

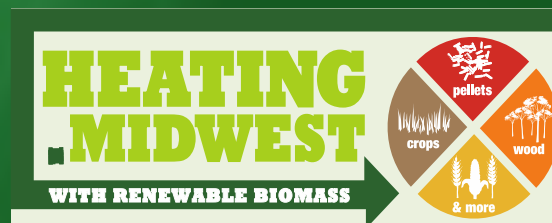
# Heating the Midwest with Renewable Biomass: A Midwest Vision!

**Tony “T.J.” Morice**

Vice-Chair, Heating the Midwest Steering Committee  
and Marth Wood Shaving Supply, Inc.

**William Strauss**

President, FutureMetrics, LLC



# HTM Steering Committee

- Brian Brashaw, University of Minnesota Duluth, Natural Resources Research Institute (NRRI), Chair
- T.J. Morice, Marth Wood Shaving Supply, Inc., Vice-Chair
- Chris Wiberg, Timber Products Inspection/Biomass Energy Lab, Vice-Chair
- Scott Bagley, Wood for Warmth Renewable Heat Services
- Jeff Borling, Duluth Port Authority
- Per Carlsson, ABioNova
- Michael Curci, Andritz Inc.
- Julie Goetz, on behalf of Hearth & Home Technologies
- Fred Iutzi, Illinois Institute for Rural Affairs, Western Illinois University
- Gregg Mast, Earthtech Energy Inc.
- Becky Philipp, Agricultural Utilization Research Institute
- Pam Porter, P Squared Group, LLC
- Bruno Zagar, Fond du Lac Band of Lake Superior Chippewa

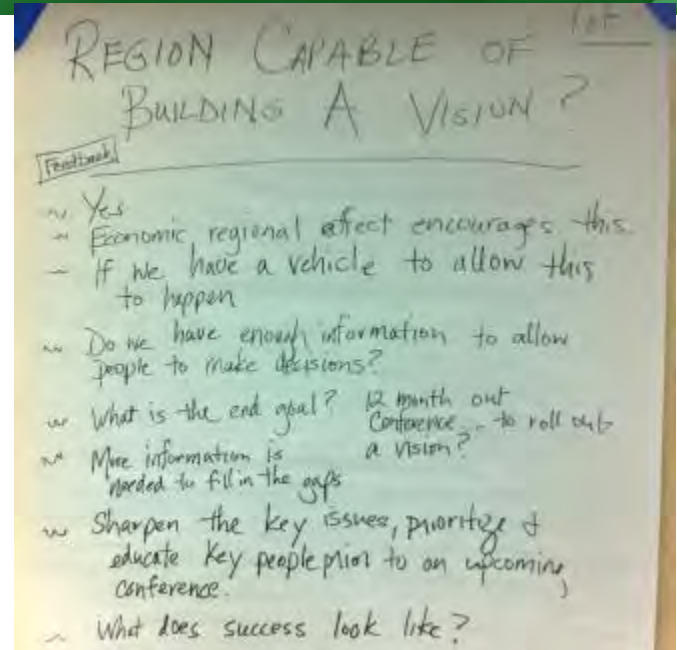
# Collaborative Organizations

- Biomass Thermal Energy Council
- FutureMetrics, LLC
- Pellet Fuels Institute



# HTM Background

- February 2011 - A group of committed volunteer organizations participated in the Carlton Summit and determined there was enthusiasm and interest in moving forward with a Midwest effort
  - Created a volunteer steering committee
  - Creation of 5 action teams (resources, heating technology, demographics, benefits and consequences, and policy)

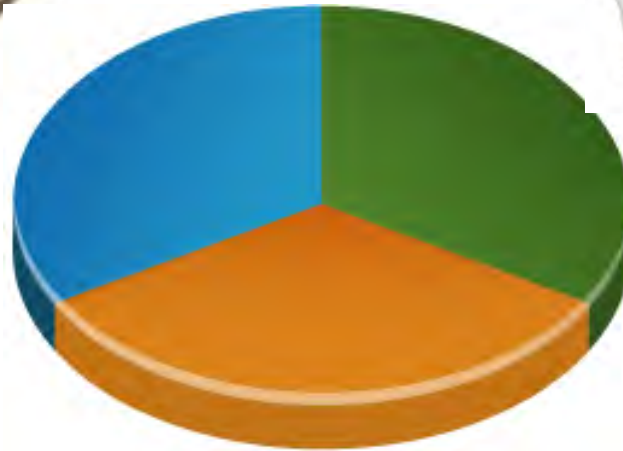


# America's Energy Usage Has Three Major Slices



**Transportation**  
29%

- Production credits (RFS)
- Investment Credits
- Sec. 1603 grants
- USDOE R&D Funding
- Billions in ARRA funding



**Electricity**  
40%

- Production credits (sec. 45)
- Investment credits
- Bonus depreciation
- Sec. 1603 grants
- USDOE R&D Funding



**Heating**  
31%

- No support for biomass thermal
- Solar thermal and geothermal ITC and production credits

# First Conference & Expo a Success!

## “Building the Vision”

- 2012 Heating the Midwest Conference and Expo
  - 165+ attendees with 28 exhibit booths



**HEATING  
MIDWEST**  
WITH RENEWABLE BIOMASS

**CONFERENCE**

April 25-27, 2012  
Ramada Convention Center  
Eau Claire, Wisconsin

Building the Vision

A photograph showing a large pile of wood chips or biomass, likely used for heating. The wood is piled up in a field or a large open area.

