Objectives

- In accordance with the President’s Climate Commitment, decrease UB’s carbon footprint
- Create an on-campus sustainable energy source
- Inspire the increased use of wind power
- Explore new methods to harness wind power in campus or city environments.
- Reduce cost of electricity for the University at Buffalo
- Incorporate wind turbines that do not detract from aesthetics of campus

Case One: Rooftop Turbine

Turbines placed on rooftops can take advantage of the increased wind speeds that occur as altitude rises.

Methods

Data collected from the New York State Wind Resource Explorer will be normalized to calculate the wind speed at certain heights on campus.

Power estimates will be generated as a function of wind speed, rotor area, and air density, using:

\[
\text{Power} \approx k C_p \rho \frac{V^3}{2A}
\]

Expected Results

2-10kW wind turbines could be implemented in this case.

Case Two: Wind Funneling

Small vertical axis turbines positioned between buildings take advantage of the increased wind speeds caused by wind funneling.

Methods

Data suitable for examining wind funneling on campus are not readily available. Data will thus be directly collected using anemometers.

Possible sites include:
- Bell and Furnas
- Lockwood and Clemens
- Hochstetter and the Natural Sciences Complex

Expected Results

The effectiveness of small turbines on a power vs. cost basis is something to be determined as a result of this project.

Case Three: Commercial Scale

Commercial scale turbines can generate significant power because of the large rotor blade surface area. Drawbacks, however, include space requirements, visual and acoustic aesthetics, and high costs.

Methods

Data from the New York State Wind Resource Explorer will be used to calculate the power output of a commercial scale wind turbine for the University area.

Expected Results

Ideal power output: 2.5 mega-watts (wind speeds between 25 and 55 mph). Good locations for such turbines would be on an open area of land, which can be found around Lake LaSalle on North Campus.

Projected Conclusion

- The three cases will be compared on the basis of cost, power output, maintenance, and aesthetics. If costs are prohibitive, the data from this project will be saved for the future, when cost factors may decline.
- It is hoped that the findings of this project will be used in similar settings in other university campuses and cities.
- The core belief of this project is that every little bit helps and that any positive offset of carbon emissions or reduction in electricity cost is a step in the right direction and will have a greater effect when combined with other sustainable energy production methods.

Wind Speeds (m/s) at Altitude (m)

<table>
<thead>
<tr>
<th>Altitude (m)</th>
<th>30 m Annual</th>
<th>17 m Annual</th>
<th>50 m Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ellicott Complex</td>
<td>5.09</td>
<td>5.36</td>
<td>5.78</td>
</tr>
<tr>
<td>Furnas</td>
<td>5.13</td>
<td>5.38</td>
<td>5.76</td>
</tr>
<tr>
<td>Clemens</td>
<td>5.07</td>
<td>5.32</td>
<td>5.7</td>
</tr>
</tbody>
</table>

Resources:

- Bradley, David. Personal interview. 3 Mar. 2008. CHAIRPERSON, WNY WIND ACTION GROUP, ENGINEERING COMMITTEE

"C_p = Max power coefficient, \( \rho \) = air density, A = rotor swept area, V = wind speed (mph), k = 1.33 x 10^-4 (constant to yield power in kW)