Developing a Solar Roadmap Strategic Plan for Your School

CREATE

www.CreateEnergy.org

mrea midwest renewable energy association

www.midwestrenew.org

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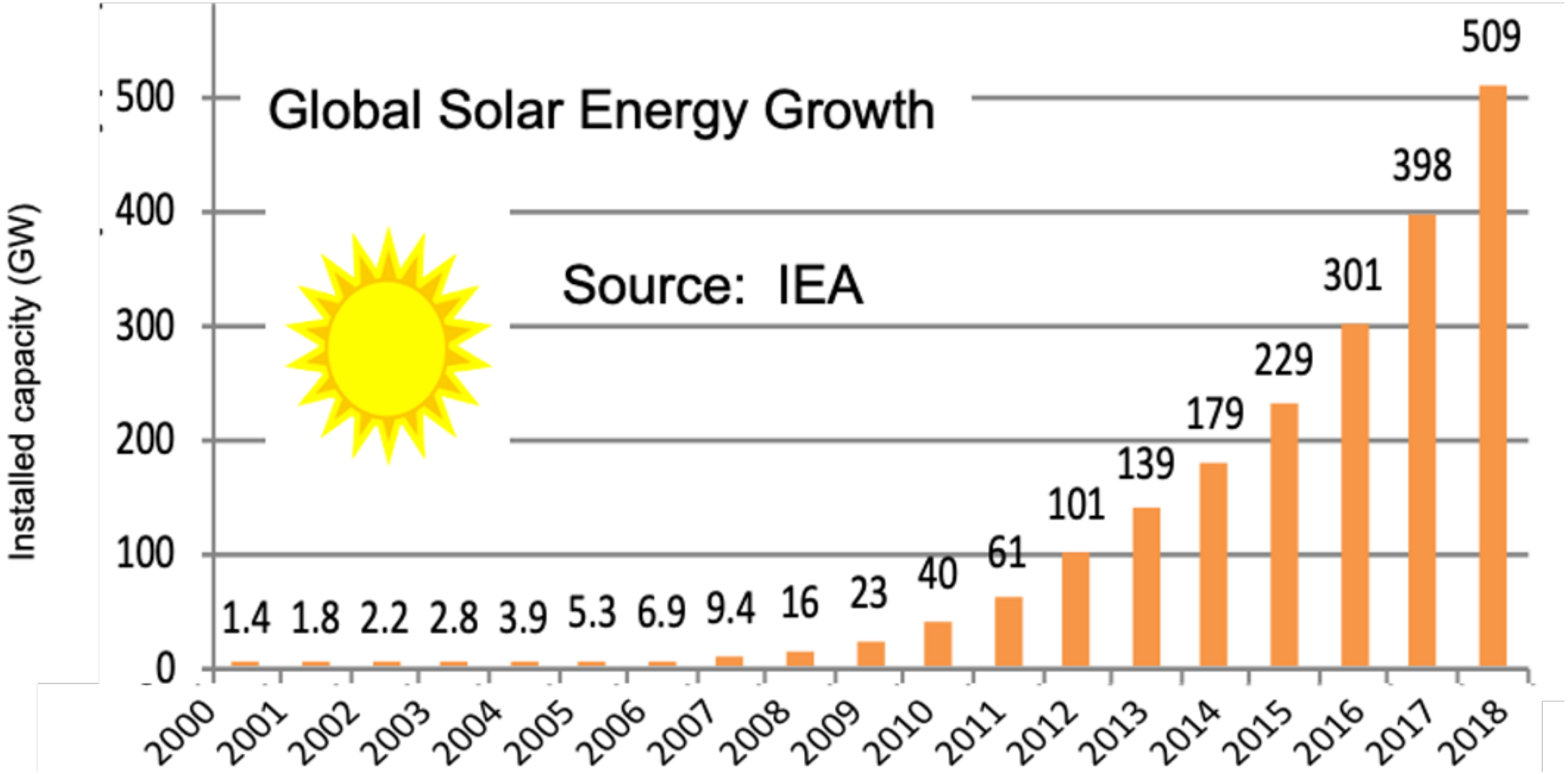
Amanda Schienebeck, Solar on Schools Program Manager

November 13, 2020

Acknowledgements

This work was partially supported by the National Science Foundation Advanced Technological Education Program (awards 1600934, 1800893, 1901852, 2000714) and the Department of Energy Solar Energy Technologies Office (awards DE-EE0006910 and DE-EE0008573). The views, opinions and recommendations expressed are those of Madison College and the CREATE Energy Center and do not necessarily reflect those of the National Science Foundation or the Department of Energy.

We live at a historic time…



Renewable energy costs hit new lows, now cheapest new power option for most of the world

Phil Dzikiy - May. 29th 2019 2:54 pm ET @phildzikiy

UNITED STATES DEPARTMENT OF LABOR

BUREAU OF LABOR STATISTICS

OOH HOME | OCCUPATION FINDER | OOH FAQ | OOH GLOSSARY | A-Z INDEX | OOH SITE MAP

OCCUPATIONAL OUTLOOK HANDBOOK

Clean Energy Jobs:

1) ***Pay a family supporting wage***
2) ***Cannot be outsourced***
3) ***Cannot be done by robots***
4) ***Benefit society***

Occupational Outlook Handbook >

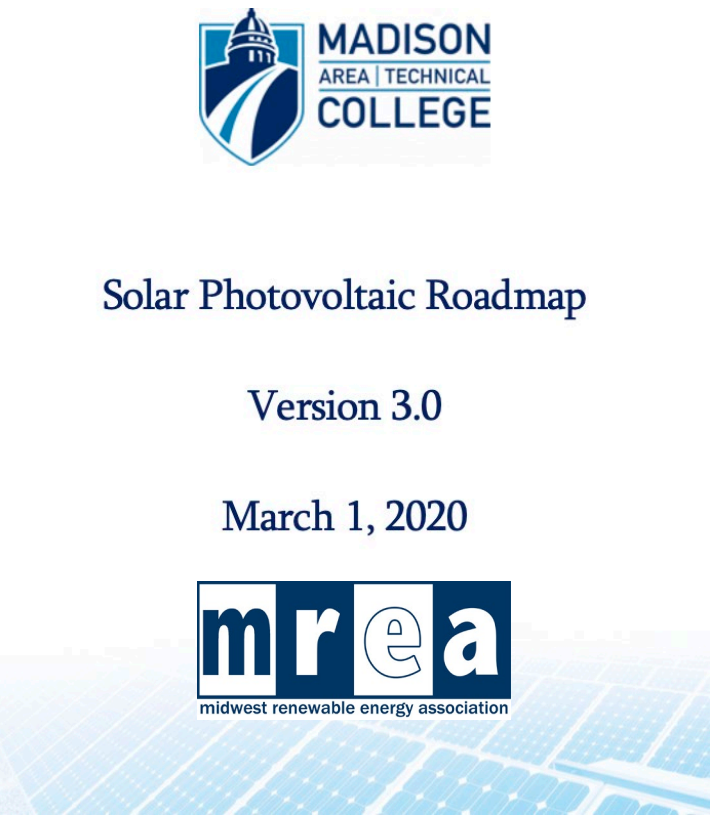
Fastest Growing Occupations

Fastest growing occupations: 20 occupations with the highest percent change of employment between 2018-28.

Click on an occupation name to see the full occupational profile.

OCCUPATION	GROWTH RATE, 2018-28	2018 MEDIAN PAY
Solar photovoltaic installers	63%	$42,680 per year
Wind turbine service technicians	57%	$54,370 per year
Home health aides	37%	$24,200 per year
Personal care aides	36%	$24,020 per year
Occupational therapy assistants	33%	$60,220 per year

Why Create a Solar Roadmap?



