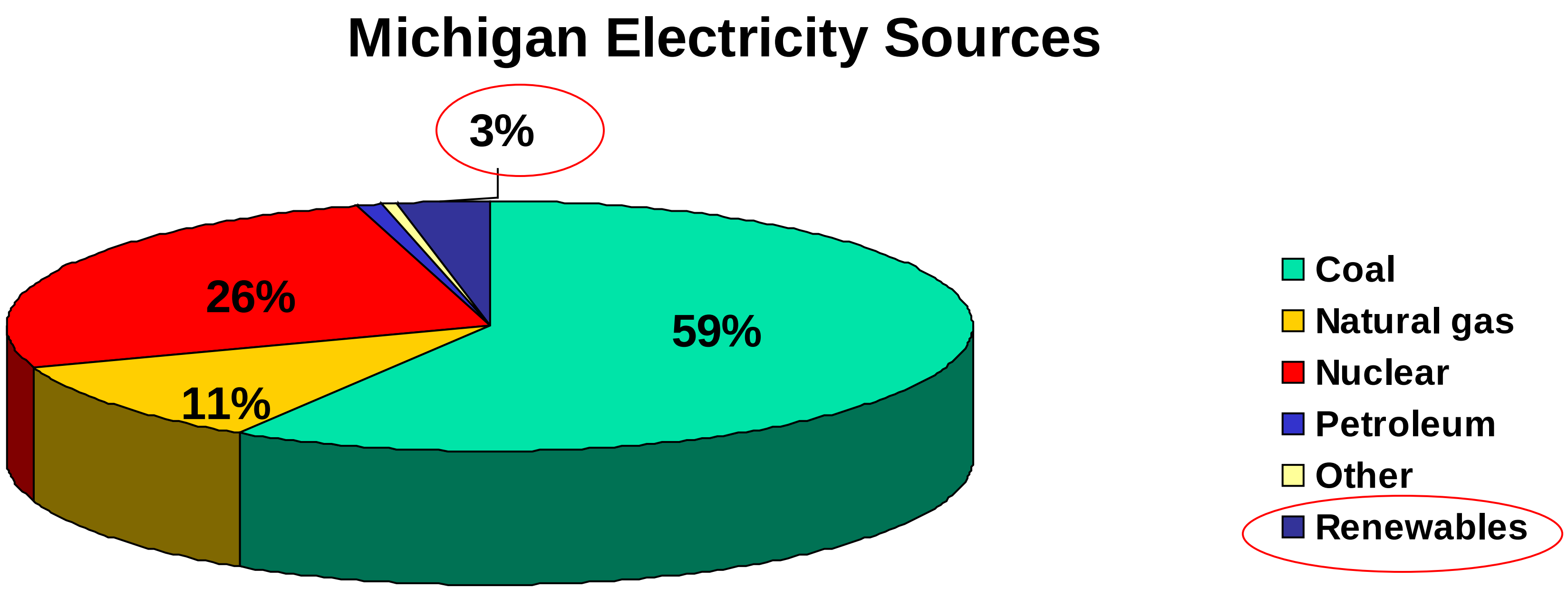
Wood for power generation

Michigan Biomass

Michigan Biomass Group

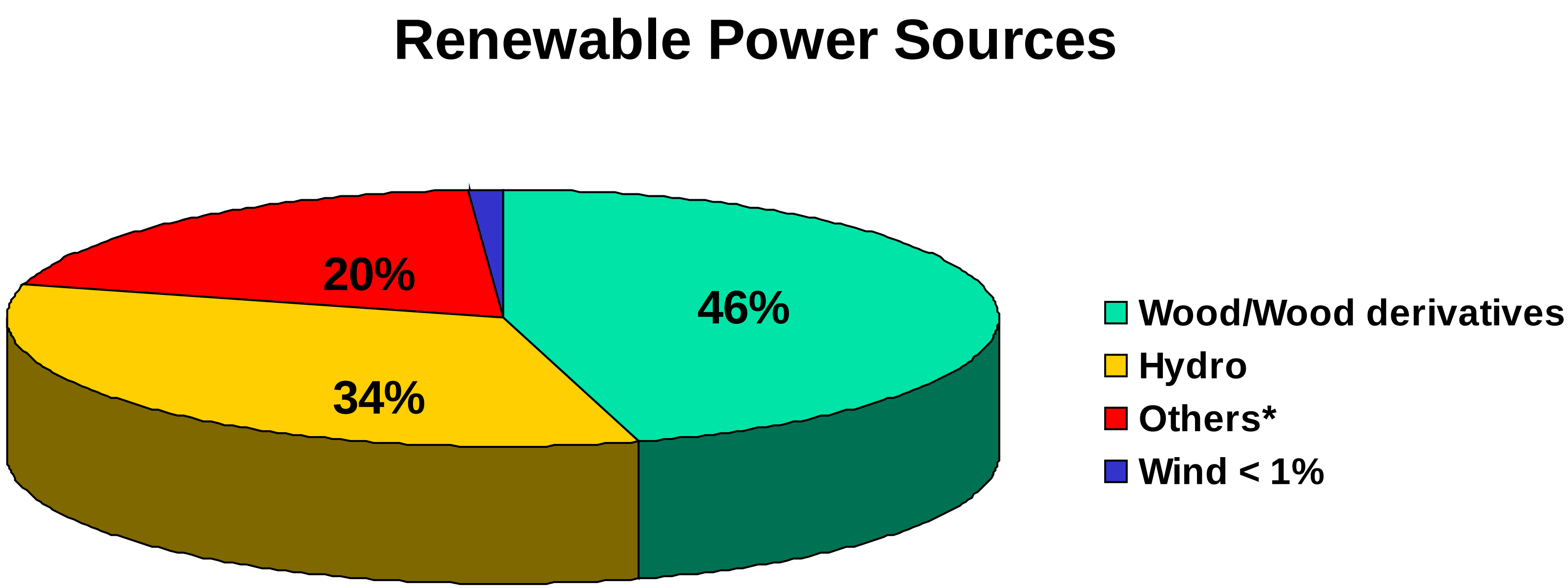
- 6 facilities
- 162 MW
  - >30% of all Michigan renewables
  - < 1% of all grid power
- 2.5 million tons waste wood
- Offset 1.2 million MWh coal
  - 3.8 million tons CO_2 reduction
- $68 million annual economics

Electricity sources



Source: Energy Information Agency 2007

Electricity sources



Source: Energy Information Agency 2007
* Landfill gas, poultry litter, manure digestion, etc.

Data & information

- All wood = green tons
  - Ave. 2 GT/MWh
- Maximum potential
  - Installed capacity
  - 90% capacity factor

Biomass demand

- Commercial generation
  - Power delivered to the grid
- Self-service generation
  - Mills & manufacturing
- Other
  - Pellets
  - Biofuels

Current biomass sources

Wood chips	33%
Forest residue	40%
Mill residue	20%
Urban wood sources	7%

- Recycled wood
- Brush, yard debris, land clearing

Survey: Oct. 2009, Larry A. Leefers, Karen Potter-Witter, MSU forestry

Existing demand: Commercial

1.	Cadillac Renewable Energy	36 MW
2.	Genesee Power Sta.	36 MW
3.	Grayling Generating Sta.	36 MW
4.	Hillman Power Co.	18 MW
5.	L'Anse Warden Electric	18 MW
6.	Lincoln Power Sta.	18 MW
7.	McBain Power Sta.	18 MW
Totals		**182 MW**
		2.9 million tons

