Grand Traverse Band of Ottawa and Chippewa Indians

Renewable Energy & Energy Efficiency Feasibility Study

DOE Tribal Energy Forum

October 25, 2006

Grand Traverse Band

- 3,988 Members
- 2,370 Acres – Checkerboard
- Six-County Service Area
- EDC: 2 Casinos, Resort (424 Rooms), Gas Station, etc.
- Gov't: Administration, Housing, Medicine Lodge, Strong Heart Center, Day Care, etc.

Grand Traverse Resort and Spa

GTB Energy Demand

- Total Cost: $2.24 million/yr
- Electric Cost: $1.6 million/yr
- Natural Gas Cost: $570,000/yr
- LP Gas Cost: $70,000
- Electric kW-hrs/yr: 24 million
- Natural Gas ccf/yr: 700,000 ccf
- LP: 60,000 gallons/yr
- Peak KW: 3,600

GTB Energy Vision & Plan

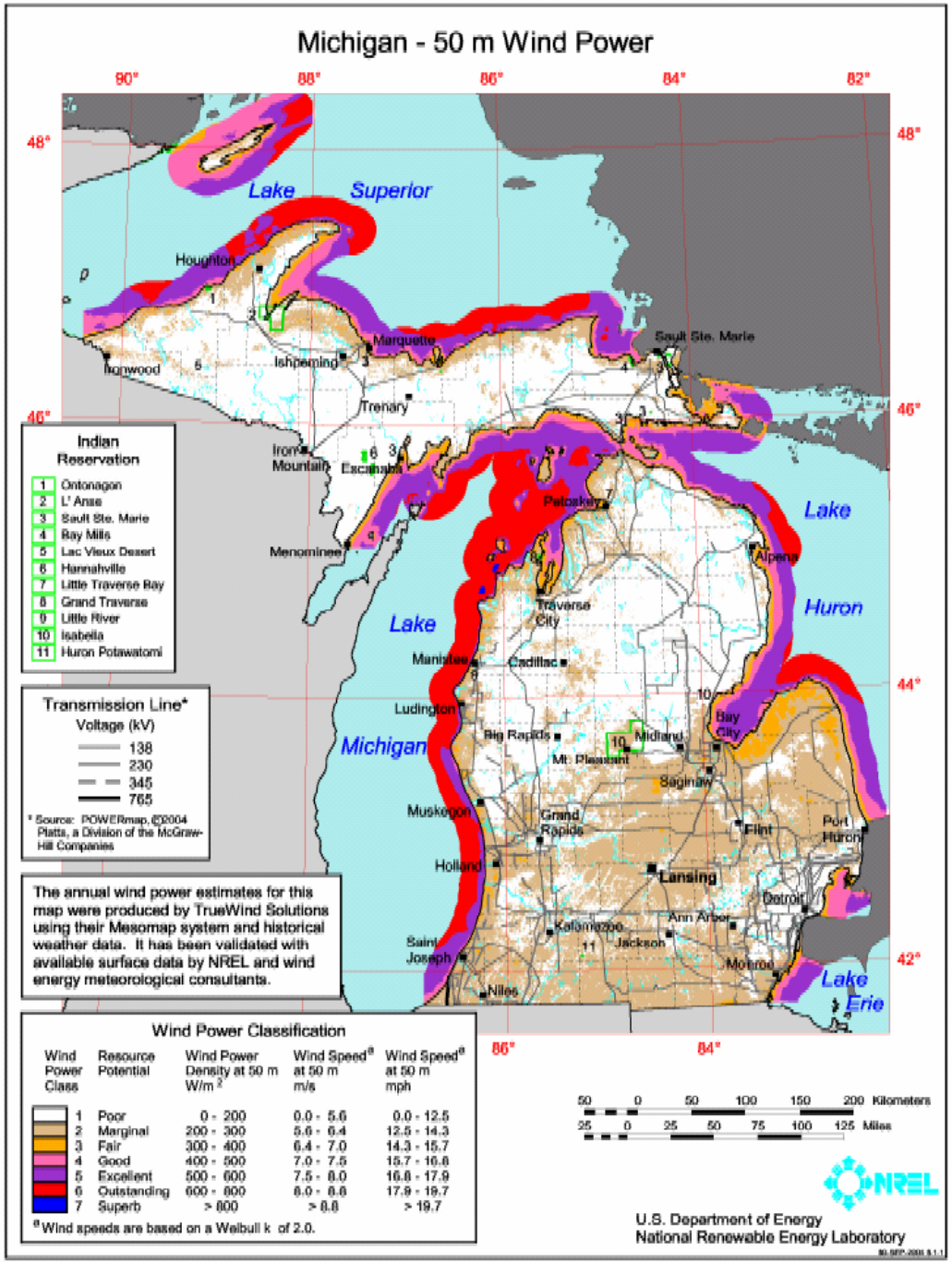
Three Focus Areas:

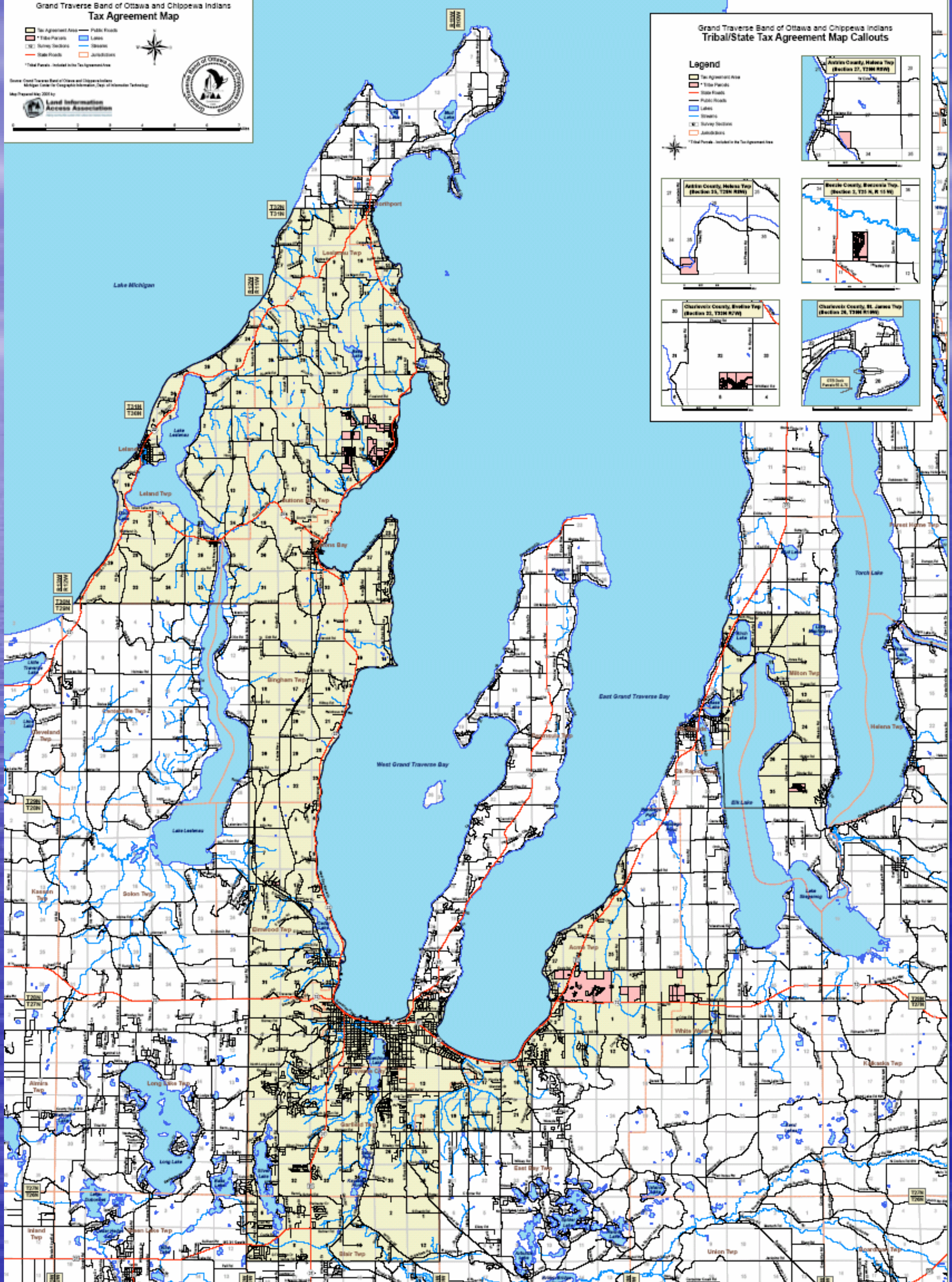
- Energy Diversity
- Environmental Quality
- Economic Benefits

