Southeast Regional Clean Energy Policy Analysis

Revised

Joyce McLaren

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

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National Renewable Energy Laboratory
1617 Cole Boulevard
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303-275-3000 • www.nrel.gov

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NREL's Clean Energy Policy Analyses (CEPA)

The CEPA suite of analyses and activities explore clean energy development and policy implementation at the regional, state, and local levels and disseminate that information to interested stakeholders. The activities gauge the effectiveness of and interactions between clean energy policies, provide insight into regional activities, investigate the interactions between local and state-level policies, and convene leading thought leaders to develop innovative regional, state, and local clean energy policies. The goal is to provide information to decision makers, researchers, and other stakeholders regarding the status of, barriers to, and possibilities for increased energy efficiency and renewable energy development at various levels of governance. For more information, see http://www.nrel.gov/cepa/. This report focuses primarily on energy use in electricity and buildings. For more information on transportation policies at the state and local level, please see the Alternative Fuels Data Center: http://www.afdc.energy.gov/afdc/.

Executive Summary

Compared to the national average, the Southeast[1] uses a slightly higher percentage of coal and nuclear energy and a lower percentage of natural gas to produce electricity (EIA 2010b). Coal fuels 51% of the region's electricity production, however the southeastern states depend heavily on coal imports. Every state in the region, with the exception of Kentucky, is a net importer of coal. The majority of the coal is brought from outside the region, from as far away as Wyoming and South America, at a cost of billions of dollars per year for each state (Deyette and Freese 2010).

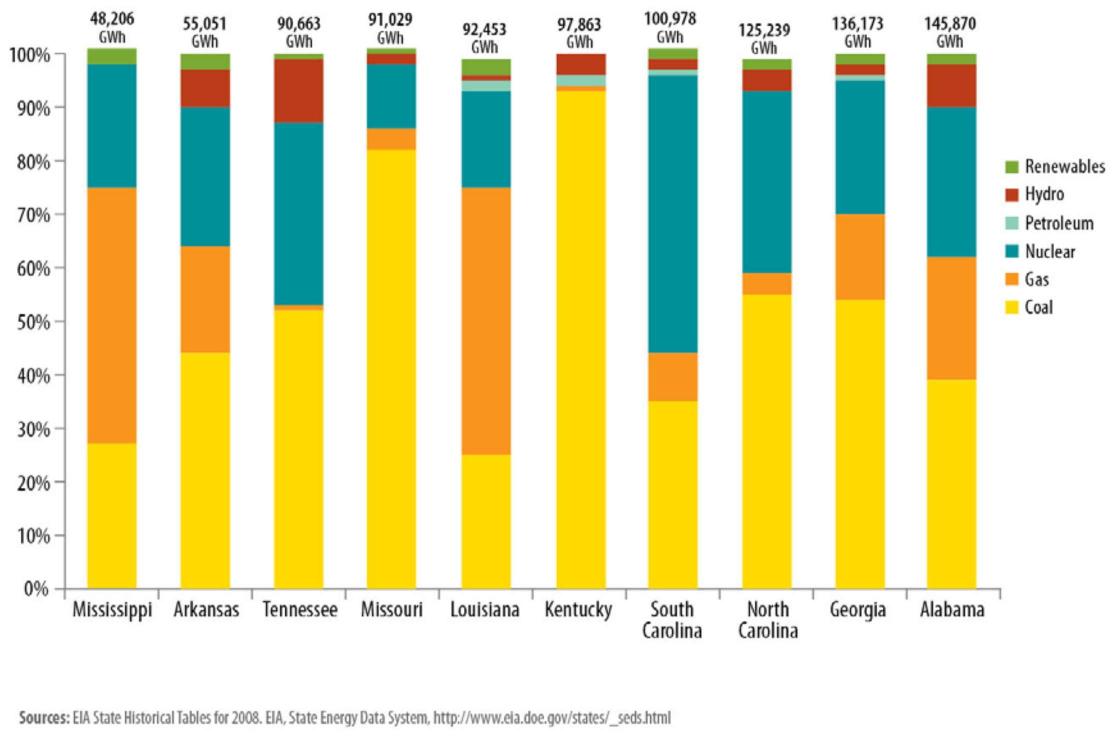


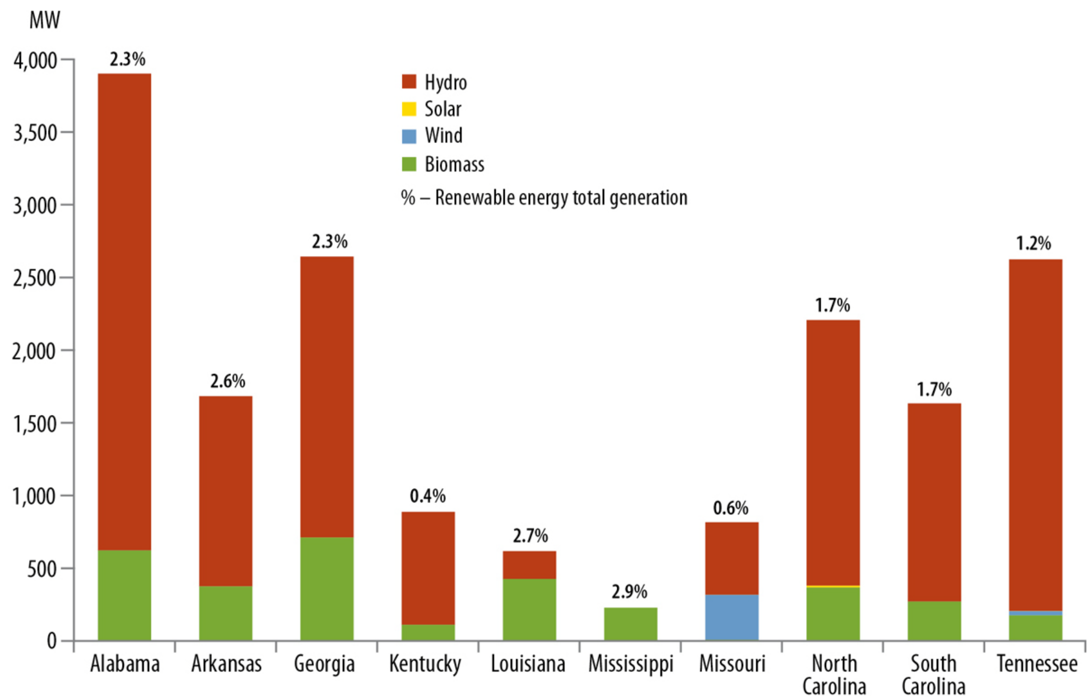
Figure ES-1 Fuel-mix for electricity generation by State (2009)

More than 50,000 MW of coal-fired plants were built in the Southeast during the 1950s and 1960s, and many of these aging plants are planned for retirement between 2020 and 2030 (Hart 2010). Although demand projections were decreased as a result of the economic recession, history alerts us to the possibility of rapid demand increases during periods of post-recession recovery (NERC 2010; NERC 2010). The southeast region is growing rapidly, and according to recent forecasts, regional electricity capacity will need to increase by nearly 50 GW by 2030 to

[1] This report covers the states that largely fall into the Southeastern Reliability Corporation (SERC) region: Alabama, Arkansas, Georgia, Louisiana, Kentucky, Missouri, Mississippi, North Carolina, South Carolina, and Tennessee. Actual SERC regional boundaries do not follow state lines, however, since this document focuses on state policy; state boundaries are used for the purposes of this report. If the majority of a state's electricity demand is in the SERC region, then the state is discussed in this report.

meet demand (Brown et al. 2010). This increase amounts to approximately 20% of the regional capacity in 2008.

The Southeast is making efforts to increase energy independence through energy efficiency and renewable energy implementation. States are defining their goals and priorities, focusing on job development opportunities and demonstrating efficiency and renewable energy use in public buildings. However, the region produced only 1.8% of the electricity from renewable resources other than conventional hydroelectricity in 2009, half of the national average (EIA 2010a). Biomass currently provides the majority of the region's non-hydroelectric renewable electricity (EIA 2010b).



Renewable Energy Capacity (MW)											
	AL	AR	GA	KY	LA	MS	MO	NC	SC	TN	TOTAL
Hydro	3,280	1,309	1,932	777	192	0	499	1,828	1,363	2,418	13,598
Solar	0	0	0	0	0	0	0	13	0	1	15
Wind	0	0	0	0	0	0	309	0	0	29	338
Biomass	622	374	711	110	426	223	8	367	270	175	3,287
TOTAL	3,902	1,683	2,643	888	618	223	816	2,207	1,633	2,623	

Sources:

Wind: AWEA: (http://www.awea.org/projects)

Geothermal: GEA, http://www.geo-energy.org/pdf/reports/April_2010_US_Geothermal_Industry_Update_Final.pdf

Biomass and Hydro: EIA Capacity by State, 2008: http://www.eia.doe.gov/cneaf/electricity/ and proposed 2009 additions by state, EIA Electric Power Monthly: http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html, Table ES3.

CSP: SEIA 2009 Solar Industry Year in Review page/capacity/capacity.html

PV: Larry Sherwood, U.S. Solar Market Trends 2009, Interstate Renewable Energy Council, July 2010

Solar includes on-grid PV and CSP.

Figure ES-2. Southeast renewable energy capacity by technology and state

Renewable Energy Potential

The Southeast has sufficient local renewable energy resources to support a strong clean energy economy (Howell et al. 2010; NREL 2010b; Porter et al. 2009). Most notably, the region is rich in untapped biomass resources, including residue resources (e.g., from forests, agriculture, mills, in untapped biomass resources, including residue resources (e.g., from forests, agriculture, mills, and urban waste) (NREL 2010b).

There is also the opportunity to develop a dedicated energy crop market in the Southeast. Dedicated energy crops, such as switchgrass and short-rotation woody crops, can be grown on Conservation Reserve Program lands, which have already been set aside for the growth of permanent vegetation rather than traditional crops. These crops can be grown on marginal lands, do not compete with traditional crops, and have fewer price spikes (Howell et al. 2010).

Encouraging biomass co-firing in existing coal facilities would provide an immediate demand for biomass resources, support the early stages of a biomass supply market, and immediately reduce emissions from coal-fired facilities (Robinson et al. 2003). In states with renewable portfolio standards (RPS), co-firing is a low-cost alternative for utilities to meet renewable energy requirements. Limiting the amount of co-firing that is eligible for the RPS in later years will encourage diversification of the renewable portfolio.

The Southeast has a variety of other clean energy resources besides biomass. Missouri has excellent on-shore wind potential. Louisiana has some of the best off-shore wind resources in the country. The Carolinas also have excellent off-shore wind potential. All of the states in the region have sufficient solar resources to produce distributed power from photovoltaic technology. The region has a high density of energy-intensive commercial and industrial facilities that are suitable for combined heat and power technologies. There are opportunities for methane-to-energy and small hydroelectric development in every state in the region.[2]

[2] See references listed in Table 11.

Table ES-1. Renewable Energy Potential in the Southeastern States

State	Onshore Wind Potential	Offshore Wind Potential	Solar (PV) Potential	Small Hydroelectric Potential	Combined Heat and power (CHP) Potential	Methane-to-Energy Potential	Solid Biomass Residue Potential	Total Renewable Energy Potential	
								GWh/year	% of 2008 state electricity generation
Alabama	0%	0%	10%	10%	6%	1%	8%	61,169	42%
Arkansas	49%	0%	13%	27%	7%	2%	26%	82,538	150%
Georgia	0%	136%	19%	8%	13%	2%	11%	272,619	200%
Kentucky	0%	0%	11%	9%	7%	1%	7%	42,130	43%
Louisiana	1%	1046%	14%	6%	11%	1%	15%	1,024,696	1108%
Mississippi	0%	0%	9%	10%	7%	1%	16%	52,847	58%
Missouri	1682%	0%	27%	30%	25%	4%	25%	875,945	1817%
North Carolina	2%	728%	19%	12%	14%	3%	10%	1,000,660	799%
South Carolina	0%	395%	12%	7%	9%	1%	7%	443,428	439%
Tennessee	1%	0%	19%	19%	10%	2%	7%	57,699	64%

Notes:
Potentials are shown as a percent of total state electricity generation for 2008 as reported in: Energy Information Administration (EIA), Historical State Generation data: 1990–2008 Net Generation by State by Type of Producer by Energy Source (EIA-906), published in the Electric Power Annual 2008 http://www.eia.doe.gov/cneaf/electricity/epa/epa_sprdshts.html released January 21, 2010.

For detailed notes of how the potentials were calculated, please see the version of this table presented in Chapter 4 of the full report.

Clean Energy Benefits

Developing the clean energy resources of the Southeast will yield a variety of benefits. Clean energy development is an investment in energy security and independence, acts as insurance against energy price fluctuations, can increase the value of marginal lands, and provides local and global environmental paybacks. In today's economy, however, job creation is one of the most commonly stated drivers for state-level clean energy investment.

Even accounting for job losses in the fossil fuel industry, the development of low carbon electricity sources, such as renewable energy, creates more jobs than fossil fuel generation per unit of energy delivered (Wei 2010). In addition, energy efficiency improvements could provide an estimated 4 million job-years in the United States through 2030 (Wei et al. 2010). The jobs created by the clean energy industry are for a wide range of skilled laborers, including scientists, construction workers, engineers, manufacturing workers, planners, and site managers.

Clean Energy Policy

There are a variety of policies that support energy efficiency and renewable energy development. In the Southeast, the most common state-level policies to support efficiency improvements are rebates and loans. Most of the states in the region also have efficiency standards for public buildings or government purchases.

Residential and commercial building codes meet current international standards in Georgia, Kentucky, Louisiana, North Carolina, and South Carolina; however, there is significant room for improvement in building codes in the other states (BACP 2010).

There are several policy actions that can help establish a regulatory environment favorable to energy efficiency. Decoupling of utility revenue from sales removes the utilities' incentives to sell more energy. Clear and standardized cost recovery processes reduce uncertainties and encourage utility participation in efficiency efforts. Integrated resource planning encourages utilities to value efficiency in their planning processes. Although a majority of the southeastern states have some form of decoupling and integrated resource planning, several clarifications and adjustments could strengthen the policies. Alabama, Louisiana, and Mississippi have no such policies in place. States can provide guidance to public utility commissions on balancing the provision of least-cost energy to consumers with goals for clean energy development. Rewards for utilities that implement effective customer-side efficiency programs can also stimulate energy savings, particularly when the incentives include clear metrics and verify results (NREL 2010a; Shirley et al. 2008).

The most common state-level policies to support renewable energy development in the Southeast are personal and corporate tax incentives and loans. While many of the states in the region have net-metering and interconnection policies, built in limitations reduce their effectiveness in stimulating development. In particular, raising the installation size limits and program participation caps would encourage further deployment.

Missouri and North Carolina are the only states in the region that have thus far implemented RPSs. RPS policy creates demand for clean energy that reduces uncertainty for investors. An RPS acts as a foundation policy on which other clean energy policies can be built.

Development of the region's unique biomass resources could be supported through policies that strengthen the supply-demand chain (such as favorable zoning and land use designations), information provision (to farmers and university extensions), incentives to retain biomass fuel in the region rather than exporting it, and providing loans and incentives for equipment manufacturers and biomass energy facilities.

Table ES-2. Clean Energy Development Opportunities in the Southeast

Barrier	Opportunity	Policy Support
Some biomass crops compete with traditional crops, driving up prices for staples such as corn and the derivative products (e.g. pork, poultry). Land values also prohibit the growth of biomass for energy production.	Grow dedicated biomass crops such as switchgrass and short-rotation woody crops. These crops can be grown on land under contract with the Conservation Reserve Program, which are already under contract to grow permanent vegetation, or on marginal lands.	• Encourage the use of the optimal biomass production zones by biomass growers by providing biomass tax incentives, zoning for biomass, increasing farmer education regarding opportunities, and connecting farmers with investors/power producers.
Biomass supply and demand market is immature. High risk for both biomass suppliers and energy developers.	Reduce investment risk and support the early stages of the biomass market formation by encouraging co-firing biomass in existing coal power plants.	• Include the biomass portion of co-firing in clean energy policies. • Implement policies that encourage near-term carbon dioxide reductions. • Implement carbon taxes or tradable carbon permits. • Provide technical support and education to biomass suppliers and plant operators.
Utilities revenue structures provide little incentive to promote energy efficiency.	Separate utility revenues from sales and place a value on efficiency in the electricity market.	• Strengthen decoupling policy, implement integrated resource planning process that values efficiency as a resource, and establish incentives for effective utility-led efficiency programs.
Local resources are distributed. Distributed generators face barriers to entering market.	Encourage the use of local energy resources by providing a favorable market for third-party power producers.	• Implement or strengthen interconnection standards and net metering policies. • Allow net metering for system sizes of 2MW and increase total program size limits. • Standardize interconnection standards for all utilities. • Refer to the Interstate Renewable Energy Council for model rules and standards.
Lack of public knowledge and experience with efficiency and renewable energy technologies.	Strengthen government clean energy leadership through increased demonstration of efficiency and renewable energy technologies on and in public buildings.	• Set EERE requirements for state facilities. • Model legislation and best practices designed to facilitate the implementation of EERE in public buildings is available from the Energy Services Coalition [http://www.energyservicescoalition.org/].
Lack of incentive for manufacturers to reduce energy usage of appliances. Lack of incentive for builders to reduce energy usage of buildings.	Align the interests of manufacturers and builders with those of customers through policy updates.	• Implement energy efficiency standards on appliances and update building efficiency codes. • Model state-level legislation for setting appliance efficiency standards is available from a variety of sources, including the Energy Services Coalition and the Appliance Standards Awareness Project.
The largest hydroelectric resources that are easily permitted have already been developed.	Develop incremental hydro resources and small hydroelectric facilities.	• Incentivize utilities to increase efficiency at existing dams through retrofits. • Make tax credits and financing available for small hydroelectric facilities.
High energy intensity of water heating.	Reduce energy needs through increased efficiency in water use and water heating.	• Financial incentives (tax credits/rebates) for solar water heaters and WaterSense and EnergyStar labeled appliances.

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1 Introduction

The southeastern states are making efforts moving toward a clean energy economy. States are defining goals and priorities, focusing on job development opportunities, and otherwise taking advantage of the unique character, background, and resources of the region. This report highlights these efforts through a discussion of the clean energy resources in the region, the policies and programs that states have implemented, and the resulting energy savings and clean energy production. Opportunities to strengthen policies that could support the increased development of local resources are also described.

1.1 Purpose of the Report

Many southeastern states currently depend on imported coal for a significant portion of their electricity production, and coal provides over 50% of the electricity for the region as a whole. Although some states do have coal supplies, all but one state within the region is a net importer of coal. The majority of the coal is brought from outside the region—as far away as Wyoming and South America—costing billions of dollars per year for each state.

This report aims to clarify the clean energy potential in the region and highlight the benefits and the opportunities in continuing the efforts of building a clean energy economy. It does so by:

- summarizing the current electricity landscape: the regional and state electricity mix (Chapter 2);
- discussing the status of clean energy development in the region, including the policies used to encourage this development (Chapter 3);
- defining the clean energy resource potential (Chapter 4);
- clarifying the regional benefits of clean energy development (Chapter 5); and
- pinpointing region-specific opportunities to advance clean energy through state-level policies that address current barriers (Chapter 6).

1.2 States Covered in this Report

This report covers the states that largely fall into the Southeastern Reliability Corporation (SERC) region: Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, and Tennessee. SERC is a regional division of the North American Electricity Reliability Corporation (NERC), a not-for-profit organization that oversees the reliability of the electric power system in North America, with oversight from the Federal Electricity Regulatory Commission (FERC). NERC develops and maintains reliability standards, which are then enforced by the eight regional entities. Actual NERC regional boundaries do not follow state lines; however, state boundaries are used in this document since they are most relevant to a discussion of state policy and development potential.

Utilities in the same reliability region often collaborate on issues affecting grid operations and planning, which include several issues that are crucial to the development of clean energy. In addition, SERC is surrounded by organized, wholesale power markets: the Electric Reliability Council of Texas, the Southwest Power Pool, the Midwest Independent System Operator, and PJM Interconnection.[3] This effectively defines the Southeast as a distinct region with respect to interstate power exchanges. With the exception of Texas, each of these markets is interconnected electrically through the Eastern Interconnection.

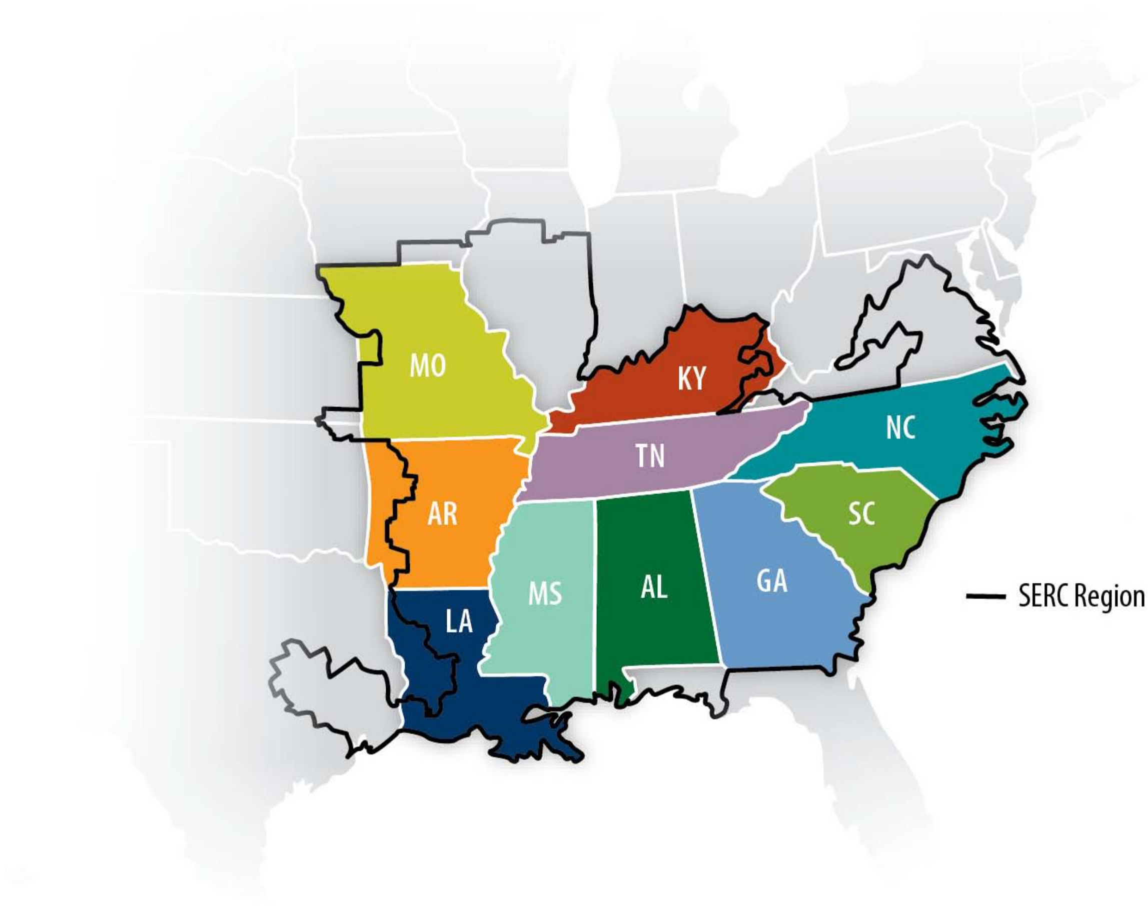


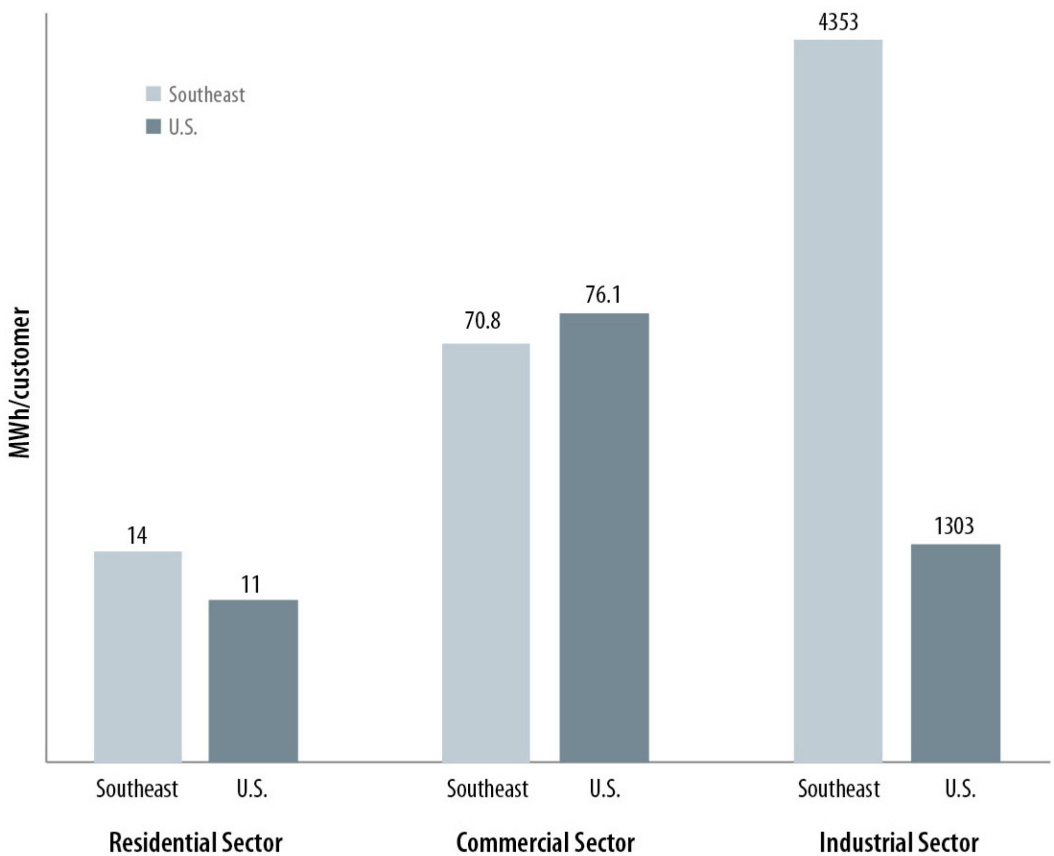
Figure 1. States covered in this report

[3] Florida is an exception; it is a separate NERC region but is not an organized wholesale power market.

2 The Energy Landscape in the Southeast

In 2008, the Southeast was responsible for 23.9% of the nation's total electricity consumption. The regional electricity consumption was 16.1 MWh per person that year, which was 32.4% higher than the national average of 12.1 MWh per person.
The Southeast consumed 0.41 GWh per million dollars of gross state product, 55% more than the national average of 0.26 GWh per million dollars of gross domestic product.

Figure 2 compares the sectoral electricity consumption per person for the southeast region with that of the United States as a whole. In 2008, the Southeast's residential sector used nearly 30% more electricity than the national average. The region's commercial sector was less energy intensive, using 6% less than the national average. Most notably, the industrial sector uses over 230% more electricity than the national average.



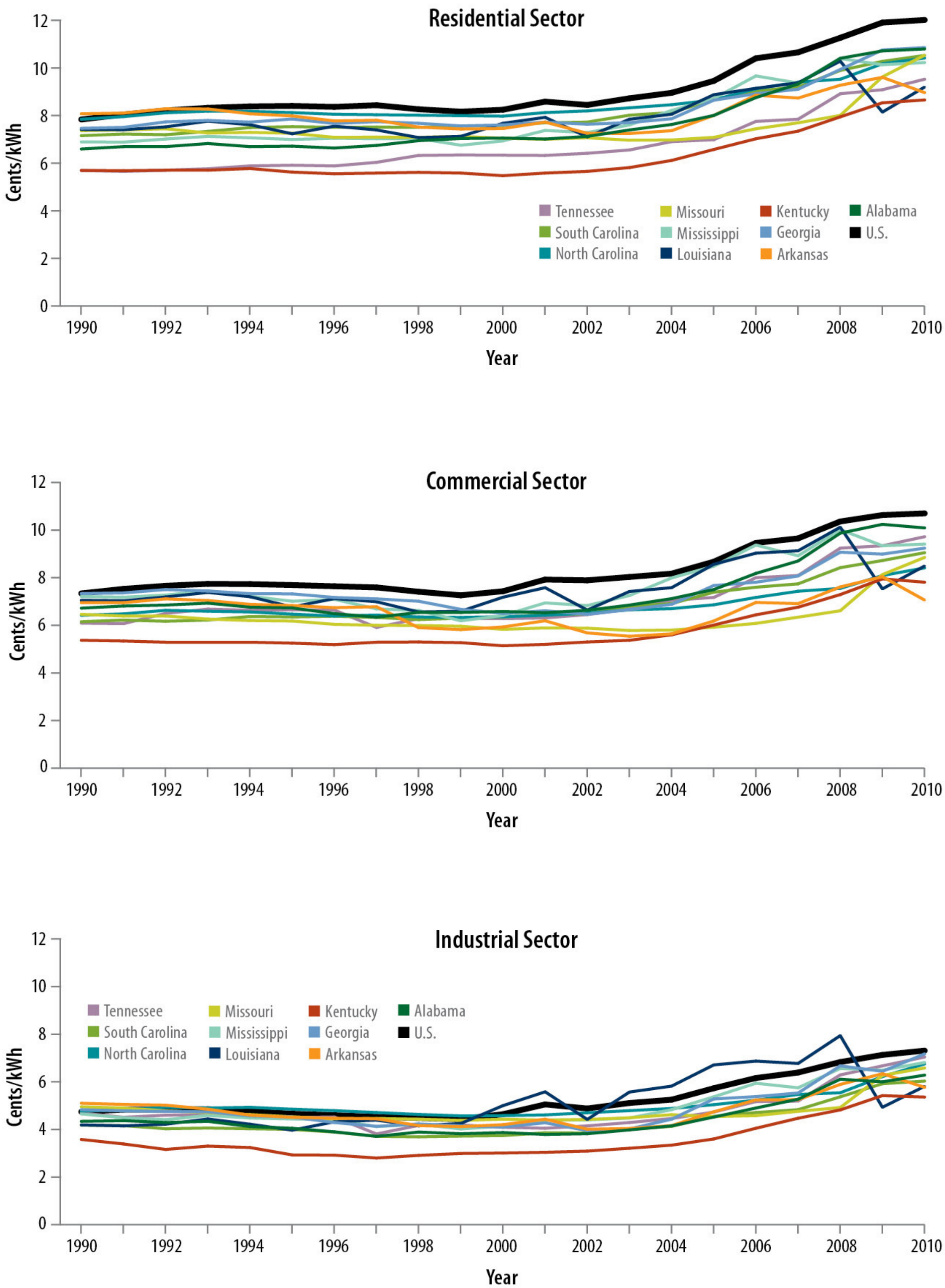
Source: Energy Information Administration (2010). Table 5. Average Monthly Bill by Census Division and State for 2008.
http://www.eia.doe.gov/cneaf/electricity/esr/table5.html

Figure 2. Electricity consumption per customer by sector (2008): Southeast vs. U.S. average

The high industrial electricity use in the region is likely the result of the region's concentration of energy intensive industries. According to U.S. Census Bureau data for 2007, the major industries in the Southeast include transportation equipment and vehicle, chemical, food, and beverage product manufacturing. Also making the top 10 for the region are the metal, iron, and steel product; pulp and paper; and machinery and electrical equipment manufacturing industries. Louisiana's main industry is refining petroleum and coal products (U.S. Census Bureau 2010).

Other factors likely influencing the relatively high percentage of electricity use per customer in the residential and industrial sectors include:

- historically low electricity rates, which also typically draw energy-intensive industries (see Figure 3);
- wide annual temperature variations, requiring air conditioning in the summer and heating in the winter; and
- relatively low levels of public expenditure on efficiency programs and historically limited use of energy conservation methods (discussed in section 3.1) (Brown et al. 2010).



