WOOD to ENERGY

Glossary

The following terms may be commonly used in discussions about using wood for energy generation. Several of these definitions come directly from the U.S. Department of Energy's *Glossary of Energy-Related Terms* and the U.S. Forest Service's *Primer on Wood Biomass for Energy*, which are both available on the Internet and contain additional terminology that may be helpful. Please see the reference section below for the full citations.

Alkali metal: Potassium and sodium metals in the wood fuel in the form of oxides, hydroxides, and metallo-organic compounds.

Ash: The noncombustible components of fuel.

Bagasse: The fibrous material remaining after the extraction of juice from sugarcane; often burned by sugar mills as a source of energy.

Bioenergy: Heat and/or electricity produced from biomass energy systems, usually measured in J/g (Joules of energy per gram of fuel), MJ/g, or GJ/g.

Biofuels: Liquid fuels made from biomass, which are used for transportation or cooling.

Biogas: A gas that is produced from biomass that is usually combustible.

Biomass: Organic matter available on a renewable basis. Biomass includes forest and mill residues, agricultural crops and wastes, wood and wood wastes, animal wastes, livestock operation residues, aquatic plants, fast-growing trees and plants, and municipal and industrial wastes.

Boiler: A vessel or tank where heat produced from the combustion of fuels such, as natural gas, fuel oil, or coal, is used to generate hot water or steam for applications ranging from building space heating to electric power production or industrial process heat.

Boiler horsepower (BHP): The equivalent of heat required to change 15.6 kg (34.5 lb) per hour of water at 212°F (100°C) to steam at 212°F (100°C). One BHP equals 9.81 kW (33,479 Btu/hour).

British thermal unit (Btu): A standard unit of energy that is the amount of energy equal to the heat required to increase the temperature of 1 lb of water 1°F.

Carbon cycle: The process of transporting and transforming carbon throughout the natural life cycle of a plant from the removal of CO_2 from the atmosphere to the accumulation of carbon in the plant as it grows, and the release of CO_2 back into the atmosphere when the plant naturally decays or is burned.

Carbon sequestration: Refers to the provision of long-term storage of carbon in the terrestrial biosphere, underground, or oceans, so that the buildup of carbon dioxide (principal greenhouse gas) concentration in the atmosphere reduces or slows.

Char: Carbon-rich combustible solids that result from pyrolysis of wood in the early stages of combustion. Char can be converted to combustible gases under certain conditions or burned directly on the grate.

Co-firing: Burning more than one fuel simultaneously.

Cogeneration: See combined heat and power (CHP).

Combined heat and power (CHP): The simultaneous production of heat and mechanical work or electricity from a single fuel.

Combustion: The process of burning; the oxidation of a material by applying heat, which unites oxygen with a material or fuel.

Combustor: The primary combustion unit, usually located next to the boiler or heat exchanger.

Community: An area where people live and interact with one another, which may be defined by a town, city, county, or region. For the purpose of the Wood to Energy Outreach Program, community refers to the people affected by the proposed wood to energy facility.

Direct combustion systems: A method of burning that burns the wood directly in its solid form instead of first gasifying the wood or converting into a liquid fuel before combustion takes place.

District energy system: A system using central energy plants to meet the heating and/or cooling needs of residential, institutional, commercial, and industrial buildings.

Dry ton (of wood): Wood that contains 10 percent or less moisture.

Emission(s): A substance(s) or pollutant emitted as a result of a process.

Forest biomass: The accumulated above- and below-ground vegetation, including bark, leaves, and wood, from living and dead woody shrubs and trees.

Forest residues: The above-ground residues from pre-commercial thinnings and harvesting operations. The leftover materials from harvesting operations are also called logging residues.

Fossil fuels: Fuels formed in the ground from the remains of dead plants and animals. It takes millions of years to form fossil fuels. Oil, natural gas, and coal are fossil fuels.

Fuel: Any material that can be burned to make energy.

Gasifier: A combustion device that produces biogas from solid biomass.

Grate: A combustion device floor, which may be inclined or horizontal, that has openings to allow the passage of air to aid in combustion and to allow ash to fall through. The "floor" may be a stationary surface or a moving (traveling) chain.

Green ton (of wood): Wood that contains more than 10 percent water and usually refers to wood containing 40-50 percent water.

Industrial process heat: The thermal energy used in an industrial process.

Kilowatt (kW): A standard unit for expressing the rate of electrical power output, which is equal to 1000 watts.

Kilowatt hour (kWh): A common measure for energy supply or consumption, which is equal to 1,000 watts over a one-hour period.

