

Facts about Wood

Introduction

Wood was once the main energy resource used during the early history of the United States, but now it plays only a small role in meeting the nation's energy needs. Still, in certain parts of the country, including Wisconsin, wood provides people with a cheap and plentiful source of energy for heating.



Wood gets its energy from the sun and nutrients in the soil and is a type of biomass fuel (see [Facts about Biomass Fuels](#)). Sunlight strikes the leaves, photosynthesis uses the light (energy from the sun) to combine air (CO₂ mostly) and water to create glucose ("chemical energy"- sugars), which is stored in the wood itself. Wood is a renewable resource, which means that additional resources can be grown to replace any wood that is cut down.

Wood for heating is sold in units called cords. A cord is a stack of wood 8 feet long, 4 feet high, and 4 feet wide (128 cubic feet). A face cord is a stack 8 feet long, 4 feet high, and 12 to 16 inches wide (32 to 40 cubic feet).

A cord of hardwood such as maple, oak, or hickory may contain twice as much energy as a cord of softwood such as pine or balsam fir. This variation in energy is because a cord of hardwood is more dense and heavy than softwood (see [Energy Content and Weight per Cord of Certain Types of Wood Found in Wisconsin](#)).

Energy Content and Weight per Cord of Certain Types of Wood Found in Wisconsin

Type of Wood	Energy Content per Cord of Wood (million Btu per cord)	Energy Content per Pound of Wood (Btu per pound)	Weight per Cord or Air-Dried Wood (pounds per cord)
Ash	20.0	5,814	3,400
Aspen	12.5	5,787	2,160
Balsam Fir	11.3	5,381	2,100
Beech	21.8	5,798	3,760
Birch (yellow)	21.3	5,788	3,680
Hickory (shagbark)	24.6	5,801	4,240
Maple (sugar)	21.3	5,788	3,680
Oak (white)	22.7	5,791	3,920
Pine (white)	13.3	6,394	2,080

Source: Solar Energy Project "Heating Value of Wood" p. 2-13 in "Wood: Stored Solar Energy." Renewable Energy Activities for Biology. Albany, N.Y.: Solar Energy Project, State University of New York at Albany, n.d.

Wisconsin Department of Natural Resources, Bureau of Forestry. *Forest Trees of Wisconsin: How to Know Them*. Madison, WI, 1990. PUBL-FR-053 90REV.

Facts about Wood

For example, about ten cords of white pine are needed to heat a 2,500 square foot home in Wisconsin for the year, while only about six cords of white oak are needed to provide the same amount of heat. These figures assume that a 2,500 square foot Wisconsin home needs 96 million Btu for heating each year and uses a wood stove with an efficiency of 71.7 percent.

Wood Energy Potential

Forests cover one-third of the total land area of the United States (766 million acres). About two-thirds of this forest is productive enough to grow commercially valuable trees. About 17 million acres, or 48 percent, of Wisconsin's land are forested. Since 2009, Wisconsin has seen a 2.1 percent increase in forested land. With a general increase in forest age throughout the state, overall growing stock volume in Wisconsin's timberland has increased as well. According to a study conducted at the University of Wisconsin - Madison, Wisconsin's forests have the potential to displace almost 19 percent of statewide natural gas demand.

Harvesting, Processing, and Transportation

Methods for harvesting wood range from simply cutting down a tree with an ax or saw to removing all the trees from a large area (clear cutting) using chainsaws and other equipment. Other than drying, wood does not require much processing before being used as fuel. Some homeowners may burn wood pellets that are manufactured from finely ground wood fiber, which requires more processing. Wood pellets for burning in power plants are made by harvesting and shredding whole trees. Pellet fuel can also be made from sawdust, shavings, and fines leftover after processing trees for lumber and other wood products. Wood is usually transported by truck or train within the United States.

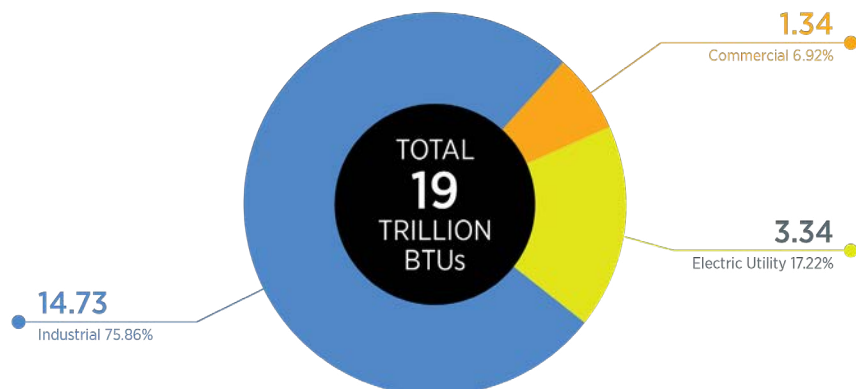
Wood Fuel Production

In 2015, 10 percent of energy supplied to the United States was from renewable sources, and biomass wood accounted for 21 percent of those renewables. The forest products industry consumes almost two-thirds of all fuel wood. Nearly 20 percent of U.S. homes get some heat from burning wood, while about four percent of households across the country use wood as the main fuel for home heating.

Approximately 200,000 (9 percent) of Wisconsin homes burn about 1.2 million cords of wood every year. The total amount of wood energy used by all economic sectors in Wisconsin in 2012 for heating was more than 46 trillion Btu, about three percent of all the energy used in the state. Worldwide, one-half of all the wood that is cut down is used for fuel, while in many developing countries 90 percent is used for fuel. Sweden and Finland are world leaders in using wood as an energy source. In Sweden the majority of wood used is for fueling district heating plants.

