, Oklahoma has a higher-than-average level of energy intensity (i.e., it consumes more energy per dollar of economic activity).

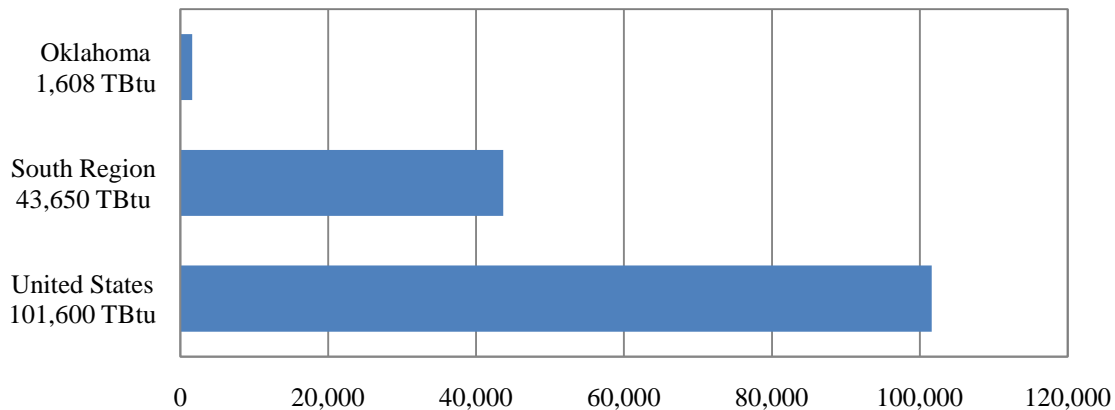


Figure 1: Energy Consumption in Oklahoma, the South, and the U.S., 2007³

Oklahoma’s industry energy consumption as a percentage of its overall energy consumption exceeds that of the nation (Figure 2). However, its residential and commercial energy consumptions are lower (Figure 2). This contributes to Oklahoma’s high per capita energy consumption, ranking 11th nationally.⁴ Oklahoma is rich natural gas and crude oil and the state’s economy relies heavily on its oil and gas industry.

The state consumes more natural gas fuel than the nation with energy consumption focused in the industry sector (Figure 3). Oklahoma’s electricity is largely generated from coal (54%) and

natural gas (42%).⁴ The state spent 6.7 percent of its primary energy to generate electricity to be sold to adjacent states in 2007.

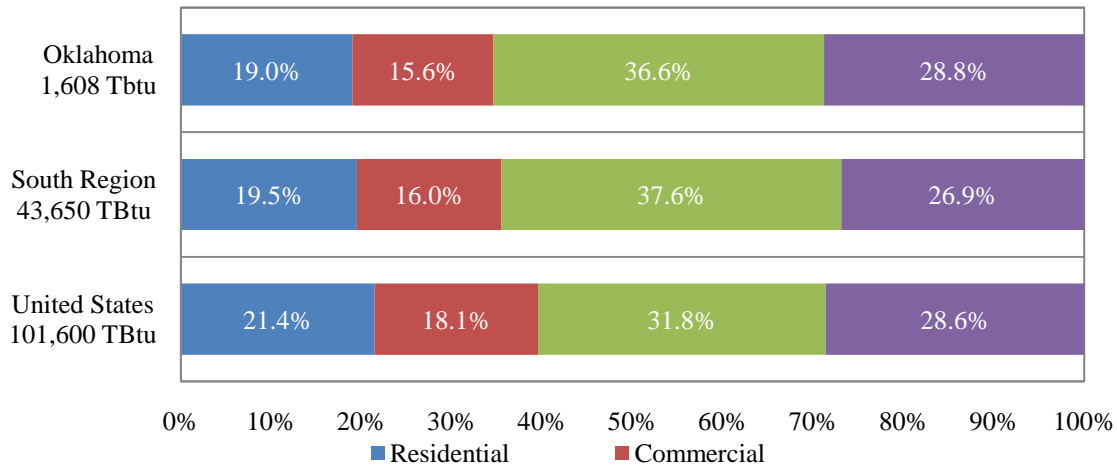


Figure 2: Energy Consumption in Oklahoma, the South, and the U.S. by Sector, 2007⁴

