Summary of Characteristics and Energy Efficiency Demand-side Management Programs in the Southeastern United States

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April 2010

Prepared for

The U.S. Department of Energy - Industrial Technologies Program

Under the Guidance and Direction of

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Acknowledgments

This study was a collaborative effort by a team of researchers from BCS, Incorporated.
The research findings were contributed by Elizabeth Smith and Garrett Shields. Editorial support was provided by Beth Schwentker. The final report was prepared by Ryan Harry and Robert Naranjo of BCS, Incorporated and Sandy Glatt of the U.S. Department of Energy. We also gratefully acknowledge the communications and graphic design support of Rajita Majumdar and Jared Largen.

Executive Summary

This report is the first in a series that seeks to characterize energy supply and industrial sector energy consumption, and summarize successful industrial demand-side management (DSM) programs within each of the eight North American Electric Reliability Corporation (NERC) regions. This report specifically targets regional entity SERC Reliability Corporation (SERC), which covers most of the southeast region of the United States. SERC works with NERC to improve the reliability of the bulk power system.[1]

In looking at energy sources, the SERC region is characterized by an abundance of natural gas, as well as a substantial amount of petroleum. The large amounts of coal and nuclear power throughout the SERC region support the generation of low-cost electricity. The region is also defined by a significant concentration of hydropower plants, primarily within the Tennessee Valley Authority's area of operation.

The analysis found the SERC region to have enacted little energy legislation and regulatory oversight concerning energy efficiency and conservation relative to the rest of the nation. Only one state has a greenhouse gas emissions reduction target, while energy efficiency building codes are often based on older, less stringent standards. State spending on energy efficiency incentives for industry does not reach more than 0.5% of GDP for any state in the SERC region, while only two of the states discussed in this report have an energy efficiency resource standard.

The primary conclusions of this analysis are that the relatively low population density, abundance of coal and nuclear electricity, and plentiful natural gas keep energy prices in the SERC region low. These low prices lead manufacturers to consume more energy relative to the rest of the country. Additionally, the lack of robust energy efficiency regulation by states does not incentivize energy service providers to make improving industrial energy efficiency a primary activity. Because of these factors, this report identified 56 utilities within the region that offer an aggregate of 109 industrial DSM programs. Many of the programs were for lighting, as they represent an affordable way to capture cost-beneficial energy savings.

The top manufacturers in the SERC region are chemicals, petroleum production, and transportation manufacturing. Total cost of fuels and electricity in the SERC manufacturing sector is $33.7 billion and could potentially save $1.7, $3.4, and $6.7 billion if they reduced annual energy consumption by 5%, 10%, and 20%, respectively. These savings would reduce overall material costs by 0.2%, 0.5%, and 0.9%, respectively.

With neither the financial incentive from high energy prices nor the regulatory force from state legislation, utilities in the SERC region are not motivated to offer robust DSM programs. Utilities that have the most success are offering DSM programs that are relatively inexpensive for manufacturers to implement while still achieving energy savings, such as lighting programs. In order for more substantive DSM programs to be put in place, the region will either have to experience higher energy prices or states will increase energy regulations to drive the manufacturers in the SERC region to seek greater energy efficiency.

Contents

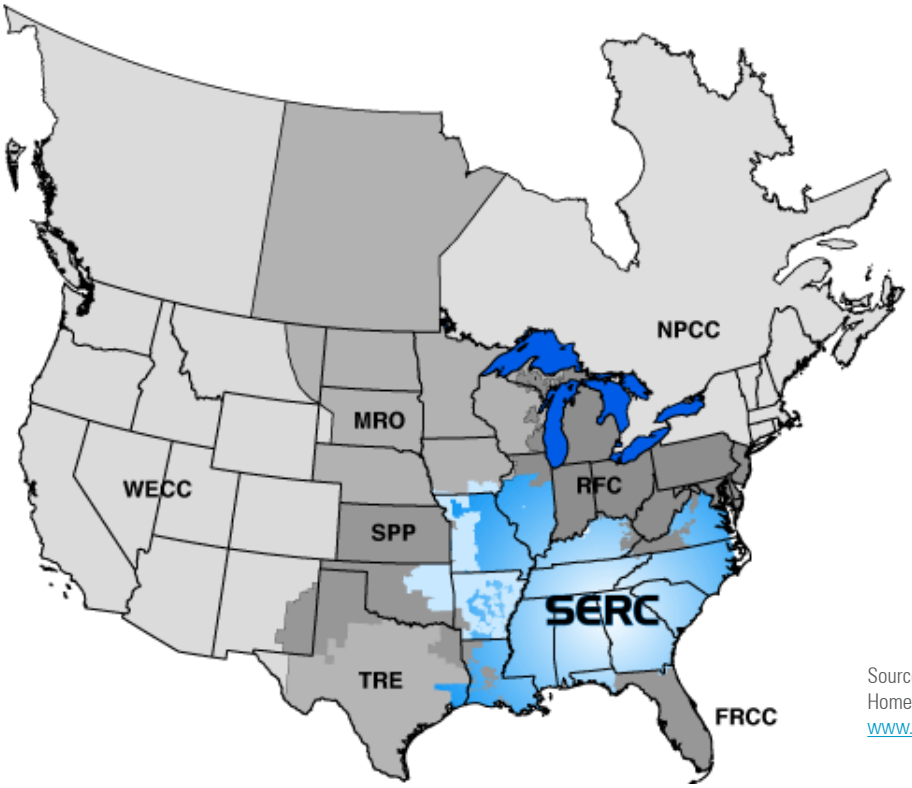
1. Introduction

Increasing industrial energy efficiency is an effective way for states and utilities to achieve significant cost savings, particularly in regions that have not fully taken advantage of the simplest and least expensive efficiency measures. The United States consumed an estimated 99.3 quadrillion Btu (quads) of energy in 2008, slightly lower than the estimated 101.5 quads used in 2007. Approximately 31.4% of the total energy consumed in 2008, approximately 31.2 quads, was used in the industrial sector. These 31.2 quads of energy consumption represent a unique energy-saving opportunity for the U.S. because industrial sector energy consumption is highly concentrated within large plants across the country. This concentrated energy consumption allows for a much higher return on investment for energy efficiency improvements compared to reducing energy consumption in the commercial and residential sectors where energy consumption is far more dispersed. One or two large plants that improve their energy efficiency by 10%-20% can have a considerable impact on that manufacturing sector's overall energy use within a region.

This report is part of a series focusing on Demand Side Management (DSM) within each of the eight regions of the North American Electric Reliability Corporation (NERC). Appendix D contains a map and list of NERC regions. Together, the areas within NERC produce nearly all of the electricity for the United States, Canada, and a small portion of Mexico. The methodology used was a combination of research on the regional characteristics and a series of interviews conducted with utilities in the region. Appendix A contains a glossary of terminology used in this report.