Sources: EIA, State Historical Tables: EIA-861, Average Price by State by Provider 1990–2008, http://www.eia.doe.gov/cneaf/electricity/epa/epa_sprdshts.html and Table 5.6.A., Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State, July 2010 and 2009 http://www.eia.doe.gov/electricity/epm/table5_6_b.html

Figure 3. Average electricity prices by sector, 1990–2010

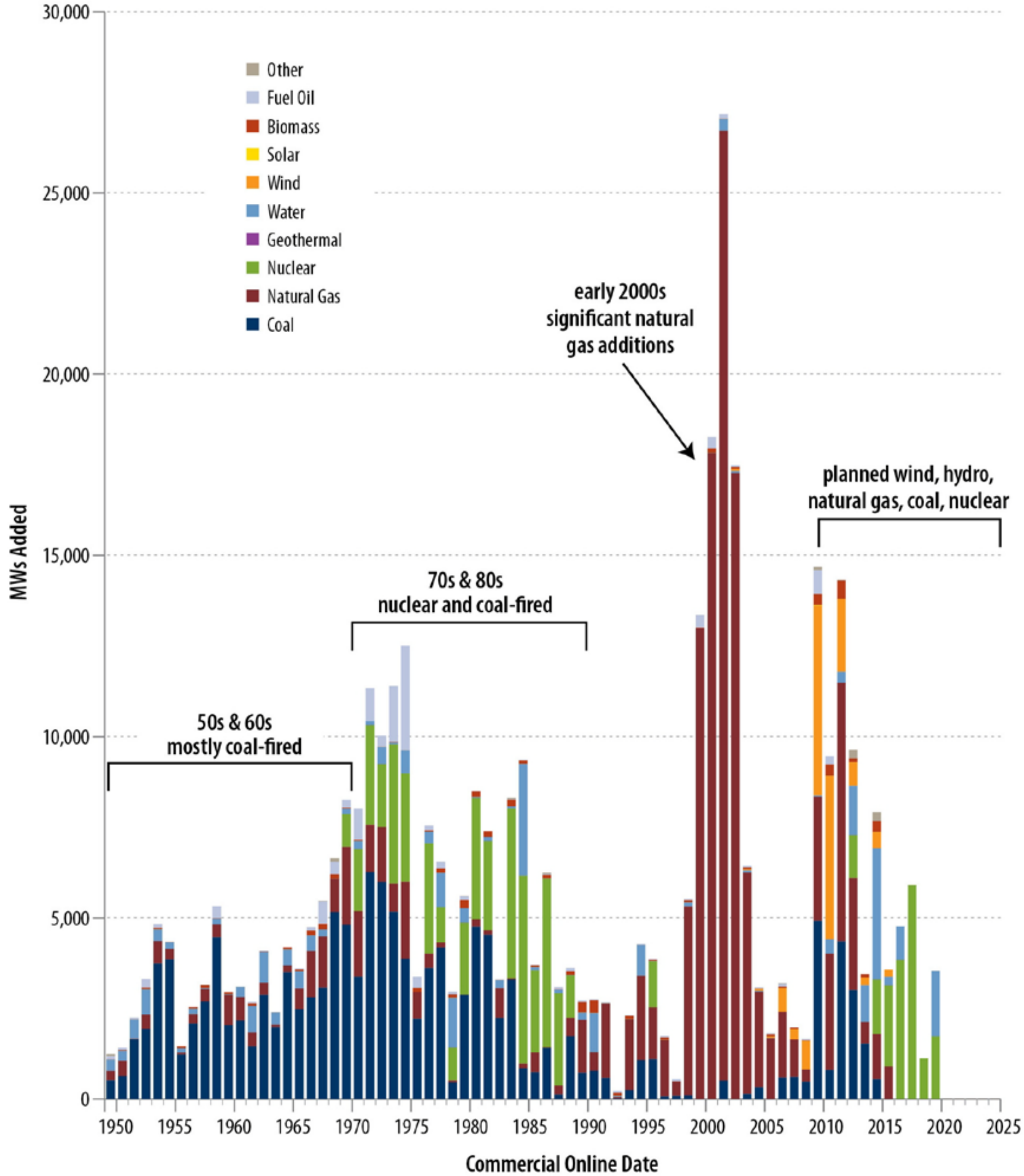
The rest of this chapter discusses the distinctive energy landscape of the Southeast. It covers the current electricity sources used in the region and the electricity mix, imports and exports, level of demand, and regulatory environment within each state. Chapter 3 will provide further context by specifically detailing the status of clean energy development. Together, Chapters 2 and 3 describe the unique character of the region and set the background for the remainder of the report.

2.1 Southeast Electricity Sources

As new technologies become available, fuel costs change, and priorities shift, the source of electricity in a region changes. Figure 4 shows the types of generation plants that were brought online in the Southeast over the past 60 years. During the 1950s and 1960s, coal-fired plants were the main source of electricity for the South, with limited hydro and natural gas capacity. By the 1970s and 1980s, nuclear was becoming a significant supplier of power. Low gas prices during the early 2000s lead to a spike in natural gas use for electricity production; nearly all new supplies that came online during this time were natural gas facilities. Looking into the near future, the planned facilities are more varied, with coal, natural gas, wind, hydro, nuclear, and biomass all contributing to the planned fuel mix (Ventyx 2010).

Although a few new coal-fired plants are being discussed, the high cost of transporting coal, along with regulatory uncertainty and permitting difficulties, may make other resources more attractive in coming years. Co-firing biomass with coal is one alternative option (Ringe et al. 1998; Robinson et al. 2003) as is increased use of natural gas plants. These fuel decisions will also be affected by pre-existing contractual obligations, pipeline or transmission system constraints, power plant capacities, regulatory pricing rules, and any environmental costs that are internalized into the market (Platt 2009).

The decisions made by state lawmakers, regulators, and utilities over the last 60 years have led to the current fuel mix. Fuel and technology availability and costs, economic development opportunities, and environmental and safety considerations are all factors that are considered in energy planning. As shown in Figure 5, over half of the region’s electricity is produced with coal, a quarter using nuclear technology, and 16% with natural gas. The remainder is generated with hydro, renewable energy technologies, and petroleum. Compared to the national average, the Southeast uses a slightly higher percentage of coal and nuclear and a lower percentage of natural gas. The region produced 1.8% of its electricity using renewable resources in 2009, compared with the national average of 3.6%. The majority of the region’s renewable energy came from biomass resources (EIA 2010a).



Notes: Existing includes operating, standby and restarted units.
Planned includes application pending, feasibility, permitted, postponed, site prep, proposed, testing and under construction plants.

Source: Ventyx's Velocity Suite, 2010.

Figure 4. Type of electricity generation facilities built in the Southeast, 1950–2010

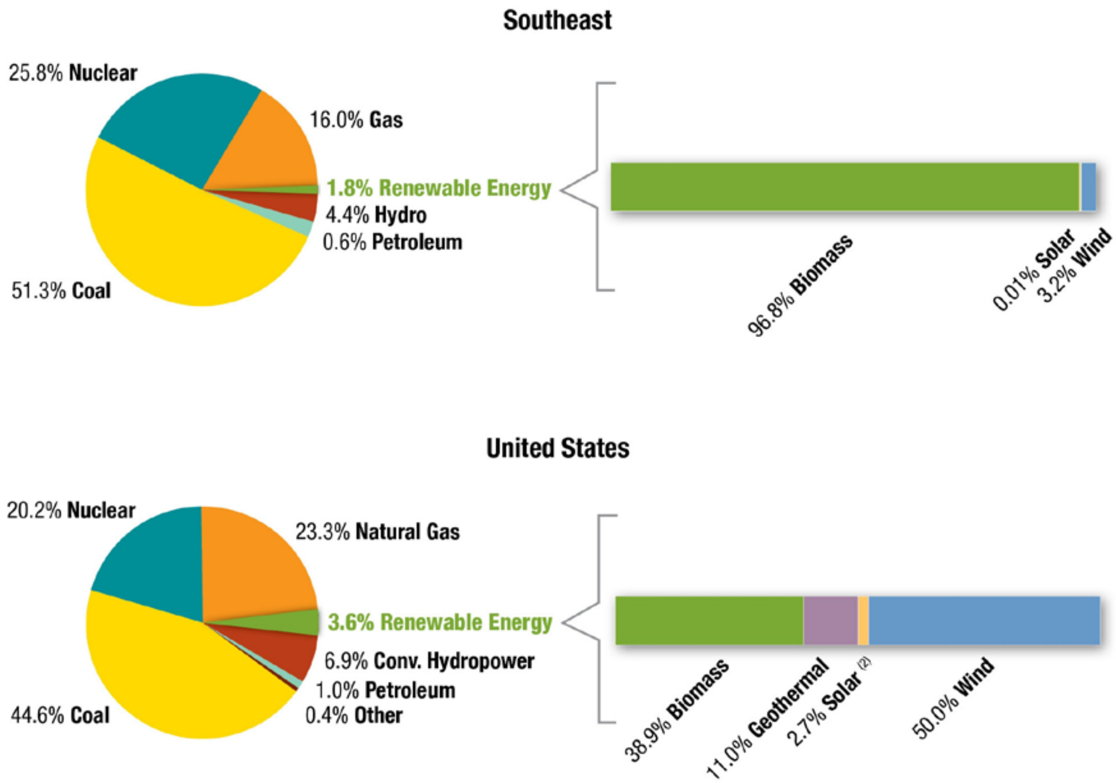
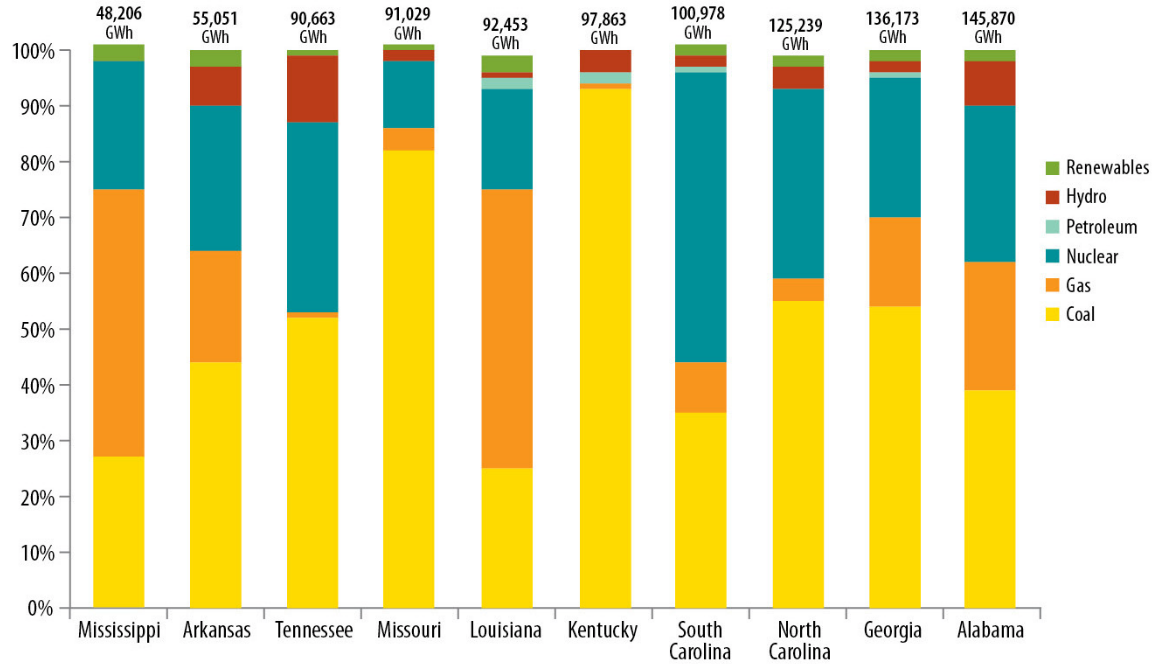


Figure 5. Electricity generation breakdown by technology (2009): Southeast compared to United States

Figure 6 depicts the specific mix of fuels used by each state in the region. As it shows, each of the southeastern states has a unique electricity resource mix; however, the states share many of the same issues. One of these is reliance on imported fuels and electricity. There is increasing focus on the desirability of energy independence and the need for job creation through local electricity production and the use of local fuels.



Sources: EIA State Historical Tables for 2008. EIA, State Energy Data System, http://www.eia.doe.gov/states/_seds.html

Figure 6. Fuel-mix for electricity generation by state (2009)

Figure 7 shows the states in the region that are currently net importers of electricity and the states that are net exporters. Tennessee, Georgia, Kentucky, and North Carolina are all net importers of electricity.

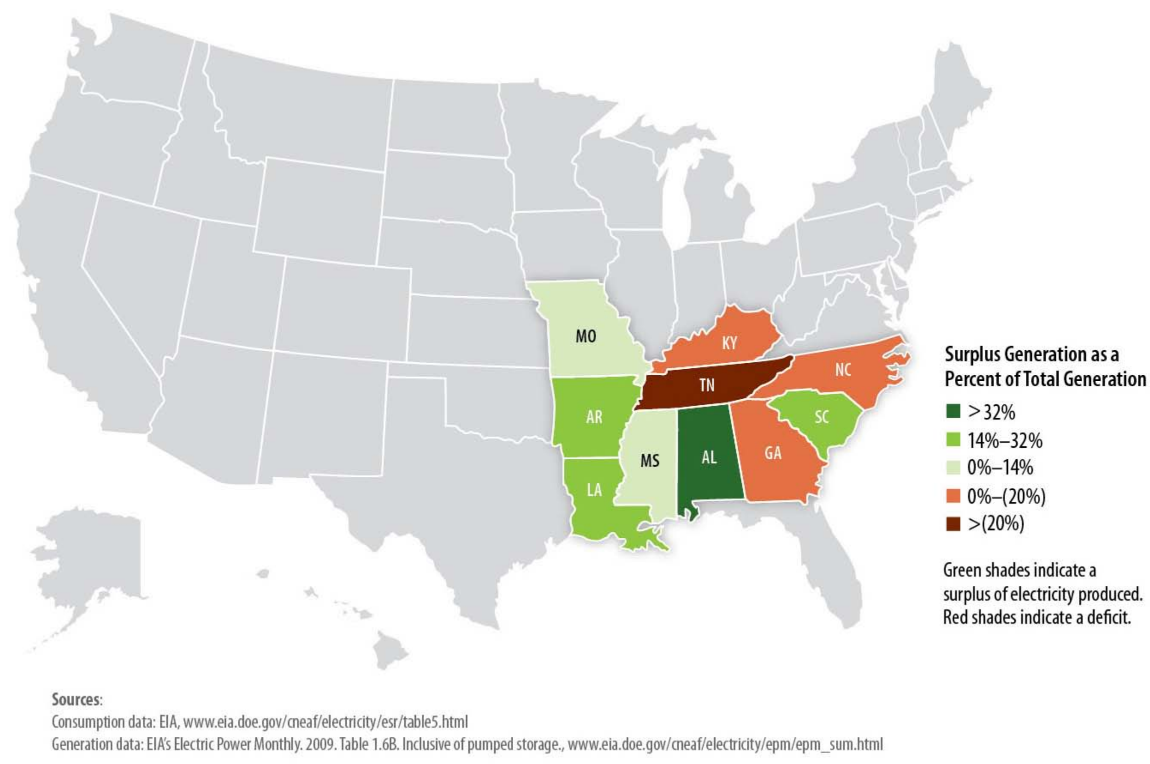


Figure 7. Net import/export of electricity (2009)

All of the states in the region, except Kentucky, are net importers of coal. The majority of this coal is purchased from outside the region or country, much of it from Wyoming. Some states import coal from as far away as South America. Table 1 shows key coal statistics for each state, including the percentage of coal each state uses to generate electricity, how much of the coal is imported, and how much the state spends on the net coal imports. Georgia, for example, generated 62% of its electricity from coal in 2008 and imported all of this coal at a cost of $2.6 billion. In total, the region spent approximately $5.8 billion dollars on net coal imports. With the exception of Kentucky, which has positive revenues from coal exports,[4] the states in the region spent between $110 and $297 per person on net coal imports. Comparatively, states spent between $0.00 and $1.62 per person on ratepayer-funded energy efficiency programs (Deyette and Freese 2010).

Table 1 also shows the percentage of state electricity that could potentially be derived from in-state renewable resources based on analysis presented in Chapter 4. Even excluding the significant potential of electricity from solid biomass resources such as residues and energy crops, most of the states have the potential to generate electricity from local resources in excess of that currently generated by imported coal. Although there are still social and economic barriers to realizing this potential, an important message here is that resource availability is not a barrier for the region.

[4] As states continue to pursue the development of local resources and reduced coal use, Kentucky may experience a reduction in revenues from coal exports.

The current fuel mix in the region is the baseline, or starting point, but it does not limit the future trajectory of the Southeast energy industry. While there are significant investments inherent in the current technology mix that create challenges to transition, there are substantial benefits of moving toward an alternative fuel mix.

Those who influence energy decisions can preserve and draw on the unique characteristics and history of the region to help create an energy future that suits changing needs and goals. This may include tapping the deep agricultural tradition of the region to develop a robust biomass industry, drawing on the region's hydroelectricity experience to take advantage of the small-hydro opportunities and benefiting from the region's pride in independence to establish greater energy security through less dependence on imported fuels.

Table 1. Coal Use, Imports and Expenditures, Efficiency Expenditures, and Renewable Energy Potential in the Southeastern States

State	% of Electricity from Coal	% of Coal Imported[1]	Main Coal Import Sources	Expenditures on Net Coal Imports[2]	Expenditures on Net Coal Imports/person	Expenditures on Energy Efficiency programs/person	Net Coal Imports Relative to State's Total Electricity Use	Renewable Energy Potential Relative to State's Total Electricity Generation	Notes
Alabama	51%	79%	CO, KY, WY Columbia	$1.39 billion	$297/ person	$0.49/ person	36%	42%	• Ranks first in the nation for expenditures per person on net coal imports. • Substantial coal and natural gas reserves • Good resources for hydroelectric and biomass generation from wood and wood-waste. • Demand for electricity in residential/industrial sectors is high compared to other states, largely due to the hot summer climate and the extensive use of electricity, rather than gas, for heating in winter.
Arkansas	47%	100%	WY	$46 million	$162/ person	$0.55/ person	50%	150%	• High per capita electricity use due to an energy-intensive indusrial sector.
Georgia	63%	100%	WY, South America	$2.62 billion	$270/ person	$0.50/ person	65%	200%	• Spends more than any other state in the country on net coal imports. • Generation and consumption are among the highest in the country. • Industry is the largest energy-consuming sector.
Kentucky	94%	38%[4]	IN, WV	($5 billion)	($1170/ person)	$0.40/ person	-158%	43%	• Among the top five states in the country for coal production. • Residential per capita electricity use is one of the highest in the country. • Energy-intensive aluminum industry.
Louisiana	26%	75%	WY	$489 million	$110/ person	$0.00/ person	22%	1108%	• Significant natural gas reserves that supply almost half of the state's electricity. • Very limited coal production; the coal-fired plants are concentrated in the northwest of the state.
Mississippi	35%	70%	CO, VA, WY, Columbia	$457 million	$155/ person	$0.11/ person	34%	58%	• Relatively high per capita consumption of electricity.
Missouri	81%	99%	CO, KY, WY	$1.13 billion	$190/ person	$0.22/ person	82%	1817%	• Although it was an early coal producer, MO has little coal extraction today and imports coal from neighboring states. • The per capita and industrial energy use are about average compared to the rest of the country. • Adopted a Renewable Electricity Standard in 2010.
North Carolina	61%	100%	KY, VA, WY Colombia	$2.35 billion	$254/ person	$0.75/ person	57%	799%	• Ranks second in the nation on expenditures for net coal imports. • One of the country's top nuclear power producers. • In the top 10 states for photovoltaic additions in 2009. • Adopted a combined Renewable Portfolio and Energy Efficiency Portfolio Standard in 2007.
South Carolina	41%	100%	KY, PA, WY, Columbia	$1.1 billion	$245/ person	$2/ person	37%	439%	• Approximately half of its electricity is produced with nuclear power. • Actively pursuing new nuclear developments.
Tennessee	62%	99%	IL, KY, WV, WY	$1.21 billion	$194/ persom	$1.62/ person	63%	64%	• One of the country's leading producers of hydroelectric generation. • In the country's top 20 for total electricity consumption and per capital electricity consumption.

Notes: Coal data are for 2008. Data on expenditures on energy efficiency programs are for 2007. The renewable energy potential is a % of total state generation in 2008, and includes commerical potential for onshore and offshore wind, photovoltaics, small hydroelectricity, combined heat and power, gaseous and solid biomass, and methane-to-energy. Potentials exclude solid biomass. Please see Table 11 for more details on how renewable energy potential was calcuated.

1% of coal imported=(tons of coal imported)/(tons of coal imported + tons of coal produced in-state)/100. This does not account for coal exports.

[1]All coal is not equivelent in energy content or in emission output during burning. States with in-state coal resources may import lower sulphur coal in order to meet emissions/air quality standards.

[2]Expenditures for imports include the cost of transport.

[4]Kentucky is a net exporter of coal, however it does import coal for use in state generation facilities. The state makes more revenue from the sale of coal than is spent on imports. This is reflected in this table by the positive number under "% coal imported" and the negative number under "net expenditures on imported coal".

Renewable energy potential is calculated using commerical potential, taking into account the current state of technology. The estimates also take into account environmental considerations and exclude sites based on environmental restrictions.

Geothermal potential is not included in these estimates due to the limitations of the data at the required level of specificity. Of the Southeastern states, Louisana has the greatest geothermal potential. Mississippi and Missouri also have some geothermal resource.

Sources: Burning Coal, Burning Cash, UCS, 2009. EIA–Historical Tables for 2008, released Janurary 2010. ACEEE Scorecard, 2009. Institute for Local Self-Reliance, Energy Self-Reliant States, 2010. Louisiana coal imports, EIA–State Coal Profile: Louisiana

EIA–State energy profiles KY coal imports, http://www.coaleducation.org/ky_coal_facts/coal_markets/utility_coal.htm

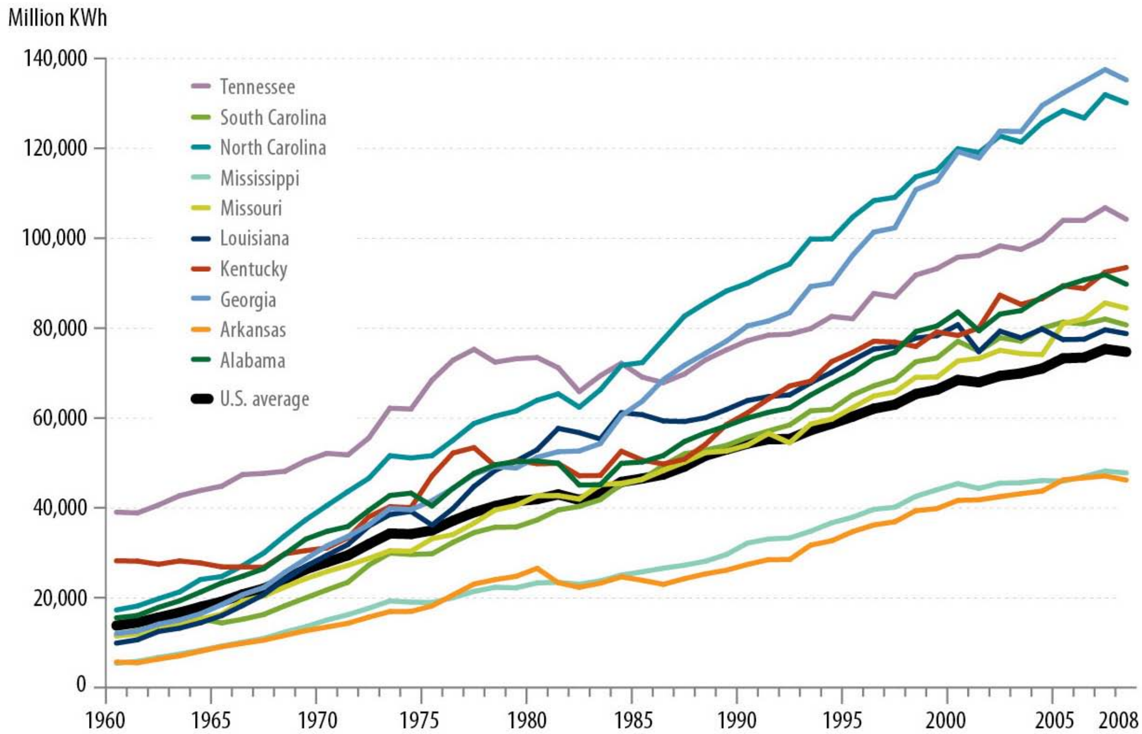
2.2 Electricity Demand

As shown in Figure 4, more than 50,000 MW of coal-fired plants were built in the Southeast during the 1950s and 1960s. Many of these aging plants will be beyond their expected useful lives and are likely to be retired between 2020 and 2030 (Hart 2010). During the same time period, the Southeast is projected to have increasing electricity demands in response to the influx of population into the region and the continuing growth of the region's metropolitan areas. Capacity requirements in the Southeast are forecasted to increase by nearly 50 GW by 2030 unless energy efficiency measures are implemented (Brown et al. 2010). This is approximately a 20% increase in capacity[5] (EIA 2009). Under one aggressive efficiency scenario, however, demand in the region could actually decline by 19 GW over the same time period (Brown et al. 2010).

NERC's recent demand projections for 2010–2019 were lower than those made for the last 2 years. This year, projections for the year 2018 were 4.1% lower than those for 2009 and 7.8% lower than the projection made for 2008. The decline in demand projections and the high over all reserve margins were the result of the economic recession, as well as advancements in demand-side management (NERC 2010). Although the recession has delayed expected demand levels by about 4 years, history has shown the possibility of a rapid increase in demand during the post-recession period (NERC 2010). For this reason, NERC stresses the importance of the electric industry maintaining a flexible generation supply in order to respond to higher than expected demand and unforeseen resource issues. NERC predicts an unprecedented shift in the generation fuel mix over the coming decade, including an increasing role of new gas-fired, wind, solar, and nuclear capacity (NERC 2010).

Typically, the actual capacity of electricity that comes online is significantly less than the amount of capacity planned and announced by utilities. This gap is due to delays and cancellations as well as regulatory uncertainties and economic change, which affect power plants of all types and fuel sources. In the southeastern region, four new coal-fired power plants were under construction at the beginning of 2010 (Shuster 2010). Only one additional plant had been permitted for construction at that time. Obtaining financing for new coal-fired plants is becoming more difficult as a result of uncertainties regarding climate policy and emissions regulations (Ball 2010; Berry 2008; Clayton 2010; Duke and Lashof 2008). As Figure 4 shows, other resources are being increasingly considered; in fact, more wind energy capacity has been proposed than natural gas or coal capacity (Shuster 2010).

[5] The states in the region had a total of 238.3 GW capacity in 2008 (EIA 2009).



Source: EIA, State Energy Data System, http://www.eia.doe.gov/states/_seds.html

Figure 8. Electricity consumption in the Southeast (1960–2008)

2.3 Electricity Market Regulation in the Southeast

Another defining characteristic of a state's electricity system is the regulatory structure. All of the states in the southeastern region have regulated utility industries. Arkansas started a utility restructuring process in the late 1990s but has suspended the processes due to various concerns and uncertainties (EIA 2010d).

The Tennessee Valley Authority

The Tennessee Valley Authority (TVA) is a federal corporation, created in 1933 by Congress as part of the New Deal to assist the country out of the Great Depression. It is the largest publicly owned electric utility in the country with 155 distributors, including municipal utility companies and cooperatives, which resell TVA power to their consumers. TVA is the primary electricity provider in Tennessee and also covers small areas of Mississippi, Alabama, Georgia, North Carolina, Kentucky, and Virginia. In addition, TVA power is sold directly to 51 large industrial customers and 6 federal installations. Besides power production, TVA provides navigation, flood control, and land management issues for the Tennessee River system.

Since TVA is self-regulated, it is not subject to oversight by state public service commissions, as are other regulated utilities. This means that state-level policies do not apply to the area within the TVA district. TVA, however, is subject to PURPA and other applicable federal policies, and the TVA board considers the PUPRA standards in a similar fashion as state utility commissions (see PURPA text box in Chapter 3).

A state's regulatory structure affects the ways in which energy efficiency and renewable energy projects are supported and implemented. Public utility commissions (PUCs) are mandated to protect the interests of consumers and ensure least-cost energy. The way in which this mandate is interpreted and balanced with other policy goals, such as the development of clean energy, can vary considerably from state to state. While the development of clean energy options may increase costs to consumers in the short term, it may provide long-term price insurances and other benefits that are not captured in simple, short-term cost calculations. Providing clear guidance to PUCs on how to balance least-cost mandates with goals for clean energy development is an important consideration for state legislatures. Chapter 3 describes some legislative options that southeastern states can implement to provide a regulating environment supportive of clean energy development.

Electricity Regulation: Defining the Players and Terminology

PUCs are state-level organizations that regulate investor-owned utilities. They monitor rates, ensure quality of service, and enforce safety rules. PUCs are also called Public Service Commissions or Regulatory Commissions in some states.

Alabama http://www.psc.state.al.us/
Arkansas http://www.state.ar.us/psc
Georgia http://www.psc.state.ga.us/
Kentucky http://www.psc.state.ky.us/
Mississippi http://www.psc.state.ms.us/
Missouri http://www.ecodev.state.mo.us/psc/
North Carolina http://www.ncuc.commerce.state.nc.us/
South Carolina http://www.psc.state.sc.us/
Tennessee http://www.state.tn.us/tra
Virginia http://www.state.va.us/scc

National Association of Regulatory Utility Commissioners (NARUC) is a non-profit organization that represents the state PUCs who regulate the utilities.

Federal Energy Regulatory Commission (FERC) regulates the *interstate* commerce and transmission of electricity; protects the reliability of the high voltage interstate transmission system through mandatory reliability standards; reviews proposals to build new transmission; licenses and inspects hydroelectric projects; and monitors energy markets, including reviewing mergers, acquisitions, and corporate transactions.

Rate cases are the formal processes that set the allowable price that public utilities may charge their customers for electricity and service.

Restructuring occurs when a fully regulated monopolistic system of electric utilities is replaced with a market system in which there is customer choice and competition between electricity providers.

3 Clean Energy in the Southeast

This chapter looks at the extent to which clean energy technologies are currently being employed in the Southeast and the policies the states have implemented to encourage this development.[6] First, the extent to which the Southeast is using energy efficiency and renewable energy technologies is discussed. A brief overview of the major actors at the state level follows. Finally, the details of the policies that states have implemented to support this development are given.

3.1 Energy Efficiency in the Southeast

Although it is difficult to determine how much energy is *not* being used that would otherwise have been, there are several indicators that can be used to measure energy efficiency. One indication of the degree to which states are employing efficiency methods is given by the policies being implemented. Many of the southeastern states have government rebates and loans to encourage consumer energy efficiency. In addition, most of the states have efficiency standards for public buildings. A summary of these and other policies implemented in the region is given in Table 5 and some of the policies are detailed in Section 3.4.

However, having a policy does not guarantee that it is being implemented effectively to reduce energy consumption. In a study managed by the Natural Resources Defense Council, researchers used energy consumption data for each state to determine the change in the residential energy use per capita over time, adjusting for annual weather differences (NRDC 2010). This delta is a measure of the energy efficiency of the state economy and provides an indication of the extent to which states are effectively implementing efficiency measures.

According to the study, none of the southeastern states reduced their adjusted residential energy use per capita between 1996 and 2006. Louisiana, Tennessee, and Kentucky had the least increase (indicating more efficiency), while South Carolina and Alabama had the highest increase in use (indicating less efficiency). The 10-year change for each state is given in Table 2. Smaller values indicate less growth in energy intensity—a positive trend (NRDC 2010).

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[6] Some states, including Louisiana and West Virginia, have established regulatory frameworks to allow carbon capture and sequestration from coal plants, addressed long-term liability and ownership issues, and defined permitting and safety requirements regarding injection and long-term storage of carbon dioxide. These state policies are not evaluated in this report, as they fall more into the category of climate change policies rather than energy efficiency and renewable energy policies.

