



# ENERGY EFFICIENCY IN THE SOUTH

## APPENDIX G

### STATE PROFILES OF ENERGY EFFICIENCY OPPORTUNITIES IN THE SOUTH: SOUTH CAROLINA

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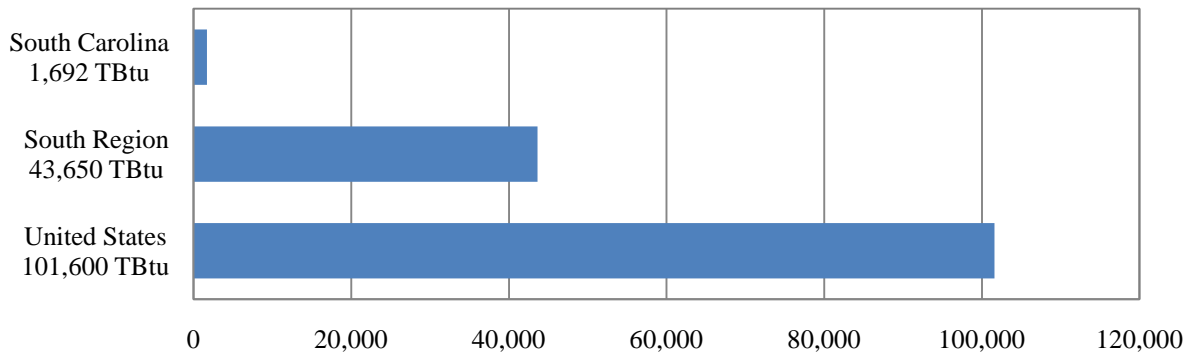
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## A Profile of Energy-Efficiency Opportunities in South Carolina

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 South Carolina’s residential, commercial and industrial sectors. 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).<sup>1</sup>

South Carolina has a population of about 4.5 million.<sup>2</sup> The population of South Carolina represents about 1.5% of the U.S. population, 1.1% of the nation’s Gross Domestic Product, and 1.7% of U.S. energy consumption (Figure 1).<sup>3</sup> Thus, compared to the rest of the nation, South Carolina has a higher than average level of energy intensity.<sup>1</sup>