Adopted 1/26/05

Action Plan

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


Michigan - 50 m Wind Power
90°
88°
86°
84°
82°
48°
46°
44°
42°
Lake Superior
Houghton
Marquette
Sault Ste. Marie
Ironwood
Ishpeming
Trenary
Iron Mountain
Escanaba
Menominee
Petoskey
Alpena
Lake Huron
Traverse City
Lake Michigan
Manistee
Cadillac
Ludington
Bay City
Big Rapids
Midland
Mt. Pleasant
Saginaw
Muskegon
Grand Rapids
Flint
Port Huron
Holland
Lansing
Detroit
Kalamazoo
Ann Arbor
Jackson
Saint Joseph
Monroe
Niles
Lake Erie
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
Tax Agreement Area
* Tribe Parcels
Survey Sections
State Roads
Public Roads
Lakes
Streams
Jurisdictions
Land Information Access Association
Grand Traverse Band of Ottawa and Chippewa Indians
Tribal/State Tax Agreement Map Callouts
Legend
Lake Michigan
West Grand Traverse Bay
East Grand Traverse Bay
Torch Lake

Project Participants

- Project Director – Andy Knott
- Principal Investigator – Steve Smiley
- Project Advisor – Bob Gough

Project Partnership

Traverse City Light & Power (TCLP)

MOU between GTB and TCLP

Sharing wind energy monitoring and evaluation

Sharing electric utility expertise

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.

Technology Assessments - Options

- Solar (thermal and electric)
- Biomass (thermal and electric CHP)
- Wind (small and large)
- Energy efficiency
- Other

Feasibility Study Project Activities

- Energy Load Assessments
- Review Energy Efficiency Potential
- Power Market Assessment
- Site Specific Resource Monitoring
- Transmission and Interconnection Studies
- Technology Analysis
- Economic Analysis

