SOLARIZE MASS
SHIRLEY

Solar 101

Presented by:
Massachusetts Clean Energy Center

May 24, 2012

"Installing a solar PV system is a terrific investment, and of course it is a good thing to do for the earth. Once you become familiar with the economics, it is a no-brainer."

– Resident, Hatfield, MA

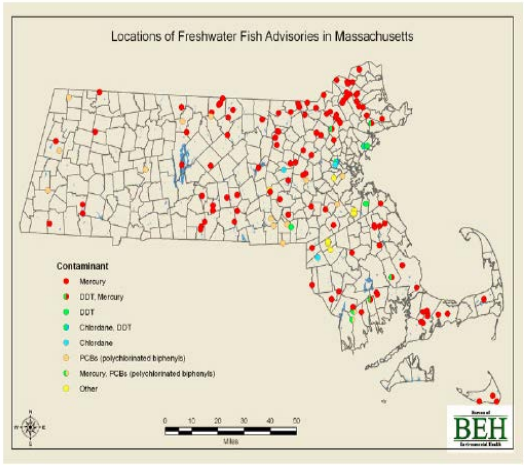
MASSACHUSETTS CLEAN ENERGY CENTER
JOIN THE INNOVATION REVOLUTION

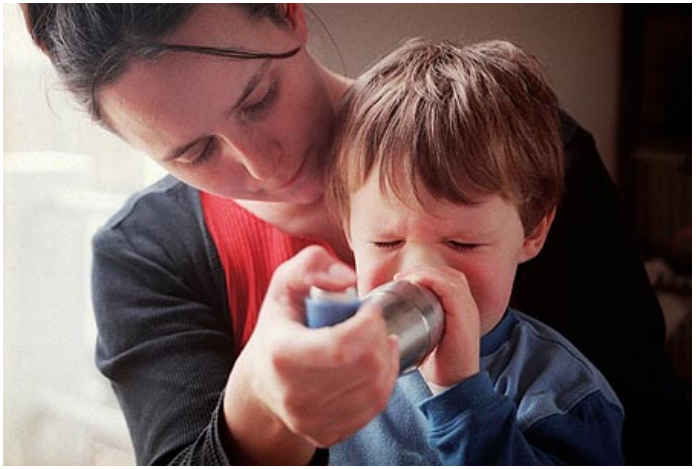
GREEN COMMUNITIES
Massachusetts DEPARTMENT OF ENERGY RESOURCES

Agenda

- Why are we here?
- Solar PV Basics
- Goals/Structure of Solarize Massachusetts
- Solar PV Incentives and Financials
- Getting Started