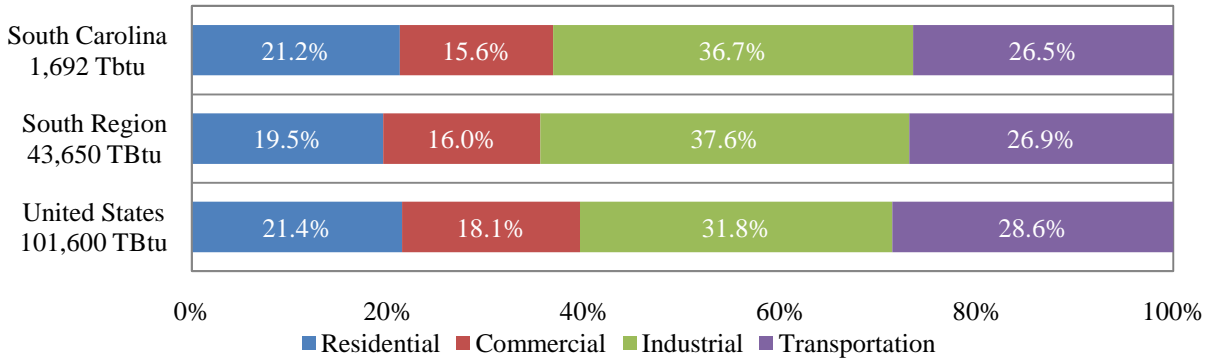


**Figure 1: South Carolina, South, and United States Energy Consumption, 2007<sup>3</sup>**

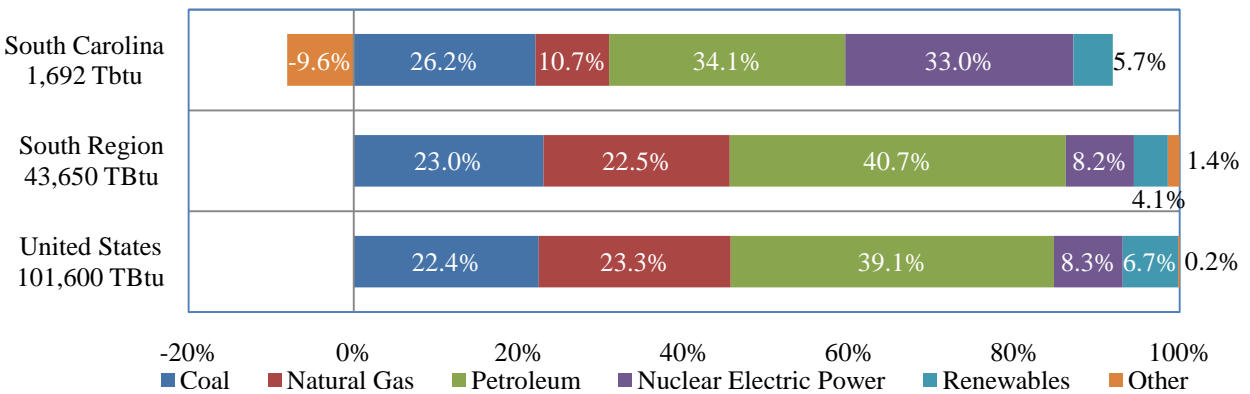
South Carolina’s use of industrial energy as a percentage of its overall energy consumption exceeds that of the nation, but this is largely true of the South as a region, which the State closely resembles. Climate and a heavy reliance on electricity for both heating and cooling needs has contributed to South Carolina’s high per capita energy consumption, ranked 17<sup>th</sup> nationally.<sup>3</sup>

The State consumes more nuclear power and relatively less natural gas than the South and the nation as a proportion of overall energy consumption. South Carolina is a net exporter of other fuels (Figure 3). The State’s electricity is largely generated from nuclear power (53%) and coal (39%), with smaller portions from natural gas (5%), hydropower (2%), and biomass (1%). South Carolina is a national leader in nuclear generation.<sup>4</sup>

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



**Figure 2: South Carolina, South, and United States Energy Consumption by Sector, 2007**



**Figure 3: South Carolina, South, and United States Energy Consumption by Fuel Type, 2007**

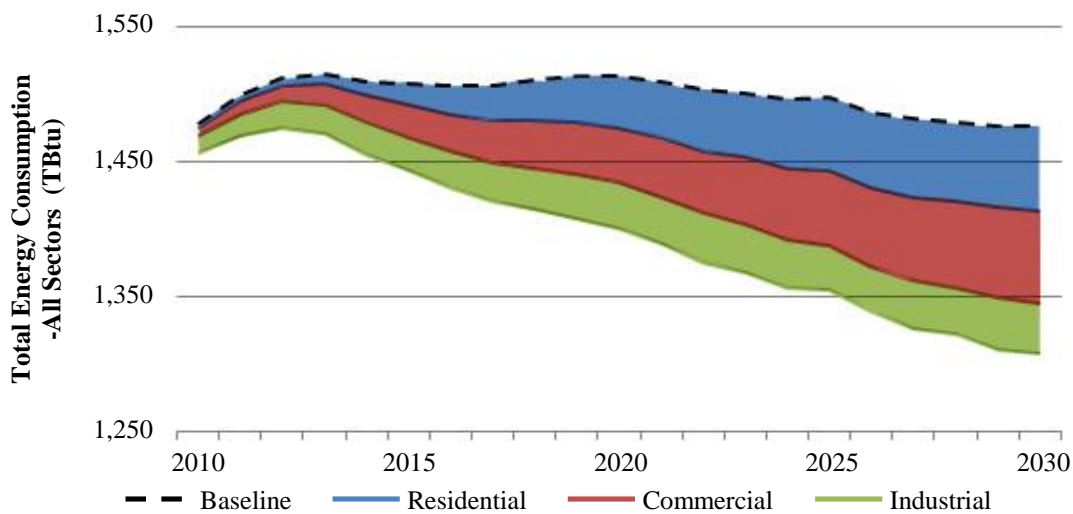
South Carolina has many energy-efficiency policies already in place. For instance, the State has passed legislation requiring many public buildings to reduce energy consumption 20% by 2020, with annual requirements and guidelines to be met along the way. The State has also supported the growth of energy-efficiency-related industries. For example, Clemson University has also recently landed \$98 million to research the next generation of wind turbines and drive trains. More state initiatives are described in recent Southern States Energy Board and National Association of State Energy Officials publications.<sup>4,5</sup>

