Southern Bioenergy Roadmap

SAFER
SOUTHEAST AGRICULTURE & FORESTRY ENERGY RESOURCES ALLIANCE

UF UNIVERSITY of FLORIDA
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A project of the Southeast Agriculture & Forestry Energy Resources Alliance (SAFER) and the University of Florida

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SAFER Underwriting Member: *Southern Association of Agriculture Experiment Station Directors*

Special thanks to: *Memphis Bioworks Foundation, Biomass South 2008*

Funded in part by: *The Energy Foundation*

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The Southern Bioenergy Roadmap can be downloaded in full at
http://www.saferalliance.net/projects/bioenergy_roadmap.pdf

Executive Summary

In June 2008, U.S. gasoline prices soared to over $4 a gallon, bringing into question the country's dependence on oil. In November 2008, the International Energy Agency reported that by 2030 the demand for energy would grow by 45 percent. In January 2009, recession and rising unemployment caused local, state, and federal leaders to seek new ways to stimulate the economy, create jobs, and increase tax revenues. Altogether, these events, rather than be cause for fear and anxiety, represent a window of opportunity for which the South[1] is uniquely positioned.

What's the opportunity?

For the South to lead the U.S. in reducing the nation's dependence on imported oil, meeting new energy demand, and creating thousands of jobs for Southerners.

How does the South do it?

By wisely using its resources to become the nation's leader in the research, production, and distribution of bioenergy[2].

What's the economic impact?

Increased jobs and wealth for Southerners, particularly in rural communities. In 2007, the renewable energy sector grossed over $40 billion in revenues and employed over 500,000 workers in the U.S.[3] Two studies provide examples of the potential economic impact:

- A 2007 study by the University of Georgia found that the annual operation of a 49 million gallon cellulosic ethanol[4] plant in Treutlen County, Georgia (population ~7,000) would have a total direct and indirect economic impact to the state of $150 million in annual revenues, $17.5 million in annual labor income, $3 million in annual state and local taxes, and 444 jobs.[5]
- The University of Florida calculated the potential economic impact of the annual operation of a 40 megawatt biomass power plant across a number of different counties in the South. The study found that, on average, a 40 megawatt plant would have a total direct and indirect economic impact of $21.6 million in annual revenues, $13 million in personal and business income, and 370 jobs.[6]

To promote further bioenergy development in the South, the Southeast Agriculture & Forestry Energy Resources Alliance (SAFER) and the University of Florida developed the Southern Bioenergy Roadmap to inform and support each state's energy plan. The Roadmap identifies the South's bioenergy strengths and weaknesses in the areas of industry, policy and research, with the goal of making targeted recommendations for growing the bioenergy industry.

About SAFER:

SAFER

The Southeast Agriculture & Forestry Energy Resources Alliance (SAFER) was formed to provide strategic leadership to the agricultural and forestry sectors in advancing renewable energy initiatives in the Southeast with the purpose of seeing the South become the nation's leader in renewable energy production. SAFER works toward this vision by engaging in strategies for better policy, targeted research, efficient commercialization, and outreach and education. The Alliance was formed in 2006 through an initiative of the Energy Foundation in conjunction with the national 25x'25 committee to bring together representation from across the bioenergy landscape. In early 2007, the Alliance selected Southern Growth Policies Board to be its management and fiscal agent. To become a member and for more information, go to http://www.saferalliance.net.

Southern Growth Policies Board

Southern Growth Policies Board is a non-partisan public policy think tank based in Research Triangle Park, North Carolina. Formed by the region's governors in 1971, Southern Growth develops and advances economic development policies by providing a forum for partnership and dialog among a diverse cross-section of the region's governors, legislators, business and academic leaders and the economic- and community-development sectors. This unique public-private partnership is devoted to strengthening the South's economy and creating the highest possible quality of life. For more information go to http://www.southern.org.

Bioenergy in the South

- In 2007, 46 percent of the nation's electricity fueled by biomass was generated in the South with Alabama, Florida, Georgia, and Louisiana leading the region.
- The economic contributions of biopower production in 2007 included $7.3 billion in company revenues, $4.3 billion in labor income, and over 110,000 jobs for the region. [Table 1]
- In the South, there are 41 biodiesel plants that produce 22 percent of the nation's biodiesel; 12 operating ethanol plants that produce 6.4 percent of the nation's ethanol; and 534 of the nation's biodiesel and E85 fueling stations, or 23 percent. [see Table 2 and Figure 1 on page 3, and Figure 2 on page 4]
- Southern states have developed policy initiatives to encourage the development of the bioenergy industry including consumption standards, tax incentives, subsidies, and loans. [see Table 3 on page 4]

Table 1: Direct and indirect economic contributions of biopower generation by heat and electric plants in the South, 2007

State	Output (Million Dollars)	Labor Income (Million Dollars)	Employment (Jobs)
Alabama	1,125	662	16,407
Arkansas	495	284	7,894
Florida	1,149	687	17,682
Georgia	1,366	819	19,981
Kentucky	112	63	1,841
Louisiana	904	536	13,148
Mississippi	356	205	5,615
North Carolina	362	214	5,559
Oklahoma	133	77	2,308
South Carolina	480	284	7,369
Tennessee	189	111	2,787
Virginia	615	369	9,729
Total	**7,286**	**4,311**	**110,320**

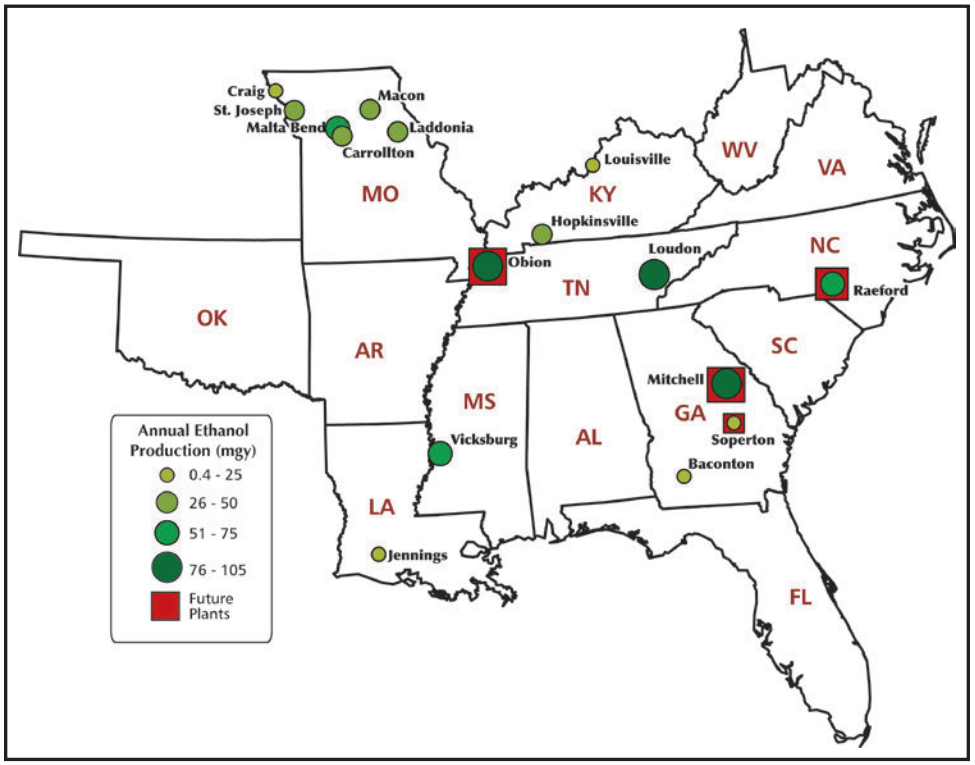
Values stated in 2007 dollars. Employment impacts include full-time, part-time and seasonal jobs. Estimates include secondary (multiplier) effects. Missouri and West Virginia not shown because impacts were negligible.

Table 2: Alternative fueling stations in the South, 2007

State	Biodiesel	Ethanol (E85)	Natural Gas	Electric	Hydrogen	Propane	Total
Alabama	11	6	3	0	0	40	60
Arkansas	2	6	3	0	0	37	48
Florida	12	16	15	3	2	47	95
Georgia	28	28	18	0	0	37	111
Kentucky	1	11	0	0	0	13	25
Louisiana	1	3	5	0	0	9	18
Mississippi	5	2	0	0	0	33	40
Missouri	5	80	6	0	1	65	157
North Carolina	66	14	12	0	0	44	136
Oklahoma	6	6	51	0	0	64	127
South Carolina	73	72	4	0	0	20	169
Tennessee	35	23	3	0	0	42	103
Virginia	12	6	9	1	1	19	48
West Virginia	1	3	2	0	0	7	13
Region Total	**258**	**276**	**131**	**4**	**4**	**477**	**1150**
U.S. Total	**620**	**1701**	**774**	**417**	**51**	**2125**	**5688**

Source: Alternative Fuels Data Center (AFDC). U.S. Department of Energy, Energy Efficiency and Renewable Energy Program, September 2007. Available at http://www.afdc.energy.gov/afdc/.

Figure 1: Locations and capacities in million gallons per year of current and future ethanol plants in the South, 2008

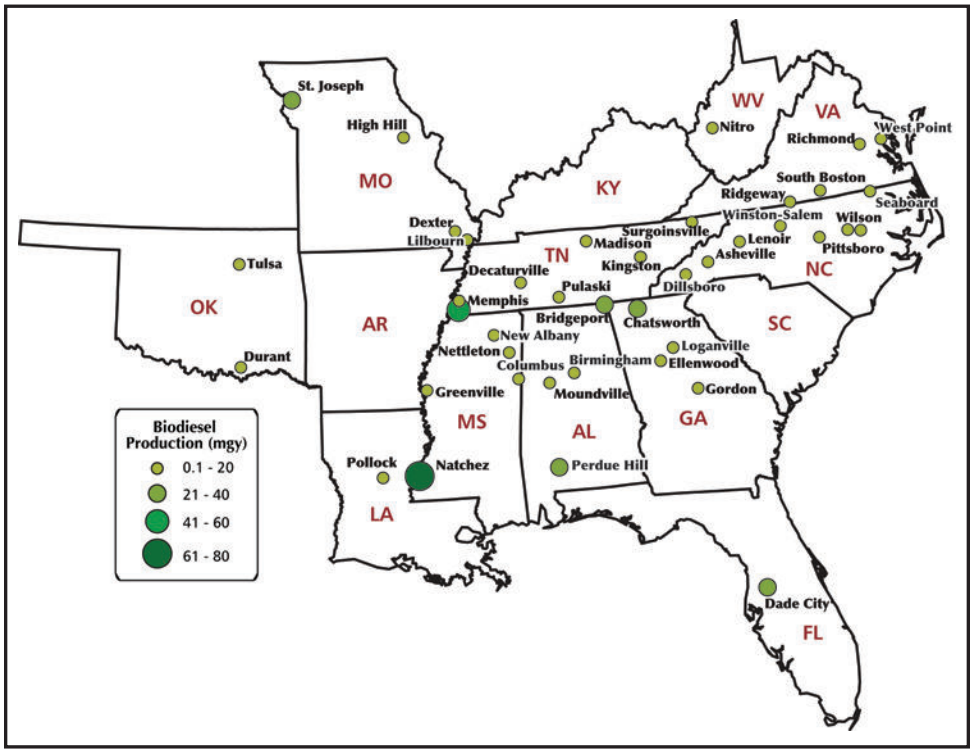


Source: Renewable Fuels Association. List of Fuel Ethanol Producers, Current and Pending, September 2008. Available at http://www.ethanolrfa.org/industry/locations/.

6.4% of the Nation's Ethanol is Produced in the South

22% of the Nation's Biodiesel is Produced in the South

Figure 2: Locations and capacities in million gallons per year of current biodiesel plants in the South, 2007



Source: National Biodiesel Board (NBB). Commercial Biodiesel Production Plants, January 2008, available at http://www.biodiesel.org/buyingbiodiesel/producers_marketers/.

Table 3: Summary of bioenergy policies by state, 2008†

State	State Energy Plan	Regulatory Mechanisms				Incentive Based Policies			Support Based Policies		
		RFS	RPS	Both NM/IC	AFV	Tax	Sub/ Grant	Loan	Prod. & Infra.	Exten. & Educ.	Tech
Alabama						X	X			X	X
Arkansas		X		X	X	X	X		X		X
Florida	X	X		X	X	X	X		X	X	
Georgia	X			X	X	X	X		X		
Kentucky	X			X	X	X			X	X	X
Louisiana		X		X		X			X	X	
Mississippi							X		X	X	
Missouri		X	X	X	X	X	X	X	X	X	X
North Carolina	X		X	X	X	X	X	X	X	X	X
Oklahoma					X	X		X	X	X	
South Carolina	X	X			X	X	X		X		X
Tennessee					X		X	X	X	X	X
Virginia	X		X	X	X	X	X	X	X		
West Virginia	X			X	X					X	

Source: Bioenergy policy information compiled by research team

† See Abbreviation Key in Endnotes on page 11.

Southern strengths

The bioenergy activity in the South is built, and continues to grow, on the region's significant assets for both biopower and biofuel:

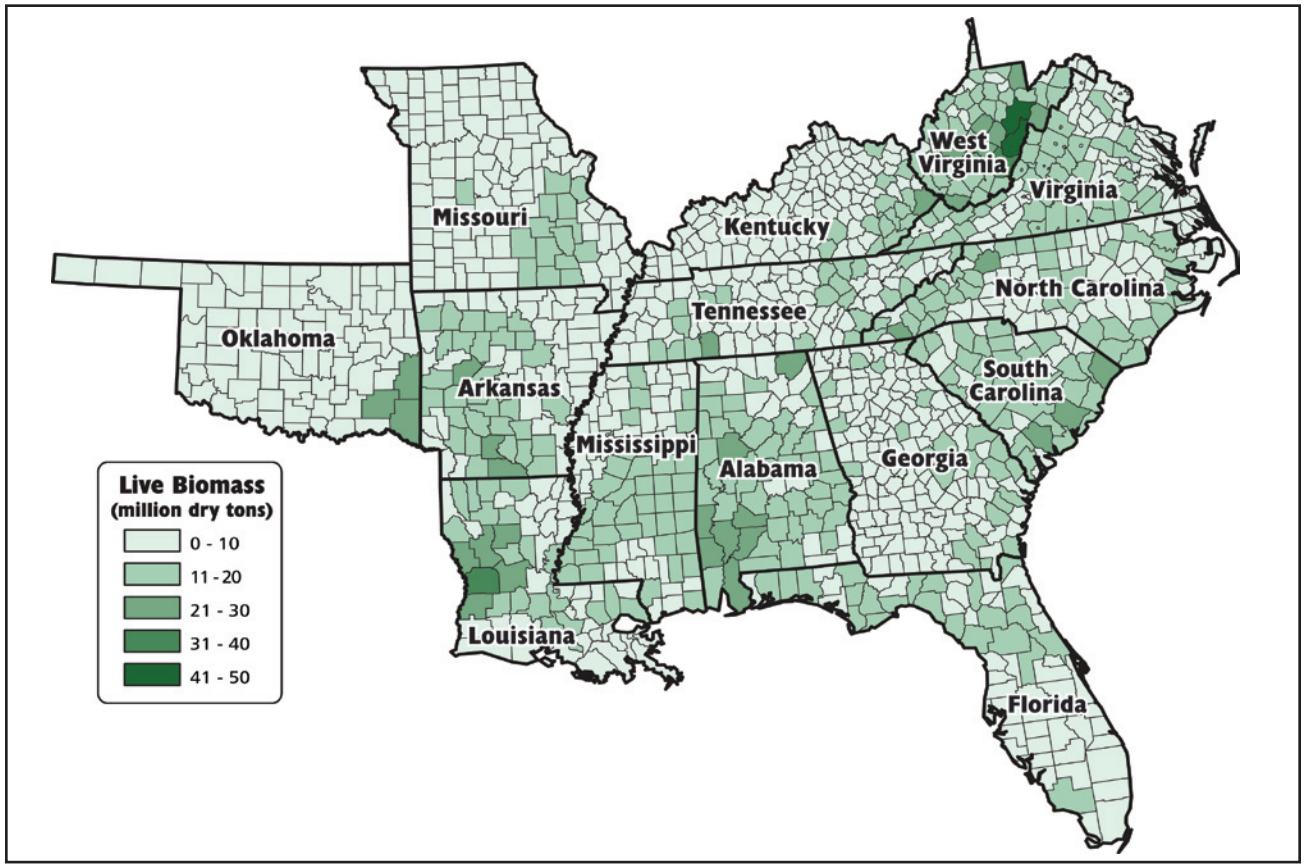
- The South holds 44 percent of the energy in the nation's forestlands, 31 percent of the nation's energy in crop, mill, and urban waste residues, 28 percent of the nation's energy in biogas, and 19 percent of the nation's energy in croplands. [Table 4]
- Southern forests had nearly 9.5 billion dry tons of live biomass inventory in 2006 and showed a net annual growth of more than 13 billion cubic feet, accounting for nearly 44 percent of the U.S. total. [see Figure 3 on page 6]
- There are 24 wood pellet manufacturers in the South, 29 percent of all wood pellet manufacturers in the U.S.
- Thirteen states provide incentives to promote bioenergy development, such as tax breaks, subsidies, grants and/or loans. [see Figure 4 on page 6, and Figures 5 & 6 on page 7]
- Research in bioenergy is occurring in every Southern state with centers affiliated with universities, non government organizations, industry, and government entities.

Table 4: Summary of energy values of biomass feedstock resources in the South

State	Biofuel Crops	Forest Resources	Crop, Mill & Urban Wood Residues	Biogas	All Resources
			Trillion BTU		
Alabama	23	182	96	4	305
Arkansas	82	123	134	2	342
Florida	36	88	101	6	230
Georgia	31	231	114	4	380
Louisiana	74	100	121	2	296
Kentucky	98	56	48	3	205
Mississippi	67	150	47	2	266
Missouri	231	53	168	5	457
North Carolina	41	175	97	9	323
Oklahoma	103	29	41	2	176
South Carolina	17	124	41	2	185
Tennessee	54	96	53	3	206
Virginia	42	115	54	3	214
West Virginia	13	52	14	1	79
Region Total	**911**	**1575**	**1129**	**48**	**3663**
U.S. Total	**4900**	**3581**	**3630**	**169**	**12281**
Region Share of U.S.	**18.6%**	**44.0%**	**31.1%**	**28.6%**	**29.8%**

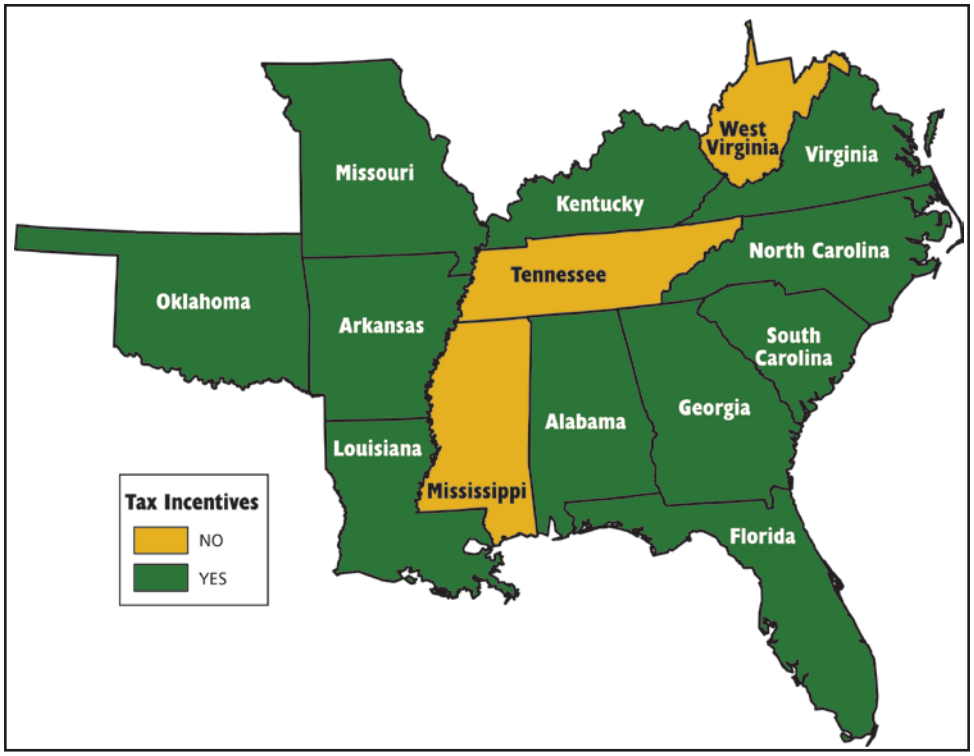
Source: Composite data from Southern Bioenergy Roadmap, 2009.

Figure 3: Inventory of live biomass on forestland in the South, by county, 2006-2007



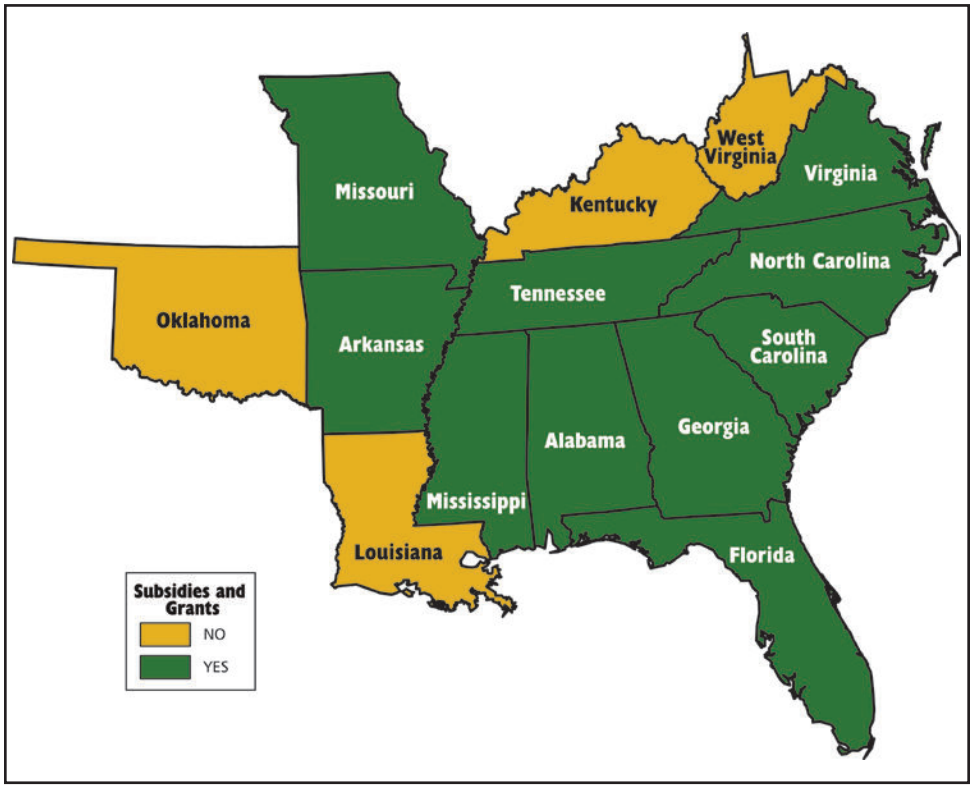
Source: U.S. Department of Agriculture, Forest Service (USDA-FS). Forest Inventory and Analysis, Timber Product Output online database; Forest Inventory Database, Mapmaker 3.0 online data retrieval tool. Available at http://www.ncrs.fs.fed.us/4801/tools-data/mapping-tools/.

Figure 4: Tax-based incentive policies in the South, 2008



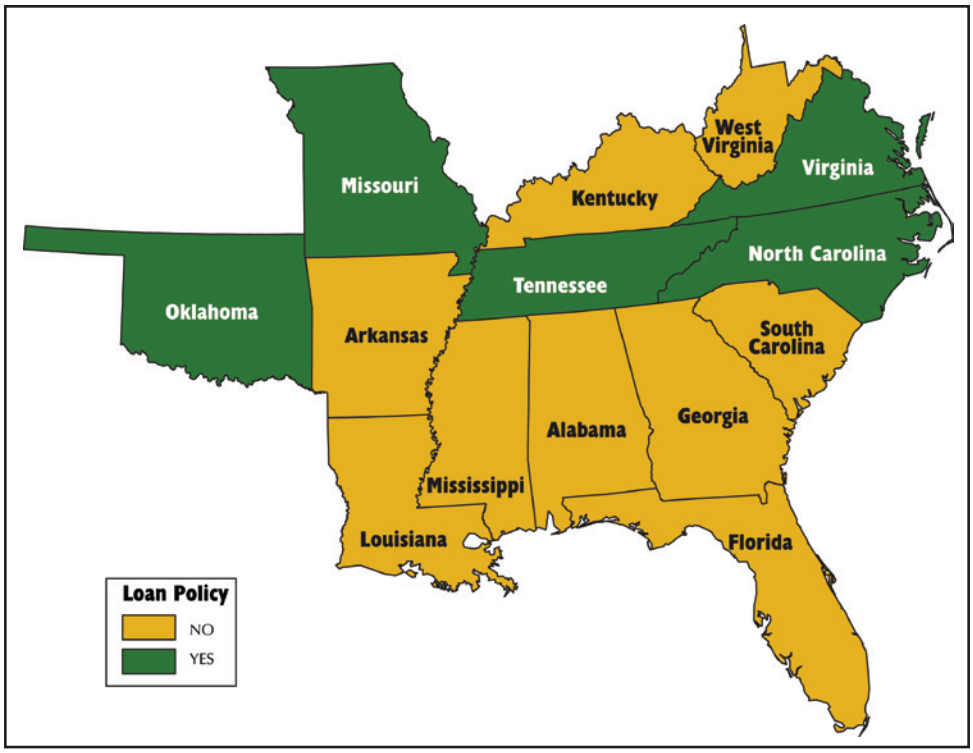
Source: Compiled through the Database of State Initiatives for Renewables & Efficiency (DSIRE), literature review, and personal interviews by University of Florida Research Team.

Figure 5: Subsidy and grant-based policies in the South, 2008



Source: Compiled through the Database of State Initiatives for Renewables & Efficiency (DSIRE), literature review, and personal interviews by University of Florida Research Team.

Figure 6: Loan-based policies in the South, 2008

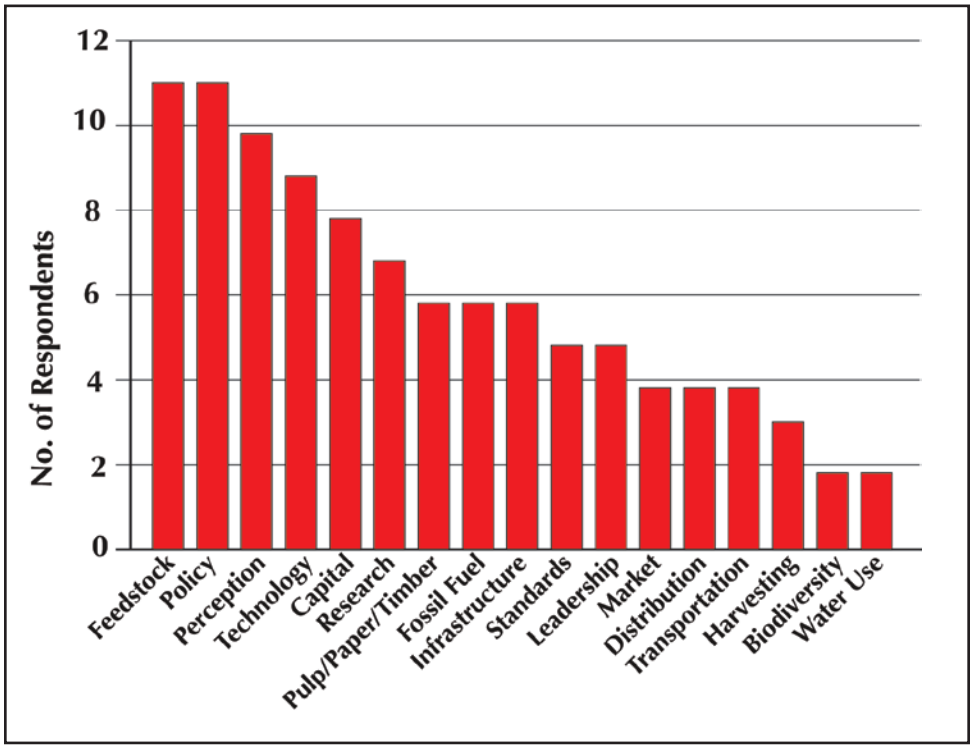


Source: Compiled through the Database of State Initiatives for Renewables & Efficiency (DSIRE), literature review, and personal interviews by University of Florida Research Team.

Southern weaknesses

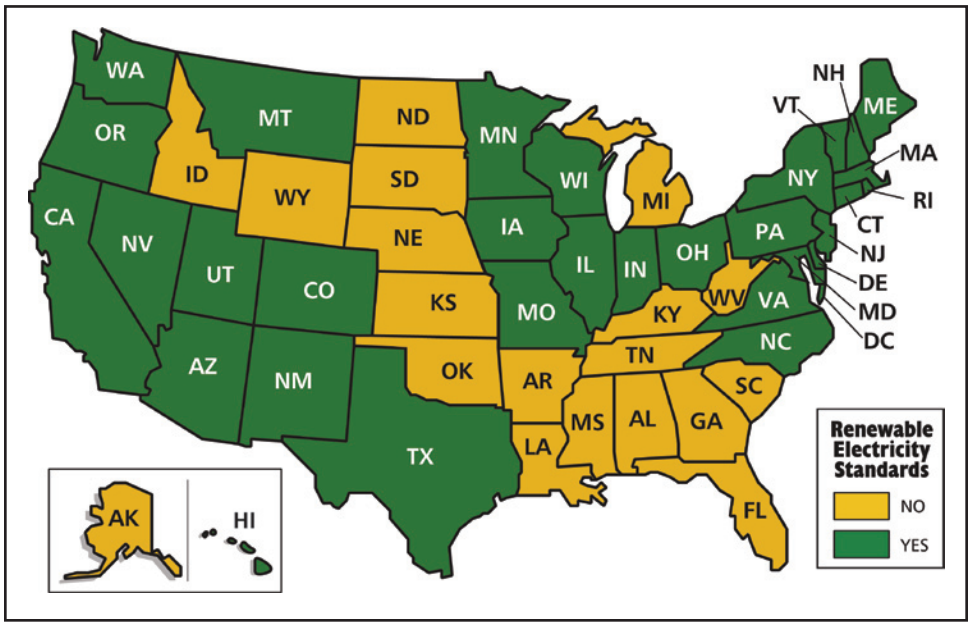
- Only 6.4 percent of the nation's ethanol is produced in the South, with a majority of the South's plants (operational and planned) found in Missouri due to the state's supply of corn as its feedstock.
- Southern bioenergy experts cited the cost and availability of bioenergy feedstocks, lack of public policy, and lack of public understanding as significant barriers to the bioenergy industry in the South. [Figure 7]
- Only three of the 30 states with mandatory or voluntary renewable electricity standards in the U.S. are found in the South. [see Figure 8 on page 9]
- While the South only produced a small percent of the nation's ethanol, the South consumed 33 percent of the nation's E85 in 2006. Consumption of all alternative fuel in the South fell between 2003 and 2006 by 15 percent, while the nation's alternative fuel consumption increased by nearly 4 percent. [Figure 9 on page 9]

Figure 7: Weakness and threats for bioenergy in the South



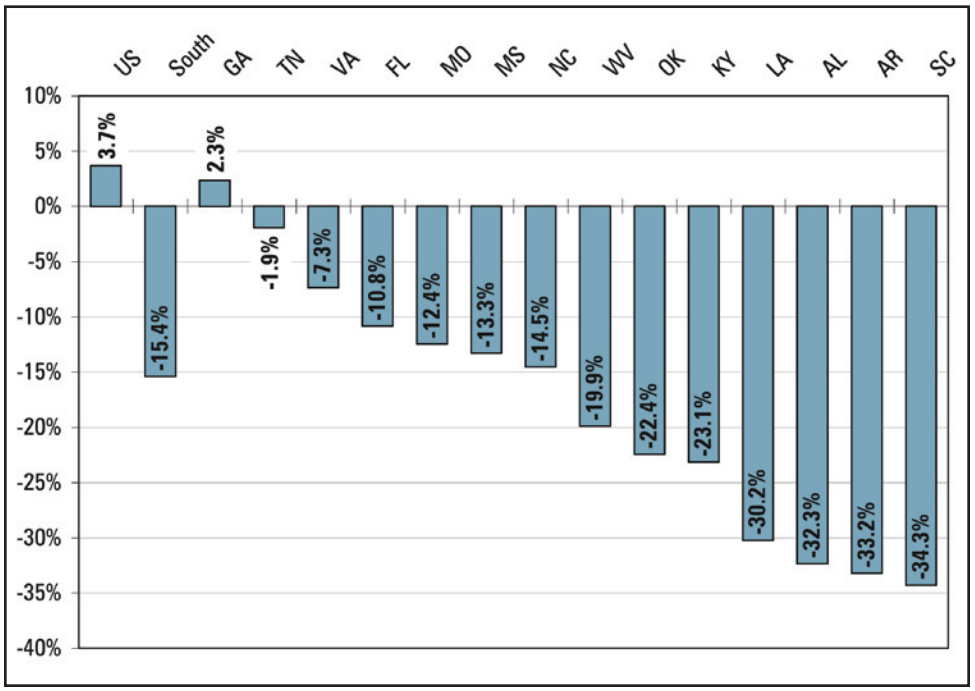
Source: University of Florida Expert Survey, 2008.

Figure 8: Mandatory and voluntary renewable electricity standards in the U.S., 2008



Source: Department of Energy, Energy Efficiency & Renewable Energy, January 2009. Available at http://apps1.eere.energy.gov/states/maps/renewable_portfolio_states.cfm#map.

Figure 9: Percentage change in consumption of alternative fuel* in the U.S. and South, 2003-2006



Source: Energy Information Administration (EIA), 2008. Estimated consumption of alternative fuels, by state, 2003-2005. Accessed on April 15, 2008. Link: http://www.eia.doe.gov/cneaf/alternate/page/atftables/afvtransfuel_II.html.

*"Alternative fuel" includes: compressed natural gas, electric, E85, hydrogen, liquefied natural gas, and liquefied petroleum gas.

Recommendations

Considering the South's strengths and weaknesses, the following recommendations are made to accelerate the South's journey to becoming the nation's leader in the research, production, and distribution of bioenergy:

1. Improve the supply, demand, and regulatory environment for biopower and biofuels industries in the South.

A key component in the development of any emerging industry, such as petroleum, aerospace, biotechnology, and now bioenergy, is the implementation of policies that improve the supply, demand, and regulatory environment of the industry. Federal and state policies that could influence this market for biopower and biofuels, include:

- Renewable fuel and electricity standards
- Improved net-metering and interconnection guidelines
- Government fleet acquisitions

2. Invest in the development of commercial biopower and biofuels facilities in the South.

To mitigate the risk entrepreneurs and existing industries make when investing in emerging industries, there is a need for direct investment in pilot and commercial biopower and biofuel facilities in the South. Investment vehicles include:

- Tax incentives
- Production tax credits
- Facility grants, loan guarantees or low-interest loans
- Siting and feasibility study grants

3. Educate Southern leaders and the public (including farmers, foresters, and rural communities) on the economic and environmental opportunities of biopower and biofuels.

To support current and future initiatives of the region's leaders and communities, a critical step is to provide government and community leaders, farmers, foresters, rural communities, and the general public with the most up-to-date

information regarding biopower and biofuels. To be successful, this outreach should:

- Engage a broad range of partners, including farm and forestry organizations, state biomass councils, state energy offices, state agriculture departments, and community and economic developers
- Communicate in concise and easy-to-read materials
- Address both the economic and environmental opportunities surrounding biopower and biofuels

Endnotes

1 In this document, the "South" refers to Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Virginia, and West Virginia.

2 Bioenergy is renewable energy created from biomass such as biopower (i.e. electricity) and biofuels (i.e. ethanol, biodiesel). Biomass is organic materials derived from plants and animals and includes agricultural and forestry residues, municipal solid wastes, industrial wastes, and land and aquatic crops grown solely for energy purposes.

3 Management Information Services, Inc. and American Solar Energy Society. *Green Collar Jobs in the U.S. and Colorado: Economic Drivers for the 21st Century,* January 2009.

4 While most ethanol plants in the U.S. use corn as their fuel source, the South's opportunities lie in the development of cellulosic ethanol: transportation fuel derived from non-food sources, such as wood, grasses, and residues.

5 Flanders, Archie and John McKissick, *Economic Impact of Cellulosic Ethanol Production in Treutlen County,* University of Georgia Center for Agribusiness and Economic Development, April 2007.

6 Hodges, Alan W. and Mohammad Rahmani, *Economic Impacts of Generating Electricity Fact Sheets*, University of Florida, September 2007. http://edis.itas.ufl.edu/FE697.

†Table 3 Abbreviation Key:

RFS – Renewable Fuel Standard

RPS – Renewable Portfolio Standard (mandatory and voluntary)

NM/IC – States have both Net-metering/Interconnection standards

AFV – Alternative fuel vehicle acquisition regulations

Tax – Tax incentives

Sub/Grant – Subsidies and grants

Loan – Loan-based policies

Prod & Infra. – Production and infrastructure development

Exten & Educ – Extension and educational outreach

Tech – Technology advancement policies

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Introduction

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How does the South do it?

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What's the economic impact?

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To promote further bioenergy development in the South, the Southeast Agriculture & Forestry Energy Resources Alliance (SAFER) and the University of Florida developed the Southern Bioenergy Roadmap to inform and support each state's energy plan.

The key objectives of the project were to:

- Create a bioenergy inventory of the South's assets in the areas of resources, research, industry, and policy
- Gather feedback on bioenergy opportunities and challenges from Southern bioenergy experts
- Create a coherent set of recommendations, based on the findings, aimed at improving the bioenergy industry in the region

The bioenergy inventory was prepared through internet searches, literature reviews, and personal interviews with bioenergy stakeholders. Two regional bioenergy stakeholder meetings were also held, where approximately 100 bioenergy experts discussed the opportunities and challenges for bioenergy in the South. Expert opinions were also gathered through a survey that was distributed on-line and at regional stakeholder meetings.

Report overview

The Southern Bioenergy Roadmap contains the following five sections:

Section I – Socio-economic, Land Use, and Energy Profile – provides data on socio-economic indicators, land use allocations, and energy consumption and production. Data points include:

- Population growth, median income, housing demand
- Urban lands, forestlands, croplands, pasturelands
- Electricity, transportation fuels, renewable energy
- Emissions

Section II – Commercial Inventory – focuses on the industry side of biopower and biofuels. Data points include:

- Fueling stations
- Production plants
- Heat & electric power generation
- Feedstock availability – forest biomass, agricultural crops, byproducts, residues, biogas
- Economic impact

Section III – Policy Inventory – itemizes bioenergy policies in each of the Southern states. Data points include:

- State energy plans
- Regulatory mechanisms
- Incentive-based policies
- Support programs

Section IV – Research and Education Inventory – provides a listing of the bioenergy research and educational programs in the South.

Section V – Results from Expert Survey and Stakeholder Meetings – explores responses of Southern bioenergy leaders to an open-ended survey and two regional stakeholder meetings held in Memphis, Tennessee with the Memphis Bioworks Foundation and Raleigh, North Carolina at Biomass South 2008.

I. Socio-economic, Land Use, and Energy Profile

Section I provides data on socio-economic indicators, land use allocations, and energy consumption and production. Data points include:

- ➤ Population growth, median income, housing demand
- ➤ Urban lands, forestlands, croplands, pasturelands
- ➤ Electricity, transportation fuels, renewable energy
- ➤ Emissions

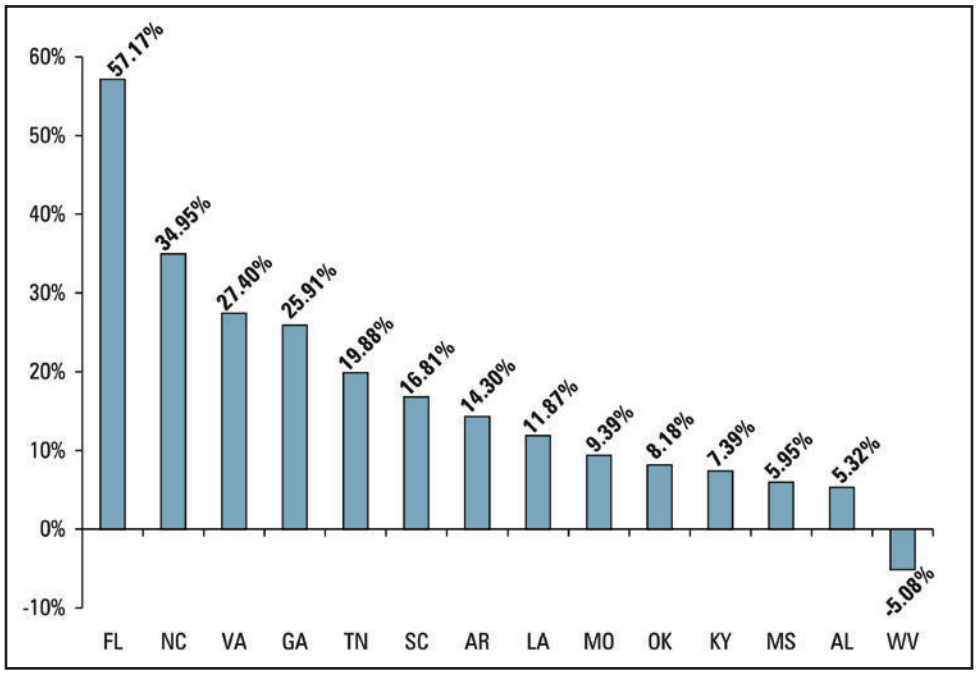
Socio-economic profile

Population growth

In 2007, the South's population numbered approximately 85.5 million, or 28.3 percent of the nation's total population. The largest number of people resided in the states of Florida (21.4 percent of the South), Georgia (11.2 percent), and North Carolina (10.6 percent).

As the South's population grows, so will its demand for energy. Population projections suggest that by 2030, the South's total population will reach 108 million, or 30 percent of the nation's population. While the nation's population is expected to grow at a rate of 20 percent, the South is expected to grow at a rate of 26 percent. The states with the highest growth rates include Florida, North Carolina, Virginia, and Georgia (Figure 10).

Figure 10: Projected percentage population growth between 2007 and 2030



Projected U.S. Population Growth Rate = ~20%

Projected Southern Population Growth Rate = ~26%

Source: U.S. Census Bureau (USCB), 2008. Annual population estimates 2000 to 2007. Accessed on March 23, 2008. Link: http://www.census.gov/popest/states/NST-ann-est.html.

U.S. Census Bureau (UCSB), 2004. U.S. Population Projections. Accessed on March 23, 2008. Link: http://www.census.gov/population/www/projections/projectionsagesex.html.

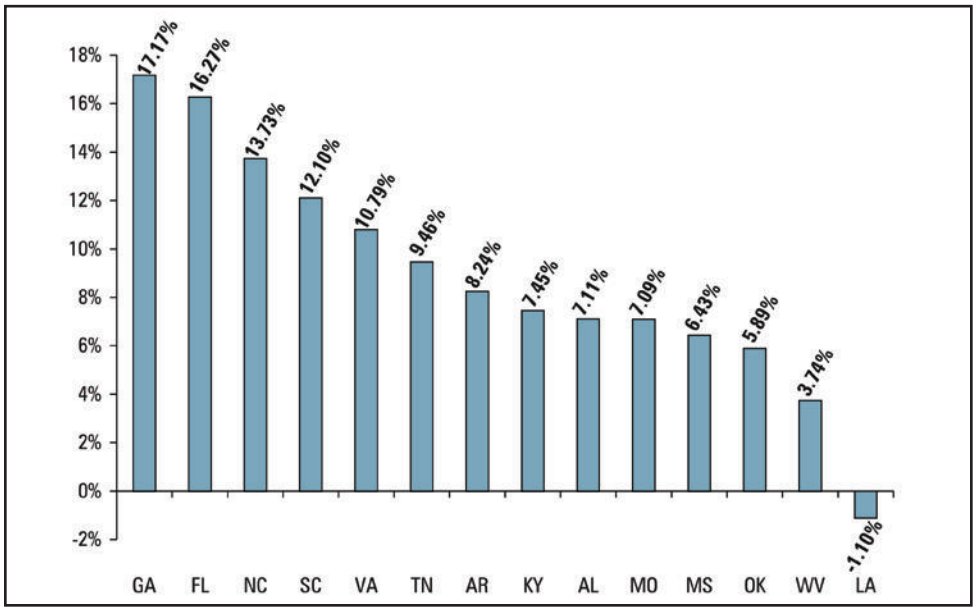
Housing demand

As the population increases, so does housing demand, resulting in increased energy needs for heating and cooling. Since 2000, all Southern states except Louisiana have seen increases in the number of housing units (Figure 11). In 2006, the total number of housing units in the South was approximately 30 percent of the total number of housing units in the nation. While the nation's housing units grew at approximately nine percent from 2000 to 2006, the South's grew at approximately 11 percent.

Figure 11: Percentage growth in housing units from 2000-2006

National Growth Rate = ~9%

Southern Growth Rate = ~11%



Source: U.S. Census Bureau (USCB), 2008. State housing unit estimates: 2000 to 2006. Accessed on March 23, 2008. Link: http://www.census.gov/popest/housing/HU-EST2006.html.

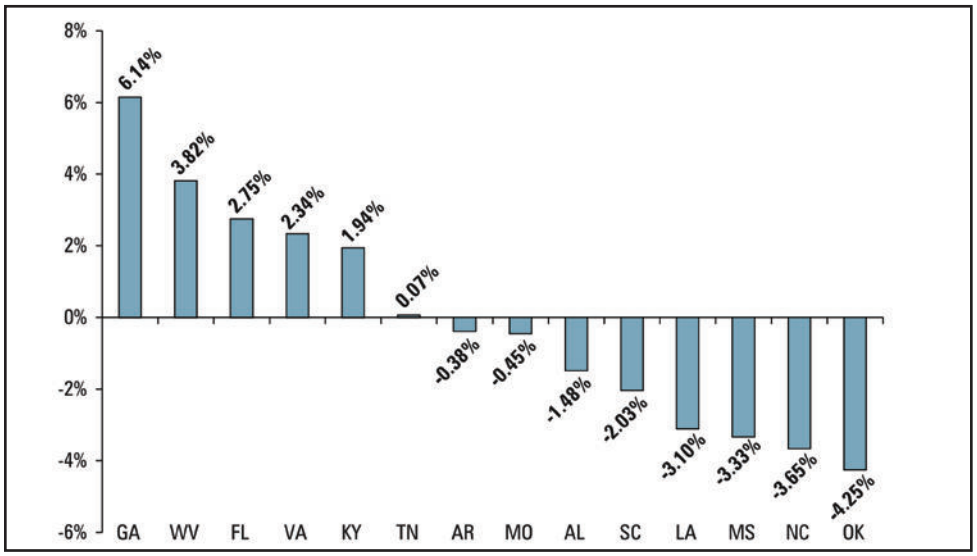
Median income

From 2004 to 2006, the median income of eight Southern states fell. However, the percentage increase in the median income of Georgia, West Virginia, Florida, Virginia, and Kentucky were more than the national average of about one percent (Figure 12).

Figure 12: Percentage growth in median income between 2004 and 2006

National Median Income Growth Rate = ~1%

Southern Median Income Growth Rate = ~0%



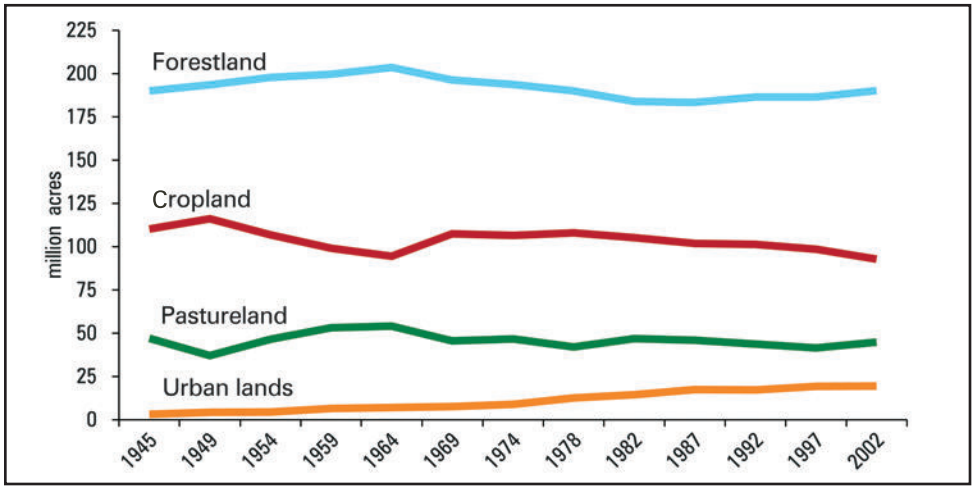
Source: U.S. Census Bureau (USCB), 2008. Two year average median household income by state: 2004-2006. Accessed on March 23, 2008. Link: http://www.census.gov/hhes/www/income/income06/statemhi2.html.