# Keep the Momentum Going!

- 2013 Heating the Midwest Conference and Expo
  - 180 attendees with 30 exhibit booths

**Heating the Midwest  
with Renewable Biomass**

**A Midwest Vision for 2025**



**Key Findings and Outcomes**

- Achieve **15%** of all thermal energy from renewables by 2025
- Reduce **1.01 billion gallons** of propane and **278 million gallons** of heating oil
- Reinvest **\$2.2 billion** into the Midwest economy
- Create **13,170 jobs** from the expansion of the thermal biomass industry and up to **210,000 direct, indirect and induced jobs** from annual energy savings and the effects of no longer exporting heating fuel money from the region
- Supply **17.2 million green tons** of sustainable woody and agricultural biomass for thermal energy and combined heat and power by 2025
- **12,630,950 homes and businesses are not connected** to low-cost natural gas
- Improve air quality, reduce greenhouse gases, and enhance forest management
- Vitalize communities through rural economic opportunities, new industry and innovation

**Achieve 10% of all thermal energy from biomass by 2025**

**The Vision**

We propose that 15% of all thermal energy in the Midwest come from renewable energy sources with 10% derived from sustainably produced biomass by 2025. The remainder of this energy would come from solar thermal and geothermal sources. This shift in our sources for thermal energy will produce extraordinary economic, social and environmental benefits for the Midwest, which currently relies on fossil fuel for 97% of its thermal energy.

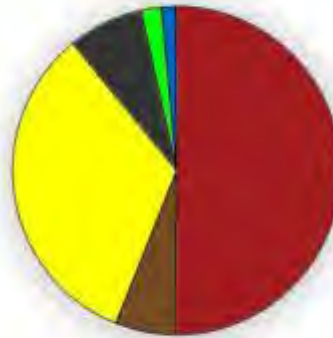
# Why is Heating the Midwest Important?

- ***Slow growth in biomass heating*** in the Midwest
- ***Biomass*** heating projects often “***under the radar***”
- Biomass ***resource availability***
- Areas do not have access to ***low-cost natural gas***
- ***Rural economic development*** is needed
- Increased understanding and discussions as to why ***renewable energy standards should include thermal***
- Our ***region is export challenged***

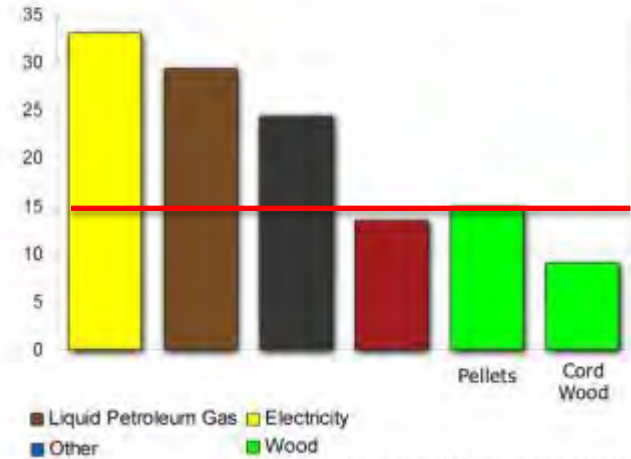




Percent of Households by Primary Fuel Use



Residential Fuel Cost (Dollars per Million BTU)



Sources: EIA, US Census, Hearth.com

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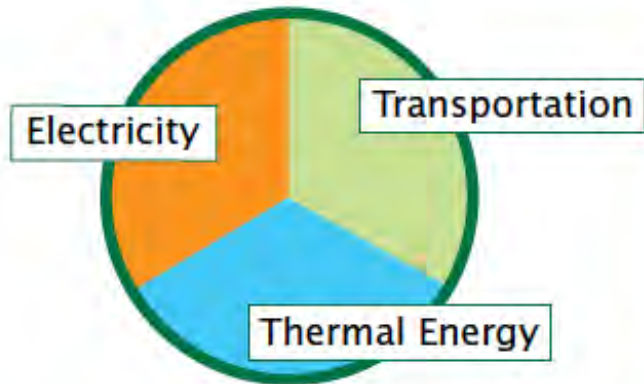
## U.S. IN RECESSION