Identifying the regional characteristics of successful DSM programs allows energy efficiency program managers to more easily develop DSM programs based on the unique attributes of their service territories. More importantly, however, the eight reports in aggregate will provide a valuable resource for planners across regions to develop programs by learning from the successes of other regions. In summary, these reports begin to draw a picture of why DSM programs work where they do.

Exhibit 1 | NERC regions with SERC highlighted



Source: SERC Reliability Corporation, Homepage, Accessed March 2010, www.serc1.org

This report specifically targets the SERC Reliability Corporation (SERC), one of the eight NERC regional entities. The SERC region covers all or part of Alabama, Arkansas, Florida, Georgia, Illinois, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia (see Exhibit 1). States that are only minimally included in the SERC region cannot be considered to be representative of the area and hence their data are not included in this analysis. Further explanation about SERC coverage of these states is provided in Appendix B.

This report aims to break down the SERC region by its many characteristics including population, natural energy resources, and state energy regulation. These characteristics will be examined to determine their influence on both the type of DSM programs being offered to industry and on the success of these programs. A variety of utilities were interviewed to gain insights into their efficiency programs, why they were being offered, and their success rates. The resulting analysis will help form a picture of best practices for utilities within the region. Utilities that are interested in initiating or expanding their industrial DSM program offerings will be able to use this report and its results in determining which DSM programs to offer to their industrial customers. This report will also be useful to policymakers in understanding how the region's unique characteristics can shape policy and ultimately influence the drive and commitment of utilities to improving energy efficiency.

2. Energy Profile

The energy consumption and generation within a region are strong indicators of the types of initiatives that will evoke response from the industrial community. States that use a high percentage of natural gas, for example, will likely have a higher success rate with rebate programs for natural gas powered equipment. Reviewing the energy profiles of each state (including electricity consumption) may provide insight into the best programs to achieve results in the industrial sector.

The SERC region utilizes a variety of energy sources including fossil fuels, nuclear power, and renewable forms of energy. Exhibit 2 shows the energy production estimates of various resources within the fully or significantly covered states within the SERC region.[i]

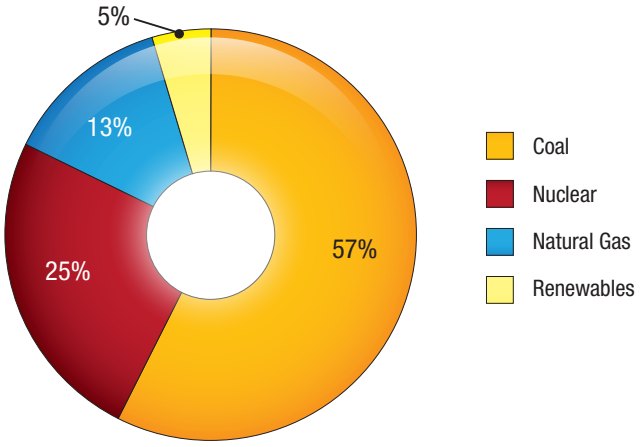
Exhibit 2 | Energy Production Estimates in the US, 2007

State	Fossil Fuels			Nuclear (billion Btu)	Renewables (billion Btu)	Total Energy Production (billion Btu)
	Coal (billion Btu)	Natural Gas (billion Btu)	Petroleum (billion Btu)			
Alabama	469.0	402.1	41.7	360.0	230.4	1,503.2
Arkansas	1.9	272.0	35.0	162.4	117.4	558.7
Georgia	0.0	0.0	0.0	341.3	209.0	550.3
Kentucky	2,872.9	100.8	15.5	0.0	51.7	3,040.9
Louisiana	42.9	3,718.4	2,802.4	179.1	150.6	6,893.4
Mississippi	36.2	96.1	118.3	98.2	64.6	413.3
Missouri	5.3	0.0	0.5	98.3	49.4	153.5
North Carolina	0.0	0.0	0.0	420.0	113.7	533.7
South Carolina	0.0	0.0	0.0	558.0	96.4	654.3
Tennessee	67.7	4.1	1.6	301.0	109.6	484.1
Virginia	656.3	116.5	0.1	286.0	114.2	1,173.1

Source: EIA, State Energy Production Estimates, October 2009, http://www.eia.doe.gov/emeu/states/_seds_production.html.

[i] See Appendix B for an explanation of "Fully," "Significantly," and "Insignificantly" covered states in SERC.

Exhibit 3 | Electricity Generation by Fuel Source, 2008



Source: EIA, Fossil Fuel Consumption for Electricity Generation by Year (EIA-906), January 2010. http://www.eia.doe.gov/cneaf/electricity/epa/epa_sprdshts.html.

The energy estimates show the importance of both fossil fuel and nuclear-generated power within the SERC region. Although not as prevalent, renewable energy is an important and growing energy resource. This is especially true for states that have little to no natural fossil fuel resources. States that consume significantly more energy than they produce (such as Georgia, North Carolina, and Tennessee) require assistance from states that produce more than they consume. Ample regional resources have kept prices relatively low throughout the area which has attracted many manufacturers to SERC states. In fact, the southeastern region of the U.S. leads the nation in value of product shipments in most manufacturing sectors and industry groups.

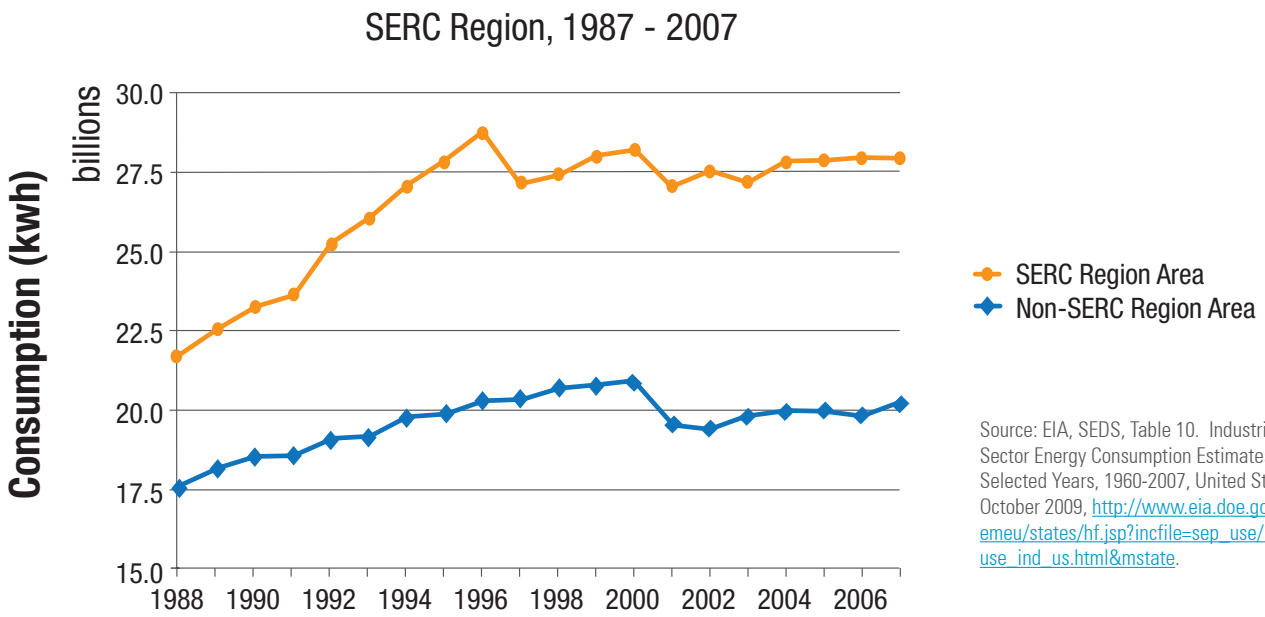
Low-cost electricity

Actual electricity consumption within the SERC states grew steadily between 1988 and 1996 but has since hovered around an annual amount of 27.5 billion kWh or 93.8 trillion Btu as displayed in Exhibit 4.

