

Sustainable Campus Committee Proposal Application

Solar Installation for Smart Grid



Name, Job title
Tennessee Tech University
9/14/16
someone@example.com

Executive Summary

Tennessee Tech's Smart Grid Laboratory in Clement 103 needs a real solar panel installation for students to utilize for research and Tennessee Tech needs a visible focus point to illustrate the student's commitment to renewable energy. It is proposed that a shared cost project be undertaken to make this a reality with the Center for Energy Research providing half the funds and the student Sustainable fee providing the other half.

Total estimated cost is \$37k with a proposed split of \$18.5k.

The project will include AC, DC, and grid-tie connections in Clement 103 so that the installed solar panels can be utilized for both AC and DC research and can be grid-tied to offset power use on campus when not being used for research.

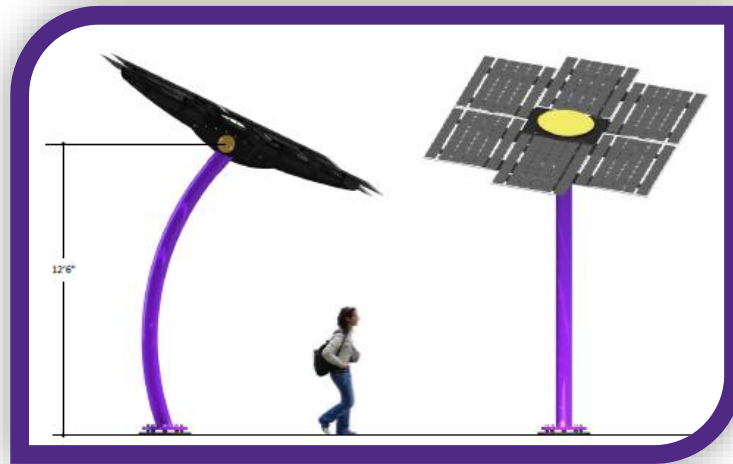


Figure 1 Elevated installation ensures out of the way and great view of the sky over Lewis Hall

Contents

Executive Summary 1

Contents 2

Project Work Plan..... 3

Project Sustainability Benefits..... 5

Engagement & Visibility 5

Funding..... 6



Project Work Plan

An application has been presented to TTU facilities to install solar outside the Clement 103 Smart Grid Laboratory. It has been made clear that any solar installation on campus must be aesthetically pleasing so as to not detract from the recent upgrades to campus appearance and the overall commitment to a pleasant campus atmosphere. The project manager made an initial contact to Hannah Solar who provided their vision of the project which is on the cover of this application and the attached quote.



Figure 2 Typical solar panels

A Form 2 is being prepared with specifications that meet the student research needs in the Smart Grid Laboratory including DC connection for inverter design research. An AC grid connection so that real solar power can be utilized on the Laboratory sized power grid.

In addition to the research connections a grid tie connection is requested which will ensure that power not utilized in research will go to offset some of the electric bill of the campus.

A set of specifications under consideration are as follows:

- Provide and install 6 panel solar array that produces 1.5kW of total electrical power
- Must have means of adjusting angle of solar panels
- Provide engineering and design support to meet with the end user to identify and meet the specific needs of Smart Grid
- Design, provide and install system with ability to provide Smart Grid with both AC and DC power
 - Must have Cut-Off switch for DC or AC operation
 - Connection for DC supply to lab will be via suitable DC receptacle such as Anderson Powerpole (provide both installed receptacle and standalone plug)
 - AC must be 3-phase 208V (provide suitable inverter)
 - AC must have 3-phase switch from in-lab operation to grid-tie operation
 - Connections for grid-tie will be via 208V service existing in lab
 - Connections for in-lab 3-phase 208V AC operation will be via an SO cable to the available power connection already existing for this purpose
- Provide and install frameless crystalline panels and minimize the amount of visible wires and other electrical components to offer superior aesthetics
- Provide and install all required inverters, wiring, below grade conduit installation, foundation excavation and installation, as well as any permitting and sites-specific engineering.
- Provide and install structural support for solar panels that will elevate the solar array out of harm's way from maintenance/student actions (approximately 10')
 - Structural support must be aesthetically pleasing and work well with campus landscape

