

# Community Energy Resilience

## Renewable Energy

# Solar and Wind Electricity

League of Women Voters  
Leelanau County

February 25, 2014

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# **The Three Myths About Solar and Wind Energy**

- There are not enough solar & wind energy resources**
- Solar & Wind energy costs too much**
- The technology is not ready**

# THE POTENTIAL OF RENEWABLE ENERGIES WORLDWIDE



Bundesverband  
WindEnergie e.V.

**hydropower**  
 $4.6 \times 10^{13}$  kWh

**biomass**  
 $152.4 \times 10^{13}$  kWh

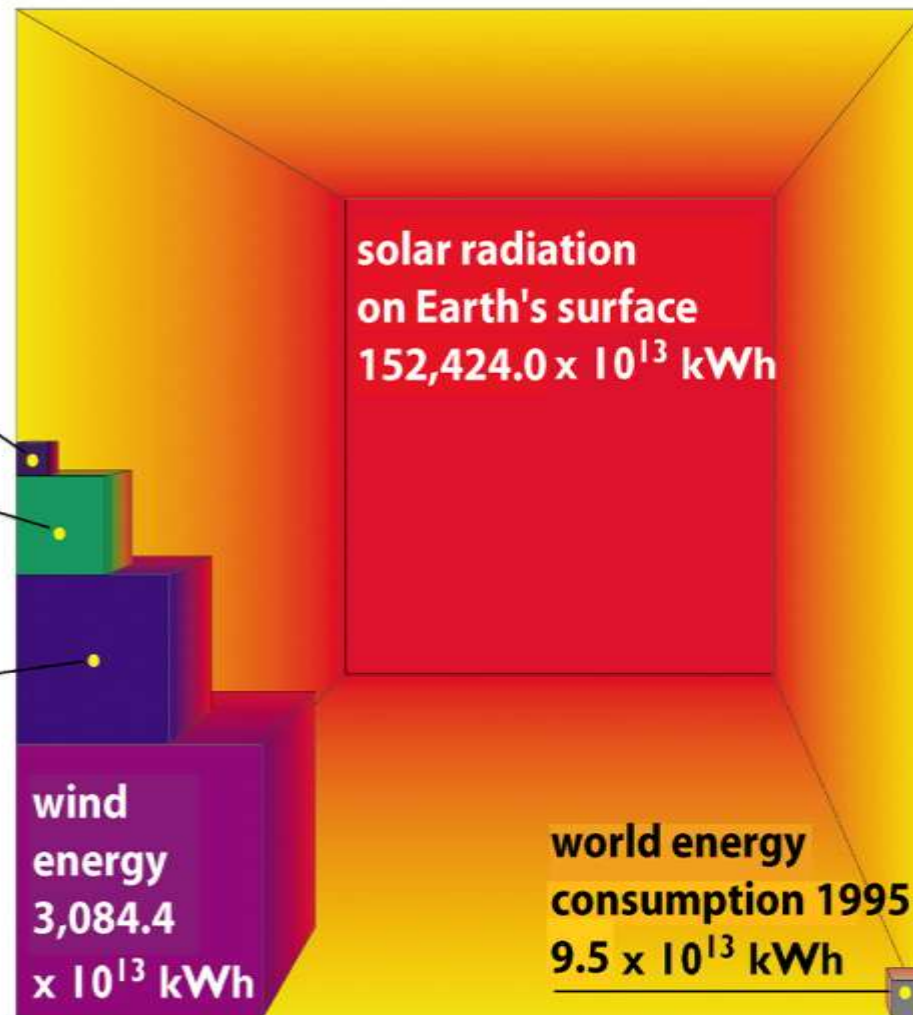
**energy of the  
waves & sea**  
 $762.1 \times 10^{13}$  kWh

Source:  
*Eurec.Agency/Eurosolar,,WIP:  
Power for the World – A Common Concept*

**wind  
energy**  
3,084.4  
 $\times 10^{13}$  kWh

**solar radiation  
on Earth's surface**  
 $152,424.0 \times 10^{13}$  kWh

**world energy  
consumption 1995**  
 $9.5 \times 10^{13}$  kWh



# Solar Energy:

## The Solar Resource in Leelanau County

- Annual solar energy falling on the county: 1 trillion kW-hrs/year (over 10 times the energy generation of the state).
- Capturing a tiny fraction of this can provide 100% net annual energy supply
- Average home electric use can be covered by 500 sq. ft. of solar panels (8,500 kW-hrs/yr, approximately \$85/month or \$1,000/yr electric bill)
- For Leelanau Township; Preliminary estimates are a 450 acre solar array would generate roughly 100% of net annual electric supply.

