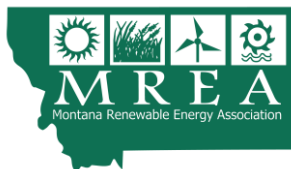


# Solar-Ease Workshop

March 7, 2018

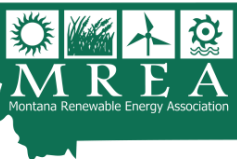


# Montana Renewable Energy Association

## Mission & Focus areas:

- Education and Outreach
- Policy and Advocacy
- Industry Engagement

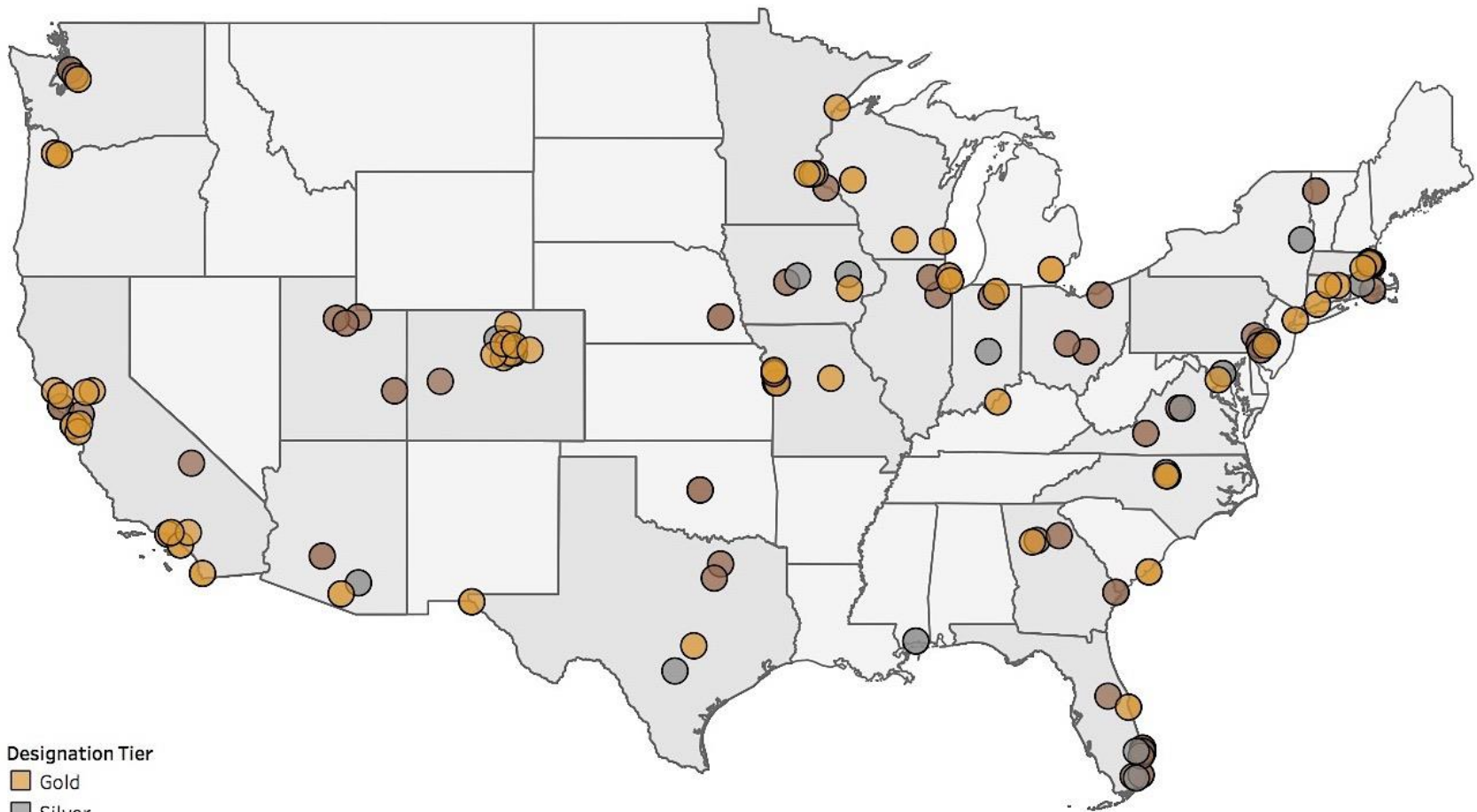
[www.montanarenewables.org](http://www.montanarenewables.org)



# SolSmart

- “Solar Ready” communities – making process of going solar easier
- Focuses on “soft costs” (non-hardware)
  - Permitting and inspection
  - Fees and overhead
  - Planning and Zoning
  - Utility outreach
  - Contractor education
  - Consumer education
- Whitefish, Helena, Missoula County, Missoula, Bozeman, Red Lodge, *Great Falls*





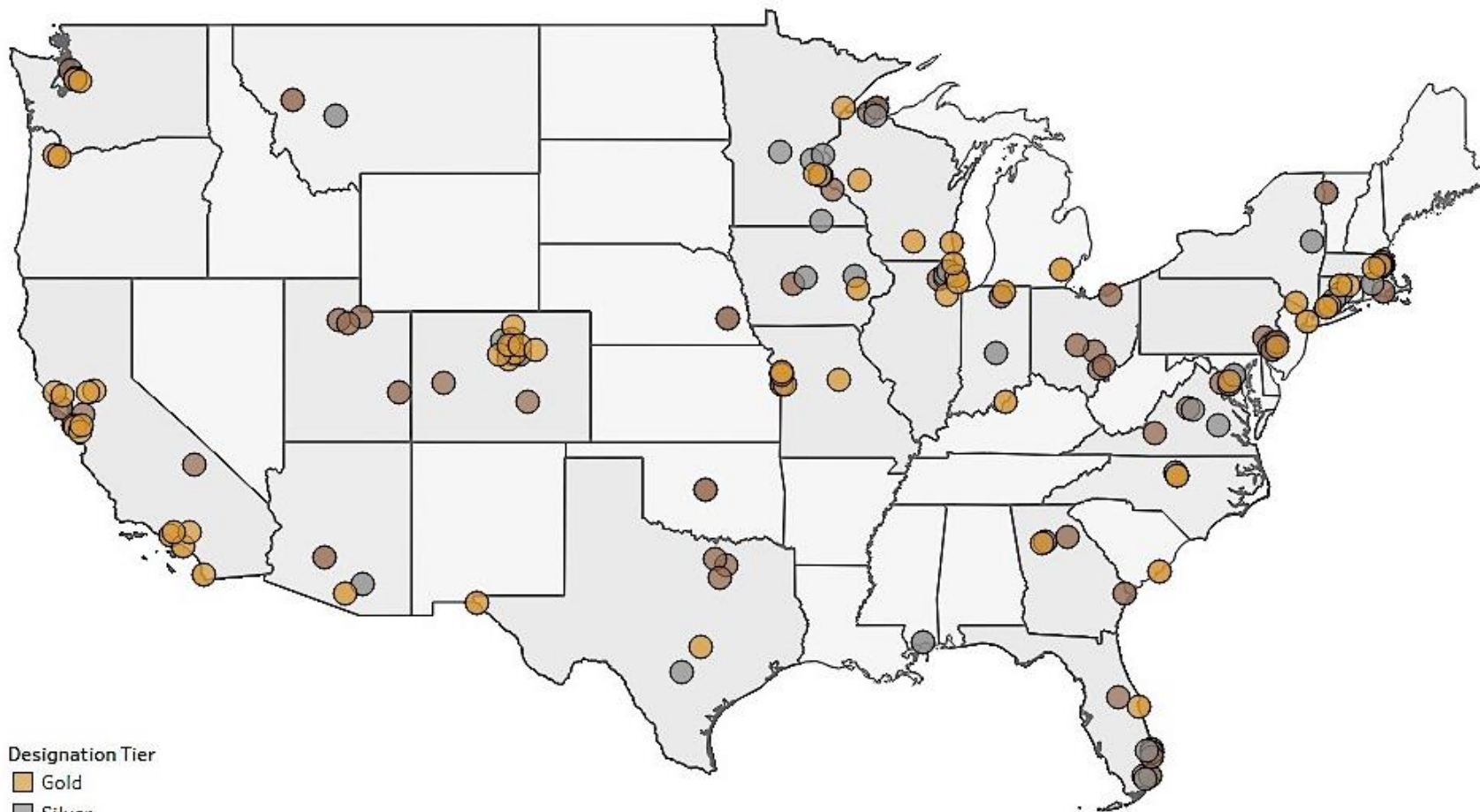
Designation Tier

- Gold
- Silver
- Bronze

Since 2016, 100+ designees  
SolSmart goal: 300+ by October 2019







Designation Tier

- Gold
- Silver
- Bronze

City of Helena – Silver Designation  
 Missoula County – Bronze Designation  
 City of Missoula – Silver Designation



# Montana's Solar Landscape

- Small, rooftop systems: ~ 8.5 MW since 2000
- Shared solar by CoOps: ~ 500 kW since 2015
  - 1<sup>st</sup> in Montana: Flathead Electric's SUN Community Solar, 101 kW
- Utility scale solar: 17 MW, in 2017 alone
- Today: ~26 MW of installed solar capacity

Solar today:  
**< 1%** of MT electricity

Rooftop solar potential:  
**28%** of MT electricity needs  
(NREL 2016)

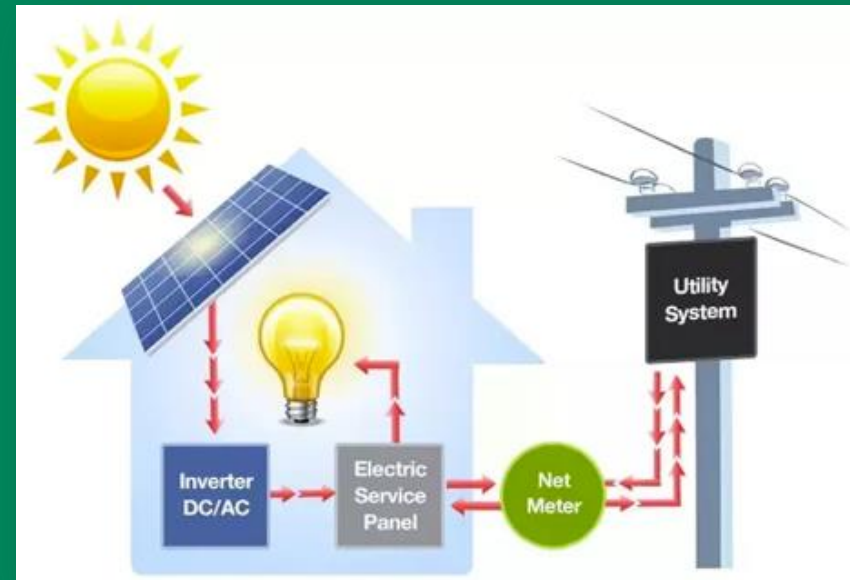


*Photo Credit: Flathead Electric Co-op.*

# Net Metering

*On-bill credit for excess energy exported to grid*

- System cap
  - Flathead: 50 kW
  - Glacier: 10 kW
  - Lincoln: 25 kW
- On-bill credit: retail rate
  - kWh :: kWh exchange
- Aggregate net metering
- Excess credits
  - Flathead: accumulate indefinitely
  - Glacier: true-up on December 31
  - Lincoln: true-up on March 31



# Shared solar?

- Buy “share” of a larger array
- Just as if array were on your home
- Co-ops leading the way





