Renewable Energy Planning and Assessment Report

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"*Pleasant it looked, This newly created world. Along the entire length and breadth of the Earth, our grandmother, Extended the green reflection of her covering and the escaping odors were pleasant to inhale*."

~ Winnebago, as quoted in the Little River Band of Ottawa Indians' "Green Concept of a Green Community", 2001.

1 Introduction

The forward-thinking and holistic-thinking exhibited by the Little River Band of Ottawa Indians in commissioning a study on the options for renewable energy is just one of the many steps in line with the collective goal presented in Tribe's concept of a Green Community:

> "*to create sustainable futures that integrate and balance economics, environment, and culture*."

The Little River Band Tribe commissioned this Renewable Energy Report to address the Tribe's energy needs and the possibility of harnessing renewable energy to meet those needs. Using renewable energy to meet the Tribe's energy requirements presents many diverse and important outcomes, such as decreasing the Tribe's environmental impact, increasing Tribal sovereignty, increasing job and career opportunities within the Tribe, and providing valuable investments and demonstration tools.

What is in Michigan's energy future?

How will Michigan meet its future energy demands? Michigan's electricity power plants that generate base load requirements are now an average of 48 years old. Older, less efficient plants, totaling a large fraction of Michigan's energy needs, will be retired by 2025. There are no known plans for energy replacement of most of these retirements[1].

Michigan's total electric generation requirements are expected to grow at an annual average rate of 1.3 percent from 2006 to 2025[2]. How will this increase in energy demand be addressed? Natural gas will not be an option due to its price volatility. Nuclear energy requires 12 years lead time to build a plant and currently a plan for nuclear waste does not exist. Hence, unless renewable energy systems are built, the state of Michigan and the sovereign Tribal nations in Michigan will be reliant on coal.

Coal-fired generation is a major source of air pollutants and is the major stationary source of carbon dioxide. Michigan's coal fired generating units emit approximately 70 million tons of carbon dioxide emissions annually, or an estimated 40% of the state's total emissions.

Michigan and its energy users could realistically expect to be subjected to a federal tax on carbon dioxide that begins with $10 per ton in 2010 and increases to $30 per ton in 2018. Carbon dioxide emissions regulation could raise the cost of electricity produced by

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[1] Michigan Public Service Commission. *Michigan's 21st Century Electric Energy Plan.* www.michigan.gov/documents/mpsc/21stcenturyenergyplan_185274_7.pdf
[2] Michigan Public Service Commission. *Michigan's 21st Century Electric Energy Plan.*

conventional coal units by 1.5 to 2.0 cents per kilowatt-hour (kWh)[3]. While wind and solar energy would continue to be free.

Purpose and use of this Report

This project between the Little River Band of Ottawa Indians and Seventh Generation Energy Systems follows in the footsteps of the Tribe on their journey towards clean energy. As leaders of a coalition, the Tribe has already successfully fought and defeated the construction of a coal plant. The Tribe continues to focus on a sustainable energy future through their involvement in the First and Second Annual Michigan Renewable Energy Fair. The excitement and strong conviction within the Tribe to incorporate renewable energy is palpable when visiting and speaking to Tribal members.

This report attempts to provide relevant and contextualized information. Within this report, the Tribe's options for on-site renewable energy, large scale wind projects, Tribal energy aggregation, and Tribal utility formation are presented. The positives and barriers are discussed, and future steps are outlined. We have also attempted to present questions that would be relevant to research when the Tribe decides to move ahead with any of the initiatives presented.

The on-site renewable energy construction can be easily implemented in 2007 while monitoring for big wind and initial analyses for a Tribal utility will gain momentum and steam roll in to 2008 and beyond.

Specifically we recommend that the Tribe:

- Implement the most cost effective, energy saving on-site renewable energy applications as summarized in Chapter 2.
- Consider the possibilities surrounding medium to large scale wind, as outlined in Chapter 3. If the Tribe decides to move ahead, we recommend investing in or borrowing a 50 or 60 meter monitoring tower to determine the exact wind resource at their desired location.
- After considering the options for Tribal utility formation, and if the Tribe decides to move ahead, they should begin with a feasibility study for the specific type of utility and look into the possibilities surrounding rights-of-way.

Acknowledgments

We are thankful for the opportunity to have worked with the Little River Band of Ottawa Indians on this project and we would especially like to thank those who have guided us along the way. Ogema Patrick Wilson, Robert Memberto, Jay Sam, Mark Dougher, Lee Ivinson, Jessica Burger, Chuck Fisher, Dave Schultz and especially Dan Shepard and Liz Gonzalez, thank you for all of your hard work and support during this project.

[3] Michigan Public Service Commission. *Michigan's 21st Century Electric Energy Plan.*

2 On-site RE

During our visit to the Little River Band reservation in early November of 2006, we surveyed several sites to assess the possibility of installing on-site renewable energy technologies.

Within this section, the summaries of the existing sites are intended to give some basic recommendations regarding the potential for renewable energy technologies on each site.

Site assessments of each location are provided, which details the types, cost and simple payback of the relevant technologies for each location. Simple payback is a calculation that measures of economic viability. This calculation has several advantages: it is easy to perform; it is conservative in nature since utility rate hikes are often not accounted for; and, once set up on a computer spreadsheet, sensitivity analyses are readily performed. The payback period is presented in years.

In general, Aki represents the site with the greatest overall potential in terms of access to wind and solar resource, payback, education, and demonstration of an environmental ethic because it is a community in early stages of development. LEED certification (or a Tribal equivalent), geothermal, solar ready design, community solar and wind are all possible. Implementing these technologies should be considered part of the Housing Strategic Plan.

2.1 Wind Turbine Site Priorities

There are four sites profiled for small to medium commercial scale wind turbines. For the most part, turbines ranging in size from 20 kW to 660kW and in price from $60,000 to $1,500,000 are mentioned and include production and cost estimates. All of these four sites may also be appropriate for large (utility) scale turbines, but wind speed monitoring would be necessary before any recommendations could be made for this scale of investment.

The production, cost and simple payback estimates for these site assessments are generated by Seventh Generation Energy Systems Turbine Output Calculator v9.4, topographical maps, and information gathered at the site during the time of the visit[4].

Simple payback estimates do not include any energy cost increase, cost of money, inflation, incentives or avoided cost of tribal member's electricity assistance. The paybacks do, however, include an estimate for annual operation and maintenance of the turbine. In this respect, the simple paybacks are likely quite conservative.

[4] The wind data utilized for these estimates is taken from the study of the state of Michigan's wind resource conducted by AWS True Wind and uses both average wind speed numbers and wind directional data.

Based on the wind site profiles, our recommendations for prioritizing each site would be as follows:

- Aki (including the new community) should be considered top priority for a small to medium commercial turbine if the utility infrastructure of the community is shared (one point of interconnection with the utility). The turbine decrease or eliminate resident's costs, serve as an educational and demonstration tool, and be symbolic of the Tribe's commitment to a sound environmental ethic.
- Beside Aki, we would recommend both the wastewater treatment plant and the East Lake property (Big Blue) as high priorities for wind as the resource appears strong. The East Lake property likely has the best payback scenario of the two, but the wastewater plant is a high visibility site to casino-goers and could be dedicated to 'greening' the casino.
- The Whisper Lite turbine at Aki needs to be fixed or removed as soon as possible. The furled turbine creates for false assumptions of wind turbines. Consider selling the Whisper Lite turbine, perhaps to a university or an institution that could use it for educational purposes. The current situation of the Whisper Lite turbine demonstrates the need for diligent maintenance of wind turbines.

2.2 Solar Technology Site Priorities

There are seven sites profiled for solar technologies including solar electric (PV); solar domestic hot water (SHW) and solar thermal space heating. Our recommendations for solar priorities are:

- Again Aki has incredible potential for implementing solar, especially solar domestic hot water on individual homes. The potential for community wide application, both for SHW space heating and PV exists and should be considered in further community design. Common infrastructure, as mentioned above, would be required (see Appendix 6). This represents a project of considerable scale and is of a different type that those mentioned below.
- The casino may have the greatest potential for renewable energy as an investment. Solar domestic hot water employed to reduce the casinos natural gas bill and hedge against rising prices over the next 30 years has a huge potential. Like with wind, visibility is another primary benefit of the casino site.
- The House of Flavors is the most visible site of all and has a great roof for a small PV (or SHW) array that would serve exceptionally well as a demonstration site.
- The Public Safety and Cultural Heritage site have the best potential for on-site education and solar hot water space heating could realize a good payback as well.

Simple payback for the solar sites include the same caveat as mentioned above in the wind portion. Energy cost inflation is a very important factor in the payback of a system and it is not unreasonable to expect 10% per year, especially with natural gas, the

production of which has peaked in North America and prices are expected to rise significantly[5].

2.3 Wind Site Assessments

The following section provides the wind site assessments, including the simple payback, benefits and barriers for four wind sites. These sites are suitable for medium to small wind turbines and are presented in general order of priority: Aki, Big Blue, Wastewater, and Public Safety.

2.3.1 Aki Maadiziwin Wind Site Profile

Aki Maadiziwin, W Maw Gaw NE, Manistee, MI, 49660

Natural Gas Provider: DTE
Electric Provider: Consumers
Demand Charge: Yes
County: Manistee

Electric Consumption

Electric consumption at this site is not completely known as bills for the Elder's housing was not available and the more likely interconnection point, the community center, does not yet exist. Turbine sizing and simple payback is then more difficult to estimate, but is also more flexible as the project moves ahead.

Site Overview and Wind Recommendations

Aki represents the best opportunity the Tribe has to incorporate renewable energy applications into the community. There are a couple of possibilities for siting a turbine here, each near the potential locations for a community center. The higher ground is preferable. The housing development area is on a ridge from which the terrain descends to both the northwest and southwest sides. This ridge should improve wind speed from those directions. A turbine could be installed either near the site of the current small Whisper turbine or on the northeast corner of the circle across from the space slated for a park. The wind resource should be adequate for one or more, small to medium sized commercial turbines. Precise siting would still have to be determined.

Turbine installation plans should proceed along with the community center development to make integrating it into the electrical system easier. Negotiating with the utility for a favorable rate up front will be crucial in the economics of this project. Another option for interconnection may exist if the Tribe seeks to aggregate all of Aki's electrical use in

[5] RETScreen project software as well as a payback calculator produced by the state of Wisconsin were used in the calculations

one meter. A larger turbine might be utilized in this scenario to offset a majority of the whole community's consumption. Included, then, in the simple payback, is the Vestas V-47 for consideration, though this tends to fall closer to the large commercial turbine category and wind speed monitoring should probably be considered before investing in such a costly machine.

The following chart (and similar charts for the rest of the site assessments) provides the turbine performance rating for a variety of turbines that could be installed at Aki. Included in the summary is the power capacity of the turbine (kW rating), the amount of energy the turbine could produce on an annual basis (annual kWh), how much greenhouse gases would be avoided each year (tons GHG avoided), the cost to install the turbine, and how many years it would take to pay back the wind turbine. Please remember the simple payback is a conservative estimate.

Figure 1. Turbine Performance Estimate for Aki

Turbine	Height	kW Rating	Annual kWh	Tons GHG Avoided	Cost	Simple Payback*
Bergey XLS	120'	10	14,000	8.4	$55,000	60+
ARE 442	120'	10	20,000	12	$75,000	56
Jacobs 20kW	120'	20	26,500	15.9	$60,000	49
Vestas V-15 1p	110'	35	72,000	43.2	$135,000	25
Vestas V-15 3p	110'	40	83,000	49.8	$135,000	21
Vestas V-17	132'	90	130,000	78	$170,000	21
Furhlander 100	138'	100	186,000	111.6	$275,000	30
Vestas V-27	131'	225	340,000	204	$475,000	56
Furhlander 250	138'	250	385,000	231	$450,000	38
Vestas V-47	197'	660	1,250,000	750	$1,500,000	47

*Simple payback assumes all turbines up to 100kW in size would be offsetting retail non-demand electricity rates. Greater than 100kW assumes a flat $.043.

Benefits

Introducing residents of Aki and other tribal members visiting the community to renewable energy may be the greatest asset of this site. This site also has the potential to be of great help with utility costs for residents. Depending how the electrical service agreement is structured, it could end up being the best site economically of any of the small to medium commercial turbine sites.

Barriers

Barriers are minimal here as the entire development is still in the early stages and turbine integration in the project can progress with the rest.

2.3.2 East Lake Property Wind Site Profile

East Lake Property, 159 Brickyard Rd, Manistee, MI 499660

Natural Gas Provider: DTE
Electric Provider: Consumers
Demand Charge: No
County: Manistee

Figure 2. Electric Consumption at East Lake Property

Month	kWh
Jan	18,600
Feb	34,200
Mar	32,400
Apr	19,200
May	19,200
Jun	19,800
Jul	9,600
Aug	27,600
Sep	16,200
Oct	18,600
Nov	22,800
Dec	26,400
Year	**264,600**

Site Overview and Wind Recommendations

The East Lake property at Big Blue is very well suited to small commercial wind. The lakefront has great access to the prevailing west winds. The building uses a fairly large amount of electricity and yet the service is not demand metered, making customer side generation a very good option. For further explanation on demand versus non-demand metering, see Chapter 3. When a large amount of energy is being used and is not demand metered, it is best to under-size a turbine in relation to the required load. This will allow the Tribe to take advantage of the higher value of electricity that is off-set versus the lower value at which it is sold back to the utility. The below table reflects a range of turbines whose estimated annual production represents a percentage of the annual load at Big Blue. The Furhlander 100, in particular, is well sized for this application.

Figure 3. Turbine Performance Estimate for East Lake Property

Turbine	Height	kW Rating	Annual kWh	Tons GHG Avoided	Installed Cost	Simple Payback
Jacobs 20kW	120'	20	29,000	17.4	$60,000	40 yrs
Vestas V-15 1p	110'	35	74,000	44.4	$135,000	23 yrs
Vestas V-15 3p	110'	40	86,000	51.6	$135,000	20 yrs
Vestas V-17	132'	90	134,000	80.4	$170,000	21 yrs
Furhlander 100	138'	100	200,000	120	$275,000	29 yrs

Benefits

The existing utility infrastructure appears to be robust enough to handle all of the turbines mentioned above. The wind resource and site exposure next to the lake appear to be excellent for the area. The lake front also offers high visibility of the turbine.

Barriers

Lake front siting may present zoning issues as it appears from the Plat book that the tribe does not own the land all the way to the lakeshore. A setback equal to the height of the tower may be imposed. Neighbors who are opposed to wind will see the turbine imposing on the view shed. The area on the lakefront is quite wet and the soil may present some difficulty for foundation engineering.

2.3.3 Wastewater Treatment Wind Site Profile

Wastewater Treatment, 2539 Dontz Rd, Manistee, MI 49660

Natural Gas Provider: DTE
Electric Provider: Consumers
Demand Charge: Unknown
County: Manistee

Energy consumption

Electrical use data for the wastewater plant was not obtained.

Site Overview and Wind Recommendations

The field to the north and east of the wastewater treatment plant near the casino as well as the orchard parcel across the street are excellent prospects for wind sites.

This area is situated on the same ridge as Aki and the terrain slopes downward to the lake to the west and northwest. Lower terrain also lies to the southwest giving it a great access to the prevailing winds.

This is the site closest to the airport and, as such, will require special consideration of FAA permitting. *For any turbine listed below, the Tribe should file form 7460-1 with the FAA.*

The below table provides estimates for small to medium commercial turbines, but it is also recommended that these sites be considered for wind speed monitoring for larger commercial turbines. The wastewater treatment plant does not have a high consumption of electricity, which makes this site less financially viable for medium sized turbines and reinforces that it may be better for big wind.

Further exploration is needed as to whether it would be beneficial to tie a medium sized turbine into the casino's electrical infrastructure, which is a significant distance from the wastewater treatment plant's field and lies across a ravine. If the goal was a green powered casino, the Vestas V-47 below is fairly well matched to the electric load.

Figure 4. Turbine Performance Estimate for the Wastewater Treatment Plant

Turbine	Height	kW Rating	Annual kWh	Tons GHG Avoided	Cost
Vestas V-15 3p	110'	40	82,000	49.2	$135,000
Vestas V-17	132'	90	132,000	79.2	$170,000
Furhlander 100	138'	100	190,000	114	$275,000
Vestas V-27	131'	225	350,000	210	$475,000
Furhlander 250	164'	250	430,000	258	$450,000
Vestas V-47	197'	660	1,300,000	780	$1,500,000

Benefits

The existing utility infrastructure appears to be robust enough to handle all of the turbines mentioned above. The wind resource and topography appear excellent for the area. The turbine would be very visible to casino goers. Big wind possibilities exist.

Barriers

How to best connect a turbine to the grid will be an issue. The FAA permit should be relatively straight forward, but should be pursued early on in the process. The orchard parcel was mentioned to be less desirable as a wind site and if the Tribe has other uses slated for it, then the space for big wind (and multiple turbines in the area) may be limited.

2.3.4 Public Safety Wind Site Profile

Public Safety, 3031 Domres Rd, Manistee, MI 49660

Natural Gas Provider: DTE
Electric Provider: Consumers
Demand Charge: Yes
County: Manistee

Figure 5. Energy Consumption at Public Safety and surrounding buildings

Month	kWh - 55960483	kWh - 32141349
Jan	7,480	9,224
Feb	6,960	6,186
Mar	7,200	5,944
Apr	7,120	2,490
May	6,920	2,092
Jun	5,760	939
Jul	7,600	1,608
Aug	7,320	1,928
Sep	7,480	1,888
Oct	7,640	3,378
Nov	7,800	4,847
Dec*	7,207	3,684
Year	**86,487**	**44,208**

Site Overview and Wind Recommendations

The Public Safety, Historic Preservation and Language Preservation, and water tower site has excellent access to the wind from the west. The topography is also very well suited to wind in that regard. The water tower will create some turbulent air and the tallest available tower for each turbine option listed below is recommended.

As both main meters at the site are demand metered, the economics of small to medium wind suffer here. The rate for offsetting electricity used is ~$.043/ kWh, which is approximately half of what the Big Blue site offers. If the electrical service for both buildings could be tied together and put into a non-demand metered rate assignment, then the situation would be different.

As it is, this area might be better suited as a single large turbine installation if the Tribe decides that it wants to pursue that option. The list below suggests a size range that would be suitable to the larger of the 2 metered loads (middle column in Figure 5) at the site. Like the Big Blue site, all of these turbines, with the exception of the V-17, are undersized to offset usage rather than to sell electricity back to the grid.

Figure 6. Turbine Performance Estimate for Public Safety

Turbine	Height	kW Rating	Annual kWh	Tons GHG Avoided	Installed Cost	Simple Payback
Jacobs 20kW	120'	20	24,000	14.4	$60,000	none
Vestas V-15 1p	110'	35	67,000	40.2	$135,000	60 yrs
Vestas V-15 3p	110'	40	77,000	46.2	$135,000	50 yrs
Vestas V-17	132'	90	120,000	72	$170,000	51 yrs

Benefits

The wind resource and site exposure appear excellent for the area. Customer side generation would directly power the Public Safety building with renewable energy, may reduce the peak demand, and would hedge against rising electricity costs.

Barriers

If the site were on neighboring land, there would be additional cost. Justifying this site in purely economic terms would require a serious incentive source to decrease its cost and/ or a restructuring of the electrical service and rate agreement.

2.4 Solar Site Assessments

The following section provides the solar site assessments, including the possibilities, benefits and barriers for seven solar sites. These sites are presented generally in order of priority, including: Casino, Aki, House of Flavors, Public Safety, Casino Maintenance Warehouse, Health Clinic, and the Bank and Tribal Offices. (Energy consumption and site location information not included in the following site assessments, if provided above)

2.4.1 Casino Solar Site Profile

Casino, 2700 Orchard Highway, Manistee, MI 49660

Natural Gas Provider: DTE
Electric Provider: Consumers
Demand Charge: Yes
County: Manistee

Electric Consumption at the Casino

Electrical usage data for the casino indicates annual consumption of ~1,330,000 kWh. Gas usage was not available.

Site Overview and Recommendations

The casino is by far the largest energy consumer of all Tribal properties. As such it deserves special consideration and planning. This assessment can do little in terms of specifying size and design as a thorough investigation with greater access to the infrastructure and plans would be needed. The solar resource is certainly available and there are a number of different sites on the casino grounds where PV or Solar Water collectors could be situated, the best of which are listed below.

As the casino is demand metered, an electric generator (PV, Wind or other) may not be the most economically sound investment, though it would certainly hedge against rising costs and may reduce peak demand charges. The casino, its restaurants, and hotel have a significant hot water (and natural gas) use and this seems to be an area on which to focus for best use of resources.

A solar hot water system could be tied into the domestic water system and reduce the amount of natural gas consumed for kitchen, laundry and other uses significantly. Pool heating is another great application for solar hot water as it, like domestic hot water use, has year round demand.

Solar hot water would have the quickest payback of any possible technology. This, then, should be the immediate priority for the casino.

Potential Sites

1) The current flat portion of the casino roof and the new addition being built has a large amount of unused space that could hold significant solar hot water collector. We recommend using as much of this space as can hold collectors.
2) The field on the southwest corner of the resort measures about 120’ x 90’ and could also hold a large array, while still avoiding any major traffic. This would be the second priority for siting.
3) The raised seam pitched roof on the resort side has a good amount of space for an array, though it would be best for a PV system. The pitch is less than ideal for solar hot water and producing extra heat in the summer does not have the same advantages as producing extra electricity. Any PV system that is installed initially should go on this type of available roof space. There is also a nice roof mount possibility (for PV) on the RV park building located to the southwest of the casino, which measures roughly 30’x40’. This could hold about 12kW of PV and might be a nice system to dedicate to the RV park, for example.

There are other possibilities for siting ground mounted collectors, but the second option above represents the best solar window and should not interfere with the aesthetic or operation of the casino.

Other Considerations

Depending on how much and when the Tribe wants to invest in solar at the casino, it may be advisable to design multiple solar hot water systems for different applications and implement them in stages. The pool, laundry and kitchen, depending on the plumbing infrastructure (for which detailed plans would be needed) could all have separate

dedicated systems. The pool may be the easiest place to begin. A pool system could be roughly sized at 800 square feet (20 4'x10' collectors), which would easily fit on either the roof or field site mentioned above.

The casino's annual electrical consumption might be a good target number for a big wind application nearby. The turbine would not likely be tied into the casino's electrical service, but would have its own interconnection and power purchase agreement (see Chapter 3). By producing an equivalent amount of electricity with a wind turbine, the Tribe could offset all of the green house gas emissions associated with operating the casino and market it as green.

2.4.2 Aki Solar Site Profile

Aki Maadiziwin, W Maw Gaw NE, Manistee,MI.,49660

Natural Gas Provider: DTE
Electric Provider: Consumers
Demand Charge:
County: Manistee

Electric Consumption

Electric and gas consumption at this site is not fully known as bills for the Elder's housing were not available. The following are general recommendations for incorporating solar into the development.

Site Overview and Recommendations

Aki represents the best opportunity the Tribe has to incorporate renewable energy applications into the community. The housing development has only begun and is therefore in a great position to incorporate solar into single and multifamily housing whether on the individual units themselves or as a community wide application (see Appendix 6).

Either option (or combination) will involve a serious economic commitment and an extensive design phase prior to construction. Collaboration between builders (or an architect) and renewable energy system designers/ installers together will be essential. A development project like this would be a good candidate for external funding, whether federal or private.

Renewable energy applications on a communitywide scale are only beginning to take off. There are new ideas and research being discussed all of the time and maintaining flexibility and engaging in that conversation with other leaders in sustainable community development will be critical to a sustainable Aki. The below recommendations are general in nature and meant to help the Tribe develop priorities for the development.

Newly designed homes
The circular layout of Aki is such that, if all houses are built to face the road, there will be few homes that have true southern orientation and the ability to take advantage of passive solar heating gain and roof mounted solar panels. It is therefore suggested that new homes be built with a priority on true southern orientation for roofs and for south facing glazing (windows). Though still situated in a circle, most homes would not 'face' the road, but with good planning, this should not detract from the aesthetic of the neighborhood.

New construction on homes that do not immediately install solar technologies should at least be made solar ready, so that future installation is easy and cheaper (See Appendix 6).

Single-family units
Solar ready homes or homes that incorporate PV or SHW systems during the design phase (rather than retrofitting them later) are more economical and appear more attractive than homes that have to be retrofit. A kind of Aki standard of design features should be developed including PV and SHW systems, examples for which are given below. For PV systems, starting with a smaller (1kW) array with built in inverter capacity for later expansion might be the best option.

Multi-family units
Multi-family homes can also be made solar ready. They also can take advantage of the heating/ cooling efficiency when more people live within one building envelope. The cost per person for heating, in particular, should be measurably reduced in this type of housing. Some combination of solar, geothermal and wood are suggested. All three sources for heat can be used with either a high mass radiant system or forced air system for distributing heat.

Geothermal may make the best long term financial sense in the multi-family units, while solar could supplement the hot water heating load that is partially supplied by the geothermal (with a desuperheater). If geothermal (or wood) were used as the main heating source, the roof would be free for a sizable PV array (3-6kW) to offset the added electrical consumption of the geothermal pump. A geothermal system designer/ installer is needed to determine the type (i.e. horizontal versus vertical loop) and size of system that would best serve this situation.

Community wide applications and considerations
Designing a neighborhood wide heating system using solar collectors is a possibility, but it would be a large and expensive project. Something of similar scale could be done with geothermal, but again the infrastructure planning and implementation would be costly. A feasibility study specifically for this kind of project would be necessary.

A common, local sub-grid for electrical distribution is certainly a possibility. By building a main distribution panel, service and meter for the entire Aki community, multiple renewable energy systems could be tied into it and utilized by the community members.

The same service would be tied to the utility grid. The difficulties would come with negotiations with the utility as well as metering and billing of individual homes. This would be the best way to tie a medium commercial wind turbine(s) into the system as well either individual home or large scale PV systems.

Figure 7. Solar technologies performance estimate for Aki.

System	Cost per unit	Energy Production	GHG Avoided (Tons CO2)	Annual Energy Cost Savings
1kW PV array	$7500-8000	1200kWh	.72	~$100
2kW PV array	$14,000-15,000	2400kWh	1.44	~$200
64 sf 60 gal SDHW	$5000-5500	80-85 therms	.8	~$180
80 sf 80 gal SDHW	$6300-7000	140-145 therms	1.3	~$275

1) The system and energy production columns assume panels are mounted on the roof at 45 degrees.
2) The prices given above assume the lower range of typically installed system in this region including the assumption that outfitting the majority of homes would allow for purchasing power, labor efficiencies and lower per unit design and other costs. For PV assume ~$7-8 / installed watt and for SDHW assume ~$80-85 / square foot of collector.
3) Annual energy cost savings based on a $.086 / kWh rate for electric and $1.20 / therm and no energy inflation rate over the next 20 years. As fuel prices must go up, and natural gas the most rapidly, this is a highly conservative number.

2.4.3 House of Flavors Solar Site Profile

House of Flavors, Corner River St and US 31, Manistee, MI 49660

Natural GaProvider: DTE
Electric Provider: Consumers
Demand Charge: Unknown
County: Manistee

Energy Consumption

Energy consumption information was not available for this site.

Site Overview and Renewable Energy Recommendations

The House of Flavors ice cream shop and neighboring commercial property offer perhaps the best opportunity for publicity and education on solar power. They are very visible and well known properties that have adequate solar exposure for a sizeable collector. We would prioritize PV for educational purposes here. SHW would certainly work as well, but its effectiveness would be minimized if the shop is closed in the winter.

The south-facing roof of the House of Flavors is particularly well suited for visibility, ease of installation and attractive visual integration. If the Tribe is interested in pursuing a PV array primarily for education/ demonstration purposes on an existing building in a public area, we would suggest this site. Because the utility bills were not available for

this newly purchased property, accurately sizing a system to meet 100% of the electrical usage is not possible at this time. The size of the roof will likely limit the system anyway, so a good goal would be to fill the available roof space with as much PV as possible. Simple payback below assumes net metering.

Figure 8. Solar technology performance estimates for the House of Flavors.

Priority	Technology	Size	Annual Energy Production	Annual Avoided GHG	Installed Cost Range	Simple Payback w/ no incentives (net metering)
1	Solar Electric	4kW	~4400 kWh	2.6 tons	~$30,000-35,000	>20 years
2	Solar Domestic Hot Water	120 sf 150 gal	~270 therms	2.5 tons	~$10,000-14,000	~10 years

Benefits

The primary benefit of installing renewable energy here is the visibility of the location. It would be a symbol of the Tribe's commitment to the environment and can contribute great public relations to the business and the Tribe. If the store will have seasonal hours, the PV array will be well suited to the summer time load and can feed electricity back onto the grid in the winter. As well, the Michigan Energy Office just released a grant for up to $50,000 to support the installation of a demonstrational PV system. The House of Flavors would be an extremely well-suited candidate.

Barriers

PV – The pitch of the roof is much less than the ideal angle for a PV array, but the best bet is still to mount it flush to the roof. Summer production will be higher and winter production lower. The problem comes in the winter with snow building up and some removal may be necessary.

2.4.4 Public Safety Solar Site Assessment

Site Overview and Solar Recommendations

The Public Safety and Cultural Heritage and Language Preservation buildings have great solar resource and plenty of land to use for one or multiple arrays. The field to the south of Cultural Heritage is well suited to tracking arrays and would serve as a great demonstration site and may be able to tie into the work of the center. The roof of the Cultural Heritage center would also function well for an array. As well, a comparison in performance between a fixed array and a tracking array could be observed by metering both systems separately. A number of educational institutions have begun doing this and if the tribe was interested in this kind of education, this might be the place to do it.

Solar hot water is an option as well and space heating applications are certainly recommended for the Public Safety building as there is a forced air system that could be tied into for distribution. Our recommendation is for both solar technologies to be employed at this site. The sizing exercise below should be considered as an example

only as a more thorough examination of the site and load are appropriate. The SHW systems mentioned below are considered for the Public Safety building as we did not visit the inside of the Cultural Heritage building because of time restraints.

Figure 9. Solar technology performance estimate for Public Safety.

Priority	Technology	Size	Annual Energy Production	Annual Avoided GHG	Installed Cost Range	Simple Payback w/ no incentives
1	Solar Electric	3 kW tracker (example)	4600 kWh	2.8 tons	32,000-40,000	>30 years
1	Solar Electric	6 kW roof	6500 kWh	3.9 tons	$48,000-60,000	>30 years
1	Solar Thermal Space Heating w/ storage	400 sf/ 500 gal	500-550 therms	3.6 tons	$28,000 – 40,000	25 years
2	Solar Domestic Hot Water	64 sf/ 60 gal	100 therms	.8 tons	$5500-7000	20 years

Benefits

The benefits of PV here are primarily educational, though it may serve well in terms of peak demand reduction. SHW will have economic benefit in the long term as natural gas prices continue to rise.