Land use allocations

Total land use

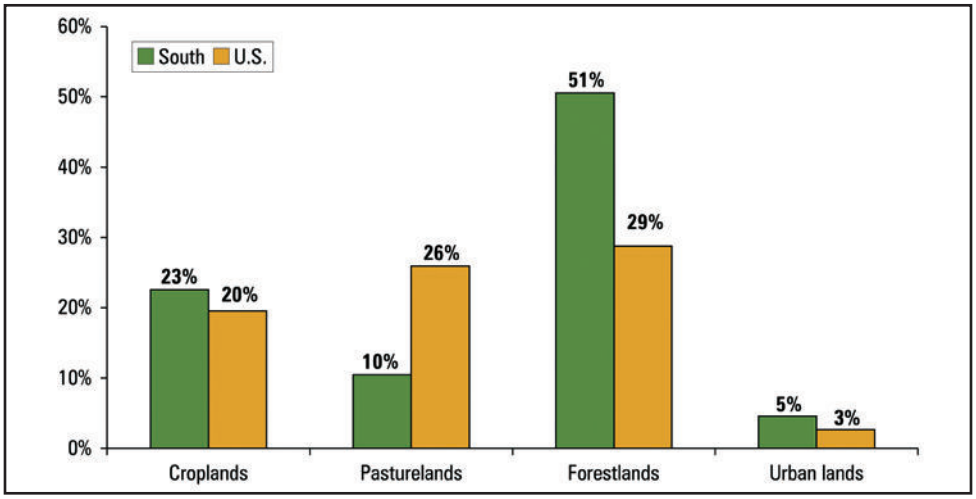
The South contains approximately 426 million acres of land. Figure 13 captures land use trends from 1945-2002 and Figure 14 illustrates major land uses in 2002.

Figure 13: Land use trends between 1945 and 2002.



Source: Economic Research Service (ERS), 2007. Major land uses. Accessed on April 20, 2008. Link: http://www.ers.usda.gov/data/majorlanduses/.

Figure 14: Major land uses in the U.S. and the South, 2002*



Source: Economic Research Service (ERS), 2007. Major land uses. Accessed on April 20, 2008. Link: http://www.ers.usda.gov/data/majorlanduses/.
*Chart does not include "other" or "special" land uses.

Total Geographic Area = 426 Million Acres

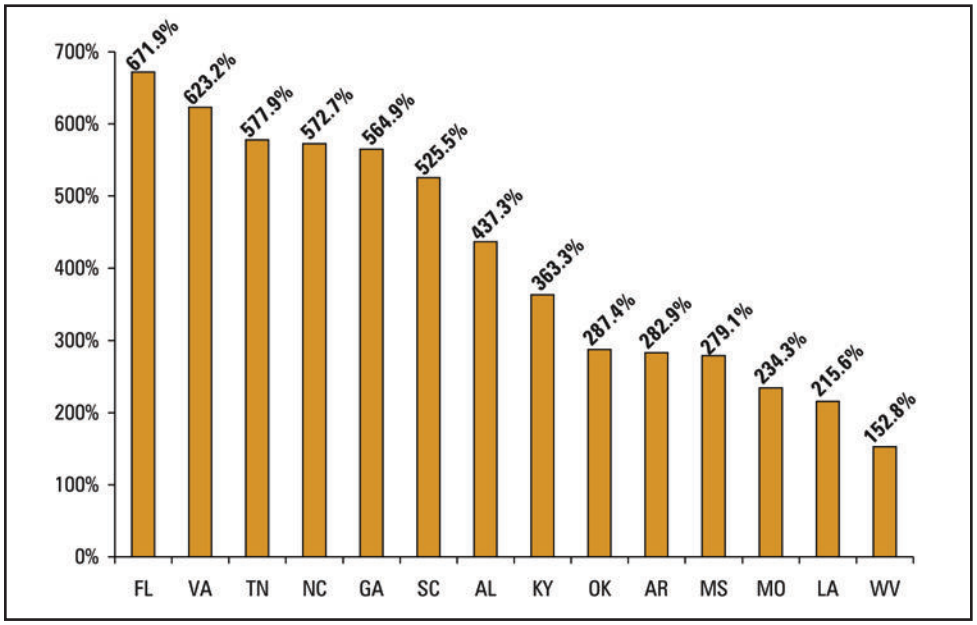
Urban lands

Population growth in the South has increased demand for land to accommodate residential and commercial needs. Between 1945 and 2002, urban lands in the South expanded four times over — an average annual growth rate of eight percent. At the same time, the average growth rate in urban lands nationally was approximately five percent. All Southern states saw urban land increases from 1945 to 2002, with six states having a total percentage increase of over 500 percent (Figure 15). In 2002, urban lands made up approximately 20 million acres in the South.

National Average Annual Growth Rate in Urban Lands between 1945 and 2002 = ~5%

Southern Average Annual Growth Rate in Urban Lands between 1945 and 2002 = ~8%

Figure 15: Percentage growth in urban lands between 1945 and 2002 in the South



Source: Economic Research Service (ERS), 2007. Major land uses. Accessed on April 20, 2008. Link: http://www.ers.usda.gov/data/majorlanduses/.

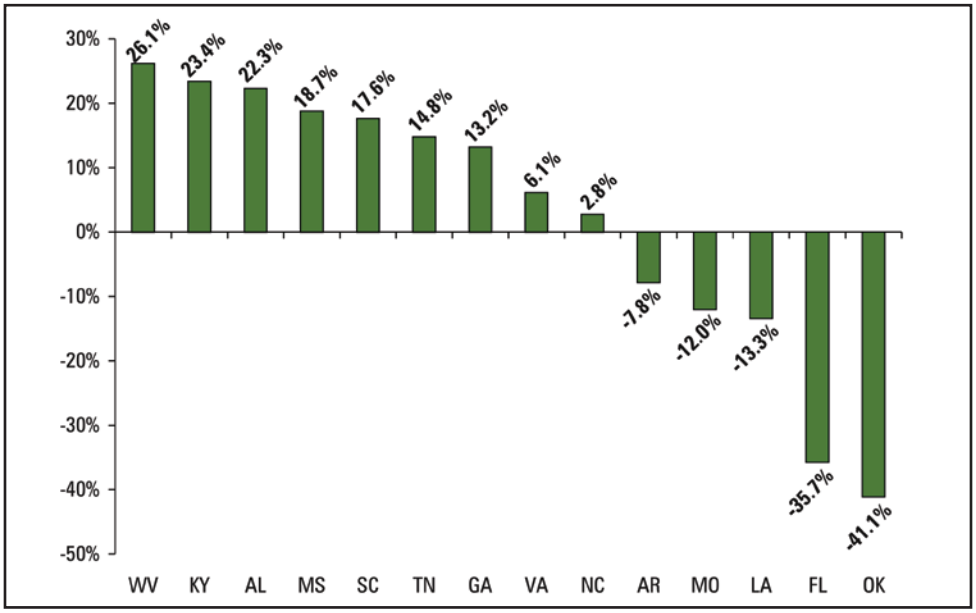
Forestlands

The amount of forestland in the South has not significantly changed between 1945 and 2002. Forestlands increased by 0.8 percent, whereas nationally forestlands increased by about eight percent in the same period. The largest percentage decreases in total forestlands were in Oklahoma and Florida. The largest percentage increases in total forestlands were seen in West Virginia, Kentucky, and Alabama (Figure 16). In 2002, forestlands made up approximately 215 million acres in the South.

National Average Annual Growth Rate in Forestlands between 1945 and 2002 = ~8%

Southern Average Annual Growth Rate in Forestlands between 1945 and 2002 = ~0.8%

Figure 16: Percentage growth in forestlands between 1945 and 2002 in the South

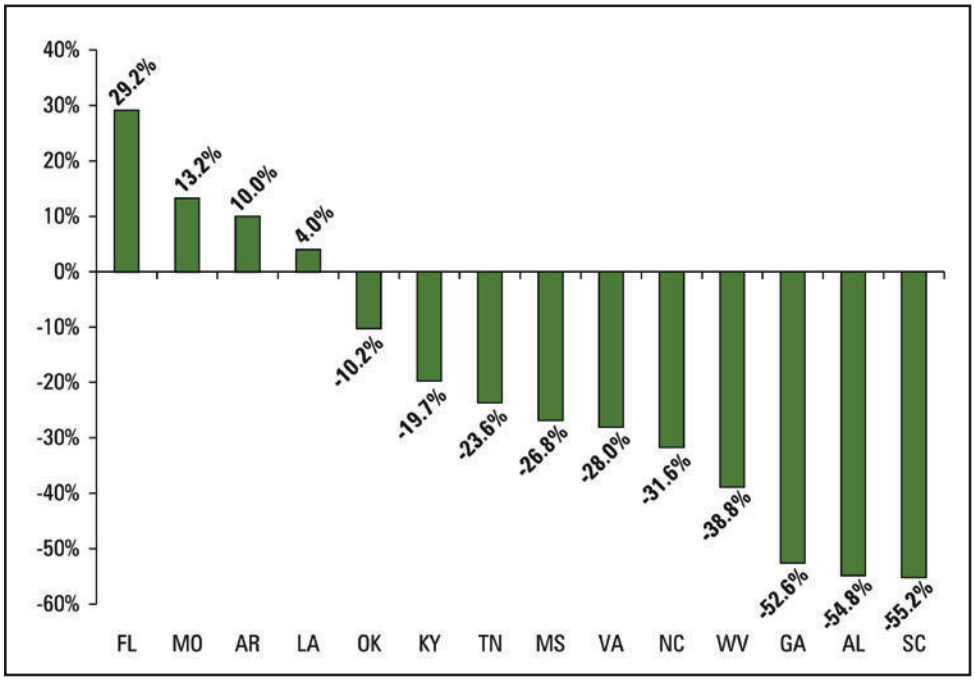


Source: Economic Research Service (ERS), 2007. Major land uses. Accessed on April 20, 2008. Link: http://www.ers.usda.gov/data/majorlanduses/.

Croplands

Croplands in the country are divided into three categories: farming, pasture (land rotated between crop and pasture, or marginal cropland), and idle lands. Total croplands declined by approximately two percent in the nation and 18 percent in the South between 1945 and 2002. In the South, pasture croplands increased by approximately 25 percent, while farming and idle croplands showed a decline of approximately 25 and 38 percent. The largest percentage decreases in total croplands were seen in South Carolina, Alabama, and Georgia. The only states with increases in total croplands were Florida, Missouri, Arkansas, and Louisiana (Figure 17). In 2002, croplands made up approximately 96 million acres in the South.

Figure 17: Precentage growth in croplands between 1945 and 2002 in the South



National Average Annual Growth Rate in Croplands between 1945 and 2002 = ~ –2%

Southern Average Annual Growth Rate in Croplands between 1945 and 2002 = ~ –18%

Source: Economic Research Service (ERS), 2007. Major land uses. Accessed on April 20, 2008. Link: http://www.ers.usda.gov/data/majorlanduses/.

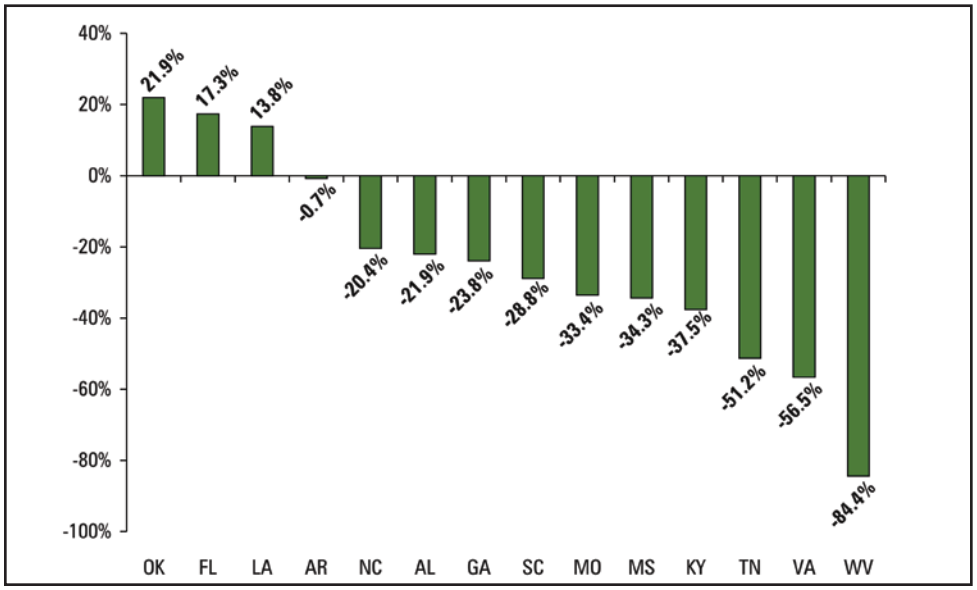
Pasturelands

Between 1945 and 2002, the total area of pasturelands in the South declined by 17 percent, while nationally, the decline was only 11 percent. The largest percentage decreases in pasturelands were seen in West Virginia, Virginia, and Tennessee. Only three states, Oklahoma, Florida, and Louisiana, registered increases in pastureland area (Figure 18). In 2002, pasturelands made up approximately 45 million acres in the South.

National Average Annual Growth Rate in Pasturelands between 1945 and 2002 = ~ –11%

Southern Average Annual Growth Rate in Pasturelands between 1945 and 2002 = ~ –17%

Figure 18: Percentage growth in pasturelands between 1945 and 2002 in the South



Source: Economic Research Service (ERS), 2007. Major land uses. Accessed on April 20, 2008. Link: http://www.ers.usda.gov/data/majorlanduses/.

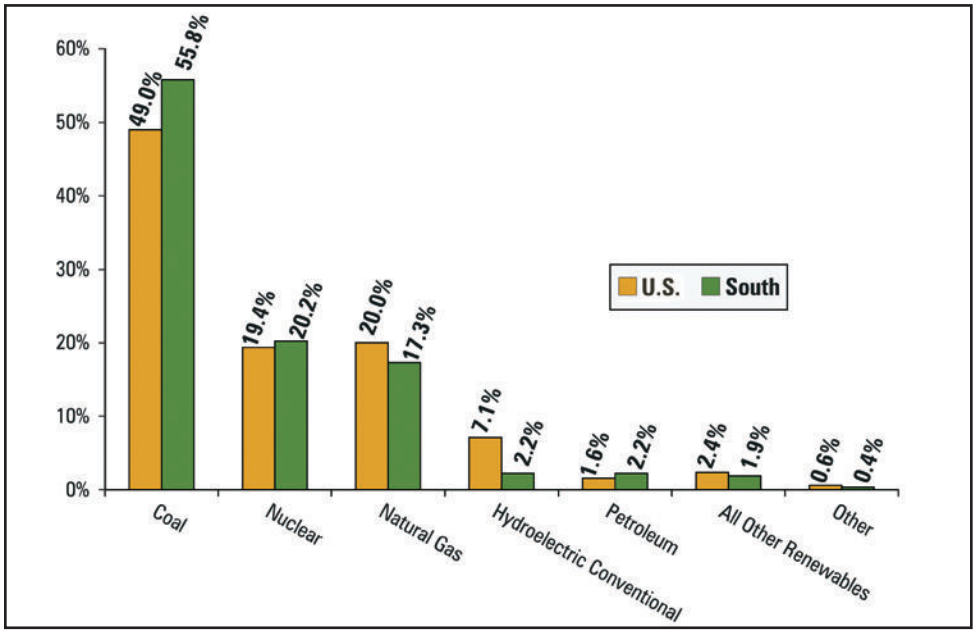
Energy profile

Electricity

In 2006, the South generated 1.4 billion megawatt hours, or 35 percent of the nation's total electricity. Between 2000 and 2006, all Southern states increased their generation of electricity. The majority of the electricity in the South is produced from coal (56 percent), nuclear (20 percent) and natural gas (17 percent) (Figure 19). Renewable energies, excluding hydroelectric, make up two percent of the region's electricity generation. As seen in Figure 20, average prices of electricity supplied to consumers have increased in all the Southern states. Still, with the exclusion of Florida, electricity prices for the region are lower than the national average.

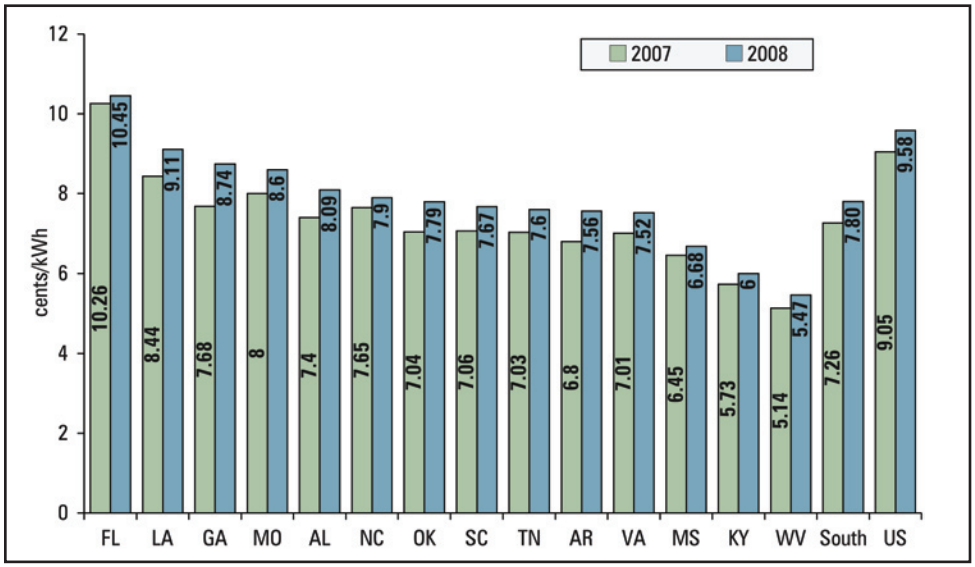
The South Produced 35% of the Nation's Electricity in 2006

Figure 19: Electricity production in the U.S. and the South, 2006



Source: Energy Information Administration (EIA), 2008. Net generation by state by type of producer by energy source. Accessed on April 15, 2008. Link: http://www.eia.doe.gov/cneaf/electricity/epa/epat1p1.html.

Figure 20: Electricity rates by state, 2007 and 2008

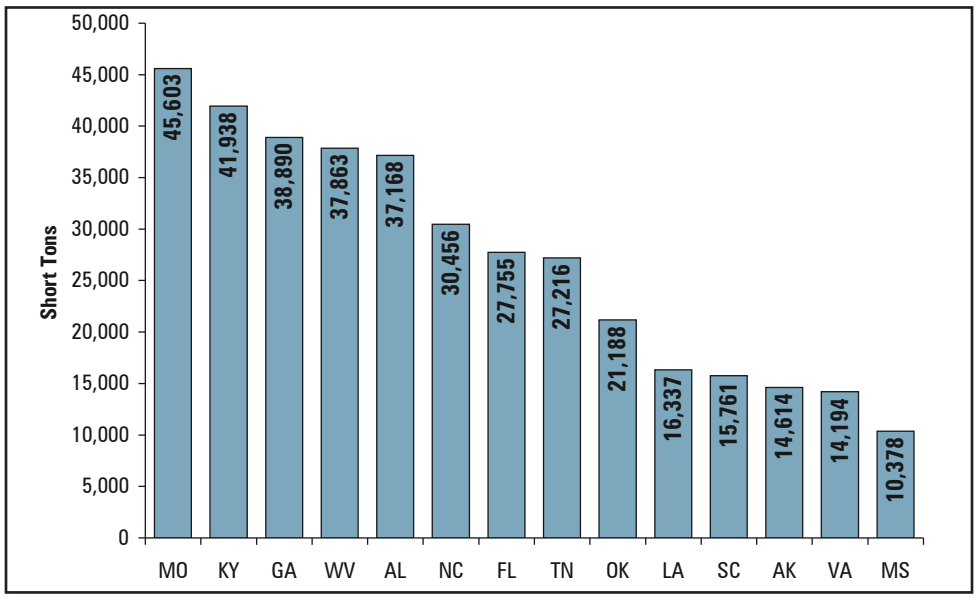


Source: Energy Information Administration (EIA), 2008. Average Retail Price of Electricity to Ultimate Customers: Total by End-Use Sector. Accessed on April 28, 2008. Link: http://www.eia.doe.gov/cneaf/electricity/epm/table5_3.html.

Coal

The majority of coal consumed in the South is used for electricity production. In 2006, 380 million short tons (about 37 percent of the nation's total) was used for electricity production. Figure 21 shows that the states that consumed the largest amounts of electricity from coal were Missouri, Kentucky, Georgia, West Virginia, and Alabama.

Figure 21: Coal consumption in the South, 2006



The South Consumed 37% of the Nation's Coal for Electricity.

Source: Energy Information Administration (EIA), 2008. U.S. coal consumption by end use sector, by census division and state. Accessed on April 28, 2008. Link: http://www.eia.doe.gov/cneaf/coal/page/acr/table26.html.

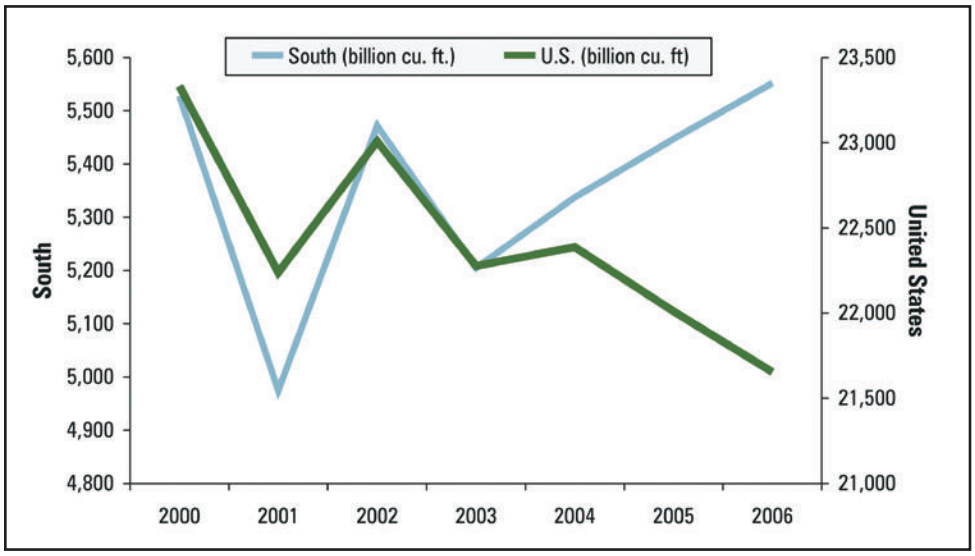
Natural gas

The total consumption of natural gas in the South is about 5.5 trillion cubic feet in 2006, or 26 percent of the nation's total. Of this, 33.5 percent was used for electricity production, 12 percent for residential needs, and 0.03 percent as a fuel for vehicles. As seen in Figure 22, total Southern consumption of natural

gas in recent years has increased primarily due to the rise in number of natural gas-powered electricity plants. When compared to the base year 2000, the percentage increase in natural gas consumption in the South was just 0.44 percent. However, there was a net drop of about seven percent in natural gas consumption nationally.

Total Consumption of Natural Gas for Electricity Production in the South was 26% of the Nation in 2006.

Figure 22: Natural gas consumption in the U.S and the South, 2000-2006

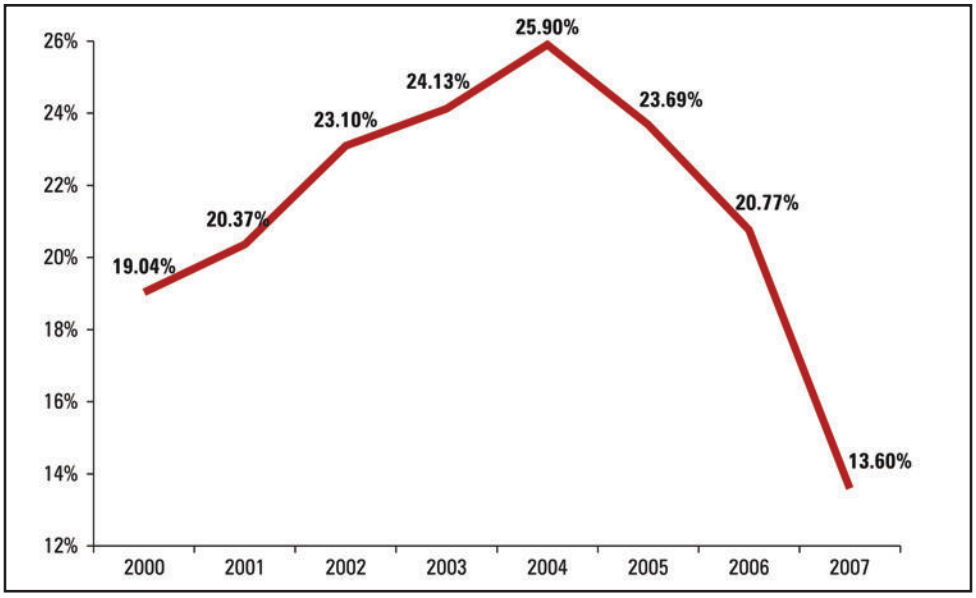


Source: Energy Information Administration (EIA), 2008. U.S. natural gas consumption by end use. Accessed on April 28, 2008. Link: http://tonto.eia.doe.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm.

Heating oil

Heating oil is a low viscosity, flammable liquid petroleum product used to fuel building furnaces or boilers. Southern states consumed about 14 percent (2,370 gallons per day) of the total heating oil consumed in the nation in 2007. The trend indicates that the Southern states are consuming relatively less heating oil than the nation (Figure 23).

Figure 23: Percentage of the nation's heating oil consumed in the South, 2000-2007

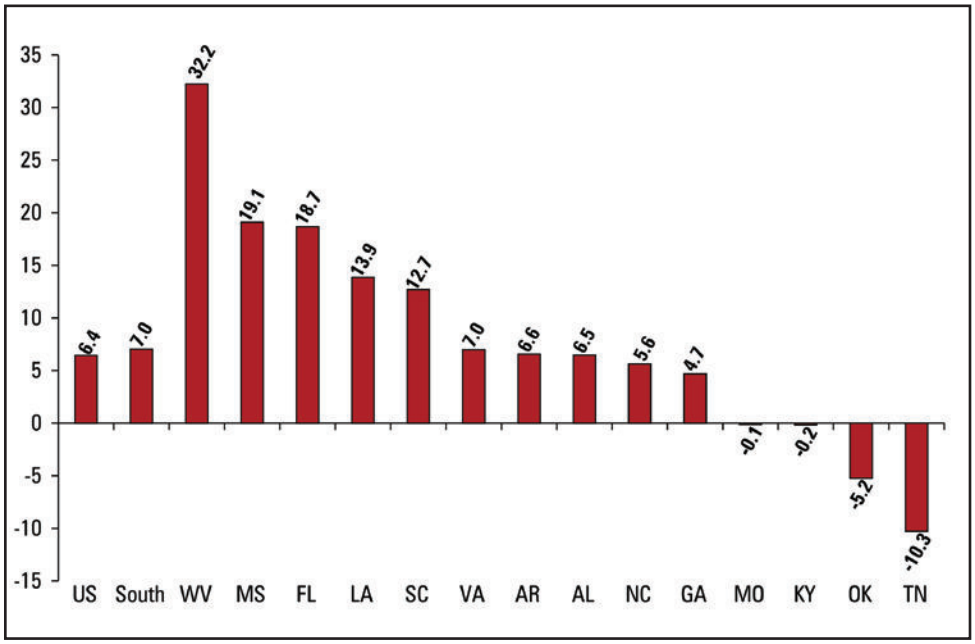


Source: Energy Information Administration (EIA), 2008. U.S. prime supplier sales volumes of petroleum products. Accessed on April 28, 2008. Link: http://tonto.eia.doe.gov/dnav/pet/pet_cons_prim_dcu_nus_a.htm.

Gasoline

In 2007, the South consumed approximately 117 million gallons of gasoline per day, which was 31 percent of the total daily gasoline consumed in the nation. Between 2000 and 2007, the South's consumption of gasoline grew by seven percent, slightly faster than the nation's increase of 6.4 percent. West Virginia, Mississippi, and Florida saw the largest increases in gasoline consumption (Figure 24).

Figure 24: Percentage change in gasoline consumed in the South, 2000-2007

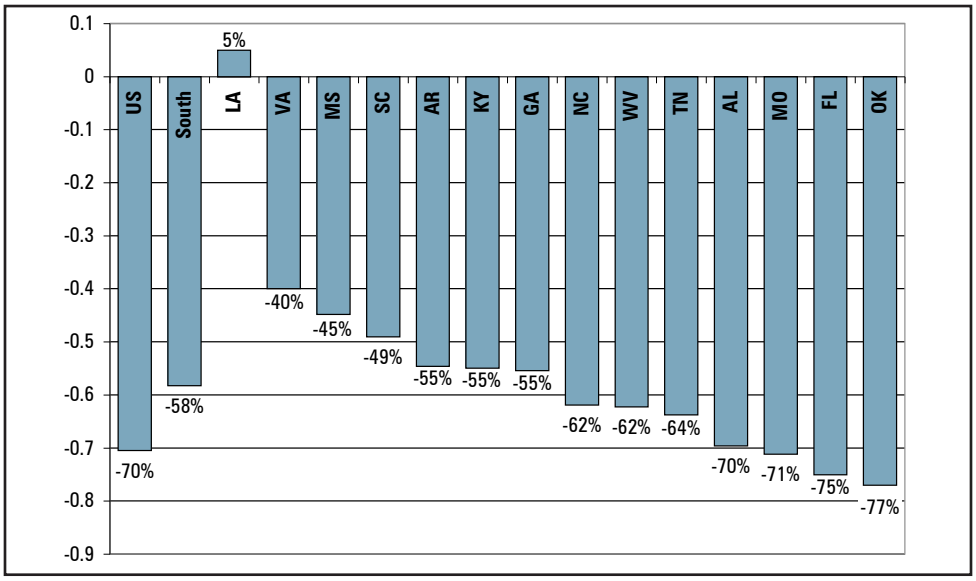


Source: Energy Information Administration (EIA), 2008. U.S. prime supplier sales volumes of petroleum products. Accessed on April 28, 2008. Link: http://tonto.eia.doe.gov/dnav/pet/pet_cons_prim_dcu_nus_a.htm.

Low sulfur diesel

Low sulfur diesel is, in general, used to meet commercial transportation needs. In 2007, the South consumed approximately 29 million gallons of low sulfur diesel per day, which is 45 percent of the nation's daily low sulfur diesel consumption. Increasing prices caused a significant decline in low sulfur diesel consumption in 2007. Between 2000 and 2007, while the nation's consumption of low sulfur diesel decreased by 70 percent, the South's consumption decreased by only 58 percent (Figure 25).

Figure 25: Percentage change in low sulfer diesel consumed in the South, 2000-2007

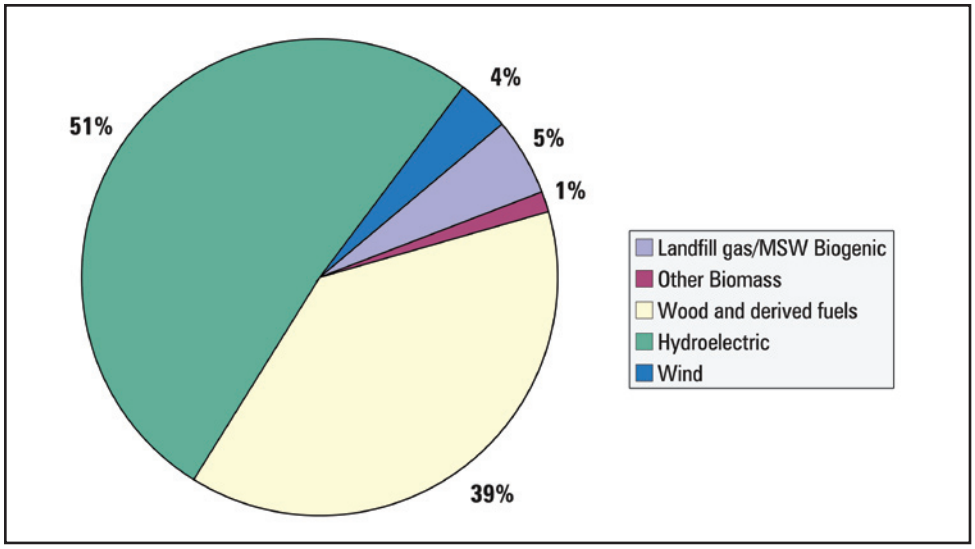


Source: Energy Information Administration (EIA), 2008. U.S. prime supplier sales volumes of petroleum products. Accessed on April 28, 2008. Link: http://tonto.eia.doe.gov/dnav/pet/pet_cons_prim_dcu_nus_a.htm.

Renewable electricity

In 2005, electricity produced from various renewable energy sources in the South made up approximately 16 percent of the total renewable electricity produced in the nation. Most of the electricity produced from renewable energy sources in the Southern states is from hydroelectricity, followed by various biomass resources (Figure 26). Alabama, Georgia, and Tennessee produced the most renewable electricity in the Southern region (Figure 27).

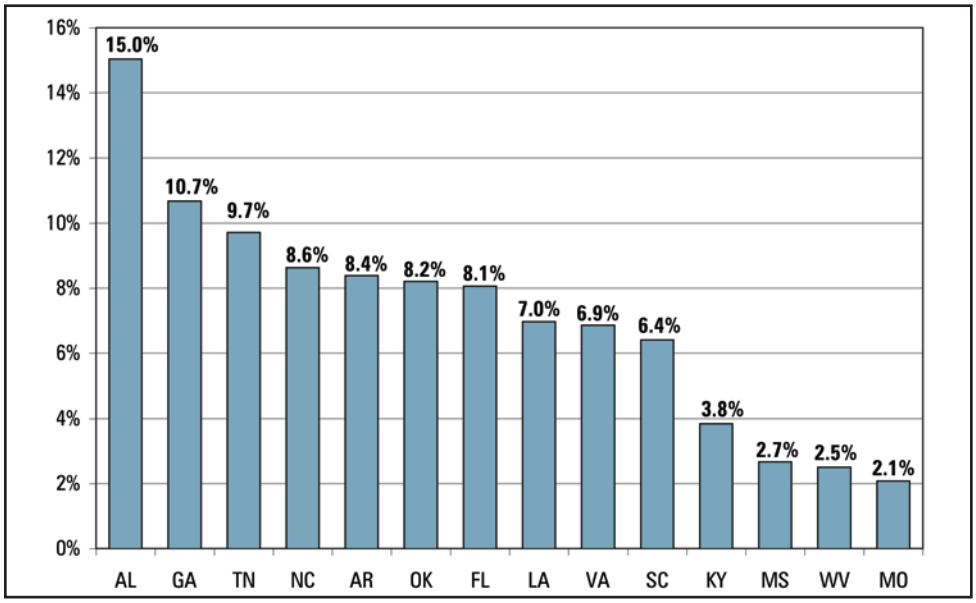
Figure 26: Renewable electricity produced by source in the South, 2005



Source: Energy Information Administration (EIA), 2008f. Renewable electric power sector net generation by energy source and state, 2005. Accessed on April 30, 2008. Link: http://www.eia.doe.gov/cneaf/solar.renewables/page/rea_data/rea_sum.html.

*Geothermal and Solar were negligable.

Figure 27: Contribution of renewable energy by state as a percent of the South's total, 2005

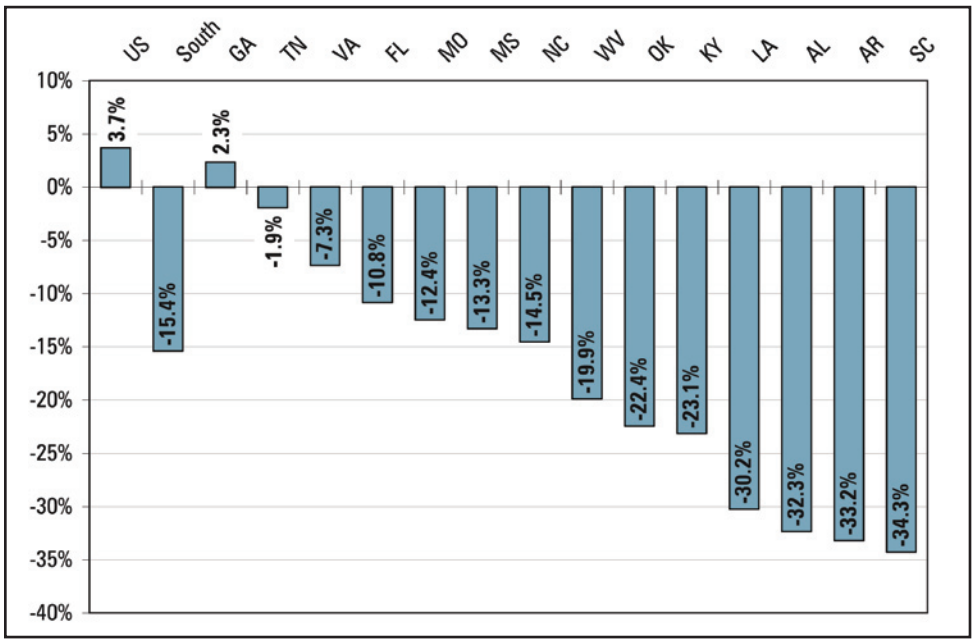


Source: Energy Information Administration (EIA), 2008. Renewable electric power sector net generation by energy source and state, 2005. Accessed on April 30, 2008. Link: http://www.eia.doe.gov/cneaf/solar.renewables/page/rea_data/rea_sum.html.

Alternative fuels

In 2003, the total alternative fuel consumed in the South was approximately 24 percent of the total alternative fuel consumed in the nation. However, the percentage dropped to 20 percent in 2006. As seen in Figure 28, alternative fuel consumption in the nation increased by four percent, while the South's consumption decreased by 15 percent. The South consumed 33 percent of the nation's E85 in 2006.

Figure 28: Percentage change in consumption of alternative fuel* in the U.S. and South, 2003-2006



Source: Energy Information Administration (EIA), 2008. Estimated consumption of alternative fuels, by state, 2003-2005. Accessed on April 15, 2008. Link: http://www.eia.doe.gov/cneaf/alternate/page/atftables/afvtransfuel_II.html.

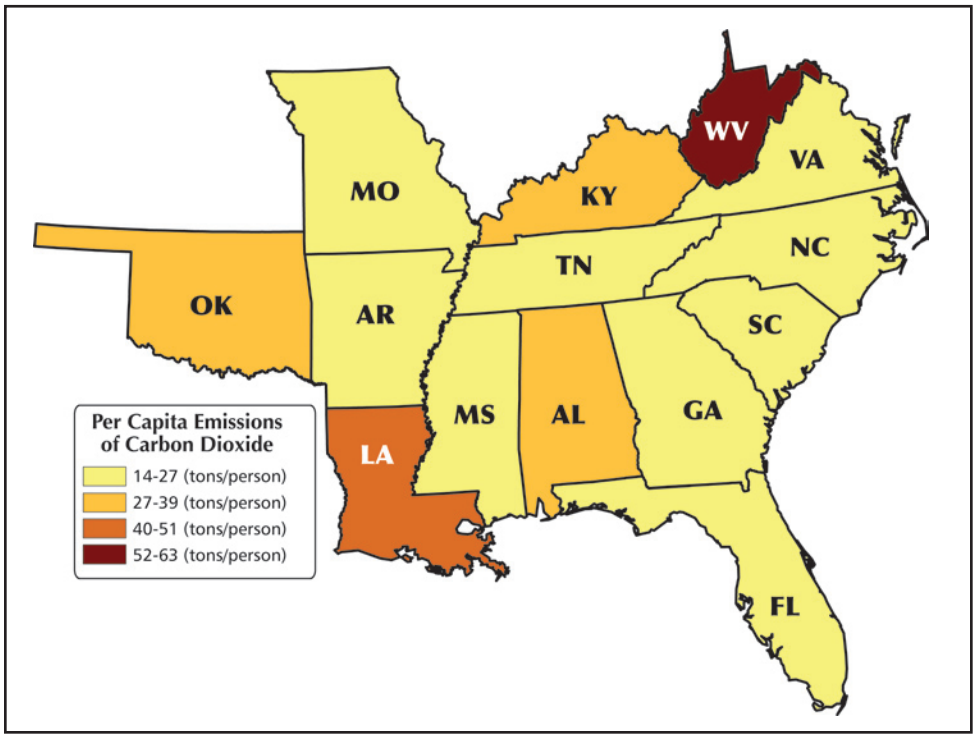
*"**Alternative** fuel" includes: compressed natural gas, electric, E85, hydrogen, liquefied natural gas, and liquefied petroleum gas.

Emissions

Carbon dioxide (CO_2)

In 2005, the South emitted about 1.9 billion metric tons of carbon dioxide (CO_2) into the atmosphere—approximately 32 percent of the nation's total. Between 1990 and 2005, the South saw a 25 percent increase in CO_2 emissions, compared to only 18 percent for the nation. In 2005, the electricity sector, followed by the transportation sector, emitted the largest amounts of CO_2 in the South. In absolute terms, Florida, Louisiana, and Georgia emitted the most CO_2. However, on a per capita basis, Louisiana and West Virginia were the highest emitters of CO_2 (Figure 29).

Figure 29: Per capita emission of carbon dioxide (tons/person) in the South, 2005



Source: Energy Information Administration (EIA), 2008. Environment energy-related emissions data & environmental analyses. Accessed on April 1, 2008. Link: http://www.eia.doe.gov/environment.html.

II. Commercial Inventory

Section II focuses on the industry side of biopower and biofuels. Data points include:

- Fueling stations
- Production plants
- Heat & electric power generation
- Feedstock availability — forest biomass, agricultural crops, byproducts, residues, biogas
- Economic impact

Fueling stations

According to the Alternative Fuels and Advanced Vehicle Data Center (AFDC) there are 1,150 alternative fuel stations in the South, 20 percent of all alternative fuel stations in the U.S.: 276 E85 (85 percent ethanol, 15 percent gasoline), 258 biodiesel, over 600 liquefied propane gas or compressed natural gas, and a few electric charging or hydrogen (Table 5). Georgia, Missouri, North Carolina, Oklahoma, South Carolina and Tennessee each have more than 100 alternative fueling stations. Missouri has the largest number of E85 fueling stations and South Carolina has the largest number of biodiesel stations (Figure 30).

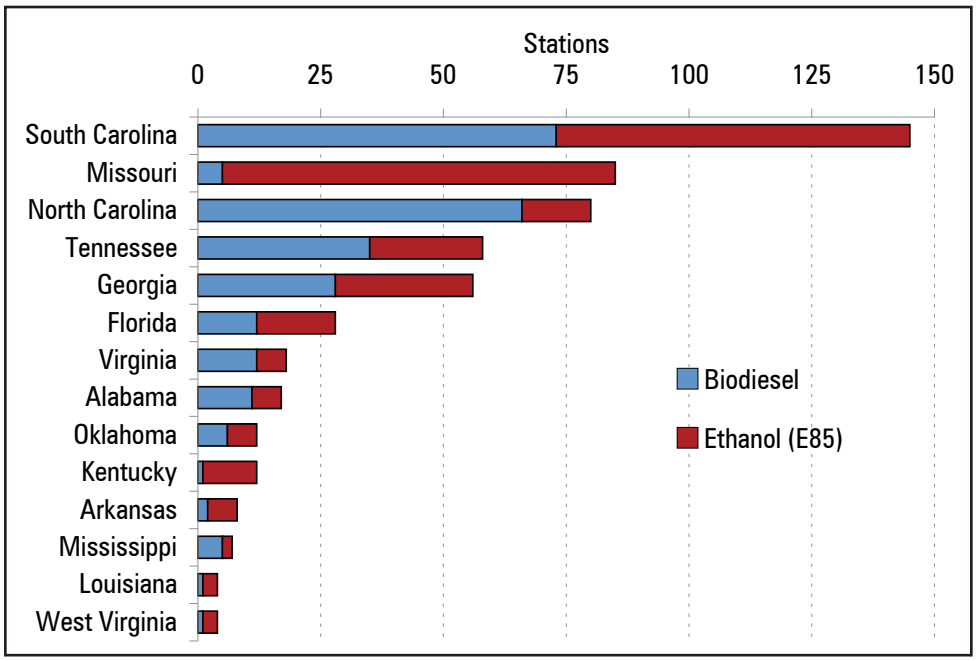
Table 5: Alternative fueling stations in the South, 2007

State	Biodiesel	Ethanol (E85)	Natural Gas	Electric	Hydrogen	Propane	Total
Alabama	11	6	3	0	0	40	60
Arkansas	2	6	3	0	0	37	48
Florida	12	16	15	3	2	47	95
Georgia	28	28	18	0	0	37	111
Kentucky	1	11	0	0	0	13	25
Louisiana	1	3	5	0	0	9	18
Mississippi	5	2	0	0	0	33	40
Missouri	5	80	6	0	1	65	157
North Carolina	66	14	12	0	0	44	136
Oklahoma	6	6	51	0	0	64	127
South Carolina	73	72	4	0	0	20	169
Tennessee	35	23	3	0	0	42	103
Virginia	12	6	9	1	1	19	48
West Virginia	1	3	2	0	0	7	13
Region Total	**258**	**276**	**131**	**4**	**4**	**477**	**1,150**
U.S. Total	**620**	**1,701**	**774**	**417**	**51**	**2,125**	**5,688**

Source: Alternative Fuels Data Center (AFDC). U.S. Department of Energy, Energy Efficiency and Renewable Energy Program, September 2007. Available at http://www.afdc.energy.gov/afdc/.

The South Contained 23% of all E85 and Biodiesel Stations in the U.S. in 2007.

Figure 30: E85 & biodiesel fueling stations in the South, 2007



Source: Alternative Fuels Data Center (AFDC). U.S. Department of Energy, Energy Efficiency and Renewable Energy Program, September 2007. Available at http://www.afdc.energy.gov/afdc/.

Biofuel production plants

Ethanol

According to the Renewable Fuels Association, there are currently 16 ethanol fuel plants in the South, including 12 that are operational and 4 that are under development (Table 6). The current production capacity is 417 million gallons per year (MGY), and new plants under construction will provide an additional 318 MGY, representing a total capacity of 735 MGY. The South's operating ethanol plants produced 6.4 percent based on the nation's 6.5 billion gallons in 2007. A majority of the ethanol plants in the region are located in Missouri and use traditional corn feedstocks. The locations of ethanol production facilities in the South are mapped in Figure 31.

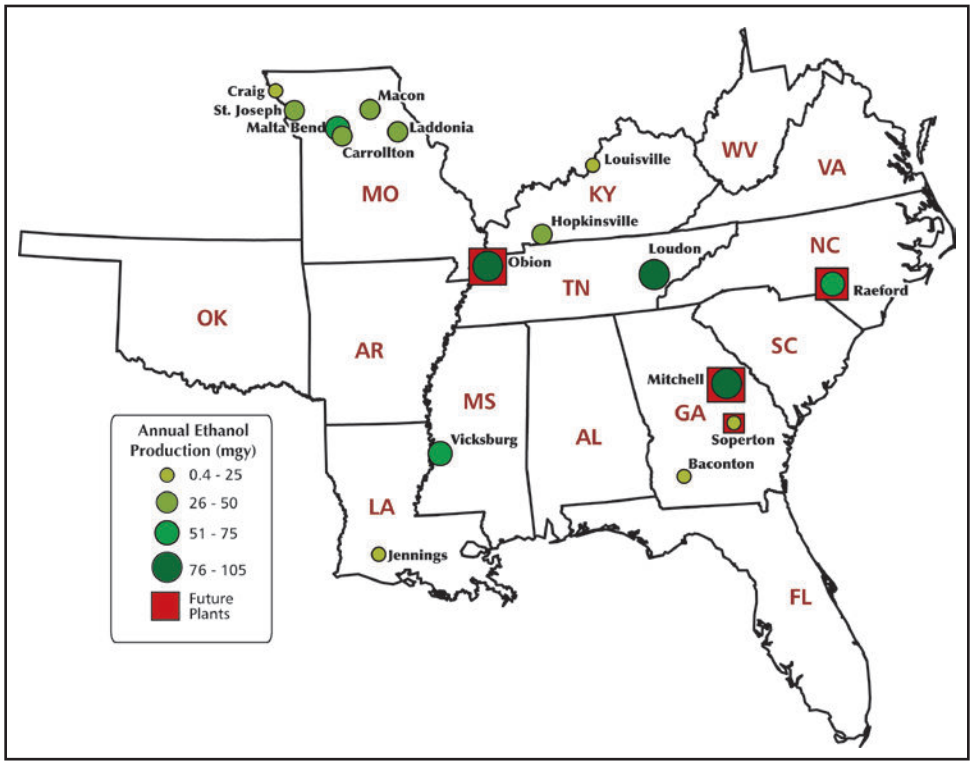
Production of fuel ethanol by conversion of cellulosic feedstocks such as wood and waste materials is widely regarded as the next generation of biofuels. "Next generation" biofuel characteristics include higher net energy yields, reduced greenhouse gas emissions, and use of non-food crops. While the U.S. Department of Energy, National Renewable Energy Laboratory, and other government agencies have made substantial investments in research and development for cellulosic ethanol, there are currently no cellulosic ethanol plants operating commercially in the United States. Two plants under development in the South that will use wood or other cellulosic feedstocks would be the first of their kind in the U.S. Range Fuels in Soperton, GA will use a thermochemical cellulosic conversion process, with a planned capacity of 100 MGY ethanol. Verenium in Jennings, LA is developing a smaller plant that will use a biochemical process to produce ethanol from sugarcane residue.