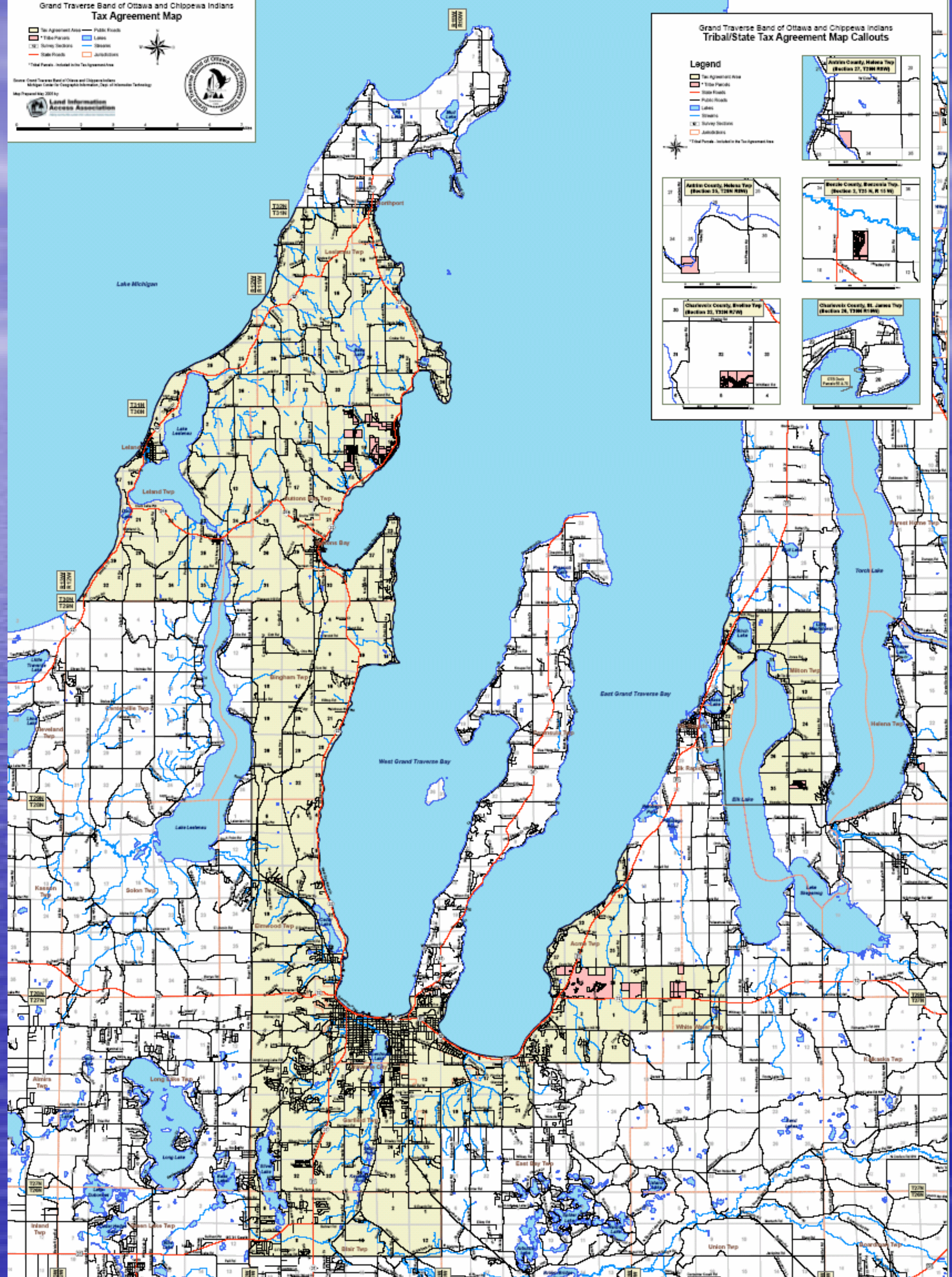
Feasibility Study Project Activities (cont)

- Environmental Evaluation
- Benefit Assessment
- Preliminary System Designs
- Community Awareness/Support Activities
- Long-Term O&M Plan
- Business and Organizational Planning
- Financing Plan

Accomplishments

- MOU with Traverse City Light & Power
- Wind monitoring underway (May 2006)

50 Meter (164 ft.) Meteorological Towers



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
Lake Michigan
West Grand Traverse Bay
East Grand Traverse Bay
Torch Lake
Lake Leelanau

Accomplishments (cont)

- Outreach to Tribal Members & Outside Community
  - Articles in GTB newsletter, local newspaper, community forum
- Load Assessment Completed
- Extensive Biomass Evaluation

Accmplishments (cont)

- Energy Efficiency Reviews Mostly Complete

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)

- Technology and Economic Evaluation Underway
- Power Market Assessment Underway
- Transmission & Interconnection Discussions with Local Utilities

Future Study Activities

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

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...

