



## Wood to Energy: Woody Biomass Basics<sup>1</sup>

Jessica Tomasello, Lauren McDonell, Martha C. Monroe, and Annie Oxarart<sup>2</sup>

The demand for energy in the United States is increasing; in fact, according to the U.S. Energy Information Administration (U.S. EIA), total energy consumption in the U.S. is expected to grow by 19 percent from 2006 to 2030 (U.S. EIA 2008). We depend on energy for nearly everything—it takes energy to light, cool, and heat our homes, and it also takes energy to fuel our vehicles, grow our food, and power our machinery and technology. Much of the energy we use is in the form of electricity, which is generated from a variety of resources. Energy resources used in the United States include nonrenewable sources (such as petroleum, natural gas, coal, and nuclear) and renewable sources (such as wind, solar, biomass, hydroelectric, and geothermal).

### Nonrenewable Energy Sources

Fossil fuels, such as coal, petroleum, and natural gas, are nonrenewable energy sources because they cannot be replenished in our lifetime. Fossil fuels are found in the top layer of the Earth's crust and are formed from the fossilized remains of plants and animals. Fossil fuels have historically provided the United States with a reliable, inexpensive, and

domestically available source of energy. Today, fossil fuels make up the largest portion of energy consumed in the United States; in 2007, approximately 85 percent of the energy consumed in the United States was produced with coal, petroleum, and natural gas (U.S. EIA 2008a).

When fossil fuels are burned, greenhouse gases are emitted. These gases include carbon dioxide, water vapor, methane, and nitrous oxide. At small quantities, most of these gases are not harmful, but with growing energy consumption rates, emissions have increased, resulting in an overall increase in the amount of greenhouse gases in the atmosphere over the last century. Greenhouse gases trap heat from the sun in the Earth's atmosphere, preventing it from escaping into space. While greenhouse gases are naturally found in the atmosphere, burning fossil fuels is contributing to an overall increase in the amounts of these gases. The increasing level of these gases is leading to an overall change in the Earth's climate. See the Wood to Energy Fact Sheet, *Climate Change and Carbon*, for more information. All of the Wood to Energy materials can be found at <http://edis.ifas.ufl.edu> under Woody Biomass and at <http://www.interfacesouth.org/products/wood-to-energy>.

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2. Jessica Tomasello, outreach research associate, School of Forest Resources and Conservation; Lauren McDonell, outreach research associate, School of Forest Resources and Conservation; Martha C. Monroe, professor, School of Forest Resources and Conservation; and Annie Oxarart, outreach research associate, School of Forest Resources and Conservation, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville

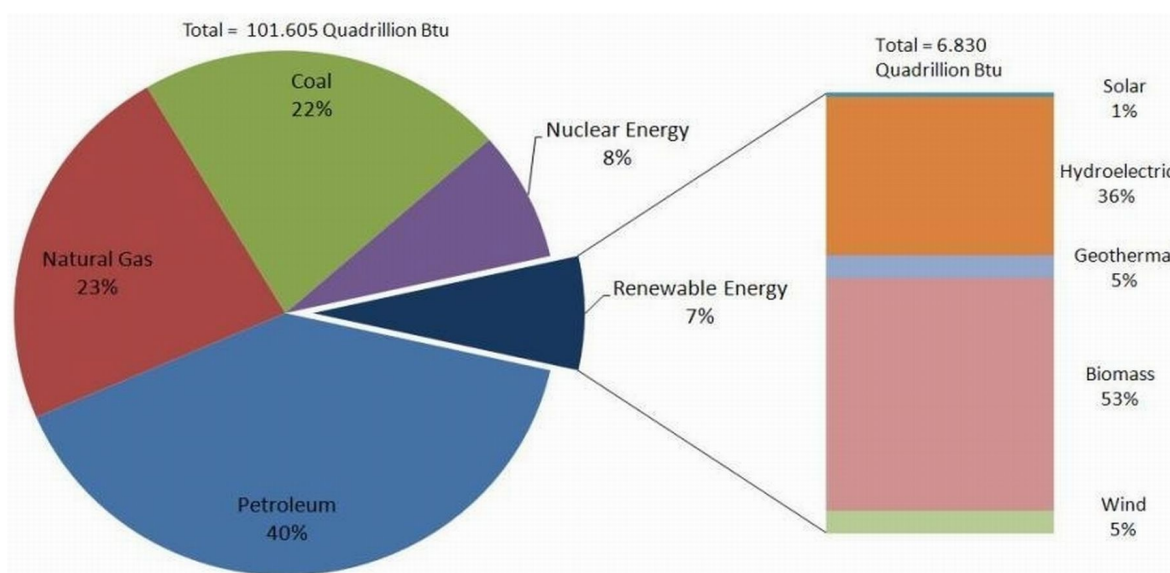
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## Renewable Energy Sources

Renewable energy sources include solar, wind, biomass, hydrogen, geothermal, hydropower, and ocean (thermal and tidal) energy (National Renewable Energy Laboratory, hereafter NREL, 2008). Renewable energy sources are either continuously replenished, like the sun and wind, or are replenished over a reasonably short period of time, like biomass from trees or crops (NREL 2008). In 2007, 7 percent of the energy supply in the United States was produced with renewable energy sources (U.S. EIA 2008a) (Figure 1).

power, or transportation fuels, it is called biomass energy, or bioenergy. Examples of bioenergy resources are food crops like sugarcane and corn, grassy and woody plants, agricultural and forestry residues, municipal and industrial solid wastes, and landfill gases (NREL 2008). Biomass is a renewable energy resource because trees and plants can be grown in a short period of time and waste is continuously produced.