Nevertheless, the *2009 State Energy Efficiency Scorecard* from the American Council for an Energy Efficient Economy 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 South Carolina 37<sup>th</sup> 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.<sup>6</sup>

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 8-27% from projected energy consumption in these studies.<sup>7</sup> South Carolina’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. An ACEEE study of South Carolina’s energy efficiency and water savings potential was conducted in 2010. It estimated that the State could save almost 17,000 GWh or about 18% of the projected demand for the state in 2025 through energy efficiency policies and utilities programs.<sup>8</sup>

### Energy Efficiency Potential by Sector

The State’s total energy consumption (residential, commercial, industrial, and transportation sectors) is projected to increase 6% 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 South Carolina. Altogether, these policies offer the potential to reduce South Carolina’s energy consumption by approximately 11% of the energy consumed by the State in 2007 (180 TBtu in 2030) (Figure 4). With these policies, South Carolina’s projected energy consumption could be reduced over the next two decades. For complete policy descriptions, refer to *Energy Efficiency in the South* by Brown et al. (2010).

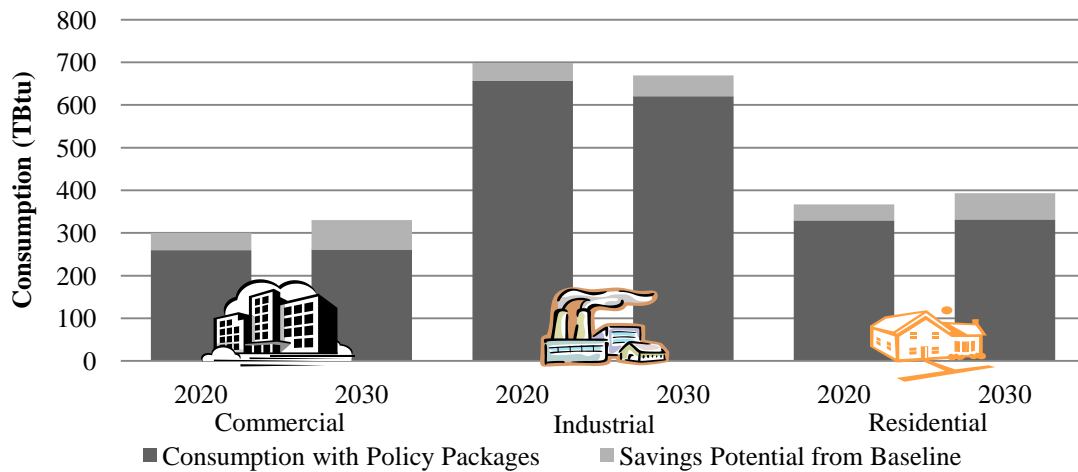


**Figure 4: Energy Efficiency Potential in South Carolina**

(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 South Carolina (Figure 5). In 2020, savings from all three sectors is about 7% (120 TBtu) the total

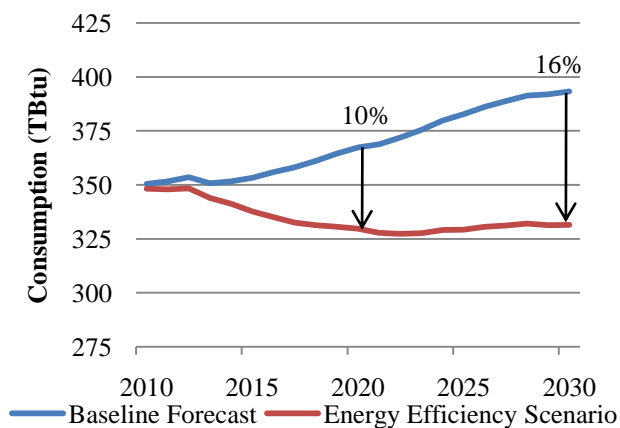
energy consumed by the State in 2007. Electricity related savings constitute 110 TBtu of this amount. With these policies, the electricity generated by three 500-MW power plants in 2020 and five such plants in 2030 could be avoided.<sup>9</sup>