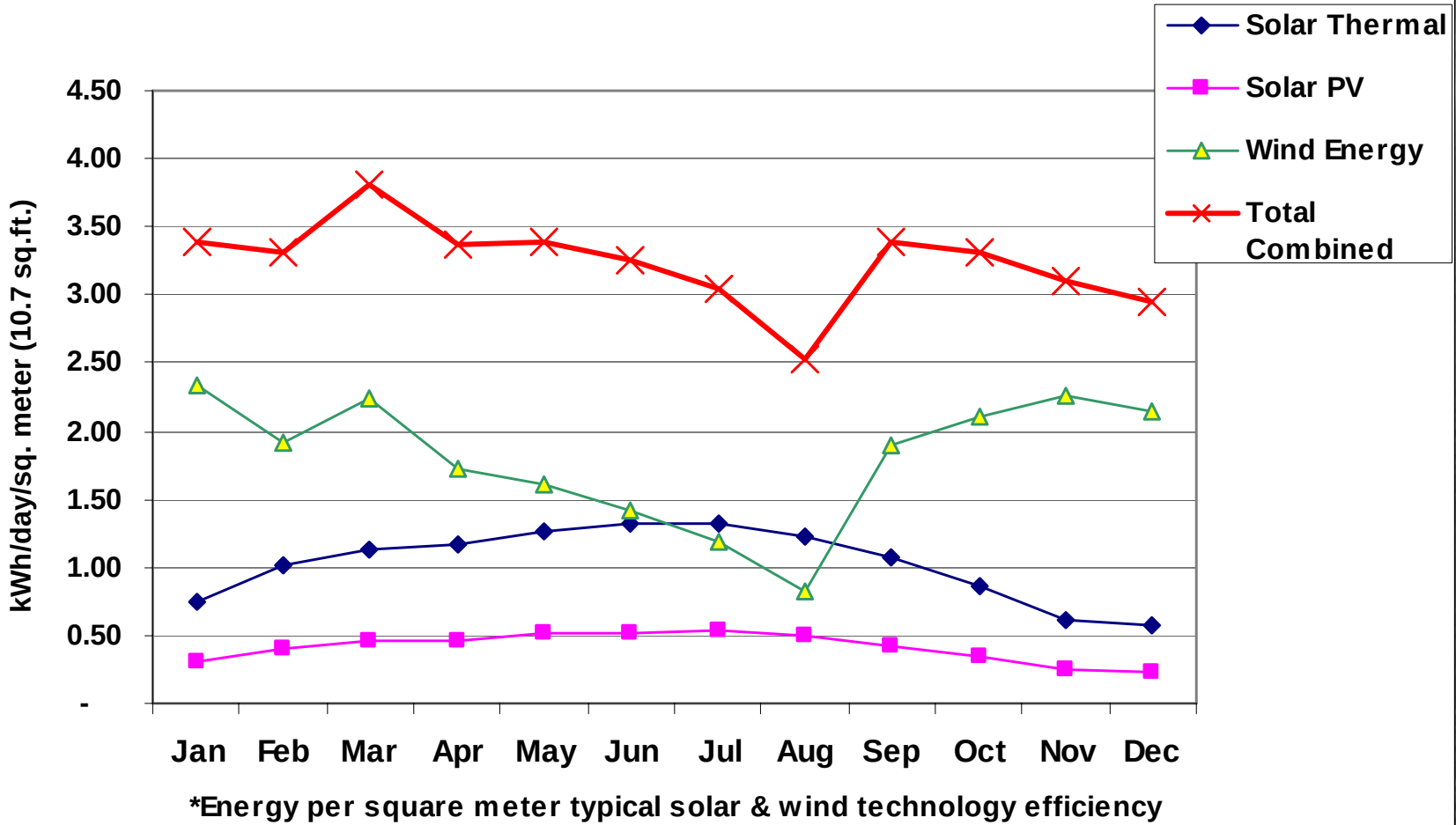
Site Specific Resource Monitoring

- Comprehensive site survey of all GTB properties underway
- Review of existing data: solar, wind, biomass
- On-site wind resource monitoring, and preparation of a regional GTB wind map
- Wind data sharing with TCL&P
- Survey of biomass resources
- Survey of solar resources

