

Introduction

Over the past 10 years, the cost of installing solar energy has rapidly dropped in the United States, making investment in solar energy a realistic economic decision. Procuring solar energy reduces carbon emissions, makes financial sense, and gives us control over their own energy production. While there are multiple ways to deploy low carbon renewable energy sources, solar is one of the most underused forms of renewable energy. As we transition to a clean energy landscape we will need a mixture of multiple sources, including solar. The University has made great strides in increasing energy efficiency across campus, but this can only take us so far. Solar energy is the next logical step in reducing the U's carbon footprint.

While other sources of renewable energy have cheaper upfront costs, solar has the advantage of minimal ongoing costs. Wind is a good source of clean electricity without fuel costs, but wind turbines require spacing (32 - 50 acres per MW¹). With a wind turbine already in place at UMore Park, the most efficient use of the land is to install solar near the wind turbine². Interim land use laws in Rosemount allow the use of solar energy on UMore property.

UMore Park consists of approximately 4,775 acres of property in south Rosemount and north Empire Township. This area was given to the University by the Federal Government following the closure and partial decommissioning of the onsite Gopher Ordnance Works at the end of the WWII era. The heavy industrial use at UMore Park left contaminants, some of which are still located on site. The contamination may complicate any use of UMore Park, making low impact solar development an attractive development option. Today most of UMore Park is used as agricultural test plots by University researchers. Gravel mining dominates the western third of the UMore property. UMore Park is located in Xcel Energy's service area.

Due to the wind turbine already on site there have been upgrades to some of the electrical systems on site, see the site assessment attached to RFP (Attachment G) for greater detail. The University has the opportunity to take advantage of the growing solar revolution at UMore Park.

Proposal

There are three types of ownership systems that the University could pursue at UMore to meet a total array size goal of approximately 2 MW. The University could solicit proposals that include a variety of combinations of the following ownership structures.

University owned system

This would be a direct cash purchase of a system. The University would own all aspects of the project, including the Renewable Energy Credits (RECs) and could use the system for research purposes in tandem with the wind turbine already on site. RECs can be monetized and traded. The disadvantage of a University owned system is the inability to capture the 30% Federal tax credit without complex financial agreements, due the University's tax exempt status. Owning the system would also require a more significant upfront cost, and would make require the University to be responsible for any operation and maintenance costs.

¹ Land-Use Requirements of Modern Wind Power Plants in the United States, NREL

² See St. Anthony Falls Laboratory (SAFL), Wind Power, at <http://www.safl.umn.edu/research/energy/wind-power>

Community Solar Garden (CSG)

The University could lease land to a community solar developer and subscribe to 40% of the output of the garden.³ Subscribing would reduce the responsibility and liability of the University, while still guaranteeing a positive financial return. CSGs are limited to 1 MW at a single location, so there would be an opportunity to have another method of ownership at the site. The University would only get the RECs for the portion of the garden they subscribe to (at a maximum of 40%), but the University would only be financially responsible for their subscription costs, which could be negotiated as either an upfront payment, or a pay-as-you-go option. Going with the CSG-Host option would also allow the University to extend community benefits to other residents of Minnesota as well, including the ability to specify a certain amount of subscriptions for low income individuals.

PPA (Power Purchase Agreement)

The solar panels would be owned by the developer and the University would purchase the electricity output from the system. In essence, the University could get a discounted fixed electric rate, allowing us to lock in their energy costs for the next 20-30 years. The University could also negotiate to get the RECs. The PPA would allow the University to capture the financial benefits of the 30% Federal Tax Credit through reduced electricity costs even though they would not own the system outright. Not owning the system also reduces the liability and risks should any issues arise with the PV system.

Other Considerations

Renewable Energy Credits (RECs)

RECs are a method of measuring carbon offsets and can be used toward the University's goal of carbon neutrality by 2050. A 1 MW array would generate approximately 1,450 RECs per year, which can be bought and sold in the REC marketplace. According to the U.S. Department of Energy, in March of 2016 nationally-sourced RECs were approximately \$0.34/MWh. While this is currently quite low, as demand for RECs increases the price may increase. Minnesota's Solar Standard may also inflate demand for solar RECs as utilities need to meet 1.5% of their energy production from solar power. The University will need to purchase or retain RECs to meet their carbon neutrality goals.

Investment Tax Credit

30% tax credit given to owners of solar energy installations. As a non-profit entity, the U is not able to directly benefit from the tax credit, but certain third-party financing options would allow for this possibility.

Extra benefits of U investment in solar at UMore

A UMN solar array will advance research and education at the University. Data produced from a solar array and weather station will allow researchers to create and enhance photovoltaic system models. Siting the solar array near the SAFL wind turbine will allow studies of colocation of solar and wind resources and grid impacts. The solar array would allow educational site visits for

³ See Xcel Energy

https://www.xcelenergy.com/programs_and_rebates/residential_programs_and_rebates/renewable_energy_programs/solar_rewards_community; Clean Energy Resource Teams <https://www.xcelenergy.com/staticfiles/xcel/Marketing/Files/MN-SRC-CERTS-Subscriber-Questions.pdf>.

classes and student groups across the University. Solar on University property, be it at UMore or another location will increase the visibility of the U’s position as a leading institution in clean energy and combating climate change.

Suggested Research Contacts:

- Sairaj Dhople – Department of Electrical and Computer Engineering (ECE)
sdhople@umn.edu
- Paul Imbertson – (ECE) imberts@umn.edu
- Jeff Marr – (SAFL) marrx003@umn.edu

With the solar system, the University can become a leader in innovation by pairing pollinator habitat with energy generation. Including native prairie plantings in conjunction with solar panels improves soil health, reduces stormwater runoff, and can reduce maintenance costs. This will help preserve and improve the agricultural value of the surrounding land, as well as increase habitat for declining pollinator populations. It could also provide an opportunity for research on pollinator friendly species that grow well in conjunction with solar gardens.

Attributes	University Owned	CSG	PPA
ITC Benefit	None to minimal	Reflected in reduced electricity cost	Reflected in reduced electricity cost
RECs	Owned by U	40% negotiable with subscription	Negotiable
Upfront Cost	Entire system	Subscription cost	Varies with developer
Estimated Total Cost per MW	\$3.2 million/MW	\$3.2 million/MW \$2.3 million w/ ITC	\$3.2 million/MW \$2.3 million w/ ITC
O&M	U’s responsibility	None by U	None by U
ROI	Benefits accrued as system costs paid off	Stable - set % of electricity cost, income from leased land	Stable - set % of electricity cost
Size Consideration	No limit	1 MW system (U can have 40% subscription)	No limit
Research Potential	U’s ownership allows research	Data monitoring and collection only, with system owner permission	
Pollinator Habitat	Compatible with ground mount solar systems		

Conclusion

The following RFP invites developers to propose some combination of the options described above, which will allow the University to choose the option that makes the most sense. Investing in solar energy will be a positive step forward for the University of Minnesota that will help it meet its carbon neutrality goal by the year 2050. Our state is already a national leader on clean

energy and the University should share this vision of a sustainable, local energy landscape. This proposal outlines one of many ways that the University can advance solar on the local level and into their energy portfolio. UMore Park provides the opportunity for research, education, carbon reduction, and economic benefits for the University of Minnesota.