Solar Renewable Energy To-Do List

1. Request Site Assessment 10/19/11 - ongoing
    a. Initial Email sent to Rick Warpinski, union director, and Ken Statz, provider, to have them get in contact about conducting a site assessment.
    b. 11/3/11- Meeting set up to discuss SGA findings and methods to move forward
    c. Point of Contact – Jeff Cook

2. Outreach to WPS, Union, and Facilities 10/19/11 – ongoing
    a. Contact with Carla Martin, intern at WPS.
    b. Discussed options with Jay Dressen, UWGB WPS Campus Sustainability Committee Member
    c. Solar Panels are available for donation, requires above site assessment and additional discussion
    d. Jay might be present at Meeting 11/3/11
    e. Paul Pinkston will also be present at 11/3/11 meeting
    f. Point of Contact – Jeff Cook

3. Research Solar Energy 10/19/11 – Deadline 11/2/11
    a. **How efficient is it?** Very efficient for smaller projects (such as homes, or small buildings) (It does have to run off of a battery when the sun is not out, however) But solar energy is a very powerful source - http://www.altenergy.org/renewables/solar.html
    Solar panels can turn 11-13% of energy from sunlight into electricity. http://www.bloomberg.com/news/2011-10-25/miasole-manufacturing-thin-film-solar-panels-with-13-efficiency.html
    b. **How much does it cost?** Higher cost initially (typically) than wind energy, but almost no maintenance costs for solar after the installation. About $3-6 per watt of solar energy (the higher end, if you are paying for installation). The initial cost does not take into consideration any tax rebates or grants or other incentives, which can save you up to 80% (?) of the overall cost. Also take into account that solar panels add value to a home or building, so in the long run you will end up saving money, if not make money, off the initial investment.
    http://solarpanelspower.net/solar-panels/solar-panels-cost
    http://www.greenfudge.org/2011/06/30/how-much-do-solar-energy-panels-cost/
    -Rebates or "Cash-Back Rewards" as Wisconsin likes to call them are available for installing or expanding commercially available renewable energy systems. Rewards vary by renewable energy system type, size and by the amount of energy the system is expected to produce. http://solarpowerrocks.com/wisconsin/
    c. What types of facilities can we put in place? Tracking: The solar panel moves subtly in the direction of where the sun is at that point during the day. These can gather more solar energy and thus provides more energy in the long-run.

http://www.fox11online.com/dpp/news/local/green_bay/solar-panel-dedication-in-green-bay

Stationary: The solar panel is installed in one spot, and whatever sunlight hits that exact spot will be the sun that can potentially become energy.

d. Point of Contact – Brittany Polze
e. Additional info
    i. Requires very little maintenance
    ii. Operates silently
    iii. Reduce energy dependence
    iv. Highly visible
    v. IKW dual axis tracking device produces approximately 1600 KWh per year.
    vi. Difference Between Rooftop system and ground system
    vii. Some cost discussion
    viii. http://www.focusonenergy.com/files/Document_Management_System/Renewables/solarelectricityhomeorbusiness_factsheet.pdf.

4. Research SMALL Wind Energy 10/19/11 – Deadline 11/2/11
    a. How efficient is it? Facilities could produce anywhere from 55,000 kWh – 95,000kWh/yr
    b. How much does it cost? $64,000-125,000. Grants can be acquired for larger operations of approximately 25%.
    c. What types of facilities can we put in place? We would have to put in a wind turbine at least 140ft high but no higher than 160 ft.
    d. Info derived from capstone project 2005 Energy Work Group
    e. Point of Contact – Trevor Fuller
    f. Additional Info
        i. Must be 30 ft higher than any building or structure within 500ft
        ii. Roof mounted systems are ineffective
        iii. Stationary wind potential could be cost effective, concerns on efficiency
        iv. Highly Controversial, Governor Walker Wind Regulations could be a concern
        v. Need big open space, reduce wind impediments
        vi. Requires Education
        vii. http://www.focusonenergy.com/files/Document_Management_System/Renewables/windenergysmallscalesystems_factsheet.pdf.

The implementation of a wind turbine on the campus as a source for clean energy in order to reduce UWGB's reliance on fossil fuels is contingent on many issues. The initial issue is whether or not a wind turbine on campus would even be feasible in producing an adequate amount of energy to meet a timely return on the investment. The UWGB wind site assessment report notes that any wind tower must be at least 30ft. above the highest obstruction. According to this report, the highest obstructions that would be of concern are the trees. Since the projected maximum height of the trees in the area are 75ft, it is logical to use this height as the base height. Therefore, 75ft with an additional 30ft for comfort room and 25ft for blade length arrives at a minimum of a 130ft turbine.

However, the segments generally only come in 20ft increments and so the new minimum height would then be 140ft. According to the Wind Resource Assessment Program conducted by Wisconsin utility companies in the late 1990's the primary direction of the wind in the Green Bat area comes from southwest to southeasterly directions at an average of 14.1 mph at ~197ft.

However, according to the amendment of Green Bay's ordinance 13.1 the highest a small scale wind tower can be from the base to the top of a blade at its zenith cannot exceed 170ft. Because this height is lower than what was assessed by WRAP, new calculations must be taken into account. According to the UWGB wind site assessment report, taking into account the decrease of speed with a lower height and the locations of Green Bay city to the east and the Niagara Escarpment northeast of the campus, the new calculated wind speed would be ~11.6mph. This wind speed can be used to calculate the average annual energy output of the potential wind turbines.