### Ainsworth Lumber closes Minn. plants permanently

by Tom Robertson, Minnesota Public Radio  
January 28, 2009

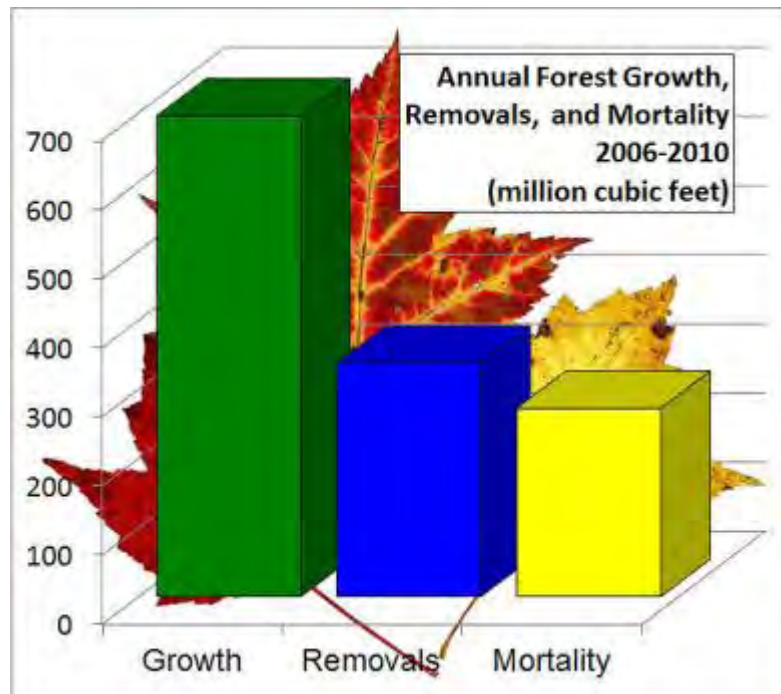
Bemidji, Minn. — Canadian-owned Ainsworth Lumber Co. says it will permanently close its two lumber mills in Cook and Bemidji. The move means the permanent loss of





**Only 3% of the Thermal Energy in the Midwest is from Biomass!**

### United States Ag Based Biomass Resource



Courtesy: Michigan Forests Forever



# This Vision will also. . .

- ***Challenge the region*** to identify biomass heating opportunities that make ***economic and technical sense***
- ***Increase awareness*** that high quality biomass fuels are available for modern, efficient high technology appliances and boilers
- ***Define challenges and devise strategies*** and policy recommendations to overcome them

# Perhaps most importantly . . .

***Catalyze industry support and engage partners in government, non-profit and private enterprise to accelerate progress toward increasing biomass thermal use for heat and combined heat and power in the Midwest***

