

North Carolina *Biomass and Bioenergy Overview*

Samuel W. Jackson, Research Associate

GENERAL OVERVIEW

In 2003, North Carolina consumed an estimated 2,643.7 trillion BTUs (774.8 billion kWh) of energy.¹ The state's energy consumption ranks 12th nationally. Petroleum accounted for about 37 percent of total consumption, with coal providing another 30 percent. Other major energy sources were nuclear and natural gas, which accounted for approximately 17 and 9 percent of the state's total energy consumption, respectively. Biomass supplied over 109.2 trillion Btu (32 billion kWh), or about 4 percent of North Carolina's total consumption.¹ The state ranks 7th nationwide for amount of energy consumption derived from biomass resources.¹ Total energy consumption in North Carolina increased by 919 trillion Btu (269.3 billion kWh) between 1980 and 2001, an average annual increase of 2.1 percent. Electricity consumption rose by 183.3 trillion Btu (53.7 billion kWh) during the same period, an average annual increase of 2.9 percent.² Per capita petroleum use for transportation was estimated to be 16 barrels for 2001, an increase of 1.7 barrels since 1980.²

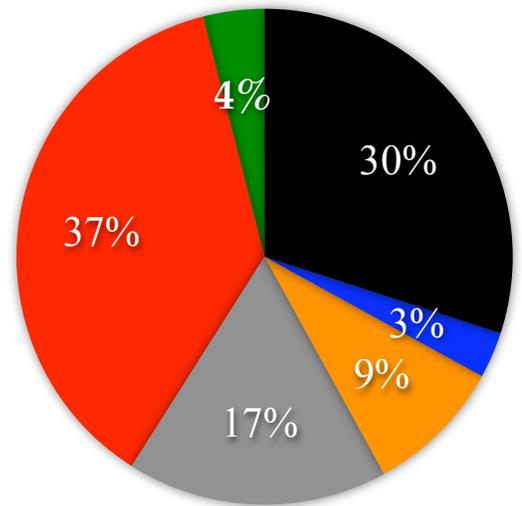
FOREST-BASED RESOURCES

North Carolina has over 18.7 million acres of forestland.³ It is estimated that logging residues in the state could provide 2.3 million dry tons of biomass each year. Mill residues can add over 5 million dry tons more to the supply.⁵ This translates into 6.5 trillion and 22.2 trillion Btu (1.9 billion and 6.5 billion kWh) per year in potential energy production.⁵ Today, wood and wood waste accounts for 11% of North Carolina's industrial energy needs.⁵ Urban wood residues could contribute another 833,000 dry tons of biomass annually.⁶

AGRICULTURAL RESOURCES

North Carolina has 5.4 million acres of crop land.⁷ It is estimated that the state's agricultural community could produce 1.5 million dry tons of residue biomass annually.⁶ Another 639,000 dry tons of dedicated energy crops could be produced at \$40/ton.⁸ One study estimated that on Conservation Reserve Program (CRP) land alone, 577,000 dry tons of switchgrass and 440,000 million dry tons of willow and hybrid poplar could be produced each year.⁶

North Carolina Energy Consumption by Source, 2003



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

Source: Energy Information Administration¹

Livestock in North Carolina produce an estimated 143 million BTUs of recoverable methane each year. This methane could generate up to 130 million kWh annually.⁵

CURRENT ACTIVITIES

Another large source of biomass material in North Carolina is waste from swine. North Carolina has 9.8 million head of hogs and pigs, making it second in the nation.⁹ In cooperation with state government, large swine operators, farmers, and others, North Carolina State University (NCSU) is investigating the technical and economic feasibility of using a variety of techniques, including gasification, as a means to convert hog waste to energy products.¹⁰ Currently, a demonstration gasifier has been installed and test runs are occurring to determine the optimum combustion requirement for generating liquid fuels. Research has estimated that by using swine waste as a feedstock,

the state could attain a theoretical production rate of 80 million gallons per year of ethanol.¹¹

North Carolina is also home to some innovative bio-based energy projects. In Wilmington, the city uses a 100% municipal solid waste combustion process to produce over 7.5 megawatts of electricity.⁵ A landfill used by Mitchell and Yancy counties provides methane gas to power the EnergyXchange Renewable Energy Center (<http://www.energyxchange.org>). The methane gas produced from the six-acre landfill powers two craft studios (pottery and glass blowing), an arts gallery, and a visitor’s center. This landfill gas project (LFG) was the first of its kind in the state. Another, larger 20-acre landfill in Wilkes County is where methane from the landfill will be used as fuel for a regional fire training facility for firefighters. The gas will also provide fuel and/or electricity for nearby Wilkes Community College and for a community apple storage/processing center to sustain the local apple growers. Currently, there are at least 11 operating landfill gas energy production projects in the state, all producing energy at varying scales. The US EPA has identified another 34 landfills in the state who are candidates for the energy production program.¹² Overall, North Carolina had 17 biopower facilities, one biofuels production facility, and one bioproducts facility actively producing materials in 2003.¹⁰

The North Carolina Green Power Program (<http://www.ncgreenpower.org/>) allows electric utility customers to purchase electricity from renewable sources, including methane derived from biomass and other biomass products. The program is unique in that it applies to all utilities in the state and all who do business in North Carolina participate by offering the program.

