Biomass Energy and Funding Resources for MI Greenhouses

Dulcey Simpkins, Coordinator
Michigan Biomass Energy Program
November 9, 2005
Michigan Biomass Energy Program

- **What We Do:** Promote and support the use of domestically grown or produced biomass as fuel or energy feedstocks.

- **How We Do It:** Various grant programs for biomass technologies that are near-to-market or new to Michigan market; education and outreach presentations and materials; facilitating information sharing among potential producers, consumers and beneficiaries of biomass energy.
MBEP Program Areas

- Waste-to-Energy → Anaerobic Digestion, LFTGE
- Combustion, Gasification → wood, crop residue
- Co-firing → various biomass w/coal
- Renewable Transport fuels → ethanol and biodiesel

*MBEP supports non-solar and non-wind renewable energy sources.*
What is Biomass?
Biomass is renewable.

- Renewable fuels and energy resources are made from living crops and can be used in a sustainable way, such that consuming them today does not necessarily prevent us from doing so tomorrow.

- Coal, natural gas, and petroleum products are made from fossilized flora and fauna, of which there is a finite amount. When they become scarce, the cost of extracting petroleum climbs. New technology cannot prolong this resource’s life, but cannot prevent the ultimate exhaustion of usable petroleum supply.
Biomass is a carbon sink.

- Combusting one gallon gas/diesel
  \[ \rightarrow \approx 20 \text{ lbs } \text{CO}_2 \text{ emissions} \]

Displace petroleum
  \[ \rightarrow \text{decrease } \text{CO}_2 \text{ emissions} \]

See also Closed-Loop Biomass
Biomass energy reduces most emissions compared to fossil fuels.

Converting biomass to energy in modern technologies reduces emissions of carbon monoxide (CO), volatile organic compounds (VOCs), and particulate matter (PM)—pollutants dangerous to public health, which are produced by combustion of fossil fuels.
Biomass is A Local Resource

In contrast to coal or petroleum-based fuel, biomass is grown and harvested on local and regional forests and farms, or is diverted from waste streams. Energy dollars spent on biomass fuel stay in the regional economy, creating jobs and supporting forestry and agriculture.

Figure 5. Total energy production and consumption, 1970-2025 (quadrillion Btu)

Some Local Biomass Resources

Three major biomass types are captured by this map:

- Crops
- Crop Residues
- Animal Waste

All three are abundant near MI Greenhouses.

(MSU Extension 2004)
Urban Areas Have Available Biomass Too

Urban organic wastes and mill residues are also important. They are the cheapest available residues, and do not require land conversion. (US—ORNL)
Biomass Feedstocks are More Economical

"Biomass to Energy Projects," Christopher Abbuehl, FEMP, Energy 2005 Conference, Long Beach, California, August 14-17, 2005,
A 2,000 square foot home in Michigan uses approximately 85.3 million BTU of heat (MBtu) per winter. The annual heating bill would vary in cost depending on the fuel used:

- **Electricity**: $2,000
- **Propane**: $1,699
- **Heating oil**: $1,419
- **Wood pellets**: $981
- **Natural gas**: $827
- **Corn**: $505

*Based on Natural Gas at $8.47 / kcf *

Chris Schilling, Ph.D., Saginaw Valley State University, (989) 964-2601, schillin@svsu.edu
Biomass fuel prices are generally lower and more stable.

Compared to fossil fuels, biomass fuels are historically lower-priced. Also, biomass fuel prices have increased by only about 1 percent per year over the past 20 years.
Conventional Energy Prices Rising

Midwest Natural Gas Prices 1999-2005

(EIA 2005)

Winter of Year

Price ($/mcf)

<table>
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<td>$14.60 (est)</td>
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Natural Gas Spike also expected in 06-07

Figure 3. U.S. Natural Gas Spot Prices (Base Case and 95% Confidence Interval*)

*The confidence intervals show +/- 2 standard errors based on the properties of the model. The ranges do not include the effects of major supply disruptions.
Biomass can be used for Heat and Energy

- Boilers or furnaces that operate using corn, wood pellets, wood chips, or other biomass (grasses, combinations) can provide renewable energy at a steady price more cheaply than natural gas and oil at current prices (and at estimated future prices...).
Questions to Ask When Considering a Biomass Stove/Boiler

- What is the difference in price between current option and biomass option(s)?
- Warranty for equipment, work?
- Costs include equipment, installation?
- How can you ensure this supply?
  - Need a fuel purchase agreement or own fuel/land resource.
Price Comparisons — Corn vs Nat Gas

Corn $1.80 now ($2.30 median) vs. Natural Gas >$7.50 expected past 2006

http://energy.cas.psu.edu/energyselector/
Corn stoves pros and cons

○ Pros
  ● Cheaper heat per BTU
  ● Can use corn AND other pelleted fuel—cherry pits, wood pellets, matchbook-sized wood chips
    ○ Wood stoves work well but cannot use corn or other biomass.
  ● Renewable, local fuels

○ Cons
  ● Maintenance costs and time higher → ash removal...but ash is an acid neutralizer that can raise pH of soil.
    100lbs corn=1-3 lbs ash → value-added?
  ● Capital costs higher
    ○ Whole house furnace 175K BTU/hr on NG or Propane = $850; sold in superstores, imports
    ○ Similar sized corn-stove = $5,000
Permitting

- The first big greenhouse that installs a large-scale corn/mixed biomass furnace/boiler is going to have to negotiate with DEQ to get it permitted.