People have been using biomass in the form of firewood for centuries to cook food, heat their homes, and produce steam. Currently, many people in



**Figure 1.** The recent role of renewable energy consumption in the nation's energy supply in 2007. Source: U.S. EIA 2008a.

Growing public concern about the negative effects of climate change on the environment and people has resulted in an increased interest in utilizing energy from renewable, locally available resources. For example, the Energy Policy Act of 2005 includes a number of provisions to encourage the use of renewable energy to produce electricity and provides federal tax credits for using renewable fuels. These efforts may aid in reducing the production of greenhouse gases and increase energy security.

## What is Biomass?

Biomass is biological material from plants or animals that either is living currently or was living recently (Environmental Literacy Council 2008). When biomass is converted into electricity, heat,

developing countries depend on burning biomass to provide heat for both cooking and warmth, making it the most widely used renewable energy source in the world. Biomass can potentially provide some U.S. communities with a local source of renewable energy. Current research and advances in technologies are working towards making bioenergy a cleaner and more efficient source of renewable energy.

## What is Woody Biomass?

Woody biomass is plant material from trees and shrubs and can include roots, bark, leaves, branches, limbs, trunks, and vines. Woody biomass can come from many sources, including residues from forestry operations and industries that make products out of wood, like paper or furniture; tree and shrub

trimmings from urban areas; forest thinning; and trees grown for energy.

### Residues

When trees are harvested, branches, tree tops, stumps, and other debris are left behind. These forestry residues can be collected and used to produce energy. Sawdust, scraps, and chips are generated by sawmills and furniture and other wood-product industries, and these facilities often use their own wood waste to produce heat, steam, or electricity for powering their equipment and machinery.

### Urban Waste Wood

As you travel through your community, you might see piles of debris and yard waste along the street (Figure 2). This waste and debris represents a source of woody biomass and is the most inexpensive source of woody biomass in the United States. Similarly, the material generated when utility companies trim tree limbs and branches from power lines can be used as a source of woody biomass energy. In addition, when land is cleared for development or when a storm damages trees, woody biomass debris is produced. All of this urban waste wood can be collected, transported, and used for energy.

Often, to dispose of urban waste wood, materials are mulched, taken to a landfill, or burned without emission controls. Woody biomass from urban waste wood could instead be used to produce energy, substituting an economically and environmentally beneficial practice for an economically and environmentally harmful practice to accomplish the waste disposal goal.

### Forest Thinning

To improve forest health and productivity, foresters and landowners often remove some trees and vegetation. This reduces crowding and promotes healthy tree growth. In addition, removing smaller trees in the understory of a forest reduces the risk of wildfire and insect or disease outbreaks. Woody biomass from forest thinning represents another source of biomass for energy.



**Figure 2.** Urban wood waste represents an inexpensive source of woody biomass. Credits: Larry Korhnak

### Trees Grown for Energy

Just as trees are grown to produce lumber, paper, and other products, trees can be grown for energy. In the southeastern United States, pine and hardwood plantations are a possible source of woody biomass for energy production (Figure 3).



**Figure 3.** In the Southeast, pine plantations are a possible source of woody biomass for energy production. Credits: Larry Korhnak

Some species of trees or woody plants, known as short-rotation woody crops, grow very quickly. Some hardwood species, such as eucalyptus and willow trees, can resprout after they are cut. These crops produce a lot of biomass in a short period of time and can be harvested numerous times before they must be replanted.

In addition, some trees are planted for phytoremediation, a process in which plants take up pollutants in the soil and use them as nutrients. Phytoremediation can be used to clean up sites that have contaminated soil or water. This can be a good

use of degraded and otherwise unusable lands, like old phosphate mines, that cannot be used to grow food crops. Trees grown on these sites can be removed and used for energy.

## Summary

Using wood for energy is not a new concept. People have been using biomass for centuries to cook food, heat their homes, and produce steam. Advancements in technology, such as emission controls and the production of wood pellets, have created cleaner, more efficient ways to harness the energy in wood. Woody biomass can provide some communities with a locally available, renewable source of energy to help meet some of their energy needs.

In addition to developing new, renewable, carbon-neutral ways to produce energy, reducing the overall energy demand in the United States is key to our energy future. Energy conservation can be achieved if individuals and businesses reduce how much they drive and use electricity; if technological improvements enhance the efficiency of electronics, automobiles, and appliances; and if we use appropriate construction materials and architectural plans to design energy-efficient buildings. A combination of energy conservation and the use of multiple renewable energy sources is the most likely recipe for success when it comes to meeting energy needs in an environmentally, socially, and economically sustainable way.

Additional Wood to Energy fact sheets, community economic profiles, and case studies can be accessed at <http://edis.ifas.ufl.edu> under Woody Biomass or at <http://www.interfacesouth.org/products/wood-to-energy>. Also, visit the Forest Bioenergy website, <http://www.forestbioenergy.net>, to access a number of other bioenergy resources.

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