# Five Solar Electric System Types

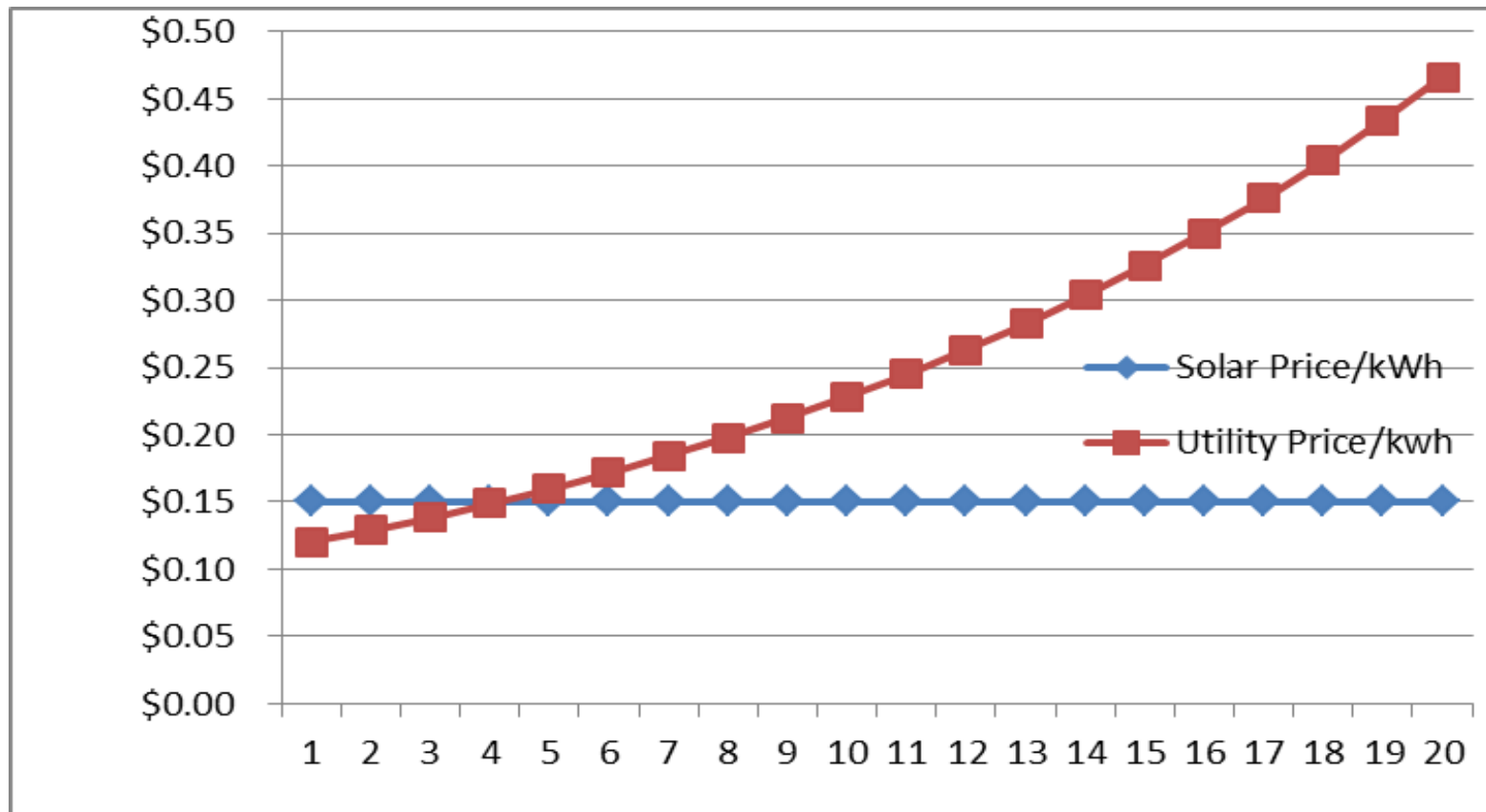
- Fixed Ground Mount
- Adjustable Single Axis Ground Mount
- Roof Top
- Building Integrated Solar Systems
- Dual Axis Tracking
  