Smart of Allocation of Resources

- Most school districts operate multiple buildings at multiple locations
- There are many ways to invest $ to improve the energy footprint of school facilities, solar is just one of them
- Want to spend $ where it has the greatest benefit
- Need to establish priorities

A 10-Step Guide to Creating a Solar Roadmap

1. Assemble Team and Articulate Purpose
2. List and Rank Motivating Objectives
3. Identify Stakeholders
4. Quantify Current Energy Usage and Costs
5. Examine Energy Management Practices
6. Assess Sites for Solar
7. Economic Modeling
8. Prioritize Projects
9. Share the Solar Roadmap Plan
10. Implement Projects

MADISON COLLEGE HONORS PROGRAM

Honors student: Steven Ansorge

Honors Mentor: Ken Walz

Download available at: www.CreateEnergy.org

Step 1: Assemble Roadmap Team

Steven Ansorge
Student Senate
President

Tom Helbig
Faculty Member &
District Electrician

Wes Marquardt
Facilities Director

Mark Thomas
Vice President & CFO

Ken Walz
Faculty Member &
Renewable Energy
Program Director

Step 2: Determine Motivating Objectives

What do you feel are the most important reasons for Madison College to "go solar"	Rank	Rank	Rank	Rank	Rank	Average Rank
cost savings	2	1	2	4	4	2.6
learning opportunities for students	1	4	3	2	3	2.6
energy budget certainty (cost hedging)	3	2	4	1	5	3.0
social and environmental goals	4	5	1	6	1	3.4
energy resilience for critical electrical loads	6	6	6	3	2	4.6
"green" visibility	5	3	5	5	6	4.8

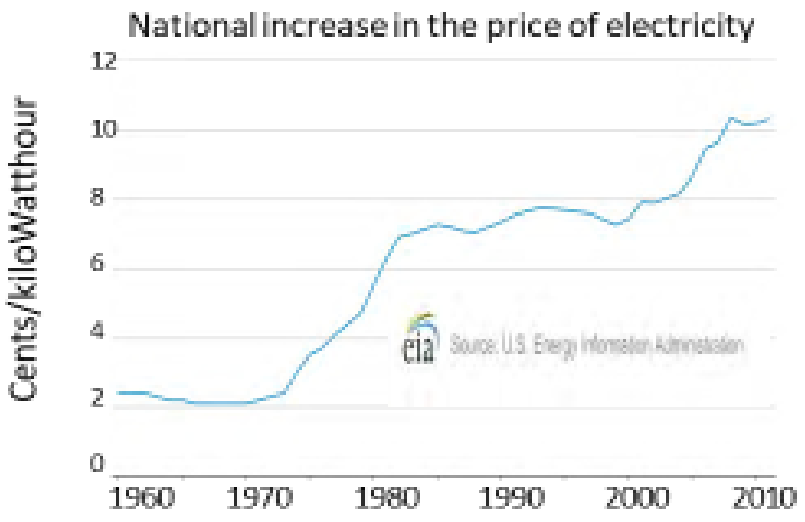
Step 3: Identify Stakeholders

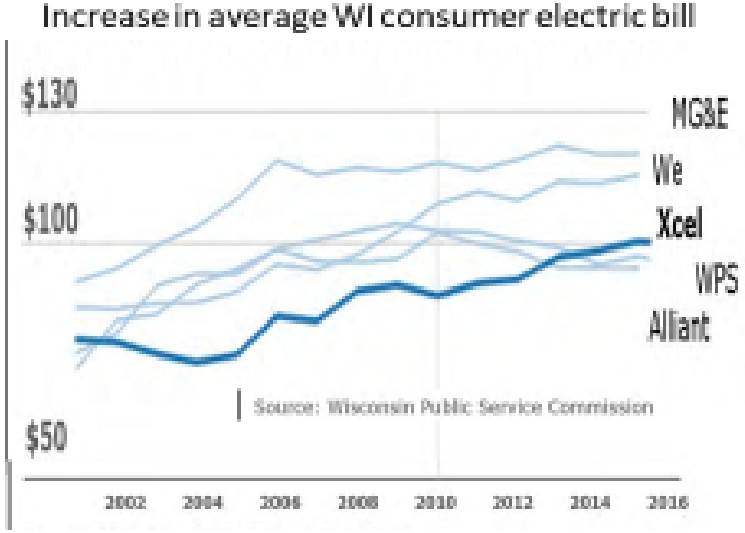
START <----------Phases of Development ----------> FINISH

	Development of Solar Roadmap	Prioritization of Solar Sites	Exploration of Funding Vehicles	Proposal and Approval of Projects	Legal/ Contractual	Project Design	Project Execution	Operations and Maintenance
Internal Stakeholders	PV Roadmap team	PV RoadMap Team	PV RoadMap Team	PV RoadMap Team	Facilities Team	Facilities Team	Facilities Team	Facilities Team
		Campus Managers	Finanical Team	Presidents Office	Legal Office	Program Faculty	Faculty?	Faculty?
		PV Students?	MATC Foundation	College Board	Procurement Office	Students?	Students?	Students?
			Grants Office		Grants Office			
External Stakeholders		Solar Contractors	Electric Providers	WTCS	Solar Developers	Solar Developers	Solar Developers	Solar Contractors
		Roofing Contractors	NSF, DOE, etc.	Electric Providers	Electric Providers	RE Industry Adv Board	Solar Contractors	
			Focus on Energy	City Permitting		Electric Providers	Electric Providers	
			PV Developers	FAA Permitting		NREL	Permitting Bodies	

Step 4: Quantify Energy Usage and Costs

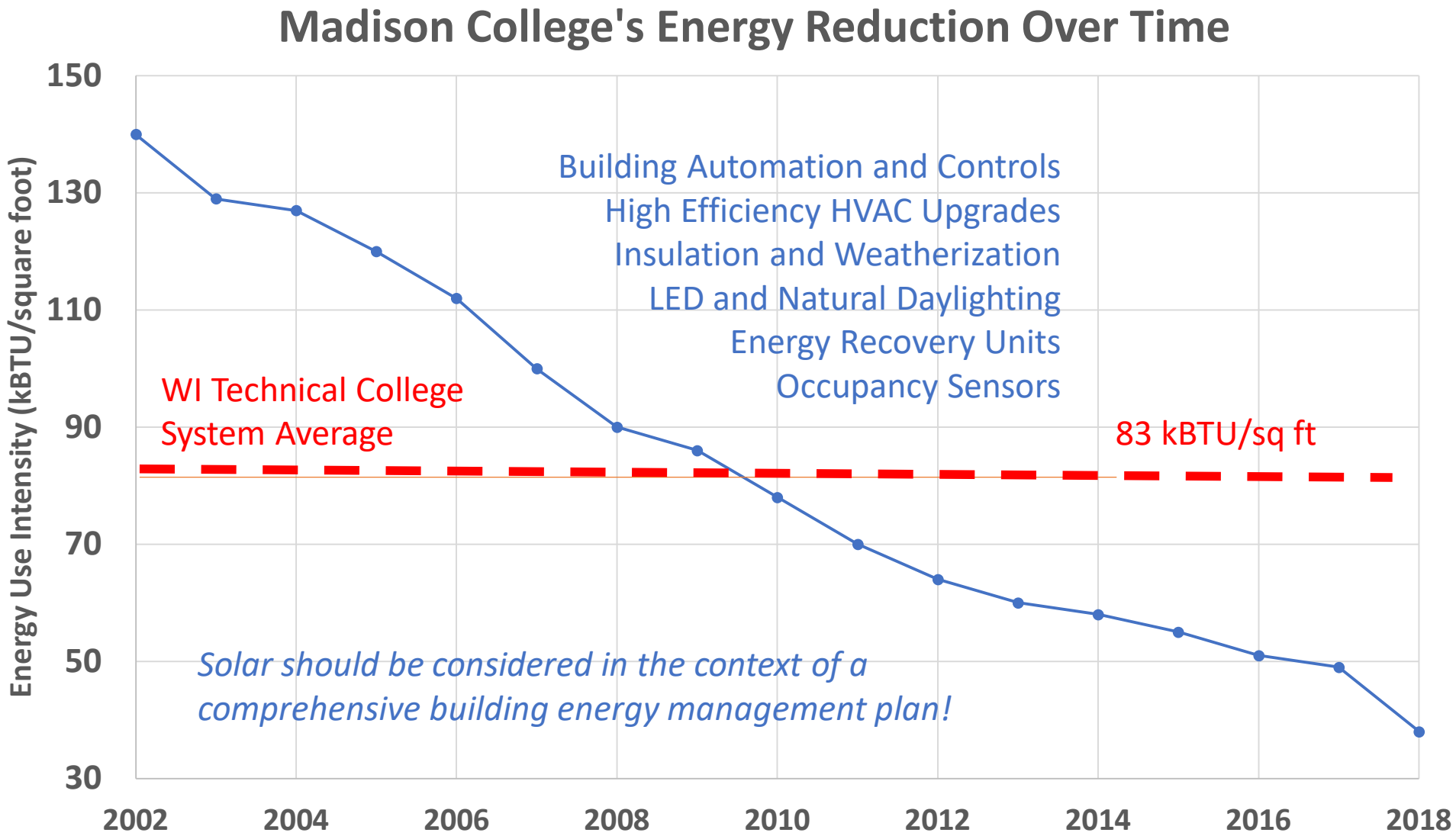
Electric bills represent an ongoing operational cost for colleges and universities





