

APPENDIX **B** Glossary

Anaerobic Digestion

Decomposition of biological wastes by microorganisms, usually under wet conditions, in the absence of air (oxygen), to produce a gas comprising mostly methane and carbon dioxide.

Annual Removals

The net volume of growing stock trees removed from inventory during a specified year by harvesting, cultural operations such as timber stand improvement, or land clearing.

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.

Barrel of Oil Equivalent (BOE)

The amount of energy contained in a barrel of crude oil, i.e. approximately 6.1 gigajoules (GJ) (5.8 million British thermal units), equivalent to 1,700 kWh. A “petroleum barrel” is a liquid measure equal to 42 U.S. gallons (35 Imperial gallons or 159 liters); about 7.2 barrels are equivalent to one tonne of oil (metric).

Best Management Practices

Management guidelines formulated by each state to enable forest managers to maintain and improve the environmental values of forests associated with soils, water, and biological diversity; primarily used for the protection of water quality.

Biobased Products

Products determined by the U.S. Secretary of Agriculture to be commercial or industrial, other than food or feed, that are composed in whole or in significant part, of biological products or renewable domestic agricultural materials including plant, animal, marine materials, or forestry materials.

Biochemical Conversion

The use of fermentation or anaerobic digestion to produce fuels and chemicals from organic sources.

Biodiversity

Diversity of species, genes, ecosystem function, and habitats.

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

Fuels made from biomass resources, or their processing and conversion derivatives. Biofuels include ethanol, biodiesel, and methanol.

Biogas

A gas produced from biomass, usually combustible.

Biomass

Any organic matter including forest and mill residues, agricultural crops and wastes, wood and wood wastes, animal wastes, livestock operation residues, aquatic plants, and municipal and industrial wastes.

Biorefinery

A facility that processes and converts biomass into value-added products. These products can range from biomaterials to fuels such as ethanol or important feedstocks for the production of chemicals and other materials. Biorefineries can be based on a number of processing platforms using mechanical, thermal, chemical, and biochemical processes.

Biosolids

Solids removed from wastewater during the treatment process; can be used as fertilizer.

Black Liquor

Solution of lignin-residue and the pulping chemicals used to extract lignin during the manufacture of paper.

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 space heating for buildings to electric power production or industrial process heat.

Bottom Ash

Ash that collects under the grates of a combustion furnace.

British Thermal Unit

A nonmetric unit of heat, still widely used by engineers. One Btu is the heat energy needed to raise the temperature of one pound of water from 60°F to 61°F at one atmosphere pressure: 1 Btu = 1055 joules (1.055 kJ).

Bundlers

A machine that collects, compresses, and binds forest residues in cylindrical bundles.

Calorific Value

The maximum amount of energy that is available from burning a substance.

Carbon Cycle

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

Carbon Displacement

Offsetting of CO₂ emissions from fossil fuel combustion by substituting fossil fuels with bioenergy.

Carbon Sequestration

The provision of long-term storage of carbon in the terrestrial biosphere, underground, or oceans, so that the buildup of carbon dioxide (a principle greenhouse gas) concentration in the atmosphere reduces or slows.

Cellulose

A straight-chain polymer built of a large number of glucose anhydride molecules with the empirical formula of $(C_6H_{10}O_5)_n$ that is the principle chemical constituent of the cell secondary walls of higher plants and occurs mainly as long, hollow, chains called fibers.

Char

The remains of solid biomass that has been incompletely combusted, such as charcoal if wood is incompletely burned.

Chipper

A large mechanized device that reduces logs, whole trees, slab wood, or lumber to chips of more or less uniform size. Stationary chippers are used in sawmills, while trailer-mounted whole-tree chippers are used in the woods.

Chip Van

Enclosed box trailers, generally 8 to 8.5 feet in width, designed to be less than 12.50 feet high when pulled by a road tractor. The difference between the box trailers seen on most highways and vans hauling harvesting products (bulk vans) is that most box trailers are built for containerized cargo (commodities in boxes or on pallets).

Clean Chips

Chipped wood free of bark, needles, leaves, and soil contamination.

Clear-cutting

Regeneration or harvesting method that removes essentially all woody vegetation that might compete with the desired crop trees in one harvesting operations.

Co-firing

Utilization of bioenergy feedstocks as a supplementary energy source in high efficiency boilers.