# Solar Tariffs

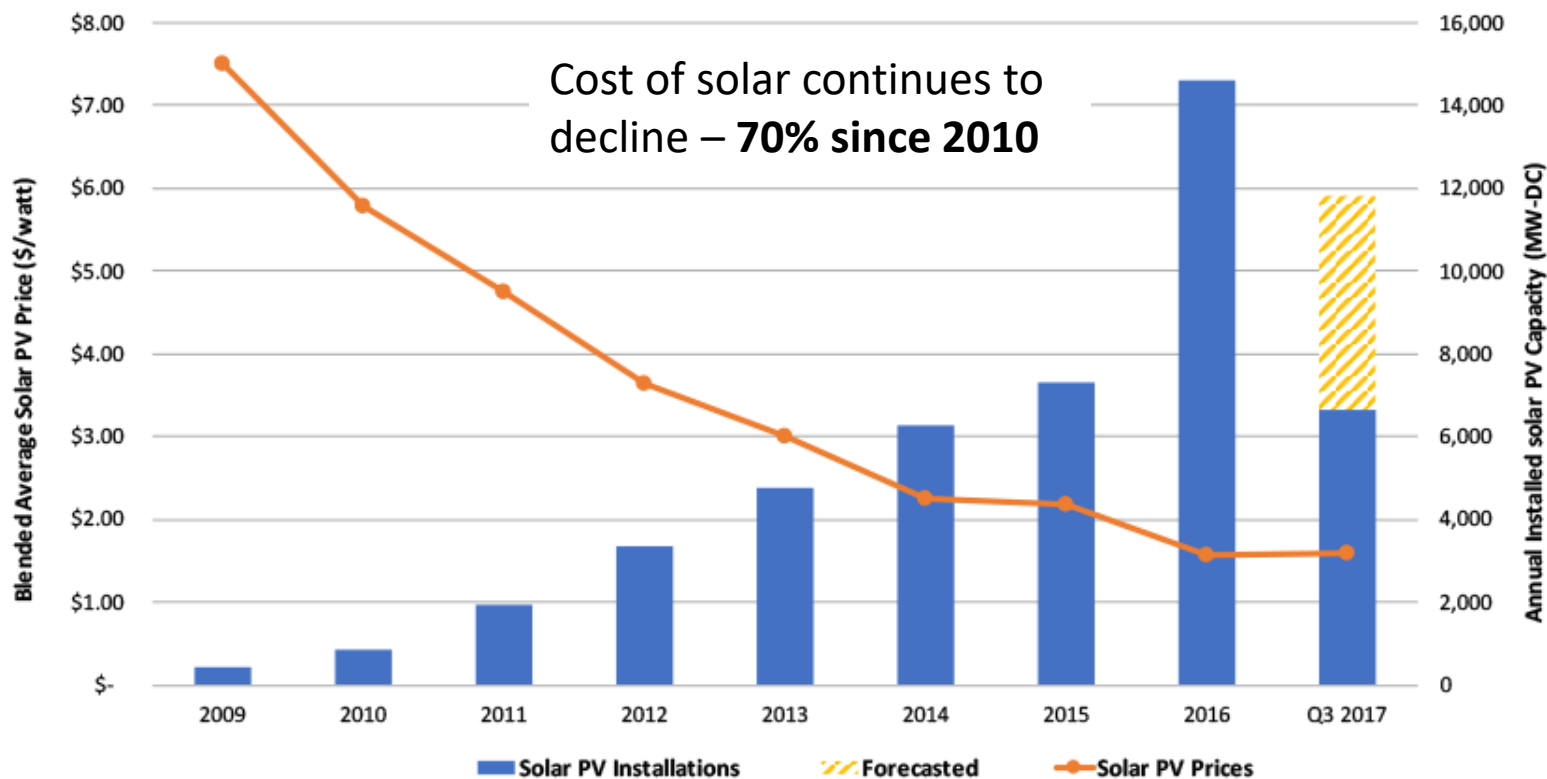
- **January 2018:** President sets 30% tariff on imports (~ \$0.10/W) following USITC petition and ruling
- **Impacts:**
  - artificial price increase sets industry back
  - curtails business expansion
  - utility scale hit hardest



Yet another political speed bump for solar:  
ITC sunset, State NEM Policies, attacks on state incentives, etc.

**BUT: This is not the end of the solar industry!**

# Solar Tariffs



© 2017

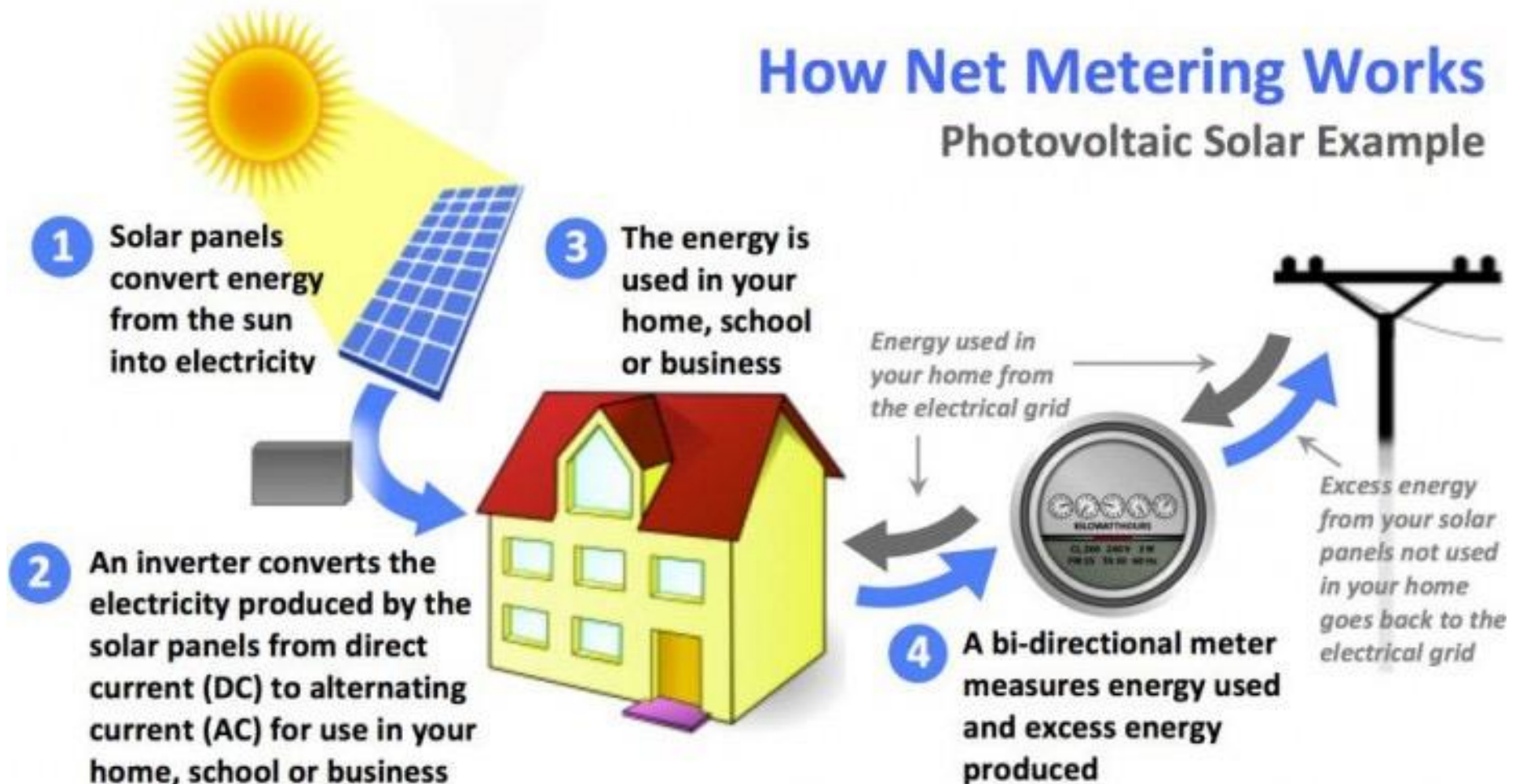
gtmresearch

SEIA  
Solar Energy  
Industries  
Association®

# Why Go Solar?

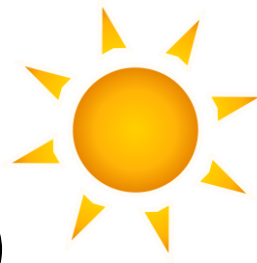


# Solar Energy & Net Metering





# Solar Panels



- Typical size: 65 inches (5' 5") by 39 inches (3' 3")
- E.g., 10-panel system: ~ 11' high by 16' wide



- Typical panel: **265 watts** (also 210, 280, 320 W)
- 10 panels X 265 watts = 2,650 watts or **2.65 kW** system

# Installations



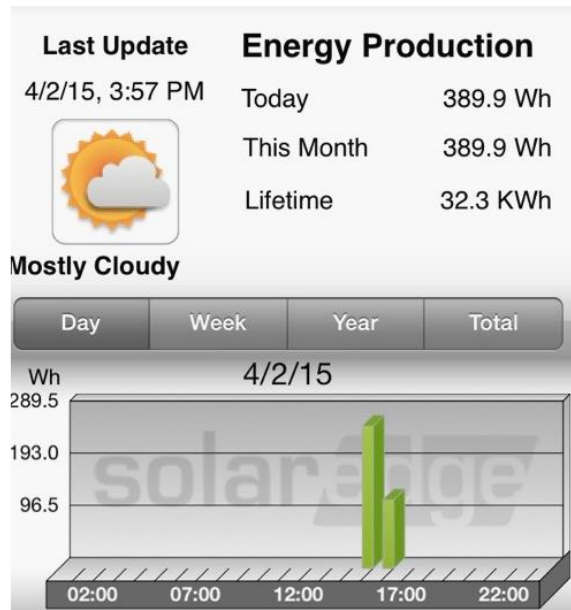
# The Ecstasy of Information

8 kWh net! 18.7 produced today!



Sorry, you must be sick of me nerding out over this, but I can see what each individual panel is producing...

891.5 Wh	860.75 Wh	880.25 Wh	866 Wh	881.75 Wh
1.0.5	1.0.1	1.0.9	1.0.7	1.0.4
873.5 Wh	883 Wh	869.5 Wh	863.25 Wh	877.75 Wh
1.0.2	1.0.3	1.0.8	1.0.1	1.0.6