**Heating the Midwest with Renewable Biomass**  
**A Midwest Vision for 2025**



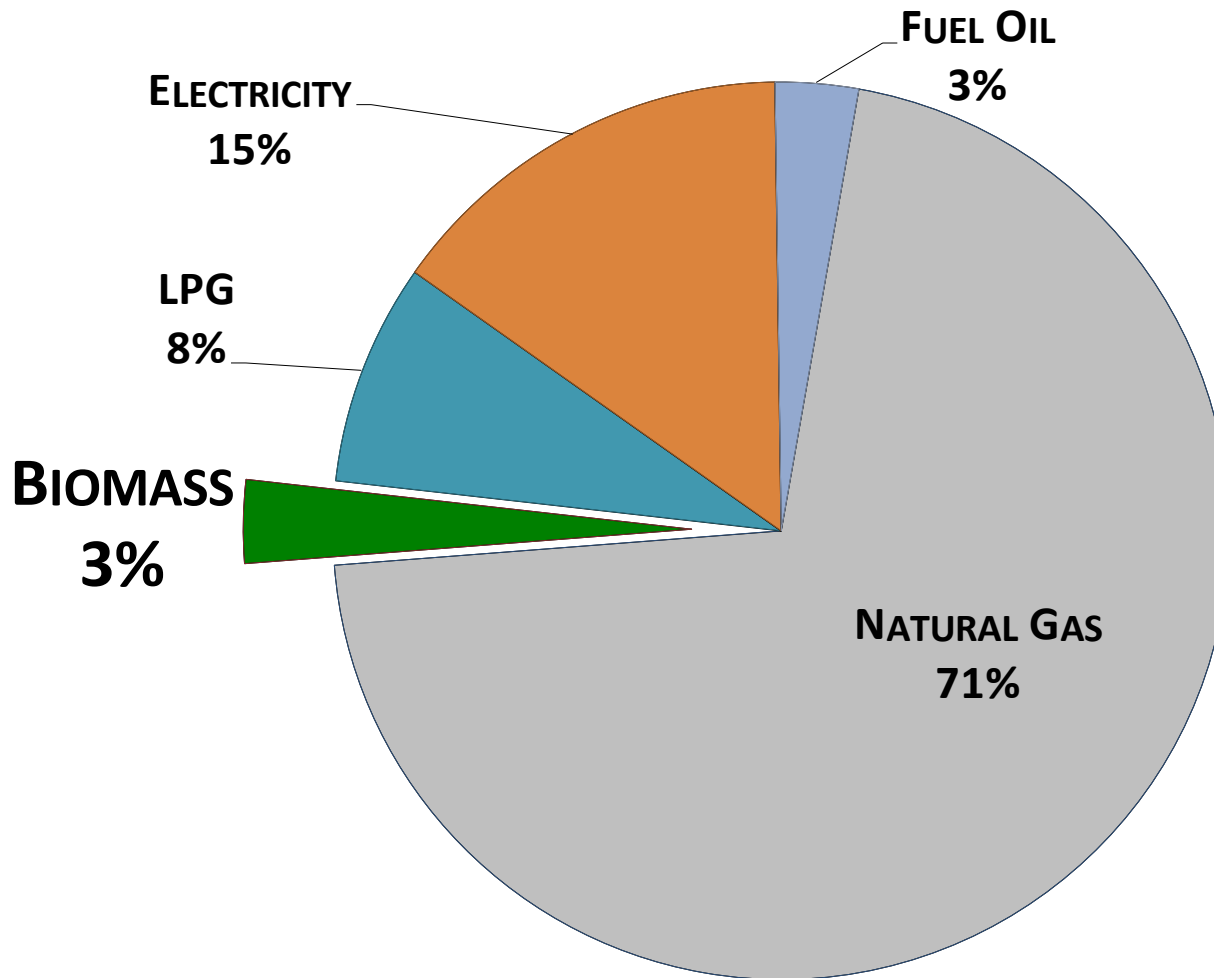
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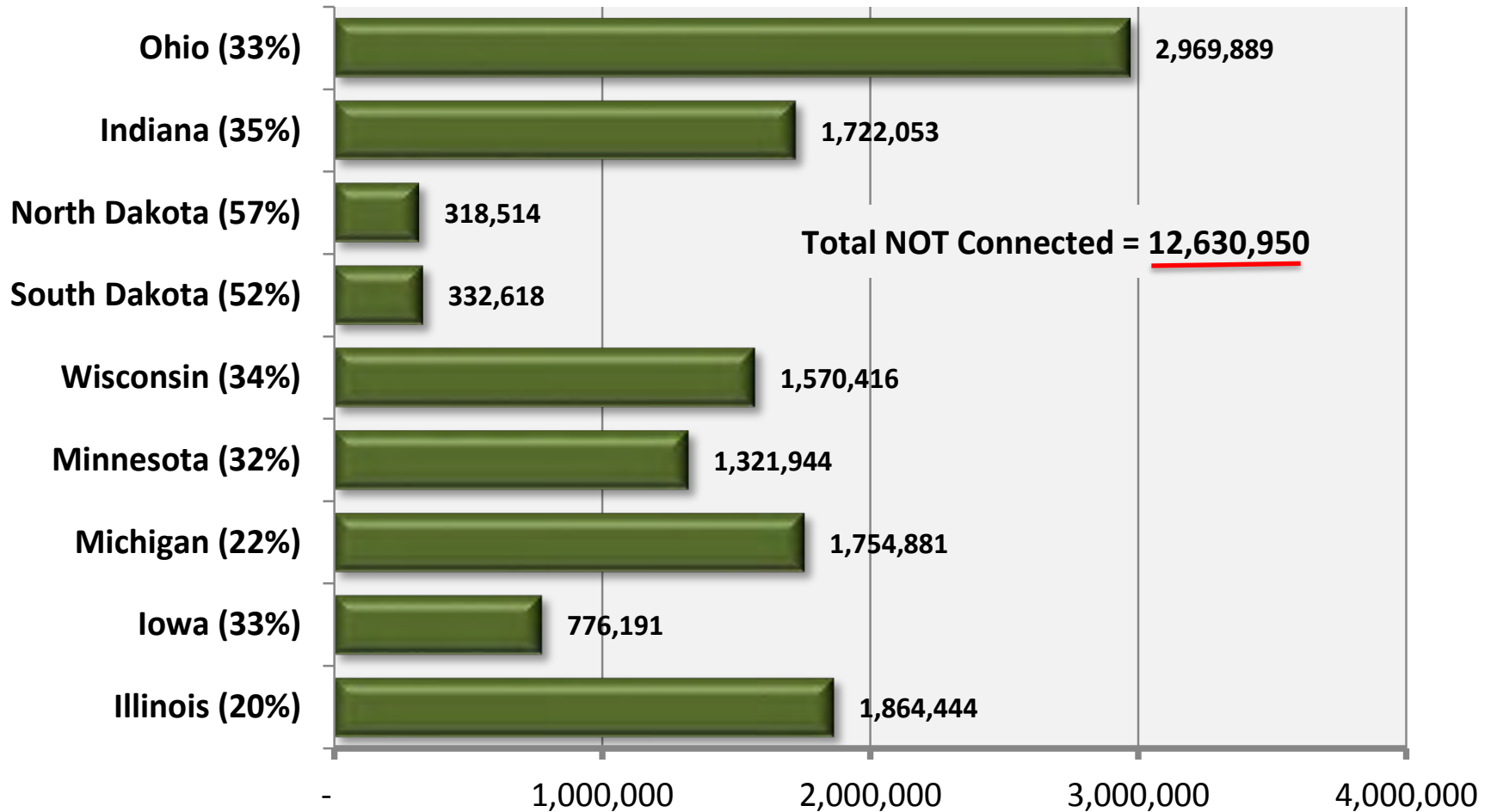
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# 2012: Midwest Thermal Energy



