

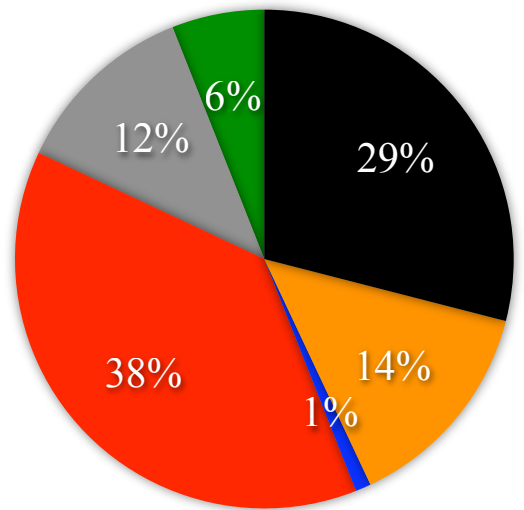
# Georgia Biomass and Bioenergy Overview

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## GENERAL OVERVIEW

In 2003, the State of Georgia consumed an estimated 3003.7 trillion Btu (880.3 billion kWh) of energy, 10<sup>th</sup> highest nationwide.<sup>1</sup> Petroleum accounted for about 38 percent of total consumption, while coal provided another 29 percent of total consumption. Other major energy sources were natural gas and nuclear, which accounted for approximately 14 and 12 percent of the state's total energy consumption, respectively. Biomass supplied over 181.6 trillion Btu (53.2 billion kWh), or about 6 percent of Georgia's total consumption, ranking the state 2<sup>nd</sup> nationally.<sup>1</sup> Biomass combustion in Georgia primarily comes from pulp and paper manufacturing facilities. Other biomass power comes from the combustion of landfill and wastewater treatment biogas.<sup>2</sup> Total energy consumption in Georgia increased by 1,153 trillion Btu between 1980 and 2001, an average annual increase of 2.5 percent. Electricity consumption rose by 226.8 trillion Btu (66.5 billion kWh) during the same period, an average annual increase of 4 percent.<sup>3</sup> Per capita petroleum use for transportation was estimated to be 19 barrels for 2001, an increase of 0.6 barrels since 1980.<sup>3</sup>

**Georgia Energy Consumption by Source, 2003**



- Coal
- Natural Gas
- Hydroelectric
- Petroleum
- Nuclear
- Biomass

Source: Energy Information Administration<sup>1</sup>

## FOREST-BASED RESOURCES

Georgia has over 24.7 million acres of forestland, 24.3 million of which are available for commercial uses.<sup>4</sup> In 2005, an initial assessment of forest biomass authorized by the Georgia Forestry Commission showed that Georgia forests had the potential to produce 45 million dry tons of forest biomass annually for use in energy and other product scenarios.<sup>4</sup> Unmerchantable timber makes up the majority of this volume, at 13.3 million dry tons or 29 percent.<sup>4</sup> Of this unmerchantable timber, only 3 percent is currently used for energy or other products.<sup>4</sup> Harvesting or logging residues amount to 3.5 million dry tons per year.<sup>5</sup> Only 5 percent of this total is currently in use.<sup>4</sup>

Currently, the wood products and forest industries in Georgia generate more than 20 million dry tons of wood waste each year.<sup>4</sup> This represents almost 50% of the total forest related biomass available. Dry mill residues account for 8 million dry tons of this total, 99 percent of which is already in use for secondary

products.<sup>4</sup> Paper mill black liquor is estimated to produce over 12 million dry tons of waste annually.<sup>4</sup> All of these residues are currently used for energy production.

Other forest-based sources of biomass include the first thinnings of pine plantations, which could supply 2.3 million dry tons of biomass annually.<sup>4</sup> Urban wood waste also could contribute over 1.44 dry tons annually.<sup>4</sup>

## AGRICULTURAL RESOURCES

Georgia has over 4.7 million acres of cropland.<sup>6</sup> It has been estimated that the state could produce 997,000 dry tons of agricultural residue biomass annually.<sup>7</sup> It has also been estimated that an additional 1.3 million dry tons of dedicated energy crops could be produced at \$40/dry ton.<sup>8</sup> One study estimated that on Conservation Reserve Program (CRP) land alone, 1.6 million dry tons of switchgrass and 1.2 million dry tons of willow and hybrid poplar could be produced

each year.<sup>7</sup> Management of farm animal manure could provide an additional 139,000 tons of methane annually.<sup>7</sup>

**CURRENT ACTIVITIES**

Government agencies, private companies, and others in Georgia have begun investigating the use of biomass to make energy related products, such as transportation fuels, electricity, and even natural gas. A good example of this work is Bioconversion Research and Education Center located at the University of Georgia in Athens, Georgia, which is the site of a biomass-to-hydrogen R&D project funded by U.S. DOE Phase III research on the pilot-scale production unit, will examine the generation of 25 kg of hydrogen per day from catalytically reformed biomass pyrolysis vapor in a 1,000 hour run. The project involves the cooperation of the Georgia Institute of Technology, Clark Atlanta University, Eprida Scientific Carbons, Inc., Enviro-Tech, Inc. and the National Renewable Energy Laboratory.