Madison Gas and Electric Rates per kWh	Summer	Winter
Off-Peak (nights and weekends)	$0.049	$0.037
On-Peak (days)	$0.099	$0.086

Step 5: Examine Energy Management Practices



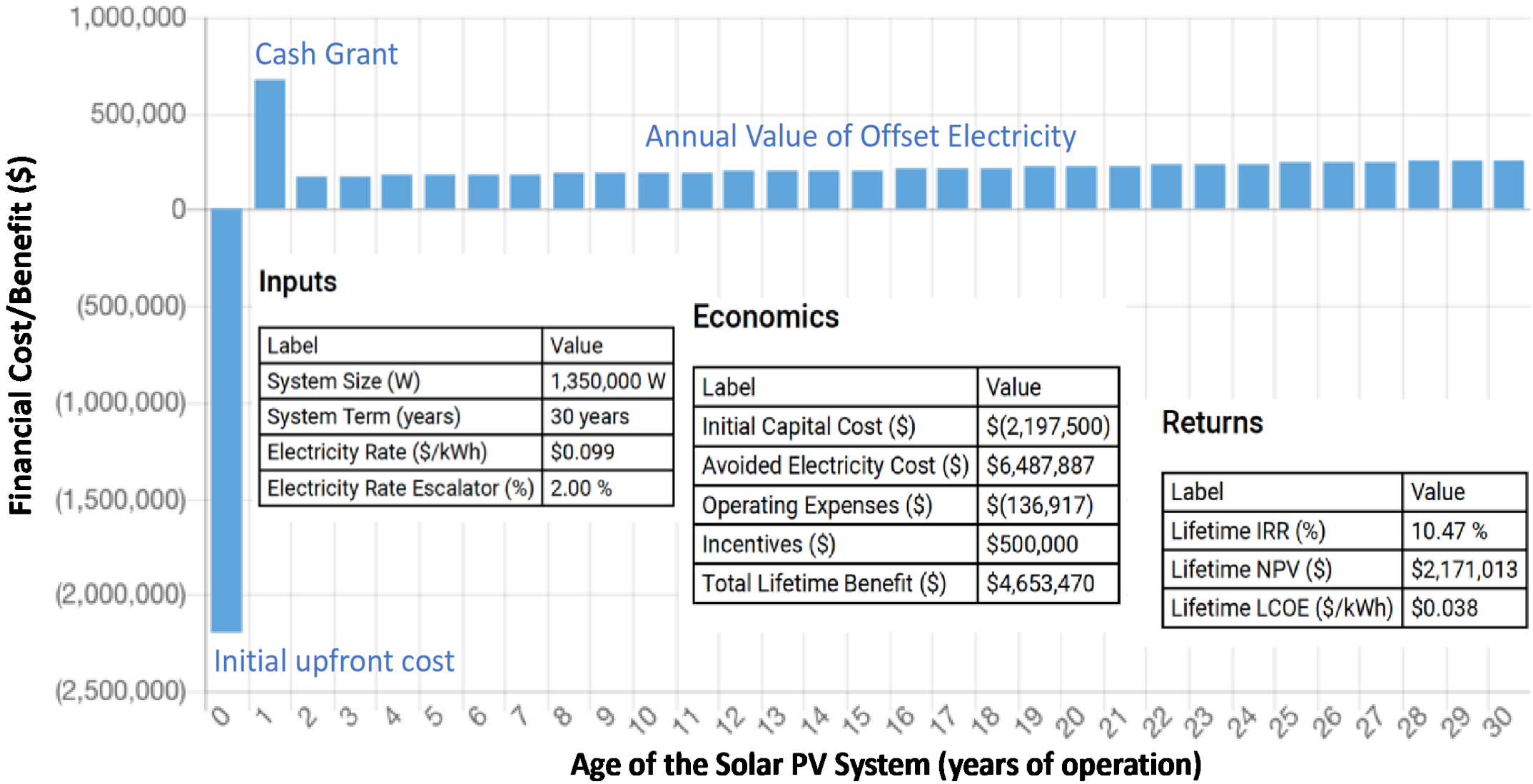
Step 6: Assess Sites for Solar

Health Education Building

Electric Provider = MGE, CG-2 Rate
Energy Use Index (Btu/ft^2) = 33,178
Peak Electric Load = 545 kW

Age of Roof = 3 years
Rooftop size estimate = 250 kWdc

Step 7: Economic Modeling



Inputs

Label	Value
System Size (W)	1,350,000 W
System Term (years)	30 years
Electricity Rate ($/kWh)	$0.099
Electricity Rate Escalator (%)	2.00 %

Economics

Label	Value
Initial Capital Cost ($)	$(2,197,500)
Avoided Electricity Cost ($)	$6,487,887
Operating Expenses ($)	$(136,917)
Incentives ($)	$500,000
Total Lifetime Benefit ($)	$4,653,470

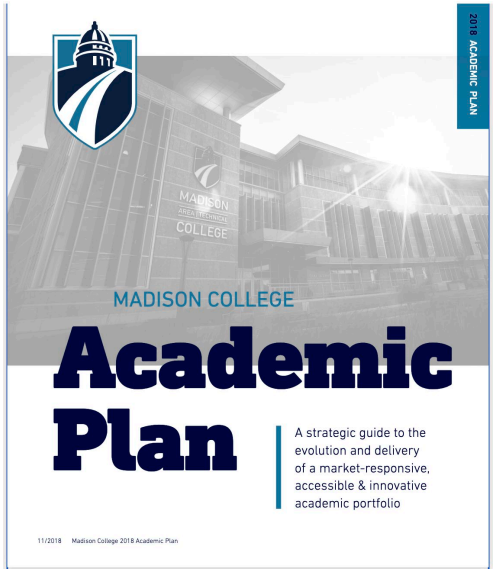
Returns

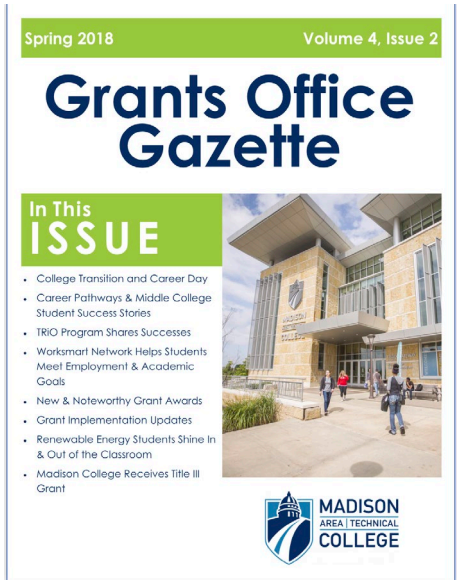
Label	Value
Lifetime IRR (%)	10.47 %
Lifetime NPV ($)	$2,171,013
Lifetime LCOE ($/kWh)	$0.038

