



## FORESTRY TECHNICAL NOTE

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### Woody Biomass - A Renewable Energy Source

#### A FACT SHEET FROM THE WEST FORESTRY CONSORTIUM

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**Introduction:** Attached is a fact sheet from the West Forestry Consortium on the use of woody biomass as a renewable energy source. Renewable energy has attracted much attention recently. The use of woody biomass as a renewable energy source has been around since mankind has been able to heat with wood. The focus recently has been turning woody biomass into other energy uses. There has been significant information written about the use of woody biomass as a renewable energy source. The science and emerging discoveries are changing the information daily. The attempt at this fact sheet is to briefly inform and encourage people to consider woody biomass as part of the renewable energy equation. The fact sheet does not attempt to provide all the answers, but hopefully encourages others to look more closely at woody biomass as a renewable energy source. Feel free to contact me with any questions or concerns.



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### **OVERVIEW**

Woody biomass is a term used to describe wood, wood residue, and dedicated trees or shrubs. It has been used as a source of energy for heat and light for thousands of years. Woody biomass can provide clean and renewable energy in the form of heat, electricity, or transport fuels.

### **WHY USE WOODY BIOMASS FOR ENERGY?**

Woody biomass is a renewable energy source. It also has almost zero net greenhouse effects as the carbon dioxide given off during combustion is absorbed by the growth of the next crop.

Woody biomass can be used to generate heat or electricity, or converted into liquid fuels such as ethanol or methanol. It can be used as a substitute for fossil fuels with a reduction in greenhouse gas emissions.

Woody biomass can be very cost effective, particularly when the wood residue being used is a by-product of an existing process. It can often be used to provide some of the energy for the production process itself.

### **GROWING WOODY BIOMASS**

Woody biomass is available from three main sources:

- Wood Residue--Small branches, tree thinning materials, tree tops, and other wood from harvested trees
- Wood Waste--Bark, sawdust, shavings, and off-cuts from processed wood in dimensional lumber, post and pole operations, plywood plants, etc.
- Woody Crop Plantations--Short rotation crops grown specifically for energy purposes

Wood residue results primarily from the harvesting of timber. Whole tree harvesting systems are now common. The trees are felled and skidded to a landing area for processing. The tops, branches and cull wood are piled and chipped into trucks then shipped to a nearby plant to generate electricity or used to produce heat to dry other wood products.

Wood waste is a by-product of timber processing. This includes timber milling, producing plywood, pulp and paper manufacturing, and post/pole operations.

Woody crop plantations are specifically grown for energy purposes. The species of trees are often chosen for their ability to sprout from a cut stump. They generally grow rapidly and are ready to harvest in a short period of time (5-10 years). This process can be repeated several times before replanting is necessary.

### **THE POTENTIAL FOR USING WOODY BIOMASS**

Woody biomass can be used as a substitute for coal, gas, or oil in many energy supply applications. In the past, wood provided 5% of the total energy needs for the United States in the form of heat for industry, firewood for our homes, and a small amount of electrical generation. There is the potential for woody biomass to provide 10% of the total U.S. energy needs.

Liquid fuels such as ethanol and methanol can be produced from wood residue, but the processes are not yet commercialized. The future potential for ethanol production and wood residue needs are good given the increasing use of ethanol-petrol blends.

## CONVERSION TO USABLE ENERGY

Converting woody biomass into usable energy can be achieved using a number of conversion processes.

- Domestic Heating
  - Traditional wood burning stoves for domestic space heating are around 50% efficient. New low emission wood burners are about 70% efficient.
  - New wood burners designed to burn wood pellets for heating are increasingly used in public and commercial buildings. These pellet burners are up to 86% efficient and are clean burning with low air pollution emissions. The wood pellet fuel is made from wood residue and sawdust waste.
- Industrial Heat
- Other Uses
  - Processes to produce organic oils, gasses, and liquid fuel are emerging.

Wood gasification systems are also under development. Woody biomass is turned into hydrogen, carbon monoxide, and other gases, which in turn can be used to generate electricity by powering efficient gas turbines and diesel engines.

## THE ECONOMICS

Comparing the cost of the renewable woody biomass energy to a non-renewable energy source should be calculated based on residential or industrial usage.

- Residential
  - Firewood bought from a local dealer and burned in a modern wood burner supplies heat at about 7.5 cents per kilowatt hour. The average retail electricity price is around 15 cents per kilowatt hour.
- Industrial
  - On a larger industrial scale, heat supplied from wood fuel is about 10 cents per kilowatt hour. The most significant factor affecting the cost is transportation and conversion to a wood burning system.
  - Liquid fuels such as ethanol and methanol produced from wood residue are not yet commercialized and costs are not fully known.
  - Electricity can be produced from woody biomass. The process often requires a costly steam-turbine plant. Electricity can be generated at a cost of about 12.5 – 15 cents per kilowatt hour.

## LIMITATIONS

In some situations, the collecting and transporting of bulky woody material from a forest is often expensive. Bringing the process to the woody biomass site may be cost effective through portable chippers and processors. Further research would be useful.

If all the woody biomass is removed, it could reduce the soil fertility to an unacceptably low level. Leaving a desired amount of woody biomass on the forest floor may be necessary to maintain soil fertility.

Contact your local NRCS office for more information.



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