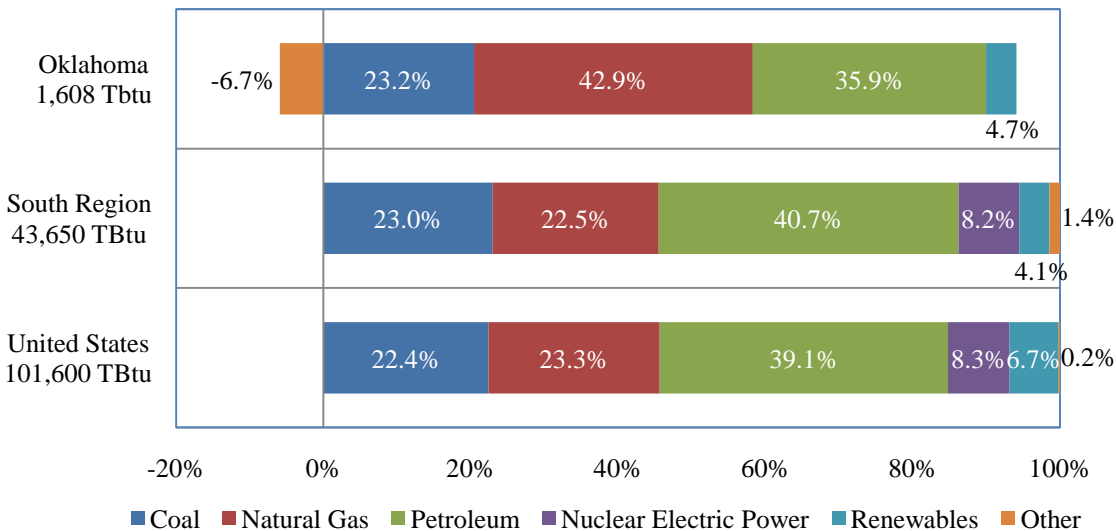


Figure 3: Energy Consumption in Oklahoma, the South, and the U.S. by Fuel Type, 2007⁴

Oklahoma has a number of energy efficiency policies already in place. For instance, it has a State Energy Office to provide information, training and technical assistance to increase energy efficiency and the use of renewable resources. For public building constructions and renovation projects, the state has energy standards to develop a high-performance certification program. The state also offers loan funds for schools and local governments to improve energy efficiency, tax credits for small wind turbine manufactures and zero-emission electricity producers. Utilities in Oklahoma actively participate in promoting energy-efficiency and demand response programs.^{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 Oklahoma 39th 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

Chandler and Brown reviewed Oklahoma's energy-efficiency studies in the *Meta-Review of Efficiency Potential Studies and Their Implications for the South* (2009). Energy savings range from 8-47% from projected energy consumption under a maximum pursuit of achievable savings in these studies.⁷ Oklahoma'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.

Energy Efficiency Potential by Sector

The State's total energy consumption (residential, commercial, industrial, and transportation sectors) is projected to stay unchanged in 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 Oklahoma. Altogether, these policies offer the potential to reduce Oklahoma's energy consumption by approximately 16% of the energy consumed by the State in 2007 (258 TBtu in 2030) (Figure 4). With these policies, Oklahoma's energy consumption could drop significantly below the 2010 level. For complete policy descriptions, refer to *Energy Efficiency in the South* by Brown et al. (2010).

