Grand Traverse Band of Ottawa and Chippewa Indians

Renewable Energy & Energy Efficiency Feasibility Study
DOE Tribal Energy Program Review
Denver, Colorado
November 14 - 20, 2008

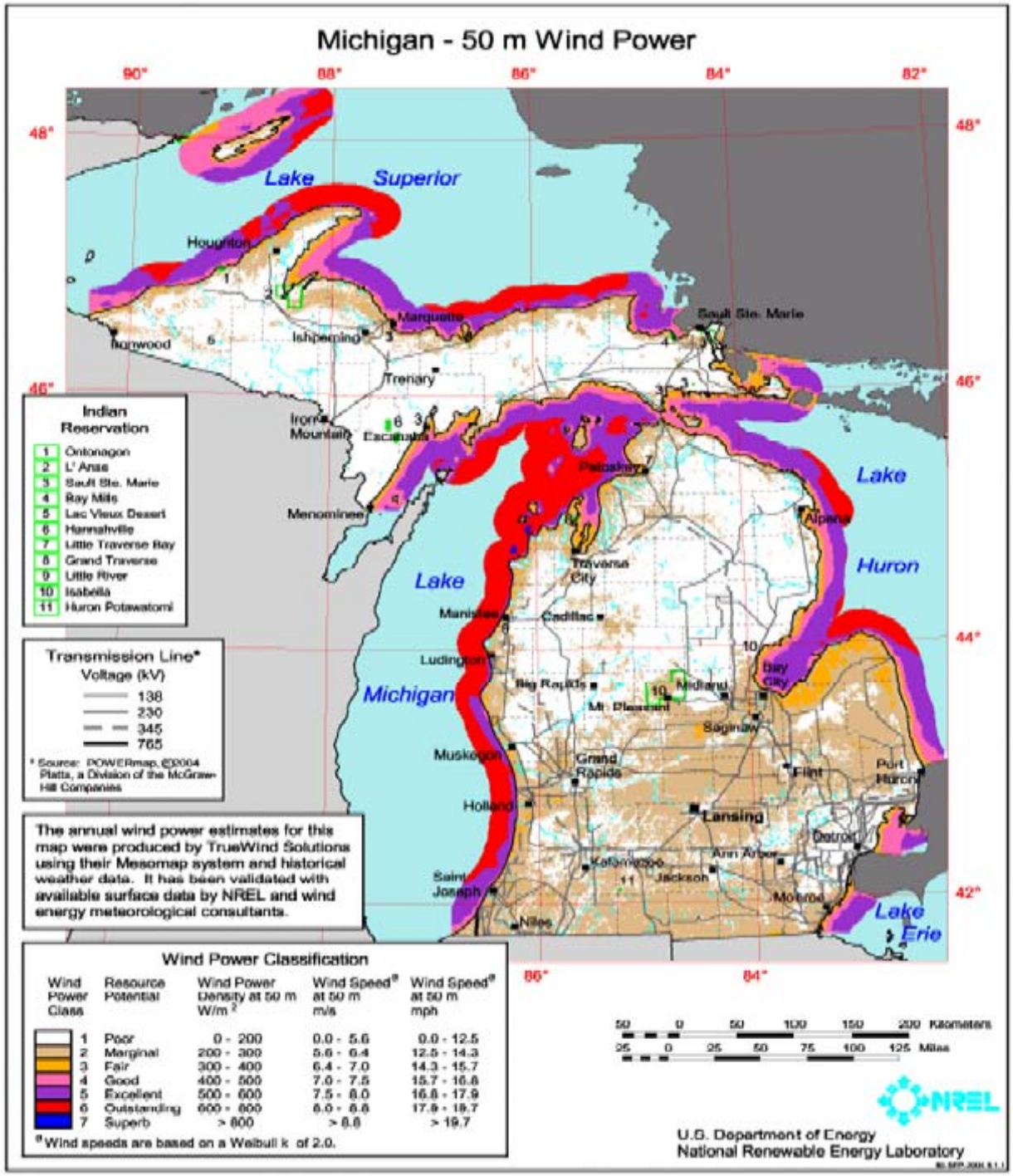
November 2008

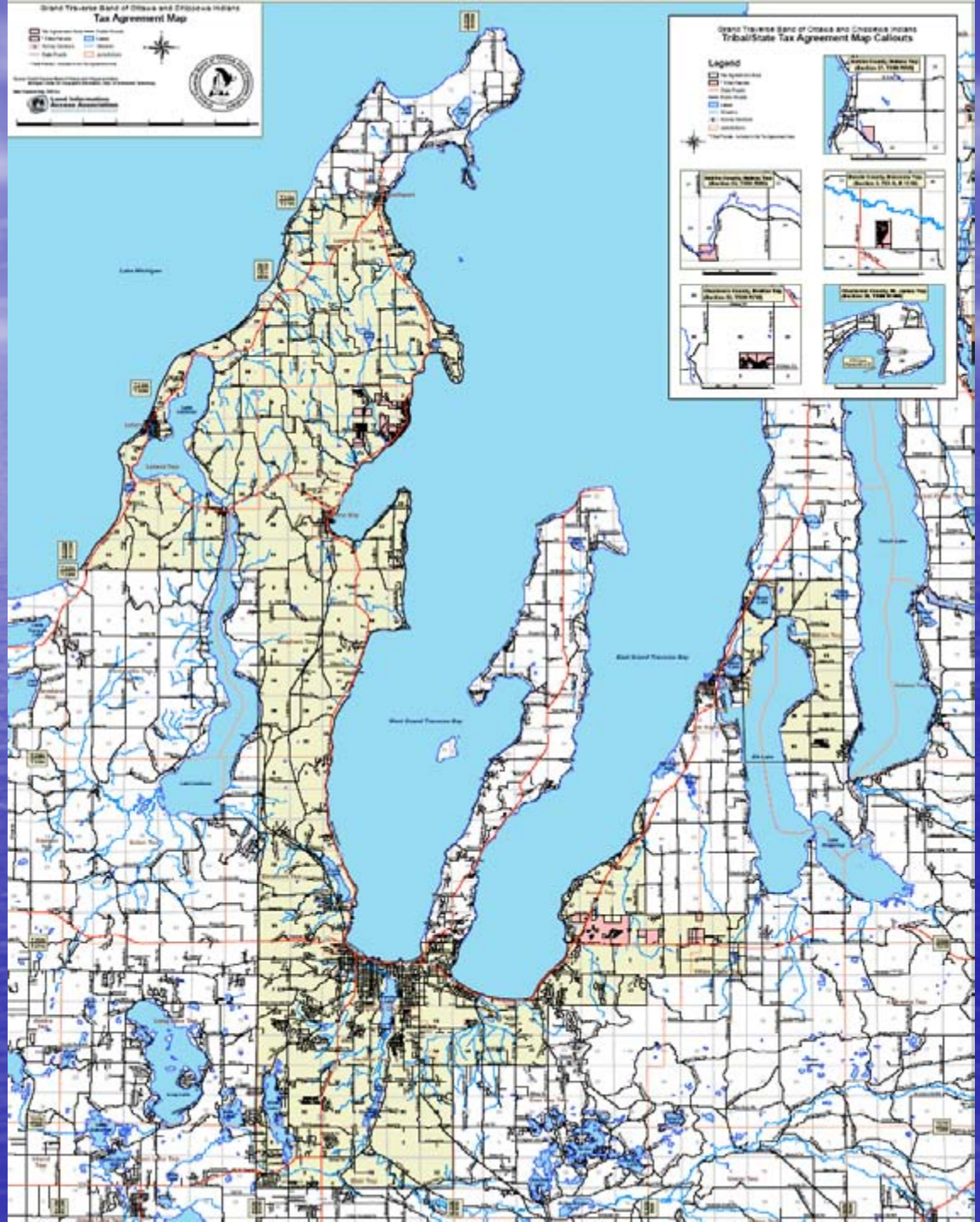
Grand Traverse Band

- 3,988 Members
- 2,370 Acres – Checkerboard
- Six-County Service Area
- EDC: 2 Casinos, Resort Hotels (600 Rooms), Gas Station, etc.
- Gov't: Administration, Housing, Medicine Lodge, Strong Heart Center, Day Care, etc.