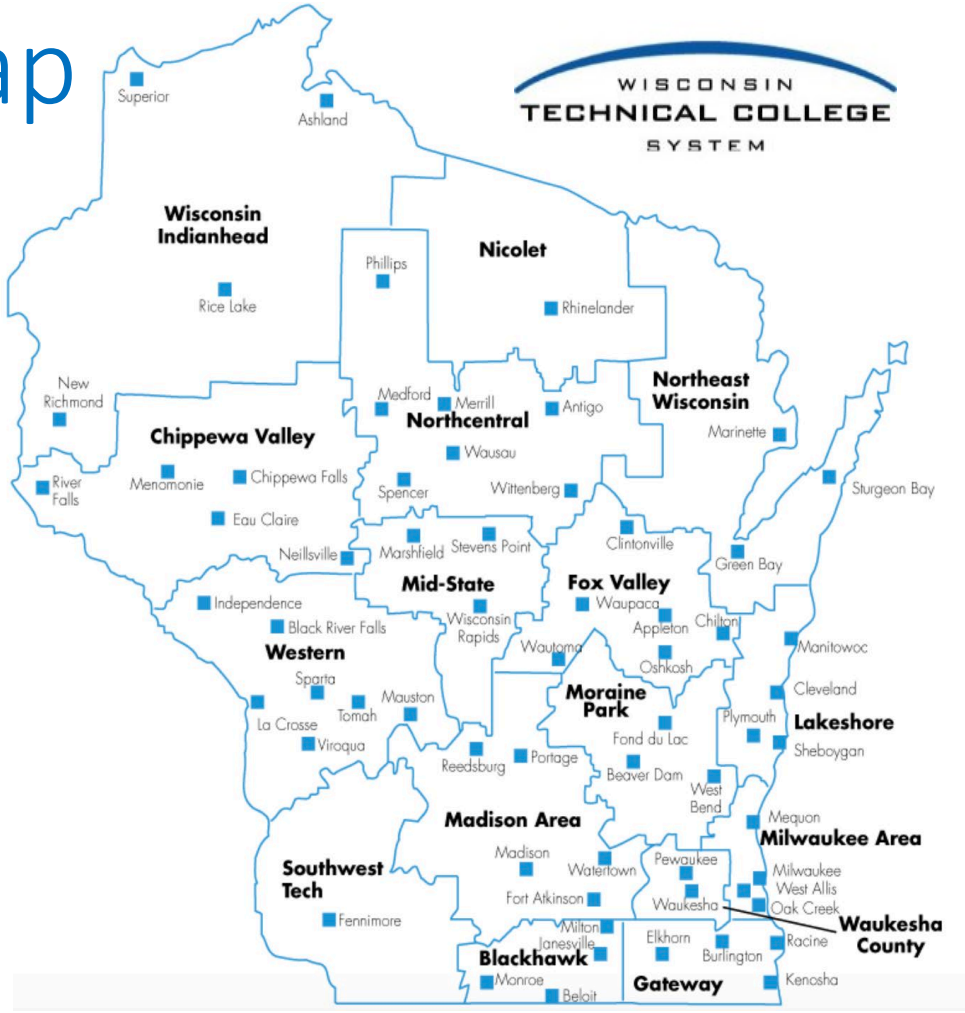
Step 8: Prioritize Projects

System and Status	Target Completion Date
1. Truax Rooftop System 1.85 MW	June 2019
2. Madison South Campus Rooftop System 125 kW	Sept 2019
3. Reedsburg Campus Ground Mount System 100 kW	Nov 2020
4. Fort Atkinson Ground Mount System Campus 150 kW	Nov 2020
4. New Childcare Center Rooftop System 150 kW	Dec 2020
5. Comm. Ave Instructional Lab – 30 kW Solar + Storage + EV charging	Spring 2021
6. Truax Fitness Center Rooftop System 75 kW	Summer 2021
7. Watertown Campus Ground Mount System	Summer 2021
8. Portage Campus Ground Mount System	Fall 2021
9. Protective Services and Health Education Rooftop Systems	2022
10. Columbus Campus Ground Mount System	2023
11. Truax Parking Canopy Systems	?
12. Truax Energy Storage System (feasibility study completed in 2020)	?

Step 9: Disseminate the Roadmap







AMERICAN ASSOCIATION OF COMMUNITY COLLEGES

Step 10: Implement Projects

Identify Funding Sources
Issue Requests for Proposals
Design of System
Installation Contracting
Commissioning
Ongoing O&M

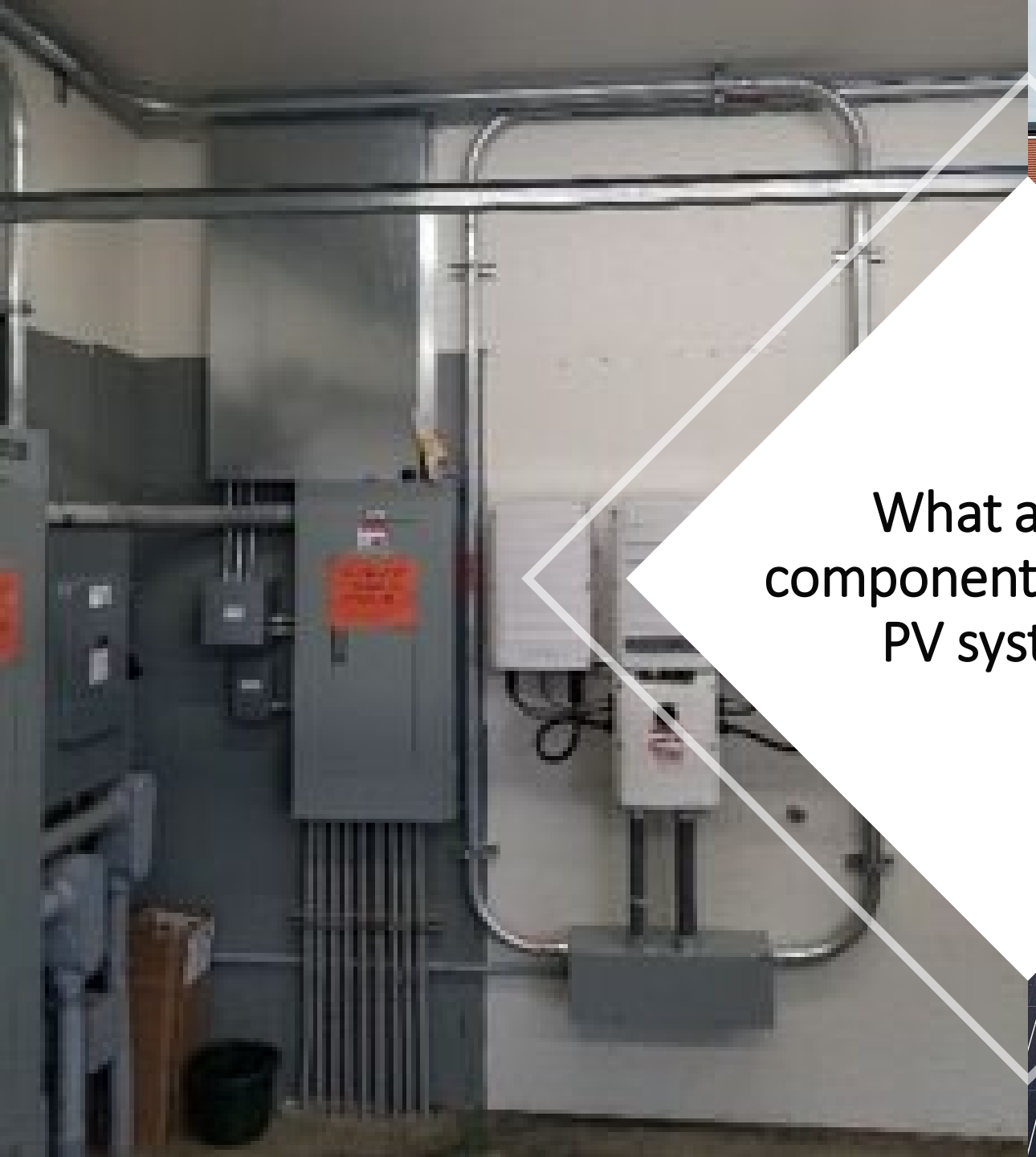
(These are topics for future CREATE webinars…)

SOLAR ON SCHOOLS

midwestrenew.org/solar-on-schools

mrea

midwest renewable energy association



What are the components of a solar PV system?