- Plus:
  - Grid intertie with net metering + daytime solar back-up advanced technology
  - Off grid – with battery storage & back-up
  - Hybrid – on grid/off grid option

# Solar Electric Energy Costs

## With recent rapid cost declines:

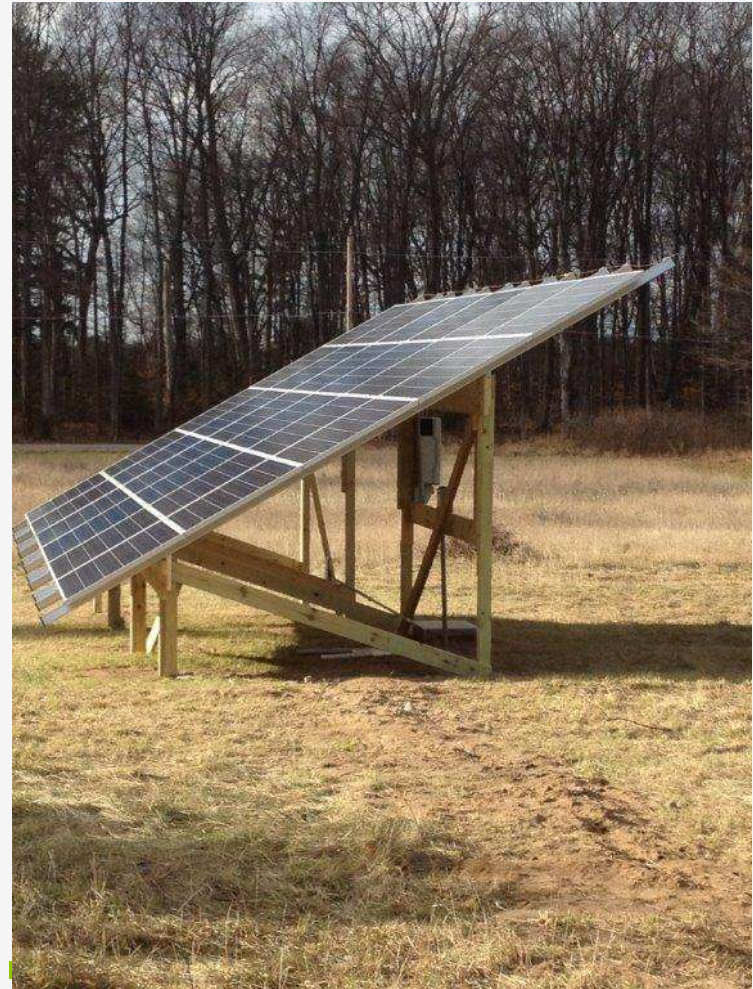
- Competitive with present electric prices – 10 – 14 cents per kW-hr, depending on site and application.
- Immediate positive cash-flow if financed in a mortgage or long-term loan
- 10% or more return on investment – one of the best retirement annuities available.

# Owning Solar Saves Money



- **Fixed Ground Mount**
  - Lowest installed cost if roof access is limited.
  - No moving parts or maintenance – virtually maintenance free
  - Easy snow removal for better winter performance
  - Any open unshaded area works
  - Wood or steel frame options

## Fixed Ground Mount





- Best production for limited space areas.
- Easy manual vertical tilt adjustment for each season
- Easy snow removal
- Winter tilt sheds most snow
- Flexible sizing options