Why are we here: Environment



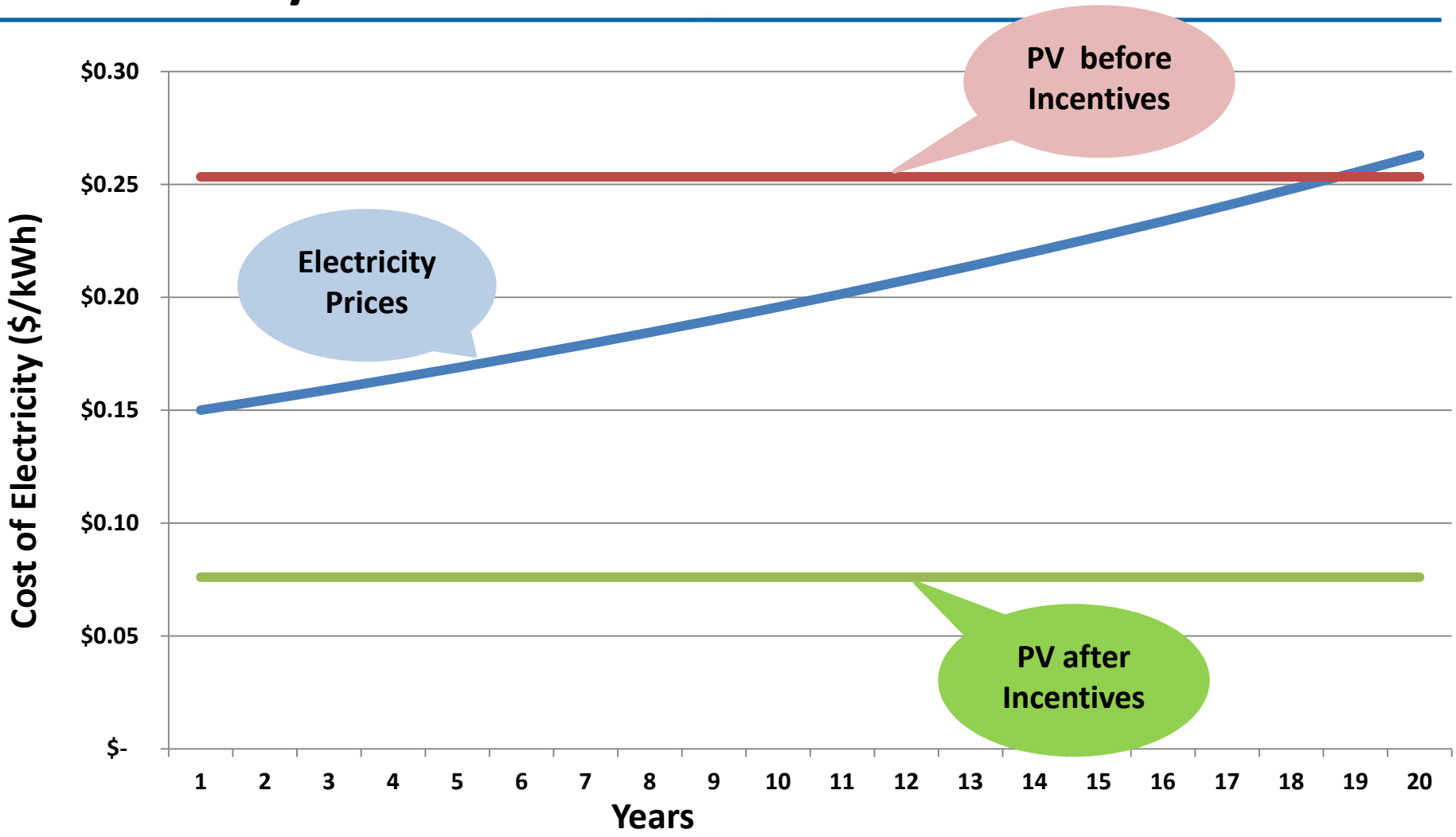


From 1990 to 2006, MA averaged 100 deaths per year from asthma

Source: MA DPH

Statewide Fish Advisory: Safe Eating Guidelines: "…for pregnant women, women who may become pregnant, nursing mothers and children under 12 years old: Do Not Eat: Freshwater fish caught in streams, rivers, lakes, and ponds in MA"

Why Are We Here: Economics



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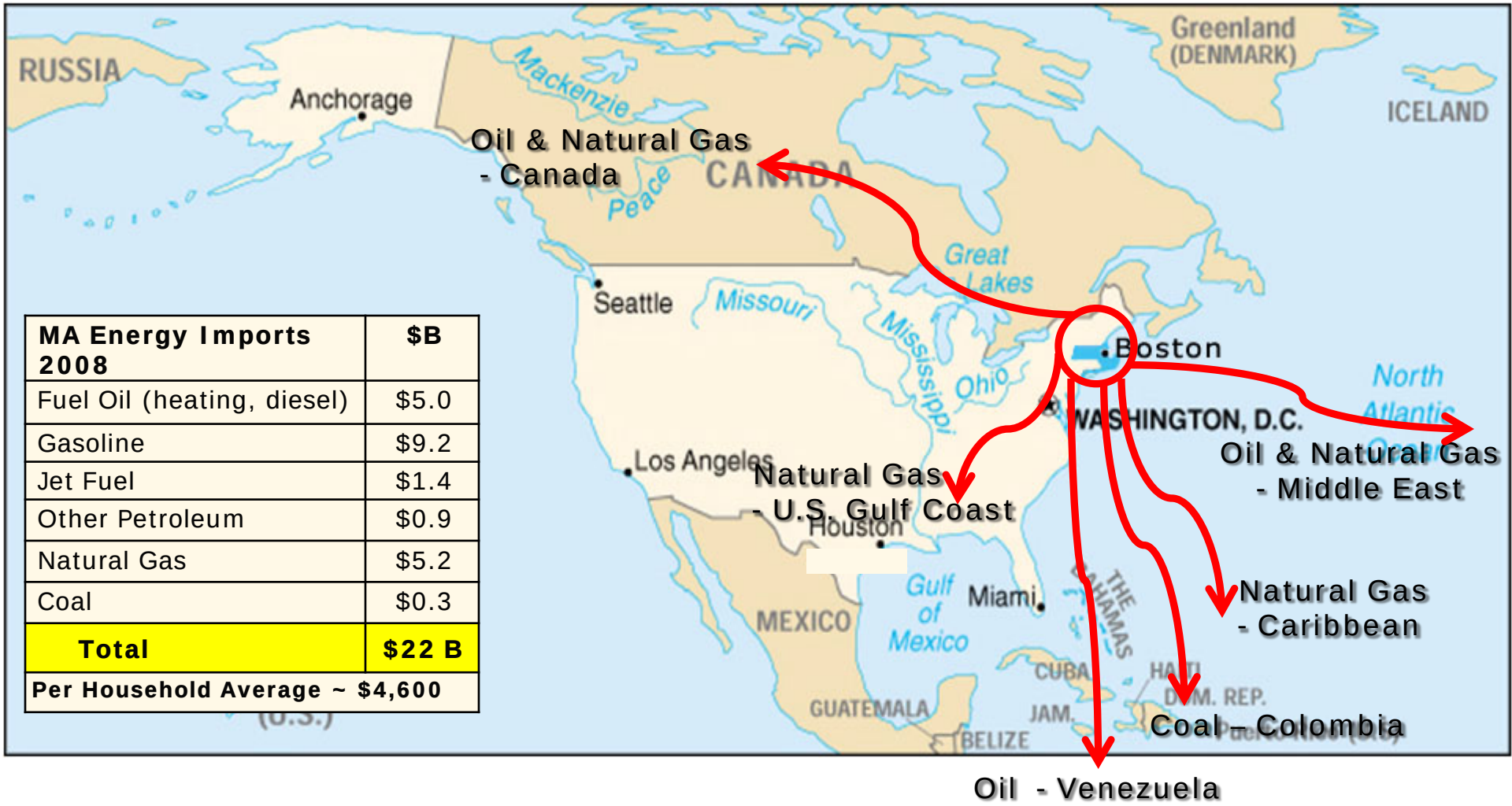
$18B Energy Dollars Flow Out of MA Annually