Table 6: Current and planned ethanol plants in the South, 2008

Company	Capacity (MGY)	Current Capacity (MGY)	Capacity Under Construction (MGY)	Location	Feedstock
Tate & Lyle	105	67	38	Loudon, TN	Corn
Ethanol Grain Processors, LLC	100		100	Obion, TN	Corn
First United Ethanol, LLC	100		100	Mitchell County, GA	Corn
Clean Burn Fuels, LLC	60		60	Raeford, NC	Corn
Show Me Ethanol	55	55		Carrollton, MO	Corn
Bunge-Ergon	54	54		Vicksburg, MS	Corn
POET Biorefining	50	50		Laddonia, MO	Corn
POET Biorefining	46	46		Macon, MO	Corn
Mid-Missouri Energy, Inc.	45	45		Malta Bend, MO	Corn
Lifeline Foods, LLC	40	40		St. Joseph, MO	Corn
Commonwealth Agri-Energy, LLC	33	33		Hopkinsville, KY	Corn
Golden Triangle Energy, LLC	20	20		Craig, MO	Corn
Range Fuels	20		20	Soperton, GA	Wood waste
Parallel Products	5.4	5.4		Louisville, KY	Beverage waste
Verenium	1.5	1.5		Jennings, LA	Sugar Cane bagasse
Wind Gap Farms	0.4	0.4		Baconton, GA	Brewery waste
Total	**735.3**	**417.3**	**318**		

Source: Renewable Fuel Association. List of Fuel Ethanol Producers, Current and Pending, September 2008. Available at http://www.ethanolrfa.org/industry/locations/.

Figure 31: Locations and capacities in million gallons per year of current and future ethanol plants in the South, 2008



6.4% of the Nation's Ethanol is Produced in the South

Source: Renewable Fuel Association. List of Fuel Ethanol Producers, Current and Pending, September 2008. Available at http://www.ethanolrfa.org/industry/locations/.

Biodiesel

According to the National Biodiesel Board (NBB), there are 70 companies in the South producing or marketing biodiesel fuel, including eight firms accredited as BQ-9000 producers. Total biodiesel production capacity in the South is over 500 million gallons per year, representing about 22 percent based on the U.S. total of 2.24 billion gallons in 2007. These facilities utilize feedstocks such as soybean oil, animal fats, and recycled cooking oils. Biodiesel producers and their production capacity are listed in Table 7. Locations of biodiesel production plants are also shown in Figure 32.

Table 7: Biodiesel production plants and capacities in the South, 2007

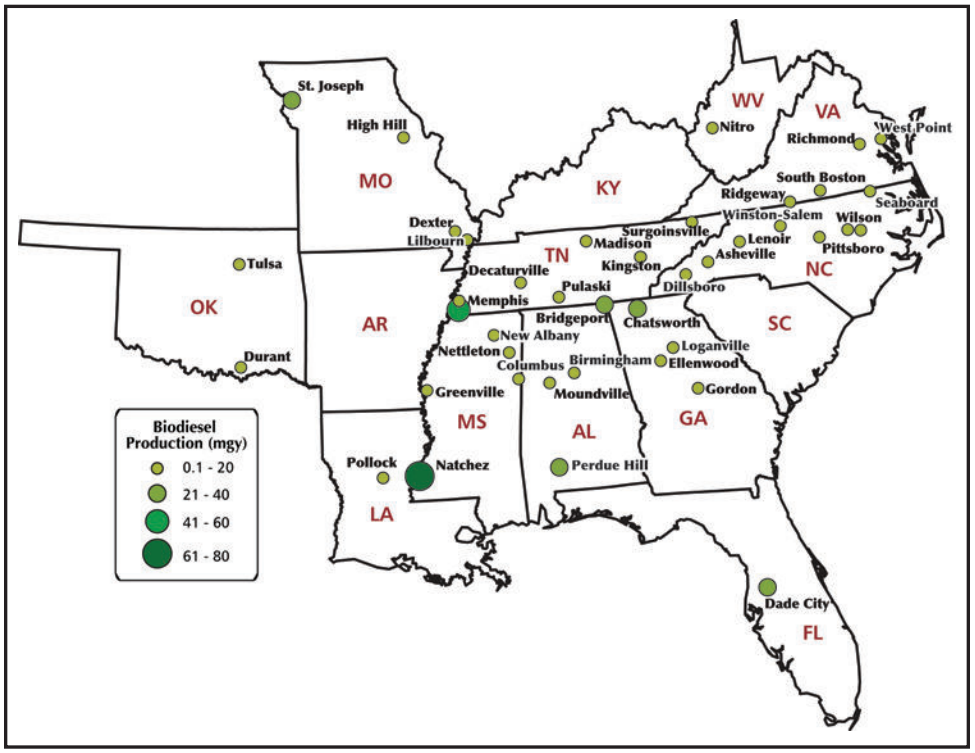
State	Company	Annual Capacity (million gallons)	Location	Primary Feedstock(s)
Alabama	Alabama Biodiesel Corporation	10.0	Moundville	Soy
	Allied Renewable Energy, LLC	15.0	Birmingham	Soy
	Eagle Biodiesel, Inc.	30.0	Bridgeport	Soy
	Independence Renewable Energy Corp.	40.0	Perdue Hill	Various
Florida	Agri-Source Fuels, Inc.	30.0	Dade City	Various, Soy, Animal Fats
Georgia	Alterra Bioenergy of Middle Georgia, LLC	15.0	Gordon	Soy
	BullDog BioDiesel	20.0	Ellenwood	Various
	ECO Solutions, LLC	25.0	Chatsworth	Various
	Georgia Biofuels Corporation	1.0	Loganville	Plant Oils, Animal Fats
Louisiana	Allegro Biodiesel Corporation	12.0	Pollock	Soy
Missouri	AGP	29.9	St. Joseph	Soy
	Global Fuels, LLC	3.0	Dexter	Various
	Great River Soy Processing Cooperative	5.0	Lilbourn	Soy, Poultry Fat
	High Hill Biodiesel, Inc.	5.0	High Hill	Various
Mississippi	CFC Transportation, Inc.	1.5	Columbus	Various
	Delta Biofuels, Inc.	80.0	Natchez	Various
	North Mississippi Biodiesel	7.0	New Albany	Various
	Scott Petroleum Corporation	20.0	Greenville	Various
	Universal Bioenergy North America, Inc.	10.0	Nettleton	n/a
North Carolina	Blue Ridge Biofuels	1.0	Asheville	Various
	Evans Environmental Energies, Inc.	6.0	Wilson	n/a
	Foothills Bio-Energies, LLC	5.0	Lenoir	Various
	Gortman Biofuel, LLC	0.1	Winston-Salem	n/a
	North Carolina BioFuels, LLC	1.0	Seaboard	Various
	Piedmont Biofuels	4.0	Pittsboro	Various
	Smoky Mountain Biofuels, Inc.	1.5	Dilsboro	Various
	Triangle Biofuels Industries, Inc.	3.0	Wilson	Various
Oklahoma	Earth Biofuels, Inc.	10.0	Durant	n/a
	Tulsa Biofuels, LLC	n/a	Tulsa	n/a
Tennessee	BIG Biodiesel, LLC	0.2	Pulaski	Soy
	Biofuel of Tennessee, LLC	10.0	Decaturville	Soy
	Blue Sky Biodiesel, Inc.	3.0	Kingston	Various
	Freedom Biofuels, Inc.	12.0	Madison	Soy
	Memphis Biofuels, LLC	50.0	Memphis	Various
	Milagro Biofuels of Memphis	5.0	Memphis	Soy
	Nu-Energie, LLC	10.0	Surgoinsville	Various

Table 7 cont.

State	Company	Annual Capacity (million gallons)	Location	Primary Feedstock(s)
Virginia	Chesapeake Custom Chemical	5.5	Ridgeway	Various
	RECO Biodiesel, LLC	6.0	Richmond	Various
	Renroh Environmental Company	0.1	South Boston	n/a
	Virginia Biodiesel Refinery	7.0	West Point	Soy
West Virginia	AC & S, Inc.	3.0	Nitro	Soy
Total		**502.8**		

Source: National Biodiesel Board (NBB). Commercial Biodiesel Production Plants, January 2008. Available at http://www.biodiesel.org/buyingbiodiesel/producers_marketers/.

Figure 32: Locations and capacities in million gallons per year of current biodiesel plants in the South, 2007



Source: National Biodiesel Board (NBB). Commercial Biodiesel Production Plants, January 2008. Available at http://www.biodiesel.org/buyingbiodiesel/producers_marketers/.

22% of the Nation's Biodiesel is Produced in the South

Electric power generation from biomass

Use of biomass is well established for electric power generation by utilities and for combined heat and power systems at industrial facilities to meet internal energy needs. Power plants in the South utilized biomass fuels to generate over 25 trillion watt hours of electricity in 2007, which represented about 46 percent of the total U.S. electricity from biomass (Table 8). The state of Florida had the highest power generation in the region from biomass (4.3 trillion watt hours), followed by Alabama, Georgia, and Louisiana, each generating over 3 trillion watt hours. Total biomass fuel consumption by these facilities amounted to 966 trillion Btu, including fuels used for process heating as well as electric

power generation. Biomass fuels include wood/residuals, black liquor, wastewater sludge, biogenic municipal solid waste, and landfill gas (methane). Heating values of the biomass fuels are shown in Table 9. It should be noted that heating values for biomass fuels vary within the given ranges due to moisture content, tree species, conversion technology, and other factors.

Table 8: Biomass fuel consumption and electric power generation in the South, 2007

State	Total Fuel Consumption (billion Btu)	Net Electric Generation (Gigawatt-hours)						
		Agricultural Crops & Residues	Black Liquor & Other Biomass Liquids	Landfill Gas & Other Biomass Gases	Municipal Waste (Biogenic)	Wood & Wood Waste	Sludge and Other Biomass Solids	Total
Alabama	156,825	0	2,590	4	0	1,245	17	3,855
Arkansas	70,169	21	985	10	0	580	2	1,599
Florida	140,717	456	1,135	262	1,621	789	86	4,349
Georgia	154,111	0	2,471	16	10	942	42	3,481
Kentucky	16,161	0	287	93	0	87	2	469
Louisiana	120,637	84	2,015	0	0	981	4	3,084
Missouri	482	0	0	23	0	0	0	23
Mississippi	53,321	5	1,048	0	0	443	0	1,497
N. Carolina	73,445	0	760	84	17	939	1	1,801
Oklahoma	19,479	0	203	0	0	93	0	295
S. Carolina	57,505	0	1,079	62	47	675	0	1,863
Tennessee	28,958	0	306	26	0	139	0	472
Virginia	74,051	0	1,086	109	561	743	23	2,522
West Virginia	47	0	0	0	0	0	0	0
South Total	**965,908**	**567**	**13,965**	**689**	**2,256**	**7,658**	**177**	**25,312**
U.S. total	**1,669,400**	**726**	**18,242**	**7,054**	**8,568**	**20,284**	**525**	**55,400**

Source: U.S. Department of Energy, Energy Information Administration (USDOE-EIA). EIA-906/920 Fuel Stock Data for Electric Power Sector Generating Facilities, 2007. Available at http://www.eia.doe.gov/cneaf/electricity/page/eia906_920.html.

Table 9: Heating values of biomass fuels used by heat and electric power plants

Fuel	Range of Heating Values (Million Btu)
Agriculture Crop Byproducts	7-8 per ton
Black Liquor (sulfate pulpmills)	10-18 per ton
Landfill Gas	0.4-0.5 per Mcf (1000 cubic feet)
Municipal Solid Waste (mixed biogenic & non-biogenic)	5-8 per ton
Other Biomass Solids (animal manure and waste and other solid byproducts)	13-17 per ton
Sludge Waste	3-13 per ton
Wood Waste Solids (paper, pellets, railroad ties, utility poles)	7-18 per ton

Individual power plants and industrial facilities using biomass fuels in the South are listed in Table 10. The locations of these plants are mapped in

Figure 33. There are over 50 such facilities in the region, including many forest product manufacturing plants that utilize their wood by-products.

Table 10: Biomass fuel consumption for electricity generation and combined heat and power plants in the South, 2007

Company	Facility Name	Location	Electric Generation (megawatt-hours)	Fuel Consumption (billion BTU)
Alabama				
Alabama Pine Pulp Co., Inc.	Alabama Pine Pulp	Perdue Hill	418,350	14,523
Alabama River Pulp Co., Inc.	Alabama River Pulp	Perdue Hill	308,333	13,189
DTE Energy Services	Mobile Energy Services, LLC	Pennington	213,210	3,665
Georgia-Pacific Corp.	Georgia Pacific Naheola Mill	Courtland	292,537	12,925
International Paper Co.-Courtland	International Paper Courtland Mill	Selma	393,364	12,198
International Paper Co. – Riverdale	International Paper Riverdale Mill	Phoenix City	281,071	13,544
Mead Coated Board, Inc.	Mead Coated Board	Mobile	599,660	23,426
Rock-Tenn Company	Rock-Tenn Mill	Demopolis	165,853	10,135
Sloss Industries, Inc.	Sloss Industries Corp.	Birmingham	3,511	136
Smurfit-Stone Corp.	Smurfit Stone	Montgomery	259,920	16,613
Weyerhaeuser Co.	Weyerhaeuser Pine Hill Operations	Pine Hill	379,810	11,901
Arkansas				
Crossett Paper Operations	Georgia Pacific Crossett	Ashdown	458,720	19,232
Domtar Industries, Inc.	Ashdown	Crossett	610,705	27,060
Evergreen Packaging, Inc.	Pine Bluff Mill	Pine Bluff	301,062	15,450
Florida				
Buckeye Florida Ltd. Partners	Buckeye Florida LP	Perr	305,635	18,286
Georgia Pacific Corp. – Palatka	Georgia Pacific Palatka Operations	Palatka	305,925	11,753
Hillsborough County	Hillsborough County Resource Recovery	Tampa	107,318	2,045
International Paper Co. – Pensacola	International Paper Pensacola	Pensacola	241,327	10,820
JEA	Northside Generating Station	Jacksonville	288	3
Jefferson Smurfit Corp.	Jefferson Smurfit Fernandina Beach	Fernandina Beach	410,115	13,516
Lee County Board of Commissioners	Lee County Solid Waste Energy	Fort Myers	121,915	2,099
Montenay Power Corp.	Miami Dade County Resource Recovery Facility	Miami	161,430	4,172
New Hope Power Partnership	Okeelanta Cogeneration	Okeelanta	493,782	11,090
Orlando Utilities Commission	Stanton Energy Center	Orlando	69,040	693
Pasco County	Pasco County Solid Waste Resource Recovery	New Port Richey	105,408	1,909
Plummer Forest Products, Inc.	Rayonier Fernandina Mill	Fernandina Beach	165,571	7,545
Solid Waste Authority of Palm Beach	North County Regional Resource	West Palm Beach	194,307	3,778
Veolia ES Pinellas, Inc.	Pinellas County Resource Recovery	St. Petersburg	227,447	4,888
Wheelabrator Environmental Systems	Ridge Generating Station	Lakeland	160,268	3,726
Wheelabrator Environmental Systems	Wheelabrator North Broward	Pampano Beach	226,061	4,703

Table 10 cont.

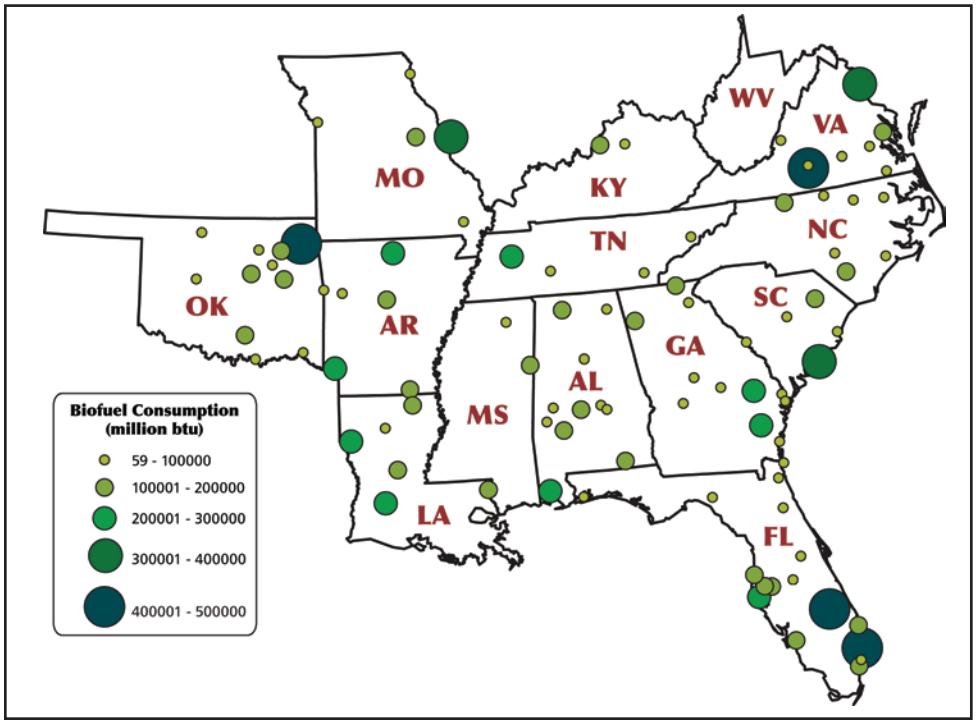
Company	Facility Name	Location	Electric Generation (megawatt-hours)	Fuel Consumption (billion BTU)
Wheelabrator Environmental Systems	Wheelabrator South Broward	Pampano Beach	250,662	4,649
Georgia				
Brunswick Cellulose, Inc.	Brunswick Cellulose	Brunswick	428,654	22,565
Georgia Pacific CSO, LLC	Georgia Pacific Cedar Springs	Cedar Springs	385,352	16,724
Georgia-Pacific Corp. – Savannah	Savannah River Mill	Savanna	3,589	59
Inland Paperboard & Package, Inc.	Inland Paperboard Packaging Rome	Rome	329,685	14,450
International Paper Co.	International Paper Savanna Mill	Savanna	592,438	14,899
International Paper Co. – Augusta	International Paper Augusta Mill	Augusta	349,631	16,868
Plummer Forest Products, Inc.	Rayonier Jesup Mill	Jesup	442,366	22,301
Riverwood Int'l USA, Inc.	Riverwood International Macon Mill	Macon	216,135	10,078
SP Newsprint Company	SP Newsprint	Dublin	41,309	975
Weyerhaeuser Co.	Flint River Operations	Oglethorpe	290,850	12,589
Weyerhaeuser Co.	Port Wentworth Mill	Port Wentworth	288,617	10,063
Kentucky				
Domtar Paper Company, LLC	Kentucky Mills	Frankfort	362,510	14,246
Louisiana				
Boise Packaging & Newsprint, LLC	DeRidder Mill	Deridder	320,757	15,365
Georgia Pacific Corp. – Port Hudson	Georgia Pacific Port Hudson	Port Hudson	444,796	14,020
Graphic Packaging International	Plant 31 Paper Mill	Pineville	298,962	14,786
International Paper Co.	International Paper Louisiana Mill	Bastrop	328,105	11,102
IPC-Mansfield Mill	Mansfield Mill	Mansfield	556,752	19,917
Stone Container Corp.	Stone Container Hodge	Hodge	338,190	13,363
Temple-Inland Corp.	Gaylord Container Bogalusa	Bogalusa	427,700	14,234
Missouri				
City of Marshall	Marshall	Marshall	130	2
Mississippi				
Georgia Pacific Corp.	Georgia Pacific Monticello Paper	Monticello	342,283	16,736
Leaf River Cellulose, LLC	Leaf River Cellulose, LLC	Richton	386,843	10,035
Weyerhaeuser Co.	Weyerhaeuser – Columbus	Columbus	589,047	17,864
North Carolina				
Blue Ridge Paper Products, Inc.	Canton North Carolina	Canton	151,918	10,328
Carlyle/Riverstone Renewable Energy	Coastal Carolina Clean Power	Kansasville	19,643	623
CMS Generation Operating Co. II	Craven County Wood Energy LP	New Burn	386,397	5,961
Domtar Paper Company, LLC	Domtar Paper Co., LLC	Plymouth	533,791	19,656
International Paper Co. – Riegel	International Paper Riegelwood Mill	Riegelwood	191,353	4,446
Primary Energy of North Carolina, LLC	Primary Energy Roxboro	Roxboro	12,014	150
Primary Energy of North Carolina, LLC	Primary Energy Southport	Southport	13,979	243
Oklahoma				
Weyerhaeuser Co. – Valliant	Weyerhaeuser Valliant	Valliant	276,133	15,803
South Carolina				
International Paper Co. – Eastover	International Paper Eastover Facility	Eastover	626,898	18,047
International Paper Co. – GT Mill	International Paper Georgetown Mill	Georgetown	364,429	17,511

Table 10 cont.

Company	Facility Name	Location	Electric Generation (megawatt-hours)	Fuel Consumption (billion BTU)
Smurfit-Stone Container Enterprises, Inc.	Stone Container Florence Mill	Florence	428,917	14,241
South Carolina Electric & Gas Co.	Cogen South	Charleston	334,154	5,630
Tennessee				
Bowater Newsprint Calhoun Operations	Bowater Newsprint Calhoun Operation	Calhoun	105	10,341
Eastman Chemical Co. – TN Operations	Tennessee Eastman Operations	Kingsport	0	394
Packaging Corp. of America	Packaging Corp. of America	Counce	278,769	10,080
Virginia				
Covanta Fairfax, Inc.	Covanta Fairfax Energy	Lorton	340,471	6,277
International Paper	International Paper Franklin Mill	Franklin	346,117	14,127
Smurfit-Stone Container Enterprises, Inc.	Stone Container Hopewell Mill	Hopewell	249,499	7,850
Smurfit-Stone Container Enterprises, Inc.	West Point Mill	West Point	458,477	13,929
Southeastern Public Serv. Auth.	SPSA Waste To Energy Power Plant	Chesapeake	85,662	3,204
Virginia Electric & Power Co.	Altavista Power Station	Altavista	26,850	197
Virginia Electric & Power Co.	Multitrade of Pittsylvania LP	Hurt	439,405	4,894
Westvaco Corp.	Covington Facility	Covington	333,940	18,347

Source: U.S. Department of Energy, Energy Information Administration (USDOE-EIA). EIA-906/920 Fuel Stock Data for Electric Power Sector Generating Facilities, 2007. Available at http://www.eia.doe.gov/cneaf/electricity/page/eia906_920.html.

Figure 33: Locations and capacities of biomass fueled heat and electric power plants in the South, 2007



Source: U.S. Department of Energy, Energy Information Administration (USDOE-EIA). EIA-906/920 Fuel Stock Data for Electric Power Sector Generating Facilities, 2007. Available at http://www.eia.doe.gov/cneaf/electricity/page/eia906_920.html.

Wood pellets

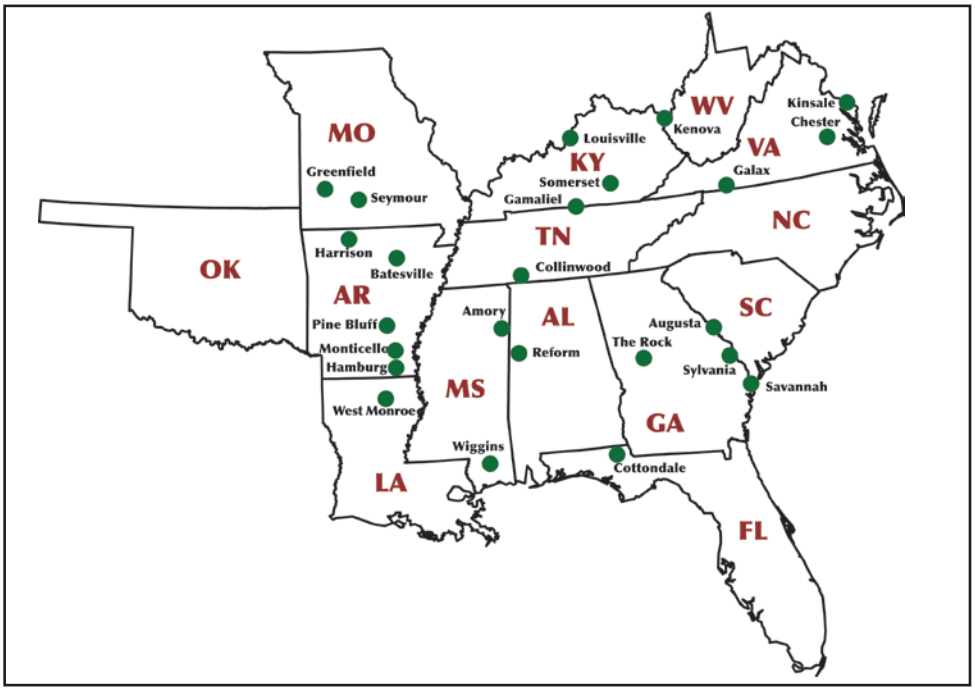
Wood chips and densified wood pellets are used as fuel for commercial/industrial heating and electric power generation. Wood pellets are an attractive fuel because their uniform size and shape facilitate automated handling, and they have an energy value approximately 1.5 times that of normal wood. There are currently a total of 24 pellet fuel manufacturers in the South, including five in Arkansas, four in Georgia, three in Kentucky, and three in Virginia (Table 11). Locations of wood pellet producing facilities are shown in Figure 34.

Table 11: Pellet fuel manufacturers in the South, 2008

Company	Location
Anderson Hardwood Pellets, LLC	Louisville, KY
Barnes Brothers Hardwood Flooring	Hamburg, AR
Bayou Wood Pellets, LLC	West Monroe, LA
CKS Energy	Amory, MS
Equustock, LLC	Chester, VA
Equustock, LLC	Sylvania, GA
Fiber Resources, Inc.	Pine Bluff, AR
Fram Renewable Fuels, LLC	Savannah, GA
Fulghum Fibrefuels	Augusta, GA
FutureFuel Chemical Company	Batesville, AR
Green Circle Bioenergy	Cottondale, FL
Hamer Pellet Fuel Co., Inc.	Kenova, WV
Hassell & Hughes Lumber Company	Collinwood, TN
Nature's Earth Pellet Energy	Reform, AL
Ozark Hardwood Products, LLC	Seymour, MO
Pennington Seed, Inc.	Greenfield, MO
Piney Woods Pellets, LLC	Wiggins, MS
Potomac Supply Corporation	Kinsale, VA
Rock Wood Products, LLC	The Rock, GA
Somerset Pellet Fuel	Somerset, KY
Southern Kentucky Hardwood Flooring	Gamaliel, KY
The Price Companies	Monticello, AR
Turman Hardwood Pellets	Galax, VA
Wabash Wood Products	Harrison, AR

Source: Pellet Fuels Institute. List of pellet fuel manufacturers. Available at http://www.pelletheat.org/3/residential/fuelAvailability.cfm#south.

Figure 34: Location of wood pellet manufacturers in the South, 2008



Source: Pellet Fuels Institute. List of Pellet Fuel Manufacturers. Available at http://www.pelletheat.org/3/residential/fuelAvailability.cfm#south.

Biomass feedstock availability

Availability of biomass resources, referred to as feedstocks, for production of biofuels and biopower is critical to further development of bioenergy commercial activity. Biomass feedstocks evaluated in this report include forest resources, agricultural crops and crop residues, wood mill residues, urban wood wastes, and methane gas from animal manure and landfills.

Forest biomass

Woody biomass from forests is a major resource for combustion/gasification for heat energy and electricity generation, and, potentially, for cellulosic ethanol. The forest products industry is both a source of biomass and a large producer and consumer of biomass energy.

According to the Forest Inventory and Analysis report from the U.S. Department of Agriculture-Forest Service, the South had nearly 9.5 billion dry tons of live biomass inventory on forestlands (Table 12). The state of Georgia had the highest amount of live biomass, with nearly 1 billion dry tons. Alabama, North Carolina, and Virginia each had over 800 million dry tons. Figure 35 shows the inventory of total live forest biomass available in Southern counties. This includes nonmerchantable biomass such as branches, tops, foliage and stumps of trees, as well as the main stem.

In addition to the standing inventory of forest biomass resources, an important consideration for long-term sustainability of bioenergy is the growth of forests.

Net annual growth of forest in the region was estimated at more than 13 billion cubic feet, accounting for 44 percent of the U.S. total (Table 12). The state of Georgia has the highest forest growth with nearly 2 trillion cubic feet per year, while Alabama, Arkansas, Mississippi, North Carolina and South Carolina each have more than one trillion cubic feet. The gross energy value of the net growth of forest biomass represents about 1.575 quadrillion Btu.

Table 12. Summary of forest biomass resources in the South, 2006-07

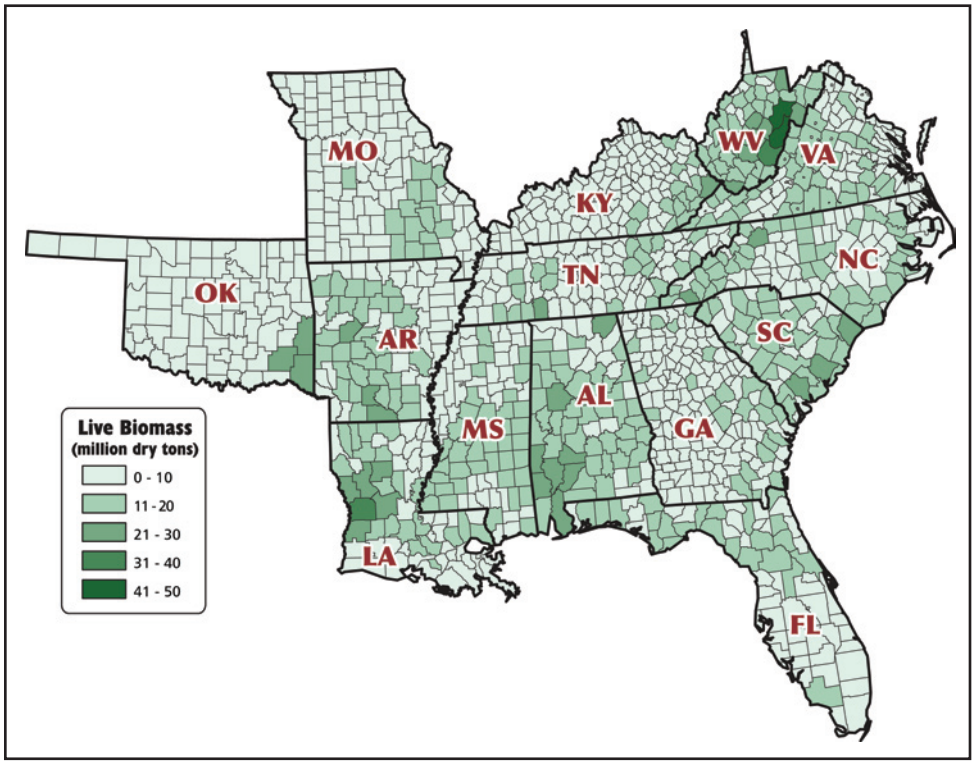
State	Forest land area (million acres)	Total aboveground biomass on timberland (million dry tons)	Net volume on timberland (million cubic feet)	Net annual removals on timberland (million cubic feet)	Net annual growth on timberland (million cubic feet)	Gross Energy Value of Net Growth* (trillion Btu)
Alabama	23	870	32,091	1,157	1,512	181.49
Arkansas	19	757	27,938	810	1,028	123.34
Florida	16	505	18,693	575	735	88.2
Georgia	25	975	36,610	1,341	1,928	231.31
Kentucky	12	580	21,188	296	470	56.37
Louisiana	14	570	22,305	858	833	99.92
Mississippi	20	786	29,510	1,094	1,247	149.67
Missouri	15	592	18,886	187	439	52.62
North Carolina	18	896	35,167	1,075	1,459	175.03
Oklahoma	8	169	4,893	139	243	29.19
South Carolina	13	551	21,134	672	1,037	124.48
Tennessee	14	739	27,363	378	801	96.14
Virginia	16	817	30,978	644	957	114.81
West Virginia	12	688	23,539	158	436	52.36
South Total	**224**	**9,496**	**350,295**	**9,383**	**13,124**	**1,574.93**
United States	**820**	**27,191**	**1,148,567**	**16,472**	**29,840**	**3,580.81**
South's Share of U.S.	**27.4%**	**34.9%**	**30.5%**	**57.0%**	**44.0%**	**44.0%**

Source for forest data: USDA, Forest Service, Forest Inventory and Analysis (FIA), Resource Planning Act (RPA), 2007. Available at http://www.ncrs.fs.fed.us/4801/tools-data/mapping-tools/.

Source for energy conversion factors: U.S. Department of Energy, Oak Ridge National Laboratory (USDOE-ORNL) Bioenergy Conversion factors. Available at http://bioenergy.ornl.gov/papers/misc/energy_conv.html.

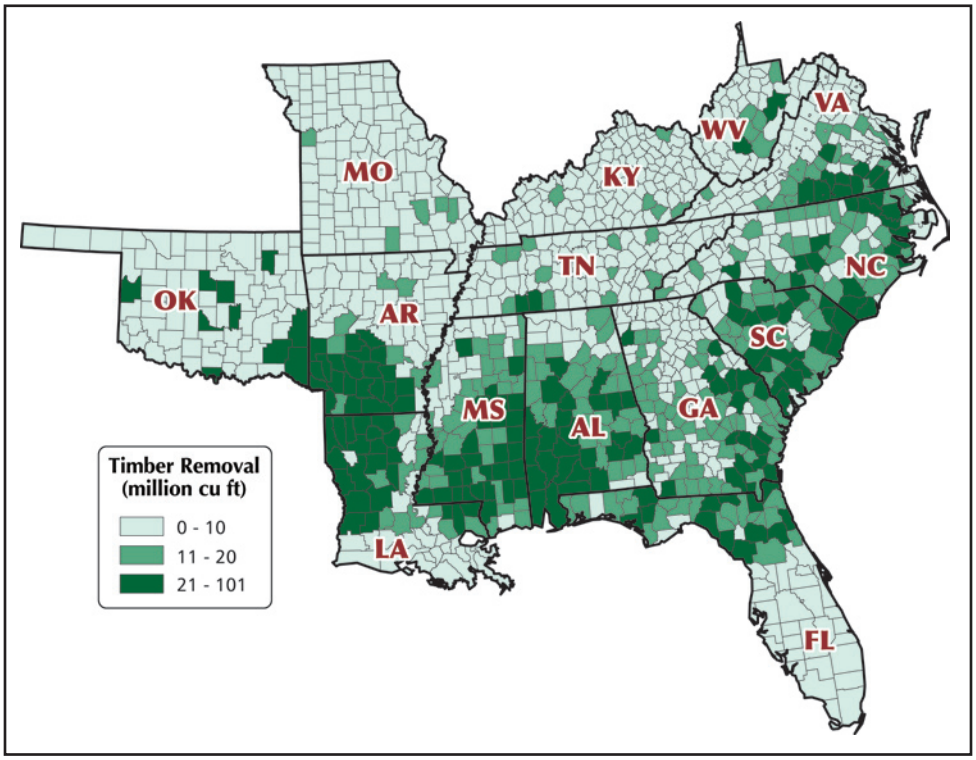
*Gross energy value of net annual growth based on 18.75 pounds per cubic foot and 6,400 Btu per pound.

Figure 35: Inventory of live biomass on forestland in the South by county, 2006-07



Source: U.S. Department of Agriculture, Forest Service (USDA-FS). Forest Inventory and Analysis, Timber Product Output online database; Forest Inventory Database, Mapmaker 3.0 online data retrieval tool. Available at http://www.ncrs.fs.fed.us/4801/tools-data/mapping-tools/.

Figure 36: Timber removals on forestland in the South, 2006-07



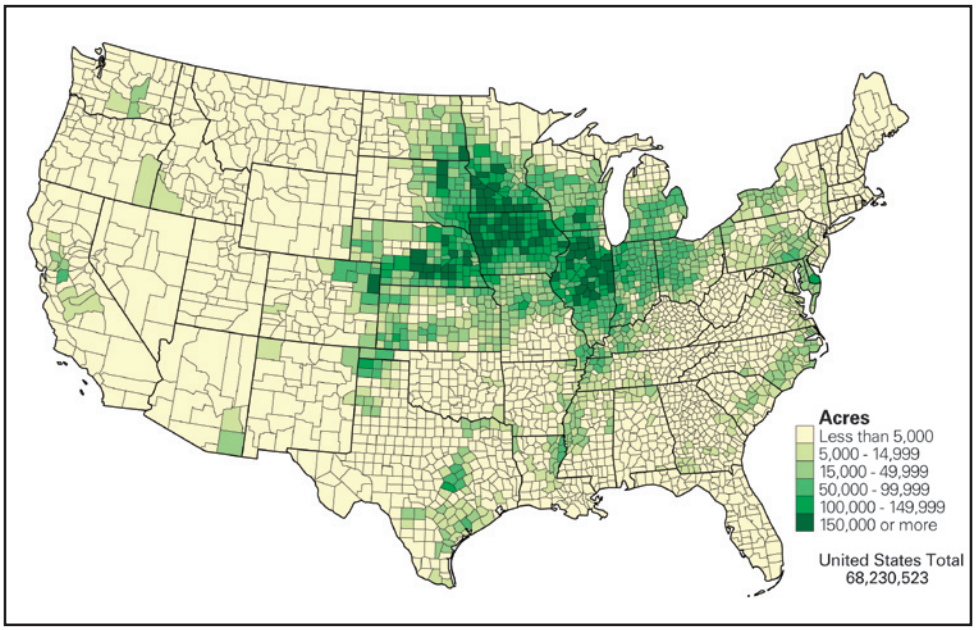
Source: U.S. Department of Agriculture, Forest Service (USDA-FS). Forest Inventory and Analysis, Timber Product Output online database; Forest Inventory Database, Mapmaker 3.0 online data retrieval tool. Available at http://www.ncrs.fs.fed.us/4801/tools-data/mapping-tools/.

Agricultural crops

Agricultural crops such as corn, soybeans, sorghum, hay and other forages may be used for biofuel production. Corn and sorghum are feedstocks for fuel ethanol production while soybeans and other oilseeds are used for production of biodiesel. Hay and other forage crops such as switchgrass may eventually be used for cellulosic ethanol production. Table 13 on page 42 summarizes harvested acreage, production volumes, and gross energy values for corn, soybeans and grain sorghum in the South in 2007, and Table 14 on page 46 shows values for hay/forage crops.

Corn remains the principal feedstock for ethanol production in the U.S. Although corn is produced in all of the Southern states, production levels are modest compared with Midwestern states where the ethanol industry is concentrated. Corn production in the South accounts for about 10.6 percent of total U.S. production. Missouri is the leading state in the region, with 462 million bushels, followed by Kentucky, Mississippi, Louisiana, and North Carolina, each producing more than 100 million bushels of corn in 2007. The gross energy value of corn produced in the region, if converted entirely to ethanol, would be nearly 312 trillion Btu. To put this in perspective, gasoline consumed in the South averages 117 million gallons per day, representing 13,455 trillion Btu (115,000 Btu per gallon) per day. Figure 37 shows harvested acres of corn for grain by county in 2002.

Figure 37: Corn harvested for grain in U.S. by county, 2002

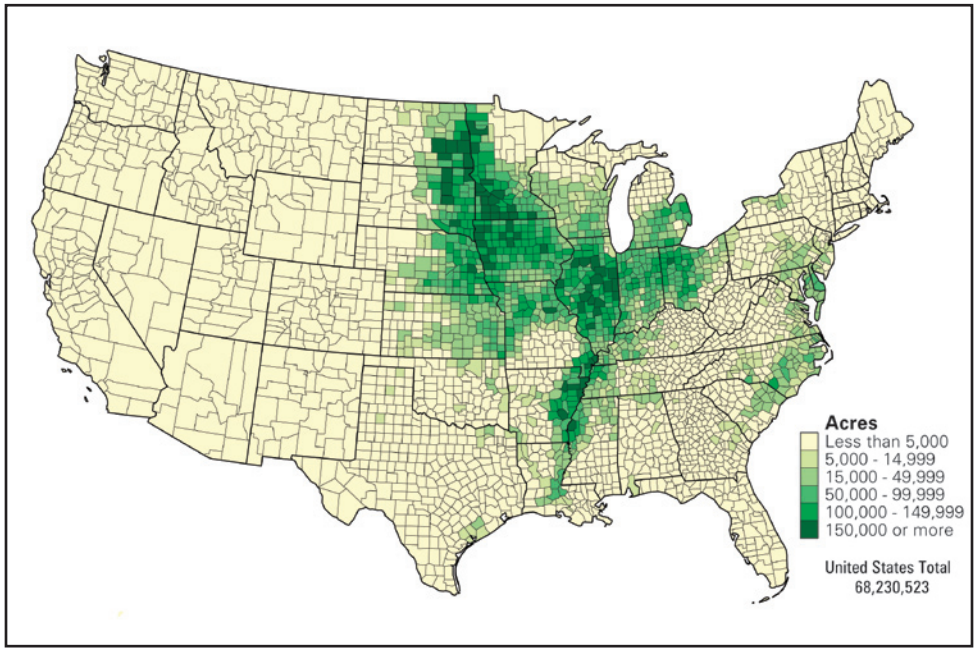


Source: U.S. Department of Agriculture, National Agricultural Statistics Service (USDA-NASS). 2002 Census of Agriculture, Ag atlas maps, Map 02-M178. Available at http://www.agcensus.usda.gov/Publications/2002/Ag_Atlas_Maps/index.asp.

Note: Alaska and Hawaii not shown

Soybeans are a primary feedstock for vegetable oil used for biodiesel fuel and are produced in most Southern states. However, production is probably not sufficient for a biodiesel industry in many places. Soybeans are cultivated on 14.3 million acres in the region, with production of about 466 million bushels, accounting for 18 percent of total U.S. production. Missouri leads the region with 168 million bushels of soybeans in 2007, followed by Arkansas with 100 million bushels. No other states produced more than 60 million bushels. If entirely converted to biodiesel, the gross energy value of soybean production in the region was estimated at about 77 trillion Btu. This compares with an average of 5,090 trillion Btu equivalent per day for consumption of low sulfur diesel in the South. Figure 38 shows harvested acres by county in 2002.

Figure 38: Soybean acreage harvested in U.S. by county, 2002

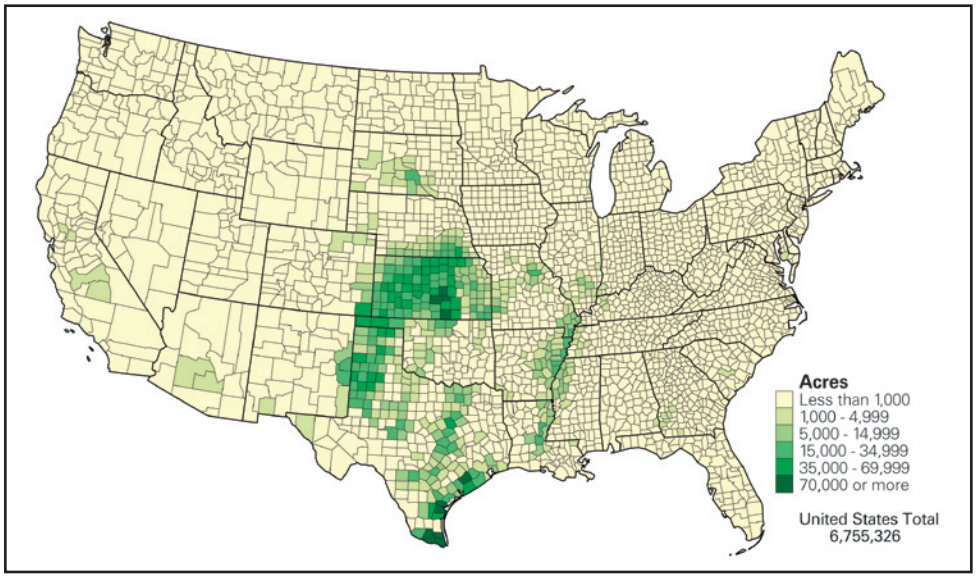


Source: U.S. Department of Agriculture, National Agricultural Statistics Service (USDA-NASS). 2002 Census of Agriculture, Ag atlas maps, Map 02-M212. Available at http://www.agcensus.usda.gov/Publications/2002/Ag_Atlas_Maps/index.asp.

Note: Alaska and Hawaii not shown.

Grain sorghum is used to produce ethanol in Kansas and Texas, where more than 3 million acres are grown. Again, although sorghum is produced in most Southern states, volumes are probably not high enough for commercial ethanol production in most places. Grain sorghum is cultivated on 1.2 million acres in the South, producing about 82 million bushels of grain in 2007, or 16 percent of the U.S. total. Louisiana and Arkansas had the highest grain sorghum production, exceeding 20 million bushels, followed by Oklahoma and Missouri, each with at least 10 million bushels. The potential gross energy value of this grain sorghum if entirely converted to ethanol would be approximately 18.5 trillion Btu. Figure 39 shows harvested acres by county in 2002.

Figure 39: Sorghum acreage harvested in U.S. by county, 2002



Source: U.S. Department of Agriculture, National Agricultural Statistics Service (USDA-NASS). 2002 Census of Agriculture, Ag atlas maps, Map 02-M184. Available at http://www.agcensus.usda.gov/Publications/2002/Ag_Atlas_Maps/index.asp.

Note: Alaska and Hawaii not shown.

Table 13: Potential energy values of corn, soybean and sorghum crops in the South, 2007

State	Corn			Soybeans			Grain Sorghum		
	Area (1000 acres)	Volume (Million Bushels)	Energy Value (Billion Btu)*	Area (1000 acres)	Volume (1000 Bushels)	Energy Value (Billion Btu)*	Area (1000 acres)	Volume (1000 Bushels)	Energy Value (Billion Btu)*
Alabama	280	22	4,999	180	3,780	629	12	270	61
Arkansas	590	99	22,401	2,790	100,440	16,700	225	20,210	4,584
Florida	35	3	751	12	288	48	**	**	**
Georgia	450	59	13,232	275	8,250	1,372	65	2,070	469
Kentucky	1,360	175	39,649	1,080	28,080	4,669	15	1,080	245
Louisiana	730	120	27,222	590	24,780	4,120	250	23,765	5,390
Mississippi	940	141	31,866	1,420	56,800	9,444	145	9,430	2,139
Missouri	3,250	462	104,299	4,550	168,350	27,992	110	10,080	2,286
North Carolina	1,020	102	23,052	1,360	28,560	4,749	105	540	122
Oklahoma	270	39	8,848	175	4,680	778	240	12,760	2,894
South Carolina	370	37	8,362	425	8,140	1,353	10	238	54
Tennessee	785	83	18,805	970	19,190	3,191	22	1,330	302
Virginia	405	34	7,780	480	13,750	2,286	**	**	**
West Virginia	27	3	677	14	462	77	**	**	**
South Total	**10,512**	**1,380**	**311,945**	**14,321**	**465,550**	**77,408**	**1,199**	**81,773**	**18,546**
U.S. Total		**13,074**	**2,954,701**		**2,585,207**	**429,848**		**504,993**	**114,532**
South's share of the U.S.			**10.6%**			**18%**			**16.2%**

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service (USDA-NASS). Crop Production 2007 Summary, January 2008, Cr Pr 2-1(08). Available at http://usda.mannlib.cornell.edu/usda/current/CropProdSu/CropProdSu-01-11-2008.pdf.

