



ENERGY EFFICIENCY IN THE SOUTH

APPENDIX G

STATE PROFILES OF ENERGY EFFICIENCY OPPORTUNITIES IN THE SOUTH: VIRGINIA

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A Profile of Energy-Efficiency Opportunities in the Commonwealth of Virginia

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 Virginia’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).¹

With a population of 7.7 million people,² the State represents about 2.6% of the U.S. population, 2.8% of the nation’s Gross Domestic Product (GDP), and 2.6% of U.S. energy consumption (Figure 1). Thus, compared to the rest of the nation, Virginia has a lower-than-average level of energy intensity (i.e., it consumes less energy per dollar of economic activity).

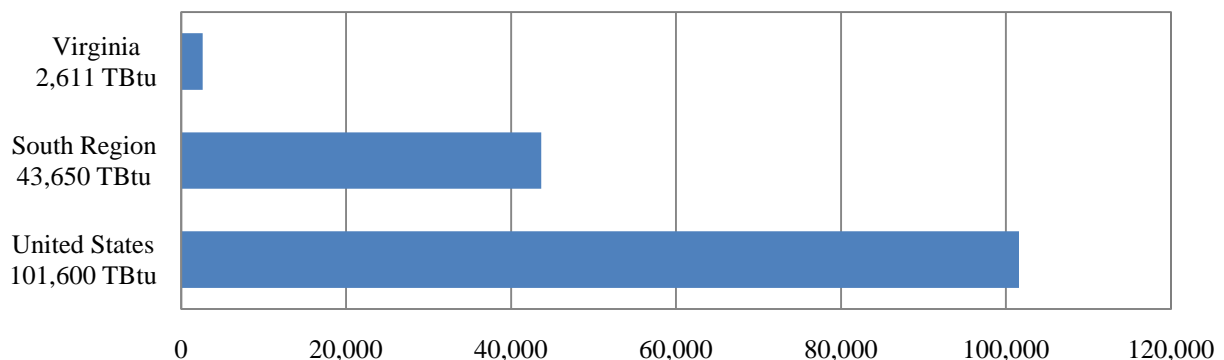


Figure 1: Virginia, South, and United States Energy Consumption, 2007³

Virginia’s consumption of energy is evenly distributed through the sectors, with transportation as the largest category, as shown in Figure 2. Virginia consumes more energy from out of state (the “other” category in Figure 3) than other states in the South. At nearly 40%, petroleum contributes the majority of the energy consumption in Virginia, which is consistent with the rest of the nation and reflective of its transportation needs. Virginia’s per capita energy consumption is nearly equal to that of the nation as a whole.^{4, 5}

Virginia has a restructured electricity market and the entire state is part of the PJM Interconnection. Virginia has two commercial nuclear power plants, North Ann in Louisa

County and Surry in Surry County. Dominion Virginia Power has received its site permit and has submitted an application for an operating license for a new 1,500 megawatt nuclear reactor.⁶

