Solar Energy for Your Farm or Business

Fritz Ebinger

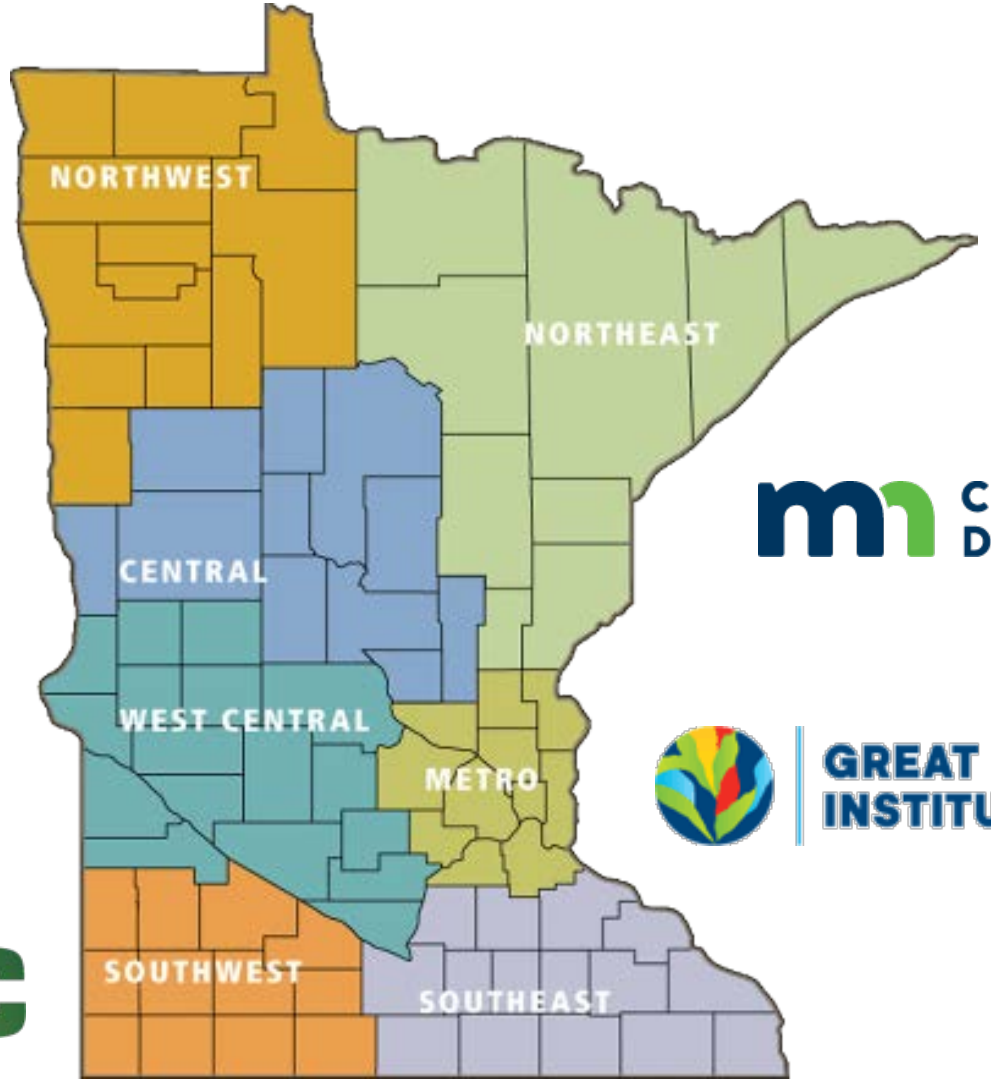
Clean Energy Resource Teams (CERTs)

July 21, 2018 – Minnesota Solar Congress

CERTs is a statewide partnership

Regional Sustainable Development Partnerships

University of Minnesota EXTENSION



Commerce Department

Great Plains Institute — Better Energy. Better World.

SRDC

What Does CERTs Do?