For electricity generation, the SERC region is especially diverse, utilizing fossil fuel and hydroelectric generation resources. Due to the high number of coal-fired power stations and the existing infrastructure, it is no surprise that over 50% of the total electricity generated within the SERC region in 2008 came from coal-fired power stations.

The net electricity generated for the SERC region shows a 3.1% decrease from coal-fired energy generation from 2007, while natural gas experienced a 4.0% loss in generation share. Electricity resulting from conventional hydroelectric resources showed a 22.7% increase across 2007.[3]

Exhibit 4 | Yearly Industrial Consumption of Electricity in SERC 1987-2007



Source: EIA, SEDS, Table 10. Industrial Sector Energy Consumption Estimates, Selected Years, 1960-2007, United States, October 2009, http://www.eia.doe.gov/emeu/states/hf.jsp?incfile=sep_use/ind/use_ind_us.html&mstate.

Exhibit 5 | Average Regional Price of Electricity, 2007

	Average Retail Price of Electricity by Region (cents per kWh)
Significant SERC States	5.31
Non-SERC and Non-significant SERC states	7.66

Source: EIA, State Energy Data System, Table S4a, August 2009, http://www.eia.doe.gov/emeu/states/sep_sum/html/pdf/sum_pr_ind.pdf.

Nuclear power made up about a quarter of SERC total electricity generation at over 267.4 million MWh in 2008. South Carolina is by far the SERC leader in nuclear power generation, producing over 53.1 million MWh of nuclear-generated electricity in 2008.[8] Similar to coal-fired generation resources, the significant presence of nuclear generation in SERC states has led to low overall energy prices throughout the region.

Browns Ferry

Browns Ferry is a nuclear power station located in northern Alabama. It currently operates three nuclear units, together capable of producing over 3,400 MW of electricity. In 1985, all three units were shut down due to a variety of maintenance and safety issues. While Units 2 and 3 were re-started by 1991 and 1995, respectively, management voted to keep Unit 1 non-operational until recovery of the facility would be financially beneficial. Alabama's nuclear power was significantly expanded when the Unit 1 nuclear reactor finally re-started in mid 2007 with Nuclear Regulatory Commission oversight.[5]

Source: Tennessee Valley Authority, Browns Ferry Nuclear Plant, Accessed March 2010. http://www.tva.gov/sites/brownsferry.htm#.

As shown in Exhibit 5, the average cost of electricity for the industrial sector in the significant SERC states is 5.3 cents per kWh which is slightly lower than the U.S. average of 6.4 cents per kWh. Only Louisiana exceeds the U.S. average with 6.8 cents per kWh.[6] Louisiana's higher price is likely due to the high consumption of natural gas. Although Louisiana has natural gas resources readily available and the lowest cost for natural gas per kWh in the SERC region, the price of coal and nuclear-generated electricity is significantly lower. States that predominantly use coal or nuclear power, such as Kentucky (93.6% coal) and South Carolina (51.3% nuclear), have much lower overall electricity prices.[7] As an aside, Kentucky's per capita consumption of electricity is among the highest in the U.S.

Low-cost natural gas55

Natural gas is the most used energy source in the U.S. industrial sector.[8] While it has uses similar to those in residential and commercial applications (i.e. space heating and cooking), natural gas is also consumed in creating heat for steam production, industrial processes including metals melting, waste treatment, and drying. Natural gas is combustible and when burned, emits fewer byproducts than other fossil fuels making it a highly desirable fuel source. It is also used as a feedstock in the production of many chemicals including butane, ethane, and methane.[9]

The Gulf Coast region (including federal offshore, Louisiana, and Texas as well as on-shore and offshore areas of Alabama) accounts for 45.7% of the total U.S. production of natural gas (see Exhibit 6).[10]

Exhibit 6 | Natural Gas Production in the Gulf Coast Region, 2008

Region	Percentage of Consumed US Total
Federal Offshore Gulf of Mexico	9.1%
Louisiana	5.4%
Alabama	1.1%
Texas	30.1%
Other Regions	54.3%
Total	100%

Source: EIA, Natural Gas Navigator, March 2010, http://tonto.eia.doe.gov/dnav/ng/ng_prod_sum_a_EPG0_FGW_mmcf_a.htm.

Exhibit 7 | Natural Gas Summary Statistics for the US, 2008

	Withdrawals (million cubic feet)	Imports (million cubic feet)	Consumption (million cubic feet)
Significant SERC States	2,700,720	153,821	3,409,238
Non-SERC and Non-significant SERC states	23,053,628	3,830,412	19,817,374

Source: EIA, Natural Gas Navigator, March 2010, http://tonto.eia.doe.gov/dnav/ng/ng_prod_sum_a_EPG0_FGW_mmcf_a.htm.

Twenty-three interstate and eight intrastate natural gas pipelines operate within the southeastern U.S. to distribute the 4 trillion cubic feet of gas consumed per year (see Exhibit 7). Fifteen of the interstate pipelines originate in the southeast and receive the majority of their supply directly from the Gulf Coast region.

Much of the expense of natural gas is due to transportation costs since it is much more expensive to transfer than oil or coal. Exhibit 8 illustrates that with a few exceptions, notably Louisiana which benefits from the location of the Henry Hub natural gas pipeline, the price of natural gas in the SERC region is higher than the U.S. average.