MISSOULA, MT 59802-2615

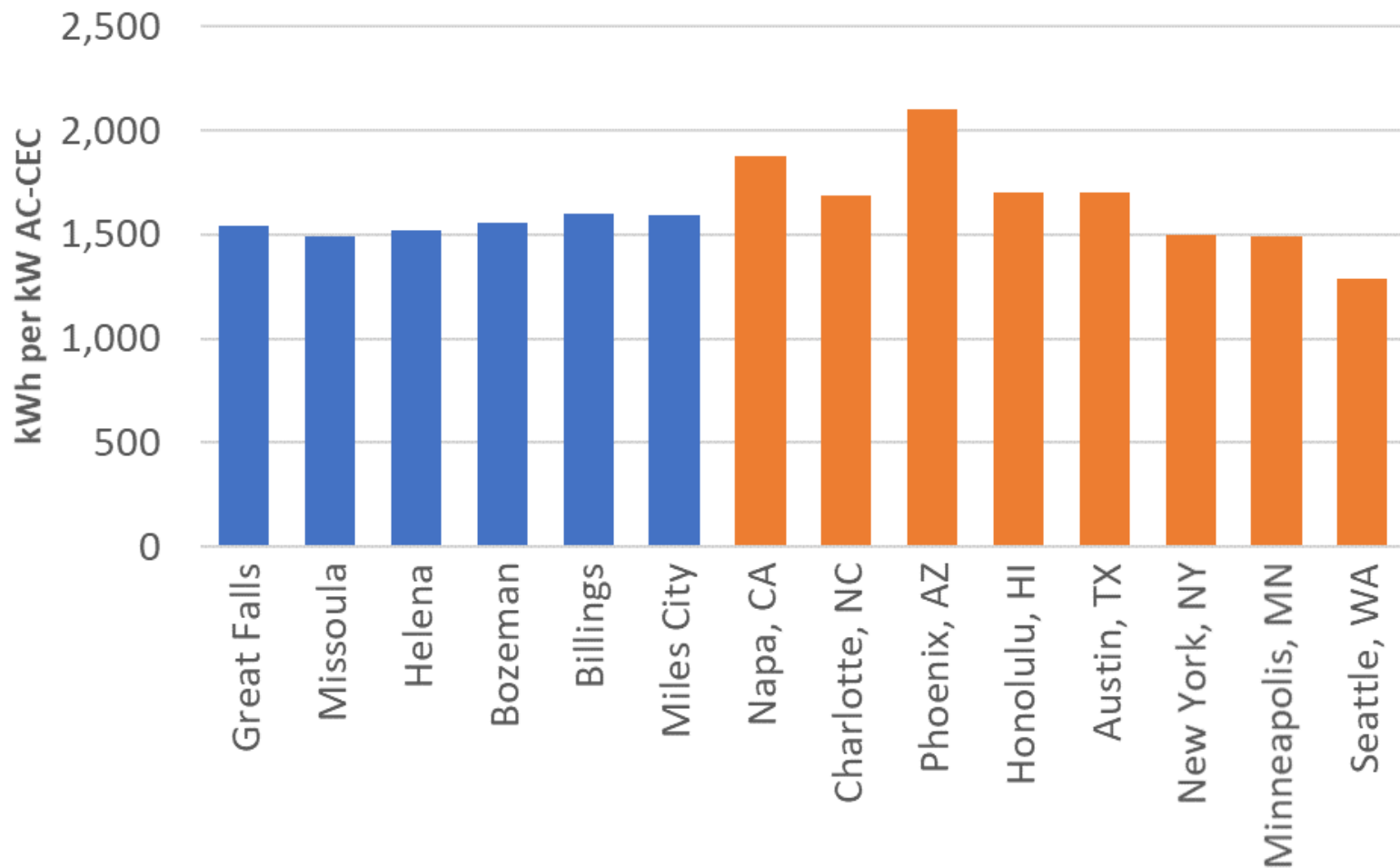
Usage Graph Usage History

Select a date to view a bill.

Bill Date	Usage	Unit of Measure
05/18/2015	0	kWh
04/16/2015	404	kWh
03/17/2015	542	kWh
02/16/2015	615	kWh
01/19/2015	846	kWh



# Ten-year average solar production in selected U.S. cities



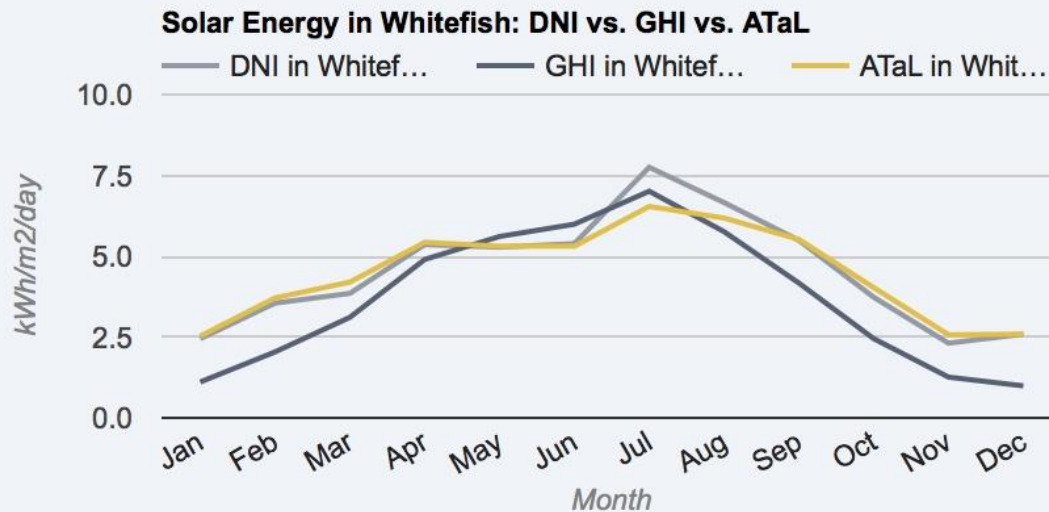


# Solar Potential in Whitefish



## Solar Energy Data in Whitefish, MT

See the chart below to see how **different types of solar panel installations compare in Whitefish.**



\* Amounts listed in kWh/m2/day (kilowatt hours per square meter per day).

\* See glossary & definitions below.

Can solar power work in Kalispell?

Yes. Flathead Electric Cooperative members are adding solar power each year. Even as far north as we are, our area receives similar solar exposure to Germany, the world's leader in solar energy. We have had a small residential size solar array at our headquarters since 2009 demonstrating that solar works in our service territory.

- from [solarenergylocal.com](http://solarenergylocal.com)

# Power from the Sun!

## Solar Energy, Missoula Style



## Simple path:

- Attend workshop
- Contact local installer
- Free site assessment
  - ✓ physical installation
  - ✓ your energy usage
- Cost & financing options
- Sign contract
- Go solar!



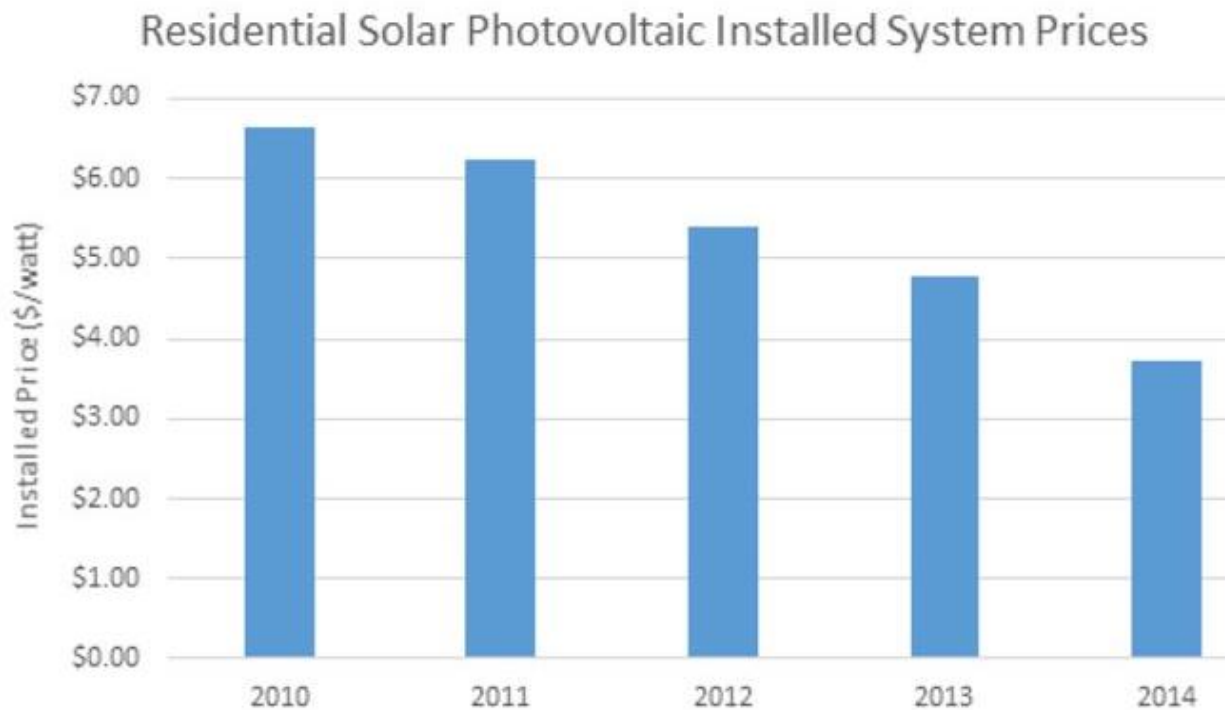
# Installer Qualifications

- NWE Qualified Solar PV Installer
- Local experience
- California SB1 eligible equipment
  - <http://www.gosolarcalifornia.ca.gov/equipment/index.php>
- Licenses and insurance
- Equipment and workmanship warranties
- Reference checks

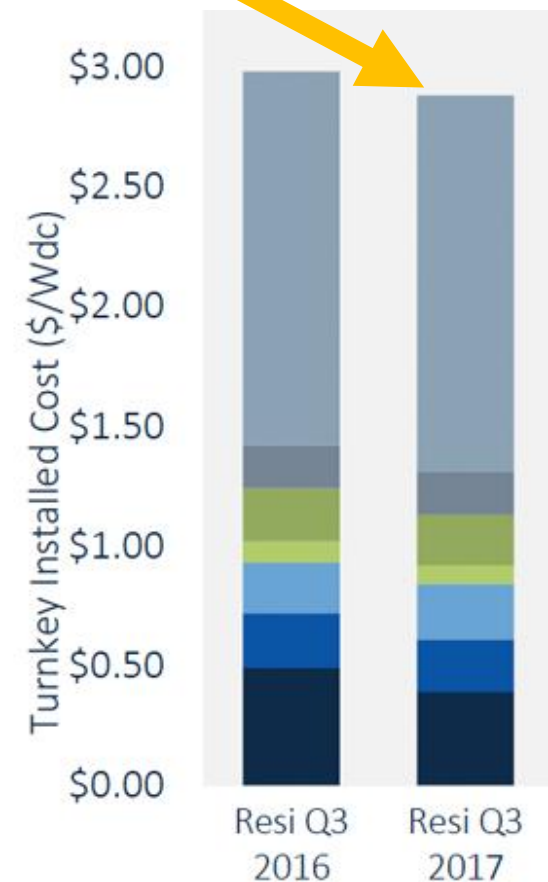
# Pricing Data & Trends



Average price of residential PV installation  
in Q3 2017: **<\$3.00/Watt**



Source: SEIA/GTM Research *Solar Market Insight*

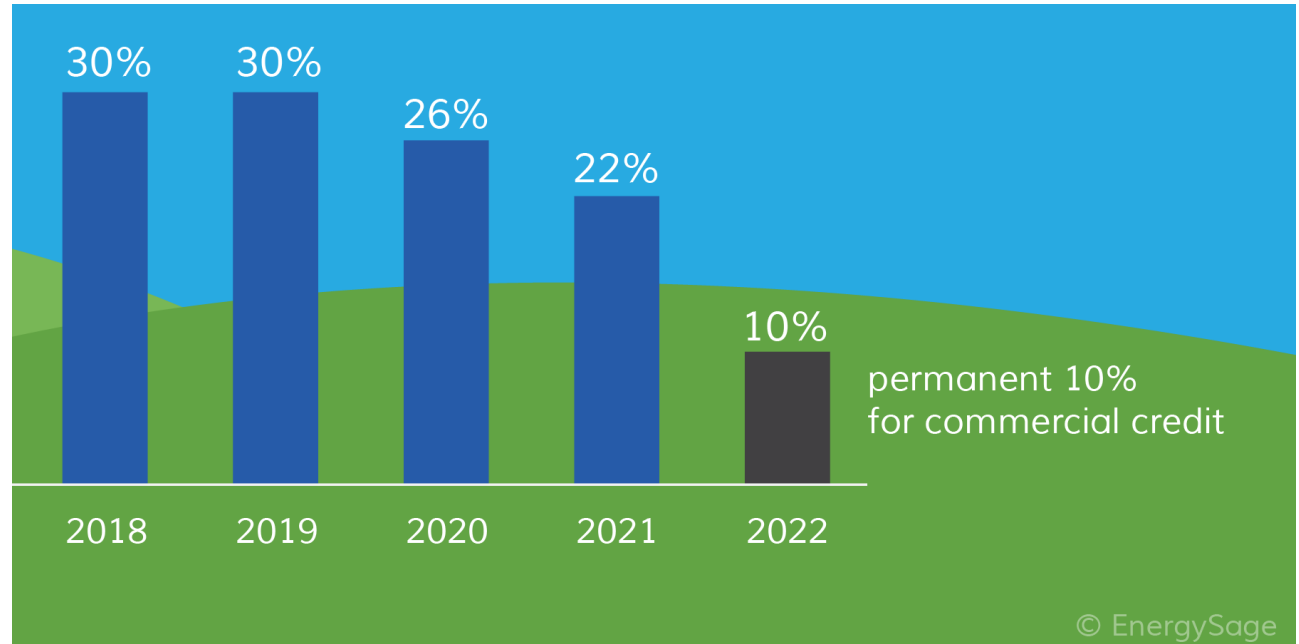




# Federal Income Tax Credit (“The ITC”)



Up to **30%** of total installed cost, no maximum



## Montana Alternative Energy Systems Credit

- \$500 per taxpayer, up to \$1,000 per household
- Solar PV, solar thermal, small wind, biomass, geothermal
- Does not expire