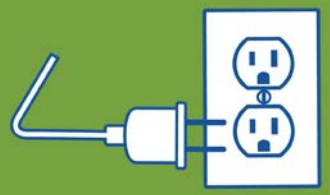
LEARN

Write blog posts & case studies

Create educational guides

Manage diverse web-based tools

CONNECT



Host events, tours, and conferences

Help with community organizing

Connect people to technical resources

ACT

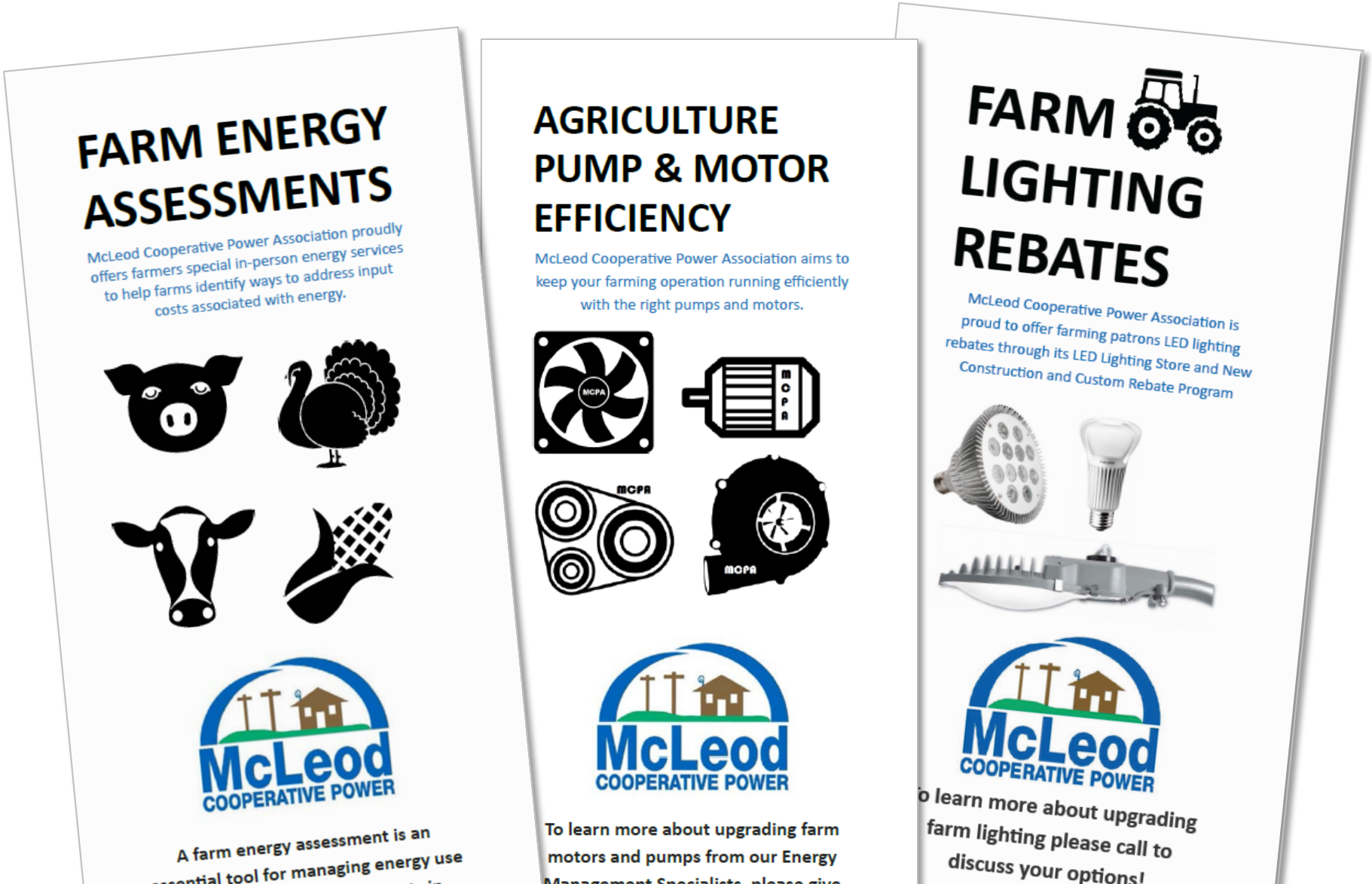
Provide seed grant funding and more

Deliver research-based campaigns

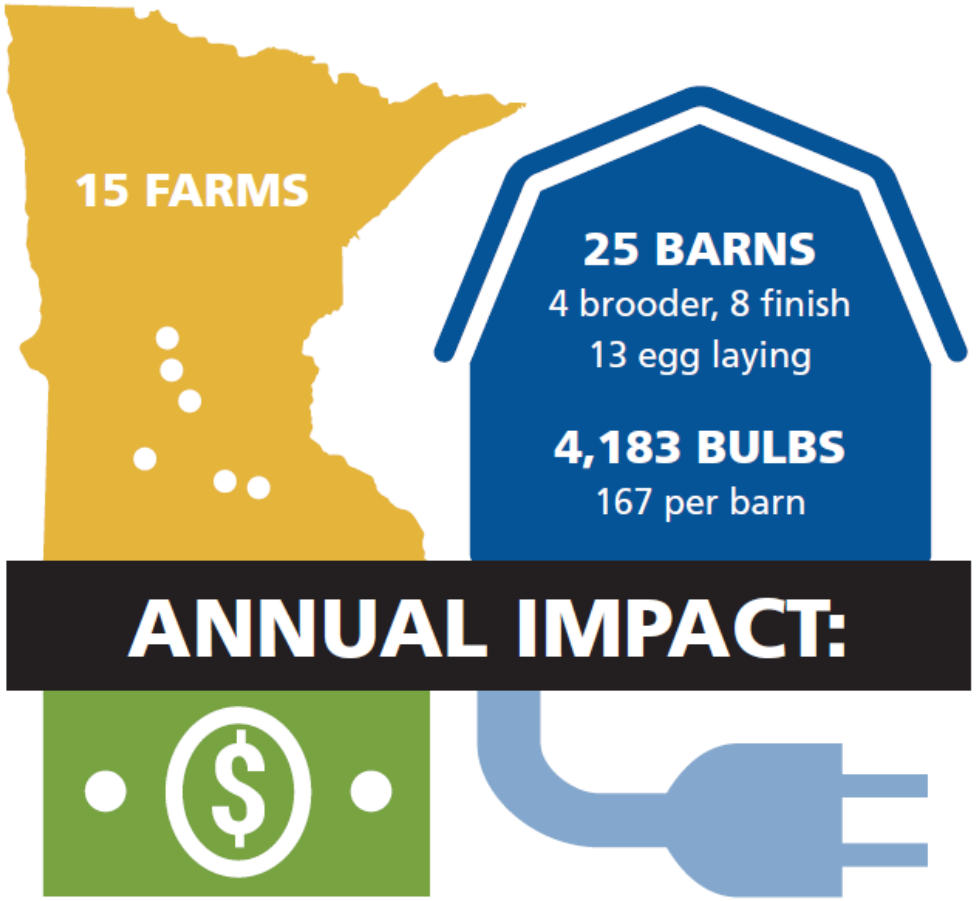
Spur other statewide programs

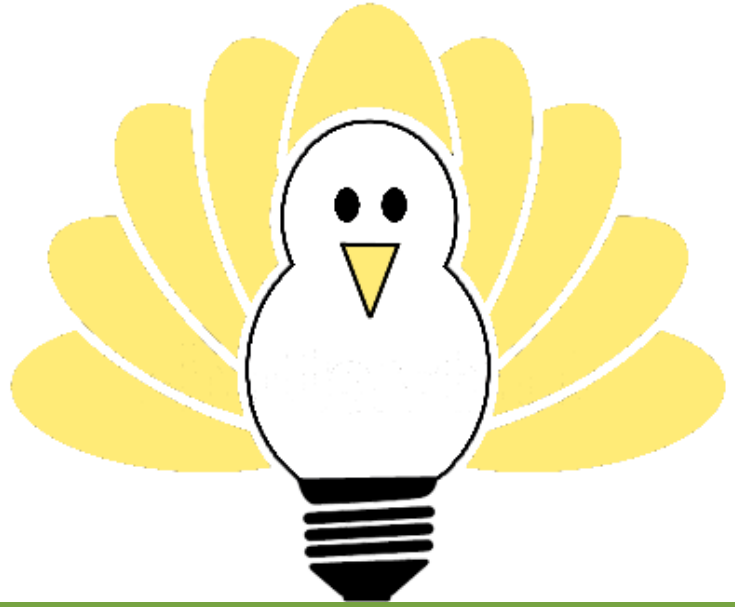
Outreach and Education Partnerships

CERTs partners with utilities and community groups to do outreach and education about farm and business programs for EE and RE



Gobbling Up Savings in Turkey Barns





WHY UPGRADE?

- Reduce costs by $1,000s each year
- Save up to 85% on lighting energy
- Pay for project in 3 yrs or less
- Reduce maintenance
- Federal & utility funding

mncerts.org/turkeys

Renewable Energy for Greater MN

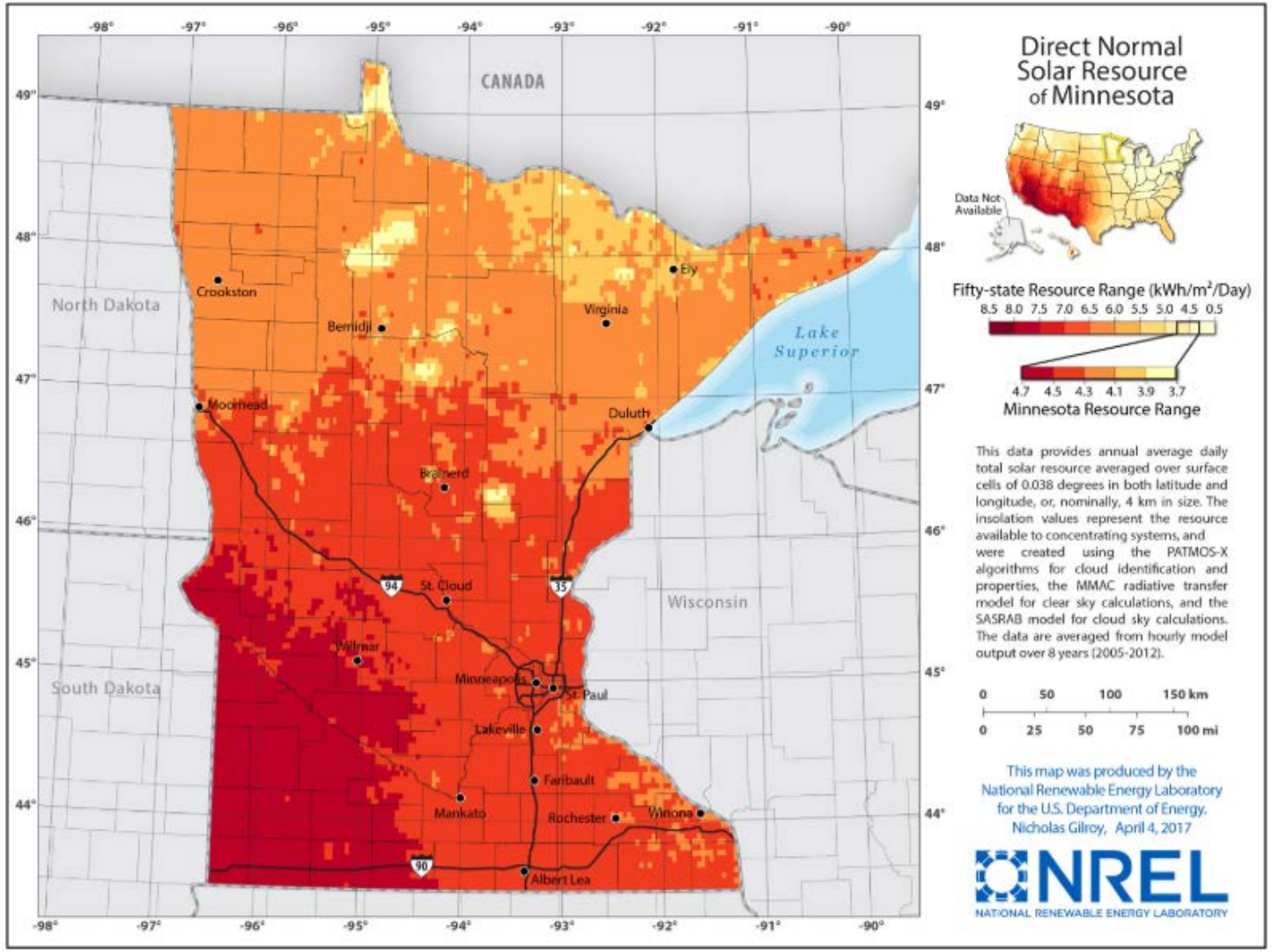
We offer FREE assistance to Farmers and Small Businesses for:

- Solar site assessments and financial modeling
- Application support for grants and loans
- Guidance on federal tax credits, depreciation
- Financing opportunities: Property-Assessed Clean Energy (PACE)