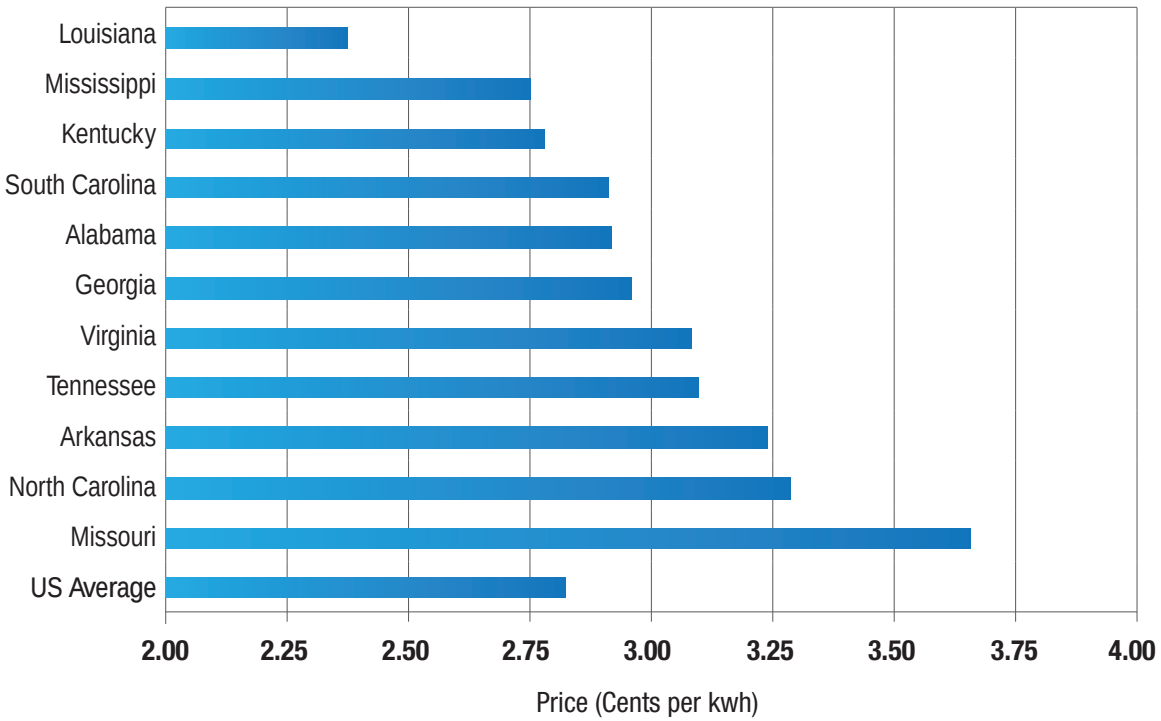
Natural Gas Conversions

One cubic foot of dry natural gas is equal to 1,027 Btu.

One cubic foot of wet natural gas is equal to 1,109 Btu.

One barrel of liquid natural gas is equal to $4.49 * 10^6$ Btu.

Exhibit 8 | Average Price of Natural Gas by State, 2007



Source: EIA, State Energy Data System, Table S4a, August 2009, http://www.eia.doe.gov/emeu/states/sep_sum/html/pdf/sum_pr_ind.pdf.

Exhibit 9 | State Population and Growth

State	2008 Population Estimate	Population Change Since 2000
Alabama	4,661,900	4.80%
Arkansas	2,855,390	6.80%
Georgia	9,685,744	18.30%
Kentucky	4,269,245	5.60%
Louisiana	4,410,796	-1.30%
Mississippi	2,938,618	3.30%
Missouri	5,911,605	5.60%
North Carolina	9,222,414	14.60%
South Carolina	4,479,800	11.70%
Tennessee	6,214,888	9.20%
Virginia	7,769,089	9.70%
TOTAL	**62,419,489**	**8.00%**

Source: United States Census Bureau, http://quickfacts.census.gov/qfd/index.html.

Population impacts on energy use

One important demographic consideration when looking at energy usage within a region is the population – especially population density – in the urban areas. Larger populations require more energy and densely populated urban areas often have unique challenges because of energy delivery constraints. Depending on the area's characteristics, these constraints can drive up energy prices within urban areas relative to the adjacent non-urban areas.

The U.S. Census Bureau estimated the 2008 population of the states fully or significantly covered by SERC to be at 62,419,489 with an approximate average growth of 8.0% since 2000 (see Exhibit 9).

The SERC region is made up primarily of sparsely populated, rural states. Although each state has at least one or two large metropolitan areas, these cities are often spread out with considerable geographic distances between them. This stands in sharp contrast to areas like the northeast, where population density remains fairly high even between cities.

Exhibit 10 reflects how the area's lower-than-average population density and an abundance of energy resources allows the manufacturing establishments within the SERC region to take advantage of lower energy prices relative to the rest of the country.

Exhibit 10 | SERC and Non-SERC State Average Industrial Energy Prices, 2007

Region	Coal ($/MMBtu)	Natural Gas ($/MMBtu)	Petroleum ($/MMBtu)	Retail Electricity ($/MMBtu)
Significant SERC States	$2.89	$8.78	$14.28	$15.55
Non-SERC and Non-significant SERC states	$2.59	$9.34	$16.05	$22.44

Source: EIA, State Energy Data System, Table S4a, August 2009, http://www.eia.doe.gov/emeu/states/sep_sum/html/pdf/sum_pr_ind.pdf.

3. Energy Efficiency Regulation

The SERC region does not have extensive energy and carbon legislation. The relatively little regulation is most likely influenced by the region's inexpensive energy prices that result from its abundance of coal and nuclear power resources and low population densities.

These laws would limit energy consumption and emissions by encouraging companies to become more energy-conscious. The DSM programs offered by utilities are largely shaped by state regulations. For example, utilities are more likely to design energy audit programs if the state adopts greenhouse gas emission limits.

Appendix C lists the energy legislation enacted by various SERC states and illustrates how most states in the region have laws based on older standards, which typically indicate a less strict policy.

Energy efficiency spending

States that include the costs for energy efficiency programs in their budgets and create standards to encourage energy efficiency send a signal to energy consumers to reduce energy consumption and emissions. State spending on industrial DSM could provide the needed assistance to make programs available and financially viable that might not have been otherwise.

Spending in 2007 on energy efficiency programs within the SERC region varied greatly from state to state, with some states like Louisiana and Virginia spending close to zero and other states like Tennessee spending nearly $10.0 million[iii]

Exhibit 11 shows both the total spending on energy efficiency programs and the spending as a percent of revenue, but the latter is more effective in revealing the possible impact of state investments in energy efficiency. Spending in 7 of the 11 considered states in the SERC region formed zero percentage of their revenue. Tennessee and Kentucky led the region spending 0.4% of their revenue on energy efficiency programs, while South Carolina spent 0.2% and North Carolina 0.06%.

Exhibit 11 | State Spending and Financial Incentives for Energy Efficiency (EE), 2007

State	2007 EE Spending (in millions)	2007 EE Spending as % of Revenue	State Financial Incentives for Industry
Alabama	$2.3	0.0%	Loan and grants programs
Arkansas	$1.6	0.0%	Small business loan
Georgia	$4.8	0.0%	Corporate tax incentive, sales tax incentive, and rebates for clean energy properties
Kentucky	$17.9	0.4%	EE tax credits, sales tax exemption for manufacturers
Louisiana	$0.0	0.0%	Sustainable energy financing loan
Mississippi	$0.3	0.0%	Loan program
Missouri	$1.3	0.0%	Corporate tax incentive for EE, energy loan program
North Carolina	$6.8	0.06%	Green business grant, rebates for steam trap systems, loan program, and green building incentives
South Carolina	$8.9	0.2%	Renewable corporate and sales tax incentives and biomass production incentive
Tennessee	$10.0	0.4%	Loan Program and tax incentives for clean energy technology

[iii] The American Recovery and Reinvestment Act funding and the increased national focus on energy has likely caused state spending figures to rise since 2007; however, the 2007 figures are the most current data released by the Energy Information Administration (EIA).