U.S. Department of Energy, Oak Ridge National Laboratory (USDOE-ORNL). Energy Conversion Factors. Available at http://bioenergy.ornl.gov/papers/misc/energy_conv.html; Southwest Farm Press, 2008 Penton Media, Inc.

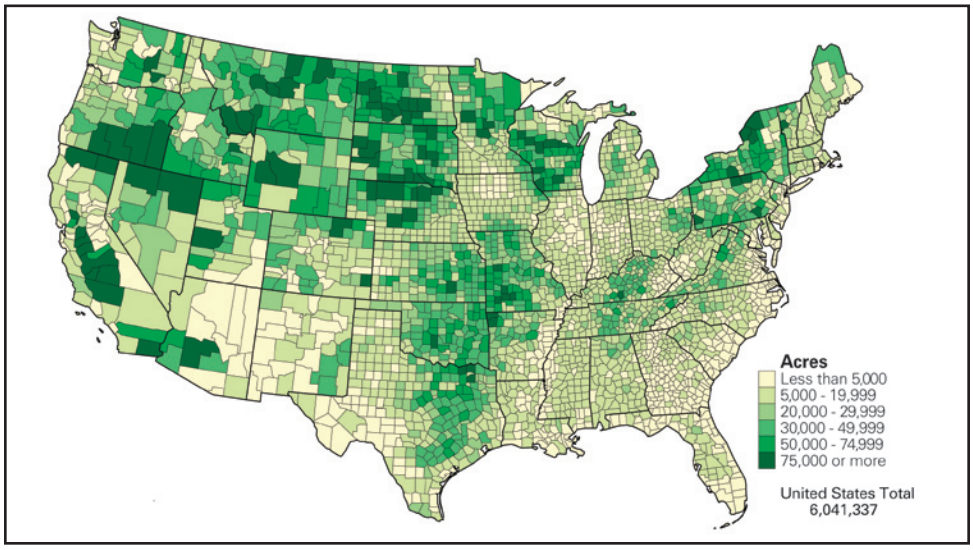
*Gross energy value if converted to ethanol or biodiesl based on 2.7 gallons ethanol per bushel corn or sorghum, and 84,000 Btu/gallon HHV (High Heating Value); 1.42 gallons biodiesel per bushel soy and 117,093 Btu per gallon.

**Values are negligible.

Sugarcane is extensively used to produce fuel ethanol in Brazil and other countries, but is currently not used for this purpose in the United States. Sugarcane is grown in Florida, Hawaii, Louisiana, and Texas. Among the Southern states, sugarcane production in 2007 was about 28 million tons, including 15 million tons in Florida and 13 million tons in Louisiana, with harvested sugarcane acreage of 378,000 and 390,000 acres, respectively. If converted to ethanol, the Btu value of sugarcane produced in Florida and Louisiana would be about 47 trillion Btu.

Hay and other forage crops such as alfalfa can be used directly as a solid fuel, or potentially converted to ethanol via cellulosic technology. Production of hay/forage crops in the South amounted to over 35 million tons in 2007, representing about one third of all hay produced in the U.S. Some of the states in the South are among the top hay and forage crop producers in the U.S.: Missouri and Oklahoma each produced more than 7 million tons of hay in 2007, and Kentucky produced over 4 million tons. The gross energy value of hay/forage production in the South is estimated at 456 trillion Btu. Figure 40 shows harvested acres of hay by county in 2002.

Figure 40: Hay and other forage crop acreage harvested in U.S. by county, 2002



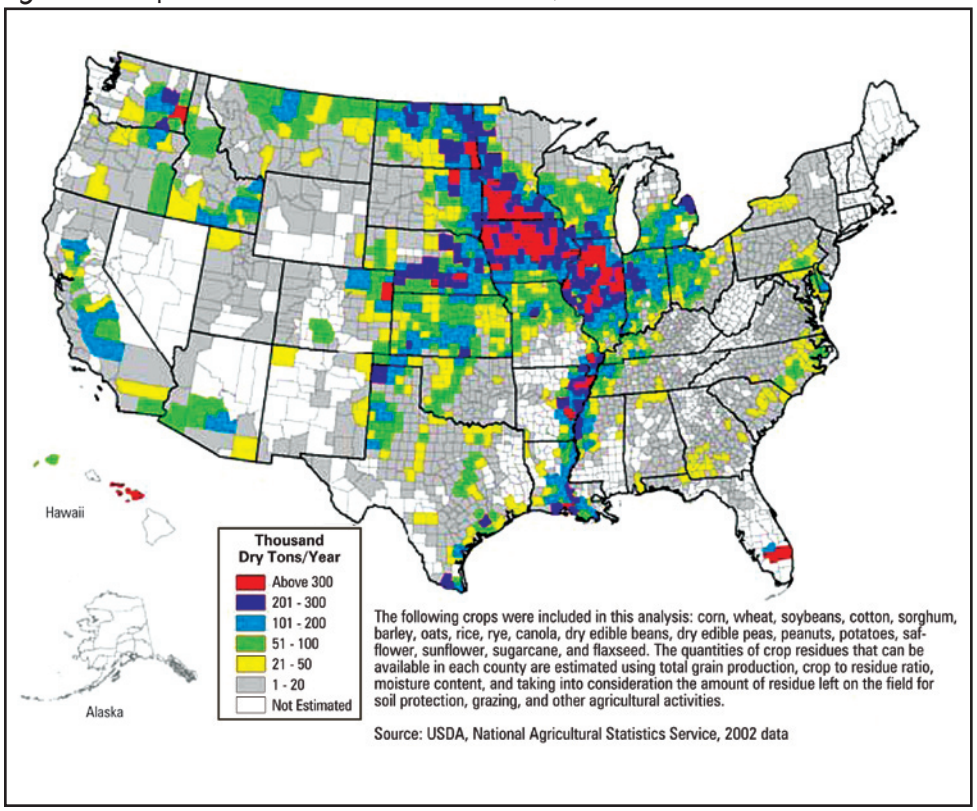
Source: U.S. Department of Agriculture, National Agricultural Statistics Service (USDA-NASS). 2002 Census of Agriculture, Ag atlas maps. Available at http://www.agcensus.usda.gov/Publications/2002/Ag_Atlas_Maps/index.asp.

Note: Alaska and Hawaii not shown.

Byproducts and residual resources

Agricultural crop residues represent another form of biomass feedstock that may be available at low cost. It is estimated that the South has more than 29 million dry tons of crop residues, including six million tons in Missouri, 4.8 million tons in Arkansas, and 4.3 million tons in Louisiana. Although crop residues are attractive for bioenergy utilization, these resources also have an important role in maintaining soil fertility and protecting cropland against erosion, so their removal must be considered on a site-by-site basis. Table 14 on page 46 shows crop residue volumes and equivalent energy values in the South in 2007, and Figure 41 illustrates crop residues across U.S. counties in 2002.

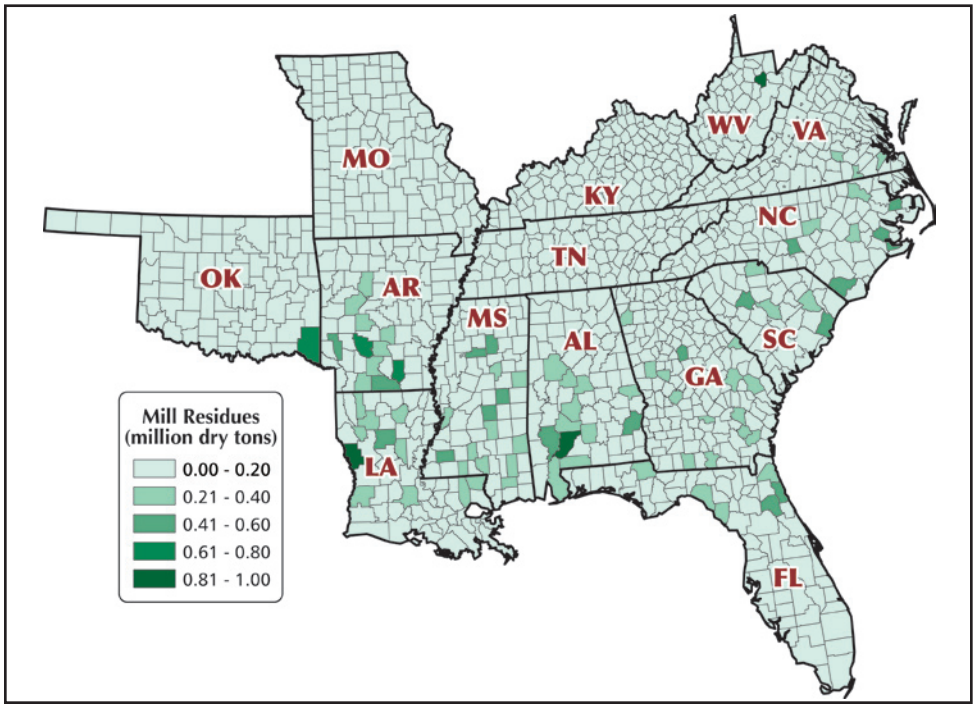
Figure 41: Crop residues available in U.S counties, 2002



Source: Milbrandt, A. A Geographic Perspective on the Current Biomass Resource Availability in the United States, *Technical Report,* National Renewable Energy Laboratory, NREL/TP-560-39181, Dec. 2005.

Industrial mill residues are widely used to produce heat and electricity in the forest products industry. These mill residues are generated by forest product manufacturers. The South generated over 50 million tons of mill residues in 2007, including seven million tons in Georgia, 6.6 million tons in Alabama, 6.5 million tons in Missouri, and more than five million tons in Arkansas and North Carolina. The energy value of these residues was estimated at more than 650 trillion Btu. However, over 90 percent of all mill residues are currently used for fiber byproducts or fuel for on-site operations, so there is limited opportunity for expanded use. Table 14 on page 46 shows the volumes and energy values of mill residues available in the South and Figure 42 shows the volume of wood residues by county.

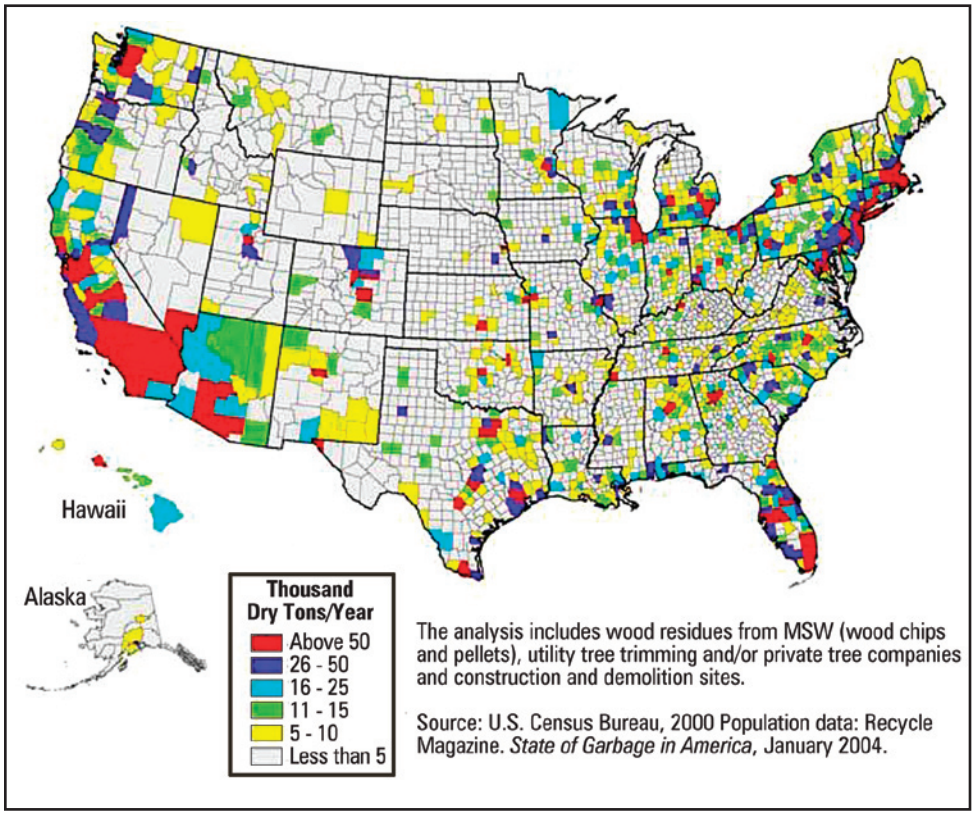
Figure 42: Mill residues in the South by county, 2006-07



Source: U.S. Department of Agriculture, Forest Service (USDA-FS). Forest Inventory and Analysis, Timber Product Output online database; Forest Inventory Database, Mapmaker 3.0 online data retrieval tool. Available at http://www.ncrs.fs.fed.us/4801/tools-data/mapping-tools/

Urban wood residue is potentially a major bioenergy resource and includes wood in municipal solid waste, such as pallets and yard waste, tree trimmings by utilities and tree service companies, and wood contained in construction/demolition debris. There were more than eight million dry tons of urban wood residues in the South in 2005, based on estimated production of 0.33 tons per capita population. Florida generated nearly 1.7 million dry tons of urban wood residues, followed by Georgia (924,000 tons), North Carolina (833,000 tons), and Virginia (813,000 tons). The South represents about 26 percent of the total U.S. urban wood residues. The energy value of this resource is estimated at 104 trillion Btu. Table 14 summarizes urban wood wastes available in the South in 2005, and Figure 43 maps the resource across U.S. counties in 2004.

Figure 43: Urban wood wastes in U.S. by county, 2004



Source: Milbrandt, A. A Geographic Perspective on the Current Biomass Resource Availability in the United States, *Technical Report,* National Renewable Energy Laboratory, NREL/TP-560-39181, Dec. 2005.

Table 14: Potential energy values of hay and other forage crops, crop residues, mill residues and urban wood residues in the South

	Hay and other Forage Crops			Crop Residues		Mill Residues		Urban Wood Residues	
State	Area (1000 acres)	Prod. (1000 dry tons)	Energy Value (Billion Btu)*	Prod. (1000 dry tons)	Energy Value (Billion Btu)*	Prod. (Million dry tons)	Energy Value (Billion Btu)*	Volume (1000 dry tons)	Energy Value (Billion Btu)*
AL	800	1,360	17,408	391	5,005	6.64	84,992	483	6,182
AR	1,580	3,022	38,682	4,796	61,389	5.37	68,736	314	4,019
FL	300	780	9,984	3,263	41,766	2.93	37,504	1,678	21,478
GA	670	1,206	15,437	997	12,762	6.99	89,472	924	11,827
KY	2,700	4,140	52,992	1,772	22,682	1.54	19,712	454	5,811
LA	400	1,200	15,360	4,335	55,488	4.61	59,008	474	6,067
MS	850	1,870	23,936	2,191	28,045	1.15	14,720	307	3,930
MO	4,050	7,528	96,358	6,007	76,890	6.54	83,712	613	7,846
NC	699	1,050	13,440	1,494	19,123	5.25	67,200	833	10,662
OK	3,180	7,044	90,163	1,641	21,005	1.22	15,616	377	4,826
SC	330	561	7,181	331	4,237	2.81	35,968	75	960
TN	1,725	2,443	31,270	1,501	19,213	2.01	25,728	614	7,859
VA	1,340	2,489	31,859	502	6,426	2.9	37,120	813	10,406
WV	600	923	11,814	32	410	0.84	10,752	184	2,355
South Total	**19,224**	**35,616**	**455,885**	**29,253**	**374,438**	**50.81**	**650,368**	**8,143**	**104,230**
U.S. Total		**105,304**	**1,347,892**	**157,194**	**2,012,081**		**1,222,692**	**30,902**	**395,554**
South's Share of U.S.			**33.8%**		**18.6%**		**53.2%**		**26.4%**

*Gross energy values based on 6,400 Btu/pound for air dried material.

Sources: U.S. Department of Agriculture, National Agricultural Statistics Service (USDA-NASS). Crop Production 2007 Summary, January 2008, Cr Pr 2-1(08). Available at http://usda.mannlib.cornell.edu/usda/current/CropProdSu/CropProdSu-01-11-2008.pdf.

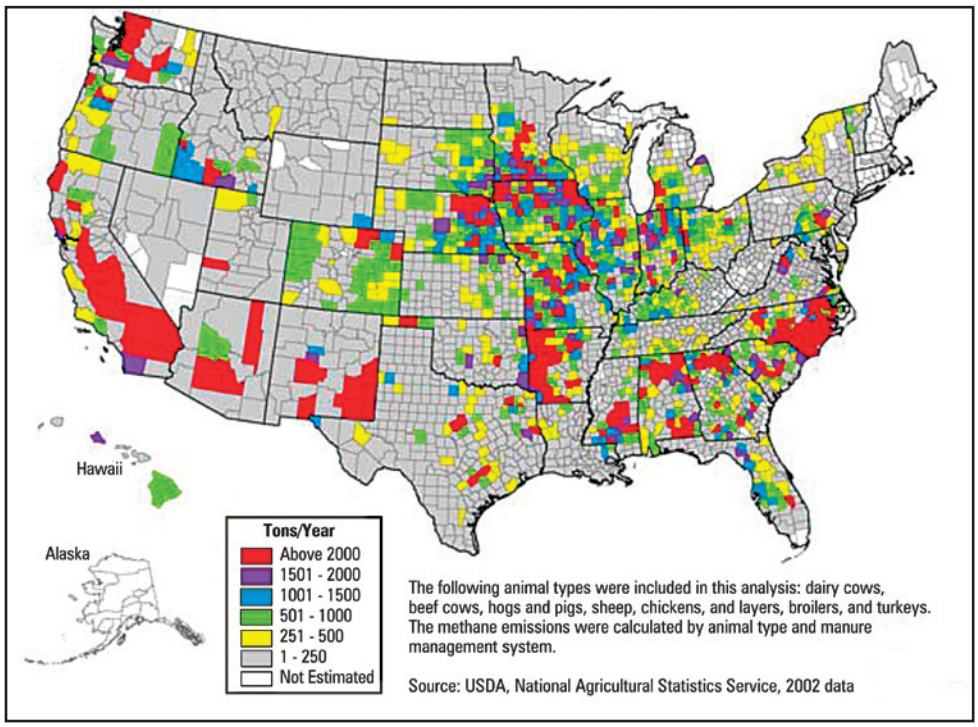
Milbrandt, A. A Geographic Perspective on the Current Biomass Resource Availability in the United States, *Technical Report,* National Renewable Energy Laboratory, NREL/TP-560-39181, Dec. 2005;

U.S. Department of Agriculture, Forest Service (USDA-FS). Forest Inventory and Analysis, Timber Product Output online database; Forest Inventory Database, Mapmaker 3.0 online data retrieval tool. Available at http://www.ncrs.fs.fed.us/4801/tools-data/mapping-tools/.

Biogas Resources

Livestock manure from cattle, swine and poultry are a source of bioenergy when converted to methane (biogas) through anaerobic digestion. The South produced more than 1.1 million dry tons of methane gas from livestock manure in 2005, including 370,000 tons in North Carolina, and over 120,000 tons each in Arkansas, Georgia, and Missouri (Table 15). Methane from livestock manure in the South accounts for about 51 percent of the U.S. total. The energy value of this resource was estimated at about 13 trillion Btu. These estimates are based on the number of each type of animal reported in the Census of Agriculture, together with information on average manure production per animal, the volatile solids content of the manure, and a methane gas density of 0.0413 pound per cubic foot. Capturing this gas through improved manure management would have significant environmental benefits due to reduced green house gas emissions, as well as energy values. Figure 44 provides a map of livestock methane emissions by U.S. counties in 2002.

Figure 44: Methane emissions from livestock manure in U.S by county, 2002

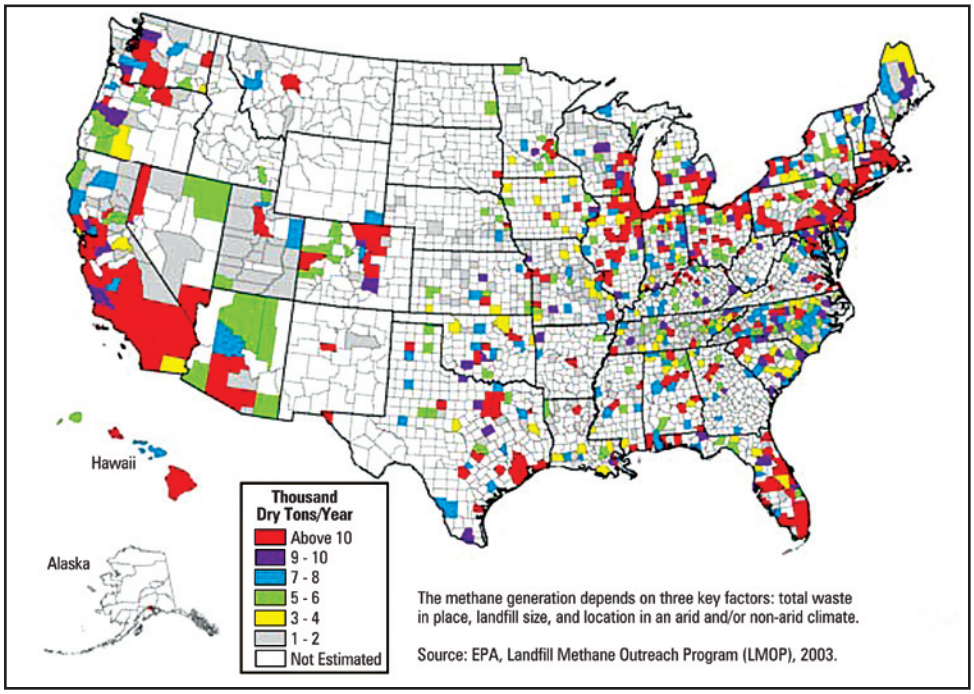


Source: Milbrandt, A. A Geographic Perspective on the Current Biomass Resource Availability in the United States, *Technical Report,* National Renewable Energy Laboratory, NREL/TP-560-39181, Dec. 2005.

Landfill gas emissions are another source of methane commonly used for bioenergy production. Many projects have been undertaken to capture landfill gas for "green" energy programs by electric utilities. The South produced more

than 3 million dry tons of methane gas from landfill emissions in 2005, including 457 tons in Florida and 427 tons in North Carolina (Table 15). The energy value of this resource was estimated at about 35 trillion Btu. Methane from landfills in the South represent about 25 percent of the U.S. total. Figure 45 indicates landfill gas emissions by counties in the U.S. in 2003.

Figure 45: Methane emissions from landfills in U.S. by county, 2003



Source: Milbrandt, A. A Geographic Perspective on the Current Biomass Resource Availability in the United States, *Technical Report,* National Renewable Energy Laboratory, NREL/TP-560-39181, Dec. 2005.

Table 15: Potential energy values of methane emissions from livestock manure and landfills in the South

State	Livestock Manure		Landfills	
	Emissions (1000 tons)	Energy Value (Billion Btu)*	Emissions (1000 tons)	Energy Value (Billion Btu)*
Alabama	94	1,091	236	2,739
Arkansas	145	1,683	11	128
Florida	19	220	457	5,304
Georgia	139	1,613	201	2,333
Kentucky	34	395	250	2,901
Louisiana	6	70	166	1,926
Mississippi	72	836	93	1,079
Missouri	120	1,393	273	3,168
North Carolina	370	4,294	427	4,955
Oklahoma	47	545	153	1,776
South Carolina	30	348	181	2,101
Tennessee	20	232	274	3,180
Virginia	23	267	275	3,191
West Virginia	1	12	47	545
South Total	**1,120**	**12,998**	**3,044**	**35,326**
U.S. Total	**2,189**	**25,404**	**12,380**	**143,671**
South's Share of the U.S.		**51.2%**		**24.6%**

*Gross energy values based on 600 btu per cubic foot and 9.671 cubic feet per pound.

Sources: Milbrandt, A. A Geographic Perspective on the Current Biomass Resource Availability in the United States, *Technical Report,* National Renewable Energy Laboratory, NREL/TP-560-39181, Dec. 2005.

Barker, James C., Water Quality and Waste Management, Methane Fuel Gas from Livestock Wastes, A Summary, North Carolina State University, North Carolina Cooperative Extension Service, Raleigh, NC, March 2001.

Summary of bioenergy feedstock resources

In order to provide a comprehensive view of total available feedstock resources for bioenergy production in the South, energy values of the various resources evaluated are summarized in Table 16. Altogether, the region has annualized bioenergy resources of about 3.66 quadrillion Btu, including 1.58 quadrillion Btu from forest resources; 1.13 quadrillion Btu from crop residues, industrial mill residues and urban wood residues; 911 trillion Btu from crops if entirely converted to biofuels; and 48 trillion Btu from biogas (methane) emitted by landfills and livestock. Among the leading states in the South for aggregated bioenergy resources are Missouri (457 trillion Btu), Georgia (380), Arkansas (342), North Carolina (323), and Alabama (305).

Table 16: Summary of energy values of biomass feedstock resources in the South

State	Biofuel Crops	Forest Resources	Crop, Mill and Urban Wood Residues	Biogas	All Resources (Trillion BTU)
Missouri	231	53	168	5	457
Georgia	31	231	114	4	380
Arkansas	82	123	134	2	342
North Carolina	41	175	97	9	323
Alabama	23	182	96	4	305
Louisiana	74	100	121	2	296
Mississippi	67	150	47	2	266
Florida	36	88	101	6	230
Virginia	42	115	54	3	214
Tennessee	54	96	53	3	206
Kentucky	98	56	48	3	205
South Carolina	17	124	41	2	185
Oklahoma	103	29	41	2	176
West Virginia	13	52	14	1	79
South Total	**911**	**1,575**	**1,129**	**48**	**3,663**
U.S. Total	**4,900**	**3,581**	**3,630**	**169**	**12,281**
South's Share of U.S.	**18.6%**	**44.0%**	**31.1%**	**28.6%**	**29.8%**

Source: Composite data from Southern Bioenergy Roadmap, 2009.

Economic contributions of biopower generation

Bioenergy is an attractive industry for economic development. Through substituting locally available resources for fuels imported from other regions of the U.S. and foreign countries, communities can reduce "leakage" of financial resources, and therefore keep more money in the local economy. To indicate the potential benefits for economic development, the current economic impacts of using biomass fuels for industrial heat and electric power generation in the South were estimated.

Economic contributions of biopower production were evaluated using an analytical procedure known as input-output analysis, which quantifies the interactions within a local economy between businesses, households and governments. Regional input-output models were constructed for each state in the South with the *IMPLAN Pro* software package and associated regional databases licensed to users by the Minnesota *IMPLAN* Group, Inc. The economic data for *IMPLAN* is based on the system of national accounts for the United States, updated annually, with information on industry output, commodity production, employment, labor and property income, inter-regional trade, transfer payments, and capital investment, for households, governments and over 400 industry sectors defined according the North American Industrial Classification System. This modeling system enables estimation of the secondary economic impacts to a regional economy arising from supply chain activities (indirect effects) and employee household spending (induced effects), as well as direct spending.

For the purposes of this project, data on fuel consumption reported by the U.S. Department of Energy, Energy Information Administration (DOE-EIA) was used to input the types of fuel that were used by heat and electric power plants as well as the energy content of the fuels. Annual operating costs for a typical 40 megawatt wood-fueled power plant were applied to estimate costs per million Btu of fuel consumed. Average unit costs for biomass fuels purchased by industrial users reported by DOE-EIA in each state in 2005 ranged from 1.87 dollars per million Btu in Missouri to 2.7 dollars per million Btu in Louisiana, stated in current dollars using the producer price deflator as shown in Table 17.

Table 17: Average unit costs for biomass used by heat and electric plants in the South, 2005

State	Dollars per million Btu*
Alabama	2.56
Arkansas	2.55
Florida	2.39
Georgia	2.69
Kentucky	2.64
Louisiana	2.70
Mississippi	2.56
Missouri	1.87
North Carolina	2.66
Oklahoma	2.38
South Carolina	2.47
Tennessee	2.60
Virginia	2.47

Source: USDOE-EIA, State Energy Data 2005: Prices and Expenditures, Industrial Sector Energy Price Estimates.

* Values stated in 2007 dollars

Using this model, economic contributions of biopower production in the South in 2007 were estimated and summarized in Table 18. For all states in the region, total direct and indirect economic impacts included $7.3 billion in output (revenues), $4.3 billion in value-added (personal and business income), and employment of over 110,000 workers (fulltime, part-time, seasonal). Employment impacts were highest in Georgia, with nearly 20,000 jobs, followed by Florida (17,682), Alabama (16,407) and Louisiana (13,148). Five other states had at least 5,000 jobs. Missouri and West Virginia had negligible economic impacts for biopower generation.

Table 18: Direct and indirect economic contributions of biopower generation by heat and electric plants in the South, 2007

State	Output (Million Dollars)	Value-added (Million Dollars)	Employment (Jobs)
Alabama	1,125	662	16,407
Arkansas	495	284	7,894
Florida	1,149	687	17,682
Georgia	1,366	819	19,981
Kentucky	112	63	1,841
Louisiana	904	536	13,148
Mississippi	356	205	5,615
North Carolina	362	214	5,559
Oklahoma	133	77	2,308
South Carolina	480	284	7,369
Tennessee	189	111	2,787
Virginia	615	369	9,729
Total	**7,286**	**4,312**	**110,319**

Values stated in 2007 dollars. Estimates include secondary (multiplier) effects.

Economic contributions were also estimated for biopower generation by industry sector (Table 19). The agriculture and forestry sectors saw the greatest impacts, with over 60,000 jobs and $1.38 billion in value added, representing the activities associated with biomass feedstock procurement. Other economic sectors with significant employment impacts included local, state and federal government (7,831), professional and technical services (6,588), retail trade (6,511), and health and social services (5,089).

Table 19: Direct and indirect economic contributions by industry group for biopower generation by heat and electric plants in the South

Industry Group	Output (Million Dollars)	Value Added (Million Dollars)	Employment (Jobs)
Agriculture, Forestry, Fisheries	2,327	1,375	60,006
Mining	30	17	112
Utilities	156	102	401
Construction	267	116	2,694
Manufacturing	605	182	1,971
Wholesale Trade	196	149	1,522
Retail Trade	337	253	6,511
Transportation & Warehousing	123	70	1,242
Information	125	59	471
Finance & Insurance	313	205	2,161
Real Estate & Rental	235	157	1,807
Professional, Scientific & Tech Services	648	390	6,588
Management of Companies	67	39	436
Administrative & Waste Services	159	88	2,551
Educational Services	35	19	759
Health & Social Services	371	232	5,089
Arts- Entertainment & Recreation	41	25	836
Accommodation & Food Services	182	88	3,973
Other Services	171	89	3,360
Government & Non NAICs	884	657	7,831
Institutions	13	0	0
Total	**7,286**	**4,312**	**110,319**

Values stated in 2007 dollars. Estimates include secondary (multiplier) effects. Employment impacts include fulltime, part-time, and seasonal jobs.

Bioenergy-related companies in the South

A listing of bioenergy-related companies was compiled from the *One Source Business Directory* using relevant keywords such as "biomass," "biofuel," "biodiesel," "ethanol," "biopower," "bioenergy," and "wood energy." This listing, provided in Appendix A, includes information describing the business, company location, ownership type, and in some cases employment.

III. Policy Inventory

Section III itemizes bioenergy policies in each of the Southern states. Appendix B provides a full listing of bioenergy policies in the South. Data points include:

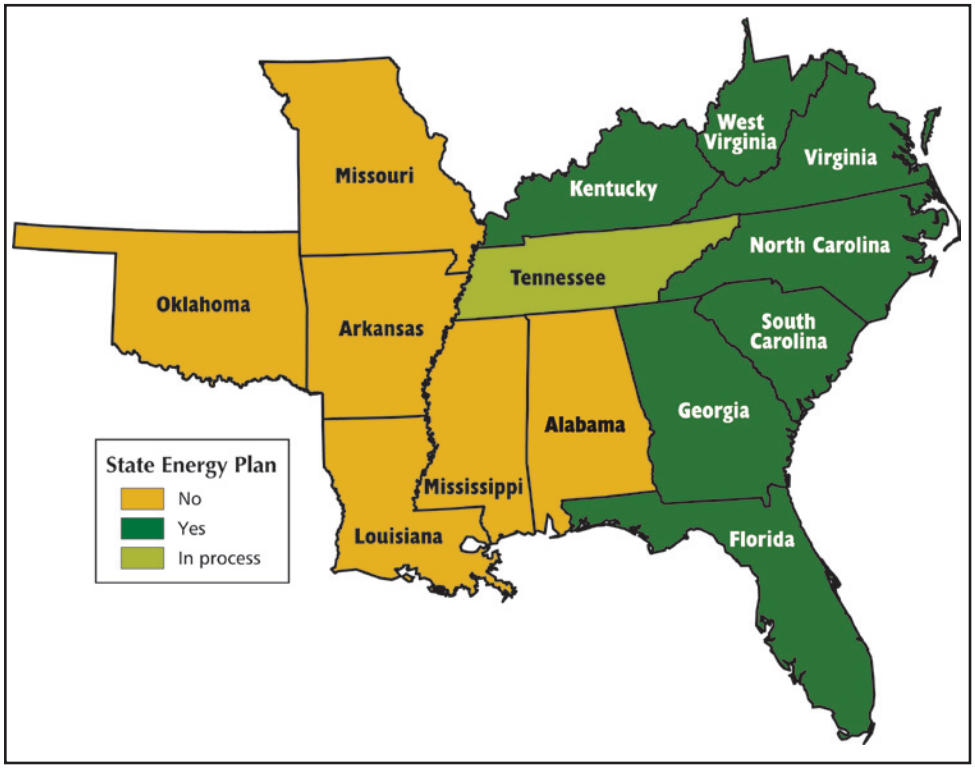
- State energy plans
- Regulatory mechanisms
- Incentive-based policies
- Support-based programs

State energy plans

Over the last decade, many states have developed and integrated comprehensive state energy plans to maximize resources within their state. Of the 14 Southern states, seven have passed comprehensive state energy plans. Other states have started to develop energy plans, such as in Tennessee, where legislation to develop a state energy plan has been passed and work is underway.

There are also challenges and impediments to the development of energy plans in certain states. For example, in Oklahoma, proposed legislation to require the Oklahoma Secretary of Energy to develop a State Energy Plan was defeated in 2008. Figure 46 identifies the Southern states that have already developed energy plans and those who are in the process of developing energy plans.

Figure 46: State energy plans in the South, 2008



Source: Compiled through the Database of State Initiatives for Renewables & Efficiency (DSIRE), literature review, and personal interviews by University of Florida Research Team.

Policies and programs

As seen in Table 20, Southern states have implemented a number of bioenergy policies. These policies can be categorized into three subgroups — regulatory mechanisms, incentive-based policies, and support-based policies:

- Regulatory mechanisms are government policy instruments which regulate, mandate, or restrict in order to promote bioenergy development. The primary regulatory mechanisms used in the South are blending requirements (also called renewable fuel standards), renewable energy standards (also called renewable portfolio standards), net-metering, interconnection standards, and alternative fuel vehicle (AFV) acquisition regulations.
- Incentive-based policies aid bioenergy suppliers, producers or consumers through financial instruments such as subsidies, production incentives, or grants. The types of incentive-based policies most frequently identified within the South are tax incentives, subsidies, grants, low-interest loans and loan guarantees.
- Support-based programs play a vital role in creating initiatives for the development of bioenergy. Support-based programs include biofuel infrastructure development, bioenergy production assistance, technical assistance and public outreach, and advancement of bioenergy technologies.

These policies are explained in detail in the following section.

Table 20: Summary of bioenergy policies by state, 2008†

State	State Energy Plan	Regulatory Mechanisms				Incentive-based Policies			Support-based Policies		
		RFS	RPS	Both NM/IC	AFV	Tax	Sub/ Grant	Loan	Prod. & Infra.	Exten. & Educ.	Tech.
Alabama						X	X			X	X
Arkansas		X		X	X	X	X		X		X
Florida	X	X		X	X	X	X		X	X	
Georgia	X			X	X	X	X		X		
Kentucky	X			X	X	X			X	X	X
Louisiana		X		X		X			X	X	
Mississippi							X		X	X	
Missouri		X	X	X	X	X	X	X	X	X	X
North Carolina	X		X	X	X	X	X	X	X	X	X
Oklahoma					X	X		X	X	X	
South Carolina	X	X			X	X	X		X		X
Tennessee					X		X	X	X	X	X
Virginia	X		X	X	X	X	X	X	X		
West Virginia	X			X	X					X	

Source: Bioenergy policy information compiled by University of Florida research team.

† **Abbreviation Key**
RFS – Renewable Fuel Standard
RPS – Renewable Portfolio Standard (mandatory and voluntary)
NM/IC – States have both Net-metering/Interconnection standards
AFV – Alternative fuel vehicle acquisition regulations
Tax – Tax incentives
Sub/Grant – Subsidies and grants
Loan – Loan-based policies
Prod. & Infra. – Production and infrastructure development
Exten. & Educ. – Extension and educational outreach
Tech. – Technology advancement policies

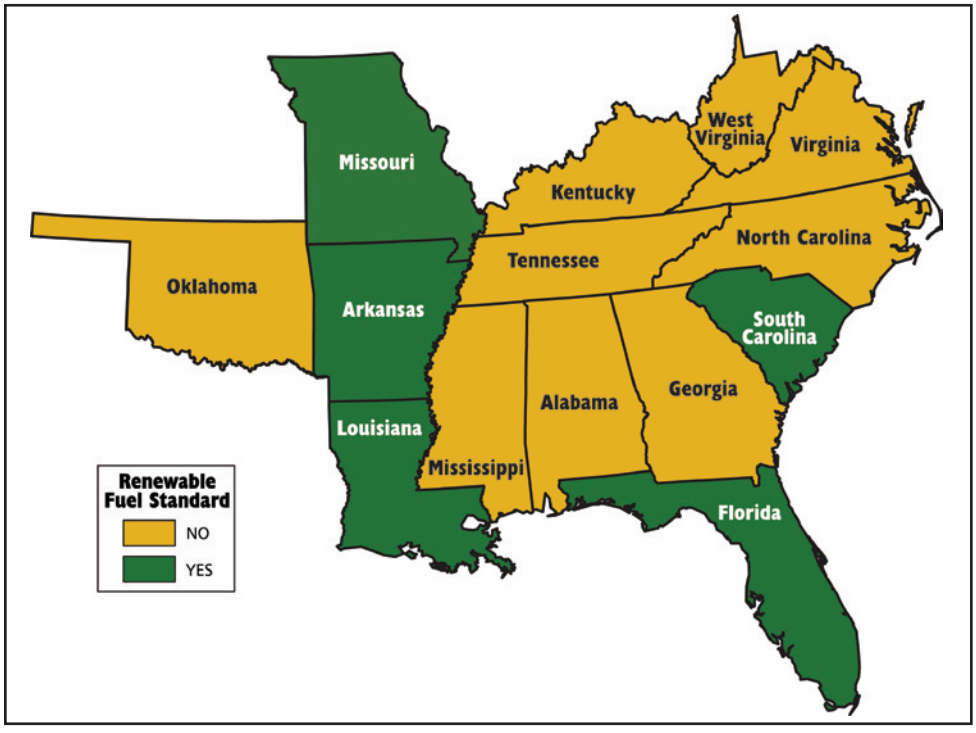
Regulatory mechanisms

Regulatory mechanisms place requirements or restrictions on public or private energy production or consumption. Southern states have implemented a variety of regulatory mechanisms, although the scope and intentions of them vary significantly across the region. These mechanisms can be broadly categorized into the following three categories: renewable fuel and electricity standards, net-metering and interconnection standards, and alternative fuel vehicle (AFV) acquisition regulations.

Renewable fuel standards

Renewable fuel standards are policies which require a certain amount of the transportation fuel consumed in the state to come from renewable fuels. For example, in Missouri, the policy requires that after January 1, 2008, all gasoline sold or offered for sale at retail stations within the state must contain 10 percent ethanol. In Arkansas, all diesel-powered motor vehicles owned or leased by a state agency must be operated with at least 2 percent biodiesel. Figure 47 illustrates the states in the South which have adopted renewable fuel standards.

Figure 47: Renewable fuel standards in the South, 2008

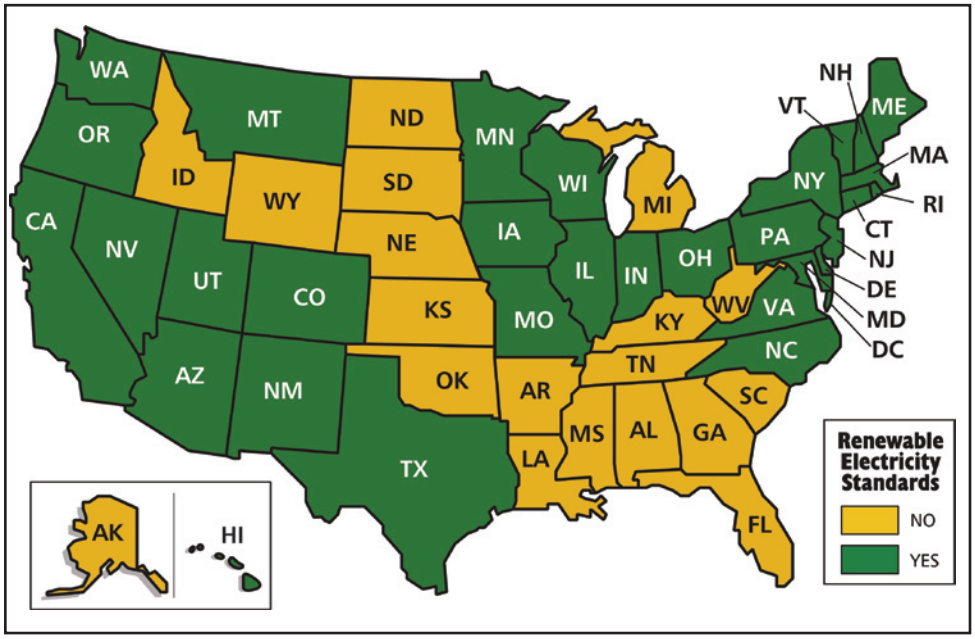


Source: Compiled through the Database of State Initiatives for Renewables & Efficiency (DSIRE), literature review, and personal interviews by University of Florida Research Team.

Renewable electricity standards

Figure 48 illustrates the states in the U.S. that have passed renewable electricity standards. These standards are regulations requiring a certain percentage of total electricity consumption come from renewable energy. For example, North Carolina adopted a renewable energy and energy efficiency standard, which requires the state's investor-owned utilities to supply 12.5 percent of retail electricity sales by 2021 from renewable energy and efficiency sources. Municipal utilities and electric cooperatives must meet a target of 10 percent by 2018. Recently, Missouri voters passed a referendum that 15 percent of the state's electricity needs come from renewable sources by 2021. Virginia has a voluntary goal for investor-owned utilities. The goal is for seven percent of base year sales in 2017 through 2021, and 12 percent of base year sales in 2022 to come from eligible renewable energy sources.

Figure 48: Mandatory and voluntary renewable electricity standards in the U.S., 2008



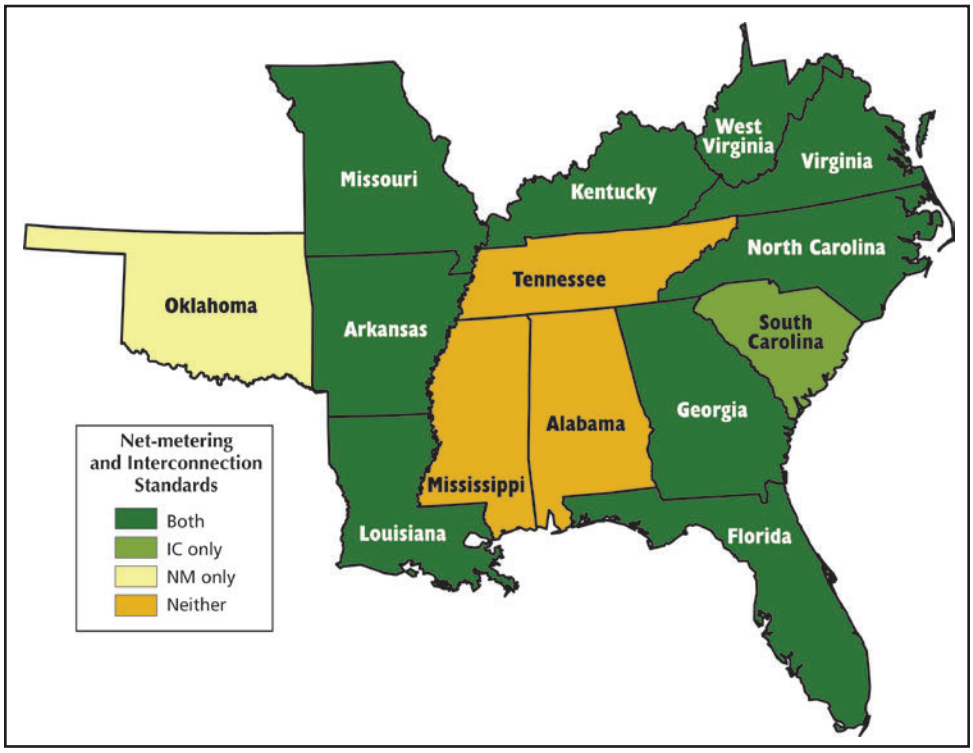
Source: Department of Energy, Energy Efficiency & Renewable Energy, January 2009. Available at http://apps1.eere.energy.gov/states/maps/renewable_portfolio_states.cfm#map.

Net-metering and interconnection standards

Net-metering and interconnection standards are electricity policies for customers who produce their own electricity. Net-metering enables these customers to offset their consumption by allowing their electric meters to run backwards when they generate electricity in excess of their demand. Interconnection standards are safety and power quality requirements which must be met before a customer can connect a renewable power generator to the electric grid. These policies allow citizens to reduce their electric bills, and reduce energy demand from non-renewable sources.

Figure 49 identifies the Southern states that have adopted net-metering and interconnection standards. Ten of the fourteen states have adopted net-metering and ten states have adopted interconnection standards. Nine states have adopted both policies.

Figure 49: Net-metering and interconnection standards in the South, 2008



Source: Compiled through the Database of State Initiatives for Renewables & Efficiency (DSIRE), literature review, and personal interviews by University of Florida Research Team.

Levels and types of net-metering differ from state to state. For example, Oklahoma requires investor-owned utilities and electric cooperatives to pay net-metering tariffs to customer-owned renewable-energy systems and combined-heat-and-power (CHP) facilities up to 100 kilowatts. Net-metering is available to all customer classes and there is no limit on the amount of aggregate net-metered capacity. In West Virginia, net-metering applies to residential and commercial systems up to 25 kilowatts that generate electricity using photovoltaic, wind, biomass, landfill gas, hydropower or fuel cells. The regulations do not include an aggregate cap on net-metered systems, but each utility's tariff will limit the aggregate capacity to 0.1 percent of the utility's total load.

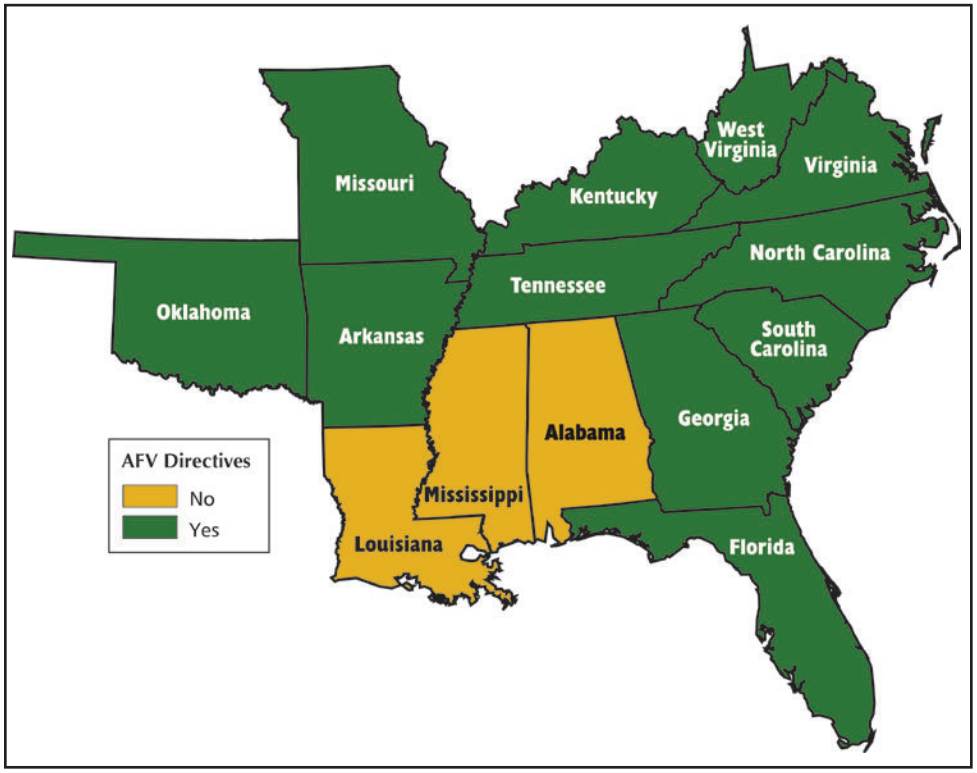
As noted by the Network for New Energy Choices in "Freeing the Grid," many of these policies seek to maintain the stability of the grid and the safety of those who use and maintain it. Additionally, some states aim policies at individual homes or businesses, which are more likely to use solar or fuel cell technologies rather than biomass.