# Does Solar Make Financial Sense?

**BELONG**

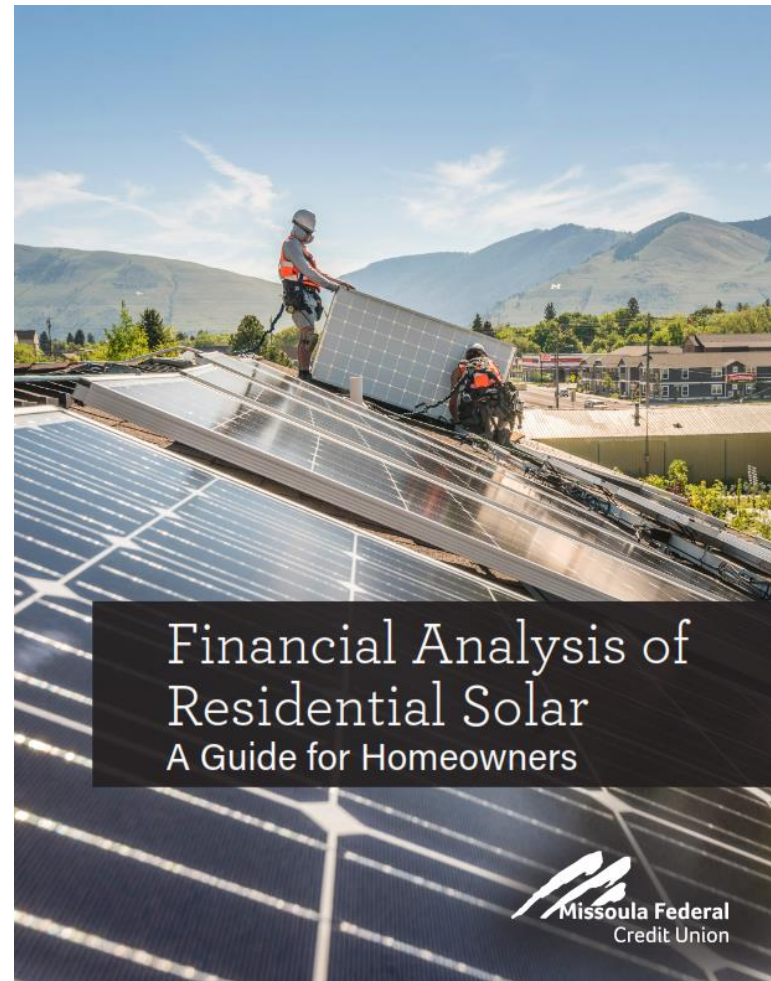


# Does Solar Make Financial Sense?

Details in report

$$NPV = \sum_{n=0}^N \frac{C_n}{(1 + d)^n}$$

Available at [www.missoulafcu.org/environment/](http://www.missoulafcu.org/environment/)



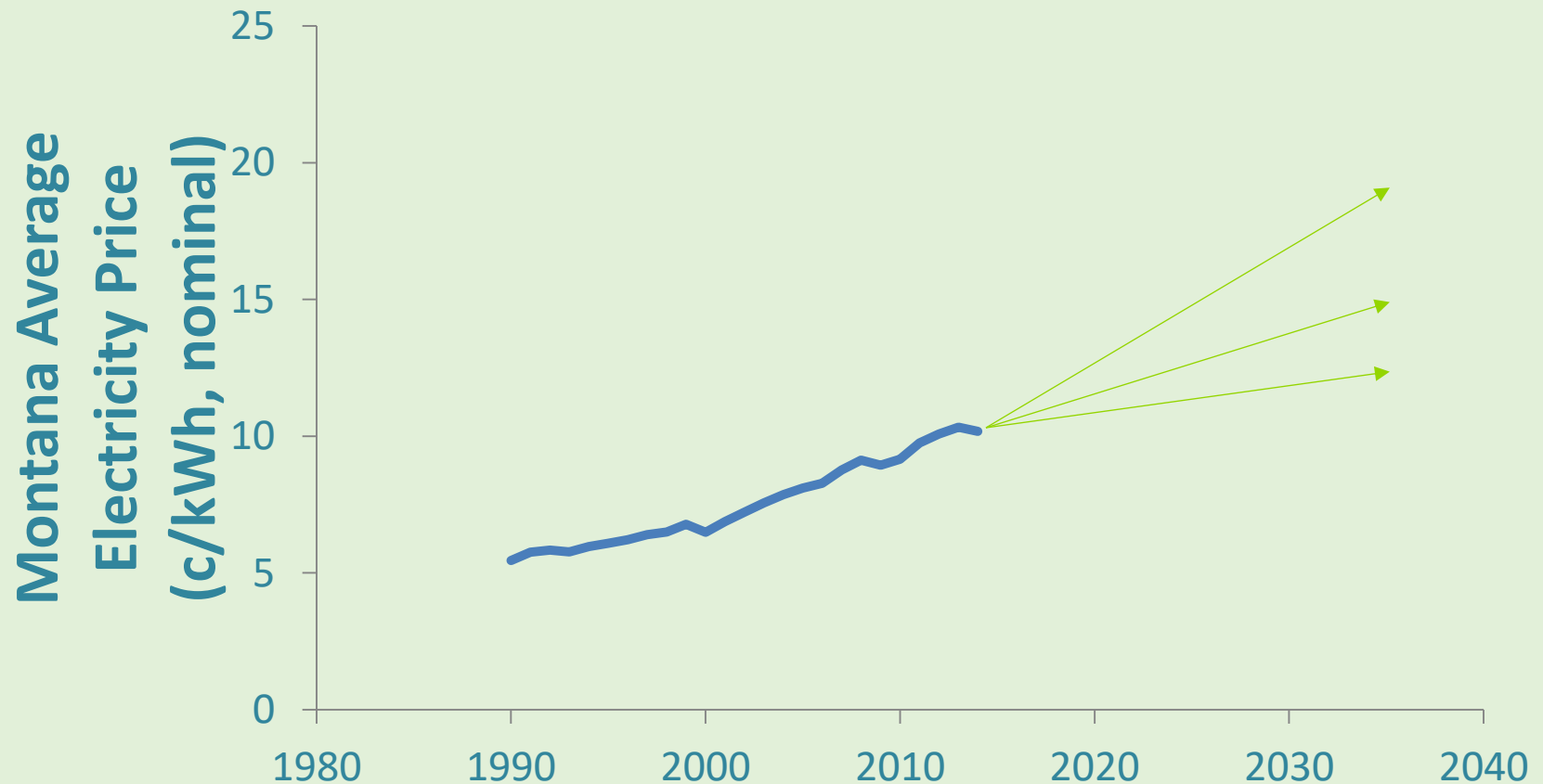
# Does Solar Make Financial Sense?

Lots of details / assumptions



Photo by Mark Longair. Licensed under Creative Commons CC BY-SA 2.0 (<https://creativecommons.org/licenses/by-sa/2.0/>)

# Does Solar Make Financial Sense?





# Does Solar Make Financial Sense?

## No One Metric

- Good investment?
- What's the payback?
- Buy now or wait?

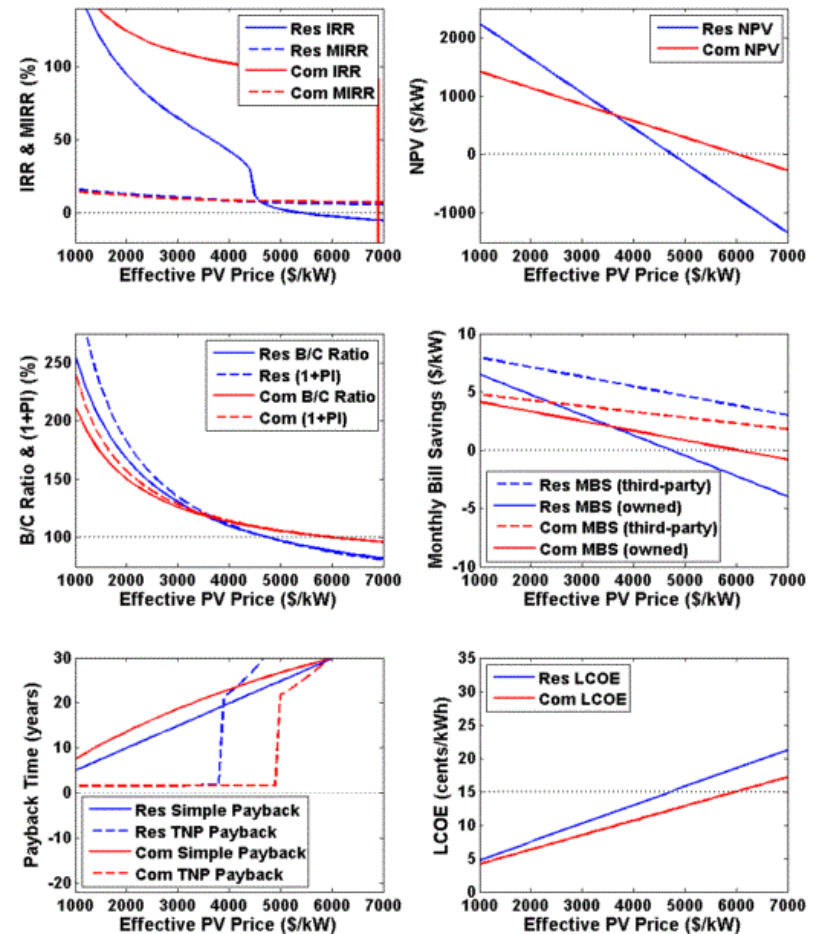


Figure 2. PV economic performance, characterized using several metrics, for a range of effective PV prices for residential ("Res") and commercial ("Com") systems

# Base Case



©emily mills

Photo by Emily Mills. Licensed under Creative Commons CC BY-ND 2.0 (<https://creativecommons.org/licenses/by-nd/2.0/>)