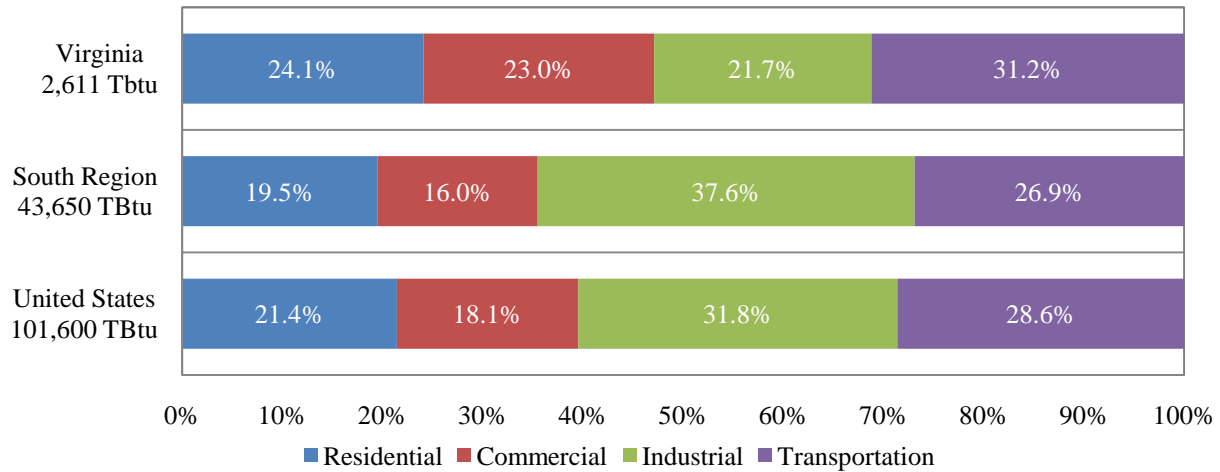


Figure 2: Virginia, South, and United States Energy Consumption by Sector, 2007⁷

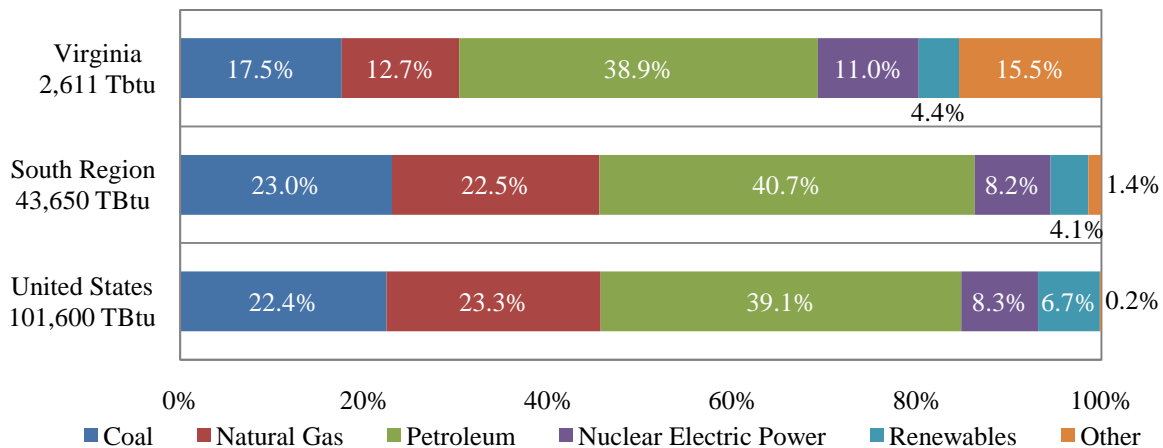


Figure 3: Virginia, South, and United States Energy Consumption by Fuel Type, 2007⁸

In 2007 Virginia initiated a comprehensive energy plan that focused on improving conservation and energy efficiency, supporting research and development, promoting renewable energy resources and educating consumers on how to save energy. Through funding from the American Recovery and Reinvestment Act, Virginia is investing \$15 million in energy auditing and energy efficiency improvements in residential and commercial sectors.⁹

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 Virginia 34th of the 50 states and DC for its adoption and implementation of energy-efficiency policies.¹⁰ 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.

Chandler and Brown reviewed Virginia’s energy-efficiency studies in the Meta-Review of Efficiency Potential Studies and Their Implications for the South (2009). Under the maximum achievable scenario for Virginia, total electricity consumption for 2020 could be the same as it was in 2007. With a lower level of efficiency, Virginia reduce 8% of its energy forecast by 2015 and 19% by 2025.¹¹

Energy Efficiency Potential by Sector

The State’s total energy consumption (residential, commercial, industrial, and transportation sectors) is projected to increase 14% 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 Virginia. Altogether, these policies offer the potential to reduce Virginia’s energy consumption by approximately 12% of the energy consumed by the State in 2007 (330 TBtu in 2030) (Figure 4). With these policies, 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).