Grand Traverse Resort and Spa

Turtle Creek Casino Hotel (June 08)


Michigan - 50 m Wind Power
90°
88°
86°
84°
82°
48°
46°
44°
42°
Lake Superior
Houghton
Marquette
Ishpeming
Ironwood
Trenary
Iron Mountain
Escanaba
Menominee
Sault Ste. Marie
Lake Michigan
Lake Huron
Lake Erie
Petoskey
Alpena
Traverse City
Manistee
Cadillac
Ludington
Big Rapids
Midland
Bay City
Mt. Pleasant
Saginaw
Muskegon
Grand Rapids
Flint
Port Huron
Holland
Lansing
Detroit
Ann Arbor
Kalamazoo
Jackson
Saint Joseph
Monroe
Niles
Indian Reservation
1 Ontonagon
2 L' Anse
3 Sault Ste. Marie
4 Bay Mills
5 Lac Vieux Desert
6 Hannahville
7 Little Traverse Bay
8 Grand Traverse
9 Little River
10 Isabella
11 Huron Potawatomi
Transmission Line*
Voltage (kV)
138
230
345
765
* Source: POWERmap, ©2004 Platts, a Division of the McGraw-Hill Companies
The annual wind power estimates for this map were produced by TrueWind Solutions using their Mesomap system and historical weather data. It has been validated with available surface data by NREL and wind energy meteorological consultants.
Wind Power Classification
Wind Power Class
Resource Potential
Wind Power Density at 50 m W/m²
Wind Speed[a] at 50 m m/s
Wind Speed[a] at 50 m mph
1 Poor 0 - 200 0.0 - 5.6 0.0 - 12.5
2 Marginal 200 - 300 5.6 - 6.4 12.5 - 14.3
3 Fair 300 - 400 6.4 - 7.0 14.3 - 15.7
4 Good 400 - 500 7.0 - 7.5 15.7 - 16.8
5 Excellent 500 - 600 7.5 - 8.0 16.8 - 17.9
6 Outstanding 600 - 800 8.0 - 8.8 17.9 - 19.7
7 Superb > 800 > 8.8 > 19.7
[a] Wind speeds are based on a Weibull k of 2.0.
50 0 50 100 150 200 Kilometers
25 0 25 50 75 100 125 Miles
NREL
U.S. Department of Energy
National Renewable Energy Laboratory


Grand Traverse Band of Ottawa and Chippewa Indians
Tax Agreement Map
Grand Traverse Band of Ottawa and Chippewa Indians
Tribal/State Tax Agreement Map Callouts
Legend

GTB Energy Vision & Plan

Three Focus Areas:

- Energy Diversity
- Environmental Quality
- Economic Benefits

Adopted 1/26/05

Action Plan

- Conduct energy diversification feasibility study
- Financing plan
- Public education campaign
- Distributed renewable power study

Project Objectives

Project Goal: To conduct a feasibility study to determine the cost effectiveness and other economic, environmental, cultural and social benefits of maximizing the diversity of energy sources used at GTB facilities.

Grant Timeline: 9/15/05 to 12/31/08

Project Partnership

Traverse City Light & Power (TCLP)

MOU between GTB and TCLP

Sharing wind energy monitoring and evaluation

Sharing electric utility expertise

GTB Renewable Energy Options

- Biomass (wood and crops) & District Heat
- Solar thermal
- Solar electric (photovoltaics)
- Passive solar buildings and designs
- Small scale wind power
- Large scale wind power
- Economic integration of renewable energy
- Energy efficiency & Combined Heat & Power

Site Specific Resource Monitoring

- Comprehensive survey of all GTB properties and energy consumption
- Review and documentation of energy data: solar, wind, biomass
- On-site wind resource monitoring, and preparation of a regional GTB wind map
- Wind data sharing with TCL&P wind monitoring activities in adjacent twp

GTB Energy Demand

- Total Cost: $6 million/yr
- Electric Cost: $3 million/yr
- Natural Gas Cost: $2.4 million /yr
- LP Gas Cost: $600,000
- Electric kW-hrs/yr: 42 million
- Natural Gas ccf/yr: 2 million ccf
- LP: 435,000 gallons/yr
- Peak KW: 5,700 (Commercial/Public)

Total Energy Consumption Per Yr

Grand Traverse Band

Breakdown of GTB Energy Use

Year 2005 (w/ 2008 adj)	Electric kW-hrs/yr	Electric Cost / Yr	Natural Gas CCF's/yr	Natural Gas Cost/yr	LP Gas Gal/yr	LP Gas Cost/yr	Total Cost	Percent
Peshawbestown (Commercial/Public)	5,891,286	$ 388,802	144,624	$ 173,549	834	$ 1,084	$ 563,434	9.3%
Peshawbestown Residential W	842,400	$ 75,816	98,150	$ 117,779	39,167	$ 54,834	$ 248,430	4.1%
Peshawbestown Residential E	770,400	$ 69,336	123,553	$ 148,263			$ 217,599	3.6%
Turtle Creek Casino (Comm/Public)	15,513,551	$ 1,035,664	376,024	$ 451,229	-	$ -	$ 1,486,893	24.5%
GT Resort & Spa	12,545,244	$ 878,167	528,570	$ 634,284			$ 1,512,451	25.0%
Traverse City (Commercial/Public)	453,760	$ 40,838	6,954	$ 8,345			$ 49,183	0.8%
Benzie (Admin)	60,585	$ 5,950			5,640	$ 7,896	$ 13,846	0.2%
Benzie (Residential)	381,600	$ 34,344	-	$ -	64,871	$ 90,819	$ 125,163	2.1%
Charlevoix (Admin)	30,560	$ 2,576			3,437	$ 4,812	$ 7,388	0.1%
Charlevoix (Residential)	266,400	$ 23,976	-	$ -	45,287	$ 63,402	$ 87,378	1.4%
Antrim (Residential)	187,200	$ 16,848	-	$ -	31,824	$ 44,553	$ 61,401	1.0%
Balance of Residential	5,745,600	$ 517,104	691,088	$ 829,306	244,184	$ 341,858	$ 1,688,268	27.9%
	42,688,586	$ 3,089,421	1,968,962	$ 2,362,755	435,245	$ 609,259	$ 6,061,436	100.0%

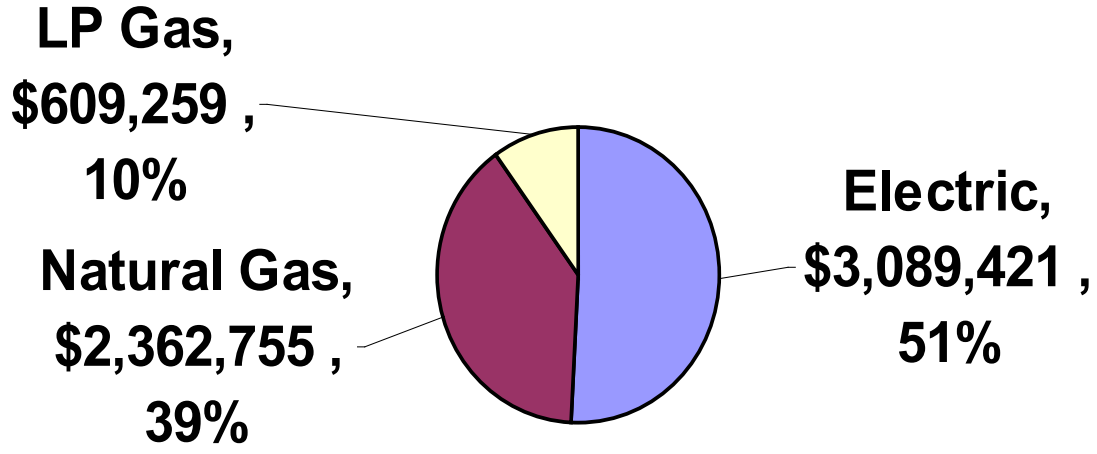
Energy Breakdown (With New Turtle Creek Casino)

GTB Energy Breakdown By Fuel Type (2008 Est.)