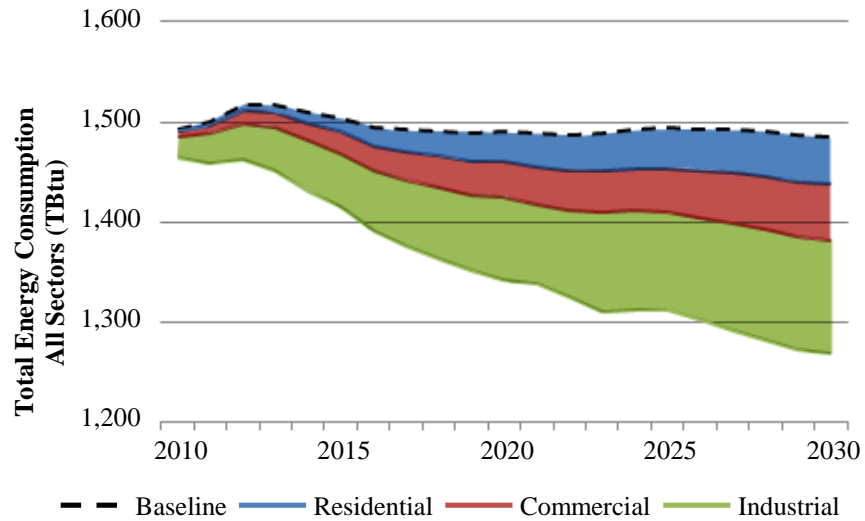


Figure 4: Energy Efficiency Potential in Oklahoma

The industry sector offers the greatest energy efficiency potential in Oklahoma (Figure 5). In 2020, savings from all three sectors is about 11% (170 TBtu) of the total energy consumed by the State in 2007. Electricity savings constitute 96 TBtu of this amount. With these policies, the generation of electricity from the equivalent of three 500-MW power plants in 2020 and five such power plants in 2030 could be avoided.⁸

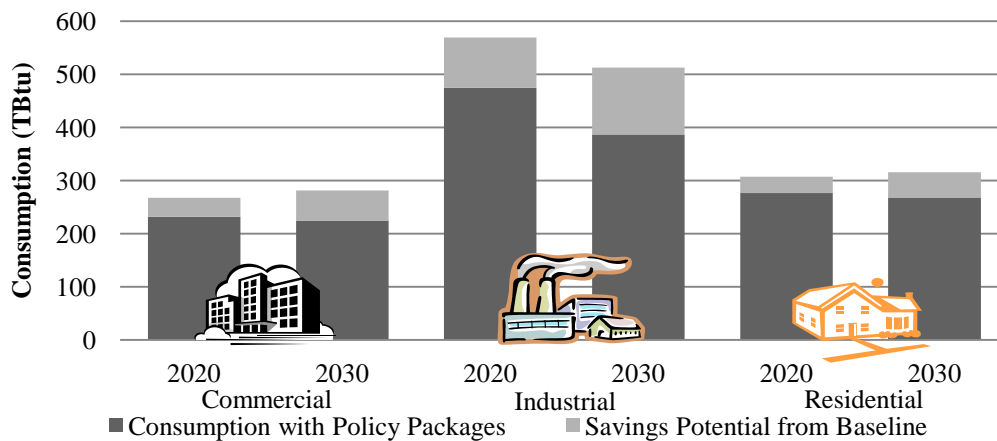


Figure 5: Energy Efficiency Potential by Sector in Oklahoma, 2020 and 2030

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 Oklahoma’s projected residential consumption by about 10% (31 TBtu) in 2020 and 15% (48 TBtu) in 2030 (Figure 6).