Barriers

Tying into the Public Safety building's heating system will be a challenge with it's two systems.

2.4.5 Casino Maintenance Warehouse

Casino Maintenance Warehouse, Unknown, Manistee, MI 49660

Natural GaProvider: DTE
Electric Provider: Consumers
Demand Charge: Unknown
County: Manistee

Energy Consumption

Energy usage data for the casino maintenance building was not available, though it appears to have a significant heating, cooling and electrical load.

Site Overview and Recommendations

The maintenance building behind the casino offers an opportunity to employ solar in a similar way to Big Blue in that it is an industrial space with large energy consumption, but little public exposure. Aesthetics should, therefore, not be a concern. This is the one site at which we would recommend implementing solar hot air collectors as a means of

offsetting the heating load. There is a well exposed and large south facing wall on the building that serves no purpose and has little public exposure. Solar hot air technology is quite inexpensive and would tie into the forced air/ AC ductwork system easily. We suggest prioritizing solar hot air here.

The roof of the building, though not seen during the site visit, would likely work well for a large PV array. Depending on how this building is metered (demand or not) will determine whether this is a suitable place to do PV or small wind. If, for instance, the waste water treatment plant's service is demand metered and the maintenance building is not, it may be more beneficial to tie a PV or small wind system into this service and take advantage of net metering. The building is approximately 150'x200', making the roof very capable of supporting a large array.

2.4.6 Health Clinic Solar Site Profile

Health Clinic, 310 9th Street, Manistee, MI 49660

Natural Gas Provider: DTE
Electric Provider: Consumers
Demand Charge: No
County: Manistee

Figure 10. Electricity Consumption at the Health Clinic

Month	kWh
January	6640
February	6400
March	7120
April	5600
May	4720
June	6800
July	9120
August	8480
September	12320
October	7040
November	5440
December	5760
Total	**85440**
Monthly Avg	7120
Daily Avg	234

Site Overview and Renewable Energy Recommendations

As we were not able to enter the clinic during the site visit, it is not known what type of heating system is used, though the utility bills indicate natural gas is the fuel. The solar resource at this site is excellent and the roof space is accommodating to mounting

collectors. Both SHW and PV are options, though the amount of roof space would limit the size of a PV array to well below what is needed to meet 100% of load. SHW should be the priority, both for space heating and domestic hot water.

Figure 11. Solar technology performance estimates for the Health Clinic

Priority	Technology	Size	Annual Energy Production	Annual Avoided GHG	Installed Cost Range	Simple Payback w/ no incentives
1	Solar Thermal Space Heating w/ storage	400 sf/ 500 gal	500-550 therms	3.6 tons	$28,000 – 40,000	25 years
1	Solar Thermal Space Heating w/ storage	800 sf/ 800 gal	1000-1100 therms	7.2 tons	$56,000 – 80,000	25 years
2	Solar Domestic Hot Water	200 sf/ 200 gal	260-280 therms	2.6 ton	$15,000-20,000	20 years
3	Solar Electric	5 kW (example)	5500-6000 kWh	3.5 tons	$40,000-50,000	>30 years

Benefits

Avoided greenhouse gas emissions, hedging against rising natural gas costs, green advertising, positive publicity for the clinic, and education are all benefits. The clinic has great usable roof space and significant natural gas consumption.

Barriers

Solar Thermal – As the heating system is unknown, problems may arise when tying into it. Look into tying the SHW into the ductwork of the AC system if the space heating is done with a boiler.
PV – It would be difficult for PV to have a significant impact on the electrical load here because of the limitations in roof space.

2.4.7 Bank and Tribal Offices Solar Site Profile

Bank and Tribal Offices, 375 River Street, Manistee, MI 49660

Natural Gas Provider: DTE
Electric Provider: Consumers
Demand Charge: Yes
County: Manistee

Figure 12. Energy Consumption at the Bank and Tribal Offices

Meter Number	Annual kWh	Meter Number	Annual Therms
55165288	69,946	6301305	14,584
81231147*	87,827		
84141059	48,231		
58761798*	208,400		
Total	**414,404**		**14,584**
Monthly Avg	34,534		1215
Daily Avg	1,135		40

Site Overview and Renewable Energy Recommendations

The Bank and Tribal offices offer an opportunity to advertise green energy in downtown Manistee as well as directly power the Tribal leadership's operation with solar energy. The roof space has adequate solar access for a significantly sized collector(s) of either a PV or SHW system, but will present some complications in terms of design.

The electrical system is also complicated and involves at least 4 separate services, 2 of which are demand metered (*above). The heating system employs at least 2 boilers. Of the existing properties, this will be one of the more complicated projects to pursue. We would recommend that the Tribe prioritize Solar Thermal applications on this site because it can have a shorter term and more significant financial benefit compared with PV in when considering the up front cost and available roof space.

Figure 13. Solar technology performance estimates for the Bank and Tribal offices.

Priority	Technology	Size	Annual Energy Production	Annual Avoided GHG	Installed Cost Range	Simple Payback w/ no incentives
1	Solar Thermal Space Heating w/ storage	400 sf/ 400 gal	550-600 therms	4 tons	$28,000 – 40,000	12-16 years
1	Solar Thermal Space Heating w/ storage	800 sf/ 800 gal	1000-1200 therms	8 tons	$56,000 – 80,000	13-17 years
2	Solar Domestic Hot Water	80 sf/ 60-80 gal	140-150 therms	1 ton	$5600 - 8000	10-13 years
3	Solar Electric for Peak Load Shaving	10kW (example)	11,000-12,000 kWh	7 tons	$70,000 – 100,000	>30 years

Benefits

Avoided greenhouse gas emissions, hedging against rising natural gas costs, green advertising, positive publicity in business district, and education are all benefits.

Barriers

Solar Thermal - Complications with tying into the heating system with different operational temperatures between the solar and the natural gas boiler. This design problem might be mitigated by using the air conditioning and air exchange duct system to distribute the heat. The roof space is unusual and limited in size, which, will in turn, require specialized racking and limit the physical size of the collector. The system designer will address these issues.

PV – With PV as well, there will be design issues including the roof racking and complex electrical system. The cost and its relationship with the utility interconnection agreement will greatly impact the payback and cash flow. On purely financial grounds, PV could not be recommended.

3 Tribal-owned Wind

3.1 Summary of recommendations for tribal-owned wind

Wind energy is the fastest growing energy resource in the world. With more than 60,000 megawatts now in service, wind power is an economical and reliable option to produce clean energy. One reason for wind energy's success is that it can meet the needs of many different customers. With turbines ranging in size from several hundred watts and weighing under 20 pounds, to enormous utility-scale turbines capable of providing enough power for 1500 homes, the right wind turbine can be found for any application.

This chapter covers the development factors for grid-connected battery-free wind turbines which provide the lowest cost wind energy solution[6]. Wind turbine locations for the Tribe are discussed as well as the economics and logistics of each location. Current knowledge about the strong wind resource around Lake Michigan is shared as are possible funding sources and partnerships that could help the Tribe with a wind project.

If the Tribe moves forward with a small wind turbine installation, we suggest the Tribe *trains staff specifically for their maintenance*, or *hires qualified technicians* to conduct the maintenance through a maintenance and service contract to ensure the turbines function and reliability.

The Tribe could under-take a big wind project on their own, as a Consumers customer, or the Tribe could undertake a big wind project as part of the process of forming their own utility. Either way, if the Tribe wants to pursue big wind, we would suggest *monitoring wind speeds at Aki and/or the casino* for at least a year, and then reassess the projects' feasibility after the wind data has been analyzed.

3.2 How can wind projects be connected to the electricity grid?

Before beginning a discussion on wind projects, it is important to understand the options of how Tribal wind projects can be connected to the electricity transmission and distribution grid. The size of the wind turbine affects where the turbine will be connected to the grid and how the energy will be used, both of which affect the monetary value of the electricity.

[6] While off-grid and battery backed-up wind energy systems have their place, this type of system is beyond the scope of this report.

For Little River, there are three primary uses for wind power as an economic development and environmental protection tool:

1. Net metering (turbines <30kW)
2. Parallel generation (turbines >30kW)
    a. Inside the fence
    b. Direct grid-tied
3. Commercial wind farm
    a. On-shore
    b. Off-shore

These applications are discussed in detail below.

3.2.1 Net Metering Applications

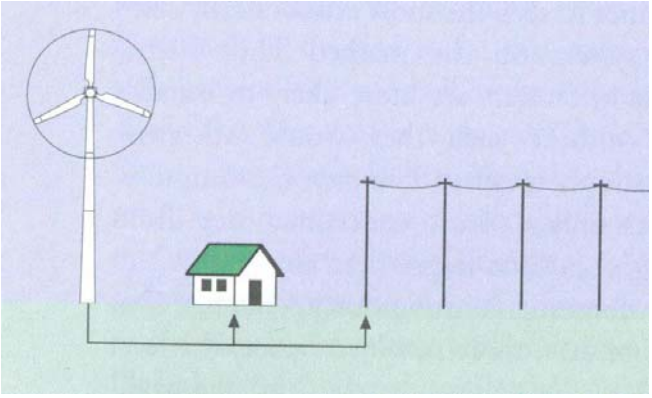
Any wind turbine with a rated capacity of 30kW or less can be connected to the grid as a net metered installation (Figure 14). In this application the turbine is connected in the customer's or facility's side of the utility revenue meter.

When the wind is blowing and the turbine is producing electricity, the amount of energy purchased from the utility decreases. In strong winds, the turbine may produce more energy than the customer is using and excess energy flows back to the grid where it is credited by the revenue meter. At the end of each billing cycle, if the turbine generated more energy then the customer has used, the customer receives a credit applied to the next bill. At the end of the year, if the credit still exists, the credit is "donated" to the utility.

The value of this electricity is then essentially the rate the customer is paying, which for the Tribal residents is around **8-9 cents/kWh**.

The customer or Tribe would have to meet approved interconnection requirements both with the Michigan Public Service Commission and with Consumers Energy.

Figure 14.Turbines connected to the customer's side of the kWh meter (Gipe 2004)



Further information:
- Michigan Public Service Commission. Resources for Net Metering Information: *www.michigan.gov*
- Cherryland Electric Cooperative. Net Metering Program: *www.cecelec.com/rates/index.cfm*
- Great Lakes Energy Cooperative. Net Metering Program: *www.gtlakes.com/aboutus/pdf/rates.cfm*
- Consumers Energy. Net Metering Program: *www.consumersenergy.com/welcome.htm*

3.2.2 Parallel Generation Applications

Several of the Little River facilities could be candidates for turbines larger than 30kW based on the facility's annual energy use. A typical project in this class can be as small as 30kW or as large as 50-100 megawatts[7].

If a wind turbine of this size range were installed at an existing facility, it is likely the project's highest value would accrue if the turbine were connected "inside the fence", on the customers side of the utility revenue meter.

With parallel generation, how is excess electricity accounted for?

Functionally, this arrangement is similar to net-metering. The difference is how excess wind generation is accounted for. If the output of the turbine is less than the energy use of the facility, the wind turbine will displace retail purchases for the utility, thereby lessening the electric bill (by **8cents/kWh**). On the other hand, if the turbine is producing excess electricity, it is fed into the electric grid and credited at a rate lower than the full retail rate, usually at the utility's avoid cost (at **3-4 cents/kWh**). This is known as parallel generation (PG).

What are the service options for parallel generation?

The rates and requirements for this type of arrangement are provided by Consumers tariff, "Cogeneration and small power purchase rate CG". This tariff has two service options. The first is for the wind system to negotiate a *favorable buy-back rate* with

[7] New and re-manufactured turbines are available in sizes such as 35kW, 50kW, 90kW, 150kW, 225kW, 500kW, 660kW, and 900kW.

Consumers, subject to the approval of the MPSC[8]. The second option is to accept the *standard terms of service* (usually the utility's avoided cost) established by the current tariff[9].

Under what conditions does the PG tariff apply?

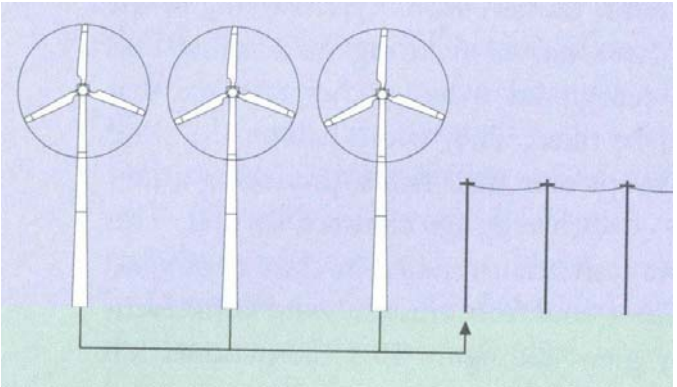
It is important to understand that the parallel generation (PG) tariff rates apply only under two conditions. The first condition is if a wind turbine is connected to an *existing facility* and is producing more energy that the facility consumes (Figure 14). The PG tariff rate applies only to excess power generated by the turbine and determines how much money the customer will receive for the excess power. Since the PG rate is usually a fraction of the retail rate, an ideal design goal is to select a turbine that meets most of the facility's energy needs and will minimize excess power generation to be sold.

The other application of the PG tariff is if a single turbine or multiple turbines are installed at a favorable site *without an existing facility* (Figure 15). In this case the turbine(s) connect directly to the distribution system (grid) and all electric generation is sold to the host utility under the terms of the PG tariff, and could be equal to **3-5cents/kWh**. This type of application is known as "outside the fence" or "direct-connect" wind energy.

[8] Negotiating a rate higher than the standard tariff can be a complex and daunting process. The utility has a lot of bargaining power as there is normally only one grid available to tie into. It is reasonable to assume that a utility will negotiate a higher rate only if it has an interest in the existence of the project. That interest may be economical, environmental, marketing and public relations, or educational. In the absence of a willing and vested utility, pursuing a higher negotiated PG tariff is not advised for small or single turbine projects.

[9] Under the non-negotiated PG tariff, a different buy-back rate applies from 7 am to 10 PM on weekdays (the on-peak rate) from the rate offered during other weekday hours, weekends, and holidays (the off-peak rate). The on-peak and off-peak rates are set each month, based on a three-month rolling average. These rates are defined as the cost of energy that the utility has avoided by purchasing the generator's electricity instead of making its own electricity. The exact language is that the rate paid is "…the incremental cost, measured using the top 10 MW band, of delivered power to the Company's load center from the Company's fossil-fueled steam, nuclear and combustion turbine units, and from interchange power sources, based upon the rolling average of the three consecutive months ending on the last day of the second month prior to the month that purchases are made by the Company ..." Judging from the rates offered in 2006, and anticipating that wind generation patterns will not show any special coincidence to on- and off-peak hours, wind power production will be paid an average of 3.7 cents per kWh.

Figure 15. Parallel generation turbines, without an existing facility, are connected at the utility's distribution voltage.



How would a PG tariff affect the price of other tariffs?

The Tribe should be aware that larger facilities have different utility billing tariffs then small energy users and residential customers. For example, the Casino and Big Blue are subject to what is known as demand-metered tariffs. The monthly electric bill has an energy component and a demand component. The energy component is charged based on the actual number of kilowatt hours used during the monthly billing cycle. The demand component accounts for the utilities required capital investment in power plants and power lines necessary to serve the load.

Wind power cannot get any credit for reducing a facility's demand charge unless by coincidence the wind blows strongly during just the 15-minute interval during which the facility draws the most power. It is almost certain that wind will not be blowing its hardest during the summer-time peak electric usage.

3.2.3 Commercial Wind Farms

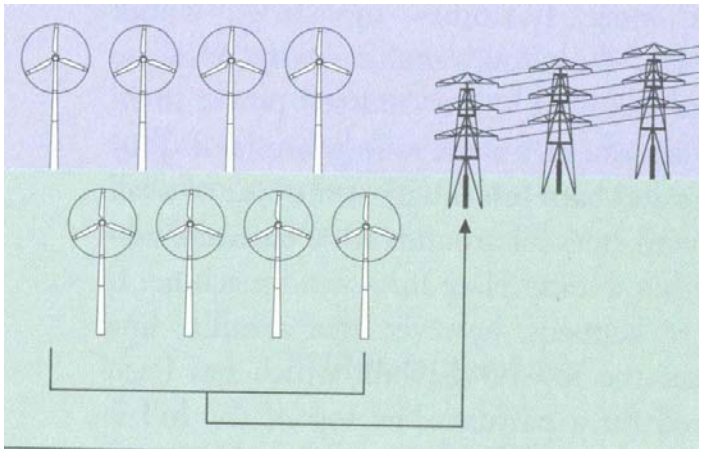
Commercial or utility-scale wind turbines are the largest and most complex wind energy development undertakings, based on a number of multi-megawatt turbines. Today turbines range in size from 1.5Mw to 3Mw each. Based on typical economics, a viable wind farm is at least 20Mw (7-13 turbines) and could be 10 times that if there is sufficient land available.

Wind farms are developed and operated with one goal: *to produce energy for sale* to a willing buyer and to provide a *satisfactory return* to developers or owners. The terms of the sale such as the rate, landowners, and duration are mutually agreed upon between the buyer and seller.

The rate paid for electricity generation is negotiated to arrive at the power purchase agreement (PPA). The PPA is usually the final step in the development process. It is impossible for the developer to know what their bottom-line PPA rate is until the project is well on it's way. Developing a PPA requires that the following agreements are in place:

1. Sufficient land has been secured typically through lease agreements with host landowners.
2. The wind resource is will defined through on-site tall-tower monitoring
3. Transmission access has been secured
4. All necessary permits have been obtained
5. Turbine performance analysis have been completed

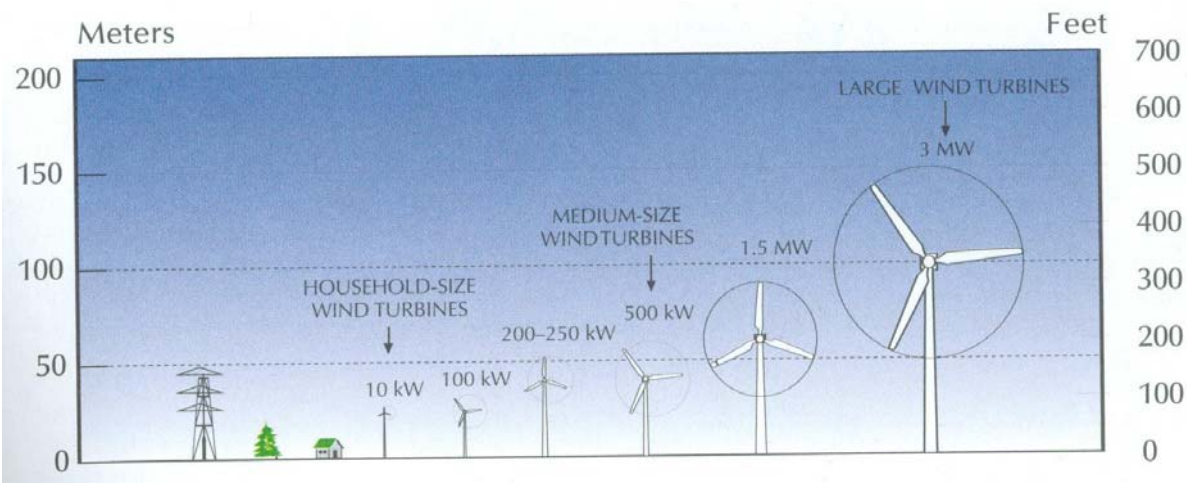
Figure 16. Wind farms are connected at transmission voltages (Gipe 2004)



As the energy value comparisons show, energy used on-site has a greater value (at retail value) then energy sold to a utility (at wholesale value).

In order to grasp the relative size of the wind turbines, the following figure shows the difference between the some what arbitrary designations of small, medium and large wind turbines.

Figure 17. Relative size of wind turbines (Gipe 2004)



3.3 Wind energy development factors

This section establishes the general criteria by which the Little River Band can evaluate the potential role for wind power in the community[10]. These criteria involve: program objectives, wind resource, economics, permitting concerns, land use, connection to the grid, and other factors.

The importance and complexity of the development factors are heavily weighted by the size and cost of a project. In general, small projects are subject to less detailed evaluation than are larger more capital intensive wind projects. As always, the Tribe's objective and vision will shape the application and with of each development factor.

3.3.1 Establish Tribal objectives

The Tribe will need to determine what its wind energy development goals are for the community. Wind power can be used to achieve many of the following objectives.:

- To off-set energy use at Tribal facilities by onsite "inside the fence" wind generation
- To displace all Tribal conventional electric consumption
- To zero the Tribe's carbon footprint
- To generate wind power for commercial sales as a business investment
- To demonstrate leadership in clean energy production

These objectives are not mutually exclusive. The Tribe could, for example, pursue development of a small scale wind turbine for the community center while also beginning work on a commercial-scale wind farm. If resources are limited, the Tribe will need to clearly identify its highest priorities.

The Tribes' objectives for the energy produced will determine the scope and complexity of the project development process.

The objectives are best determined after careful consideration of all options, and an assessment of both long-term and short-term community needs, and available resources. *What are the Tribe's short-term community needs? What are the Tribe's long-term community needs? What resources are available?*

How do we garner community support for wind projects?

Community support for the project is important for the project's success, which is currently fostered by the informal discussions taking place among Tribal leaders and renewable energy articles submitted to the newspaper. A series of community and Council meetings focusing on education and discussion can help people become familiar

[10] Adapted from Blecker, D. (2002) *Wind Power Development: Options for Indigenous Communities.*

with the idea of wind energy – basic understanding, realistic expectations about the advantages and challenges of wind energy, and some specifics about the development process and amount of time it can require from project idea to a spinning turbine. As well, community meetings will provide an opportunity for community and Council members to be able to share their ideal objectives, fostering a sense of ownership and excitement within the community for the project to move forward. However, the Tribe knows what type of community development process will work best for the Little River Band of Ottawa Indians.

The Tribe's objectives as well as its risk sensitivity will fine-tune the application of this guideline.

3.3.2 Determine the wind resource

The process of (1) establishing the objectives of a wind project, and (2) determining the available wind resource, is a linked decision making process. The community and economic goals will decide whether a wind project is realistic, while the quality of the wind resource may determine what the size of the turbine.

The size of the project will determine the time and effort needed for a wind resource analysis. Smaller single turbine projects require less diligence then larger commercial projects. In fact, most decisions about whether or not to invest in a small residential scale wind turbine are typically made with the wind resource information provided through a simple site assessment.

For medium and large projects[11], a precise **wind speed monitoring program** is necessary to fully characterize the amount of available wind and how its speed and consistency varies throughout the year, through the use of a tall tower equipped with multiple *anemometers* (wind speed measuring devices), wind vanes, data logger and other sensors. For larger turbines, the level of detail and information required from a wind resource assessment depends wholly on two factors. The capital cost of the project and the risk tolerance of the investors. Actual tall tower site wind speed data is also required by most financial partners.

Conducting a site specific detailed wind resources assessment can cost upwards of $25,000. As a rule of thumb, this investment is justified only when the cost of the wind resource assessment is less than 2% of the total project development cost; or, if the investors have very little risk tolerance and need to know exactly how much energy a wind turbine will produce at a particular site.

Under the 2% rule, one would only spend $25,000 to monitor the wind resource if the expected cost of the turbine was more than $500,000. An initial wind resource analysis is provided in the next section for the Manistee area, but this section will present the basics of a wind analysis.

[11] For this report, large is defined as >500kw.

Monitoring beforehand can save a lot of money by preventing a project from being built in a poor area, or by finding an area with a high access to a consistently fast wind speed.

What is important to learn about the wind resource at each wind turbine site?

Several of the most important aspects of wind to consider are outlined below.

1. The **average annual wind speed** gives a general idea of how much *energy* one can expect to be produced by a wind turbine over a fairly long period of time. Average annual wind speed has a linear relationship with the potential *energy* generated from any wind turbine[12].

   The wind speed is also related to the *power* in the wind available to a wind generator, defined by the exponential equation:

   $$\text{Power (P)} = 1/2 \times (\text{air density}) \times (\text{area of turbine rotor}) \times (\text{wind speed})^3$$

   Notice that wind speed is cubed. Restated, the equation really reads (P is power, d is density of the air, A is the swept area of the rotor, and V is wind speed):

   $$P = ½ \times d \times A \times V \times V \times V$$

   This means that small changes in wind speed have large impacts on the amount of *power* available. However, the *energy* that the wind turbine is capable of harnessing matters most, not necessarily the *power*. Energy is defined as power multiplied by time. For example, if you produce 1 kilowatt (power) for one hour (time), the amount of energy produced equals 1 kilowatt hour.

2. For large wind projects, detailed data will be needed on **wind speed distribution**. The Tribe will need to find out how the speed varies, or cycles on a daily, monthly, and seasonal basis. If, for example, the wind speed distribution shows high speeds only occur one hour out of the day, then the wind turbine will not be able to produce much sustained energy.

   The daily wind distribution profile (*diurnal distribution*) will also help determine how well the wind resource typically complements energy usage. Depending on the local wind resource, wind power production might match up nicely to the local need for power. Being able to predict the energy output of the turbine will benefit utility operations and therefore make energy distribution more reliable.

[12] All small wind turbine manufacturers and most mid-size and large wind turbine companies publish annual energy output tables that show the estimated energy production as a function of the site's *average* annual wind speed. These estimates, however, are the theoretical maximums and may need to be adjusted downward to account for turbulence, wake losses, line losses, and maintenance outages.

Wind speed distribution will also help to predict the wind turbine's affect on demand charge, as mentioned earlier[13].

3. **Wind direction distribution** tells how often the wind is blowing from each direction. This distribution helps choose which sites have best access to the wind resource and how to place wind turbines if more than one is being erected.

At least one year of wind speed monitoring is required before the decision can be made to proceed with a large wind project unless there are other high quality sources of long-term wind data that can be used for correlation purposes.

3.3.3 Site selection and evaluation

The performance and ultimate success of any wind energy project is critically dependent on the characteristics of the site. While a region may be blessed with an abundant wind resource, the viability of a particular site may be adversely affected by topography, ground cover, access to power lines, buildings, etc.

For "inside the fence" installations, or wind projects on existing parcels of land, the goal is to site the turbine at the best location on that parcel subject to existing physical and political constraints. At times, it may be necessary to reach the prudent but difficult conclusion that a particular site is not amenable to wind energy development for any number of reasons. If there are no fatal flaws, we then proceed to select a position on the land that offers the optimal balance of the following factors:

1) Best exposure to prevailing winds
2) Shortest electrical run to the point of interconnection
3) Compliance with all applicable zoning and permitting requirements

Development of commercial wind farms takes a decidedly different approach. Typically a wind farm developer searches for the best tracts of land available that meet a predefined set of criteria. The wind developer has the luxury of searching for the best wind sites to host a project rather than trying to fit a project onto a predefined parcel of land. The primary criteria are nonetheless similar. When a wind developer is searching for land, the following criteria are applied:

1) High expected wind resource
2) Close proximity to adequately sized power lines
3) Favorable regulatory environment for zoning and wind permitting

Within this broad framework for site selection, there are a number of detailed factors that merit consideration. These are discussed below.

[13] All wind turbine manufacturers assume the "normal" wind speed distribution when they provide their annual energy output estimates.

Topography

Topography effects how quickly wind can move across the land and if the wind flows in a straight stream or if it is turbulent. **Wind shear** is the change in wind speed with height above the ground, as the wind encounters fewer obstructions. Not only can choosing locations with a smooth, obstruction-free access to wind improve the chances of a higher wind speed, but it decreases the amount of turbulence in the wind. Turbines close to lakes, such as offshore wind turbines or a turbine on the northeast side of Lake Manistee, are good locations due to the expected lower wind shear and turbulence.

Swirling, turbulent wind not only can not be effectively harvested, it causes premature failure of a wind turbine. As a rule of thumb, the effect of an outcropping of rocks or a house and other such obstacles extends to a height and to a distance downwind of 10-20 times the obstacle height.

Security

The physical security of the area should be considered. Avoid high traffic areas. Wind farms should be sited away from population centers and single turbines should be sited in a way to minimize the potential for vandalism.

Traditional land use and land ownership

In order for a wind energy project to be successful, it should have the broad support of members of the community. When evaluating potential sites, be sure to clearly identify historical and cultural land use, as well as land ownership and access routes to the site. Projects should avoid sites with significant historical value or that are used for recreation or hunting.

Environmental impact

The environmental impact of wind turbines is minimal especially when compared to nuclear and fossil fuel energy resources. However, no form of electric generation is impact-free. There will be minor short term and long term environmental impacts associated with any wind energy project. Short term impacts are due primarily to construction activities. Long term impacts stem from the ongoing operation and maintenance of the wind turbine. The effects are typically limited to: aesthetics, sound, avian mortality, and safety.

Even if the Tribal law does not require an environmental assessment or environmental impact statement, the Tribe may want to work with their tribal environmental department to assess the potential impact of a wind turbine or wind farm.

Aesthetics

Aesthetics have been repeatedly raised as a major concern by opponents when new wind farms are being proposed and developed. How would the population of Manistee react to wind farms in the area? At a minimum, the Tribe should discuss this issue with people in the community and within view of the project, and listen to their concerns.

Sound

Wind turbines make sound as the blades turn through the air and small turbines are noisier than large turbines. Our experience with both small and very large wind turbines is that the noise of blowing wind is louder than the noise made by the turbines. However, it is important to recognize that there is some noise produced and that the monitoring station and turbines should be sited far enough away from homes to avoid any potential conflict[14].

Avian mortality

Avian mortality has been more thoroughly researched than any other aspect of wind energy operations. The data is clear – on average, a commercial scale wind turbine can be expected to cause two bird deaths per year. This is an insignificant mortality source as compared to all sources of bird deaths. Moreover, there is no known avian threat caused by small-scale wind turbines. Due diligence during the development process should attempt to avoid known migratory routes and habitats of threatened endangered species.

Safety

Public health and safety is protected through common sense measures usually applied at the local level to ensure a safe and reliable wind energy installation. Safety is assured through two primary means:

1) Code compliance
2) Set back requirements

Wind turbines should be designed and installed in accordance with all applicable state, utility, national and international codes. Compliance should be assured for the foundation, tower, and electrical systems.

Wind turbines should be installed in accordance with standard set back requirements. This will all minimize the chance of an incident involving anyone other than project personnel or the system owner.