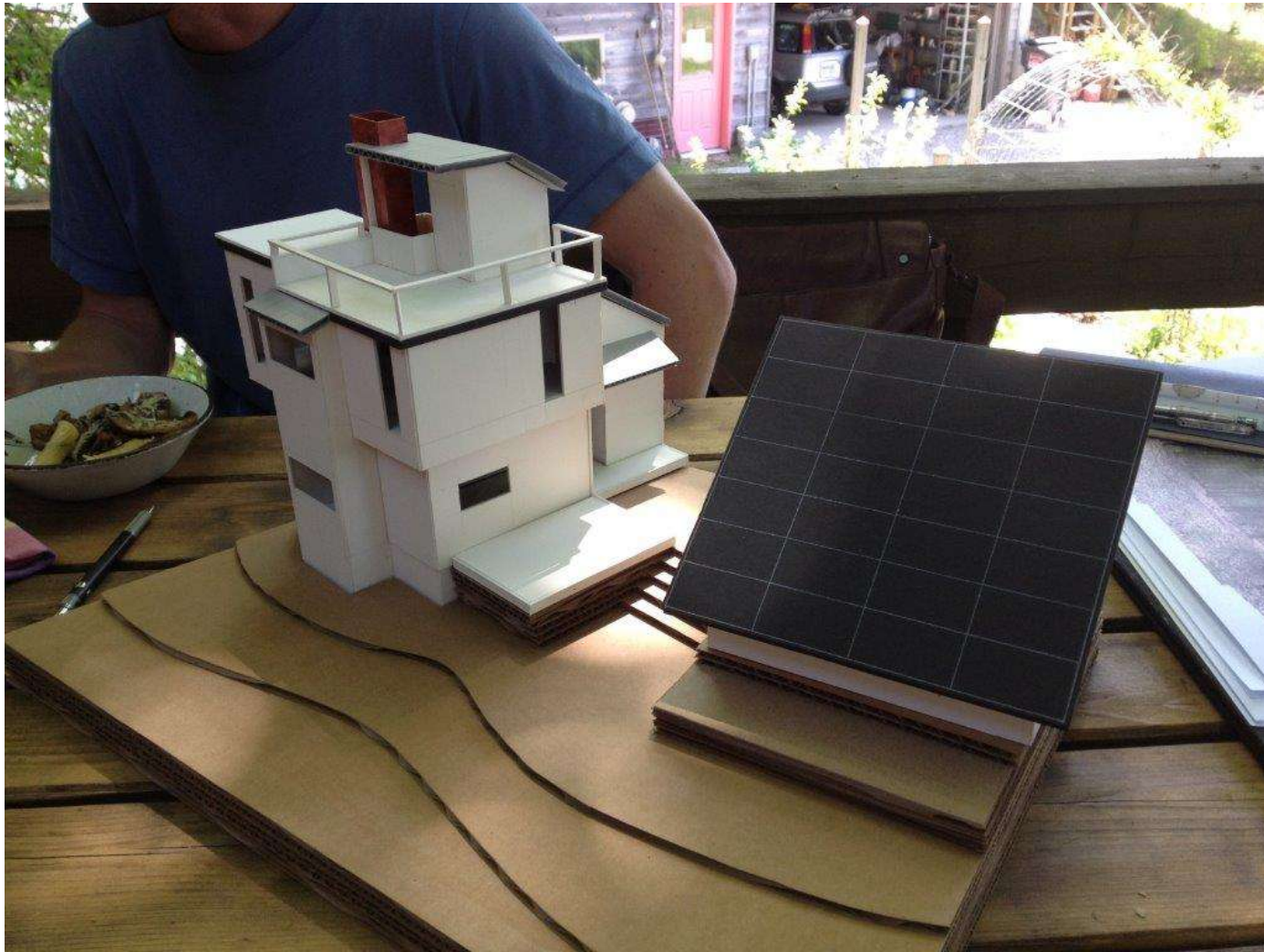
## Adjustable Ground Mount – Single Axis



# Roof Top Light of Day Organics



# Building Integrated Solar



# Dual Axis: Maximum Energy Generation When Space Available

- Most kilowatt-hours per solar array
- GPS control for orientation
- Internet daily production logging and reporting



