Biomass FactSheet

Small Modular Biomass Systems

Introduction to Modular Systems

Small modular biomass systems can help supply electricity to rural areas, businesses, and the billions of people who live without power worldwide. These systems use locally available biomass fuels such as wood, crop waste, animal manures, and landfill gas. Small systems rated at 5 megawatts down to 5 kilowatts can provide heat and power where needed. Some units are portable. They can provide power in remote villages, on farms and ranches, and at businesses. Small modular biomass systems fulfill the great market potential for distributed, on-site, electric power generation throughout the world. Users may attach the systems to existing transmission and distribution grids close to where consumers use electricity. Consumers may connect their units to the power grid on the customer's side of the electric meter.

Small modular biomass systems typically consist of a fuel processor and an electric generator. Fossil fuel systems predominate in today's markets, but biomass provides an alternative that is more environmentally acceptable. Furthermore, successful commercialization of small modular biomass systems completes the development of a biomass industry that covers all ranges of expected power applications:

- Small systems for distributed applications and village power
- Combined heat and power systems for industrial applications
- Gasification and advanced combustion for utility-scale power generation

Community Power Corporation/PIX12220

15 kW unit by Community Power Corporation

Benefits of Small Modular Systems

Modular biomass systems offer many benefits to potential customers. They have little environmental impact. Economics is attractive, especially when owners connect the unit to a power grid that will buy unused power. Efficiency and the flexibility to use more than one fuel appeal to many users. Simplicity of operation means that they need no special skills to run the units. And, where no electricity now exists, biomass greatly improves quality of life with lights, refrigeration, and the comforts of home.

Small Modular Biomass Systems Project Objectives

- Bring to market readiness biomass-based generation systems of less than 5 MW.
- Develop flexible, efficient, and simple-to-install and operate systems that offer minimal environmental impact.
- Accelerate the process that comprises feasibility studies, prototype demonstration, system integration, and development of mature business strategies.

The Program and Collaborations

The U.S. Department of Energy's Small Modular Biomass Initiative works with industry to develop small modular biomass systems that are efficient and clean. In 1998 the National Renewable Energy Laboratory in Golden, Colorado and Sandia National Laboratories in Albuquerque, New Mexico, began work on the Small Modular Biomass Initiative. This two-phase project includes feasibility studies, prototype demonstrations, and system integration based on a business strategy for commercialization. In the first phase of the Small Modular Biomass Initiative, ten projects aimed to determine the feasibility of developing systems that are fuel flexible, cost effective, efficient, and simple to operate. Phase 1 also focused on minimizing environmental impacts and addressed key technical, operating, and logistics issues.

Phase 1 produced very promising results and the Initiative moved on to Phase 2 involving prototype systems. The U. S. Department of Agriculture Forest Service became deeply involved in the program at this point. They collaborate in the deployment and evaluation of demonstration projects because small modular biomass units offer a valuable tool for supporting clean up and maintenance of the national forests. A new emphasis on forest thinning for fire suppression will make waste wood fuel available as never before. Small modular biomass units will use the waste wood to generate electricity close to

the wood source. This will provide new power in remote locations while consuming the waste wood created by forest thinning to reduce fire risks.

What's Next?

Project managers selected four promising systems to participate in Phase 2 development of prototype systems. The first of these, built by Community Power Corporation, demonstrated integrated systems capability by operating in a Philippine village. Community Power also achieved the first small modular biomass unit integration with a power company service line in California. This small modular technology combines a wood chip or other biomass gasifier with an engine generator to burn the gas and produce electricity. Electric capacities of five and 15 kW have been produced. At least six more demonstration locations will use Community Power combined gasifier and generator small units with installations scheduled through 2002 and 2003.

External Power LLC will make and test a second system prototype. Six laboratory prototypes and one integrated prototype proved the feasibility of their approach during 2002. The system uses a stove that burns wood pellets or chips. Heat from the stove drives a free-piston Stirling engine that generates both electricity and heat. The External Power prototype system produces 2.5 kW.

Flex Energy International built the third prototype system that will gasify biomass to make fuel for a unique microturbine electricity generator. Tests using methane, carbon monoxide, and hydrogen fuels proved the idea. Engineers completed the detailed design for a 30-kW system in 2002 and they will test the prototype engine following its fabrication. Landfill gas and digester gas from sewage treatment plants can also fuel the prototype.

Rob Walt, Community Power Corporation/PIX12221

Small modular unit connected to a power line.

Carbona Corporation will demonstrate a prototype wood chip and shavings gasifier coupled to an internal combustion generator with a 5-MW capacity. The unit will also produce useful heat.

For More Information

Visit the Biopower Web Site:

http://www.eren.doe.gov/biopower

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