Table 2. Implementation of Energy Efficiency in the Southeast

National Rank in Efficiency	State	1997–2006 Adjusted Energy Consumption Slope
19	Louisiana	0.33
22	Tennessee	0.36
23	Kentucky	0.36
27	North Carolina	0.39
29	Missouri	0.48
30	Georgia	0.51
40	South Carolina	0.68
42	Alabama	0.68

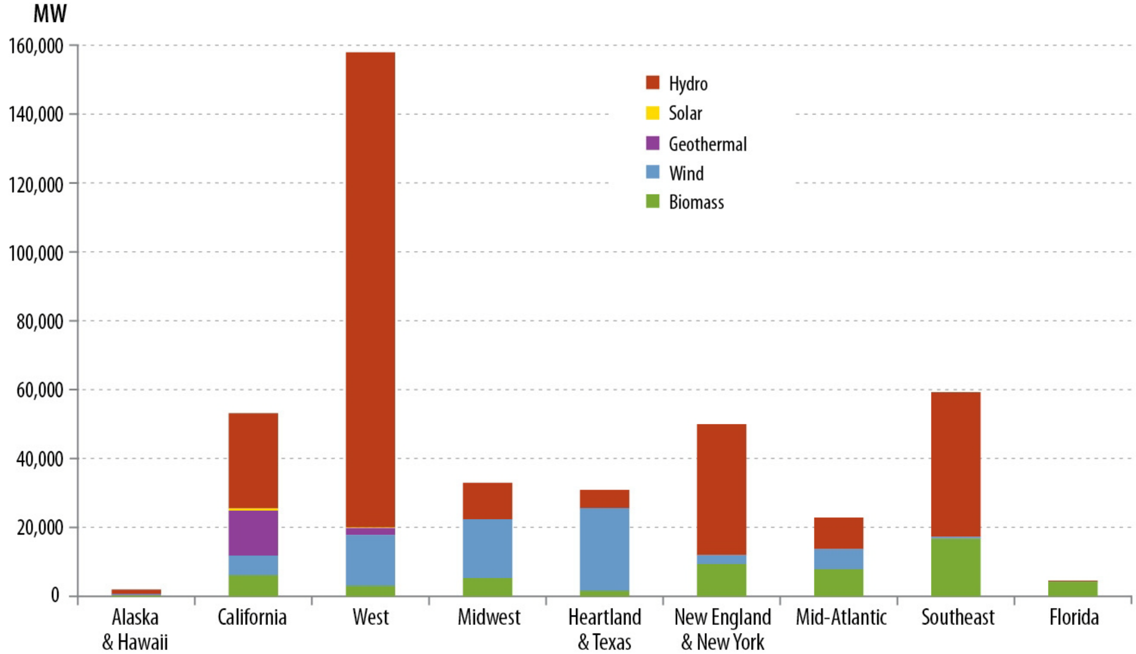
Notes: Smaller slopes indicate a slower increase in electricity use per capita. The calculations used Energy Information Administration data for primary (undelivered) residential electricity generation. The data were adjusted using a weighted average heat rate for each state, based on electricity production fuel source data. Adjustments were also made using multiple linear regression to estimate how energy intensity for each sector depends on weather, price of energy, and relevant economic indicators. For more details on the methodology, see: Sheppard, et. al (2010). "Exploring Strategies for Implementing a Performance based State Efficiency Program: State Energy Consumption Metrics – Residential Sector Analysis." Performance-based State Efficiency Program. Downloadable from: http://www.schatzlab.org/projects/psep/psep.php.

Source: Performance Based State Efficiency Program, http://www.schatzlab.org/projects/psep/psep.php

3.2 Renewable Energy Use in the Southeast

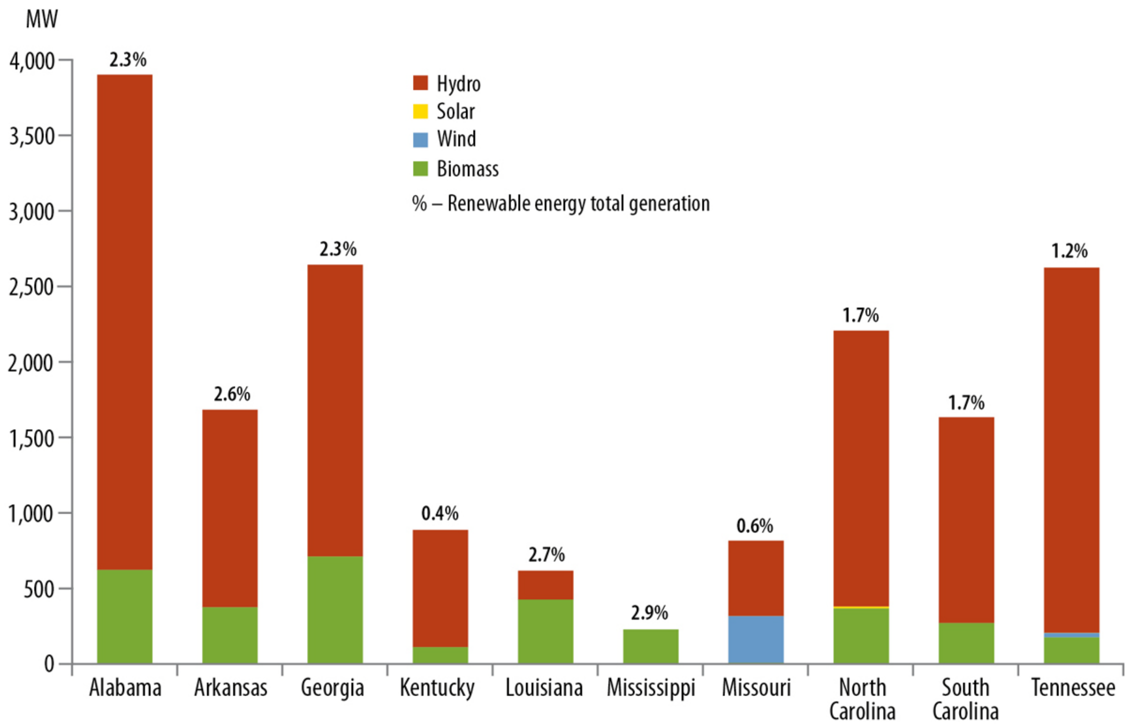
The Southeast has substantial renewable energy resources (see Table 11 in Chapter 4). The World Research Institute estimates that the Southeast currently harnesses just over one-tenth of the practical renewable energy available, but by deploying currently available, cost-effective technologies, over 30% of the region's total electricity needs could be met by renewable resources (Creech et al. 2009).

Figure 9 shows the renewable energy capacity of the various U.S. regions and indicates the percentage of total regional generation that is produced by this renewable capacity. Figure 10 provides these figures for the individual southeastern states. As Figure 10 indicates, Alabama leads the region in terms of total renewable energy capacity due to significant generation produced by hydroelectric facilities. Georgia, however, leads in non-hydro renewable energy with over 700 MW of biomass capacity. North Carolina by far has the most solar energy capacity, while Missouri leads in wind energy development. Missouri's wind energy potential is discussed further in Chapter 5.



Sources: AWEA, GEA, SEIA, Larry Sherwood/IREC, EIA

Figure 9. Southeast renewable energy capacity by technology and region



	Renewable Energy Capacity (MW)										
	AL	AR	GA	KY	LA	MS	MO	NC	SC	TN	TOTAL
Hydro	3,280	1,309	1,932	777	192	0	499	1,828	1,363	2,418	13,598
Solar	0	0	0	0	0	0	0	13	0	1	15
Wind	0	0	0	0	0	0	309	0	0	29	338
Biomass	622	374	711	110	426	223	8	367	270	175	3,287
TOTAL	3,902	1,683	2,643	888	618	223	816	2,207	1,633	2,623	

Sources:

Wind: AWEA: (http://www.awea.org/projects)

Geothermal: GEA, http://www.geo-energy.org/pdf/reports/April_2010_US_Geothermal_Industry_Update_Final.pdf

Biomass and Hydro: EIA Capacity by State, 2008: http://www.eia.doe.gov/cneaf/electricity/ and proposed 2009 additions by state, EIA Electric Power Monthly: http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html, Table ES3.

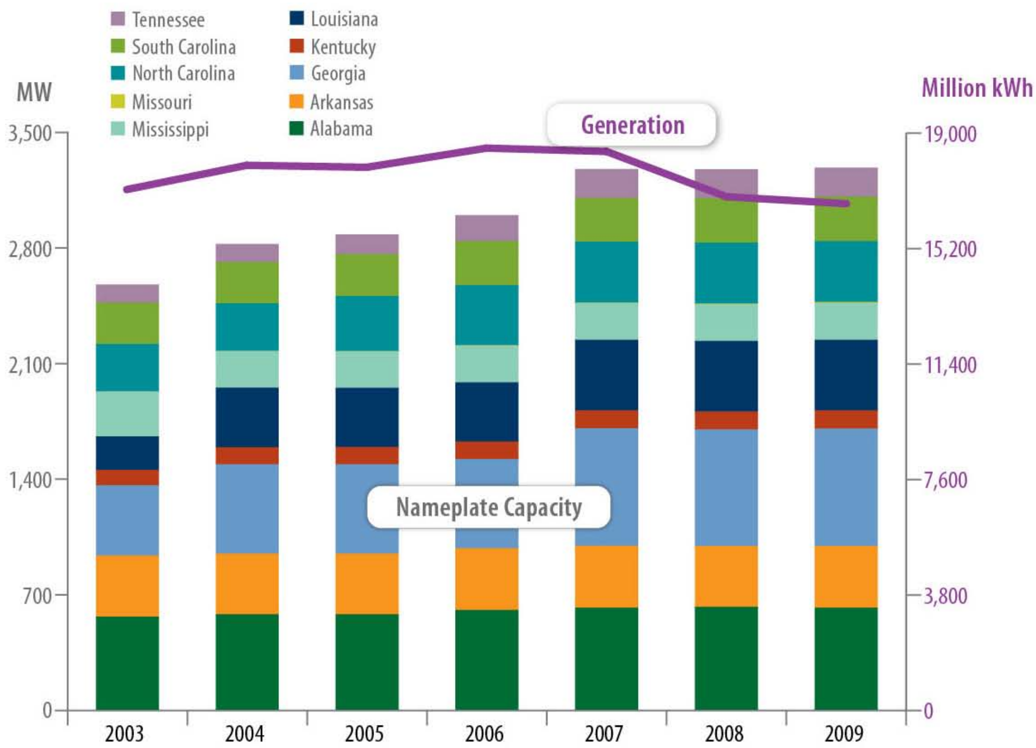
CSP: SEIA 2009 Solar Industry Year in Review page/capacity/capacity.html

PV: Larry Sherwood, U.S. Solar Market Trends 2009, Interstate Renewable Energy Council, July 2010

Solar includes on-grid PV and CSP.

Figure 10. Southeast renewable energy capacity by technology and state

Figures 11–14 show the change in capacity and generation of each of the renewable energy technologies over the past 7 years. Despite the sizeable potential of biomass in the Southeast (discussed further in Chapter 4), biomass capacity growth has leveled off in the past 3 years and generation has declined. Wind energy use has increased sharply with the addition of 309 MW in Missouri and 29 MW in Tennessee, as well as some initial activity in Arkansas. The solar capacity is concentrated in North Carolina, although each of the states has viable solar resources and some recorded capacity. Conventional hydroelectric capacity has remained unchanged, although generation dipped significantly between 2006 and 2009 due to regional droughts. Improvements in existing facility efficiency and the construction of small-hydro facilities (typically less than 10 MW) are likely to account for most of the hydroelectric capacity increases in the future.



	Biomass Energy Capacity (MW)										Regional Biomass Energy Generation (Million kWh)
	AL	AR	GA	KY	LA	MS	MO	NC	SC	TN	
2003	568	370	425	93	203	273	0	287	250	110	17,144
2004	581	370	540	102	361	223	0	287	250	110	17,942
2005	581	370	540	103	359	223	0	331	256	119	17,876
2006	607	375	540	105	359	223	3.2	363	267	156	18,507
2007	622	375	712	108	426	223	3.2	367	267	175	18,397
2008	622	374	706	108	426	223	5.2	367	270	175	16,907
2009	622	374	711	110	426	223	8.2	367	270	175	16,679

Sources:

EIA – Electric Power Monthly, Table 1.1, http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html

EIA – Electric Generating Capacity, http://www.eia.doe.gov/cneaf/electricity/page/capacity/capacity.html

EIA – Planned Nameplate Historical Additions, http://www.eia.doe.gov/cneaf/electricity/epa/epat2p4.html

EIA – Electric Power Annual, http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html

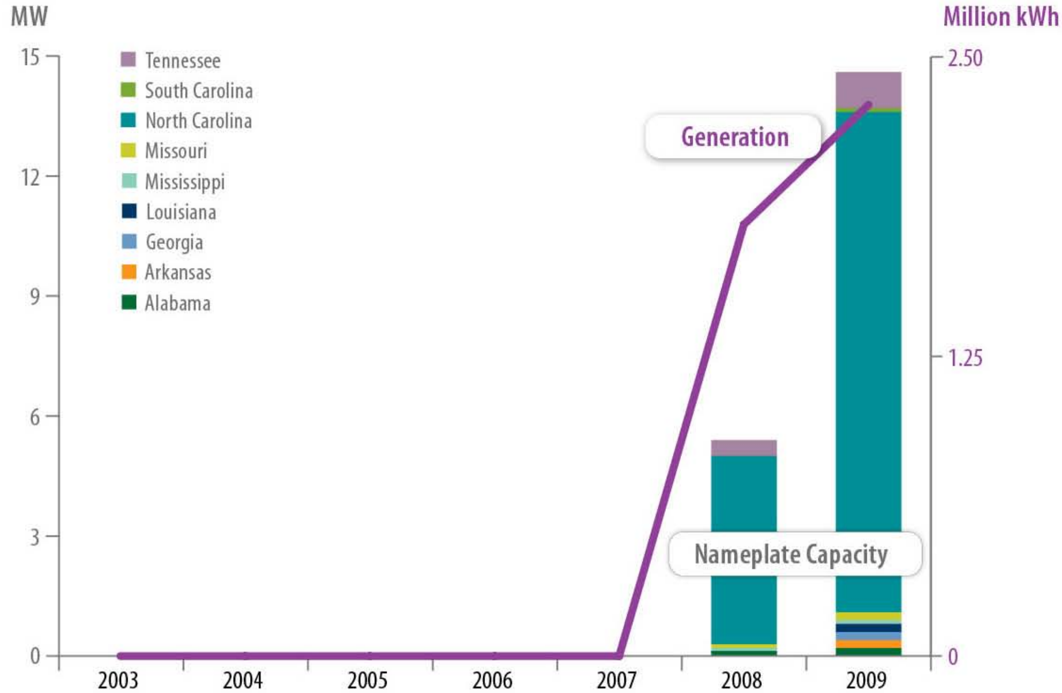
American Wind Energy Association (AWEA) – Annual Wind Industry Report, 2009, http://www.awea.org/publications/reports/AWEA-Annual-Wind-Report-2009.pdf

Solar Energy Industries Association (SEIA) – US Solar Industry Year In Review 2009, http://seia.org/galleries/default-file/2009%20Solar%20Industry%20Year%20in%20Review.pdf

Geothermal Energy Association (GEA), US Geothermal Power Production and Development Update – April 2010, http://geo-energy.org/pdf/reports/April_2010_US_Geothermal_Industry_Update_Final.pdf

Larry Sherwood/IREC

Figure 11. Total installed biomass energy capacity and generation in the Southeast (2003–2009)



	Solar Energy Capacity (MW)									Regional Solar Energy Generation (Million kWh)
	AL	AR	GA	LA	MS	MO	NC	SC	TN	
2003	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0
2008	0.1	0	0	0	0.1	0.1	4.7	0	0.4	1.8
2009	0.2	0.2	0.2	0.2	0.1	0.2	12.5	0.1	0.9	2.3

Sources:

EIA – Electric Power Monthly, Table 1.1, http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html

EIA – Electric Generating Capacity, http://www.eia.doe.gov/cneaf/electricity/page/capacity/capacity.html

EIA – Planned Nameplate Historical Additions, http://www.eia.doe.gov/cneaf/electricity/epa/epat2p4.html

EIA – Electric Power Annual, http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html

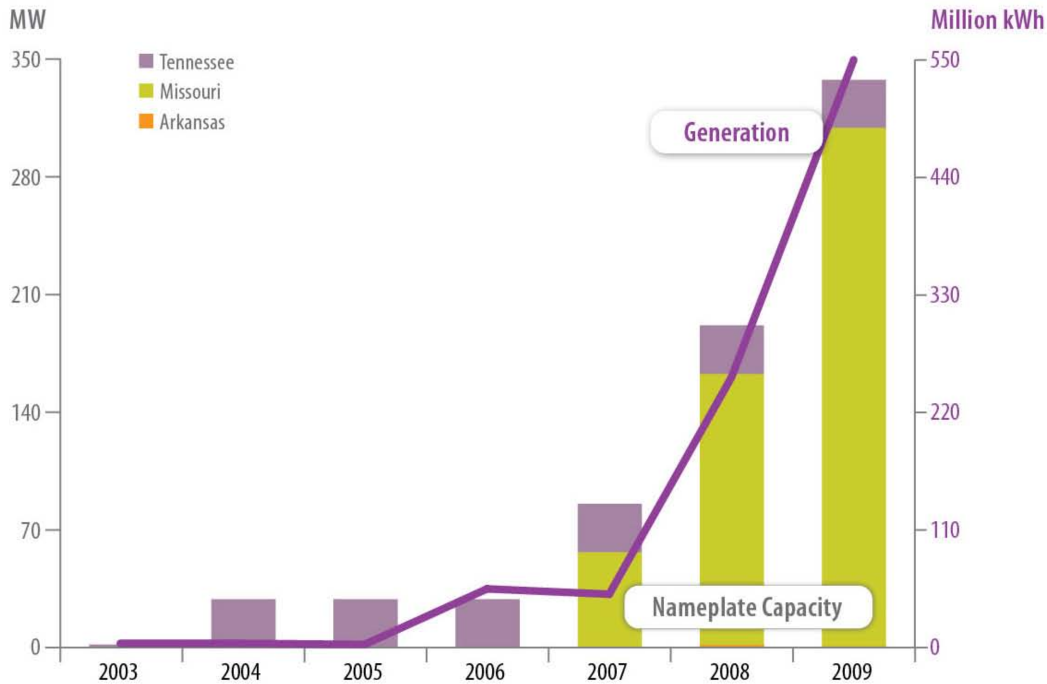
American Wind Energy Association (AWEA) – Annual Wind Industry Report, 2009, http://www.awea.org/publications/reports/AWEA-Annual-Wind-Report-2009.pdf

Solar Energy Industries Association (SEIA) – US Solar Industry Year In Review 2009, http://seia.org/galleries/default-file/2009%20Solar%20Industry%20Year%20in%20Review.pdf

Geothermal Energy Association (GEA), US Geothermal Power Production and Development Update – April 2010, http://geo-energy.org/pdf/reports/April_2010_US_Geothermal_Industry_Update_Final.pdf

Larry Sherwood/IREC

Figure 12. Total installed solar energy capacity and generation in the Southeast (2003–2009)



	Wind Energy Capacity (MW)			Regional Wind Energy Generation (Million kWh)
	AR	MO	TN	
2003	0	0	1.8	3.9
2004	0	0	29	3.8
2005	0	0	29	3.3
2006	0	0	29	55
2007	0	57	29	50
2008	1.0	163	29	253
2009	0.1	309	29	550

Sources:

EIA – Electric Power Monthly, Table 1.1, http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html

EIA – Electric Generating Capacity, http://www.eia.doe.gov/cneaf/electricity/page/capacity/capacity.html

EIA – Planned Nameplate Historical Additions, http://www.eia.doe.gov/cneaf/electricity/epa/epat2p4.html

EIA – Electric Power Annual, http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html

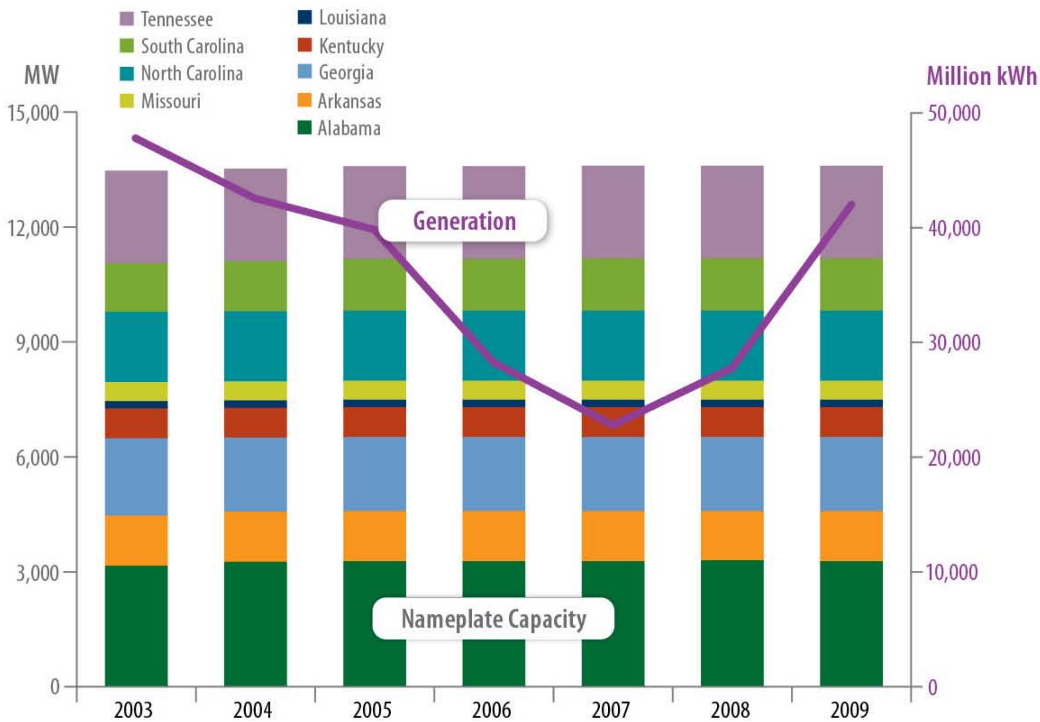
American Wind Energy Association (AWEA) – Annual Wind Industry Report, 2009, http://www.awea.org/publications/reports/AWEA-Annual-Wind-Report-2009.pdf

Solar Energy Industries Association (SEIA) – US Solar Industry Year In Review 2009, http://seia.org/galleries/default-file/2009%20Solar%20Industry%20Year%20in%20Review.pdf

Geothermal Energy Association (GEA), US Geothermal Power Production and Development Update – April 2010, http://geo-energy.org/pdf/reports/April_2010_US_Geothermal_Industry_Update_Final.pdf

Larry Sherwood/IREC

Figure 13. Total installed wind energy capacity and generation in the Southeast (2003–2009)



	Hydroelectricity Capacity (MW)									Regional Hydro-electricity Generation (Million kWh)
	AL	AR	GA	KY	LA	MO	NC	SC	TN	
2003	3,159	1,309	2,016	777	192	499	1,828	1,271	2,418	47,798
2004	3,261	1,309	1,931	777	192	499	1,828	1,311	2,418	42,557
2005	3,280	1,309	1,932	777	192	499	1,828	1,353	2,418	39,835
2006	3,280	1,309	1,932	777	192	499	1,828	1,353	2,418	28,270
2007	3,280	1,309	1,932	777	192	499	1,828	1,363	2,418	22,788
2008	3,280	1,309	1,932	777	192	499	1,828	1,363	2,418	27,773
2009	3,280	1,309	1,932	777	192	499	1,828	1,363	2,418	42,014

Sources:

EIA – Electric Power Monthly, Table 1.1, http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html

EIA – Electric Generating Capacity, http://www.eia.doe.gov/cneaf/electricity/page/capacity/capacity.html

EIA – Planned Nameplate Historical Additions, http://www.eia.doe.gov/cneaf/electricity/epa/epat2p4.html

EIA – Electric Power Annual, http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html

American Wind Energy Association (AWEA) – Annual Wind Industry Report, 2009, http://www.awea.org/publications/reports/AWEA-Annual-Wind-Report-2009.pdf

Solar Energy Industries Association (SEIA) – US Solar Industry Year In Review 2009, http://seia.org/galleries/default-file/2009%20Solar%20Industry%20Year%20in%20Review.pdf

Geothermal Energy Association (GEA), US Geothermal Power Production and Development Update – April 2010, http://geo-energy.org/pdf/reports/April_2010_US_Geothermal_Industry_Update_Final.pdf

Larry Sherwood/IREC

Figure 14. Total installed hydroelectricity capacity and generation in the Southeast (2003–2009)

The primary mechanism through which clean energy development is currently being supported within the southeastern states is the federally-funded State Energy Program (SEP),[7] which was provided with $3.1 billion of funding in the American Recovery and Reinvestment Act of 2009 (ARRA). Table 3 indicates how much ARRA funding the southeastern states received for their SEPs and the types of clean energy projects they are funding. More information can be found at the Department of Energy's (DOE's) Weatherization and Intergovernmental Program Web site: http://www1.eere.energy.gov/wip/sep.html.

[7] SEP is a 30-year-old program administered by the Department of Energy's Weatherization and Intergovernmental Program (WIP). It provides federal grants and technical assistance for the development of energy efficiency and renewable energy products and technologies. Grant awards require some cost sharing by states. The program emphasizes the state's role as the decision maker and administrator for the program activities, with State Energy Offices allocating funding and overseeing projects. Activities that can be funded include technical assistance, training, education, and project implementation. Funding may not be used for research activities or construction.

Table 3. State Energy Program ARRA Funding and Activities in the Southeast

State	Total State Energy Program ARRA Funding	Examples of State Energy Program Activities
Alabama	$55,570,000	• EE retrofits of correctional facilities • EE in Automotive industry • Training on Building energy Codes
Arkansas	$39,416,000	• Creating a revolving loan fund to make energy efficient improvements in state buildings. Renovating state buildings with goal of attaining LEED certification. • Building Training Centers of Excellence at colleges. • Reduce energy consumption and costs to poultry growers through lighting efficiency improvements using LEDs.
Georgia	$82,495,000	• Grants for the installation of solar electric systems • EE education programs • Lighting retrofits in the commercial sector • Program to build energy assessment capacity in cooperative utilities • Residential EE improvement programs • EE design training for residential builders, contractors, real estate agents and appraisers
Kentucky	$52,533,000	• Expand existing program to reduce energy consumption in school buildings • Establish energy education workshops for schools • Financing for energy audits, energy management systems and EERE upgrades in government buildings • Establishment of advanced battery strategic planning and advanced battery manufacturing facilities • Smart-grid exploration • Residential and farm EERE programs
Louisiana	$71,694,000	• EE retrofits at state universities • Encourage EE retrofits in residential and commercial buildings • Improve efficiency in transportation lighting • Teacher training and public education • State energy plan development
Mississippi	$40,418,000	• EE and smart meters for public facilities and institutions • Smart meters • Training and education on energy efficiency codes • Grants for companies to install RE systems • Green workforce development • Expand efficiency in transportation
Missouri	$57,393,000	• Expand efficiency in the state's five major industrial and manufacturing sectors • Training to expand workforce capabilities in energy efficiency • Expand program to improve efficiency in residences, commercial buildings, schools and public buildings
North Carolina	$75,989,000	• EE grants for public buildings • Commercial RE system grants; • Green workforce development; • Education for building code inspectors; • Revolving no-interest and low-interest loan fund for nonprofit and public agencies to finance EERE projects • Energy assessments for public buildings and schools • EE audits and improvements in new affordable housing and existing homes • Grants to expand infrastructure for alternative transportation
South Carolina	$50,550,000	• Grants for EE in public buildings and educational facilities • Assistance to industrial and commercial entities to support EERE projects • Training and education programs to support clean energy job creation
Tennessee	$62,482,000	• Development of industry partnerships to improve solar products • Grants for solar industry expansion • Grants for the installation of solar generation facilities

Sources: NASEO's State Energy Program ARRA Update, March 2010
http://www1.eere.energy.gov/wip/project_map/

Aside from the SEP, the DOE sponsors several other state-level programs, such as the Weatherization Assistance Program, the Energy Efficiency and Conservation Block Grant Program (EECBG), and Solar America Cities. The Southeast has two Solar America Cities (Knoxville, Tennessee, and New Orleans, Louisiana) as well as EECBG projects.[8] These DOE programs assist state, local, and tribal governments through funding and technical assistance to implement energy efficiency and renewable energy technologies and develop strategies to improve efficiency and reduce fossil fuel emissions. The State Energy Offices in each state are responsible for allocating the funding available under these programs and SEP. DOE's Solar Energy Technologies Program is also supporting several southeastern states (Alabama, Georgia, and Mississippi) through a NARUC-DOE partnership in order to help states overcome barriers to development of solar technologies. For more information on these programs and the efforts of the State Energy Offices, see DOE's EERE Web site at http://www.eere.energy.gov/ and the National Association of State Energy Officials Web site at http://www.naseo.org.

3.3 Clean Energy Actors in the Southeast

Besides the multitude of investor-owned utilities (IOUs), municipal utilities, cooperative utilities, and independent power producers who already produce or purchase renewable energy, there are numerous regulatory and non-regulatory stakeholders involved in clean energy development in the Southeast. Table 4 provides an overview of government, regulatory, and regional not-for-profit organizations that play a variety of roles in the development of clean energy. In addition to these stakeholders, there are numerous state and local not-for-profit organizations that are not listed.

[8] More information on these projects can be found on the Solar America Cities Web site http://www.solaramericacities.energy.gov/ and the WIP Web site http://www1.eere.energy.gov/wip/eecbg.html.

Table 4. Energy Efficiency and Renewable Energy Actors in the Southeast

Organization	Relevant Role
State Government Bodies and Government Assistance	
Council of State Governments (CSG) and the Southern Legislative Conference (SLC)	A region-based forum to assist state officials at all branches of government by fostering the exchange of insights and ideas, helping states formulate policy approaches, facilitating the formation of partnerships, and advocating for member states. The Council's Energy and Environmental Task Force encourages multi-state problem-solving, sharing of best practices, and networking among state officials and between the public and private sectors. The Southern Legislative conference is the southern branch of CSG.
National Council of State Legislatures (NCSL)	A bipartisan organization comprised of state legislators and their staff. Provides research, technical assistance and opportunities to exchange ideas on current state issues; advocates for the interests of state governments before Congress and federal agencies.
National Association of State Energy Officials (NASEO)	Non-profit organization with the aim to improve the effectiveness and quality of state energy programs and policies, provide policy input and analysis, share successes among the states, and to be a repository of information on issues of particular concern to the states and their citizens. Membership includes the governor-designated energy officials from each state and territory.
Southern States Energy Board (SSEB)	Non-profit organization with the mission to enhance economic development and the quality of life in the South through innovations in energy and environmental policies, programs and technologies. The SSEB's Biobased Alliance focuses specifically on biomass development issues in the region.
Utility Regulatory Bodies and Regulatory Assistance	
Public Utility Commissions (PUCs)	Regulate investor-owned utilities in order to balance the interests of utility consumers and providers. PUCs monitor rates, ensure quality of service, and enforce safety rules. Also called Public Service Commissions or Regulatory Commissions in some states.
National Association of Regulatory Utility Commissioners (NARUC)	A non-profit organization representing the state public utility commissions (PUCs), who regulate utility services to protect supply and ensure a fair rate structure.
North American Electric Reliability Corporation (NERC)	A self-regulated organization overseen by federal government authorities, with the mission to ensure the reliability of the bulk power system in North America. Develops and enforces reliability standards; monitor the bulk power system; educates, trains, and certifies industry personnel.
Southern Electric Reliability Corporation (SERC)	The regional entity with delegated authority from NERC, responsible for promoting, coordinating and ensuring the reliability of the area's power supply systems. Participates in the establishment of reliability standards; administers a regional compliance and enforcement program; and provides a mechanism to resolve disputes on reliability issues.
Regulatory Assistance Project (RAP)	Non-profit team of experts, many of whom are former utility commissioners, providing technical and policy assistance to current utility commissioners and other government officials on a broad range of energy and environmental issues. Expertise and emphasis on regulatory and market policies that promote economic efficiency, protect the environment, ensure system reliability, and fairly allocate system benefits among all consumers.
Renewable Energy and Energy Efficiency Organizations and Programs	
American Council for an Energy-Efficient Economy (ACEEE)	A non-profit organization dedicated to advancing energy efficiency as a means of promoting economic prosperity, energy security, and environmental protection. Conducts in-depth technical and policy analyses; advises policymakers and program managers; works collaboratively with businesses, government officials, public interest groups, and other organizations; convenes conferences and workshops (primarily for energy efficiency professionals); provides educational resources.
Southern Alliance for Clean Energy (SACE)	Regional organization primarily focused on developing clean energy solutions throughout the Southeast. Identifies barriers and solutions; connects environmental, business, agricultural and governmental stakeholders and interests; promotes policy change through education and outreach.
Southeast Energy Efficiency Alliance (SEEA)	A non-profit organization promoting energy-efficient policies and practices through the networking of stakeholders, and the provision of programs, activities and education. Brings together businesses, utilities, governments, public utility commissions, energy service companies, manufacturers, retailers, energy and environmental organizations, low-income energy advocates, large energy consumers, and universities.
The North Carolina Sustainable Energy Association (NCSEA)	A non-profit membership organization that advises organizations and business councils throughout the Southeast region. NCSEA assists state organizations and entities in understanding the relationship between public policy, regulation and market development and job creation for renewable energy and energy efficiency solutions and how to build capacity to conduct education and outreach on energy policy.

3.4 Clean Energy Policy in the Southeast

There is a wide range of state-level EERE policies, regulations, and incentives currently in place in the Southeast.[9] Tables 5 and 6 indicate the states that have implemented each of these support mechanisms.[10] Definitions for each of the common policy mechanisms listed in the tables are included in the Appendix. Details regarding the implementation of some of these policies are provided in the following sections.