State	2007 EE Spending (in millions)	2007 EE Spending as % of Revenue	State Financial Incentives for Industry
Virginia	$0.0	0.0%	Property tax incentive for EE, EE rebate program, and energy loan program
Non-Significant States:			
Florida	$92.6	0.4%	
Illinois	$0.8	0.0%	
Texas	$79.5	0.9%	

Source: ACEEE, The 2009 State Energy Efficiency Scorecard, http://aceee.org/pubs/e097.pdf?CFID=4605174&CFTOKEN=51769641, pages 9-10.
Source: Database of State Incentives for Renewables and Efficiency, http://www.dsireusa.org/summarytables/finee.cfm.

Exhibit 11 above also highlights the current state financial incentives offered to manufacturers operating in the state. A majority of the states offer some type of loan program for businesses that are interested in undertaking efficiency-improving projects, along with state tax incentives focused on energy efficiency improvements or renewable energy generation. Some states, like Alabama, Georgia, and South Carolina, also offer grants and/or rebates for energy projects.

Public Benefits Fund

A Public Benefits Fund (PBF) is a state or state-managed fund that is most often used for energy efficiency or renewable energy programs and is funded by utilities levying a small fee or surcharge on customers' electricity rates. North Carolina is the only state in the SERC region that has a PBF. The North Carolina Utilities Commission established a PBF in 1980 to fund renewable energy programs. It also established a nonprofit, North Carolina Advanced Energy Corporation, to administer the PBF.

Energy Efficiency Resource Standard

An Energy Efficiency Resource Standard (EERS) is a market-based means to promote more efficient generation, transmission, and use of electricity and natural gas. By setting energy-savings goals rather than spending targets, an EERS can be easier to legislate and quicker to put into place than other types of efficiency programs. Although state policies differ in their savings targets, all EERS policies encourage end-user energy-saving improvements. Two significant SERC states, North Carolina and Virginia, have an EERS in place, while Florida is seriously considering it.

4. Available DSM programs

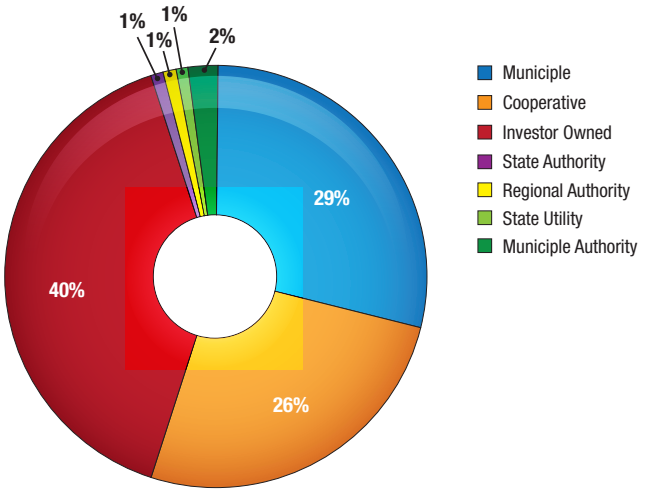
DSM characteristics

At the time of developing this report, 56 utilities or organizations within the SERC region made DSM programs available for their industrial customers. Since DSM programs can be added, dropped, or altered on a near monthly basis, it is difficult to develop an authoritative list of programs in a region. While the list of programs used for this report may not be completely exhaustive, it adequately illustrates the profile characteristics of the region.

Exhibit 12 | Utility Types Offering DSM Programs in the SERC Region

Utility Type	Number of Utilities
Cooperative	21
Investor-owned	15
Municipal	16
Municipal Authority	1
Regional Authority	1
State Authority	1
State Utility	1
Total	**56**

Exhibit 13 | Percentage of Total Programs Offered by Each Utility Type



Source: DOE, EERE, State Incentives and Resources Database, March 2010. http://www1.eere.energy.gov/industry/states/state_activities/incentive_search.aspx.

These 56 utilities and organizations offered a total of 109 DSM programs available to industrial customers in April 2010 (see Exhibit 14). Investor-owned utilities offered the largest share of the DSM program available with 15 utilities offering 44 programs, coming to 40.4% of all programs offered in the region. Municipal utilities offered 32 programs and cooperatives offered 28 programs, comprising 29.4% and 25.7% respectively. Exhibit 13, above, displays the percentage of total programs offered by each utility type.

Of the 17 rebate programs offered in the SERC region, 5 are specifically for lighting improvements and 2 for motor improvements. This total does not include the rebate programs labeled as "other," which often involve custom rebates or a rebate program for multiple types of efficiency projects that could include lighting or motors.

The programs identified for this report were categorized with the goal of achieving energy savings, load savings, or both energy and load savings. Programs categorized as "Energy Savings" have the goal of reducing over-all energy usage, most often through improved efficiency. Programs labeled as "Load Savings" have the goal of reducing the transmission load during peak hours. This could be achieved through a shift in the schedule of energy usage or through measures that actually reduce energy usage during peak hours. Since load reduction could be realized through improved efficiency measures, these categories can overlap. The program categories of "Energy Saving," "Load Saving," and "Energy and Load Saving" were assigned based on the specific program description. Exhibit 15 shows a break-down by these categories of DSM programs identified in the SERC region.

Exhibit 15 | Program Savings Type

	Energy Saving	Load Saving	Energy and Load Saving
Total Programs	87	14	8

Exhibit 14 | SERC Region DSM Program Types, April 2010

	Total	Electric	Gas	Electric & Gas
Energy Advice	7	5	-	2
Energy Analysis	18	16	-	2
Energy Analysis	44	42	2	-
Grants	2	2	-	-
Load Management	12	12	-	-
Loans	3	3	-	-
Payment	2	2	-	-
Rate Incentive	1	1	-	-
Rebates	17	13	3	1
Training	3	3	-	-
All DSM Programs	**109**	**99**	**5**	**5**

DSM in practice

Interviews were conducted with representatives from utilities in the SERC region to gain a better understanding of their DSM programs. Nearly a quarter of the utilities contacted provided information, helping to shed light on various program characteristics. The utilities provided details on how long they have offered industrial DSM programs, what programs they offer and why, and how successful these programs have been.

The interviews revealed that approximately one-third of the responding utilities started an industrial energy saving program in 2009.[19] Another significant portion of the utilities have offered savings programs since the 1970s and 1980s, whereas only about 16% of the programs saw their inception in the 1990s.[20] The large increase in the number of utilities offering DSM program in the last few years indicates that utilities in the SERC region are beginning to step up their efforts to reduce energy consumption. This could be influenced by the increasing environmental consciousness of utility customers as well as the recent injection of federal support for energy saving programs through the *American Recovery and Reinvestment Act of 2009*.