# Wind Energy:

## Wind Energy Resources

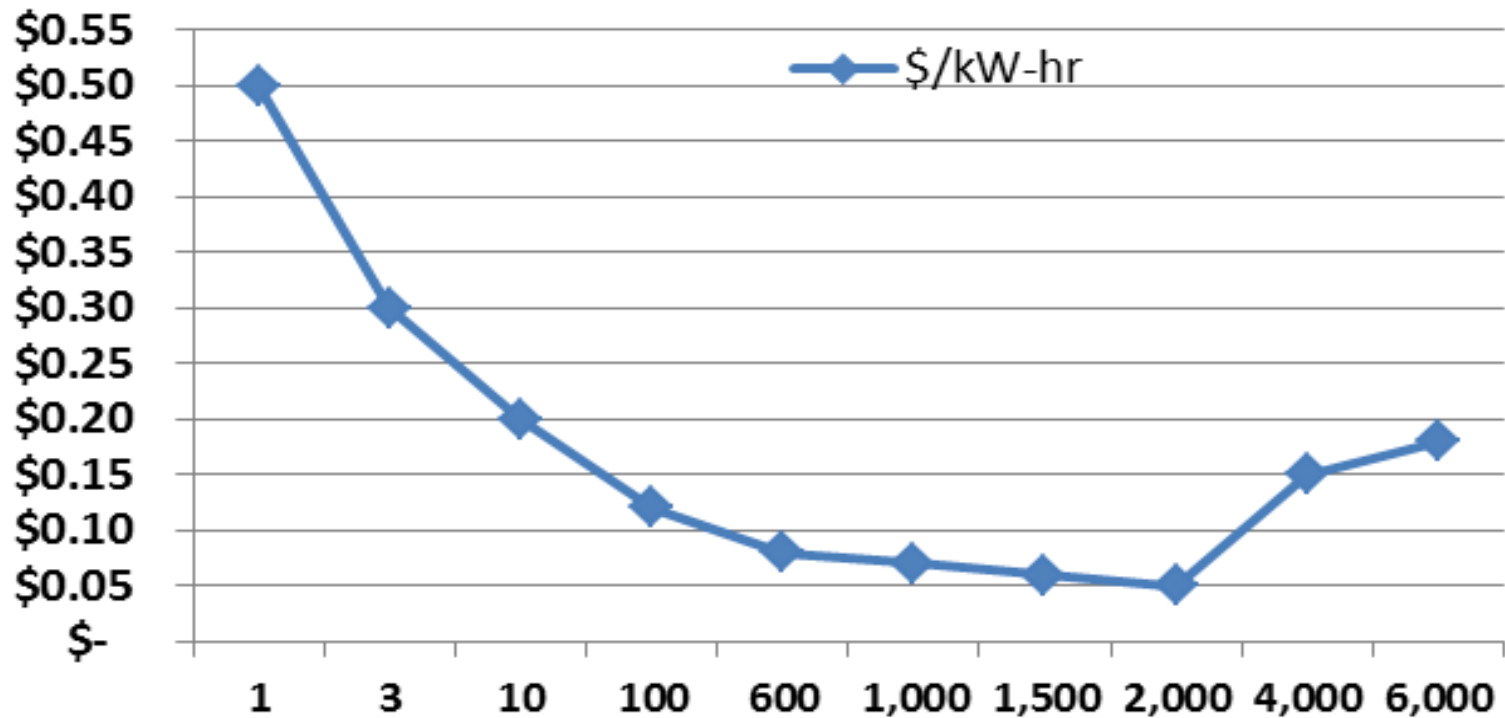
- Extensive studies show excellent wind energy resources
- Depending on size, 4 to 8 wind turbines per township, appropriately located can make the county 100% wind powered

# Wind Energy Costs

- Recent technology advances make commercial wind power the lowest cost new electric generation
- The trend toward large rotor diameters and tall towers have lowered the cost to 4 – 6 cents per kW-hr, depending on the site
- With high capacity factors (40% – 60%) using “low specific power-high specific area wind turbines, the need for expensive storage and transmission capacity is reduced. This lowers overall cost further.