Table 5. State-level Energy Efficiency Incentives and Regulations

	Personal Tax Incentives	Corporate Tax Incentives	Sales Tax Incentives	Property Tax Incentives	Rebates	Grants	Loans	Bonds	State Authorization for Green Building Permit Incentives	Appliance/Equipment Standards	Energy Standards Public Buildings	Public Benefit Funds	Energy Efficiency Resource Standard (EERS)	Residential Building Codes	Commercial Building Codes
Alabama							●				●			*	*
Arkansas					●		●				●			**	**
Georgia		●			●		●				●			***	***
Kentucky	●	●	●		●	●	●				●			***	***
Louisiana					●		●				●			***	***
Missouri							●				●			*	*
Mississippi	●		●		●		●							*	*
North Carolina			●		●	●	●		●		●		●	***	***
South Carolina	●		●				●				●			***	***
Tennessee					●	●	●				●			**	*

* – no statewide code, or code precedes 1998 IECC
** – code meets or exceeds 1998–2003 IECC
*** – code meets or exceeds 2006 IECC

Note: State incentives only. Does not include utility, local, or non-profit incentives. Updated from sources as of October 1, 2010.

Sources: DSIRE, http://www.dsireusa.org/summarytables/index.cfm?ee=1&RE=1
Building Codes Assistance Project: Online Code Environment & Advocacy Network, http://bcap-ocean.org/
OCEAN, http://bcap-ocean.org/code-status-map-commercial
ACEEE, http://www.aceee.org/energy/state/State_EERS_Summary_Apr_2010.pdf

[9] Utility and local policies can and do make an important contribution to energy efficiency and renewable energy development. However, a discussion of utility and local-level policies is beyond the scope of this report. These policies, as well as the potential interactions between policies at state, local, utility, and federal levels need to be considered and will be addressed in other CEPA reports, including the "Analysis of the Status and Impact of Clean Energy Policies at the Local Level" (Bushe 2010). In many cases, policies at multiple levels of governance can be designed to support each other and work together to have greater impact than they would alone. In addition, there are cases in which state policy is necessary in order to open the door to effective local policies (e.g., state-level policy may be necessary to allow local governments to offer certain financing options such as property assessed clean energy programs).

[10] Voluntary green power programs are not included in this list since they are not considered to be state incentives.

Table 6. State-level Renewable Energy Development Policies and Incentives

	Access Laws	Bonds	Construction & Design	Contractor Licensing	Corporate Tax Incentives	Equipment Certification	Generation Disclosure	Grants	Industry Support	Interconnection	Line Extension Analysis	Loans	Net Metering	Personal Tax Incentives	Production Incentives	Property Tax Incentives	Public Benefit Funds	Rebates	Required Green Power	Renewable Portfolio Standard	Sales Tax Incentives
Alabama								●				●		●							
Arkansas			●							●			●								
Georgia	●		●		●					●			●	●				●			●
Kentucky	●				●					●		●	●	●							●
Louisiana					●					●		●	●	●		●					
Missouri	●		●		●					●		●	●							●	
Mississippi												●									
North Carolina	●		●		●			●		●		●	●	●		●				●	●
South Carolina			●		●					●		●		●	●						●
Tennessee	●							●	●			●				●					

Updated from sources as of October 1, 2010
Note: State incentives only. Does not include utility, local, or non-profit incentives.
Source: DSIRE, http://www.dsireusa.org/summarytables/index.cfm?ee=1&RE=1

3.4.1 Renewable Portfolio Standards and Energy Efficiency Resource Standards

Renewable portfolio standards (RPS) and energy efficiency resource standards (EERS) are increasingly common policies used by states to encourage clean energy development. These standards require utilities to provide a percentage of electricity from renewable energy resources or reduce demand through efficiency. Two southeastern states (North Carolina and Missouri) have set mandatory standards (Table 7), while others have set goals or are implementing trial standards.[11] South Carolina, for example, has a goal of reducing energy use by 20% between 2000 and 2020 (EIA 2010c).

In 2007, North Carolina implemented an EERE standard requiring the state's IOUs to meet 12.5% of demand with renewable energy by 2021. Municipal and cooperative utilities must provide 10% of electricity from renewable resources by 2018. Currently, IOUs may meet 25% of this requirement through energy efficiency measures, with an increase to 40% after 2021. A small percentage of the requirement must be met using solar technologies, poultry waste, and swine waste. Municipal and cooperative utilities may meet 100% of the requirement through efficiency, with the exception of the solar, poultry, and swine waste requirements (DSIRE 2010). A price cap limits the cost of

[11] The Tennessee Valley Authority's goal across its seven-state territory is 50% zero- or low-carbon generation by 2020 (FERC 2010b). Kentucky has the goal of generating at least 25% of its projected energy demand (the equivalent of 1,000 MW) from energy efficiency, renewable energy, and biofuels by 2025 while continuing to produce safe, affordable, and abundant food, feed, and fiber (Commonwealth of Kentucky 2010).

compliance (ACEEE 2009). More information on North Carolina's EERE standard can be found at: http://www.ncuc.commerce.state.nc.us/reps/reps.htm.

Table 7. Renewable Portfolio Standards in the Southeast

State	Final Rules Adopted	Standard		Interim Standards	Eligible Technologies	Efficiency Eligible	Technology Set-asides	Multiplier	Credit Trading Allowed	REC tracking and verification required	Cost recovery
North Carolina	Feb 2008	Investor-Owned Utilities	12.5% by 2021	2010: 0.02% from solar 2012–2014: 3% 2015: 6% 2018: 10% 2021: 12.5%	Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Landfill Gas, Wind, Biomass, Geothermal Electric, CHP/Cogeneration, Hydrogen, Anaerobic Digestion, Small Hydroelectric (up to 10MW), Tidal Energy, Wave Energy	Yes	Solar: 0.2% by 2018 Swine Waste: 0.2% by 2018 Poultry Waste: 900,000 MWh by 2014	None	Yes	Yes: North Carolina Renewable Energy Tracking System (NC-RETS)	Utilities may recover the incremental cost of renewable resources and up to $1 million in alternative energy research expenditures annually from customers. The cost per customer account is capped.
		Municipal and Co-operative utilities	10% by 2018								
Missouri	Jun 2010	Investor-Owned Utilities	15% by 2021	2011– 2013: 2% 2014 – 2017: 5% 2018 –2020: 10% 2021 and thereafter 15%	Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Municipal Solid Waste, Anaerobic Digestion, Small Hydroelectric (up to 10 MW), Fuel Cells using Renewable Fuels	No	Solar Electric: 2% of annual requirement	In-state generation = 1.25	Yes	Yes: North American Renewables Registry	Yes, the PSC must develop rules for cost recovery. No cost cap for customers is specified, but the RES is subject to a maximum average retail rate increase of one percent

Sources: http://www.ncuc.commerce.state.nc.us/reps/reps.htm
https://www.efis.psc.mo.gov/mpsc/Filing_Submission/DocketSheet/docket_sheet.asp?caseno=EX-2010-0169&pagename=case_filing_submission_rst.asp

In 2008, Missouri voters approved a 2008 ballot initiative to replace the state's voluntary renewable energy and energy efficiency standard with a mandatory RPS. The Missouri RPS requires IOUs to generate 15% of their electricity through renewable sources by 2021, with 2% coming from solar power. The final administrative rules were issued in July 2010 (DSIRE 2010).

In October 2010, Louisiana approved the plan for a pilot renewable energy program that could be a step toward a state RPS. The program has two components: a research requirement for small-scale projects and a long-term development component through requests for proposals (RFP). The research component requires utilities to develop at least three projects, either self-built or through a standard offer tariff. Utilities may have one self-built facility of up a maximum of 5 MW and two of a maximum of 300 kW. In the standard offer option with a contract up to 5 years, utilities may not buy more than 5 MW from any single project. Costs for both options are capped.

The longer-term RFP component requires utilities to obtain a total of 350 MW of electricity from renewable resources, which would come online between 2011 and 2014. Contracts of 10–20 years are to be offered through the RFP process to non-affiliated developers. This component provides utilities with experience with larger renewable energy projects built by third parties. After the pilot program period, an analysis of the pilot will help the Public Service Commission determine whether to implement an RPS (Louisiana Public Utility Commission 2010). Louisiana's RPS discussion and pilot was a policy originating from the state's Public Service Commission.

3.4.2 PACE

Property assessed clean energy (PACE) financing allows property owners to borrow money to pay for energy improvements. The amount borrowed is typically repaid over a period of years by the homeowner via a special assessment on their property tax bill. If the property changes hands, the loan is thus transferred to the new owner who takes over the benefits of the energy upgrades. PACE programs were supported via EECBGs established by ARRA, and states were encouraged to move forward with legislation to authorize such programs.

The implementation of PACE programs is currently on hold, due to the recent Federal Housing Finance Agency declaration that residential PACE financing programs do not meet the financial requirements of Fannie Mae and Freddie Mac (Federal Housing Finance Agency 2010). When, and if, these issues are resolved, however, two southern states are poised to move forward with PACE programs: Georgia and North Carolina.

In May 2010, Georgia authorized county, city, or town development authorities to provide financing for the installation of renewable energy systems, energy efficiency or conservation improvements, and water efficiency or conservation improvements to residential, commercial, industrial, or other qualifying properties.

North Carolina has authorized certain local governments to establish "energy assessment programs," which are similar to PACE programs authorized in other states. Senate Bill 97, enacted in August of 2009,[12] authorizes counties and cities to make special assessments in order to finance the installation of distributed generation renewable energy sources or energy efficiency improvements that are permanently fixed to residential, commercial, industrial, or other real property. The legislation authorizes local governments to impose special assessments on the real properties to which the energy projects are affixed and establish a variety of energy financing programs, including energy rebate programs, energy audit and retrofit programs, and weatherization programs. Funding for PACE programs can be provided through revenue bonds, general obligation bonds, or general revenues, among others. Some of these programs require partial or full federal grant funding (Millonzi 2010a; Millonzi 2010b).

[12] The original act was modified by S.L. 2010-167 (H 1829) in August 2010 to provide clarifications on local government authority and fund energy financing programs.

The fact sheet "Property Assessed Clean Energy (PACE) Enabling Legislation: Ten Key Components of PACE Legal Authority" (Vote Solar and Renewable Funding 2010) provides information on the components of state-level legislation that best enable PACE programs. The fact sheet highlights the importance of:

- identifying existing financing and assessment authority within state statutes,
- ensuring that assessments are secured by liens on the property benefitted,
- establishing the mechanism for creation of financing districts and programs,
- authorizing financing of improvements on private property,
- ensuring that state law authorizes local governments to finance energy efficiency and renewable energy improvements;
- including legislative findings that the improvements are in the public interest,
- creating an opt-in assessment feature,
- authorizing bonding and the use of bonds or grants to finance improvements,
- enabling statewide or multi-jurisdictional PACE programs to allow coordination and take advantage of economies of scale, and
- ensuring that bonds are not backed by full faith and credit of the government, but are secured by the assessment or tax lien on the property benefitted.

3.4.3 Lead by Example/EERE in Public Buildings

State governments are increasingly leading by example by setting design and energy efficiency standards for new and existing public buildings; setting energy consumption goals; installing energy efficient lighting, computers, appliances, and power-monitoring equipment in public facilities; purchasing clean energy for public facilities; and installing on-site renewable energy systems. Table 8 summarizes the lead-by-example initiatives undertaken in the southeastern states.

A variety of resources are available to states to help strengthen existing lead-by-example programs. To help states assess the costs and benefits of lead-by-example actions and identify further resources, the Environmental Protection Agency (EPA) published the *Clean Energy Lead by Example Guide: Strategies, Resources, and Action Steps for State Programs* (2009; http://www.epa.gov/statelocalclimate/resources/example.html).

Table 8. Southeastern State Lead-by-example Policies

State	Building Requirements	Product Procurement
Alabama	State agencies must reduce energy consumption in all conditioned facilities by 10% by the end of FY 2008 and 20% by the end of FY 2010 from 2005 levels.	State agencies must purchase ENERGY STAR labeled equipment, if cost-effective, whenever replacing or purchasing new equipment.
Arkansas	The state is developing a plan for reducing energy use in all existing state owned major facilities by 20 percent from 2008 levels by 2014 and 30 percent by 2017. Energy audits are being completed for every public agency.	n/a
Georgia	The Governor's Energy Challenge 2020 as part of "Conserve Georgia." State agencies and departments must reduce energy consumption 15% by 2020, using 2007 energy use as a baseline. Reductions in energy use must come from energy efficiency measures and can also come from renewable energy development.	n/a
Kentucky	State requires that all construction or renovation of public buildings for which 50% or more of the total capital cost is paid by the state must be renovated or designed to meet high-performance building standards. LEED certification is required for new buildings, with the level of certification depending on the project budget. Baseline data and a tracking system to be used for evaluating results is in place.	State procurement policies promote the purchase of ENERGY STAR-qualified products to the extent feasible.
Louisiana	Energy efficiency goals must be set for state facilities, office buildings, and complexes for fiscal years 2009, 2010, and 2011. Construction or renovation of major state-funded facilities must be designed and built to exceed state energy codes by at least 30%.	The State Division of Administration must adhere to state requirements for energy conversation, adopt best energy purchasing practices, and use ENERGY STAR as a minimum standard for purchases products such as lighting, computers and appliances.
Mississippi	n/a	n/a
Missouri	All state buildings over 5,000 square feet involving new construction or substantial renovation and any building over 5,000 square feet considered for purchase or lease by a state agency must comply with the State's minimum energy efficiency standard.	ENERGY STAR appliances are to be used in all state facilities
North Carolina	State-owned buildings must to be designed, constructed and certified to exceed the energy efficiency requirements of ASHRAE 90.1-2004 by 30% for new buildings, and 20% for major renovations. The energy consumption per gross square foot for all State buildings in total must also be reduced by 20% by 2010, and 30% by 2015 based on consumption during the 2003-2004 fiscal year.	All electronic office equipment purchased by state agencies be ENERGY STAR qualified. State agencies are to give consideration to environmentally preferable products.
South Carolina	New state-constructed buildings must meet either the LEED Rating "Silver" standard or the Green Globes Rating System for construction. The State Energy Office develops energy efficient codes/standards for state-owned and leased buildings, including public school buildings, and requires state agencies and school districts to adhere to these codes. State agencies and public school districts must develop energy conservation plans towards an ultimate goal of a 20% reduction in energy use by 2020.	State agencies must notify the State Energy Office prior to purchasing or biding for a item on a predefined list of energy-related goods. The Energy Office will then assist in drafting or reviewing specifications and evaluating bids received in response to the solicitation for the purchase of the item. There are no requirements to purchase energy-efficient products.
Tennessee	The Governor's Task Force on Energy Policy made recommendations in July 2008 on opportunities for state government to lead by example in energy efficiency and conservation, with an emphasis on building construction and management, and vehicle fleet purchasing and management. In 2009, the State Building Energy Management Program was created to monitor energy data and usage in state buildings across the state.	Executive branch state agencies must to purchase products that are ENERGY STAR qualified.

Note: As of October, 2010.
Source: ACEEE, http://www.aceee.org/sector/state-policy/lead-example-initiatives

The Consortium for Energy Efficiency provides a set of guidebooks to help states implement government efficiency measures: http://www.cee1.org/gov/purch/guides.php3. The guidebooks are directed to specific audiences in state and local governments including:

- government purchasing organizations,
- government property and facility management organizations,
- government policymakers, and
- third-party architects/engineers who work with state and local government property/facility management organizations.

3.4.4 Building Codes

Given the long life of most buildings, lowering their energy intensity through efficient design and material and appliance choices can save significant amounts of energy. Building codes specify the minimum level of efficiency that a new or renovated building must meet. Building codes are either adopted through the legislative process, through the regulatory process via a state agency that has been assigned the power to issue code, or through a combination of both methods.

State-level policy regarding building codes varies greatly from state to state and can even vary within a state. However, under the U.S. Energy Policy and Conservation Act, states are required to certify that their building energy codes meet or exceed the requirements of the standard energy code within 2 years of being updated or submit a reason for not doing so. The standard codes are the International Energy Conservation Code (IECC) for the residential sector and the ASHRAE Standard 90.1 for the commercial sector, both of which are updated regularly.

In October 2010, final action hearings of the International Code Council (ICC) took place in North Carolina to determine the new standards that will appear in the 2012 version of the code. The newly adopted code is estimated to improve residential and commercial building efficiency by 30%. Residential requirements include improved sealing, more efficient windows, increased home insulation, reduced energy losses from heating and cooling ducts, improved hot water distribution systems, and improved lighting efficiency. The code for commercial buildings advances requirements for continuous air barriers and daylighting controls and increases the number of climate zones where economizers are required. In addition, building designers must reduce the building's carbon footprint through a choice of renewable energy use and through the installation of higher efficiency HVAC equipment and more efficient lighting systems. It also requires lifelong performance monitoring to ensure that efficiency is maintained according to the building's design (EECC 2010).

Figures 15 and 16 show the extent to which each of the southeastern states meets the standard code. Alabama, Mississippi, and Missouri do not have mandatory state codes, and none of the other southeastern states meet the current national standard code set in 2009.

A set of studies by the DOE estimated the potential savings if each of the southeastern states updated the current state code to meet the 2009 IECC standard code (U.S. DOE 2009). According to the reports, the savings would amount to a 14%–18% energy reduction in the residential sector alone, providing a savings of $173–$336 per household per year. Additional savings would occur with updates to the commercial codes as well. The reports provide details on the specific efficiency measures that lead to these savings and the differences between the current state codes and the 2009 IECC standards. The reports for each state and other information on building codes can be downloaded at http://www.energycodes.gov/states/.

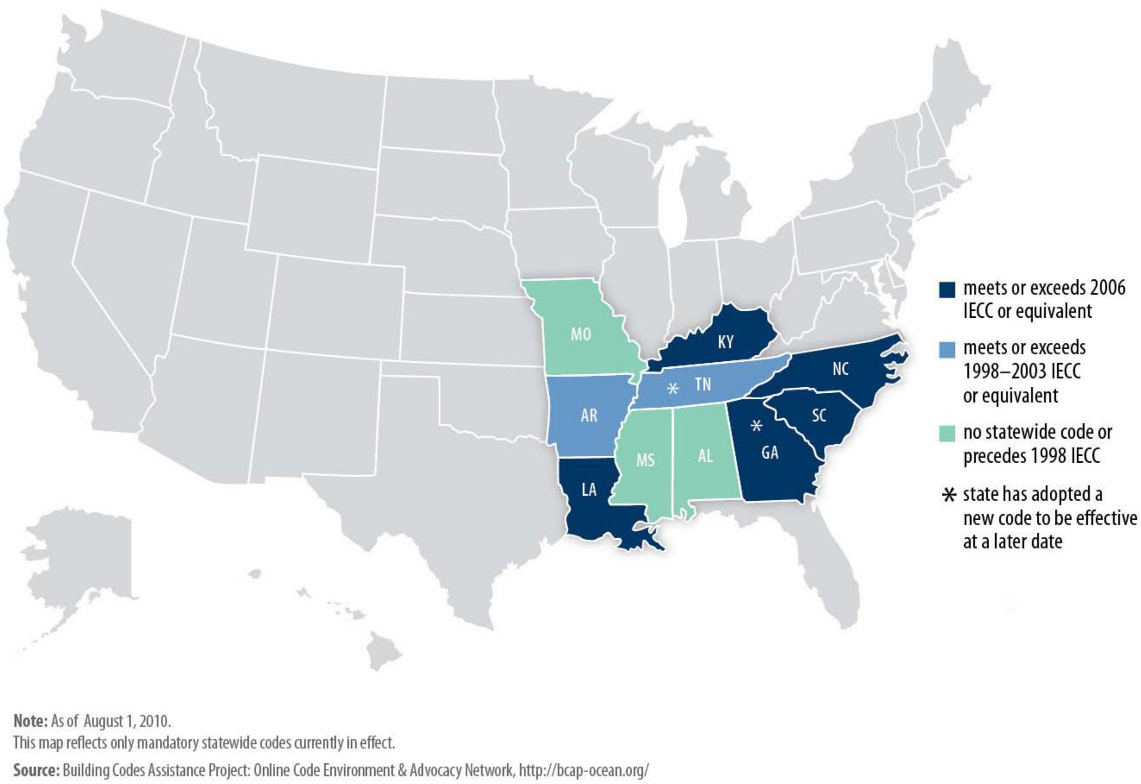


Figure 15. Residential state energy code status in the Southeast

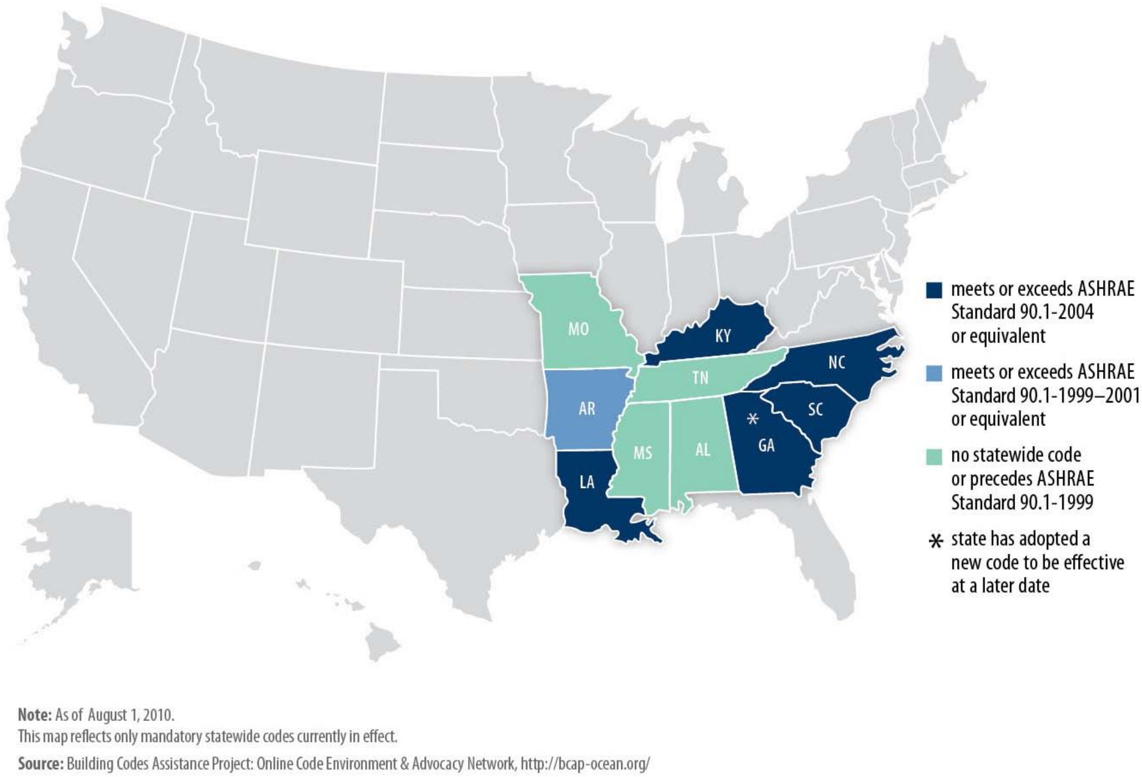


Figure 16. Commercial state energy code status in the Southeast

More detailed and up-to-date information about state building codes can be found at the Building Code's Assistance Project and their online network (OCEAN) at http://bcap-ocean.org and from the DOE Building Codes Program at http://www.energycodes.gov/.

PURPA's Relevance to Renewable Energy Development

Congress enacted the 1978 Public Utility Regulatory Policies Act (PURPA) in response to the oil crisis of that decade. The three aims of PURPA are to:

1. encourage energy conservation by electric utilities,
2. promote the efficient use of facilities and resources, and
3. ensure equitable rates to customers.

PURPA sets forth standards for the consideration of state regulatory authorities and certain non-regulated utility companies (including the TVA). These authorities must determine whether it is appropriate for each electricity utility to implement the standards for the purposes of carrying out the three aims of PURPA. New standards have been added as amendments over the years, including those dealing with interconnection, net metering, integrated resource planning, smart grid investment, and information provision to consumers.

Initially, PURPA had a major impact on the development of renewable energy projects. The Act required utilities to buy electricity from qualifying independent companies—referred to as Independent Power Producers (IPPs)—that could produce power for less than what it would cost for the utility to generate that power (the avoided cost). The rates paid for this power tended to be highly favorable to the producer and were intended to encourage more production of this type of energy as a means of reducing emissions and dependence on other sources of energy. This created a market for IPPs, stimulating the development of renewable energy projects and, in particular, natural gas fired co-generation plants.

The current effects of PURPA on renewable energy development, however, are less evident. This is because today's low avoided costs mean that fewer renewable energy projects are able to compete with traditional generation based on price factors alone. Currently, FERC does not include benefits such as economic stimulation, environmental quality, or public health as factors in PURPA decisions. In addition, many of the original contracts signed between IPPs and utilities during the early days of PURPA are now expiring.

3.4.5 Utility Efficiency Cost Recovery (Decoupling), Integrated Resource Planning, and Performance Incentives for Efficiency Programs

A direct connection between the amount of electricity that a utility sells and the revenue the utility earns can discourage the utility from supporting and implementing energy efficiency measures. "Decoupling" is a policy approach that severs the link between kilowatt-hours sold and utility earnings. Utilities are able to recover the fixed costs of providing service. Under decoupling, a customer's bill is still connected with the amount of electricity consumed, so there is still incentive for customers to implement efficiency to reduce consumption (NREL 2010a).

Decoupling can be implemented in several stages. In its most complete form, decoupling completely insolates a utility's earnings from any difference between actual sales and expected sales, regardless of the reason for this difference (e.g., increased investments in energy efficiency, weather, and economic climate). Through standard rate-case methods, the total revenues the utility needs in order to provide safe, adequate, and reliable service to customers is determined for a certain period. Only changes in expenses during the rate-case period can change the utility's profits (Shirley et al. 2008).

Partial decoupling is similar, except that only a portion of the utility's revenue collections is separated from the difference between expected and actual sales (e.g., 90%). Any variation in sales of the remaining portion results in an adjustment in utility revenues during the next period through electricity rate changes. Under partial decoupling policies, only specified causes of variations in sales result in adjustments, such as variations due to weather or the economy (Shirley et al. 2008).

Decoupling has benefits other than removing the disincentive to efficiency: it also reduces financial risks to utilities because it reduces the volatility of traditional pricing mechanisms. Overall costs to the utility and customers may go down over time, as the utility benefits from increased leverage in the capital structure. Bond ratings may increase due to reduced risks. The costs of the overall rate-making process may go down if the decoupling process reduces the need for general rate cases (NREL 2010a).

Well-designed decoupling policy reflects the true cost of electricity production and delivery. Decoupling can also reduce utility resistance to state-level policies encouraging or requiring renewable energy development, including feed-in tariffs and renewable energy standards, since the revised rate structure allows the recovery of fixed costs and makes utilities more receptive to third-party power production (NREL 2010a).

While decoupling removes the incentive for the utility to sell more electricity, it does not provide an incentive for the utility to increase the level of energy efficiency. Other mechanisms are needed in combination with decoupling to encourage utility participation in efficiency. One mechanism is the establishment of an integrated resource planning process that treats demand-side resources equal to or more valuable than supply-side resources. Another is the implementation incentive structures that encourage utilities to establish effective efficiency programs (Shirley and Schwartz 2009). Performance-based incentives are some of the most commonly employed incentive structures. This method increases utility earnings as a reward for effective programs to encourage customer-side efficiency. Effectiveness can be measured through a variety of metrics, including market transformation indicators, cost-effectiveness of the program, net benefits achieved, and program equity. These incentives are most effective when performance metrics are clearly stated (as well as observable, measurable, and verifiable) and when there are financial risks and rewards directly associated with the metrics. Implementing this policy in an effective manner involves a degree of oversight and analysis. Other incentives include setting a budget based on avoided-costs in order to fund standard offer contracts for the provision of efficiency measures and setting aside a percent of the utility budget for efficiency program management (which encourages utility spending on efficiency but does not guarantee effectiveness) (Shirley and Schwartz 2009).

Decoupling, integrated resource planning, and efficiency program incentives work together to align utility and customer interests, allowing utilities to recover the costs of efficiency measures and partner with customers to reduce electricity demand.

State governments can impact the implementation of these policies in the regulated utility environment by requiring PUCs to implement some level of decoupling policy, integrated resource planning that includes efficiency, and efficiency program incentives. An amendment to PURPA (as part of the Energy Independence and Security Act of 2007) required regulating authorities to consider standard rate design modifications to promote utility energy efficiency efforts. Table 9 summarizes the policies and methods that the regulatory bodies in the southeastern states currently use to encourage efficiency within their utilities.

Table 9. State and TVA Policies that Encourage Efficiency within Utilities

State	EE Cost Recovery for Regulated Utilities (Partial Decoupling)	Integrated Resource Planning/EE considered as a resource	Rewards for successful EE programs	Notes
Alabama				No relevant policies.
Arkansas	X	X		Although there is no prioritizing for energy efficiency in resource planning, the PUC required regulated utilities to consider "all reasonably useful and economic supply and demand resources that are available to a utility or its customers" for "incremental capacity needs." As of 2007, regulated utilities must file energy efficiency plans to implement cost-effective energy efficiency programs. Recovery of incremental costs associated with commission-approved efficiency programs is accomplished through customer bill riders.
Georgia	X	X	X	Regulated utility energy efficiency and demand-side management programs are funded through a demand-side management rider that is applied to residential customers. Regulated electric utilities must file integrated resource plans that must consider the impact of energy efficiency improvements on projected energy demand.
Kentucky	X	X	X	The commission can review and approve or deny demand-side management programs and associated cost recovery through surcharges on customer bills. Lost revenue recovery is determined on a case-by-case basis, but all investor-owned utilities in Kentucky have demand-side management proposals in place that include similar lost revenue recovery methods. Some rural cooperatives have energy efficiency programs, but do not have demand-side management surcharges that allow for lost revenue recovery.
Louisiana				No relevant policies.
Mississippi				No relevant policies.
Missouri	X	X		While fundamental rules have been in place since 1993 for integrated resource planning and demand-side management, such rules have not yielded significant levels of utility spending on demand-side management programs. With the advent of greater competition in electric markets in the late 1990s, the utilities requested and were granted suspension of the rules. Recent changes to law should lead to increases in funding and availability of energy efficiency programs. State law (SB376) now requires investor-owned electric utilities to capture all cost-effective energy efficiency opportunities and calls for the Commission to provide timely earnings opportunities associated with cost-effective, measurable and verifiable efficiency savings. It states that demand-side investments are to be given equal value as traditional investments in supply and delivery.
North Carolina	X	X	X	Regulated utilities may seek to recover the costs for renewable energy and energy efficiency programs through a rate rider. Law limits cost recovery for utilities through a cap on residential customers' payments. Incentive programs for demand-side management or EE programs can be proposed by utilities and will be considered by the PUC.
South Carolina	X	X	X	Funding for demand-side management and energy efficiency programs is included in the utilities' base rates. State law requires that utility cost-recovery opportunities must be provided by the PUC.
Tennessee		X		TVA has included efficiency in its integrated resource plan and has a portfolio of programs focused on energy efficiency and demand response. TVA's policy is to look for options to work together with its distributors to plan and implement energy efficiency programs. Each distributor of TVA power must integrate energy efficiency resources into utility, State, and regional plans and adopt policies establishing cost-effective energy efficiency as a priority resource. TVA states that the allowable rates charged by any electric utility in its district will align utility incentives with the delivery of cost-effective energy efficiency and promote energy efficiency investments.

Note: As of October, 2010.

Sources: http://www.aceee.org/sector/state-policy
TVA Draft Integrated Resource Plan, September 2010. http://www.tva.gov/environment/reports/irp/index.htm
TVA's 2010 Environmental Policy. http://www.tva.gov/environment/policy.htm

3.4.6 Interconnection Standards and Net-metering Policies

Since the implementation of the PURPA, electricity consumers have had the opportunity to produce their own power using small-scale, distributed generation technologies. Two state-level policies, in particular, have played an important role in establishing standards and pricing rules to facilitate distributed generation systems: interconnection standards and net metering. The goal of these policies is to reduce the uncertainty and costs of connecting distributed generation technologies to the electrical grid and to ensure that independent electricity producers receive a reasonable payment for any electricity their system contributes back to the grid.

An NREL report identifies a list of issues that states may want consider as they design a net-metering policy (Doris et al. 2009). The issues include:

- defining eligible renewable technologies,
- identifying the customer classes that can net meter,
- identifying the utilities that must offer net metering,
- assigning or disallowing additional fees for net-metering customers,
- directing the renewable energy certificate (REC) ownership of the renewable energy system generation,
- directing the allowance or disallowance of meter aggregation,
- determining compensation for net excess generation,
- defining the aggregate amount of net metering allowed on the system, and
- setting the maximum individual system size that can net meter.

