Community-Scale Biomass Energy

THE FACTS

Biomass Energy Resource Center
Community-scale biomass energy systems burn biological material—most often wood from low-quality trees—in highly efficient, high-temperature combustion systems to produce heat. Sometimes, these systems also produce a certain amount of electric power (this is called CHP, combined heat and power). But the most efficient use of biomass for energy is to provide space heating and domestic hot water. Community-scale systems typically provide this to single buildings, such as schools and hospitals, or to groups of buildings such as college campuses, industrial parks, or whole towns or cities through “district heating” systems.

Community-scale biomass systems that produce heat or CHP are different from electric power plants, which are generally much larger and mainly produce electricity for broad distribution. Biomass-fueled technology is only about 20-25 percent efficient at producing electric power; at producing heat, it is 70-90 percent efficient. Power plants sometimes (though this is rare) sell the excess heat they generate, where it is economically feasible and if there is an appropriate user nearby; this is only 40-45 percent efficient. Technology is also being developed that can use biomass to produce liquid biofuels.

Community-scale thermal applications are the most efficient biomass energy technologies—they do the best job of turning biomass fuel into energy, with the least waste.

Systems of this type have been in use since the early 1980s, and have built a track record of safety and reliability. Today, a growing number of community-scale systems, most fueled with woodchips and some with wood pellets, are delivering heat and hot water to schools, businesses, colleges, hospitals, city centers, and whole communities across the northern United States, Canada, and north and central Europe.

Biomass fuel can be used in a wide range of technologies, from home woodstoves to power plants. Because community-scale thermal systems combine high-efficiency combustion with sophisticated emission controls, this technology meets and exceeds all emission-safety standards, while providing heat energy at relatively stable fuel prices from a local fuel source.

More and more, woodchip fuel is coming directly from low-grade wood from harvesting operations in the forest. Community-scale biomass systems use both woodchips, and further refined but more efficient, wood pellets.
When wood fuel is harvested responsibly from well-managed forests, community-scale biomass energy is a sustainable whole system. It keeps energy dollars circulating in the local and regional economy, by using a renewable fuel that is harvested nearby—and its carbon emissions are re-captured as the forests that supply the fuel continue to grow. In contrast, fossil-fuel systems extract carbon that is buried underground in geological deposits, then add it to the atmosphere over time.

Finally, by developing a reliable, local market for low-quality wood, biomass energy can create a new financial incentive for forestland owners to manage their forests for long-term productive health, lessening the pressure to “high-grade” (cut only the most valuable trees and leave the rest). The revenue stream for biomass fuel can help landowners make ends meet, also relieving the pressure to sell woodland for development.

**BENEFITS OF USING BIOMASS AT THE COMMUNITY SCALE**

**Modern community-scale biomass energy systems use sophisticated emission controls.**

These systems burn very hot, at 70-90 percent efficiency, producing about 1/10 of the fine-particle emissions of traditional wood stoves, with virtually no smoke or odor. Modern biomass energy is far cleaner than old-fashioned woodstoves or wood boilers, and is equipped with highly effective pollution-control technology, ensuring that final emissions meet and exceed the most stringent air-quality standards.

Emission-control technology continues to develop and improve. While in recent years most systems have made very effective use of fabric filters and collection bags to screen out particulates, today’s state-of-the-art control technology is electrostatic precipitators. These powerful filters use an electrostatic charge, similar to the pull of static electricity, to extract fine particles from system exhaust.

Biomass energy systems emit 1/6 of the sulfur oxides, which contribute to acid rain, than do oil-fired systems. Nitrogen oxide emissions are about the same as oil.

**When their fuel is harvested responsibly from sustainably managed forests, biomass systems can be low-carbon, or carbon-neutral over time.**

Carbon dioxide (CO₂) is a major contributor to climate change—and at the stack, biomass systems emit about twice as much CO₂ per million Btu of energy produced as do oil-fired systems. But the CO₂ released by biomass combustion is drawn from forests, which are continually absorbing and releasing carbon over time. If the carbon dioxide that biomass systems release into the atmosphere is reabsorbed over time by new forest growth, then biomass technology can replicate this natural cycling and provide a low- or no-carbon source of renewable energy. In contrast, fossil-fuel systems, which burn fuel extracted from underground, add CO₂ to the atmosphere. For this reason, converting from fossil-fuel to biomass energy can help lower carbon emissions and reduce climate change over time.

Good forest management is essential to realizing the carbon benefits of biomass energy. Key factors include: where trees are harvested, how they are harvested, how this plays out over the landscape and over time, and whether management practices support long-term forest health. It is also important that biomass energy systems be well-designed and efficiently run. When these positive factors are in place, converting from oil- or gas-fired energy to biomass can reduce net CO₂ emissions by 75-90 percent.

**A well-managed biomass fuel industry, coupled with sustainable growth in demand, creates new incentives to protect and preserve the working forest landscape.**

The current growth in demand for biomass fuel is creating a vital new market for low-grade wood. This market provides a financial incentive for landowners to implement forest management plans, do ecologically sound forest management, keep their woods in production, and manage them for mixed use: fuel, timber, wildlife, recreation, and natural beauty. In this way, harvesting low-quality wood for biomass energy can support healthy forests as part of a working landscape.

In many regions of the United States, there is an abundant supply of low-quality wood for biomass energy. In the forested regions of the Northeast, annual new forest growth exceeds the current demand for wood fiber, including biomass fuel. As long as demand remains in balance with supply, using woody biomass for energy in the most efficient, community-scale applications can help us meet our energy needs in ways that make us less dependent on distant, not-always-stable, sources of fuel.
For more information on community-scale biomass energy—including case studies, a biomass facilities database, fact sheets, a glossary of wood-heating terminology, frequently asked questions, an image library, and links to additional resources—visit the BERC website at:

www.biomasscenter.org

The Biomass Energy Resource Center (BERC) is an independent, national nonprofit located in Montpelier, Vermont with a Midwest office in Madison, Wisconsin that assists communities, colleges and universities, state and local governments, businesses, utilities, schools, and others in making the most of their local energy resources.

BERC’s mission is to achieve a healthier environment, strengthen local economies, and increase energy security across the United States through the development of sustainable biomass energy systems at the community scale. BERC’s particular focus is on the use of woody biomass and other pelletizable biomass fuels. Its work is funded in part by the US Department of Energy through the generous support of Senator Patrick Leahy.

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