## System size

5 kW

## Price

\$3/W

## Production

1,200  
kWh/kW-year

# Base Case

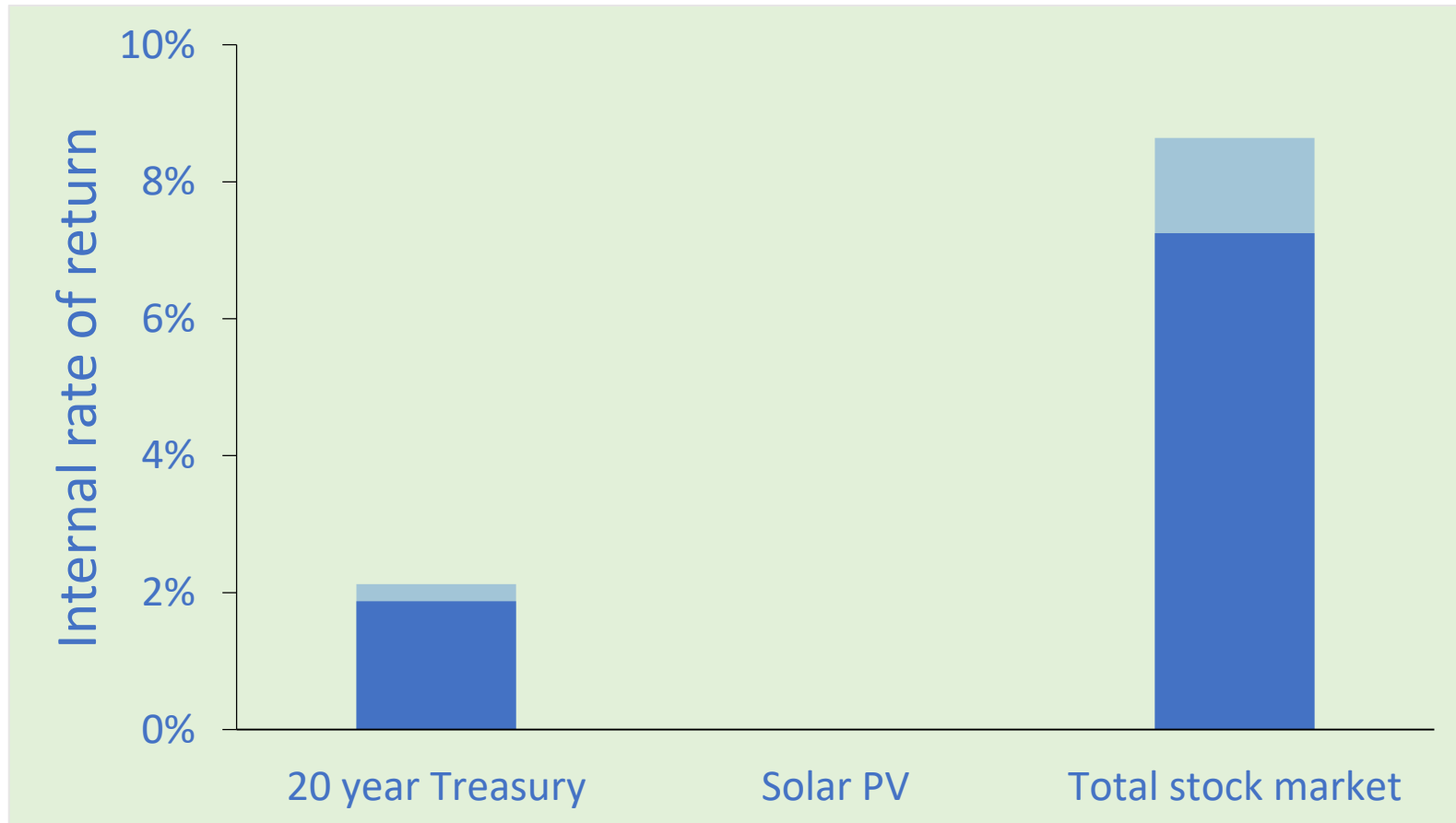


## FLATHEAD ELECTRIC — COOPERATIVE —

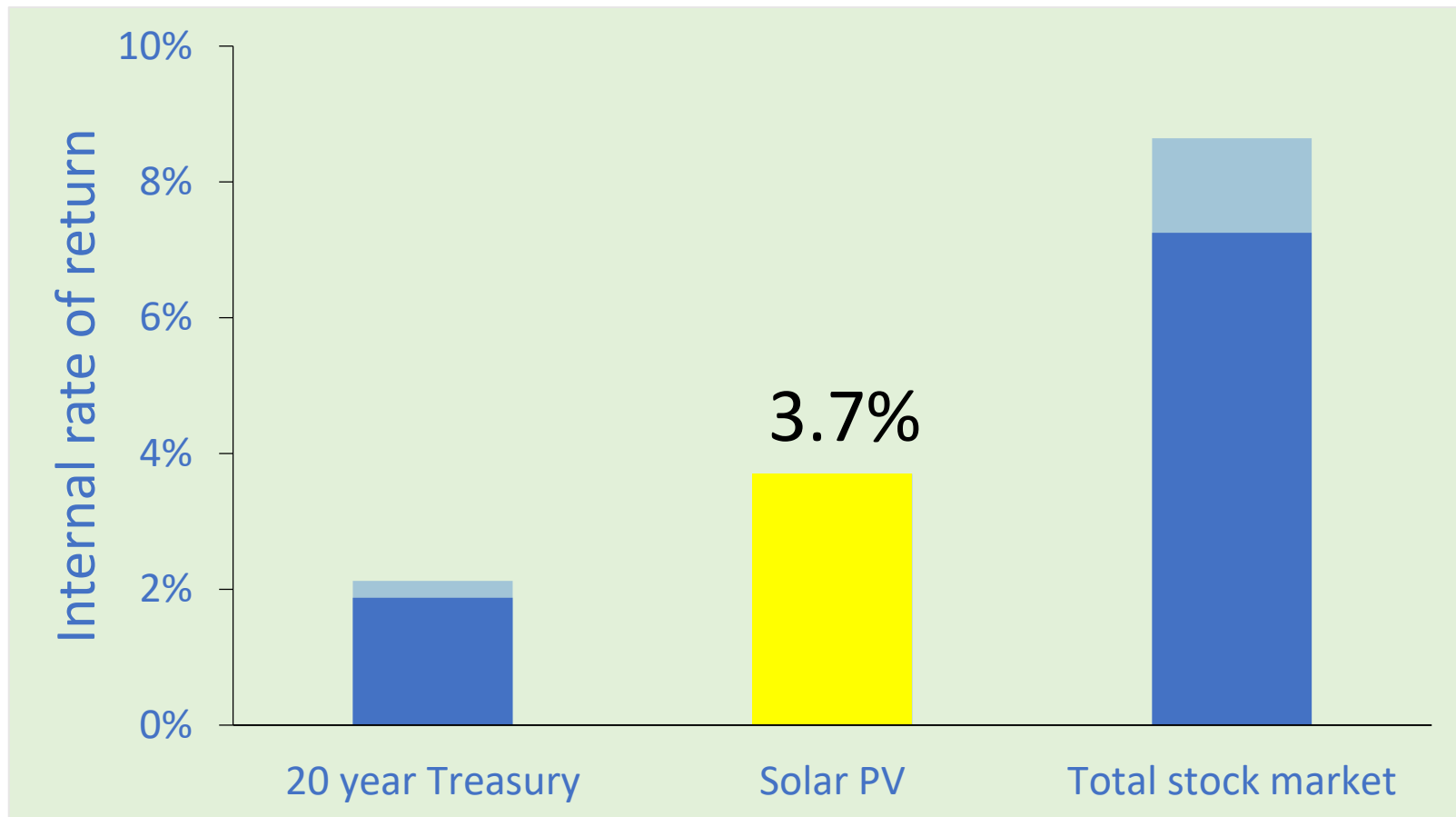
<u>Basic Charge:</u>	\$23.21	single phase service, or
	\$35.51	three phase service
<u>Energy Charge:</u>	6.49¢	per kWh for first 600 kWh, and
	7.99¢	per kWh for 601 - 3,500 kWh, and
	11.66¢	per kWh for all kWh greater than 3,500 kWh