By far, the best vehicle to address public health and safety concerns is through the promulgation of a local, county, state or Tribal wind zoning ordinance. A copy of the Wisconsin model zoning ordinance is attached as Appendix 7. The Little River Band may want to consider amending and adopting a variation of the zoning ordinance.

Ice

Wind opponents raise false concerns about wind turbines "throwing" ice during the winter. There is absolutely no documented case of ice being thrown from the blades of a turbine. Experience shows that icing events are rare but when they do occur, ice build up on the blades causes the wind turbine to shut down. Turbine blades, like airplane wings, are technologically advanced airfoils. When a turbine blade is iced, it can not generate

[14] Daniel J. Alberts: "Primer for Addressing Wind Turbine Noise", Nov. 20, 2005, p. 9.

lift much like an airplane can not fly with ice on its wings. Without lift, the blades cannot spin. When the weather changes and the ice melts, the ice will slough off harmlessly to the ground below. Proper set backs ensure public health and public safety during these rare ice conditions.

Property values

There is an unfounded belief that wind turbines adversely affect property values. To date, studies have failed to show any correlation between residential property values and the co-location of wind turbines, other than an increase after wind turbine installation[15].

Electrical Interconnection

There are specific technical and engineering requirements that govern the electrical interconnection between a wind turbine and the grid. For net-metering and parallel generation projects that connect to the utility substation, IEEE929 and ULI741 standards ensure power quality and safety requirements are maintained. Specific standardized interconnections that would be required of the Tribe are discussed in the section on specific considerations below.

For small and mid-size machines, the turbine should be located as close to the point of interconnection as possible to keep costs under control. In general, its best to keep wire runs under 1000 feet. Critical components of the interconnection include:

- Electrical safety: over/under voltage, frequency and over current protection
- Lightening protection
- Proper system grounding
- Adequate controls and shut down capability

These factors are integrated elements of most commercially available wind turbines and any qualified wind turbine installer will ensure a safe and fully code compliant system installation.

Similarly, commercial wind farms are governed by their own set of codes and regulations for reliability and safety. But since wind farms usually connect to the high voltage transmission system, the Midwest Independent System Operator (MISO) will establish the requirements for interconnection to the grid[16].

Ordinances and Permitting

Permitting is another step in the monitoring process, if the Tribe has height restrictions or set-back policies, or if the monitoring is conducted on non-Tribal land subject to zoning

[15] Sterzinger, Beck, and Kostiuk: "The Effect of Wind Development on Local Property Values," Renewable Energy Policy Project, May 2003

[16] The MISO interconnection process is expensive and lengthy and any applicant is well advised to seek experienced engineering assistance to prepare the application and see it through to the end – an executed Interconnection Agreement.

or Wind Energy Conversion System (WECS) ordinances. Permitting is covered more in depth in the section detailing the Tribe's options.

Further information:
- Michigan Department of Labor and Economic Growth. Michigan Siting Guidelines for Wind Energy Systems: *www.michigan.gov*
- RENEW Wisconsin. Small Wind Turbine Tool Box: *www.renewwisconsin.org/wind/windtoolbox.html*

3.3.4 Economics of a wind project

The fuel to power a wind turbine is and always will be free. This benefit should not obscure the fact that the construction of a wind energy system is capital intensive and successful long-term operation of any wind turbine requires a planned maintenance budget. The Little River Band will need to evaluate its financial objectives and resources for a wind energy program and then evaluate the economic viability of any proposed project – net metering, parallel generation or wind farm – from the established criteria.

What is a simple-payback analysis?

For small and mid-size projects, most people look at the simple payback period as a measure of economic viability. This calculation has several advantages: it is easy to perform; it is conservative in nature since utility rate hikes are often not accounted for; and, once set up on a computer spreadsheet, sensitivity analyses are readily performed. The payback period, in years, is the most affected by the following parameters:

1) Wind speed and the resulting annual energy production estimates for the wind turbines under construction.
2) Cost of energy: Recall that single turbine and inside the fence installations derive their highest value by displacing the purchase of electricity from the utility at the going retail rate. As a result, high cost energy decreases the payback period, but low cost energy (such as the demand metered casino) increases the payback period.
3) Turbine capital costs: Higher cost turbines, on a dollar per kilowatt basis, will have longer payback periods then more cost effective turbines. However, an expensive but very efficient wind turbine may prove to be more cost effective then a lower cost buy inefficient machine.
4) Available incentives: Grants, low cost loans, tax breaks and other incentives all improve the economic viability of any wind energy project.

For small and mid-size projects, paybacks can range anywhere from five years to more than twenty years. Again, the Tribe's financial objectives will determine what economic return is acceptable. It is important to bear in mind that the decision to invest in small wind energy projects is usually driven by more than economic objectives. These projects can empower, excite, and educate the community and these intangible returns are often as important in the overall decision making process.

How can we financially evaluate a commercial wind farm?

Commercial wind farms require more advanced financial tools to evaluate the economic viability of a project. Lenders and financial partners are more interested in the projects return on investment (ROI) then in simple payback periods. Luckily, the financial partner to any potential Little River Band project will likely provide the necessary tools to evaluate the cash flow of a wind farm. In practical terms, a wind farm is evaluated based on the required Power Purchase Agreement (PPA) rate in order to make the project successful. In other words, the financial partner would tell the developer that the project has to be able to get 5.7 cents per kWh from the buyer or off-taker in order to work. The developer then strives to meet or exceed this benchmark.

How could the Federal Production Tax Credit help our PPA?

The Little River Band should also be aware that they or their financial partner will also be required to fully utilize the available Federal Production Tax Credit (PTC). The PTC is worth 1.9 cents per kilowatt hour for all energy produced over the first 10 years of the projects life. Obviously, this is a complicated legal issue that can only be answered by qualified tax professionals. In today's market, the PTC is the difference between a project's economic success and failure. With this in mind, the Tribe should aggressively pursue options or partnerships to realize the benefits of the PTC in order to achieve the best possible PPA rate.

Further information:
- Michigan Energy Office. Wind and Solar Energy Equipment Providers: *www.michigan.gov/cis/*
- Consumers Energy. Pricing and Rules for Electricity Tariffs: *www.consumersenergy.com/tariffs*
- Michigan Public Service Commission. Glossary of terms. Demand charge: *www.cis.state.mi.us/mpsc/electric/restruct/glossary.htm*

3.4 Current knowledge about wind resource

According to the National Renewable Energy Laboratory (NREL) which offers a national wind resource assessment, the Manistee area has an "outstanding" wind resource potential with an average wind speed at 50 meters of 17.9-19.7 mph, which is a wind class of 6[17].

The numerous resources of wind data that SGES found also support NREL's average wind speed projection for offshore Manistee in Lake Michigan, with slightly slower speeds inland. These speeds, if relatively consistent, would be enough to power turbines ranging form small residential to utility-sized wind farms. However, the specific wind resource can only be determined through monitoring. We strongly recommend the Tribe undertake monitoring if interested in large wind projects.

[17] Wind power is identified by numbers ranging from 1 to 7. These are known as "Battelle Wind Power Classes" or just "wind class." For a commercial or large wind energy development, the minimum required wind class is 3 to 4, corresponding to an average wind speed of 14.3 – 16.8 mph at a height of 50m.

3.4.1 Information gathering

How will the Tribe know the wind is blowing fast enough for a wind turbine?

A good place to start is **state wind maps**. Even if the map shows that a good resource exists, it is important to realize that wind is very site specific and can change dramatically from one location to another due to hills, valleys, lakes, forests and buildings. US Department of Energy wind maps, or the National Renewable Energy Laboratory (NREL) wind maps, are all possible sources of quality wind speed and power data.

Another inexpensive method of estimating the quality of the wind resource is requesting the average wind speed of the area from the **state meteorological office**, if the data is available. Nearby **airports**, such as the Manistee airport, are also sources of information. SGES probed both of these sources and summarized what it learned below.

For household-sized wind turbines, the collective **memory** of Tribal members or **physical evidence** such as the way trees and vegetation grow in the area can also be good indicators. Living plants subject to the continuous forces of the wind will grow at an angle, and the amount of angle can be used to estimate the relative intensity of the wind.

3.4.2 Michigan wind-mapping project[18]

For each possible wind site for the Tribe, SGES looked on the Michigan State wind map at a point (and its associated wind data) that was as close as possible to the actual coordinates of the site. Therefore, the following summary of wind data is not definitive, but merely a comparison. The average wind speed for all on shore sites at heights over 70m was around 15 mph.

Figure 18. Average annual wind speed at potential, on shore wind turbine sites (AWS Truewind 2004)

Wind Speed (mph)	Big Blue	Sub-station 1104	Proposed Community Center	Public Safety	Near Wastewater
Wind Speed at 30m	12.1	12.8	12.1	12.5	11.6
Wind Speed at 50m	14.1	14.4	14.1	14.0	13.3
Wind Speed at 70m	15.5	15.7	15.5	15.4	14.8
Wind Speed at 100m	17.2	17.2	17.1	16.9	16.5

[18] ASW Truewind (2004) *Wind Energy Resource Maps of Michigan*. Prepared for the Michigan State Energy Office. Albany, New York. In 2004, AWS Truewind prepared a wind map for the Michigan State Energy Office. Using the atmospheric simulation models, AWS Truewind produced maps of mean wind speed in Michigan for heights of 30, 50, 70, and 100 m above ground, as well as data on the frequency and speed distribution of wind around the state.

In recent years, monitoring wind on taller and taller towers, has shown that wind speeds increase greatly with increasing height, and the above chart shows this relationship. Hence the taller the tower, the quicker the economic return.

Building wind turbines offshore is a much more complicated affair both in terms of engineering and political approval, and the installation and maintenance fees are also higher. However, the amount of wind available to harness and the subsequent amount of green energy to produced is much greater.

Figure 19. Average annual wind speed offshore in Lake Michigan (AWS Truewind 2004)

Wind Speed (mph)	600m Offshore	2.6K Offshore
Wind Speed at 30m	15.3	18.4
Wind Speed at 50m	16.5	17.2
Wind Speed at 70m	17.7	19.3
Wind Speed at 100m	19.0	20.3

A recent, comprehensive compilation of near-lake and in-lake data sources[19] confirms the above wind speed conclusions, by noting that the "…offshore wind resource in Lake Michigan generally exceeds 8.5 m/s (19.0 mph) at reasonable hub heights for large offshore wind turbines three or more miles offshore." The implication for wind power development in the Lake is that a lake-based wind turbine of normal height could produce 20-30% more electricity than a land-based wind turbine.

The Michigan state wind map also provides *wind roses* that show the percentage of time that the wind is blowing from certain directions and the percentage of energy from each direction at that location. The wind roses near Manistee County typically show wind arriving from the Southwest, South-Southwest, and the South, although this information would need to be validated with on-site monitoring as well.

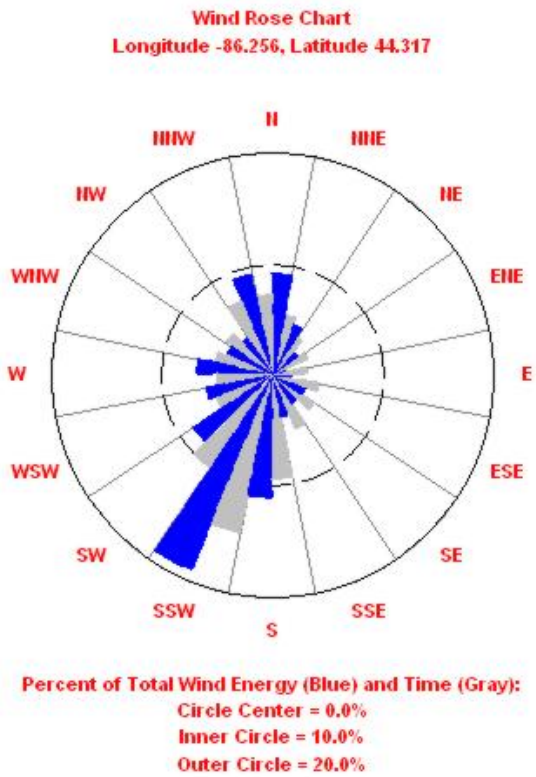
[19] Owen, Bob (2004) *Lake Michigan Offshore Wind Resource Assessment.* Final report for Focus on Energy. www.focusonenergy.com/data/common/dmsFiles/W_RW_MKTG_LMWindAssessment.pdf

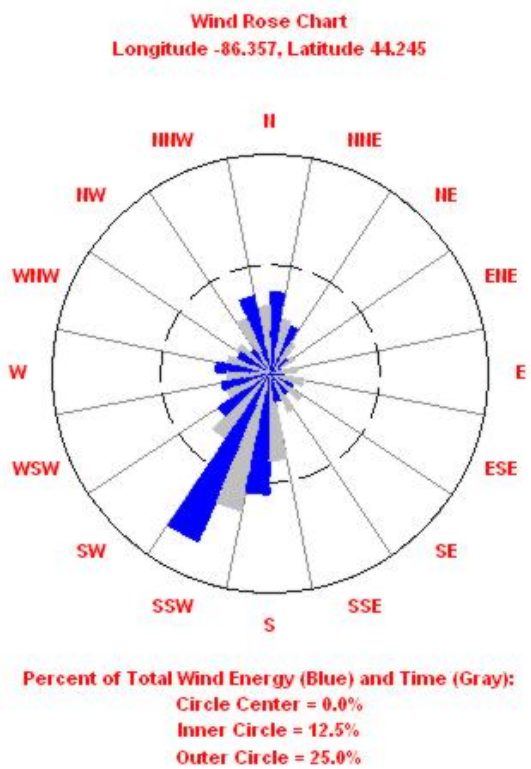
Figure 20. Onshore wind rose (-86.256, 44.317)

The following wind rose is located about 3.5 km north of Highway 31, about a half a mile west of Dontz Road. Almost one third of the wind power and wind frequency comes from the South West to the South.

Figure 21. 3KM Offshore Wind Rose (86.357, 44.245)

The offshore wind rose represents data from a point just offshore in Lake Michigan, located 2.9km due west from the intersection of Highway 31 and the south shore of the Manistee River. Roughly one third of the time, the wind is blowing from the South or Southwest direction, also representing almost 40% of the wind power at that location.





Another avenue of assessing the wind in Manistee County is through a National Oceanic and Atmospheric Administration (NOAA) program called CoastWatch, a nation-wide environmental data gathering program. The Great Lakes Environmental Research Laboratory (GLERL) functions as the Great Lakes regional node of CoastWatch[20]. Wind reports are gathered every hour from satellites and meteorological towers, including wind information from the Manistee County Airport (MBL) and a Coastal Marine Automated Network (CMAN) station just near Manistee at Big Sable Point Lighthouse. Both of

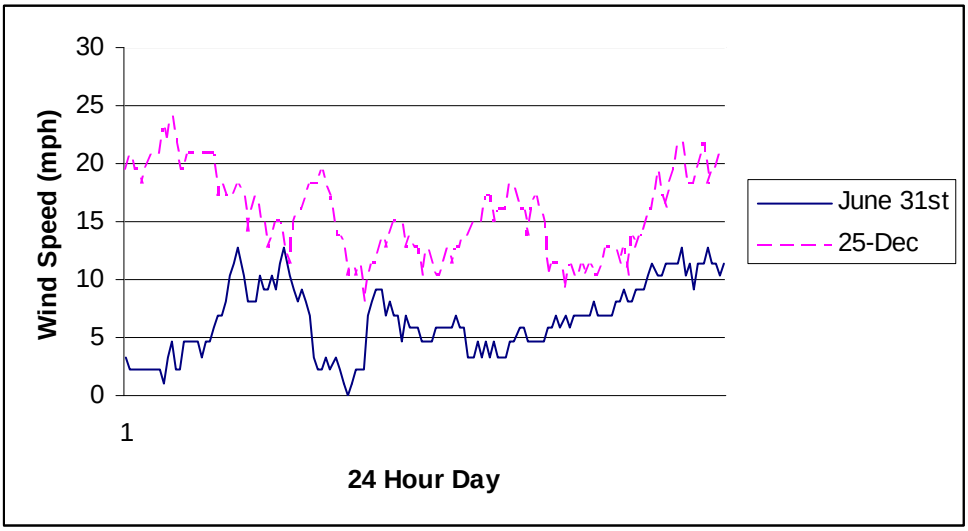
[20] Also available is the Great Lakes Coastal Forecasting System, which allows viewers to watch an animated video showing the wind strength for the two most recent days. CoastWatch. http://coastwatch.glerl.noaa.gov/overview/cw-overview.html

these reference points were evaluated, however, and are not considered to be valid data points[21].

As for the variation of wind power between seasons, according to NREL, offshore areas of all the Great Lakes have a maximum wind power in the *winter* (class 6) and minimum wind power in the *summer* (class 3). An average annual of class 5 wind power can be expected over all offshore areas[22], which meets the minimum requirements for a commercial or large wind energy development.

A very basic comparison to demonstrate seasonal variation can be gathered from the Big Sable Point data. The following graph shows the wind speeds on June 30th and December 26th, 2006 at Big Sable Point, just north of Manistee. That day in July, the winds did not rise above *13 mph*, while the maximum wind speed on December 26th was over *25 mph*.

Figure 22.Wind Speed (mph) seasonal variation at Big Sable Point, Michigan, 2006.



These seasonal variations, again, highlight the need for monitoring before large wind projects in order to find out how often the wind is blowing at speeds fast enough to generate an economically realistic amount of energy.

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[21] Airports, in general do not record reliable wind data, as is most likely the case with the Manistee County Airport. The anemometer is only 10 meter off the ground and is surrounded by forest, a rough topography that distorts actual wind speed measurements. The average wind speed found at the airport over the year 2006 was just over 9 mph. This average could indicate speeds of 12 mph at heights near 80 meters21. This average wind speed is just an estimate from raw data, and therefore should not be relied upon.

The Big Sable Point anemometer is owned and maintained by the National Weather Service Central Region and only started recording data in July 2006. However, the past 6 months have yielded an average wind speed of over 13 mph (at 10m height), which could indicate speeds over 17 mph at heights near 80 meters, but similarly is not regarded as a valid reference point.

[22] Pacific Northwest National Laboratory (1986) *Wind Energy Resource Atlas of the United States.* http://rredc.nrel.gov/wind/pubs/atlas/

3.5 Little River Band's options for large scale wind

Several locations within the 1836 Treaty Boundary and offshore in Lake Michigan are promising high wind areas. The following table summarizes the locations that SGES viewed while in Manistee County and the current energy uses of any nearby facilities that the wind turbine energy could offset. The appropriate turbine size for each location is listed as well as the likely kWh produced by each turbine.

Figure 23. Summary of possible wind turbine options.

Site	Current energy use of nearby facilities (kWh/year)	Turbine size	kWh produced per year (000's)
Near Public Safety	137,541	>30 kW	50-250
Near Big Blue	264,600	35-500 kW	50- 750
Near Casino Warehouse	13,318, 002	<200 kW	50 -2,000
Near proposed Community Center at Aki	To be determined based on design	<30 kW	30
Near Sub-station 1104 on Dontz Road	n/a	250 kW	460
Off-shore	n/a	(5) at 3,000 kW	52,000

While the first chapter explained the possibilities and priorities of the first four sites listed above, the options for developing partnership onshore projects and offshore commercial wind is discussed below.

3.5.1 Onshore Wind Developments: working with other land owners

Partnership projects with other stakeholders involve two main scenarios. In the first one described here, the Tribe would lease land from other land holders. In the second scenario, the Tribe would lease their land to another wind developer.

Tribe leasing land from farmers

Currently, the trust land holdings are slightly too small to develop large wind farms within the Tribe's boundaries. As a result, if the Tribe wants to pursue a large scale commercial farm, its best option may be to identify suitable acreage outside of the reservation and engage the project as a pure wind development opportunity. The Tribe might arrange to lease that land while owning the turbines, and therefore would receive the revenue. The Tribe could own a single large wind turbine or an entire wind farm.

The Tribe might decide to act as developer of a wind project, or it might partner with a developer. The Tribe would first approach land owners on whose land a wind turbine might reside, and solicit the land owner's cooperation in the preliminary scoping of the project.

How could the cooperation be written up in an agreement?

A cooperation agreement between the land owner and the developer creates an exclusive relationship. Because the wind development process can take a number of years, the term of the cooperation agreement might be as long as five years. This agreement includes giving the developer permission, with notice, to be on the land for purposes of prospecting for wind. A cooperation agreement would also mention the possibility of monitoring for wind on the land, i.e. erecting a wind monitoring tower.

How much farmland would a utility scale turbine use?

Keeping in mind that utility-scale turbines will require about 50 acres of land when all factors – topography, land use, set-backs – are considered, the Tribe could mention as a good rule of thumb to the land holders that for every tower planted, five percent of the usable cropland is lost, due to the tower, access roads, and possibly substation if required[23]. For example, a 100 MW wind farm will span 5000 acres, although the actual footprint of the turbine, including the tower, access roads and support equipment is only about ¼ acre per machine.

If the developer feels the project is viable, then he or she would ask the land owner to lease the land. The land lease document stipulates not only an amount of money to be paid, but how the two parties' interests will be protected during construction, operation, and at the end of the project.

How could other people be engaged in the project?

At this time, a diligent and conscientious developer will be prepared to engage interested parties who are not land owners. The developer will have a plan to compensate nearby landowners. Compensation can be as cash, or in the form of services or investments in lieu of cash. The developer will disclose to the community the development plan prior to applying for formal permission. Compensation and disclosure as mentioned above will be relevant whether or not the Tribe owns the land.

The opportunities for this type of partnership within the 1836 Treaty boundary appear positive, due to the joint participation in the fight against the coal farm. These previous friendships and partnerships could be called upon again to create a wind farm project on local farmers' land. One benefit to working with farmers is the Michigan Anemometer Loan Program, which loans wind monitoring equipment only to businesses related to farms and agriculture[24].

Developers leasing land from the Tribe

A wind turbine larger than net-metering (30 kW), if it were on the Tribe's land, would probably be owned by the Tribe. If some other party owned it, that party would be expected to pay some sort of fee to the Tribe as consideration for use of the land and the existing electrical infrastructure. A for-profit entity could take advantage of tax incentives

[23] Juhl and Wasserman (2002)
[24] Michigan State University and Michigan Department of Energy Anemometer Loan Program. web1.msue.msu.edu/wind/application.htm

by siting a wind turbine in a very windy place that is controlled by a non-profit entity. The Kumeyaay Tribe began with this land-leasing arrangement, but has since decided to take ownership over their project and subsequent projects.

Box 1. Kumeyaay Tribe Wind Power Project[25]

The Campo Band of Kumeyaay Indians is earning landowner payments for the wind farm on its tribal land near San Diego, California, that are substantially above wind industry standards. The 25-turbine, 50-MW Kumeyaay project provides roughly $16,000 per turbine (2 MW each) per year for the Campo Band. The Kumeyaay receive high payments because of a lucrative power purchase contract with local utility San Diego Gas and Electric (SDG&E), as well as local land values.

The Campo Band owns other land with a good wind resource that it is trying to develop, this time with an ownership stake. One project will be a 1-MW parallel generating turbine to power the tribal casino. The tribe also plans to develop a 20-MW project on a ridgeline near the 50-MW project. The tribe would like to have an ownership role in the 20-MW project and take a greater part of the project rewards. "It's a very stop-and-go industry, and if you're not ready to move when the time comes to move, then you miss your window," said the tribal spokesperson. The tribe will seek an experienced wind industry player as a partner who can invest some capital – aligning its interests with the tribe's – and also bring its expertise to bear.

The Little River Band's casino could possibly be tied into a project similar to, or more likely smaller than, the one above. The Tribe should consider monitoring in the field between the wastewater building and the casino warehouse.

3.5.2 Substation 1104: an example land leasing project

While SGES was on-site, we viewed a plot of land near an electrical substation along Dontz Road. The wind resource along the neighboring strip of land appeared to be strong, but if the Tribe wanted to pursue with a medium to large scale wind project here, they would have to find the exact desired wind *monitoring location* and approach the relevant land owner, as found in the Michigan state land owner and plat book.

Which local ordinance would this site be subject to?

As this land is not in trust, the construction of a wind monitoring system or a wind turbine would be subject to the Manistee Township Zoning Ordinance, and their Wind Energy Conversion System (WECS) Amendment[26]. The setbacks within the Manistee County WECS Amendment require that the wind turbine adjacent to any property lines must be set back at least the height of the tower, including blade length. Therefore, the

[25] Native American Wind Interest Group (NAWIG) News Summer 2006. www.eere.energy.gov/windandhydro/windpoweringamerica/na_anemometer_loan.asp

[26] Manistee WECS Ordinance available from Manistee Township, contact Rob Marble (213) 723.6507 x12. A copy has already been forward to the Tribe's Department of Planning.

Tribe should also notify adjacent land owners if the placement of the wind monitoring equipment is near property lines.

How do the other development factors affect this site?

Looking at this site through the lens of the development factors discussed above shows a relatively positive site. The turbine would not be immediately near any residential dwellings, therefore *noise*, *safety*, and *aesthetics* would not be an issue. Further research would be needed to determine if this land had a *traditional land use* or if there would be any severe *environmental impact*. Considering, however, that the turbine would be near an already existing substation, these issues will have already been considered and dismissed for the area. *Security* could be achieved with proper fencing, and the *cost of interconnection* would be low due to the close proximity of a substation.

What size wind turbine would be appropriate?

A feasible wind project at this site could include one (or two) 250 kW sized turbines, or one 600 kW sized turbine. Figure 24 outlines the specifications for two turbines of these sizes. The Vestas (600kW) has more than twice the size of rated capacity of the Fuhrlander (250 kW). Note that when installing these turbines, the voltage and phase must be compatible with the closest distribution system.

Figure 24. Turbine specifications for Fuhrlander FL-250 and Vestas V-47.

Turbine Specifications		
Manufacturer	**Fuhrlander**	**Vestas**
Model	FL-250	V-47
Rated Capacity (kW)	250	600
Output Voltage	480	600
Phase	3	3
Rotor Diameter (m)	33	47
Rotor Diameter (ft)	108	154
Tower Type	Monopole	Monopole
Tower Height (ft)	142	220
Tower Height (m)	42	65
Total Structure Height Above Ground Level (ft)	196	297

As noted in Figure 25, the Vestas would generate at least three times the amount of energy annually then the Fuhrlander, due to the difference in rotor blade size of the turbines and the tower height.

Figure 25. Turbine performance of the Fuhrlander and Vestas

Turbine Performance	**Fuhrlander**	**Vestas**
Wind Speed at Hub Height (mph)	13.9	15.1
Annual Energy Output (kWh)	431,663	1,390,712
Monthly Energy Output (kWh)	35,972	115,893

Based on the average residential household usage of 10,000 kWh/year, the Fuhrlander would generate enough on average to power 43 homes a year, the Vestas would power almost 140.

Figure 26 shows how the Fuhrlander would cost about a third of the price of the Vestas, over $1million less. Notice as well the added yearly costs for projects involving land leasing. Ideally the cost to lease would be as low as $1,000 per year, but the price may reach as high as $4,000 per year.

Figure 26. Sytem costs of the Fuhrlander and Vestas

System Costs	Fuhrlander	Vestas
Installed Capital Cost ($)	$400,000	$1,500,000
Operation and Maintenance (O&M) ($ per turbine per year)	$4,000	$15,000
Land leasing costs ($ per turbine per year)	$1,000	$1,000
Insurance charges ($ per turbine per year)	$2,000	$2,000
Political Action	$2,000	$8,000

*Interest charges can vary depending on how the Tribe would choose to finance these projects, and therefore was left out of the calculation.

Using these two wind turbines, we can demonstrate how the electricity value and the factors that impact electricity value can significantly affect the economics of the project, creating paybacks as short as 6 years to as long as 10 years. Appendix 8 details an example of the economic pricing for the Fuhrlander (250 kW) and a Vestas (600 kW) through four scenarios, each with a different electricity value.

Box 2. Short example of rates and grants which improve a wind turbine payback

Traverse City Light and Power Wind Generator[27]

In June 1996, Traverse City Light & Power dedicated the first utility scale wind turbine generator in Michigan. The wind turbine is a Vestas model V-44, 600 kW generator and has a blade diameter of 144 ft. on a 160 ft. tower. In average annual winds of between 14-15 mph the annual production from the wind turbine is estimated between 1.1-1.2 million kWh's which is enough electricity for approximately 200 average Traverse City homes. The capital cost of approximately $650,000 was partially funded by a $50,000 grant from the State of Michigan and the U.S. Dept. of Energy's State Energy Program.

Green Rate

The wind turbine was made possible because of community support for a green rate program. The green rates are voluntary residential and commercial rates available to customers willing to pay a premium for wind generated electricity. The green rate premium of 1.58 cents/ kWh amounts to a 17-23% increase depending on the rate class. For the average residential customer this is a $7.58/ month bill increase. An average green rate customer will annually avoid the burning of three tons of coal and air pollution consisting of 10,000 lbs. of carbon dioxide, 60 lbs. of sulfur dioxide, and 40 lbs. of

[27] Michigan DLEG Renewable Energy case study: www.michigan.gov

nitrogen oxides. With an amortized operating cost of 5.5 cents/kWh, the customer green rate premium of 1.58 cents/kWh and the federal renewable energy production incentive of 1.9 cents/ kWh, the wind generator provides electricity at a cost equal to that available from the municipal power pool.

Further information:

- US Department of Energy, Energy Efficiency and Renewable Energy: Wind Powering America, Software to compute the impacts of wind development. *www.eere.energy.gov/windandhydro/windpoweringamerica/software.asp*
- Native American Wind Interest Group Newsletter, National Renewable Energy Laboratory, Department of Energy.
- Native Wind: *www.nativewind.org*
- U.S. Department of Energy Tribal Energy Program: *www.eere.energy.gov/tribalenergy*
- Windustry: *www.windustry.org*
- Michigan Department of Energy, Renewable Energy: *www.michigan.gov.eorenew*

3.5.3 Offshore wind in Lake Michigan

The Tribe's treaty rights and proximity to Lake Michigan make an offshore win application worthy of further of consideration.

What are the positives of off-shore wind?

The wind energy resource in Lake Michigan appears to be more substantial that the wind resource on land. The wind is extremely smooth, not turbulent, which bodes well for reliability of lake-based wind turbines. Offshore resources with their steadier and higher speed winds may prove significantly more valuable, to producers and utility managers alike[28], as one of the major technical challenges for wind generation is that winds are both intermittent and variable.

In Michigan there is not a great correlation between when the wind blows and electricity demands, ie low summer winds do not compliment the increased power demand for air-conditioning. The steadier and more predictable the winds are, however, the more capacity value can be credited to wind generators.