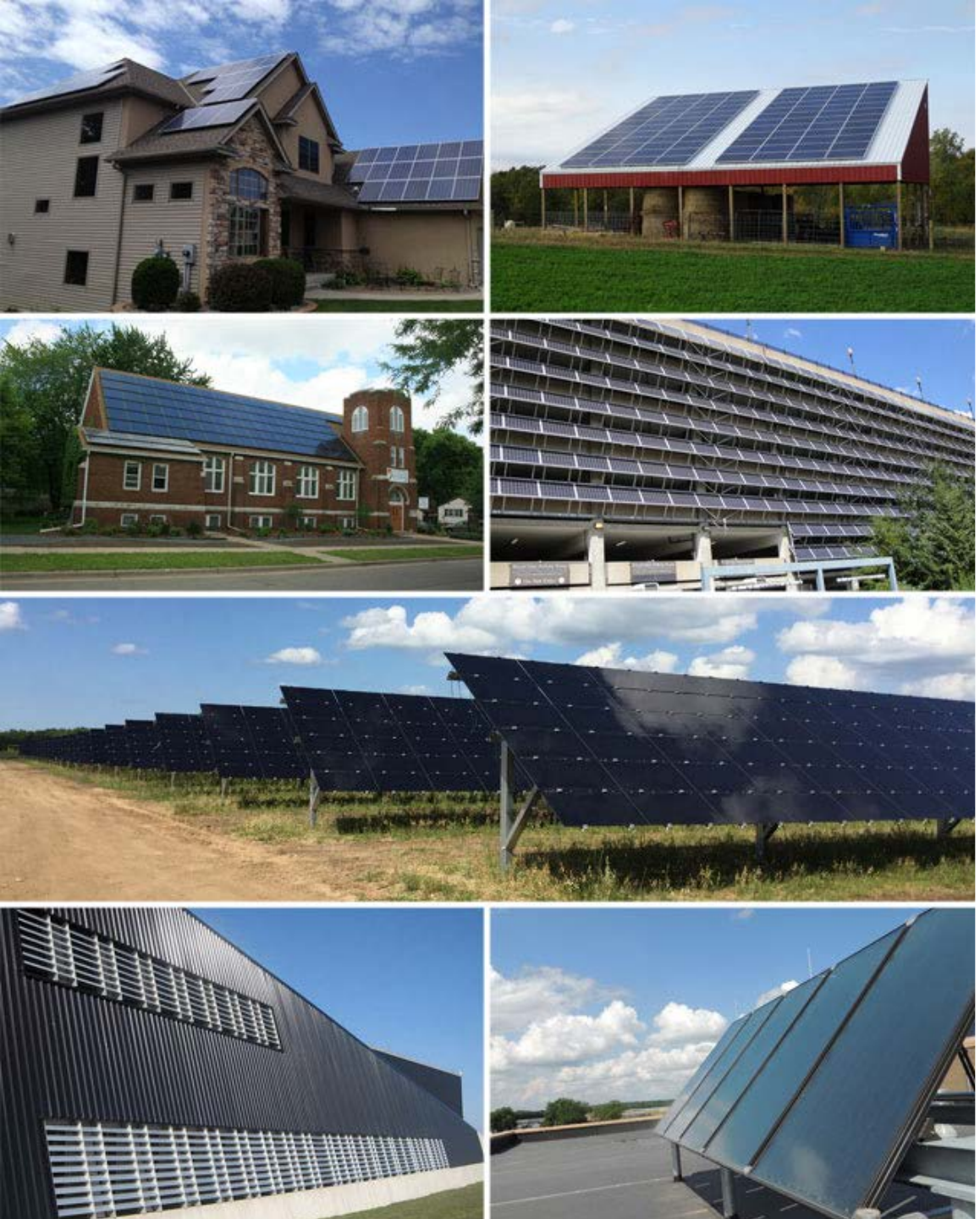
Renewable Energy for Greater Minnesota

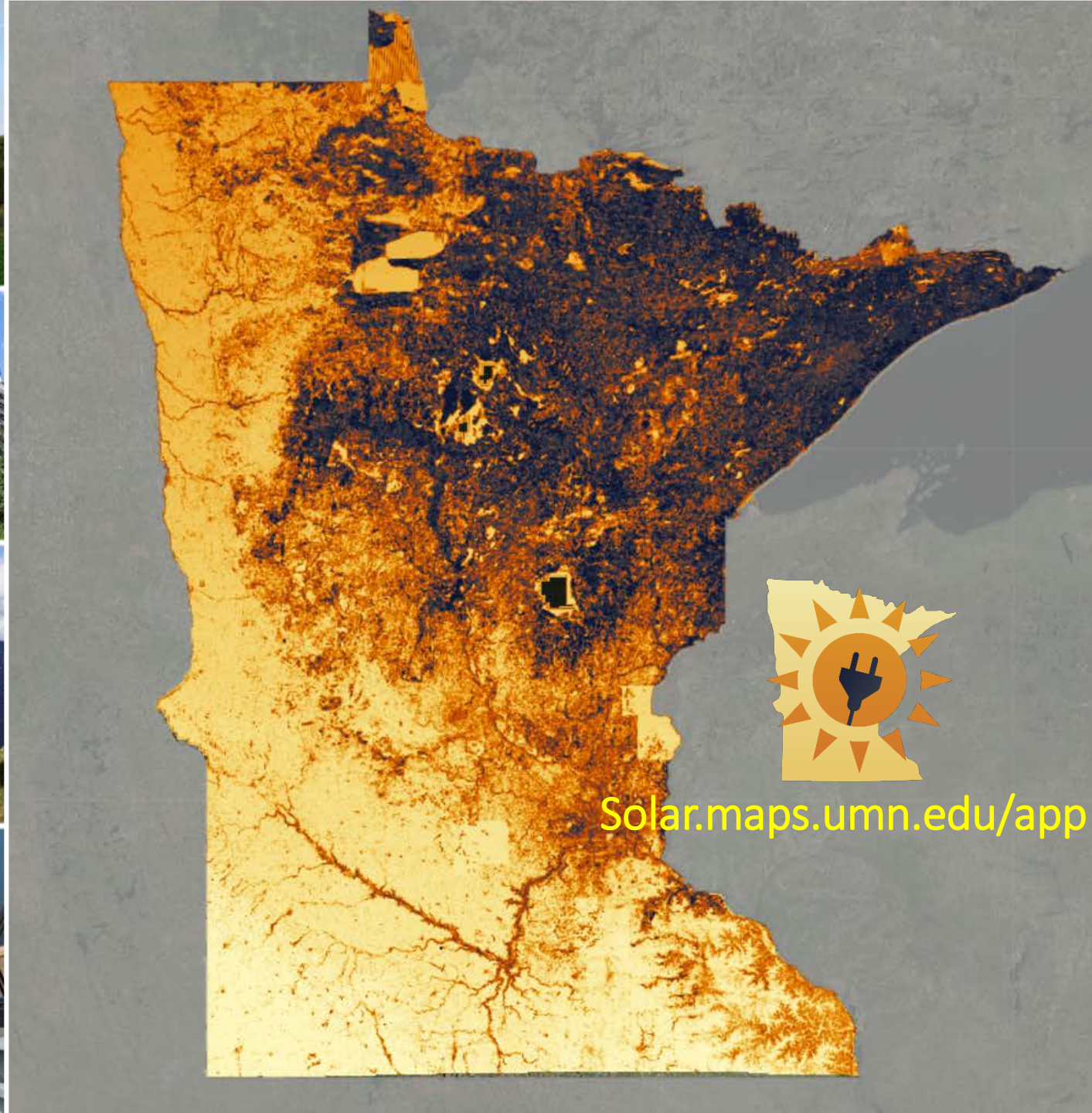
mncerts.org/greatrenewables

SOLAR FOR FARMS & SMALL BUSINESS



Annual Average Range of 4.7 to 3.7 Sun Hours per Day




Solar.maps.umn.edu/app

Sharing farm case studies

MN ENERGY
STORIES
mncerts.org/blog

Zumbrota Farm harvesting solar power to reduce energy costs

Ronningen Dairy Farm adds solar PV to their West Concord operation

Jorgenson Hog Farm in Westbrook, MN cashes in with wind, solar PV

Family farm invests in renewable energy, saves barn

Learning about solar energy at Featherstone Farm

Solar exceeds expectations at Guentzel Family Farms in Eagle Lake

Hoffman Farms near Chatfield saves money with utility rebates

The Popps are harvesting solar and wind energy on their farm

Turkey farmers learn about solar air and LED lighting technologies

Langmo Bros. Farm pilots LED lighting for turkey barns

Solar PV Curriculum & Simple Steps

mncerts.org/solar

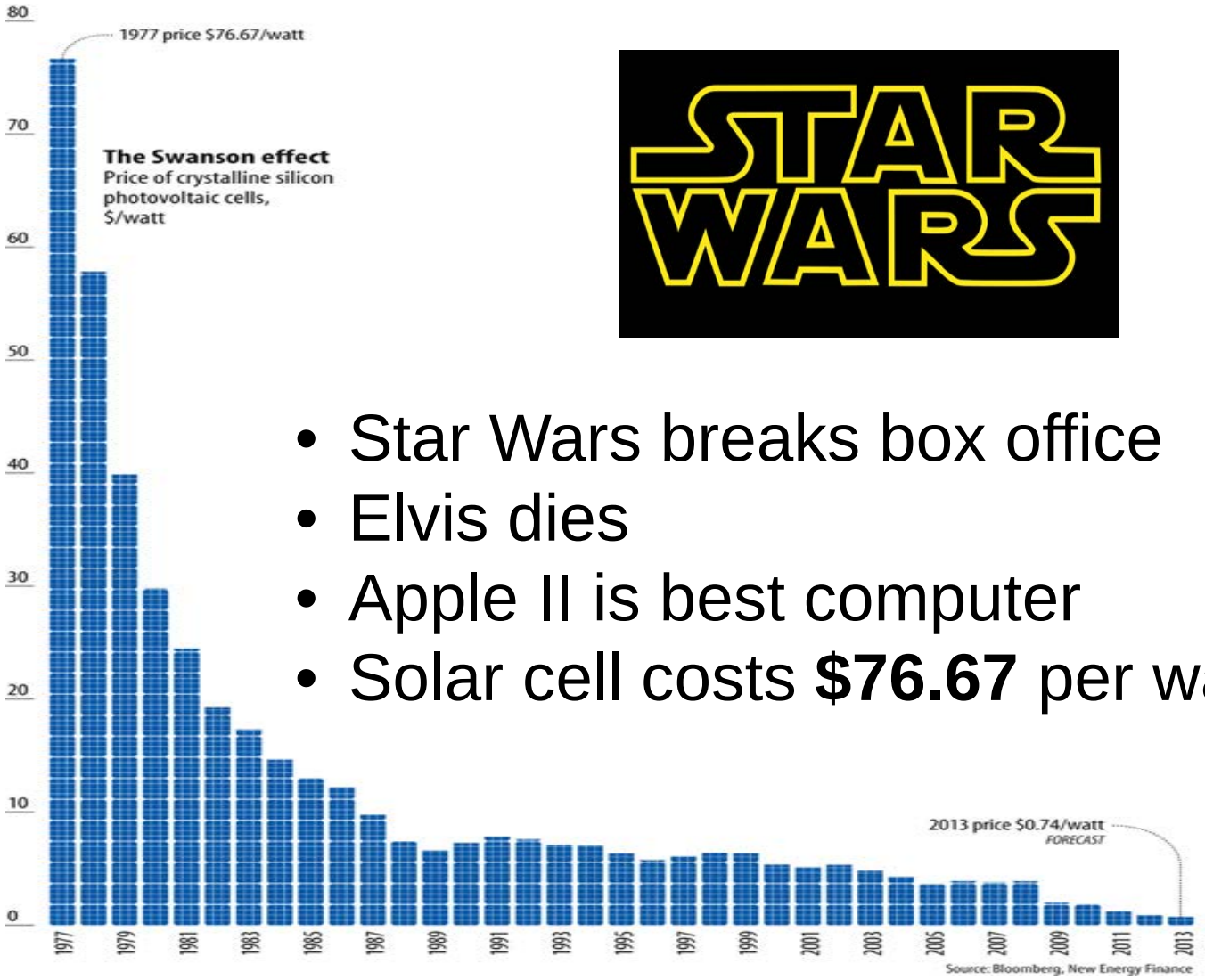
YOU:
SOLAR -
WHAT DOES
IT COST?

ME:
WHAT DO
YOU MEAN
BY “IT”?

THE HARDWARE COST OF THE SOLAR CELL

(a.k.a. The major driver in cost reduction over the years)

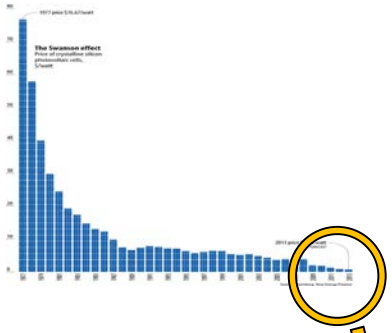
