BIOMASS POWER

AN OLD RESOURCE FOR A NEW TECHNOLOGY

Biomass Power Today

Biomass power has developed into a diverse industry. About 350 biomass power plants with a combined rated capacity of 7000 megawatts (MW) feed electricity into the nation's power lines, while another 650 enterprises generate electricity with biomass for their own use as cogenerators. The biomass power industry employs more than 66,000 people nationwide in skilled jobs ranging from equipment manufacturing and plant operations to agricultural activities. Today's biomass power plants primarily use residues from the farm and wood-products industries.

● Biomass-fired power plants

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VISION OF TOMORROW

AS MANY AS 50,000 MW
OF ELECTRICITY COULD BE GENERATED
BY BIOMASS POWER PLANTS IN THE YEAR 2010
WITH ADVANCED TECHNOLOGIES AND
IMPROVED FEEDSTOCK SUPPLIES.

Advanced Technologies

Technologies under development today can increase by 50% or more the amount of electricity produced from a given quantity of biomass. The key is to generate electricity using the combined-cycle gas turbine instead of a conventional steam turbine. Although the best steam-turbine systems have efficiencies as high as 40%, combined-cycle gas turbines fueled by natural gas have efficiencies as high as 55%.

To take advantage of these higher efficiencies, biomass must be converted into a gaseous form called *biogas*. The U.S. Department of Energy's (DOE's) Biomass Power Program has helped develop prototype gasifiers to produce biogas. And in conjunction with the State of Hawaii and industrial partners, the Program is supporting an industrial-scale demonstration gasifier plant at a Hawaiian sugar mill. Establishing a more efficient way to generate electricity with bagasse, the by-product of milling sugarcane, will help create U.S. jobs by tapping into worldwide power markets.

Dedicated Fuel Supply

Biomass power plants need a guaranteed, long-term fuel supply to ensure operation. Whereas today's biomass industry uses residues from crops and the wood-products industry as its primary fuel supply, the ultimate solution is for power plants to have a dedicated fuel supply of energy crops.

Millions of acres of set-aside land could be used to grow energy crops for biomass power plants. Putting this acreage into production would bring income to rural areas of the country and eliminate the need for federal subsidies required for the set-aside land. DOE estimates energy crops could generate as many as 120,000 new jobs in economically depressed rural areas of the country. Energy crops, such as fast-growing trees, protect the land against erosion with little effect on food prices.

One way to guarantee a biomass fuel supply is to develop long-term partnerships between energy crop producers and the utility and industrial interests that specify power plant requirements. The Biomass Power Program encourages such partnerships through cooperative research and demonstration projects. In one project, for example, an electric utility, an agricultural university, and an equipment supplier are evaluating alfalfa as a power plant feedstock. The alfalfa would be sold as animal feed, while the stem sections would be gasified to produce electricity in high-efficiency gas turbines.

Tomorrow's biomass power industry will consist of as many as 50,000 MW of electric power plants operating on reliable and renewable biomass feedstocks. Such an industry would generate clean, reliable base-load electric power without contributing to climate change.

50,000 MW

MASTER

In the future, energy crops will power advanced generating equipment to supply electricity for the nation.

DOE BUREAU OF ENERGY EFFICIENCY AND RENEWABLES

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WHAT IS BIOMASS POWER

Biomass consists of living plants all around us. As they grow, plants collect carbon dioxide (a greenhouse gas) from the air and store the sun's energy in their leaves, stems, bark, and roots. The resulting plants are called *biomass*.

When used as a fuel, biomass feedstocks (such as dried, chopped vegetation etc.) can be used in power plants the same way nonrenewable fossil fuels are used to generate electricity. This is called *biomass power*.

Biomass is one of the oldest fuels known to human kind. But the primitive campfire is a far cry from the technology that runs a modern biomass power station.

In the last two decades, biomass power has become the second largest renewable source of electricity after hydropower. Similar to hydropower, biomass plants provide baseload power to utilities. Biomass power plants are fully dispatchable—they operate on demand whenever electricity is required.

If biomass is cultivated and harvested properly, it is a renewable resource that can be used to generate electricity on demand, with no net contribution to global carbon dioxide.

The energy stored in these fast-growing trees will be used at a biomass power plant to generate electricity. The wood will be chipped, dried, and burned in a boiler to produce steam, which, in turn, will drive an electric generator.

FOR MORE INFORMATION

DOE's Biomass Power Program conducts a cooperative research program with industry, utilities, and agriculture to increase the use of clean, renewable biomass resources to generate electricity. For more information on biomass power, please contact:

Solar Thermal and

Biomass Power Division

Office of Solar Energy Conversion
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
(202) 586-8121

Biomass Power Program

National Renewable Energy
Laboratory
1617 Cole Boulevard
Golden, CO 80401
(303) 275-2946

Utility Biomass Energy

Commercialization Association

1800 M Street, NW, Suite 300
Washington, DC 20036
(202) 296-8663

Energy Efficiency and Renewable Energy Clearinghouse (EREC)

P.O. Box 3048
Merrifield, VA 22116
(800) 363-3732

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Washington, DC 20585

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This new biomass facility on Maui
produces biogas from the fibrous
by-product of milled sugarcane. The
biogas can fire efficient gas turbine-
generators or be converted to methanol.

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