The Interstate Renewable Energy Council (IREC) maintains model rules for policymakers to refer to as they consider adopting, revising, or expanding net-metering and interconnection policies (see IREC's "Connecting to the Grid Program" at http://www.irecusa.org/). The Energy Policy Act of 2005 amended PURPA to require regulatory agencies to consider standards for net metering and interconnection

The Network for New Energy Choices (NNEC) publishes best practices for these policies, tracks the details of their implementation within the various states,[13] and publishes a scorecard to indicate the extent to which state policies effectively support the development of distributed generation technologies, such as rooftop photovoltaic systems (Network for New Energy Choices 2009). The NNEC's "Freeing the Grid" report, although subject to methodological scrutiny, is the only comprehensive scoring system with which to compare state net-metering and interconnection policies. Table 10 summarizes NNEC's evaluations of these policies in the southeastern states, as they were executed in 2009. In many cases, the report suggests increasing the system size cap. An NREL study concluded that increasing the system size cap may encourage the

[13] The NNEC report does not track TVA's net-metering and interconnection policies; however, information on these policies is provided in the footnotes of Table 10.

development of more distributed generation, including a larger average size of solar PV systems and a broader array of stakeholders. In addition, system administrators do not report negative impacts on ratepayers as a result of the increase in system size limit, likely because of the relatively small impact of these distributed systems on the larger utility grids (Doris et al. 2009).

Table 10. Net-metering and Interconnection Policies in the Southeast—Summary of NNEC's 2009 Evaluation and Recommendations

State	Policy Grade	Recommendations for Policy Improvements
Alabama	None	• Adopt net metering and interconnection policies
Arkansas	Net Metering: C	• Expand to 2MW for non-residential • Adopt safe harbor language to protect customer generators from extra and/or unanticipated fees
	Interconnection: F	• Increase system capacity from 300 kW to 20 MW • Prohibit requirements for additional insurance
Georgia	Net Metering: F	• Increase system capacity from 100 kW for commercial facilities to at least 2 MW • Increase program capacity to at least 5% of a utilities peak demand • Adopt safe harbor language to protect customer-site generators from extra and/or unanticipated fees
	Interconnection: F	• Increase covered system capacity to 20 MW • Develop 4 levels of interconnection review, with expedited review for systems less than 10 kW • Prohibit requirement for redundant external disconnect switch
Kentucky	Net Metering: B	• Increase system capacity from 30 kW to at least 2 MW • Increase program capacity to at least 5% of a utility's peak demand
	Interconnection: F	• Adopt IREC's model interconnection procedures
Louisiana	Net Metering: B	• Increase system capacity from 100 kW for commercial customers to at least 2 MW • Adopt safe harbor regulation to protect customer-sited generators from extra and/or unanticipated fees
	Interconnection: F	• Adopt IREC's interconnection procedures
Mississippi	None	• Adopt net metering and interconnection policies
Missouri	Net Metering: C	• Increase system capacity limit to 2 MW • Credit net excess at the retail rate with indefinite rollover
	Interconnection: F	• Increase overall system size limit to 20 MW • Remove requirements for redundant external disconnect switch • Prohibit requirements for additional insurance
North Carolina	Net Metering: D	• Increase allowed system capacity to at least 2 MW • Adopt safe harbor language to protect customer-sited generators from extra and/or unanticipated fees • Expand net metering to all utilities (i.e. munis and co-ops)
	Interconnection: B	• Prohibit requirements for redundant external disconnect switch • Prohibit requirements for additional insurance • Expand interconnection standards to all utilities (i.e. munis and co-ops)
South Carolina	Net Metering: *	• Adopt IREC's model net metering rules
	Interconnection: F	• Adopt IREC's model interconnection standards
Tennessee	Net Metering: TVA not graded	• Increase program capacity to at least 5% of peak demand
	Interconnection: TVA not graded	• Ensure that interconnection standards meet IREC model standards

*South Carolina does not clearly require utilities to offer net metering, however the three investor owned utilities began offering net metering. A settlement has been signed between individual intervenors, the Office of regulatory Staff and the IOUs that standardizes the structure of net metering programs.

In the TVA territory, distributors have the option to provide a net-metering alternative to customers who generate renewable energy on-site. Through the Generation Partners Program, TVA will purchase all of the green energy generated, at the retail rate plus a premium, for a guaranteed period of 10 years. Two meters are used to separately measure electricity usage and electricity production. Energy consumed on-site, whether it is generated at the site or delivered over the local power distribution system, is billed at the standard rate. Many of TVA's distributors now participate in the Generation Partners program. The TVA Renewable Standard Offer provides an alternative for systems up to 20 MW. The standard offer provides set prices based on season and time of day in up to 20-year contracts. The total program limit is 100 MW of capacity, with no single technology exceeding half of that total.

Sources: Network for New Energy Choice's, NNEC's, Freeing the Grid, 2009
DSIRE Database, www.dsire.org
TVA Generation Partners Program: http://www.tva.com/greenpowerswitch/partners/faq.htm
TVA Renewable Standard Offer: http://www.tva.gov/renewablestandardoffer/

Five Southeastern States have Adopted Climate Action Plans

By 2010, five of the Southeastern states had adopted (or were in the process of formulating) state-level Climate Action Plans: Arkansas, Kentucky, Missouri, North Carolina, and South Carolina.

Climate Action Plans identify specific, cost-effective opportunities for reducing GHG emissions, taking into account the economics, resources, and political structure of the state. Some plans also specify a target for emission reduction or identify possible climate change adaptation needs or strategies.

The Center for Climate Strategies (CCS) has assisted many states in formulating Climate Action Plans and determining the estimated costs and savings of climate policy actions. According to CCS estimates, Arkansas, for example, could reduce emissions by 522 million tons of CO_2 equivalent by 2020 if the policies in the state's Climate Action Plan were implemented this year (CCS 2010). The challenge facing states now is to implement the actions prioritized in the plans.

State	Climate Action Plan Completed	Link to Plan
Missouri	2002	http://www.dnr.mo.gov/pubs/pub1447.pdf
South Carolina	2007	http://www.scclimatechange.us/plenarygroup.cfm
North Carolina	2007	http://www.ncclimatechange.us/index.cfm
Arkansas	2008	http://www.arclimatechange.us/stakeholder.cfm
Kentucky	In progress	http://www.kyclimatechange.us/home.cfm

Examples of Policy Priorities from State Climate Action Plans

- Incentives to capture waste heat
- Encouragement for energy production from local farm and forest products
- RPS/renewable energy feed-in tariff
- Combined heat and power incentives
- Demand-side management programs
- Public benefits funds
- Encouragement for green power purchasing
- "Beyond-code" building design incentives/improved appliance efficiency standards
- Incentives for waste-to-energy and methane-to-energy plants
- Carbon dioxide tax on the electricity sector
- Efficiency increases in government buildings

The southeastern states continue to make progress in the development of clean energy. However, there are many opportunities for strengthening policies to support further development. As state clean energy policies mature and have time to affect markets, as new policies are adopted and as efforts currently underway build results, the Southeast is likely to gain headway toward a stronger clean energy economy.

Databases of State-level EERE Policies and Actions

Database of State Incentives for Renewable Energy (DSIRE)
http://www.dsireusa.org/

ACEEE State Policy Database
http://www.aceee.org/sector/state-policy

Online Code Environment & Advocacy Network (State Building Codes)
http://bcap-ocean.org

Center for Climate Strategies' State Policy Tracker
http://www.climatestrategies.us/Climate_Policies_Work.cfm

EPA's State Climate and Energy Program: Policy Tracking
http://www.epa.gov/statelocalclimate/state/index.html

EPA's State Climate Action Plans Database
http://yosemite.epa.gov/gw/statepolicyactions.nsf/webpages/index.html

National Conference of State Legislatures' Energy, Environment Legislation Tracking Database (Legislation introduced)
http://www.ncsl.org/

4 The Potential for Clean Energy in the Southeast

4.1 Energy Efficiency Potential

Several recent analyses conclude that investing in efficiency measures to reduce electricity usage costs less than half the cost of conventional electricity generation supplies for both the residential and commercial sectors (Committee on America's Energy Future 2009; Friedrich et al. 2009; Laitner 2009). Without efficiency measures, energy consumption in these sectors is predicted to increase by 16% between 2010 and 2030 (Brown et al. 2010). Efficiency can off-set the need for new electricity generation facilities, transmission lines, and supporting infrastructure, and it is not subject to the same regulatory, planning, and construction uncertainties as the construction of power plants. This is a particular benefit in the Southeast where many coal-fired plants will be decommissioned at a time of increasing demand.

The Southeast Energy Efficiency Alliance (SEEA) reports that 25 GW of older power plants in the region could be decommissioned without replacing the supply if energy efficiency were prioritized, say, through a number of policies. SEEA studied common efficiency policies in the residential, commercial, and industrial sectors to determine their potential to provide energy savings and the cost of their implementation in the Southeast. Figure 17 summarizes their findings by charting policies according to their cost per kilowatt-hour and potential electricity savings.

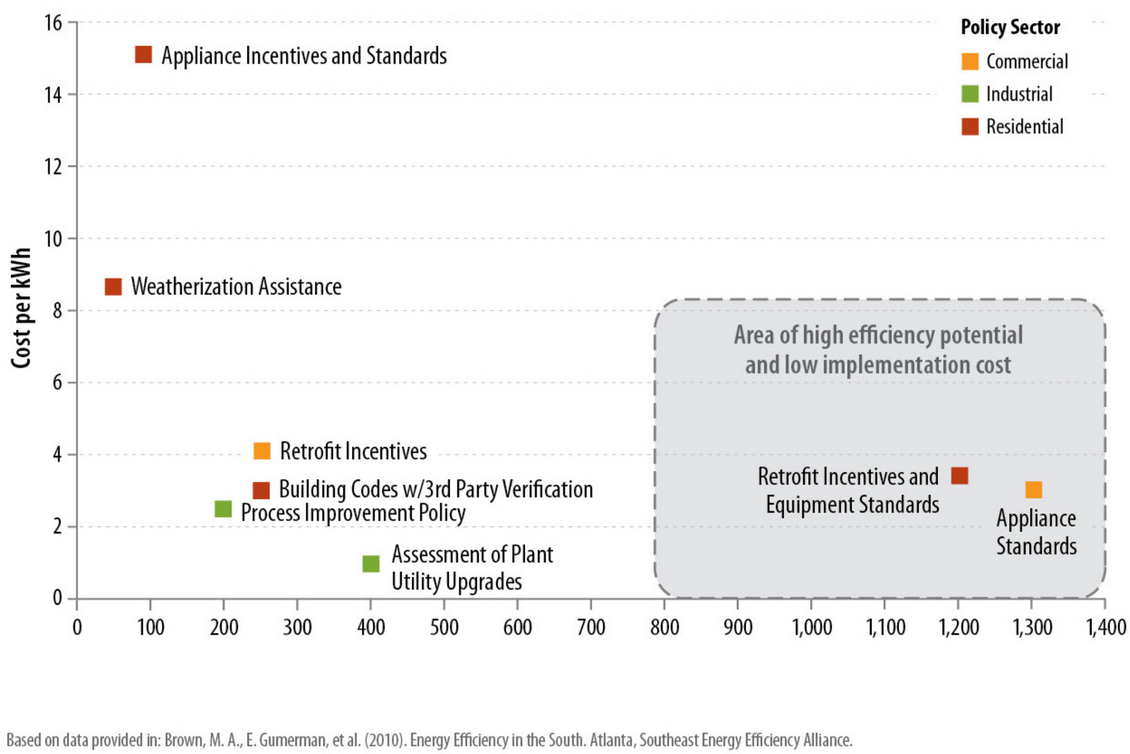


Figure 17. Energy efficiency policies for the Southeast: Potential energy savings and policy cost

As Figure 17 shows, commercial appliance standards are found to have the highest potential for efficiency savings and the lowest levelized cost per kilowatt-hour saved. In the residential sector, retrofit incentives combined with equipment standards for heating, cooling, and water heating provide significant potential for energy savings at a low cost. For reference, the average electricity cost is between $0.062/kWh for industrial customers and $0.105/kWh for residential customers. Thus, all but two of the efficiency policies studied are more cost effective than purchasing the electricity at commercial rates (Brown et al. 2010).

According to the SEEA study, implementing these efficiency measures would not only cut utility bills in the Southeast by $41 billion but would also:

- reduce the need to build/replace fossil fuel power facilities,
- create 380,000 jobs,
- moderate electricity rate increases,
- provide significant freshwater savings, and
- grow the regional economy by $1.23 billion (Brown et al. 2010).

The CCS recently concluded a study for NREL and DOE in which the costs and emission benefits of implementing various clean energy policies and actions at the state level were estimated. For North Carolina, implementing improved building codes and appliance efficiency standards and requiring higher levels of efficiency and green power purchasing for government buildings could actually save money while reducing green house gases (GHG)—as much as $120 of savings per ton of GHGs reduced. Providing technical assistance and energy audits for the residential, commercial, and industrial sector and providing technology development programs could save an additional $65/ton of GHGs reduced (Center for Climate Strategies 2010).

The American Council for an Energy Efficient Economy (ACEEE) has recently conducted in-depth studies for North Carolina, South Carolina, and Arkansas and has begun work on a report for Missouri. The reports provide detailed information about the status and potential for efficiency in these states (Eldridge et al. 2010; Neubauer et al. 2010).

In their analysis of North Carolina, ACEEE finds that investments in energy and water efficiency measures can meet almost 25% of the state's increased electricity demand by 2025, as well as lower energy and water bills. The report highlights the opportunity to increase overall state energy efficiency by concentrating efforts on ensuring the efficiency of new construction in rapidly growing areas. In particular, there are 23 counties that are experiencing rapid population growth. North Carolina can enjoy significant savings, comfort, and job creation by focusing efficiency efforts in these areas. This is both easier and more cost effective than retrofitting existing infrastructure. The report lists 11 suggested policies, such as new building initiatives, building code enforcement, and financing programs, to support increased efficiency in the state (Eldridge et al. 2010).

In the report for South Carolina, ACEEE acknowledged the state's recent commitments to efficiency through reducing consumption in government buildings, strengthening building codes, and investing in home weatherization. In addition, working with stakeholder groups to define the state's most pressing issues and barriers, ACEEE identified additional efficiency initiatives that would most benefit South Carolina, including: efficiency assessments and training in the manufacturing and agricultural sectors, low-income and manufactured home weatherization programs, and encouraging residential energy saving by providing personalized energy-use information. The state government can further support efficiency through enabling policies such as strengthening building energy codes, broadening the academic and technical areas covered by existing workforce development initiatives, and expanding demand response programs (Neubauer et al. 2009).

In their recommendations for Arkansas, ACEEE included residential energy programs, low-income and manufactured home weatherization, industrial and agricultural initiatives, and demand response programs, as well as other policies to support increased efficiency. State strengthening of building codes, financing programs, and research and development is also recommended for Arkansas. It is estimated that the policy suite would produce an energy savings that would provide virtually all of the projected energy demand growth and add over 10,000 net jobs by 2025 (Neubauer et al. 2010). In all of the ACEEE reports, the EERS, which mandates utilities to reach a targeted energy savings, is recommended as a core policy that can act as a foundation on which other policies are built. All of the ACEEE reports can be accessed at http://www.aceee.org/sector/state-policy/scerp.

4.2 Renewable Energy Potential

There is a common misconception that the Southeast does not have substantial renewable resources. Current data indicates that there is the potential for the region to generate power from local solar, biomass, methane, wind, and geothermal resources using current technology. The World Resources Institute estimates that over 30% of the Southeast's total electricity needs could be met by renewable resources (Creech et al. 2009). Other estimates based on individual resources are even more positive, particularly for biomass potential. Table 11 summarizes the resource potential for renewable resources in the Southeast and is based on the most current data available. The sections that follow provide detail for each of these resources, including a breakdown of the counties and states that hold the greatest potential for each.

There is a substantial potential for increasing the region's energy independence through the development of local clean energy resources. While this move to a locally supplied clean energy source may require short-term shifts in costs and system operations, it promises substantial long-term benefits in independence and security of energy supply. Each state enjoys a unique mix of resources and an opportunity to define and specialize in its own clean energy path going into the future.

Table 11. Renewable Energy Potential in the Southeast: Summary Table

State	Onshore Wind Potential	Offshore Wind Potential	Solar (PV) Potential	Small Hydroelectric Potential	Combined Heat and power (CHP) Potential	Methane-to-Energy Potential	Solid Biomass Residue Potential	Total Renewable Energy Potential: GWh/year	Total Renewable Energy Potential: % of 2008 state electricity generation
Alabama	0%	0%	10%	10%	6%	1%	8%	61,169	42%
Arkansas	49%	0%	13%	27%	7%	2%	26%	82,538	150%
Georgia	0%	136%	19%	8%	13%	2%	11%	272,619	200%
Kentucky	0%	0%	11%	9%	7%	1%	7%	42,130	43%
Louisiana	1%	1046%	14%	6%	11%	1%	15%	1,024,696	1108%
Mississippi	0%	0%	9%	10%	7%	1%	16%	52,847	58%
Missouri	1682%	0%	27%	30%	25%	4%	25%	875,945	1817%
North Carolina	2%	728%	19%	12%	14%	3%	10%	1,000,660	799%
South Carolina	0%	395%	12%	7%	9%	1%	7%	443,428	439%
Tennessee	1%	0%	19%	19%	10%	2%	7%	57,699	64%

Notes:

Potentials are shown as a percent of total state electricity generation for 2008 as reported in: Energy Information Administration (EIA), Historical State Generation data: 1990–2008 Net Generation by State by Type of Producer by Energy Source (EIA-906), published in the Electric Power Annual 2008 http://www.eia.doe.gov/cneaf/electricity/epa/epa_sprdshts.html released January 21, 2010.

Onshore Wind potential

Onshore wind potential is based on AWS Truewind, LLC wind resource data for windNavigator® (http://navigator.awstruewind.com) with a spatial resolution of 200 m was used as the basis of the analysis. NREL then produced estimates of the windy land area (i.e. the area with a gross capacity factor, without losses, of 30% and greater at 80-m height above ground). The windy energy potential was determined by filtering the estimates of windy land area to exclude areas unlikely to be developed such as wilderness areas, parks, urban areas, and water features. The potential installed capacity was calculated as the number of megawatts of rated capacity that could be installed on the available windy land area, assuming 5 MW/km of installed capacity. The potential annual generation (in GWh) was then determined and divided by the state's total annual generation in 2008 (from EIA) to obtain the percentage of state generation that could be provided by wind energy.

Offshore Wind potential

The offshore wind potential is based on a 2010 NREL analysis (Schwartz, et. al, 2010) that determined the available square kilometers of water and potential installed capacity in gigawatts for annual average wind speeds greater than 7.0 meters/second at 90 meters above surface and within 50 nautical miles of shore. A uniform factor of 5 MW/km2 was applied to calculate the potential installed capacity. Resource estimates were not reduced by any environmental or water-use considerations. The potential annual generation (GWh) was then calculated using a 35% capacity factor. This was divided by the state's total annual generation in 2008. Sources: Schwartz, et. al. (2010). Assessment of Offshore Wind Energy Resources for the United States. National Renewable Energy Laboratory Report NREL/TP-500-45889.

Solar PV potential

The rooftop photovoltaic potential is based on technical potential estimates by Paidipati et. al (2008). Technical potential is defined as PV system power density in MWpDC per million square feet times the roof space available for photovoltaics in a given area. Available roofspace is assumed to be 25% roof coverage for residential buildings and 60% coverage for commercial buildings, to take into account shading, building orientation, and roof structural soundness. An 18-degree pitch for residential buildings is assumed. The power density of a module was calculated on a square-footage basis, and the power density of a PV system was calculated by applying a packing factor of 1.25 for all systems to account for space needed for access between modules, wiring, and inverters. The resulting system power density is 10 MW/million ft2, using an average module efficiency of 13.5%. The available roofspace in 2010, as reported by Paidipati et. al, was converted to annual generation potential using the mean AC capacity factor for each state (13.5% for KY and TN; 14.5% for the other states), with an assumption of southfacing panels with tilt equaling latitude and a rerate value of 0.77 to account for losses during conversion from DC to AC. This was then divided by the state's total annual generation in 2008 to obtain the percent of total generation that rooftop photovoltaic technology could contribute in each state. The figures consider only current rooftop availability. Additional potential exists from new construction and from ground-level installations, for example along highways or surrounding airports. Sources: Paidipati et. al (2008). Rooftop Photovoltaics Market Penetration Scenarios. National Renewable Energy Laboratory Subcontract Report Number NREL/SL-581-42306. and NREL map: AC Capacity Factor - Flat Plate Tilted at Latitude, Assuming a derate value of 0.77 Produced March 2, 2010 by Billy Roberts.

Small and Low-Power Hydropower potential

Low-power and small hydroelectric potential estimates are based on data from Idaho National Laboratory. Low power projects are defined as less than 1 MW. Small hydro projects are greater than or equal to 1 MW but less than or equal to 30 MW. Includes only projects that do not include a dam obstructing the main stream channel and do not include water impoundments in the operation. The power potential for each site was estimated by determining the realistic penstock length, flow rates and other development constraints. Potential sites were identified using site development criteria regarding project location, penstock length and flow rates. Feasibility criteria were then applied to further exclude sites based on project size, federal land designations, and proximity to roads and power infrastructure. Source: Hall, D. et. al (2006). Feasibility Assessment of the Water Energy Resources of the United States for New Low Power and Small Hydro Classes of Hydroelectric Plants Feasibility Assessment of the Water Energy Resources of the United States for New Low Power and Small Hydro Classes of Hydroelectric Plants. Idaho National Laboratory Report Number DOE-ID-11263. http://hydropower.inel.gov/resourceassessment/index.shtml

CHP potential

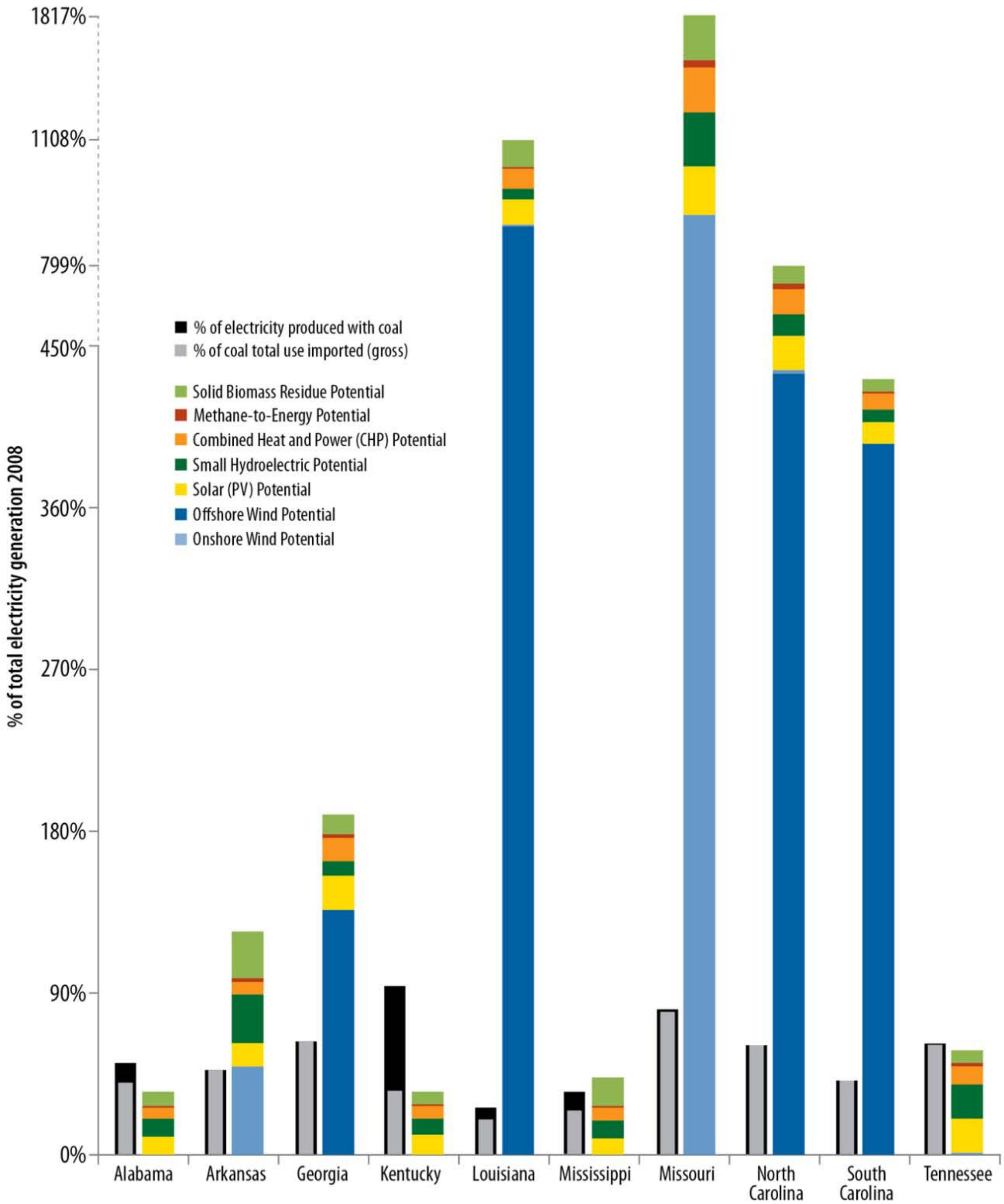
Potential is based on CHP potential data prepared by Onsite Sycome Energy Corporation (2000). Potential projects were identified through a review of the thermal energy consumption data in the DOE EIA 1995 Commercial Buildings Energy Consumption Survey and commercial market summaries, considering the required profiles for CHP applications. Applications that met the following criteria were targeted: relatively coincident electric and thermal loads, thermal energy loads from steam or hot water, electric to thermal demand ratios between 0.5-2.5, moderate to high operating hours (more than 4000 hours/year). The number and size of technically feasible applications was then determined and the MW capacity estimated, assuming that system would be sized to meet the average electricity demand for each site, unless thermal loads limited the capacity. From these results, potential MWh/year was calculated assuming a 80% capacity factor. Sources: Onsite Sycom Energy Corporation (2000). The Market and Technical Potential for Combined Heat and Power in the Commercial/Institutional Sector. Prepared for U.S. Department of Energy.

Methane-to-energy potential

Electricity potential from methane emissions from landfills, domestic wastewater treatment and animal manure. Assumes 4.7 MWh/tonne of methane, and a 30% conversion efficiency. Source: http://www.nrel.gov/gis/biomass.html.

Solid biomass resource potential

Electricity potential from solid biomass resources—crop residues, forest residues, primary and secondary mill residues, and urban wood waste. Assumes 1.1 MWh/dry tonne, and 20% conversion efficiency. Source: http://www.nrel.gov/gis/biomass.html.



Note: The percentages shown here for coal imports reflect the gross imports in 2008 as a percent of total state electricity generation. Coal exports are not accounted for. Kentucky is a net exporter of coal, however it does import coal for use in state generation facilities, as indicated in the chart.

Sources: Deyette, J. and B. Freese (2010). Burning Coal, Burning Cash: Ranking the States that Import the Most Coal, Union of Concerned Scientists.

EIA (2010). State and U.S. Historical Data, Energy Information Administration. http://www.eia.gov/overview_hd.html

For sources and calculations for the renewable energy potentials, see Table 11.

Figure 18. Coal used for electricity generation compared with renewable energy potential in the Southeast

4.2.1 Biomass Potential

The Southeast is seeing increased investments in its biomass industry, and there is much potential for expansion. Biomass electricity production is unique in that there are a variety of fuels that can be used as well as a variety of methods to convert these fuels to electricity.

Biomass resources for electricity production include:

- agricultural residues like wheat straw and corn stover;
- forestry residues from logging, dead wood, and small pole trees;
- mill residues and urban wood waste from construction and demolition;
- methane from animal waste, landfills, and wastewater treatment; and
- dedicated energy crops, including switchgrass and short-rotation woody crops, such as poplar and willow.

Biomass residues and methane resources are easier to estimate than dedicated crop potential since the sources of the residues and methane can be identified and the biomass output quantified.

The Southeast has an abundant supply of biomass from forests, mills, urban wood, and agricultural residues (Figures 19–22). Forest and mill residues are most concentrated in Louisiana, North Carolina, and South Carolina, although there are forest residues in almost every county in the region. North Carolina and South Carolina also have particularly dense urban wood residues, as do certain counties in the other states. Crop residues are densely concentrated along the Mississippi River and in Missouri but are available in lesser quantities throughout the region.