How does my utility credit me for energy our system produces?

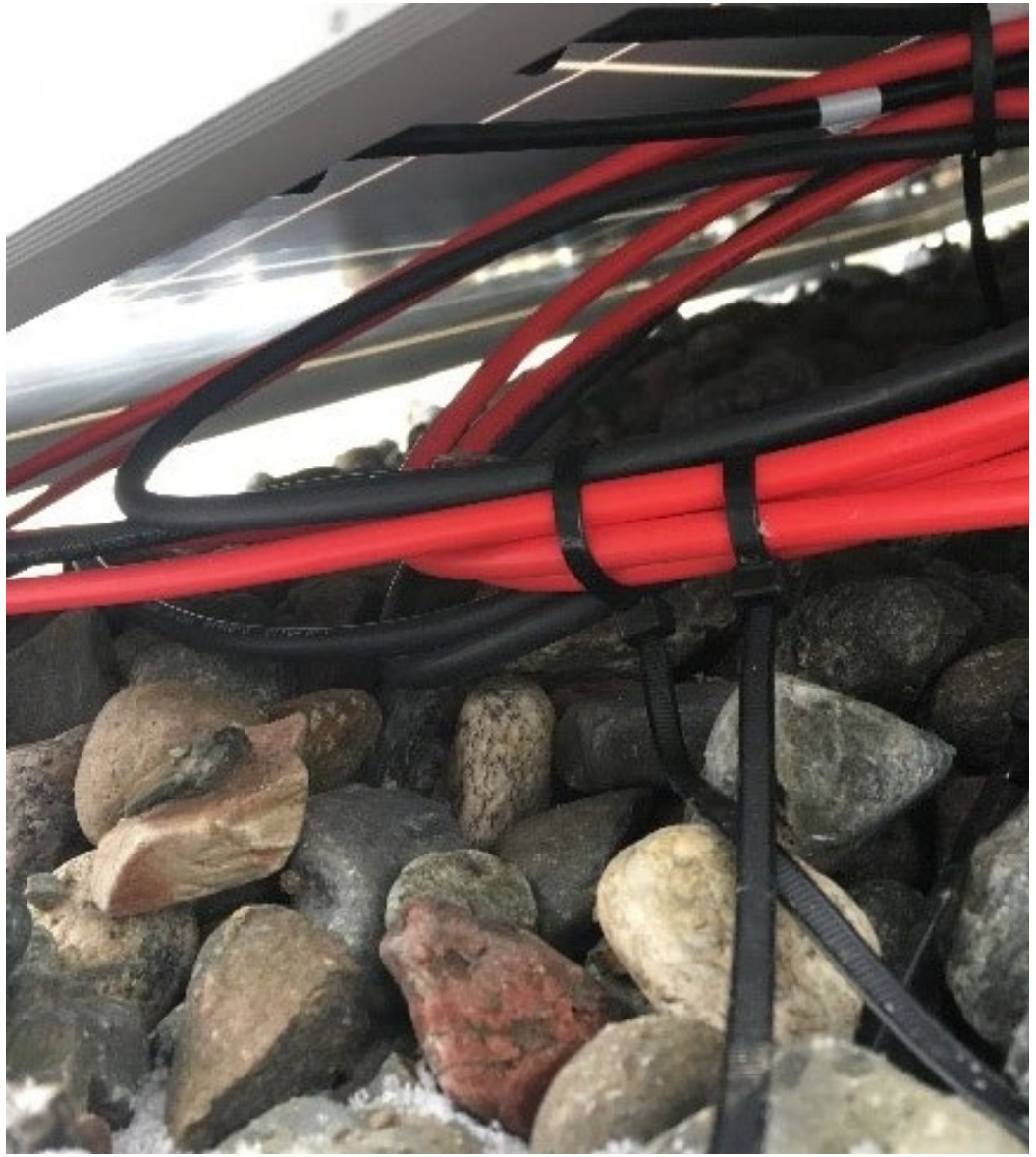
How do we determine our ideal solar PV system size?

- Is your goal to offset as much of your energy use as possible?
- Are you limited by roof/other space?
- Are you limited by funding?
- Do you want to maximize your ROI?

What do I need to know about my roof and solar?

- Age Considerations
- Roof Penetrations
- Weight Considerations
- Solar Impacts on Roof Quality

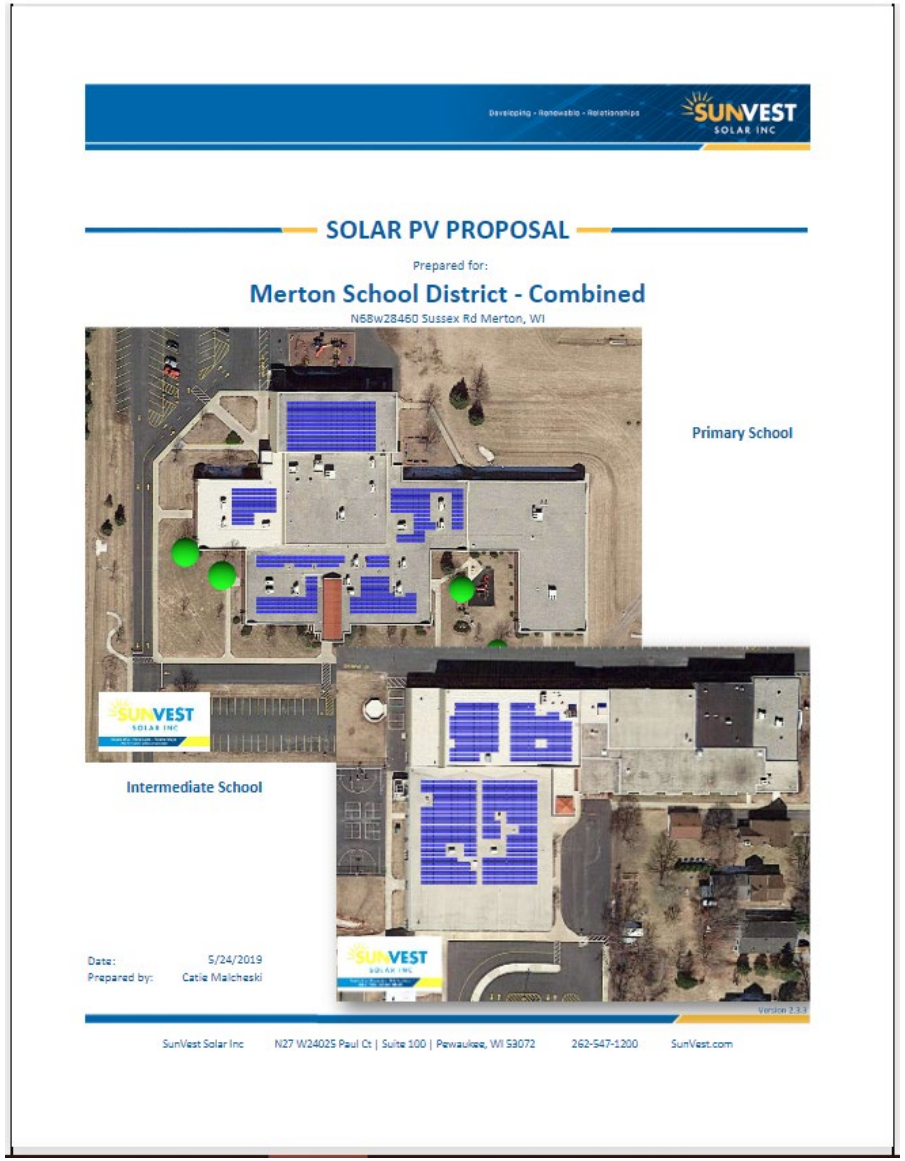
What kind of maintenance is required for these systems?