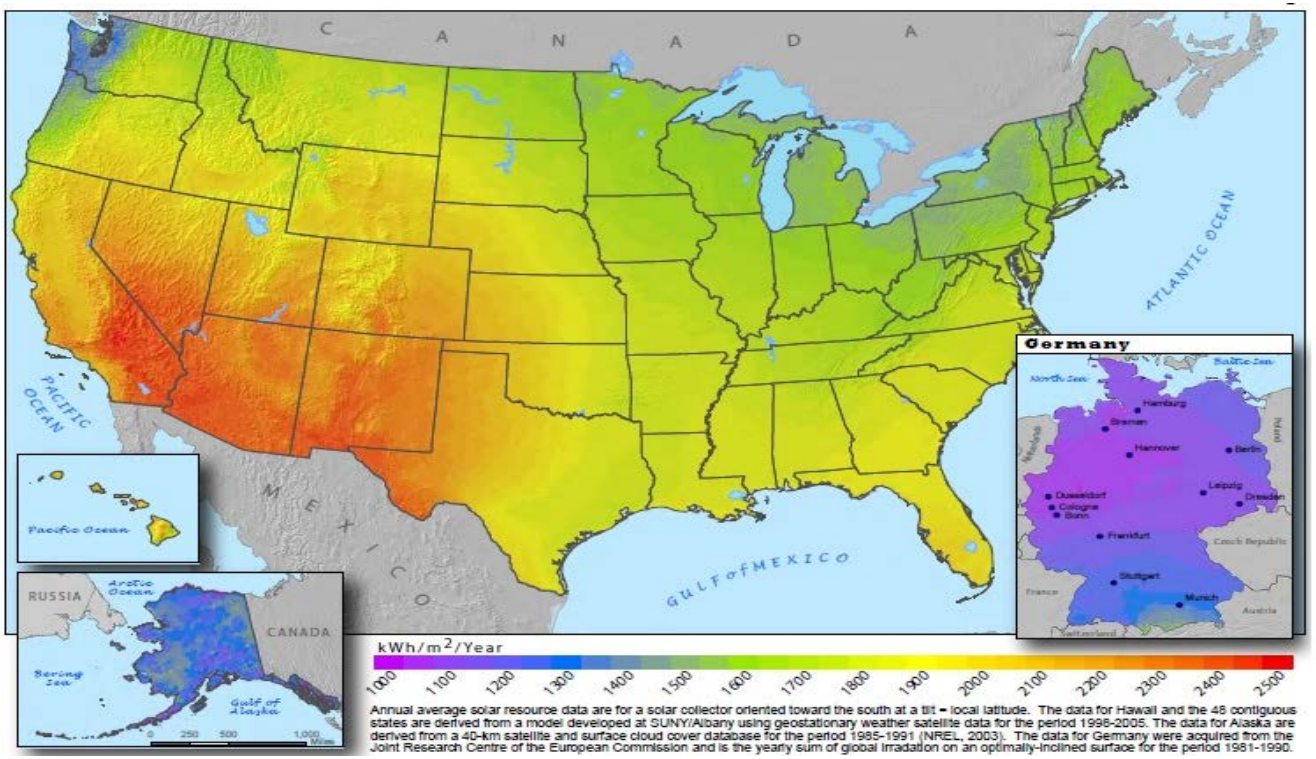
MA Energy Imports 2008	$B
Fuel Oil (heating, diesel)	$5.0
Gasoline	$9.2
Jet Fuel	$1.4
Other Petroleum	$0.9
Natural Gas	$5.2
Coal	$0.3
Total	**$22 B**
Per Household Average ~ $4,600	