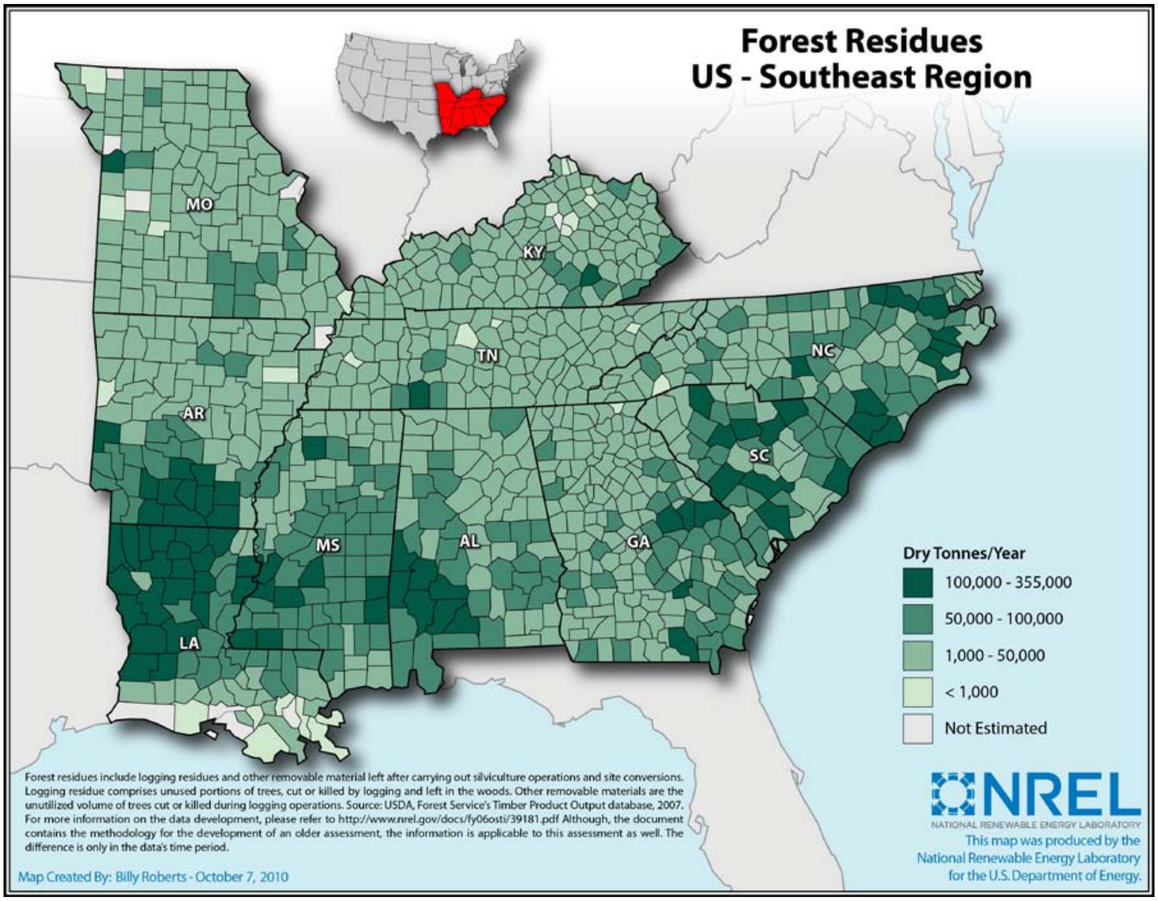


Figure 19. Forest residues available for energy production

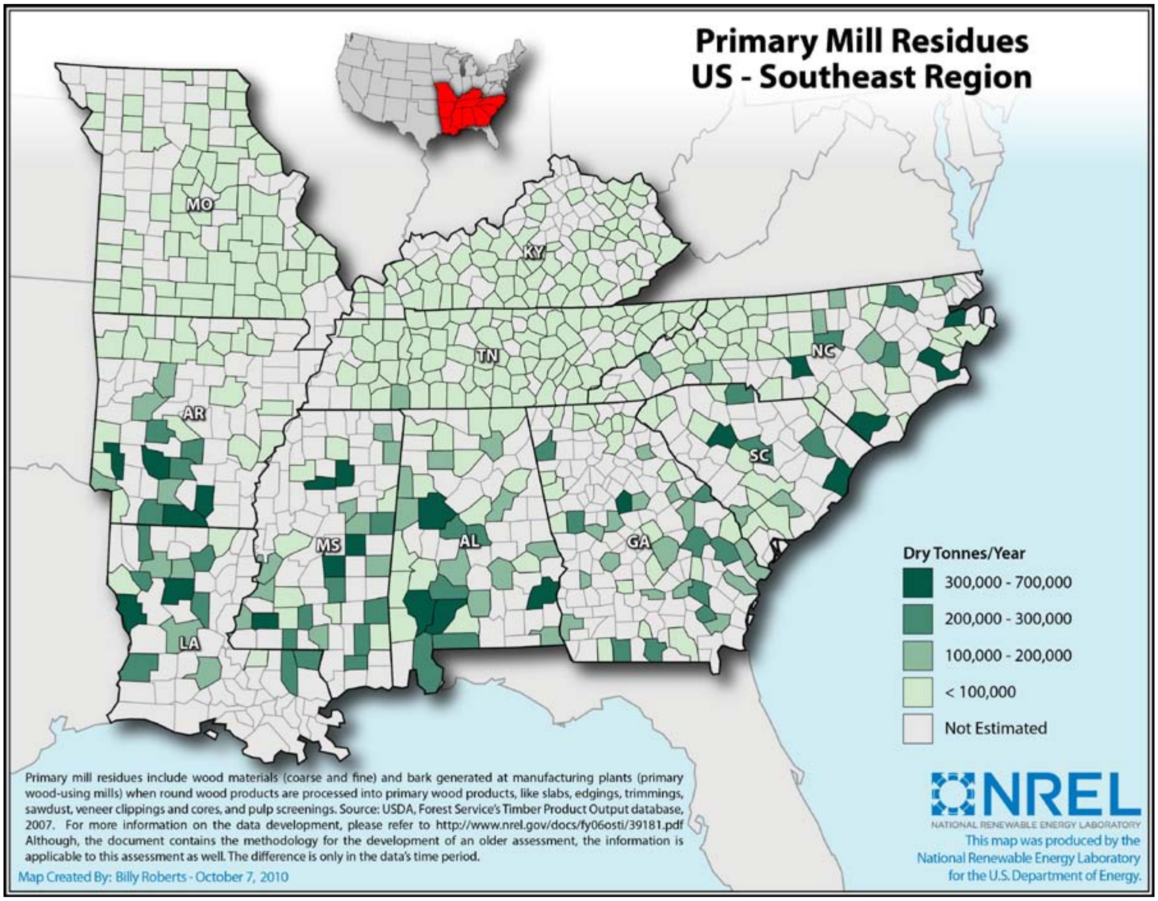


Figure 20. Primary mill residues available for energy production

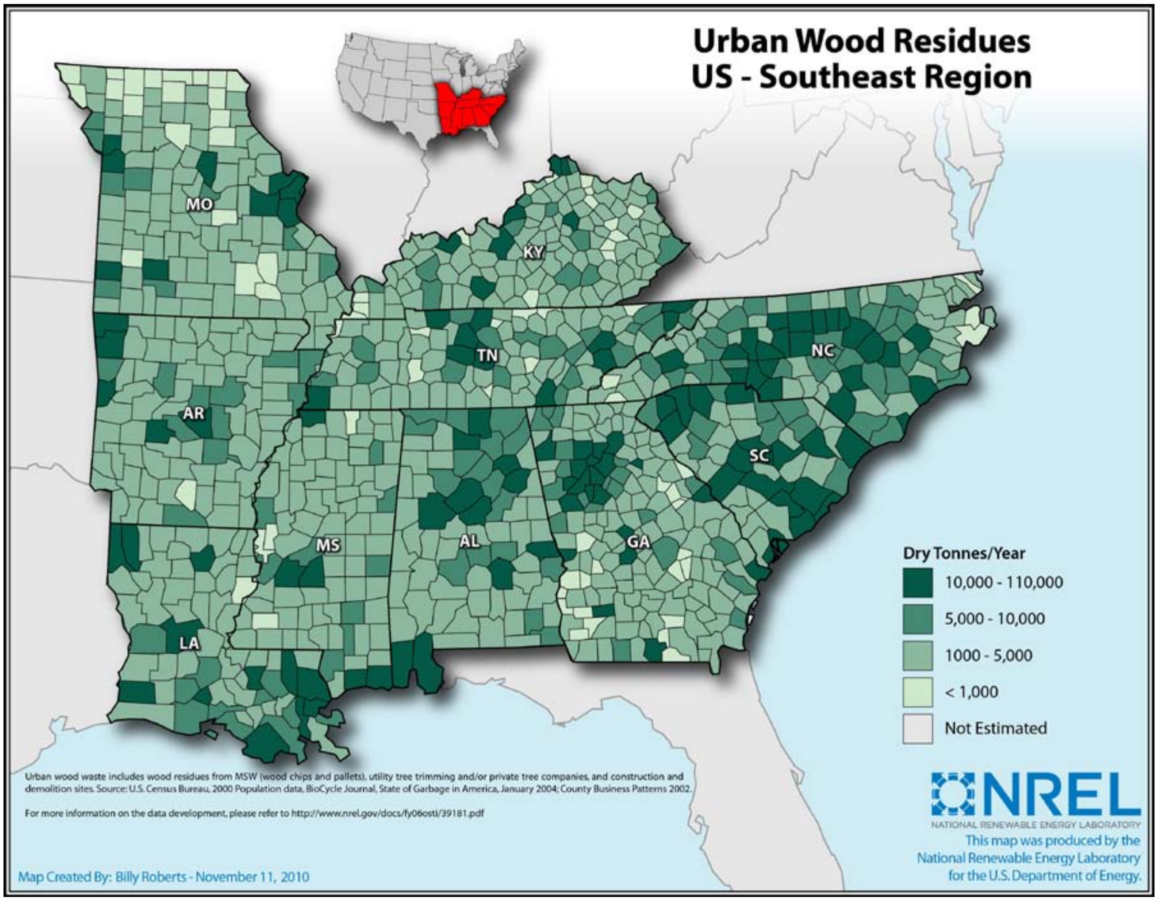


Figure 21. Urban wood residues available for energy production

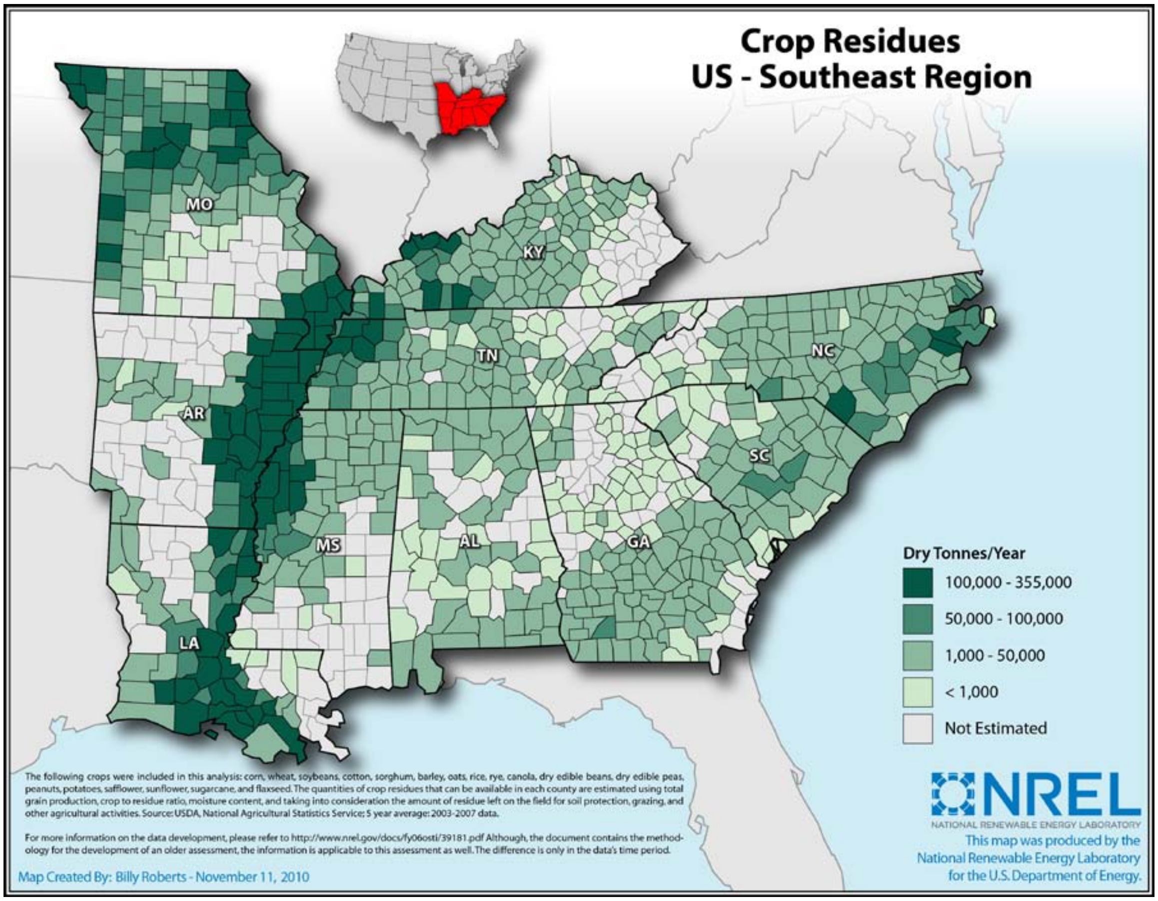


Figure 22. Crop residues available for energy production

Methane emissions from manure management are densely concentrated in North Carolina and Arkansas (Figure 23). North Carolina and South Carolina have significant methane resources from domestic water treatment, as do other dispersed counties across the region (Figure 24).

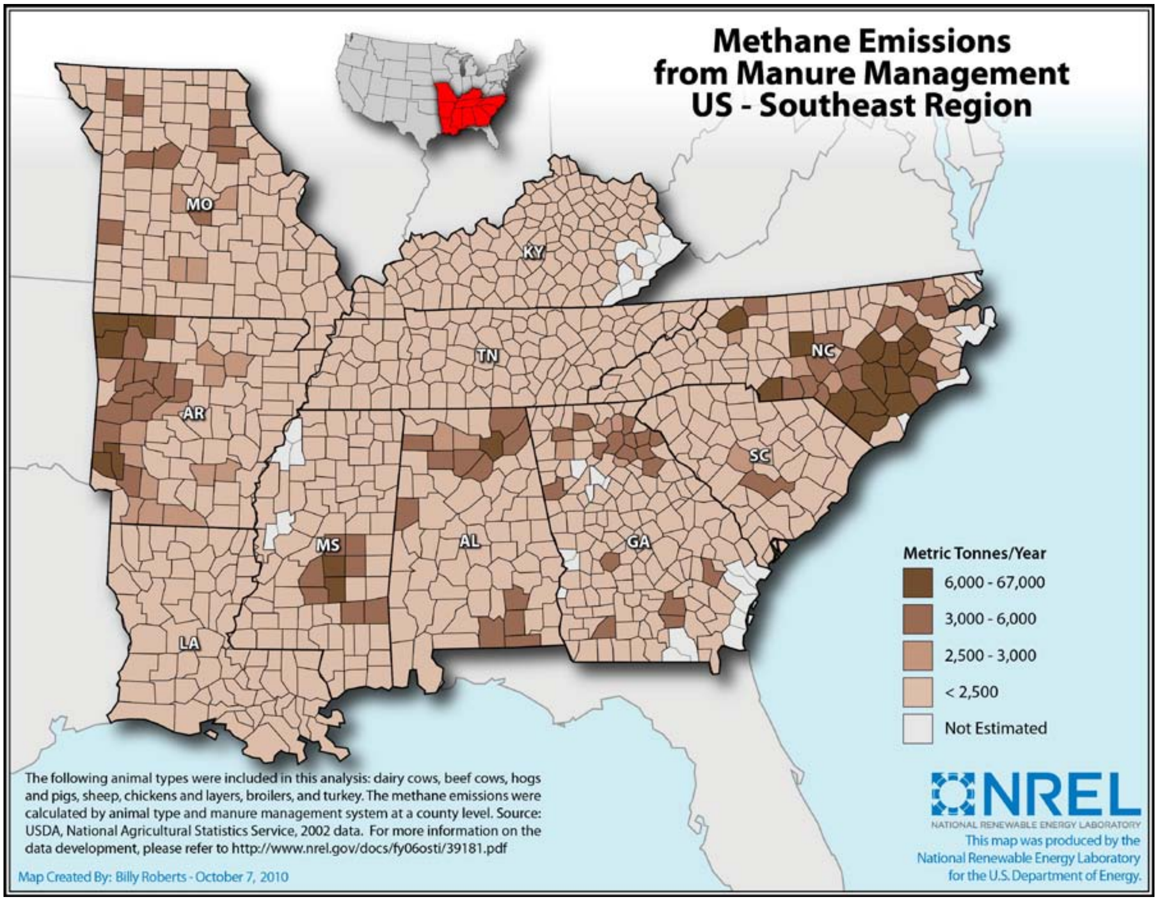


Figure 23. Methane emissions from manure management

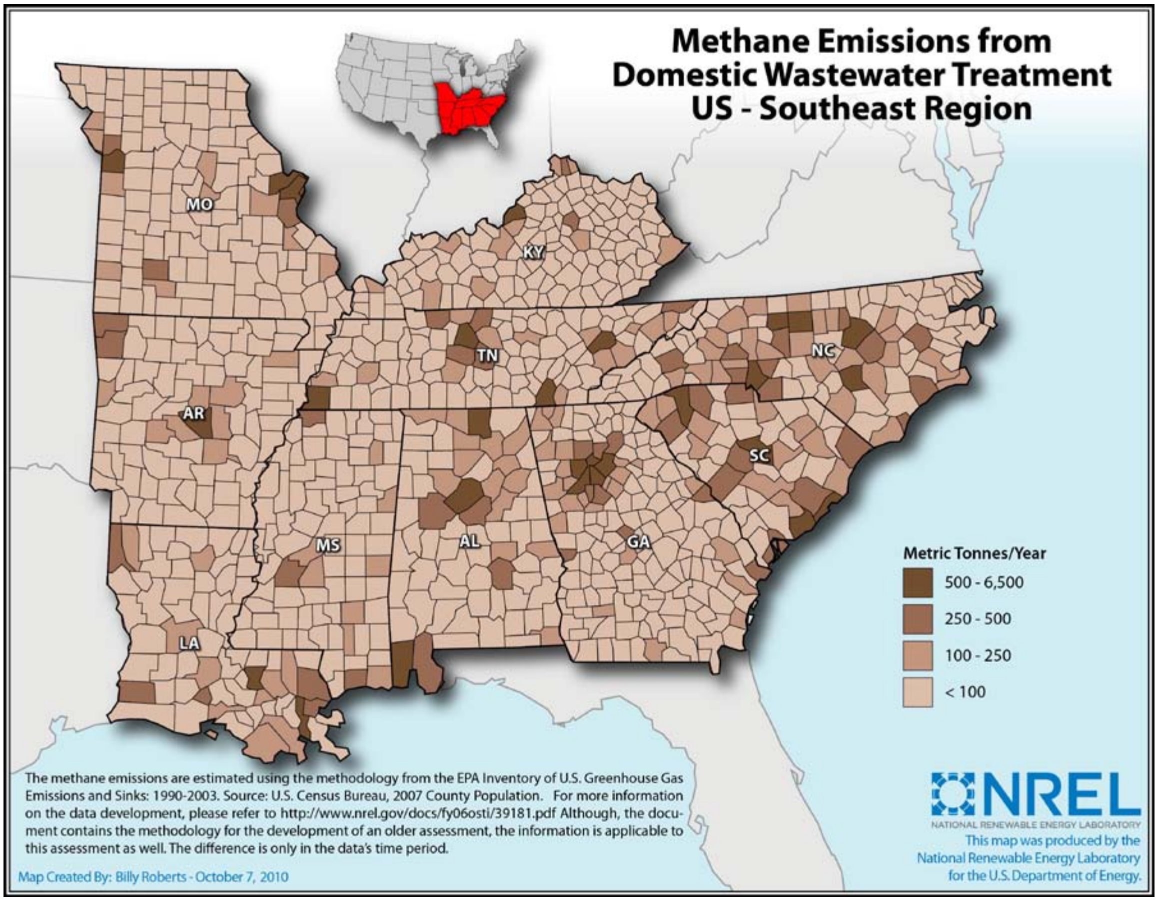


Figure 24. Methane emissions from domestic wastewater treatment

Landfill gas resources exist in each state. Some projects have already been developed to tap this resource. Table 12 indicates the number of existing methane-to-energy projects at landfills, as well as the remaining opportunities for development in each state. The data is provided by the EPA's Landfill Methane Outreach Program (LMOP), an assistance program that helps state and local governments, project developers, and other stakeholders assess project feasibility, find financing, and market the benefits of landfill methane power development. More information can be obtained from http://www.epa.gov/lmop/.

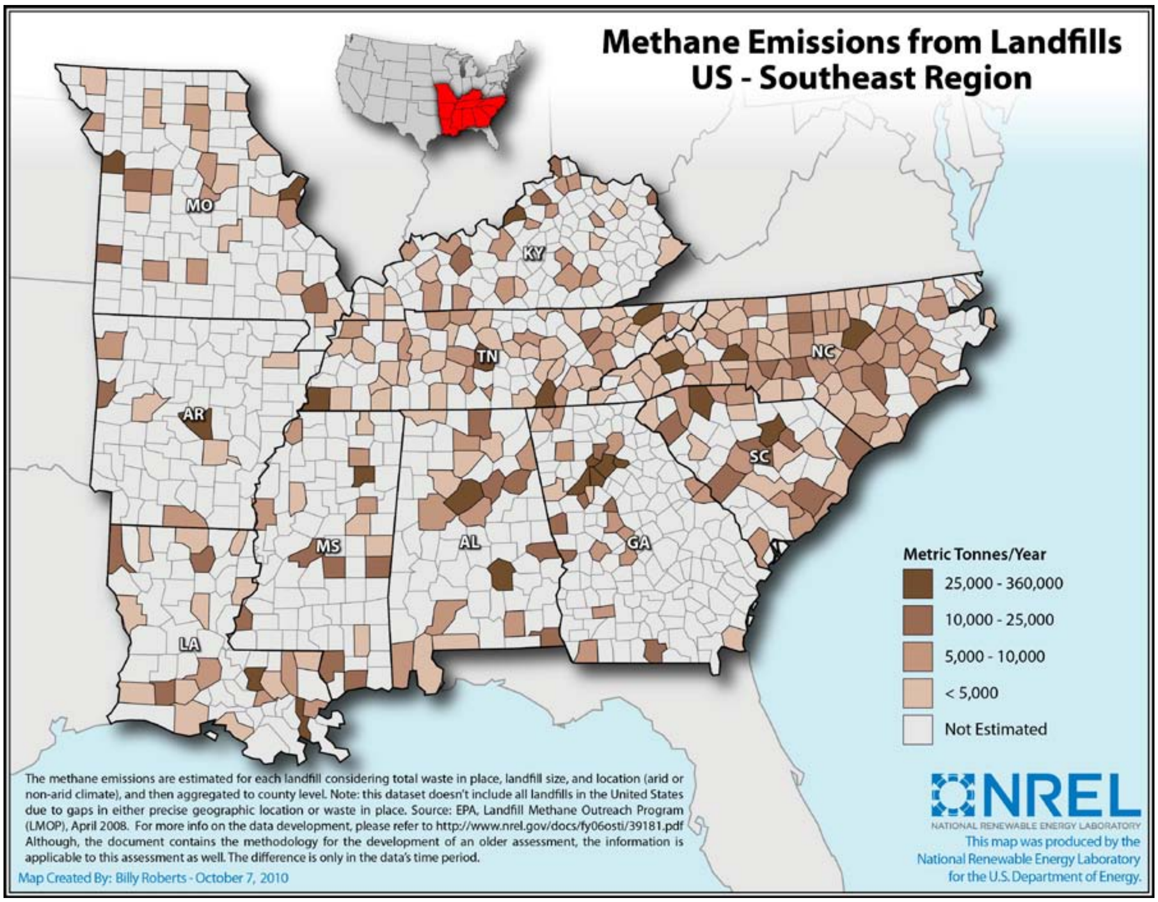


Figure 25. Methane emissions from landfills

Table 12. Landfill Methane-to-energy Projects and Opportunities in the Southeast

State	Number of landfill methane projects existing	Number of landfill methane opportunities remaining to be developed
Alabama	3	22
Arkansas	3	7
Georgia	12	23
Kentucky	7	18
Louisiana	4	7
Mississippi	2	13
Missouri	10	13
North Carolina	15	35
South Carolina	11	7
Tennessee	1	13

Source: U.S. EPA Landfill Methane Outreach program Database, http://www.epa.gov/lmop/

In addition to the biomass residues and the potential to produce biomass energy from methane, there is significant potential for growing dedicated energy crops in the Southeast. This option provides benefits to both farmers and the biomass market (see text box "Benefits of Dedicated Energy Crops for Biomass Energy Production"). Estimating the potential of this resource, however, is more difficult than estimating biomass from residues. Dedicated crop potential is greatly affected by farmer choice, agricultural policy, land use needs, and energy priorities.

Several studies have been conducted regarding farmers' views, land availability, and the economic and regional impacts of dedicated energy crops for bioenergy production in the Southeast. A 2009 study at the University of Kentucky examined the potential to grow dedicated energy crops on abandoned agricultural land and mine land considering current land uses, soil fertility/contamination, energy content of native grasses, and emissions related to biomass fuel production (Debolt et al. 2009). The researchers conclude that a significant percentage of the energy needs in Kentucky and similar southeastern states can be fueled through dedicated energy crops while reducing net carbon dioxide emissions.

A survey and behavior study by the University of Tennessee investigated farmer views on growing switchgrass as an energy crop (Velandia et al. 2010). Overall, farmer attitudes toward switchgrass production are positive, and a large percentage of the producers who were interviewed are likely to continue growing the crop after their current contracts expire. About 85% of switchgrass farmers surveyed believed that growing the energy crop would likely increase and stabilize their income as well as help them better allocate resources during the agricultural off-season.

The study also found that the decision of farmers to continue to grow energy crops is influenced by their families' and communities' perceptions about bioenergy crops and the support of university extension programs. University extension support was found to be more important in a farmer's decision to grow the crop than direct contractual negotiations of private companies. Demographics (such as age, experience, percentage of farm income, and size of cropland) did not affect a farmer's decision to grow energy crops; however, expectations about the development of the switchgrass market within the next 5 years was significantly associated with the decision to continue growing the crop (Velandia et al. 2010).

These findings suggest that education and involvement of the local communities and Extension staff in bioenergy initiatives could positively influence farmer decisions to grow energy crops and assist in the development of a stable biofuel supply.

Benefits of Dedicated Energy Crops for Biomass Energy Production

- Dedicated energy crops can be grown on marginally productive land, unused land, pastures, and for the Conservation Reserve Program.
- Dedicated crops do not introduce competition with food crops.
- Dedicated energy crops suffer fewer price spikes than some other agricultural products, resulting in more stable agricultural markets.
- Switchgrass is a perennial that requires less chemicals/fertilizers and fewer field operations, which saves time and money and reduces the overall environmental impact of agricultural processes.
- The root structure of perennial grasses works to improve soils and provide enhanced carbon sequestration.

A recent study by Howell et al. (2010) has identified the most optimal zones for dedicated energy crop production, taking into account these and other factors.

The study provides an analysis of biomass production potential and the socio-economic factors and policy considerations involved in its development. Accounting for potential crop yield, land costs, and production costs, the researchers identified the most viable biomass crop production zones across the country for the two types of dedicated energy crops (switchgrass and the short rotation woody crops) (Howell et al. 2010; Porter et al. 2009).

According to the study, the Midwest and Southeast are by far the regions of greatest potential for biomass energy development in the United States (Howell et al. 2010). The most optimal zones for switchgrass are along the coasts of North Carolina, South Carolina, and Georgia. The potential for short-rotation woody crop production is optimal in a broad area of the Southeast, including most of North Carolina, South Carolina, Georgia, Alabama, and Tennessee (Howell et al. 2010). Figure 26 shows the optimal production zones for the southeastern states in green.

An important policy issue arises from the overlap of the metropolitan areas with the optimal biomass production zones. Many of the areas that are optimal for biomass growth in the Southeast are close to or overlapping metropolitan areas, which are continuing to experience population growth and urban expansion. Competition for housing and other urban development may result in higher land prices and zoning challenges for biomass growers in these areas (Howell et al. 2010). This presents an important policy consideration for the development of biomass in the Southeast. If utilizing the optimal growth areas for biomass production is deemed desirable, then policies that help biomass growers obtain the most productive land for their crops will be an important factor in the development of a bio-economy in the Southeast. This may include the joint consideration of strategic energy planning and land-use planning to ensure that energy priorities and land resource allocations are in alignment. In addition, concerted discussions regarding the use of available biomass resources for the production of electricity, transportation fuel, and direct heat could assist the formation of a more strategically developed biomass market and alleviate strain caused by competition between biomass uses.

The Southeast has a strong biomass potential, however, many of the optimal lands for growing dedicated energy crops are close to urban areas. State-level policy could play an important role in developing a strong bio-economy in the Southeast by helping growers and developers utilize the most favorable locations.

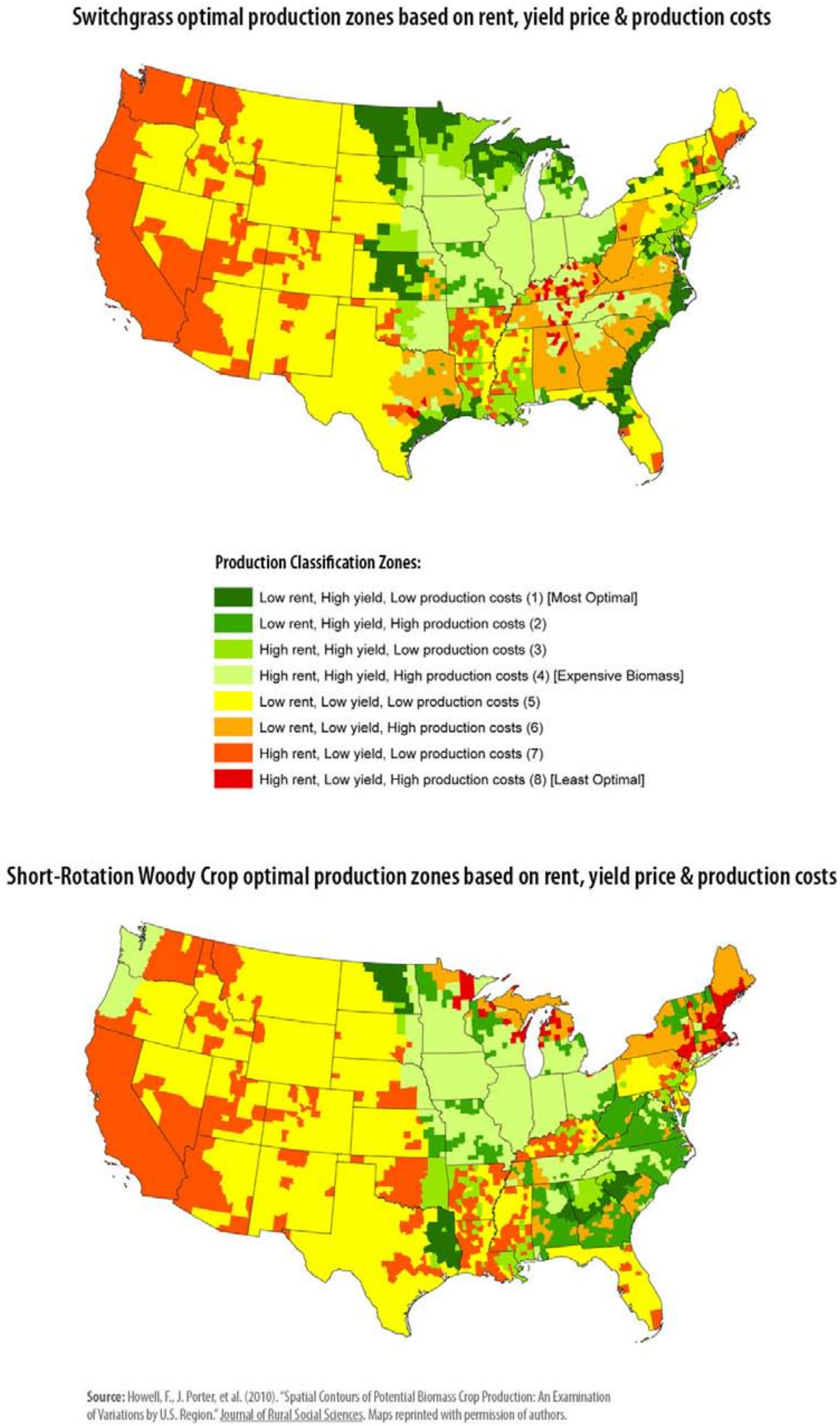


Figure 26. Optimal production zones for dedicated energy crops in the Southeast

4.2.2 Combined Heat and Power Potential

Combined heat and power (CHP; also called co-generation) is the generation of electrical or mechanical power from the waste energy of another process (e.g., an industrial process, factory, or commercial building). A variety of technologies and fuels can be employed for CHP, depending on the industrial process or building characteristics. CHP systems have efficiencies in the range of 80% (Shipley et al. 2008).

Total system efficiency is improved through the use of energy that would have otherwise been wasted. CHP technologies have a variety of benefits to both system owners and the broader society. CHP systems:

- can be deployed quickly, economically, and in a wide variety of locations;
- provide reduced energy costs, increased energy independence, and a reduced carbon footprint to system owners;
- have a lower perceived risk to financers compared to some energy technologies;
- are reliable and have small footprints;
- typically do not consume water for cooling; and
- can free long distance transmission capacity for other sources of electricity when located near load centers.

Given the intensity of industrial activity in the Southeast and the relatively high usage of electricity in the industrial sector of this region, the potential for employing CHP technologies is significant. Industries with high and continuous demand for both electrical and thermal energy, such as food processing, paper manufacturing, petroleum refineries, chemical industry, and metal production, are particularly well suited to the application of CHP technology (U.S. DOE 2010). According to the U.S. Census data, these are the exact industries that make up the top 10 industries in the southeastern states (U.S. Census Bureau 2010).

The summary in Table 11 shows the percentage of generation that each state could potentially produce using CHP technologies, while Figure 27 shows the potential in terms of megawatts of capacity. All of the states in the region have CHP potential. North Carolina and Georgia have the potential to develop over 2,000 MW of CHP capacity (Onsite Sycom 2000; Shipley et al. 2008).

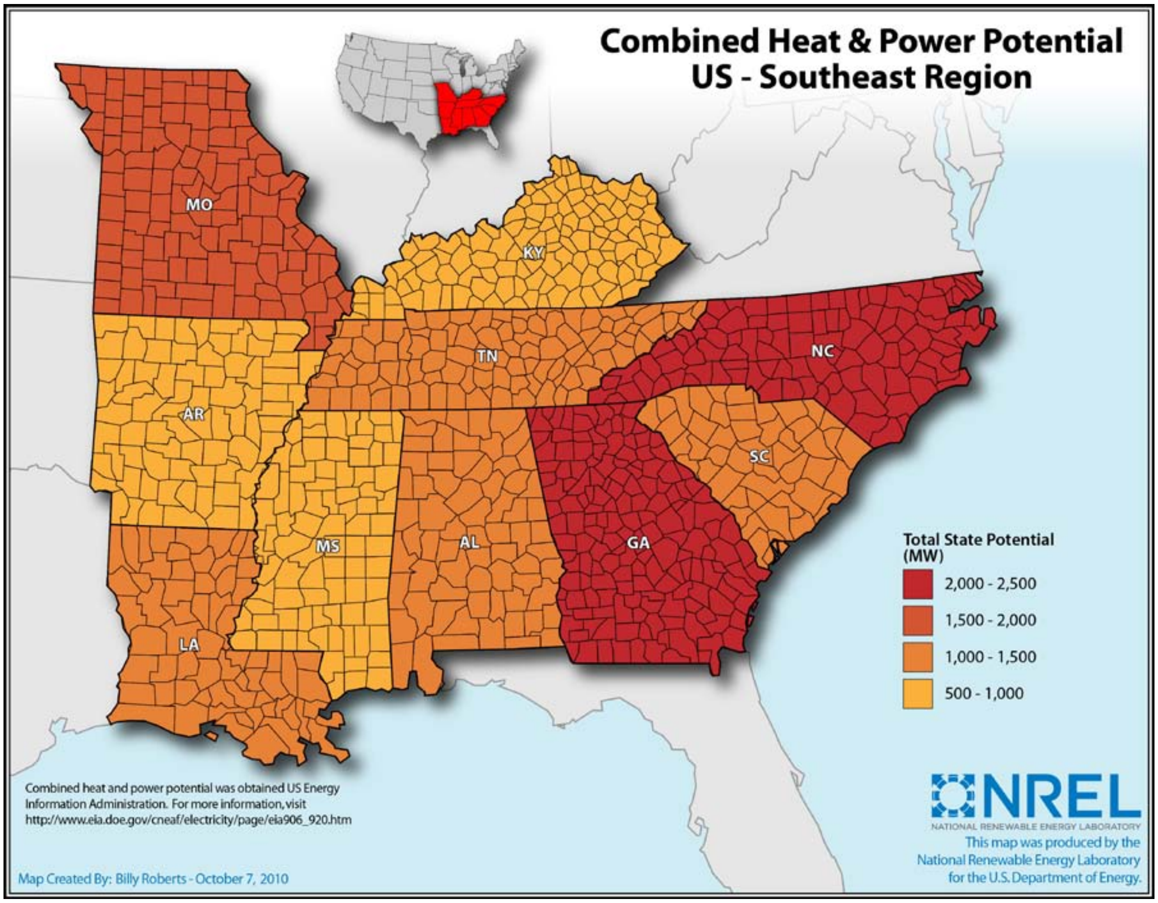


Figure 27. Combined heat and power potential in the Southeast

4.2.3 Small and Incremental Hydroelectric Potential

Development of currently untapped hydro resources can allow states to make use of existing technologies and draw on the long-term history of hydroelectricity in the southeast region. A 2006 study conducted by Idaho National Laboratory for DOE identified the potential for increasing hydroelectricity capacity through the use of low power and small hydroelectric facilities (Hall et al. 2006). The majority of this capacity does not require the construction of new dams, making use of run of the stream or incremental capacity technologies.