What if something breaks?

Will my insurance cover damage to the system?

How much will the system cost?



Developing • Renewable • Relationships

SUNVEST SOLAR INC

SOLAR PV PROPOSAL

Prepared for:

Merton School District - Combined

N68w28460 Sussex Rd Merton, WI

Primary School

Intermediate School

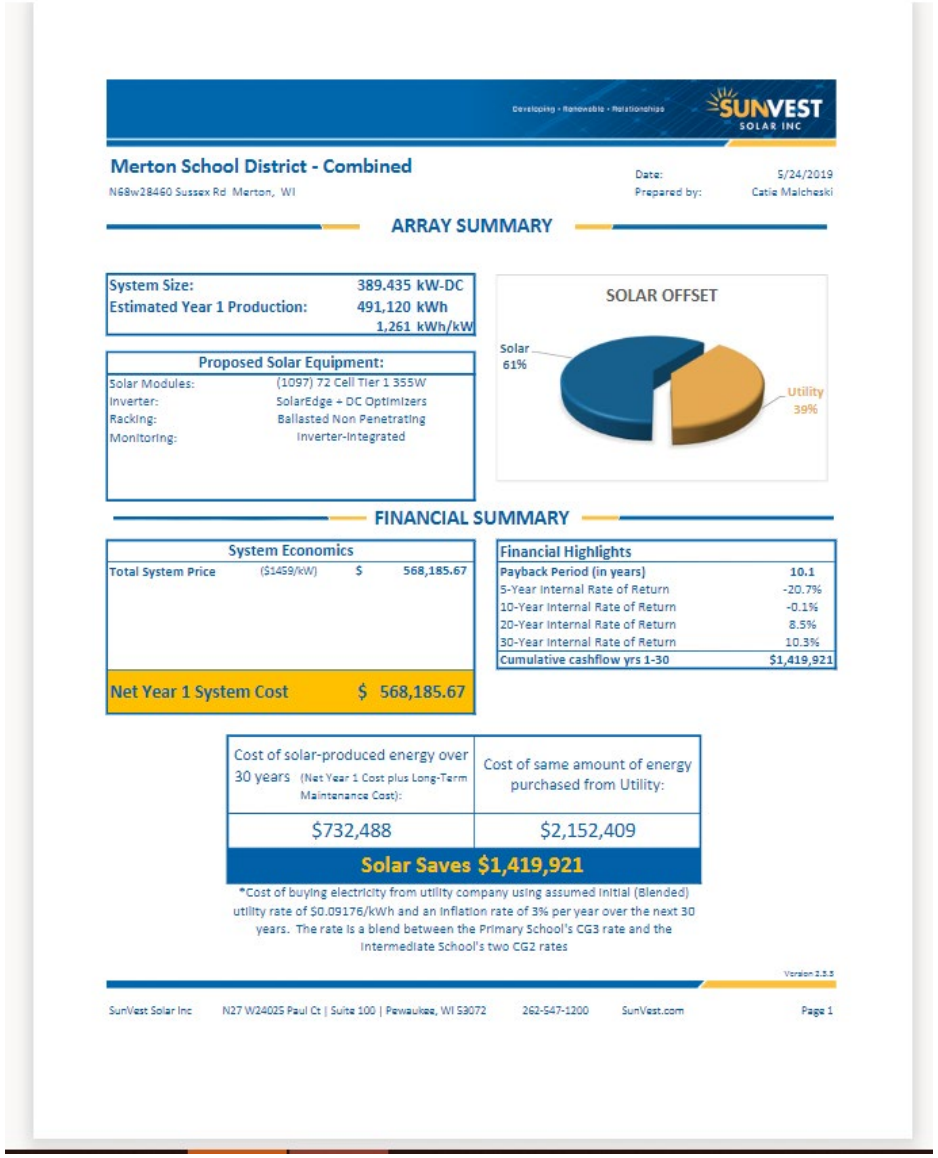
Date: 5/24/2019

Prepared by: Catie Malcheski

Version 2.3.3

SunVest Solar Inc N27 W24025 Paul Ct | Suite 100 | Pewaukee, WI 53072 262-547-1200 SunVest.com

How much can I expect to save on my electrical bills from my PV system?



Developing • Renewable • Relationships

SUNVEST SOLAR INC

Merton School District - Combined

N68w28460 Sussex Rd Merton, WI

Date: 5/24/2019

Prepared by: Catie Malcheski

ARRAY SUMMARY

System Size:	389.435 kW-DC
Estimated Year 1 Production:	491,120 kWh
	1,261 kWh/kW

Proposed Solar Equipment:

Solar Modules:	(1097) 72 Cell Tier 1 355W
Inverter:	SolarEdge + DC Optimizers
Racking:	Ballasted Non Penetrating
Monitoring:	Inverter-Integrated

SOLAR OFFSET

FINANCIAL SUMMARY

System Economics

Total System Price	($1459/kW)	$ 568,185.67
Net Year 1 System Cost		$ 568,185.67

Financial Highlights

Payback Period (in years)	10.1
5-Year Internal Rate of Return	-20.7%
10-Year Internal Rate of Return	-0.1%
20-Year Internal Rate of Return	8.5%
30-Year Internal Rate of Return	10.3%
Cumulative cashflow yrs 1-30	$1,419,921

Cost of solar-produced energy over 30 years (Net Year 1 Cost plus Long-Term Maintenance Cost):	Cost of same amount of energy purchased from Utility:
$732,488	$2,152,409

Solar Saves $1,419,921

*Cost of buying electricity from utility company using assumed initial (Blended) utility rate of $0.09176/kWh and an inflation rate of 3% per year over the next 30 years. The rate is a blend between the Primary School's CG3 rate and the Intermediate School's two CG2 rates

Version 2.3.5

Finding a Contractor

Consult with a Contractor– may provide a site assessment and financial analysis at no cost:

- MREA Busines Member Directory
- Focus on Energy Trade Allies
- NABCEP
- RENEW Wisconsin Business Members

mrea
midwest renewable energy association

Selecting a Solar Installer

GETTING STARTED:

1. The North American Board of Certified Energy Practitioners (NABCEP) maintains an approved list of trained and certified solar installers. Check out the list on their locator map at this link: *nabcep.org/installer-locator.*
2. A number of installers are also members of the MREA, and may have participated or even taught courses for MREA. Visit the MREA Business Directory at: *midwestrenew.org/business-member-directory.*
3. Focus on Energy maintains a searchable database of their Trade Allies. These are contractors and service providers who partner with Focus to deliver energy efficiency and renewable energy products and expertise to WI residents and businesses. Learn more at: *focusonenergy.com/trade-ally/find.*

CHECK FOR CERTIFICATIONS: National certifications show an advanced level of knowledge for solar installers such as:

- **NABCEP Certified:** This national certification requires coursework through accredited training programs, designing & installing a specified number of solar installs, & passing a professional technical exam.
- **UL Photovoltaic (PV) System Installation Certification:** Installers receive the PV System Installer Certification by passing an exam that is intended to measure the necessary competencies, safety training, & several years of hands-on experience in the field.
- **Electronics Technicians Association Photovoltaic Installer Certification:** This certification involves an in-depth program with apprenticeship & exam requirements.