LINKS TO OTHER NORTH CAROLINA RESOURCES

North Carolina Department of Agriculture
<http://www.ncagr.com/>

North Carolina State Energy Office
<http://www.energync.net/>

North Carolina Division of Forest Resources
<http://www.dfr.state.nc.us/>

CITATIONS

1) U.S. Department of Energy, Energy Information Administration, "Table S3. Energy Consumption Estimates by Source, 2003." http://www.eia.doe.gov/emeu/states/sep_sum/html/pdf/sum_btu_tot.pdf

North Carolina’s Biomass Resources	
Corn Produced (Silage and Grain)¹⁴	3,545,040 tons
Soybeans Produced¹⁴	1,305,600 tons
Wheat Produced¹⁴	743,400 tons
Conservation Reserve Program¹⁵	133,712 acres enrolled
Municipal Solid Waste¹⁶	8,130,914 tons generated
Logging Residues⁴	2.3 million dry tons
Poultry¹⁴	808,059,900 head
Livestock¹⁴	1,044,100 head

The state of North Carolina provides an array of personal and corporate tax credits and an energy loan improvement program to promote the use of biomass. Under the Renewable Energy Corporate Tax Credit a corporation can take a tax credit up to 35% (up to \$2,500,000) of the cost of construction of any facility that will be used to produce an energy related product from a renewable resource. For private properties, such as residences, the credit limit is \$10,500 for biomass related energy production projects. Other tax credits are available to individuals utilizing renewable energies and technologies.¹³

2) U.S. Department of Energy, Energy Efficiency and Renewable Energy. 2006. North Carolina Energy Statistics http://www.eere.energy.gov/states/state_specific_statistics.cfm/state=NC

3) U.S. Department of Agriculture Forest Service. 2004. Forest Statistics for North Carolina, 2002. Mark Brown. SRS-88. http://www.srs.fs.usda.gov/pubs/rb/rb_srs088.pdf

4) U.S. Department of Agriculture, Forest Service Forest Inventory and Analysis Unit Timber Product Output Data 2003. <http://srsfia1.fia.srs.fs.fed.us/>

5) North Carolina State Energy Office. North Carolina State Energy Plan, January 2005 Revised edition. http://www.energync.net/sep/docs/sep_12-04.pdf

6) Milbrandt, A. A Geographic Perspective on the Current Biomass Resource Availability in the United States. 2005. U.S. Department of Energy, National Renewable Energy Laboratory. <http://www.nrel.gov/docs/fy06osti/39181.pdf>

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- 7) U.S. Department of Agriculture, National Agricultural Statistics Service. 2002 Census of Agriculture. North Carolina State Data. <http://www.nass.usda.gov/>
- 8) Biomass Feedstock Availability in the United States: 1999 State Level Analysis. Marie E. Walsh, Robert L. Perlack, Anthony Turhollow, Daniel de la Torre Ugarte, Denny A. Becker, Robin L. Graham, Stephen E. Slinisky, and Daryll E. Ray. <http://bioenergy.ornl.gov/resourcedata/index.html>
- 9) U.S. Department of Agriculture, National Agricultural Statistics Service. Quarterly Hogs and Pigs Report, Dec. 2005. <http://usda.mannlib.cornell.edu/reports/nassr/livestock/php-bb/2005/hgpg1205.pdf>
- 10) U.S. Department of Energy, Biomass Research and Development Initiative. North Carolina Biobased Fuels, Power and Products State Fact Sheet. 2003. <http://sungrant.tennessee.edu/factsheets/ncarolina.pdf>
- 11) North Carolina State University Cooperative Extension. 2001. Formation of Fuel-Grade Ethanol From Swine Waste Via Gasification, <http://mark.asci.ncsu.edu/swinereports/2001/03manbrett.htm>
- 12) Environmental Protection Agency Landfill Methane Outreach Program Active Program Map (July 13, 2006). <http://www.epa.gov/lmop/docs/map.pdf>
- 13) North Carolina Incentives for Renewable Energy, DSIRE. 2006. <http://www.dsireusa.org/library/includes/map2.cfm?CurrentPageID=1&State=NC>
- 14) U.S. Department of Agriculture, National Agricultural Statistics Service. 2006 Statistics by Commodity. Accessed May, 2007. <http://www.nass.usda.gov/>
- 15) U.S. Department of Agriculture, Farm Service Agency. Conservation Reserve Program Summary and Enrollment Statistics, FY 06. http://www.fsa.usda.gov/Internet/FSA_File/06rpt.pdf
- 16) Simmons, P., N. Goldstein, S. Kaufman, N. Themelis, and J. Thompson Jr. 2006. The State of Garbage in America. BioCycle. 47(3) April 2006. PP. 26-43. <http://www.jgpress.com/biocycle.htm>
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