WESTERN
Community Energy
Complete • Local • Wind

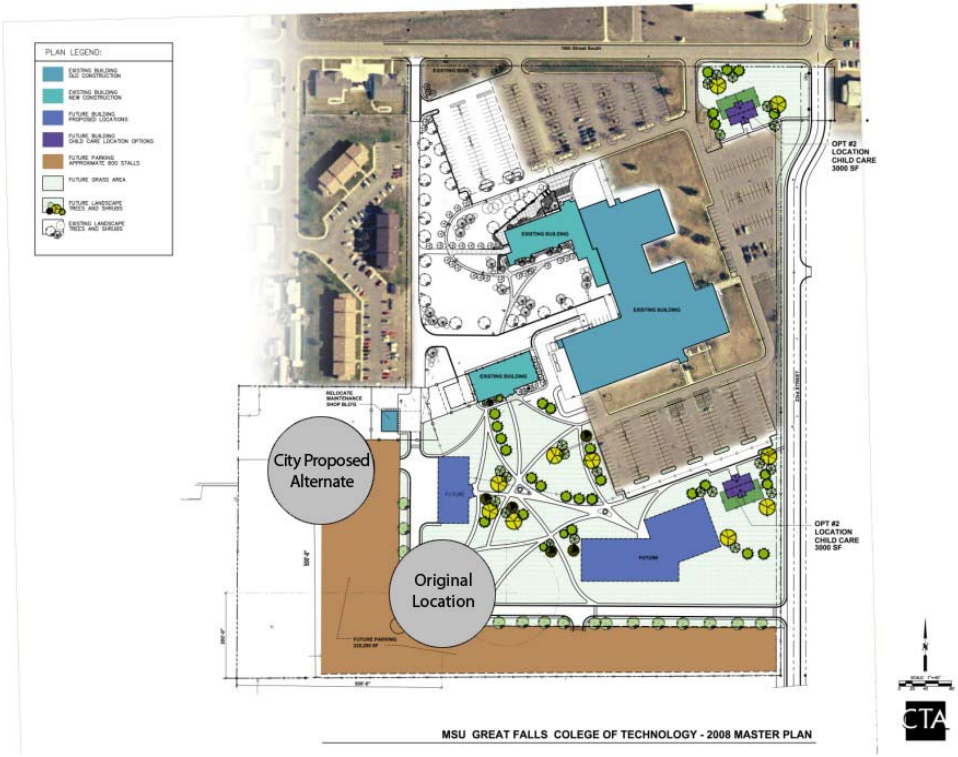
MSU-Great Falls

Wind Turbine Project
Feasibility Study Report

January 7, 2009
Helena College of Technology

Presentation Overview

- Equipment Assessment
- Wind Resource
- Project Cost Savings
- Implementation



Equipment Assessment

Turbine Grading Criteria	Points
Energy Generation	25
Education/Training	20
Return on Investment	15
Warranty	10
Web Monitoring	10
Operation & Maintenance	10
History/References	5
Noise Level	5
	100 possible

Equipment Assessment

Baseline Requirements:

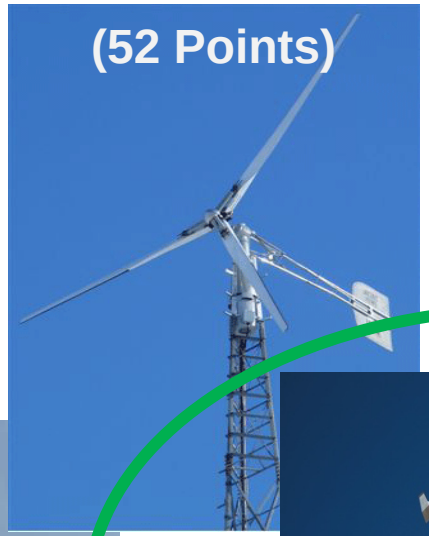
- Current ~~X~~ Available
- 2-yr ~~X~~ Warranty
- ≥ 10 kW
- ≤ 5~~0~~ kW

Remanufactured Turbines?