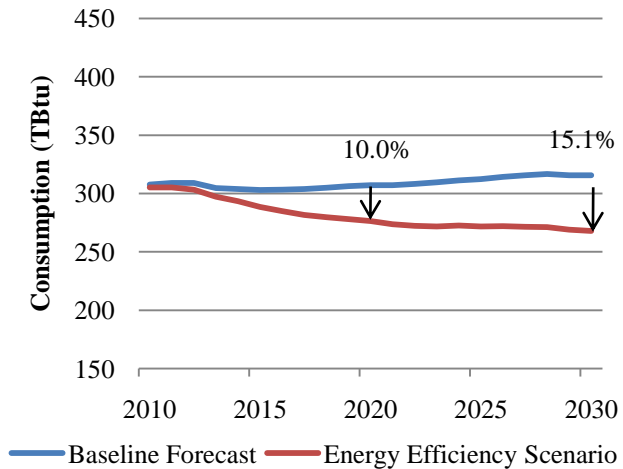


Figure 6: Residential Sector Savings

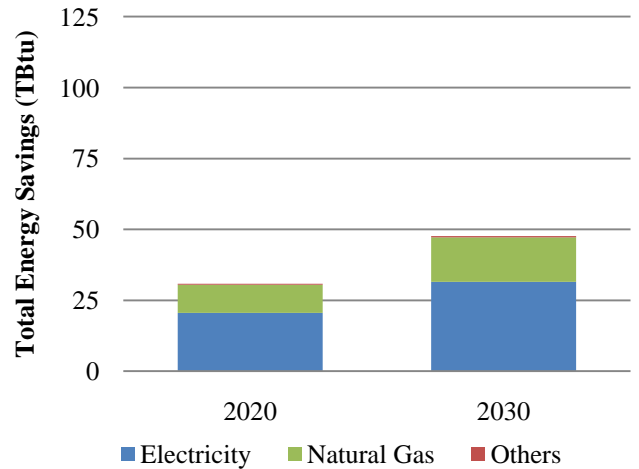


Figure 7: Residential Sector Savings by Fuel Type

The principal energy savings are from electricity, but significant natural gas savings could also occur (Figure 7). In 2020, the residential energy required by about 140,000 Oklahoma households could be avoided or annual energy bill savings of \$300 per household.

Commercial Sector

The implementation of appliance standards and retrofit policies in Oklahoma’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 36 TBtu, which is equivalent to the amount of energy that 1,000 Wal-Mart stores spend a year. Each business in Oklahoma could save \$27,000 on average.

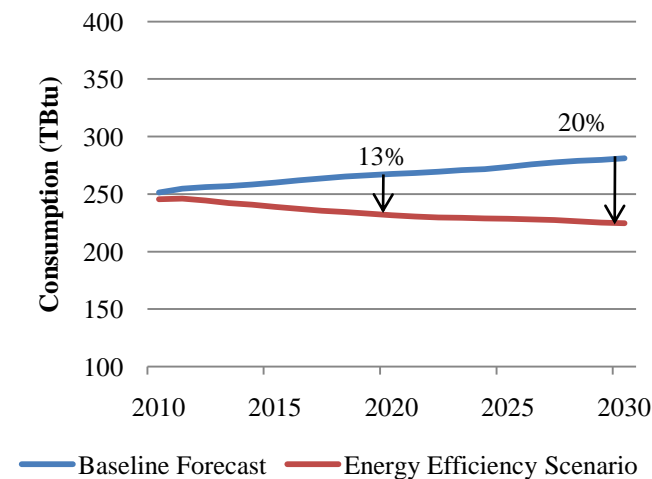


Figure 8: Commercial Sector Savings

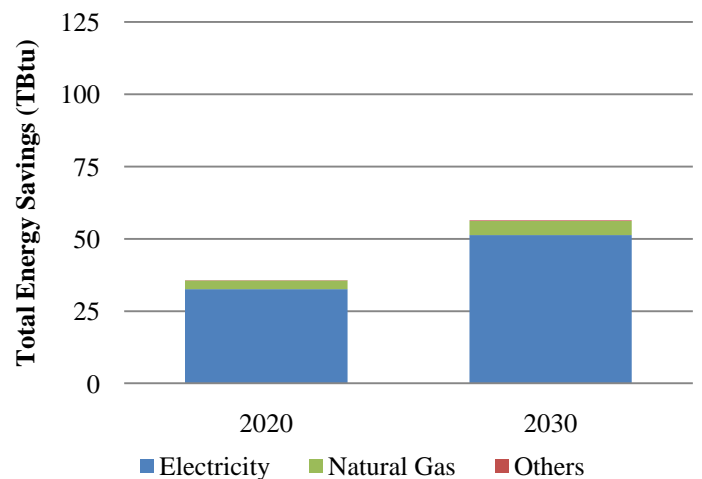


Figure 9: Commercial Sector Savings by Fuel Type

Industrial Sector

The implementation of plant utility upgrades, process improvements, and combined heat and power policies in Oklahoma's industrial sector can reduce projected consumption by about 18% (103 TBtu) in 2020 and 30% (154 TBtu) in 2030 (Figure 10). The industrial energy required by about 148 average industrial facilities is avoided in 2020, or about \$173,000 in annual energy savings per industrial facility. The principal energy savings are from natural gas, but significant electricity savings could also occur (Figure 11). These three energy efficiency policies could significantly reduce the consumption of industrial energy over the next two decades.

