

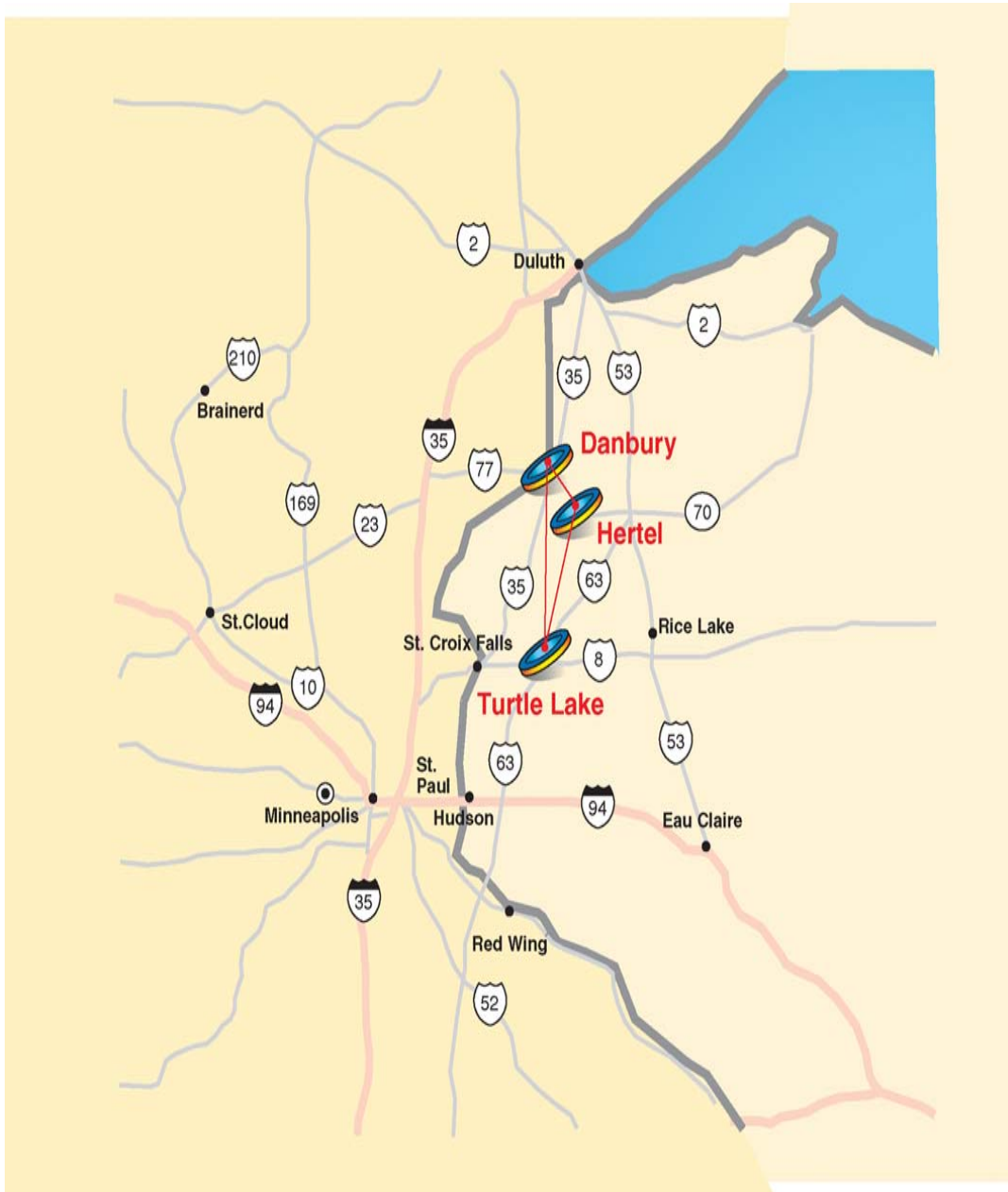
Feasibility Study for Bio Mass Electrical Generation on Tribal Lands



St. Croix Chippewa Indians of Wisconsin

Background

- During 2003, The St. Croix Chippewa Tribe was awarded a grant by DOE Tribal Energy Program to evaluate feasibility of bio-mass electric generation on tribal lands.
- The St. Croix Tribal Community economic development goals are closely aligned with the DOE's "Renewable Energy Development on Tribal Lands" initiative. Using locally available bio fuel for power generation directly fits into the community, economic, social, and cultural goals of the St. Croix Tribe. Bio fuel power projects will leverage community assets and resources and provide a foundation for future sustainable development.



The St. Croix Chippewa Indians of Wisconsin are located in northwestern Wisconsin. The Tribe operates three casinos, a fishery and various other tribal enterprises, including the government center.