Logging residues: Poor quality trees and tree components (i.e., crowns, limbs, stump-root systems) which are typically left on-site during commercial harvesting operations. Stump-root systems were not included in the Wood to Energy Outreach Program's estimates of available logging residues.

Merchantable timber: Trees which are economically valuable to harvest.

Megawatt (MW): A common measure of power plant electricity generation capacity, which is equal to 1,000,000 watts.

Moisture content: Amount of moisture remaining in wood and is an important consideration in the quality of biomass resources. Moisture content is 0 percent in oven-dried biomass, about 20 percent for air-dried biomass, and about 50 percent for fresh or "green" biomass.

Non-industrial private landowner: A person owning less than 1000 acres of forested land who is not directly affiliated with a wood processing plant.

Non-merchantable: Trees which are not harvested because they are too small, poor quality or are not an economically valuable species.

Particulates: Minute, solid, airborne particles that result from combustion.

Pellets: Solid fuels made from primarily wood sawdust that is compacted under high pressure to form small (about the size of rabbit feed) pellets for use in a pellet stove.

Phytoremediation: The use of trees or other vegetation to remove contaminants (such as heavy metals) and restore degraded land.

Pre-commercial thinning: A silvicultural treatment or type of cut in which young trees are removed to promote the growth of the remaining trees.

Pulpwood: Small diameter trees (3.6 to 6.5 inches diameter at breast height) that are usually harvested for manufacturing paper, purified cellulose products (such as absorbents, filters, rayon and acetate), and oleoresin products (such as pine oils, fragrances, cosmetics, and thinners).

Psi: Pounds of pressure per square inch.

Pyrolysis: The process of burning fuel during oxygen-starved conditions, which involves the physical and chemical decomposition of solid organic matter by heating into liquid, gas, and carbon char residue.

Refuse-derived fuel (RDF): A solid fuel produced by shredding municipal solid waste (MSW). Noncombustible materials such as glass and metals are generally removed prior to making RDF. The residual material is sold as it is or compressed into pellets, bricks, or logs.

Renewable energy: Energy derived from resources that are regenerative or for all practical purposes can not be depleted. Types of renewable energy resources include moving water (hydro, tidal and wave power), thermal gradients in ocean water, biomass, geothermal energy, solar energy, and wind energy. Municipal solid waste (MSW) is also considered to be a renewable energy resource.

Sawtimber: Trees that meet minimum diameter and stem quality requirements, making them suitable for conversion to lumber.

Short rotation woody crops (SRWC): Fast growing tree species, such as poplars, willows, and eucalyptus, grown in high density plantations on fertile land to produce woody biomass with rotation periods of less than 30 years (Hoffmann and Weih 2005).

Steam: Water in vapor form; used as the working fluid in steam turbines and heating systems.

Stoker: A method of feeding fuel to a burning device which may include blowing the fuel into the combustion chamber with air, pushing the fuel up from below the grate, mechanically spreading the fuel onto a moving grate, or other methods.

Thermal energy: The energy developed through the use of heat energy.

Thinning: Removing small, deformed, or unwanted species to improve forest health, restore ecosystems, reduce wildfire risk, or improve economic viability. See also pre-commercial thinning.

Turbine: A device for converting the flow of a fluid (air, steam, water, or hot gases) into mechanical motion.

Under-fire air: Combustion air added under the grates.

Urban wood waste: Woody biomass generated from tree and yard trimmings, the commercial tree care industry, utility line thinning to reduce wildfire risk or improve forest health, and greenspace maintenance.

Utility: A regulated entity which exhibits the characteristics of a natural monopoly (also referred to as a power provider).

Watt (w): The basic measurement of electricity.

Woody biomass: Plant material from trees and shrubs, including branches, limbs, trunks, and vines.

Wood gasification: The process of heating wood in an oxygen-starved chamber until volatile pyrolysis gases (e.g., CO, H_2, O_2) are released from the wood. The gases emitted are low- or medium-energy-content gases that can be combusted in various ways.

Wildland-urban interface: Areas where increased human influence and land use conversion are changing natural resource good, services, and management (Hermansen and Macie 2002).

References

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Hermansen, L. A. and E. A. Macie. 2002. Introduction in *Human Influences on Forest Ecosystems: The Southern Wildland-Urban Interface Assessment, General Technical Report SRS-55* edited by L. A. Hermansen and E. Macie. Asheville NC: USDA, Forest Service, Southern Research Station.

Hoffmann, D. and M. Weih. 2005. Limitations and improvement of the potential utilisation of woody biomass for energy derived from short rotation woody crops in Sweden and Germany". *Biomass and Bioenergy* 28, pp. 267-279.

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