Approximately half of the utilities contacted indicated that cash incentives, such as rebates or grants, will be most effective in boosting participation in energy-saving programs in their area.[21] Lighting efficiency programs were highlighted as the most popular by approximately half of the utilities[22] because of their simplicity and affordability for most customers. Many of the utilities referred to lighting programs as the lowest hanging fruit in capturing efficiency. The lighting program is representative of the approach necessary to successfully address energy efficiency within an area that enjoys very low energy prices.

When asked if they had advice for other utilities interested in starting DSM programs, a respondents generally emphasized the importance of starting with a small, manageable number of programs and having patience with the length of time it could take for the programs to take off.

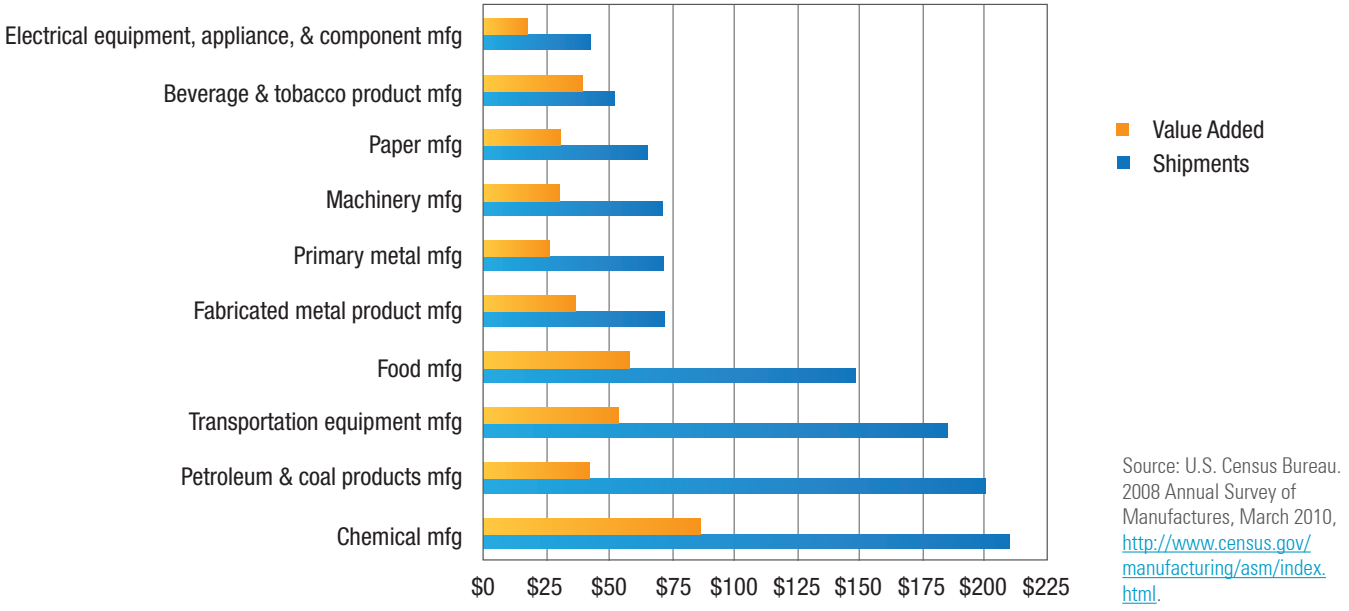
5. Manufacturers and DSM

When reviewing the energy uses and efficiency rates of the industrial sector, it is important to recognize the manufacturing industries that use the largest amount of energy. Using this data, it is easier to formulate an understanding of the most popular types of incentives and why they are so successful.

Top manufacturing industries

Manufacturing industries represent an important economic factor for the states within the SERC region ranging from 8.6% in Virginia to 19.5% in North Carolina of total state economies.[23] The chemicals industry was the most profitable to the SERC region as shown in Exhibit 16.

Exhibit 16 | Top 10 Manufacturing Industries in SERC Region, 2008



Source: U.S. Census Bureau. 2008 Annual Survey of Manufactures, March 2010, http://www.census.gov/manufacturing/asm/index.html.

North Carolina and Louisiana have the highest grossing annual chemical shipments for 2008. These two states account for half of the chemical business in the entire SERC region. The transportation equipment manufacturing industry (that which builds equipment for transporting people and goods) is the top shipment industry in 6 of the 11 SERC states analyzed in this report.

The beverage and tobacco industry in the SERC region represents 50.9% of total U.S. manufacturing, with North Carolina alone bringing in 27.1% of the U.S. industry with its tobacco leaf products. As U.S. consumption of cigarettes decreases, a steady decline in the industry is occurring nationally leading to an increased focus on the international market.

While not in the top 10 manufacturing industries in the SERC region, the textile and textile product mills industries also produced over one half of the total U.S. manufacturing in 2008. This is a major industry that converts fiber into yarn, fabric, and textiles. An abundance of cotton, flax and hemp crops in the southeast make this an ideal area for the production of fabrics. Georgia alone is responsible for one-fourth of the nation's total textile value in shipments.

Energy consumption by top manufacturers in SERC region

Energy costs make up a small, yet significant part of material costs within the manufacturing sector. SERC states tend to spend approximately 4 – 5% of total material expenditures on energy, as shown in Exhibit 17. Exceptions to this are Missouri and North Carolina which spend less (2.8% and 3.5% respectively), while Mississippi spends as much as 6.0% of total material costs on energy. A higher percentage of energy expenditures could reflect a variety of factors, including a larger presence of energy-intensive manufacturers or a lower level of interest in energy efficiency.