SEE MORE SOLAR RESOURCES AT:
midwestrenew.org/community-resources

— FLIP FOR MORE —

The Midwest Renewable Energy Association (MREA) is a non-profit 501(c)(3) educational organization. Founded in 1990, the MREA promotes renewable energy, energy efficiency, and sustainable living through education and demonstration. To learn more, call 715-592-6595 or visit www.midwestrenew.org.

1

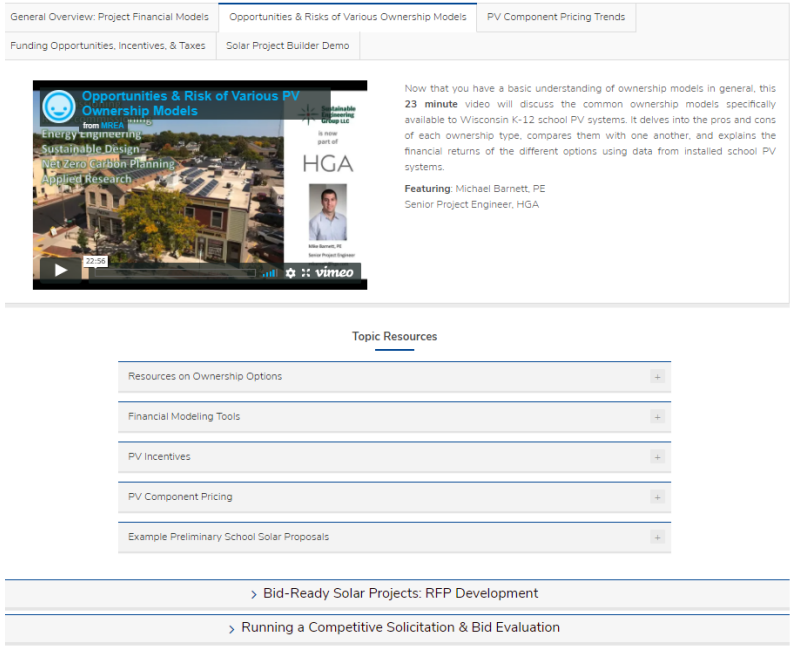
How can we pay for our PV system?

Discuss and Determine Financing Options –

- Total system cost
- Operating budget availability
- Go to referendum/tie solar into other facility upgrades
- Availability/willingness to take out a loan
- Fundraising opportunities
- Grant availability
- Required ROI to move forward
- Ownership type – direct ownership, third party ownership, utility owned

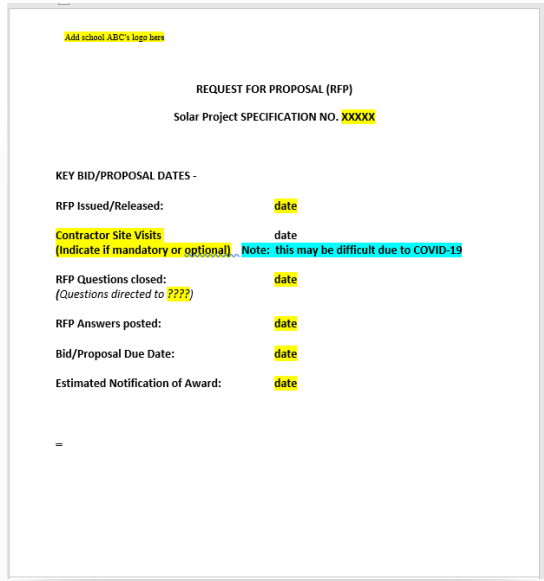
Financial and PV Modeling Tools –

- PVwatts.nrel.gov
- SolarProjectBuilder.org



What technical and other considerations should I include on our RFP?

How should we best evaluate our received bids?



Add school ABC's logo here

REQUEST FOR PROPOSAL (RFP)

Solar Project SPECIFICATION NO. XXXXX

KEY BID/PROPOSAL DATES -

RFP Issued/Released: date

Contractor Site Visits date
(Indicate if mandatory or optional) Note: this may be difficult due to COVID-19

RFP Questions closed: date
(Questions directed to ????)

RFP Answers posted: date

Bid/Proposal Due Date: date

Estimated Notification of Award: date

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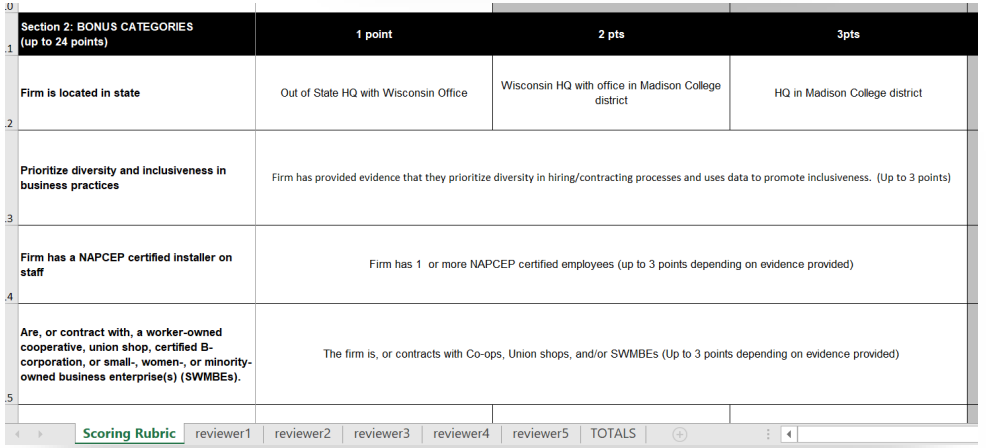


Section 2: BONUS CATEGORIES (up to 24 points)	1 point	2 pts	3pts
Firm is located in state	Out of State HQ with Wisconsin Office	Wisconsin HQ with office in Madison College district	HQ in Madison College district
Prioritize diversity and inclusiveness in business practices	Firm has provided evidence that they prioritize diversity in hiring/contracting processes and uses data to promote inclusiveness. (Up to 3 points)		
Firm has a NAPCEP certified installer on staff	Firm has 1 or more NAPCEP certified employees (up to 3 points depending on evidence provided)		
Are, or contract with, a worker-owned cooperative, union shop, certified B-corporation, or small-, women-, or minority-owned business enterprise(s) (SWMBEs).	The firm is, or contracts with Co-ops, Union shops, and/or SWMBEs (Up to 3 points depending on evidence provided)		

Scoring Rubric | reviewer1 | reviewer2 | reviewer3 | reviewer4 | reviewer5 | TOTALS

Where can I go to get resources to add solar into our curriculum?

Wisconsin K-12 Energy Education Program (KEEP)
College of Natural Resources
University of Wisconsin-Stevens Point

Other Teachers & Schools!