Off-shore development avoids many of the land-use challenges associated with traditional wind farms. As well, offshore sites present the ability to transport and deliver very large pieces of wind energy equipment using a well-established water transportation infrastructure[29].

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[28] Pryor, S. et al (2005) Offshore Wind Energy Development in the Great Lakes: A Preliminary Briefing Paper for the Michigan Renewable Energy Program. www.fws.gov/midwest/eco_serv/wind/references/MichiganOffshoreRpt.pdf

[29] Pryor, S (2005) "Land-based wind turbines are already approaching the maximum size for generators and components that can be delivered via highway or rail, and manufacturers are now looking to offshore applications with delivery by ship as a means of achieving additional economies of scale with even larger generators."

What are the unique challenges of offshore wind?

Aside from the strong wind, and possibilities for turbine transportation and placement, off-shore wind development enjoys its own unique challenges many of which are unresolved. To date, foundation engineering requirements for offshore turbines generally have been determined by wave height in the North Sea and pack ice in the Baltic Sea. Both of these issues are expected to present technical challenges for sites in the Great Lakes as well, where wave heights can reach six meters. In addition, concerns have been raised about the durability of turbines, blades, and foundations that would be exposed to freshwater freeze and thaw cycles in the Great Lakes[30].

The noise, safety, and environmental development factors need to be considered too. Safety issues, such as tower failure or ice throws are essentially a non-issue offshore. The perceived view of the offshore wind turbines may or may not be worse than onshore wind turbines, but again it is important to remind opponents, that to not see wind turbines in the sky is to know that the air quality is worsening.

How would offshore turbines be interconnected?

Underwater, marine cables would connect offshore wind farms to the mainland electrical grid. Undersea cabling is a well-established technology. Underwater cables are often buried in shallow trenches dug into the lake bottom, to reduce the risk of damage from fishing equipment, boat anchors, and the like. There are well-established technologies and standards for interconnections with electric grids. As with any electric generator, for interconnections to be both feasible and economical, offshore wind generators must be located in reasonable proximity to adequate distribution or transmission lines[31].

Who would be a partner in an offshore project?

Currently, there are no off-shore wind projects proposed in Lake Michigan. As a result, the permitting process is nebulous at best and involves multiple state, federal, and possibly international agencies. In addition, it is likely that any proposed off-shore wind farm will encounter opposition by NIMBY groups and other narrow interests. The political battle this project will require could be offset by comprehensive research beforehand and a large coalition of interested parties, stakeholders and communities supporting the project.

Stakeholders could include Michigan's Wind Working Group (WWG), the Michigan Renewable Energy Program (MREP), Michigan's Department of Environmental Quality, Office of the Great Lakes and Land and Water Management Division.

The State of Michigan owns the bottomlands of the Great Lakes, from the shores of the state out to the boundary lines between Michigan and neighboring states and the

[30] Pryor, S (2005)
[31] Pryor, S (2005)

Canadian province of Ontario. This is true however, if the Treaty boundary could not be projected into the Lake at some distance. The US Army Corp of Engineers has jurisdiction over structures in the lakes, and would need to be involved in the permitting process and the State of Michigan.

What could the actual wind farm look like?

By projecting the treaty boundary west into the lake, and limiting the assessed area to within five kilometers from shore, it is apparent from a cursory inspection of the bathymetry[32] that all depths are less than 15 meters. Offshore wind facilities in European waters are being installed in waters two and three times as deep.

Logistically, depending on turbine size and the distance between turbines, between 50 and 100 offshore wind turbines could be placed in a parallelogram-shaped area off shore of Manistee. This could generate enough electricity for more than 50,000 typical homes.[33] A pilot project of five turbines, each 3,000 kW (a typical size for offshore wind turbines) could cost over $40 million and generate enough electricity for about 5,000 homes. More extensive feasibility studies should be conducted only when the Tribe has full consensus to pursue this option.

If the Tribe is interested in exploring the feasibility of an off-shore wind project, it should investigate options to install near-shore (coastal) and off-shore wind speed monitoring equipment. It is likely that a study such as this would be a good candidate for grant support through BIA, DOE, EPA, or ANA.

In sum, permitting uncertainty and expected opposition will make the first Lake Michigan wind farm development process longer and more expensive than it should be. However, Little River's unique status as a sovereign nation may provide the Tribe a distinct advantage. We recommend that Little River investigate the legal and political opportunities that it may enjoy with respect to off-shore wind development.

Further information:
- European Wind Energy Association. Offshore wind projects in Denmark and Great Britain: *www.ewea.org/*
- Cape Wind: *www.capewind.org*
- Winergy: *www.winergyllc.com*

[32] http://www.ngdc.noaa.gov/mgg/greatlakes/lakemich_cdrom/html/images.htm
[33] Spacing of 750 meters between turbines, each turbine generating 7-11 million kWh.

3.6 Specific Considerations for Installing Wind Projects

The specific considerations for big wind development will be detailed in this section, including specifics on wind monitoring, energy transmission, selling the energy, permits, installation, and maintenance.

3.6.1 Monitoring

As mentioned above, benefits to monitoring the wind resource are plentiful, if the Tribe needs to exactly estimate the performance and economics of small of mid-size wind projects, or for any commercial wind farm. Slight increases in the speed of the wind will translate into large differences in energy produced and money saved, or money earned. Wind data specific to each development site will provide confidence to the entire Tribe in their turbine investment and opportunities for payback.

Wind monitoring is usually conducted by fixing wind monitoring equipment to a temporary tilt-up tower. The cost for buying a tilt-up-tower and having it professionally installed will be $15,000-$20,000 on a 50 or 60m tower. Installation alone will cost $4,000-$6,000 if the Tribe's maintenance crew would not be equipped to erect the tower. It is also possible to rent a monitoring tower for one year. The maintenance cost of the tower and equipment is usually around $1000 dollars a year, if the Tribe needs external help.

How is data collected?

The data can be collected manually by having someone swap data cards periodically from the base of the tower, or the Tribe could have the data emailed daily for a start up cost of $2,000 and monthly charges of $50 for cell service. If there is someone in the Tribe who is quite technically adept, he or she might be able to do the data crunching for the Tribe, or external companies such as TruWind or SGES would be able to do this for a fee around $100 per month. If the Tribe does not take part in the Native American Loan Program described below, monitoring could cost from $19,000 to $26,000.

What is the Native American Anemometer Loan Program?

The NREL Native American Anemometer Loan Program allows Native American tribes to borrow anemometers and the equipment needed for installation so that they may measure the wind resource on tribal lands[34].

There is a 20-meter loan program and a 40-50 meter loan program. The 20-meter anemometer loan is free to the Tribe and anemometers are more accessible, however the data would not be useful. Perhaps the most useful aspect of erecting a 20-meter is as a

[34] NREL Native American Anemometer Loan Program. www.eere.energy.gov/windandhydro/windpoweringamerica/na_anemometer_loan.asp

training tool for the Tribe for later efforts at monitoring wind and interpreting data, and assessing feasibility.

The 40 and 50 meter anemometer loan program has a waiting list and only one anemometer is loaned per Tribe. To apply for the taller monitoring equipment, the Tribe will be required to already have a well-planned project concept and to arrange and pay for the installation and dismantling of the tower ($5,000 – $10,000). NREL will provide a full report of the yearly wind speed and direction, but the data will be public.

If the Tribe does decide to monitor the wind resource over the next year, the time could be used to:

- Collect detailed data on the actual electricity loads that the Tribe anticipates serving, a substantial amount of which has already been collected, and determine the future load growth.
- The Tribe could also implement the on-site renewable energy possibilities, as well as the energy conservation and efficiency measures in order to decrease the current energy load.
- The year long monitoring period may also be a good time to being training for potential project personnel and to continue the community meetings to further discuss and refine the goals.
- The Tribe could also begin discussions with the local utility and local zoning officials to find out the specifics on the interconnection process and required permits. The discussion might best be started with the help of a lawyer or consultant with a background in interconnection issues.
- The Tribe may also want to purchase a 50 meter or 60 meter wind monitoring system. The tower could then be installed at multiple locations over a several year period. In addition, the Tribe could lease or rent the tower to other Tribes in the region to further increase the value of the equipment.

After site selection and monitoring, the specific steps involved in a successful wind project include:

- Selecting a wind turbine
- Distribution and transmission
- Selling the Energy
- Interconnect Agreement
- Local and Federal Permits
- Financing: Equity and Debt
- Installation
- Operations and Maintenance.

3.6.2 Selecting a wind turbine

Selecting a wind turbine size depends on the amount of wind available, as determined through monitoring and the Tribe's financial objectives. Initial costs of a wind turbine range from $50,000 for a turbine that would produce more than enough electricity for a

typical house, to at least $4 million for a state-of-the-art wind turbine that would be installed and ready to operate on a wind farm.

Below is a table showing several commonly available wind turbines, the estimated annual energy production (based on 12 mph average wind speed) and a range of installed costs (before rebates) assuming a professionally installed system. In general, larger generators will produce electricity at a lower cost than smaller turbines.

Figure 27. Commonly available turbines, association energy production and cost.

Rated capacity (kW)	Rotor Size (feet)	Annual Energy Production (kWh/year)	Estimated Cost (000's)
1	7	1.8	15
2.5	12	4.3	25-35
10	23	18	40-75
35	50	50	100-150
90	56	80	170-220
225	81	220	500
660	150	850	1300

3.6.3 Distribution and Transmission

If the Tribe really to be sell wind, their ability to become involved will be greatly enhanced by the physical access to power lines that the Tribe can tie into, which will allow the electricity to be transmitted and distributed. The farther away the wind machines are from an electrical "access road," the more expensive it will be for the Tribe to hook up and start selling their energy[35].

How can we determine if there is enough capacity on the grid for the turbine to be connected?

There appears to be two transmission lines serving Manistee, both a 138 kV and a 345kV, which is beneficial if a wind turbine farm is developed. SGES was not able to assess the available capacity of these two lines in this report. If the Tribe is interested in pursuing a commercial wind farm project, on of the early tests would be to conduct a "thermal screening" of these lines. A thermal analysis will answer the big question, "Is there any room or capacity available on either line?" If yes, then the project can proceed. If no, then more analyses would be required to identify what options, if any, exist to resolve the lack of transmission capacity.

In order to connect to the grid, wire running on or nearby the site needs to be 3-phase and no less than 12KV. Ideal line voltage is between 25kV and 41.6KV. If the voltage is 69KV to 115KV, it will be necessary to build a substation.

[35] Juhl and Wasserman (2002) *Harvesting Wind Energy as a Cash Crop: A guide to locally owned wind farming.* (507) 777.4310.

If the Tribe is producing high voltage electricity they will need to secure rights to transmit the energy on MISO's infrastructure. OASIS (Open-Access Same-Time Information System) is MISO's open access on-line tool which is used to schedule and reserve transmission.

How much does connecting the wind turbine cost?

Determining the cost of connecting to distribution or connection lines involves finding a distribution map of Consumers Energy as well as Cherryland and Great Lakes Energy, as they offer services close to the Tribe. The best way to do this is to call the Operations and Engineering Departments with specific wind site coordinates and they will be able to tell the Tribe where the closest line is to connect to and how much the cost would be.

A general rule of thumb prices the stringing of wires from the wind farm to a grid hookup at $50,000 to $150,000 per mile, depending on the topography and rights of way[36]. Interconnection is not a simple issue and would require a technical study before doing a final costing out of a project.

The Tribe can talk to other possible partners to see if another partner has an interest in installing a turbine as well and therefore sharing the cost to build the substation. The size of the wind farm will determine whether a substation is necessary and they can be built for prices ranging up to $500,000.

Further information:
- Transmission Policy, American Wind Energy Association: *www.awea.org/policy/regulatory_policy/transmission.html*
- Great Lakes Energy, Vice President of Operations and Engineering, Dan Nelson: 231.582.6521
- Cherryland, Vice President of Operations and Engineering, Tony Anderson: 231.486.9214

3.6.4 Selling the Energy

To review the economics of a wind project, a wide gulf separates the value of electricity for on-site use of self-generated power and developing a wind project that exclusively sells power. There are many variations.

When all the costs are spread over the number of kWh produced over the lifetime of a wind turbine, one can derive what the wind-generated electricity cost to produce. In a wind project, the cost of production is referred to as the 'busbar cost'.

Smaller wind turbines generally have higher busbar costs. They can't make electricity as inexpensively as a wind farm. For a small wind turbine, especially those less than 35 kW, busbar cost is likely to be upwards of ten cents per kWh. Again, this is why the decision to invest in smaller turbines usually is based on economic *and* non-economic factors.

[36] Juhl and Wasserman (2002)

In a good wind site, the busbar cost from a wind farm can be as low as five cents per kWh. Major variables include windiness, financing costs, cost to lease the land, and the cost to connect a large wind turbine to the utility system.

In general, as the busbar cost falls, the price that the market will pay for electricity also falls. For example, a small wind turbine that is eligible for net metering might have a busbar cost of ten cents per kWh. However, it displaces electricity that for many facilities only costs between five and seven cents. To close that gap, the Tribe might choose a larger wind turbine with a lower busbar cost. However, that turbine would not be eligible for net metering. While it would displace electricity at the facility's cost of between five and seven cents, any electricity sold to the utility would only be valued at just under four cents per kWh.

Only by searching for the right combination of factors – whether a net-metered, parallel generation, or wind farm project - while understanding the choices and identifying incentives and partners, is it possible to close the gap between busbar cost and market cost, resulting in an economic project.

Power Purchase Agreement

A large wind turbine that would generate electricity but would not be connected to any of the Tribe's buildings to displace their electrical load would essentially be a merchant plant. According to Michigan law, a merchant plant may sell its capacity to alternative electric suppliers, electric utilities, municipal electric utilities, retail customers, or other persons. However, a merchant plant making sales to retail customers is an alternative electric supplier and shall obtain a license (alternative electric suppliers are discussed in detail in the following chapter).

What is a Power Purchase Agreement?

To sell their energy, the merchant plant would negotiate a power purchase agreement with a buyer[37]. A power purchase agreement is basically the Tribe's agreement with the utility company on the fact that they will buy the electricity that the Tribe produces, how much the utility will pay for it, how long they will be committed to buying it, and under what conditions[38]. The agreement would have to account for fees to transmit the power to the buyer. The work of negotiating a power purchase agreement is highly demanding and will most likely require specialized help. As explained below, there is the opportunity to sell the power into the open market, but the market does not guarantee a cash flow coming off the machines like a power purchase agreement, which is almost a requirement for financiers and investors.

The Tribe will have to decide how long they would like the power purchase agreement to last. Usually the agreements extend between 15 to 25 years. A minimum of 15 years provides a bit of cushion beyond debt and loan obligations.

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[37] Michigan Legislature. Michigan Public Service Comission, Section 460.10e: *www.legislature.mi.gov*
[38] Juhl and Wasserman (2002)

In terms of structuring a power purchase agreement, it is important to remember that the fuel will be free and the maintenance will be marginal. The largest expense will be paying back the capital it took to construct the wind turbine or wind farm. The large initial upfront cost can be tempered by front-loading the power purchase agreement. If the Tribe requires financing for these wind projects, the Tribe could get a higher price for the electricity in the early years, to cut into the debt, and then accept a lower price when the debt is down. The Tribe should be sure to create team with an accountant and experienced lawyer that they trust in order to create a quality power purchase agreement with the buyer, because of the sheer length of the contract. Power purchase agreements can be quite lengthy agreements that may exceed 100 pages in length and take several months to even years to finalize[39].

Who could purchase the wind energy?

According to the 1978 federal Public Utility Regulatory Policies Act (PURPA), utilities are required to buy electricity produced from wind and other natural resources. The dialog can be started just by calling the power purchasing department of Consumers, Cherryland, or Great Lakes.

The Tribe can negotiate with Consumers, their current energy provider. Consumers Energy began offering its customers new renewable energy service choices on October 1, 2005.[40] Due to the RRP, Consumers may be interested in purchasing wind energy from the Tribe, although we think it would be better for the Tribe to support their own renewable energy initiatives rather than Consumers[41].

It is possible to sell power to a utility other than the one in whose area the wind turbine is placed. Cherryland and Great Lakes Energy Cooperatives, for example, operate within Manistee County, and both have "all requirements contracts" with Wolverine Power Supply Cooperative, meaning they buy all of their energy from Wolverine. Wolverine is always looking to purchase renewable energy and could be a possible buyer. The Michigan Public Power Agency is also a power supply agency that would be interested in purchasing renewable energy. The Tribe could call any of these potential buyers and ask for a sample power purchase agreement.

If Consumers and Wolverine do not want to buy any potential wind energy, more distant utilities may be in the market. To do that type of navigating, the Tribe should seek the advice of an expert more familiar with the local power market. On the other hand, if the

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[39] Juhl and Wasserman (2002)

[40] MREP (2005) Michigan Renewable Energy Program Annual Report.

[41] Consumers Energy Renewable Resources and Green Generation Program (RRP) offers electric customers the opportunity to participate in a voluntary program that promotes the development of renewable resources in Michigan. However, part of the donations goes to researching renewable energy sources and the customer does not know how much renewable energy their donation is purchasing. *Green-e* is an independent certification and verification program for high quality renewable energy, run by the Center for Resource Solutions, by which this Consumer's Energy Program is not certified (www.Green-e.org). In our opinion, this program is not worthwhile.

Tribe decides to form their own utility, they will be able to use any wind energy to supply their service territory.

How could a Renewable Energy Portfolio improve a PPA?

The Michigan Public Service Commission just released Michigan's 21st Century Energy Plan, a plan detailing how Michigan will supply the State's growing energy demand. The plan calls for a statute requiring all utilities to have a Renewable Energy Portfolio Standard, meaning all load serving entities to would need to reach 10 percent of their energy sales from renewable energy options by the end of 2015. Entities could meet the standard by building and owning renewable generators, by contracting with in-state renewable generators, by buying qualifying renewable energy credits, or by making an alternate compliance payment[42]. If this statute were written and passed, the Tribe would find selling their energy to be much easier and more lucrative.

Further information:
- Renewables Portfolio Standard for Utilities, American Wind Energy Association: *www.awea.org/policy/renewables_portfolio_standard.html*
- Wolverine Power Supply Cooperative: *www.wpsci.com*
  - Pete Chase: *pchase@wpsci.com*
- Michigan Public Power Agency: *www.mpower.org*
- MPSC approves power purchase agreements for renewable energy in Michigan: *www.michigan.gov/mpsc/0,1607,7-159-16393-128605--,00.html*

To review the options of selling wind energy, let us look at the possible wind sites for the Tribe and the method in which the energy would most likely be used.

Figure 28. Summary of likely wind energy selling and distributing options.

Site	Type of wind power distribution	Likely value of wind electricity
Near Public Safety building	Net-metering	Retail and avoided cost
Near Big Blue on the shore of Lake Manistee	Parallel generation	Retail and avoided cost
Near Wastewater and Casino buildings	Parallel generation	Retail and avoided cost
Near the proposed Community Center site at Aki	Net-metering	Retail and avoided cost
Near Sub-station 1104 on Dontz Road	Parallel generation	Wholesale to buyer through Power Purchase Agreement
Off-shore in Lake Michigan	Distributed to transmission system	Wholesale to buyer through Power Purchase Agreement

[42] Michigan Public Service Commission. *Michigan's 21st Century Energy Plan.* www.michigan.gov/documents/mpsc/21stcenturyenergyplan_185274_7.pdf

How could energy be sold on the open energy market?

There is a second alternative way to sell power, and that is to bid into the open market. Prices change hourly and by location. There is considerable work to distill the 8760 hourly prices for one year for each of several locations into some meaningful averages. Judging from a preliminary look at price data of some locations near Manistee into which a wind turbine might sell, the rates are very similar to avoided energy cost.

3.6.5 Utility interconnection rules and agreements

According to the Public Utility Regulatory Policies Act (PURPA), a utility, including Consumers, must connect all qualifying independent electric power producers to in its service area to its transmission grid system. In fact, the Tribe could request and receive connection with any rural coop, municipal or investor owned utility.

What is the interconnection process with Consumers?

For any project in which energy could be fed back into the system, the Tribe would need to complete an interconnection application for Consumers. Consumers would conduct an interconnection study to determine the impact of the project on their system, which is conducted by the utility yet paid for by the customer. As a warning, Consumers has been known to find undue system modifications for the safe and reliable interconnection of the project.

Next an Interconnection and Operating Agreement is signed between the two parties. The utility will usually then procure the required equipment, and design and construct the interconnection facilities, for which the customer also pays. Consumers has also been known to maintain the rights of way for the interconnection wiring, even though the customer has paid the bill. Be sure to have an experienced rights-of-way lawyer on hand when creating the Interconnection and Operating Agreement.

What if the energy is sold to a buyer outside of Consumer's territory?

If the Tribe wants to sell to a buyer outside of Consumer's service territory, or is installing a high voltage wind farm, the Tribe or the utility will need to do a study with the regional transmission operator or Independent Systems Operator (ISO). This will help uncover the kinds of agreements that are in place between one power line owner and the next, in order to help the Tribe understand who they can sell their electricity to and if their power could be moved past the edge of Consumers service territory, or if Consumer's could 'wheel' the Tribe's energy through to the buyer.

If the Tribe does choose to sell to a buyer outside of Consumers region, the second utility must purchase the power as if the Tribe's energy load is interconnected to its system. Although, the Tribe would have to pay for energy lost in transmission and for wheeling charges to the interconnected utility. The ISO study will serve as written documentation that the Tribe can get their wind energy onto the wires and into the markets.

There are technical requirements of connecting regulated by the utilities and FERC. These requirements must be understood and complied.

Further information
- Michigan Public Service Commission, Distribution Interconnection Standards. Michigan Electric Utility Generator Interconnection Requirements: *www.michigan.gov/mpsc*
- Consumers Energy. Interconnection Standards: *www.consumersenergy.com*
- Federal Energy Regulatory Commission (FERC). Interconnection Standards: *www.ferc.gov*

3.6.6 Selling green tags and carbon credits

Green tags, or renewable energy credits (RECs), or tradable renewable energy certificates (TRCs) are the traded stock of a market set-up to capitalize on the green-ness of projects. One green tag is assigned to each wind-driven kilowatt-hour a wind machine puts into the grid. The Green tags from any wind electricity the Tribe may produce can either be bought by a utility as part of a power purchase agreement, or the Tribe would also be able to sell their green tags directly to interested customers through a certification program offered by Green-e and their renewable electricity certification program.

The Tribe could also sell the green tags on to an open market, although the price can be even more unpredictable in the long term than the electricity itself[43]. Currently, the price of green tags is ranging from $3 per MWh to $9 per MWh [44].

The Tribe could also sell their carbon credits, a trading system formalized through the Kyoto protocol. The Little River Band of Ottawa Indians has shown much interest in the Kyoto protocol, and selling carbon credits would be in line with this international treaty. Carbon credits are measured in units of certified emission reductions, and for trading purposes is equivalent to one ton of CO^2 reduced, and can be traded on the Chicago Climate Exchange.

Box 3. Partnership between NativeEnergy and COUP

In 2005, NativeEnergy, a Native-owned marketer of green tags and greenhouse gas offsets, and the nonprofit Intertribal Council On Utility Policy (COUP), announced that COUP has acquired a majority interest in NativeEnergy on behalf of its member tribes. The equity investment will give the COUP tribes *direct access to the retail market* to sell the *renewable power* and *RECs* generated from tribe-owned wind farms.

One of the initial strategic goals of the acquisition was to facilitate the development of an 80-MW distributed wind project, to be built in 10-MW "clusters" at eight different COUP reservations. The new effort follows on the Rosebud Sioux Tribe wind project, the first 100% Native American-owned and operated commercial-scale wind facility. The tribe is

[43] Juhl and Wasserman (2002)
[44] Pennock, A (2007) Pers comm. with Green-e.

selling the green energy certificates generated from the project to Ellsworth Air Force Base in South Dakota and NativeEnergy[45].

If the Tribe is interested in selling their Green tags or renewable energy credits from a wind project, NativeEnergy would be a good place to start investigating. The Intertribal Council on Utility Policy would also be able to provide more guidance on the Tribe's zoning and codes for renewable energy systems and interconnection rules.

Further information:
- NativeEnergy: *www.nativeenergy.com*
  - Tom Stoddard: (802) 425 - 3419
- Intertribal Council on Utility Policy: *www.intertribalcoup.org*
  - Patrick Spears (605) 945 - 1908
- Center for Resource Solutions: *www.green-e.org*
- Chicago Climate Exchange: *www.chicagoclimatex.com*
- US Department of Energy, List of Green Tag Marketers: *www.eere.energy.gov/greenpower/*
- International Emissions Trading Association: *www.ieta.org*

3.6.7 Permits

The construction of the wind turbine, as well as field offices, sheds, transformers, power poles and any other structures associated with the wind turbine project must be properly permitted before the Tribe can move ahead. Permits are usually required at the Tribal, county, state and federal levels.

What permits are required by the Tribe?

At this point in time, the Tribe is drafting a wind turbine ordinance. This ordinance will be extremely helpful when determining the safety and logistical steps to take when constructing and maintaining a wind turbine. The Tribal wind ordinance would provide the Tribe with control over wind development on Tribal land as well as promote its sovereignty and to establish its interest and support of wind energy.

The Tribe could consider setting policies for easing the installation of renewable energy, solar thermal, solar PV, small and large wind, and even biomass in all sectors relevant for each technology: homes, government, commercial, economic development.

What permits are required in Manistee county?

Within Manistee County, the wind turbine permits are issued at a township level. To the best of our knowledge the only three townships within Manistee County that have Wind Energy Conversion Ordinances (WECS) are Filer, Manistee and Onekama Townships. The Little River Band of Ottawa Indians, to the best of our knowledge, would not have to file for a permit if their wind turbine went up on the fee land.

[45] US Department of Energy, Energy Efficiency and Renewable Energy: Green Power Markets, Renewable Energy Certificates.www.eere.energy.gov/greenpower/markets/certificates.shtml?page=2&companyid=172

At the local level, building and electrical permits may also be required much as they are for any construction project. If local permitting officials have never approved a wind turbine installation, the application process may take longer then initially planned. Applicants are encouraged to view the permitting process as a unique opportunity to educate local decision makers about the benefits and characteristics of wind power.

What permits are required at the state level?

State-level regulations may also require specific permitting, but at this time the Michigan Department of Energy does not have the authority to issue regulations related to the siting of wind turbines. The state does however, offer guidelines to consider[46]. State interconnection permits must be filed with the Michigan public service commission, if the wind turbine will be connected to the utility's distribution system.

What federal permits are required?

The federal requirements may include:

- Federal Aviation Administration (FAA) Form 7460-1, Notice of Proposed Construction or Alteration: This form is required of any structure that is larger than 200 feet. If a structure is being built within 20,000 feet of any airport, this form should be consulted as well. The Tribe could fill out this form detailing the possible project, in order to see what the FAA would have to say, as part of laying the groundwork for any wind project near the airport.
- Federal Communications Commission (FCC): A permit is not required, but the FCC should be consulted to determine whether there are any microwave pathways than run across the possible wind turbine location.
- US Army Corp of Engineers Environmental Impact Statement might be needed is the project involves a large wind farm offshore in Lake Michigan.

3.6.8 Financing

Once all elements of the wind farm are organized and ready, it is time to get it paid for. Depending on how the Tribe chooses to finance these projects, the projects may be self-financed, grant-financed, or financed through a bank. If the Tribe wants to involve a bank, they will need to approach prospective lenders with spreadsheets showing eventual profits and a signed power purchase agreement in hand. The banks will mostly likely be interested, but will peg the interest rates at the prime level, or one to two percent above prime[47]. If the wind project is not self-financed, the Tribe will have to think about if they will need an equity partner and, depending on the amount of equity offered by the bank, who the equity partner will be.

[46]Michigan Department of Labor and Economic Growth (2005) *Michigan Siting Guidelines for Wind Energy Systems*. www.michigan.gov/documents/Wind_and_Solar_Siting_Guidlines_Draft_5_96872_7.pdf
[47] Juhl and Wasserman (2002)

3.6.9 Wind Energy Tax Incentives

The federal Energy Policy Act of 2005 (Renewable Energy Production Incentive Payment) allows Tribes, as the sole owners of a renewable energy project, to receive a direct payment around 1.9cents per kWh.[48] The credit is available for the first ten years that a wind system is operating and the electricity must be sold to an unrelated party. The Grand Traverse Band is currently collecting this payment as part of their revenue for the Grand Traverse wind project.

The Michigan legislature just passed a Michigan tax credit, equal to about 1.5cents per kwh, but his was vetoed by Governor because of the budget[49]. If this bill is introduced again, the incentive may or may not improve the economics for the Tribe depending on whether or not there is a direct payment incentive for Tribal businesses.

Further information:
- Renewable Energy Production Tax Credit: *www.dsireusa.org*

3.6.10 Installation

The wind turbine vendor can set up everything for the Tribe, under a Engineering, Procurement, and Construction contract. If the Tribe chooses local contractors instead or if the Tribe were to install the turbines themselves, the Tribe might save as much as $50,000 per turbine and/or keep in the money in the local community[50].

A joint venture already exists between Mushigon Construction LLC and DeVere Construction[51]. Installing monitoring equipment for wind-speed monitoring could be a good first project for the joint venture to undertake in the area of wind development. For an installation of a larger wind turbine, or a wind farm, the construction company might be an equity partner, but could certainly provide at least some preliminary engineering or costing for a wind turbine construction project.

While it's impossible to know how or whether the joint venture's plans and capabilities would coincide with Tribe's planning for wind development, the opportunity to work closely with an organization that grasps the importance of the Tribe's long-term goals, such as developing expertise in energy issues and gaining employment, is preferable to having to qualify and educate potential partners who are starting with little knowledge of Tribe's goals. Part of insuring Tribe's interests are a priority would be to inform the Mushigon Construction Board and Mushigon Construction LLC of the current investigation into renewable energy.

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[48] Internal Revenue Service, Renewable Energy Tax Credit form: www.irs.gov/pub/irs-pdf/f8835.pdf
[49] Energy Office of Michigan. Wind Turbine Tax Credit Vetoed: www.michigan.gov/cis/0,1607,7-154-25676---,00.html
[50] Juhl and Wasserman (2002)
[51] Little River Currents, vol 3 issue 11, November 2006, page 15

If the Tribe decides to contract with various parties to do this maintenance work they will still need their own supervisor and work crew to do the various simple jobs that come up along the way. If there are parts of the installation work that the Tribe does not feel comfortable with, they can always turn back over to the vendor. As well, warranties and service agreements are likely not to extend out more than five years. Therefore, the more the Tribe can know and understand about what has gone into the basic installation and operation of the machines, the better off the Tribe will be in the long run.