Alternative energy to the rescue (again)

- In ~1600, alt. energy meant coal (vs. wood)
- In 1869, alt. energy meant petroleum (vs. whale oil)

- In 2012, it means renewable energy:
  - Solar
  - Wind
  - Biomass
  - Wave/Tidal

Do we have enough Sun?



Fun Fact: Every 88 minutes, enough sunlight reaches the Earth's surface to power the world for a year

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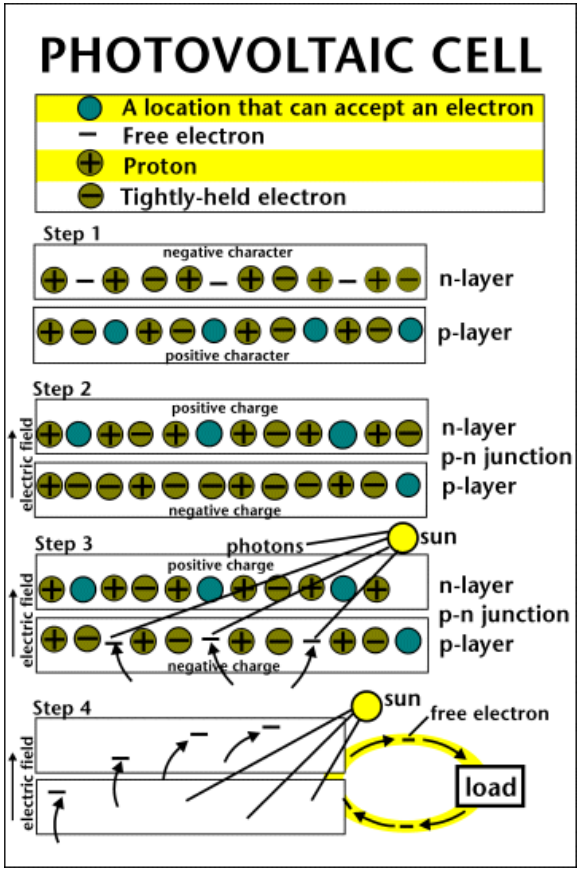
How does Solar PV Work (for the engineers in the room…)

- Absorbed sunlight dislodges electrons in a semiconductor

- Electric field (voltage) in the PV panel forces free electrons to flow in one direction (current or amperage). Volts x Amps = Watts