Turbines that meet the aforementioned criteria can produce anywhere from 10kW – 90kWh/yr., at a cost of $64,000 - $125,000 respectively. The expected return according to the UWGB wind site assessment report would be around 30 years. Additional grants can be applied for, one being a Focus on Energy grant that would repay up to 25% of costs on turbines with minimum production of 20kWh/yr.

g. http://www.uwgb.edu/sustainablegb/discover/wind-assessment.pdf
h. www.focusonenergy.com/page.jsp?pageId=725.
i. http://www.ci.green-bay.wi.us/clerk/forms/UpdatedOrdinances/2011/7June2011.pdf
j. http://www.energysavers.gov/your_home/electricity/index.cfm/mytopic=10880
k. Point of Contact – Trevor Fuller
l. Additional Info
    i. Must be 30 ft higher than any building or structure within 500ft
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    iii. Stationary wind potential could be cost effective, concerns on efficiency
    iv. Highly Controversial, Governor Walker Wind Regulations could be a concern
    v. Need big open space, reduce wind impediments
    vi. Requires Education
    vii. http://www.focusonenergy.com/files/Document_Management_System/Renewables/windenergysmallscalesystems_factsheet.pdf.

5. Research Tax Credits for Renewables 10/19/11 – Deadline 11/2/11
    a. Federal Level – 30% tax credit, can we use it?
    b. State Level – Focus on Energy-funding still available?
    c. What types of projects receive funds –
        i. Unsure if we can access these, without private partnerships, something we are going to pursue
    d. Point of Contact – Kim Dawson

6. Research Current Energy Consumption Rates at Union 10/19/11 – Deadline 11/2/11
    a. What is the current energy use?
        i. 207,399.3 MMBtu's of electricity consumption on campus? Incorrect data?
            1. 1 MMBtu = 293.1 kWh
            2. 3412 BTU = 1kWh, so above conversion is correct
            3. http://www.energyvortex.com/energydictionary/british_thermal_unit_(btu)__mbtu__mmbtu.html
            4. 60,788,734.83 kWh not correct
            5. We actually purchased 20,035,193 kWh in 2010 according to AASHE report
            6. MWH = 1,000 kWh
            7. 20,035.193 MWh
    b. Where is this energy coming from, coal?
        i. http://www.wisconsinpublicservice.com/home/choice_fuelmix.aspx
        ii. 70.14% coal
    c. How much GHG emissions and air pollutants are we producing from that energy use?
        i. Carbon dioxide – 1,773lbs/MWH x 20,035.193 MWH = 35,533,397lbs/2.2 lbs/kg = 16,146,544 kg
        ii. Methane - 169.1 kg, pulled from AASHE report
        iii. Nitrogen Oxides – 1.4lbs/MWH x 20,035.193 MWH = 28,049lbs/2.2lbs/kg = 12,749 kg.
        iv. Sulfur Dioxide- 3.5lbs/MWh x 20,035.193 MWh= 70,123 lbs / 2.2 lbs/kg = 31,874 kg
        v. All emission factors pulled from WPS fuel mix, unless otherwise specified
            1. http://www.wisconsinpublicservice.com/home/choice_fuelmix.aspx
    d. Point of Contact – Jeff Cook

7. Research Solar Energy Effectiveness and GHG reductions 10/19/11 – ongoing (requires some knowledge of what our ultimate proposal will be at the end of this research assessment) Emails out to gather most of this info.
    a. Based on efficiency assessment how many GHG emissions and other air pollutants can we reduce **best scenario**
        i. CO_2 reduction = 5333kWh/1000Kwh/MWh = 5.333MWH
            1. 5.333 x 1,773lbs = 9,455lbs .03% reduction of CO_2 from electricity
                a. This accounts for approximately 20% of the direct CO_2 emission produced from the average household
                b. 12.4 tons of carbon dioxide used by an average household from household operations. 11.7 tons from auto use. Grand Total 24.1 tons.
                c. http://www.thehcf.org/emaila5.html.
        ii. Methane-unclear

iii. Nitrogen Oxides = 5.333 x 1.4lbs = 7.4661lbs .03% reduction
iv. SO_2 reduction = 5.333 x 3.5lbs = 18.6655lbs .03% reduction

b. What is the payback period to SUFAC and SGA for this project?
   i. 3kWh at 3400kWh a year, at 15% shading, cost savings/year= $244.46 Pay back74yrs
   ii. 3kWh at 4000kWh a year, at 0% shading, cost savings/year = $287.6. Pay back 63 yrs
   iii. **Best scenario -** 4kwh system at 5333KWh a year, at 0% shading, cost savings/yr = $383.44. Pay back 47 years. (this number would require additional funding upfront, theoretically from SUFAC, which we would receive back in the form of a tax credit, only if possible). Data is also not entirely accurate, extrapolated from personal interview data and discussions.

c. Point of Contact – Jeff Cook

Helpful Links

http://www.doe.gov/maps/solar-energy-potential

http://www.windpoweringamerica.gov/images/windmaps/wi_80m.jpg

http://www.focusonenergy.com/files/Document_Management_System/Renewables/windenergysmallscalesystems_factsheet.pdf\

http://rei.appstate.edu/pagesmith/27

WIND ENERGY SITE ASSESSMENT LINKED BELOW.

2005 Capstone Energy Workgroup

http://www.uwgb.edu/esp/Courses/Capstone05/index.html