Hardware: 1977

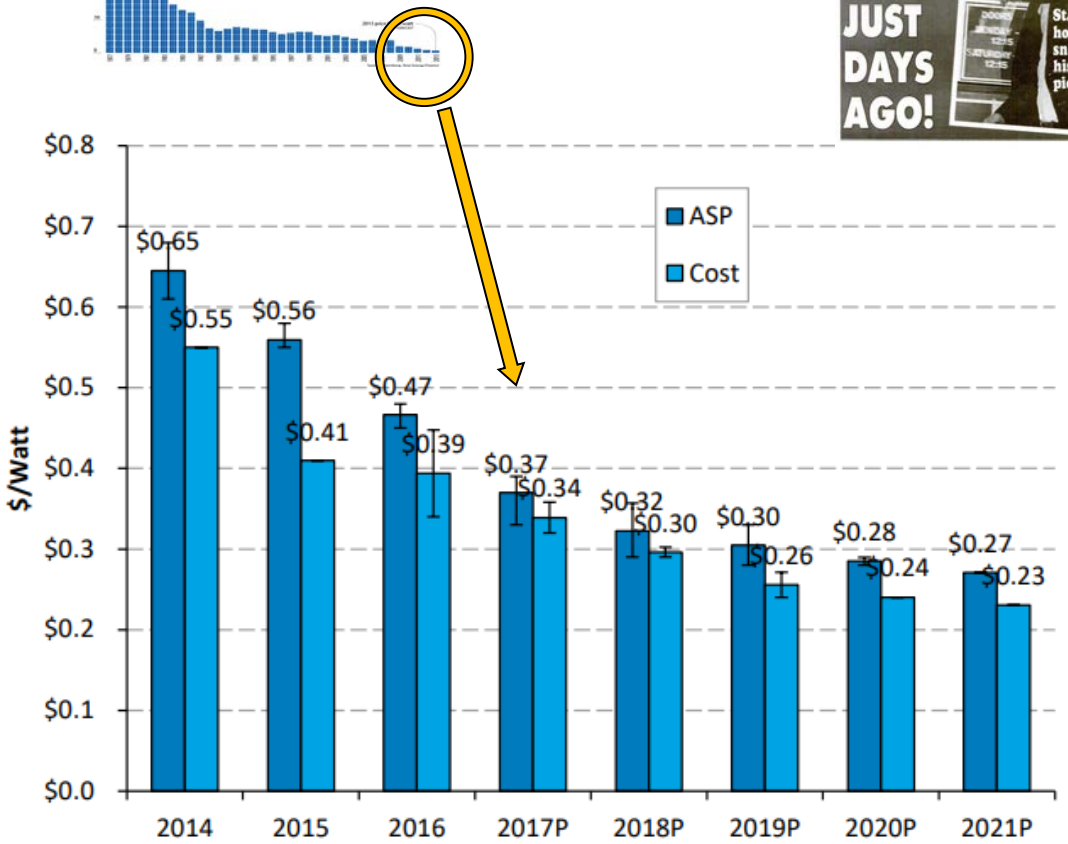


STAR WARS

- Star Wars breaks box office
- Elvis dies
- Apple II is best computer
- Solar cell costs **$76.67** per watt

Hardware: 2018





- **Star Wars: The <u>Last</u> Jedi on Netflix**
- **Apple iPhone X is best seller**
- **Elvis lives!**
- **Solar cell costs <u>$0.34 per watt</u>**

Source: NREL, Q4 2017 / Q1 2018 Solar Industry Update May 2018

THE WHOLESALE PACKAGE COST YOU FOUND ON THE WEB

(A.K.A. DO-IT-YOURSELF SOLAR PACKAGE WITH BONUS VISIT TO THE E.R.)

SOLAR D.I.Y. PACKAGE COST

Hardware and Shipping Cost:	**$1.00 - $1.50 per watt**
Re-order cost because you accidentally destroyed some panels:	**$1.00 - $1.50 per watt**
Emergency Room Visit:	**$5.00 - $10.00 per watt**

THE INSTALLED COST PER WATT

(A.K.A. THE TURNKEY COST)

TURNKEY COST

"Installed cost per watt"

- Commercial Rooftop Fixed Tilt: $2.40 - $2.60 per watt
- Ground-mount Commercial Fixed Tilt: $1.90 - $2.40 per watt
- Ground-mount Commercial Tracking: $5.10 - $5.30 per watt
- Residential Rooftop Fixed Tilt: $2.50 - $4.00 per watt

CAVEAT: Non-scientific data!!! These are just recent quotes to cross my desk

tax cred·it

noun

an amount of money that can be offset against a tax liability.