- Provide and install structural powder coated support and solar panel racking system (colors to be determined by TTU)
- Provide structural member design that is approved and stamped by a licensed structural engineer
- Provide integrated table (standing height) and personal electronic charging stations
- Provide TTU branding to assembly
- Provide all tools and equipment required to install system



Project Sustainability Benefits

Using the on-line solar calculator at <http://www.solarmango.com/in/tools/solar-carbon-emission-reduction>

It reports 1.34 Tons of CO₂ emissions will be offset by this solar installation as per year. If you consider this to be small then note that this facility enhancement may help solve the power grid instabilities due to the intermittent nature of renewables or even inspire a more efficient solar inverter design by smart grid researchers in the laboratory.

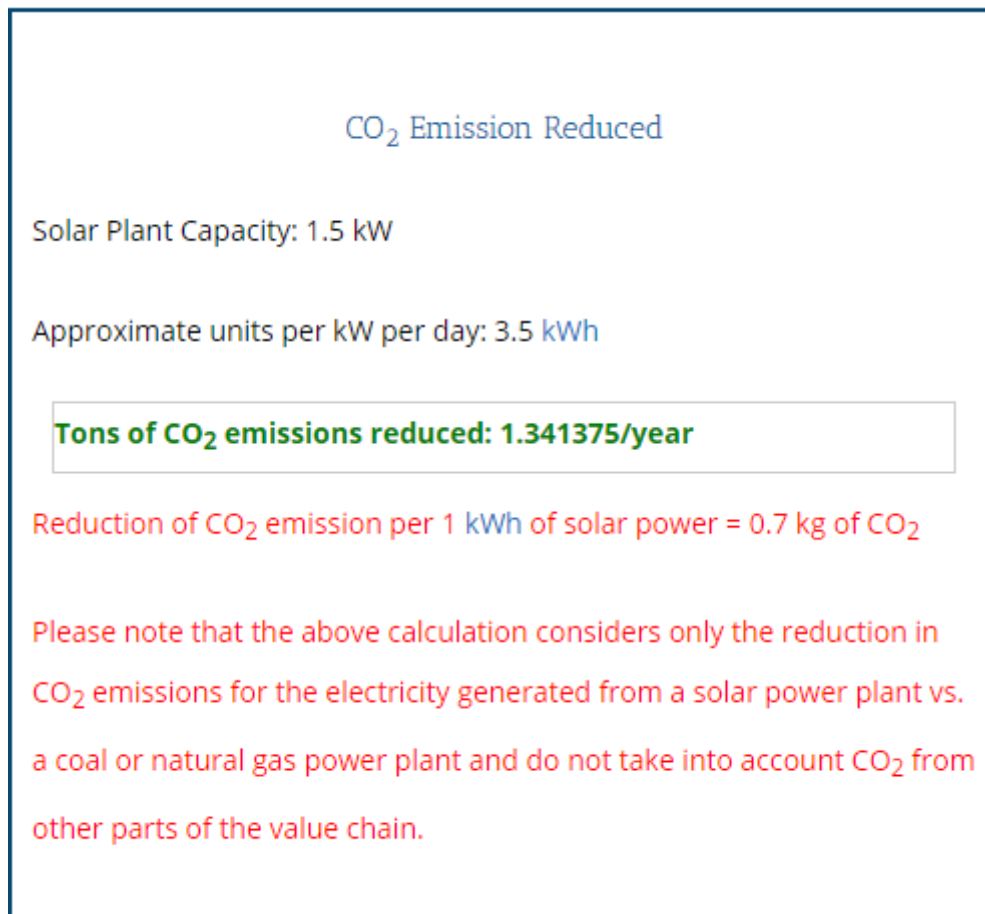


Figure 3 Online solar calculator for CO₂ offset

Engagement & Visibility

The proposed installation visible in Figure 4 will be a vibrant Tennessee Tech commitment to sustainability in practice now and in the future through research achievement by student researchers. An included charging station on a small table option included in the attached quote will provide for hands on utilization and engagement.



