Community Solar Power at the College of St. Benedict

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Introduction:

Solar power is a virtually unlimited and versatile source of energy. However, **solar is inaccessible for many individuals and institutions alike because of high upfront cost**. Community solar, a system in which a solar array is owned in shares by members of a community, offers a way to overcome these prohibitive costs. **This paper is a feasibility study of community solar for the College of St. Benedict**. In this thesis, I estimated solar production capacity at CSB, discussed the logistics of setting up a community solar garden at CSB, and ran these numbers against the cost of buying and installing our own panels.

Methods:

- I began with researching a detailed background on community solar and then laid out my **criteria for feasibility**.
- I determined **how much power CSB uses**, and where this comes from.
- I gathered data from a solar calculator for the St. Cloud area to estimate yearly solar production[1]. I also gathered yearly solar production data from the existing St. John's Solar field.
- I looked at a **map of the buildings on the CSB campus**, and determined which roofs were flat and appropriate for solar installation. I did not include the more difficult slanted roofs. I then determined, by calculating the square footage of this flat roof space, **how much solar power could be installed by multiplying this total square footage by 8-10 watts per square foot of solar production**[3]. I then verified my results with CSB utilities.
- During this time I also was in contact with **Cooperative Energy Futures (CEF),** an energy co-op that manages community solar gardens. I ran my ideas for Community solar at CSB, and they expressed interest in possibly managing a solar garden at CSB.
- I then built out the numbers of community solar at CSB to assess its feasibility.

Feasibility Criteria for Community solar at CSB:

1. It will provide a large amount of CSB's energy needs.
2. The payback time of community solar will have a much shorter payback time than for an outright purchase and installation of panels.
3. It will adhere to the Benedictine Values at CSB
4. It is continuous with the track for increased sustainability at CSB and good for the image of the college.

Sources:

1. PVWATTS AC Energy and Cost Savings. http://rredc.nrel.gov/solar/calculators/PVWATTS/version1/US/code/pvwattsv1.cgi
2. Saint John's Solar Farm. http://live.deckmonitoring.com/?id=saint_johns_solar_farm
3. Solar Estimate. http://www.solar-estimate.org/?page=solar-calculations
4. Original Document by Sebesta Bloomberg analyzing renewable energy potential at CSB. February 2013. Collected from Brad Sinn October 2014.

What is Community Solar Power?

Community solar power is a system of shared renewable energy production. Solar arrays, called community solar gardens, are built on leased property by solar installation companies who handle the cost of both the installation and maintenance of the arrays. The electricity produced by the arrays is bought in shares by members of the community. These shares are then offset from their electricity bills by the utility who operates in that region. This makes solar power much more accessible to people of any socio-economic class, except for the very poor.

What is a kilowatt vs. a kilowatt-hour?

A watt is a measurement of energy produced. A watt-hour is the number of watts used over time. Energy consumption is usually measured in kilowatt-hours.

What is rated capacity?

Rated capacity divides the full capacity for production of a power plant by the amount of energy it actually produces. For example, the St. John's solar field has a 16.5% rated capacity.

Figure 1

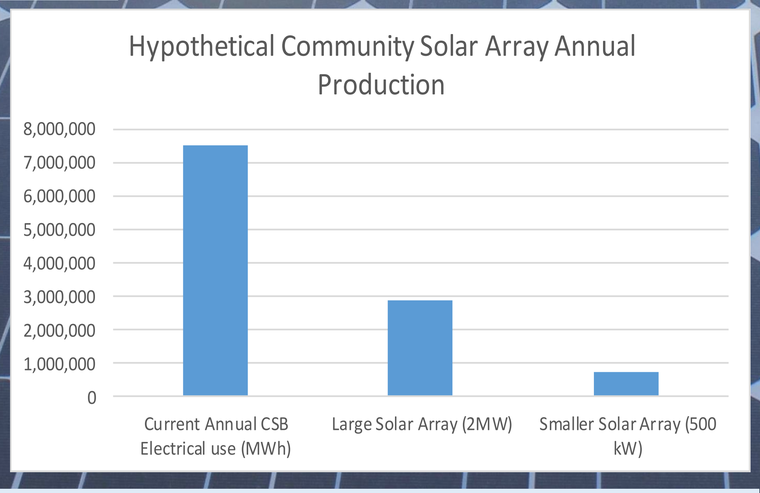
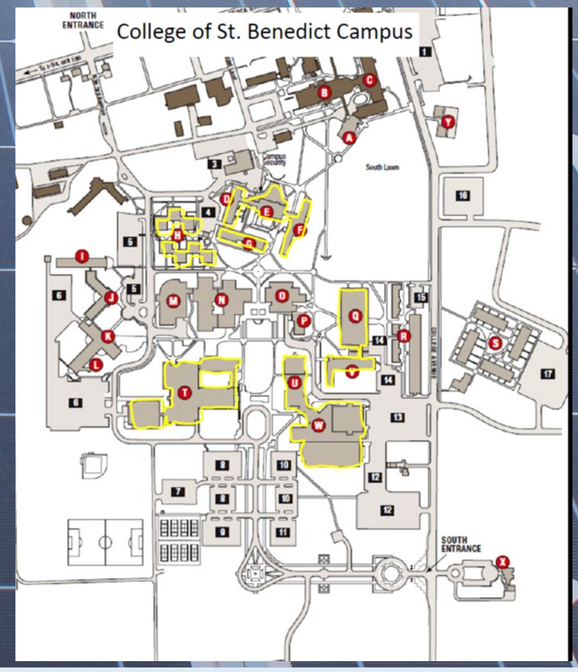


Fig. 1 shows the hypothetical annual production of two different possible community solar arrays at CSB. The large array is rated for 2 MW (producing 2.8 MWh a year) and the smaller is 500 kW (producing 780 kwh a year). The annual production of these arrays is measured based on the 16.5 rated capacity for solar observed at the St. John's solar field. They are measured against the current total annual CSB electrical use, at about 7.5 MWh.

Results and Conclusion:

- **CSB uses about 7-8 megawatts per year.** This power is derived from the grid, which is managed by the utility company Xcel Energy.
- I determined that just on flat roof space at **CSB, there is a solar potential of 2.3-2.8 megawatts** shown on the map below. **These roofs include the first year dorms, the East Apartments, the HCC athletic complex, and the usable portions of the roof of the Benedicta Art Center.** After an analysis by CEF, they determined that my solar potential estimations were high, and estimated a little less than 2 megawatts of solar potential.
- CEF said they would hypothetically install a 400-600 kW array initially to judge the interest of the college as well as the community who would be buying at least 60 % of the shares. (**Any one group cannot have more than 40% of the shares of one array**). **CEF would charge $400-450 per share.**
- **I have calculated that if CSB were to buy 500 kW of solar from community solar arrays, it would cost $1-1.13 million.**
- **Buying and installing a 500 kW solar array as an outright purchase would cost the school over $2.3 million.**[4]
- Conclusion: it is most likely more economic for CSB to buy community solar shares rather than buy our own solar panels. I am still working out the exact finances to support this.



This picture shows the flat roof space usable for solar on the campus of CSB.