GTB Renewable Energy Options for Integration

- 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

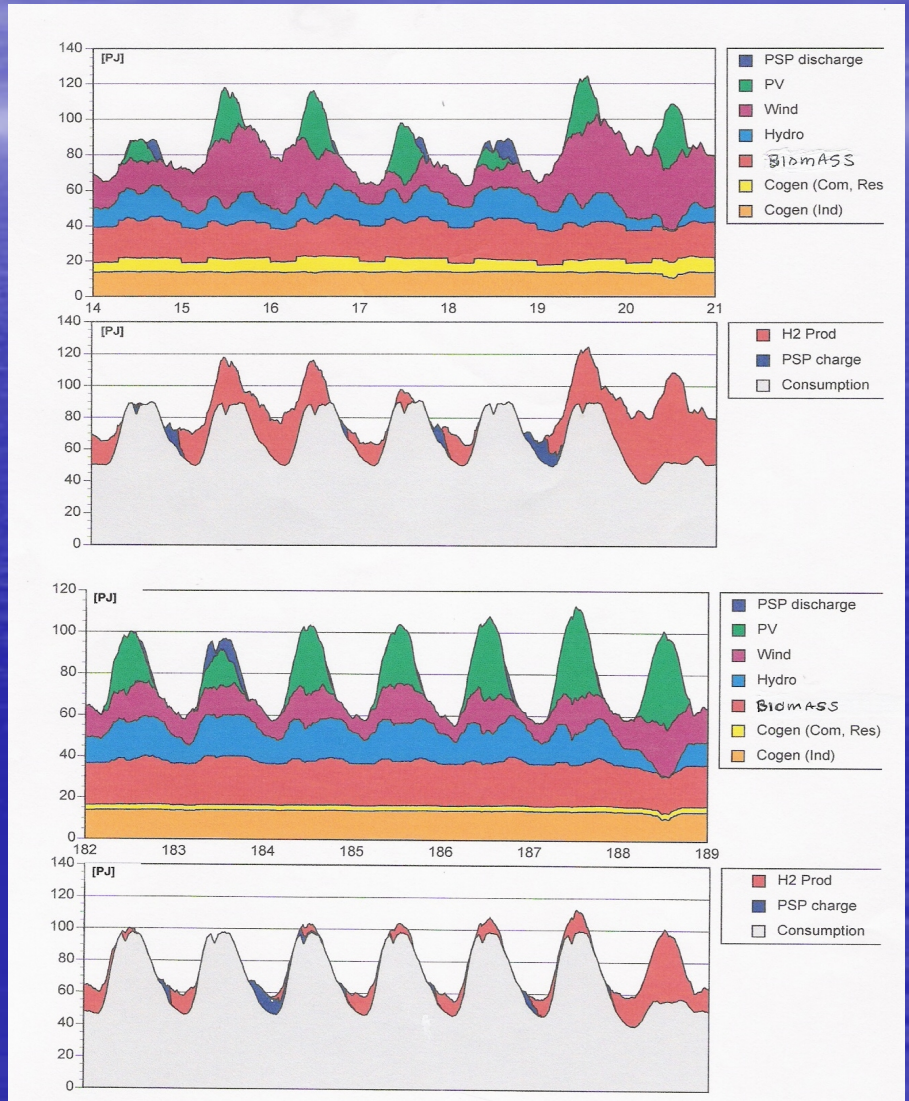
GTB Wind & Solar Resources*



*Energy per square meter typical solar & wind technology efficiency

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!



