Woody Biomass for Energy in Michigan

TOPICS FOR DISCUSSION AND INQUIRY

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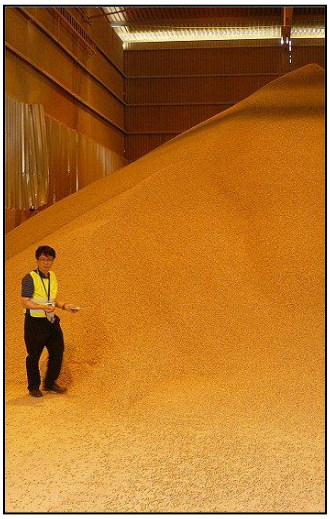
Wood-based Energy Technologies

Michigan offers some significant advantages for developing more wood-based bioenergy facilities: a large forest resource, good transportation systems, and access to the Great Lakes. Michigan has relatively low harvest pressure on its forests. Of course, each renewable energy technology has a range of applications, and these vary among the technologies. For instance, wind power generates electricity rather than heat or transportation fuel. Similarly, wood-based technologies have a range of applications in the emerging bioeconomy.

The simplest technology for wood is direct combustion to produce heat. While wood has been used as a heat source for millennia, the technologies now employed to extract and distribute wood-generated heat vary. Many home furnaces, both indoor and outdoor, are inefficient and cannot be used where air quality standards apply.

Raw material--ground wood.



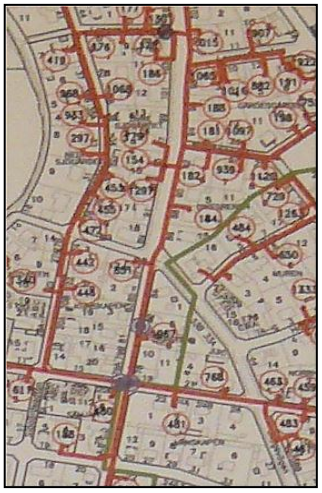
Pellet storage area.

Nevertheless, they remain practical and low-cost alternatives in some situations. Some manufacturers have produced more efficient home furnaces that do meet air quality standards.

Wood pellets are an attractive alternative for home heating or for larger individual buildings. Pellets are used in furnaces built for fairly high combustion temperatures. This technology has grown rapidly around the world, with the largest markets in Europe. Pellets can be pressed using wood by-products such as sawdust, or they can be pressed using raw wood.

Higher quality pellets are made from wood only, rather than with bark, switchgrass, or other materials with more ash content. It is also possible to concentrate energy, reduce weight, and make waterproof pellets through a process called torrefaction. Europeans are researching torrefied pellets. Currently in North America, torrefaction is used only for solid wood products such as flooring, siding, and furniture.

On a broader scale, wood can feed a **District Energy** system, which involves a low pressure boiler and the distribution of hot water. An underground pipe network might extend as far as 10 miles in radius. Efficient burning technology and heat transfer systems allow more energy to be directed to space heating and less to be wasted through emissions.



Heat pipe map.

Blocks of buildings such as schools, government offices, and hospitals, can be connected to the system. It can also work for collections of cooperating homes. Use of District Energy in the United States has been increasing.

Using wood to feed a **Combined Heat and Power** (CHP) station produces both heat and electricity. Electricity is generated from a high-pressure boiler and turbine, and then heat is

distributed through a District Energy grid. Efficiencies are high, and small to large cities can be served by CHP plants. St. Paul, Minn., has a CHP plant that largely runs on municipal solid waste. Both district heating and CHP plants can also produce pellets for local housing that is outside of the hot water grid or for sale to larger markets.

Large CHP plant boiler.

Thermochemical and biochemical refining is also quite efficient and can generate both heat and electricity. It requires more advanced technology, but these technologies can also convert wood into high-value products such as bio-oil, chemicals, and transportation fuels. Several companies in Europe, Canada, and the United States are working on this approach.

Employing appropriate wood-using technologies depends on the available wood resources, transportation systems, and existing wood-using facilities. Integrating systems with existing power plants and industries such as pulp and paper mills can increase market flexibility and spread costs over a larger infrastructure. Economies of scale might be gained by complementing and integrating a local operation.

Willow energy plantation.

Finding a sustainable stream of feedstocks and developing long-term markets can be more challenging than building a facility. Existing wood procurement systems in Michigan--many small contracts--are not very attractive to investment capital. Developing ways to guarantee a given number of tons of wood within a specified price range has helped bring new developments to Georgia, Florida, Minnesota, and New England.

Building markets can sometimes be likened to a chicken-and-egg scenario. Strategies--possibly public policy changes--to reduce initial economic risk of developing markets can be devised to help encourage the bioeconomy. Michigan offers some significant advantages for developing more wood-based bioenergy facilities.

Applying strategic planning to the bioeconomy on a statewide or regional scale will likely yield the best long-term alternatives. Pooling Industrial, governmental, and university resources has been a proven model to overcome environmental, social, and economic challenges in building a bioeconomy. Woody biomass, together with other renewable energy sources, will help reduce dependency on fossil fuels and improve our lagging rural economy.

Northern hardwoods, Michigan's most abundant forest type.

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For more information on MSU initiatives, visit the Office of Biobased Technologies at www.bioeconomy.msu.edu