

### MSAD # 3 Wind Turbine Feasibility Project

MSAD # 3 is currently building a new comprehensive K-12 school, called Mount View School, on the top of Knox Ridge in Thorndike on Route 220 (Knox Ridge Road). Coastal Enterprises, Inc. in Wiscasset obtained a foundation grant to study the feasibility of constructing a wind turbine to supply electricity to the new school and to provide a renewable energy educational experience to students. The school administration supported the foundation application and is cooperating with the study. The project manager for CEI is Steve Cole and Gore Flynn serves as a financial consultant to CEI. The architects and engineers for the school, Oak Point Associates, have provided comprehensive electricity demand data for the new facility. Part of the inspiration for the idea was a neighboring farm owned by Wes Kinney who has had a residential-scale, 20 kW wind turbine in operation for about 25 years about 300 yards from the school.

The following data are very preliminary and have been developed specifically for this case study for the Governor's Wind Power Task Force. The school has not reviewed this data and has made no decisions regarding the project. This preliminary analysis has been released as a courtesy to the Task Force.

The case study is based on a Fuhrlander 100 kW turbine, but there are other 100kW turbines with comparable characteristics. The initial decision to use a 100 kW turbine was predicated on the availability of Maine's net metering law which allows the school to capture the retail cost of both delivery and energy charges for 100% of the turbine's output as long as it does not exceed the school's total annual electricity usage. Due to the significant recent increases in energy prices and the reduced percentage of total retail energy bill allocated to the T & D delivery charge and the demand charge as a percentage of total costs, additional modeling will be conducted using larger turbines with which the energy charge can be sold back to the standard offer provider under Maine's small generator aggregator rule (Chapter 315).

The financial analysis is based on the projected total electricity demand at the new school. Data for both historical and projected energy use are included in the attached schedule.

|  |                     |
|--|---------------------|
| Initial Projected Turbine Size   | 100 kW              |
| Rotor Diameter   | 21 meters, 69 feet  |
| Tower Height   | 35 meters, 115 feet |
| Total Height (tip of blade)  | 56 meters, 184 feet |
| Tower Design   | Tubular Steel       |
| Design life of turbine   | 20-25 years         |
| Preliminary Estimated Capacity Factor<br>(Rough guess pending better data) | 30%                 |
| Installed turbine cost* (turnkey)<br>(Rough estimate from literature)      | \$375,000-\$450,000 |
| Maximum annual power output at capacity factor                             | 262,800 kWh         |
| Percentage of the school's total demand provided                           | 22.7%               |

|  |                 |
|--|-----------------|
| Percentage of the school's total cost supplanted<br>(Difference is due to the demand charge) | 18.8%           |
| Average delivery charge cost (current rate, 6 months)  | \$0.015367/kWh  |
| Average price of supply (current rate, 6 months)   | \$0.092080/kWh  |
| Total revenues from avoided delivery charge savings  | \$ 4,049        |
| Total revenues from avoided/earned energy charge   | <u>\$24,199</u> |
| Total revenues   | \$28,238        |

The avoided costs/revenues of \$28,238 represent the amount of money available annually to pay for the O & M (operating and maintenance) cost of the turbine and pay for the cost of capital. Preliminary research indicates that O & M might cost an average of \$2,000-\$3,000 per year leaving about \$25,000 for capital repayments. Given that most wind turbine projects are financed over ten years to accommodate the unpredictable life expectancy of such complicated machinery, this project would not be feasible without some capital or operating subsidy at current energy prices if those prices held for the term. It could, however, pay the debt service on 100% financing at municipal interest rates over a period of twenty years at current energy prices with a small capital subsidy. Projecting a nominal increase in standard offer energy supply prices over the project's life expectancy could make the project economically feasible.

\* Fuhrlander turbines are manufactured in Germany and prices are subject to changes in relative currency values.

## MSAD # 3 Electricity Utilization

### Historical Usage (from invoices)

July, 2006-June, 2006 (12 months)

Service Type: MGS Secondary, 3 Phase (customers with demand of 20 kW to 400 kW)

|                  |                                     |
|------------------|-------------------------------------|
| Usage            | 618,840 kWh                         |
| Total Cost       | \$56,966.85                         |
| Measured Demand* | 79.32 kW (Aug.) to 228.00 kW (Feb.) |

### Annual Cost Components

|                  |                    |
|------------------|--------------------|
| Service Charge   | \$ 376.68          |
| Delivery Service | \$ 7,428.64        |
| Demand           | \$18,652.72        |
| Energy Supply    | <u>\$30,508.81</u> |
| Total Cost       | \$56,966.85        |

### Component Prices

|                  |   |
|------------------|---|
| Service Charge   | \$ 31.39/month (fixed monthly charge)             |
| Delivery Service | \$ 0.008951/kWh (level all 12 months)             |
| Demand           | \$ 7.66/kW, Apr.- Nov. and \$10.40/kW, Dec.- Mar. |
| Energy Supply    | \$ 0.0492999/kWh (level all 12 months)            |

### Projected Demand and Usage (electricity from project engineer, pricing by consultant)

July-June, (12 months)

Service Type: Intermediate General Service-Secondary-TOU\*\* for 10 months and MGS-Secondary for 2 months (July & August)

|                      |  |
|----------------------|--|
| Usage                | 1,157,733 kWh  |
| Estimated Total Cost | \$171,544.22 (based on current tariffs for class***) |
| Projected Demand*    | 173.60 kW (July) to 583.90 kW (May)                  |

### Estimated Annual Cost Components

|                  |                     |
|------------------|---------------------|
| Service Charge   | \$ 1,009.50         |
| Delivery Service | \$ 17,791.45        |
| Demand           | \$ 46,139.22        |
| Energy Supply    | <u>\$106,604.05</u> |
| Total Cost       | \$171,544.22        |

### Component Prices

|                      |   |
|----------------------|---|
| Service Charge       | \$ 31.39/month                                      |
| Delivery Service     |   |
| On Peak              | \$0.016458/kWh                                      |
| Shoulder             | \$0.014672/kWh                                      |
| Off-Peak             | \$0.009188/kWh                                      |
| Demand (assume Peak) | \$ 7.05/kW, Apr.- Nov. and \$8.42/kW, Dec.- Mar.    |
| Energy Supply        | \$ 0.092080/kWh (6 month average tariff annualized) |

\* Total system demand at highest 15 minute period during the billing period.

\*\* Intermediate class entails demand in excess of 400 kW, but reverts to lower class automatically if demand is less than 400 kW in any billing period.

\*\*\* Distribution between Off-Peak, Shoulder and On-Peak pricing was based on the average engineering allocation for time of day and is approximate. Demand charge was assumed to be On-Peak. (There are other minor assumptions that may affect actual price, but they are considered de minimus for the purposes of this analysis.)