Steps leading up to the installation can include:

- Soil sampling: Geological surveys revealing the type of soil, amount of water, and amount of rock will determine the type of foundation the Tribe will build and exactly where it will be put.
- Foundation design: There are two basic types of foundations, one involving a deep column in the ground and another involving a 'pad and pier.' Which ever design the Tribe chooses, the basic work can be done by a local contractor.
- Electric grounding grid: The towers need to be well grounded to protect against lightening or a faulty current. This work is done by a certified electrical contractor.
- Crane availability and capacity are large factors in putting up and maintaining wind turbines, therefore before the Tribe orders their hardware, the Tribe should contact the nearest crane company and find out what they can do in terms of installation and maintenance[52].

The electrical costs of installation also represent a substantial amount. The electrical wires that will carry the electricity from the wind machines to the utility grid need to be installed underground, as the tower is being installed. A detailed electrical plan will need to be developed by a licensed electrical engineer, and should be put out to a bid.

3.6.11 Operating costs

Unlike a gas-fired, coal-fired or wood-fired power plant, a wind turbine uses free fuel, but like any other power source, a wind turbine must have scheduled service visits. Maintenance is not optional. *If maintenance is not done, the turbine will fail*.

Some types of routine service are based on the number of hours of operation. Other types of service could include repairing lighting damage, and eventually, rebuilding or replacing a gearbox. Sometimes upgrades become available and are economically justified.

When working out the economics of a wind turbine, people usually estimate maintenance costs in cents per kWh. This estimation technique reflects the fact that a wind turbine

[52] The cost of renting the crane depends on the weight and lifting heights for the turbine, which can be gathered from the turbine supplier. The price can range from $30,000-50,000 per machine for turbines 950kw to 1.5mw. Make sure the timing is planned out between the arrival of the equipment and the renting of the crane, as services of the crane operators can run $50 per hour, whether things are working or not (Juhl and Wasserman 2002).

produces more energy in a windier site, but also needs more maintenance. Money for maintenance must be readily available, perhaps in a separate account.

The complexity of the maintenance increases with turbine size. In general, small and mid-size machines should have routine maintenance performed twice a year. Early detection of a loose bolt is the easiest way to avoid system failures later. The good news is that anyone with good mechanical and basic electrical skills can be readily trained to maintain a wind turbine.

As the Tribe buys their turbines, make sure to get all necessary documentation, including installation diagrams, operating procedures, and maintenance information. Perhaps appoint or hire someone in the Tribe or community to become familiar with this documentation. If the Tribe does not want to perform maintenance, then a maintenance or service contract with a qualified installer must be arranged on a time-and-materials basis for all types of maintenance or repair. The Tribe may at least be able to train someone to conduct the simple maintenance requirements, such as greasing bearings, changing filters, checking fluids, and tightening bolts[53]. Determining the nearby service teams and how good they is a major factor in any wind project.

Further information:
- Midwest Renewable Energy Association. Solar and wind system installation and maintenance training: *www.the-mrea.org*
- Michigan Commercial Energy Training Program: *www.michigan.gov/cis/0,1607,7-154-25676---,00.html*

3.7 Funding sources

Michigan funding opportunities for wind power are scant. However, the Michigan Department of Labor and Economic Growth, Energy Office occasionally offers grants for renewable energy projects. Federally, the USDA Farm Bill offers loans and grants to assist farmers and ranchers in projects to establish new, or expand existing, farmer or rancher cooperatives, or other rural business ventures to enable farmers to become owners of sources of renewable electric energy. This bill would be extremely beneficial if the Tribe decided to move ahead with partnership projects between farmers.

Other sources could include:

- EPA Tribal Pollution Prevention Grants: *www.tribalp2.org/funding.php*
- Department of Energy, Tribal Energy Program Grants: *www.eere.energy.gov/tribalenergy/financial.html*
- IRS Clean Renewable Energy Bonds: *www.elpc.org/energy/farm/crebs.php*

Further information:
- Michigan Energy Office. Renewable energy grants contact, Roger Doherty: 517.241.6224.
- Michigan Energy Office, Funding FAQ for renewable energy: *www.michigan.gov/cis/0,1607,7-154-25676_31631---,00.html*
- Native Wind: *www.nativewind.org*

[53] Juhl and Wasserman (2002)

3.8 Partnerships

Building a large turbine or a wind farm would be a great opportunity to lay the foundation for a Tribal utility or an inter-tribal utility in Michigan, and partnerships would no doubt be extremely beneficial to this process.

The Tribe has begun an initial discussion with the Great Lakes Renewable Energy Association regarding the possibility of working together on the current Manistee County wind energy project, and these discussions should be continued.

The Grand Traverse Band partnership with Traverse City Light and Power provides a good example of the kind of partnership that the Little River Band could develop with a utility[54]. Grand Traverse Band might also be open to a direct partnership with the Little River Band, based at least in part on its current experience.

Possibilities also exist for the Little River Band to form a relationship with the Michigan Public Power Agency, if interested in forming their own utility. This will also be discussed further in the next chapter.

For the past five years a group of organizations interested in wind energy in Michigan began meeting on a regular monthly schedule as the Michigan Wind Working Group (WWG), and is open to any interested party. By partaking in these monthly meetings, the Tribe could to learn more about the initiatives, barriers and opportunities related to wind development in Michigan. If interested in more information, contact John Sarver at the State of Michigan.

Key members of the Manistee Citizens for Responsible Development[55] (MCRD) could be engaged as the Little River Band plans renewable energy development. Fifteen organizations are listed as adopting positions, including six units of local government. Some contact can be informal, and would be important in the event of needing allies when attempting to install one wind turbine or several. The Little River Band staff and members who were most involved with the effort to prevent the coal plant can refer the Tribe staff involved with energy planning to initial contacts from MCRD.

Another method of engaging local government could involve reaching out to the eight Michigan mayors who have signed the US Mayors Climate Protection Agreement for support, including mayors from Traverse City, or to ICLEI, Local Governments for Sustainability.

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[54] In a sign of cooperation, Traverse City Light and Power, in January, 2006, authorized "…the Executive Director to execute a Memorandum of Understanding with the Grand Traverse Band of Ottawa and Chippewa Indians for sharing wind resource information and participating in a cooperative wind energy resource and wind site assessment program…" While the Little River Band probably can not expect to collaborate with Consumers Energy as closely as Grand Traverse Band has worked with Traverse City Light and Power, certainly the Grand Traverse Band -TCL&P cooperation could be held up to Consumers Energy as the kind of relationship to work toward.

[55] http://www.manisteecfrd.org/

Further Contacts:
- Great Lakes Renewable Energy Association: www.glrea.org
- Local Governments for Sustainability: *www.iclei.org*
- Wind Working Group. John Sarver contact information: 517-241-6280, jhsarve@michigan.gov

4 Tribal Load Aggregation and Utility Formation

This chapter provides an overview of the electricity market in Michigan, including how energy is generated, transmitted and delivered. The chapter then estimates the amount of electricity used by the Little River Band of Ottawa Indian households and businesses.

Secondly, this section discusses the possibilities for the Little River Band of Ottawa Indians to aggregate their total energy load, as well as the issues and questions associated with these initiatives. Electric load aggregation is the process by which individual energy users band together to secure more competitive prices than they might otherwise receive independently. Aggregations can be as simple as pooling the Tribe's energy load to purchase energy from an investor-owned utility, such as Consumers Energy, or an Alternate Electric Supplier. Aggregation can also be as complex. Forming and operating a Tribal utility to purchase wholesale electricity for part, or all, of the Tribe's load requires multiple agreements with grid owners.

4.1 Summary of aggregation options

The total Little River Band Tribal energy usage is expected to jump from the current 3 MW to 5 MW by 2015. The associated amount of money spent on electricity will jump from $1 million to $4.2 million. The hike in electricity price is due to the projected increase in electricity use and increase in electricity price. However, if the Tribe were to create and implement a renewable energy and Tribal aggregation plan, a portion of this price increase could be offset and help the Tribe step assuredly into the future in terms of supplying the Tribe's energy.

How could the Tribe aggregate their Tribal load?

The Tribe could aggregate with Consumers, which may bring a short–term economical impact, but will not provide long-term security. The Tribe could aggregate with an Alternate Electricity Supplier (AES), but participation with AESs is dropping due to the extremely high costs of AES energy and the instability of the AESs themselves.

Another option for the Tribe would be to aggregate their electricity load with the Cherryland or Great Lakes Energy Cooperatives, which serve in Manistee Township. This would not necessarily provide any short-term economic gain, but might provide a beneficial partnership if the Tribe decides to invest in big wind but not their own utility. The energy provider to Cherryland and Great Lakes, Wolverine Power, is extremely interested in purchasing wind power right now, and might be easier to work with then the bureaucratic layers of Consumers Energy.

How could the Tribe form a tribal utility?

Our research has found that forming a Tribal utility would be a great way of gaining Tribal sovereignty and assuring energy security. Due to the current electricity market however, it is extremely pricey for new utilities to form and purchase energy on the open market. Due to the deregulated electricity market and associated increase in cost, there are not any coal plants or other energy plants being built, i.e. there is no new energy to purchase. If the Tribe were to form their own utility, we would recommend that the Tribe power their own utility with their own energy source, such as wind power, biomass, or geothermal projects. Alternatively, the Tribe could wait until prices on the energy market are lower than the tariff rates of the utilities.

Another option is that the Tribe could sell any Tribal produced energy on the open energy market to take advantage of the high rates and build capital for future infrastructure creation for a Tribal utility. Keep in mind, as discussed in the previous chapter, the energy market can be quite unpredictable and volatile.

One of the first steps that the Tribe needs to address is to double check all the account numbers they have for energy bills with the account numbers that Consumers has on file, as some discrepancies have been uncovered during this research process.

4.2 Overview of current Michigan utility environment

In 2000, Michigan electricity service became deregulated when the Michigan state legislature passed Public Acts 141 and 142, the Customer Choice and Electricity Reliability Act. Under Michigan's Electric Customer Choice, the generation and supply of power is opened to competitive suppliers. The electric transmission and distribution businesses remain under a regulated monopoly utility structure and the electricity is still distributed through the same regulated transmission and distribution system it has always been[56]. (For a more detailed explanation of deregulation, check Appendix 9)

The thinking behind deregulation and allowing competition was to promote lower prices, efficiency, and innovation in electricity supply. The prices of electricity, however, have continued to rise and *the number of people interested in electric choice has fallen.*

Why does deregulation fail?

States that have deregulated their electricity markets have inevitably had higher electricity prices. Deregulation fails because after the power generation has been cut loose from the customer delivery services, the customer demand of electricity does not play a large role in providing incentives to build new electricity generation plants. After a state deregulates, investors and builders are discouraged from building power plants because of the finances of deregulation. New electricity generation competitors are not emerging.

[56] MPSC. Accessed 30 November 2006 at: www.michigan.gov.

The failure of deregulation means that customers, such as the Little River Band, who do not switch providers, are stuck paying a much higher price for their electricity than before deregulation occurred. According to the basic rules of supply and demand, as the competition for electricity generation dries up, the price of electricity increases.

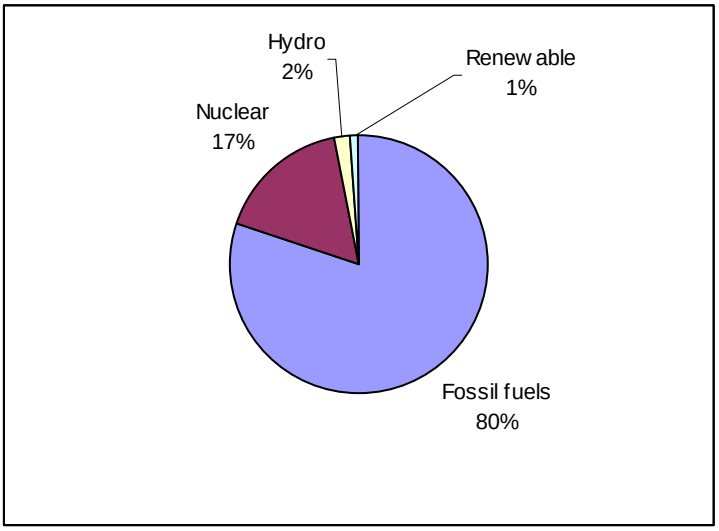
4.3 Electricity Service of the Little River Band of Ottawa Indians

Three operating electricity providers operate within Manistee County, including Cherryland Cooperative, Great Lakes Energy Cooperative, and Consumers Energy (For comparison of energy pricing between utilities, see Appendix 10. Both Cherryland and Consumers service Manistee Township[57].

Cherryland offers commercial rates competitive with Consumers, and Cherryland's residential rates would be about $10 more per month.

As far as we can tell, all of the electricity needs of the Little River Band are serviced by Consumers, which means most of the Tribe's energy needs are serviced by fossil fuels, including coal, natural, gas, and oil. Only a tiny portion, less than 1%, of Consumers energy is renewable: woodwaste, wind, biomass.

Figure 29. Consumers energy supply



As mentioned above, electricity produced in Michigan from fossil fuels is responsible for 40% of the states carbon dioxide emissions.

[57] Michigan Service Areas of Electric and Gas Utilities. www.dleg.state.mi.us/cgi-bin/mpsc/electric-gas-townships.cgi

4.3.1 Total Tribal electricity use and cost

The total estimated connected electric load for the Little River Band of Ottawa Indians is just over 3 MW per year, costing just over $1 million dollars per year.

Figure 30 provides a break down of energy demand, or use, by sector. Commercial buildings include businesses and government buildings (For complete list of buildings used, see Appendix 4)

Figure 30. Current energy demand by sector

Sector	Number of meters	Energy use (kwh/yr)	Peak Power demand (kW)	Total power demand (%)	Total yearly cost ($)	Total Tribal electricity cost (%)
Casino	2	13,304,160	2725	89	$799,409	76
Commercial	23	1,211,304	152	4	$103,021	10
Aki - Residents and street-lighting	14	186,018	9.1	1	$19,752	2
Residential – On Reservation but not Aki	178	1,385,010	167	5	$134,900	13
Total	217	16,086,492	3053	100	$1,057,083	100

*See Tribal members energy source for home heating, Appendix 1; Tribal members annual heating costs, Appendix 2; and Tribal member annual electricity bills, Appendix 3.

The casino may be using almost 90% of the total connected electric load, but the decrease in the casino's percentage of total cost (to 76%) shows how customers who use more energy receive a cheaper price per kWh, which presents a good case for aggregating the Tribal energy load.

Residential housing, other than Aki, and commercial buildings each account for about 5% of the total Tribal power demand. As the average Little River Band member, who is not living in the energy efficient dwellings at Aki, uses around 648 kWh per month, a small change in energy efficiency can make a big impact in terms of cost saved per month[58]

The future energy cost and demand of the Tribe can be calculated by taking several factors into account, including the expected increase in energy price and the expected increase in energy use. The expected total connected electric load for the Tribe in 2015 will be over 5 MW, over one and half times the current energy use. The total cost is expected to quadruple to almost $4.2 million.

[58] This was calculated by taking the average of the number of dwellings and the average amount of energy used by each dwelling.

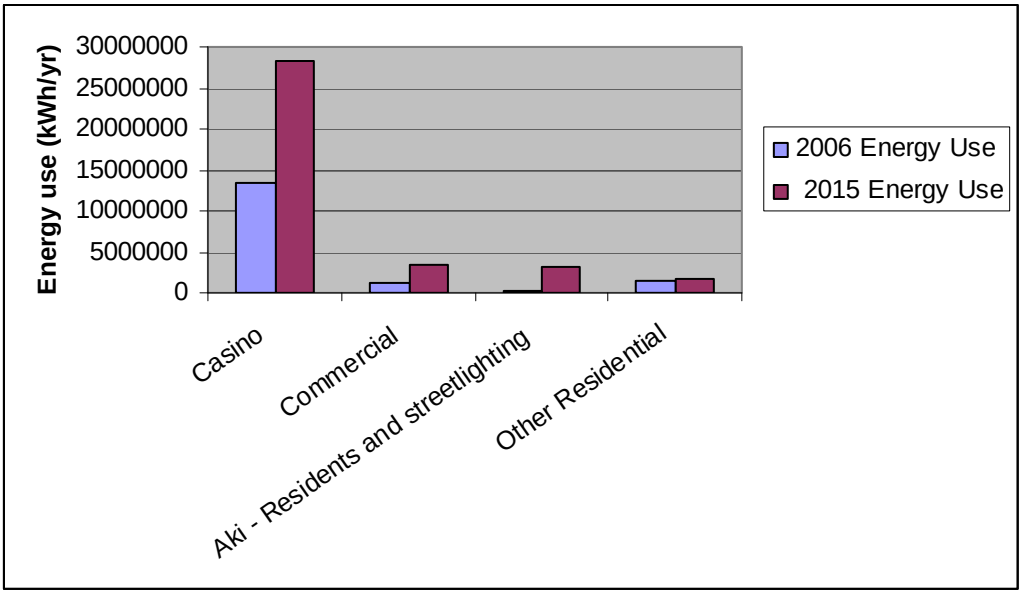
Figure 31. Projected energy demand by sector for 2015[59]

Sector	2015 Energy use (kWh)	2015 Power demand (kW)	Power increase from 2006 ($)	2015 P ower demand (%)	Cost in 2015 ($)	Cost increase from 2006 (%)	Total 2015 Electricity Cost (%)
Casino	28,403,952	4,088	50	81	$ 2,883,454	261	68
Commercial	3,448,127	392	158	8	$ 495,464	381	12
Aki	3,097,711	352	3759	7	$ 555,727	2713	13
Other Residential	1,716,670	195	17	4	$ 282,487	109	7
Total	36,666,460	5,027		100	$ 4,217,132		100

While these numbers are based off of current assumptions listed in the footnotes, the power and energy required of the casino will still dominate all other sectors in 2015, but the cost to power residential buildings will increase in price quicker than large business rates. If the average Tribe member uses 648 kWh per month now, with a bill around $50, then the average member in 2015 can expect to use around 920 kWh per month, and pay much more!

The following graph helps put the Tribal energy use into perspective. This shows how each sector compares in terms of current and future energy use.

Figure 32. Comparison of current and future energy use by sector.



[59] These calculations are based on the following assumptions: Residents in Michigan increase their home energy use by 1.4% each year, the number of homes (non-Aki) will increase by 1% each year, the cost of energy will increase by 6% each year, all 117 Aki lots will be developed by 2015, the new government complex will be built and will double the amount of commercial energy needed, the casino current and future expansions will increase the energy usage by another half.

This graph shows how the casino uses the greatest amount of energy now, compared to other sectors, and is also expected to see the biggest increase. Both the commercial buildings and Aki buildings are expected to increase substantially in terms of energy use due to the planned construction of a new government building and the development of all 117 Aki sites.

Further questions for the Tribe to consider for total energy load:

- *What is the total Tribal energy use including natural gas consumption?*
- *What is the estimated total CO^2 released per year based on electricity and gas consumption?*
- *What percentage of the LRBOI economy is going towards energy costs?*

Ogema Wilson was interested in the total amount of CO^2 released from the Tribe's use of cars. This can be calculated online, when a survey of car use is completed online. Try checking the calculator at NativeEnergy, under individuals and businesses: www.nativeenergy.com/welcome.html

4.3.2 Energy conservation and efficiency

Although the Little River Band of Ottawa Indians has renewable energy supply options, using energy more efficiently is another avenue towards reducing energy bills while conserving natural resources and improving energy independence. According to the 2005 Community Wellbeing and Support Survey Report, about 57% of surveyed Members spend between $500 to $1500 dollars on their annual heating cost. A total of 27% of Members need assistance with their annual heating costs. The annual electric cost for 45% of Members is between $500 and $1000. A total of 22% need assistance with electric costs.

Considering that almost half of the Tribal members living with in the reservation are renting their homes, one of the best methods of decreasing energy use and energy bills long-term would be to create dwelling specific initiatives in terms of rented dwellings, retro-fitting existing dwellings or technologies to include in new dwellings. Appendix 5 outlines possible energy saving actions, their cost and the types of housing each action would benefit.

The Little River Band should be commended for the foresight used to create the 10 Aki dwellings with energy efficiency in mind. This allows the use and cost of energy to be permanently reduced. The Little River Band is also providing $500 energy stipends to the member's utilities to help members lower their energy costs. The money could support the installation of energy efficiency technologies in homes, the hiring of a director who would implement energy efficiency programs, or even on-site renewable energy technologies to permanently reduce energy costs.

Further information:

Green Building Standards
- US Department of Energy. Healthy and Affordable Housing: Practical Recommendations for Building, Renovating and Maintaining Housing: *www.buildingscience.com/bsc/resources/mold/Read_This_Before_You_Design_Build_or_Renovate.pdf*
- US Department of Energy, Energy Efficiency and Renewable Energy: *www.eere.energy.gov/*
- Council of Energy Resource Tribes: CERT Energy Efficiency Guide *www.certredearth.com/EEguide/*
- Michigan Uniform Energy Code: Administrative Rules and Public Acts: *www.michigan.gov/bcc*
- US EPA and US DOE. Energy Star. Standards and Guidelines: *www.energystar.gov/*
- Energy and Environmental Building Association. Home Energy Checklist, Reduce Your Energy Costs: *www.eeba.org/technology/publications/hec/default.htm*

Funding
- Five CAP Community Action Partnership, Housing Weatherization: *www.fivecap.org/Weatherization.htm*
- Michigan Public Service Commission, Low Income and Energy Efficiency Fund: *www.michigan.gov/mpsc/*
- Michigan Department of Labor and Economic Growth: Residential Energy Efficiency and Programs *www.michigan.gov/*

As the casino is the biggest energy user, it would be a good candidate for a in-depth energy efficiency and conservation analysis. When touring the facilities, we heard many good ideas from the employees specifically for improving the casino's energy efficiency, however the cost and benefit of incorporating expensive energy efficient equipment should be considered in parallel with the construction of renewable energy systems.

Further information:
- Western Area Power Administration. Casino Energy Management: *www.wapa.gov/es/pubs/fctsheet/casino%20fact%20Sheet.pdf*
- WAPA. Fort Mojave tribal casino gets cooling system makeover: *www.wapa.gov/ES/pubs/esb/2006/dec/dec065.htm*
- Rebuild Michigan Energy Efficiency Program: *www.**michigan**.gov/eo**rebuild***

The Tribe is considering the construction of a new government office building, for which the LEED standards and designs would be a stringent energy efficiency model to follow. Unfortunately, becoming certified as a LEED building has associated expensive costs. Therefore, the Tribe could adhere to all of the construction standards espoused by LEED or the International Organization of Standardization (ISO) environmental standards, yet create a Tribal certification system which would highlight the "green-ness" of their new buildings, yet not cost thousands to certify. The challenge would be ensuring that each building actually lived up to the standard of the certification, without charging for an expensive on-site assessment.

Further information:
- US Green Building Council. Leadership in Energy and Environmental Design: *www.usgbc.org/*
- International Organization of Standardization (ISO): *www.iso.org*

4.4 Strategic options

Within the current energy situation in Michigan, the Little River Band of Ottawa Indians has several strategic options.

This section lays the possibilities and issues involved with each option of

- Aggregating the Tribal load with an AES or with Consumers
- Forming a utility
- Forming an Alternate Electric Supplier

Before making decisions on which aggregation option to choose, if any, the Tribe should consider what the goals are for the Tribe, both short and long-term. The decision should be based on: Tribal sovereignty, the environment, their economy, Members' interests, the impact of energy consumption, and the future reliability of non-renewable energy sources on the Tribe's goals.

When determining the goals, it is important to think about how to involve the government departments and the Tribal members in the decision-making.

4.4.1 Aggregation as a retail customer

In Michigan, local units of government, public and private schools, universities, and community colleges may aggregate to purchase electricity for themselves or for customers within their boundaries with the written consent of each customer aggregated. There are two methods of aggregation. The first is to aggregate with an Alternate Electric Supplier (AES). The second is to aggregate under Consumers[60].

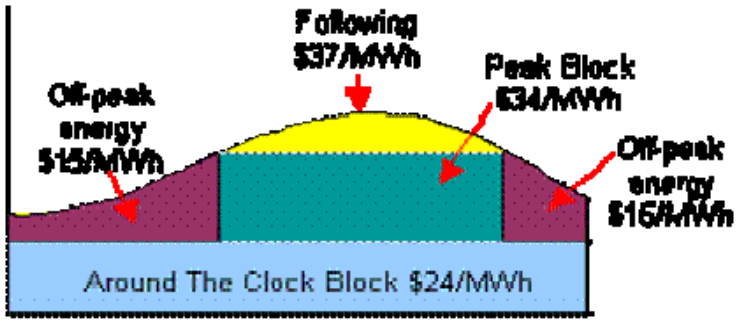
What are the benefits?

There may be some benefits to aggregating as a retail customer. By adding the smaller energy loads of the government buildings and Aki homes to the energy load of the casino, it would be possible to lower the Tribe's overall energy costs, especially for the dwellings that do not use nearly as much energy as the casino. Buying from some AESs also offers the chance to buy renewably generated energy and decrease the carbon output of the Tribe.

Some aggregators offer various energy products to meet one's energy requirements throughout the day, depending on how much energy is being used and when it is being used. The following figure shows how the AES could offer different energy prices for different times of the day and different amounts of energy used.

[60] Customers within a local unit of government have the right to choose their electricity supplier and are not required to purchase electricity through the aggregator, if their local unit of government does opt to.

Figure 33. Example of energy products offered by an AES.[61]



Buying specific energy products might be beneficial for decreasing the amount of money spent on the casino's energy, although the load requirements would have to be carefully analyzed by the AES. Some aggregators offer a fixed electricity rate which can help provide budget certainty as the Tribe would know what the future energy charges will be, although a fixed rate would most likely not offer any financial savings.

What are the drawbacks?

Drawbacks also exist when aggregating retail loads. The biggest drawback that we see for the Tribe is that this is an extremely short-term solution, which may save a small sum of money, or if the Tribe purchases renewable energy from an AES, this decision will most likely not save the Tribe any money at all. The contracts with an AES usually last between one to three years, which does not provide a long-term investment in the Tribe's future energy stability.

Right now, many AESs admit to having a hard time providing any economic benefit for "electricity only" contracts because the rates on the energy market are high while the electricity rates offered by the MPSC regulated utilities are still quite low. The Tribe may be able to find a more financial beneficial aggregation contract if they were interested in aggregating their total electricity *and* gas usage under one AES. Either way, several AESs have gone out of business or were forced to leave the Michigan market in the last three years because of the increasingly lower paybacks for them.

Several other issues should be considered when looking into purchasing energy from an AES. The Tribe must take into account whether or not the AES will aggregate residential loads and if the economic will be more stable in the near future[62].

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[61] Figured accessed at: http://www.retailenergy.com/articles/loadagg.htm

[62] One AES thought their ability to offer savings in electricity could improve as soon as the Power Supply Cost Recovery factor is increased for the MPSC regulated utilities. Every year Consumers Energy will accrue charges. For example, the operators of the high voltage transmission grid will pass on any charges they have accrued from operating the system to Consumers Energy. Consumers will then present their total 'power supply costs' to the Commission and ask for the Commission to approve a certain fixed charge for the next year ~ a charge that Consumers will pass on to their customers in order to pay off their total power supply costs. For the past two years, Consumers has been able to delay recovering their costs, as the MPSC did not want to hit the consumers with both large electricity and large gas bills, as the price of gas shot up.

How would the Tribe begin purchasing from an AES?

The Tribe would first have to research the Alternate Electric Suppliers to find one that can offer what they are looking for. The *active* AESs operating in the Consumers Energy jurisdiction are online at the Michigan Public Service Commission website.[63]

When talking to each AES, it is important to find out:

- what types of contracts are being offered in the Consumers utility service area, including aggregation and renewable energy contracts,
- what sectors are served (commercial, industry, and residential),
- what types of energy is available (electricity, gas),
- if there is a required KW load; and
- the types of products offered.

Figure 34. Matrix of Alternate Electric Suppliers

AES Name	Contact
WPS Energy Services	Fred Polenz 734.761.2552
American PowerNet	David Butsack 877.977.2636
Constellation New Energy	Eric Bennett 248-936-9015
Green Power Exchange	Donald Johns 517.268.1276
MidAmerican Energy Co	800.432.8574
Sempra Energy Solutions	Hendricks Carroll
Strategic Energy	John Bodene 734.432.2615
Wolverine Power Marketing Cooperative	Craig Borr 231.775.7500

If the Tribe does not find an AES right away that they would like to work with but are still interested in aggregating their load, continue to check the MPSC website. Some AES may have become active again, may have opened up new contracts for Michigan, may have expanded their area of coverage, or may have added renewable energy to their portfolio.

If the Tribe finds an AES that they are interested in, find out what type of energy information the AES needs to compute the possible energy savings for switching to their service. The AES will use the Tribe's energy consumption to compare the electricity costs if the Tribe stayed with Consumers on the service tariff verses if the Tribe went with the AES on the Retail Open Access tariff. The AES will look at the tariff that all of

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To make up for this delay, in January 2007, the Commission might approve a $12 fixed rate for Consumers power supply cost recovery charge.

[63] http://www.michigan.gov/mpsc/ > "Electricity" > "Customer Choice" > "Supplier List" > "Consumer's Energy

the Tribal buildings are on and project what they believe the tariffs and rates will be increased to in the future.

Again, it does not appear that any aggregation with an AES will provide a long-term, economically positive solution, but if interested in learning more information about the process see Appendix 11.

Further information:
- Download the Retail Open Access Tariff at:
  www.consumersenergy.com/tariffs.nsf/ELECTRIC_TARIFFS

4.4.2 Utility Formation Overview

In the US, there four types of power utilities: investor-owned, municipals, cooperatives, and Federal utilities.

Utilities in Michigan under the jurisdiction of the Michigan Public Service Commission and the Federal Energy Regulatory Commission are privately owned, either by investors or through a cooperative[64].

Municipal power utilities are publicly owned and therefore governed and regulated by their consumer-owners through locally elected or appointed officials, rather than the MPSC. These public-owned utilities are nonprofit, owned by a community, and operated by municipalities, counties, states, public power districts, or other public organizations. Citizens have a say in decisions and policies about rates, services, generating fuels, and the environment[65].

Federal utilities, including the U.S. Bureau of Indian Affairs, produce not-for-profit power and primarily sell it wholesale to other electric utilities. Federal utility power is primarily generated by water resources, but also includes wind power.

About ten tribal utilities operate in the United States. A few were started and developed by the U. S. Bureau of Indian Affairs and are now managed by tribal governments. A few were developed during a casino development project. A few were built from the ground up to serve tribal members on reservations. A few are “virtual utilities” that contract for power and serve administrative needs of existing service providers. A few have acquired existing utility infrastructure and begin operation with a different power supplier[66]. For more examples of Tribal initiatives, see Appendix 12.