Exhibit 17 | Relative State Manufacturing Energy Inputs, 2008

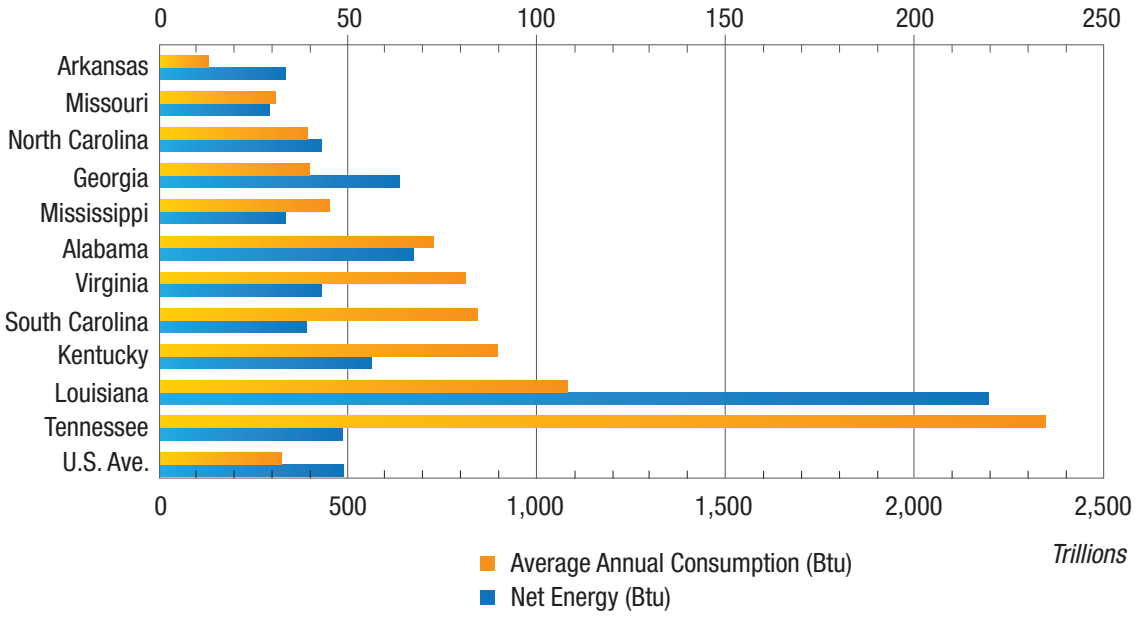
State	Energy Cost Percentage of Total Manufacturing Material Input Costs
Alabama	5.0%
Arkansas	4.9%
Georgia	4.9%
Kentucky	4.8%
Louisiana	4.9%
Mississippi	6.0%
Missouri	2.8%
North Carolina	3.5%
South Carolina	4.6%
Tennessee	4.1%
Virginia	5.1%

Source: U.S. Census Bureau. 2008 Annual Survey of Manufactures, March 2010, http://www.census.gov/manufacturing/asm/index.html.

Interestingly, the value of energy cost percentage has increased in every state by 0.3%-- 0.6% since 2006 making the implementation of energy efficiency initiatives within these states a key factor in helping to reduce material costs.

The low energy prices do not incentivize consumers to save energy. Consequently, while many manufacturing industries located in the SERC region lead the nation in the value of shipments, many also lag behind the national average for energy efficiency. The significant difference in average annual consumption between SERC states and the U.S. average is shown in Exhibit 18.

Exhibit 18 | Average Annual Energy Consumption by Industrial Customers by State, 2008



Source: EIA, Number of Retail Customers by State, by Sector, (EIA-861), January 2010. http://www.eia.doe.gov/cneaf/electricity/epa/epa_sprdshts.html.
Source: EIA, Table S6. Industrial Sector Energy Consumption Estimates, August 2009, http://www.eia.doe.gov/emeu/states/hf.jsp?incfile=sep_sum/plain_html/sum_btu_ind.html.

Tennessee Valley Authority

TVA is a federally owned corporation created to improve the economic and social circumstances of the people in the region. The power administration provides services to people in seven states (Tennessee and surrounding states) including energy-related environmental and economic programs. It supplies electricity to over 9 million people via coal-fired plants, combustion-turbine sites, nuclear power stations, hydroelectric power and renewable energy plants that use wind turbines, methane gas, and solar panels. TVA has grown to be the largest electricity supplier in the United States providing over 164 billion kWh in 2009 to its customers.[24]

In 2008, the U.S. average annual energy consumption per industrial customer was 32.2 billion Btu, while the SERC regional average was 136.3% higher at 76.1 billion Btu. Louisiana has the distinction of having the highest net annual consumption rate of all the SERC states at 2.2 quadrillion Btu, more than four times the national average.

Potential energy savings

The relatively high energy consumption of manufacturers in SERC represents a significant energy savings opportunity. Cost savings across the manufacturing industry would be significant even with small improvements in manufacturing energy efficiency. A 5.0% reduction in energy consumption across SERC manufacturers translates into a $1.7 billion cost savings for the industry and a 0.2% savings in material costs. These savings would directly boost manufacturers' bottom lines. Higher energy consumption reductions would lead to even more cost savings as is shown in Exhibit 19, below.

Exhibit 19 | Potential SERC Manufacturing Energy Cost Savings

Energy Consumption Reduction	Manufacturing fuel and electricity cost savings	Overall Material Cost savings
5%	$1.7	0.23%
10%	$3.4	0.46%
20%	$6.7	0.91%

Source: U.S. Census Bureau. 2008 Annual Survey of Manufactures, March 2010, http://www.census.gov/manufacturing/asm/index.html.

6. Conclusion

The industrial sector uses the largest amount of energy in the SERC region compared to the residential, commercial and transportation sectors. At 37% of total consumption,[25] industrial energy use goes mostly to powering machinery and process heating and cooling.[26] The lower energy prices of the southeastern U.S. have drawn many high-energy use manufacturers to the area leading to a high industrial consumption of electricity.

The energy landscape in the SERC region is affected by a variety of localized factors including population, energy resources, and state energy regulations. The relatively low population densities of the southeastern U.S. provide a complex atmosphere in which to offer energy efficiency programs to industrial customers. Smaller utility companies serve the majority of the area and its consumers. More than 63% of the utilities interviewed within the area have less than 50 industrial customers, with only 18% having more than 500 industrial customers. The majority of energy services offered appeared to be more general in nature requiring the companies to implement the changes themselves. For example, 54% of utilities interviewed offered either energy audits or energy analysis programs while only 8% offered load management programs where peak shaving generators were often supplied to the consumer.[27]

As the industrial sector consumes the most energy, it has the potential to achieve the greatest levels of energy efficiency through the installation of upgraded equipment such as energy-saving lighting, heat pumps, and motors. Capitalizing on utility offerings like energy audits or analysis, efficiency training, and peak-shaving programs can substantially reduce industrial consumers' energy profile and costs.

Although some utilities offer programs encouraging energy efficiency, industrial customers in the SERC region have demonstrated a low participation rate. This indicates that despite the high regional energy use, efforts at reducing consumption have gone largely unnoticed or have been rejected by the industrial community. The great majority of program offerings target residential and commercial customers because of the larger number of people served. Utilities in this region fail to acknowledge the greater energy-savings potential of manufacturing, agriculture, mining, and construction industries within the area.

Policy implementation regarding interconnection and renewable portfolio standards has also been unresponsive to its industrial customer base. There has been no carbon legislation implemented in any of the fully or significantly SERC-covered states, resulting in a lack of restrictions on the sizeable carbon emissions released by major industrial firms in the region.[28]

In order to reduce excess energy consumption and environmentally harmful emissions, it is imperative for states and regions to design energy-saving programs tailored to their industrial communities and to become more effective at engaging those communities in the programs.

