Options

1. Continue to Operate the plant “as is”
2. New Generation
3. Improve Plant Efficiency
4. Wind
5. Gasification
6. Biomass-wood chips
7. Biomass-processed wood
8. PRB Conversion
9. Purchase full requirements energy

Continue As Is

Benefits

- reliable power from local source
- continuation of existing jobs
- plant maintenance and upgrade contracts typically awarded to local businesses
- local control

Disadvantages

- limited to 25MW base load capacity
- relatively high cost

Build A New Coal-Fired Generation Plant

- This option is not cost effective for the City of Escanaba
- Too Expensive ~$95/MWh
- Partner(s) needed for economies of scale

Construction costs:

60Mw CFB	150MwCFB	300MwCFB
$293M	$514M	$785M
$4883/kW	$3427/kW	$2617/kW

Improve Plant Efficiency

Benefits

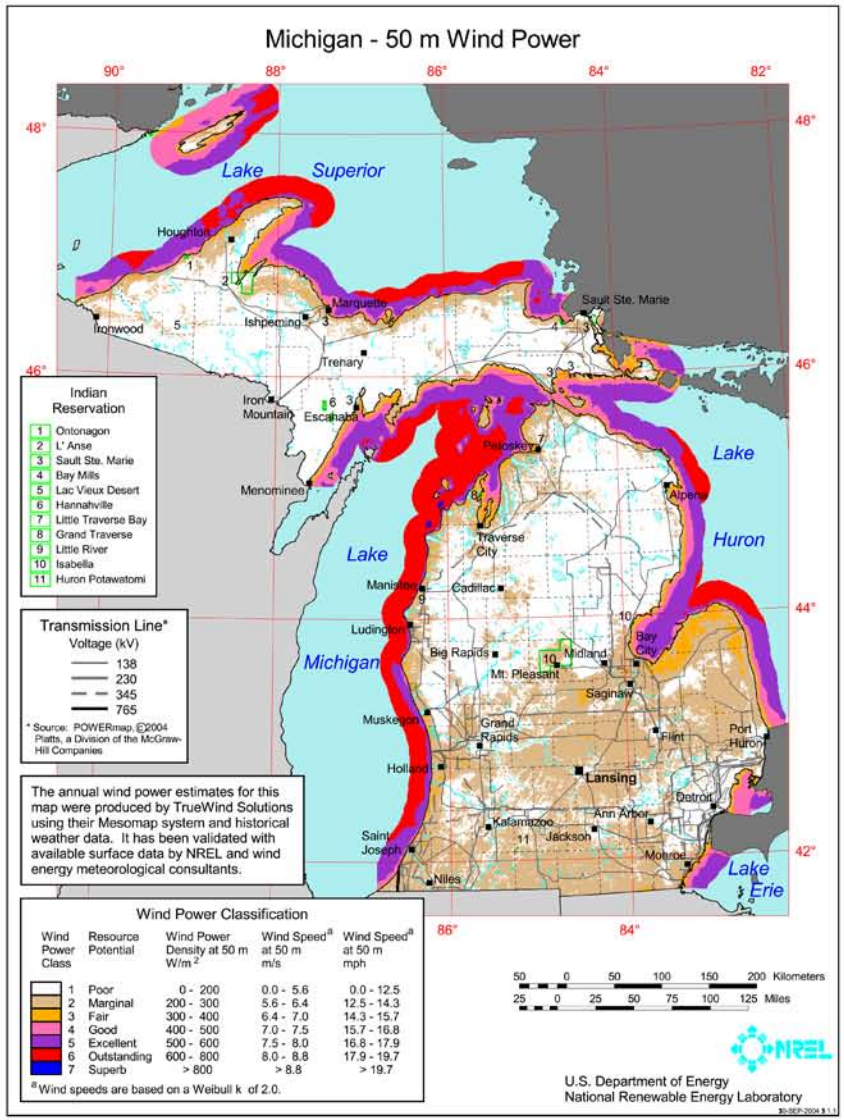
- Local source of power
- Lower generation costs as compared to "as is" option
- Continuation of existing plant jobs
- Maintain local control

Disadvantages

- Limited to 25MW base load capacity
- Higher costs than could be obtained through wholesale purchase

Wind Generation

- Cost range ~ $55 - $95/MWh
- Escanaba is not a good candidate for wind power; believed we would be at the higher end of the range ~ $80 - $95/MWh
- Would need multiple wind turbines to realize economies of scale
- A 2.5MW wind turbine has an installed cost of $5.2M
- Wind could supplement our base power supply, but cannot replace it


Michigan - 50 m Wind Power
Lake Superior
Lake Michigan
Lake Huron
Lake Erie
Houghton
Marquette
Sault Ste. Marie
Ironwood
Ishpeming
Trenary
Iron Mountain
Escanaba
Menominee
Petoskey
Alpena
Traverse City
Manistee
Cadillac
Ludington
Bay City
Midland
Big Rapids
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