Total Cost per Year: $6,061,436

Public, Commercial & Residential

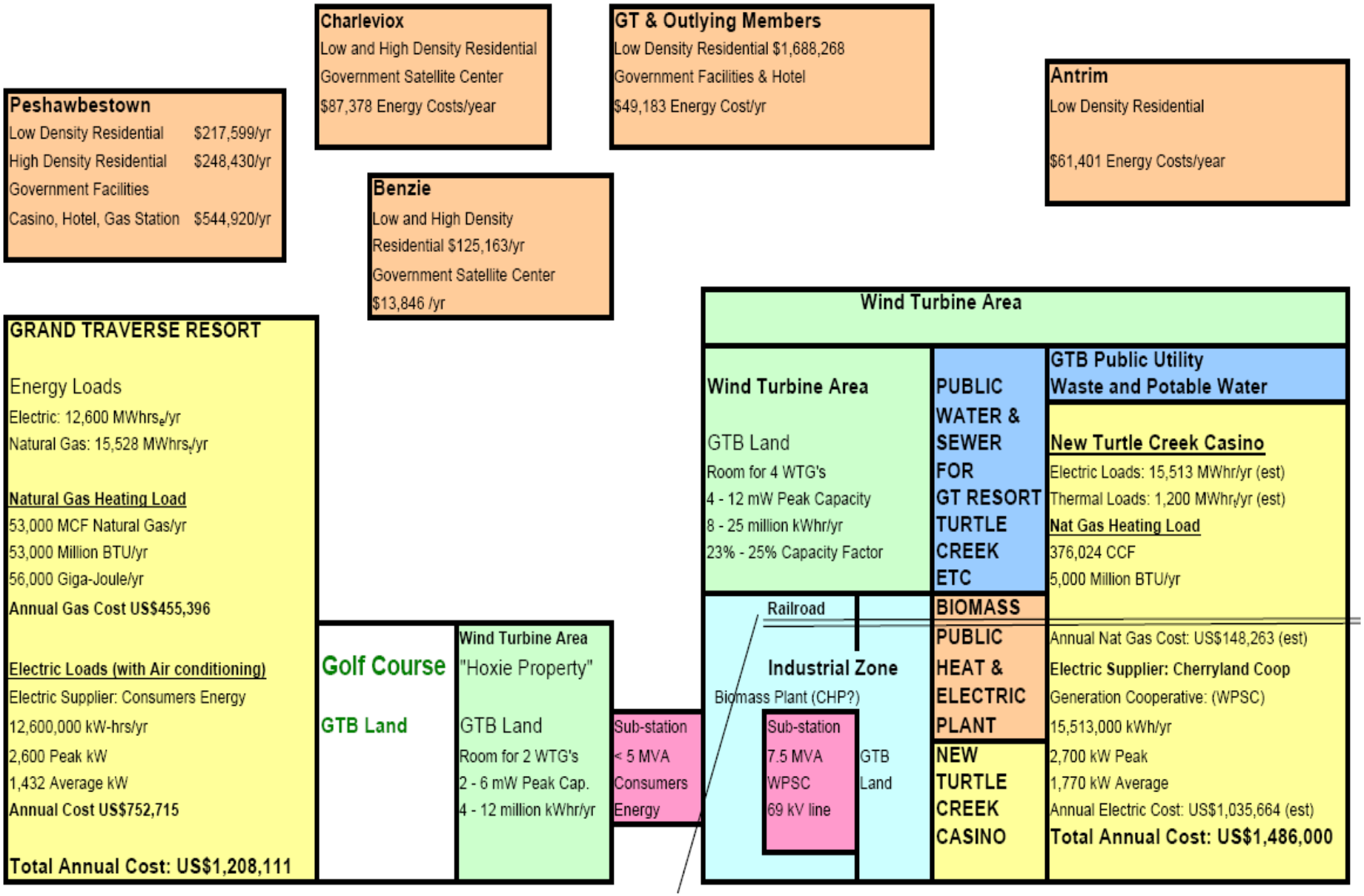
(Does not include wood heat)



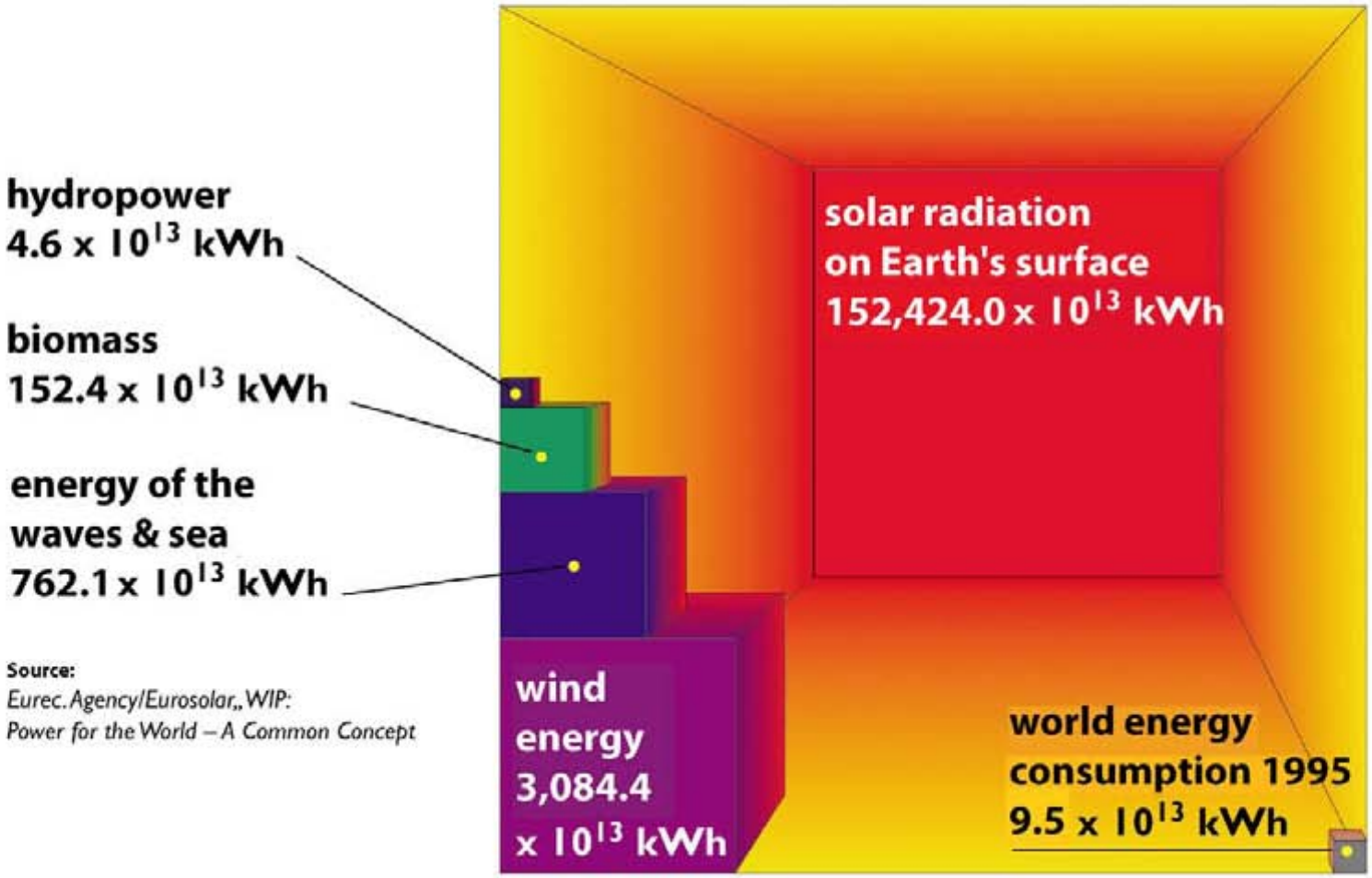
GRAND TRAVERSE BAND ENERGY PLANNING CHART

GTB STRATEGIC ENERGY PLANNING: GTB Department of Natural Resources

Question: How do we make GTB 100% renewable energy heated and powered?