# Wind Energy Costs: Size Matters

## Wind Energy Costs By kW Size



# Wind Energy Logistics

## 83.5 m (275 ft.) Danish blade heading to Samsung - Korea





## Case Study:

Leelanau Community Energy, LLC Wind Project at  
Northport-Leelanau Township Waste Water Plant;  
First Michigan community wind project - 120 kW wind  
turbine supplying 50% of energy for waste water plant



- **Micro inverter PV's**

**Case Study:  
Doug & Ann  
McInnis 7.7 kW  
Solar Electric**

**\$261 Credit on  
electric utility  
bill**



## Case Study:

# Phil & Barb Voigtlander: Solar- Plug-in Hybrid Car

Micro-inverter Solar PV

Plug-in Hybrid



# Case Study: Garthe Farms – Adjustable Array

- 13.7 kW Solar
- 18,000 kW-hrs/year
- 80% of Annual electric consumption
- 25% REAP Grant
- Cost before incentives: \$2.70/watt
- Cost after incentives; \$1.40 / watt



# Case Study:

## Brengman Brothers Crain Hill Vineyards – 100% electric HVAC and power

- Three – 6.24 kW “All Sun” dual axis tracking systems for total of 18.72 kW DC peak output.
- 72 solar panels at 260 watts each
- Three 6000 watt (6 kW) SMA “Sunny Boy” DC to AC inverters (18 kW total) direct grid intertie
- Estimated annual production – 30,000 kW-hrs
- Cost: \$3.75 / watt or \$2.30 / kW-hr/yr (without incentives)
- \$2.60 With Incentives
- \$2.00 / watt with REAP Grant



# Case Study: Gallery/Lavey Residence

- 2 kW windmill
- 4.9 kW Solar PV
- 100% wind and solar electric power
- Zero annual electric payment to utility (\$266 credit on October bill)

0007472311



Cherryland Electric Cooperative

A Touchstone Energy Partner  
5930 US 31 South  
PO Box 500  
Grawn MI 49637-0500

Office Hours: Monday - Friday 7:30 to 4:00  
Questions, Concerns and to Report an Outage call  
231-486-9200 Local Traverse City Exchange  
1-800-442-8616 Toll Free  
Fax: 231-486-9404 Web address <http://www.cherrylandelectric.com>

7868 1 AT 0.384 4 7868  
MICHELE LAVAY C-24 P-25  
THOMAS GALLERY  
6360 N CHRISTIANSON RD  
NORTHPORT MI 49670-9739



Billing Date	10/23/2013	Account Number	7472311
CREDIT - DO NOT PAY		Current Amt Due Date	11/20/2013
Amount Due After Due Date		Amount Due	Credit Bill
Service Address 6360 CHRISTIANSON RD			

**\*\* COOPERATIVE NEWS \*\***  
QUESTIONS ABOUT THE  
MI LOW INCOME ENERGY FUND CHARGE?  
SEE CHERRYLANDELECTRIC.COM FOR DETAILS.

Historical Usage Comparison Provided on Back of Bill

Account #: 7472311 Line and Pole #: LL1 163A 1N

Page 1 of 1

Rate Meter #	Previous Meter Reading Date	Reading	Reading Type	Ending Meter Reading Date	Reading	Reading Type	Energy Used	Totals
BEGINNING BALANCE								-200.75
PATRONAGE CAPITAL								-55.23
B01 FARM AND HOME SERVICE								
101417418	09/20/13	13836	ACTUAL	10/20/13	14056	ACTUAL	220 KWH	
			ENERGY CHARGE		X 0.109800			24.16
NBQ-A NET EXCESS GENERATION-PES								
101417418	09/20/13	9809	ACTUAL	10/20/13	10281	ACTUAL	472 KWH	
			ENERGY CHARGE		X 0.109800-			-51.83
AVAILABILITY CHARGE								15.00
SALES TAX								1.57
MI LOW INCOME ENERGY FUND								0.99
PSCR ADJUSTMENT @ 0.00000/KWH								0.00
CURRENT CHARGES								-10.11
TOTAL AMOUNT DUE								-266.09

CHANGE OF ADDRESS ON BACK      SEE BACK FOR ADDITIONAL INFORMATION      RETURN THIS PORTION WITH YOUR PAYMENT

IF PAYING BY CREDIT CARD: AMOUNT PAID \_\_\_\_\_

CARD # \_\_\_\_\_

EXPIRATION DATE \_\_\_\_ / \_\_\_\_

SIGNATURE \_\_\_\_\_

Current Amount Due Date	11/20/2013	Account Number	7472311
Account Name		MICHELE LAVAY	
Amount Due	Credit Bill	A late fee will apply to past due balances	
Payment Amount Enclosed:			