Gasification Generation

- Start up costs expensive ~ $10-$15M
- Believed to be limited to 2-3MW with identified fuel supply
- Moderate energy costs ~ $80/MWh
- Could be a supplement to main power supply
- Needs further study to complete evaluation

Biomass Generation- Wood Chips

- Cost of study: $148,000
- Estimated cost of conversion: $20M - $30M
- Not cost competitive with wind generation from good wind areas
- Estimated Energy Cost: $93 - $99/MWh
- Limited interest from regional utilities due to cost
- Recent Renewafuel announcement will have an impact on availability of biomass wood chips

Biomass Generation- Processed Wood (Cubes)

- Generation costs expected to be in the range of $86-$118/MW
- Moderate capital expenses expected
- Limited interest from regional utilities due to cost
- Renewafuel recently announced plans to site a production facility at the former K.I. Sawyer airbase

Powder River Basin Coal Conversion

- Estimated cost of conversion: $20M - $30M
- Estimated cost of PRB delivered to Escanaba: upper $40's – low $50's/ton
- Estimated generation cost: $66 - $78/MWh*
  * does not include debt repayment
- Estimated total costs with debt repayment included: $76 - $103/MWh

Purchase full requirements energy, discontinue plant operations

- 3 regional suppliers submitted wholesale proposals in July 2007
- Power System Engineering (PSE) analyzed these offers and compared them to Escanaba's load curves for the past 3 years
- Results showed all 3 were less expensive than self generation
- 1 of the 3 regional suppliers was dropped due to being the highest cost of the 3 and lack of interest in partnering with Escanaba in converting the plant to biomass
- The 2 remaining suppliers have an "all-in" cost of $64.42 and $68.10 respectively based on Escanaba's most recent 3 years load curves and their 2007 proposal
- Disadvantages include: loss of local generation, loss of plant jobs

Purchase full requirements energy, sell/lease plant to private entity

- Escanaba would realize lower costs of energy through full requirements purchase
- Reliability of local generation
- Plant jobs
- Private entity could be eligible for production tax credits if plant is converted to biomass

Sample Power Charges

These represent approximate charges. Variations could exist depending on actual usage patterns.

This chart shows Escanaba's rates as they are today

	Marquette	Manistique	Sturgeon Bay	Escanaba	Menominee	Kingsford	Gladstone	Ishpeming	Alger-Delta
Residential 500 kWh/mo	$40.50	$46.57	$50.15	$50.88	$51.43	$58.32	$65.50	$73.97	$80.38
Commercial 4000 kWh/mo	$321.60	$404.76	$368.20	$378.97	$379.00	$428.04	$462.80	$592.56	$549.08
Large Power 200,000 kWh/mo	$13,009.50	$18,046.70	$14,158.05	$15,627.49	$15,329.12	$17,025.12	$18,365.00	$18,507.50	$25,191.40

Sample Power Charges

These represent approximate charges. Variations could exist depending on actual usage patterns.

This chart shows what Escanaba's rates would be with a 13% increase to cover the recent coal cost increase.

	Marquette	Manistique	Sturgeon Bay	Menominee	Kingsford	Escanaba	Gladstone	Ishpeming	Alger-Delta
Residential 500 kWh/mo	$40.50	$46.57	$50.15	$51.43	$58.32	$57.49	$65.50	$73.97	$80.38
Commercial 4000 kWh/mo	$321.60	$404.76	$368.20	$379.00	$428.04	$428.24	$462.80	$592.56	$549.08
Large Power 200,000 kWh/mo	$13,009.50	$18,046.70	$14,158.05	$15,329.12	$17,025.12	$17,659.06	$18,365.00	$18,507.50	$25,191.40

Sample Power Charges

These represent approximate charges. Variations could exist depending on actual usage patterns.

This chart shows what Escanaba's rates could be by buying full requirements energy.