Source: Energy Kids, US Energy Information Administration

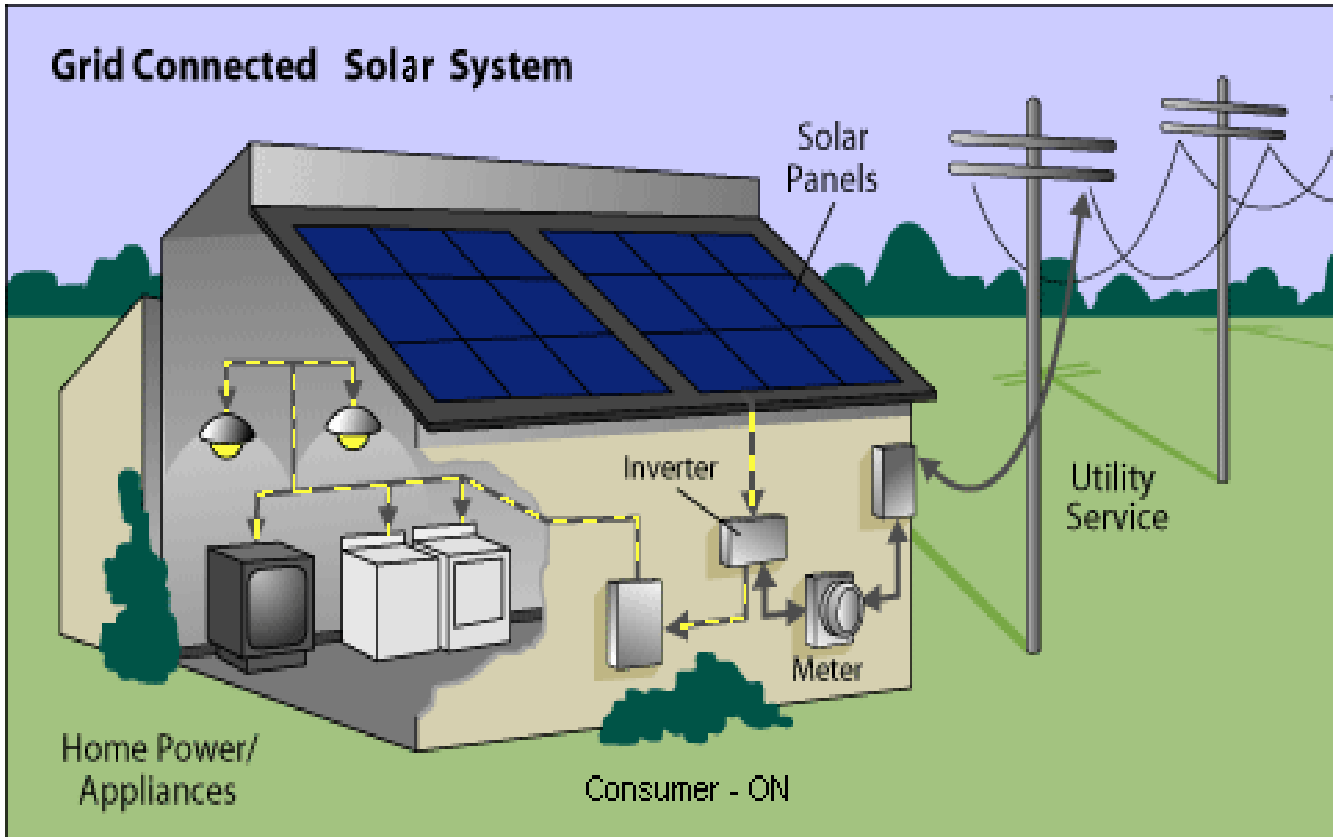
Kilowatts vs. Kilowatt-hours

- PV system size is measured in kilowatts
  - 1,000 watts = 1 kilowatt (kW)

- Electricity use measured in kilowatt-hours
  - 100 watt light bulb left on for 10 hours uses 1,000 watt-hours (1 kWh)

- Average New England home uses 8,004 kWh per year (EIA, 2010)

How Does Solar PV work on my house?



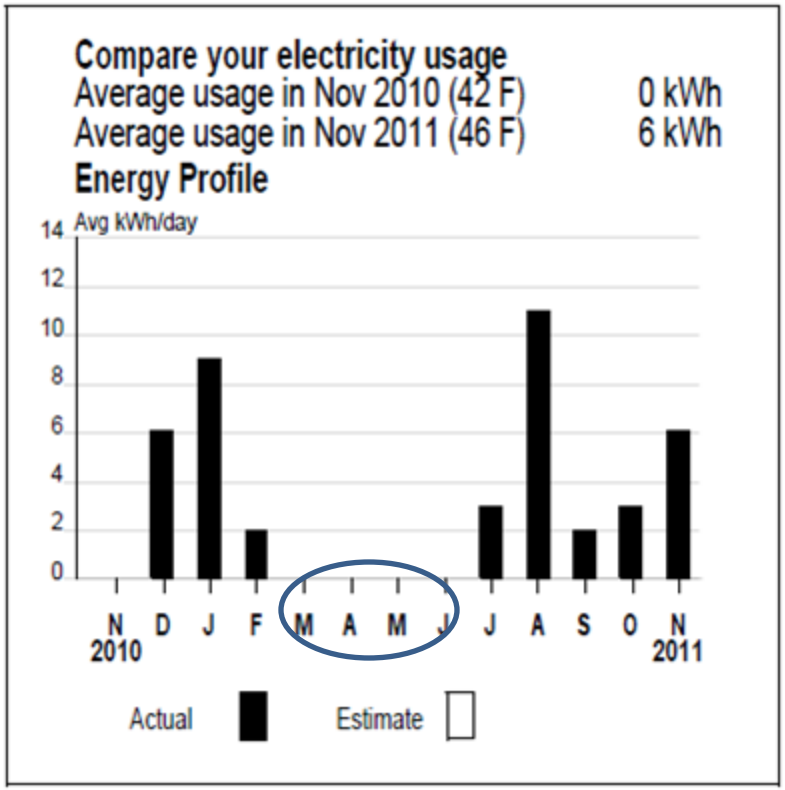
Courtesy of NREL

- Grid-connected projects can apply for Net Metering (utility meter spins backwards)
- **Power outage: Inverter shuts down, unless a battery-back up system is installed**

What is Net Metering?