[64] National Rural Electric Cooperative Association: www.nreca.org
[65] Public Power: www.eere.energy.gov
[66] Schaff, M. (2002) Case Study On the Formation of Umpqua Indian Utility Cooperative: A Tribal Utility Formed by the Cow Creek Band of Umpqua Tribe of Indians. Affiliated Tribes of Northwest Indians.

What are the benefits and complexities of forming a Tribal utility?

As the General Manager of the Aha Macav Power Service, a Fort Majave Indian Tribal utility, said, "to create an electric utility is to engage in a complex and amazing affair.[67]" The General Manager was right; there are many "amazing" benefits to creating a utility. If the Tribe formed a fully operating utility with their own distribution lines and administrative services, the Tribe would protect and exerciseTribal sovereignty and jurisdiction. The Tribe would be self-providing critical electric infrastructure.

Utility formation diversifies business interests for the Tribal members and the local community. It could attract other energy businesses such as biomass or geothermal. According to Roger Fragua of the Council of Energy Resource Tribes, Tribes as "developers" of their own energy plans and projects is gaining momentum and a cadre of young Indian professionals will be needed to assure the development will continue on Tribal terms." The movement offers the opportunity for Tribes, government, and Industry to involve young members.

Forming a Tribal Utility, of any size, would allow the Tribe to protect their environment through distributing renewable energy that the Tribe could generate on site with wind, sun, or biomass energy. The Tribe could also purchase from a renewable energy from other generators, but this would be a very expensive option. The electricity sold to Tribal members from the Tribal utility would help keep money in the Tribe. Even if the Tribal utility did not generate any of their own power, but rather purchased wholesale power, a Tribal utility could lower energy costs.

Forming a utility can also present many "complex" questions surrounding *energy supply and demand, cost, utility governance, jurisdiction, and rights of way*, which are now discussed.

What are the energy supply and demand considerations?

If the Tribe were to form a fully, self-sufficient utility, they would need to either supply all of their own energy, supply part of the energy and purchase the rest, or purchase all of the energy. Deciding how much energy to self-supply depends on:

- the electric load the Tribal utility wants to serve and the rapid growth of electricity demand,
- the electricity procurement method that will save the most amount of money in the long-term depending on the load served; and,
- presumably what is best for the environment and the health of the Tribal members.

[67] Council of Energy Resource Tribes (CERT) (2006) Developing Utility Ability: Dispensing the Value of Tribal Energy Resources to the Tribal Community. March 13 & 14, 2006, Avi Resort & Casino, Laughlin, Nevada. Accessed December 6 2006, http://www.certredearth.com/documents/FMITExecutiveSummary.pdf

How will the Tribe decide the electricity load it wants to serve?

The Tribe would also have to deicide if the utility would only serve Tribal members or if the Tribe would want to serve the entire Manistee Township or County. The answer to this question would depend on how big the Tribe wanted the utility to become, how realistic it would be for the Tribe to form a utility that serviced areas other than dwellings located on trust land, and whether or not the Tribe would have the only franchise to the area.

How will the Tribe decide which method of electricity procurement is best?

With a total Tribal electric load of 3MW, it could be conceivable for the Tribe to produce enough energy to service their own load through wind power with another form of dispatchable energy, such as hydro, geothermal, or biomass. A dispatchable energy source is one that a utility can plan to use at their convenience.

What energy forms are dispatchable?

Wind energy is not typically dispatchable, as some days the wind will blow harder than others. Coal is usually the most reliable, dispatchable electricity source that can handle base requirements, but as mentioned above, coal plants are not being built in Michigan because of the prices associated with deregulation, and buying energy on MISO is extremely expensive. There are several alternative plants in the works right now in Michigan that are looking into ethanol, biomass, and carbon recapture that will be ready to float a bond issue soon. The Tribe could possibly buy into one of these plants. This option would also be more secure in the long-term. The Tribe could also look into county partnerships available for interest in creating a joint biomass plant.

Another viable option for increasing the value of wind generation is to combine it with some form of energy storage. Near Manistee, the 1800 MW Ludington pumped storage facility presents a unique capability for electric power storage. At least in theory, it could be possible to use wind power to pump water uphill into the Ludington reservoir during times when wind generation would not be particularly valuable to the electric grid; effectively storing electricity in the form of hydroelectric potential that could be dispatched as needed when the capacity is more valuable[68].

The Tribe will have to use historical trend data, including load factors and variances between times of day and seasons of the year, to determine if the electricity source would be able to meet these demands.

What partnerships would help the utility ensure electricity delivery?

The Tribe will also need to find partners with which to form energy back-up contracts, in case of an emergency. Possible partners include Consumers, merchant plants, or other utilities. According to the Public Utility Regulatory Act (PURPA), an act enacted by

[68] Pryor, S (2005)

Congress as part of the 1978 National Energy Act that encourages the development of independent electric power producers, utilities must grant any reasonable request for back-up power, maintenance power, or supplementary power.

Depending on the size of load that the Tribe chooses the serve, the Tribal utility may need help with serving peak energy demands both on a daily level and a seasonal level. The demand information is important to know to determine the Tribe will have to use the transmission system of MISO, as the total load will effect which Open Access Transmission schedules, and therefore costs, apply to the Tribe. Usually the Open Access Transmission schedule is only for energy loads greater than 5 MW, unless the area is highly constrained.

What are the cost considerations?

To determine the extent of eventual cost savings for developing a Tribal utility, the existing utility costs would need to be compared to the new utility costs. In terms of electricity cost per kWh or kW, Consumers Energy has nuclear and coal-fired plants that sell to the customer at cost value and a Tribal utility would not be able to offer energy at cost value until the construction of the energy source and the infrastructure was paid off.

SGES was interested to determine if the Tribe could take over the electrical infrastructures in order to aggregate the Tribal load, but the location and distribution appears to be too fragmented to allow for a natural aggregation from an electrical perspective. Therefore, in terms of costs for infrastructure and substations, the Tribe will also have to consider the cost of either buying or building. The Tribe will have to conduct a survey to see how many substations the Tribe's buildings are connected to.

If the Tribe decided to purchase substations and infrastructure from Consumers by using eminent domain to take ownership over the lines, the price would most likely be based on the future value of the wires, as opposed to the current monetary value. Depending on the legality of Consumers' franchise, the Tribe may just decide to duplicate the distribution lines that are already up. The cost of building the distribution lines would include not only the cost for materials, but time for the engineering company to design and build the distribution infrastructure.

What are the utility governance considerations?

The Tribe would also have to determine where the Tribal utility would fit in terms of organization. Is the Tribe interested in a publicly-owned or a privately-owned utility? Would the utility report to the council or another committee? Along the same lines, the Tribe would have to consider who will manage the utility and how a utility board can be created. Perhaps a Request for Proposal can be issued for maintenance and operational assistance of the utility, with the condition that the chosen entity train Tribal members to take over the maintenance and operations within a certain time frame. The Tribe can

procure experienced management to help with the utility formation by recruiting from the same pool of qualified electricity industry managers as Consumers and the cooperatives.

The basis for managing a Tribal utility is good solid analytical work, data, and framework. The analytical data is used for modeling business growth and reacting to trends and is valuable for utility operation and business planning[69].

What are the jurisdictional considerations?

A first step in forming a utility is determining the jurisdictional authorities involved in the formation of a utility on tribal lands. What regulations and bodies will have opinions as to how or if the Little River Band can form a utility? Are the facilities and utility actions taking place on the Little River Band's existing utility system truly federal, state, or Tribal jurisdictional?[70]

Box 4. **Case study part one: Umpqua Indian Utility Cooperative**

During the Umpqua Tribe's journey to become a utility, at no time did the Umpqua Tribe approach the State of Oregon to address the jurisdictional issue. To do so could have been seen as the tribe acquiescing to their authority. Their existing service provider did, however, inform the State Public Utility Commission of their actions and the State accepted those actions as the proper jurisdiction of the Tribe.

Would any state acts infringe on the Little River Band's right to form a utility?

In litigation between Tribes and non-Tribes arising out of conduct on a Tribal reservation, resolution of conflicts between the jurisdiction of state and tribal courts has depended, absent a governing act of Congress, on whether the state action infringed on the right of reservation Indians to make their own laws and be ruled by them[71]. It would seem that any law that conflicted with a Tribal law regarding utility matters on the Little River Band trust lands would infringe the right of the Tribe to make laws and be ruled by them. Along these lines, does the Little River Band have any Tribal law regarding utility matters or the current wastewater utility?

Tribes have inherent sovereign authority on their reservations to regulate entities doing business on tribal lands as an essential attribute of Indian sovereignty; it is a necessary instrument of self-government and territorial management. Case law has limited this sovereignty when actions are within reservations, but not on tribal lands, such as on fee owned lands within reservations. This limitation does not extend to tribal trust lands.[72]

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[69] CERT (2006)
[70] The Federal Power Act defines the split between federal and state jurisdiction over electrical matters. Tribal jurisdiction is not specifically referenced in the Federal Power Act[70].
[71] Case Study On the Formation of Umpqua Indian Utility Cooperative
[72] Case Study On the Formation of Umpqua Indian Utility Cooperative

The casino, the biggest energy user of the Little River Band, is located on trust land. The Tribe could *begin by forming a smaller utility* that would include only servicing the Casino and other buildings sharing the Casino's substation.

Box 5. Case study part two: Umpqua Indian Utility Cooperative (UIUC)

The existing utility serving the Umpqua Tribe had an internal policy that none of their facilities were for sale. Therefore, the Tribe did not have the option of negotiation for the facilities. A legal taking, or condemnation was the only option. The existing service provider was, however, cooperative and all activities were amicable. A company representative was interviewed by the Associated Press for a news article after UIUC was operational. The spokesperson stated that they understood the tribe's right to sovereignty, and conversely, the tribe understood their responsibility to their customers and shareholders.

Because the United States holds title to Indian lands and real property in trust for tribes, any condemnation of real property was required to be instituted by the United States Department of Justice on behalf of the Tribe. However, any acquisition of personal property was within Tribal jurisdiction. Whether property is real property or personal property is determined by the law of the place where the property is found, therefore, ***the Tribe passed a law stating that utility facilities which are not subject to real property agreements are deemed to be personal property***. The utility facilities were not subject to any real property agreements.

Next, another Tribal code was established, this one establishing an eminent domain, or condemnation process for personal property on the reservation. The procedures and standards in the tribe's condemnation law are similar to the procedures and standards in federal condemnation law and procedure. ***The condemnation law grants the tribe the authority to condemn personal property under the Tribe's Constitution, and provides subject matter jurisdiction over condemnation cases in the previously established Tribal Court system***. The law, however, is thereafter mostly a procedural law which instructs the tribe in filing procedures, and the tribal court clerk in responsive actions. Upon appropriate filing of the action and payment of estimated just compensation under Tribal law, just as under Federal condemnation law, the facilities automatically become the property of the Tribe.

Often, when utilities build new lines to new homes or businesses, they require the new customer to pay for the installation of the lines. ***All Tribes should have regulations on their books that state that any such upgrades paid for by the Tribe are owned by the Tribe, and as a condition of using the lines the utility company is required to operate and maintain them.*** Other times, utility rules and policies (called line extension policies) allow the utility to add new facilities to their rate base without charging the customer, but simply including the cost of the new infrastructure in the existing rate base[73].

[73] Case Study On the Formation of Umpqua Indian Utility Cooperative

What Tribal laws would benefit the formation of a Little River Band utility?

Tribal laws can legally form the utility and provide its management and operational structure within the Tribal government. The laws can assist the Tribe in being able to acquire the existing distribution system and and a general utility responsibility for the service area. The laws can clarify sovereign immunity issues for legal recourse against the Tribe if the Tribe purchases energy from an alternative supplier and payments are not made for power.

The Tribe should consider preparing a strong legal framework before they begin discussions with Consumers Energy[74]. If there are not any Tribal laws for utility formation, operation, and regulation, the drafting and Tribal Council approval of appropriate *laws may be part of the Little River Band's utility formation process*. A detailed Tribal utility code could be drafted, redrafted, and then approved by the Tribal Council[75]. The Tribe can again seek council from CERT or other Tribes who have already formed a Tribal utility.

Further information:

- The Department of Energy provides competitive First Steps and Renewable Energy Feasibility grants. Other funding sources include very competitive grants from Department of the Interior, ANA Social and Economic Development program, EPA, or Department of Housing and Urban Development.
- US Department of Energy and Department of Interior. Executive Summary of in the Draft Report to Congress: Energy Policy Act of 2005, Section 1813: Indian Land Rights of Way Study: http://1813.anl.gov/documents/index.cfm
- Download the Tribal Legal Code for the Umpqua Indian Utility Cooperative and the Tribal Legal Code for eminent domain at: *www.eere.energy.gov/tribalenergy/guide/uiuc_web_text.html*
- Department of Energy. A Guide to Tribal Energy Development: www.eere.energy.gov/tribalenergy/guide/
- Native American Rights Fund: www.narf.org/

What are the rights-of-way considerations?

Rights-of-way issues will quickly arise if the Tribe begins researching jurisdiction.

According to Roger Fragua of the Council of Energy Resource Tribes, "the industry challenge to Tribal sovereignty on rights-of-way is a contemporary issue that Tribes are working to resolve. Many rights-of-way granted to energy companies on Tribal lands are soon expiring or have already expired. With nearly 56 million acres of Tribal lands spanning 32 states, there are a number of Tribes considering renewal terms for their

[74] The Tribe might also want to consider the external impacts of forming a utility. For example, if Consumers has traditionally calculated its power supply cost recovery factor with the Tribal facilities and loads included, the Little River Band could consider how their actions will impact the current Consumer Energy's loads and facilities that will be removed from the State governed PSCR. Several Tribes, when forming utilities, strove to accommodate the existing utility to assure that the transaction was not confrontational, but business-like.

[75] Case Study On the Formation of Umpqua Indian Utility Cooperative

rights-of-way and reevaluating the compensation in return for access across and over their lands. Armed with knowledge of right-of-way laws, tools for assuring physical compliance, and valuation techniques, Tribes can better negotiate what they want from energy companies in exchange for allowing access through and over Indian lands."

How can rights-of-way be negotiated?

Negotiated terms for rights-of-way (ROW) can be in monetary terms, access to reliable electricity, or a number of Tribal defined terms[76]. Market theory, today's prevailing ideology, would say that the fair compensation is what is agreed upon between a willing seller and a willing buyer in an open market. The company has chosen the Tribal lands route for its right-of-way as optimal for the company's interests. Therefore, the value for the right-of-way is best established by negotiations between a Tribe and a company if the Tribe is as informed as is the company[77]. Easements across thousands of miles of Tribal trust lands provide rights-of-way for highways, railroads, electric transmission lines, communication facilities, and oil and gas pipelines[78]. It is vital for both ROW holders and Tribes to understand the legal status of easements across Indian lands so all entities can negotiate terms that reflect statutory rights of the Tribes and the important values of these easements.

What has happened historically?

Virtually all of the historical ROW negotiations over the just level of compensation for energy ROWs have been determined through the Bureau of Indian Affairs and the energy industry, and the tribe did not actively participate in the process. Only recently have some tribes actively negotiated the compensation terms of energy ROWs on their lands, and have succeeded in reaching a much fairer and just compensation[79]. Generally, the definition of tribal lands does not include energy ROWs on tribal fee lands, individual Indian trust allotments or individual Indian fee lands. However in many cases, a tribe owns a portion of an interest in allotted or other lands[80].

What is currently happening with rights-of-way?

A host of issues surround energy rights-of-way on Tribal land. The Energy Policy Act of 2005, Section 1813, acknowledged this complexity by calling for the Department of the Interior and the Department of Energy to conduct as study on Indian Lands Rights-of-Way[81]. The report, detailing compensation and sovereignty interests, is available at the

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[76] CERT (2005)
[77] CERT (2005)
[78] Miller (2002) "Easements on Tribal Sovereignty", American Indian Law Review 2001-2002.
[79] Jacarille Apache Nation (2006) *Comments on Section 1813 Draft Report.* http://1813.anl.gov/documents/docs/draftcomments/index.cfm
[80] Affiliated Tribes of Northwest Indians, Economic Development Corporation (2006) *December 2006 comments on Section 1813 Draft Report.* http://1813.anl.gov/documents/docs/draftcomments/index.cfm
[81] Energy Policy Act 2005, Section 1813: Indian Lands Rights of Way Study. http://1813.anl.gov/text/index.cfm

Section 1813 website[82], but more beneficial to the Little River Band would be to review the comments on the report, put forth by Tribes who have already engaged in the right-of-way issue with the utilities, such as the Rosebud Sioux Tribe[83].

What information is needed to properly value right-of-way agreements?

To gather and analyze the information needed to properly value right-of-way agreements, the Tribe should find out what easements are currently granted across the Tribe's land. Sources for uncovering this information include Tribal records, state and national archives, and state, county and church records. Keep in mind the search may expand and evolve to a more obscure or uncommon depository of information specific to the Tribe. Consumers would have to be able to provide legal proof of their authority over non-Tribal poles located on Tribal lands. Also keep in mind that the issues surrounding ROWs of interstate transportation of energy differ greatly from the issues of local energy distribution ROWs.[84]

What arguments will the utility, Consumers, bring up?

When engaging with Consumers or other utilities, it will be important for the Little River Band to show research, as documented in the above report, which demonstrates how "Contrary to the oft-repeated, but never substantiated, claims by energy and pipeline industry representatives, Tribal consent for energy ROWs across tribal lands to not constituted a threat to national security, have not and do not create any energy supply emergency and is not "consequential" in terms of energy costs for either the nation or consumers"[85], or in other words, does not drive up the energy and transmission costs[86].

Box 6. Arguments from the energy providers[87]

There is an unfounded "deep sense of concern by electric utilities and natural gas pipelines that the companies can no longer rely on continued use of existing rights-of-way and the availability of new rights-of-way on tribal lands at reasonable fees." Recent Edison Electric Institute supposedly shows that recent right-of-way renewals resulted in fees exceeding fair market value of the land involved by multiples of 20 to 30 or more and that right-of-way permit terms have dropped by half, from a typical 50 year term to an average of 25 years or less.

[82] http://1813.anl.gov/index.cfm
[83] http://1813.anl.gov/documents/docs/draftcomments/index.cfm
[84] Jacarille Apache Nation (2006) *Comments on Section 1813 Draft Report.* http://1813.anl.gov/documents/docs/draftcomments/index.cfm
[85] Confederated Tribes of the Umatilla (2006) *Comments on Section 1813 Draft Report.* http://1813.anl.gov/documents/docs/draftcomments/index.cfm
[86] Fond du Land Reservation Business Committee (2006) *December comments on Section 1813 Draft Report.* http://1813.anl.gov/documents/docs/draftcomments/index.cfm
[87] Edison Electric Institute (2006) (2006) *December comments on Section 1813 Draft Report.* http://1813.anl.gov/documents/docs/draftcomments/index.cfm

Energy providers also believe that fair market value should be the standard used for setting right-of-way fees, rather than tribal sovereignty, not only in utility negotiations and eminent domain proceedings involving private land, but also by federal, state, and local governments in setting fees for use of their sovereign lands.

Does the Little River Band constitution or other documentation mention ROW?

Many of the comments offered by Tribes in response to the Indian Lands Rights of Way Study reiterate the legal and moral duty required of the federal government to respect and uphold treaty rights by recognizing the sovereign rights of Tribes to control their lands. Another extremely important point was that "Tribal constitutions and ordinances strongly support tribal decision-making regarding energy ROWs and natural resource management on tribal land versus federal regulation.[88]" Does the Little River Band Treaty, constitution or ordinances include a clear requirement that Tribal consent is required for an energy ROW to be placed on tribal lands on their Reservation? The Tribe should seek to investigate and substantiate an answer to this question.

The Council of Energy Resource Tribes can help the LRBOI in the appraisal and negotiation process by helping to determine what constitutes fair compensation that a Tribe may command from an energy company for providing access over Tribal land. CERT can also explain the existing and potential challenges for Tribes in negotiating a new ROW agreement or renegotiating an existing agreement.

Further information:
Energy Policy Act Section 1813. Indian Lands Rights-of-Way: http://1813.anl.gov/

4.4.3 Forming a Municipal (public power) Utility

Public power utilities are operated by local governments to provide communities with reliable, responsive, not-for-profit electric service. Public power utilities are directly accountable to the people they serve through local elected or appointed officials[89]. Some public power utilities have been formed in a year or two. A few of the most hard-fought municipalization campaigns took 7 or 8 years to complete. The average appears to be about 3 to 4 years. In Michigan, municipal utilities are not under the jurisdiction of the MPSC, but rather are under the jurisdiction of local ordinances and state law[90].

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[88] Harvey, Carol (2006) *Comments on Section 1813 Draft Report.* http://1813.anl.gov/documents/docs/draftcomments/index.cfm

[89] American Public Power Association www.appanet.org/

[90] SB 937, a substitute bill on Key Restructuring Legislation signed by the governor June 3, 2000: Municipal utilities do not have to allow other electricity suppliers operate within their jurisdiction. A municipal utility's governing body determines whether it will permit retail competition, and has exclusive jurisdiction to set rates, determine stranded cost recovery and establish rules and conditions for a customer choice program. (§10y.1 and 7) If a municipal utility elects to supply power to another utility's customers, the municipal

The Michigan Constitution allows the formation of a municipal utility for any city or township, and allows up for 25% of the service to be outside the city or village[91]. This could benefit the Little River Band by allowing them to serve Tribal members living outside of Manistee, but the municipal utility will need a franchise to serve beyond the city limits.

What are the benefits of forming a municipal utility?

What are the cost benefits of becoming a local utility?

When an entity becomes involved in the selling of energy, it becomes hard not to see the process as a business from which to make more money by generating and selling more. A public utility would not encounter this problem, as the revenue is directed into shareholder's pockets.

Being non-profit allows the municipality to offer the lowest electrical prices and any income made by the utility are invested back into the community and are put back into utility operations. Dividends are not paid to stockholders. Being a smaller utility, municipal utilities can run more efficiently and the costs are kept down. The municipal utility can provide full attention to customer service and can provide local employment and aid local economic development, as public power dollars stay within the community.

What are the local control benefits of a municipal utility?

The values of a municipal utility seem to align closely with those values of a Tribal decision-making process.

In a municipal utility, every citizen is a utility owner with a direct say in policies that affect rates and service. Residents have public notices and access to meetings, planning alternatives, reports, assumptions used, and cost estimates. Municipal utilities are more accessible to the community and therefore there is more accountability.

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utility must obtain an alternative supplier license from the PSC, and allow all of its customers located outside the municipal boundaries to choose an alternate supplier. The municipal utility can supply power to other utilities' customers up to an amount equal to the municipal utility's load that is allowed to choose. The municipal utility can assign its right to supply power to its joint action agency. (§10y.4 and 10) No one can provide delivery or customer accounting services to a municipal utility's customers without the consent of the utility. After December 31, 2007, this provision is not applicable if the municipal utility does not allow choice for all customers located outside the municipality. (§10y.2 and 3)

[91] It is not clear within the legislation what the 25% refers to, ie number of total customers, percentage of load, etc, or if the 25% is even still applicable because of new legislation that brought in a territorial requirement, stating that all customers served outside of the municipal boundary must be located with the neighboring boundary. As well, some believe that the territorial clause may be disregarded, if the load served beyond any adjoining townships is under 25%.

A component of local control is local decision-making. As the governing board[92], the members establish the utility's annual budget and set rates for electric service; act in the long-term best interest of the community and the utility; and represent the interest of the owners of the utility, who are the customers.

Even if the Little River Band doesn't form a utility, what benefits could arise just form looking into the possibilities?

The Tribe will enjoy some benefits just by evaluating municipalization. Once the Tribe begins to look at alternatives, the Consumers will become more alert and visibly active in supporting the Tribe's projects. Customer service and reliability may improve. Consumers may offer special incentive rates tied to long-term contracts to large businesses, such as the casino. If the rates are extremely low, the city may need to re-evaluate the feasibility of forming a utility. The large energy users, such as the casino receive a benefit that would not have been made available had it not been for the Tribe's considering public power.

What are the barriers of forming a municipal utility?

The barriers to forming a municipal utility are similar to forming any utility, in terms of infrastructure and associated costs. It is likely that the municipal utility will save money in the long run, but there will be some large upfront costs.

Aside from upfront infrastructure costs, what are the other considerations?

If the Tribe decides to purchase their energy, fluctuations in power supply costs can be lessened with the proper power supply contracts. The risk of devastation from major storms can be mitigated with the proper reserves, insurance and mutual aid agreements. Since these costs are already included in Consumer's distribution costs, customers are already paying for them in their electric rates. However, when the city takes ownership and operation of the utility, it has control over both the revenues and the expenses. Other costs can include feasibility studies and engineering consultant, litigation, public education, purchasing distribution equipment, possibly paying for stranded costs of Consumer's Energy. Reading other municipal utility reports provide a good example of what is involved in terms of the yearly costs[93].

How could the Tribal utility supply energy?

Similar to other types of utility formation, the Tribe could supply their energy through wind turbines and a dispatchable energy source, such as biomass or wood-waste.
The Tribe may also call and join the Michigan Public Power Agency to see if any power supply plants are producing excess electricity that they could purchase. For example,

[92] The governing body of a public power utility may be an elected city council, elected utility board, appointed utility board, or independent utility board. The Tribe would determine which governing body would fit best with the Little River Band's structure and culture.
[93] For example, Holland Utility Annual Report: www.hollanbpw.com

right now, the Lansing Water and Light would be able to sell excess. The Tribe may also be able to buy into a plant through a Joint Action Agency. A list is available on the APPA website for municipal utilities.

What size of area would the municipal utility serve?

The Tribe would have to determine the size of the municipal utility and which customers they would serve. Would the entire township of Manistee be willing to jump on board with a municipal utility initiative? If so, how would the Tribal government work with the Manistee local government? Is there any interest among the Manistee local government to form a municipal utility? Would both parties want the venture to be a joint project? How could this joint project work as a partnership? Or would the Tribe want to form a municipal utility on trust land only?

How would the Tribe work with Consumers?

One of the biggest barriers might be opposition by Consumers Energy. If the investor owned utility (IOU), Consumers Energy in Manistee County, is determined to stop the formation of the public power utility, it may take the city to court on various legal issues. Consumers may spend an exorbitant amount of money on newspaper, radio, and television advertising to spread misinformation about public power. However, despite the huge funds spent on these campaigns, cities have been successful in using their communication channels to keep citizens fully informed about the proposed public power utility.

First steps in forming a municipal utility

Usually townships or local units looking to form a municipal utility have similar hopes. The first is that the local unit will create a utility. The second is for a large power entity, such as the Casino, to decrease their energy prices. They can involve the local government to help gain leverage to get a special contract with the investor-owned utility.

The process of forming a public power utility typically includes the following elements, which are discussed below: a feasibility study, legal analysis, facilities valuation, consumer educational campaign, citizen referendum, price negotiation and/or condemnation proceedings, petition to the public service commission, power supply arrangements, and start up operations[94].

Feasibility Study

Typically, one of the first things a city or Tribal council does is to approve a sum of money for a feasibility study to determine if forming a public power utility is likely to be economically viable. The study looks at capital and operating costs for the proposed new utility, factoring in various alternatives for power supply. The study is usually conducted

[94] Entire section adopted from APPA (2006) Forming a public power utility. www.appanet.org/

by a qualified engineering firm, and it identifies fatal flaws (if any), a range of expected savings, other benefits, risks, and recommended next steps.

Often a preliminary study is done and if it shows savings, a more detailed study follows. The second phase might estimate property value (determining the general condition of the facilities to be acquired) and the cost of separating the new system's facilities from the remaining part of the investor-owned utility's system. If building a new, alternative distribution system is to be considered as an option, the feasibility study would estimate the cost of new construction of a distribution system with current technology.

Depending on the scope of the study and the area of the possible utility, the studies can cost between $5,000 to $150,000.

Further information:
To get a list of qualified engineering firms that conduct feasibility studies, sample requests for proposals and sample feasibilities studies, contact Ursula Schryver at APPA (202-467-2980), USchryver@APPAnet.org.

Legal Analysis

It is important to consider how Tribal rights-of-way, eminent domain, and other laws fit into the legal analysis. Early on there should be a review of state statutes pertaining to the formation of a public power utility[95].

There should also be a review of the city's franchise with Consumers and Cherryland (if one exists) to determine any specific language pertaining to the city's acquisition of distribution facilities that serve the community. If the Tribe is unsure as to whether or not any of the utilities serving their area have a franchise, the Tribe can write a letter to them asking them if they have a franchise to serve in Manistee County, the township of Manistee, or at minimum to the area where the Casino is located, and what they have in the way of a legitimate claim for this franchise. It is also important to know if it is exclusive, revocable by the Tribe, or if it is in place only for a certain number of years. If the utilities do not have a franchise, then there are no stranded costs (See Box 4).

In most cases if the municipal utility displaces the investor-owned utility franchise, the utility will take the city to court. If the feasibility study has been thorough and actions have been based on legal authority, the city will probably win the law suit, but there will be a cost in time, money and perhaps political will. The utility's goal is not necessarily to win in court, but to run the city out of money or scare city officials into abandoning the idea.

[95] The Michigan state statues pertaining to the formation of a public power utility include the Constitution, Article 7, Sect 24, 25 and Bonding Statute Act 94.

Box 7. Municipal utility formation case study: Alma, Michigan and stranded costs

In 1906, Michigan passed the 'Foot Act', allowing franchises for existing utilities. This Act has since been repealed, however Consumers has been known to claim they have a Foot Act Franchise at every location that is interested in forming a municipal utility, even if Consumers does not have a franchise. Consumers must be able to show that they had a predecessor operating in Manistee County before 1906 to show they have a franchise.

Very importantly, the Foot Act is not exclusive: Consumers can only take local units to court if the local units plan to displace Consumer's franchise. If the local unit still plans on allowing Consumers to operate there and provide a choice to the residents, then there is no need for a court hearing under the Foot Act.

When Alma, Michigan formed a municipal utility and wanted to displace Consumer's franchise, Consumers Energy made a stranded cost argument of $125 million for a city of 10,000 people, mostly because Alma housed Consumer's 8th largest customer, an oil refinery. Alma brought Consumers into litigation over the issue with FERC, the Federal Energy Regulatory Commission.

It took three years to finalize the case, but FERC eventually found that the stranded costs were only $3 million at that time. If Alma were to wait three more years, there would be no stranded cost as they will have been completely recovered in three more years.

Even on a general basis, stranded costs should be a non-issue at this point in time, if the Little River Band were to pursue a municipal utility.