The Potential of Renewable Energies Worldwide



Accomplishments:
Technology and Economic Evaluation

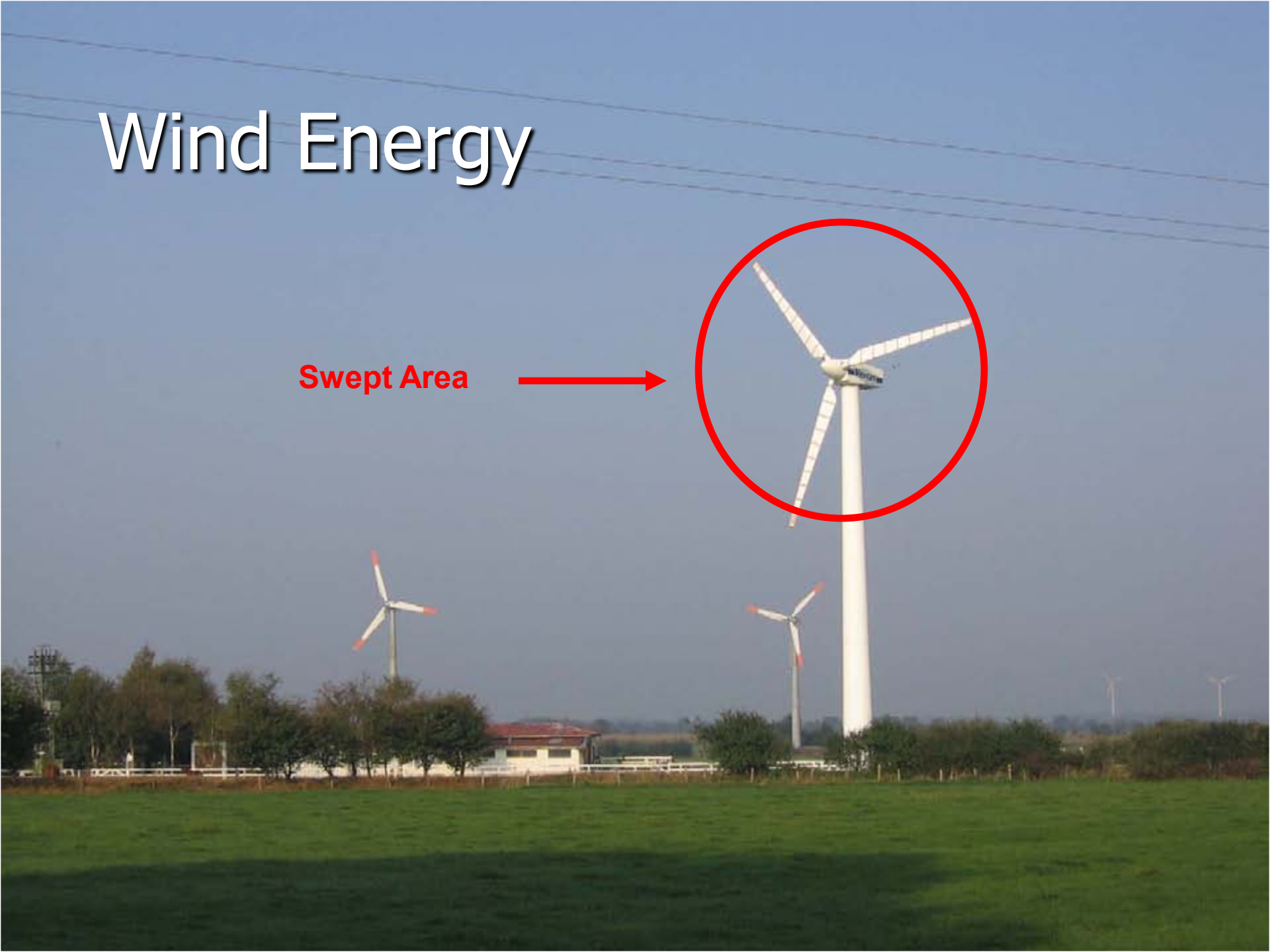
- Wind Power (small and large)
- Biomass (heat and power)
- Solar Thermal (hot water)
- Solar Electric (photovoltaic)

Wind Accomplishments

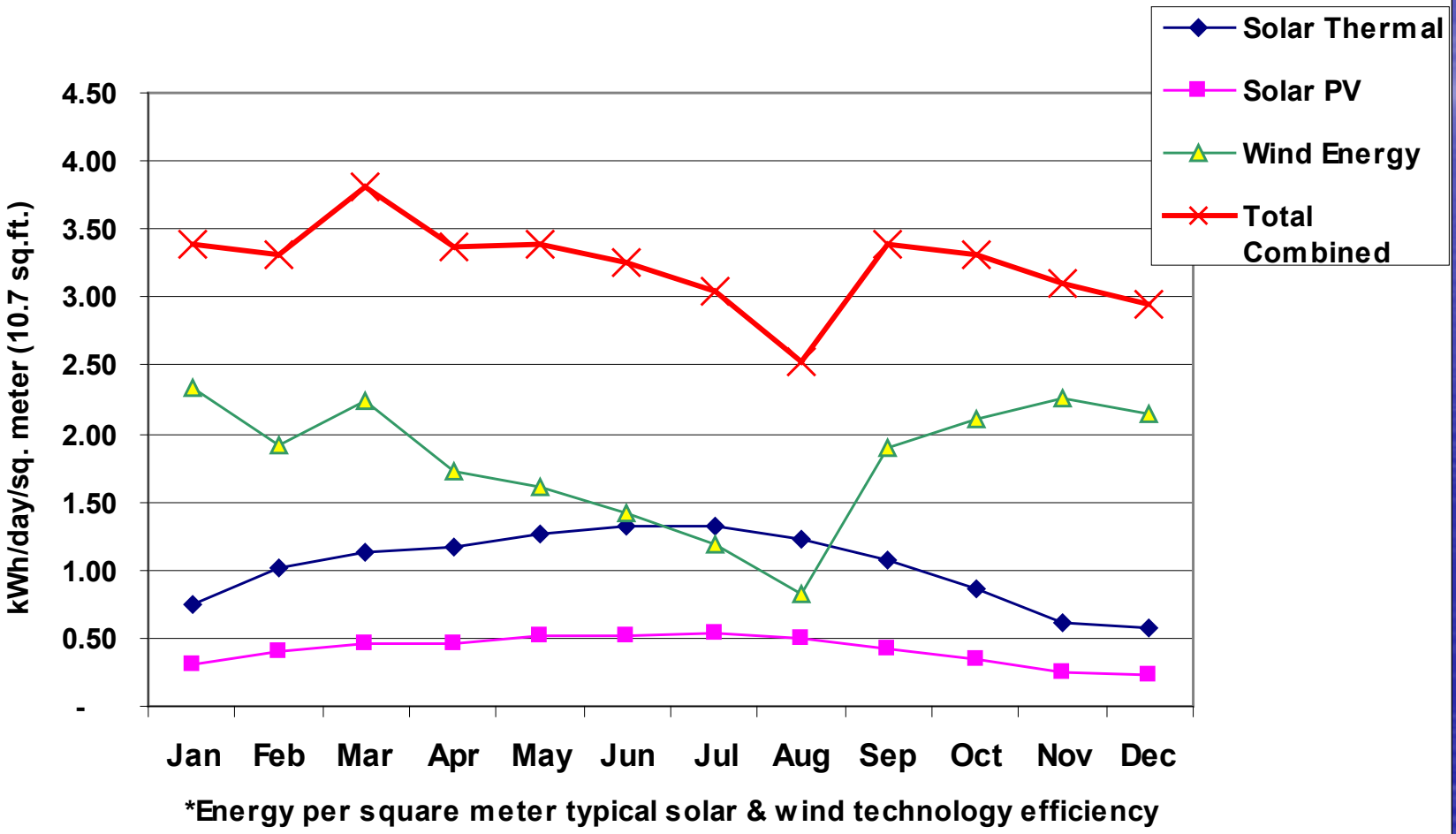
- MOU with Traverse City Light & Power
- Wind monitoring report completed on GTB GT Resort "Hoxie" property
- GT Resort wind data collection continuing for expanded data base and improved wind resource studies
- TCL&P monitoring in Long Lake Twp completed August 2007
- Resource & Economic Feasibility for wind power