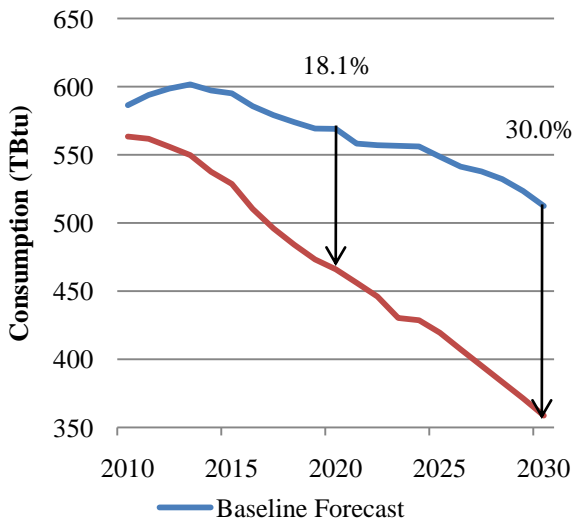


Figure 11: Industrial Sector Savings

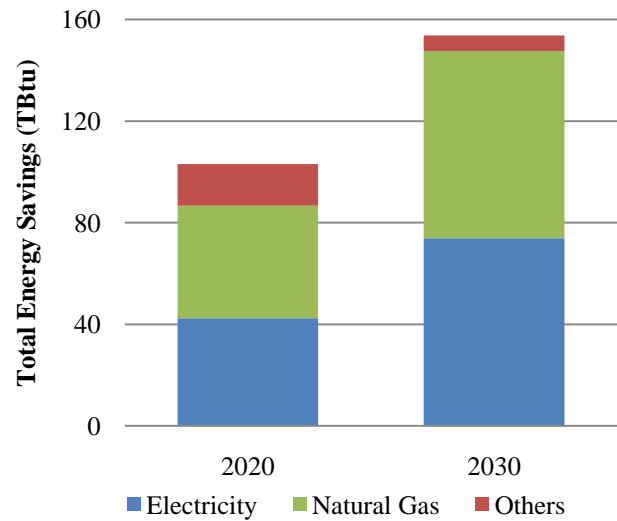


Figure 12: Industrial Sector Savings by Fuel Type

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.

New residential products can provide greater energy savings without sacrificing performance. For instance, recently available heat pump water heaters can cut annual energy costs for water heating from 50-62% and pay back initial costs within three years.⁹

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 savings.¹⁰

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 fire tubes 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.¹¹

These technologies are illustrative. Please refer to *Energy Efficiency in the South* 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 Oklahoma consumers and would generate jobs in the State (Table 1).

Residential, commercial and industrial consumers could benefit from total energy savings of \$1.5 billion in 2020 (\$0.7 billion of which is specific to electricity), and \$2.2 billion in total energy savings in 2030. In comparison, the State spent \$4.0 billion on electricity in 2007.¹²

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 Oklahoma would experience a net gain of 11,300 jobs in 2020, growing to 15,000 in 2030. In comparison, there were 121,400 unemployed Oklahomans at the end of 2009.¹³

While the South's economy would grow more rapidly as a result of the energy-efficiency policies, Oklahoma's Gross State Product would grow by \$64 million less in 2020, and by \$74 million less in 2030. This change is a small fraction of the State's \$136 billion economy; the loss is due to the lower-than-average economic multiplier associated with energy-efficiency manufacturing and construction activities in Oklahoma.¹⁴

Table 1: Economic and Employment Impacts of Energy Efficiency		
Indicator	2020	2030
Public Sector Policy Financial Incentives (in million \$2007)	335	468
Private Sector/Household Productive Investment (in million \$2007)	309	282
Change in Electricity Costs (in million \$2007)	-746	-1,314
Change in Natural Gas Costs (in million \$2007)	-\$340	-\$597
Annual Increased Employment (ACEEE Calculator)	11,300	15,000
Change in Gross State Product (in million \$2007)	-64	-74

Conclusions

The energy-efficiency policies described in this report could set Oklahoma 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 concerted effort to use energy more wisely, Oklahoma 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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Footnotes and References

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