Existing demand: Self-service

712,316 MWh

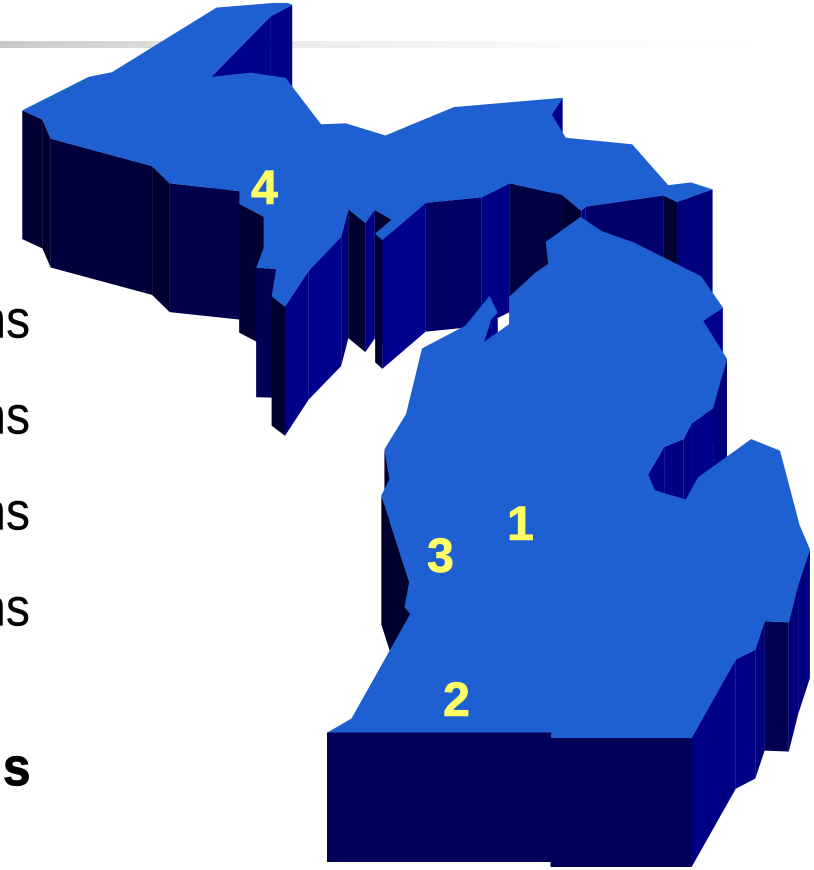
90 MW

1.4 million tons

Source: Energy Information Agency 2007

Existing demand: Other

Pellet producers	
1. Maeder Brothers	25,000 tons
2. Fiber By-Products	20,000 tons
3. Michigan Wood Pellet	50,000 tons
4. Vulcan Wood Products	8,000 tons
Totals	**103,000 tons**



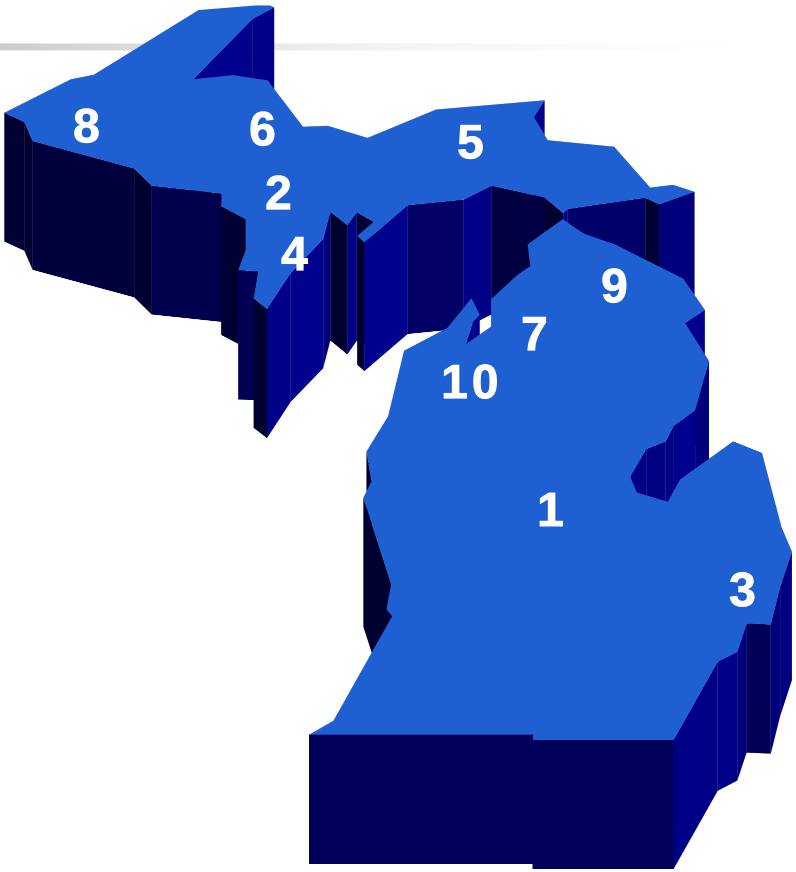
Source: Telephone survey

Current demand

■ Commercial	2.9 million tons
■ Self-service	1.4 million tons
■ Other	103,000 tons
TOTAL	**4.4 million tons**

Future demand: Commercial

1.	CMU expansion	17 MW
2.	Gwinn	20 MW
3.	Detroit Edison	~400 MW
4.	Escanaba	25 MW
5.	NMU	10 MW
6.	Newberry	24 MW
7.	Mancelona	36 MW
8.	White Pine	40 MW
9.	Wolverine Power	120 MW
10.	Traverse City L&P	20 MW
	TOTAL	**712 MW**
		11.2 million tons