Financial Tool: Federal Income Tax Credit

- 30% Fed. Energy Investment Income Tax Credit (the 30% ITC)
- 1 year carry-back, 20 year carry-forward period (26 U.S.C. §39)
- Extended at 30% through 2019, then tapers to 26%...22%...10%

www.mncerts.org/taxcredits

Accelerated Depreciation (MACRS)

- Cost of doing business expense taken as a tax credit
- 5-year Property Schedule (IRS Pub. 946)
- Depreciable <u>adjusted basis</u> is 85% of total cost (not 70% after the 30% ITC, hmmm…)**

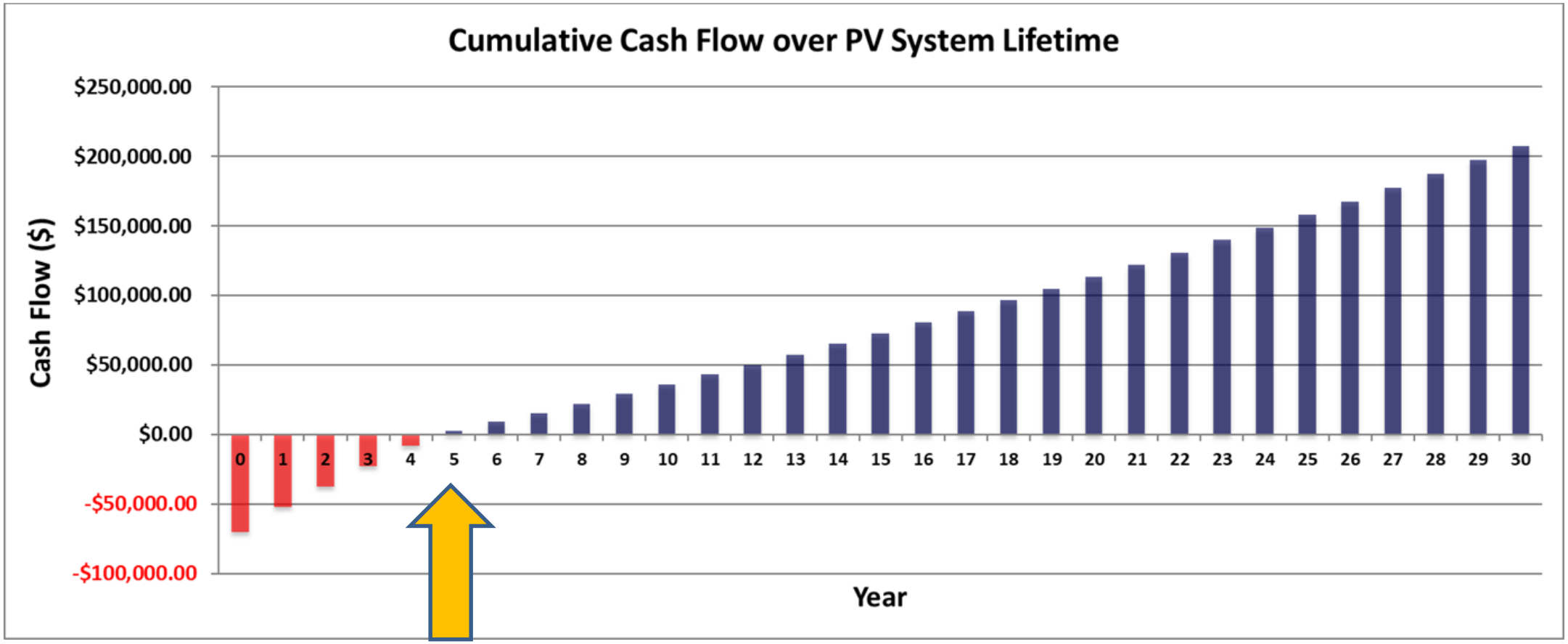
www.mncerts.org/macrs

**26 U.S.C. §50(c) (2018)

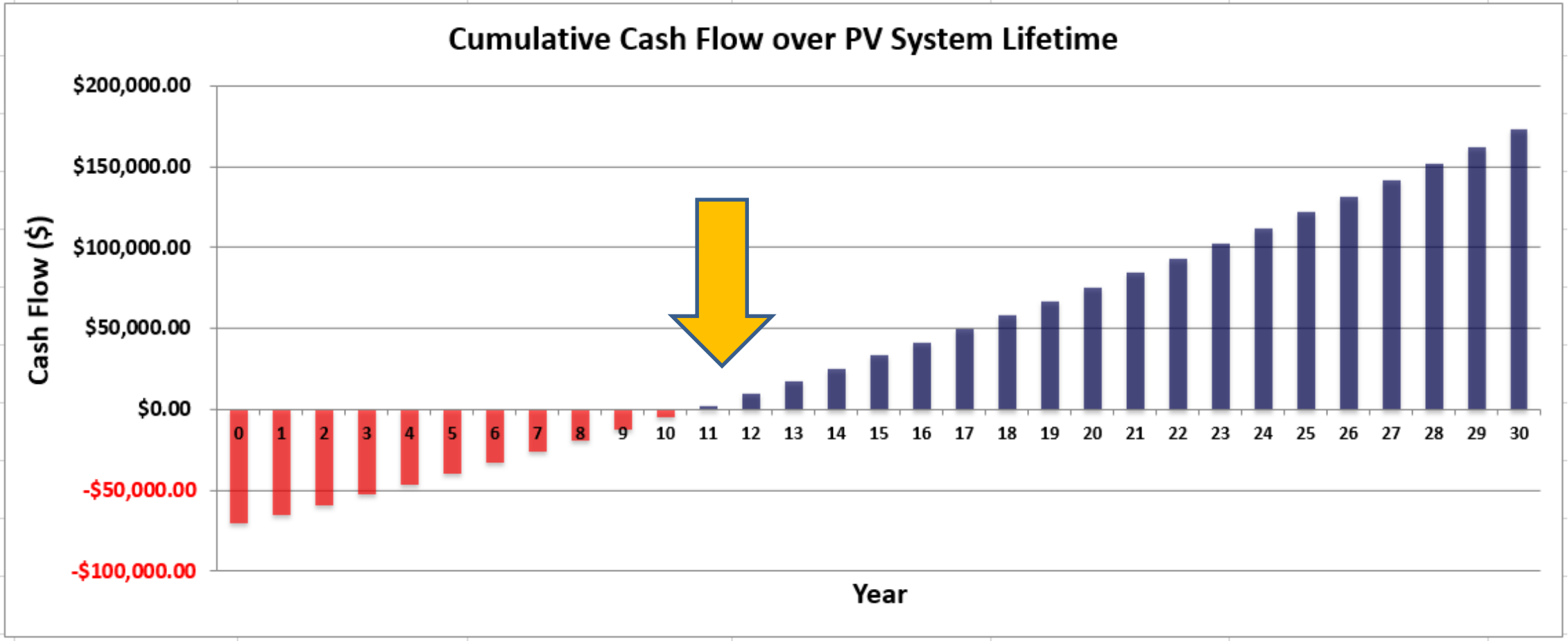
Example: 40 kW Array at $2.50/Installed Watt with $0.11 kWh utility rate

Initial Cost of PV System (Without Incentives)	$100,000.00	
Total Incentives	$30,000.00	(The 30% tax credit)
Net Cost of PV System After Incentives	**$70,000.00**	
First Year Utility Bill Savings	**$5,682.94**	
Number of Years to Equipment Cost Recovery	**5.0**	Years (This is the MACRS
Simple Payback	**12.3**	Years
Net Present Value (NPV) of PV System	**$79,678.55**	
Internal Rate of Return	**15.96%**	
Profitability Index	**2.14**	
Cumulative Cash Flow	**$207,514.97**	