Rates dated March 2017

# Is Solar A Good Investment?

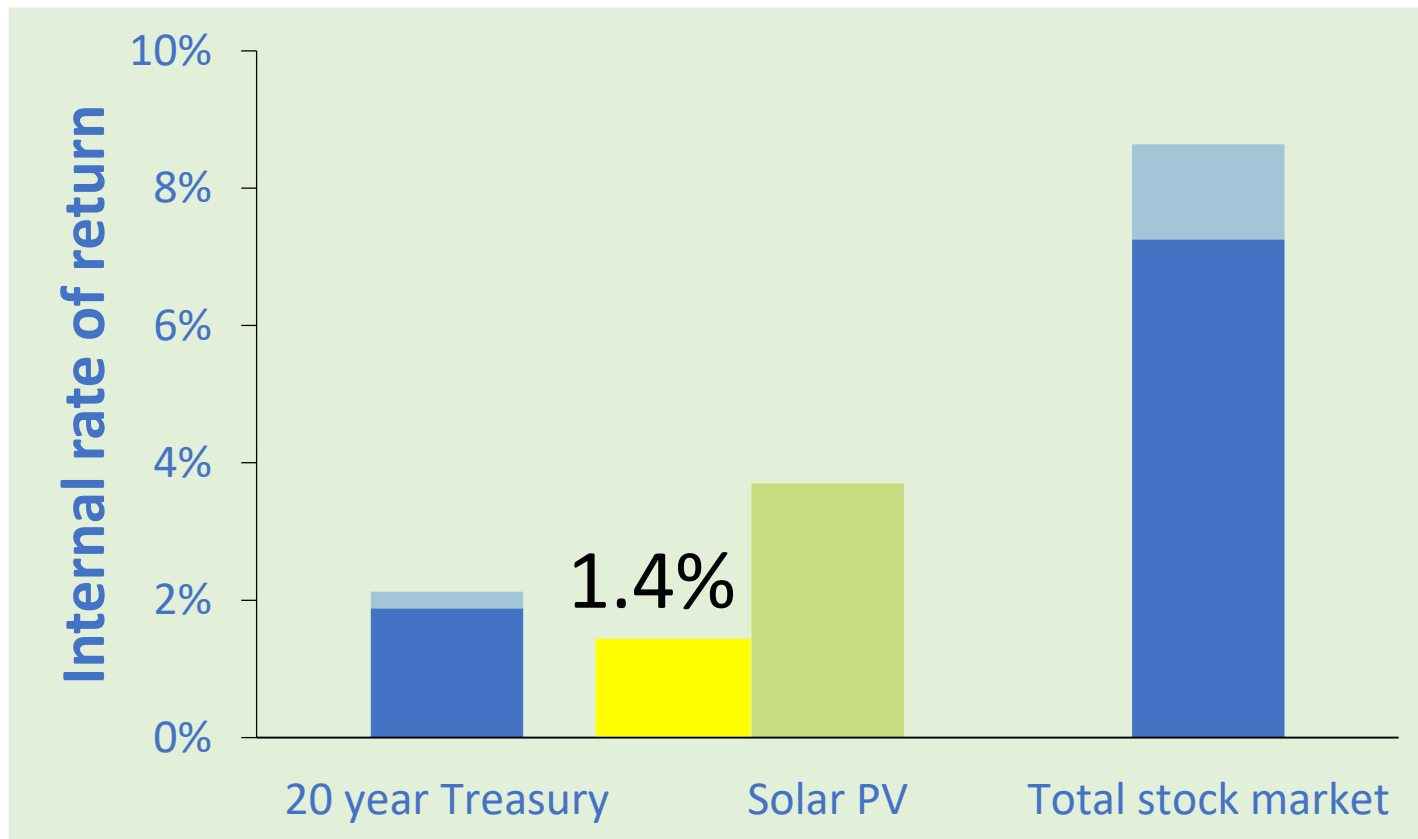


# Is Solar A Good Investment?



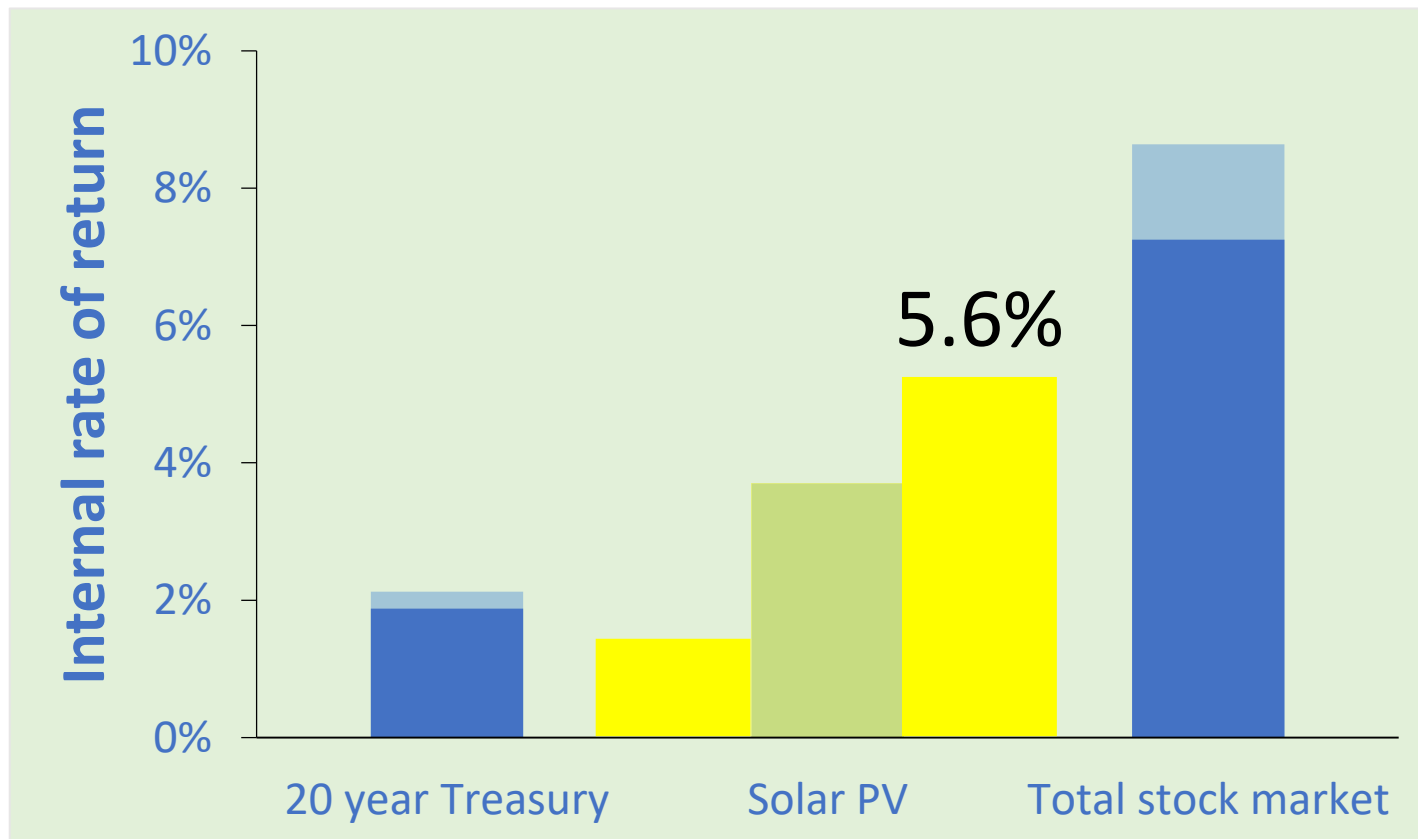


# Is Solar A Good Investment?



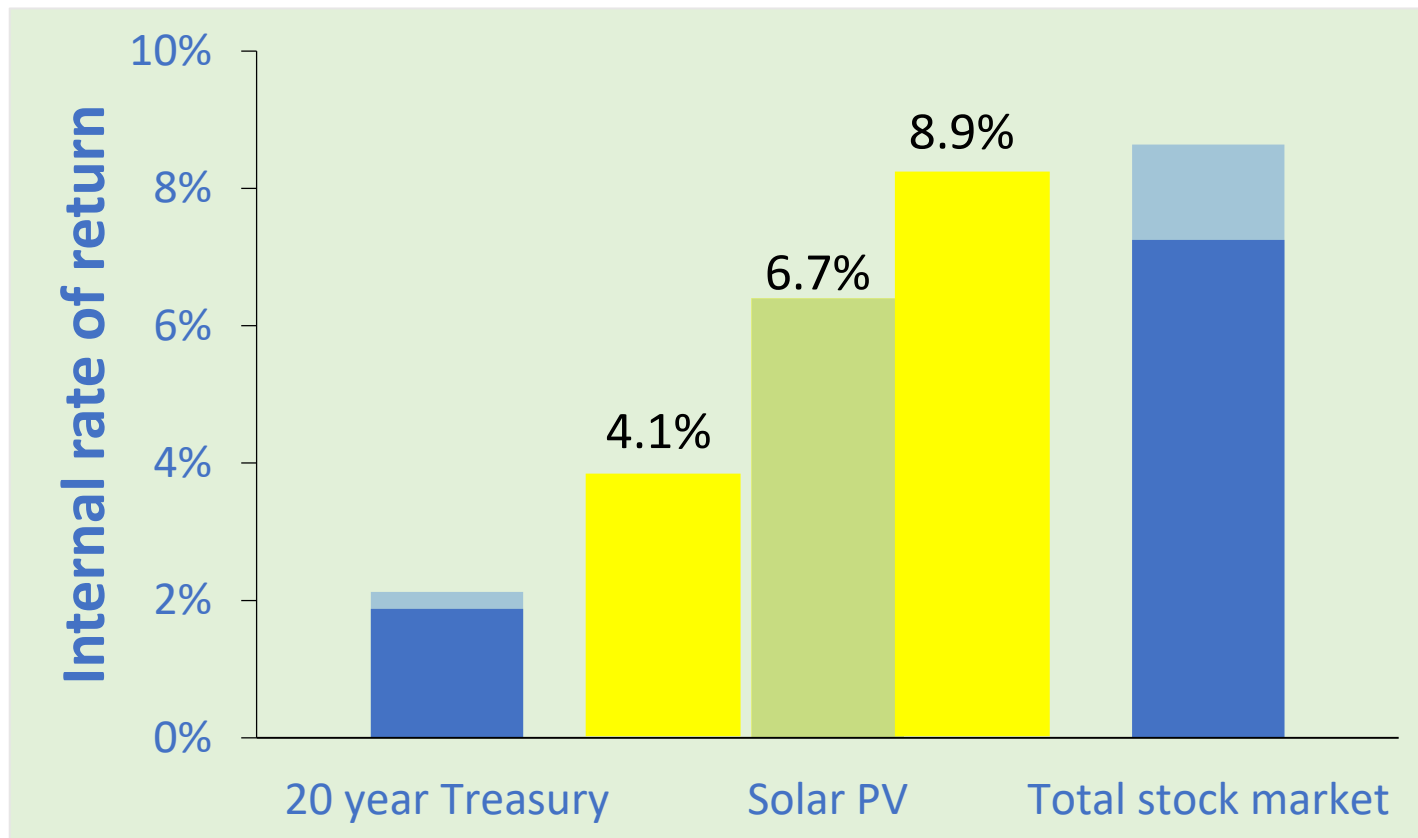
25% rate decline

# Is Solar A Good Investment?



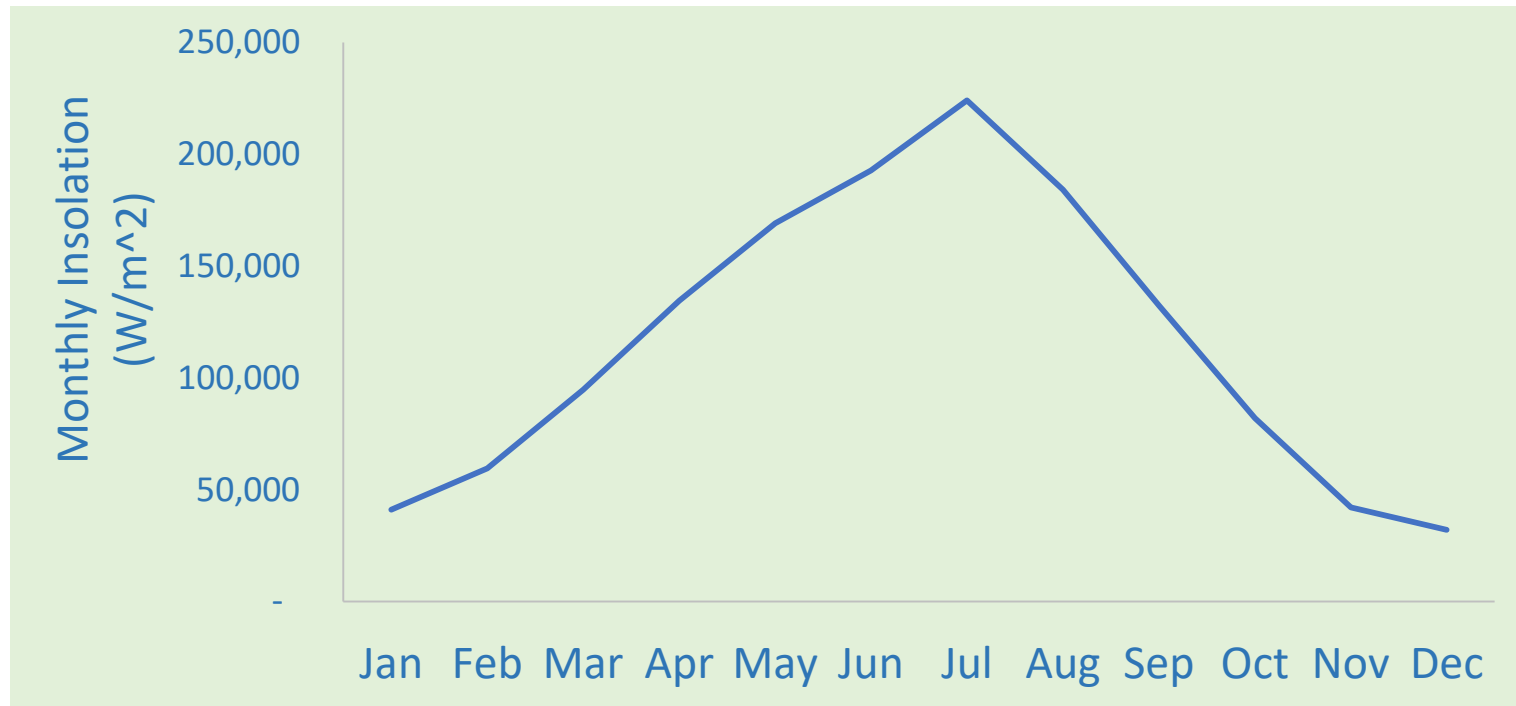
25% rate increase

# Is Solar A Good Investment? – Northwestern Energy



# What's the Payback?