CREATE

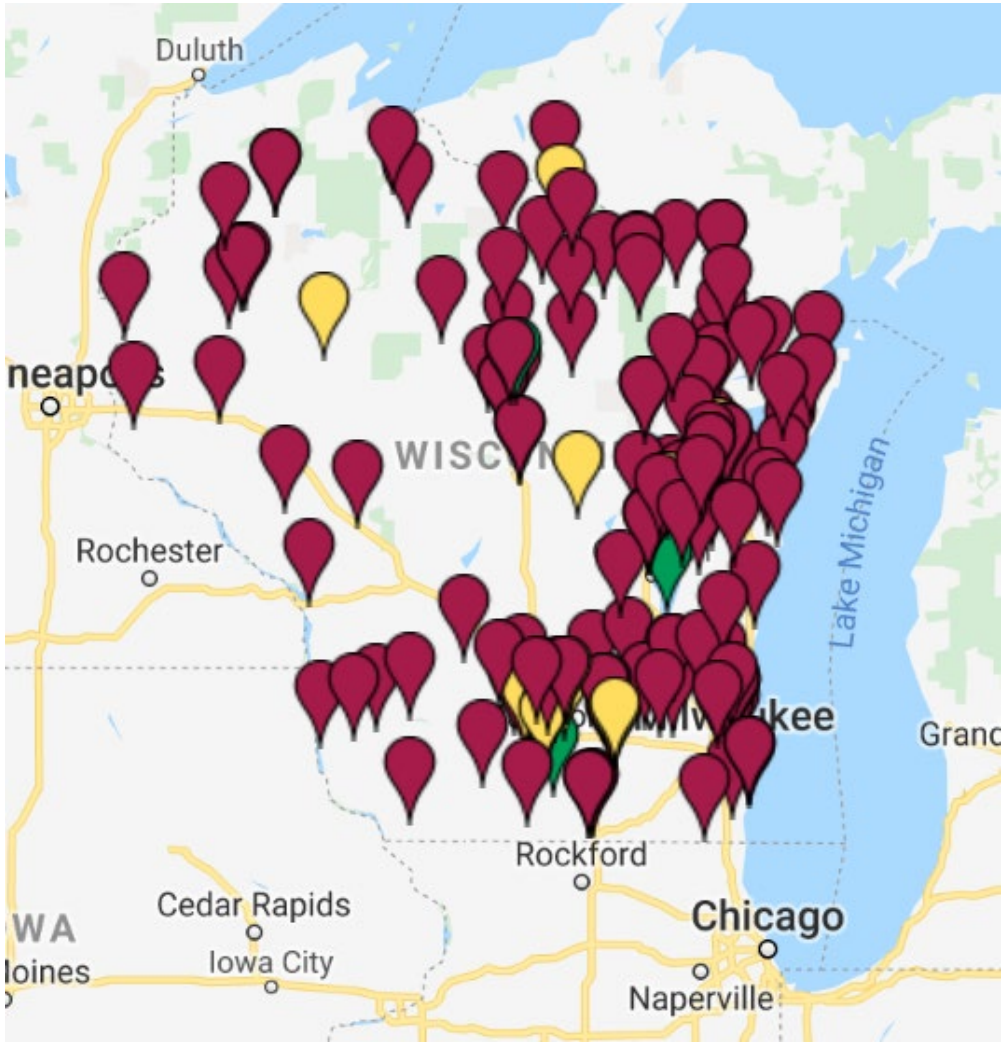
Center For Renewable Energy Advanced Technological Education

Merton Community School District

- Commissioned: December 2019
- System Size: 389kW DC
- Expected Year 1 Performance: 491,120 kWh
- Racking: Ecolibrium Ballasted Non-Penetrating
- Modules: Adani 72 Cell Tier 1 355W
- Inverters: SolarEdge + DC Optimizers
- Monitoring: SolarEdge Consumption + Production monitoring
- Solar Installer: SunVest Solar Inc.
- Total System Cost: $568,185
- Value of Grants & Incentives: $108,182.28
- Cost/Watt: $1.46
- 30-Year IRR: 10.3%
- Average Annual Savings: $70,000
- 30 Year Cashflow: $1,419,921

2019-2020 Grant Recipients

- Madison West High School
- Merton Elementary
- Merton Intermediate School
- Marshfield High School
- Madsion College – Reedsburg
- Madison College – Fort Atkinson
- Forest Edge Elementary School
- Northeast Wisconsin Technical College
- Rice Lake Area School District – High School
- Rice Lake Area School District – Middle School
- Rice Lake Area School District –Tainter Elementary
- Midstate Technical College
- Eau Claire Memorial High School
- Eau Claire North High School
- MATC – Mequon Campus
- MATC – Oak Creek Campus



Some Resources to get you started for solar at *YOUR SCHOOL*

Solar on Schools

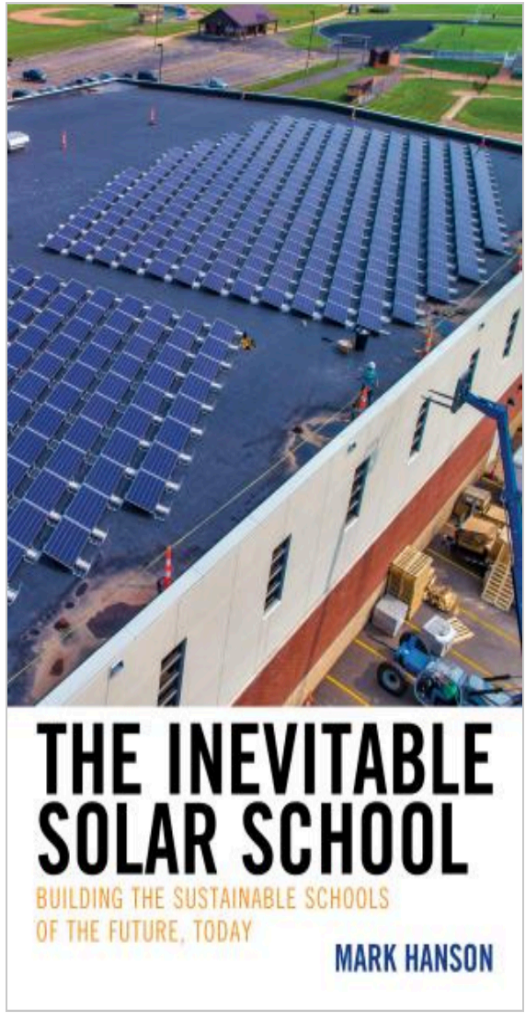
https://www.midwestrenew.org/solar-on-schools/

Wisconsin public schools spend more than $175 million annually on energy, the largest expense outside of personnel. Solar PV installations provide a unique means for schools to reduce operating expenses without cutting educational programs. Schools can also utilize these installations to educate and energize the next generation with hands-on renewable energy curriculum, exposing them to careers in clean energy. The industry added jobs 70 percent faster than the overall economy from 2015-2019. The demand for these jobs is only going to continue to grow as our national energy economy transitions away from fossil fuels.

Recognizing these unique benefits, and with generous support from the Couillard Solar Foundation, Solar on Schools was developed to provide a range of resources to Wisconsin schools, assisting with and simplifying the solar project development process. The program aims to help Wisconsin schools realize the financial, educational, and community benefits of going solar. **Wisconsin schools are going solar.**

Program Contact

Amanda Schienebeck
Program Manager
Email: amandas@midwestrenew.org
Phone: (608)-217-3281



The Inevitable Solar School

Building the Sustainable Schools of the Future, Today

MARK HANSON

"The Inevitable Solar School: Building the Sustainable School of the Future, Today" describes the two major forces that are driving public and private schools and other buildings to solar energy. These forces are the recognition of climate change and the cost advantage of on-site solar energy. Either force would be sufficient reason on its own to change the school market, but in combination they become indominable.

Sustainability has emerged as a widely accepted theme in school building design. Daylight and views, indoor air quality, responsible life-cycle materials selection, and energy and water efficiency are expected features. This book adds on-site solar energy, sufficient in many instances to meet all of a school's energy requirement, as a critical element of sustainability. The zero energy school is the sustainable school of the future.

Contrary to common expectations, zero energy sustainable schools are being built at costs that are competitive with regional school cost averages. This outcome requires teamwork between school... [>>]

CREATE

Center For Renewable Energy
Advanced Technological Education

www.CreateEnergy.org

Solar On Schools Toolkit

1. Introduction, Rationale, Acknowledgments, References
   .PDF
2. 10-Step Guide to Create a Solar Roadmap
   .PDF
3. Solar Roadmap example
   .PDF | .DOCX
4. Request for Proposals (RFP) for Solar Projects template and example
   .PDF | .DOCX
5. RFP Scoring Rubric for Solar Projects template
   .XLSX
6. Solar Installation Timelapse Video example
   https://youtu.be/LIvC-pVM0m8

Solar PV Faculty Institute
July 2021

www.CreateEnergy.org

CREATE

MADISON AREA | TECHNICAL COLLEGE

Thanks For Joining Us!

Good Luck in Your Solar Endeavors!

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