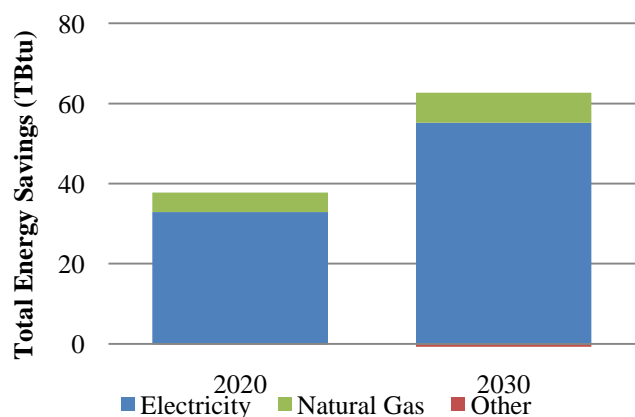
**Figure 5: Energy Efficiency Potential by Sector in South Carolina, 2020 and 2030**

***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 South Carolina’s projected residential consumption by about 10% (38 TBtu) in 2020 and 16% (62 TBtu) in 2030 (Figure 6).



**Figure 6: Residential Sector Savings**



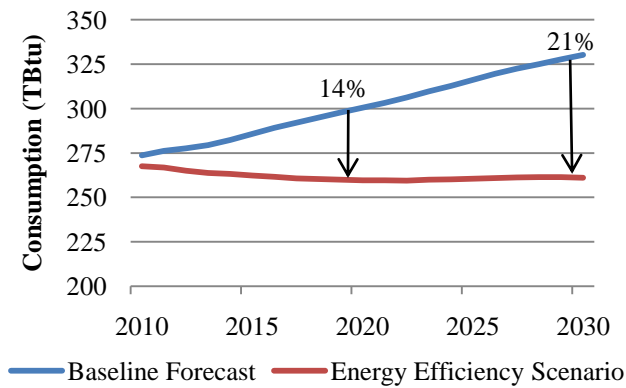
**Figure 7: Residential Sector Savings by Fuel Type**

In 2020, the residential energy required by about 180,000 households in South Carolina can be avoided by these policies, representing about \$310 in annual energy savings per household. The

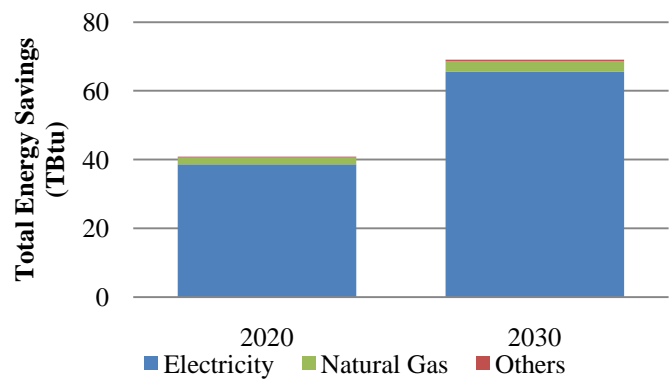
principal savings are from electricity (Figure 7). With these policies, the projected growth in residential energy consumption could be eliminated.

**Commercial Sector**

The implementation of appliance standards and retrofit policies in South Carolina’s commercial sector could reduce projected energy consumption in 2020 by approximately 14%, and by 21% in 2030 (Figure 8). In 2020, the commercial sector could save about 41 TBtu , which is equivalent to the amount of energy that 1,200 Wal-Mart stores use a year. Each business in South Carolina could save \$52,000 on average.<sup>10</sup> 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 forecasted for South Carolina could be stalled and slightly reduced with these policies.