## How Much Will I Save?



**Monthly Savings (Avg)**

**\$40**

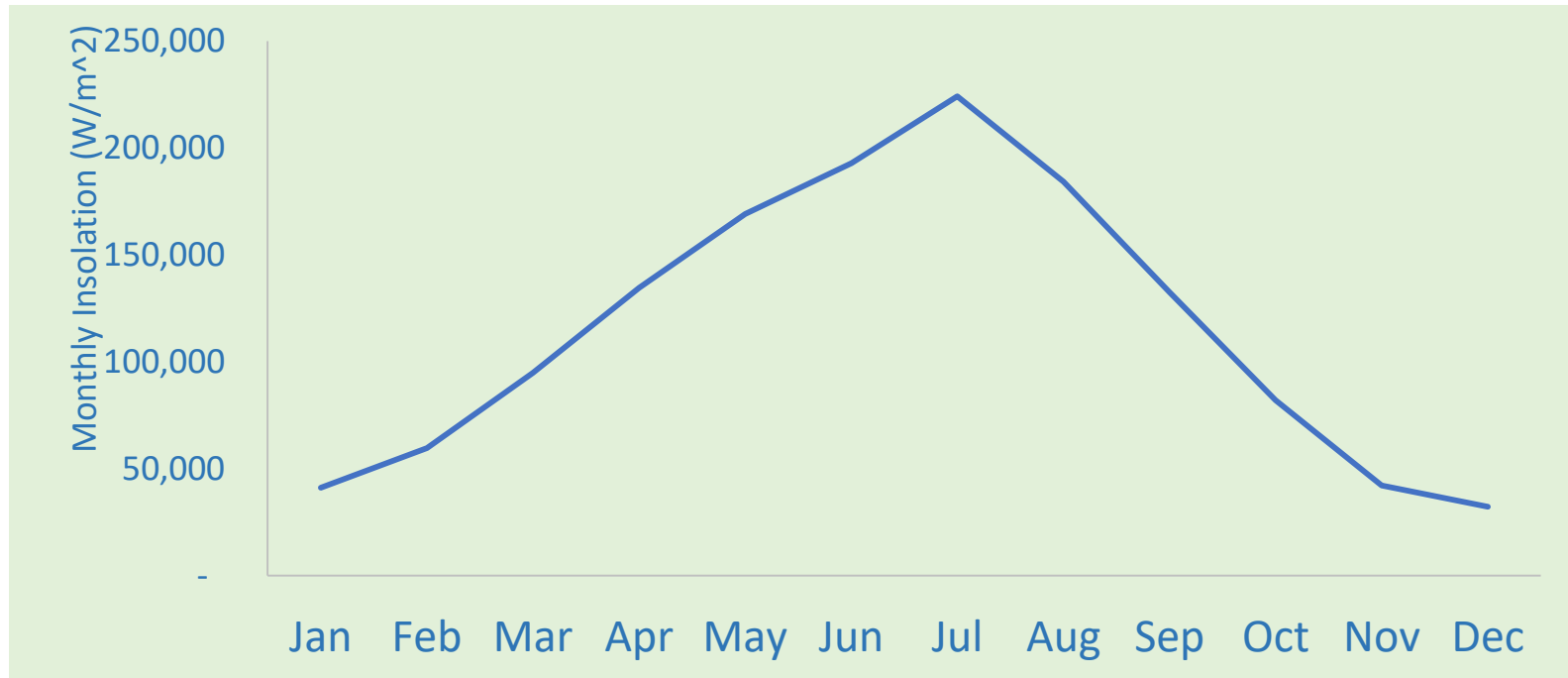
**Payback**

**16.8 years**

NWE: 56 \$/mo  
12.4 years

# What's the Payback?

## How Much Will I Save?



**Monthly Savings (Avg)**

**\$40**

**Payback**

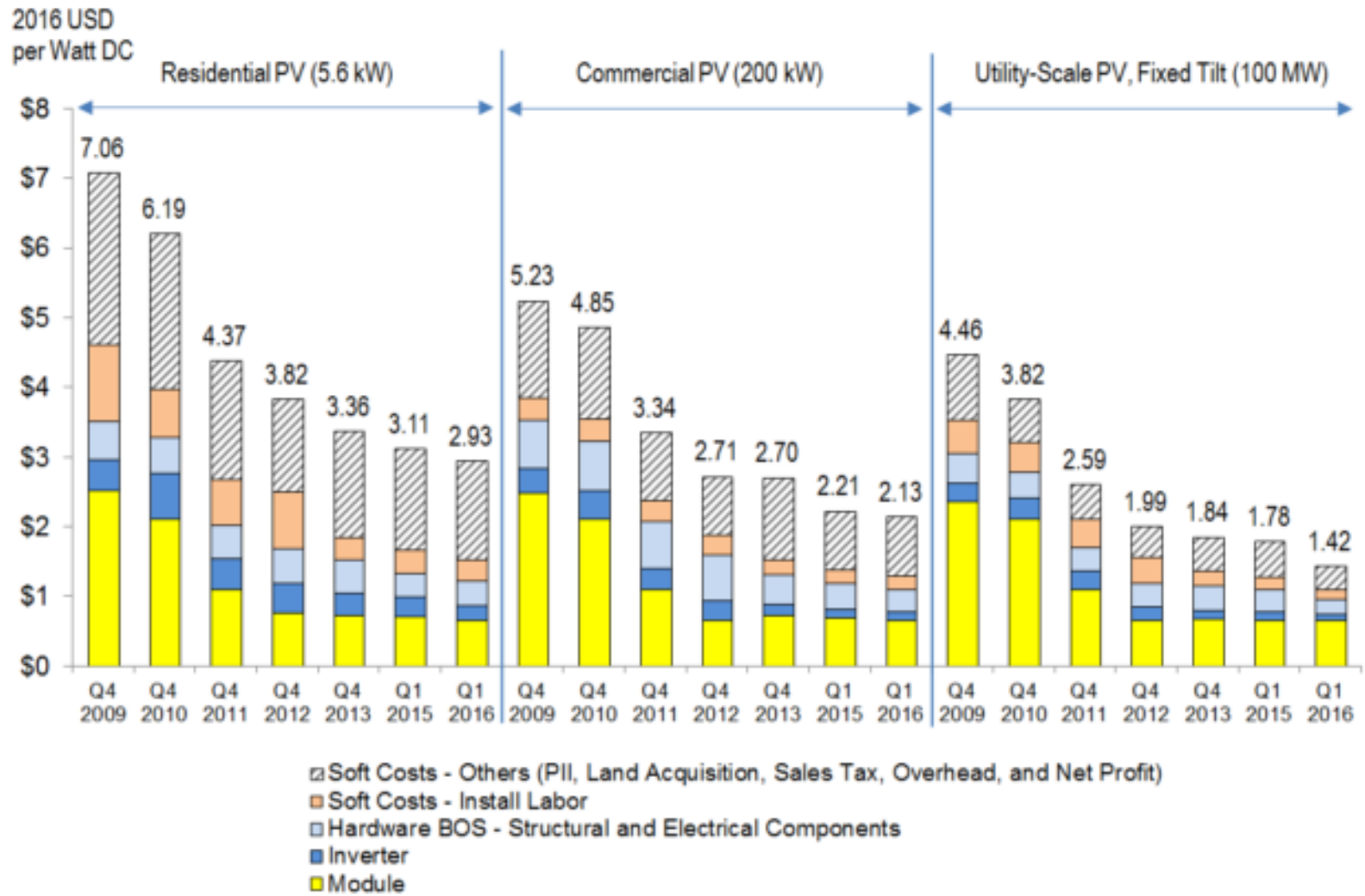
**16.8 years**

**Loan Payment**

**\$100 - \$140**



# Buy Now, or Wait?



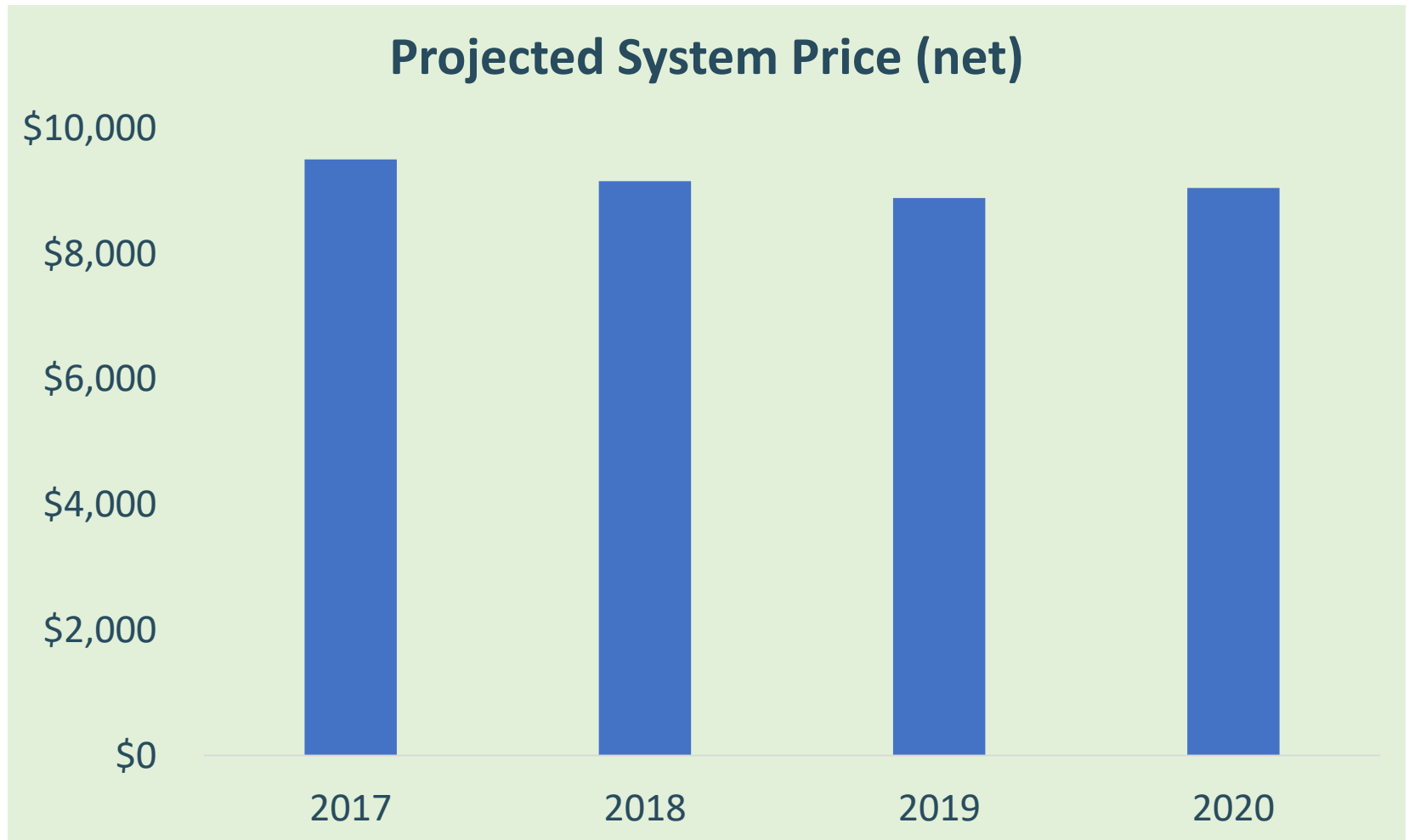
# Buy Now, or Wait?