Alternative fuel vehicle (AFV) acquisition regulations

Many states have used government agencies to lead bioenergy development through the acquisition of alternative fuel vehicles for state agencies, local governments, and/or state employees. For example, Georgia state agencies and departments are required to prioritize the procurement of high fuel efficiency and flexible fuel vehicles when such technologies are commercially available and economically practical. In addition, all state-owned fueling facilities are required to maximize the purchase of ethanol-blended gasoline and biodiesel for use in state vehicles when available and economically practical.

Figure 50 illustrates that 11 of the 14 states in the South have adopted some type of AFV acquisition regulation. States that have not adopted these policies are Alabama, Louisiana, and Mississippi.

Figure 50: Alternative fuel vehicle acquisition policies in the South, 2008



Source: Compiled through the Database of State Initiatives for Renewables & Efficiency (DSIRE), literature review, and personal interviews by University of Florida Research Team.

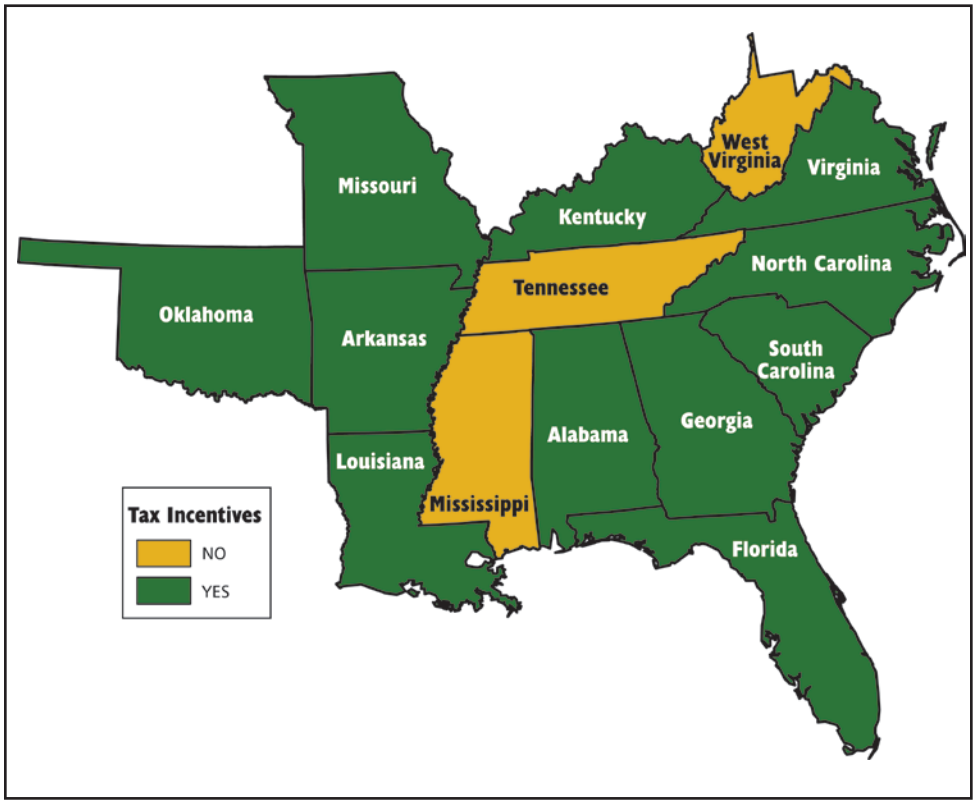
Incentive-Based Policies

Thirteen of the Southern states have adopted incentive-based policies. These policies provide financial incentives to develop bioenergy initiatives. There are three major types of incentive-based policies in the South: tax incentives, subsidies or grants, and loans.

Tax incentives

In order to promote bioenergy development, governments often offer tax incentives to individuals and businesses. Due to the differences in state tax codes, the objectives of these policies vary significantly from state to state. For example, Florida provides a credit against the state sales and use tax for 75 percent of all capital operation and maintenance, and research and development costs due to the production, storage, and distribution of biodiesel (B10-B100) and ethanol (E10-E100) up to a maximum of $6.5 million per fiscal year. In Kentucky, qualified biodiesel producers or blenders are eligible for an income tax credit of $1.00 per gallon of pure biodiesel (B100) produced or $1.00 per gallon of biodiesel in the blending process up to an annual cap of $5 million. Figure 51 illustrates that 11 of the 14 states in the South have passed some form of tax incentive for bioenergy.

Figure 51: Tax-based incentive policies in the South, 2008



Source: Compiled through the Database of State Initiatives for Renewables & Efficiency (DSIRE), literature review, and personal interviews by University of Florida Research Team.

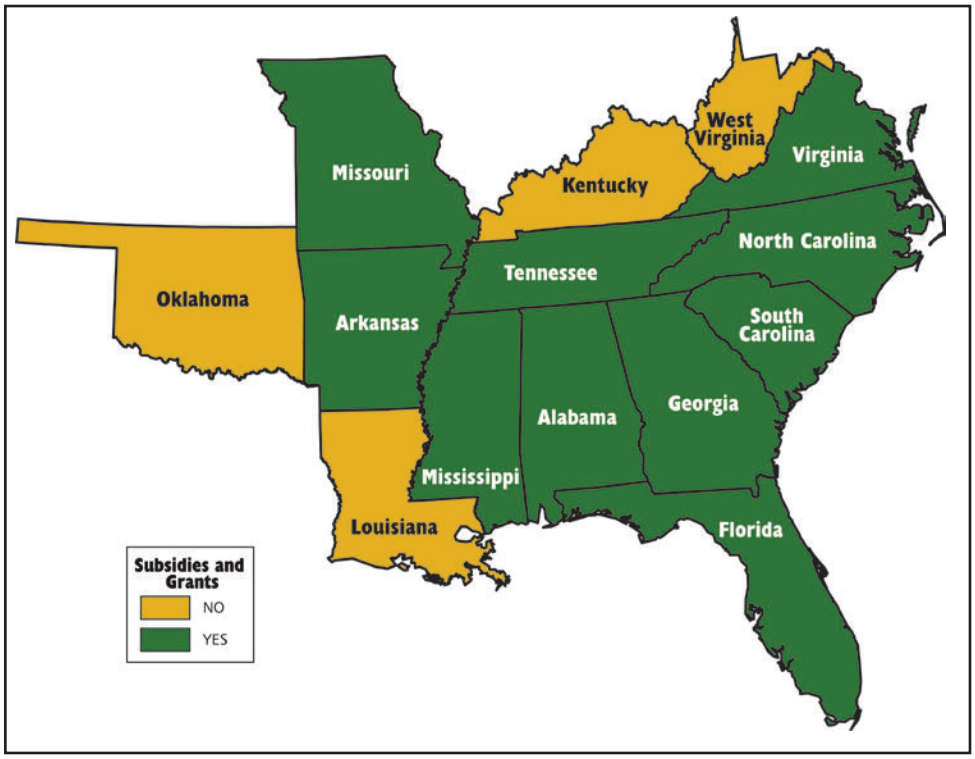
Subsidy and grant-based incentives

Subsidy and grant-based policies provide financial assistance to an individual or business to lessen the financial risk of new facilities. Subsidies and grants differ in structure and size. For example, Georgia has adopted a grant-based initiative where up to $20,000, or one-third of the total planned project cost, will be made available for each approved E85 fueling infrastructure project. Tennessee has implemented several subsidy and grant-based programs, including the Tennessee biodiesel manufacturers' incentive fund which provides $0.20 per gallon of biodiesel fuel produced and sold to Tennessee companies, up to 10 million gallons annually. Figure 52 illustrates that ten states in the South have adopted subsidy or grant-based policies.

Loan-based policies

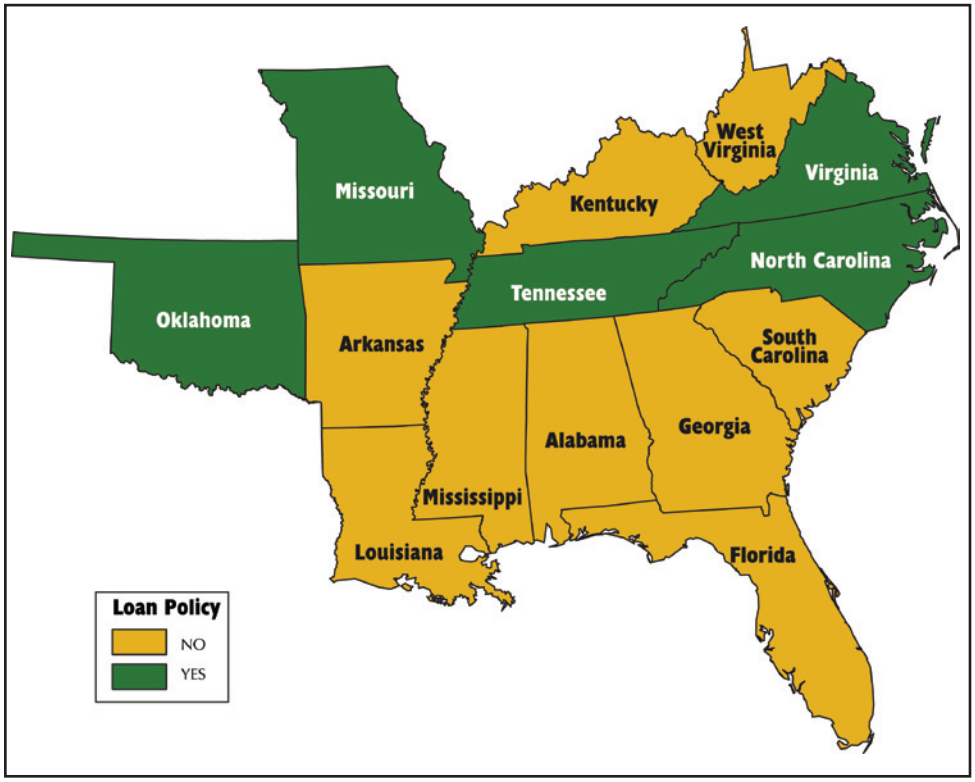
Loan-based policies provide loans with low or no interest to individuals, governments, and businesses. For example, Virginia allows its Board of Education to grant loans to school boards that convert school buses to alternative fuels or construct alternative fueling stations. In North Carolina, state and local government credit unions offer green vehicle loans for new alternative fuel vehicles. The loans are offered at a one percent interest rate discount as compared to traditional new vehicle loan rates. Figure 53 illustrates that five states in the South have implemented some form of loan-based policy for bioenergy.

Figure 52: Subsidy and grant-based policies in the South, 2008



Source: Compiled through the Database of State Initiatives for Renewables & Efficiency (DSIRE), literature review, and personal interviews by University of Florida Research Team.

Figure 53: Loan-based policies in the South, 2008



Source: Compiled through the Database of State Initiatives for Renewables & Efficiency (DSIRE), literature review, and personal interviews by University of Florida Research Team.

Support programs

Government can also play a vital role in funding and implementing education and outreach information on the benefits of bioenergy to states, communities, farms, industries, and consumers. Existing Southern support programs are aimed at biofuel infrastructure development, bioenergy production, technical assistance, public educational outreach, and advancement of bioenergy technologies.

Bioenergy production and infrastructure development

Twelve of the fourteen states in the South have implemented both bioenergy production policies and policies which focus on biofuel infrastructure development. Bioenergy production policies promote the increased production of all types of bioenergy. The majority of policies in the South promote the production of biofuels, particularly ethanol. These policies come in the form of subsidies, tax incentives, and support mechanisms. For example, Mississippi's Commissioner of Agriculture and Commerce is authorized to make direct payments to ethanol and biodiesel producers. Producers can receive $0.20 per gallon, up to 30 million gallons per year, for a period of up to 10 years following the start date of production. However, while this policy exists, it has never been funded. In Kentucky, qualified ethanol producers are eligible for an income tax credit of $1.00 per gallon of corn- or cellulosic-based ethanol that meets industry standards.

Many states have also implemented policies to promote the development of biofuel infrastructure. These policies increase the availability of biofuels throughout the state. Louisiana offers an income tax credit worth 20 percent of the construction cost of an alternative fuel station. In South Carolina, any taxpayer that constructs, installs, and operates a qualified commercial facility for distribution or dispensing of renewable fuels is eligible for a tax credit of up to 25 percent of the construction and installation costs.

Extension and educational public outreach

Ten of the fourteen states in the South have implemented some form of technical or educational policy for bioenergy. Some states do not provide direct financial assistance to bioenergy initiatives, but provide technical assistance for the creation or expansion of bioenergy production or facilities. Other programs inform and educate citizens about the benefits of existing state bioenergy policies.

In West Virginia, the Division of Energy promotes energy efficiency and increased public awareness of the environmental impacts of energy use and production. In Alabama, the Center for Alternative Fuels assesses the current status and development of alternative fuels, ensures that all alternative fuels sold in the state meet ASTM standards, and acts as an information center for alternative fuels. In Kentucky, the Kentucky New Energy Ventures program maintains an alternative fuel and renewable energy resource network to build the technical and business capacity of entrepreneurs. It also builds statewide awareness

of the economic development opportunities offered by Kentucky's alternative fuel and renewable energy industry.

Bioenergy technology advancement

Another type of bioenergy policy promotes the advancement of bioenergy technologies. Seven of the 14 Southern states have implemented some form of policy designed to stimulate bioenergy technology development. In Tennessee, the Tennessee Department of Agriculture is authorized to develop and implement an alternative fuel research program to stimulate public and private research in fuel-related conversion technology. This research addresses converting Tennessee agricultural products, such as soybeans, switchgrass, and other biomass, into alternative fuels. In Missouri, the Missouri Ethanol and Other Renewable Fuel Sources Commission promotes the development and use of alternative fuel vehicles and technology that will enhance the use of alternative and renewable transportation fuels.

IV. Bioenergy Research and Education

Section IV provides an inventory of bioenergy research and education activities in the South. Appendices C & D include a full list of research centers and education programs.

Research centers

A research center refers to any university, non-government organization (NGO), industry or government entities that conduct research in the field of bioenergy. In many cases, these centers include a training or education component. However, conducting bioenergy research remains their primary activity.

Each Southern state has a bioenergy research center. The centers in the South are mainly located in universities. NGO-run research centers are operational in four states (Florida, Mississippi, Oklahoma and South Carolina). Three states (Florida, Missouri, and Tennessee,) have industry-run research centers. Universities often partner with government or industry to facilitate bioenergy research. One example of an industry-university center is the partnership between BioEnergy International, LLC ("BioEnergy"), a developer of biorefineries and proprietary technologies, and the University of Florida. BioEnergy has an exclusive research agreement with the university to develop technologies to produce certain biorefined specialty chemicals from sugars and cellulose.

Southern centers have a focus on feedstock, technology and/or economics & policy. Almost all Southern states have research centers working in each of these focus areas. Some state's research centers appear to be stronger in some areas than in others. For example, North Carolina and Missouri centers have strong technology focus, while Alabama and Louisiana centers focus more on feedstock research. Economics and policy research does not stand out as a key focus area in any of the Southern states.

Examples of some of the bioenergy research centers in the South include:

Arborgen (SC)
Arborgen is a South Carolina-based company focused on making working trees and commercial forests more productive. The company is advancing tree genetics that will most ideally suit the cellulosic ethanol industry. The company employs over 100 researchers in the United States, Brazil and New Zealand.

B3I: Biofuels, Biopower, and Biomaterials Initiative (GA)
B3I is a University of Georgia initiative that researches the genetic and molecular structure of potential bioenergy plants and microbes used in the conversion of biomass to fuel. The center also focuses on implemention of technologies to bring bioenergy to market. The initiative includes the Biorefining and Carbon Cycling Program which researches conversion technologies through an integrated biorefinery system.

BioEnergy Science Center (TN)
The BioEnergy Science Center (BESC) at Oak Ridge National Laboratory is one of three bioenergy science centers created by the Department of Energy. The Center's purpose is to develop cost-effective and sustainable means of producing biofuels from plants, and includes partnerships with over ten universities and companies. Researchers are focused on new technologies that can modify plant cell walls to reduce their resistance to breakdown, and the creation of a one-step process of turning biomass into biofuels.

Center for Bioenergy and Bioproducts (AL)
The Center for Bioenergy and Bioproducts at Auburn University is focused on economic development in Alabama by working to establish new bioenergy and bioproducts industries. The Center's research priorities include the development of new technologies to reduce the cost of bioenergy, the pursuit of biopower and biofuels through regionally appropriate feedstocks and technologies, the analysis of the entire bioenergy system, and the creation of partnerships across institutions and sectors.

Oklahoma Bioenergy Center (OK)
The Oklahoma Bioenergy Center is a virtual center initiated by the State of Oklahoma with the University of Oklahoma, Oklahoma State University, and the Samuel Roberts Noble Foundation. With the goal of increased investment in commercial-scale biorefineries, the Center represents a coordinated effort for research in the areas of crop development, crop production, transportation and logistics, and conversion technologies.

Sustainable Energy Research Center (MS)
The mission of the Sustainable Energy Research Center is to generate engineering and scientific knowledge, and to advance sustainable industries in the South and U.S. The Center performs interdisciplinary research on fuels, feedstocks, and economics and policy. Key objectives include promoting sustainable industries in Mississippi and researching new energy technologies.

A full inventory of Southern research centers can be found in Appendix C.

Education & training centers

Education and training centers include all institutions that either provide short/long term courses or degrees/diploma in bioenergy, or train bioenergy practitioners. These centers are also categorized by type of institution namely, university, industry, NGOs and government.

Several of the South's institutions of higher learning are rapidly developing undergraduate and graduate-level educational programs in the field of bioenergy. An example includes Biosucceed, an initiative geared towards developing the bioenergy workforce by the University of Tennessee in partnership with North Carolina State University and North Carolina Agricultural and Technical State University. The University of Tennessee Agricultural Experiment Station is developing a new academic curriculum and a complete Master of Science

degree program that can be delivered by the three University partners. Course work will be delivered through classroom courses or distance education. This program is supported by a USDA grant and aims to develop six graduate level classes, two undergraduate classes, and modules that can be part of individual classes. It is envisaged that these classes will be offered at no cost to the national biomass community for customization by any institution around the country.

Bioenergy training and workforce development is also occurring at community colleges like Central Carolina Community College (CCCC) in North Carolina. CCCC offers workshops, continuing education programs, and curriculum programs to suit the needs of students and industry. It recently developed a two-year biofuels technology training program. In the fall of 2008, CCCC began offering an associate degree in Alternative Energy Technology: Biofuels. CCCC plans to work with new plant developers to train the workforce needed in their projects.

An inventory of education and training centers can be found in Appendix D.

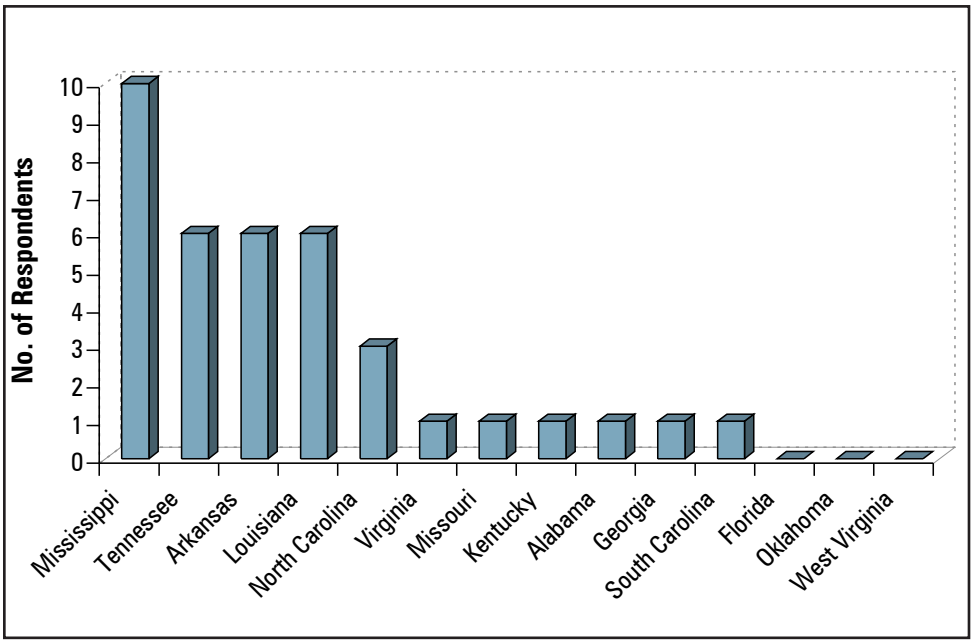
V. Results from Expert Survey and Stakeholder Meetings

Section V explores responses of Southern bioenergy leaders to an open-ended survey and two regional stakeholder meetings held in Memphis, Tennessee with the Memphis Bioworks Foundation, and Raleigh, North Carolina at Biomass South 2008.

Open-ended survey

The open-ended survey was used for identifying research, technology, outreach, commercialization, and policy gaps, and for formulating appropriate strategies. The survey had a general section which was common to three stakeholder groups— industry, NGOs and researchers — and another section targeted specifically towards each stakeholder group. The survey was completed by 37 experts representing 11 of the Southern states (Figure 54). There were 18 respondents from academia, six from industry, six from NGO groups, and seven who responded to only the general section questions.

Figure 54: Number of respondent per state

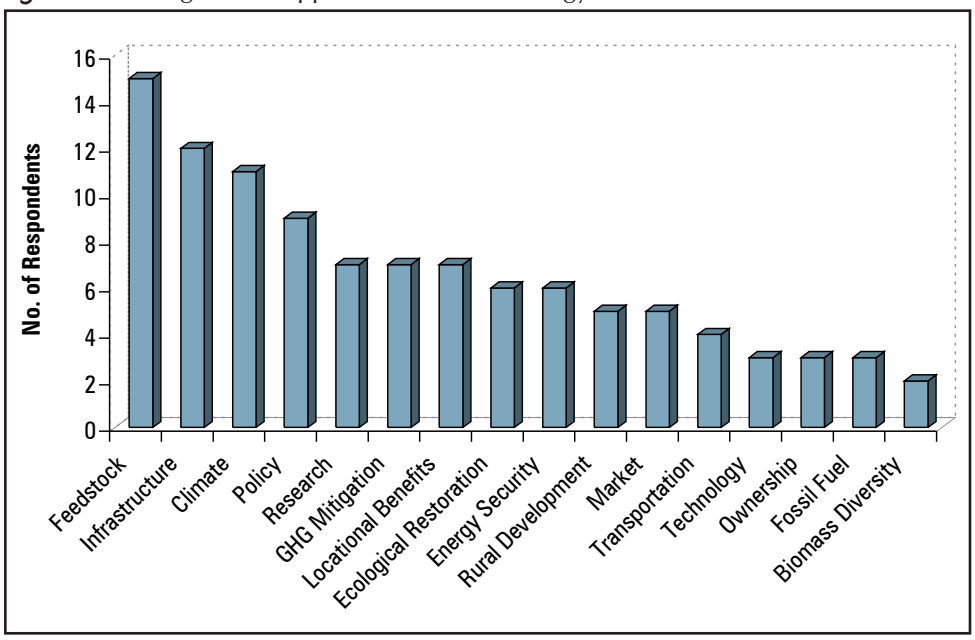


Source: University of Florida, Expert Survey, 2008.

Strengths and opportunities for bioenergy development

When asked about strengths and opportunities for bioenergy development, most of the respondents said that feedstock availability is a key strength and opportunity for the region. This was followed by favorable climate and infrastructure (Figure 55).

Figure 55: Strengths and opportunities for bioenergy in the South

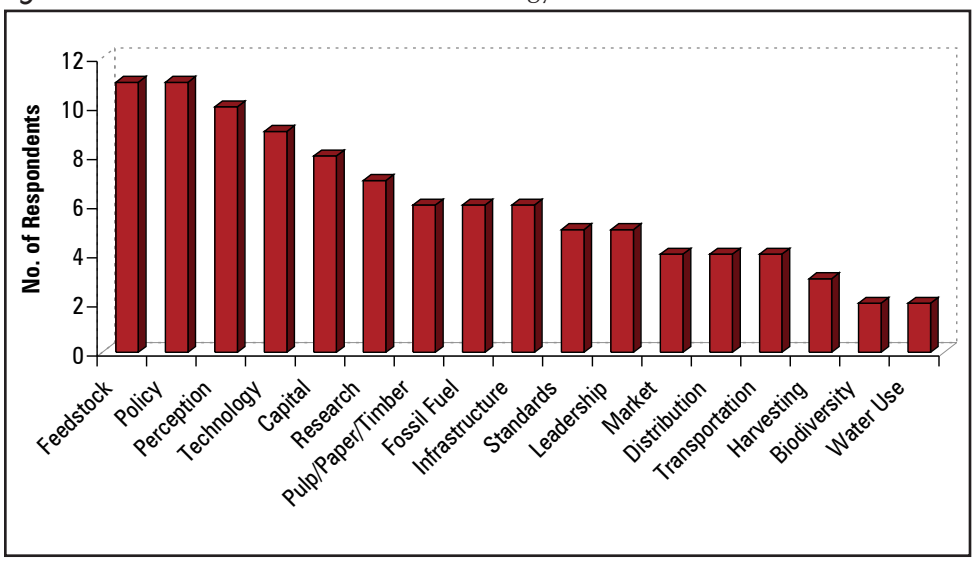


Source: University of Florida, Expert Survey, 2008.

Weakness and threats for bioenergy development

Respondents listed three weaknesses and threats for bioenergy development in their state. The responses outlined a number of reasons that hinder the bioenergy industry in the South. The issues most often identified were related to feedstock and policies, followed by perception, technology, capital, and research (Figure 56).

Figure 56: Weaknesses and threats for bioenergy in the South



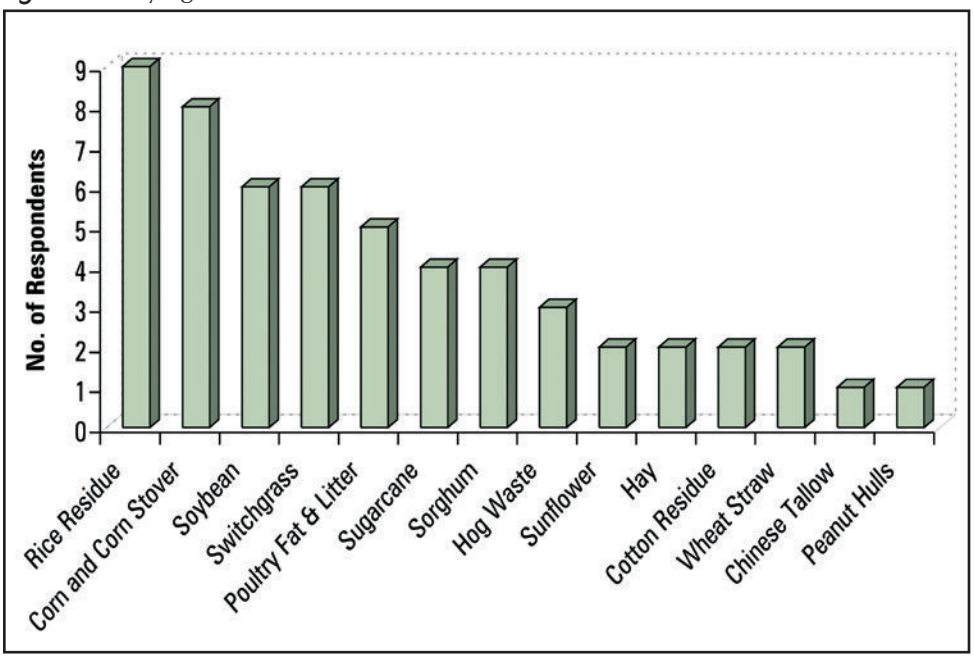
Source: University of Florida, Expert Survey, 2008.

Key agricultural feedstocks

In an effort to estimate the key agriculture-derived biomass resources that can be used for meeting regional energy demand, respondents listed their three major agriculture feedstocks (Figure 57). Crop residues such as rice hulls, stubble and straw, corn and corn stover, and wheat residues were outlined by 19

experts as major sources of agriculture-based feedstocks. The primary reasons for these feedstock choices were soil and climate suitability, existing infrastructure, and existing and continuing research.

Figure 57: Key agricultural feedstocks in the South



Source: University of Florida, Expert Survey, 2008.

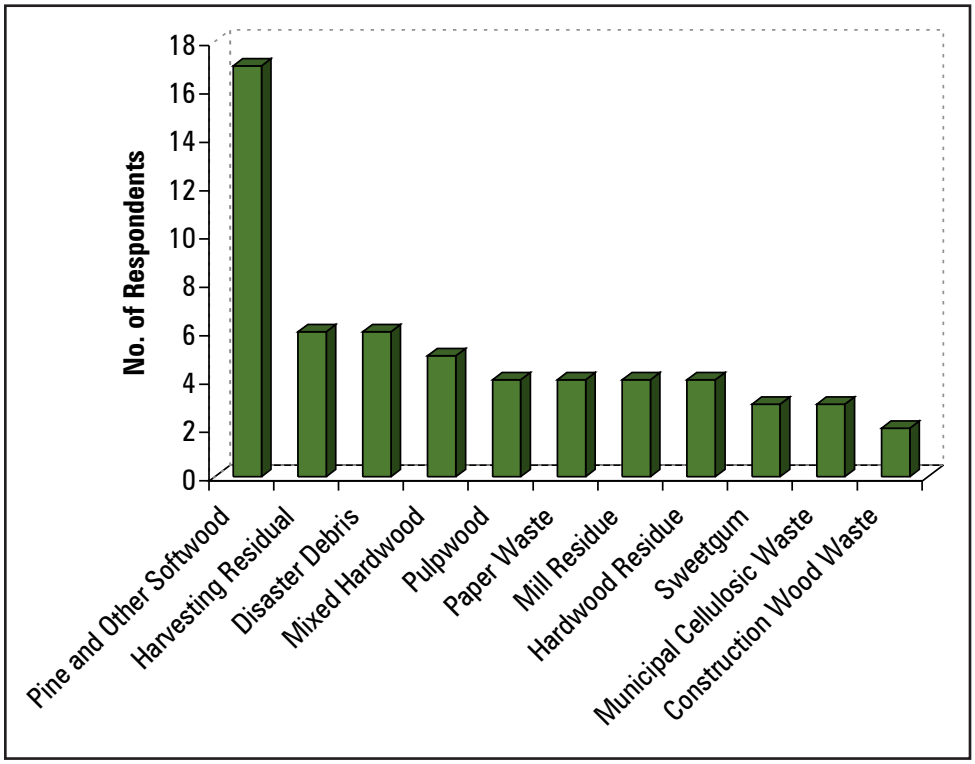
Key forestry feedstocks

As observed in Figure 58, seventeen respondents outlined pine and other softwood as key forestry feedstocks in the region, primarily due to their wide availability in the region. Unused forest harvesting residuals, natural disaster debris, and mixed hardwood species were also cited as significant forestry-based feedstock.

Some respondents advocated for growing dedicated energy trees, such as hybrid poplar, cottonwood, willow, and silver maple on lands poorly suited for agricultural crops. However, there was also caution regarding hardwood utilization as natural stands of hardwood species. Although widespread in the Piedmont region, such resources cannot be harvested intensively or regenerated artificially and therefore should be used sparingly. Furthermore, plantation-grown hardwood species are only feasible in a limited number of areas, as these species can have demanding site requirements. This drawback could result in providing feedstock to only specific areas. Many respondents also believed that the current practices of leaving unutilized wood not only created economic problems, but also environmental ones.

The respondents also suggested that the current planting practices by landowners interested in producing high-value saw timber often avoided thinning, thus reducing the availability of small-diameter low-cost biomass. A few respondents advocated for an active campaign to persuade landowners to plant and manage for high-volume, small-diameter biomass trees.

Figure 58: Key forestry feedstocks in the South



Source: University of Florida, Expert Survey, 2008.

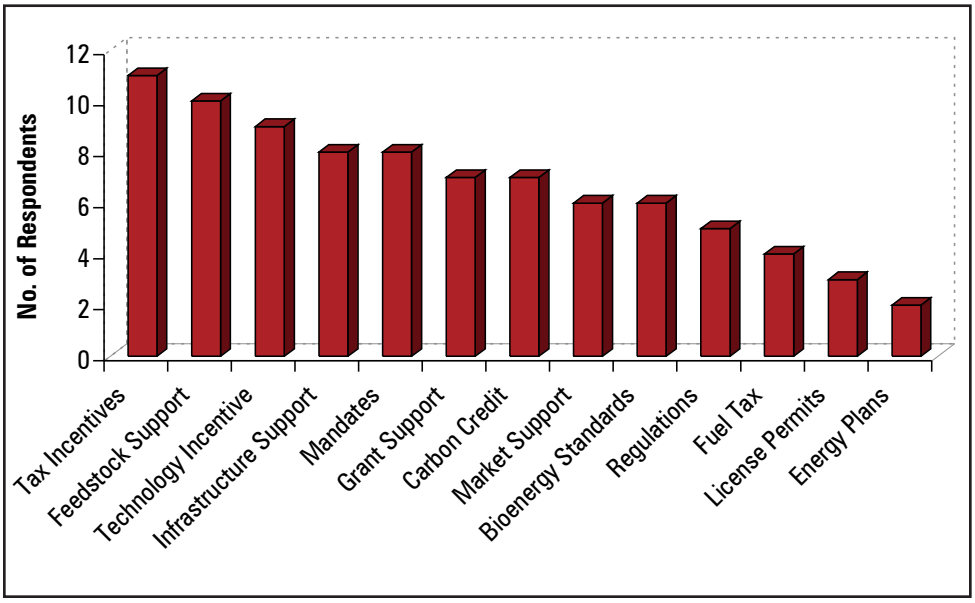
Climate change and energy security

Of the survey respondents, 95 percent perceived that bioenergy plays a "very helpful" or "helpful" role in combating climate change and in increasing energy security. The final five percent said that bioenergy had no role.

Policy initiatives for bioenergy development

For bioenergy development at the state and national levels, survey respondents listed the three most important regulations/incentives for the development of bioenergy (Figure 59). According to the respondents, tax and technological incentives are very much required to promote bioenergy. Policies that support feedstock development were also cited as a critical need. The respondents suggested mandates for setting production targets as well as establishing national standards that clearly defined biofuels. The role of policymakers in terms of infrastructure support, grant support, carbon credits and trade, and market support initiatives were also emphasized. Under the regulatory incentives, fossil fuel tax, strict licensing regimes, and setting mandatory requirements were listed as important tactics.

Figure 59: Type of regulation/incentives required for bioenergy development in the South



Source: University of Florida, Expert Survey, 2008.

Industry perceptions about bioenergy

In an effort to gauge perceptions of the industry representatives, specific questions relating to the bioenergy industry were included.

Technology development issues researchers should target

Industry respondents each suggested three critical issues that researchers should address for bioenergy development. Some of the research areas outlined by the industry experts were: algae harvest and algae oil extraction; wood gasification; anaerobic digestion; efficient use of wood fuel for power generation; enzymes/catalysts that result in biocrude or green gasoline/diesel; finding indigenous dedicated energy crops; efficient conversion from biomass to bioenergy; smaller conversion satellite plants that would decrease transportation cost of a high volume low value product; and biorefineries that could handle non-uniform feedstocks. One respondent cautioned that the researchers should not reinvent the wheel and stop doing the research over and over again rather than "doing" something to move forward with commercialization.

Technology transfer

Industry respondents suggested the following as effective avenues for technology transfer from researchers to industry and government experts: trade magazines, agricultural extension services, university systems, and demonstration projects to prove that the research could be undertaken on large scale. The key message was to work in close cooperation with each other and to coordinate activities that minimize duplication.

Bioenergy distribution issues

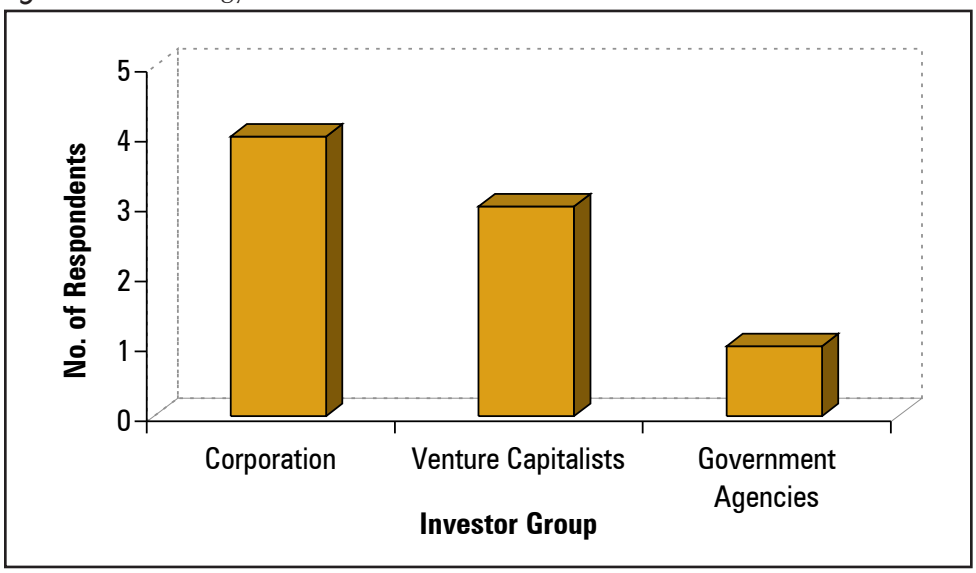
Key distribution issues identified by the industry experts were: apprehension about the type of biofuel like cellulosic ethanol which is not yet economically

feasible; lack of distribution and retail infrastructure; high costs of diesel adding to transportation and distribution cost; cold-flow issues for biodiesel; need for new tanks and pump cabinets for E85; resistance of distribution industry and consumers to sell/buy biofuel product; inability of ethanol to transport through pipelines; and most importantly, the very nature of feedstock itself, as biomass is an extremely high-volume low-value product and thus increases the transportation cost.

Bioenergy capital investment

Most of the industry respondents listed corporations as major bioenergy investors, followed closely by venture capitalists. Government was also listed by one expert as a major bioenergy investor (Figure 60). When asked to list the primary reasons for investment in bioenergy, industry respondents said: to be a part of an emerging and potentially marketable business; to help promote economic development in rural areas while also making a profit; speculating future needs in energy; profiting from biomass that these groups already own and currently have no market for the product.

Figure 60: Bioenergy investors in the South



Source: University of Florida, Expert Survey, 2008.

Approaches for fostering partnership

Industry respondents suggested that some partnerships among bioenergy stakeholders (private sector, NGOs, academic community, and government) could be improved through regular informal meetings and occasional formal meetings; developing state bioenergy plans through an inclusive approach; and educational efforts through newspapers, schools, and government agencies.

NGO perception about bioenergy

Non-government organizations (NGO) are important stakeholders whose involvement in bioenergy development are critical. Two-thirds of survey respondents believe NGOs are "very helpful" and the rest ranked NGO participation as "helpful" in bioenergy development.

Rural economy impact of bioenergy

Many NGOs advocate for localized rural development through bioenergy. All NGO respondents said that bioenergy development in their state would play a very helpful (83.3 percent) or helpful (16.7 percent) role in benefiting the local economy.

Developing partnerships

NGO respondents felt that more dialogue about activities, research, and policy development is needed at the state level. A bioenergy champion (elected official or university head) was identified as a need for each state to act as a public catalyst for change. The need for partnerships was reinforced by a respondent who remarked that:

> "we should address a series of sustainability issues in order to avoid growing bioenergy industries so quickly that they create their own backlash. Carbon lifecycle benefits, water consumption, water quality, wildlife impacts, forest impacts, soil impacts, and impacts on other existing industries (livestock feeding operations, pulp & paper mills, etc.) are a few of the things that must be understood better. We must engage all stakeholders, and seek constructive agreement on the science and economics. Only then might we be able to avoid the negative repercussions."

Policy sufficiency

Not one NGO respondent indicated that current bioenergy policies were sufficient. One third of the NGO experts strongly disagreed with the statement that "current bioenergy policies are appropriate/sufficient." The rest simply disagreed with the statement. This perception points out the need for more effective policies in the bioenergy arena.

Researcher/academia perception about bioenergy

One of the key stakeholder groups in bioenergy development consists of scientists, researchers, and academicians who not only carry out research and development, but also undertake extension and education activities to promote bioenergy.

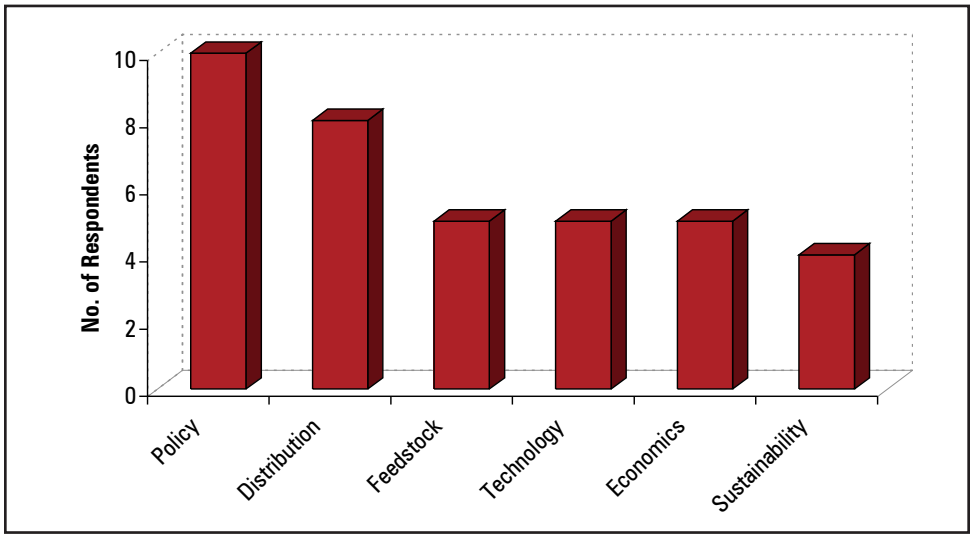
Technology transfer

Researchers suggested that many mechanisms could be used for better technology transfer. These included journal articles, demonstration projects and information sharing meetings. They also emphasized the use of websites. Research experts suggested increased government efforts to support early commercialization of research and development projects; provide federal and state support for fostering centers of excellence for energy-related biomass research and development; and provide legislatively mandated support for long-term investment, as well as other activities. One respondent suggested "meetings, presentations, discussion groups convened by government agencies (without having the agenda set by lobbyists in advance) should primarily focus on hearing new approaches."

Areas of research

Most of the research respondents pointed to policy and distribution as areas requiring more emphasis for research within their states. Technology, feedstock and economics were identified by five experts, while four experts wanted sustainability issues to be more focused (Figure 61). Several respondents believed that at this point in the emerging industry, all areas of public research are inadequate primarily due to limited funding. They suggested additional federal, state and private investments and not reallocation from other areas.

Figure 61: Areas needing further research in the South



Source: University of Florida, Expert Survey, 2008.

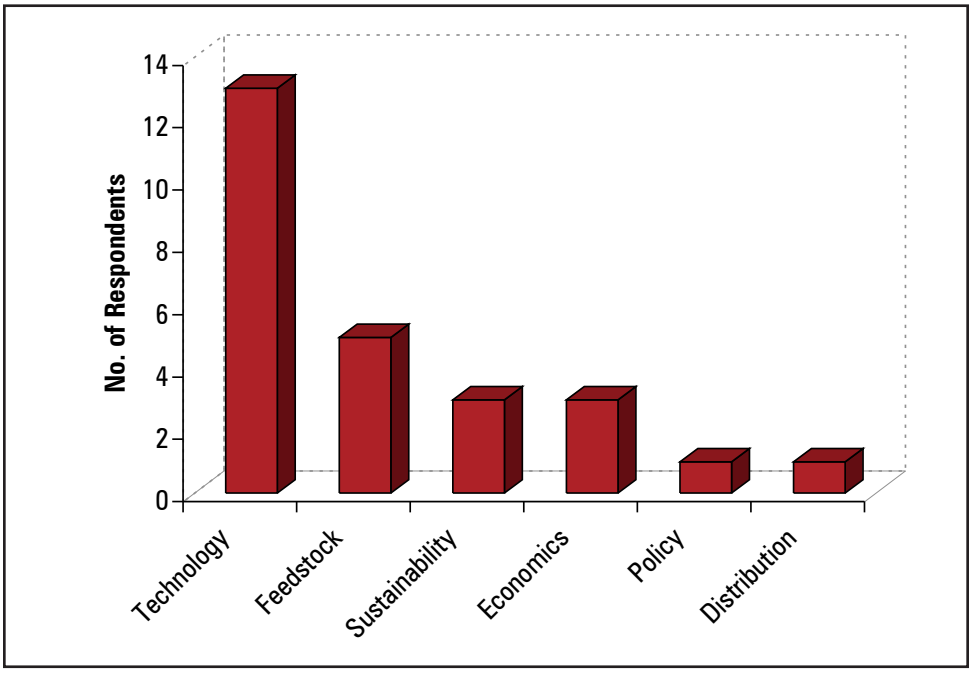
Bioenergy Funding

Overwhelmingly, the respondents suggested that most bioenergy research funds were targeted towards technology research. Feedstocks ranked as a distant second, while three experts felt that economics and sustainability issues are favored (Figure 62).

The respondents emphasized the need for development of more proposals on feedstock, distribution, economics and policy and suggested that technology is receiving the greatest attention due to the potential intellectual property benefit. Several experts supported the current emphasis on technology as it is important to develop conversion technologies that can work economically on small scales. Some experts were critical about the preference given to technology and suggested that "we need to more clearly show the economic benefits of a bioenergy economy and should focus on applying technologies instead of constantly talking about them."

Some experts prioritized feedstock production as the critical issue, especially for biodiesel. They suggested more long-term funding for feedstocks that do not compete with food supplies. According to them, the land-grant experiment and extension services need to include feedstock production as a high priority in filling new positions.

Figure 62: Where are research dollars going?



Source: University of Florida, Expert Survey, 2008.

Improving outreach of bioenergy education/training centers

Suggestions from research respondents about outreach, training and education were also obtained. Ideas for improvement included: keeping biomass supply data up-to-date; establishing a clearinghouse for shared information and resources; more coordination with national laboratories; and a creation of a bioenergy outreach award. In addition, some respondents were critical of the outreach mandate of bioenergy education/training centers. One expert stated that the goal of a research center is to do research rather than outreach.

Stakeholder meetings

Two regional stakeholder meetings brought nearly 100 bioenergy leaders from across the South to discuss the challenges and opportunities to the Southern bioenergy industry. The first was held in Memphis, Tennessee and was sponsored by the Memphis Bioworks Foundation in August 2008. The second was held in Raleigh, North Carolina in September 2008 and held in conjunction with Biomass South 2008. Five themes that emerged from the discussions stated that the South needs to:

1. Improve its leaders' and general public's knowledge, understanding, and perceptions of biomass, biopower, and biofuels.
2. Support long-term, comprehensive public policy for bioenergy at the local, state and federal level.
3. Address sustainability and environmental impact issues related to bioenergy.
4. Invest in continued research and development for effective conversion technologies.
5. Address bioenergy industry and market infrastructure needs.

Endnotes

1 In this document, the "South" refers to Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Virginia, and West Virginia.

2 Bioenergy is renewable energy created from biomass such as biopower (i.e. electricity) and biofuels (i.e. ethanol, biodiesel). Biomass is organic materials derived from plants and animals and includes agricultural and forestry residues, municipal solid wastes, industrial wastes, and land and aquatic crops grown solely for energy purposes.

3 Management Information Services, Inc. and American Solar Energy Society. *Green Collar jobs in the U.S. and Colorado: Economic Drivers for the 21st Century,* January 2009.

4 While most ethanol plants in the U.S. use corn as their fuel source, the South's opportunities lie in the development of cellulosic ethanol: transportation fuel derived from non-food sources, such as wood, grasses, and residues.

5 Flanders, Archie and John McKissick, *Economic Impact of Cellulosic Ethanol Production in Treutlen County,* University of Georgia Center for Agribusiness and Economic Development, April 2007.