- DEQ has data re wood burning furnaces, but not for corn and not for some mixed biomass.
  - What is the chemistry of the ash?
  - What is the chemistry of the smoke?

Note: Below a certain size is below the radar.

Questions? Call DEQs Environmental Assistance Center: 800-662-9278.
For More Information on Biomass Furnaces (air) and Boilers (water)

Dr. Chris Schilling, Saginaw Valley State University
(989) 964-2601, schillin@svsu.edu

Messersmith
- Only MI manufacturer that makes large boilers (1-10 million BTU/hr); also smaller.
- Bark River, MI, 906-466-9010, www.burnchips.com

L.R. Equipment (manufacturer)
- Beaverton, MI, 989-435-9052, “Econokorn”
- Sells water-heated furnace used in greenhouses
Anaerobic Digestion

AD is a natural process of decomposition in which bacteria feed and alter the properties of the digested material, while generating gaseous by-products.
AD is like your GI tract, but on a local scale

Organics move through a heated enclosed system at a controlled pace and temperature to foster different bacterial metabolisms, creating useful outputs like odor-free digestate, concentrated nutrients, and **methane** “waste” as a byproduct.

- **Problems**—environmental concerns about CAFOs, perceived lack of benefit to small farms if state subsidizes anaerobic digestion

- **Factoid**—centralized AD commonly used in Europe for mixed waste management
Manure contains volatile solids, which bacteria digest to create methane.

- **volatile solids (VS)**
- **acid-forming bacteria**
- **volatile organic acids**
- **biogas**
  - methane (60%), carbon dioxide (35%), water, trace gases
- **Odor**
  - methane-forming bacteria

David Schmidt, University of Minnesota Department of Biosystems and Agricultural Engineering
Synergy of Anaerobic Digestion and Greenhouse Industry

- **DIGESTER TANKS**
  - AD creates process heat, biogas, and effluent solids

  - **greenhouse:** heat, lighting, fans, pumps, dryers, injection molding
  - biogas for on-site boiler
  - thermal energy from genset
  - compost for onsite use, sale
  - transport fuel [CNG = 99% methane]
  - CO₂

- Electricity for on-farm use or grid

Norma MacDonald, Phase 3 Developments & Investments, LLC
How to Link Greenhouses with AD?

- Livestock operations
- Diary, Swine, Poultry Producers organizations
- County economic development corporations
- Municipalities-organic waste recycling to AD
A Note About Biofuels

- Biodiesel is a “drop-in” substitute for diesel, requiring no vehicle modification.
- Made from oilseed crops (soy, canola, sunflower, hemp, etc) or waste grease.
- Produced in the USA, soon in Michigan as well.
- Price much lower than diesel—IF blender passes on tax credit (see funding, incentives)

Wacker Oil, Manchester, MI on Oct 21, 2005
B20 Reduces Most Harmful Emissions Generated by Diesel

B20 Emissions Reductions vs Diesel Baseline

- Sulfates: -20%
- PAHs**: -13%
- Hydrocarbons: -14%
- Ozone potential: -10%
- Carbon Monoxide: -9%
- Particulate Matter**: -8%
- NOx: 1%
Using Biodiesel Can Make Your Operation Green and Sustainable

• It’s cleaner.
• It’s made from domestic crops.
• It’s putting money into local agriculture.
• It’s helping break our addiction to foreign oil.
• And if all that wasn’t enough:
Significance of the Billion Ton Vision (ORNL 2005)

Yields Based on Mid-Term Conversion Technology

U.S. Petroleum Production Levels

2003 Imports

2003 U.S. Petroleum Consumption

Billion Barrel of Oil Equivalents

1.3 billion tons of biomass - heating value equivalent

1.9

Thermochemically Convert Biochar Residues & Forest Resources (0.3)

Biochemically Convert Non-Edible Carbohydrates (1.1)

Near-Term Corn Without Affecting Food Prices (0.3)

2.0

U.S. Oil Production - Max. 1970

3.5

2.7 - Gasoline (3.0 Actual)

4.4

0.5 Jet Fuel

1.4 Distillate

6.4

Other (Gases, LPG, Asphalt, etc.)
Why Biomass? A Summary

- Michigan has a larger than average biomass resource base.
- Biomass feedstocks can be utilized by many commercial technologies.
- Biomass enhances independence from fossil fuel markets and price volatility.
- Clean, renewable, made in the USA 😊
- Ideal for community-based energy partnerships.
State-Level EERE Incentives

- MI Biomass Energy Program Grants ([www.michigan.gov/biomass](http://www.michigan.gov/biomass))
- NextEnergy Authority Renewable Energy Production Tax Credits ([www.nextenergy.org](http://www.nextenergy.org))
- MPSC LIEEF EERE Grants ([www.michigan.gov/mpsc](http://www.michigan.gov/mpsc))
- DEQ Pollution Prevention Loans ([www.michigan.gov/deq](http://www.michigan.gov/deq); Karen Edlin, 517-323-0604, edlink@michigan.gov)
- Ag Pollution Prevention (Terri Novak, 517-930-3170, novaktl@michigan.gov)
BUT...few state-level incentives.