50 Meter (164 ft.) Meteorological Towers

Wind Energy



GTB Wind & Solar Resources*

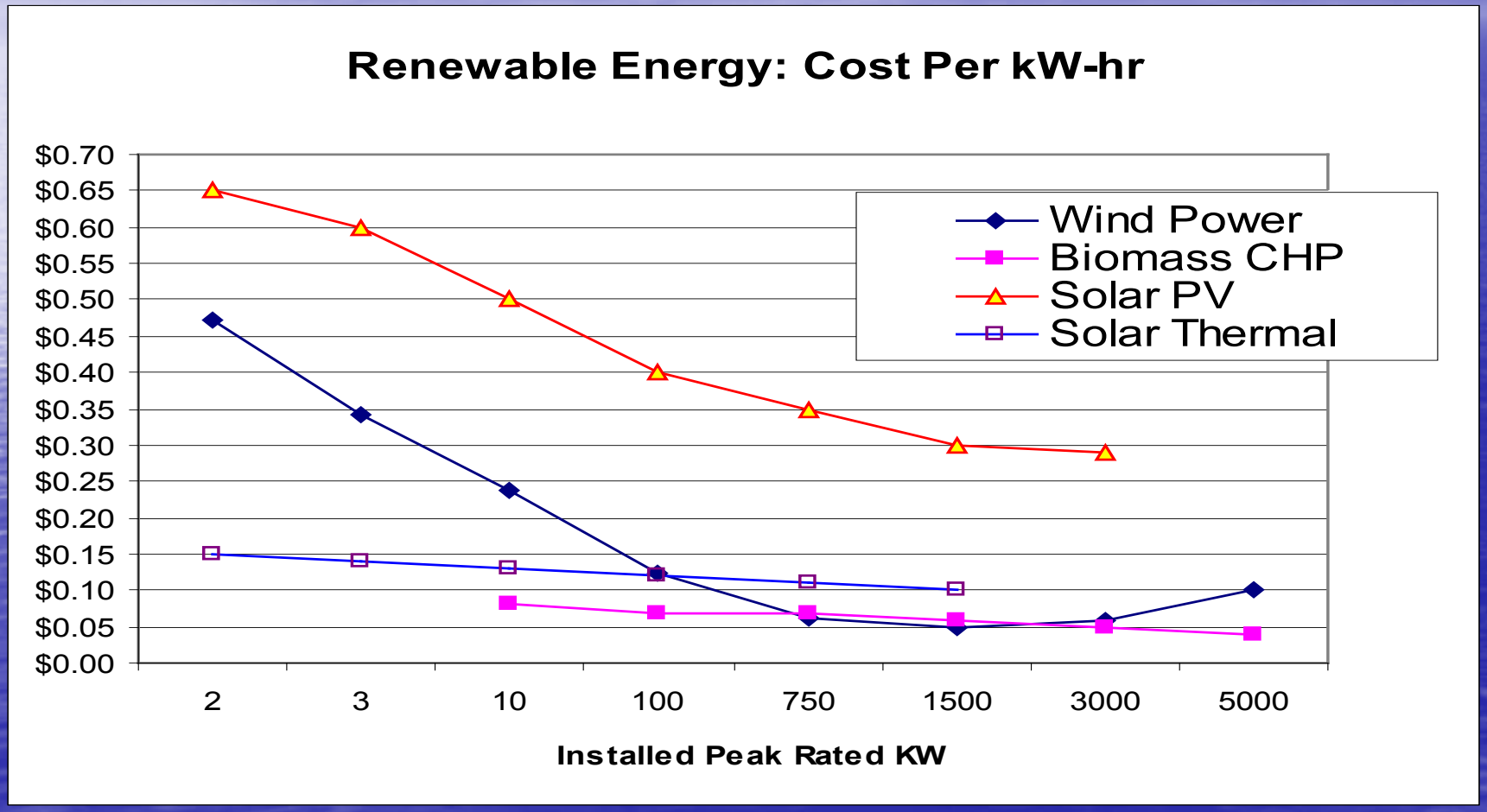


*Energy per square meter typical solar & wind technology efficiency

Energy Cost Comparison 2008
Ranked By Lowest to Highest

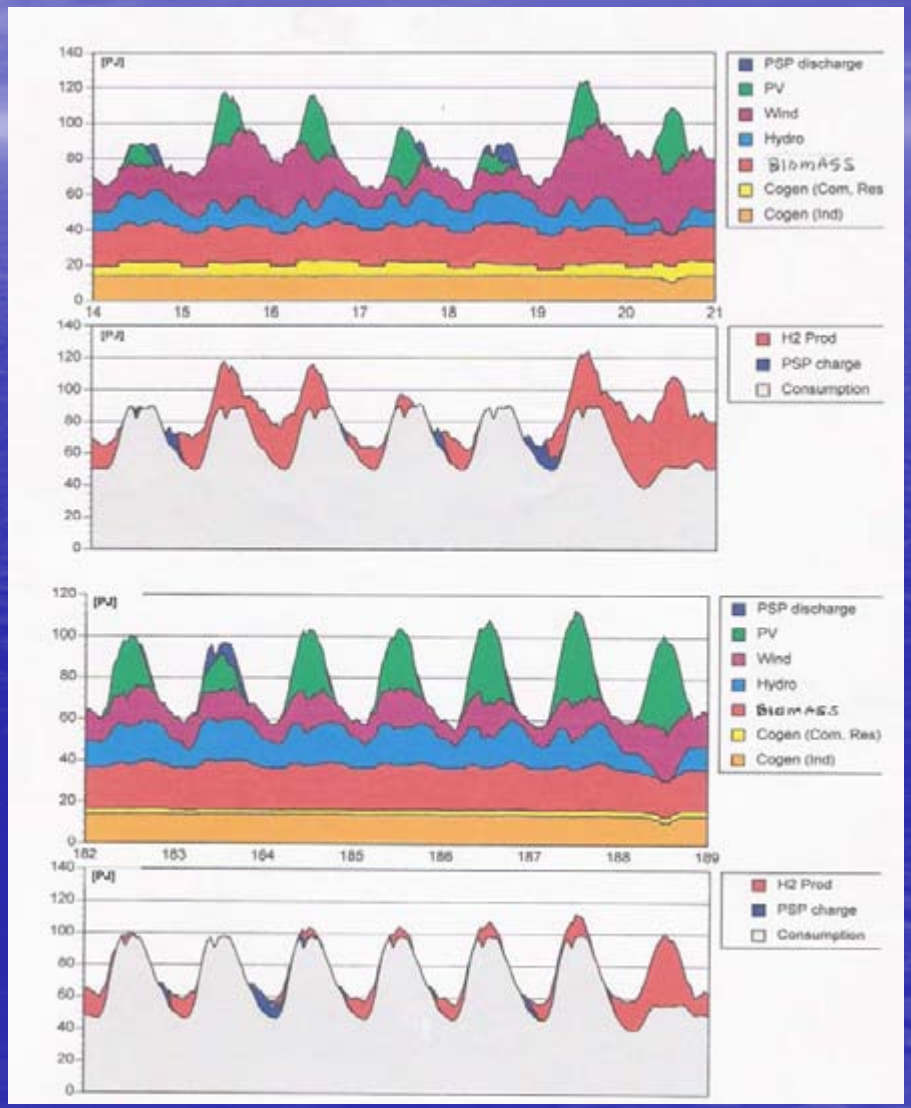
	Unit	Unit Cost	Energy Only Cost / kWh	All Costs / kW-hr	W / Enviro Costs/kWh
Efficiency /Passive Solar	**kW-hr**	**$ -**	**$ -**	**$ 0.03**	**$ 0.03**
Wood Chips	**US Ton**	**$ 26.00**	**$ 0.007**	**$ 0.03**	**$ 0.04**
Large Wind	**kW-hr**	**$ -**	**$ -**	**$ 0.06**	**$ 0.06**
Cord Wood	**Face Cord**	**$ 70.00**	**$ 0.065**	**$ 0.06**	**$ 0.07**
Dryed Cherry Pits or Pellets	**Ton**	**$ 200.00**	**$ 0.067**	**$ 0.08**	**$ 0.08**
Natural Gas CHP (electric)	CCF	$ 1.20	$ 0.055	$ 0.07	$ 0.09
Natural Gas CHP (heat)	CCF	$ 1.20	$ 0.055	$ 0.07	$ 0.09
Natural Gas Large	CCF	$ 1.20	$ 0.055	$ 0.08	$ 0.10
Natural Gas Res /Comm	CCF	$ 1.25	$ 0.057	$ 0.09	$ 0.11
Lg Commercial Grid Electricity	kW-hr	$ 0.070	$ 0.070	$ 0.09	$ 0.13
Solar Hot Water	**kW-hr**	**$ -**	**$ -**	**$ 0.15**	**$ 0.15**
Sm Commercial Electricity	kW-hr	$ 0.100	$ 0.100	$ 0.11	$ 0.15
Residential Electricity	kW-hr	$ 0.100	$ 0.100	$ 0.11	$ 0.15
LP Gas	Gallons	$ 2.50	$ 0.121	$ 0.14	$ 0.18
New Coal Fired Electricity	kW-hr	$ 0.170	$ 0.170	$ 0.17	$ 0.19
Gasoline	Gallons	$ 3.90	$ 0.160	$ 0.18	$ 0.22
Heating Oil	Gallons	$ 4.85	$ 0.162	$ 0.18	$ 0.23
New Atomic Electricity	kW-hr	$ 0.23	$ 0.230	$ 0.23	$ 0.25
Small Wind	**kW-hr**	**$ -**	**$ -**	**$ 0.28**	**$ 0.28**
Solar PV Electric	**kW-hr**	**$ -**	**$ -**	**$ 0.60**	**$ 0.60**

GTB RE Cost Comparisons



Integrated Renewables For GTB

- Integrating all the renewable energy sources such as wind, solar (thermal & electric), & biomass
- And enhancing them with efficiency, combined heat and power, and district heating systems
- And implementing them on a community basis--can meet our 100% renewable energy goal!