Wisconsin Wood Use, by Economic Sector, 2015

(Trillions of Btu and Percent of Total)



Source: Wisconsin Office of Energy Innovation. [Wisconsin Energy Statistics Book](#)

Facts about Wood

Electricity Produced from Wood

Certain electric power plants in the United States and the rest of the world burn wood to generate electricity. Like coal and fuel oil, wood is burned in a boiler that heats water into steam. The steam then spins a turbine connected to an electric generator. Power plants usually burn wood along with other fuels; they rarely burn wood exclusively.

Approximately 85 power plants in the United States burn wood to produce and sell electricity, including the Bay Front Plant in Ashland, Wisconsin.

Other Uses

Wood is unique in that it can be used for the production of solid, liquid, and gaseous fuels for the generation of energy including electricity, heat, and power needed by the industrial, commercial, household and transportation sectors.

Wood is a major fuel source for industries that produce wood products. Most wood-fired power plants currently operating in the United States are owned by industries such as the paper and pulp industry. Many of these industries use wood energy to provide steam, heat, and electricity (this multiple use is called cogeneration).

In parts of the United States where wood is plentiful, many rural homeowners burn wood for space heating. About 200,000 (9 percent) of Wisconsin homes burn wood as a primary or secondary fuel source. Wisconsin residents use about one-half of all wood fuel, while the other half is used for commercial and industrial purposes.

Wood is also used to make building materials, pulp, and paper. Other uses include consumer products (e.g., toys, sporting equipment, pencils, and musical instruments) and chemicals. Wood and its derivatives are used in as many as 10,000 products. Generally, except in facilities that utilize cogeneration, wood harvested to make wood products does not come from the same sources as wood harvested for energy.

Effects

Using wood energy has many benefits. Wood is easy to store and use, it does not require very much processing, and it is a renewable resource when harvested sustainably. Burning waste wood for fuel eliminates having to put it in landfills. Getting wood is easy for many landowners and rural residents in Wisconsin and other parts of the United States.

Air pollution, however, caused by burning wood can be a significant problem. Burning wood produces smoke, carbon monoxide, and polycyclic aromatic hydrocarbons that may cause bronchitis, emphysema, and cancer. Indoor air pollution may occur due to improper burning or leaks in pipes and chimneys. Outdoor air pollution may arise when large numbers of residents burn wood. However, high-efficiency wood stoves can reduce air pollution problems. In the United States, new wood stoves are required to emit 70 percent fewer particulates than those sold before 1990. Burning wood also releases carbon dioxide, a cause of global climate change. By replanting trees after a timber harvest, the carbon dioxide emitted by burning wood can be absorbed and the pollution can be offset.

Removing most or all of the trees from a large area (sometimes called deforestation or clear cutting) can harm wildlife habitat and cause erosion. Deforestation may also lead to wood shortages and make tree replanting difficult due to topsoil loss. If the deforested area had moderate-high diversity prior to deforestation, repeated harvesting and replanting of one kind of tree will reduce biological diversity.

Facts about Wood

Large amounts of energy are often needed to harvest large amounts of wood and transport it long distances. This fact may limit the advantages of using wood as an energy resource, especially by larger-sized power plants.

Outlook

Wood will continue to play a role in providing energy for heating, Wood will continue to play a role in providing energy for heating, cooking, and generating electricity in the United States and the world. However, wood will not replace fossil fuels as an energy source due to efficiency, limited availability, restrictions on harvesting wood in protected areas, and competing uses for making various products. Although the use of wood as an energy resource is expected to increase, it will likely be limited.

References

Food and Agriculture Organization of the United Nations. Forest Product Statistics: 2014 Global Forest Products Facts and Figures. 2015. Retrieved from: fao.org/forestry/44134-01f63334f207ac6e086bfe48fe7c7e986.pdf

Travis Industries House of Fire Cost of Heating Worksheet. Retrieved from: travisindustries.com/CostOfHeating_WkSht.asp?P=2

U.S.D.A. Forest Service. Forest Resources of the United States, 2012. General Technical Report WO-91, October 2014. Retrieved from: srs.fs.usda.gov/pubs/gtr/gtr_wo091.pdf

U.S.D.A. Forest Service. Forests of Wisconsin, 2014. Resource Update FS-43, April 2015. Retrieved from: fs.fed.us/nrs/pubs/ru/ru_fs43.pdf

U.S. Energy Information Administration. U.S. Energy Facts Explained. Retrieved from: eia.gov/energyexplained/us-energy-facts

Wisconsin Natural Resources Magazine. Fast Forestry Facts. December 2005. Retrieved from: dnr.wi.gov/wnrmag/html/supps/2005/dec05/forest.htm

Wisconsin Office of Energy Innovation. 2013 Wisconsin Energy Statistics Book; Chapter 1: Total Energy Use. 2013. Retrieved from: psc.wi.gov/Pages/Programs/OEI/WisconsinEnergyStatistics.aspx

Wisconsin Office of Energy Innovation. 2013 Wisconsin Energy Statistics Book; Chapter 3: Renewable Energy. 2013. Retrieved from: psc.wi.gov/Pages/Programs/OEI/WisconsinEnergyStatistics.aspx

Wisconsin Statewide Wood Energy Team. *Wood Energy 101 – An Introduction to the Use of Woody Biomass in Wisconsin*.

© 2020 Wisconsin Center for Environmental Education

The Wisconsin K-12 Energy Education Program is supported through funding from



Wisconsin K-12 Energy Education Program (KEEP)
College of Natural Resources
University of Wisconsin - Stevens Point