Commercial Scale Biomass District Heating

- 14 Million BTU Unit (Turtle Creek Casino, housing district, etc.)
  - $825,000 Installed
  - Fuel Cost: $2.80 per million BTU (mmbtu)
  - Total Capital, O&M & fuel cost: $5.00/ mmbtu
  - Present cost of natural gas or propane is greater than: $12/ mmbtu

Biomass District Heat System Studies

- Peshawbestown (Residential & Commercial)
- GT Resort & Turtle Creek
- Benzie
- Charlevoix

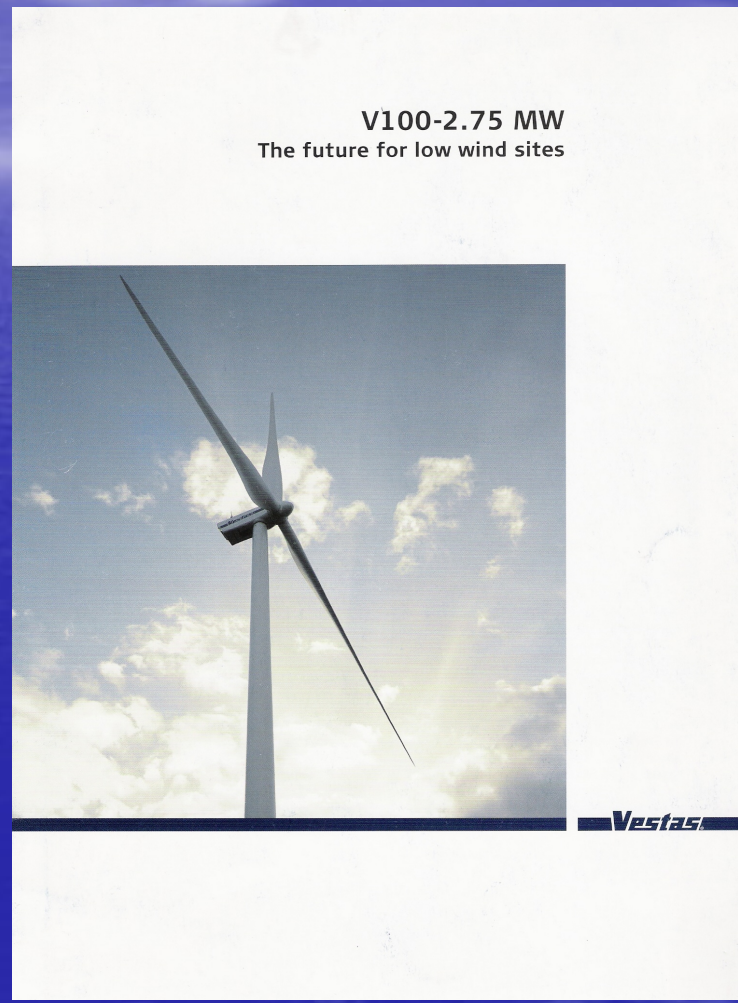
Wind Power Feasibility Studies

- 50 m Wind Monitoring Towers @ GT Resort & Long Lake – Section 2 (May ’06 & August ’06)
- Wind mapping & feasibility for all GTB regions including:
  - GT Resort & Turtle Creek
  - Charlevoix
  - Peshawbestown
  - Benzie
  - Antrim
  - Beaver Island