Cogeneration

The sequential production of electricity and useful thermal energy from a common fuel source. Heat from this industrial process can be used to power an electric generator, used for industrial processes, or space and water heating purposes.

Combined Heat and Power (CHP)

The simultaneous production of heat and mechanical work or electricity from a single fuel.

Combustion

Burning. The transformation of biomass fuel into heat, chemicals, and gases through chemical combination of hydrogen and carbon in the fuel with oxygen in the air.

Combustion Efficiency

The efficiency of converting available chemical energy in the fuel to heat.

Combustor

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

Comminuted Material

Biomass material that has been pulverized or precision reduced into smaller sized material.

Composite Residue Log

Compacted logging residues that have been made into cylindrical bales or bundles.

Container Trailer

A trailer designed to hold bulk material with container constructed to be handled full. Sturdy walls and supports make the total capacity in cubic volume less than bulk vans or log trailers. However, they can be left on a site and filled as desired, and efficiently removed and replaced with an empty.

Crown Thinning

Removal of trees from the upper level in the canopy in order to favor desired crop trees whose crowns are at a lower position in the canopy.

Cut-to-Length

This is when trees are felled, delimbed, and bucked to various assortments or dimensions.

Deadwood

Dead, standing or fallen, woody biomass from trees or woody shrubs in natural or managed forests that were killed in various ways including old age, fire, disease, or logging.

Direct Combustion Systems

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

Direct Energy System

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

Habitat

The place or environment where a plant or animal naturally or normally lives, grows, and reproduces.

Digester

An airtight vessel or enclosure in which bacteria decomposes biomass in water to produce gas.

Direct Impacts

The set of expenditures applied to the predictive model for impact analysis in input-output modeling.

Dirty Chips

Chipped wood containing bark, needles, leaves, and soil.

Dry ton (of wood)

Wood that contains 10 percent or less moisture.

Effluent

The liquid or gas discharged from a process or chemical reactor, usually containing residues from that process.

Emissions

A substance or pollutant emitted as a result of a process.

Energy Ratio

The ratio of the energy output versus the energy input, compared to the conventional fuel lifecycle. An energy ratio below one suggests energy input is higher than energy output.

Even-aged Management

Management technique for a stand of trees composed of a single age class.

Extinction

The loss of an animal or plant species from the world.

Feedstock

Raw material used for the generation of bioenergy and the creation of other bio-products.

Fermentation

Conversion of carbon-containing compounds by microorganisms for production of fuels and chemicals such as alcohols, acids, or energy-rich gases.

Flail Delimber

A machine used for delimiting multiple elongated tree stems, which includes a pair of vertically mounted, longitudinally offset flail members with flexible impact members mounted on rotatable drums.

Fly Ash

Ash transported through the combustion chamber by the exhaust gases and generally deposited in the boiler heat exchanger.

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 precommercial thinnings and harvesting operations. The leftover materials from harvesting operations are also called logging residues.

Fossil Fuels

Solid, liquid, or gaseous fuels formed in the ground after millions of years by chemical and physical changes in plant and animal residues under high temperature and pressure. Oil, natural gas, and coal are fossil fuels.

Forwarder

A vehicle that carries logs completely off the ground from stump to road side landing.

Fuel Cell

A device that converts the energy of a fuel directly to electricity and heat, without combustion.

Fuel Treatment Thinnings

Trees removed from the forest for the sole purpose of reducing the risk of wildfires.

Full Cost Method

Cost accounting method that allocates the total production cost across biomass and conventional wood products.

Furnace

An enclosed chamber or container used to burn biomass in a controlled manner to produce heat for space or process heating.

Gas Turbine

A turbine that converts the energy of hot compressed gases, produced by burning fuel in compressed air, into mechanical power; often fired by natural gas or fuel oil.

Gasification

A chemical or heat process to convert a solid fuel to a gaseous form.

Gasifier

A device for converting solid fuel into gaseous fuel. In biomass systems, the process is referred to as pyrolytic distillation.

Gigawatt (GW)

A measure of electrical power equal to 1 billion watts or 1 million kilowatts. A large coal or nuclear power station typically has a capacity of about 1 GW.

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 chain.

Green Ton (of wood)

Wood that contains more than 10 percent water and usually refers to wood containing 40 to 50 percent water.