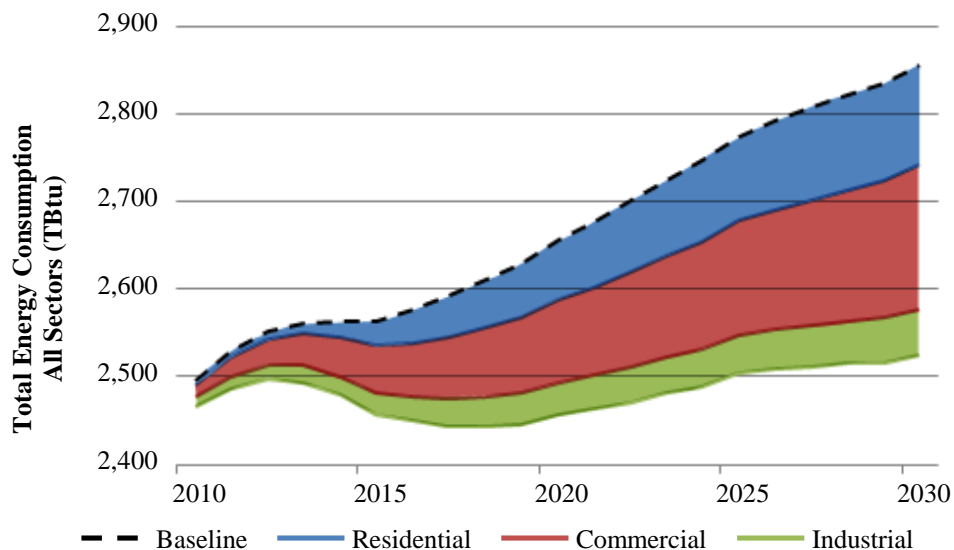


Figure 4: Energy Efficiency Potential in Virginia

The commercial and residential sectors offer the greatest energy efficiency potential in Virginia (Figure 5). In 2020, savings from all three sectors is about 7% (199 TBtu) of the total energy consumed by the State in 2007. Electricity savings constitute 166 TBtu of this amount. The energy-efficiency savings from the three sectors decrease the total projected consumption for the state by 7.5% in 2020 and 11.5% in 2030. With these policies, planners could avoid the construction of five 500-MW power plants to meet growing demand by 2020.¹²

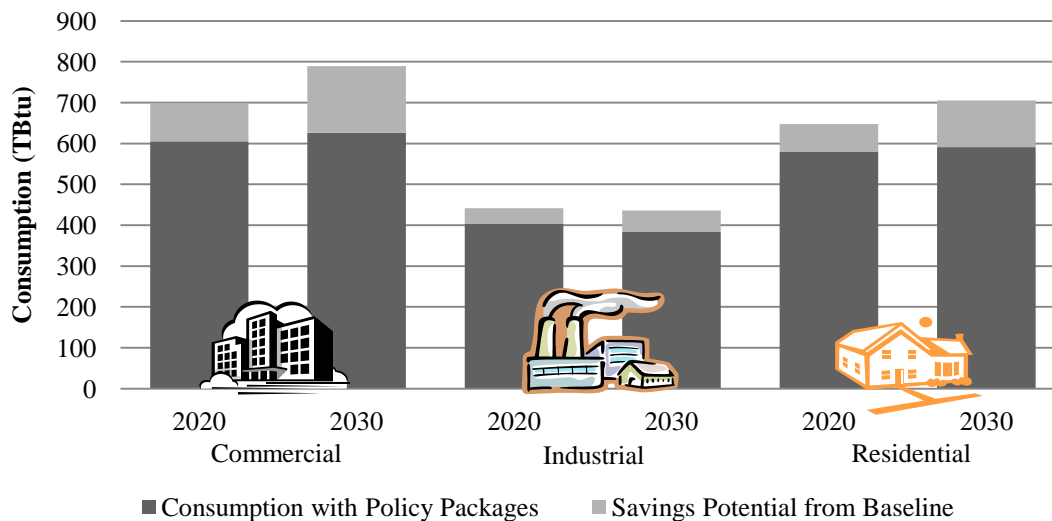


Figure 5: Energy Efficiency Potential by Sector in Virginia, 2020 and 2030

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 Virginia’s projected residential consumption by about 10% (68 TBtu) in 2020 and 16% (110 TBtu) in 2030 (Figure 6).