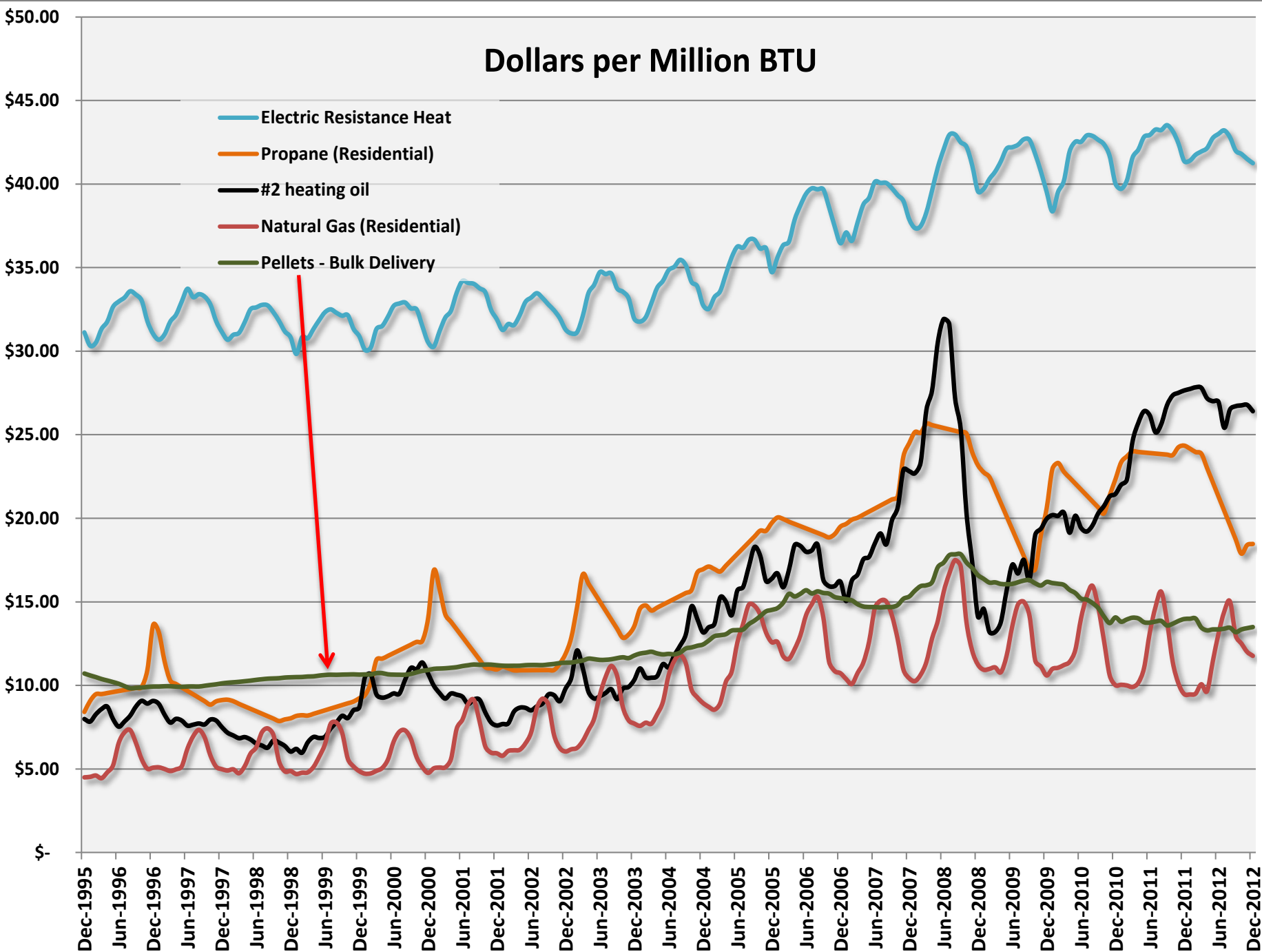
# Number of Homes and Businesses

**Number of Homes and Businesses NOT connected to Natural Gas**  
(proportion of total locations NOT connected in parenthesis)



source: US Energy Information Administration, US Census, 2012, analysis by FutureMetrics

# Dollars per Million BTU



# The Midwest Vision for 2025

**We propose that 15% of all thermal energy in the Midwest come from renewable energy sources with 10% derived from sustainably produced biomass by 2025, with the remainder of this energy from solar and geothermal sources.**