Figure 4 Proposed Solar Installation for Smart Grid

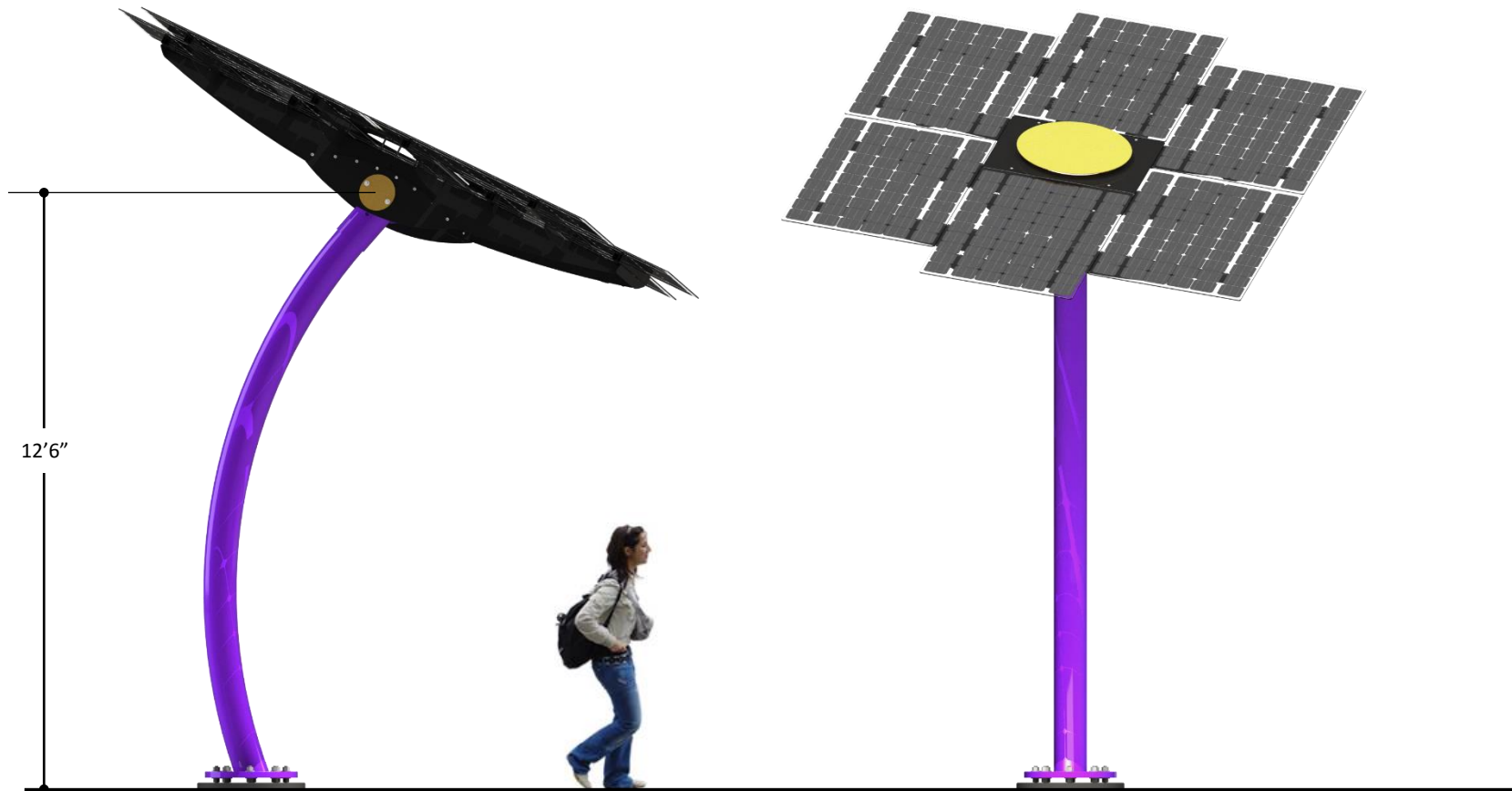
Funding

The attached quote provides a cost for this project as \$37,000. It is proposed that the Center for Energy Systems Research (CESR), provide half the cost and the student sustainability fund the other half.

