ACEP
Alaska Center for Energy and Power

UNIVERSITY OF ALASKA FAIRBANKS

Many different types of biomass can be used for heating, including logs, pellets, and woodchips. Photo Courtesy Cold Climate Housing Research Center.

Biomass Technology Briefing

The types of woody biomass used as energy fuels include cordwood (round or split logs), chips (chipped or shredded wood), pellets (densified wood product), and hog-fuel (waste woodchips such as bark). In Alaska, producing heat is the most important and economical way to use biomass. In private homes, woody biomass is most often used to provide radiant heat, burning wood to heat a space. In community buildings, however, it is more efficient (both in terms of energy and labor) to use biomass to heat a fluid, and then circulate the fluid throughout the conditioned space.

For larger scale usage (>500 MBTU), biomass is typically economical for heating only when it is a by-product of manufacturing or a result of forest management activities (e.g., wildfire risk reduction or forest health restoration). On a smaller scale, such as for residential use, some biomass can be grown or harvested specifically for energy generation.

ACEP studied data collected from commercial biomass boilers installed in institutional buildings around Alaska.

Current Installations in Alaska

Region	Cordwood (MBTU/hr)	Pellet (MBTU/hr)	Large Pellet (MBTU/hr)	Small Chip (MBTU/hr)	Large Chip (MBTU/hr)
Interior	Tanana (2,940) Gulkana (650) Hughes (360) Koyukuk (325)			Mentasta (500)	Tok (5,500) Delta Junction Galena
Western	Kobuk (180)				
Southeast	Coffman Cove (650) Thorne Bay (350) Kasaan (325)	Chilkoot Indian Assn. (Haines) (123) Haines Senior Center (109)	Sealaska (750) Ketchikan Library (510) Ketchikan GSA Building (1000)		Craig (4,000)

Biomass is widely available in Alaska and comes in many forms, including cordwood, pellets, and woodchips.
Photo courtesy of iStockphoto.

ACEP Biomass Projects

Biomass Boiler Performance Evaluation Study

Short Rotation Biomass Crops for Alaska

Yakutat Biomass Resource Survey

Cofiring Biomass with Coal Study

Local Feedstock Usage in Combined Heat & Power Applications

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Biomass

Producing biomass fuel for a wood chip boiler that provides heat and power to the school in Tok, Alaska. Photo by Amanda Byrd/ACEP.

Key Performance Metrics

Capital costs as well as operations and maintenance costs vary by boiler type and location around the state. Most boiler manufacturers claim life expectancies of 20-30 years, assuming normal running conditions and maintenance. System efficiencies vary with biomass system type, installation protocol, operation and maintenance protocols, piping distance, thermal storage, and wood moisture content. Sizing biomass units to meet 80% of peak required heat load ensures the boiler will run at the maximum heat output.

The boiler is one of the most substantial costs for each installation, along with the site foundation, the boiler building, and the integration of the system into the building. Fuel storage and construction management are also large expenses, though not reported in each project. Despite the large installed capacity of chip boilers in the Interior, installation costs are higher than those of other boilers.

Technology Trends

Cordwood biomass systems are very labor-intensive. One way to cut costs has been to move to automated woodchip systems, which use a cheaper and more available fuel source. Increasingly, schools and communities adopting biomass as a heating fuel are also installing greenhouses and incorporating biomass energy and food production into their curriculum. Compared with cordwood systems, however, chip-fed combustion requires extra processing time and expense to manufacture chips.

Technology Gaps & Barriers to Success

When it comes to energy, technology must be matched to location. Rural Alaska needs simple and robust systems that require less attention, tuning, and replacement parts. Locations along the road system (including the marine highway) may use systems that require specialists, unique parts, or technical input during operations. In addition, in places where wood burning has led to air quality concerns, more focus should be given to improving those systems than cultivating new biomass systems.

The paybacks for cordwood systems are marginal, and none of the evaluation tools consider other community benefits of biomass systems such as local jobs and local fuel. The availability of local fuel supply is also a key component–as soon as shipping costs are factored in, biomass systems are not economical.

Recommendations

Given the large number of potential applications, smaller chip systems could prove their value with increased emphasis on installation and testing in Alaska. (Mentasta has the only one right now.) On a larger scale, given communities' reluctance to finance biomass projects, education and encouragement could spur communities to take on debt burdens for projects with excellent economics, especially if coupled with a revolving loan fund. Regulations could also be changed so that bulk fuel loans could be used to purchase biomass.

Business models could also be explored that pair private ownership of a heating system or plant with sales agreements to facility operators and owners (like a heat utility). Facility operators wouldn't save as much money in these scenarios but would avoid the risks.

For the full report visit www.uaf.edu/acep

For more information on biomass contact

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November 10, 2017