# Renewable Thermal Technologies

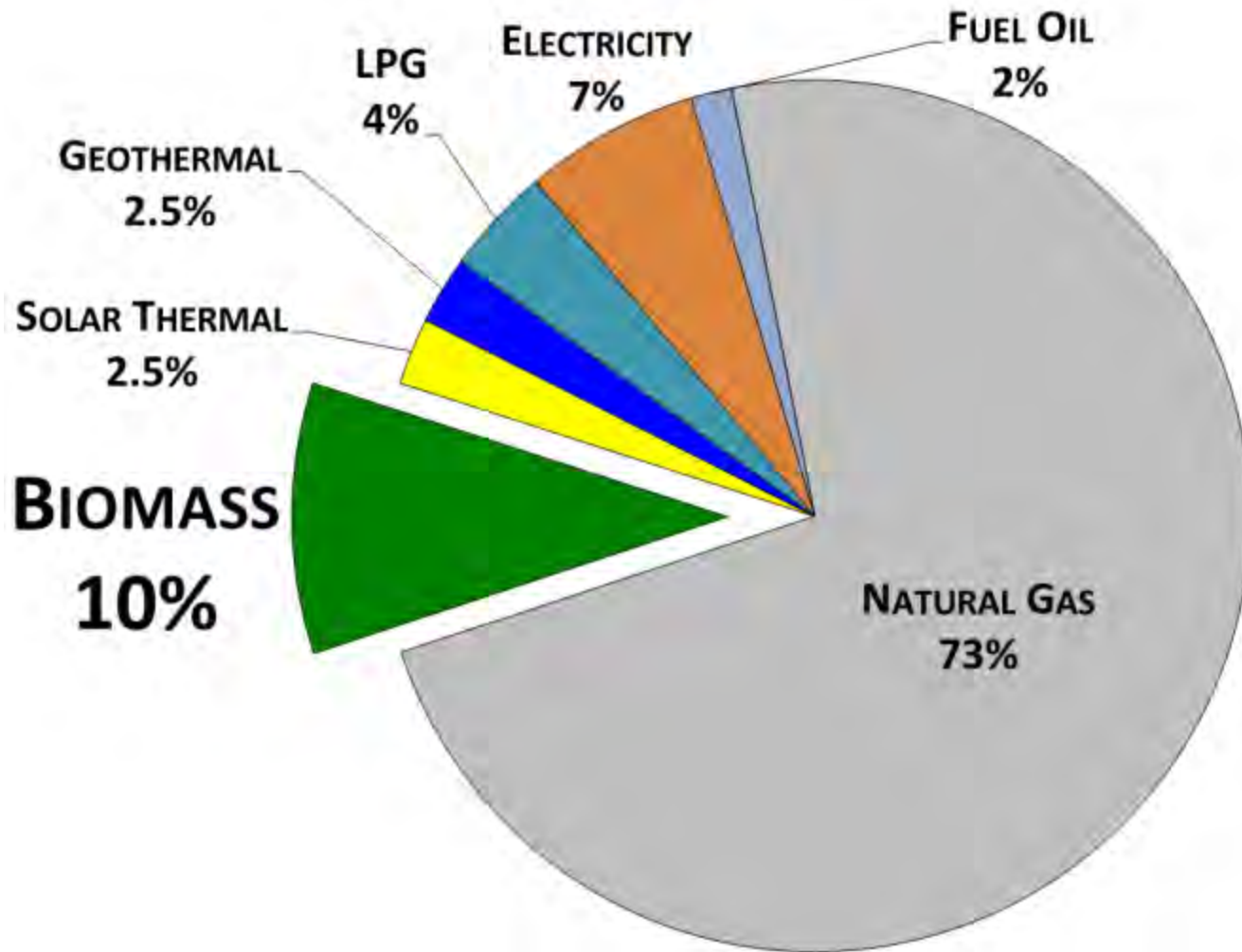
- **Biomass:** solid (chips, residues, pellets), liquid (biodiesel, pyrolysis oil, ethanol), gas (biogas)



- **Solar Thermal**
- **Geothermal:** water and ground source



# 2025: Midwest Thermal Energy



# Feedstock and Economic Impact Analyses to Support the Vision!

William Strauss, Ph.D.  
FutureMetrics

# Sustainable Feedstock Assessment

What qualifies as *renewable*?

The feedstock supply will be considered *sustainable* as long as the net annual *growth to harvest ratio is one or greater*.

The aggregate harvesting of biomass must be offset by the aggregate growth of new stock, considering only land that can be harvested.

# Sustainable Feedstock Assessment

1. The analysis works backwards from high-level data to estimate the potential biomass supply in 2025 given broad assumptions.
2. At every decision point, the analysis follows a very conservative path.
3. After following the logic to the conclusion, the resulting estimates are again adjusted to significantly less than the estimated values. By cutting this conservative estimate, we are acknowledging the potential for errors in our high level analysis, and increasing the probability that the actual numbers in 2025 will be higher than this work.

# Sustainable Feedstock Assessment

Estimated Agricultural Biomass 2012										
Estimates in 1,000's of Green Tons										
<b>Agricultural Biomass</b>	Illinois	Iowa	Michigan	Minnesota	North Dakota	South Dakota	Wisconsin	Indiana	Ohio	Total
Crop Residue										
Barley Straw	0	0	0	43	701	0	0	0	0	744
Corn Stover	9,496	20,777	1,070	6,998	1,366	4,960	1,563	3,703	3,073	53,006
Wheat Straw	862	8	832	420	229	3,009	232	58.8	1501.9	7,153
Oat Straw	0	0	0	0	0	0	0	0	0	0
Total	10,358	20,785	1,902	7,461	2,296	7,969	1,795	0	0	52,566
Hay	2,016	4,319	1,753	4,602	4,286	6,753	5,513	1,764	3,157	34,163
Total	12,374	25,104	3,655	12,063	6,582	14,722	7,308	1,764	3,157	<b>86,729</b>
<b>Dedicated Energy Crops</b>										
Perennial grass	0	0	0	0	0	0	0	0	0	0
Woody Energy Crops	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
<b>Forest Biomass for Pellet Production</b>										
Logging Residue & Thinnings	276	102	898	873	7	68	1,130	609	402	4,365
Other Removal Residue	234	62	294	656	15	14	1,049	94	5	2,423
Sustainable Harvest of Roundwood available for pellet making	1196.5	597.5	3056	1247	77.5	67.5	2,482	1,338	1,240	11,302
Total	1,707	762	4,248	2,776	100	150	4,661	2,041	1,647	<b>18,089</b>
<b>Total</b>	<b>14,081</b>	<b>25,866</b>	<b>7,903</b>	<b>14,839</b>	<b>6,682</b>	<b>14,872</b>	<b>11,969</b>	<b>3,805</b>	<b>4,804</b>	<b>104,818</b>

source: "Midwest Biomass Inventory Assessment", April, 2012, Billion Ton Study data, USDA FIA Data, analysis by FutureMetrics