30% Tax Credit & MACRS Depreciation

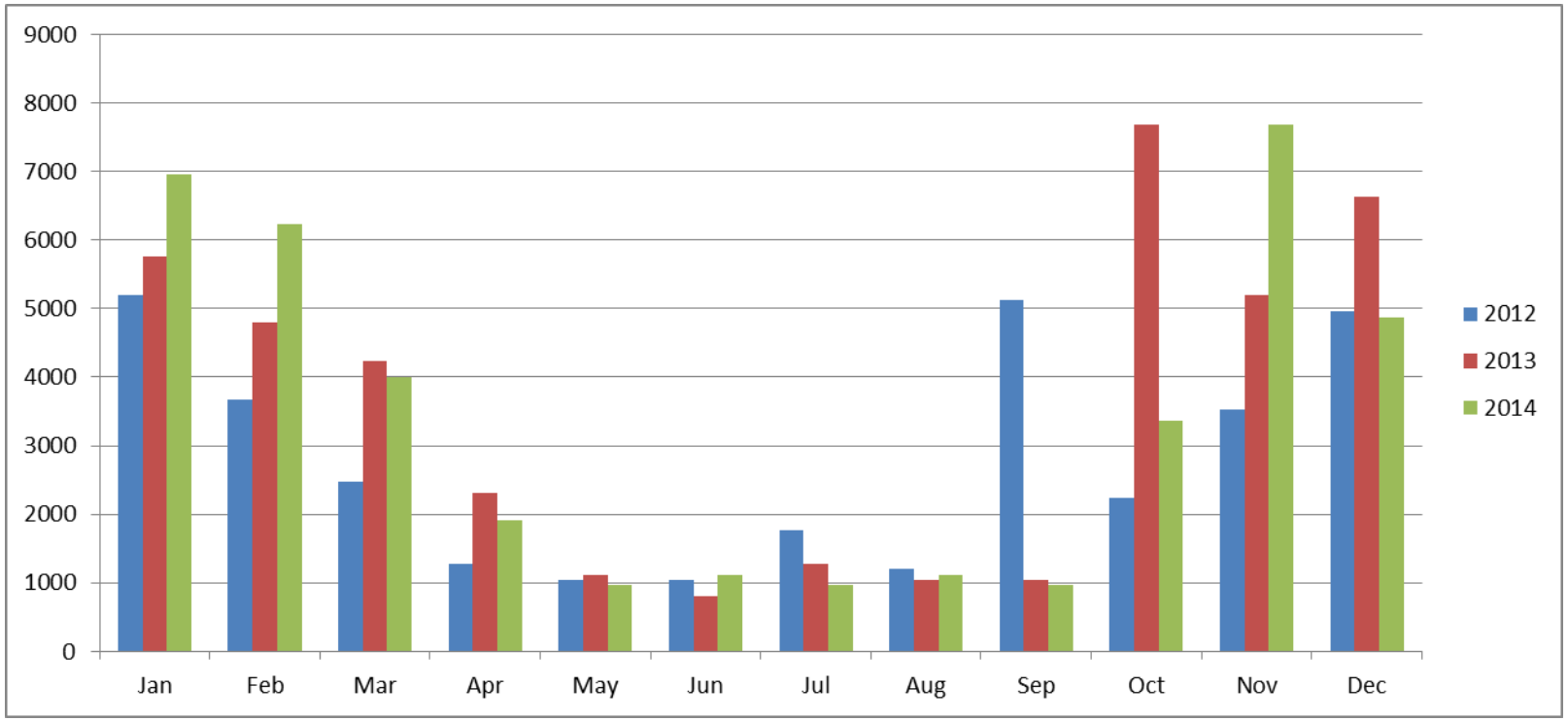


30% Tax Credit Alone



Sizing Up Solar

- Starts with a load analysis
- How much energy use? What's the goal? Budget?



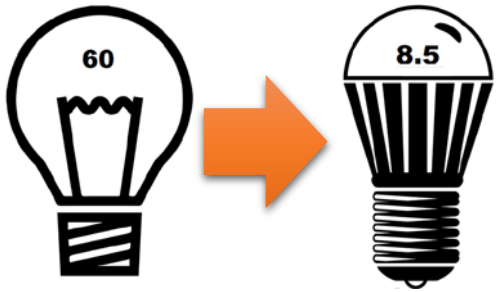
Efficiency first!

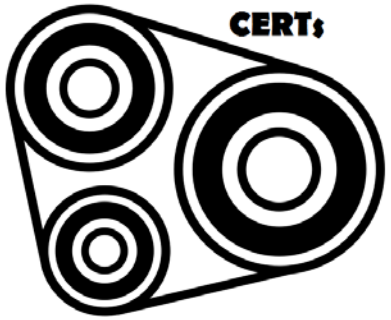
Benefits:

- Always the lowest cost option
- Every $1 invested saves $3-5 in a renewable energy project
- Reduce peak loads
- Easier to finance

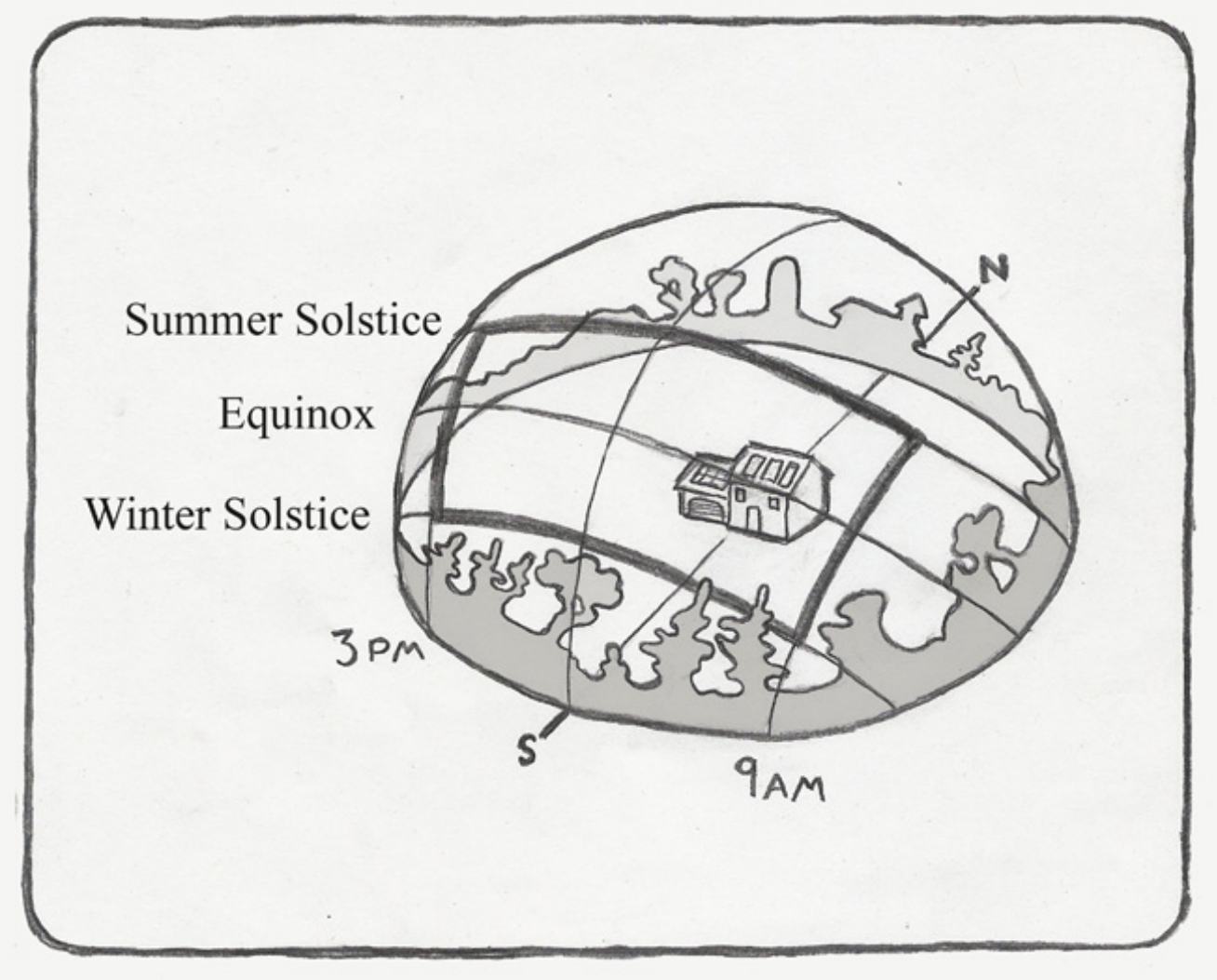
Opportunities:

- Mostly heavily-used lighting
- Basic fan and motor maintenance
- Occupancy sensors and timers
- Efficient Ventilation/ECM motors
- Behavior change