- Credits generated when system is producing more than is being used
  - "Meter runs backwards"
- Excess credits are carried over month-to-month indefinitely
- Receive credits at almost full retail rate

How big a system do I need?

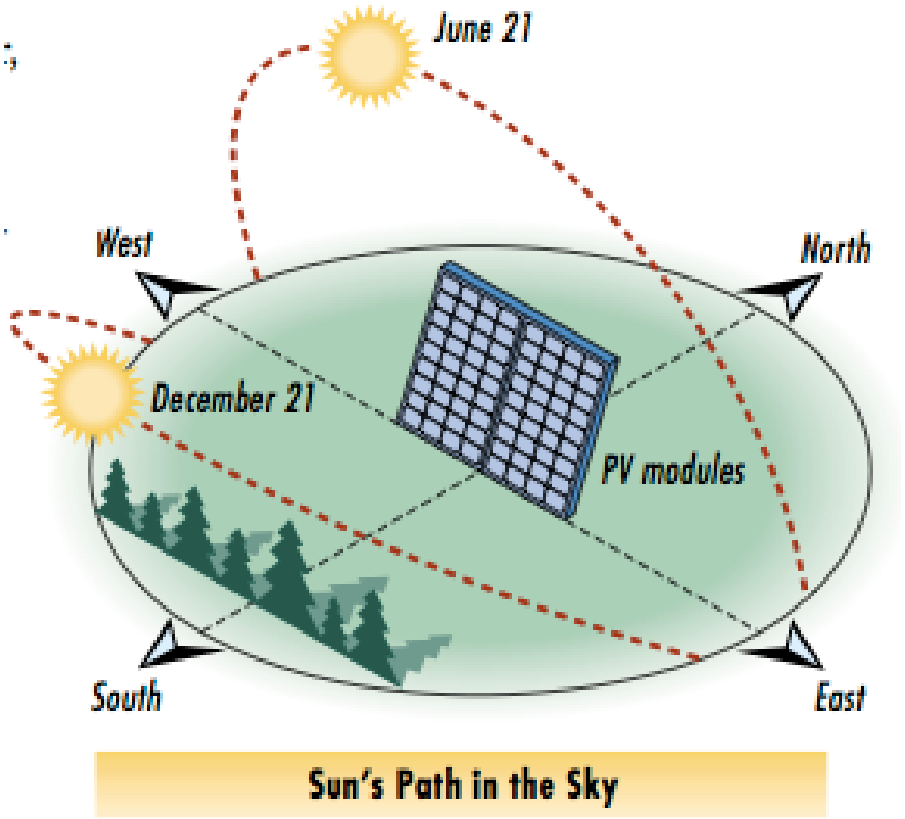


- Electricity bill shows summary of prior year's consumption
- Incentives are designed for systems sized ≤ load
- Efficiency or lower energy use allows for a smaller system!

Back of the Envelope Calculation: 1 kW PV = approximately **1,200** kWh/year

What makes a good site?