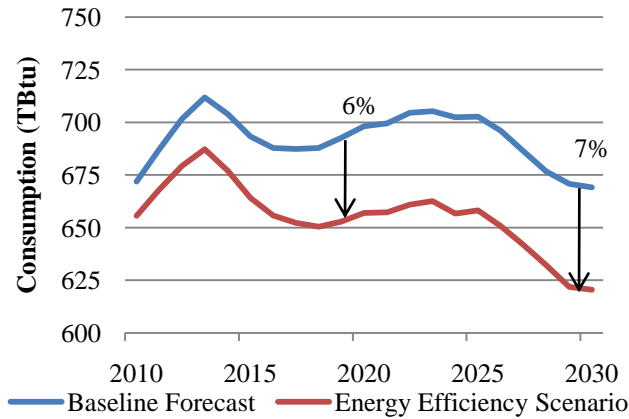
**Figure 8: Commercial Sector Savings**



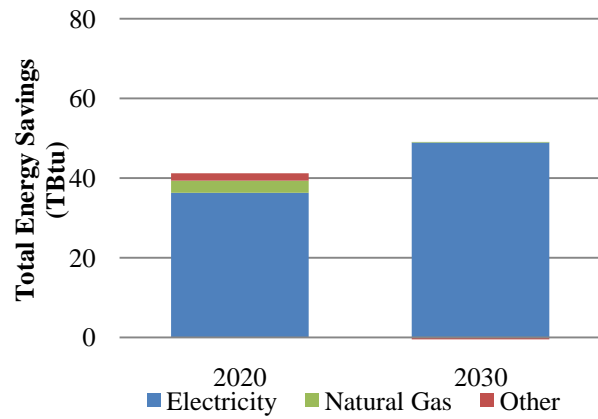
**Figure 9: Commercial Sector Savings by Fuel Type**

**Industrial Sector**

The implementation of plant utility upgrades, process improvements, and improved combined heat and power policies in South Carolina’s industrial sector can reduce projected consumption by about 6% (41 TBtu) in 2020 and 7% (49 TBtu) in 2030 (Figure 10). The industrial energy required by about 59 average industrial facilities could be avoided in 2020, roughly \$64,000 in annual energy savings per industrial facility. The principal energy savings are from electricity (Figure 11). These three energy efficiency policies could reduce the growing consumption of industrial energy projected 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* describes 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 up to 62%.<sup>11</sup>

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.<sup>12</sup>

Super boilers, which represent over 95% 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 by reducing size, weight, and footprint. The advanced heat recovery system combines compact economizers, a humidifying air heater, and a patented transport membrane condenser.<sup>13</sup>

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* could reduce energy costs for South Carolina consumers and could generate jobs in the State (Table 1).

Residential, commercial and industrial consumers could benefit from total energy savings of \$1.8

billion in 2020 (\$1.0 billion of which is specific to electricity), and \$3.0 billion in total energy savings in 2030. In comparison, South Carolina spent \$5.9 billion on electricity in 2007.<sup>14</sup>

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 South Carolina would experience a net gain of 13,400 jobs in 2020, growing to 17,800 in 2030. In comparison, there were 268,900 unemployed residents of South Carolina at the end of 2009.<sup>15</sup>

While the South's economy would grow as a result of the energy-efficiency policies, South Carolina's Gross State Product would grow by \$70 million less in 2020 and \$122 million less in 2030. This change is a small fraction of South Carolina's \$126 billion economy; the loss is due to the lower-than-average economic multiplier associated with energy-efficiency manufacturing and construction activities in South Carolina.<sup>16</sup>

**Table 1: Economic and Employment Impacts of Energy Efficiency**

<b>Indicator</b>	<b>2020</b>	<b>2030</b>
Public Sector Policy Financial Incentives (in million \$2007)	401	572
Private Sector/Household Productive Investment (in million \$2007)	179	189
Change in Electricity Costs (in million \$2007)	-994	-1,744
Change in Natural Gas Costs (in million \$2007)	-\$178	-\$248
Annual Increased Employment (ACEEE Calculator)	13,400	17,800
Change in Gross State Product (in million \$2007)	-70	-122

**Conclusions**

The energy efficiency policies described in this profile could set South Carolina 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, South Carolina could 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*.<sup>1</sup>

## Acknowledgements

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