GT Resort Site - Large Wind

- Annual wind speed average at 50 m (164 ft)– 4.8 m/s (10.8 mph)
- Annual wind speed average at 100 m (328 ft) – 6.3 m/s (14 mph)

Energy Per Swept Area in kilowatt-hours per square meter per year

- Wind Turbine Annual kW-hrs/sq.meter/year 80 m – 719 kW-hrs/m^2/yr
- Wind Turbine Annual kW-hrs/sq.meter/year 100 m – 790 kW-hrs/m^2/yr

Reference Note:

- Existing TCLP V-44 600 kW-hrs/sq.meter/year – 522 kW-hrs/m2/yr
- Percent increase in energy for GT Resort 100m vs. V44 in Elmwood – 51%

Summary Financials 1 WTG

New Turtle Creek Wind Sites — PRO FORMA CASH FLOW PROJECTIONS — [illegible]

1 WTG

1500 kW — Net Wind Output [illegible]

ASSUMPTIONS — Rotor Dia 82 meter

			Cost/kW			
Total Cost:		$2,600,000	$1,733	Finance Term:	12	years
Debt	75%	$1,950,000		Interest Rate	7.00%	/year
Equity	25%	$650,000		Federal Tax	0%	per annum
Wind Power Purchase Electric Rate or Offset		$0.0650		Federal Incentive (10 yrs)	$0.0200	per kWh
Electric escalation rate		3.00%		Federal Tax Credit	$0.000	
Annual Output kWh/yr /WTG		3,788,711		O&M & REPI Escalation rate	2.00%	
Maintenance $/yr /WTG		24,000		Mgt. $/yr /WTG	$6,000	
All Risk Insurance/$100		$0.25		Utility/Sub. $/yr /WTG	$1,200	
All Pollution Emission Credits/kWh		$0.005		Land Rent/yr /WTG	$0	
				Local Property Tax	0.00%	

YEAR	2009	2010	2011	2012	2013	2014	2015	2016
	1	2	3	4	5	6	7	8
Price/kWh	0.0650	0.0663	0.0676	0.0690	0.0704	0.0718	0.0732	0.0747
Output/yr	3788711	3788711	3788711	3788711	3788711	3788711	3788711	3788711
Electric Sales Revenues	246266	251659	256680	261302	266426	271754	277189	282733
Fed Renewable Incentive Pmt.	75734	77249	78794	80370	81977	83617	85289	86995
All Emission Credits	18934	19312	19699	20092	20494	20904	21322	21749
GROSS INCOME	340,934	347,820	354,573	361,664	368,897	376,275	383,801	391,477
EXPENSES								
Land Rent	0	0	0	0	0	0	0	0
Management	6,000	6,120	6,242	6,367	6,495	6,624	6,757	6,892
Maintenance	24,000	24,480	24,970	25,469	25,978	26,498	27,028	27,568
Local Taxes	0	0	0	0	0	0	0	0
All-risk Insurance	4,875	4,973	5,072	5,173	5,277	5,382	5,490	5,600
Performance Insur.	0	0	0	0	0	0	0	0
Utility & Substation	1,200	1,224	1,248	1,273	1,299	1,325	1,351	1,378
TOTAL EXPENSES	36,075	36,797	37,532	38,283	39,049	39,830	40,626	41,439
NET REVENUE	304,729	310,824	317,040	323,381	329,849	336,445	343,174	350,038
Debt Service	245,509	245,509	245,509	245,509	245,509	245,509	245,509	245,509
Total Debt & O&M Expense	281,584	282,306	283,041	283,792	284,558	285,339	286,135	286,948
CASH FLOW	59,220	65,318	71,531	77,872	84,340	90,937	97,666	104,529
Debt Coverage Ratio	1.24	1.27	1.29	1.32	1.34	1.37	1.40	1.43
Cost kWh w/o REPI	$0.074	$0.075	$0.075	$0.075	$0.075	$0.075	$0.076	$0.076
Cost/kWh With REPI	$0.054	$0.054	$0.054	$0.054	$0.053	$0.053	$0.053	$0.053
Principal	109,009	116,639	124,804	133,541	142,888	152,891	163,593	175,044
Interest	136,500	128,869	120,705	111,968	102,620	92,618	81,916	70,464

FINANCIAL SUMMARY DATA — Single $2.6 Million WTG

BENEFIT/COST RATIO	1.66	
PV of Benefits w/REPI	$6,441,680	Net Present Value (25 yr)
PV of Costs	$3,874,554	$2,566,485
First year "Cash on Cash"	11.72% (net revenue/total cost)	
25 YR PRE-TAX IRR	18.02%	
NPV Electric Cost/kWh	$0.034	
Discount Rate	3.00%	

- $2.6 Million
- 3.7 Million/kwh/yr
- $.06 - $.07/kWh
- $.04 - $.05/kWh w/REPI
- NPV $2.5 million
- Levelized $.035/kWh
- IRR = 18%
- Benefit/Cost 1.6

Summary

Grand Traverse Band of Ottawa & Chippewa Indians
November 2008

Commercial Wind Power Project
Capital Cost: Range from $1.3 million to $28 million
Capital Cost: Single wind turbine (minimum recommendation) $1.3 million.

Capital Cost: To meet 100% net electric needs of the GT Resort/New Turtle Creek Casino with wind power:
Capital Cost: $18 million to displace $2 million annual electric cost and 28 million kW-hrs per year.
Capital Cost: To account for 100% of GTB commercial, public and residential electric use of $3 million with wind power - $28 million.

Accomplishments:

Biomass

- Extensive Biomass Energy Evaluation

Why Burn Wood? Biomass is:

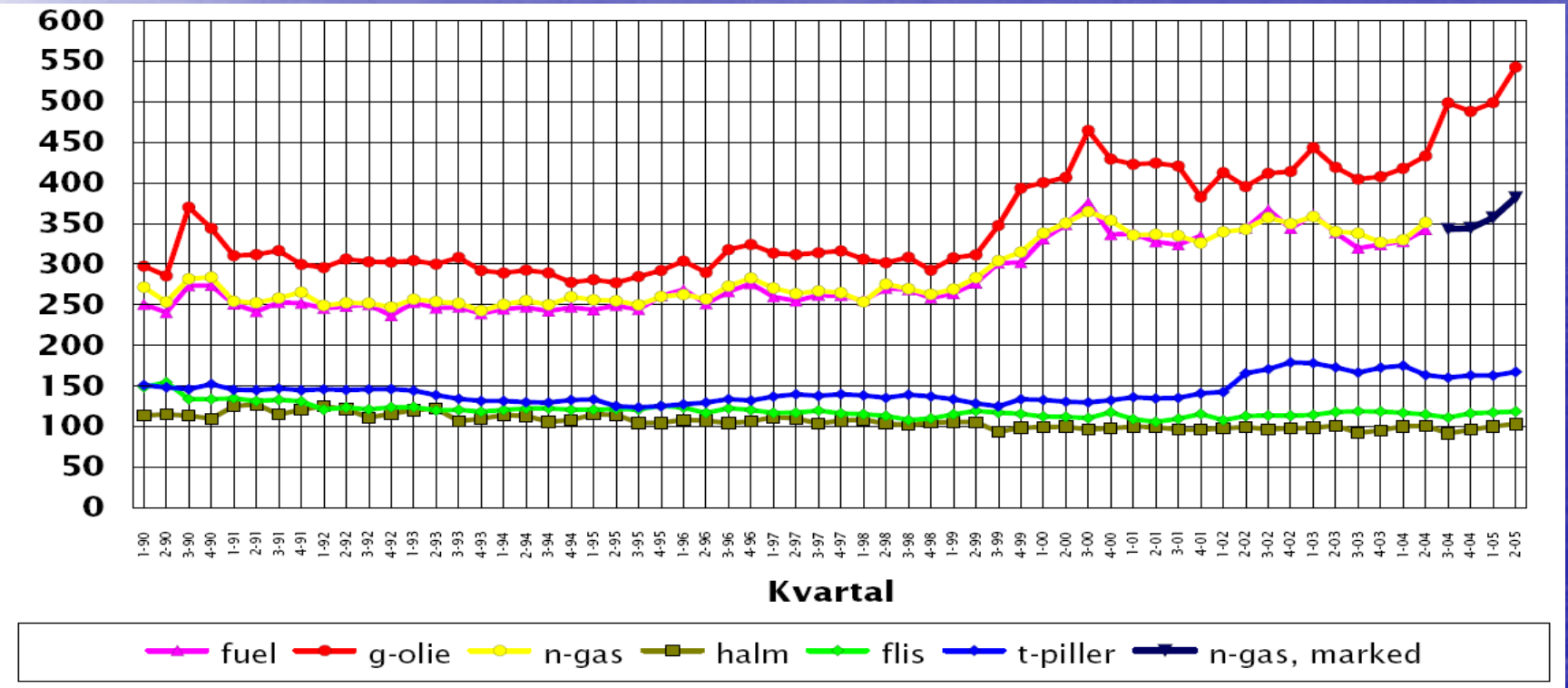
- Humanity's Oldest Fuel
- Locally Available
- Often a Waste Product
- Can Be Low Cost
- Low In Sulfur, Nitrogen, Mercury and Other Pollutants
- Carbon Dioxide Neutral
- **A Renewable Resource**
- **Low Cost Fuel $20/ton ($2 vs $10 per MMBTU**