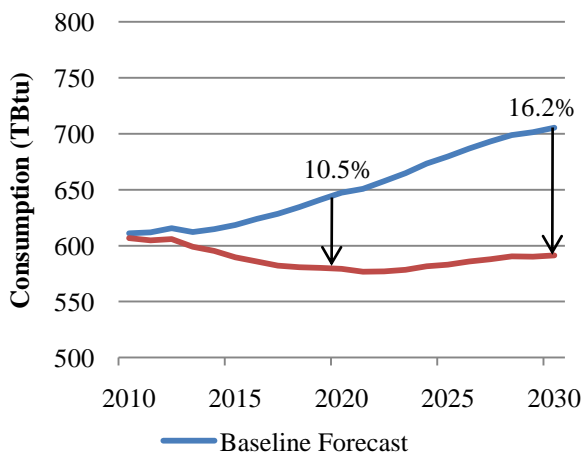


Figure 6: Residential Sector Savings

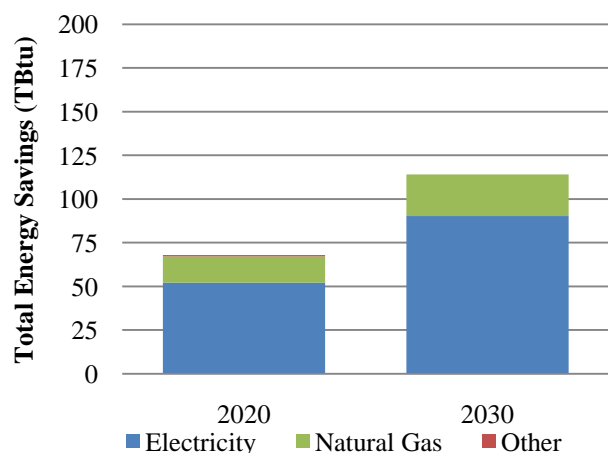


Figure 7: Residential Sector Savings by Fuel Type

In 2020, the residential energy required by about 320,000 Virginia households could be avoided by these policies, representing about \$325 in annual energy savings per household. The most savings are from electricity (Figure 7). Implementing these energy efficiency programs would hold residential energy consumption in Virginia relatively constant over the next two decades.

Commercial Sector

The implementation of appliance standards and retrofit policies in Virginia’s commercial sector could reduce projected energy consumption in 2020 by approximately 13%, and by 21% in 2030 (Figure 8). In 2020, the commercial sector could save about 94 TBtu, which is equivalent to the amount of energy that 4,600 Wal-Mart stores spend a year.¹⁰ Each business in Virginia could save \$80,000 on average. The most savings are from electricity (See Figure 9). Energy efficiency policy could mitigate a steep increase in the energy consumption of commercial buildings through 2030.