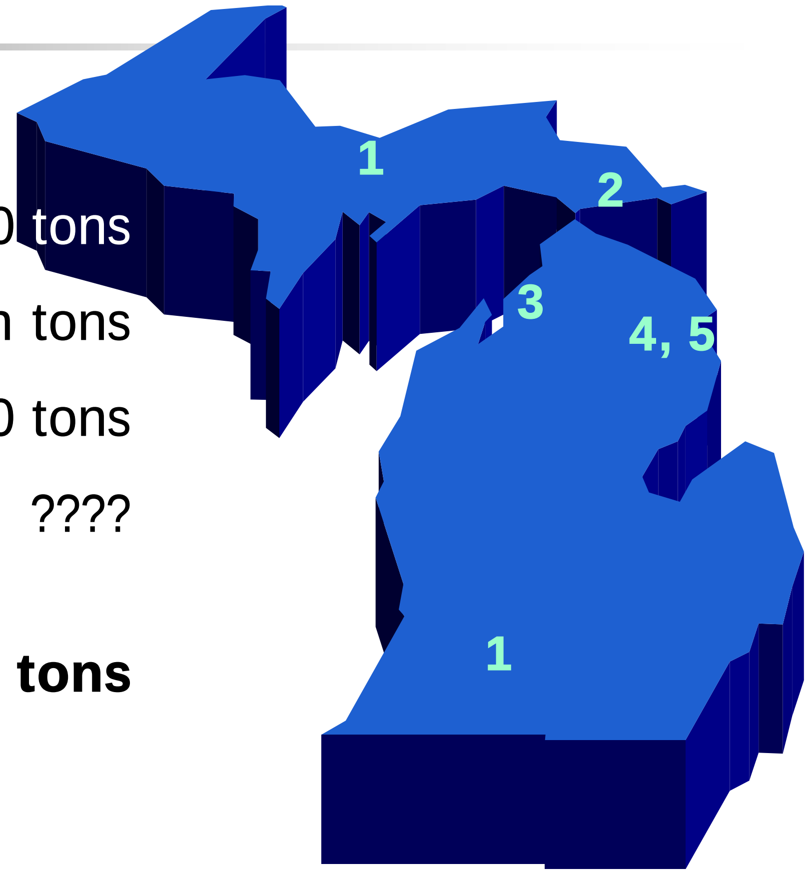
Future demand: Self-service

LaFarge Cement (?)	213,000 tons
Totals	**213,000 tons**

Future demand: Other

1. RenewaFuel (briquettes) 300,000 tons
2. Frontier (ethanol) 1 million tons
3. Kirkland Products (pellets) 71,000 tons
4. POET (ethanol) ????

TOTAL 1.4 million tons



Biomass demand

- Current potential

Commercial	2.8 million tons
Self-service	1.4 million tons
Other	103,000 tons
SUBTOTAL	**4.4 million tons**

- Potential future

Commercial	11.2 million tons
Self-service	213,000 tons
Other	1.4 million tons
SUBTOTAL	**12.8 million tons**

Biomass demand

- Total potential

Commercial	14.0 million tons	^391%
Self-Service	1.6 million tons	^15%
Other	1.5 million tons	^1443%

POTENTIAL
GRAND TOTAL 17.1 million tons ^292%

Michigan forest stats

- 19.3 million acres (53%)
  - Incr. 6%, 1980
  - 65% private
    - 57% non-industrial (ave. <27 acres)
    - 8% forest industry
  - 35% public
    - 14% national
    - 20% state

Source: Michigan Forest Products Council

MCAC report

- Unutilized* woody biomass**

Unharvested fiber (<5")	13.4 million tons
Saw timber	10.6 million tons
Pulpwood	9.4 million tons
Urban wastes	2.2 million tons
Logging residue	1.5 million tons
Roads, ROW, clearing	160,000 tons
Secondary mill waste	158,000 tons
Primary mill waste	75,000 tons
TOTAL	**37.5 million tons**

Source: Michigan Climate Action Council Report, Table J-1., pg J-7

* Adjusted for other, higher-value uses (see report footnote 2)

** Woody biomass only, adjusted to green tons

Uncertainties

- Supply chain infrastructure
  - Producers
    - Loss/change of primary markets
    - Economic impacts
- Regional supply
  - Accessibility
  - Availability
  - Affordability

Uncertainties

- Forest health
  - Slowed regeneration
  - Increased disease, mortality
- Market development
  - Energy = higher value market?
  - Impact on users
    - Social, biological, environmental

Initiatives

- Forest Biomass Information System
  - MSU, MTU, MEDC, MFPC
  - Data extrapolations
    - FIA and TPO data
  - Logger, mill, generator surveys (MSU)

Summary

- Current demand: 4.4 million tons
- Potential total demand: 17.1 million tons

- “High altitude” data suggests feasibility
  - MCAC report
  - Lacks regional/detailed data
    - Forest Biomass Inventory System
- Forest status
  - Regeneration slowed, health deteriorated
  - Majority owner: small, private, non-industrial
  - State ownership: 20%, most timber sales

Thank you

Michigan Biomass
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