Curve at Tennessee Tech University



Curve at Tennessee Tech University



Curve
6 Lumos LSX modules
1.5kW
Adjustable array
17-22' tall



QUOTATION

Spotlight Solar Curve

Prepared by: James Talley
 Cell Phone: (706) 455-8077
 Email: James.Talley@hannahsolar.com

Tennessee Tech University
 Clement Hall
 Cookeville, TN 38501

System Type: Spotlight Solar Curve
 Commercial PV

System Size 1.50
in DC Watts (kW)

Date: 9/8/2016
Quotation valid until: 10/18/2016

SALESPERSON	P.O. NUMBER	SHIP DATE	SHIP VIA	TERMS
JT		TBD	Ground	Per Contract

QUANTITY	DESCRIPTION	TOTAL
6	Lumos LSX 250 W Panels	
1	Spotlight Solar Curve	
1	Inverter	
1	Balance of System Components	
1	Certified Installation, Electrical Connection & Equipment Rental	
1	Freight	
1	Design, Engineering, Permitting, Administration	
1	1 year installation warranty covering labor, service and mounting. All Manufacturers warranties convey.	

Price includes turn-key installation of the above equipment and electrical permit.

Note: Tax Exempt

SUBTOTAL	\$37,330
SALES TAX	\$0
OTHER	
TOTAL	\$37,330

THANK YOU FOR YOUR BUSINESS!



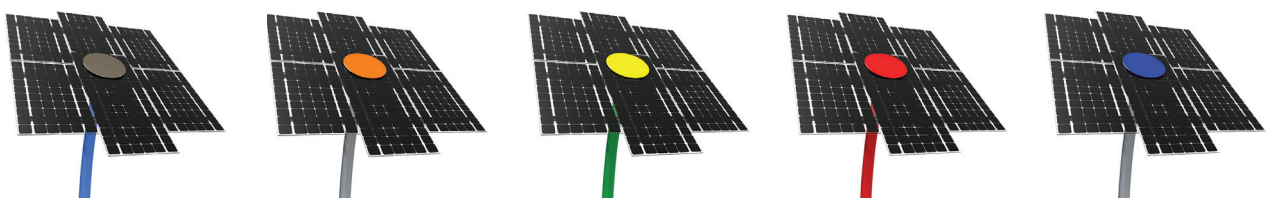
Curve

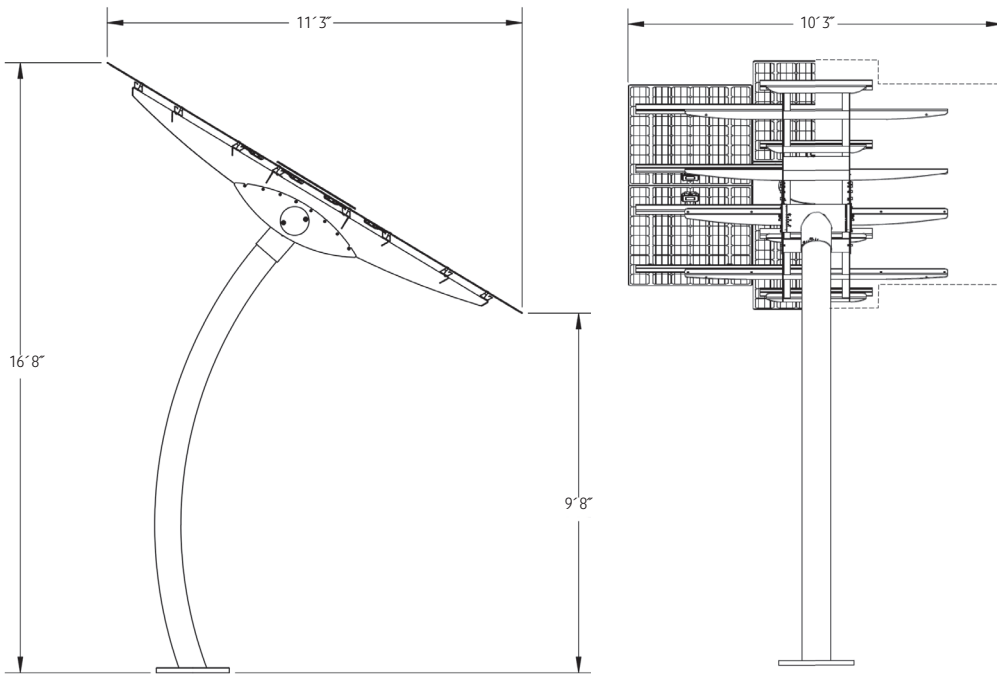
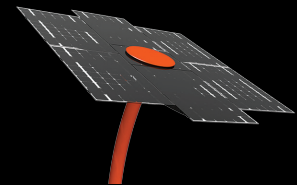