Appendix A: DSM Program Type Descriptions

For the development of this report, the following definitions were used when considering each program incentive type:

- **Energy Advice:** Online informational tools, such as energy libraries, energy calculators, and efficiency tips, containing general information that is not customer specific.
- **Energy Analysis:** Online or other tools and resources that monitor or use actual usage information from the customer to determine a customer-specific energy profile or usage characteristics.
- **Energy Assessments:** Onsite and online energy audit programs that evaluate a customer's facility, including the building envelope and manufacturing equipment, in order to recommend projects to improve energy efficiency or load management.
- **Grants:** Programs that offer certain amounts of money for undertaking energy-efficiency projects.
- **Load Management:** Programs that focus primarily on reducing load during peak hours.
- **Loans:** Financial assistance with terms of repayment.
- **Payment:** Both programs listed as "Payment" in this report agree to pay for power produced from a renewable energy source on a customer's premises.
- **Rate Incentive:** Program that offers net-metering for customers with renewable generation.
- **Rebates:** Programs offering cash back or bill credit after the actual purchase of efficient equipment or the completion or an efficiency project.
- **Training:** Programs with training centers that offer courses or classes on efficiency or technological improvements to customers.

Appendix B: SERC Region Descriptions

Significant Coverage

States that have significant, although not full, geographic coverage include:

- **Arkansas**
- **Kentucky**
- **Louisiana**
- **Missouri**
- **Virginia**

Partial Coverage

States with small amounts of SERC service territory include:

- **Florida**
- **Oklahoma**
- **Texas**
- **Illinois**[4]

State-level data are not representative of the small areas that are part of the SERC region and, as such, this data was either not considered or discounted during the aggregation of state-level data to determine SERC characteristics.

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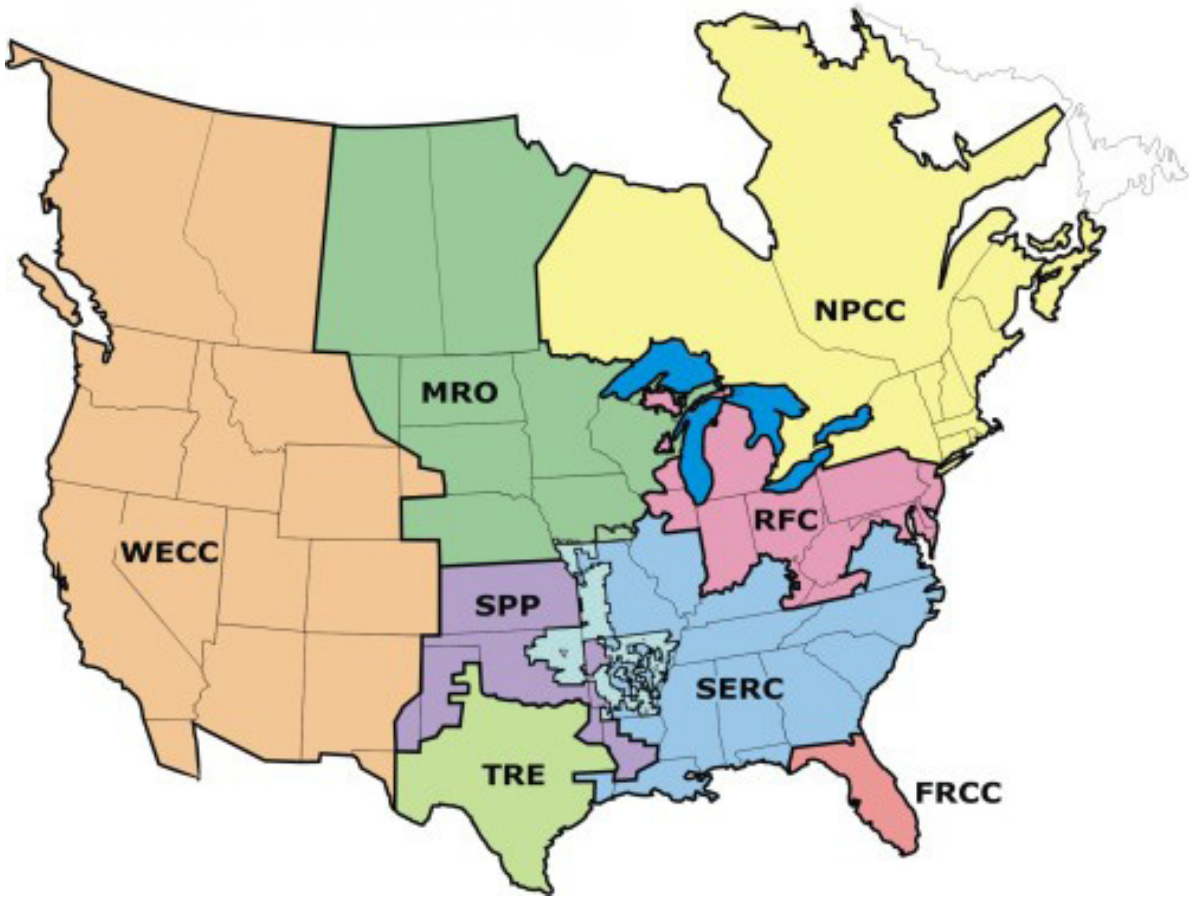
[4] The Chicago metro area is not part of SERC which limits the applicability of state-level data to describe SERC's characteristics within Illinois.

Appendix C: Energy Legislation

State	State Energy Efficiency Legislation for Industry	Carbon Legislation
Alabama	None	None
Arkansas	2003 IECC mandatory statewide	None
Kentucky	ASHRAE/IESNA 90.1-2004, mandatory statewide	None
Louisiana	2006 IECC and 2006 IBC	None
Mississippi	ASHRAE/IESNA 90.1-2004, and 2006 IECC for buildings not covered by ASHRAE, mandatory statewide	None
Missouri	None	None
North Carolina	2006 IECC is the basis for the state-developed code	None
South Carolina	2006 IECC mandatory in all jurisdictions	None
Tennessee	ASHRAE 90A-1980 and 90B-1975 are voluntary but jurisdictions can adopt a more stringent code	None
Virginia	2006 IECC mandatory statewide; enforcement is the local government's responsibility	Target of reducing statewide GHG emissions to 30% below business as usual by 2025
Non-Significant States:		
Florida	State-developed code mandatory that is more stringent than ASHRAE 90.1-2007	GHG emission reduction goals: 2000 levels by 2020; 1990 levels by 2030; and 80% below 1990 levels by 2050
Illinois	2009 IECC	GHG targets: 1990 levels by 2020, and 60% below 1990 levels by 2050
Texas	2000 IECC with 2001 Supplement	None

Source: Database of State Incentives for Renewables and Efficiency, http://www.dsireusa.org/summarytables/rrpee.cfm.
Source: Department of Energy, Building Energy Codes Program, http://www.energycodes.gov/implement/state_codes/index.stm.
Source: Environmental Protection Agency,http://www.energycodes.gov/implement/state_codes/index.stm.

Appendix D: North American Electric Reliability Corporation (NERC) Regions



Source: U.S. Energy Information Administration, http://www.eia.doe.gov/cneaf/electricity/chg_str_fuel/html/fig02.html

FRCC - Florida Reliability Coordinating Council

MRO - Midwest Reliability Organization

NPCC - Northeast Power Coordinating Council

RFC - ReliabilityFirst Corporation

SERC - SERC Reliability Corporation

SPP - Southwest Power Pool, RE

TRE - Texas Regional Entity

WECC - Western Electricity Coordinating Council

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