# Sustainable Feedstock Assessment

Estimated Agricultural Biomass 2025										
Estimates in 1,000's of Green Tons										
<b>Agricultural Biomass</b>	Illinois	Iowa	Michigan	Minnesota	North Dakota	South Dakota	Wisconsin	Indiana	Ohio	Total
<b>Crop Residue</b>										
Barley Straw	0	0	0	82	1038	0	0	0	0	1,120
Corn Stover	14,621	33,242	1,844	10,579	3,299	8,260	3,306	7,745	6,748	89,644
Wheat Straw	1223	15	1124	1014	1315	3,961	338	91.5	1820	10,902
Oat Straw	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>15,844</b>	<b>33,257</b>	<b>2,968</b>	<b>11,675</b>	<b>5,652</b>	<b>12,221</b>	<b>3,644</b>			<b>85,261</b>
<b>Hay</b>	<b>1,862</b>	<b>3,842</b>	<b>1,621</b>	<b>3,916</b>	<b>3,829</b>	<b>5,662</b>	<b>5,097</b>	<b>1,608</b>	<b>2,960</b>	<b>29,240</b>
<b>Total</b>	<b>17,706</b>	<b>37,099</b>	<b>4,589</b>	<b>15,591</b>	<b>9,481</b>	<b>17,883</b>	<b>8,741</b>	<b>1,608</b>	<b>2,960</b>	<b>114,501</b>
<b>Dedicated Energy Crops</b>										
Perennial grass	29	0	0	0	0	583	0	89.3	1990	2691.3
Woody Energy Crops	0	0	1501	936	0	0	1854	161	1492.8	5944.8
<b>Total</b>	<b>29</b>	<b>0</b>	<b>1501</b>	<b>936</b>	<b>0</b>	<b>583</b>	<b>1854</b>	<b>250.3</b>	<b>3482.8</b>	<b>8636.1</b>
<b>Forest Biomass for Pellet Production</b>										
Logging Residue & Thinnings	280	103	915	898	7	76	1,155	624	413	4,471
Other Removal Residue	238	63	298	666	16	14	1,064	96	5	2,459
Sustainable Harvest of Roundwood	1794.75	896.25	4584	1870.5	116.25	101.25	3,723	2,006	1,860	16,952
<b>Total (includes woody energy crops)</b>	<b>2,313</b>	<b>1,062</b>	<b>5,797</b>	<b>3,435</b>	<b>139</b>	<b>191</b>	<b>5,942</b>	<b>2,726</b>	<b>2,278</b>	<b>29,827</b>
<b>Total (woody energy crops are not double counted)</b>	<b>20,048</b>	<b>38,161</b>	<b>11,887</b>	<b>19,962</b>	<b>9,620</b>	<b>18,657</b>	<b>16,537</b>			<b>147,020</b>

source: "Midwest Biomass Inventory Assessment", April, 2012, Billion Ton Study data, USDA FIA Data, analysis by FutureMetrics

# What can a pellet mill in Georgia teach us about development in the Midwest?

- Speak to the players in town
- Offer existing players to do some of the wood procurement
- Use complimentary species that an existing mill does not use
- Piggy back on existing logistics
- Build a non-threatening size





# Sustainable Feedstock Assessment

<b>In Millions of Tons of Oil Equivalent (MTOE) per Year</b>										
<b>Agricultural Biomass</b>	Illinois	Iowa	Michigan	Minnesota	North Dakota	South Dakota	Wisconsin	Indiana	Ohio	Total
Crop Residue										
Barley Straw	0.00	0.00	0.00	0.03	0.37	0.00	0.00	0.00	0.00	0.40
Corn Stover	5.21	11.84	0.66	3.77	1.17	2.94	1.18	2.76	2.40	31.93
Wheat Straw	0.44	0.01	0.40	0.36	0.47	1.41	0.12	0.03	0.65	3.88
Oat Straw	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	5.64	11.84	1.06	4.16	2.01	4.35	1.30	2.79	3.05	36.21
Hay	0.66	13.21	1.63	5.55	3.38	6.37	3.11	3.36	4.11	41.39
Total	6.31	25.06	2.69	9.71	5.39	10.72	4.41	6.15	7.16	77.60
<b>In Millions of Barrels of Oil Equivalent per Year</b>										
<b>Agricultural Biomass</b>	Illinois	Iowa	Michigan	Minnesota	North Dakota	South Dakota	Wisconsin	Indiana	Ohio	
Crop Residue										
Barley Straw	0.00	0.00	0.00	0.18	2.30	0.00	0.00	0.00	0.00	2.48
Corn Stover	32.38	73.63	4.08	23.43	7.31	18.29	7.32	17.15	14.95	198.55
Wheat Straw	2.71	0.03	2.49	2.25	2.91	8.77	0.75	0.20	4.03	24.15
Oat Straw	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	35.09	73.66	6.57	25.86	12.52	27.07	8.07	17.36	18.98	225.17
Hay	4.12	82.17	10.16	34.53	21.00	39.61	19.36	20.92	25.53	257.40
Total	39.22	155.83	16.74	60.39	33.52	66.68	27.43	38.27	44.51	482.58

analysis by FutureMetrics

482.6 million barrels per year is about 7% of the entire US consumption of oil.