Valuation

If not included in the preliminary feasibility study, a follow up study, as per the rights-of-way discussion above, should estimate the value of the electric distribution system. As with other types of appraisals, several valuation methodologies may be used. This would include original cost less depreciation and replacement cost less depreciation[96]. When Traverse City and Light bought out Consumer's Energy distribution system, they did so on a 20 year, $875,000 buyout contract.

Education

Providing the community with information on the proposed public power utility is important throughout the process, not only to gauge the support of citizens, local officials and business leaders, but also to counter strong opposition from Consumers. The educational process includes disseminating information about possible benefits of the proposed municipal utility and bringing citizens' needs and recommendations back to local officials, in a cultural appropriate and significant way. Public hearings may be held to test the level of public support before proceeding to the next step in the

[96] Sheehan, Dr. Michael. "Valuation and Compensation Issues in Establishing a Public Power Utility," APPA.

municipalization process. Representatives from the Michigan Municipal Electric Association would be willing to come and present.[97]

Some communities appoint a committee of prominent citizens to guide the public power evaluation. This can be very helpful in the process as long as the task force remains public and unbiased, and is not captured by Consumers.

Because the local business community plays an important role in the success or failure of a municipalization effort, involving businesses early in the process can help avoid misunderstandings. Similarly, since the media provides an important role in educating citizens, it is important that they understand the issues in a public power evaluation. Municipal officials find it helpful to convene a meeting with the editors of the local newspaper to explain the initiative.

Another important element in considering public power is the local and regional political scene. Any strategy for municipalization must factor in not only the results of the feasibility analysis, but also a sense of the political climate of forming a public power utility.

Referendum

Under Michigan law, the township, city, or county would need to hold a vote to authorize the establishment of the public power utility, asking "should the city be authorized to establish a municipal utility?"[98] The Tribe would have to determine if the referendum rule applied to a utility forming in trust or fee lands, or both. If the Tribe served non-Tribal customers, a referendum would almost certainly be required. Leading up to the referendum, city officials would present findings and facts on the issue of forming a public power utility. Separately, a volunteer community group may be organized to push for approval of the ballot issue. In order for the referendum to pass, the vote would have to be 3/5 in favor.

There are no required public service commission proceedings under Michigan law for municipal utility formation, but the MPSC Chair, Peter Lark, is supportive of municipal utility initiatives and might be a good contact to receive advice from.

Price negotiation/condemnation

Moving forward beyond the study and the referendum, the Tribe or Manistee city would develop a negotiating strategy and make a purchase offer to Consumers for the relevant parts of its facilities. The simplest way to form a public power utility is through a voluntary agreement between the two parties. In other words, the Tribe would agree to purchase Consumers' distribution facilities and the Consumers would agree to sell.

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[97] See *Straight Answers to False Charges Against Public Power* on the APPA website.

[98] If there is a municipal utility that is already serving electricity of any level, there may not have to be a referendum, unless it is required by the Bond Council if revenue bonds are going to be issued to build infrastructure.

Such "voluntary" purchase agreements happen rarely. The Tribe would have more leverage if its electric franchise specifies that it may acquire the utility's facilities. Some franchises expressly allow the city to acquire the utility prior to the expiration of the franchise term. The process for valuing the distribution facilities may be specified as well. But even with this specific language, Consumers may exercise self-interest and challenge the validity of the contract it signed.

A negotiated purchase price is more likely and would be a compromise between the price deemed appropriate by the Tribe and the price desired by the utility, although the price may be higher if it includes repayment for any previously low ROW payments by Consumers for use of the Little River Band land.

The utility often demands an exorbitant price for the facilities, far in excess of the consultant's valuation. Typically, Consumers criticizes the consultant's study as being faulty, overly optimistic, or biased. But consultants who do these feasibility studies have their professional reputations on the line and try to be as accurate as possible with their estimates. To counter the utility's demands for an exorbitant price, some cities hire two independent consulting firms to value the facilities and then compare their results. If the utility is willing to negotiate, it may be possible to get to a more reasonable, feasible purchase price.

What about using eminent domain?

The Tribe would have the right to pursue the formation of a public utility by acquiring the utility's facilities through eminent domain. Most municipalities have the right of eminent domain which enables them to condemn utility facilities. If the utility property is acquired through eminent domain, usually circuit court jury will determine the just compensation in condemnation proceedings. This can be risky as the jury may find a compensation that is outlandish for either side.

What if the valuation is too outlandish?

To the extent the ability to condemn is restricted and the utility franchise does not require a sale and the utility will not voluntarily sell, the municipality may consider the construction of an alternative system rather than the purchase of the existing facilities, creating another franchise.

Evaluation of financing alternatives

As an investment, a new public power utility has *tremendous payback potential*, but it does take the commitment of considerable funds to begin operations. After estimating the total cost of buying or building the distribution system and other capital and start-up costs, the city should estimate the annual debt service on that amount of debt which would typically be issued as revenue bonds.

The purchase of a new public power utility's facilities is generally done through the issuance of revenue bonds. These bonds are repaid from electric utility revenues. The proposed electricity debt is evaluated by bond rating services based upon the projected net revenues of the electric system. Revenue bonds, unlike general obligation bonds, are not backed by the city or by the city's ability to impose property taxes. The new electric revenue bonds should have no impact on other city projects and borrowings.

Start-up operations

The final steps in forming a public power utility include:

- issuing bonds for the purchase and/or construction of facilities;
- completing power supply and transmission arrangements[99];
- planning for the severance of the system from Consumers;
- developing an organizational plan;
- setting up the new governing body and recruiting a utility manager;
- planning for materials, equipment, and supplies; and
- commencing operations.

The Tribe may decide to contract out some of these functions in the short-run, selecting a firm experienced in electricity operations to do the job.

Further information:

- American Public Power Association[100]
- Michigan Public Power Agency – Jim Weeks
- Michigan Municipal Electric Association – Jim Weeks
- Dickenson Wright – Dickenson Wright is a Michigan based law firm which can provide lawyers who have had a long history in municipal utility formation. **Peter H Ellsworth** , pellsworth@dickinsonwright.com, 517-487-4710

4.4.4 Forming a 'Muni Lite'

The Tribe could form a recognized 'muni lite.' A 'muni lite' is a partial municipalization where the city or Tribe has chosen to defer the acquisition of the incumbent utility's distribution facilities (poles, lines, transformers, etc.) for a later time. Instead the Tribal Utility's main focus is to aggregate the Tribal load. This would allow the Tribe to enter the electricity business by setting up a municipal utility without local wires, but with the

[99] Completing power supply arrangements includes putting together a load profile and submitting it with a RFP for plants to see if they can beat the current electricity cost that the Tribe pays. If the Tribe wants to go this route, it might be best to wait until there is generation with plenty of suppliers and the market prices are lower than the cost-based rates. The cheapest way in the long-term would be to invest in Tribal-owned wind farms. The Tribe may also invest in a coal plant with revenue bonds which will help them invest in long-term energy, but if gas prices suddenly decrease because of new drilling locations, then the Tribe may be stuck with a very expensive form of energy.

[100] American Public Power Association www.appanet.org

authority to purchase electricity in the wholesale market for its own uses. The muni lite could also have self generation. In terms of transmission, the muni lite is only subject to the Open Access Transmission Tariff if the plant is outside the fence.

Further information:
-Clark Hill: Clark Hill is another Michigan based law firm which can provide lawyers who have had a history in municipal utility formation. **Rick Coy**, rcoy@clarkhill.com, 517-318-3028
- FERC. Open Access Transmission Tariff: *www.ferc.gov/industries/electric/indus-act/oatt-reform.asp*

4.4.5 Forming an Investor-owned utility

Forming an investor owned utility deals with similar issues raised above. As well, electric services supplied by electric utilities will be relatively similar no matter if the utility is investor-owned or municipally owned.

However, an investor-owned utility is under jurisdiction of the MPSC. Therefore, if the Tribe's utility was investor-owned and extended beyond trust land, the Tribe would have to file rules and regulations governing the utility's services, that would need to be consistent with, and approved by, the MPSC's rules for electric service.[101]

The services associated with forming a utility, and approved by the MPSC, include such things as:

- Safety awareness
- Customer utilization level
- Power supply/generation, transmission, and distribution
- Customer service
- Rolling and general stock: the physical large and small equipments necessary to build a utility and to carry out day-to-day activities.
- Information technology is essential component that includes hardware and software to read meters, preserve records, and maintain the utility business.
- Correct meter reads
- Correct application of electricity rates to bills
- Creations of a billing system: postage, paper, printing services, envelopes
- Submitting reports to the MSPC
- Preserving records, documents and information in a current status
- Engineering, maintenance, and inspection of the electric plant
- Maintenance of the utility line
- Metering equipment, inspections and tests
- Standards of quality of service (ie constant, reliable supply)
- The line workers, engineers, technicians, accountants, and resource schedulers are a few examples of key employees essential to a utility.[102]

[101] Department of Consumer and Industry Services Accessed 30 November 2006 at: www.state.mi.us.
[102] CERT (2006)

To offer the basic elements of a utility, the Tribe may have to develop a new skill set or seek out experienced help, with the goal of eventually being able to take over operations on their own.

4.4.6 Forming a Cooperative utility

A cooperative is privately owned and is therefore similar to private investor-owned utilities in that profits can be distributed to members as dividends paid on a member's investment into the cooperative. However a cooperative utility is very similar to a publicly owned municipal utility in that profits can be reinvested locally for infrastructure. As well, each customer is a member/owner with an equal say to every other member of the cooperative, unlike investor-owned utilities where the amount of say is governed by the number of shares held.

Each cooperative prides themselves on operating according to seven principles (similar to how municipal utilities operate) including: voluntary and open membership; democractic member control; member's economic participation; autonomy and independence; education, training, and information; **cooperation among cooperatives**; and concern for community.

Further information:
- National Rural Electric Cooperative Association: www.nreca.org/
- Michigan Electric Cooperative Association: www.countrylines.com/

4.4.7 Forming an Alternate Electric Supplier

An Alternate Electric Supplier is a person selling electric generation service to retail customers in Michigan. Unlike utilities, an alternative electric supplier does not include a person who physically delivers electricity directly to retail customers in Michigan. As an AES, the Tribe would be subject to both MISO and utility tariffs (Appendix 13).

If the Tribe were to build large scale commercial wind, the AES would be an avenue of selling the electric generation, without having to build distribution infrastructure. The Tribe could sell directly to the open market, other utilities, cooperatives, or public power associations.

Public Act 141 of 2000 (The Michigan Customer Choice and Electricity Reliability Act) requires a license for Alternative Electric Suppliers (AES) desiring to participate in Commission-approved electric customer choice[103]. The licensing procedures apply to any

[103] Michigan's Customer Choice and Electricity Reliability Act relate specifically to alternative electric suppliers: 460.10a -- Paragraph 2: Licensing procedure. Paragraph 3: Anti-slamming provisions. Paragraph 4: Code of Conduct. 460.10c -- Remedies, penalties, and fines for violations of the Act. 460.10e -- Paragraph 2: Merchant plants (that is, electric generators properly authorized to sell power at market based

person selling electricity at unregulated retail rates in Michigan and participating in a Commission approved electric choice program.

What are the steps in forming an AES?

To receive a license, an AES must provide certain information, meet "fitness" standards, and commit to adhere to certain conditions when operating in Michigan. These requirements are detailed in the AES application: Retail Access Participation Agreement.

The MPSC processes the Application and makes a recommendation to the Commission, who then issues an order granting or rejecting the license. The Commission will look over applications very seriously if the applicant does not have any prior energy experience. The applicant must be a registered business in Michigan.

Forming an AES also requires submitting and storing letters of credit with both Consumers and the MPSC, with the MPSC requiring a $100,000 letter of credit in case of a default.[104]

Further Information[105]:

Sheila Cornfield, skcornf@michigan.gov , (517) 335-5539
Financial Analysis & Customer Choice Section
Regulated Energy Division, Michigan Public Service Commission

- Download Retail Access Participation Agreement and Electronic Case Filings User Manual:
  www.cis.state.mi.us/mpsc/electric/restruct/esp/app-rep.htm

4.5 Partnerships

The Tribal formation initiatives of the Little River Band would be benefited by at multi-governmental summit, perhaps during 2008. Federal, state, local, BIA departments and all Tribal governments in Michigan could be brought together to talk about issues surrounding renewable energy and energy efficiency, such as rights-of-way.

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rates) may sell to alternative electric suppliers. 460.10g -- Definitions. 460.10q -- License requirements. 460.10t -- Shut-off of service.

[104] Consumers Energy (2006) ROA Service Tariff, Section F. For Consumers, the Tribe would have to demonstrate and maintain current creditworthiness in an amount sufficient to cover anticipated charges for all services provided by Consumers. The Tribe would have to provide an amount of credit equal to two months of anticipated distribution-related charges. This requirement for distribution-related charges will terminate once the Tribe has accumulated 24 months of good payment history.

[105] Information about Alternative Electric Supplier licensing is available at http://www.dleg.state.mi.us/mpsc/electric/restruct/esp/app-rep.htm.
In addition, if your firm will act as an electric power marketer (buying power at wholesale and selling at either wholesale or retail), FERC requires you to obtain a license. Contact FERC by telephone (202-208-0571), or on its Web site at: http://www.ferc.gov/industries/electric/gen-info/pm-over.asp.

What partnerships would be beneficial for other forms of renewable energy?

Partnerships for including other sources of renewable energy into a Tribal utility would benefit the Little River Band, especially if the Tribe builds large wind turbines as their main source of energy. Such partnerships could include those specializing or offering opportunities with biomass. Examples of biomass include fast-growing trees and plants, wood and wood waste, agricultural crops and residues, aquatic plants and algae, animal wastes, and organic municipal and industrial wastes.[106]

What are the possibilities regarding biomass?

Residues from the wood products and forestry industries are the largest source of biomass available today for energy, supplying about 64 percent of the total used in the United States. The Tribe could contact local forestry industries, or the EPA, to determine the level of interest in a biomass project in the region. The Tribe could also contact the Packaging Corporation of America mill in Filer City to learn what they do with their waste and if they have any interest in biomass energy production. Specifically, the bark, sawdust, residues, and spend pulping liquors created during the wood harvesting and product manufacturing processes can all be used to create electricity.

Another strategy for reducing greenhouse gas emissions with biomass energy involves the capture and use of landfill methane, which is generated by the bacterial decomposition of organic materials in landfills. Landfills are the single largest human source of methane emissions in the United States[107]. There are also several waste sites in the area that might want to work with the Tribe on a biomass project.

What are the partnerships for a state-wide Tribal utility?

Partnerships for a state-wide Tribal utility would also be beneficial. The Tribe could contact other Tribes, such as the Little Traverse Bay Band of Ottawa Indians and Traverse City Light and Power, as well as other relevant partners including:

- Inter-Tribal Energy Network (ITEN)
- Inter-Tribal Council on Utility Policy (ICOUP)
- US Department of Interior, Office of Indian Energy and Economic Development. Resource Developing

As mentioned above, the Council of Energy Resource Tribes assists Tribes to create comprehensive Tribal energy visions, strategic and implementation plans according to unique Tribal values and resources. The process includes casting a broad net of inclusion from the Tribal community and administration and looking creatively at potential partnerships with, between, and amongst Tribes, government, and industry. Also essential

[106] EPA (2000) *State and local climate change program: Biomass energy. http://yosemite.epa.gov/OAR/globalwarming.nsf/UniqueKeyLookup/SHSU5BNJXH/$File/biomassenergy.pdf*

[107] EPA (2000) *State and local climate change program: Biomass energy.*

in strategic planning is resource assessments, feasibility studies, and business planning (*www.certredearth.com*).

The Department of Energy, Energy Efficiency and Renewable Energy, Tribal Energy Program provides funding and education opportunities as well as the National Renewable Energy Laboratory for technical assistance.

- Roger Taylor, NREL, (303) 384-7389 roger_taylor@nrel.gov
- Sandra Begay-Campbell, (505) 844-5418, skbegay@sandia.gov

Further information:
- Biomass Energy Projects Guide: www.oregon.gov/ENERGY/RENEW/Biomass/guide.shtml

5 Glossary

Alternate Electric Supplier (AES) – An AES provides a similar service as a utility or a electricity cooperative. An Alternate Electric Suppliers can generate their own energy or purchase energy from another generator and sell it retail to the energy users. The difference between an AES and a utility is that the utilities and their rates are regulated by the Michigan Public Service Commission. The AES rates are not regulated.

Deregulation – Deregulation is the changing of regulation to permit the price of electric generation to be determined in retail, competitive markets. This is also called "industry restructuring" or "utility restructuring". Restructuring allows customers to purchase electricity from an AES and pay their local distribution company (usually a utility) to deliver the electric power to their home or business. The delivery or distribution charge is regulated by the Michigan Public Service Commission. To facilitate competition, utility costs are separated (unbundled) into categories such as generation, transmission, distribution and customer services. In Michigan, customers do not have to choose an AES and may remain customers of their existing electric utility under fully regulated rates.

Electric Customer Choice - The Michigan state legislature passed Public Acts 141 and 142 of 2000, the Customer Choice and Electricity Reliability Act. The Choice law, or Retail Open Access, provides "that all retail customers in this state of electric power have a choice of electric suppliers."

Federal Energy Regulatory Commission (FERC) – FERC is the US government agency that regulates the price, terms and conditions of transmission services and wholesale sales of electricity.

Generation Supplier – A generation supplier means an entity that owns or has title to electric generation. A Generation Supplier may also act as a Retailer.

Investor-owned utility (IOU) **–** An IOU is a stockholder-owned utility company that provides utility services to retail customers. Consumers Energy and Detroit Edison are the largest IOUs in Michigan.

Load factor - Load factor represents the ratio of the average amount of power used (average load) to the greatest amount of power needed at any time (maximum demand). Some businesses have peaks and valleys in their electric consumption. It is better to use electricity more constantly without having the peaks and valleys. A business with a more constant use typically results in a lower average cost per kWh. [108]

[108] Load Factor is calculated by the following formula: Load Factor = {kWh / hours in period} / KW (Billing Demand)

Open Access Service Tariff - A tariff approved by the Michigan Public Service Commission that allows customers to purchase energy generation service from a licensed Alternate Electric Supplier for delivery over the local distribution company system.

Open Access Transmission Tariff – This tariff is administered by the Midwest Independent Transmission System Operator and on file with the Federal Energy Regulatory Commission (FERC).

Merchant plant – In Michigan, a merchant power plant is one that is not owned by a utility and does not make retail sales. The merchant power plants are not regulated by the MPSC[109].

Michigan Public Service Commission (MPSC) - The state government agency that regulates investor-owned electric utilities, rural electric cooperatives, and Alternative Electric Suppliers.

Midwest Independent Transmission System Operator (MISO) – MISO is a non-profit, regional transmission organization, that manages the electricity grid, supervises open access to the transmission facilities, and sells wholesale electricity.

Power Supply Cost Recovery (PSCR) - The PSCR is the amount billed monthly to customers to cover projected fuel and purchased power (power supply) costs.

Retail Open Access (ROA) – Retail Open Access is the opportunity for retail customers to choose their suppliers and specific services for purchase. With respect to electricity, this is sometimes called "electric customer choice," "direct access," "open access" or "retail open access."

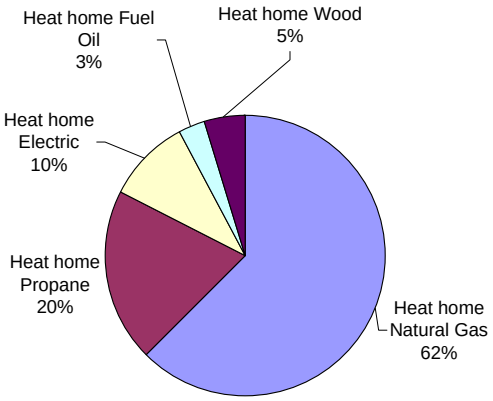
Tariff – A schedule, or rules, outlining what the utility, transmission company, or electricity supplier will ask the customer to pay. Each tariff is a different schedule based on different electricity and power rates for specific services.

Stranded Cost - In the bills currently paid by all ratepayers, utilities are allowed to recover the cost of the investments made to serve its existing customers. A "stranded cost" occurs when customers of one utility leave that utility and have power brought to them from some other supplier, thereby leaving the original utility with debts for plants and equipment it may no longer need and without the revenue from the ratepayers the plants were built to serve.

[109] "Merchant power plants in Michigan." www.cis.state.mi.us/mpsc/electric/restruct/merchantplants.htm

6 Appendices

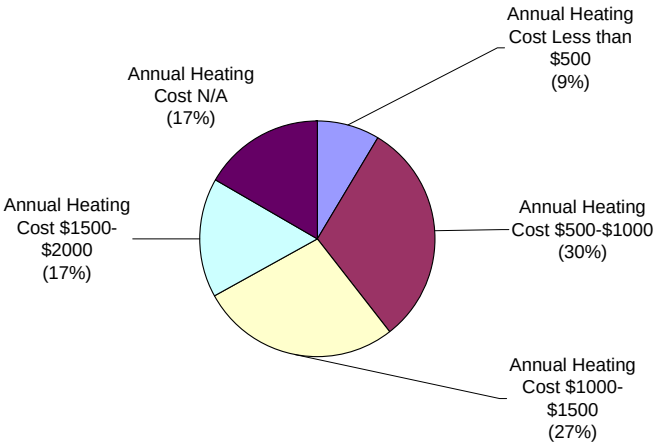
Appendix 1. Energy source for home heating, Wellbeing and Support Survey Report 2005: Members on the reservation



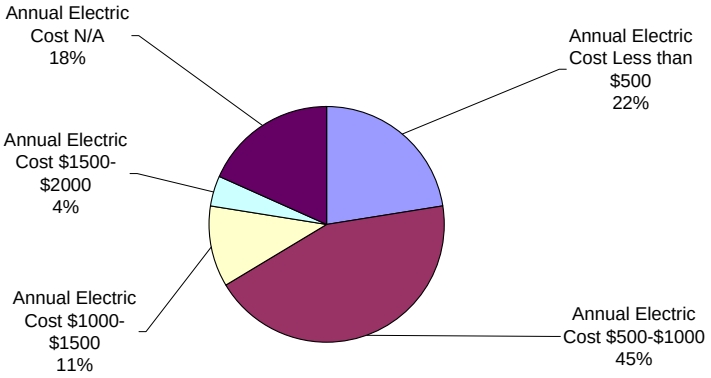
In Michigan, the primary fuel for home heating is gas[110]. The same is seen within the Little River Band. Most surveyed Tribal members living on the Reservation heat their home with natural gas (62%), followed by propane (20%) and electricity (10%).

[110] Consumers Energy (2005) *Consumers Energy Environmental Report: Benefiting from Renewable Power*. Accessed 30 November 2006 at: www.consumersenergy.com/

Appendix 2. Annual heating cost, Wellbeing and Support Survey Report 2005: Members on the reservation



Appendix 3. Annual electricity cost, Wellbeing and Support Survey Report 2005: Members on the reservation



Appendix 4. List of buildings, account number, meter, tariff, and kw use.

Presented below are the buildings and their associated addresses, account numbers and electricity consumption data used in calculating the entire Tribal energy consumption. Note, there are a few important buildings missing from this summary. As well, there were some building had a different account number listed on their Consumers Energy bill, verses the account number found on the electricity consumption data sent to the Tribe, and have been noted in brackets below.

Buildings	Address	Account Number	Meter Number	Electricity use (kWh/yr)	Electricity cost ($/yr)
CASINO					
Casino	2974 Chippewa Hwy	16 15 36 2189 02	83158960	192,960	$ 13,092.95
Casino	2700 Orchard Hwy	16 28 00 4842 00 8	57521382	13,111,200	$ 784,986.44
			TOTAL	13,304,160	$ 798,079.39
AKI NON-RESIDENTIAL					
Utility wellhouse	2624 W. Maw-gaw-ne-quong Rd.	16 15 35 4990 0 8	3563169	56,549	$ 5,581.36
Street lighting	2660 W. Maw-gaw-ne-quong Rd.	16 15 35 4991 0 7	85393874	30,540	$ 3,841.77
Street lighting	2659 E. Maw-gaw-ne-quong Rd.	16 15 35 4995 0 3	85393797	16,980	$ 2,155.31
Hook-up	2624 E. Maw-gaw-ne-quong Rd.	16 15 35 4996 0 2	93639383	1,949	$ 274.89
			TOTAL	106,018	$ 11,853.33
RESIDENTIAL					
No information (assumed 10 Aki dwellings at 8,000 kwh/year each)				80,000	$ 7,899.20
Within reservation	multiple	multiple	multiple	1,385,010	$ 134,900.00
			TOTAL	1,465,010	$ 142,799.20
COMMERCIAL					
Multi-business office	294 River Street #1	16.09.28.3878.2.0		4,708	need verification
Multi-business office	294 River Street #3	16.09.28.3882.1.6		5,535	need verification
Bank	375 River Street	16 05 36 4039	58761798	87,827	$ 6,853.62
Bank #B	375 River Street	16 05 36 4014 0 1	84141059	48,231	$ 4,654.69
Bank #12	375 River Street	16 05 36 4011 1 2	81231147	88,493	$ 7,364.17
Bank #16	375 River Street	16 05 36 4039 00 3	58761798	208,400	$ 15,654.00
Bank #22	375 River Street	16 05 36 4074 16	55165288	69,946	$ 6,054.97
Public safety buildings	3031 Domres Road	16 09 50 0169 0 1	n/a	713	$ 142.70
Public safety buildings	3031 Domres Road	16.16.28.2912.0.5 (16 15 35 3779 0 7)	32141349	49,748	$ 4,177.42
Public safety buildings	3031 Domres Road	16.16.28.3774.01.8 (16 15 35 3774 01 5)	55960483	87,080	$ 7,206.64
Publicl saftety buildings	3031 Domres Road	16.16.28.2866.0.1		10,845	$ 1,273.44
Forest Health Clinic	310 9th Street	16 04 35 8517 2 2	64449521	85,440	$ 8,412.31
Community center	1780 US 31 South	16 02 36 5290 2 2	91884676	70,777	$ 6,734.26
Admin building	1762 US 31 South	16 02 36 5270 1 8	91884692	91,139	$ 8,938.50
Admin building (area light)	1762 US 31 South	16 09 50 0451 007	n/a	3,353	$ 445.60
Big Blue	159 Brickyard Rd	16 11 35 3340 089	01750987	264,600	$ 22,106.77
Unknown	148 1/2 Ford Str	16.11.27.2980.0.8 (16 08 35 1568 6 2)	86377030	1,611	$ 156.73
Unknown	148 Ford Str			1,611	$ 150.95
Unknown	3335 Orchard Hwy	16 15 3565 50 13	74956316	5,371	$ 497.18
Unknown	2929 Chippewa	16 15 36 2118 08	34764226	15,479	$ 1,439.20
Unknown	2811 Chippewa Hwy	16 15 36 3106 00	80171219	1,320	$ 213.32
Unknown	230 9th Str	16 04 35 8433 3 1	65914995	2,940	$ 292.08
Unknown	230 1/2 9th Str	16 04 35 8440 3 2	83122334	6,137	$ 253.19
			TOTAL	1,211,304	$ 103,021.74

BUILDINGS STILL WITHOUT ELECTRICITY INFO
Wastewater and neighboring warehouse
Aki
House of Flavors

BUILDINGS NEEDING VERIFICATION

Not in Little River name	909 Davis Str		
Not in Little River name	194 Quincy Str	16 12 36 6172 0 5	83065828
No record of address (Wastewater)	2539 Dontz Rd.		
Account no longer active as of July 2005	2700 Orchard Hwy #5	1615353888005	55472409
Not in Little River name	2711 W. Maw-gaw-ne-quong Rd.	16 15 35 5001 28	83133772

Appendix 5. Energy efficiency and conservation actions for residential and commercial buildings.

The following table outlines how energy efficiency and conservation actions could be targeted based on the housing type.

Action	**Cost: Low, Medium, High**	**Relevant housing type: Rented, Owned, New or All**
Well-ventilated fridge space	Low	All
Build clothes drying line	Low	All
Compact fluorescent bulbs	Low	All
Water saving fixtures	Low	All
Planting shade trees	Low	All
Shell improvements	Medium	All
Oven	Medium	New
Window frames	Medium	New
Window glass	Medium	New
Daylighting	High	New
Appliances	Medium	Dependent
Insulation	High	Dependent
Cooling	High	Dependent
Heating	High	Dependent
Energy efficiency study	Dependent	All
Renewable energy	High	Dependent

In most cases, steps taken to make a building more energy efficient can pay for themselves in a couple of years by reducing monthly energy bills.

Provide a well-ventilated fridge space. Well ventilated, in relation to refrigerator spaces, means that at least one side or the top of the refrigerator space is completely open. This will reduce the amount of energy a fridge requires to function properly.

Provide clothes drying line. Drying clothes in a dryer demands a high amount of energy, which installing an indoors and/or outdoors clothes drying line can easily remove.

Switch to compact fluorescent lightbulbs. This small act can save up to an average of $30 each or more in energy costs over their lifetime; change five bulbs to compact fluoresents and save more than $150. Each light bulb prevents more than 450 pounds of greenhouse gas emissions each over their life[111].

Water fixtures. Heating water uses a lot of energy, but installing water saving fixtures in the shower, bathroom sink and kitchen sink can help decrease the amount of energy used to heat the water, especially an extremely water efficient shower head.

111

Planting shade trees. Shade trees can keep the sun off the building during the summer and during the winter, when the trees lose their leaves, the winter sun can provide free heat.

Shell improvements. Shell improvements can include sealing cracks around doors and windows, and installing roofs with light colors.

Oven. Install a gas oven with a gas cook top.

Window frames. Install window frames that will be better at keeping heat inside the house, such as timber frames as opposed to aluminum.

Window glass. For south facing windows where relevant, install glass that will be better at keeping the house cool in the summer when the sun is blazing down, such as toned/air gap/clear glass verses a clear, single paned glass.

Daylighting. Installation of skylight windows can greatly reduce the need to use lights during the day (after consideration of how much heat could be lost through the window).

Refrigeration and other appliances. New refrigerators, heating and cooling systems and other appliances use far less energy than refrigerators made even 10 years ago

Insulation. Consider adding extra insulation to wall and ceiling spaces if necessary.

Cooling. Consider adding ceiling fans instead of air-conditioners, purchasing air-conditioners with a high energy efficiency rating, just installing air conditioners in the bedroom, or day-night zoning the air-conditioning.

Heating. Consider gas fixed-flued heaters or heaters with a high energy efficiency rating.

Energy efficiency study. An energy consulting company could be brought on to review the Tribal buildings that use a significant amount of energy to find specific ways to streamline the energy use of these buildings.