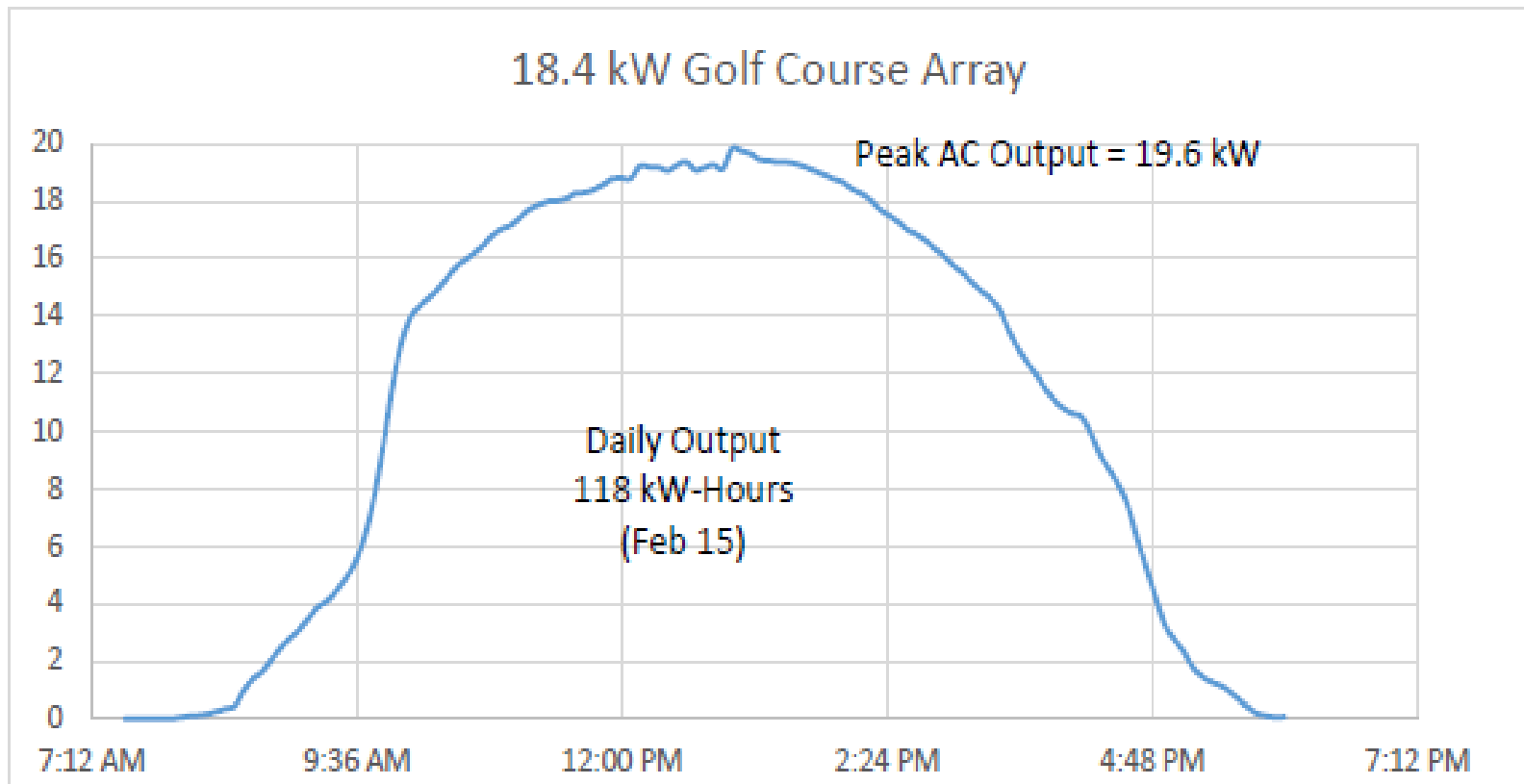
# Case Study: Northport Creek Golf Course

- First 100% Solar Powered Golf Course in Michigan
- 62 kW Solar PV
- 196 solar modules on 16 adjustable arrays – 49 kW for irrigation and water pumping
- Two, All Sun Solar Trackers 13 kW, at club house for golf cart charging, etc.