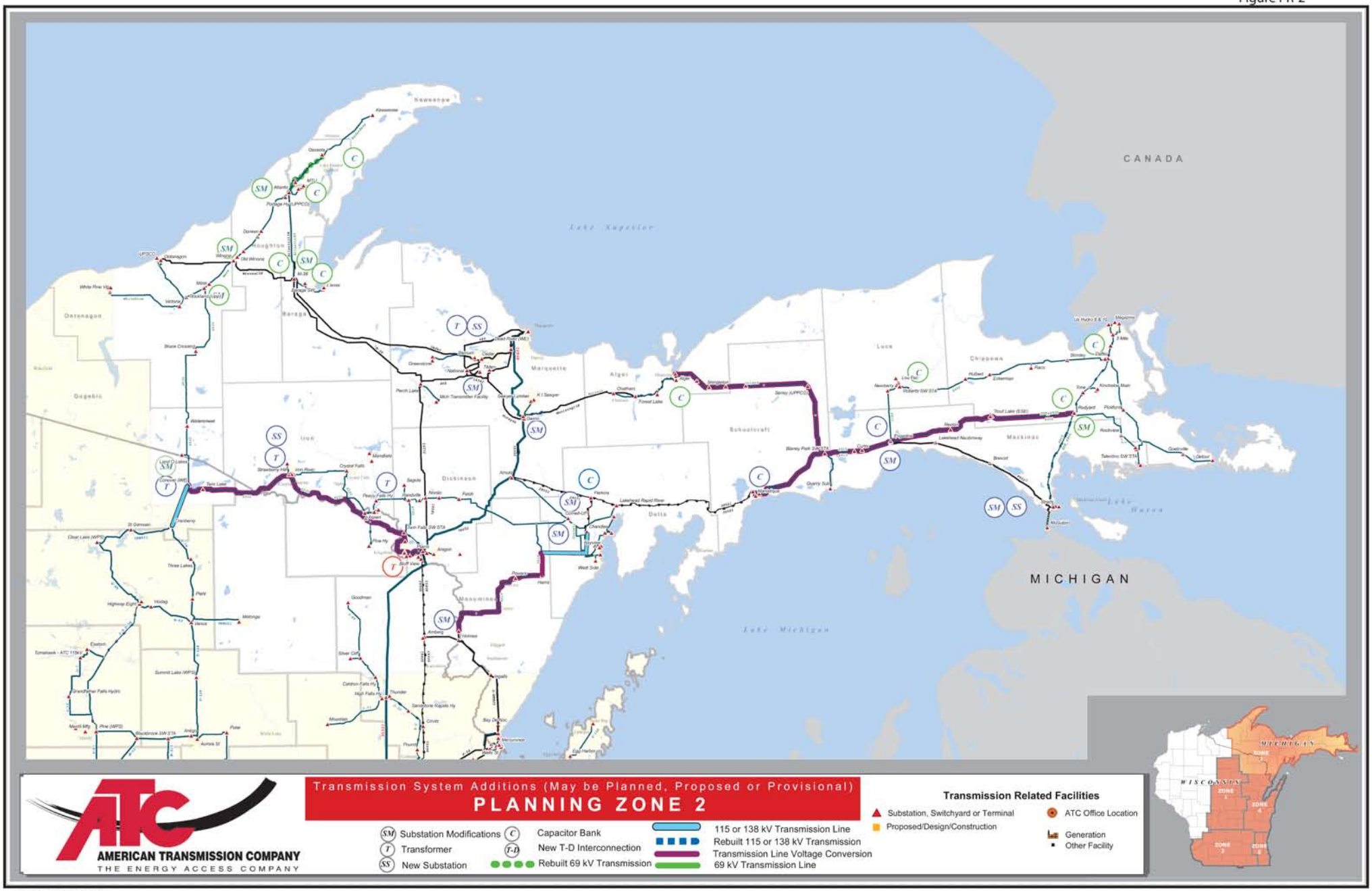
	Marquette	Escanaba	Manistique	Sturgeon Bay	Menominee	Kingsford	Gladstone	Ishpeming	Alger-Delta
Residential 500 kWh/mo	$40.50	$44.77	$46.57	$50.15	$51.43	$58.32	$65.50	$73.97	$80.38
Commercial 4000 kWh/mo	$321.60	$333.49	$404.76	$368.20	$379.00	$428.04	$462.80	$592.56	$549.08
Large Power 200,000 kWh/mo	$13,009.50	$13,752.19	$18,046.70	$14,158.05	$15,329.12	$17,025.12	$18,365.00	$18,507.50	$25,191.40

Sample Power Charges

These represent approximate charges. Variations could exist depending on actual usage patterns.

This chart shows what Escanaba's rates could be under the various options.

	Purchase Full Requirements Energy	Gasification	Improve Plant Efficiency	As is, with 13% increase to cover coal increase	PRB Conversion	Wind	New Generation	Biomass-Wood Chips	Biomass-Processed Wood (Cubes)
Residential 500 kWh/mo	$44.77	$52.32	$55.82	$57.49	$58.47	$58.80	$62.09	$63.06	$90.46
Commercial 4000 kWh/mo	$333.49	$389.75	$415.77	$428.24	$435.54	$437.81	$462.50	$469.75	$673.89
Large Power 200,000 kWh/mo	$13,752.19	$16,071.75	$17,144.72	$17,659.06	$17,960.07	$18,060.40	$19,071.78	$19,370.78	$27,788.94
Large Power 1,000,000 kWh/mo	$60,160.35	$74,794.20	$79,715.74	$82,181.17	$83,581.99	$84,048.92	$88,718.31	$90,147.14	$129,323.28



Updated 11/26/2007