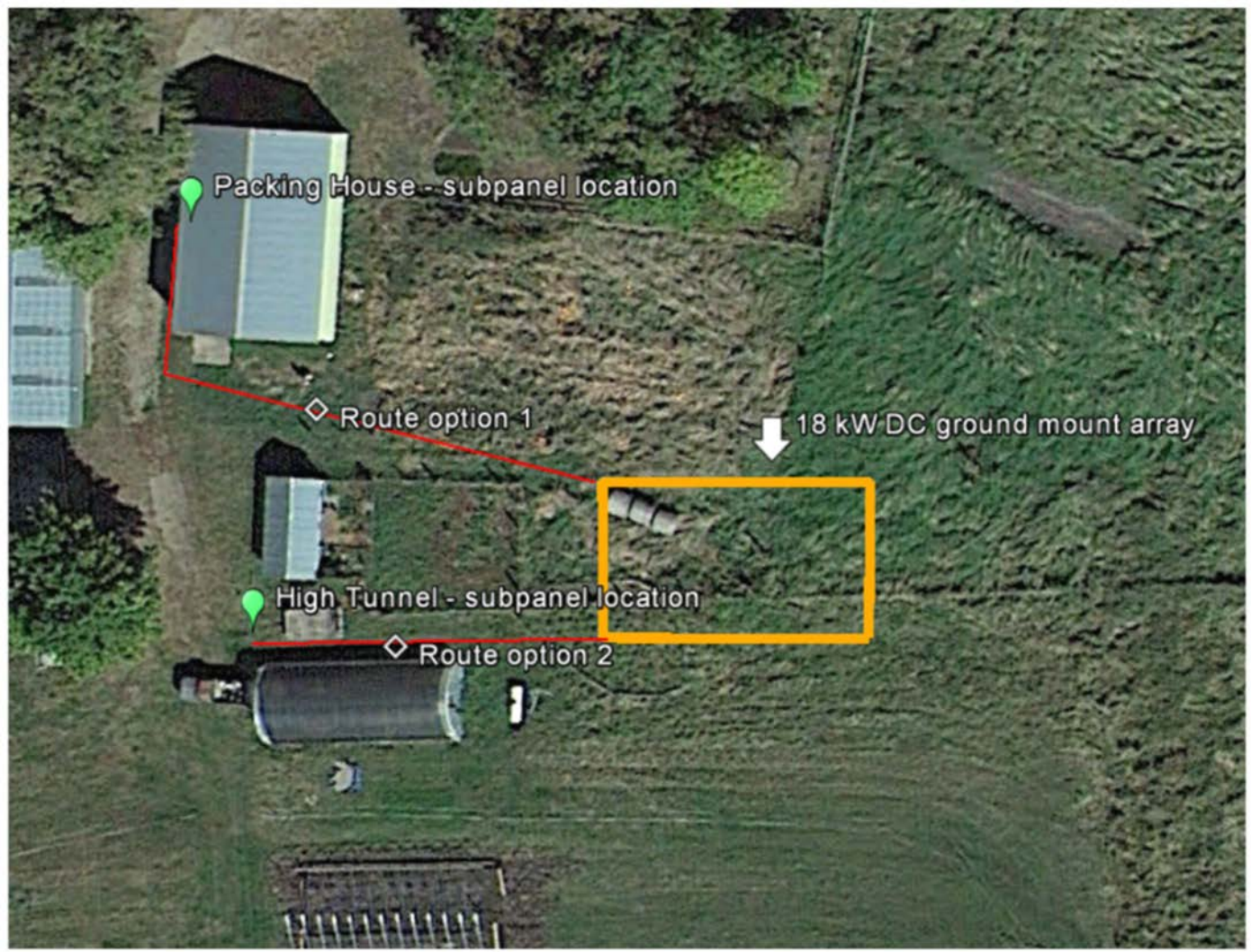


Solar Window



Source: Ramlow, B and Nusz, B. 2010. *Solar Water Heating: A Comprehensive Guide to Solar Water and Space Heating Systems*. Second Edition. New Society Publishers: B.C., Canada.

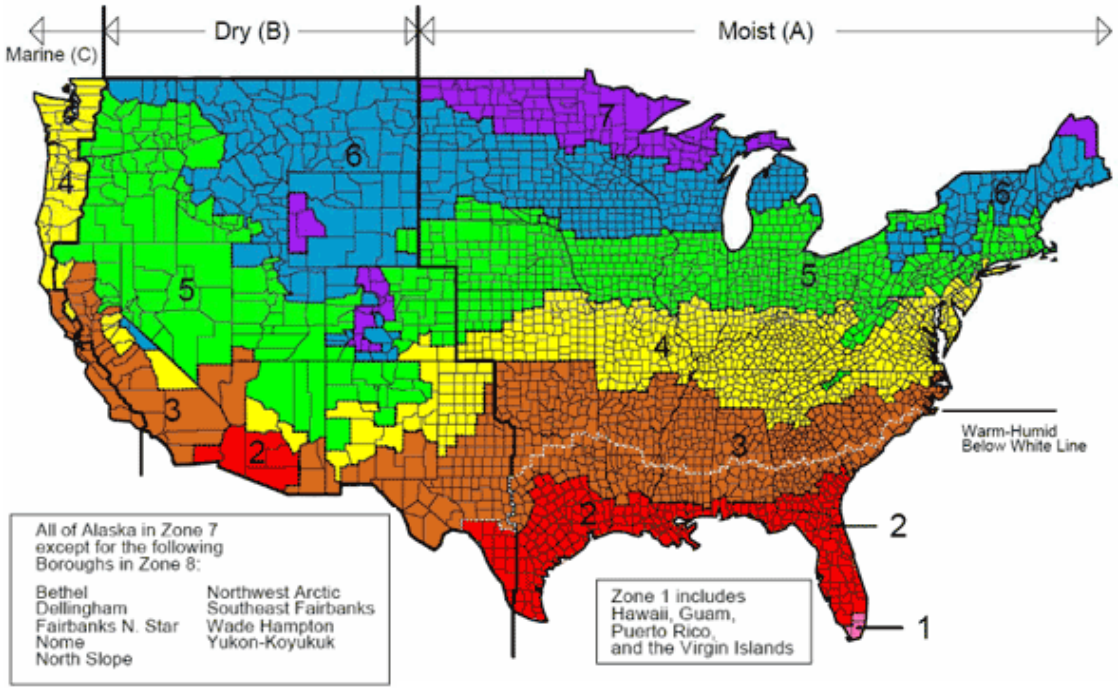
Access to a subpanel or the service drop



180° south or close

Structural Considerations

Snow load



Do not install solar on shingles that are 10+ years old!

Where to put it?

Ground: Unlimited square feet, less labor.

Less heat, easier maintenance

Photo Credit: Green Energy Products

Photo Credit: Farm Market News

Farm Electrical Infrastructure

- Bus bar spaces for hosting capacity
- NO fuses

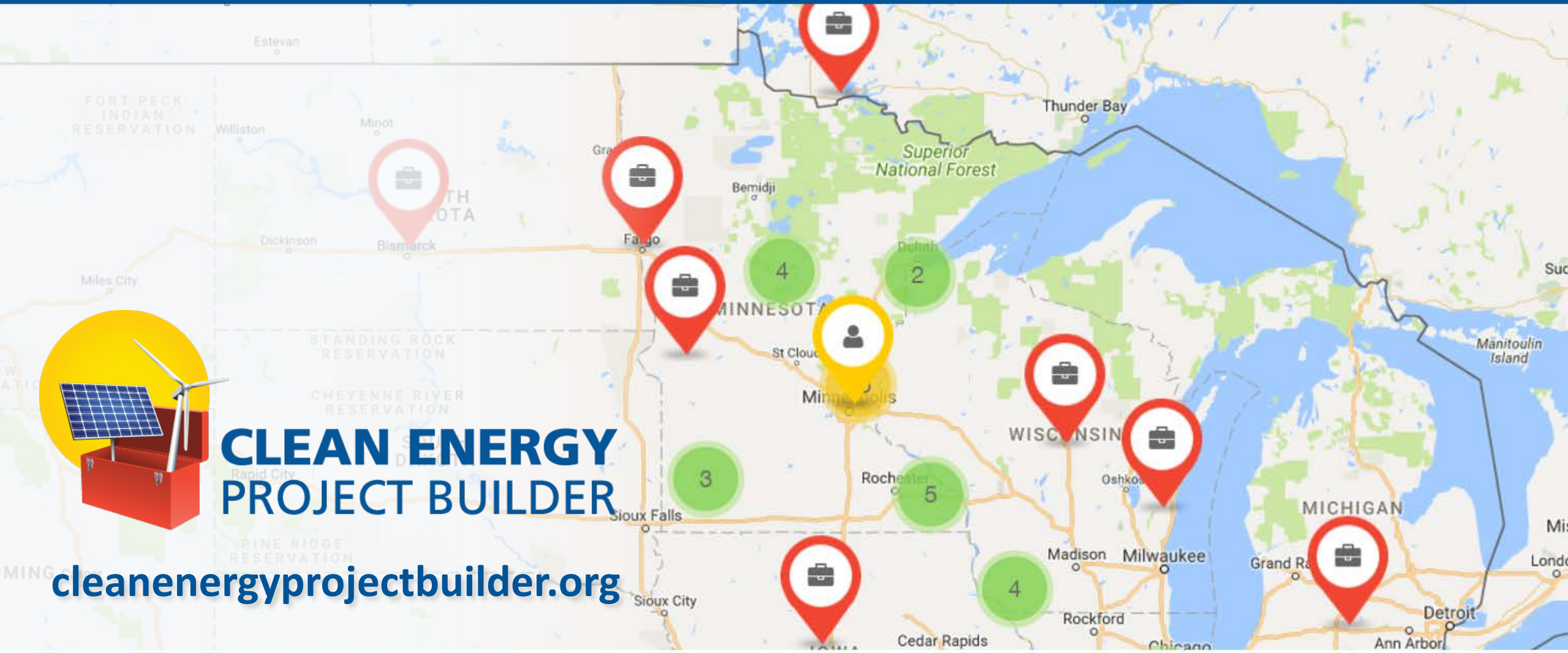
Source: Can[illegible]. "Fuse box." www.camelblog.com.; The Fu[illegible]mpany. "Fuses." www.thefuseco[illegible]net.