Grinder

A machine that reduce particles in size by repeatedly pounding them into smaller pieces through a combination of tensile, shear, and compressive forces.

Group Selection

Regeneration method in which trees are removed and new age classes are established in small groups.

Heat Rate

The amount of fuel energy required by a power plant to produce one kilowatt-hour

of electrical output. A measure of generating station thermal efficiency, generally expressed in Btu per net kWh. It is computed by dividing the total Btu content of fuel burned for electric generation by the resulting net kWh generation.

Heating Value

The maximum amount of energy that is available from burning a substance.

Higher Heating Value

The maximum potential energy in dry fuel. For wood, the range is from 7,600 to 9,600 Btu per pound.

Hog Fuel

Biomass generated by grinding wood and wood waste for use in a combustor.

Hydrocarbon Feedstock

Petroleum (hydrocarbon) based substance used as a raw material in an industrial process. Examples of petrochemical feedstocks are ethylene, propylene, butadiene, benzene, toluene, xylene, and naphthalene.

Improvement Cutting

Used in mixed species stands past the sapling stage where trees of undesirable species or form are removed from the main canopy to favor the more desirable species.

Incinerator

Any device used to burn solid or liquid residues or wastes as a method of disposal. In some incinerators, provisions are made for recovering the heat produced.

Inclined Grate

A type of furnace in which fuel enters at the top part of a grate in a continuous ribbon, passes over the upper drying section where moisture is removed, and descends into the lower burning section. Ash is removed at the lower part of the grate.

Indirect Impacts

The interindustry effects of input-output analysis; the impacts above and beyond the direct effects when applied to Type I multipliers.

Indirect Liquefaction

Conversion of biomass to a liquid fuel through a synthesis gas intermediate step.

Induced Impacts

The impacts of household expenditures in input-output analysis.

Industrial Process Heat

The thermal energy used in an industrial process.

Joule (J or j)

Metric unit of energy, equivalent to the work done by a force of one Newton applied over a distance of one meter. One joule = 0.239 calories.

Kilowatt (kW)

A measure of electrical power equal to 1,000 watts. 1 kW = 3412 Btu per hour.

Kilowatt-Hour (kWh)

A measure of energy equivalent to the expenditure of one kilowatt for one hour. For example, 1 kWh will light a 100-watt light bulb for ten hours.

Liberation Cutting

Removal of poor quality or non-merchantable trees to favor the growth of desirable trees.

Lignin

Structural constituent of wood and (to a lesser extent) other plant tissues that encrust the cell walls and cements the cells together.

Logging Residues

The unused portions of growing stock and nongrowing stock trees cut or killed by logging and left in the woods.

Log Trailer

A trailer designed to haul trees, poles, or shortwood in racks. They are lightweight and as a result have high payload capacities. Most require unloading equipment at the receiving facility, although some are modified to drop one side of the log restraints and allow a front loader to push the load off one side of the trailer.

Low Thinning

Removal of smaller, weaker, and most deformed trees whose crowns are in the lower portion of the stand canopy.

Marginal Cost Method

Cost accounting method that counts only the additional costs from the conventional logging operation as the biomass production cost.

Merchantable Timber

Trees that are economically valuable to harvest.

Megawatt (MW)

A common measure of power plant electricity generation capacity which is equal to one million watts.

Mill Residues

Excess material generated from wood processing mills and pulp and paper mills.

Moisture Content

The weight of the water contained in wood, usually expressed as a percentage of weight, either oven dried or as received (green).

Net Energy Yield

The gross energy produced by the biomass, minus the energy provided from the fossil fuels used in the production and processing of the biomass and usually expressed on a per unit basis.

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 that are not harvested because they are too small, of poor quality, or not an economically valuable source.

Output

The value of production by industry for a specific time period.

Particulates

Minute, solid, airborne particles that result from combustion.

Pellets

Solid fuels made primarily from wood sawdust that is compacted under high pressure to form small pellets for use in a pellet stove or combuster.

Petrochemical Feedstock

Petroleum (hydrocarbon) based substance used as a raw material in an industrial process. Examples of petrochemical feedstocks are ethylene, propylene, butadiene, benzene, toluene, xylene, and naphthalene.