Using a set of feasibility criteria, researchers identified the possible locations and potential capacity additions for each state. According to the study, most of the states in the region have the potential to produce between 1–2 GW of additional capacity of small and low-power hydroelectricity. For detailed information about these opportunities, see the full report "Feasibility Assessment of the Water Energy Resources of the United States for New Low Power and Small Hydro Classes of Hydroelectric Plants," downloadable from http://hydropower.inel.gov/resourceassessment/index.shtml/.

4.2.4 Solar Potential

Energy from the sun can be tapped using several technologies, including solar hot water heating units, photovoltaic panels, and concentrating solar power (CSP) technologies. In the Southeast, both solar hot water heating and the generation of electricity through photovoltaic panels are feasible opportunities. For many applications, the entire region has sufficient solar resource to benefit from solar hot water and photovoltaic technology deployment.

Figure 28 shows the number of therms per year that are available to heat or preheat water. The Federal Energy Management Program (FEMP) and NREL have identified areas where it is currently cost effective to install solar hot water heating systems (see http://www.nrel.gov/gis/femp.html). The analysis takes into account solar resources, current technology costs, electricity prices, natural gas prices, and incentives.

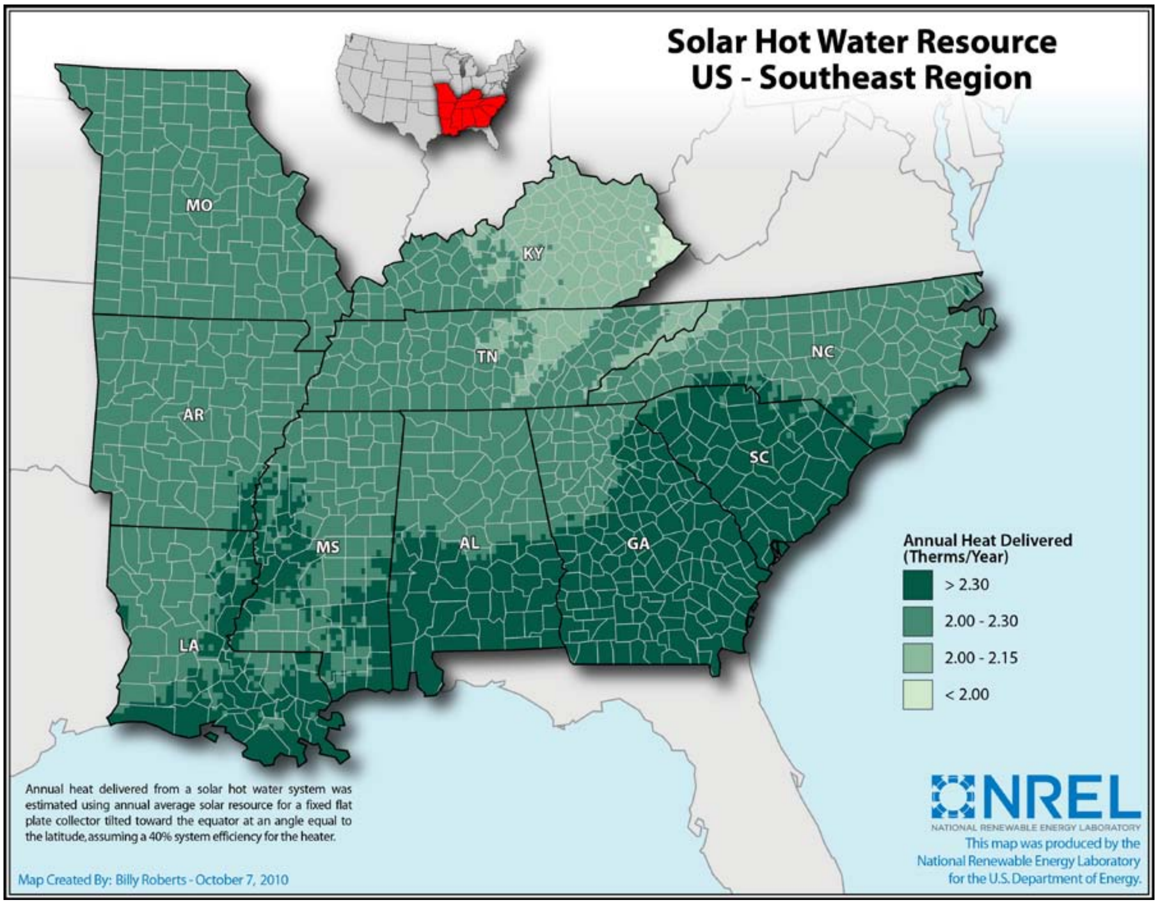


Figure 28. Solar hot water resource in the Southeast

Figure 29 shows the solar resource in the Southeast as it pertains to electricity generation from photovoltaics. In many counties in Georgia, South Carolina, and southern Louisiana, the potential for generating electricity from photovoltaic technology is significant. As electricity prices increase and photovoltaic technology prices decrease, generating electricity from photovoltaic technologies will become an increasingly attractive option in a wide variety of locations across the Southeast. According to the

FEMP-NREL analysis referenced above, installing photovoltaic systems is currently cost effective using incentives available to government and not-for-profit entities in Tennessee, much of Georgia, and parts of North Carolina (NREL 2010b).

The potential is great for governments and non-profits to lead by example and demonstrate solar technologies in the Southeast. Current technology and incentives make investments cost effective in many locations across the region.

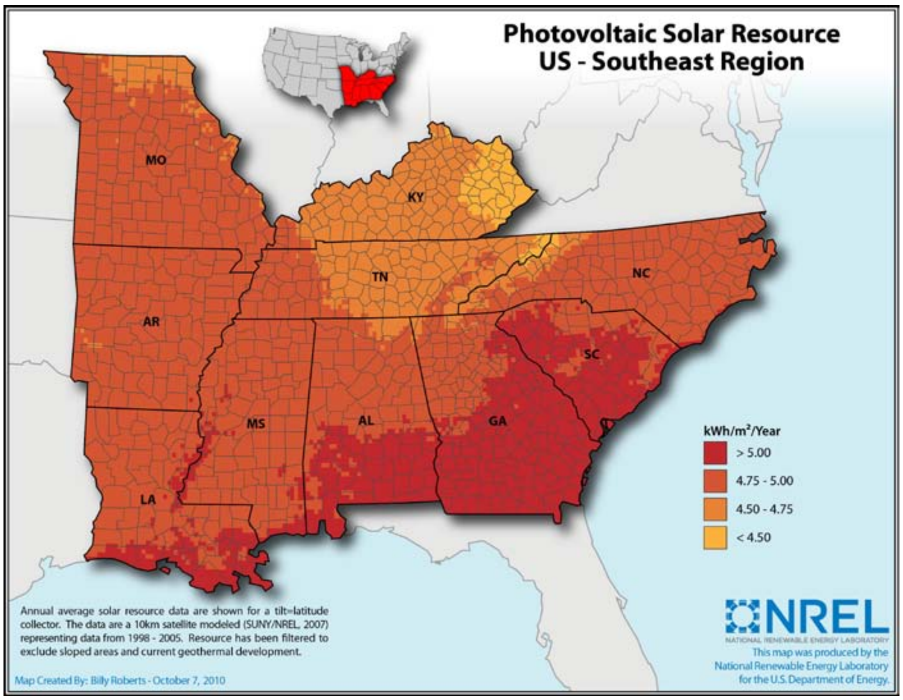


Figure 29. Photovoltaic solar resource in the Southeast

4.2.5 Geothermal Potential

Of the southeastern states, Louisiana has the greatest potential to generate electricity from geothermal resources (Figure 30). Mississippi and Missouri also have limited potential. In 2010, Louisiana had 5.3 MW of geothermal power capacity planned, while Mississippi had 0.5 MW planned. There is increasing discussion and demonstration of combined geothermal oil production. Energy can be harnessed at working oilfields and used to power them without interrupting their operation. One southeastern company, Gulf Coast Green Energy, is exhibiting this relatively new technique in both Mississippi and Louisiana (http://www.renewableenergyworld.com/rea/news/article/2010/07/oil-and-gas-coproduction-expands-geothermal-power-possibilities/). Both fluids recovered from oil and gas wells as well as the use of low-temperature or highly pressurized fluids have great potential in the Southeast, and the development and demonstration of these technologies is underway.[14]

Figure 30. Geothermal resource in the Southeast

4.2.6 Wind Potential

Several states in the Southeast have already begun developing wind energy projects. Although the onshore wind resource is not as strong as in states such as Texas and Iowa, there are locations in the Southeast that have viable wind resource and lands that are appropriate for its development. Figure 31 shows the on-shore wind resources in the Southeast.

[14] For more details on the potential of geothermal production, see the 2007 report from MIT: "The Future of Geothermal Energy – Impact of Enhanced Geothermal Systems (EGS) on the United States in the 21st Century," which is available at http://geothermal.inel.gov/publications/future_of_geothermal_energy.pdf.

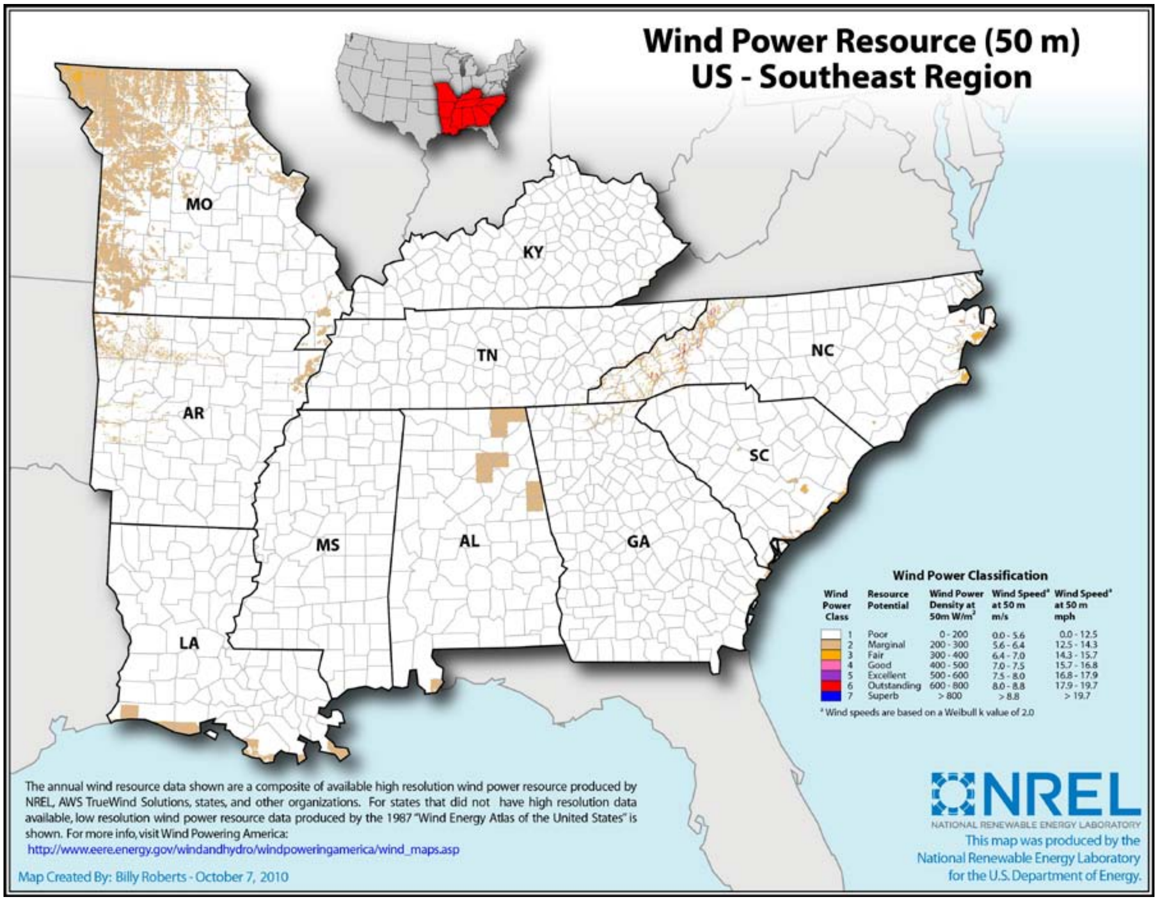


Figure 31. On-shore wind power resource in the Southeast

Of the southeastern states, Missouri has the greatest potential for on-shore wind energy development. A recently updated wind resource map for the state of Missouri, published by the DOE Wind Program and NREL (Figure 32) shows the predicted mean annual wind speeds at 80 m high.

As Figure 32 shows, much of the state has wind speeds above 6.0 m/s, which is the minimum resource necessary for utility-scale turbines, according to the American Wind Energy Association (www.awea.org). As the red areas indicate, there are particularly strong wind resources in the northwest portion of the state.[15]

In fact, according to NREL estimates, Missouri has 70,000 km^2 of land area that has sufficient technical potential for wind energy development. With this, Missouri has the potential to build 275,000 MW of wind energy capacity and produce over 800,000 GWh of electricity per year.[16]

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[15] The areas of Missouri with the greatest wind potential are not in the SERC region. However, this report uses state boundaries, not reliability regions.

[16] Assumes a 30% gross capacity factor at 80 m and 5 MW/km^2 of installed nameplate capacity and excludes national park, wilderness, and other sensitive land areas and lands incompatible with wind energy

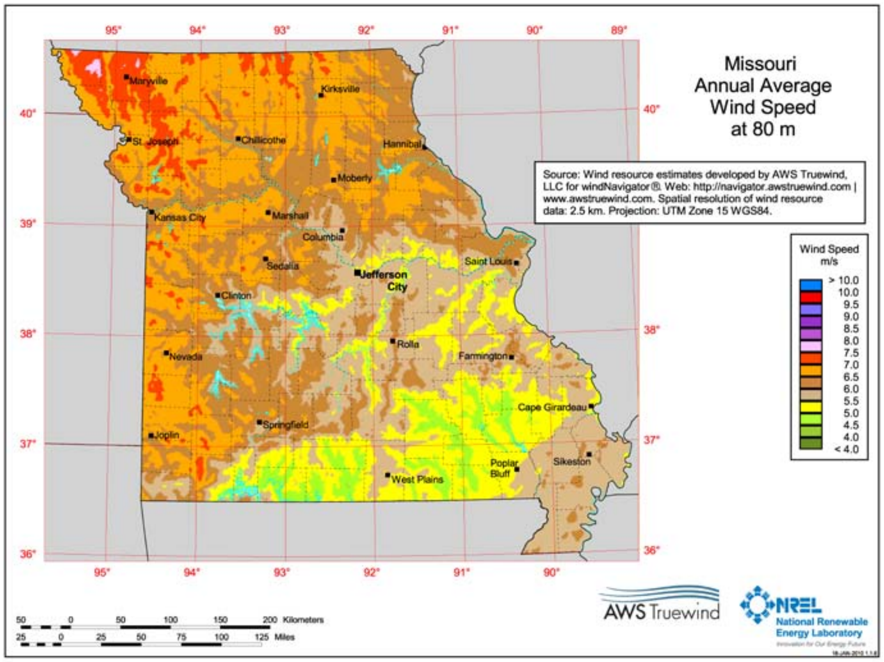

Figure 32. Predicted mean annual wind speeds in Missouri

Several states in the region, particularly Louisiana, also have significant potential for off-shore wind power production. Although off-shore wind technology faces technical and economic challenges, the benefits are great. Many coastal areas have high electricity demands and limited land space for constructing on-shore wind turbines.

The DOE and NREL are currently producing a validated national database that will quantify resource availability and its distribution. From this resource data, potential can be evaluated based on exclusion areas and other factors. Figures 33–36 show the off-shore wind energy resources for Louisiana, Georgia, North Carolina, and South Carolina.

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development (e.g., urban areas, airports, and wetlands). It does not take into consideration current transmission access.

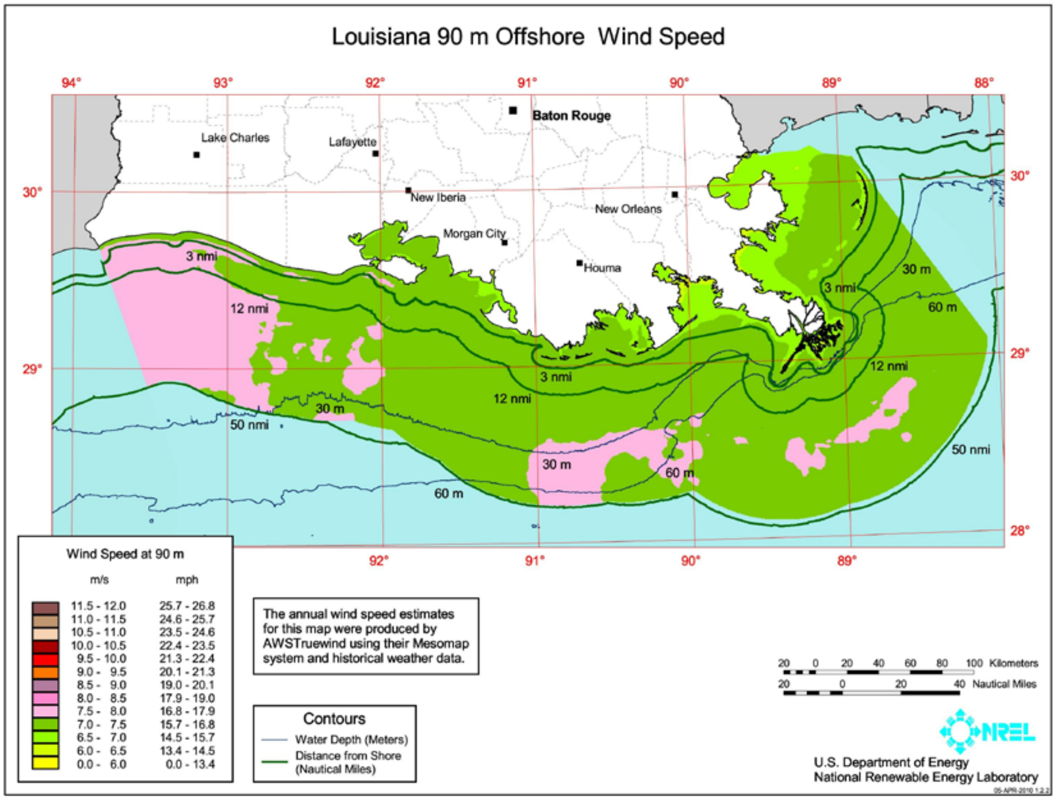

Figure 33. Off-shore wind power resource in Louisiana

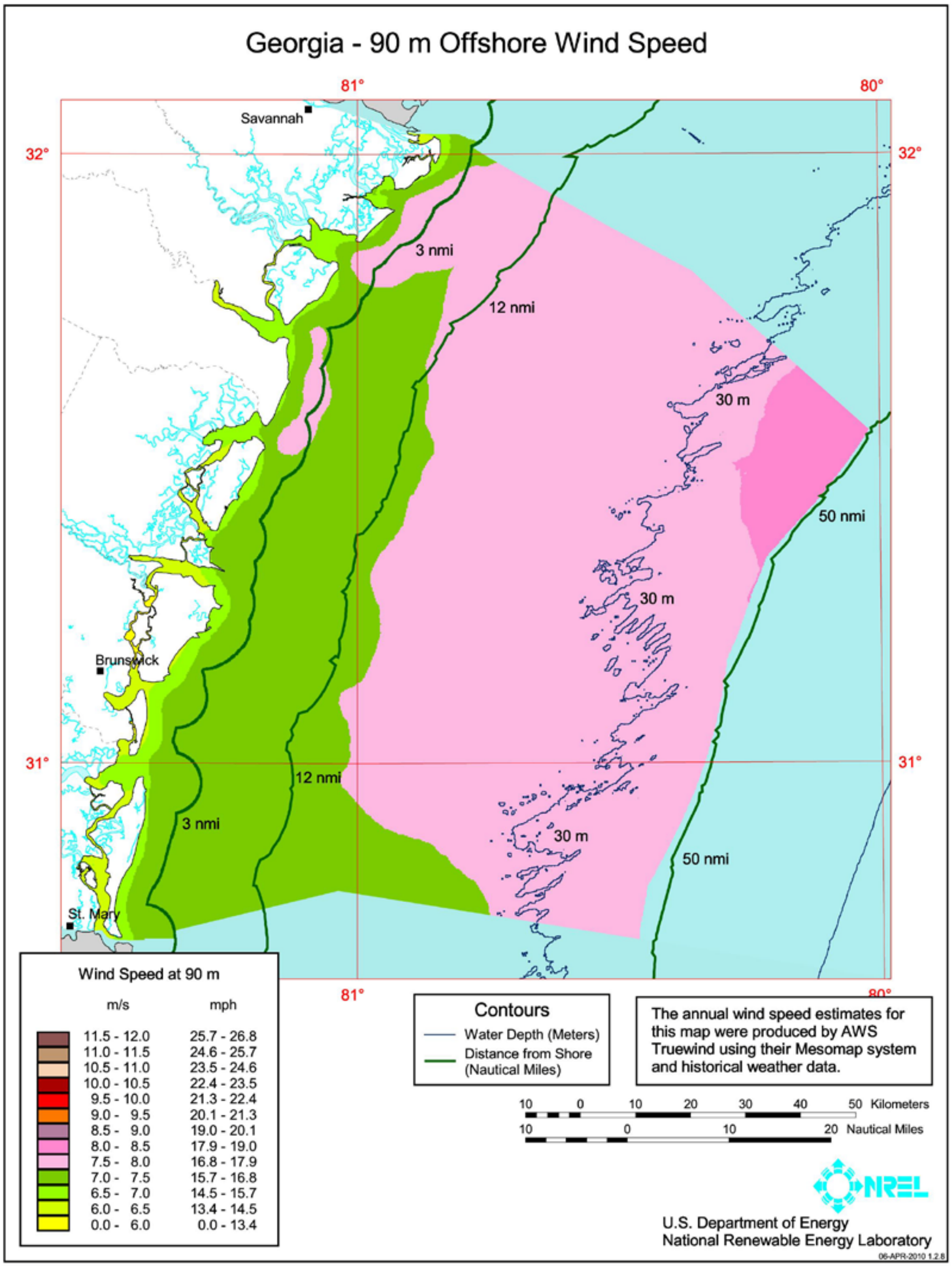

Figure 34. Off-shore wind power resource in Georgia

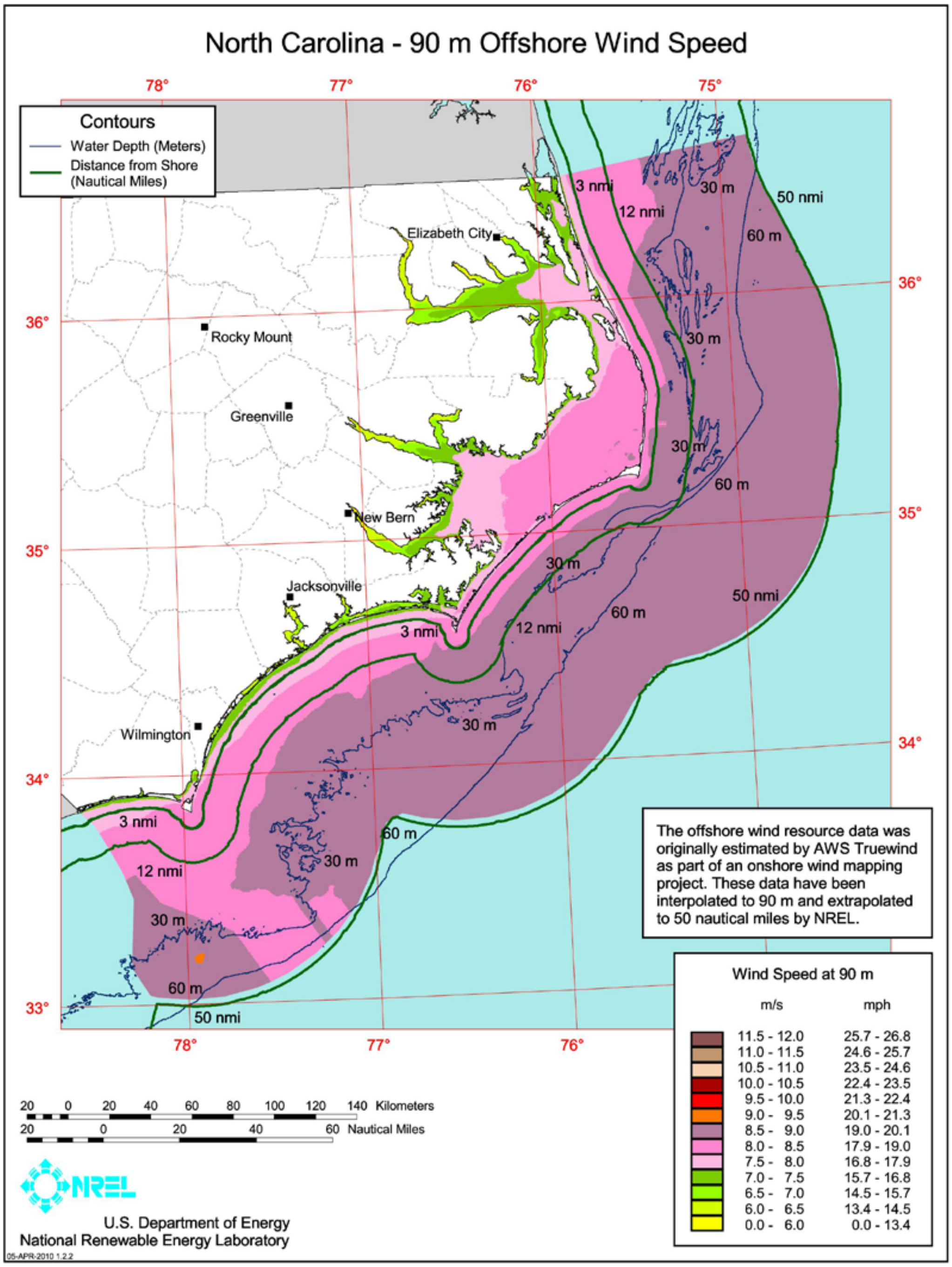

Figure 35. Off-shore wind power resource in North Carolina

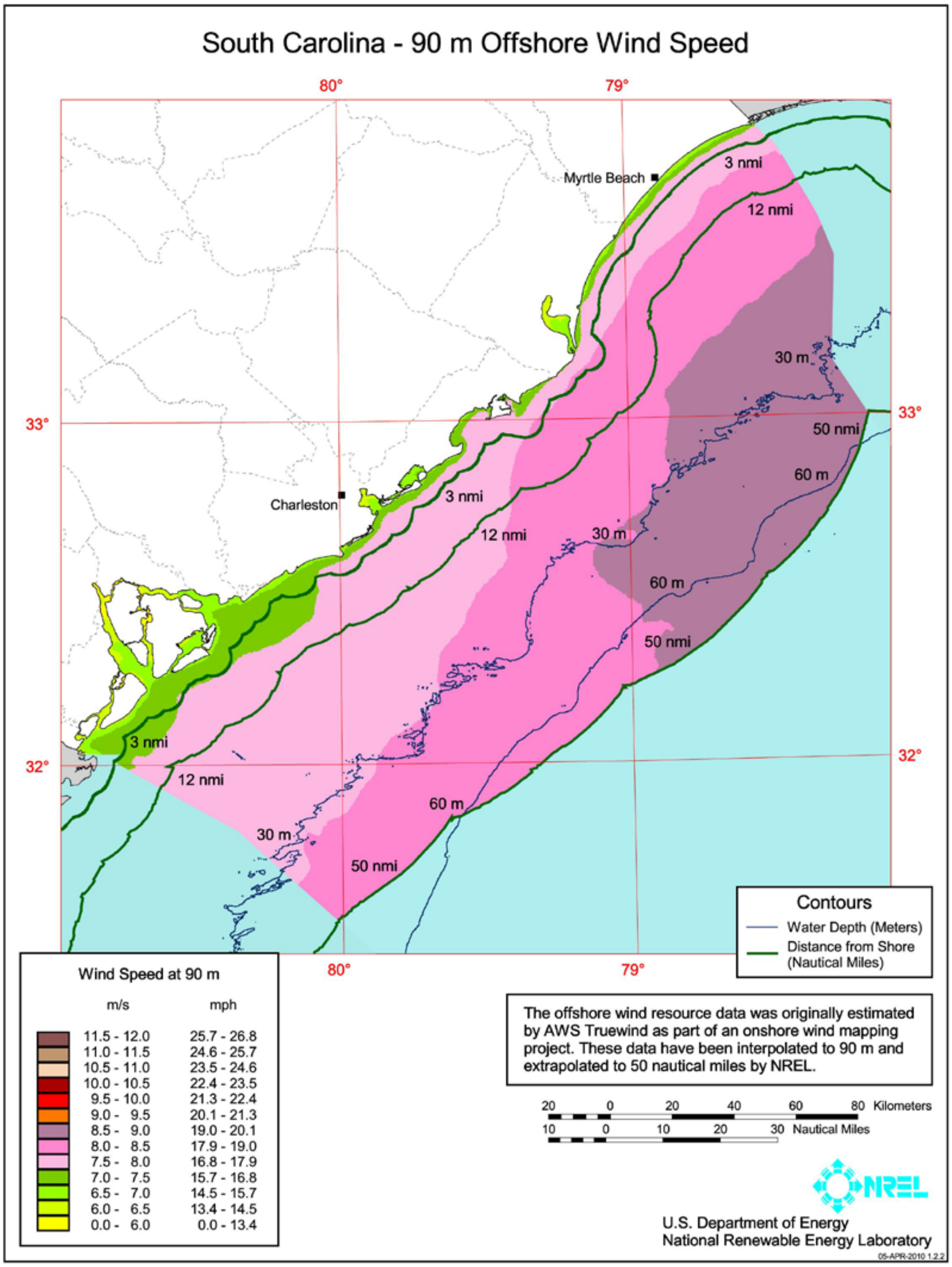

Figure 36. Off-shore wind power resource in South Carolina

5 The Benefits of Clean Energy to the Southeast

Developing the clean energy potential described in Chapter 4 will require state commitment through policy development, dedicated involvement of the commercial and industrial sector, and public support.

The southeastern states face rising electricity demand, driven by rapid population growth and increasing energy use per capita. Utilizing the clean energy resources highlighted in the section above could help address this increasing energy demand as well economic development and energy security needs. Specific drivers for the development of clean energy technologies in the Southeast include:

Upcoming power plant retirements.

As discussed in Chapter 2, many of the coal-fired plants in the Southeast were built in the 1950s and 1960s. Many of them will reach the end of their useful life over the next 10–20 years (Hart 2010). Financing for new coal-fired power plants is becoming increasingly difficult under a variety of regulatory policy uncertainties (Ball 2010; Brown 2010; Clayton 2010).

Job creation/local economic development.

Investments in clean energy create jobs, develop markets, and can increase the competitive advantage of the Southeast. Given favorable conditions, the Southeast could become a major supplier of equipment for the solar and wind industries. There is also significant potential for job creation and economic growth from investments in the biomass market, which would likely spur growth in other related sectors as well (Creech et al. 2009).

A recent study at the University of California, Berkeley, synthesized 15 studies on the job creation prospects of renewable energy and developed a model to project job creation over time, accounting for job losses due to reduced fossil fuel use. The study concluded that all renewable energy and other low carbon electricity sources create more jobs than fossil fuel plants per unit of energy delivered (Wei et al. 2010). The jobs created are for a wide range of skilled laborers, including those in science, construction, engineering, manufacturing, and planning, as well as site managers.