The University of Georgia Faculty of Engineering Outreach Service is also researching the effects of blending and storing petroleum diesel with liquid biofuels for use in industrial boilers. The project, funded by the U.S. Poultry and Egg Association's Poultry Protein and Fat Council, is examining the effects of temperature, blends, and time on the physical and chemical characteristics of these fuels. The results will provide guidance to managers on using fats, oils, and grease from biological sources as fuel to produce heat and steam.<sup>9</sup>

The Black Liquor Gasification (BLG) program at the Institute of Paper Science and Technology (IPST) at Georgia Tech is working to make BLG, and BLG with combined cycle power generation, a commercially viable process in accordance with the industry's vision of becoming independent of fossil fuels and ultimately a net exporter of electrical power.<sup>10</sup> The US DOE shares this vision and is partnering with industry to resolve the remaining technological issues.<sup>11</sup> The adoption of BLG with combined cycle power generation offers a number of potential benefits to paper mills, including increased pulp yields, increased power generation, and direct and autoausticization (by adding a chemical agent to the black liquor, the causticizing process can be accomplished within the gasifier, thus eliminating the need for the conventional lime cycle).

The United States Department of Agriculture, Agriculture Research Service in Tifton, GA is

<b>Georgia's Biomass Resources</b>	
<b>Corn Produced (Silage and Grain)<sup>16</sup></b>	1,385,600 tons
<b>Soybeans Produced<sup>16</sup></b>	105,000 tons
<b>Wheat Produced<sup>16</sup></b>	176,400 tons
<b>Conservation Reserve Program<sup>17</sup></b>	306,326 acres enrolled
<b>Municipal Solid Waste<sup>18</sup></b>	8,142,378 tons generated
<b>Logging Residues<sup>5</sup></b>	3.5 million dry tons
<b>Poultry<sup>16</sup></b>	1,495,635,000 head
<b>Livestock<sup>16</sup></b>	1,510,000 head

conducting research on a variety of feedstocks for use as biofuels. Research in the Crop Genetics and Breeding Research Unit has focused on bermudagrass, bahiagrass, giant reeds and other plants. Another key project looks at using pearl millet for the production of ethanol. Research has shown that using pearl millet as a feedstock is equally or even more economical than corn.

Some private companies, such as Earth Resources, Inc., located in Carnesville, Georgia, and Atlanta-based Biomass Gas and Electric (BG&E, <http://www.biggreenenergy.com>) are in the process of developing large-scale biomass gasification plants that can serve commercial customers. In 2003, the US DOE and USDA issued a joint biomass R&D solicitation from which Earth Resources, Inc., was awarded \$1,136,936 to fund their project, "Animal Waste Management-Chicken Litter to Energy" (<http://www.remenergy.com/newstory.asp>). Georgia is the country's largest source of poultry manure, generating 1.5 million tons a year.<sup>12</sup> This level of production makes poultry manure of particular interest in Georgia because the manure is rich in phosphorous and nitrogen, which are linked to water pollution. Earth Resources, Inc. is partnering with the University of Georgia Faculty of Engineering Outreach Service and the Gas Technology Institute, Des Plaines, IL, for R&D in gasification technology to facilitate animal waste management. The 3-year

project will focus on converting broiler poultry litter to energy.

Although there are no large-scale ethanol or biodiesel production facilities currently in Georgia, feasibility studies are being conducted to explore this. In August 2003, Georgia's Environmental Facilities Authority organized a Biodiesel Summit in Plains, Georgia that brought together State Legislators with interested parties as a means to identify the incentives or policies needed to encourage industry development. Former President Jimmy Carter hosted the event and gave remarks in strong support of the creation of a biodiesel industry in Georgia.

One way to ensure future industry development is to establish a vision and roadmap - which is exactly what the State of Georgia has done. The Georgia Industrial Technology Partnership (GITP) funded initially by DOE and located on the University of

Georgia campus, has developed through the participation and guidance of Georgia's biomass industries, a Vision and research Roadmap for the future of the biomass industry in Georgia. This activity led to the establishment of the Georgia Integrated Biorefinery and Carbon Cycling Initiative. (<http://www.engr.uga.edu/service/outreach/index.html>)

Georgia has approximately 49 facilities involved in the production of biopower resources and 3 facilities producing some type of bioproducts.<sup>2</sup> Currently, there are seven landfills producing methane for energy, with 18 more landfills identified as potential program sites.<sup>13</sup> The TVA Green Power Program is available through most Georgia electrical utilities. All Georgia Power new electrical generation capacity built since 2000 uses natural gas.<sup>14</sup> The state also offers a tax credit incentive program for the purchase, lease, or conversion of an alternative fuel vehicle.<sup>15</sup>

#### LINKS TO OTHER GEORGIA RESOURCES

Georgia Department of Agriculture  
<http://agr.georgia.gov/>

The Georgia Environmental Facilities Authority, Division of Energy Resources  
[http://www.gefa.org/energy\\_program.html](http://www.gefa.org/energy_program.html)

Georgia Forestry Commission  
<http://www.gfc.state.ga.us/>

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