Petroleum-based Feedstock

Petroleum (hydrocarbon) based substance used as a raw material in an industrial process. Examples of petrochemical feedstocks are ethylene, propylene, butadiene, benzene, toluene, xylene, and naphthalene.

Phytoremediation

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

Precommercial Thinning

Thinning that occurs when trees are too young or too small, or of species undesirable to be used for traditional timber products.

Process Heat

Heat used in an industrial process rather than for space heating or other housekeeping purposes.

Producer Gas

Fuel gas high in carbon monoxide and hydrogen, produced by burning a solid fuel with insufficient air or by passing a mixture of air and steam through a burning bed of solid fuel.

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).

Pyrolysis

The thermal decomposition of biomass at high temperatures (greater than 400° F, or 200° C) in the absence of air. The end product of pyrolysis is a mixture of solids (char), liquids (oxygenated oils), and gases (methane, carbon monoxide, and carbon dioxide) with proportions determined by operating temperature, pressure, oxygen content, and other conditions.

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.

Salvage Cutting

Removal of trees that have dead, damaged, or are expected to die, generally as a result of natural disaster.

Sanitation Cut

Removal of dead and weaker trees in an overstocked stand to reduce the danger of natural disasters.

Sawtimber

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

Seed-tree Silvicultural System

A silvicultural system in which all trees are harvested except for a small number of selected trees are retained for seed production for natural regeneration.

Shelterwood Silvicultural System

A silvicultural system in which trees are removed in a series of cuts, leaving those needed to produce sufficient shade to produce a new age class in a moderated microenvironment.

Short-rotation Woody Crops

Fast growing species, such as willows and poplars, that are grown specifically for the production of energy.

Shredder

A machine that tears material apart by shearing rather than smashing.

Silviculture

Science and art of managing the establishment, growth, composition, and quality of forest stands and woodlands for the desired needs and values of landowners and society on a sustainable basis.

Site Productivity

Combination of soil and climatic factors contributing to plant growth and development; may be measured as biomass accumulation as a function of time.

Skidder

Machinery used to pull logs from stump to a roadside landing. Logs are pulled with a grapple, cable-winch, or clam-bunk.

Soil Fertility

The total availability, concentration, and amount of essential plant nutrients.

Soil Function

The role that soils play in the environment and managed landscapes.

Soil Productivity

The capacity of a soil to contribute to the production of a crop, whether it is agricultural crops or forest biomass.

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 that 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.

Streamside Management Zones

Buffer zones in which cover is retained in riparian areas adjacent to surface water and aquatic habitat.

Sustainability

The capacity of forests, ranging from stands to ecoregions, to maintain their health, productivity, diversity, and overall integrity, in the long run and in the context of human activity and use.

Sustainable Forest Management

Forest management that ensures that forest resources will be managed to supply goods and services to meet the current demands of society while conserving and renewing the availability and quality of the resource for future generations.

Sustained Yield

A forest management strategy in which the net growth and yield are such that a forest can produce continuously at a given intensity of management.

Syngas

A gas mixture that contains varying amounts of carbon monoxide and hydrogen generated by the gasification of a carbon containing fuel to a gaseous product with a heating value.

Thinning

Silvicultural practice of reducing tree numbers in a stand in order to favor the growth and health of the remaining crop trees.

Transpiration Drying

The natural drying that occurs in when leafy material is left on trees. Water evaporates from the various leaf parts, in particular the stomata.

Tree-length

Trees are felled, delimbed, and topped in the stump area and processed at the landing.

Turbine

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

Uneven-aged Management

Regeneration and management technique that removes some trees in all size classes either singly, in small groups, or strips in order to maintain a multi-aged stand.

Urban Residues

Wood and yard waste; construction and demolition debris.

Value-added

Payments made by industry to workers, interest, profits, and indirect business taxes.

Water Quality

Suitability of the water coming from ground and surface supplies for drinking water, recreational uses, and as habitat for aquatic organisms and other wildlife.

Water Quantity

Timing and total yield of water from a watershed.

Watt (w)

The basic measurement of electricity.

Whole Tree

Trees that are felled and transported to roadside with branches and top intact. Processing occurs at the roadside landing.

Wood Ash

Ash recovered from the combustion of woody biomass; may be used as fertilizer or soil liming agent to reduce soil pH.

Wood Processing Residue

The unused portion of materials generated during wood processing or byproducts created during the pulping process.