

BIOMASS AT A GLANCE



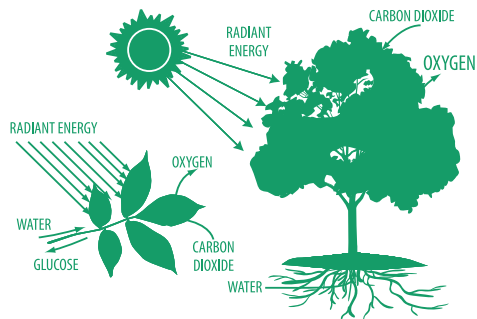
Biomass provided about 5 percent of all energy consumed in the United States in 2024.

WHAT IS BIOMASS?

Biomass is any organic matter—wood, crops, seaweed, animal wastes—that can be used as an energy source. Biomass is probably our oldest source of energy after the sun. For thousands of years, people have burned wood to heat their homes and cook their food. Biomass gets its energy from the sun. All organic matter contains stored energy from the sun. During a process called photosynthesis, sunlight gives plants the energy they need to convert water and carbon dioxide into oxygen and sugars. These sugars, called carbohydrates, supply plants and the animals that eat plants with energy. Foods rich in carbohydrates are a good source of energy for the human body. Biomass is a renewable energy source because its supplies are not limited. We can always grow trees and crops, and waste will always exist.

PHOTOSYNTHESIS

In the process of photosynthesis, plants convert radiant energy from the sun into chemical energy in the form of glucose (or sugar)



TYPES OF BIOMASS

We use four types of biomass today—wood and agricultural products, solid waste, landfill gas, and biofuels.

1 WOOD AND AGRICULTURAL PRODUCTS

Waste wood products—logs, chips, bark, and sawdust—account for 36 percent of biomass energy. Wood and wood waste are used as a heat source and to generate electricity. A very small percentage of homes use wood as its heating fuel. Most of the waste wood products are used by industries making the waste to generate electricity. This electrical power is not distributed by utilities, but is used in a process called cogeneration. Paper mills, saw mills, and timber companies use much of their waste products (sawdust and scrap wood), to generate steam and electricity for their use. The paper and pulp industries rely on biomass for over half of their energy needs, however, they still need to buy additional electricity from utilities. Other industries that use wood biomass for energy include lumber producers, furniture manufacturers, agricultural businesses like nut and rice growers, and liquor producers.



2 SOLID WASTE

Burning trash turns waste into a usable form of energy. One ton (2,000 pounds) of garbage contains about as much heat energy as 500 pounds of coal. Garbage is not all biomass; a fair amount of its energy content comes from plastics, which are made from petroleum and natural gas. Power plants that burn garbage for energy are called waste-to-energy plants. These plants generate electricity in the same way fossil fuel-fired power plants do, except that combustible garbage is the fuel used to fire their boilers.

3 LANDFILL GAS AND BIOGAS

Bacteria and fungi are not picky eaters; they eat dead plants and animals, causing them to rot or decay. A fungus on a rotting log is converting cellulose to sugars to feed itself. This same process occurs slowly in a landfill, producing a called methane as the waste decays. Methane gas is colorless and odorless, but it is not harmless. Methane is a very potent greenhouse gas if released into the atmosphere on its own. It can also cause explosions if pressure is allowed to build up in the landfill. Landfills must collect the methane gas. Some landfills burn or flare the gas to reduce the pressure. Other options include burning the biogas to create steam to turn turbines and generate electricity on-site, or purifying the biogas and sending it into the natural gas distribution network as renewable natural gas (RNG). Biogas or methane can also be produced from agricultural and human wastes. Biogas digesters are airtight containers or pits lined with steel or bricks. Waste put into the containers is fermented without oxygen to produce a methane-rich gas. This gas can be used to produce electricity, or for cooking and lighting.

4 BIOFUEL: ETHANOL

Ethanol is an alcohol fuel (ethyl alcohol) made by fermenting the sugars and starches found in plants and then distilling them. Any organic material containing cellulose, starch, or sugar can be made into ethanol. The majority of the ethanol produced in the United States comes from corn. New technologies are producing ethanol from cellulose in woody fibers from trees, grasses, and crop residues.

Today nearly all of the gasoline sold in the U.S. contains around 10 percent ethanol and is known as E10. Consumers can also use E15 (15 percent ethanol, 85 percent gasoline) in most recently made vehicles, where supply is available. Some vehicles, called flexible fuel vehicles (FFV) are made to operate efficiently on E10, E15, or E85 (85 percent ethanol, 15 percent gasoline). However a small percentage of FFVs on the road today use E85 today, due to supply.

5 BIOFUEL: BIODIESEL

Biodiesel is a fuel made by chemically reacting alcohol with vegetable oils, animal fats, or greases, such as recycled restaurant grease. Most biodiesel today is made from soybean oil. Biodiesel is most often blended with petroleum diesel in ratios of two percent (B2), five percent (B5), or 20 percent (B20). It can also be used as neat (pure) biodiesel (B100). Biodiesel fuels are compatible with and can be used in unmodified diesel engines with the existing fueling infrastructure. Biodiesel contains virtually no sulfur, so it can reduce sulfur levels in the nation's diesel fuel supply, even compared with today's low sulfur fuels. While removing sulfur from petroleum-based diesel results in poor lubrication, biodiesel is a superior lubricant and can reduce the friction of diesel fuel in blends of only one or two percent. Low-sulfur fuels are required for use in the U.S.

6 BIOFUEL: SUSTAINABLE AVIATION FUEL (SAF)

Sustainable aviation fuel is a synthetic fuel used for jets and aviation that is made from biomass products including solid waste, oils, woody biomass, and even algae. SAF can be blended with conventional jet fuel or replace it entirely without damaging the engines.