Biomass Fuel Supply

- Wood chips (MC 35 – 50%)
- Well established market for delivery with 30 – 40 tons per truck
- Cost: $18 - $26 per ton ($2 - $3 / MMBTU)
- Need to ensure good forestry practice and sustainable utilization
- Supply 10 X GTB needs….

Biomass: Local, sustainable, renewable, clean, and efficient with the appropriate type & scale.

Biomass Prices: Stable prices with a competitive market (courtesy of Force Technologies: A. Evald)



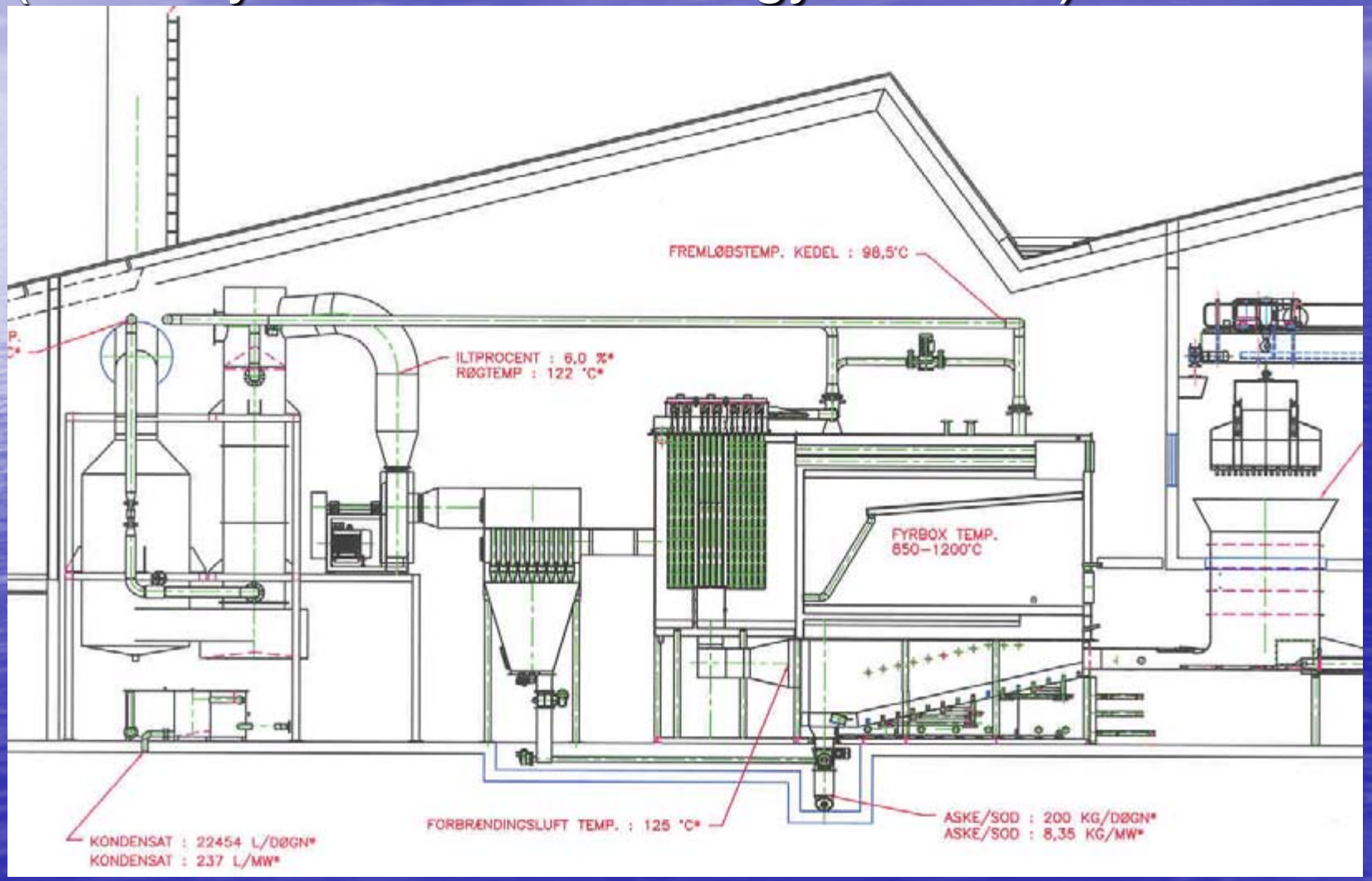
Medium Scale Biomass Supply Options (Sustainable!)

- Wood lot improvement whole tree chips
- Straw
- Pellets
- Farm Wood Mill Waste
- Other (clean waste, cherry pits, corn..)

Larger Scale District Heating Plants (Denmark)

Wood Chip Biomass Heat Plant

(courtesy of Force Technology A. Evald)



Central Michigan University Biomass Heat and Electric Plant

CMU Biomass Combined Heat & Power (CHP) District Heat System

District Heat Distribution System

- Buried Supply and Return Pipelines
- Pre-Insulated Twin-Pipe
- Use Sidewalks and Some Roads
- Individually Metered

Photo courtesy of Force Technology

Residential Connection

Photo courtesy of Force Technology

Biomass District Heat Study Options

- Peshawbestown (West & East)
- Charlevoix
- Benzie
- GT Resort, New Turtle Creek, New Acme

Preliminary Residential Biomass Feasibility

- Up to 100 homes in district
- $16,676 per home
- 100% wood space & hot water heat
- 12 year simple payback
- Added O&M savings, social & environmental benefits

Peshawbestown District Heating Loop

COST ESTIMATE

	BUDGET
HURST HOT WATER BOILER, 600 GPM ~ 130F IN TO 180 F OUT	$411,825.00
FREIGHT TO JOBSITE	$25,000.00
FOUNDATION	$9,000.00
FIELD ERECTION	$125,000.00
START-UP & OPERATOR TRAINING	$9,500.00
FUEL HANDLING	$95,904.00
OPTIONAL EQUIPMENT	$62,909.00
TOTAL BOILER COST, INSTALLED AND RUNNING	**$739,138.00 BUDGET**

$525.00 AIR HANDLING UNIT COST
$200.00 AIR HANDLING UNIT INSTALLATION---GUESS ONLY
$725.00 TOTAL COST PER INSTALLED AIR HANDLING UNIT
120.00 AIR HANDLERS REQUIRED
$87,000.00 TOTAL AIR HANDLING UNITS COST — BUDGET

PIPING COST

$650,000.00 PLACE HOLDER ONLY. NEED SITE SPECIFIC DETAILS ON INSTALLATION. — BUDGET

ENGINEERING AND PROJECT MANAGEMENT

$200,000.00 PLACE HOLDER ONLY — BUDGET

TOTAL INSTALLED COST

$1,676,138.00 — BUDGET

WOOD FUEL COST

4500 BTU/LB WOOD HEAT CONTENT
4350 POUNDS PER HOUR OF WOOD REQUIRED
2.175 TONS PER HOUR OF WOOD CHIPPED AND DELIVERED
$18.00 DOLLARS PER TON FUEL COST
$39.15 FUEL COST PER HOUR FOR 120 HOMES
$0.200 PER THERM WOOD FUEL COST