# Heating Fuel Use for an Average Home

Heating Fuel Use for an Average Home				
	Average Annual Heating Oil Use (gallons)	Average Annual Propane Use (gallons)	Average Annual Electricity Use (kWh)	Average Equivalent Pellets (tons) at 7800 BTU/lb
Wisconsin	811	1,178	32,809	7.18
Minnesota	1,234	1,792	49,893	10.91
Michigan	738	1,072	29,850	6.53
North Dakota	1,127	1,636	45,564	9.97
South Dakota	765	1,111	30,931	6.77
Iowa	883	1,282	35,695	7.81
Illinois	749	1,088	30,298	6.63
Indiana	780	1,133	31,547	7.17
Ohio	810	1,177	32,761	7.76
Average =>	877	1,274	35,483	7.86
source: EIA State Data, 2010, analysis by FutureMetrics				

# The Region “Exports” Jobs!

**\$3.75/gallon fuel oil**

**\$1.76/gallon propane**

#2 Distillate Fuel and Propane use in Residential, Commercial, and Industrial (not Transportation) in gallons	Average Gallons per year of Heating Oil	Money Exported from Regional Economy at \$3.75/gal for oil	Permanent Jobs Lost to Heating Oil Purchases	Average Gallons per Year of Propane	Money Exported from Regional Economy at \$1.76/gal for propane	Permanent Jobs Lost to Propane Purchases	TOTAL Money Exported from the Regional Economy	TOTAL Permanent Jobs Lost
Wisconsin	47,475,400	(\$138,870,000)	-9,300	94,825,864	(\$130,180,000)	-8,700	(\$269,050,000)	-18,000
Minnesota	53,661,283	(\$156,960,000)	-9,400	129,916,791	(\$178,350,000)	-10,700	(\$335,310,000)	-20,100
Michigan	31,489,749	(\$92,110,000)	-5,600	125,793,262	(\$172,690,000)	-10,500	(\$264,800,000)	-16,100
North Dakota	12,166,891	(\$35,590,000)	-2,300	31,420,463	(\$43,130,000)	-2,800	(\$78,720,000)	-5,100
South Dakota	5,722,433	(\$16,740,000)	-1,100	26,125,272	(\$35,860,000)	-2,300	(\$52,600,000)	-3,400
Iowa	7,158,436	(\$20,940,000)	-1,300	83,188,567	(\$114,200,000)	-6,900	(\$135,140,000)	-8,200
Illinois	6,278,225	(\$18,360,000)	-1,000	182,398,956	(\$250,400,000)	-13,600	(\$268,760,000)	-14,600
Indiana	32,565,000	(\$95,250,000)	-5,800	141,914,842	(\$194,820,000)	-11,900	(\$290,070,000)	-17,700
Ohio	81,708,750	(\$239,000,000)	-13,900	197,821,184	(\$271,570,000)	-15,800	(\$510,570,000)	-29,700
	<b>278,226,168</b>	<b>(\$813,820,000)</b>	<b>-49,700</b>	<b>1,013,405,201</b>	<b>(\$1,391,200,000)</b>	<b>-83,200</b>	<b>(\$2,205,020,000)</b>	<b>-132,900</b>

data from EIA and US Census, 2012, analysis by FutureMetrics

**Jobs are lost because about 78% of every dollar spent on propane and heating oil leaves the regional economy.**

**The \$2.2 BILLION per year that does not circulate in the regional economy means that about 133,000 jobs are not sustained.**



**\$2,205,020,000  
and  
132,900 jobs**

# Creating Fuel from Regional Sustainable Biomass Stops the Permanent Job Destruction!

	Occupied Households	Equivalent Number of Businesses, Schools, Buildings	Total Number of Household Equivalents	Percent that Use #2 Heating Oil, Propane, or Electricity	Total Potential Converting (natural gas is excluded)	Actual household units at 10.0% of total	Total Tons of Dry Biomass if 10.0% Convert	Total Tons of Green Biomass Required to Heat 10.0% of Total
Wisconsin	2,624,358	1,994,512	4,618,870	30%	1,385,661	139,000	994,326	1,988,653
Minnesota	2,347,201	1,783,873	4,131,074	28%	1,156,701	116,000	1,262,255	2,524,511
Michigan	4,532,233	3,444,497	7,976,730	20%	1,595,346	160,000	1,041,573	2,083,147
North Dakota	317,498	241,298	558,796	54%	301,750	30,000	300,717	601,434
South Dakota	363,438	276,213	639,651	49%	313,429	31,000	212,037	424,075
Iowa	1,336,417	1,015,677	2,352,094	31%	729,149	73,000	569,257	1,138,515
Illinois	5,296,715	4,025,503	9,322,218	19%	1,761,899	176,000	1,167,560	2,335,119
Indiana	2,795,541	2,124,611	4,920,152	34%	1,672,852	167,000	1,154,268	2,308,535
Ohio	5,113,446	3,886,219	8,999,665	30%	2,690,900	269,000	1,928,133	3,856,266
<b>TOTAL</b>	<b>24,726,847</b>	<b>18,792,404</b>	<b>43,519,251</b>		<b>11,607,687</b>	<b>1,161,000</b>	<b>8,630,127</b>	<b>17,260,255</b>

**8.6 million dry tons or  
17.3 green tons of biomass**

**Estimated Annual Sustainable Woody Biomass in 2025**



**147.0 million green tons**

3	4,471
5	2,459
0	16,952
8	<b>29,827</b>
	<b>147,020</b>
	FutureMetrics