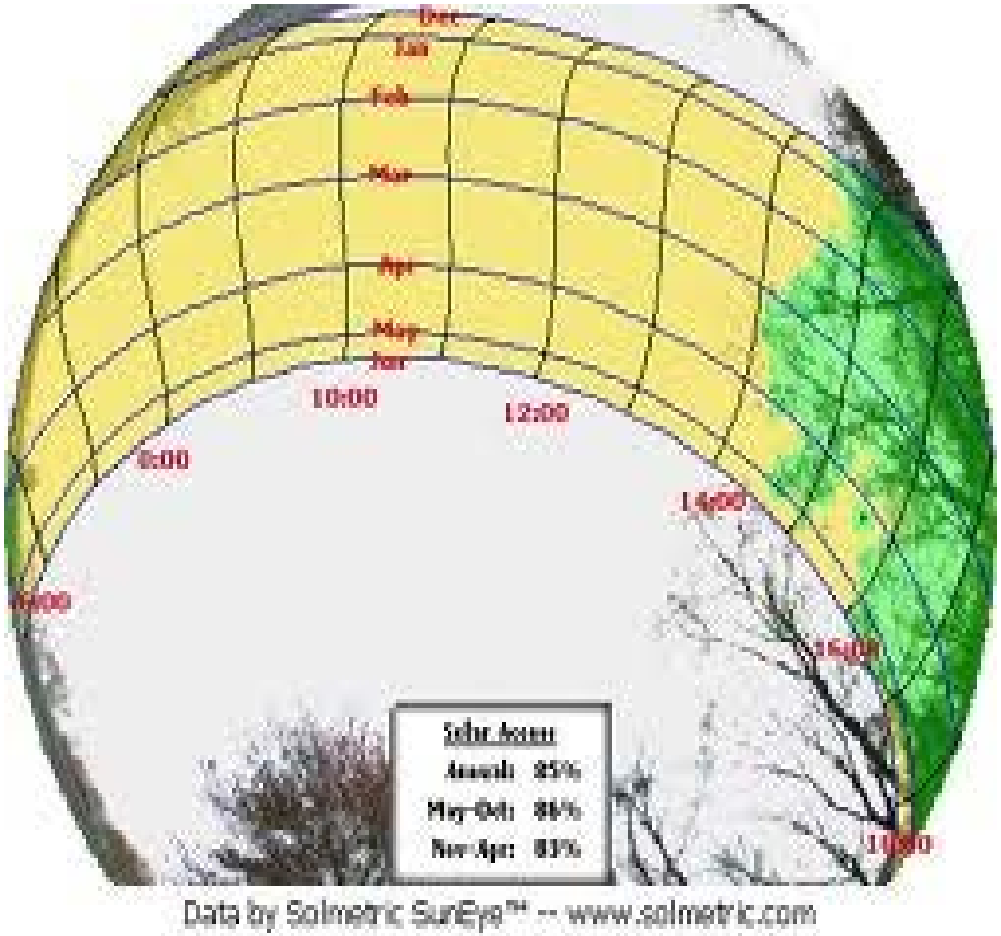
- Southern exposure
- PV panels angled 30˚ – 45˚
- At least 4-6 hours of direct sunlight
- Open roof area of ~100 sq ft per 1 kW
- Open space for a ground or pole mounted system



http://energy.ltgovernors.com/solar-energy-pv-systems-self-generation-make-your-own-power.html

Shading of Solar PV Systems

- Initial site feasibility can be determined online through aerial images
- Shading can significantly reduce the output of a system. May increase cost of a PPA contract.
- Installer is the expert in determining feasibility



What to do with a Non-Feasible Site

- Consider energy efficiency
  - www.MassSave.com
- Other renewable energy technologies
  - Solar Hot Water (www.masscec.com/solarhotwater)
  - Geothermal
  - Biomass
- Community Solar Projects
- Help us spread the word about Solarize Mass

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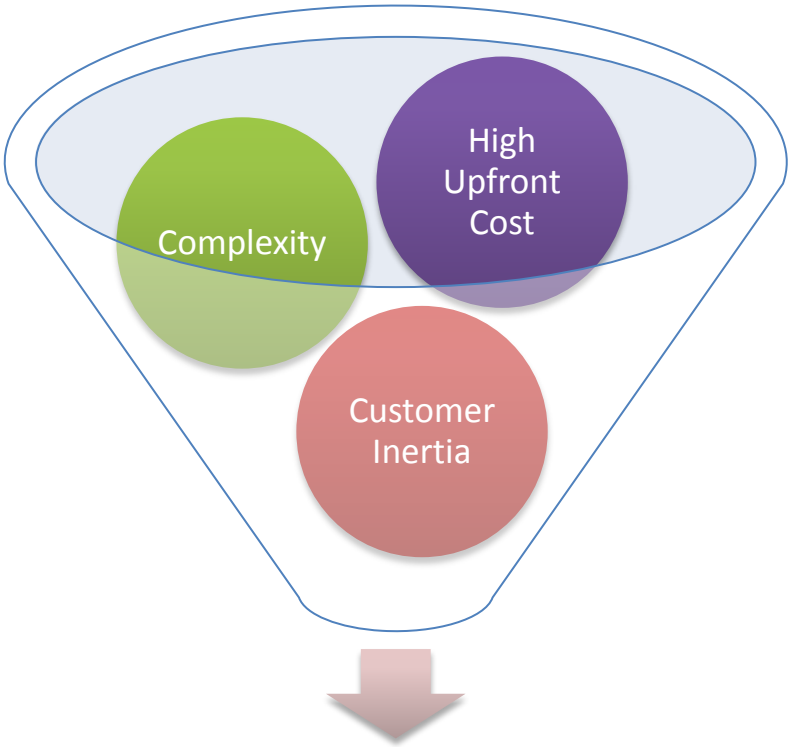
Goals of Solarize Mass