	2017	2018	2019	2020
Price (\$/W)	\$3.00	\$2.76	\$2.54	\$2.34
Alternative Rate of Return (%/yr)	n/a	1.25%	1.25%	1.50%
Gross Cost	\$15,000	\$13,800	\$12,696	\$11,680
State Tax Credit	\$(1,000)	\$(1,000)	\$(1,000)	\$(1,000)
Federal Tax Credit	(4,500)	\$(4,140)	\$(3,809)	\$(3,037)
Additional electric cost	n/a	\$678	\$1,374	\$2,087
Interim Interest Earned	n/a	\$(188)	\$(377)	\$(685)
<b>Total Cost</b>	<b>\$9,500</b>	<b>\$9,151</b>	<b>\$8,883</b>	<b>\$9,046</b>

# Buy Now, or Wait?

	2017	2018	2019	2020
Price (\$/W)	\$3.00	\$2.76	\$2.54	\$2.34
Alternative Rate of Return (%/yr)	n/a	1.25%	1.25%	1.50%
Gross Cost	\$15,000	\$13,800	\$12,696	\$11,680
State Tax Credit	\$(1,000)	\$(1,000)	\$(1,000)	\$(1,000)
Federal Tax Credit	(4,500)	\$(4,140)	\$(3,809)	\$(3,037)
Additional electric cost	n/a	\$678	\$1,374	\$2,087
Interim Interest Earned	n/a	\$(188)	\$(377)	\$(685)
<b>Total Cost</b>	<b>\$9,500</b>	<b>\$9,151</b>	<b>\$8,883</b>	<b>\$9,046</b>

# Buy Now, or Wait?



# What About Home Value?

## Selling Into the Sun: Price Premium Analysis of a Multi-State Dataset of Solar Homes

Ben Hoen, Sandra Adomatis, Thomas Jackson, Joshua Graff-Zivin,  
Mark Thayer, Geoffrey T. Klise, Ryan Wiser

**Lawrence Berkeley National Laboratory**





# What About Home Value?

$$\ln(P_{itk}) = \alpha + \beta_1 (T_i) + \beta_2 (K_i) + \sum_a \beta_3 (X_i) + \beta_4 (PV_i \cdot \text{SIZE}_i) + \varepsilon_{itk}$$

where

$P_{itk}$  represents the sale price for transaction  $i$ , in quarter  $t$ , in block group  $k$ ,

$\alpha$  is the constant or intercept across the full sample,

$T_i$  is the quarter  $t$  in which transaction  $i$  occurred,

$K_i$  is the census block group  $k$  in which transaction  $i$  occurred,

$X_i$  is a vector of  $a$  home and site characteristics for transaction  $i$ ,

$PV_i$  is a fixed-effect variable indicating a PV system is installed on the home in transaction  $i$ ,

$\text{SIZE}_i$  is a continuous variable for the size (in kW) of the PV system installed on the home prior to transaction  $i$ ,<sup>7</sup>

$\beta_1$  is a parameter estimate for the quarter in which transaction  $i$  occurred,

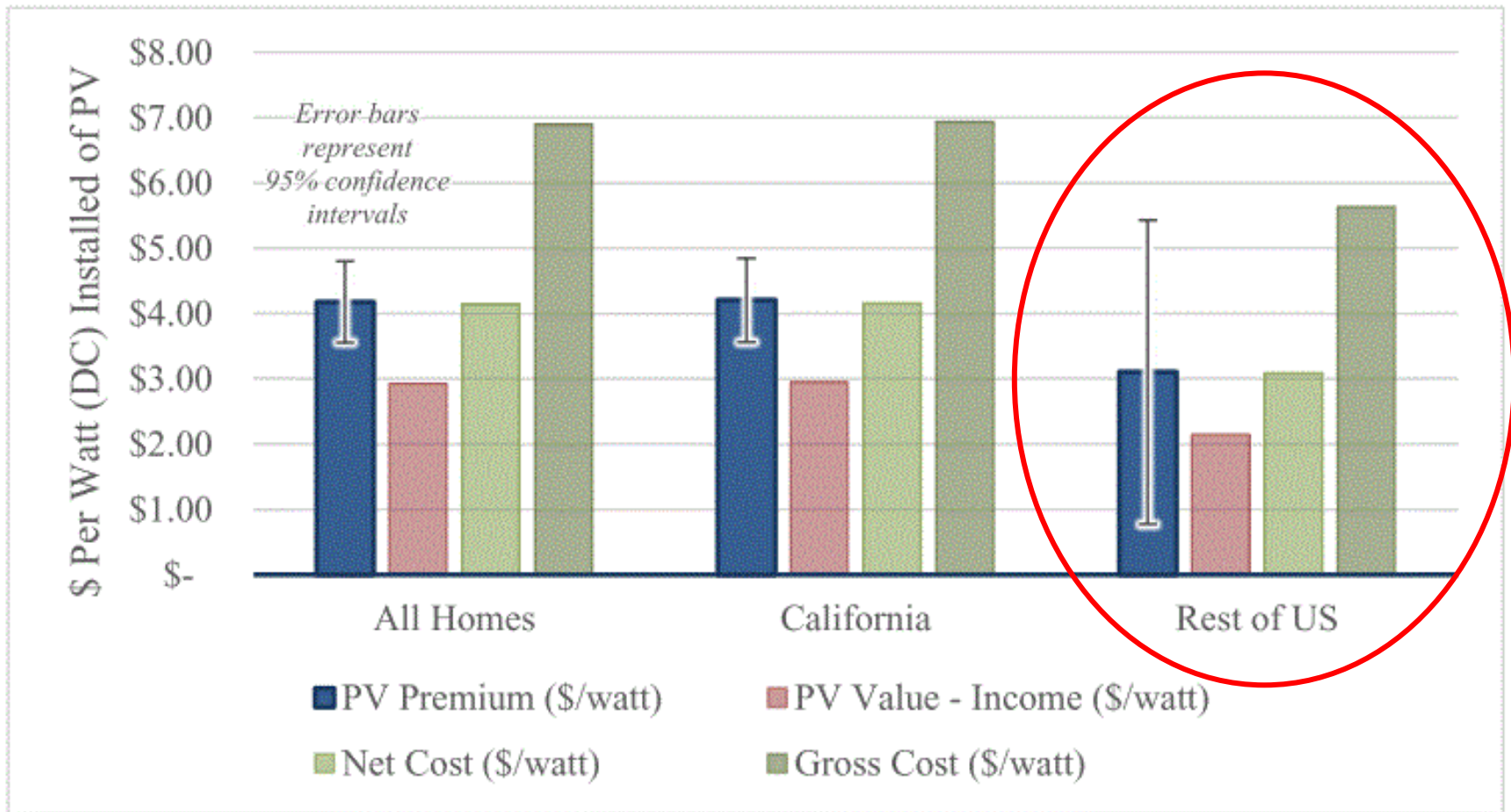
$\beta_2$  is a parameter estimate for the census block group in which transaction  $i$  occurred,

$\beta_3$  is a vector of parameter estimates for home and site characteristics  $a$ ,

$\beta_4$  is a parameter estimate for the change in sale price for each kilowatt added to a PV system, and

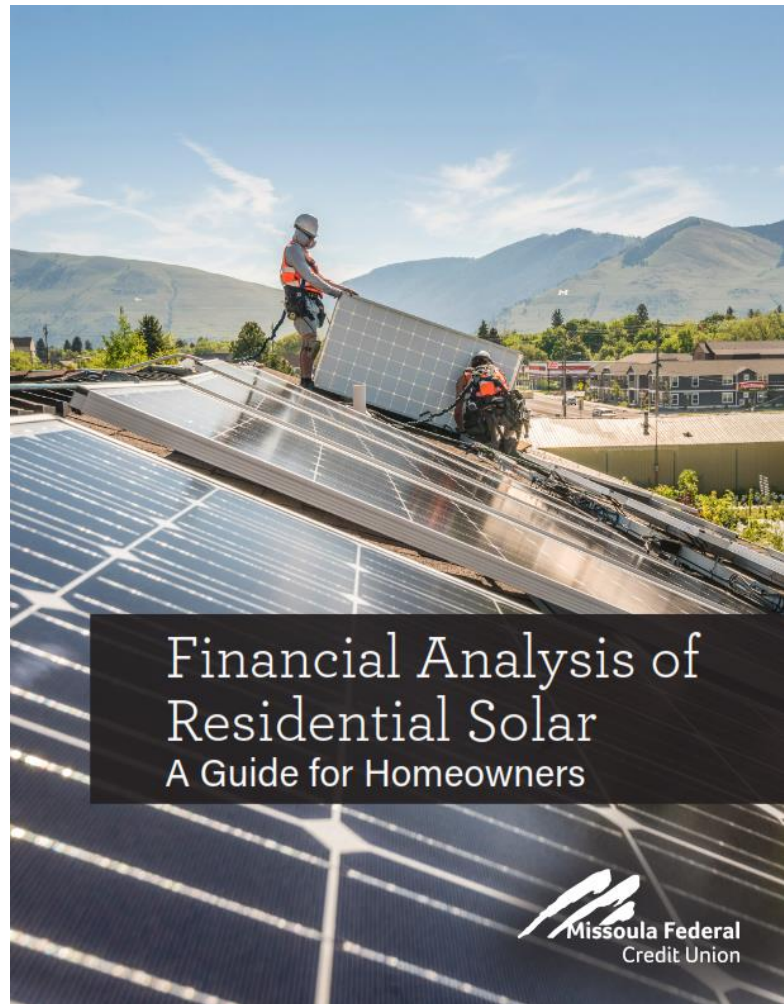
$\varepsilon_{itk}$  is a random disturbance term for transaction  $i$ , in quarter  $t$ , in block group  $k$ .

# What About Home Value?



# Other Questions

- Loan or cash?
- System size?
- Best type of loan?



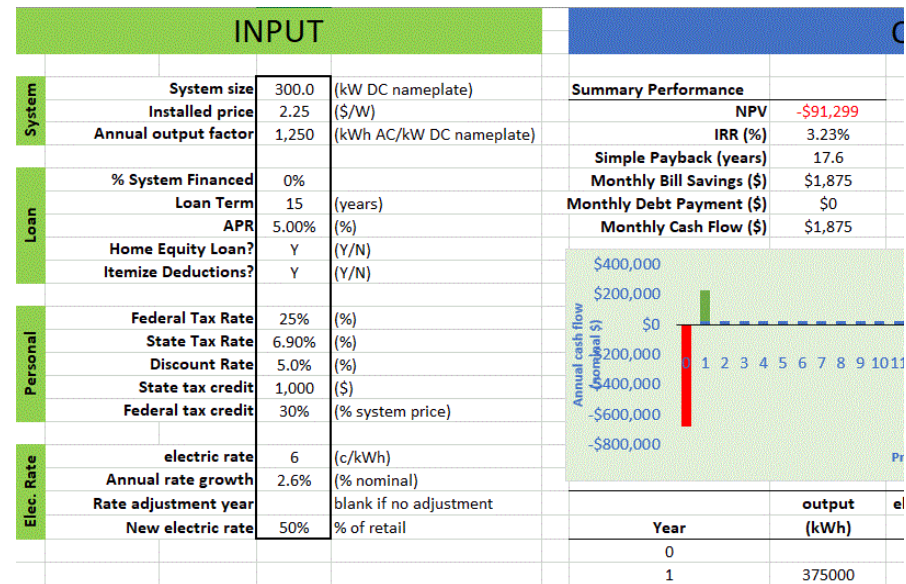
# Putting it All Together

## 1. Pick Your Questions

## 2. Collect Data

- Electric rate
- Installed Price
- Production

## 3. Calculate!



Available at [www.missoulafcu.org/environment](http://www.missoulafcu.org/environment)

# Available Loans



## Alternative Energy Revolving Loan Program

- 10 years
- \$40,000
- 3.5%
- Secured

### **Contact:**

Ben Brouwer 444-6586



## Home Energy Loan

- 15 years, \$25,000
- 4.9 - 5.9%
- Reamortization
- Unsecured, easy-access

## Solar Home Equity Loan

- 20 years, \$150,000
- 5 – 5.5%
- Secured
- Deductible interest



A photograph of a single-story house with a brown shingled roof. A large array of dark blue solar panels is mounted on the roof. The house has light-colored horizontal siding and a stone-patterned lower section. A white front door is visible, flanked by windows. The house is surrounded by green grass and trees under a clear blue sky.

# Questions?