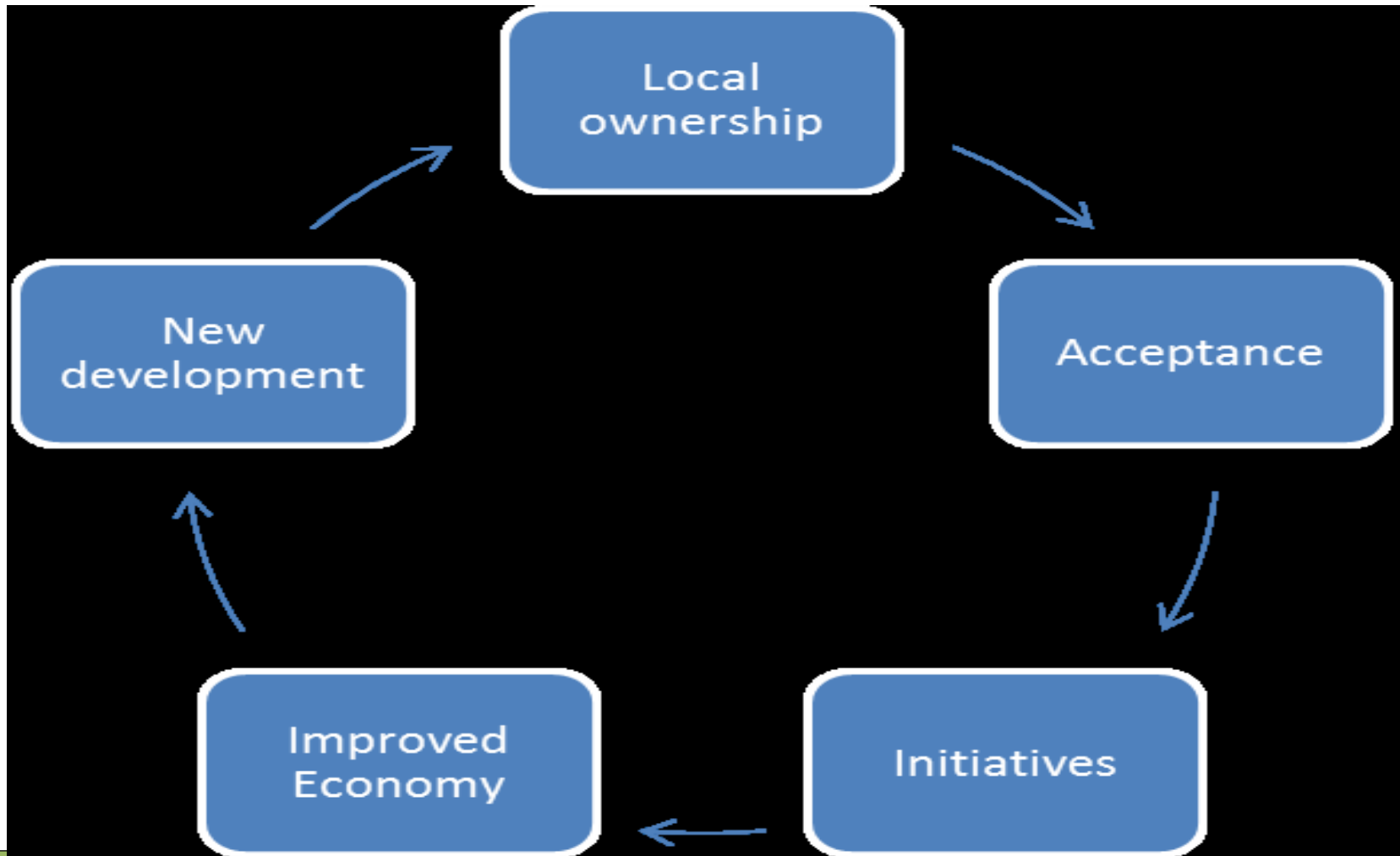
# Solar Works! Even in the Winter

## Array producing 108% of rated output





# Community Resilience can be built with renewable energy and local ownership!



**Thanks for listening 😊**