Step 1 - Screening Study

- Objectives
 - Provide tribal investment opportunity (diversification)
 - Provide tribal employment opportunities
 - Enhance economics of other tribal operations (fishery, headquarters campus, future industrial/energy park)
- Resources
 - Limited land
 - Poor wind, geothermal and solar potential
 - Strong logging and forest products industry in the region
- Markets
 - Wisconsin regulations prohibit retail power sales
 - Fishery, tribal headquarters campus and casinos are potential users of waste heat
 - State has initiatives to mandate accelerated use of renewable energy
- Conclusion
 - A biomass renewable energy project based on burning residues and waste from logging and forest products manufacturing operations is consistent with tribal objectives and resources, and consistent with state renewable energy initiatives.

Step 2 - Feasibility Study

Project Initiation

- Project Team roles and responsibilities
- Project schedule
- Work authorization procedures
- Invoicing procedures and requirements
- Initial project team assignments
- Budgets
- Deliverables

Step 2 - Feasibility Study

Project Team

- Project managed by Director of Planning
- Project specialists (technology, site selection, bio-fuels, environmental permitting and impact analysis, power markets, transmission, connectivity, economic modeling, and community relations)

Step 2 - Feasibility Study

Scope of Work

- Identification of potential power purchasers and assessment of level of interest
- Resource assessment (sources, volumes, reliability, pricing, fuel value, current uses)
- Fuel supply strategy (for biomass projects)
- Candidate technology assessment (equipment manufacturers, experience, fuel compatibility, impacts, site requirements, preliminary economics screening)
- Project structure strategy (ownership, operation and staffing responsibility, etc.)
- Market development strategy (regulatory constraints, mandates, incentives, transmission constraints, competition)
- Preparation of detailed site selection criteria (“musts and wants” re: proximity to sales points, proximity to fuel source, transportation infrastructure, utility infrastructure, environmental considerations, land and buffer requirements, etc.)
- Site Screening / Site Selection (prime and back-up, if appropriate)
- Permitting Strategy
- Socio-economic and environmental impacts
- Economics

Capital Investment

- Costs associated with a 3-MW project have been estimated at \$4.75 million as follows:
 - Turbines - \$1 million
 - Combustion Equipment - \$1 million
 - Fuel Preparation Equipment - \$.25 million
 - Buildings - \$.25 million
 - Ancillary Equipment - \$.5 million
 - Substation - \$.5 million
 - Construction - \$1 million
 - Project Development Costs - \$.25 million

Fuel Supply

- Alternatives:
 - mill wastes
 - tree farming
 - logging
 - logging wastes

Markets

- Alternatives:
 - Captive use
 - Regional IOUs and Co-ops
 - State government

Markets

- A combination of factors makes this a good time to develop the St. Croix Tribe's biomass projects:
 - The Wisconsin Task Force for Renewable Energy published its recommendations in July 2004 for increasing State government purchases of renewable energy to 10% and 20% by 2006 and 2010, respectively, and to increase statewide renewable energy use to 10% by 2015. Wisconsin Governor Jim Doyle immediately endorsed the recommendations of the Task Force.
 - Economic recovery is causing an expected and corresponding rise in total demand for electric power; and
 - Sharply higher natural gas prices, supply constraints and market volatility have combined to stifle the unprecedented growth in new gas-fired generating capacity.
- Because of these factors, we anticipate that the market price for renewable power will soon support project implementation.
- While utilities do not resist renewable energy in principle, in reality they are reticent to add renewable capacity, unless mandated, since “renewables” tend to raise the average of embedded generation costs, and ultimately the price of power to consumers.

Siting Criteria

- **Land** - Acreage required desired configuration, topography, zoning, and geology.
- **Utilities and Support Services** – Access to power line corridors, gas, water, sewer, wastewater, uses for waste heat.
- **Transportation** –Highway requirements (bio fuel supply delivery requirements).
- **Labor** - Skill levels and number of employees required.
- **Environmental Issues** - Prior land use, construction and operating permits expected to be required, buffer zones, community receptivity, sensitivity to noise, sensitivity to truck traffic, visual impacts.
- **Business Climate** - Taxes, financing, construction costs, cultural considerations, proximity of support services, and infrastructure sharing opportunities.

Two potentially viable projects have been identified:

- 1-3 MW wood chip burning plant adjacent to St. Croix Fishery in Danbury, WI
- 1-3 MW wood chip burning plant adjacent to Tribal Headquarters in Hertel, WI

Danbury Site, St. Croix Waters Fishery

The Fishery uses 1.5 MW. Excess heat from a biomass-fired power plant can be used to heat culture water to its optimum growth temperature. Potential savings will bolster revenues and create additional full-time employment for the plant which currently has 35 employees.