Wind Turbine Financial Assumptions

Wind Turbine Installed Cost
Vestas: V-100 2.75 mW

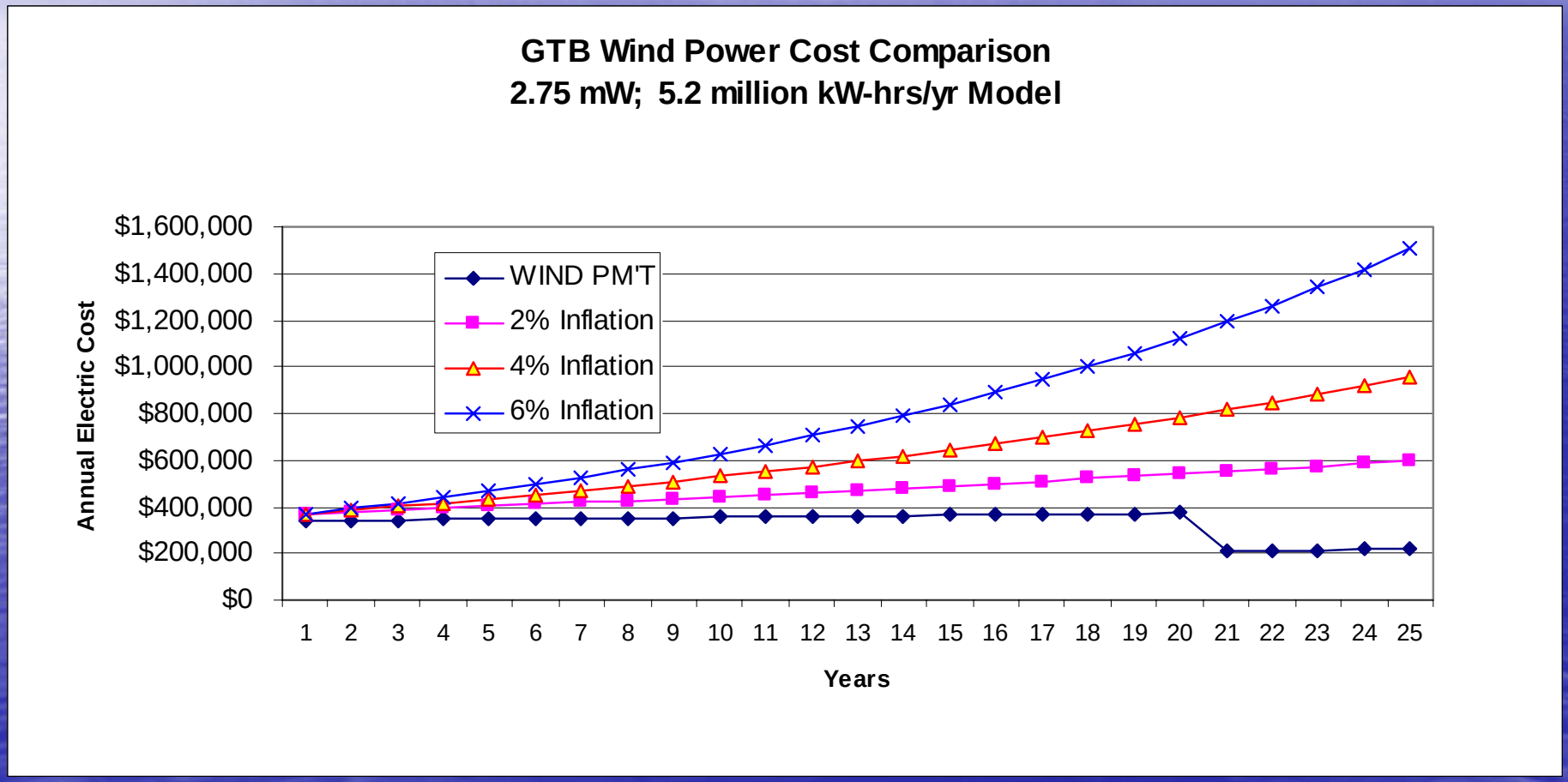
Wind Turbine (without tower)	$2,250,000
80 meter tower	$450,000
Foundation	$200,000
Electrical	$50,000
Installation	$175,000
Shipping	$250,000
Engineering & Site Design	$75,000
Development: (legal, financing, permitting, etc.)	$50,000
	$3,500,000
Annual Service & Warranty Package	$30,000



Wind Power Economics for Sample Large Wind Turbine

- Total Installed Cost: $3.8 million
- Annual Revenues: $450,000
- Annual O&M Expenses: $40,000
- Annual Electric Generation: 5 million kWhrs
- Lifetime: 20 – 25 years

One Large Wind Turbine: 25 year net revenues of between $4 and $12 million



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!