CLEAN ENERGY PROJECT BUILDER

HOME | COMPANIES | SOLAR GARDENS | AUDITORS | PROJECTS | RESOURCES | MORE

FIND COMPANIES

Company Name | Solar Installer | Zip Code (250 mi) | Search



CLEAN ENERGY PROJECT BUILDER

cleanenergyprojectbuilder.org

Net Metering

Communicate <u>early and often</u> with your electric utility

- Minn. Stat. § 216B.164 and Rule 7385 govern compensation
- Must meet Interconnection Standards

39.9 kW DC = Tennis Court

Grid Access Fee

Usually:

- **First 3.5 kW exempt**
- **$2.50-$3.50 per kW monthly**
- **Added to basic service fee**

Example: 10 kW – 3.5 kW = 6.5 kW x $3.28 = $21.32
plus $30 basic service fee = $51.32/mo

($35 cap in Agralite Elec. Coop)

Grant or Loan: USDA REAP

Grant Program:

- 25% of eligible project costs
- Labor, equipment, fees, permits
- October & March deadlines
- Competitive: 1 in 4 odds

Loan Program:

- Up to 75% backing of private bank loan
- Not competitive
- $5,000 minimum loan amount
- Rolling applications accepted

rd.usda.gov/reap

Eligibility:

- Farms
- Rural Small Businesses
- Rural Electric Cooperatives

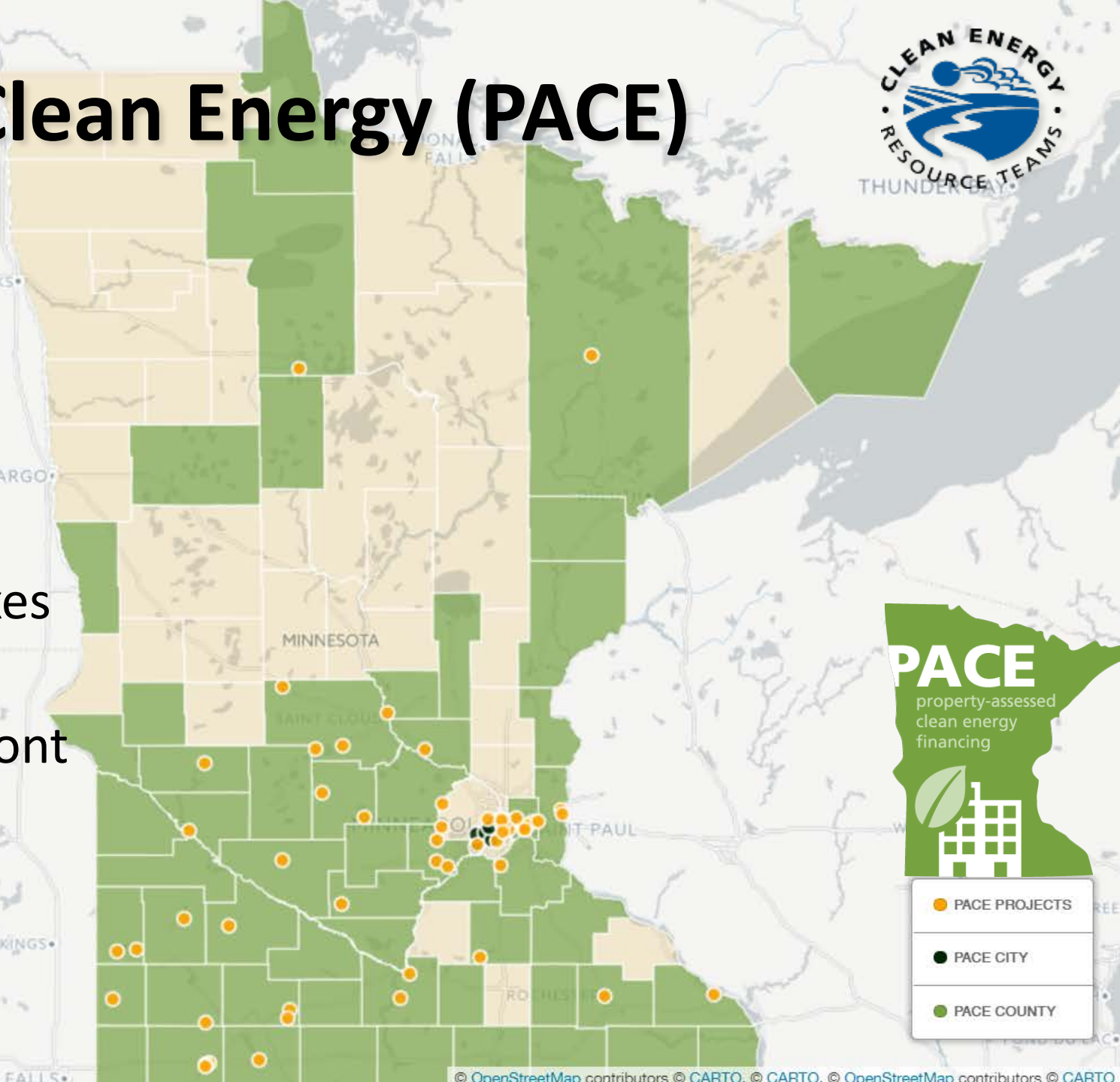
PACE FOR FINANCING

Property-Assessed Clean Energy (PACE)

Finance energy efficiency and renewable energy upgrades for commercial or agricultural property owners

- Project cost is repaid as a separate item on property taxes
- Eliminates the burden of upfront costs

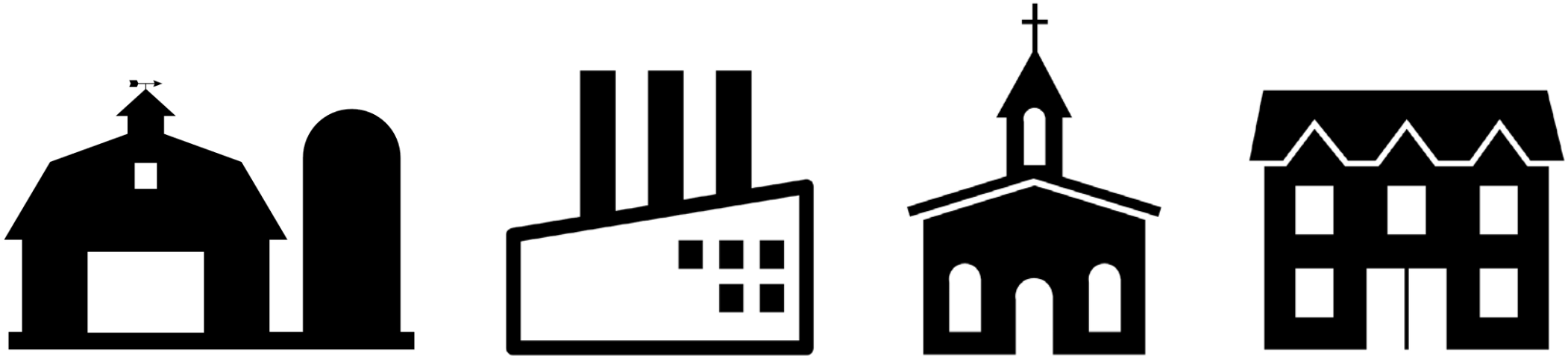
mncerts.org/pace



How does PACE work?

1. Landowner scope a project that reduces energy costs (site assessment or energy audit)
2. Following loan application approval (due diligence) St. Paul Port Authority provides financing to the landowner
3. County adds the property tax assessment to tax rolls
4. Landowner pays the assessment for up to 20 years

Qualifying Entities - PACE



Hurdles & Benefits

- **Hurdles**
  - **Financing limited to 20% of current assessed property value**
  - **Must be current on mortgage and property tax payments**
  - **Davis-Bacon Act may apply**
- **Benefits**
  - **Low origination fee**
  - **Cash flow positive**
  - **Job creator and maintainer**
  - **5% rate for 10 Year Term or Less**

Vectors Market

Want to Follow Up?

Fritz Ebinger

Program Manager – Rural Energy

Ebing007@umn.edu

612-626-1028