Hertel Site, Water Tower

The Tribe has recently developed a partnership with Caterpillar, Inc. (Power Systems North America) to develop, construct, finance, and operate a 40-45 MW peaking power project in a utility park, for the sale of capacity and energy to the grid. This location has infrastructure and land to also support up to a 10 MW renewable energy project. Excess heat from a biomass-fired power plant can be used to provide district heat for the tribal headquarters campus and heat for future industrial park developments.



Economic Modeling

- Inputs to financial models were varied to determine sensitivity to key factors. Over 60 variations were run. The variables included:
 - Size of Plant
 - Fuel Costs
 - Financing costs and length of service
 - Potential sources of grants to reduce financing requirements
 - The Tribes equity position and expected return on investment
 - Revenue potential based on sales price of electricity produced
 - Thermal loads availability
 - Capacity charges

Base Case

Economic Assessment Assumptions

- Online Factor-90%
- 3 MW, Danbury location
- Plant operation labor force is estimated at 1 1/2 operators
- Tribal equity at 25% of total (\$4.75mm) with 12% rate of return
- Finance remainder at 5% for 10 years
- No depreciation tax credits

Fuel Price Sensitivity

<u>Price of Fuel</u>	<u>Power Price</u>
• \$10/ton	\$0.054 KWH
• \$15/ton	\$0.068 KWH
• \$20/ton	\$0.083 KWH

Lessons Learned

- Northwest Wisconsin Renewable Energy Markets
 - Currently, in Wisconsin and Minnesota, there are insufficient renewable energy portfolio mandates to create a price premium for renewable energy necessary to justify our project. However, proposed renewable energy portfolio mandates in Wisconsin may soon create a viable market with price premiums for renewable energy sufficient to justify biomass-fired power generation.
 - Although transmission constraints are a problem in the region, transmission system “fixes” have been identified that can easily resolve transmission constraints for a small project such as ours.

Lessons Learned (cont.)

- Northwest Wisconsin Biomass Fuel Supply
 - There are ample supplies of suitable biomass fuel from existing logging operations. Slash (limbs and tops) account for 20% to 30% of the trees harvested. This material is a viable biomass fuel. With current logging practices, this slash material is left in place. Since a steady market for these materials doesn't exist, area loggers have not focused on utilizing the slash material. This material is routinely used to fuel power plants in northern Europe. If a steady market for these materials existed, such as our biomass power plant, we believe that area loggers would adapt harvesting practices and invest in necessary equipment to more efficiently and economically collect and deliver these materials.
 - Much research has been done in our region on hybrid-poplar tree farming. To date the research has focused on growing woody biomass suitable for pulp and paper applications. Alternative growing practices (denser planting, shorter harvesting cycles) have potential to generate woody biomass with economics favorable for fuel applications.

Lessons Learned (cont.)

- **Applicable Biomass-to-Power Technology**
 - For the plant capacity and market price range viable in our area, proven boiler/generator technology makes the most sense. Gasifier/engine power production technologies are not proven for the our size, fuel and market price range.
- **Site Opportunities**
 - St. Croix Tribe has two sites that are ideal for a biomass power project. Land, buffer, access to the power grid, proximity to logging operations, and proximity to waste heat users are favorable attributes of both the Danbury and Hertel sites.
- **Impacts**
 - The projects environmental and socio-economic impacts are minimal.

Lessons Learned (cont.)

- Project Economics

- Fuel price and market price for power sales are the two most important factors effecting project economics. Capital costs, project financing terms, return on investment, and waste heat utilization are also important factors. However, there is less uncertainty associated with these secondary factors.
- At current biomass fuel prices (based upon quotes from area loggers) and power prices our project can not be justified. However, economic modeling of scenarios with higher power prices (reflecting green credits, tax incentives, and a premium for renewable energy that we expect as proposed state renewable energy portfolio mandates are implemented) and lower fuel costs (reflecting development of supply chain for slash and lower value species) demonstrates that our project is viable.

Step 3 – Project Development

- Preparation and Negotiation of Memorandum of Understanding (MOUs) for fuel supply, technology transfer, purchase power agreements, project financing, etc.
- Deal structure definition and associated legal work (formation of project sponsor entity, i.e.; JV, tribal entity, etc.)
- Connectivity and Transmission Approvals
- Environmental Permitting / Approvals
- Community Relations
- Contractor Selection
- Construction Management

Our Vision

- Our expectation for the next year is that implementation of proposed renewable energy portfolio standards in Wisconsin will result in a firm market premium for biomass-fired power. This, in turn, will provide a basis for negotiating with area loggers, tree farmers and mills to secure a reliable supply of biomass fuel at a price that justifies Tribal investment in the project.
- We believe that a small power project based on locally available biomass can be demonstrated to be economically viable in Danbury and Hertel and replicated in numerous tribal communities in northern Wisconsin, Minnesota and Michigan.