



Solar Carports: Turning University Parking Facilities into Renewable Electricity Plants

September 26, 2017





Speakers & Agenda

- Speakers

- Christopher Kent, Program Manager, EPA's Green Power Partnership
- Lynda Boomer, Director of Planning, Design and Construction, Michigan State University
- Wolfgang Bauer, University Distinguished Professor and Senior Consultant in the Office of the Executive Vice President, Michigan State University
- Ezra Small, Sustainability Manager, University of Massachusetts Amherst

- Agenda

- Webinar logistics & introduction
- Introduction to Solar Carports
- University Case Studies
- Question & Answer Session

Webinar Logistics

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- Talking:** Christopher Kent
- Handouts:** - 0
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Green Power Partnership Overview

- Summary
 - The U.S. EPA's Green Power Partnership is a voluntary program that encourages organizations to use green power
- Objectives
 - Educate stakeholders on voluntary procurement options within the U.S. renewable energy market
 - Motivate stakeholders to use renewable electricity and expand the voluntary green power market
 - Standardize green power procurement as part of best practice environmental management
 - Recognize leadership in green power procurement
- Program Activities
 - Provide technical assistance and tools on procuring green power
 - Provide recognition platform for organizations using green power in the hope that others follow their lead
- 1,400+ Partners procure more than 44 billion kWh annually, equivalent to the annual electric use of more than 4 million American homes.

New Partnership Resources!

- **NEW Green Power Supply Options webpage** providing concise definitions of the various options in the renewable energy marketplace, including financial PPAs and utility green tariffs.
- **COMING SOON Green Power Procurement Options Screening Tool** allows users to determine which supply options are viable for them based on a few simple questions.
- **NEW Guide to Making Claims About Your Solar Power Use** describes best practices for appropriately explaining and characterizing solar power activities and the fundamental importance of renewable energy certificates (RECs) for solar power use claims.
- **NEW Renewable Energy Certificate (REC) Arbitrage** guidance document describes procurement strategy used by consumers installing self-financed renewable electricity projects or consumers who purchase renewables electricity directly from a project, such as through a power purchase agreement (PPA).

Green Power Procurement Options Identification Tool

The purpose of this tool is to help you identify renewable electricity (e.g., solar, wind) procurement options that might best fit your organization.

OBJECTIVE

Use the drop-downs below to answer the questions about your organization. Your answers will be used to identify the procurement options as determined by the tool based on your organization's specific characteristics, and will be used to narrow the results for your organization of green power procurement options in the results section. To learn more about the procurement option and why or why it doesn't work for your organization, click on the procurement option's respective link.

KEYWORD FILTERING

Please answer the following questions by clicking on options from each drop-down menu.

1. Is your organization a for-profit or a nonprofit organization?	Yes/No
2. Is your organization an environmentally sensitive user of electricity?	Yes/No
3. Is your organization currently directly engaged with other projects outside of your site or in the geographic area you operate?	Yes/No
4. Are you willing to commit to a long-term energy purchase (e.g. 20 years)?	Yes/No
5. Does your organization use more than 40 kilowatts per year?	Yes/No
6. Does your organization have a renewable goal?	Yes/No

RESULTS: Your Organization's Procurement Options

Following is a listing of renewable electricity procurement options that better fit your organization based on your answers to the screening questions. Click the links to learn more about the different procurement options, including cost structure and other key information.

Procurement Option	Renewable Energy Certificate (REC)	Power Purchase Agreement (PPA)	Green Tariff	Other
Utility Green Tariff	Yes	No	Yes	No
Utility Green Power Purchase Agreement	Yes	Yes	No	No
Utility Green Tariff	Yes	No	Yes	No
Utility Green Power Purchase Agreement	Yes	Yes	No	No

For comments or questions on the tool, please contact: epa.greepower@epa.gov

This tool was last updated on: September 10, 2017





Higher Education Partners

153 Institutions

4 Billion kWh

Could power
370,000 homes



University of Missouri





Common Financing Options for Solar

■ Self-Financing

- **Cash purchases:** often least expensive option overall as no financing costs or solar finance company fees incurred
 - Upfront cost of PV system is significant and likely a barrier for many universities
 - University needs sufficient federal tax liability for full benefit of federal investment tax credit (ITC)
- **Traditional self-financing:** provided by banks and credit unions and therefore likely the most available options (e.g., loans and mortgages)
 - Requires universities to have good credit and determine whether it can take full benefit of the federal ITC

■ Third-Party Financing

- **Power purchase agreements (PPAs):** solar array offsets university's electric bill, and developer sells power generated to university at fixed rate, typically lower than local utility
- **Solar leases:** university signs contract with installer/developer and pays for use of solar system over specified period of time, rather than paying for generation (\$/kWh)



Introduction to Solar Carports

- What is a solar carport?
 - Similar to ground-mounted solar panels, but the structure is intentionally built tall enough to house cars parked underneath
 - Many solar parking lots also incorporate electric car charging stations so that drivers of electric vehicles can recharge with solar power while parked.
- Benefits over roof-mounted solar panels?
 - Can generally produce more power because solar canopies have fewer space constraints
 - Can be built at an optimal angle for sunlight, while many roofs cannot

Arizona State University, Tempe, Arizona



Endicott College, Beverly, Massachusetts





Benefits for Your University

- Reduce university's carbon footprint (with REC ownership)
- Reduce electricity expenditures and hedge against future cost increases
 - Lower cost per kWh
 - Lock in price/kWh for next 10-20 years
 - Reduce demand surcharges
 - Certain states, like Massachusetts, have specific tax incentives for solar canopy structures.
- Increase efficiency of under-utilized space
- Improve parking experience for students, staff, and visitors
- Encourage environmentally-friendly forms of transportation
- Showcase university's commitment to sustainability to students and visitors



Benefits for Users of Parking Facilities

- Protection from the elements
 - Shade vehicles from sun to prevent overheating of interior
 - Protection from rain and snow, for both the car and its owner.
- Improved fuel economy
 - By providing shade to prevent cars from baking in the hot sun, solar carports can substantially improve car owners' fuel economy.
 - According to FuelEconomy.gov, running your car's air conditioning system can reduce a conventional vehicle's fuel economy by more than 25% under very hot conditions.
- Access to electric vehicle charging stations
 - Carports can include EV charging stations and covered bicycle parking, to encourage environmentally-friendly transportation.
- Increased school pride!



What if....

- There are an estimated 800 million parking spaces in the U.S., occupying some 4,360 square miles, or an area almost the size of Connecticut.
- If even 1/100 of those spaces were covered by solar carports, they would:
 - Produce an estimate 285 billion kWh/year of solar electricity!
 - That is enough electricity to power every home and business in California!



More Information

- Green Power Partnership: www.epa.gov/greenpower
- Renewable Energy Project Development Toolbox: www.epa.gov/repowertoolbox
- More Questions?
 - Christopher Kent, EPA, kent.christopher@epa.gov