Equipment Assessment

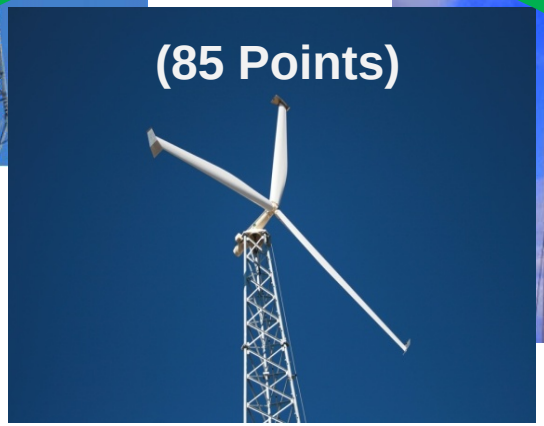
ARE 442

Jacobs 31-20



Proven WTI1500

Bergey Excel S



Entegrity EW50

Wind Resource

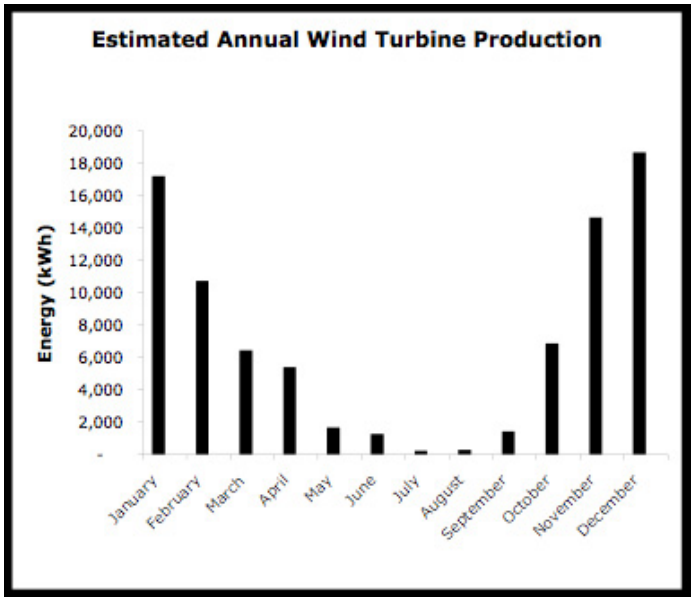
WCE Analyzed:

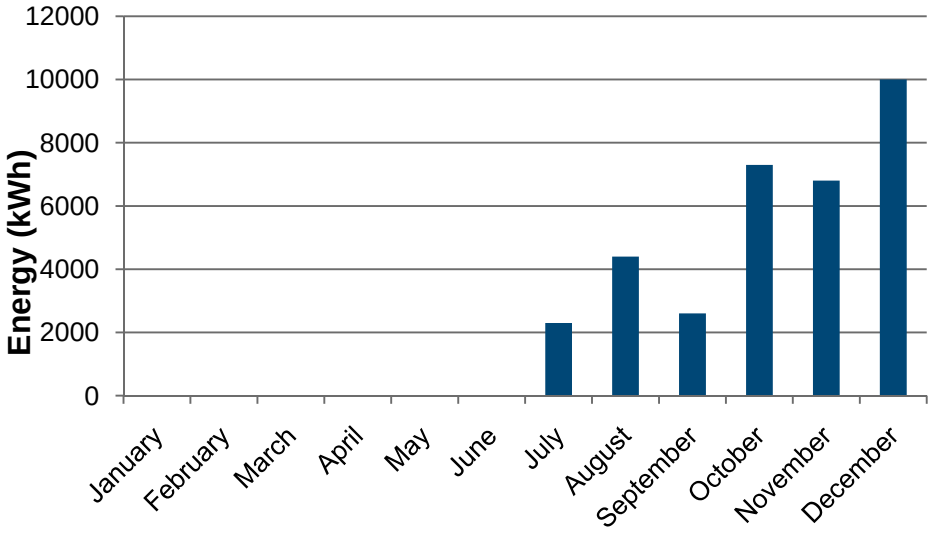
1. **Local Observational Data**
   - Great Falls Int'l Airport
   - 11.6 mph annual average ('06-'07)
2. **Wind Maps**
   - *"Class 2"* Wind Resource;
   - ~11.5 – 12.5 mph annual average
3. **Computer Models**
   - AWS TrueWind™
   - ~12 mph annual average
4. **Site Characteristics**
   - Prevailing Winds from *SW*
   - Agricultural land to *S*
   - Neighborhood to *W*
   - Campus to *N*