6 Hodges, Alan W. and Mohammad Rahmani, *Economic Impacts of Generating Electricity Fact Sheets*, University of Florida, September 2007. http://edis.itas.ufl.edu/FE697.

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Appendix A.

Listing of bioenergy-related companies in the South

This list was compiled from One Source Business Directory only using keywords such as "biomass," "biofuel," "biodiesel," "ethanol," "biopower," "bioenergy," and "wood energy." It is not an exhaustive listing of bioenergy-related companies in the South.

Company Name	Abengoa Bioenergy
Business Description	Abengoa Bioenergy Corporation is among the nation's largest producers of ethanol, the gasoline additive that helps clean the air while reducing dependence on foreign oil. Abengoa operates facilities in Colwich, Kansas, York, Nebraska, and Portales, New Mexico, which produce over 85 million gallons of ethanol annually, as well as 275,000 tons of both wet and dry distillers grains and solubles-a high-protein animal feed product used primarily for beef and dairy cattle. In 2002, Abengoa Bioenergy was operating as a public company under the name of High Plains Corporation when it was acquired by a subsidiary of Abengoa, S.A. Abengoa, S.A. is headquartered in Seville, Spain, and is listed on the Madrid Stock Exchange. Abengoa has administrative offices in Chesterfield, Mo.
Ownership	Private Subsidiary
Ultimate Parent	Abengoa S. A.
Country	Spain
Year Founded	1941
City	Chesterfield, Missouri 63017
Web Site	http://www.abengoa.com
Company Name	ADM Southern Cellulose
Business Description	ADM Southern Cellulose is a division of Archer Daniels Midland. Archer Daniels Midland is one of the world's largest agricultural processors of soybeans, corn, wheat and cocoa. The company works with farmers throughout the world to turn crops into soy meal and oil, corn sweeteners, flour, cocoa and chocolate, ethanol and biodiesel, as well as a variety of other value-added food ingredients, animal nutrition and industrial products. It was founded in 1902. Incorporated in 1923, Archer Daniels Midland is headquartered in Decatur, Ill., and operates processing and manufacturing facilities throughout the United States and worldwide. ADM Southern Cellulose is located in Chattanooga, TN.
Ownership	Private Branch
Ultimate Parent	Archer Daniels Midland Company
Country	United States
Year Founded	1920
City	Chattanooga, Tennessee 37410
Web Site	http://www.admworld.com
Employees	120
Company Name	ADM Trucking
Business Description	ADM Trucking is a division of Archer Daniels Midland Company, one of the largest agricultural processors in the world. It is a world leader in the production of soy meal and oil, corn for ethanol and sweeteners, wheat for bakery products and cocoa for multiple chocolate products. The company's operations cover agricultural producing and consuming regions on six continents, as well as a global network of agricultural sourcing, processing, transportation and financial services. Archer Daniels is headquartered in Decatur, Ill. The worldwide employer of more than 25,000 maintains 250-plus processing plants. Its trucking division maintains a multifaceted fleet that has the capability to transport products over river, rail, oceans and land on a global scale. Its fleet consists of more than 20,500 railcars, 2,300 tractor trailers, 2,100 barges, and close to 30 tow boats and line boats. ADM Trucking has a location in Chattanooga, TN.

Ownership	Private Branch
	Archer Daniels Midland Company
City	Chattanooga, Tennessee 37403
Web Site	http://www.admworld.com
Employees	50

Company Name	Alternative Energy Sources, Inc.
Business Description	Alternative Energy Sources, Inc. is a development stage company that focuses on providing consulting services and selling wind energy power systems to the residential, agricultural and small business sectors throughout Washington, Idaho, Montana, and Oregon. The Company redirected its focus towards identifying and pursuing the development of a new business plan and direction for the company.
Ownership	Public Independent
City	Kansas City, Missouri 64108
Web Site	http://www.aensi.com/
Employees	7

Company Name	American Process, Inc.
Business Description	American Process was founded in 1994 and is one of the leading consulting firms for the application of thermal Pinch technology. It has completed more than 200 studies and offers thermal Pinch and energy cost minimization services to other energy intensive industries, such as petrochemical and ethanol. The company has also established a software office in Romania to develop a range of proprietary software products. PARIS and SPARTA provide mills with decision-making tools that help them reduce their overall costs by optimizing production and energy usage. PIB is a proprietary web-based application that enables each department and the entire mill to calculate energy. American Process also provides call center support, and has branches in Athens, Greece, and Cluj-Napoca, Romania. Additionally, the company is active in the lignocellulosic biorefinery field. Its proprietary process, American Value Added Pulping, produces ethanol from wood in an integrated biorefinery application.
Ownership	Private Independent
City	Atlanta, Georgia 30308
Web Site	http://www.americanprocess.com
Employees	10

Company Name	American River Transportation Co.
Business Description	The American River Transportation Company, or ARTCO, is a subsidiary of the Archer Daniels Midland Company. ARTCO manages the transportation of ADM products along the Mississippi River, Ohio River and Illinois River in the United States. It also manages transportation of cocoa along the Madeira River in Brazil. ARTCO owns thousands of waterway ships, including barges, towboats and harbor tugboats. The company ships many of ADM's products, including grain and oil seed, ethanol and corn gluten meal. The Archer Daniels Midland Company is publicly traded on the New York Stock Exchange and is based in Decatur, Ill. It operates more than 270 plants worldwide, where cereal grains and oilseeds are processed into numerous products used in food, beverage, nutraceutical, industrial and animal feed markets worldwide. The American River Transportation Company maintains a location in St. Louis.
Ownership	Private Branch
Ultimate Parent	Archer Daniels Midland Company
Country	United States
City	St Louis, Missouri 63111
Web Site	http://www.admworld.com
Employees	80

Company Name	Archer Daniels Midland
Business Description	Archer Daniels Midland is one of the world's largest agricultural processors of soybeans, corn, wheat and cocoa. The company works with farmers across the world to turn these crops into soy meal and oil, corn sweeteners, flour, cocoa and chocolate, ethanol and biodiesel, as well as a wide variety of other value-added food ingredients, animal nutrition and industrial products. The company's global transportation network, from Topeka, Kan. to Taiwan, and its facilities around the world combine to allow it to grow things where they grow best, and sell things where they're needed most. Founded in 1902 and incorporated in 1923, Archer Daniels Midland is headquartered in Decatur, Ill., and operates processing and manufacturing facilities across the United States and worldwide.
Ownership	Private Branch
Ultimate Parent	Archer Daniels Midland Company
Country	United States
Year Founded	1943
City	Mexico, Missouri 65265
Web Site	http://www.admworld.com
Employees	56

Company Name	Archer Daniels Midland Company
Business Description	Founded in 1902, Archer Daniels Midland Company is one of the largest agricultural processors in the world. It specializes in processing crops, such as soybeans, corn, wheat and cocoa. The company processes crops into food ingredients, renewable fuels, industrial chemicals and animal-feeding ingredients. Its product line includes biodiesel, ethanol, soybean oil and meal, corn sweeteners, flour, crystalline fructose, maltodextrin, cocoa powders, and citric and lactic acids. The company offers a range of soy proteins for processed meat applications, including cold cuts, hot dogs and sausages. It provides a wide range of agriculture services, such as grain trading and transportation. Archer Daniels Midland Company is located in Southport, NC. It has more than 26,000 employees on its staff and over 200 processing plants worldwide.
Ownership	Private Branch
Ultimate Parent	Archer Daniels Midland Company
Country	United States
Year Founded	1976
City	Southport, North Carolina 28461
Web Site	http://www.admworld.com
Employees	200

Company Name	Athenix Corp.
Business Description	Research and development organization developing bio-industrial products for the agricultural and chemical businesses using genetic traits from microbes. The company also produces transgenic organisms. Products are sold to the chemical, alternative energy, agricultural chemical, and seed industries.
Ownership	Private Independent
Year Founded	2001
City	Durham, North Carolina 27703
Web Site	http://www.athenixcorp.com
Employees	7

Company Name	Bulkmatic Transport Co.
Business Description	Bulkmatic Transport is one of the leading dry bulk carriers in the United States. The company offers warehousing, bulk trucking and material handling services for residential and commercial customers. Its transloading services include product screening, inventory management, sampling and carrier arrangement. Bulkmatic Transport provides a list of transloading equipment, including sifters, conveyors, blowers, air compressors, trailers, pumps and filters. The company designs and conducts safety training programs that provide pneumatic equipment handling techniques. It provides trucks for transporting a variety of materials, including plastic pellets, ethanol. Additionally, it provides storage and inventory reporting services. Bulkmatic Transport is located in Decatur, Ala.
Ownership	Private Branch

Ultimate Parent	Bulkmatic Transport Company
Country	United States
City	Decatur, Alabama 35601
Web Site	http://www.bulkmatic.com
Employees	50

Company Name	City Capital Corporation
Business Description	City Capital Corporation (CCC) is a business development company engaged in leveraging investments, holdings and other assets to create self-sufficiency for communities around the country and the world. CCC manages diverse assets and holdings, including real estate development, and buying, selling and drilling oil and gas properties. Through the Goshen Energy, Inc. subsidiary it is investigating and identifying opportunities within the biofuel market in the United States and internationally.
Ownership	Public Independent
City	Franklin, Tennessee 37067
Web Site	http://www.citycapitalcorp.net/

Company Name	CSX Transportation, Inc.
Business Description	CSX Transportation, Inc. (CSX) is a principal operating company of CSX Corporation. The Company provides a link to the transportation supply chain through its approximately 21,000 route miles rail network, which serves every population center in 23 states east of the Mississippi River, the District of Columbia, and the Canadian provinces of Ontario and Quebec. It serves 70 ocean, river and lake ports along the Atlantic and Gulf Coasts, the Mississippi River, the Great Lakes and the St. Lawrence Seaway. CSX also serves thousands of production and distribution facilities through track connections to more than 230 short-line and regional railroads. CSX Transportation, Inc., a subsidiary of CSX Corporation provides rail freight transportation in the Eastern US & two Canadian provinces.
Ownership	Private Subsidiary
Ultimate Parent	CSX Corporation
Country	United States
Year Founded	1985
City	Jacksonville, Florida 32202
Web Site	http://www.csx.com/
Employees	32,074

Company Name	Danisco
Business Description	Danisco is a supplier of food ingredients, sugar and industrial bioproducts. Based on the company's technology platform, natural raw materials and resources are used to develop and produce ingredients for food and other products used in everyday life. Danisco ingredients are used in about every second ice cream and cheese, every third box of detergent and every fourth loaf of bread produced globally, as well as in other consumer products - from feed and toothpaste to biofuel and plastics.
Ownership	Private Subsidiary
Ultimate Parent	Danisco A/S
Country	Denmark
Year Founded	1964
City	St Joseph, Missouri 64507
Web Site	http://www.danisco.com
Employees	70

Company Name	Davis Oil Company
Business Description	Davis Oil Company provides fuels and lubricants throughout Georgia. The company serves petroleum needs that range from single cases to transport loads. It features a complete line of Shell lubricants, including specialty and synthetic oils. Davis Oil Company specializes in lubricant applications for difficult operating conditions. The company performs bulk-delivery services for gasoline, aviation gas, diesel and ethanol. Its capabilities include fleet fueling, convenience store design and onsite petroleum installations. Davis Oil Company has operated since 1946 and is headquartered in Perry, GA.

Ownership	Private Parent
Ultimate Parent	Davis Oil Company
Country	United States
Year Founded	1946
City	Perry, Georgia 31069
Web Site	http://www.davisoilcompany.com
Employees	150

Company Name	DDS Technologies USA, Inc.
Business Description	DDS Technologies USA, Inc. (DDS) is a development stage company that develops advanced milling, extraction and processing technologies that preserve nutritional content and derive quality products from grains, agricultural commodities, and other biomass resources. The company has obtained the rights on a worldwide basis for a dry disaggregation and micronization system that converts certain waste into value added products for further processing or resale. The technology may have applications across numerous industries. The company is conducting tests on products in conjunction with a number of major companies in the food ingredient, flavoring and spice industries, as well as health food and pharmaceutical products. DDS' principal customers include the agricultural, food processing, pharmaceutical, animal feed and ethanol industries.
Ownership	Public Independent
City	Boca Raton, Florida 33432
Web Site	http://www.ddstechusa.com/
Employees	4

Company Name	Dyadic International, Inc.
Business Description	Dyadic International, Inc. (Dyadic) is a global biotechnology company that uses its technologies (the Dyadic Platform Technology) to conduct research and development activities for the discovery, development, and manufacture of products and enabling solutions to the bioenergy, industrial enzyme and pharmaceutical industries. The company is focused on its bioenergy business to enable the production of cellulosic ethanol, and its biopharma business, to enable the production of therapeutic monoclonal antibodies (and other therapeutic proteins) for pharmaceutical discovery and production. The company offers a range of cellulase enzyme products for applications, such as denim finishing where cellulases are used to soften and fade the denim fabric.
Ownership	Public Independent
Year Founded	2004
City	Jupiter, Florida 33477
Web Site	http://www.dyadic.com/wt/home
Employees	125

Company Name	EarthFirst Technologies, Inc.
Business Description	EarthFirst Technologies, Incorporated (EarthFirst) is a research-based enterprise engaged in the development of technologies that will produce products from carbon-rich solid and liquid materials considered wastes. The company operates in three business segments. The waste disposal segment is focused on research and development and bringing the existing technologies to commercial realization. The contracting segment operates electrical contracting and subcontracting services on commercial and municipal construction projects primarily in Florida and the Caribbean. The biofuels segment is focused on the importing and producing of biodiesel fuels. Through its subsidiary, Electric Machinery Enterprises, Inc. (EME), the company performs services as an electrical contractor and subcontractor in the construction of commercial, residential and municipal projects primarily located in Florida and the Caribbean.
Ownership	Public Parent
Ultimate Parent	EarthFirst Technologies, Inc.
Country	United States
City	Tampa, Florida 33610
Web Site	http://www.earthfirsttech.com/
Employees	253

Company Name	Gencor Industries, Inc. (DE)
Business Description	Gencor Industries, Inc. is a manufacturer of heavy machinery used in the production of highway construction materials, synthetic fuels and environmental control equipment. The company's principal core products include asphalt plants, combustion systems and fluid heat transfer systems. Gencor's products are manufactured in two facilities in the United States and one facility located in the United Kingdom. Its products are sold primarily to the highway construction industry. The company is engaged in product engineering and development efforts to expand its product lines. Some of the developments include the use of non-fossil fuels, biomass (bagasse, municipal solid waste, sludge and wood waste), refuse-derived fuel, coal and coal mixtures, recycling of old asphalt and designing of environmentally compatible asphalt plants.
Ownership	Public Parent
Ultimate Parent	Gencor Industries, Inc. (DE)
Country	United States
Year Founded	1944
City	Orlando, Florida 32810
Web Site	http://www.gencor.com
Employees	434

Company Name	Georgia-Pacific Cellulose, LLC
Business Description	GP Cellulose operates pulp mills in Brunswick, GA, and New Augusta, MS. The company's pulps are used for various applications, including diapers, feminine hygiene products, baby wipes, automotive and coffee filters, paper, postage stamps and calendars. The company has international offices in Zug, Switzerland; Montevideo, Uruguay; and Hong Kong. GP Cellulose is a subsidiary of Koch Industries. Koch Industries and its sister company, Koch Holdings, own a diverse group of privately owned companies engaged in trading, operations and investment throughout the world. Founded in the late 1920s, Koch Industries has developed and accrued companies that have a presence in more than 50 countries and employ more than 70,000 people. Its companies are engaged in core industries such as petroleum, chemicals, energy for heating and cooling, fibers, intermediates and polymers, minerals, fertilizers, pulp and paper, chemical technology equipment, ranching and securities and financial services.
Ownership	Private Subsidiary
Ultimate Parent	Koch Industries
Country	United States
Year Founded	1984
City	New Augusta, Mississippi 39462
Web Site	http://www.gpcellulose.com
Employees	320

Company Name	Green Energy Group Inc.
Business Description	Green Energy Group Inc., formerly known as Maverick Energy Group Inc., is a development-stage company. The company is a wholly owned subsidiary of eCom eCom.com, Inc. On November 22, 2006, the company entered into a purchase agreement with Tri-States Petroleum Products of Houston, Mississippi (Tri-States). Tri-States is the owner of a biodiesel refinery located in Houston, Mississippi. The purchase was to include the land, building, and all the necessary components of the refining facility.
Ownership	Private Independent
City	Jupiter, Florida 33477

Company Name	Hollingsworth Oil Co.
Business Description	Hollingsworth Oil Company supplies gasoline, diesel, kerosene, waste oils, and ethanol to farms, gas stations, marinas, and trucking firms in Tennessee and neighboring states. The company sells major oil brands, and a biodiesel product, and provides marinas with Valvtect additives for diesel and gasoline. Hollingsworth Oil has nine storage tanks with capacity of more than 32,000 gallons at its Springfield, TN main office, with another terminal in Clarksville, TN, and a trucking fleet that includes 14 transports and three tankwagons. The company also has operations in car wash systems, construction, and convenience stores. Its suppliers include Amoco, BP, Shell, Phillips 66, Exxon, Citgo, and Texaco.
Ownership	Private Independent

City	Goodlettsville, Tennessee 37072
Employees	20
Company Name	Industrial Biotechnology Corporation
Business Description	Industrial Biotechnology Corporation (IBC) provides products, services and technologies using renewable resources as an alternative to petroleum and traditional manufacturing methods. It accomplishes this with the ALCHEMx Production Platforms, which integrates technologies, sustainable manufacturing, and distribution with the supply chain partners to meet customer needs and pricing requirements. The company's renewable resource provider and joint venture projects partner is Cosan SA. The company's subsidiaries include Renewable Chemicals Corporation (RCC) and Renewable Fuels of America Corporation (RFAC).
Ownership	Public Independent
City	Sarasota, Florida 34237
Web Site	http://www.industrialbiotechnology.com/
Company Name	International Coastal Biofuels, Inc.
Business Description	International Coastal Biofuels, Inc. (ICBU) is a development-stage company. It seeks to manufacture biodiesel, renewable fuel from vegetable oils in Wilmington, North Carolina. The company's target customers are end users on the east coast of the United States, such as petroleum distributors, public and government agencies, and institutions. The capacity of the company's plant will be 40,000 gallons per day.
Ownership	Public Independent
City	Coral Springs, Florida 33076
Web Site	http://www.internationalcoastalbiofuels.com
Employees	7
Company Name	International Fuel Technology, Inc.
Business Description	International Fuel Technology, Inc. (IFT) is a technology company that has developed a range of fuel additive products that improve the combustion characteristics of petroleum-based fuels and renewable liquid fuels. IFT developed additive products for diesel, bio-diesel fuel blends, gasoline and kerosene (heating oil) fuels. IFT has introduced three trademarked product brands that are being marketed around the world: DiesoLIFT, GasoLIFT and KeroLIFT.
Ownership	Public Independent
Year Founded	1996
City	St.Louis, Missouri 63105
Web Site	http://www.internationalfuel.com/
Employees	6
Company Name	Louisiana Chemical Equipment Co., LLC
Business Description	Founded in 1968, Louisiana Chemical Equipment is a full-service process equipment company. The company has offices, storage facilities and plants located in North America, South America, Europe, Australia and Asia. It provides consulting and performs studies such as equipment, process unit and plant availability searches; pricing studies; and plant re-use and modification studies. It also conducts appraisals of equipment for lenders, purchases used individual equipment and complete plants, performs equipment removal, sells equipment and plants on a joint venture or consignment basis, and performs inventory services. The company has experience in purchasing and selling refineries and plants specializing in styrene, chlorine, acetylene, phenol, oxygen, acetic acid, methanol, ethanol, coffee, nitric acid, sulfuric acid, ammonia, fertilizer, hydrogen, urea, power, pharmaceutical, metals, glycol, vinyl acetate, butadiene and pumping and compressor stations. The company's headquarters are in Baton Rouge, LA.
Ownership	Private Independent
Year Founded	1968
City	Baton Rouge, Louisiana 70896
Web Site	http://www.lcec.com
Employees	6

Company Name	Magellan Midstream Partners, L.P.
Business Description	Magellan Midstream Partners offers services related to transportation, storage and distribution of refined petroleum products and liquefied petroleum gases. The company's pipeline system is spread over an area of more than 8,000 miles and includes various marine and inland terminals. It has a laboratory that undertakes inspection and testing of diesel fuel, gasoline, aviation turbine fuel, kerosene, fuel ethanol and biodiesel. In addition, its web site provides product specifications and options for real-time inventory management, customer control, invoice viewing and report covering. The company serves customers in over 10 states in the United States. Magellan Midstream Partners is located in Marrero, LA.
Ownership	Private Branch
Ultimate Parent	Magellan Midstream Holdings, L.P.
Country	United States
City	Marrero, Louisiana 70072
Web Site	http://www.magellanlp.com
Employees	13

Company Name	New Generation Biofuels Holdings, Inc.
Business Description	New Generation Biofuels Holdings, Inc., formerly H2Diesel Holdings, Inc., is a development-stage renewable fuels provider. The company holds an exclusive license for North America, Central America and the Caribbean to commercialize its own technology to manufacture alternative biofuels from vegetable oils and animal fats. In August 2007, the company placed into service its first biofuel production plant, a three-million gallon per year pilot facility, jointly developed with Twin Rivers Technologies and co-located at Twin Rivers' facility in Cincinnati, Ohio. The company owns all rights to the fuel produced at the facility.
Ownership	Public Parent
Ultimate Parent	New Generation Biofuels Holdings, Inc.
Country	United States
Year Founded	2006
City	Lake Mary, Florida 32746
Web Site	http://www.newgenerationbiofuels.com/
Employees	7

Company Name	New Green Technologies, Inc.
Business Description	New Green Technologies, Inc., formerly Renewable Energy Resources Inc., is focused on using its technology in the bio-fuel and waste flow industries. The company's technology is the Catalytic Activated Vacuum Distillation (CAVD) system, which is a technology that allows waste products, such as distillers dried grain (DDG), carpet waste, algae, citrus waste, tobacco waste, municipal waste, and others, to be converted into a bio-fuel and gas. The company has also acquired a plasma arc to energy technology along with a technology using waste water, fluid or gas flows to create electricity.
Ownership	Public Parent
Ultimate Parent	New Green Technologies, Inc.
Country	United States
Year Founded	2004
City	Tampa, Florida 33606
Web Site	http://www.gogreenforplanetearth.com/
Employees	3

Company Name	NewGen Technologies, Inc.
Business Description	NewGen Technologies, Inc (NewGen) is a fuel production and distribution company engaged in the development of premium biofuel blends with fuel technology. The company's fuel products include technology that improves the performance of gasoline and diesel fuels, as well as domestically produced and alternative fuels, such as Ethanol-based E85 and Biodiesel blends. The company acquired three fuel terminals during the year ended December 31, 2006, and one fuel terminal in 2007, in the Southeast United States, which are assets acquired from Crown Central, LLC. The terminals, with a total storage capacity of over 15 million gallons, and an annual throughput capacity of more than 700 million gallons will be refurbished to further enhance the storage, blending, and distribution of a full slate of transportation fuels, including biodiesel and ethanol blends, as well as traditional hydrocarbon fuels.
Ownership	Public Independent
City	Charlotte, North Carolina 28210
Web Site	http://www.newgenholdings.com/
Company Name	NexGen Biofuels Ltd.
Business Description	NexGen Biofuels Ltd. (NexGen), formerly known as Healthcare Technologies Ltd., is a development-stage company that is seeking to develop and/or acquire ethanol and bio-diesel plants and blending terminal facilities in the United States.
Ownership	Public Independent
Year Founded	1988
City	Pasco County, Florida 33544
Web Site	http://www.nexgenbiofuels.net
Employees	8
Company Name	NORTHEAST Missouri Grain
Business Description	Northeast Missouri Grain, a farmer-owned ethanol facility, produces 36 million gallons of ethanol and more than 100 million pounds of dry distiller's grain from 6 million bushels of corn annually. The company started operation in 2000, nameplated for 15 million gallons of ethanol anuually. In 2003, NEMO Grain expanded its operation to a 36 million gallon per year nameplate, including production of Dakota Gold and Carbon Dioxide. Dakota Gold is produced at plants designed and managed by the Broin Company. Dakota Gold is made from a 100 percent corn distillation process using state-of-the-art processing and drying systems. Ethanol Products is the exclusive marketer of carbon dioxide and ethanol for NEMO Grain.
Ownership	Private Independent
City	Macon, Missouri 63552
Web Site	http://www.nemog.com
Employees	31
Company Name	Pacer Fuels
Business Description	Pacer Fuels has over a 30 year history in the petroleum business both as a gasoline and convenience store retailer, and as a wholesale fuels and lubricants distributor in the Atlanta, GA area. The company offers alternative fuels such as biodiesel and ethanol gasoline. Pacer Fuels operates it's own company fleet of fuel transports and vehicles and has two lubricant warehouses offering bulk oil and case goods located in Rome, GA and a bulk plant in Austell, GA. Pacer Fuels also operates over 12 convenience stores that are open 24 hours per day. Pacer Fuels is a new name from the result of the combination of Powell Oil Company of Austell and Fitzgerald Food Stores.
Ownership	Private Independent
City	Austell, Georgia 30106
Web Site	http://www.pacerfuels.com
Employees	26

Company Name	Potential Holdings, Inc.
Business Description	Potential Holdings, Inc., formerly Axiom Management, Inc., is a generator and wholesaler of electric power to electric utilities serving the retail electric market. The company owns and operates a 38-megawatt cogeneration facility in Kenansville, North Carolina, which has governmental permits to burn a variety of fuels. Its business strategy is to acquire and operate similar facilities throughout the eastern United States. All of its business operations are conducted through its wholly owned subsidiary, Gopher Corp., and its wholly owned subsidiary, Green Power Kenansville. Potential Holdings, Inc. is a generator and wholesaler of electric power to electric utilities serving the retail electric market.
Ownership	Public Independent
Year Founded	2001
City	Wilmington, North Carolina 28401
Web Site	http://www.greenpowerenergy.com/
Employees	23

Company Name	Advance Tank Construction Co.
Business Description	Founded in 1968, Advance Tank Construction has been building and installing small and medium diameter tanks for municipal and industrial applications. It specializes in installing add-ons such as bridges and rakes arms, and managing finish work such as painting and insulation. ATC provides services for every step of projects that includes designing, procurement, fabrication, delivery and onsite erection. ATC fabricates tanks, bins, hoppers, silos and smokestacks of all sizes. ATC provides services to all types of industries such as ethanol, oil and gas, food processing, agricultural, chemical, mining, power and wastewater treatment. ATC has provided services to companies such as Anheuser Busch, Cargill, Fluor Daniel, Owensboro Grain and Proctor and Gamble. ATC has facilities in Colorado and Alabama.
Ownership	Private Independent
City	Pell City, Alabama 35128
Web Site	http://www.advancetank.com
Employees	35

Company Name	Renew Energy Resources, Inc.
Business Description	Renew Energy Resources, Inc. (RENEW), is a vertically integrated alternative energy company. The company will be active in biodiesel, ethanol, glycerin, electric, solar, synthetic gas as well as other opportunities as they arise. Vertical integration will include facility ownership as well as facility management, strategic offtake contracts to large end users, such as the Department of Defense, cruise lines and major trucking firms, value-added refinement of glycerin, distribution, sales, marketing and financing of domestic and export sales contracts. The company has completed preparation for the start of vertical integration in the biodiesel market. Prior to January 2008, the company operated as a Business Development Corporation (BDC). RENEW has changed the nature of its business so as to cease to be a BDC.
Ownership	Public Parent
Ultimate Parent	Renew Energy Resources, Inc.
Country	United States
Year Founded	2002
City	Tampa, Florida 33609
Web Site	http://www.renwenergy.com/
Employees	2

Company Name	Shafer, Kline & Warren, Inc.
Business Description	Shafer, Kline & Warren provides landscape architecture and civil engineering services. It offers a wide range of energy services, such as design, testing and commissioning of electrical substations; planning, design and commissioning of electrical power generation facilities; and electrical power transmission and distribution. Additionally, it specializes in the development of cogeneration projects that provide electrical power and steam to ethanol and biodiesel plants. Shafer, Kline & Warren also design and develop water system infrastructure to provide safe and clean water to communities and individual homes throughout Missouri. In addition, the company provides wastewater collection and treatment services that include repair and maintenance of gravity sewers, checking sanitary sewer overflows and conducting infiltration and inflow system studies. Shafer, Kline & Warren is located in Kansas City, MO.

Ownership	Private Independent
Year Founded	1885
City	Kansas City, Missouri 64108
Web Site	http://www.skw-inc.com
Employees	51

Company Name	Spinx Co., Inc.
Business Description	Established in 1946, The Spinx Company operates more than 75 convenience stores and has been operational for more than 35 years. The company employs over 700 associates through its stores and related businesses. It provides fleet management, performance tracking and reporting services. It also operates various gas stations that store and supply biodiesel fuel. In addition, the company designs and conducts fleet fueling and training programs. Headquartered in Greenville, S.C., The Spinx Company maintains a presence in Greer, S.C.
Ownership	Private Branch
Ultimate Parent	The Spinx Company, Inc.
Country	United States
City	Greer, South Carolina 29650
Web Site	http://www.spinxco.com
Employees	25

Company Name	Syntroleum Corporation
Business Description	Syntroleum Corporation (Syntroleum) is engaged in developing and employing technology to produce synthetic liquid hydrocarbons that are free of contaminants normally found in conventional hydrocarbon products. Syntroleum's Bio-Synfining Technology processes triglycerides and/or fatty acids from fats and vegetable oils with heat (thermal depolymerization), hydrogen and catalysts to make renewable synthetic fuels, such as diesel, jet fuel (subject to certification), kerosene, naphtha and propane. Syntroleum has quantified in excess of 80 different fats and oils, for conversion to synthetic fuels via the Bio-Synfining Technology, which is a flexible feedstock/flexible synthetic fuel technology.
Ownership	Public Independent
Year Founded	1984
City	Tulsa, Oklahoma 74107
Web Site	http://www.syntroleum.com
Employees	24

Company Name	ThermoEnergy Corporation
Business Description	ThermoEnergy Corporation is a diversified technologies company engaged in the commercialization of municipal and industrial wastewater treatment and power generation technologies. The wastewater treatment technologies are consolidated in the company's majority owned subsidiary, CASTion Corporation (CASTion). CASTion is a developer and manufacturer of wastewater treatment and recovery systems to industrial and municipal clients. The company is also the majority owner of a clean energy technology known as the ThermoEnergy Integrated Power System (TIPS), which converts fossil fuels and biomass into electricity without producing air emissions, and at the same time removes and captures carbon dioxide in liquid form for sequestration or beneficial reuse. The power generation technologies are consolidated in its majority owned subsidiary, ThermoEnergy Power Systems, LLC (TEPS). The company acquired CASTion on July 2, 2007.
Ownership	Public Independent
Year Founded	1988
City	Little, Rock, Arkansas 72201
Web Site	http://www.thermoenergy.com/
Employees	28

Company Name	U. S. Sustainable Energy
Business Description	U.S. Sustainable Energy Corporation, based in Port Gibson, MS, focuses on research and development of sustainable energy solutions for replacement of fossil-based fuels, such as gasoline, diesel and natural gas. The company offers a range of solutions that seek to reduce foreign fuel dependency. It has technologies related to gaseous and liquid biofuels made from natural feedstock, such as soy, corn and their by-products. USSEC conducts independent laboratory tests to verify various physical properties of biofuels. The company's liquid biofuel also exhibits low pour and cloud points. In addition, its processes provide solid by-products that can be used in a variety of commercial applications. USSEC also holds the technology for a carbon-based fertilizer. The company has developed the process, units and catalyst that transform agricultural biomass into biofuel and fertilizer.
Ownership	Private Independent
City	Port Gibson, Mississippi 39150
Web Site	http://www.ussec.us
Employees	1,200

Company Name	Walthall Oil Company
Business Description	The Walthall Oil Company offers a wide range of petroleum products. It has been operational for more than 50 years and provides various services, such as oil analysis, lubrication training and plant lubrication surveys. The company distributes biodiesel throughout the United States. It offers petroleum products of various brands, including Coastal, Peak, Petro-Canada and Fina. The company has a construction division and offers various services, such as developing architectural plans and construction management. It also operates convenience stores and offers gas refueling cards to customers. The company has a fleet of over 40 delivery trucks. It has a branch office in Macon, GA.
Ownership	Private Independent
City	Macon, Georgia 31216
Web Site	http://www.walthall-oil.com
Employees	50

Company Name	White River Valley Electric Co-Op
Business Description	Founded in 1939, White River Valley Electric Cooperative serves the Missouri counties of Christian, Douglas, Ozark, Stone and Taney. The company is part of a utility network that consists of six regional and more than 50 local electric cooperative systems in Missouri, Iowa and Oklahoma. Together, this network of cooperatives serves more than 750,000 homes and businesses, which represents nearly 2 million individual consumers. White River Valley Electric offers its members the option of purchasing blocks of renewable energy resources, which are derived from solar, wind, hydro, geothermal or biomass, such as nutshells and corn fiber.
Ownership	Private Independent
City	Branson, Missouri 65616
Web Site	http://www.whiteriver.org
Employees	130

Company Name	Xethanol Corporation
Business Description	Xethanol Corporation is a renewable energy and clean technology company. The company is pursuing opportunities in biomass gasification for electricity production, wind power, solar power, energy storage, energy infrastructure, energy efficiency, waste recycling and agricultural processes. The company's business includes an operating plant in Blairstown, Iowa that produces ethanol from corn; a planned demonstration plant in Florida for converting citrus peel waste into ethanol; bio-separation and bio-fermentation technologies, along with strategic relationships with government and university research labs to further develop and prove out these technologies, and minority investments in other renewable energy or clean tech businesses.
Ownership	Public Parent
Ultimate Parent	Xethanol Corporation
Country	United States
Year Founded	2000
City	Atlanta, Georgia 30326
Web Site	http://www.xethanol.com/
Employees	30

Appendix B.

Select bioenergy policies of Southern States

Policies were gathered through the Database of State Incentives for Renewables & Efficiency (DSIRE), online searches, and personal interviews.

State	Program/Policy	Policy type	Brief summary
Alabama	Wood Burning Heating System Deduction[1]	Incentive-based	Individual taxpayers can get a deduction for the installation of a wood-burning heating system. The deduction is equal to the total cost of installation for the conversion from gas or electricity to wood when the system is used as the primary energy source for heating a home. The deduction must be taken for the taxable year during which the conversion was completed. Note that this incentive is for the conversion of an existing system and not for the first-time installation of a wood-burning system.
	The Biomass Energy Program	Incentive-based	Assists businesses in installing biomass energy systems. Program participants receive up to $75,000 in interest subsidy payments to help defray the interest expense on loans to install approved biomass projects. Technical assistance is also available through the program. Industrial, commercial and institutional facilities; agricultural property owners; and city, county, and state government entities are eligible. Interested parties must obtain loans from commercial lending institutions and submit repayment data to ADECA for interest payment assistance. Interest rates on loans should be no greater than 2% above the prime rate. With an initial emphasis on wood waste, the program also promotes landfill gas as a potential source of energy for industrial processes and other uses. Several landfill waste disposal facilities across Alabama have been identified as prime candidates for landfill gas recovery and utilization. There is a website which provides detailed information about this project, as well as a power point presentation regarding the history of a program, an example of the program brochure which can be provided to interested parties, and some case studies of the program.[2]
	Agriculture Energy Program Projects Farmer Education and Demonstration Program for Biofuel Feedstock Production in Alabama, Auburn University	Support programs	The objective of this project is to conduct demonstrations and educational activities to instruct farmers on how to grow non-traditional energy crops for biofuel production. A seminar for county extension agents and three field days for farmers and county extension agents will be held providing information and instruction on energy crop production, harvesting and transport, and bioenergy in general. In conjunction with the field days and through county agents and additional meetings as necessary, farmers will be recruited and signed up to supply feedstock to Alabama's first cellulosic biofuel production facility. In addition, five to ten farmers will be identified to plant and establish 10-acre test plots of Alamo switchgrass. Another phase of the project will involve the establishment, demonstration and evaluation of low input alternative energy crops (sugarcane, sweet sorghum, turnips, sugar beets, cassava, and sweet potatoes) for small scale biofuel production. Biofuel conversion equipment will be tested and data collected on the conversion of various crops to biofuel. These components will then be integrated into a total system approach and evaluated on an economic basis for the small scale production of biofuel on farms in Alabama. Byproducts from the conversion process will be utilized to assess palatability and growth performance of livestock.
	Agriculture Energy Program Projects Demonstrating Combined Heat and Power Generation from Biomass Residues Indigenous to Alabama, Auburn University	Support programs	Auburn University will demonstrate a BioMax 25 modular bipower system designed to use gasification technology to convert a variety of biomass residues (e.g. wood chips, nutshells, pits, prunings, pelletized agricultural materials including switchgrass, poultry litter, and corn stover) into power, heat/cooling, and liquid fuels for farmers, enterprises, schools, homes and small communities. The system will be purchased and retrofitted so that it can be transported and demonstrated on a mobile trailer. The system will be demonstrated at major on-campus events, a poultry farm, and at a minimum of twelve stops on a tour throughout the state. This statewide tour will include stops at regional extension offices, public schools and colleges, the state capitol building, and agricultural-based facilities across the state.

	Agriculture Energy Program Projects Biodiesel Production and its Value-Added Products for Small Farms, Alabama A&M University	Support programs	Alabama A&M will establish an outreach program to demonstrate and educate farmers about the feasibility and economic benefits of growing canola for small scale biodiesel production and additional value-added products for agricultural operations. Five to ten acres of winter canola will be grown in five locations across the state (Limestone, Madison, Marshall, Lee, and Baldwin Counties). Each location will be used as a demonstration site to educate area farmers on production practices for winter canola. The canola will be harvested and oil will be extracted from the seeds and converted to biodiesel on-site at each location. A variety of pelletized food products will be formulated and produced from the canola meal for fish farming, poultry and small ruminant production, and fertilizer / soil amendments for organic crop production. The canola meal will also be used in combination with other plentiful resources such as saw dust and poultry litter to formulate solid fuel pellets with high Btu capacity for potential combined heat and power use.
	Agriculture Energy Program Projects Low Pressure Nozzles – Improving Irrigation Energy Efficiency, Alabama Cooperative Extension System	Support programs	This project will demonstrate the energy efficiency of retrofitting irrigation systems with low pressure drop nozzles at six to twelve farms in the state. An energy cost reduction of 45% is expected from these retrofits. Energy usage and cost data will be collected and analyzed with project results disseminated at grower production meetings, published in regional farm publications and electronic media, and included in Extension sponsored farm tours.
	Agriculture Energy Program Projects Low-Cost Energy Retrofits for Alabama Broiler Houses Using Emerging Sealing, Insulation, and Lighting Technologies, Auburn University	Support programs	Auburn University will demonstrate and compare energy savings for poultry farms through alternative sealing and insulating technology combinations and cold cathode lighting retrofits. The project will be conducted at two poultry farms in Blount County. Data including propane and electricity consumption and cost, total energy usage and cost, pounds of live weight produced, feed conversion and standard cost will be recorded and analyzed. Results of the project will be disseminated through instructional on-farm demonstration tours, educational meetings, and Extension educational materials.
	Center for Alternative Fuels	Support programs	It is within the Alabama Department of Agriculture and Industries, and promotes alternative fuels as a viable energy source in the state. The Center assesses current status and development of sources of alternative fuels, ensures that all alternative fuels sold in the state meet American Society for Testing and Materials (ASTM) standards, and acts as an information center for alternative fuels, as well as a clearinghouse for available federal grant funding for alternative fuel development. The Center is also responsible for administering a grant program funded by an income tax check-off program through the Alabama Alternative Fuels and Research Development Fund. [3]
Arkansas	Alternative Fuel Grants	Incentive-based	The Arkansas Alternative Fuels Development Fund includes three types of grant incentives available beginning January 1, 2007. The grants include capital and operation incentives for alternative fuel producers and feedstock processors, production incentives for feedstock producers, and distribution incentives for alternative fuels distributors. Alternative fuel producers can receive up to $0.20 per gallon of alternative fuels produced, not exceeding $2 million. Feedstock processors can receive up to $2 million for the construction, modification, alteration, or retrofitting of feedstock processing facilities that are located and operated in Arkansas. Alternative fuel distributors can receive $50,000 to assist with the distribution and storage of alternative fuels or alternative fuels mixture at distribution facilities that are located and operated in Arkansas. Funding is available through July 1, 2009. [4]
	Idle Reduction Technology Loans	Incentive-based	The Arkansas Department of Environmental Quality has a small business loan program that provides low-interest loans to Arkansas small businesses to institute pollution control measures as required by state and federal law or to institute pollution prevention measures that reduce the amount of pollution produced by businesses. Idle reduction technologies for heavy-duty trucking applications are eligible for this loan. An eligible business must employ no more than 100 individuals and demonstrate proof of profitability and the ability to repay the loan.

	Green Building Standards for State Facilities[5]	Regulatory mechanism	Effective July 1, 2005, the Arkansas Energy and Natural Resources Conservation Act encourages all state agencies, including institutions of higher education, to use Leadership in Energy and Environmental Design (LEED) and Green Globes rating systems whenever possible and appropriate in conducting or funding a public building project. The act includes Arkansas-specific provisions for LEED and Green Globes certification. Under these provisions, those pursuing LEED certification can take additional credits for the use of composite wood and agrifiber products, post-consumer recycled content, renewable bio-based materials, carbon-sequestering bio-based materials, and bio-based materials from other certified sources. Those using the Green Globes rating system can earn additional points for carbon-sequestering bio-based materials and bio-based materials from certified sources. The act also establishes the Legislative Task Force on Sustainable Building Design and Practices to continue work on issues related to sustainable design and practices for state buildings, to serve as an educational reference, and to review the related practices of state agencies.[6]
	Net-metering[7]	Regulatory mechanism	In April 2001, Arkansas enacted legislation (HB 2325) directing the Arkansas Public Service Commission (PSC) to establish net-metering rules for certain renewable-energy systems. The PSC approved final rules for net metering in July 2002. Subsequent legislation enacted in April 2007 (HB 2334) bolstered the existing statute by increasing the availability of net metering, improving the law's provision for the carryover of net excess generation (NEG), and clarifying the ownership of "renewable-energy credits" (RECs). Residential renewable-energy systems up to 25 kilowatts (kW) in capacity and nonresidential systems up to 300 kW in capacity are eligible for net metering. Eligible technologies include solar, wind, hydroelectric, geothermal and biomass systems, as well as fuel cells and microturbines using renewable fuels. There is no limit on the aggregate capacity of all net-metered systems. The 2007 amendments allow net-metered customers to carry over any NEG to their following monthly bill at the utility's retail rate. Any NEG remaining at the end of an annual billing cycle is granted to the utility. (Previously, NEG was granted to the utility monthly.) In addition, the 2007 amendments clarified that net-metered customers own RECs.[8]
	Biofuels Use Requirement	Regulatory mechanism	The Arkansas Alternative Fuels Development Act establishes an annual goal of 50 million gallons of alternative fuels produced at production facilities in the state by October 6, 2008. Furthermore, by January 1, 2009, all diesel-powered motor vehicles, light trucks, and equipment owned or leased by a state agency must be operated using diesel fuel that contains a minimum of 2% biofuels by volume. Waivers to the 2% biofuels standards for state agency vehicles may be granted if the fuel is not available in certain geographic area or if the fuel is at least $0.15 cents more expensive per gallon than the petroleum equivalent. The Arkansas Bureau of Standards will work to ensure fuel quality standards.[9]
Florida	Florida Renewable Energy Tax Incentives Program[10]	Incentive-based	The Florida Energy Act established provisions for 1) sales tax exemptions and 2) corporate income tax credits aimed at promoting infrastructure development that supports hydrogen and biofuel technologies. In addition, the Act created a production tax credit which provides a corporate income tax credit based on the amount of electricity produced from renewable energy sources at a new or expanded Florida facility. The production tax credit is administered by the Department of Revenue.
	Sales Tax Program	Incentive-based	Through July 1, 2010, the sale or use of the following is exempt from Florida state sales, rental, use, consumption, distribution, and storage tax: 1) hydrogen powered vehicles and related materials, and hydrogen refueling stations, up to a maximum of $2 million in taxes in each fiscal year for all taxpayers; 2) materials used in the distribution of biodiesel (B10-B100) and ethanol (E10-E100), including refueling infrastructure, transportation, and storage, up to a maximum of $1 million in taxes in each fiscal year for all taxpayers. Gasoline refueling station dispenser retrofits for ethanol (E10-E100) distribution also qualify for this exemption.[11]

	Infrastructure Investment Tax Credit Program	Incentive-based	For tax years beginning on or after January 1, 2007, a credit against either the corporate income tax or the franchise tax will be granted in an amount equal to the eligible costs. Credits may be used in tax years beginning January 1, 2007, and ending December 31, 2010, after which the credit shall expire. Eligible costs are defined as: seventy-five percent of all capital costs, operation and maintenance costs, and research and development costs incurred between July 1, 2006, and June 30, 2010, up to a limit of $3 million per state fiscal year for all taxpayers, in connection with an investment in hydrogen-powered vehicles and hydrogen vehicle fueling stations in the state, including, but not limited to, the costs of constructing, installing, and equipping such technologies in the state; seventy-five percent of all capital costs, operation and maintenance costs, and research and development costs incurred between July 1, 2006, and June 30, 2010, up to a limit of $1.5 million per state fiscal year for all taxpayers, and limited to a maximum of $12,000 per fuel cell, in connection with an investment in commercial stationary hydrogen fuel cells in the state, including, but not limited to, the costs of constructing, installing, and equipping such technologies in the state; seventy-five percent of all capital costs, operation and maintenance costs, and research and development costs incurred between July 1, 2006, and June 30, 2010, up to a limit of $6.5 million per state fiscal year for all taxpayers, in connection with an investment in the production, storage, and distribution of biodiesel (B10-B100) and ethanol (E10-E100) in the state, including the costs of constructing, installing, and equipping such technologies in the state. Gasoline fueling station pump retrofits for ethanol (E10-E100) distribution qualify as an eligible cost under this subparagraph.
	Florida Renewable Energy Production Tax Credit	Incentive-based	Administered by the Department of Revenue, the Florida renewable energy production credit is intended to encourage the development and expansion of facilities in Florida that produce electricity from renewable energy.
	Ethanol Production Credit	Incentive-based	County governments are eligible to receive waste reduction credits for using yard clippings, clean wood waste, or paper waste as feedstocks for the production of clean-burning fuels such as ethanol.[12]
	High Occupancy Vehicle (HOV) Lane Exemption	Incentive-based	Inherently Low Emission Vehicles (ILEVs) and hybrid electric vehicles that are certified and labeled in accordance with federal regulations may be driven in HOV lanes at any time, regardless of the number of passengers in the vehicle. The vehicle must have a decal issued by the Florida Division of Motor Vehicles, obtained for a $5 fee, which must be renewed annually.[13]
	Florida Renewable Energy Technologies Grants Program	Incentive-based	The Florida Energy Act established the Renewable Energy Technologies Grants Program to provide renewable energy matching grants for demonstration, commercialization, research and development projects relating to renewable energy technologies. The grant program is designed to stimulate capital investment in the state, and promote and enhance the statewide utilization of renewable energy technologies.
	JEA - Clean Power Program	Incentive-based	In November 1999, JEA signed a Memorandum of Understanding with the Sierra Club and the American Lung Association of Florida that details the municipal utility's commitment to generate at least 7.5% of its electric capacity from "clean and green energy sources" by 2015. Eligible renewable-energy resources include solar, biomass, biogas (methane from landfills and sewage treatment plants), and wind.
	Florida Farm-to-Fuel Initiative	Support programs	In 2006, this was created to enhance the market for and promote the production and distribution of renewable energy from Florida-grown crops, agricultural wastes and residues, and other biomass and to enhance the value of agriculture products or expand agribusiness.[14]
	The Florida Renewable Energy Technologies and Energy Efficiency Act	Regulatory mechanism	Established to increase the state's energy stability and protect public health by advancing the development of efficient and renewable energy technologies, including those related to hydrogen, ethanol, and biodiesel. The Act creates the Florida Energy Commission, which is responsible for developing recommendations for legislation to establish a state energy policy, focusing on energy-efficiency issues including the encouragement of in-state research, development, and deployment of alternative fuels for motor vehicles.[15]