NATURAL GAS FUEL COST

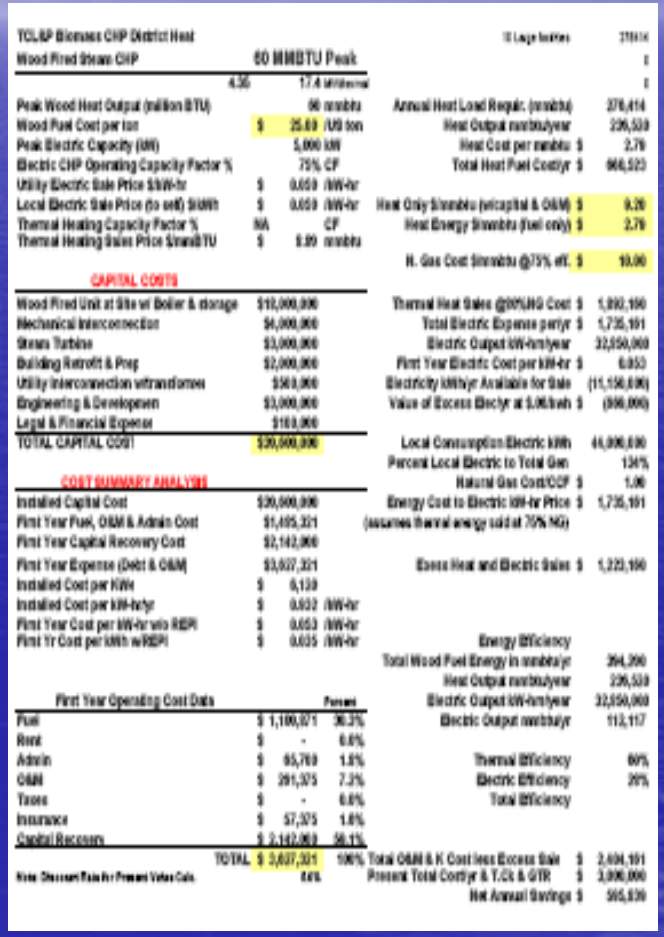
80,000 BTUH PER HOUSEHOLD
0.8 THERMS PER HOUSEHOLD
$1.20 PER THERM NATURAL GAS COST
100 HOMES
85.00% NATURAL GAS FURNACE EFFICIENCY
$112.94 FUEL COST PER HOUR FOR 120 HOMES

New Turtle Creek & GT Resort District Heat 5 MW electric, with TCL&P Cooperation

$25 Million Capital Cost

$.04 - $.05 / kWh

$8.50 / MMBTU



TCL&P Biomass CHP District Heat
Wood Fired Steam CHP — 60 MMBTU Peak

Peak Wood Heat Output (million BTU)	60	mmbtu
Wood Fuel Cost per ton	$ 25.00	/US ton
Peak Electric Capacity (kW)	5,000	kW
Electric CHP Operating Capacity Factor %	75%	CF
Utility Electric Sale Price $/kW-hr	$ 0.050	/kW-hr
Local Electric Sale Price (to self) $/kWh	$ 0.050	/kW-hr
Thermal Heating Capacity Factor %	NA	CF
Thermal Heating Sales Price $/mmBTU	$ 9.00	mmbtu

CAPITAL COSTS

Wood Fired Unit at Site w/ Boiler & storage	$12,000,000
Mechanical Interconnection	$4,000,000
Steam Turbine	$3,000,000
Building Retrofit & Prep	$2,000,000
Utility Interconnection w/transformers	$500,000
Engineering & Developemen	$3,000,000
Legal & Financial Expense	$100,000
TOTAL CAPITAL COST	$30,600,000

COST SUMMARY ANALYSIS

Installed Capital Cost	$30,600,000	
First Year Fuel, O&M & Admin Cost	$1,695,321	
First Year Capital Recovery Cost	$2,142,000	
First Year Expense (Debt & O&M)	$3,837,321	
Installed Cost per KWe	$ 6,120	
Installed Cost per kW-hr/yr	$ 0.612	/kW-hr
First Year Cost per kW-hr w/o REPI	$ 0.053	/kW-hr
First Yr Cost per kWh w/REPI	$ 0.035	/kW-hr

First Year Operating Cost Data		Percent
Fuel	$ 1,100,321	28.7%
Rent	$ -	0.0%
Admin	$ 95,769	1.5%
O&M	$ 291,375	7.3%
Taxes	$ -	0.0%
Insurance	$ 57,375	1.5%
Capital Recovery	$ 2,142,000	56.1%
TOTAL	$ 3,837,321	100%
Note: Discount Rate for Present Value Calc.	6.0%	

Annual Heat Load Requir. (mmbtu)		376,414
Heat Output mmbtu/year		226,520
Heat Cost per mmbtu	$	2.70
Total Heat Fuel Cost/yr	$	968,523
Heat Only $/mmbtu (w/capital & O&M)	$	9.26
Heat Energy $/mmbtu (fuel only)	$	2.70
N. Gas Cost $/mmbtu @75% eff.	$	10.00
Thermal Heat Sales @90%HG Cost	$	1,892,190
Total Electric Expense per/yr	$	1,735,191
Electric Output kW-hrs/year		32,850,000
First Year Electric Cost per kW-hr	$	0.053
Electricity kW/hr Available for Sale		(11,156,810)
Value of Excess Elec/yr at $.06/kwh	$	(669,000)
Local Consumption Electric kWh		46,006,810
Percent Local Electric to Total Gen		134%
Natural Gas Cost/CCF	$	1.00
Energy Cost to Electric kW-hr Price	$	1,735,191
(assumes thermal energy sold at 70% NG)		
Excess Heat and Electric Sales	$	1,223,190
Energy Efficiency		
Total Wood Fuel Energy in mmbtu/yr		364,200
Heat Output mmbtu/year		226,520
Electric Output kW-hrs/year		32,850,000
Electric Output mmbtu/yr		113,117
Thermal Efficiency		60%
Electric Efficiency		29%
Total Efficiency		
Total O&M & K Cost less Excess Sale	$	2,604,191
Present Total Cost/yr & T.Ck & GTR	$	3,000,000
Net Annual Savings	$	565,839

Solar Thermal

- Small systems for each home and building
- Large commercial systems for casino, hotels, public institutions, residential districts, resorts, etc.
- A large solar thermal system can provide most of the domestic hot water and process water (cleaning, etc.) to displace natural gas and summer peak electricity
- Cost: Less than $.15 / kWh energy depending on subsidies, etc.

Solar Thermal: Just face south without shade!

Solar (thermal) hot water

Solar electric (photovoltaics): Peak power when we need it.

- Off Grid
- Hybrid Grid
- Direct interconnec
- Net metering

Solar Electric (photovoltaic)

- Small and large systems: 1 kW to 1000 kW +
- Home, commercial and public applications based on the solar resource
- Most expensive, but most reliable electric power source
- Cost: $.40 to $.60 / kWh depending on incentives and scale

GTB: 100% Solar Electric Technology & Energy Resources

- Solar irradiation per year on one acre: 4.87 Million kW-hrs/yr (assumes 1,200 kWhrs/yr/m2)
- To meet 100% Net Annual 42 Million kW-hrs/yr Electric Consumption with Solar PV:
  - Acres Required with 50% PV land coverage and 14% efficient solar PV: = **124 acres**

Accomplishments (cont)

- Energy Efficiency Review

Total Tribal non-residential cost of energy $2 million +

10% - 20% potential savings $200,000 to $400,000 per year
suggest investment of $1 to $2 million easily justified

Top measures to consider:

- Lighting upgrades: T8's, controls, CFL's, LED's
- HVAC system retrofits

Accomplishments (cont)

- Outreach to Tribal Members & Outside Community
- Articles in GTB newsletter, local newspaper, community forum
- Educational Brochure: "The Path to Energy Sovereignty"

Accomplishments (cont)

- Power Market Assessment
- Transmission & Interconnection Discussions with Local Utilities

Technical Issues

Power Market Assessment

- Small scale: net metering
- GTB Self-supply
- TCL&P & MPPA green power supply
- Wolverine Power (Cherryland), CE, etc.
- Renewable Energy Production Incentive Payment (REPI) 10 yr - 2 cents/kW-hr
- Carbon credits, green tags, Native Energy
- Other markets…

Accomplishments (cont)

- Environmental Evaluation
- Benefit Assessment
- Preliminary System Design
- Long-Term O&M Plan
- Business & Organizational Planning
- Financing Plan

Future Plans

- Council guidance on what, where & when
- GTB energy organization?
- Set policy for:
  - Homes: Solar thermal, solar PV, small district heat, energy efficiency services
  - Government: Larger scale biomass district heat, solar PV, wind power, efficiency
  - Commercial: Large wind power, solar, biomass district heat. Begin wind permitting at GT Resort?
  - Economic Development: Commercial wind power, regional biomass district heat

Thank you!

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