Energy efficiency, which is almost always the least-cost investment, can also yield significant job creation benefits, estimated at over 4 million job-years through 2030 (Wei et al. 2010). Brown et al. (2010) find that the construction and manufacturing industries that support energy efficiency improvements generate over 16 jobs per $1 million spent. This is more than the region's electric utility industry, which employs 5.6 jobs per $1 million spent, and the remaining sectors, which provide an average of 13.9 jobs per $1 million spent (Brown et al. 2010).

The North Carolina Sustainable Energy Association conducts an annual statewide survey of renewable energy and energy efficiency businesses. The 2010 census indicates that the clean energy industry currently provides 12,500 full-time equivalent jobs in North Carolina, with 32% of these within manufacturing firms. Furthermore, the businesses surveyed projected an additional 20% increase in employment over the next 12 months. By conservative estimates, the sector generated more than $3.5 billion in annual revenue for the state this year (Quinlan and Crowley 2010).

Increased security of supply and energy independence.

Despite the perception that the Southeast has abundant fossil resources, the region spends billions of dollars every year to import fuels for electricity generation. As shown in Table 1, southeastern states spent in excess of $100 billion on imported coal in 2008. Utilizing local resources can reduce the need for imports and increase the energy independence and security of the Southeast. Some foreign supply can be replaced by utilizing the renewable resources in the Southeast. Even renewable energy that is imported from outside of the region provides benefits over fossil fuels because it can provide insurance against price fluctuations, as discussed below.

Insurance against price increases and fluctuations in fossil fuels (and accompanying benefits).

Coal prices have been steadily increasing from 1949, when prices were $5.24 per short ton, to 2009, when the cost was $32.92 per short ton (nominal 2005 dollars) (EIA 2010a). But perhaps more risky is the price volatility of natural gas, which fuels an increasingly greater proportion of the electricity supply. Natural gas prices in the electric power sector fluctuated over the last decade between $2.62 and $9.26 per thousand cubic feet (nominal 2005 dollars). Annual changes of $2.00 or more were not unusual (EIA 2010a). The interest in shale gas as an alternative to coal is growing and is not immune to these wide price fluctuations. This volatility, and the risk that is inherent in it, highlights the value of a diversified fuel supply. Implementing efficiency measures and using renewable resources that offer zero fuel costs, such as the wind and sun, protect consumers against the sometimes sudden and profound fluctuations that can occur with fossil fuels. Protection against price fluctuations could provide increased economic stability and risk reduction that would support industry and small business development in the region. Energy efficiency could even reduce electricity rates up to 17% for residential customers by 2030 (Brown et al. 2010).

Increased land values on contaminated and marginal lands.

Renewable energy projects can often be built on previously contaminated (brownfield) or underutilized lands, increasing the value of marginal or unusable land. Growing biomass can serve to preserve habitat for some species (Howell et al. 2010).

Environmental benefits.

Increased use of clean energy technologies significantly reduces harmful emissions such as sulfur dioxide, nitrogen oxide, particulates, and GHG emissions, including carbon dioxide. These emissions are a leading cause of pollution-related illnesses and global climate change. According to a recent study by the United State Global Change Research Program, average temperatures in the Southeast are expected to rise by 4.5°F by the 2080s under lower emission scenarios, while a higher emission scenario could cause a 9–10° increase and higher heat indexes across the region (U.S. Global Change Research Program 2009). Increased illnesses and deaths due to heat stress would likely occur, as well as decreased production of livestock on rangelands, reduction in agricultural production and forest growth, and loss of aquatic species diversity.

The Water–Energy Connection

The connection between water and energy production and use is multi-faceted. As demand for energy increases and competition for freshwater heightens, the need to address the energy-water connection becomes more urgent.

- Almost two-thirds of all freshwater extracted in the Southeast are sent to power plants for cooling needs. For every kilowatt-hour of electricity produced, a gallon of water is used. Most of the water is lost into the atmosphere through evaporation. Regional droughts in 2008 nearly caused the closure of several large power plants (Chandler et al. 2009).
- An average home spends $250/year on energy to heat water.
- Treating freshwater and wastewater accounts for 30% of municipal energy costs (Chandler et al. 2009).

6 Overcoming Barriers: Opportunities for Clean Energy in the Southeast

6.1 Barriers to Clean Energy in the Southeast

The Southeast has faced several significant barriers to the development of clean energy. One of the most significant factors has been the low cost of electricity in the region, which limits the amount of incentive for customers to reduce energy use and demand clean energy products and production (Bumgarner and Garret 2010).

Other challenges result from the regulatory structure of the electricity industry. Regulatory pricing has inhibited the development of renewable energy technologies because third parties have been required to supply electricity at prices at or below utility fuel costs, which is often below retail rates (Creech et al. 2009).

While moves toward decoupling utility profits from sales have been made in some states, the lack of thorough decoupling policies for regulated utilities has also created a barrier to effective implementation of renewable energy and efficiency programs. The inability to recover the additional costs of renewable energy creates a disincentive for many utilities to explore these options and makes it difficult for third parties to obtain suitable power purchase agreements. Aligning the interests of utilities with broader goals of clean energy development through the use of clean energy requirements (e.g., RPS policies) and incentives for effective efficiency programs could help overcome these barriers. Better alignment of the interests of builders and building users and those of manufacturers and customers would also result in greater building and appliance efficiency.

The lack of strong interconnection standards and net-metering policies is also limiting clean energy development in the region. Limiting the size of distribution generation systems that may connect to the grid limits CHP and commercial-scale clean energy project development (Shipley et al. 2008). Similar system capacity limits for net metering also limit commercial-scale development. And total program participation for both interconnection and net metering restrict the amount of in-state clean energy development that can occur (Varnado and Sheehan 2009).

Challenges in the development of a biomass market include the reluctance of farmers to switch to biomass crops if they are unsure if there will be a demand for the crops and the reluctance of potential investors to make large investments in biomass energy without long-term commitments from growers (Howell et al. 2010; Porter et al. 2009).

The initial costs of investment in new clean energy technologies, the lack of a supporting infrastructure, and the difficulty in obtaining financing also continue to pose challenges for all clean energy technologies the Southeast, as is the case in many regions across the country. Other factors include the social resistance to and lack of public awareness of the benefits and opportunities that clean energy development might provide the region (Bumgarner and Garret 2010), as well as the traditional paradigm that favors centralized electricity generation over distributed systems.

6.2 Opportunities for Clean Energy in the Southeast

Fortunately, there are concrete and viable ways to overcome the barriers to clean energy described above. The potential for clean energy in the Southeast is huge. Opportunities for taking advantage of this potential include the following:

Focus on encouraging the growth of dedicated energy crops through policies that support these crops specifically.

The biomass potential in the Southeast is significant. The establishment of the biomass economy can be encouraged by distribution of information on the optimal biomass production areas, zoning to encourage biomass production in optimal areas, providing tax incentives to biomass growers, increasing farmer education regarding opportunities, and connecting farmers with investors/power producers to encourage a sustainable supply-demand chain.

Provide outreach to farmers about the opportunity to grow long-rotation biomass crops on land that is under contract with the Conservation Reserve Program (CRP).

The CRP is a government program through which farmers rent out their land to the government and grow permanent vegetation, under contract, for 10–15 year periods. Farmers participating in this program have already chosen to grow permanent vegetation rather than traditional crops; thus, growing biomass for energy on these lands does not result in increased competition with traditional crops (Howell et al. 2010).

The longer rotation crops can be grown on the CRP lands may also have an economic advantage in the biomass market. Studies indicate that farmers who grow biomass crops enjoy the same profits as those who choose traditional crops; however, corn, canola, and soybeans may only provide modest profits and may require subsidies in order to be profitable (Howell et al. 2010; Robinson et al. 2003).

Overall, the low initial investment needed to transition to biomass production makes it a good opportunity for revitalization in many rural communities in the Southeast (Howell et al. 2010).

Research indicates that growing longer-rotation, woody biomass crops may provide farmers in the Southeast with advantages over short-rotation crops:

- **less competition with exiting agricultural products,**
- **potentially higher profitability than shorter rotation biomass crops, and**
- **ability to take advantage of the federal CRP.**

Expand the use of co-firing coal and biomass in power plants.

More than half of the Southeast's electricity was derived from coal in 2009 (EIA 2010a). Although the percentage is likely to decline as the coal plants age and the cleaner energy technologies replace them, the transition away from coal will take many years. Co-firing coal and biomass (typically 2%–20% biomass) in existing coal-fired plants is a low-cost, near-term opportunity to reduce carbon dioxide, sulfur, and nitrous oxide emissions and assist the development of a biomass market. Research indicates excellent success in co-firing both coal and biomass in power plants in the Southeast (Ringe et al. 1998; Robinson et al. 2003).

Co-firing biomass provides an opportunity to move toward a clean energy economy without the same economic, political, and social risks associated with some other energy technologies. Power plants may return to using coal only if sufficient biomass fuel is not available at any time. This flexibility provides the necessary security for both power producers and the electricity system during the initial development of the bio-economy. As the biomass supply becomes stronger, the percentage of biomass in the co-firing mix can increase. Eventually, full-biomass fueled plants can be supported with the growing supply.

Co-firing biomass and coal in existing coal-fired power plants provides many benefits:

- **Increases job potential by providing an immediate market to biomass producers**
- **Retains flexibility in fuel sources during the initial stages of establishing a bio-economy**
- **Provides low cost carbon dioxide reductions for existing coal-fired plants**
- **Can be implemented in a short (2–3 years or less) time horizon**
- **Increases the diversity of the energy supply with minimal disruption to the current energy economy.**

According to calculations by a research group at Carnegie Mellon University, a carbon tax of approximately $50 per ton of carbon could lead to a 10% reduction in carbon dioxide emissions from coal-fired power plants through co-firing (Robinson et al. 2003). Increasing the use of co-firing is a less expensive, near-term option to the immediate replacement of these coal plants and establishment of carbon taxes and tradable permits for carbon dioxide, similar to those that have been implemented for sulfur dioxide and nitrous oxide. The expanded availability of tax credits that apply to co-firing biomass would also encourage the implementation of this opportunity. Many state-level policies currently exclude biomass for co-firing in an attempt to encourage replacement technologies such as solar and wind (Robinson et al. 2003). Putting policies in place that do not create competition between the "replacement technologies" and biomass for co-firing would further assist the transition to a clean energy economy as well as the development of a biomass market. In states with RPSs, co-firing is a low-cost alternative for utilities to meet renewable energy requirements. Limiting the amount of co-firing that is eligible for the RPS in later years will encourage diversification of the renewable portfolio.

Government leadership by implementing EERE technologies on public sites.

State and local governments can make significant contributions to the development of EERE technologies, the distribution of information about technologies and opportunities, and the expansion of EERE markets simply by leading by example. Some states already require government facilities to purchase energy efficient products and appliances and undertake retrofits during remodeling. Other opportunities for governments to lead by example include implementing water recycling for public facilities, such as rainwater harvesting, grey-water use for landscaping, and above-ground drainage systems for landscaping.

Best practices for government leadership in EERE and model legislation designed to facilitate the implementation of EERE in public buildings is available from the Energy Services Coalition (http://www.energyservicescoalition.org/).

Energy efficiency through decoupling, integrated resource planning, and rewards for effective efficiency programs.

Many states are already encouraging utility contribution to energy efficiency through the separation of utility profits from sales and rewards for effective efficiency programs. However, there are few states in the region that have implemented a true decoupling policy, and there is also room for improvement in the integrated resource planning process. State governments can play an important role through requiring PUCs to strengthen decoupling and integrated resource planning processes. Creating more standardized practices for rewarding utilities for efficiency and allowing cost-recovery, rather than reviewing on a case-by-case basis, could reduce uncertainty and provide further incentive for utility involvement in efficiency.

Upgrade interconnection standards and net-metering policies.

Interconnection standards encourage renewable energy development by lowering risk and uncertainty for all parties involved and reduce total project costs to distributed generators. In states that have RPSs, strong interconnection standards reduce overall project costs, which ultimately result in savings to ratepayers. Clear interconnection standards that are uniform across utilities reduce confusion to third-party producers. Larger systems (e.g., up to 20 MW in size) allow for the development of CHP systems, which may have capacities over the lower limits (Shipley et al. 2008). A tiered process that expedites and simplifies the application process for smaller systems will also encourage more development. Raising restrictions on the total amount of distributed generation that can connect to the grid will allow greater development of in-state resources.

Net-metering policies ensure that distributed generators receive reasonable compensation for power returned to the grid. In regulated environments, utilities may be resistant to net-metering policies unless they are able to fully recover their costs. Decoupling policies and other mechanisms to ensure that utilities may recover fixed costs may reduce utility resistance to net metering. Allowing larger system sizes (e.g., 2 MW) to be eligible and providing for higher program capacity totals encourages more development and allows greater flexibility to project developers (Varnado and Sheehan 2009).

Upgrade efficiency standards and building codes.

While decoupling policy encourages efficiency from the utility end, efficiency standards for appliances and up-to-date building codes result in increased efficiency from the consumer end. Although some federal appliance efficiency standards exist, these are limited, and efficiency can be greatly increased through state-level standards.

The Appliance Standards Awareness Project publishes model legislation for state-level legislation to set appliance standards.[17] The most recent version includes standards for six products, none of which are covered under federal standards and all of which can be met with current technologies. The potential for energy, emission, and cost savings of implementing this model legislation in the southeastern states are estimated to be substantial. Updating building codes to meet the international and national standards will also lead to significant improvements in efficiency of new and remodeled buildings.

Small hydroelectric development and retrofitting of non-power producing dams.

The recent market for new hydroelectricity facilities has been extremely limited because of its high price compared to electricity from natural gas and coal-fired generators. However, there are opportunities to take advantage of the southeastern historical experience with hydroelectric power and the untapped hydro resources in the region. A state-mandated RPS, for example, could allow for and facilitate the construction of new smaller-scale hydropower projects and retrofits to existing, non-power dams (Konigsberg 2009). Utilities may regard such facilities as an attractive resource since these options are based on familiar technology, have no additional environmental effects (and thus should have few permitting hurdles), provide no-carbon electricity supply, and are less intermittent than solar and wind technologies. Although larger hydroelectric projects would still be subject to permitting review by FERC, they have recently focused on easing the permitting process for small hydroelectric facilities and have a new resource on its Web site (www.ferc.gov/) to provide outreach and assistance to potential developers of small hydro projects (FERC 2010b). A handful of retrofit and small hydro projects across the Southeast are already being proposed. Arkansas Electric Cooperative Corporation, for example, is moving forward with retrofits after determining it to be a low-cost option to reduce carbon emissions in the service territory. The Arkansas project,

[17] Model legislation can be found at http://www.standardsasap.org.

as well as projects in Tennessee and Kentucky, has been certified as low impact by the Low Impact Hydropower Institute (Low Impact Hydropower Institute 2010).

Encourage expanded use of CHP technologies.

Given the intensity of industrial activity in the Southeast and the relatively high usage of electricity in the industrial sector of this region, the potential for employing CHP technologies is significant. Providing information on the variety of applications of CHP, the technological options, and the benefits of CHP to potential producers as well as financiers could assist in deployment. Ensuring that net-metering policies are applicable to CHP systems and providing support to businesses that supply and maintain equipment will also encourage development.

Table 13. Clean Energy Development Opportunities in the Southeast

Barrier	Opportunity	Policy Support
Some biomass crops compete with traditional crops, driving up prices for staples such as corn and the derivative products (e.g. pork, poultry). Land values also prohibit the growth of biomass for energy production.	Grow dedicated biomass crops such as switchgrass and short-rotation woody crops. These crops can be grown on land under contract with the Conservation Reserve Program, which are already under contract to grow permanent vegetation, or on marginal lands.	• Encourage the use of the optimal biomass production zones by biomass growers by providing biomass tax incentives, zoning for biomass, increasing farmer education regarding opportunities, and connecting farmers with investors/power producers.
Biomass supply and demand market is immature. High risk for both biomass suppliers and energy developers.	Reduce investment risk and support the early stages of the biomass market formation by encouraging co-firing biomass in existing coal power plants.	• Include the biomass portion of co-firing in clean energy policies. • Implement policies that encourage near-term carbon dioxide reductions. • Implement carbon taxes or tradable carbon permits. • Provide technical support and education to biomass suppliers and plant operators.
Utilities revenue structures provide little incentive to promote energy efficiency.	Separate utility revenues from sales and place a value on efficiency in the electricity market.	• Strengthen decoupling policy, implement integrated resource planning process that values efficiency as a resource, and establish incentives for effective utility-led efficiency programs.
Local resources are distributed. Distributed generators face barriers to entering market.	Encourage the use of local energy resources by providing a favorable market for third-party power producers.	• Implement or strengthen interconnection standards and net metering policies. • Allow net metering for system sizes of 2MW and increase total program size limits. • Standardize interconnection standards for all utilities. • Refer to the Interstate Renewable Energy Council for model rules and standards.
Lack of public knowledge and experience with efficiency and renewable energy technologies.	Strengthen government clean energy leadership through increased demonstration of efficiency and renewable energy technologies on and in public buildings.	• Set EERE requirements for state facilities. • Model legislation and best practices designed to facilitate the implementation of EERE in public buildings is available from the Energy Services Coalition [http://www.energyservicescoalition.org/].
Lack of incentive for manufacturers to reduce energy usage of appliances. Lack of incentive for builders to reduce energy usage of buildings.	Align the interests of manufacturers and builders with those of customers through policy updates.	• Implement energy efficiency standards on appliances and update building efficiency codes. • Model state-level legislation for setting appliance efficiency standards is available from a variety of sources, including the Energy Services Coalition and the Appliance Standards Awareness Project.
The largest hydroelectric resources that are easily permitted have already been developed.	Develop incremental hydro resources and small hydroelectric facilities.	• Incentivize utilities to increase efficiency at existing dams through retrofits. • Make tax credits and financing available for small hydroelectric facilities.
High energy intensity of water heating.	Reduce energy needs through increased efficiency in water use and water heating.	• Financial incentives (tax credits/rebates) for solar water heaters and WaterSense and EnergyStar labeled appliances.

7 Conclusion

With concerted action, such as a focus on the opportunities highlighted in this report, the Southeast can strengthen its economy, increase job growth, develop its natural resources, and ensure a secure supply of electricity through the development of clean energy technologies and markets. The region has both the drivers to encourage this transition and the resources to succeed.

7.1 Key Findings

- Coal fuels 51% of the region's electricity production. The southeastern states depend heavily on coal imports. Every state in the region, with the exception of Kentucky, is a net importer of coal. The majority of the coal is brought from outside the region, from as far away as Wyoming and South America, at a cost of billions of dollars per year for each state (Deyette and Freese 2010).
- The region produced only 1.8% of the electricity from renewable resources other than conventional hydroelectricity in 2009, half of the national average (EIA 2010a). Biomass currently provides the majority of the region's non-hydroelectric renewable electricity (EIA 2010b).
- The region is rich in untapped biomass resources including residue resources (e.g., from forests, agriculture, mills, and urban waste) (NREL 2010b). There is also the opportunity to develop a dedicated energy crop market. Switchgrass and short-rotation woody crops can be grown on CRP lands that have already been set aside for the growth of permanent vegetation rather than traditional crops. These crops can be grown on marginal lands, do not compete with traditional crops, and have fewer price spikes (Howell et al. 2010).
- Encouraging biomass co-firing in existing coal facilities would provide an immediate demand for biomass resources, support the early stages of a biomass supply market, and immediately reduce emissions from coal-fired facilities (Robinson et al. 2003).
- Although the commercial sector used slightly less electricity per capita than the national average, the residential sector in the Southeast used nearly 30% more electricity than the national average in 2008. High residential usage may result from the region's historically low electricity rates, wide annual temperature variations, and relatively low levels of public expenditure on efficiency programs and limited use of energy conservation methods (Brown et al. 2010).
- The industrial sector used over 230% more electricity than the national average. The potential for employing CHP technologies in the Southeast is significant. The main industries in the Southeast include iron, steel, and other metal production; chemical production; food and beverage processing; oil and coal product refining; pulp and paper manufacturing; and vehicle and machinery production (U.S. Census Bureau 2010). The high and continuous

demand for both electrical and thermal energy of these processes is particularly well suited to the application of CHP technology (U.S. DOE 2010).

- The most common state-level policies to support efficiency improvements in the Southeast are rebates and loans. Most of the states in the region also have efficiency standards for public buildings or government purchases.
- Residential and commercial building codes meet current international standards in Georgia, Kentucky, Louisiana, North Carolina, and South Carolina; however, there is significant room for improvement in building codes in the other states (BACP 2010).
- Six of the ten southeastern states have some form of decoupling and integrated resource planning; however, several clarifications and adjustments could strengthen the policies. Four of the southeastern states have no such policies. Cost recovery processes in the region could also be clarified and standardized to reduce uncertainties and encourage utility participation.
- The most common state-level policies to support renewable energy development are personal and corporate tax incentives and loans. While many of the states in the region have net-metering and interconnection policies, limitations reduce their effectiveness in stimulating development. In particular, increasing facility size limits and participation caps would encourage further deployment.
- Missouri has excellent on-shore wind potential. Louisiana has some of the best off-shore wind resources in the country. North Carolina and South Carolina also have excellent off-shore wind potential. All of the states in the region have sufficient solar resources to produce distributed power from photovoltaic technology. The region has a high density of energy-intensive commercial and industrial facilities that are suitable for CHP technologies. There are opportunities for methane-to-energy and small hydroelectric development in every state in the region.
- Development of the region's unique biomass resources could be supported through policies that strengthen the supply-demand chain (such as favorable zoning and land use designations), information provision (to farmers and university extensions), incentives to retain biomass fuel in the region rather than exporting it, and providing loans and incentives for equipment manufacturers and biomass energy facilities.

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Appendix: Definitions of State Policies and Incentives for Renewable Electricity Generation

Sources: DSIRE 2010; REEEP 2010

Access Laws

Access laws establish a homeowner's or facility owner's right to install and operate a solar or wind energy system. Some solar access laws also secure a system owner's access to sunlight. These laws may be implemented at both the state and local levels. In some states, access laws prohibit homeowners associations, neighborhood covenants, and local ordinances from restricting a homeowner's right to use solar energy. Easements, the most common form of solar access law, establish an owner's rights to access to a renewable resource, such that nearby property cannot be developed in a way that restricts pre-existing access to a renewable resource. An easement is usually transferred with the property title. At the local level, communities use several policies to protect solar access, including solar access ordinances, development guidelines requiring proper street orientation, zoning ordinances that contain building height restrictions, and solar permits.

Bonds

Bonds allow governments (and corporations) to raise money by borrowing. Investors purchase the bonds and, in turn, receive interest payments over a predetermined period of time. The interest paid on the bond is often tax exempt. At the end of the bond's term, the principal value of the bond is repaid to the investor by the issuing entity. A few states and local governments have established bond programs to support renewable energy and energy efficiency for government-owned facilities. The energy savings resulting from the projects can be used to repay the investors. A tax credit bond is a particular type of bond in which a government pays an investor in the form of tax credits, rather than tax-exempt interest payments. This provides funding for government initiatives at a very low interest rate.

Permitting Standards (Construction and Design)

Permitting standards can facilitate the installation of wind and solar energy systems by specifying the conditions and fees involved in project development. Some local governments have adopted simplified or expedited permitting standards for wind and solar. Fast-track permitting saves system owners and project developers time and money. Some states have capped fees that local governments may charge for a permit for a solar or wind energy system. In addition, some states have developed (or have supported the development of) model wind ordinances for use by local governments.

Energy Standards for Public Buildings

Governments at various levels have chosen to lead by example by requiring new government buildings to meet strict energy standards. These policies establish green building standards, energy-reduction goals, equipment-procurement requirements, and the use of on-site renewable energy. Many of these policies require that new government buildings (and renovated buildings, in some cases) attain a certain level of certification under the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program. Equipment-procurement policies often mandate the use of the most efficient equipment, such as equipment that meets the federal Energy Star standard. Policies designed to encourage the use of on-site renewables generally establish conditional requirements tied to life-cycle cost analysis.

Contractor Licensing

Some states have adopted a licensing process for renewable energy contractors. Several states have adopted contractor licensing requirements for solar water heating, active and passive solar space heating, solar industrial process heat, solar-thermal electricity, and photovoltaics. These requirements are designed to ensure that contractors have the necessary knowledge and experience to install systems properly. Solar licenses typically take the form of either a separate, specialized solar contractor's license or of a specialty classification under a general electrical or plumbing license.

Corporate Tax Incentives

Corporate tax incentives include tax credits, deductions, and exemptions. These incentives are available in some states to corporations that purchase and install eligible renewable energy or energy efficiency equipment or construct green buildings. In a few cases, the incentive is based on the amount of energy produced by an eligible facility. Some states allow the tax credit only if a corporation has invested a minimum amount in an eligible project. Typically, there is a maximum limit on the dollar amount of the credit or deduction. In recent years, the federal government has offered corporate tax incentives for renewable energy and energy efficiency.

Equipment Certification

Equipment certification policies, which require renewable energy equipment to meet certain standards, serve to protect consumers from buying inferior equipment. These requirements not only benefit consumers, they also protect the renewable energy industry by making it more difficult for substandard systems to reach the market.

Generation Disclosure

Disclosure policies require utilities to provide customers with information about the electricity they supply. This information, which is often included on the monthly bill, can include an explanation of fuel mix percentages and information on the related emissions. In states where the electricity market has been restructured, generation disclosure provides customers with valuable information that allows them to make informed choices on the electricity and provider they choose. Additionally, there may be a requirement that the utility provide certification that any renewable energy sources that they use are certified as renewable. The Green-e certification, offered by the Center for Resource Solutions, is one example of a verifiable certification that can be used by utility companies.

Grants

States offer a variety of grant programs to encourage the use and development of renewable energy and energy efficiency. Most programs offer support for a broad range of technologies, while a few programs focus on promoting a single technology, such as photovoltaic systems. Grants are available primarily to the commercial, industrial, utility, education, and government sectors. Most grant programs are designed to pay down the cost of eligible systems or equipment. Others focus on research and development or support project commercialization. In recent years, the federal government has offered grants for renewable energy and energy efficiency projects for end users. Grants are typically competitive.

Industry Recruitment and Support

To promote economic development and the creation of jobs, some states offer financial incentives to recruit or cultivate the manufacturing and development of renewable energy systems and equipment. These incentives commonly take the form of tax credits, tax exemptions, and grants. In some cases, the amount of the incentive depends on the quantity of eligible equipment that a company manufactures. Most of these incentives apply to several renewable energy technologies, but a few states target specific technologies, such as wind or solar. These incentives are usually designed as temporary measures to support industries in their early years, and they commonly include a sunset provision to encourage the industries to become self-sufficient.

Interconnection Standards

Interconnection standards specify the technical and procedural process by which an electric customer connects an electricity-generating system to the grid, facilitating the development of small-scale renewable energy systems by removing certain obstacles. Interconnection standards include the technical, contractual, metering, and rate arrangements that system owners and utilities must abide by. Standards for systems interconnected at the distribution level are typically adopted by state PUCs, while FERC has adopted standards for systems interconnected at the transmission level. Not all states have adopted interconnection standards, and some states' standards apply only to IOUs—not to municipal utilities or electric cooperatives.

Line Extension Analysis

When a prospective customer requests electric service for a home or facility that is not currently served by the electric grid, the customer usually must pay a distance-based fee for the cost of extending power lines to the home or facility. In some cases, it is cheaper to use an on-site renewable energy system to meet a prospective customer's electricity needs. A few states require utilities to provide information regarding renewable energy options when a line extension is requested.

Loans

Government loan programs help customers overcome the financial barriers associated with renewable energy installations and energy efficiency improvements by providing low-cost financing, thus spreading capital costs over a longer period of time. State government loans are available to the residential, commercial, industrial, transportation, public, and non-profit sectors. Loan rates and terms vary by program; in some cases, they are determined on an individual project basis. Loan terms are generally 10 years or less. In recent years, the federal government has also offered loans for renewable energy and energy efficiency projects.

Net Metering

For electric customers who generate their own electricity with small-scale renewable energy systems, net metering allows for the flow of electricity both to and from the customer—typically through a single, bi-directional meter. With net metering, during times when a customer's generation exceeds the customer's use, electricity from the customer flows back to the grid, offsetting electricity consumed by the customer at a different time. In effect, the customer uses excess generation to offset electricity that the customer otherwise would have to purchase at the utility's full retail rate. The law in most U.S. states requires net metering, but these policies vary drastically.

Personal Tax Incentives

Personal tax incentives include income tax credits and deductions. Many states offer these incentives to reduce the expense of purchasing and installing renewable energy or energy efficiency systems and equipment. The percentage of the credit or deduction varies by state, and in most cases, there is a maximum limit on the dollar amount of the credit or deduction. An allowable credit may include carryover provisions, or it may be structured so that the credit is spread out over a certain number of years. Eligible technologies vary widely by state. In recent years, the federal government has offered personal tax credits for renewable energy and energy efficiency.

Production Incentives/Performance-based Incentives/Feed-in Tariffs

Production incentives (also called performance-based incentives or feed-in tariffs) require utilities to pay renewable energy power producers a fixed, premium rate for renewable energy generation based on the number of kilowatt-hours fed into the grid. Requiring that these payments are based on a system's actual performance, rather than the system's rated capacity, encourages system performance. Note that this policy differs from tax incentives that are based on renewable energy production in that the premium payments are made at the time of purchase of the renewable energy.

Property Tax Incentives

Property tax incentives include exemptions, exclusions, abatements, and credits. Most property tax incentives provide that the added value of a renewable energy system is excluded from the valuation of the property for taxation purposes. For example, if a new heating system that uses renewable energy costs more than a conventional heating system, the additional cost of the renewable energy system is not included in the property assessment. In a few cases, property tax incentives apply to the additional cost of a green building. Because property taxes are collected locally, some states have granted local taxing authorities the option of allowing a property tax incentive for renewable energy systems.

Public Benefit Funds (PBF)

Public benefit funds are a policy tool used to secure stable, long-term funding for state energy programs and initiatives. The funds are commonly supported by a small, fixed fee added to the customer's electricity bill each month (e.g., $0.002/kWh). This charge is sometimes referred to as a "system benefits charge." Public benefit funds often support rebate or loan programs, research and development initiatives, and energy education programs.

Rebates

Rebates are direct cash subsidies, typically paid after installation is complete, that promote the installation of renewable energy systems by reducing the initial capital cost of the project. The majority of rebate programs that support renewables are administered by states, municipal utilities, and electric cooperatives; these programs commonly provide funding for solar water heating or photovoltaic systems. Most rebate programs that support energy efficiency are administered by utilities.

Required Green Power Option

Several states require that electric utilities offer customers the option to buy electricity generated from renewable resources. The utility programs offering such options are commonly known as "green power programs."

Renewable Portfolio Standard/Renewable Energy Standard

An RPS (sometimes called a renewable energy standard–or RES) is a regulatory mechanism that requires retail electricity suppliers to procure a minimum quantity of eligible renewable energy by a specific date or according to a schedule. The required amount of renewable energy is expressed in either a percentage of the total electricity or a flat megawatt-hour term. Utilities may either generate the renewable energy or purchase the electricity from other generators. Accounting may be accomplished through RECs, which are assigned to each unit of renewable energy generated and then bought and sold through a market system. The term "set-aside" or "carve-out" refers to a provision within an RPS that requires utilities to use a specific renewable resource (usually solar energy) to account for a certain percentage of their retail electricity sales (or a certain amount of generating capacity) within a specified time frame. A few states have renewable portfolio goals, which are similar to RPS policies but are not legally binding.

Sales Tax Incentives

Sales tax incentives typically provide an exemption from, or refund of, the state sales tax (or sales and use tax) for the purchase of a renewable energy system, an energy-efficient appliance, or other energy efficiency measures. Some types of equipment purchases may be eligible for only a partial abatement of the sales tax. Several states have established an annual "sales tax holiday" for energy efficiency measures by annually allowing a temporary exemption—usually for one or two days—from the state sales tax.

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More than half of the electricity produced in the southeastern states is fuelled by coal. Although the region produces some coal, most of the states depend heavily on coal imports. Many of the region's aging coal power facilities are planned for retirement within the next 20 years. However, estimates indicate that a 20% increase in capacity is needed over that time to meet the rapidly growing demand. The most common incentives for energy efficiency in the Southeast are loans and rebates; however, total public spending on energy efficiency is limited. The most common state-level policies to support renewable energy development are personal and corporate tax incentives and loans. The region produced 1.8% of the electricity from renewable resources other than conventional hydroelectricity in 2009, half of the national average. There is significant potential for development of a biomass market in the region, as well as use of local wind, solar, methane-to-energy, small hydro, and combined heat and power resources. Options are offered for expanding and strengthening state-level policies such as decoupling, integrated resource planning, building codes, net metering, and interconnection standards to support further clean energy development. Benefits would include energy security, job creation, insurance against price fluctuations, increased value of marginal lands, and local and global environmental paybacks.

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