Proposed Site looking South

→ ***~11.5 mph Site***

Cascade County Shop Production





Estimated:
75,000 - 95,000 kWh/yr.

Observed:
36,000 kWh July - Dec.
~ *On Target to meet Estimate*

Cash Flow Assessment

Assumptions:

- **Utility Grant:** $10,000 available via USB Program
- **Financing:** 100% via existing Plant Funds
- **Annual Inflation:** 2.5% (O&M, Repair Reserve Account)
- **Energy Savings Rate:** $66.93/MWh (↑ 5% per year)
- **O&M Costs:** $15.00/MWh beginning in year 6
- **Repair Reserve Account:** $250/year beginning in year 1

(Production x Energy Savings Rate) – Expenses = Annual Cost Savings

Estimated Cost Savings

Revised Production Estimate (EW50):

- Empirical Data from Entegrity
- Accounting for "Ground Effect"
- Resulted in lower production

100' Tower: (Revised)

- 50,000 – 70,000 kWh/yr

120' Tower: (Recommended)

- 60,000 – 80,000 kWh/yr
- Increased cost possible

Year	10 mph (56 MWh/yr.)	12 mph (95 MWh/yr.)	13.5 mph (115 MWh/yr.)
1	$ 3,563	$ 6,239	$ 7,447
2	$ 3,748	$ 6,558	$ 7,826
3	$ 3,942	$ 6,892	$ 8,223
4	$ 4,145	$ 7,243	$ 8,641
5	$ 4,359	$ 7,612	$ 9,080
6	$ 3,617	$ 6,353	$ 7,589
7	$ 3,829	$ 6,719	$ 8,024
8	$ 4,052	$ 7,104	$ 8,483
9	$ 4,288	$ 7,510	$ 8,966
10	$ 4,536	$ 7,938	$ 9,474
11	$ 4,797	$ 8,388	$ 10,009
12	$ 5,072	$ 8,862	$ 10,573
13	$ 5,362	$ 9,361	$ 11,166
14	$ 5,667	$ 9,886	$ 11,791
15	$ 5,989	$ 10,439	$ 12,449
16	$ 6,327	$ 11,021	$ 13,141
17	$ 6,684	$ 11,634	$ 13,870
18	$ 7,059	$ 12,279	$ 14,636
19	$ 7,454	$ 12,958	$ 15,443
20	$ 7,870	$ 13,672	$ 16,292
21	$ 8,307	$ 14,424	$ 17,186
22	$ 8,768	$ 15,215	$ 18,126
23	$ 9,253	$ 16,048	$ 19,115
24	$ 9,763	$ 16,923	$ 20,156
25	$ 10,300	$ 17,845	$ 21,251
26	$ 10,865	$ 18,814	$ 22,403
27	$ 11,459	$ 19,834	$ 23,615
28	$ 12,084	$ 20,907	$ 24,889
29	$ 12,743	$ 22,035	$ 26,230
30	$ 13,435	$ 23,222	$ 27,640
30-yr. Total	**$ 209,337**	**363,935**	**433,736**

Wind Turbine Feasibility Study | *MSU-Great Falls*

Implementation

Thank You -- Questions?