Renewable energy. Consider solar hot water heaters and photovoltaic systems (See Chapter Two).

Appendix 6. Energy Star Homes Renewable Ready Construction Checklist (see behind)

Appendix 7. Wisconsin model zoning ordinance (see behind)

Appendix 8. Wind turbine economic pricing scenarios

Using the Furhlander 250 kW and the Vestas 600 kW wind turbines, we can demonstrate how the electricity value and the factors that impact electricity value can significantly affect the economics of a wind turbine project[112].

- Scenario 1: The optimal conditions exist to allow the Tribe to sell the energy at a very high value (**8.9cents per kWh**).
- Scenario 2 shows the other end of the spectrum in which energy value is sold purely at wholesale value (**4cents per kWh**).
- In Scenario 3, the Michigan Public Service Commission has required a Renewable Energy Portfolio Standard, meaning all utilities would need to incorporate a certain amount of renewable energy in their total electricity portfolio. In this likely situation, we assume the increased demand for renewable energy would create higher selling value of wind energy (**7cents per kWh**).
- In Scenario 4, we assume that the Tribe would use their own energy stipend of $50,000 per year to the subsidize wind energy for the whole Tribe while selling the energy at **4cents per kWh** to the Tribal members.

What happens with optimal revenue conditions?

Scenario 1 demonstrates how many years it would take the Tribe to pay off their investment in both wind turbines (simple payback), using only revenue from the electricity rate, *if the most optimal circumstances came together* for the Tribe when selling the energy produced from their wind turbine. The optimal scenario includes revenues from:

1. Customers are paying a premium *green rate* for the renewable energy[113].
2. The Green tags from the wind energy are (similar to carbon offsets) being bought,
3. The Tribe is receiving Federal tax payment for renewable energy under the 2005 Energy Act.
4. The Tribe received a $50,000 grant from the State of Michigan (similar to the grant received for the Traverse city wind turbines), or any other upfront equity worth $50,000 to build the wind system.
5. A federal tax on carbon dioxide emissions has been created. The Michigan Public Service Commission, in their 21st Century Energy Plan predicts that a federal tax on carbon dioxide emissions will be instated in the next three years and by installing a wind turbine this tax would be avoided.

Importantly, Scenario 1 assumes that the complete revenue stream of 8.9cents per kWh would be returned to the Tribe, either by being captured in a power purchase agreement with a buyer, or if the Tribe were to form their own utility to sell this energy directly to

[112] These scenarios were calculated with the assumption that the wind speed is 15.7 mph at a height of 70m.
[113] Assumes residential and commercial customers will be willing to pay a premium for green energy, similar to Green Rate Premium received for Traverse City Light and Power wind energy

customers. As demonstrated below, an ideal rate for electricity would translate into a short pay-back period for the Tribe.

Figure 35. Wind system revenue and financial summary for Scenario 1.

System Revenue: Scenario 1	**Fuhrlander ($/kWh)**	**Vestas ($/kWh)**
Wholesale purchasing price from buyer	0.040	0.040
Green rate customer program	0.016	0.016
Green tags	0.002	0.002
Avoiding likely future federal tax on carbon dioxide tax	0.012	0.012
2005 Energy Act tax payment	0.019	0.019
Total Electric Rate ($/kWh)	**0.089**	**0.089**
Financial Summary: Scenario 1		
Average annual revenue from energy sales	$38,331.67	$123,495.27
Average annual revenue less annual O&M, insurance, and land lease	$31,331.67	$105,495.27
Simple payback (yrs)	**11**	**14**

*Assume green tags sell at $6/MWh
*Assume that future federal carbon dioxide tax will be $20 per ton of CO2, and for each kWh of wind energy, 0.0006 metric tons of CO2 is prevented, therefore each kWh of wind energy will prevent 1.2 cents of tax.

A simple payback between 10-15 years as shown above is extremely rare for wind turbines and is only possible with exceptionally optimal conditions.

What happens with poor revenue conditions?

Scenario 2 highlights the opposite situation, by showing how the payback associated with a much lower selling rate of 4cents per kWh. This lower price results in a payback period lasting longer than the life of the wind turbine, due to the smaller average annual revenues.

Figure 36. Wind system revenue and financial summary for Scenario 2

System Revenue: Scenario 2	**Fuhrlander ($/kWh)**	**Vestas ($/kWh)**
Wholesale purchasing price from buyer	**0.04**	**0.04**
Financial Summary: Scenario 2		
Average annual revenue from energy sales	$17,267	$55,628
Average annual revenue less annual O&M, insurance, and land lease	$10,267	$37,628
Simple payback (yrs)	**39**	**40**

What would happen if Michigan utilities were required to have a Renewable Portfolio Standard?

Scenario 3 summarizes the possible selling price of wind electricity if a Renewable Portfolio Standard (RPS) was introduced to Michigan by the Michigan Public Service Commission (MPSC), requiring all utilities to offer a certain amount of renewable energy. We assume that the introduction of an RPS would increase the market value of

wind energy to 7cents per kWh. This scenario is likely and the Tribe should take note of these developments with the MPSC, as this scenario results in simple paybacks that would last slightly less than the life of the wind turbine system.

Figure 37. Wind system revenue and financial summary for Scenario 3

System Revenue: Scenario 3	**Fuhrlander ($/kWh)**	**Vestas ($/kWh)**
Wholesale purchasing price from buyer	**0.07**	**0.07**
Financial Summary: Scenario 3		
Average annual revenue from energy sales	$30,216	$97,350
Average annual revenue less annual O&M, insurance, and land lease	$23,216	$79,350
Simple payback (yrs)	**15**	**18**

What would happen if the Tribe could subsidize the wind turbine with $50,000 per year aside from the capital repayments?

The final scenario shows the simple payback for the turbines if the Tribe was to use an energy stipend to subsidize wind energy. If the $50,000 would be invested in the turbines each year and the energy could be sold to members at **5cents per kWh**, the simple payback in years would be significantly reduced for the Fuhrlander at 6 years, and moderate for the Vestas at 15 years.

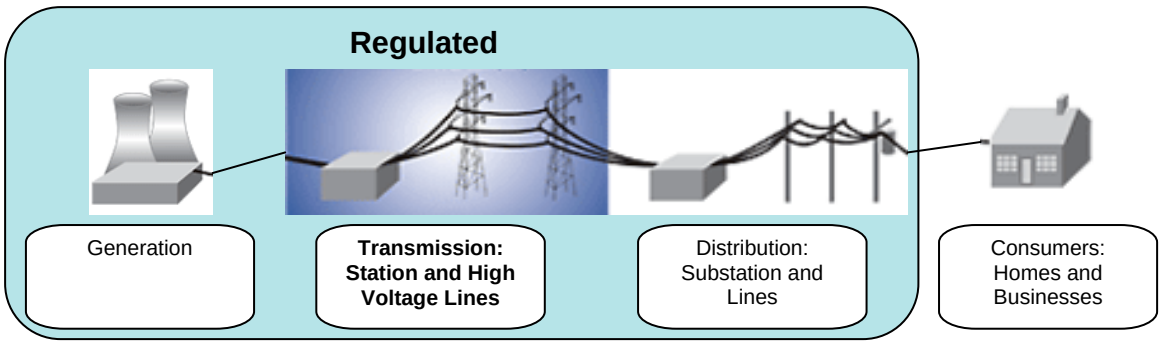
Figure 38. Wind system revenue and financial summary for Scenario 4

System Revenue: Scenario 4	**Fuhrlander ($/kWh)**	**Vestas ($/kWh)**
Wholesale purchasing price from buyer	**0.05**	**0.05**
Financial Summary: Scenario 3		
Average annual revenue from energy sales	$21,583	$69,536
Average annual revenue less annual O&M, insurance, and land lease	$64,583	$101,536
Simple payback (yrs)	6	15

Appendix 9. Closer look at the current Michigan utility environment

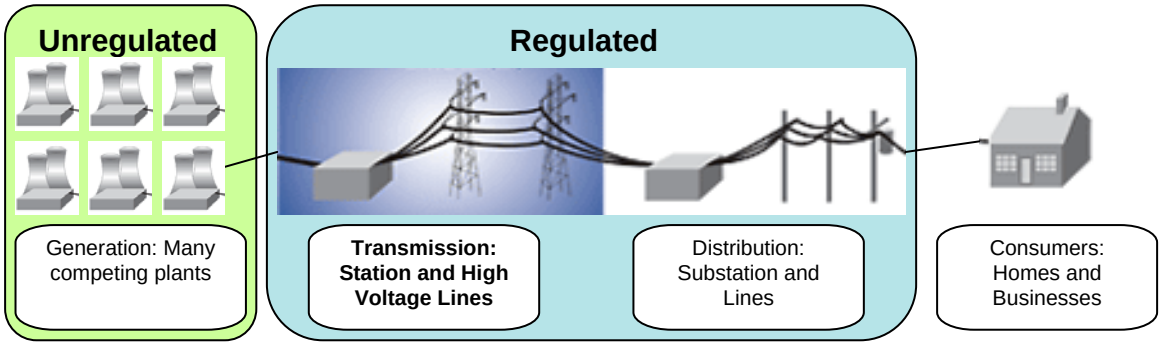
There are three core elements of electricity service: generation, transmission and distribution.

Figure 39. Regulated electric service



In states such as Michigan where the electricity service is unbundled, (meaning individual entities are responsible for each element) customers can choose their electricity supplier.

Figure 40. Unregulated electric service



In 2000, Michigan electricity service became unbundled when the Michigan state legislature passed Public Acts 141 and 142, the Customer Choice and Electricity Reliability Act. Under Michigan's Electric Customer Choice, the generation and supply of power is opened to competitive suppliers. The electric transmission and distribution businesses remain under a regulated monopoly utility structure and the electricity is still distributed through the same regulated transmission and distribution system it has always been[114].

[114] MPSC. Accessed 30 November 2006 at: www.michigan.gov.

Within Michigan, electricity can be *generated and/or supplied* by:

- Merchant plants: power plants that are not owned by utilities and to not sell retail
- Investor-owned utilities or cooperatives: regulated by the MPSC
- Alternate Electric Suppliers: unregulated by the MPSC
- Municipal utilities: regulated by local government and bodies
- Individual generation on-site: i.e. renewable energy

Within Michigan, high voltage electricity is *transmitted* in bulk from the power generating facilities to the distribution facilities by:

- International Transmission Company (ITC) throughout south-eastern Michigan.
- Michigan Electric Transmission Company (METC), an ITC Company: METC serves Manistee County among 60 other counties in Michigan.
- Both of the above companies have joined the Midwest Independent Transmission System Operator[115] (MISO), a voluntary Regional Transmission Organization (RTO)[116] that sells transmission service. MISO does not actually charge the consumer on their energy bill. Instead MISO charges the supplier and the supplier recovers costs from the customer. MISO also oversees the bidding and offering of energy on the Midwest Market[117].

Within Michigan electricity is *distributed* by:

- Utilities
- Cooperatives

Michigan Public Service Commission (MPSC), part of Michigan's Department of Labor and Economic Growth, is responsible for overseeing the implementation of the Customer Choice Act. The MPSC regulates the investor-owned utilities, such as Consumers Energy, and the cooperatives, such as Cherryland. The MPSC also approves new bodies that are interested in supplying energy, so-called Alternate Electric Suppliers (AES).

If customers choose to participate in Customer Choice they may choose from several Alternate Electric Suppliers that have been licensed by the Michigan Public Service Commission to sell energy to retail customers.

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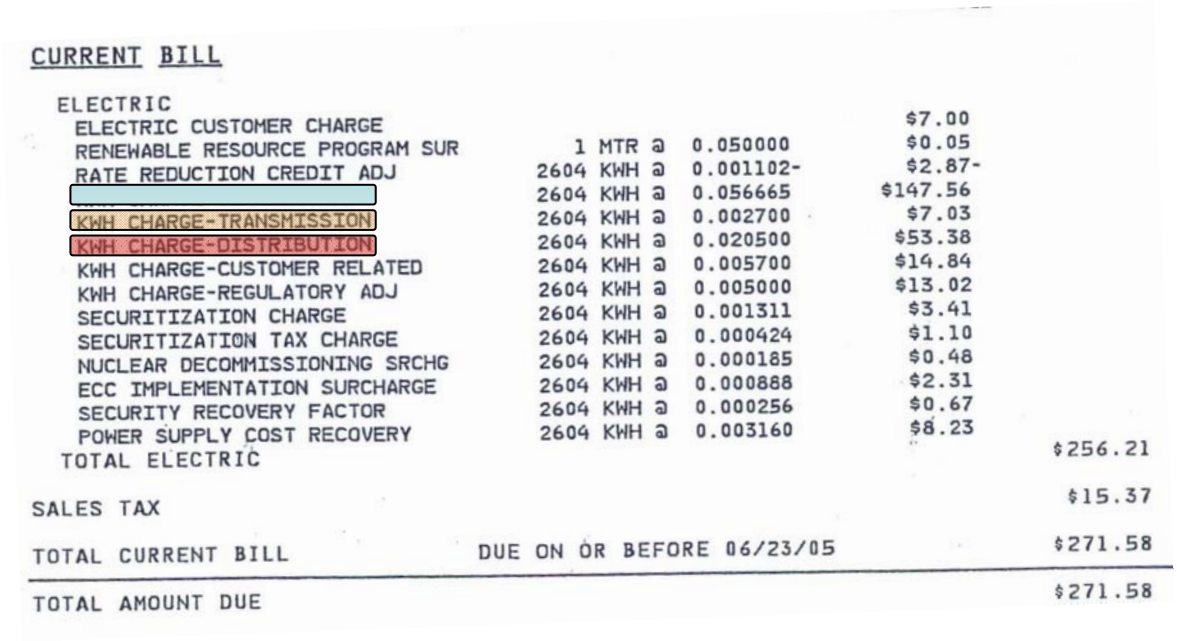
116 An RTO is a Regional Transmission Owner that is primarily concerned with the efficient and reliable operation of the transmission grid. RTOs must not have an economic interest in buying and selling power. According to Federal Energy Regulatory Commission (FERC) Order 2000, RTOs must embrace four core characteristics and eight key functions. The core characteristics are: independence, scope/regional configuration, operational authority, and short-term reliability. The key functions are: tariff administration and design, congestion management, parallel path flows, ancillary services - the RTO is the provider of last resort for ancillary services, OASIS and Capability Calculations, market monitoring, planning and expansion, and interregional coordination. Midwest Market Frequently Asked Questions: www.midwestiso.org

117 MISO (2005) Market Concepts Study Guide.

Because of deregulation, electricity bills have now become unbundled and the electricity consumer in Michigan now has charges for all three of these systems on their energy bill.

Figure 41. Example residential bill of Tribe member, demonstrating the unbundled charge of a deregulated electricity market



CURRENT BILL				
ELECTRIC				
ELECTRIC CUSTOMER CHARGE			$7.00	
RENEWABLE RESOURCE PROGRAM SUR	1 MTR @	0.050000	$0.05	
RATE REDUCTION CREDIT ADJ	2604 KWH @	0.001102-	$2.87-	
[illegible]	2604 KWH @	0.056665	$147.56	
KWH CHARGE-TRANSMISSION	2604 KWH @	0.002700	$7.03	
KWH CHARGE-DISTRIBUTION	2604 KWH @	0.020500	$53.38	
KWH CHARGE-CUSTOMER RELATED	2604 KWH @	0.005700	$14.84	
KWH CHARGE-REGULATORY ADJ	2604 KWH @	0.005000	$13.02	
SECURITIZATION CHARGE	2604 KWH @	0.001311	$3.41	
SECURITIZATION TAX CHARGE	2604 KWH @	0.000424	$1.10	
NUCLEAR DECOMMISSIONING SRCHG	2604 KWH @	0.000185	$0.48	
ECC IMPLEMENTATION SURCHARGE	2604 KWH @	0.000888	$2.31	
SECURITY RECOVERY FACTOR	2604 KWH @	0.000256	$0.67	
POWER SUPPLY COST RECOVERY	2604 KWH @	0.003160	$8.23	
TOTAL ELECTRIC				$256.21
SALES TAX				$15.37
TOTAL CURRENT BILL	DUE ON OR BEFORE 06/23/05			$271.58
TOTAL AMOUNT DUE				$271.58

Why do some states choose deregulation?

Michigan state government thinking behind deregulation and allowing competition was to promote lower prices, efficiency, and innovation in electricity supply. The prices of electricity, however, have continued to rise and *the number of people interested in electric choice has fallen.*

During 2005, the overall MW load served and the number of customers participating in Michigan's competitive electric choice market fell by approximately 40% and 20%, respectively, in the Consumers Energy and Detroit Edison service territory (the two largest investor-owned utilities in Michigan). The decline was attributed to several factors, primarily the steadily increasing costs of supplying power, and state and federal regulatory changes[118]. These factors likely impacted the competitive price of electric supply[119].

[118] These changes include the implementation of stranded cost surcharges and federal seams elimination charges. Seams Elimination Cost Adjustment (SECA) charge results from the integration of new electric transmission owners. The SECA charge allows these transmission owners to recover certain transmission related revenues that would have otherwise been stranded.

[119] MPSC (2006) "Status of Electric Competition in Michigan"

Why does deregulation fail?

States that have deregulated their electricity markets have inevitably had higher electricity prices. Deregulation fails because after the power generation has been cut loose from the customer delivery services, the customer demand of electricity does not play a large role in providing incentives to build new electricity generation plants. After a state deregulates, investors and builders are discouraged from building power plants because of the finances of deregulation. New electricity generation competitors are not emerging.

Why do energy prices increase under deregulation?

Energy produced at plants can either be sold directly to other electricity suppliers or the energy can be sold on the MISO Midwest Market, [120] where all electricity prices are based off of the most expensive method of creating energy. As a result every one pays the highest cost of production, which right now comes from natural gas plants. Gas is setting the selling price for electricity, i.e. the highest price MISO agrees to pay for a supplier is the price all suppliers are paid (single clearing price)[121]. Therefore, market rates for electricity are currently higher than cost-based rates[122].

Consumers and Detroit Edison sell their energy at cost-based rates for low cost coal and nuclear production, therefore, when purchasing electricity it is generally cheaper to stay with Consumers then to buy from an AES or to form a new utility. Consumers' tariffs are based on the average cost of electricity, which is mostly self-generated suplemented by market purchases. Therefore, any energy producer that generates excess electricity is going to sell their energy on the market rather then sell it directly to suppliers, as they will be able to get a higher return. Today's market suppliers have the leverage, as opposed to the buyers. Forming a new utility, especially if a utility is going to be purchasing a lot of their energy load, will be more realistic when market prices are lower than the tariff rates of a utility.

The failure of deregulation means that customers, such as the Little River Band, who do not switch providers, are stuck paying a much higher price for their electricity than before deregulation occurred. According to the basic rules of supply and demand, as the competition for electricity generation dries up, the price of electricity increases.

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[120] Midwest Market Frequently Asked Questions: www.midwestiso.org

[121] "Midwest ISO Has Raised Costs for Consumers": http://www.appanet.org/aboutpublic/index.cfm?ItemNumber=18001

[122] In the spring of 2008, MISO is supposed to begin a market for ancillary services, and there are concerns that this may heighten the cost of energy yet again. "Midwest ISO Has Raised Costs for Consumers": http://www.appanet.org/aboutpublic/index.cfm?ItemNumber=18001

Appendix 10. Comparison of electricity prices among the three utilities serving Manistee County

When comparing the electricity rates of the utilities in Manistee County, Consumers appears to offer lower rates for the lowest energy usage levels of residential service (under 500 kWh), but Cherryland is quite competitive with Consumers at the commercial load levels.

Figure 42. Comparison of average rates (in cents per kWh) for MPSC-regulated electric utilities in Michigan, Nov 2006

	Residential			Small Commercial			Large Commercial		
(kw)				5	25	100	100	100	1000
(kwh)	250	500	1000	1000	5000	21600	28800	36000	432000
Utility									
Consumers Energy	9.64	9.64	9.64	11.82	11.11	10.93	9.53	8.7	6.96
Great Lakes	14.39	11.99	10.79	11.64	10.2	10.37	9.47	8.93	6.1
Cherryland Coop	14.38	11.98	10.78	10.59	9.39	10.5	9.24	8.49	7.29

Almost half of the Tribal members use between 500-1000 kWh per month. When comparing the monthly residential bills for those energy levels, the difference between Consumers and Cherryland is around $10 per month.

Figure 43 Comparison of monthly residential bills for MPSC regulated Michigan electric utilities (kWh)[123]

Utility	Customer Charge	kWh use per month <250	250 - 500	500-1000	1000-2000	>2000
Consumers Energy	$0.00	$4.82	$24.11	$48.22	$96.43	$192.87
Great Lakes	$12.00	$12.00	$35.98	$59.96	$107.92	$203.84
Cherryland Coop	$12.00	$12.00	$35.95	$59.89	$107.78	$203.56
Percentage of Tribal members using a similar amount of energy per month		0%	22%	45%	15%	0%

[123] The percentage breakdown of Tribal members using a similar amount of energy per month was calculated using the energy data compiled in the Community Well-being report, using the annual average electricity cost per year of each dwelling, using the following formula:
[(Average annual electricity cost per year)/(Average cost of energy)]/12 months

Appendix 11. Detailed explanation of aggregating with an Alternate Electric Supplier.

If the Tribe chooses to participate in the electric Customer Choice Program by purchasing from an AES, the Tribe will enter a Retail Open Access (ROA) Service with Consumers Energy. Under ROA Service, the Tribe will conduct transactions with at least two entities - Consumers Energy and an (AES) retailer[124].

The existing utility company will continue to provide regulated distribution services for customers who choose an alternative electric supplier. These customers will continue to pay their existing utility a distribution charge set in an MPSC-approved tariff. If the Tribe is interested in learning about the options of aggregating through Consumers Energy, as opposed to an AES, the Tribe would have to contact the specific Consumers Energy account manager for the Tribe's current accounts.

The cost of electric supply, generation & transmission, will be determined by a contract between the customer and the AES. A transition charge would also be paid to the local utility company to cover any stranded assets which exist and costs to implement the choice program. The charge could be paid by either the customer or the retailer, depending upon details of the contract between those parties.[125]

The Tribe and the AES would have to write a performance-based fees contract, or an *Electricity Supply Agreement* document. This contract would state the specific product, the price for electric service, and the duration of the agreement. The contract may bundle energy (electricity and gas together) for a greater economic benefit, or the contract may be just for electricity alone.

The Tribe and the AES may consider writing a Contracts for Difference which will explain how the risk will be handled if for some reason the price of energy increases or decreases, including how the extra charge or the benefits will be shared.

According to the Consumers Retail Open Access (ROA)Tariff, customers choosing to purchase energy from an AES must create a ROA Service Contract with Consumers if they are resale customers, street-lighting customers or customers with a Maximum Demand of 300 kW or more. A Service Contract includes the initial agreement and any amendments or supplements, relating to the service transactions to be provided for a ROA Customer by the Consumers under the ROA Service.

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[124] Consumers Energy (2006) Customer Choice – Retail Open Access – Alternate Supplier Programs. Pricing and Rules, Section F. www.consumersenergy.com/tariffs.nsf/ELECTRIC_TARIFFS

[125] MPSC (2006). Frequently asked questions for customers. Accessed December 6 2006 at: http://www.dleg.state.mi.us/mpsc/electric/restruct/faq/customer_faq.htm

Appendix 12. Tribal case studies

Navajo Tribal Utility Authority Case Study (www.ntua.com/)
The Navajo Tribal Utility Authority is a non-profit that receives federal loans and grants. Any money made is returned to upgrade the system. This utility offers some of the lowest rates throughout the region: $3.00 Service Charge, $0.0660/kWh for all usages. NTUA serves close to 38,000 customers with 703 GWH of power through more than 7,000 miles of distribution lines. On the natural gas side, NTUA serves 7,500 customers through 600 miles of pipelines. NTUA waste-water serves close to 35,000 customers with 236 water wells and 5,474 miles of pipelines. The NTUA solar and wind programs are working toward energy sufficiency with off-grid customers and is enjoying some success. The successes are collaboration between and amongst the Tribe, government, and industry. NTUA has plans to expand their business, service territories and services.[126]

Tohono O'Odham Utility Authority. The Tohono O'odham Nation covers of 4,479 square miles, with an approximate population between 12,000 to 14,000 people in over 70 villages. The Utility Authority was established in 1970 by the Tribal Council and began operating in 1974. They acquired a telephone system from Qwest in 1987, and became an interested service provider in 1996. They partnered with Cellular One in 1997 and began providing propane service in 1987. The utility structure is made up of a Tribal enterprise with a board of directors, consisting of at least four members with significant management experience in the utility industry and at least three Tribal members. The General Manager reports to the Board. The Tribe got into the electric business because many villages had no power, and service extensions from the cooperative were very expensive.

Hualapai Tribe (Peach Springs, AZ)
The Hualapai Tribe is located on the end of their existing utility grid which has subjected them to high costs and poor reliability of electric service. The first phase of the project will establish a tribally operated utility to provide service to tribal customers at Grand Canyon West, which has been operating without grid power for the past seven years. The second phase of the project will examine the feasibility and strategy for establishing a tribal utility to serve the remainder of the Hualapai Reservation. Contact: Jack Ehrhardt (928.769.2216).

Jicarilla Apache Utility Authority (Dulce, NM)
The Jicarilla Apache Nation's reservation is located in the mountains and rugged mesas of northern New Mexico. The Jicarilla Nation looks to the Jicarilla Apache Utility Authority to chart a course for sustainable development of energy resources and business opportunities for the welfare of the Jicarilla Nation and its members. The Jicarilla Apache Utility Authority will conduct a baseline assessment of supply and demand resources for all energy categories, including conventional, renewable, and efficiency resources. The potential for both retail and wholesale (export) will be analyzed. The major milestones will include the development of baseline assessments; development of strategic plan

[126] CERT (2006)

elements for renewable energy and energy efficiency; and selection and launch of one or more specific projects. Contact: Karl Rabago (505.759.9176).

Winnebago Tribe of Nebraska (Winnebago, NE)
The Winnebago Tribe of Nebraska has experienced significant growth over the last five years. Estimated at over 10%, the growth trend has caused the tribe to examine the vital role that energy plays in supporting growth and economic development overall. The project seeks to: (1) investigate the opportunities for wind generation, improving the tribe's energy resource portfolio, and shaping the reservation load profile; (2) analyze renewable generation investment opportunities and their potential job creation and economic development benefits; and (3) conduct a tribal utility formation study to facilitate accomplishment of tribal goals. Contact: Lance Morgan (402.878.2809).

Yurok Tribe Case Study (Klamath, CA)
The Yurok Tribe has a great need for improved energy services on the reservation. The members pay $328 per month per household on average for energy, with just a $9,000 median household income. The project will assess the need for energy efficiency services on the reservation, identify available resources, and develop an implementation plan for meeting these needs. With an unemployment rate of 42%, the job training component of this program will benefit the tribe. Past attempts have been made to provide energy efficiency and renewable energy maintenance services on the reservation, but many of these services have not endured because they were not tribe-driven. This project will build tribal expertise, increase awareness, and form collaborative relationships with local energy services. Contact: Dustin Jolley (702.482.1350).

Fort Mojave Indian Tribe operates the Aha Macav Power Service, a Tribal utility. Currently AMPS has one 28 MVA and one 3.750 MVA substations. The transmission system is 30+ miles of 69 KV with 15 miles of 24 KV distribution, serving 850 Tribal and non-Tribal customers.

Colville Indian Power and Veneer plant in Washington successfully installed a substation, which is projected to reduce line losses and save between $160,000 and $260,000 per year.

Appendix 13. Tariffs affecting an Alternate Electric Supplier

The Tribe would also have to consider the cost of the MISO Open Access Transmission Tarriff and the Consumers Retail Open Access Tariff (ROA). An AES must secure Transmission Service from the transmission service provider under the Applicable FERC Open Access Tariff. The AES must execute the agreements required under the Applicable FERC Open Access Tariff such as the Transmission Enabling Agreement and the Transmission Service Agreement. An AES may purchase Transmission Service from a marketer(s) who can aggregate the loads of multiple Retailers. The AES will also have to complete the necessary applications and processes enabling the scheduling of Transmission Service and designating Consumers as the Meter Data Management Agent to act on behalf of the AES in providing the AES's ROA Customers' metered load data to the Midwest Independent Transmission System Operator. [127]

According to the Retail Open Access Tariff, the Tribe will have to secure sufficient ROA Customer participation such that the Distribution Contract Capacity with Consumers Energy is equal to or greater than 1,000 kW, which is possible if the Tribal AES were to sell to the Casino[128].

According to the Retail Open Access Tariff, Consumers will read the meter and bill the ROA Customer for ROA Service in accordance with the applicable ROA Rate Schedule. Consumers provides two ROA Customer billing options: complete billing by them or separate billing by the Company and the AES. If the AES elects the complete billing option, the ROA Customer will receive a single bill, which includes the Company's charges as well as the AES charges[129].

According to the ROA Tariff, the Direct Assignment Facilities shall be specified in a contract and the costs of the facilities shall be paid by the AESS. "Direct Assignment Facilities" means additional facilities that are needed for service under ROA Service but that are not an integral part of the Consumer's Distribution System. [130].

Besides the regular monthly costs of the transmission and distribution services, the AES is responsible for replacing Real Power Losses of 9.81% on Consumer's Distribution System associated with the movement of Power and for compensation for losses as provided for in the Applicable FERC Open Access Tariff.

According to Consumers Open Access Tariff, no Michigan-based electric utility or its affiliate shall be permitted to utilize Consumer's Distribution System to make retail sales unless such utility or its affiliate provides comparable ROA Service to retail customers located within its service territory. A municipal utility or a municipal power agency is

[127] Consumers Energy (2006) ROA Service Tariff, Section F.
[128]Distribution Contract Capacity" means the Maximum Demand of the Retailer or the sum of the Maximum Demand of all the Retailer's ROA Customers, which includes Real Power Losses and which is never less than 1,000 kW. Consumers Energy (2006) Retail Open Access Service Tariff – Section F
[129] Consumers Energy (2006) Retail Open Access Service Tariff – Section F.
[130] Consumers Energy (2006) ROA Service Tariff

required to provide reciprocity to the extent required by Public Act 141 of 2000 and other applicable law[131]. Metering equipment for a ROA Customer shall be furnished, installed, read, maintained and owned by Consumers.

[131] "Comparable" ROA Service is one which (i) provides for ROA Service in an amount of retail customer load relatively equivalent to that provided by the Company, and (ii) specifies rates, terms and conditions that have been approved by all applicable regulatory authorities for use in ROA Service transactions. Consumers (2006) Section F