	Net-metering	Regulatory mechanism	In March 2008, the Florida Public Service Commission (PSC) adopted rules for net metering and interconnection for renewable-energy systems up to two megawatts (MW) in capacity. The PSC rules apply only to the state's investor-owned utilities; the rules do not apply to electric cooperatives or municipal utilities. Some municipal utilities in Florida offer net metering voluntarily.[16]
Georgia	Clean Energy Tax Credit (Corporate)	Incentive-based	In May 2008, Georgia enacted legislation[17] establishing personal and corporate tax credits for renewable energy equipment and certain energy-efficient equipment installed and placed into service. For renewable energy property used for any purpose other than single-family residential purposes, the tax credit is equal to 35% of the cost of the system (including installation), $0.60/square foot for lighting retrofit projects, and $1.80/square foot for energy-efficient products installed during construction. The credit is subject to various ceilings depending on the type of renewable-energy system or project. For biomass equipment, a maximum of $500,000 per installation applies. A maximum of $100,000 for energy-efficient products installed during construction also applies. Leased systems are eligible for the credit. Before claiming the credit, the taxpayer must submit an application to the Georgia tax commissioner for tentative approval, as the aggregate amount of tax credits taken — both personal and corporate credits — may not exceed $2,500,000 in a given calendar year. Tax credits are granted on a first come, first serve basis and may not exceed the taxpayer's liability for that taxable year. Excess credit may be carried forward for five years from the close of the taxable year in which the installment of the clean energy property occurred. If the amount of credits exceeds the taxpayer's liability in a taxable year, the excess may be taken as a credit against the taxpayer's quarterly or monthly payment. This tax credit is in effect from July 1, 2008 until December 31, 2012.
	Biomass Sales and Use Tax Exemption	Incentive-based	Georgia enacted legislation in April 2006[18] creating an exemption for biomass materials from the state's sales and use taxes. The term "biomass material" is defined as "organic matter, excluding fossil fuels, including agricultural crops, plants, trees, wood, wood wastes and residues, sawmill waste, sawdust, wood chips, bark chips, and forest thinning, harvesting, or clearing residues; wood waste from pellets or other wood demolition debris; peanut shells; pecan shells; cotton plants; corn stalks; and plant matter, including aquatic plants, grasses, stalks, vegetation, and residues, including hulls, shells, or cellulose containing fibers." To qualify for the exemption, biomass material must be utilized in the production of energy, including the production of electricity, steam, or both electricity and steam. Pellets and fuels derived from biomass are generally eligible.[19]
	Alternative Fuel Vehicle Tax Credit	Incentive-based	An income tax credit is available for the purchase, lease, or conversion of a vehicle that operates solely on an alternative fuel and meets the U.S. Environmental Protection Agency (EPA) certification of a Low Emission Vehicle (LEV). The credit is worth up to 10% of the cost of a new AFV or up to 10% of the cost of converting the vehicle to operate on an alternative fuel, or $2,500, whichever is less. The credit cannot exceed the taxpayer's income tax liability, but any portion of the credit not used in the year the AFV is purchased or converted can be carried over for up to five additional years. This incentive does not apply to hybrid electric vehicles.[20]
	Alternative Fuel Vehicle (AFV) High Occupancy Vehicle (HOV) Lane Exemption	Incentive-based	AFVs displaying the proper alternative fuel license plate are allowed to use HOV lanes, regardless of the number of passengers.[21]
	Establishment of E85 Fueling Infrastructure Grant Program	Incentive-based	The Department of Community Affairs is required to establish a grant program for E85 infrastructure projects. The Georgia Environmental Facilities Authority administers the grant program. Grants of up to $20,000, or 1/3 of the total planned project cost, will be made available for each approved project. Construction for any approved project must begin no later than six months after the date the grant is issued and must be completed within one year of receipt of the grant. Grants are only available for issue until July 1, 2009.[22]

	Biodiesel Study Committee	Regulatory mechanisms	This involves the creation of a State Senate Biodiesel Fuel Study Committee to study the conditions, needs, and issues associated with expanding biodiesel use and production in the state of Georgia. The Committee meets as often as necessary to carry out these duties and report their findings and recommendations, if any, on or before December 1, 2008.[23]
	Alternative Fuel Use and Alternative Fuel Vehicle (AFV) Acquisition Requirements (state vehicles)	Regulatory mechanisms	State agencies and departments are required to prioritize the procurement of high fuel efficiency and flexible fuel vehicles when such technologies are commercially available and economically practical. Additionally, all state-owned fueling facilities are required to maximize the purchasing of gasoline blended with ethanol, and diesel fuel blended with biodiesel ,for use in state vehicles when available and economically practical. On December 15, 2006, the Governor's Energy Policy Council finalized the first Comprehensive State Energy Strategy, which offers a suggested approach toward a sustainable energy future for Georgia and includes implementation strategies related to alternative fuel production and use.[24]
Kentucky	Alternative Fuel Production Tax Incentive Refund	Incentive-based	In August 2007 Kentucky established the Kentucky Incentives for Energy Independence Act to promote the development of renewable energy and alternative fuel facilities, energy efficient buildings, alternative fuel vehicles, research & development activities and other energy initiatives. This provides a tax refund of up to 100% of the state sales tax paid on the purchase of personal property used to construct, retrofit, or upgrade an alternative fuel production or gasification facility. Additionally, the KEDFA provides a credit of up to 100% of the income tax and limited liability entity tax that would otherwise be owed by a company for an alternative fuel production or gasification facility that uses biomass as the primary feedstock. The incentives apply to property purchased on or after January 1, 2008, and expire upon the completion of the project, or five years from the date on which the company begins receiving the incentive, whichever is. Producers may recover up to 50% of their capital investment in tax incentives. The minimum capital investment for incentive eligibility is $25 million for an alternative fuel or gasification facility that uses biomass as the primary feedstock. KEDFA may distribute the sales tax incentive before the minimum capital investment is made. It also includes a wage assessment of up to 4% for associated employees. A renewable energy facility is defined as one that generates at least 1 MW from biomass resources, landfill gas, or similar renewable resources. The electricity must be sold to an unrelated party. The minimum investment in any renewable energy facility must be $1 million in capital expenditure which is defined to include various non-capital costs such as labor. [25]
	Alternative Fuel Production Tax Credit	Incentive-based	An income tax credit is available for biofuels producers of $1.00 per gallon of pure biodiesel, corn-based ethanol, or cellulosic-based ethanol. The total amount of credit for all biodiesel producers may not exceed the annual biodiesel tax credit cap of $1,500,000; beginning January 1, 2008, the biodiesel tax credit cap expands to $5 million per taxable year. The total amount of credit for all corn and cellulosic ethanol producers is $5 million for taxable years beginning January 1, 2008. Unused credits may not be carried forward and applied to a future tax return. However, unused ethanol credits from one ethanol-based cap (corn or cellulosic) may be applied to another ethanol-based cap in the same taxable year. For the purpose of this credit, biodiesel must meet American Society for Testing and Materials (ASTM) specification D6751, and ethanol must meet ASTM standard D4806.[26]
	Alternative Fuel Research and Development	Support programs	The Kentucky Alternative Fuel and Renewable Energy Fund Program provides funding to Kentucky-based companies for research, development, and commercialization of alternative fuels and renewable energy. The Program focuses on providing support to research and development projects that lead to innovative technology, new knowledge, commercially successful products or services, or show significant potential to stimulate economic development and employment growth in the state. Up to $5 million may be awarded to eligible projects.[27]
	Alternative Fuel and Vehicle Promotion	Support programs	The Kentucky Division of Renewable Energy and Energy Efficiency provides information on a range of alternative fuels, demonstration projects, and promotes networks of people working with alternative fuels. It has implemented a number of projects to support alternative fuel vehicles and establish an alternative fuel refueling infrastructure.
	Financial Assistance to the Kentucky Clean Fuels Coalition	Support programs	The Office for Energy Policy financially assists the Kentucky Clean Fuels Coalition, http://www.kentuckycleanfuels.org/, which is the state's main point of contact for educational and professional assistance.

	Net-Metering	Regulatory mechanism	In April 2008, Kentucky enacted legislation (SB 83) that expanded its net-metering law by requiring utilities to offer net metering to customers that generate electricity with biomass or biogas up to 30 kilowatts (kW) in capacity. Previous rules allowed net metering only for PV systems up to 10 kW. SB 83 requires the Kentucky Public Service Commission (PSC) to file rules within 180 days of the bill's passage. Within 90 days of the issuance of the PSC rules, utilities must file tariffs that include all terms and conditions of their net-metering programs, including interconnection. Net metering is available to all customers of investor-owned utilities and rural electric cooperatives, exempting TVA utilities. If the cumulative generating capacity of net-metered systems reaches 1.0% of a utility's single-hour peak load during the previous year, the PSC may limit the utility's obligation to offer net metering. When time-of-day or time-of-use metering is used, the electricity fed back to the grid by customers is net-metered and accounted for at the specific time it is fed back to the grid in accordance with the time-of-day or time-of-use billing agreement currently in place. Kentucky has not adopted interconnection standards for net-metered systems or larger distributed generation.[28]
	Vehicle Acquisition Priorities and Alternative Fuel Use Requirement	Regulatory mechanism	The Finance and Administration Cabinet is required to develop a strategy to replace at least 50% of state motor fleet light-duty vehicles with energy-efficient vehicles including hybrid-electric vehicles, fuel cell vehicles, and alternative fuel vehicles. The Finance and Administration Cabinet must also develop a strategy to increase the use of ethanol, biodiesel, and other alternative fuels in state motor fleet vehicles. The Cabinet must present its strategy to the state Legislative Research Commission by December 1, 2007, and report targeted vehicle and fuel usage amounts annually.[29]
	Biofuels Use	Regulatory mechanism	The Kentucky Transportation Cabinet and the Finance and Administration Cabinet is responsible for establishing procurement contracts which maximize market availability of ethanol (E10) and biodiesel (B2) blends. Additionally, employees using conventional vehicles in the Transportation Cabinet's fleet use either a 10% blend of ethanol (E10) or a 2% blend of biodiesel (B2) as their primary fueling option, and the Transportation Cabinet must maximize the use of E85 in its fleet of flexible fuel vehicles. The Transportation Cabinet also promotes clean fuels by educating employees about clean fuels, identifying vendors, and holding employees accountable for electing to use clean fuels in state vehicles.[30]
Louisiana	Alternative Fuel Vehicle (AFV) and Fueling Infrastructure Tax Credit	Incentive-based	The state offers an income tax credit worth 20% of the cost of converting a vehicle to operate on an alternative fuel, 20% of the incremental cost of purchasing an Original Equipment Manufacturer (OEM) AFV or hybrid electric vehicle (HEV), and 20% of the cost of constructing an alternative fuel fueling station. For the purchase of an OEM AFV or HEV, the tax credit cannot exceed 2% of the total cost of the vehicle or $1,500, whichever is less. Only vehicles registered in Louisiana can receive the tax credit. For the purpose of this incentive, alternative fuels include compressed natural gas, liquefied natural gas, liquefied petroleum gas, methanol, ethanol, electricity, and any other fuels which meet or exceed federal clean air standards.
	Biodiesel Equipment and Fuel Tax Exemption	Incentive-based	Certain property and equipment used to manufacture, produce, or extract unblended biodiesel, as well as unblended biodiesel used as fuel by a registered manufacturer, are exempt from state sales and use taxes. Unblended biodiesel is defined as B100 which meets the American Society of Testing and Materials (ASTM) standard D6751. These provisions are effective through June 30, 2012.[31]
	Low-Speed Vehicle Support	Support programs	The Legislature of Louisiana supports the commercial introduction of low-speed vehicles into the state as an energy efficient and economically beneficial form of transportation. The Legislature has urged the Louisiana Office of Motor Vehicles to use the maximum authorized inspection period for low-speed vehicles and that all parishes and municipalities involved in the inspection of motor vehicles exempt low-speed vehicles from such inspection.[32]
	Alternative Fuel Promotion	Regulatory mechanism	The Legislature of Louisiana urges the state Department of Economic Development and the Department of Agriculture and Forestry to promote the use of alternative fuels and provide incentives for companies and consumers who use alternative fuels.[33]

	Renewable Fuels Standard	Regulatory mechanism	Within six months following the point at which cumulative monthly production of denatured ethanol produced in the state equals or exceeds an annual production volume of at least 50 million gallons, 2% of the total gasoline sold by volume in the state must be denatured ethanol produced from domestically grown feedstock or other biomass materials. Ethanol is defined as ethyl alcohol that has a purity of at least 99%, exclusive of added denaturants, meets U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives and American Society for Testing and Materials (ASTM) D-4806 standards, and is produced from domestic agricultural or biomass products. This requirement will not be effective until six months after the average wholesale price of a gallon of Louisiana-manufactured ethanol, less any federal alcohol fuel mixture tax credit, is equal to or below the average wholesale price of a gallon of regular unleaded gasoline in Louisiana for a period of not less than 60 days, as determined by the Louisiana Biofuel Panel. Additionally, the Legislature urges the state Department of Agriculture and Forestry not to implement the minimum ethanol requirements if the requirements raise the price of gasoline by more than $0.02 per gallon. Within six months following the point at which cumulative monthly production of biodiesel produced in the state equals or exceeds an annual production volume of 10 million gallons, 2% of the total diesel sold by volume in the state must be biodiesel produced from domestically grown feedstock. Biodiesel is defined as a fuel comprised of mono-alkyl esters of long chain fatty acids derived from renewable resources and meeting the requirements of ASTM D-6751, or a diesel fuel substitute produced from non-petroleum renewable resources such as vegetable oils and animal fats that meet U.S. Environmental Protection Agency fuel and fuel additive requirements. Alternatively, these requirements may be met through the production of an "alternate renewable fuel," defined as a liquid fuel that is domestically produced from renewable biomass, can be used in place of ethanol or biodiesel, and meets the definition of renewable fuel in the Energy Policy Act of 2005. However, these requirements may not exceed 2% of the total gasoline and 2% of the total diesel sold by volume by owners or operators of fuel distribution terminals. Blenders and retailers will have six months to meet the new minimum ethanol, biodiesel, or alternate renewable fuel content requirements, unless the state Department of Weights and Measures determines there is an insufficient supply of ethanol or biodiesel in the state. Any combination of alternative fuels, including but not limited to denatured ethanol, biodiesel, and alternative renewable fuel may be used to meet these requirements. Fuels containing ethanol or biodiesel will not be required to be sold in ozone nonattainment areas. The Commissioner of the Department of Agriculture and Forestry will adopt rules and regulations requiring incentives to compensate for any costs associated with achieving the minimum ethanol and biodiesel standards.[34]
	Biofuels Feedstock Requirements	Regulatory mechanism	Renewable fuel plants operating in Louisiana and deriving ethanol from the distillation of corn must use corn crops harvested in Louisiana for at least 20% of the facility's total feedstock. In succeeding years, the minimum percentage of Louisiana-harvested corn used to produce renewable fuel in Louisiana facilities must be at least the same percentage of corn used nationally to produce renewable fuel as reported by the U.S. Department of Agriculture's (USDA) Office of the Chief Economist. Renewable fuel plants operating in Louisiana and deriving biodiesel from soybeans and other crops must use soybean crops harvested in Louisiana for at least 2.5% of the facility's total feedstock. In succeeding years, the minimum percentage of Louisiana-harvested soybeans used to produce renewable fuel in Louisiana facilities must be the percentage of soybeans used nationally to produce renewable fuel as reported by the USDA Office of the Chief Economist.[35]
	Net-metering	Regulatory mechanism	In November 2005, the Louisiana Public Service Commission (PSC) issued rules for net metering and the interconnection of net-metered systems. Louisiana's rules, based largely on those in place in Arkansas, require publicly-owned utilities and rural electric cooperatives to offer net metering to customers with systems that generate electricity using solar, wind, hydropower, geothermal or biomass resources. (Fuel cells and microturbines that generate electricity entirely derived from renewable resources are eligible.) The rules apply to residential facilities with a maximum capacity of 25 kilowatts (kW) and commercial systems with a maximum capacity of 100 kW.

Mississippi	Biofuels Production Initiative	Incentive-based	Mississippi's Commissioner of Agriculture and Commerce is authorized to make direct payments to ethanol and biodiesel producers located in Mississippi. The amount of payment for each producer's annual production is $0.20 per gallon, up to 30 million gallons per year per producer, for a period of up to 10 years following the start date of production. No payments will be made for production that occurs after June 30, 2015, and the maximum total annual payment to a single producer per fiscal year is $6 million.[36]
	Energy Investment Loan Program	Incentive-based	Mississippi offers low-interest loans for renewable energy and energy efficiency projects. Eligible renewable energy, alternative fuels, biomass, landfill gas, among others. All projects must demonstrate that they will reduce a facility's energy costs. The interest rate is 3% below the prime rate, with a maximum loan term of seven years. Loans range from $15,000 to $300,000. The program is supported by a revolving loan fund of $7 million, established through federal oil overcharge funds.
	Biodiesel Committee	Regulatory mechanism	A Study Committee on the Potential Use of Biodiesel Fuel was created in 2006 to study the need for mandated use of biodiesel and the agricultural and environmental benefits of biodiesel use.[37]
Missouri	Wood Energy Production Credit	Incentive-based	The Wood Energy Tax Credit, effective January 1, 1997, allows individuals or businesses processing Missouri forestry industry residues into fuels an income tax credit of $5.00 per ton of processed material. Any amount of credit exceeding the tax due by a company in the year of production may be carried over to a subsequent taxable year, not to exceed four years. A credit earned under this program may also be transferred to third parties for use within this five-year period. To be considered an eligible fuel, forestry industry residues must have undergone some thermal, chemical or mechanical process(es) sufficient to alter the residues into a fuel product.[38]
	Energy Loan Program	Incentive-based	This loan program is administered by the Energy Center of the Missouri Department of Natural Resources, and is available for energy efficiency and renewable energy projects for public and governmental buildings and structures. Loan amounts are based on projected energy savings, resulting in monetary savings that is used to repay the loan. Financing is available at a fixed interest rate below the market rate, and repayment schedules are determined on an individual project basis. Loans under this program are determined on a competitive basis according to sector and payback period. Eligible technologies include biomass technology. Since the program's inception in 1989, loans totaling over $80 million have been made to the applicable sectors, resulting in an estimated savings of $105 million.[39]
	Ethanol Production Incentive	Incentive-based	Qualified ethanol producers are eligible for incentives through the Missouri Ethanol Producer Incentive Fund. The Fund provides $0.20 per gallon for the first 12.5 million gallons and $0.05 for the second 12.5 million gallons of ethanol produced from Missouri agricultural products each fiscal year. The Fund is administered by the Department of Agriculture and expires on December 31, 2015.[40]
	Biodiesel Production Incentive	Incentive-based	The Missouri Qualified Biodiesel Producer Incentive Fund provides a monthly grant to qualified Missouri biodiesel producers, provided that 1) at least 51% of the production facility is owned by agricultural producers who are residents of the state and who are actively engaged in agricultural production for commercial purposes or 2) at least 80% of the feedstock used by the facility originates in-state. All of the feedstock must originate in the U.S. However, the feedstock requirement may be waived on a month-to-month basis if the facility provides verification that adequate feedstock is not available. The value of the grant is $0.30 per gallon for the first 15 million gallons produced in a fiscal year and $0.10 per gallon for the next 15 million gallons produced in a fiscal year, up to a total of 30 million gallons and for 60 months maximum per producer. This fund is administered by the Missouri Department of Agriculture. Biodiesel is defined according to American Society for Testing and Materials (ASTM) Standard D-6751 or its subsequent standard specifications for biodiesel fuel (B100) blend stock for distillate fuels. This incentive expires December 31, 2009.[41]
	Biodiesel Fuel Use Incentive	Incentive-based	Through the 2011-12 school year, school districts are allowed to establish contracts with nonprofit, farmer-owned new generation cooperatives to purchase biodiesel blends of 20% (B20) or higher for use as bus fuel. Every school district that contracts with an eligible new generation cooperative for biodiesel will receive an additional payment through its state transportation aid payment, to offset the incremental cost of purchasing the biodiesel.[42]

	Alternative Fuel Vehicle (AFV) Emission Inspection Exemption	Incentive-based	Vehicles that are powered exclusively by electric or hydrogen power, or by fuels other than gasoline which are exempt from motor vehicle emissions inspection under federal regulation, are exempt from state emissions inspection requirements.[43]
	Fuel Tax Exemption	Incentive-based	The $0.17 per gallon motor fuel tax does not apply to passenger motor vehicles, certain buses, or commercial motor vehicles that are powered by an alternative fuel. Instead, the owners or operators of such vehicles are required to pay an annual alternative fuel decal fee.[44]
	Alternative Fuel Vehicle (AFV) Acquisition and Alternative Fuel Use Requirements	Regulatory mechanism	Effective January 1, 2008, at least 70% of new vehicles purchased for the state vehicle fleet must be flexible fuel vehicles that can operate on fuel blends of 85% ethanol (E85). Excess acquisitions of AFVs may be credited towards future biennial goals. If a state agency fails to meet a biennial acquisition goal, purchases of any non-AFVs are not permitted until the goals are met or an exemption or goal reduction has been granted. In addition, 30% of the fuel purchased annually for use in state fleet vehicles must be alternative fuels.[45]
	Alternative Fuels Promotion	Regulatory mechanism	The Missouri Ethanol and Other Renewable Fuel Sources Commission promotes the continued production and use of ethanol, ethanol blends, and other renewable fuel sources in Missouri. The commission reports annually to the general assembly its recommendations to the governor and general assembly on changes to state law to facilitate the sale and distribution of alternative fuels and alternative fuel vehicles; promotes the development, sale, distribution, and consumption of alternative fuels; promotes the development and use of alternative fuel vehicles and technology that will enhance the use of alternative and renewable transportation fuels; educates consumers about alternative fuels; and develops a long-range plan for the state to reduce consumption of petroleum fuels.[46]
	Biodiesel Use Requirement	Regulatory mechanism	The Missouri Department of Transportation (MoDOT) is required to develop a program that provides opportunities to use B20 or higher biodiesel blends in its vehicle fleet and heavy equipment that use diesel fuel. At least 75% of the MoDOT vehicle fleet and heavy equipment that uses diesel fuel must be fueled with B20 or higher biodiesel blends, if such fuel is commercially available. The blended biodiesel fuel will be presumed to be commercially available if the incremental cost of purchasing the fuel is not more than $0.25 as compared to conventional diesel fuel. To the maximum extent practicable, MoDOT must obtain funding for the incremental cost of the blended biodiesel fuel from the Biodiesel Fuel Revolving Fund.[47]
	Ethanol Fuel Blend Requirement	Regulatory mechanism	The Missouri Renewable Fuel Standard requires that, after January 1, 2008, all gasoline sold or offered for sale at retail stations within the state must contain 10% ethanol. This requirement is waived only if a distributor is unable to purchase ethanol or ethanol-blended gasoline at the same or lower price as unblended gasoline. Premium gasoline is exempt from this requirement. Ethanol fuel is defined as meeting American Society for Testing and Materials (ASTM) Specification D-4806.[48]

North Carolina	Renewable Energy Tax Credit (Corporate)	Incentive-based	In 1999 North Carolina's various renewable-energy tax credits were revised and unified into a statute that addresses nearly all renewables. The revised statute provides for a tax credit of 35% of the cost of renewable energy property constructed, purchased or leased by a taxpayer and placed into service in North Carolina during the taxable year. These tax credits took effect January 1, 2000. In September 2005, the credits were extended for another five years.[49] The credit is subject to various ceilings depending on sector and the type of renewable-energy system. The following credit limits for various technologies and sectors apply: A maximum of $3,500 per dwelling unit for residential active space heating, combined active space and domestic water-heating systems, and passive space heating; A maximum of $10,500 per installation for photovoltaic (solar-electric), wind, or other renewable-energy systems for residential use; A maximum of $2,500,000 per installation for all solar, wind, hydro and biomass applications on commercial and industrial facilities, including photovoltaic (PV), daylighting, solar water-heating and space-heating technologies. Renewable-energy equipment expenditures eligible for the tax credit include the cost of the equipment and associated design; construction costs; and installation costs less any discounts, rebates, advertising, installation-assistance credits, name-referral allowances or other similar reductions. Under North Carolina's tax code, the allowable credit may not exceed 50% of a taxpayer's liability for the year, reduced by the sum of all other credits. Single-family homeowners who purchase and install a qualifying renewable-energy system must take the maximum credit amount allowable for the tax year in which the system is installed. If the credit is not used entirely during the first year, the remaining amount may be carried over for the next five years. For all other taxpayers, the credit is taken in five equal installments beginning with the year in which the property is placed in service. If the credit is not used entirely during these five years, the remaining amount may be carried over for the next five years. The credit can be taken against franchise tax, income tax or, if the taxpayer is an insurance company, against the gross premiums tax. SB 3 of 2007 amended North Carolina's renewable energy tax credit statute to allow a taxpayer who donates money to a tax-exempt nonprofit to help fund a renewable energy project to claim a tax credit. The donor can claim a share of the credit -- proportional to the project costs donated — that the nonprofit could claim if the organization were subject to tax
	Local Option Green Building Incentive	Incentive-based	This incentive encourages sustainable building practices and North Carolina law allows counties and cities to provide reductions or partial rebates for building permit fees. To qualify for a fee reduction, buildings must meet guidelines established by the Leadership in Energy and Environmental Design (LEED) program, the Green Globes program, or another nationally recognized certification program.[50]

	GreenPower Production Incentive	Incentive-based	NC GreenPower, a statewide green-power program designed to encourage the use of renewable energy in North Carolina, offers production payments for grid-tied electricity generated by biomass resources. Payment arrangements for electricity generated by most renewable-energy systems are available through a periodic request for proposals (RFP) process. Customer-generators who choose to net meter are not permitted to sell electricity under the NC GreenPower Program. Generators are required to enter into power-purchase agreements with their utility and with NC GreenPower. However, because premiums paid to NC GreenPower are funded exclusively by voluntary contributions from North Carolina electric customers, NC GreenPower does not provide guaranteed contracts to generators. Production incentives are based on the amount expected to make the installation of renewable-energy systems approach economic feasibility. The incentives, which include payments from utility power-purchase agreements, are made on a per-kWh basis and vary by technology. NC GreenPower is an independent, nonprofit organization created by state-government officials, electric utilities, nonprofit organizations, consumers, renewable-energy advocates and other stakeholders. It began operation in October 2003 as the first statewide green-power program in the United States. North Carolina's three investor-owned utilities — Progress Energy, Duke Energy and Dominion North Carolina Power — and many of the state's municipal utilities and electric cooperatives are participating in the NC GreenPower Program.[51]
	Energy Improvement Loan Program (EILP)	Incentive-based	North Carolina's Energy Improvement Loan Program (EILP) is available to businesses, local governments, public schools, community colleges, and non-profit organizations for projects that include energy efficiency improvements and renewable energy systems. Loans with an interest rate of 1% are available for certain renewable-energy and energy-recycling projects. Eligible renewable-energy projects include biomass projects. Loans with a rate of 3% are available for projects that demonstrate energy efficiency, energy cost savings or reduced energy demand. Energy conservation projects usually include improvements to HVAC systems, energy management controls, high efficiency lighting and building envelope improvements. Loans are secured by bank letter-of-credit (non-applicable for local governments and school systems). In order to qualify for the EILP, a project must (1) be located in North Carolina; (2) demonstrate energy efficiency, use of renewable-energy resources, energy cost savings or reduced energy demand; (3) use existing, reliable, commercially-available technologies; (4) meet federal and state air and water-quality standards; and (5) be able to recover capital costs within the loan's maximum term of 10 years through energy cost savings. Note that letter-of-credit fees do not apply to government agencies and public schools.[52]
	Biodiesel Production Tax Credit	Incentive-based	A biodiesel provider that produces at least 100,000 gallons of biodiesel during the taxable year is allowed a credit equal to the per gallon excise tax the producer paid in accordance with the motor fuel excise tax rate. The credit does not apply to tax paid on the diesel portion of the biodiesel blends and the credit may not exceed $500,000. This credit is effective for taxable years beginning on January 1, 2008, and is in effect until January 1, 2010.
	Alternative Fuel Production Tax Credit	Incentive-based	A tax credit is available for the processing of biodiesel, 100% ethanol, or ethanol/gasoline blends consisting of at least 70% ethanol. The credit is equal to 25% of the cost of constructing and equipping the facility and a facility must be placed in service before January 1, 2011. The credit must be taken in seven equal annual installments beginning with the taxable year in which the facility is placed in service. In lieu of the above credit, a taxpayer that constructs and places into service, in North Carolina, three or more commercial facilities for processing renewable fuel and invests a total amount of at least $400,000,000 in the facilities is allowed a credit equal to 35% of the cost to the taxpayer of constructing and equipping the facilities. To claim the credit, the taxpayer must obtain a written determination from the Secretary of Commerce that the taxpayer is expected to invest at least $400,000,000 in three or more facilities within a five-year period. Facilities must be placed in service before January 1, 2011.[53]
	Bond Exemption for Small Biofuels Producers	Incentive-based	A bond filed with the Secretary of Revenue is not required for fuel blenders or suppliers of ethanol or biodiesel when the expected motor fuel tax liability is less than $2,000.[54]

	Alternative Fuel Fueling Infrastructure Tax Credit	Incentive-based	A tax credit is available for qualified fueling facilities that dispense biodiesel, 100% ethanol, or ethanol/gasoline blends consisting of at least 70% ethanol. The credit is equal to 15% of the cost of construction and installation of the dispensing facility, including pumps, storage tanks, and related equipment, that is directly and exclusively used for dispensing or storing the fuel. The credit must be taken in three equal annual installments beginning with the taxable year in which the facility is placed into service. Facilities must be placed in service before January 1, 2011. [55]
	Alternative Fuel Tax Exemption	Incentive-based	The retail sale, use, storage or consumption of alternative fuels is exempt from the state retail sales and use tax.[56]
	North Carolina Green Business Fund	Support programs	The North Carolina Green Business Fund, created in 2007, provides funding to North Carolina organizations to encourage the development and commercialization of "promising" renewable energy and green building technologies. Grants of up to $100,000 are available for the development of commercial innovations and applications in the biofuels industry, sustainable building practices and private sector investment in renewable energy technologies. North Carolina-based businesses and nonprofits with fewer than 100 employees, as well as state and local governmental entities, are generally eligible. Grants in the green building sector may be awarded for innovation in areas of installation, certification or distribution of green building materials; energy audits; workforce development; and marketing and sales. For private sector investment in clean technologies, grants may target renewable energy deployment, biomass energy projects, waste reclamation for energy, implementation of energy efficiency technologies and clean distributed generation infrastructure improvements. Grants are also available for the development, production and distribution of biofuels in North Carolina.[57]
	Alternative Fuel Vehicle (AFV) and Hybrid Electric Vehicle (HEV) Grants	Support programs	Clean Fuel Advanced Technology (CFAT) is a three-year project focused on reducing transportation related emissions in North Carolina's non-attainment and maintenance counties for National Ambient Air Quality Standards. Projects that are adjacent to areas may also be eligible if emissions will be reduced in the eligible counties. The $2 million project is funded by the North Carolina Department of Transportation, State Energy Office, and the Division of Air Quality, and covers three broad areas: education and outreach; project funding; and recognition of exemplary activities. Funding for up to 80% of project costs is available for AFVs, fueling infrastructure, idle reduction technologies, heavy-duty HEVs, heavy-duty buses, and diesel retrofits.

	Net-metering	Regulatory mechanism	In October 2005, the North Carolina Utilities Commission (NCUC) adopted an order requiring the state's three investor-owned utilities — Progress Energy, Duke Energy and Dominion North Carolina Power — to make net metering available to customers that own and operate systems that generate electricity using biomass resources. Systems must be interconnected and operated in parallel with the utility's distribution system. (The NCUC adopted interconnection standards in March 2005.) The maximum capacity of net-metered residential systems is 20 kilowatts (kW); the maximum capacity of net-metered nonresidential systems is 100 kW. Net metering is available on a first-come, first-serve basis in conjunction with the utility's interconnection standards, up to an aggregate limit of 0.2% of the utility's North Carolina jurisdictional retail peak load for the previous year. Customers are required to switch to a time-of-use tariff in order to net meter. These tariffs could involve additional charges that do not apply to customers not taking service under a time-of-use tariff. In general, utilities charge monthly fees for all interconnected systems (including small renewable-energy systems). The NCUC's July 2006 order extended net-metering to eligible renewable-energy systems with battery storage. Previously, system owners with battery storage were not allowed to net-meter. (The NCUC noted that "gaming" a net-metering arrangement by using battery storage to manipulate a time-of-use tariff is not allowed.) In its July 2006 order, the NCUC clarified that net-metered customers' on-peak generation (under the time-of-use tariff) may be used to offset off-peak consumption, but not vice versa. Previously, the utilities' net-metering tariffs and riders only allowed excess on-peak production to be used to reduce on-peak consumption and excess off-peak production to be used to offset off-peak production. Net excess generation (NEG) is credited to the customer's next bill at the utility's retail rate, and then granted to the utility (annually) at the beginning of each summer season. Any renewable-energy credits (RECs) associated with NEG are granted to the utility when the NEG balance is zeroed out. This provision is designed to limit the size of individual facilities to match on-site power needs, according to the NCUC. Significantly, customer-generators who choose to net-meter are not permitted to sell electricity under the NC GreenPower Program. Utilities must file with the NCUC annual reports indicating the number of net-metering applicants and customer-generators, the aggregate capacity of net-metered generation, the size and types of renewable-energy systems, the amounts of on-peak and off-peak generation credited and ultimately granted to the utility, and the reasons for any rejections or removals of customer-generators from a net-metering arrangement.[58]

	Renewable Energy and Energy Efficiency Portfolio Standard	Regulatory mechanism	North Carolina's Renewable Energy and Energy Efficiency Portfolio Standard (REPS), enacted by Senate Bill 3 in August 2007, requires all investor-owned utilities in the state to supply 12.5% of 2020 retail electricity sales (in North Carolina) from eligible energy resources by 2021. Municipal utilities and electric cooperatives must meet a target of 10% renewables by 2018 and are subject to slightly different rules. In February 2008, the North Carolina Utilities Commission (NCUC) adopted final rules implementing the REPS. Eligible energy resources include biomass generation projects which use Best Available Control Technology (BACT) for air emissions, landfill gas, waste heat from renewables, and hydrogen derived from renewables. (The NCUC decided not to expand the definition of biomass specified in N.C. Gen. Stat. § 62-133.8(a)(8): "agricultural waste, animal waste, wood waste, spent pulping liquors, combustible residues, combustible liquids, combustible gases, energy crops, or landfill methane; or waste heat derived from a renewable energy resource." Further determination of what constitutes a qualifying biomass resource may be made on a case-by-case basis). Up to 25% of the requirements may be met through energy efficiency technologies, including combined heat-and-power (CHP) systems powered by non-renewable fuels. After 2018, up to 40% of the standard may be met through energy efficiency. The overall target for renewable energy is 0.2% energy recovery from swine waste by 2018, and 900,000 megawatt-hours (MWh) of electricity derived from poultry waste by 2014. The NCUC has required that each electric power supplier submit its first annual REPS compliance plan by September 1, 2008. Beginning in 2009, each power supplier will be required to file a compliance report, detailing the actions it has taken to fulfill the requirements of the REPS. The compliance schedule for investor-owned utilities appears below. Note that each year's percentage requirement refers to the previous year's electricity sales (i.e. the 2021 goal is 12.5% of 2020 retail sales). Electric cooperatives and municipal utilities must meet the swine waste and poultry waste goals, but these utilities only must meet an overall target of 10% by 2018. Unlike investor-owned utilities, cooperatives and municipal utilities are permitted to use demand side management (in addition to energy efficiency) to satisfy up to 25% of the standard, and may also use large hydropower to meet up to 30% of the standard. 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 according to a set schedule.[59]
	Ethanol Fueling Infrastructure Requirement	Regulatory mechanism	Ethanol blends between 10% (E10) and 85% (E85) for use in motor vehicles may be dispensed from equipment that fully complies with all requirements for dispensing E10, provided that the following conditions are met: 1) The dispensing equipment manufacturer has documented that the equipment is compatible with all ethanol blends; 2) the manufacturer has initiated the process of applying to an independent testing laboratory to have the equipment listed for use in dispensing ethanol blends; and 3) the equipment clearly discloses the particular ethanol blend that is being dispensed.[60]
	Biodiesel Requirement for School Buses	Regulatory mechanism	Every school bus that is capable of operating on diesel fuel must be capable of operating on diesel fuel with a minimum content of 20% biodiesel (B20). Furthermore, at least 2% of the total volume of fuel purchased annually by local school districts statewide for use in diesel school buses must be a minimum of B20, to the extent that biodiesel blends are available and compatible with the technology of the vehicles and the equipment used.[61]
	Alternative Fuel Use and Fuel Efficient Vehicle Requirements	Regulatory mechanism	State-owned vehicle fleets with more than 10 motor vehicles designed for highway use must establish plans to improve the use of alternative fuels and fuel-efficient vehicles. The plans must enable the state-owned fleets to achieve a 20% reduction or displacement of the current petroleum products consumed by January 1, 2010. Reductions may be met by petroleum or oils displaced through the use of biodiesel, ethanol, synthetic oils or lubricants, other alternative fuels, the use of hybrid electric vehicles, other fuel-efficient or low-emission vehicles, or additional methods as may be approved by the State Energy Office.[62]

Oklahoma	Community Energy Education Management Program	Incentive-based	The Oklahoma Department of Commerce offers a revolving loan fund for local governments to make energy efficient improvements to government buildings. All eligible projects should increase energy efficiency, reduce energy consumption, project a positive return on investment and be paid back within six years of the loan award. Funds from this program can be used to pay for a technical assistance report/audit, energy conservation measures, and operation and maintenance procedures that would contribute to overall reduced energy consumption. Generally, the loans will not be more than $150,000, and the average loan amount is around $60,000. An eligible local government may have only one active loan open at any time.
	Biofuels Tax Exemption	Incentive-based	Biofuels or biodiesel produced by an individual with feedstocks grown on property owned by the same individual and used in a vehicle owned by the same individual on public roads and highways are exempt from the state motor fuel excise tax.[63]
	Alternative Fuel Vehicle (AFV) Tax Credit	Incentive-based	Until January 1, 2010, Oklahoma provides a one-time income tax credit for 50% of the cost of converting a vehicle to operate on an alternative fuel, or for 50% of the incremental cost of purchasing a new Original Equipment Manufacturer AFV. The state also provides a tax credit for 10% of the total vehicle cost, up to $1,500, if the incremental cost of a new AFV cannot be determined or when an AFV is resold, as long as a tax credit has not been previously taken on the vehicle. The alternative fuels eligible for the credit are compressed natural gas (CNG), liquefied natural gas (LNG), liquefied petroleum gas (LPG), methanol, and electricity. For qualified electric vehicle property propelled by electricity only, the basis for the credit is the full purchase price of the vehicle. For vehicles also equipped with an internal combustion engine, such as a hybrid electric vehicle, the basis for the credit is limited to the portion of such motor vehicle which is attributable to the propulsion of the vehicle by electricity.[64]
	Alternative Fueling Infrastructure Tax Credit	Incentive-based	The state provides a tax credit for up to 50% of the cost of installing alternative fueling infrastructure. These tax credits may be carried forward for up to three years and expire January 1, 2010. The alternative fuels eligible for the credit include compressed natural gas (CNG), liquefied natural gas (LNG), liquefied petroleum gas (LPG), methanol, and electricity.[65]
	Biodiesel Production Tax Credit	Incentive-based	For tax years beginning after December 31, 2004, and before January 1, 2013, a biodiesel (B100) production facility is allowed a credit of $0.20 per gallon of biodiesel produced. An eligible biodiesel facility must produce at least 25% of its nameplate design capacity for at least six months after the first month for which it is eligible to receive the credit, on or before December 31, 2008. The credit is allowed for 60 months beginning with the first month for which the facility is eligible to receive the credit and ending not later than December 31, 2012. An eligible facility may also receive a credit of $0.20 per gallon for biodiesel produced in excess of the original nameplate design capacity which results from expansion of the facility completed on or after the effective date of this act and before December 31, 2008. Beginning January 1, 2013, a biodiesel facility may receive a credit of $0.075 per gallon of biodiesel, for new production for a period not to exceed 36 consecutive months. Additional restrictions apply.[66]
	Ethanol Production Tax Credit	Incentive-based	For tax years beginning after December 31, 2003, and before January 1, 2013, an ethanol production facility is allowed a tax credit in the amount of $0.20 per gallon of ethanol produced, for 60 months beginning with the first month for which the facility is eligible to receive such credit. The credit may only be claimed if the ethanol facility maintains an average production rate of at least 25% of its nameplate design capacity for at least six months after the first month for which it is eligible to receive the credit, on or before December 31, 2010. Producers are also eligible for an expansion credit of $0.20 per gallon of ethanol produced in excess of the original nameplate capacity that results from expansion of the facility before December 31, 2008. Beginning January 1, 2013, an ethanol facility is eligible for a credit of $0.075 per gallon of ethanol, before denaturing, for new production for a period not to exceed 36 consecutive months.[67]
	Ethanol Fuel Retailer Tax Credit	Incentive-based	A retailer of ethanol-blended fuel (blended gasoline consisting of not more than 15% ethyl alcohol by volume) may claim a motor fuel tax credit of $0.016 for each gallon of ethanol fuel sold in Oklahoma, if the retailer provides a price reduction to the purchaser of the ethanol fuel in the same amount. This incentive is effective unless the federal government mandates the use of reformulated fuel in an area within the State of Oklahoma that is in non-attainment with the National Ambient Air Quality Standards.[68]

	Alternative Fuel Vehicle (AFV) and Fueling Infrastructure Loans	Incentive-based	The Department of Central Services has an Alternative Fuels Loan program to help convert government-owned fleets to operate on alternative fuels. This program provides 0% interest loans for converting vehicles to operate on an alternative fuel, for the construction of fueling infrastructure, and for the incremental cost associated with the purchase of an Original Equipment Manufacturer AFV. The program provides up to $10,000 per converted or newly purchased vehicle and up to $150,000 for fueling infrastructure. Repayment is made from fuel savings during a maximum seven-year period. If the price of alternative fuels does not remain below the price of the conventional fuel that was replaced, repayment is suspended. Eligible applicants include state and county agencies and divisions, municipalities, school districts, mass transit authorities, and public trust authorities.[69]
	Alternative Fuel Vehicle (AFV) Loans	Incentive-based	Oklahoma has a private loan program with a 3% interest rate for the cost of converting private fleets to operate on alternative fuels, for the incremental cost of purchasing an Original Equipment Manufacturer AFV, and for the installation of AFV refueling infrastructure. The repayment of the loan is made from fuel savings during a maximum three-year period.
	Alternative Fuel Vehicle (AFV) Technician Training	Support programs	The Alternative Fuels Technician Certification Act regulates the training, testing, and certification of technicians who install, modify, repair, or renovate equipment used in the fueling of AFVs and the conversion of any engine to an alternative fueled engine. This includes Original Equipment Manufacturer engines dedicated to operate on an alternative fuel. Electric vehicles (EVs), electric charging stations, and EV technicians must also comply with the rules and regulations of this Act.[70]
	Net-metering	Regulatory mechanism	Net metering has been available in Oklahoma since 1988 under Oklahoma Corporation Commission (OCC) Order 326195. The OCC's rules require investor-owned utilities and electric cooperatives under the commission's jurisdiction to file net-metering tariffs for customer-owned renewable-energy systems and combined-heat-and-power (CHP) facilities up to 100 kilowatts (kW) in capacity. Net metering is available to all customer classes. There is no limit on the amount of aggregate net-metered capacity. Utilities are not allowed to impose extra charges for customers signed up for net metering, nor are they allowed to require new liability insurance as a condition for interconnection. Utilities are also not required to purchase net excess generation (NEG) from customers. However, a customer may request that the utility purchase NEG. If the utility agrees, then NEG will be purchased at the utility's avoided-cost rate. [71]
	Biofuels Development and Promotion	Regulatory mechanism	The Oklahoma Biofuels Development Act was created to encourage the processing, market development, promotion, distribution, and research of fuels derived from grain, ethanol or ethanol components, biodiesel, bio-based lubricants, co-products, or by-products. The Oklahoma Biofuels Development Advisory Committee will serve until June 1, 2010, to conduct a systematic review and study of the ethanol and biodiesel industry in Oklahoma and other states, study the feasibility of developing and enhancing the ethanol and biodiesel industry in Oklahoma, and otherwise encourage market development, promotion, distribution, and research on products derived from grain, ethanol or ethanol components, bio-based products, co-products, or by-products. [72]
	Alternative Fuel Vehicle (AFV) Acquisition Requirements	Regulatory mechanism	Under the Alternative Fuels Conversion Act, all school and government vehicles may be converted to operate on an alternative fuel, and all school districts should consider only purchasing school vehicles which have the capability to operate on an alternative fuel. The Act also requires all school and government vehicles capable of operating on an alternative fuel to use the fuel whenever a refueling station is in operation within a five-mile radius of the respective department or district and the price of the alternative fuel is cost competitive. If school and government vehicles must be refueled outside the five-mile radius and no refueling station is reasonably available, the school and government vehicles are exempt from this requirement.[73]
	Neighborhood Electric Vehicle (NEV) Access to Roadways	Regulatory mechanism	NEVs manufactured in compliance with the National Highway Traffic Safety Administration standards for low-speed vehicles in Title 49 of the Code of Federal Regulations, section 571.500, are allowed to operate on Oklahoma streets and highways with a posted speed limit of 35 miles per hour or less.[74]

	Alternative Fuel Labeling Requirement	Regulatory mechanism	In lieu of the motor fuel excise tax, Oklahoma imposes an annual flat fee on motor vehicles including passenger automobiles, pickup trucks, vans and heavy-duty vehicles using liquefied petroleum gas, compressed natural gas (CNG), liquefied natural gas (LNG), methanol, or blends of 85% methanol and 15% gasoline (M85). CNG, LNG, methanol, and M85 vehicles weighing less than one ton gross vehicle weight are taxed at a rate of $100 per vehicle per year, and vehicles weighing more than one ton gross vehicle weight are taxed at a rate of $150 per vehicle per year. Vehicles must display a decal issued on a yearly basis by the Oklahoma Tax Commission.[75]
South Carolina	Biofuels Retail Incentive	Incentive-based	Beginning July 1, 2009, a $0.05 incentive payment is available to E85 retailers for each gallon of E85 fuel sold, provided that the E85 fuel is subject to the South Carolina motor fuel tax. Additionally, a $0.25 incentive payment is available to biodiesel retailers for each gallon of pure biodiesel (B100) sold, provided that the resulting blends contain at least 2% biodiesel (B2). These incentives apply only to fuel sold before July 1, 2012. Biodiesel fuel is defined as a fuel for motor vehicle diesel engines comprised of vegetable oils or animal fats and meeting the specifications of American Society of Testing and Materials (ASTM) D 5761.[76]
	Alternative Fuel Vehicle (AFV) Sales Tax Rebate	Incentive-based	Beginning July 1, 2008, a $300 sales tax rebate may be applied to in-state purchases of the following: flexible fuel vehicles (FFVs) capable of operating on E85 motor fuel; hydrogen fuel cell vehicles; electric vehicles, hybrid electric vehicles; plug-in hybrid electric vehicles (PHEVs); and vehicles with a U.S. Environmental Protection Agency city fuel economy rating of at least 30 miles per gallon. Additionally, a sales tax rebate up to $500 has been established for the purchase of equipment that results in the conversion of a conventional hybrid electric vehicle to a PHEV, or for equipment to convert a conventional vehicle to operate on propane, compressed natural gas, liquefied natural gas, hydrogen, or E85. These rebates only apply to vehicles and equipment purchased prior to July 1, 2013.[77]
	Biofuels Production Tax Credit	Incentive-based	A tax credit is available to qualified ethanol and biodiesel producers for taxable years beginning after 2006 and before 2014. Corn-based ethanol and soy-based biodiesel producers are eligible for a tax credit of $0.20 per gallon of fuel produced. Producers using feedstocks other than corn or soy oil are eligible for $0.30 per gallon tax credit. An eligible production facility must be operating at a production rate of at least 25% of its name plate design capacity, before denaturing, on or before December 31, 2009. The credit is allowed for 60 months beginning with the first month for which the facility is eligible to receive the credit and ending not later than December 31, 2014. The credit may only be claimed if the facility maintains an average production rate of at least 25% of its name plate design capacity for at least six months after the first month for which it is eligible to receive the credit.[78]
	Biofuels Research and Development Tax Credit	Incentive-based	For taxable years after 2007 and before 2012, an income tax credit is available for up to 25% of qualified research and development expenditures, which include developing feedstocks and production processes for cellulosic ethanol and algae-derived biodiesel. Cellulosic ethanol is defined as fuel from lignocellulosic materials, including wood chips, corn stover, and switchgrass.[79]
	Biofuels Distribution Infrastructure Tax Credit	Incentive-based	Effective January 1, 2008, a taxpayer that constructs, installs, and places into service a qualified commercial facility for distribution or dispensing of renewable fuels in the state is eligible for a tax credit of up to 25% of the construction and installation costs. Eligible property includes pumps, storage tanks, and related equipment used exclusively for distribution, dispensing, and storing renewable fuel. A qualified facility must clearly label the equipment used to store or dispense the fuel as associated with renewable fuel. The credit must be taken in three equal annual installments beginning with the taxable year in which the facility is placed into service. Renewable fuel is defined as ethanol fuel blends of 70% or greater (E70) dispensed at the retail level for use in motor vehicles, and pure ethanol or biodiesel fuel dispensed by a distributor or facility that blends these non-petroleum liquids with gasoline fuel or diesel fuel for use in motor vehicles.[80]

