Wood-based Thermal Energy



Bill Cook Forester & Biologist MSU Extension

The point of today is to focus on THERMAL energy, or heating and cooling, rather than power or transportation.



Everybody needs heating, cooling, and hot water.

Over the next 20-30 years, WHO are you gonna pay for fuels and related expenses?

Why export dollars? Why export jobs? Why pay more? Why do more harm?

Wood is a very viable renewable fuel . . . But not for every situation.



Bottom line wood often costs less now and is likely to cost much less in the future.

mistorical meating ruer rifees in Michigan





N.Gas = \$3.25 mmbtu \$40 chips = \$7.00 mmbtu \$30 chips = \$5.25 mmbtu

\$3.25 is traded price

N.Gas = \$10.16 mmbtu N.Gas = \$20.23 mmbtu N.Gas = \$5.53 mmbtuN.Gas = \$6.65 mmbtu N.Gas = \$2.96 mmbtuN.Gas = \$2.92 mmbtu

Residential Commercial Industrial Winter / Summer

N.Gas = \$10.16 mmbtuPellets = \$16.00 mmbtuPropane = \$15.69 mmbtu Chips = \$7.00 mmbtu Cordwood = \$6.49 mmbtu

Pellets \$218/ton Propane \$1.13/gallon Cordwood \$100 Maybe money isn't the only consideration? Sustainable communities Build on what exists Enhance environ. values Increase forest quality **Budget stability**

Need case studies?

Michigan District Energy Facility Pase Studies Bill Cook, Michigan State University Extension, 2015.

an District

Michigan State Univ

St Medical Care Facili

5 Main Street 5, MI 49874 www.pinecrestm

tact. Dave Vand

inecrest is located

county in the south

offers medical car

speech therapy, f

square feet in fo

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system fueled

Cooling is pro

chiller, which

(Fahrenheit)

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water (e.g the laund

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The Mariner North P.O. Box 35 Copper Harbor, MI 49918 http://www.manorth.com Contact: Don Kauppi at 906-289-4637 recort/restaurant in dowr

Wood-based Thermal Ene Case Studies-Upper Aust

Bill Cook, Michigan State University Extensi

As an example of a regional wood-base effort, the State of Upper Austria (OberÖs a well-advanced wood energy economy the 1980s, farmer forest owners were lo value to their operations from forest pro citizens recognized their energy depe countries, experienced increasing pri and acknowledged the need to redu emissions.

In cooperation with economic de agencies, a wood-based thermal e stato's total energy d

Michigan District Energy Facility Case Studies Bill Cook, Michigan State University Extension, 2016. North Dickinson County School W6588 M-69 Felch, MI 49831 http://www.go-nordics.com Contact: Darrell Oman at doman@go-nordics.com or 906-542-9281 North Dickinson County School serves a rural area that is not tied into North Dickinson County School serves a rurar area unaris nor un the natural gas grid. Their district energy system connects three buildings the school and two school area to a the natural gas grue. Then usunce energy system connects inter buildings; the school and two garages. Total area is about 108,000 contract foot A single A million by the bailer and bot tweter swetching of the bullangs; the school and two garages. Total area is about too, ou square feet. A single 4 million bu boiler and hot water system supplies hoot for fore of the school building and radiator hoot to the building Square feet. A single 4 million blu boller and not water system supplies heat for forced air to the school building and radiator heat to the two garages. The boiler is fuel hinh quality hardwood chins delivered from local sawmills. There is a nair of 2 million blu brona heat for forced air to the school building and radiator heat to the two garages. The boiler is the boiler next in the school section building to be the school section building and radiator heat to the two garages. The boiler next is the school section building to be propared by the boiler next in the school school section building building building and radiator heat to the school section building and radiator heat to the two garages. The boiler is the boiler next in the school school school building building building and radiator heat to the two garages. The boiler is the boiler next in the school school school building build The point of the second in the Dackup bollers. The boller plant is located next to the school. The system was installed in 1991 by Messersmith Manufacturing at cost of \$310,000, to replace in the boller consumes 600_R00 tone of wood chine ner vear Annual operation costs of replace The system was installed in 1991 by Messersmith Manufacturing at cost of \$310,000, to replace \$32,500 which includes wood chips of wood chips per year. Annual operating costs run abor One hour of maintenance and Jahor One hour of maintenance is Tuels. The boller consumes out-boll tons of wood chips per year. Annual operating costs function includes wood chips, power, maintenance, and labor. One hour of maintenance is annowimately economic line of the sector of the se \$32,500 which includes wood chips, power, maintenance, and labor. One hour of maintenance is no set of the system are approximately \$500/month. Undergroups heeded per day and electric costs to run the system are approximately \$500/month. Und Piping runs about 350 reet, and consists or a 4-inch pipe to the school and a 2500 gallon thermal storage tank. The system utilizes a 2500 gallon thermal storage tank. The inches Sanages, the system unices a coord ganon memorial storage tank. I boiler ash and fly ash are disposed on site of the action chips is needed every 7-10 dave and a 55 amount of natural con the school -

C-L-K Mid-Pen **Rep-Mich N.Central** Pinecrest **N.Dickinson** DeTour

250,000 54,000 67,000 75,000 170,000 108,000 40,000



What's the catch?

Higher capital investment Public acceptance Not a silver bullet Change in status quo

50,000+ square feet? ON or OFF the nat. gas grid

Wood chip system

<50,000 square feet? OFF the natural gas grid?

Pellets Cordwood



<50,000 square feet? ON the natural gas grid? Pellets, Cordwood, or Gamble

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Square Feet	On NG Grid	Off NG Grid
<50,000	Gamble	Pellets Cordwood
50,000+	Wood chips	Wood chips Pellets

Red: 34-50% of households use propane

Houghton

Ontonagon

Gogebic

Baraga

Iron

Marquette

enomin

Dickinson

Alger

Delta

Percentage of occupied housing units per county using bottled, tank, or LP gas

0.8 - 8.6
10.5 - 17.4
17.8 - 24.5
25.1 - 33.4
34.1 - 50.6







Household Heating by Fuel Type



Baraga, Gogebic, Houghton, Iron, Keweenaw, Ontonagon

10,735 households

32% = 10,700 households ~75 million btus/household



\$12.8 million potential



What's it look like?



What's it look like?



What's it look like?



What's it look like?



Common criticisms? Stinky! Human health. Noisy! Truck traffic! Gonna cream the woods! Too expensive! Not dependable!



Local champions Public buy-in Pre-feasibility study Full feasibility study Financial package Supply agreements

What about carbon?

You can burn trees for fuel for a thousand years, or a million, with no increase in carbon within the carbon cycle. In fact, managed forest landscapes actually sequester more carbon than unmanaged forest landscapes.







440,000 CORDS OF WOOD (million cum, ~300,000 dry tons) Michigan adds ~21 of these piles each year

Heat for 88,000 homes 86 Pinconest DE facilities (over 14.5 million square feet) 37% of Verso mill consumption 1.0% of Potlatch mill in Gwinn ~50 million gallons ethanol

Thoughts? michiganwoodenergy.msue.msu.edu www.wisconsinwoodenergy.org www.dnr.state.mn.us/forestry/biomass /swet.html

http://heatingthemidwest.org cookwi@msu.edu