Make a Scene

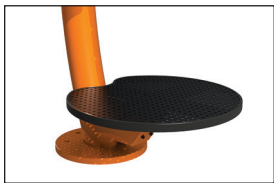
Curve by Spotlight Solar brings clean energy to center stage. It reminds people of the good things you do to protect the environment and save energy, and makes solar technology more visible.

Curve is both art and a clean energy machine. Its design is approachable and fresh. **Curve's** solar array orients in any direction you decide – to balance shading and energy production. It even comes in your favorite color, and offers accessories like accent lighting, a table with power outlets, and branding.





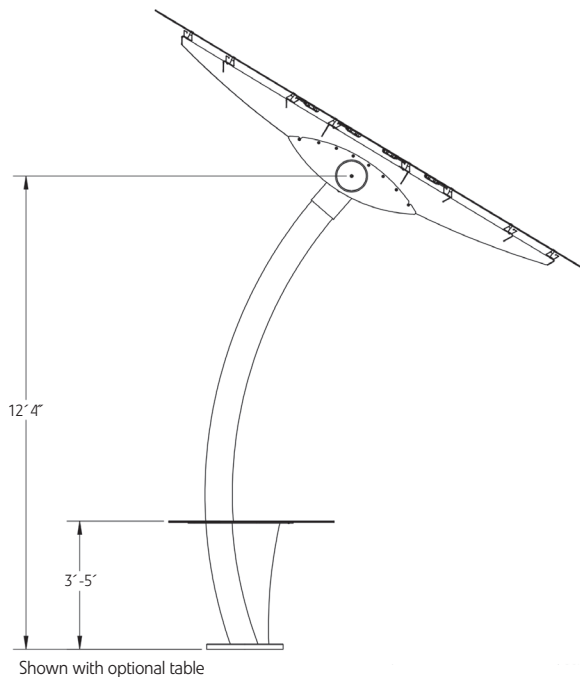
Optional accent light



Optional seat



Optional table



Shown with optional table

Specifications	
Warranty	10 year limited warranty
Maximum height (top array at vertical angle)	19'
Total weight	1,040 lbs. (ships in pieces)
Wind load rating	100 MPH (150 MPH version available)
Material	Recycled steel
Finish (contact Spotlight for color selection)	High performance powder coat
Solar panel recommendation*	Lumos LSX frameless with clear backsheet
<p>Provided by Spotlight Solar: mounting structure, module attachment hardware, installation and orientation guidelines</p> <p>Provided by solar integrator: PV modules, inverter, wiring, foundation, electrical design, installation, permitting, site-specific engineering</p>	
Configuration	Product Number
1-arm (6 panels)	CRV-103061
Accessories	
LED accent lights	CRV-110000
Standing height table with power outlets and USB charge outlets	CRV-160000
Seating	CRV-150000
Branding (signage)	CRV-170000

Certified **Spotlight Solar is up to something good.**
 Spotlight Solar is dedicated to making solar energy visible and attractive. We don't replace rooftop systems; we complement them. Our ambition is to promote the adoption of solar energy by enhancing its image, and by making it more top-of-mind.



*Curve is designed to incorporate Lumos frameless crystalline panels, offering superior aesthetics.
 Curve is PE stamped for structural engineering.
 Installation shown on reverse is simulated.
 Updated 8.24.2015