- No tax credits for biomass residential or commercial use
- No tax credits for biofuels production or use
- No Renewable Portfolio Standard (RPS)
- No Production tax credits
Renewables Portfolio Standards

Goal

- PA: 18%¹ by 2020
- NJ: 6.5% by 2008
- CT: 10% by 2010
- MA: 4% by 2009 + 1% annual increase
- WI: 2.2% by 2011
- IA: 105 MW
- MN: 1,125 MW wind by 2010
- TX: 5,880 MW by 2015
- ME: 30% by 2000
- NY: 24% by 2013
- MA: 4% by 2009 + 1% annual increase
- RI: 15% by 2020
- CT: 10% by 2010
- *NJ: 6.5% by 2008
- *PA: 18%¹ by 2020
- *DE: 10% by 2019
- *MD: 7.5% by 2019
- *DC: 11% by 2022
- HI: 20% by 2020
- CA: 20% by 2017
- *NV: 20% by 2015
- *CO: 10% by 2015
- *AZ: 1.1% by 2007
- *NM: 10% by 2011
- TX: 5,880 MW by 2015

*Minimum requirement and/or increased credit for solar
¹ PA: 8% Tier I, 10% Tier II (includes non-renewable sources)

DSIRE: www.dsireusa.org

October 2005
State Tax Credits & Deductions for Renewables

- State offers only Personal Tax Incentives
- State offers only Corporate Tax Incentives
- State/Territory offers Personal & Corporate Tax Incentives

DSIRE: www.dsireusa.org

September 2005
Net Metering Rules

MI max size 30kW, $0.03-$0.06 depending on utility

State-wide net metering for certain utility types (e.g., IOUs only)
Net metering offered by one or more individual utilities

Net metering is available in 39 states + D.C.

DSIRE: www.dsireusa.org

September 2005
Some Michigan RE initiatives have cropped up recently...maybe 2006?

- B2 mandate proposed from Reps
- B20/E10 and consumer tax credit counterproposal from Dems
- RPS testimony before House Energy Committee this summer
- MPSC leadership more interested in RE
- MREP consent agreements on net metering
- Michigan Renewable Energy Program (MREP) and Capacity Needs Forum (MPSC)
Federal Grant Programs

USDA grants (and loans) most directly apply to greenhouse operations.

- Farm Bill 9006 (through FY2006)
- Value-Added Producer Grant
- And more…

Contact USDA Rural Development:

- Paula Gromak, (989) 673-7588 ext.120, paula.gromak@mi.usda.gov
- Rick Vanderbeek, (517) 324-5100 ext.5218, rick.vanderbeek@mi.usda.gov
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<td>Energy Efficiency</td>
<td>1. Corn burner for small dairy farm in Osceola County 3,500K</td>
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<td>2. Greenhouse, Zeeland—Energy Curtains 10K</td>
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<td>3. Holland—Brewing Co. Lighting and Boiler 98K</td>
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Federal Incentives for EERE

- EPAct 2005 tax incentives for RE production
- Tax credits for solar (30%)
- Tax credits for EE
  - For buildings placed in service in 2006-7
- CREBS=Community RE Bonds
- Conservation Tax Credits
- And more…

http://www.michigan.gov/cis/0,1607,7-154-25676_31631-127538--,00.html
EPAct Rebates for RE Systems

- (c) Rebate Program-
  - (1) ESTABLISHMENT- The Secretary shall establish a program providing rebates for consumers for expenditures made for the installation of a renewable energy system in connection with a dwelling unit or small business.
    

  - (2) AMOUNT OF REBATE- Rebates provided under the program established under paragraph (1) shall be in an amount not to exceed the lesser of--
    - (A) 25 percent of the expenditures described in paragraph (1) made by the consumer, or
    - (B) $3,000

  Rebates won’t come online until FY 2006—rulemaking and appropriations necessary.
Biofuels Incentives:
2004 JOBS Creation Act and EPAct 2005

- Created a penny-per-percent of biodiesel in diesel/biodiesel blends (thus, B100 is not included) for agricultural biodiesel (from vegetable oils, etc.), and $\frac{1}{2}$ penny per-percent for recycled biodiesel (waste grease).

- Works as a rebate, with blenders filing a form with IRS to receive tax rebate.

- Blenders can pass this credit along to consumers to be more competitive with other blenders
  - **BUT**—many are not passing this on, and consumers don’t have good information…shop around, and ask your vendor about the tax credit!

- 2005 Energy Bill extended this credit through 2008.

- Similar incentives for ethanol.
Questions?

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