	Biofuels Production Facility Tax Credit	Incentive-based	Effective January 1, 2008, a taxpayer that constructs and places into service a commercial facility for the production of renewable fuel is eligible for a tax credit of up to 25% of the cost of constructing or renovating a building and equipping the facility. Production of renewable fuel includes intermediate steps such as milling, crushing, and handling feedstock and the distillation and manufacturing of the final product. The entire credit must be taken in seven equal annual installments beginning with the taxable year in which the facility is placed in service. Renewable fuel is defined as liquid non-petroleum based fuel that can be placed in motor vehicle fuel tanks and used to operate on-road vehicles, including all forms of fuel commonly or commercially known or sold as biodiesel and ethanol. [81]
	Renewable Energy Grant Program	Incentive-based	The South Carolina Renewable Energy Grant Program provides grants to private and public entities located in South Carolina to assist those involved in renewable energy-related research and projects to become more competitive in obtaining federal and other grants. Matching grants up to $200,000 are available for demonstration projects that validate the effectiveness of new and future biomass technologies and products, provided that the grant does not exceed 50% of the total cost of the demonstration project. The South Carolina Department of Agriculture administers the grant program, in cooperation with the South Carolina Institute of Energy Studies and the South Carolina Research Authority. Disbursement of these funds must be approved by the South Carolina Renewable Energy Oversight Committee. Grants are also available for project planning, and research and development projects.[82]
	Renewable Energy Revolving Loan Program	Incentive-based	The Renewable Energy Revolving Loan Program provides low-interest loans to an individual or organization that plans to build a qualified renewable energy production facility. For the purposes of this loan, a renewable energy production facility is a facility that produces energy or transportation fuels from biomass, solar or wind resources. This loan may provide up to 50% of the total cost of a project, but may not exceed $250,000 for each project. The South Carolina Department of Agriculture administers the loan program, in cooperation with the South Carolina Institute of Energy Studies. Disbursement of funds must be approved by the South Carolina Renewable Energy Oversight Committee. The interest rate for qualifying loans will not exceed the *Wall Street Journal* prime interest rate.[83]
	Biodiesel Blend Infrastructure Mandate	Regulatory mechanism	No later than January 1, 2008, all state-owned diesel refueling facilities must provide fuel containing at least 5% biodiesel (B5) in all diesel pumps.[84]
	Biodiesel Use in School Buses	Regulatory mechanism	The South Carolina Department of Education is required to fuel the state school bus fleet with biodiesel when feasible.[85]
	Low-Speed Vehicle Access to Roadways	Regulatory mechanism	A low-speed vehicle is defined as a four-wheeled motor vehicle, other than an all terrain vehicle, capable of reaching speeds greater than 20 miles per hour (mph) but not more than 25 mph. A low-speed vehicle may operate only on secondary highways with a posted speed limit of 35 miles per hour or less. A low-speed vehicle must be registered and licensed in the same fashion as a passenger vehicle and is subject to the same insurance requirements applicable to other motor vehicles. Homemade low-speed vehicles, retrofitted golf carts, or any other similar vehicles do not qualify as low-speed vehicles.[86]
	Alternative Fuel Use Requirement	Regulatory mechanism	Whenever practical and economically feasible, all state agencies operating alternative fuel vehicles are required to use alternative fuels in those vehicles. Private businesses are encouraged to increase the use of alternative fuels in the state.[87]
	Alternative Fuel Tax	Regulatory mechanism	All fuels, including alternative fuels and alternative fuel blends, are exempt from the state sales and use tax. However, all fuels are subject to a state fuels tax. Alternative fuels include liquefied petroleum gas and compressed natural gas. Blended fuels are defined as mixtures composed of gasoline or diesel fuel and another liquid, other than products such as carburetor detergent or oxidation inhibitor, which can be used as a fuel to operate a highway vehicle.[88]

	Interconnection Standards	Regulatory mechanism	The South Carolina Public Service Commission (PSC) adopted a simplified interconnection standard for small distributed generation (DG) in December 2006. The standard addresses renewable-energy systems and other forms of DG up to 20 kilowatts (kW) in capacity for residential systems, and up to 100 kW in capacity for non-residential systems. Notably, the standard does not include provisions for three-phase generators. South Carolina's model interconnection standard, which is identical to North Carolina's model interconnection standard, applies to the state's four investor-owned utilities — Progress Energy, Duke Energy, South Carolina Electric and Gas, and Lockhart Power. There is a $100 application fee for residential systems and a $250 application fee for non-residential systems. Utilities may not require residential customers to carry liability insurance beyond the amount required by a standard homeowner's policy ($100,000 minimum coverage), but non-residential generators are required to carry comprehensive general liability insurance ($300,000 minimum coverage). Generators are responsible only for upgrade and improvement costs associated directly with a system's interconnection, but these costs may be determined by utilities. Utilities are prohibited from imposing indirect fees and charges. The standard includes a mutual-indemnification requirement. A redundant external disconnect switch is required, and the capacity of all interconnected generation is limited to a maximum of 2% of rated circuit capacity. Applications for interconnected systems that exceed this saturation limit may be reviewed on a case-by-case basis. Utilities must file semiannual reports with the PSC detailing the number of interconnection requests approved and denied, and the reasons for any denial. There are no dispute-resolution procedures.[89]
Tennessee	Biodiesel Infrastructure Grants	Incentive-based	The Tennessee State Energy Office, Department of Economic and Community Development, Energy Division offers grants to county governments for the installation of biodiesel infrastructure, including biodiesel tanks, pumps, and card readers, that can be used to provide biodiesel fuel for county/city owned vehicles including school buses, maintenance vehicles, heavy equipment, or any other vehicle currently powered by diesel fuel. Grant funding will be provided for 50% of total project costs, but not more than $12,000 may be awarded per individual grant. Grants are limited to one per county and are available through June 2010.
	Provision for Establishing Alternative Fuel Refueling Infrastructure Grants	Incentive-based	The Tennessee Department of Transportation (TDOT) is authorized to undertake public-private partnerships with transportation fuel providers, including, but not limited, to farmer cooperatives, to install refueling facilities. Refueling facilities include storage tanks and fuel pumps dedicated to dispensing biofuels, including, but not limited to, ethanol (E85) and biodiesel (B20). TDOT is also authorized to establish a grant program to provide financial assistance to help pay the capital costs of purchasing, preparing, and installing fuel storage tanks and fuel pumps for biofuels at private sector fuel stations. TDOT may also develop and implement a program to encourage all political subdivisions of the state and public colleges and universities to increase the number of vehicles that use alternative fuels.[90]
	Provision for Establishing an Alternative Fuel Research and Development Program	Incentive-based	The Department of Agriculture is authorized to develop and implement an alternative fuel research program to stimulate public and private research in conversion technology. This research should address converting Tennessee agricultural products, such as soybeans, switchgrass, and other biomass, into alternative fuels, as well as the production capabilities needed to deliver such alternative fuels to Tennessee consumers.[91]
	Provision for Establishing a Biodiesel Incentive	Incentive-based	The Department of Revenue, in consultation with the Department of Economic and Community Development, is authorized to create the Tennessee biodiesel manufacturers' incentive fund, dependent on legislative appropriations. Each eligible manufacturer may receive incentives from the fund for producing up to 10 million gallons of biodiesel annually. Biodiesel is defined as mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats that meet the registration requirements for fuels and fuel additives established by the U.S. Environmental Protection Agency and conform to American Society for Testing and Materials (ASTM) D6751 specifications. [92]

	Small Business Energy Loan Program	Incentive-based	The Tennessee Energy Division offers low-interest loans of up to $300,000, with terms of up to 7 years, for energy efficiency projects and other projects shown to save energy or decrease energy demand. Businesses with fewer than 300 employees or less than $3.5 million in annual gross sales or receipts are eligible. The loan is offered with a 0% interest rate for businesses in the Three-Star and Main Street communities, and at a 3% interest rate for all others. Loans cannot be used for new construction or business start-up. All renewable energy technologies are eligible under the program's guidelines. In addition to low-interest loans, the Energy Division offers free audits and technical assistance.[93]
	Alternative Fuel and Fuel-Efficient Vehicle Use Requirements	Regulatory mechanism	By January 1, 2008, all state agencies, universities, and community colleges that have more than 10 state-owned vehicles in their fleet are required to develop and implement plans to increase the state's use of alternative fuels and hybrid electric or other fuel-efficient or low-emission vehicles. Specifically, each plan must incorporate a goal to reduce or displace at least 20% of the fleet's consumption of petroleum by January 1, 2010. If the fleet includes vehicles modified for educational, emergency, or public safety purposes or vehicles used for emergency or law enforcement purposes, the entity's plan must provide for a minimum 10% petroleum use reduction. (Reference House Bill 723, 2007.)
	Energy-Efficient Vehicle Acquisition Requirement	Regulatory mechanism	State fleets are encouraged to make every effort to ensure that at least 30% of newly purchased motor vehicles are energy-efficient vehicles. Energy-efficient vehicles are defined as passenger vehicles that are: alternative fuel vehicles as identified by the Energy Policy Act of 1992 (Public Law 102-486) including those using ethanol, biodiesel, or other alternative fuel; a hybrid-electric vehicle; or a conventional gasoline vehicle achieving a fuel economy of at least 25 miles per gallon or greater. Beginning June 30, 2008, the Commissioner of General Services will compile information on motor vehicles owned and leased by the state including a categorization of vehicles by an energy-efficiency rating.[94]
	Biofuels Committee	Regulatory mechanism	The Governor's Interagency Alternative Fuels Working group, supported administratively by the Department of Environment and Conservation, has been established to develop a comprehensive state alternative fuels strategy that will provide a roadmap to make Tennessee a leader in the production, distribution, and use of biofuels. The Working Group is also tasked with developing a comprehensive, statewide public education and outreach campaign to increase public awareness and understanding of alternative fuels, particularly biofuels. Furthermore, state agencies are required to strive to use ethanol and biodiesel in appropriate state-owned vehicles whenever possible and should support the development of biofuels refueling infrastructure. The Departments of General Services and Transportation are required to develop a program to educate state employees about the use of biofuels and publicize fuel availability as new refueling sites become available. The Department of Transportation must continue efforts to encourage development of publicly accessible biofuel refueling stations across the state.[95]
Virginia	Biodiesel Production Tax Credit	Incentive-based	Qualified biodiesel and green diesel fuel producers are eligible for a tax credit of $0.01 per gallon of biodiesel or green diesel fuels produced in a taxable year beginning on or after January 1, 2008. The annual amount of credit may not exceed $5,000, and producers are only eligible for the credit for the first three years of production. Qualified producers must be certified by the Virginia Department of Mines, Minerals and Energy.[96]
	Biofuels Production Grants	Incentive-based	The Biofuels Production Incentive Grant Program provides grants to producers of biofuels, which include neat biodiesel fuel, neat green diesel fuel, and neat ethanol fuel. A qualified biofuels producer is eligible for a grant of $0.10 per gallon of neat biofuels sold in the Commonwealth on or after January 1, 2007. To qualify, a biofuels producer must produce at least two million gallons of neat biofuels in the calendar year in which the incentive is taken. If a producer began selling neat biofuels prior to January 1, 2007, the producer is eligible for a grant only if its production of neat biofuels for the given calendar year exceeds its production in the 2006 calendar year by at least two million gallons and is maintained at a minimum of that level in future years. Each producer is only eligible for six calendar years of grants. (Reference Senate Bill 689, 2008, and Virginia Code 45.1-393 and 45.1-394)

	High Occupancy Vehicle (HOV) Lane Exemption	Incentive-based	Alternative fuel vehicles (AFVs) displaying the Virginia Clean Special Fuels license plate may use Virginia HOV lanes, regardless of the number of occupants, until July 1, 2009. For HOV lanes serving the I-95/395 corridor, only registered vehicles displaying Clean Special Fuels license plates issued prior to July 1, 2006, will be exempt from HOV lane requirements. Dedicated AFVs and some hybrid electric vehicles may qualify for the license plate and HOV exemption; see the Virginia Department of Motor Vehicles Web site for a complete list of qualifying vehicles. The annual fee for Clean Special Fuels license plates is $25 in addition to the prescribed fee for state license plates. (Reference House Bill 1014, 2008, and Virginia Code 33.1-46.2 and 46.2-749.3)
	Alternative Fuel Job Creation Tax Credit	Incentive-based	Businesses involved with the manufacturing of components for alternative fuel vehicles (AFVs), AFV conversions, or the production, storage, or dispensing of hydrogen as a vehicle fuel are eligible for a job creation tax credit worth $700 per full-time employee. The credit is allowed in the taxable year in which the job is created and in each of the two succeeding years in which the job is continued. Qualifying businesses include AFV component manufacturers and vehicle conversion companies. Qualified AFVs include vehicles that operate using natural gas, hydrogen, or electricity. This credit is effective for taxable years through December 31, 2011. (Reference Virginia Code 58.1-439.1)
	Alternative Fuel Vehicle (AFV) and Fueling Infrastructure Loans	Incentive-based	The Virginia Board of Education may use funding from the state Literary Fund to grant loans to school boards that convert school buses to operate on alternative fuels or construct alternative fueling stations.[97]
	Alternative Fuel Use and Fuel-Efficient Vehicle Acquisition Requirements	Regulatory mechanism	All state agencies and institutions must maximize biodiesel and ethanol use in state fleet vehicles except where the use of biodiesel will void warranties or incur unreasonable additional costs to the agencies. The Department of General Services (DGS) must make E85 and B20 available for agency use at sites selected based on the locations of state-owned flexible fuel and diesel vehicles. Agencies and institutions that independently purchase fuel must use E85 and B20 fueling sites to the maximum extent reasonably possible; state vehicles used for law enforcement and emergency response are exempt from these requirements. Additionally, the DGS must include in its policies and procedures requirements for the purchase of fuel-efficient, low-emission state-owned vehicles, as well as procedures for leasing vehicles requirements that give a preference to compact, fuel-efficient, and low-emission vehicles.[98]
	State Buildings Energy Reduction Plan	Regulatory mechanism	On April 5, 2007, Virginia's Governor signed Executive Order 48, "Energy Efficiency in State Government," which set out to reduce non-renewable energy purchases and increase overall energy savings. In addition, the order instructs the Commonwealth to encourage the private sector to adopt energy-efficient building standards by giving preference when leasing facilities for state use to facilities meeting LEED or EPA Energy Star Ratings. All state agencies and institutions constructing state-owned facilities over 5,000 gross square feet in size, and renovations of such buildings valued at 50% of the assessed building value, shall be designed and constructed consistent with energy performance standards at least as stringent as LEED and the EPA's Energy Star rating.

	Interconnection Standards	Regulatory mechanism	The Virginia State Corporation Commission (SCC) first developed simplified interconnection rules for systems eligible for net metering in 2000. The rules were revised in 2005 after the capacity limit for non-residential systems was raised from 25 kilowatts (kW) to 500 kW. The rules were revised again in 2006 by permitting lease financing for net-metered systems and extending net metering to all systems that generate electricity using renewable energy, defined as "energy derived from sunlight, wind, falling water, sustainable biomass, energy from waste, wave motion, tides, and geothermal power." Net metering is available on a first-come, first-served basis until the rated generating capacity owned and operated by customer-generators in Virginia reaches 1% of each electric distribution company's peak load for the previous year. This includes residential customers generating up to 10 kW and commercial systems of up to 500 kW. Utilities that have already enrolled 1% of their peak load for the previous year are not required to allow additional customers to net meter. Customer-generators with systems that meet the major national safety and equipment standards — National Electrical Code (NEC), Institute of Electrical and Electronic Engineers (IEEE) Standard 1547 (July 2003), and Underwriters Laboratories (UL) — are not required to install any additional safety equipment. However, a utility's net-metering tariff may require that customer-generators install a manual, external disconnect switch that complies with national safety requirements and is certified by a licensed electrician. Customer-generators must notify the electric distribution company and the energy service provider prior to interconnecting; the minimum advance-notice requirement depends on system size. Customer-generators may be required to pay up to $50 for an inverter inspection for inverter-based systems. In addition, customer-generators with systems greater than 25 kW in capacity must reimburse the utility for its cost to modify any facilities needed to accommodate the interconnection with respect to power quality, voltage regulation and transformer loading. Customer-generators with interconnected systems that do not exceed 10 kW in rated capacity must have at least $100,000 in liability insurance. Customer-generators with systems greater than 10 kW must have at least $300,000 in coverage. The SCC is currently developing interconnection standards for distributed generation (DG) systems that are not net metered.

	Net-metering	Regulatory mechanism	Virginia's net-metering law applies to residential generating systems up to 10 kilowatts (kW) in capacity and non-residential systems up to 500 kW in capacity. The maximum capacity for non-residential systems was raised from 25 kW to 500 kW by SB 651 of 2004. In 2006, HB 1541 extended eligibility to all systems that generate electricity using renewable energy, defined as "energy derived from sunlight, wind, falling water, sustainable biomass, energy from waste, wave motion, tides, and geothermal power." (Previously, net metering applied only to systems that generate electricity using solar, wind or hydro resources.) HB 1541 also permitted lease financing for net-metered systems. Net-metering is available on a first-come, first-served basis until the rated generating capacity owned and operated by customer-generators reaches 1% of an electric distribution company's adjusted Virginia peak-load forecast for the previous year. (The aggregate limit on net-metered capacity was raised from 0.1% to 1% in April 2007 by SB 1416 of 2006.) Net metering is available to customers of investor-owned utilities and electric cooperatives, but not to customers of municipal utilities. Net-metered energy is measured by a meter capable of gauging (but not necessarily displaying) power flow in both directions. Monthly net excess generation (NEG) is carried forward to the next month. In Virginia's original net-metering rules, any excess at the end of a twelve-month period was granted to the utility. However, it was later decided that, while the month-to-month system should remain intact, NEG remaining in the 12th month of the annual period could be credited to the following month. This credit may not exceed the amount of energy purchased during the previous annual period. Under legislation enacted in April 2007 (HB 2708 of 2006), at a net-metered customer's request, the utility is required to enter into power purchase agreements with the customer. This agreement obligates a utility to purchase customer NEG at a rate approved by the Virginia State Corporation Commission (SCC). Systems must comply with the National Electrical Code Article 690, Institute of Electrical and Electronic Engineers (IEEE) Standard 1547 (July 2003), and Underwriters Laboratories (UL) standards. Utilities may require (and usually do require) an external, lockable disconnect switch.
West Virginia	Alternative Fuel School Bus Incentive	Incentive-based	Any county that uses an acceptable alternative fuel, including compressed natural gas (CNG), for the operation of all or any portion of its school bus system is eligible for a reimbursement from the West Virginia Department of Education of up to 95% of the county's transportation cost for maintenance, operation, and related costs incurred from using the alternatively fueled school buses. A county qualifying for this allowance for alternative fuel use must submit a plan which includes the future use of the alternatively fueled school buses to the Department of Education.[99]
	Alternative Fuel Promotion	Incentive-based	The Division of Energy is established to promote energy efficiency, increase the development and production of domestic energy sources, and increase public awareness of the environmental impacts of energy use and production. The Division of Energy is required to submit and implement a development plan that addresses fuel efficiency and alternative energy, including the implementation of clean, renewable energy sources such as landfill gas, fuel cells, renewable hydrogen fuel technologies, waste-to-ethanol fuel, and coal-based liquid fuels.[100]
	Alternative Fuel Production Subsidy Prohibition[101]	Incentive-based	Incentives or subsidies from political subdivisions for the production of alternative fuels are prohibited by law, with exceptions for certain coal-based liquid fuels.[101]
	Clean State Program	Support program	The West Virginia Clean State Program is advancing alternate fuel use through the use of educational and technical assistance.

	Net-Metering	Regulatory mechanism	The West Virginia Public Service Commission (PSC) approved consensus filings regarding net-metering and interconnection standards in December 2006. The approved consensus provisions include proposed rules that apply to all electric utilities in the state. Utility tariffs incorporating the consensus net-metering provisions took effect in March 2007. The approved consensus for net-metering applies to residential and commercial systems up to 25 kilowatts (kW) in capacity that generate electricity using photovoltaics (PV), wind, biomass, landfill gas, hydropower or fuel cells. Net excess generation (NEG) will be carried over to a customer-generator's next bill, for up to 12 months, as a kilowatt-hour (kWh) credit. Net-metering tariffs must be identical in rate structure, retail-rate components, and monthly charges, to the contract or tariff for which the customer would qualify if that customer were not a customer-generator. Customers on a time-of-use (TOU) tariff are permitted to net-meter. Each net-metered customer-generator must carry a minimum of $100,000 in liability insurance; utilities may not require customers to carry additional liability insurance. No contracts or tariffs may require customers to (1) comply with any additional safety or performance standards beyond those established by the NEC, IEEE, UL, PSC rules and the standard wiring rules and customer requirements for electric service for each utility; or (2) perform or pay for any additional tests, if the system is pre-certified as complying with technical standards. Net-metering is accomplished using a single, bi-directional meter. However, a customer must pay for such a meter if one is not already in place. Although the consensus provisions do not include an aggregate cap on net-metered systems, each utility's tariff will limit the aggregate capacity to 0.1% of the utility's total load participation.
	Provision for Establishment of Alternative Fuel Vehicle (AFV) Acquisition Requirements	Regulatory mechanism	The Secretary of Administration has the authority to require that up to 75% of a state agency's fleet be made up of AFVs. To meet these requirements, AFVs may be purchased or leased, or existing vehicles may be converted to operate using alternative fuels.[103]

(Endnotes)

1 Code of Ala. § 40-18-15 (16).

2 http://www.adeca.state.al.us/C16/Biomass%20Energy%20Program/default.aspx.

3 Department of Energy, State and Federal Incentives and Laws, Alabama Incentives and Laws, also see (Alabama House Bill 123, 2007).

4 U.S. Department of Energy, State and Federal Incentives and Laws, Arkansas State Incentives and Laws, also House Bill 1379 and 1845, 2007.

5 AR Code § 22-3-1801 et seq.

6 www.dsireusa.org, Arkansas Incentives for Renewable Energy.

7 Arkansas Code § 23-18-603 et seq.

8 www.desireusa.org, Arkansas Incentives for Renewable Energy.

9 ArkansasSenate Bill 237, 2007.

10 Information for this section derived from Florida Department of Environmental Protection, Florida Energy Office, Energy Tax Incentives Program http://www.dep.state.fl.us/energy/energyact/incentives.htm, in addition to http://www.dsireusa.org and the DOE.

11 Florida Senate Bill 888, 2006 and Florida Statutes 212.08.

12 Florida Statutes 403.507 (b).

13 Florida Statutes 316.0741.

14 Florida Department of Agriculture and Consumer Services.

15 Florida Department of Environmental Protection.

16 Florida Public Service Commission 25-6.065, F.A.C.

17 Georgia House Bill 670.

18 Georgia House Bill 1018.

19 Official Code of Georgia § 48-8-3 (2007).
20 Official Code of Georgia 48-7-40.16 (2007).
21 Official Code of Georgia 32-9-4 and 40-2-76 (2007).
22 Official Code of Georgia 50-8-170.
23 Georgia Senate Resolution 1201, 2008.
24 Georgia Governor Executive Order 02.28.06.02, 2006.
25 Reference Special Session Kentucky House Bill 1, 2007.
26 Special Session Kentucky House Bill 1, 2007, and Revised Statutes 141.422 to 141.425.
27 Kentucky Special Session House Bill 1, 2007.
28 Kentucky Revised Statutes 278.465.
29 Reference Special Session Kentucky House Bill 1, 2007.
30 Reference Executive Order 2005-124.
31 Louisiana Revised Statutes 47:301.
32 Senate Concurrent Resolution 112, 2005.
33 Louisiana Senate Concurrent Resolution 10, 2006.
34 Louisiana Revised Statutes 3:4674 and 3:3712.
35 Louisiana Revised Statutes 3:3712.
36 Mississippi Code 69-51-5.
37 Mississippi Senate Bill 2942, 2006.
38 R.S. Missouri § 135.3 et seq. (2006).
39 R.S. Missouri § 640.651-640.686.
40 Missouri Revised Statutes 142.028 and 142.029.
41 Missouri House Bill 741, 2007 and Revised Statutes 142.031.
42 Missouri Revised Statutes 414.433.
43 Missouri Revised Statutes 643.315.
44 Missouri Revised Statutes 142.803 and 142.869.
45 MissouriSenate Bill 54, 2007 and Revised Statutes 414.400 and 414.410.
46 Missouri Senate Bill 54, 2007 and Revised Statutes 414.420.
47 Missouri Revised Statutes 414.365.
48 Missouri Revised Statutes 414.255 and House Bill 1270, 2006.
49 North Carolina General Statutes § 105-129.15 et seq. and NC Tax Credit Guidelines.
50 North Carolina General Statutes § 153A-340 and General Statutes § 160A-381.
51 North Carolina Utilities Commission Order, Docket No. E-100, Sub 90.
52 North Carolina General Statutes § 143-345.18.
53 Reference North Carolina General Statutes 105-129.16D.
54 Reference North Carolina Senate Bill 540, 2007, and North Carolina General Statutes 105-449.72(a).
55 Reference North Carolina General Statutes 105-129.16D.
56 North Carolina General Statutes 105-164.13.
57 North Carolina HB 1473 (2007).
58 Authority 1: North Carolina Utilities Commission Order, Docket No. E-100, Sub 83 Date Enacted:10/20/2005 Authority 2: NCUC Order, Docket No. E-100, Sub 83 Date Enacted:12/27/2005 Authority 3: NCUC Order, Docket No. E-100, Sub 83.
59 Authority 1: North Carolina Gen. Stat. § 62-133.8 Date Enacted:8/20/2007 Effective Date:1/1/2008 Authority 2: NCUC Order, Docket No. E-100, Sub 113 Date Enacted:2/29/2008 Effective Date:2/29/2008.
60 Reference North Carolina Senate Bill 567, 2007, and North Carolina General Statutes 143-143.6.
61 North Carolina Senate Bill 1452, 2007, and North Carolina General Statutes 115C-240(c) and 115C-249(a).

62 North Carolina Session Law 2005-276, Section 19.5.
63 Oklahoma House Bill 1916, 2007, and Oklahoma Statutes 68-500.4 and 68-500.10.
64 Oklahoma Senate Bill 1558, 2008, and Oklahoma Statutes 68-2357.22.
65 Oklahoma Senate Bill 1558, 2008, and Oklahoma Statutes 68-2357.22.
66 Oklahoma House Bill 1513, 2007, and Oklahoma Statutes 68-2357.67.
67 Oklahoma House Bill 1513, 2007, and Oklahoma Statutes 68-2357.66.
68 Oklahoma Statutes 68-500.10-1.
69 Oklahoma Statutes 74-130.4.
70 Oklahoma Statutes 74-130.11 through 74-130.24.
71 O.A.C. § 165:40-9.
72 Oklahoma Statutes 2-1950.10 and 2-1950.11.
73 Oklahoma Statutes 74-130.3.
74 Oklahoma Statutes 47-11-805.1.
75 Oklahoma Statutes 68-723.
76 South Carolina Senate Bill 243, 2007, and South Carolina Code of Laws 12-63-20.
77 South Carolina Senate Bill 243, 2007, and South Carolina Code of Laws 12-63-20.
78 South Carolina Senate Bill 243, 2007, and South Carolina Code of Laws 12-6-3600.
79 South Carolina Senate Bill 243, 2007, and South Carolina Code of Laws 12-6-3631 and HB 3649,2008.
80 South Carolina Senate Bill 243, 2007, and South Carolina Code of Laws 12-63-3610.
81 South Carolina Senate Bill 243, 2007, and South Carolina Code of Laws 12-63-3610.
82 Oklahoma House Bill 3749 (sec. 68).
83 Oklahoma House Bill 3749 (sec. 68).
84 South Carolina Senate Bill 243, 2007, and South Carolina Code of Laws 12-63-30.
85 South Carolina House Bill 3161, 2007, and South Carolina Code of Laws 59-67.
86 South Carolina Code of Laws 56-1-10, 56-2-100 to 56-2-130, and 56-5-820.
87 Executive Order 2001-35.
88 South Carolina Code of Laws 12-28-110 and 12-36-2120.
89 PSC Order, Docket No. 2005-387-E.
90 Tennessee House Bill 2216, 2007, and Tennessee Code 54-1-136.
91 Tennessee House Bill 2216, 2007, and Tennessee Code 54-1-136.
92 Tennessee House Bill 1826, 2007, and Tennessee Code 67-3-103 and 67-3-423.
93 Authority 1: Tenn. Code § 4-3-710 Authority 2: Tenn. Code § 4-3-702.
94 Tennessee Senate Bill 123, 2007, and Tennessee Code 4-3-11.
95 Executive Order 33, 2006.
96 Virginia House Bill 139, 2008, and Virginia Code 58.1-439.12:02) .
97 Virginia Code 22.1-146 .
98 Virginia Executive Order 48, 2007.
99 West Virginia Code 18-9A-7.
100 West Virginia Code 5B-2F-2.
101 While this regulation does not promote biomass energy, it is listed because it is a regulatory mechanism that could greatly affect biomass energy production processes within the state in question.
102 West Virginia Code 5A-2A-2.
103 West Virginia Code 5A-2A-2.

Appendix C.

Select bioenergy research centers in the South

	NAME OF CENTER	Area of Focus			Primary affiliation of these centers				
		FEED-STOCK	TECH.	ECON. & POLICY	UNIV.	INDUST.	GOV.	NGO	Website/ email/contact address for further information
ALABAMA									
1	Alabama A&M University		X		X				http://www.aamu.edu/
2	Alabama State University	X			X				http://www.alasu.edu/
3	Auburn University	X	X	X	X		X		http://www.nrmdi.auburn.edu/bio/index.php,
4	Southern Research Institute of Birmingham, Alabama		X				X		http://www.carbontoliquids.com/
5	Troy University, Troy	X	X		X				http://troy.troy.edu/
6	Troy University at Dothan	X			X				http://www.troy.edu/
7	Troy University at Montgomery	X			X				http://montgomery.troy.edu/
8	Tuskegee University		X		X				http://www.tuskegee.edu/
9	The University of Alabama, Birmingham	X			X				http://main.uab.edu/
10	University of Alabama EPSCoR Program	X	X	X	X		X		http://epscor.aamu.edu/index.html
11	University of Alabama, Huntsville	X	X		X				http://www.uah.edu/
12	The University of Alabama, Tuscaloosa		X		X				http://www.ua.edu/
13	University of Montevallo	X			X				http://www.montevallo.edu/
14	University of North Alabama	X			X				http://www.una.edu/
15	The University of South Alabama	X			X				http://www.usouthal.edu/
16	University of West Alabama		X						http://www.westal.edu/
ARKANSAS									
1	Arkansas State University, Beebe	X			X				http://www.asub.edu/
2	Arkansas State University, Jonesboro	X	X	X	X				http://www.astate.edu/
3	Arkansas Tech University	X			X				http://www.atu.edu/
4	Henderson State University	X			X				http://www.hsu.edu/
5	Southern Arkansas University	X			X				http://www.saumag.edu/
6	University of Arkansas, Fayetteville	X	X	X	X				http://www.uark.edu/home

7	University of Arkansas, Fort Smith	X			X				http://www.uafortsmith.edu/Home/Index
8	University of Arkansas, Little Rock	X	X		X				http://ualr.edu/www/
FLORIDA									
1	Applied Research Associates		X			X			http://www.ara.com/
2	Common Purpose Institute			X				X	http://www.treepower.org/
3	Florida Institute of Technology		X		X				http://www.fit.edu/
4	Florida International University		X		X				http://www.fiu.edu/
5	Sigarca, Inc.		X			X			http://www.sigarca.com/
6	University of Central Florida		X		X				http://www.ucf.edu/
7	University of Florida, Gainesville	X	X	X	X				http://ufl.edu/
GEORGIA									
1	Augusta State University		X		X				http://www.aug.edu/
2	Georgia Centers of Innovation		X				X		http://www.georgiainnovation.org/
3	Georgia Institute of Technology (Georgia Tech)	X	X	X	X				http://www.gatech.edu/
4	Georgia State University	X		X	X				http://www.gsu.edu/
5	Southern Polytechnic State University			X	X				http://www.spsu.edu/
6	The University of Georgia, Athens	X	X		X				http://www.uga.edu/
7	Valdosta State University	X			X				http://www.valdosta.edu/
KENTUCKY									
1	Center for Applied Energy Research at University of Kentucky	X	X	X	X				http://www.caer.uky.edu/research/research.shtml
2	Kentucky Rural Energy Consortium (KREC)	X	X	X	X		X		http://louisville.edu/kppc/krec
3	University of Kentucky	X	X	X	X				http://www.uky.edu/
4	University of Louisville	X	X		X				http://louisville.edu/
LOUISIANA									
1	Audubon Sugar Institute, St. Gabriel, LSU	X	X	X	X				http://www.lsuagcenter.com/NR/rdonlyres/35A3C5X-ECD9-4C5D-ACB4-8BC2FEF766E/3525/RCX42researchstations.pdf
2	Hill Farm Research Station, LSU	X			X				http://www.lsuagcenter.com/NR/rdonlyres/35A3C5X-ECD9-4C5D-ACB4-8BC2FEF766E/3525/RCX42researchstations.pdf
3	Iberia Research Station, LSU	X			X				http://www.lsuagcenter.com/NR/rdonlyres/35A3C5X-ECD9-4C5D-ACB4-8BC2FEF766E/3525/RCX42researchstations.pdf

4	Louisiana Agricultural Experiment Station				X				http://www.lsuagcenter.com/en/administration/about_us/research/
5	LSU Agcenter	X	X	X	X				http://www.lsuagecenter.com
6	Northeast Research Station, LSU	X	X		X				http://www.lsuagcenter.com/NR/rdonlyres/35A3C5X-ECD9-4C5D-ACB4-8BC2FEF766E/3525/RCX42researchstations.pdf
7	Rice Research Station, LSU	X			X				http://www.lsuagcenter.com/NR/rdonlyres/35A3C5X-ECD9-4C5D-ACB4-8BC2FEF766E/3525/RCX42researchstations.pdf
8	USDA Agriculture Research station,Southern Research Center	X	X				X		USDA ARS, So Reg Res Ctr, POB X9687, New Orleans, LA 7X24 USA , http://www.ars.usda.gov/main/site_main.htm?modecode=6435
9	W.A. Callegari Environmental Center, LSU	X	X		X				http://www.lsuagcenter.com/NR/rdonlyres/35A3C5X-ECD9-4C5D-ACB4-8BC2FEF766E/3525/RCX42researchstations.pdf
MISSOURI									
1	FAPRI Missouri	X	X	X	X				http://www.fapri.missouri.edu/
2	Missouri Bioenergy		X			X			http://www.dnr.mo.gov/env/apcp/docs/mo-bioenergyfuel.pdf
3	Missouri Department of Natural Resources Field Services Division	X	X	X			X		http://www.dnr.mo.gov/services/index.html
4	Missouri Life Science Research Board	X	X	X			X		http://www.lifesciences.mo.gov/
5	Missouri Renewable Energy	X	X	X	X				htpp:/www.moreenergy.org/
6	Northwest Missouri State University	X	X						http://www.lifesciences.mo.gov/
7	St. Louis University		X		X				http://www.slu.edu
8	University of Missouri	X	X	X	X				htpp:/www.missouri.edu
9	Washington University		X		X				http://www.wustl.edu/academics/
MISSISSIPI									
1	Jackson State University	X	X		X				http://www.jsums.edu/
2	Mississippi State University	X			X				http://www.msstate.edu/
3	Pearson Technologies of Mississippi	X	X					X	http://www.emnrd.state. nm.us/emnrd/biomass/docs/GF_presentations/PTI%2New%2Mex%2Green%2Fuels%224v2BruceVantine.pdf
4	University of Mississippi	X		X	X				http://www.olemiss.edu/
5	The University of Southern Mississippi	X		X	X				http://www.usm.edu/index.php
NORTH CAROLINA									
1	Appalachian State University	X	X		X				http://www.appstate.edu/
2	Biofuels Center of North Carolina	X	X	X	X		X		http://www.biofuelscenter.org/index.cfm
3	Central Carolina Community College	X	X	X	X				http://www.cccc.edu

4	East Carolina University	X			X				http://www.ecu.edu/
5	Elizabeth City State University		X		X				http://www.ecsu.edu/
6	North Carolina Agricultural and Technical State University		X		X				http://www.ncat.edu/
7	North Carolina Biotechnology Center	X	X	X	X		X		http://www.ncbiotech.org/
8	North Carolina Central University		X		X				http://www.nccu.edu/index.cfm
9	North Carolina State University		X	X	X				http://www.ncsu.edu/
10	Southern Research Institute		X						http://www.southernresearch.org/
11	University of North Carolina at Chapel Hill		X		X				http://www.unc.edu/
12	University of North Carolina at Charlotte		X		X				http://www.uncc.edu/
13	University of North Carolina at Greensboro		X		X				http://www.uncp.edu/default.asp
14	University of North Carolina at Pembroke		X		X				http://www.uncp.edu/
15	University of North Carolina at Wilmington	X			X				http://www.uncw.edu/
16	Western Carolina University	X			X				http://www.wcu.edu/
OKLAHOMA									
1	The Samuel Roberts Noble Foundation	X	X	X				X	http://www.noble.org
2	Oklahoma Bioenergy Center	X	X	X	X				http://www.okbioenergycenter.org/
3	Oklahoma State University	X	X	X	X				htpp:/www.okstate.edu
4	University of Oklahoma	X	X	X	X				htpp:/www.ou.edu
SOUTH CAROLINA									
1	Arborgen		X					X	http://www.arborgen.com/
2	Sustainable Institute for Energy Studies, Clemson University		X	X	X				http://www.clemson.edu/scies/
3	University of South Carolina	X			X				http://www.ce.sc.edu/
TENNESSEE									
1	Bioenergy Science Center, Oak Ridge National Laboratory		X	X			X		http://bioenergycenter.org/
2	Tate and Lyle PLC and DuPont		X			X			http://www.duponttateandlyle.com
3	The Tennessee Department of Transportation		X	X			X		http://www.tdot.state.tn.us
4	The Tennessee Dept. of Economic and Community Development, Energy Division		X	X			X		http://www.state.tn.us/ecd/energy.htm

5	University of Tennessee	X	X	X	X				http://www.utk.edu
6	Tennessee State University	X	X	X	X				http://www.tnstate.edu
VIRGINIA									
1	Center for Energy and Environmental Sustainability, James Madison University		X	X	X				http://www.cisat.jmu.edu/cees/
2	Division of Forestry and Natural Resources		X	X	X				http://www.dof.virginia.gov/index.shtml
3	Institute for Advanced Learning and Research	X			X				http://www.ialr.org
4	University of Virginia		X		X				http://www.che.virginia.edu/
5	Virginia Polytechnic Institute and State University		X	X	X				http://www.cals.vt.edu/research/
WEST VIRGINIA									
1	Division of Forestry and Natural Resources		X	X	X				http://www.forestry.caf.wvu.edu/
2	West Virginia Development Office		X				X		http://www.wvdo.org/
3	West Virginia University		X	X	X				http://www.mae.cemr.wvu.edu/ ; http://www.caf.wvu.edu/plsc/

Appendix D.

Select bioenergy education and training centers in the South

	NAME	Primary Affiliation				Website/ email/contact address for further information
		UNIV.	INDUS.	GOV.	NGO	
ALABAMA						
1	Alabama A&M University	X				http://www.aamu.edu/
2	Auburn University	X				http://www.nrmdi.auburn.edu/bio/index.php
3	Tuskegee University	X				www.tuskegee.edu/
4	The University of Alabama, Birmingham	X				http://main.uab.edu/
5	The University of Alabama, Huntsville	X				http://www.uah.edu/
6	The University of Alabama, Tuscaloosa	X				http://www.ua.edu/
7	The University of South Alabama	X				www.usouthal.edu/
ARKANSAS						
1	Arkansas State University, Beebe	X				http://www.asub.edu/
2	Arkansas State University, Jonesboro	X				http://www.astate.edu/
3	Arkansas Tech University	X				http://www.atu.edu/
4	Henderson State University	X				http://www.hsu.edu/
5	Southern Arkansas University	X				http://www.saumag.edu/
6	University of Arkansas, Fayetteville	X				http://www.uark.edu/home
7	University of Arkansas, Fort Smith	X				http://www.uafortsmith.edu/Home/Index
8	University of Arkansas, Little Rock	X				http://www.ualr.edu/
FLORIDA						
1	Applied Research Associates				X	http://www.ara.com/
2	Common Purpose Institute				X	http://www.treepower.org/
3	Florida Institute of Technology	X				http://www.fit.edu/
4	Florida Agricultural and Mechanical University	X				http://www.famu.edu/
5	Florida Atlantic University	X				http://www.fau.edu/
6	Florida Gulf Coast University	X				http://www.fgcu.edu/
7	Florida International University	X				http://www.fiu.edu/
8	Florida State University	X				http://www.fsu.edu/

9	New College of Florida	X				http://www.ncf.edu/index
10	University of Central Florida	X				http://www.ucf.edu/
11	University of Florida	X				http://www.ufl.edu/
12	University of North Florida	X				http://www.unf.edu/
13	University of South Florida	X				http://www.usf.edu/index.asp
14	University of West Florida	X				http://www.uwf.edu/
GEORGIA						
1	Augusta State University	X				http://www.aug.edu/
2	Georgia Institute of Technology (Georgia Tech)	X				http://www.gatech.edu/
3	Georgia State University	X				http://www.gsu.edu/
4	Southern Polytechnic State University	X				http://www.spsu.edu/
5	University of Georgia, Athens	X				http://www.uga.edu/
6	Valdosta State University	X				http://www.valdosta.edu/
KENTUCKY						
1	Center for Applied Energy Research (University of Kentucky)	X				http://www.caer.uky.edu/
2	University of Louisville	X				http://www. louisville.edu/
LOUISIANA						
1	Louisiana State University Agcenter	X		X		http://www.lsuagecenter.com
MISSOURI						
1	FAPRI Missouri	X				http://www.fapri.missouri.edu
2	Missouri Department of Natural Resources Field Services Division			X		http://www.dnr.mo.gov/services/educ.htm
3	Missouri Renewable Energy			X		http://www.moreenergy.org/
4	School Energy Efficiency Development (SEED) Program			X		http://www.earthwayshome.org
MISSISSIPPI						
1	Alcorn State University	X				http://www.alcorn.edu/newweb/default.aspx
2	Delta State University	X				http://www.deltastate.edu/pages/X.asp
3	Jackson State University	X				http://www.jsums.edu/
4	Mississippi State University	X				http://www.msstate.edu/
5	Mississippi Valley State University	X				http://www.mvsu.edu/index.php
6	University of Mississippi	X				http://www.olemiss.edu/
7	The University of Southern Mississippi	X				http://www.usm.edu/index.php

NORTH CAROLINA						
1	Appalachian State University	X				http://www.appstate.edu/
2	Central Carolina Community College	X				http://www.cccc.edu/
3	East Carolina University	X				http://www.ecu.edu/
4	Elizabeth City State University	X				http://www.ecsu.edu/
5	North Carolina Agricultural and Technical State University	X				http://www.ncat.edu/
6	North Carolina Central University	X				http://www.nccu.edu/index.cfm
7	North Carolina State University	X				http://www.ncsu.edu/
8	University of North Carolina	X				http://www.unc.edu/
9	Western Carolina University	X				http://search.uncw.edu/
OKLAHOMA						
1	Oklahoma Bioenergy Center	X				http://www.okbioenergycenter.org/
2	Oklahoma State University	X				htpp:/www.okstate.edu
3	University of Oklahoma	X				htpp:/www.ou.edu
SOUTH CAROLINA						
1	Department of Civil and Environmental Engineering, University of South Carolina	X				http://www.ce.sc.edu/
2	Sustainable Institute for Energy Studies, Clemson University	X				http://www.clemson.edu/scies/
TENNESSEE						
1	Bioenergy Science Center, Oak Ridge National Laboratory			X		http://bioenergycenter.org/
2	Tennessee State University	X				http://www.tnstate.edu/
3	University of Tennessee	X				http://www.utk.edu
VIRGINIA						
1	Institute for Sustainable and Renewable Resources, Institute for Advanced Learning and Research			X		http://www.ialr.org/research/horticulture.html
2	James Madison University	X				http://www.jmu.edu/cisat/
3	Virginia Tech	X				http://www.research.vt.edu/energy/resbio.html
WEST VIRGINIA						
1	West Virginia University	X	X	X		http://www.wvu.edu/

Appendix E.

Expert perception survey

Common Questions

1) Please enter the name of the state where you reside:
2) How do you perceive the role of bioenergy in combating climate change (long-term alteration in global weather patterns, especially increases in temperature and storm activity, regarded as a potential consequence of the greenhouse effect)?
   a. Very Helpful
   b. Helpful
   c. No role
   d. Harmful
   e. Very harmful
3) In your opinion, what are three major threats and weaknesses for bioenergy (renewable energy produced from organic matter) development in your state?
4) In your opinion, what are three major opportunities and strengths for bioenergy development in your state?
5) In your opinion, what are three major agriculture based bioenergy feedstock(s) (raw material supplied to a machine or processing plant from which other products can be made) in your state and why?
6) What are the three major forestry based bioenergy feedstock(s) in your state and why?
7) In your opinion, what are the three specific regulations/incentives (e.g. renewable fuel standards) at the state/national level which will be helpful in bioenergy development?
8) Are you a member of any environmental organizations or networks?
   a. Yes
   b. No
9) What is your primary affiliation?
   a. Industry
   b. Academia/Research Organizations
   c. Non-Government Organizations

Industry Section

1) What are the three specific issues you would like to see researchers examining in terms of bioenergy technology development?
2) What are three most important approaches through which bioenergy research information can be transferred from research organizations to industry and government programs?
3) What are the three major bioenergy distribution issues (process of moving a product from its manufacturing source to its customers) which can inhibit the development of bioenergy industry in your state?
4) What are the groups which are undertaking major bioenergy capital investment in your state?

a. Venture capitalists
b. Corporations
c. Government agencies
d. Any other, please specify

5) Briefly explain why a particular group (selected in previous question) is making major investments in bioenergy development?

6) Please list three approaches through which partnerships among bioenergy stakeholders (private sector, NGOs, academic community, and government) can be improved?

NGO Section

1) Please list three bioenergy projects which are being undertaken or were completed by your organization.

2) In your opinion, how critical is the role of NGOs in promoting bioenergy in your state?
a. Very Helpful
b. Helpful
c. No role
d. Harmful
e. Very harmful

3) In your opinion, what will be the affect of bioenergy production on rural economies in your state?
a. Very Helpful
b. Helpful
c. No role
d. Harmful
e. Very harmful

4) Please suggest three steps to improve partnerships among bioenergy stakeholders (private sector, NGOs, and academic institutions)?

5) Policies to promote bioenergy in my resident state are appropriate/sufficient. Please select your level of agreement with the statement.
a. Strongly disagree
b. Disagree
c. Neutral
d. Agree
e. Strongly Agree

Academia Section

1) Please list three bioenergy projects which are being undertaken or were completed by your organization.

2) What are three important approaches through which bioenergy research information can be transferred from research organizations to industry and government programs?

3) What area(s) of bioenergy research is not being given enough emphasis in your state? Please explain your selection(s).
a. Sustainability
b. Technology
c. Feedstock

d. Distribution
e. Economics
f. Policy

4) Please select research area(s) about which you feel that available funding is favorably skewed? Please list three steps which are required to be undertaken for balancing the existing skew.
   a. Sustainability
   b. Technology
   c. Feedstock
   d. Distribution
   e. Economics
   f. Policy

5) Have current bioenergy policies influenced your research? If yes, please explain.
   a. Yes
   b. No

6) Please list three suggestions which would help in improving outreach activities (the act or practice of visiting and providing the services to people who might not otherwise have access to those services) of bioenergy education/training centers (e.g. National Renewable Energy Laboratory or Center for Applied Energy Research at the University of Kentucky)?

SOUTHEAST AGRICULTURE & FORESTRY ENERGY RESOURCES ALLIANCE
c/o SOUTHERN GROWTH POLICIES BOARD
P.O. BOX 12293, RESEARCH TRIANGLE PARK, NC 27709

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Southern Bioenergy Roadmap

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IFAS