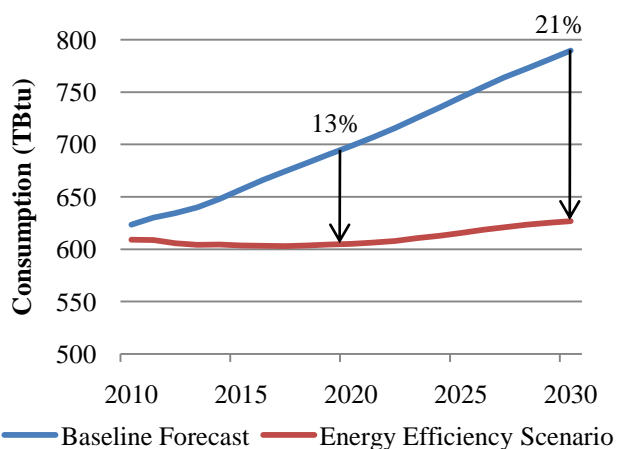


Figure 8: Commercial Sector Savings

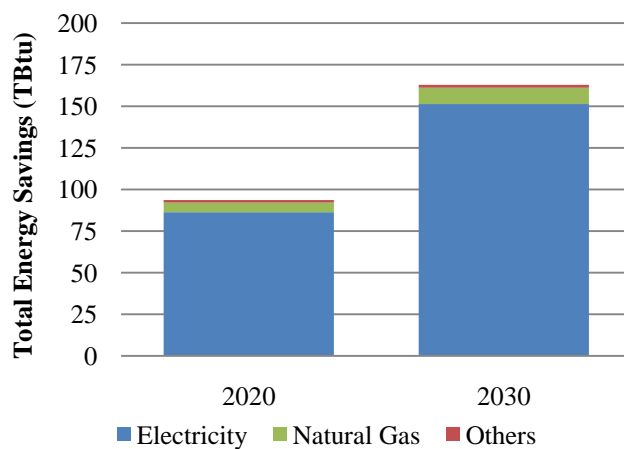


Figure 9: Commercial Sector Savings by Fuel Type

Industrial Sector

The implementation of plant utility upgrades, process improvements, and combined heat and power policies in Virginia’s industrial sector can reduce projected consumption by about 7.1% (37 TBtu) in 2020 and 9.7% (53 TBtu) in 2030 (Figure 10). The industrial energy required by about 53 average industrial facilities could be avoided in 2020, roughly \$44,000 in annual energy savings per industrial facility. The principal energy savings are from electricity, but significant natural gas savings could also occur (Figure 11). The projected industrial sector’s savings in Virginia are not as significant as in the residential or commercial sectors, but they could still reduce consumption below the baseline.

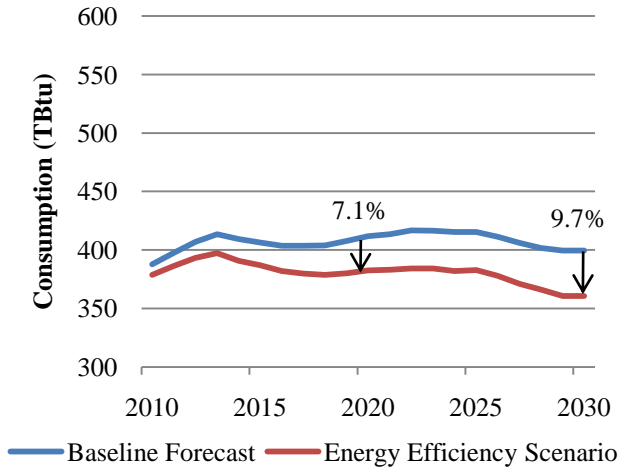


Figure 10: Industrial Sector Savings

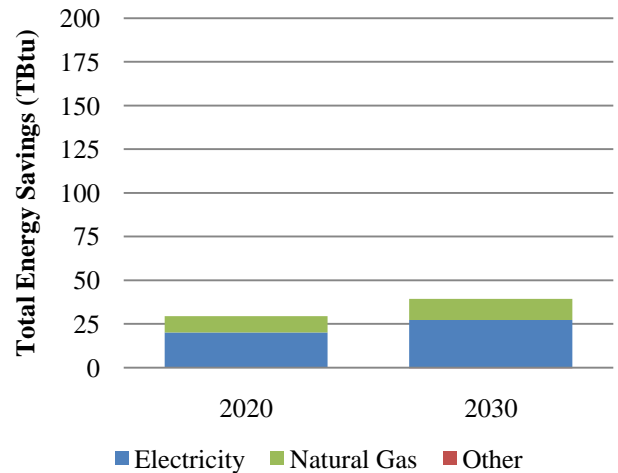


Figure 11: Industrial Sector Savings by Fuel Type

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.

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.¹³

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.¹⁴

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.¹⁵

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 Virginia consumers and could generate jobs in the State (Table 1). Residential,

commercial and industrial consumers could benefit from total energy savings of \$3.5 billion in 2020 (\$1.8 billion of which is specific to electricity), and \$6.3 billion in total energy savings in 2030. In comparison, the State spent \$7.9 billion on electricity in 2007.¹⁶

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 Virginia would experience a net gain of 28,500 jobs in 2020, growing to 38,000 in 2030. In comparison, there were 284,000 unemployed Virginians at the end of 2009.¹⁷

As is true for the South at large, the policies would also lead to an increase in Virginia's economic activity. Specifically, its Gross State Product would increase by an estimated \$178 million in 2020 and by \$296 million in 2030. This change is a small fraction of the State's \$380 billion economy.¹⁸

Table 1: Economic and Employment Impacts of Energy Efficiency

Indicator	2020	2030
Public Sector Policy Financial Incentives (in million \$2007)	765	1,106
Private Sector/Household Productive Investment (in million \$2007)	282	336
Change in Electricity Costs (in million \$2007)	-1,816	-3,365
Change in Natural Gas Costs (in million \$2007)	-\$272	-\$421
Annual Increased Employment (ACEEE Calculator)	28,500	38,000
Change in Gross State Product (in million \$2007)	178	296

Conclusions

The energy efficiency policies described in this profile could set 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, Virginia 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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