- Increase education through community outreach
- Introduce model to simplify process
- Reduce installation costs
- Reduce time to contract

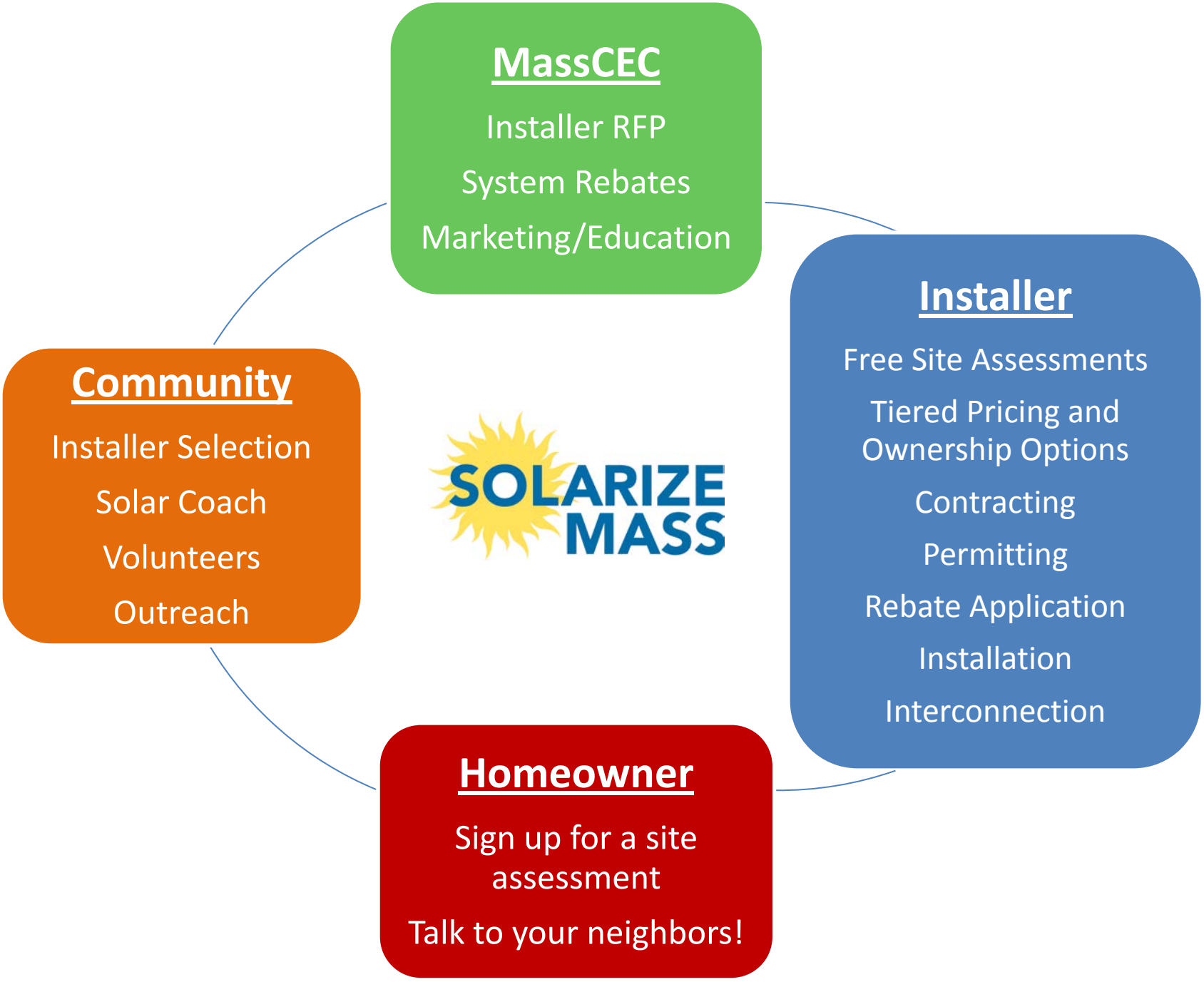


2012 Solarize Massachusetts Basics

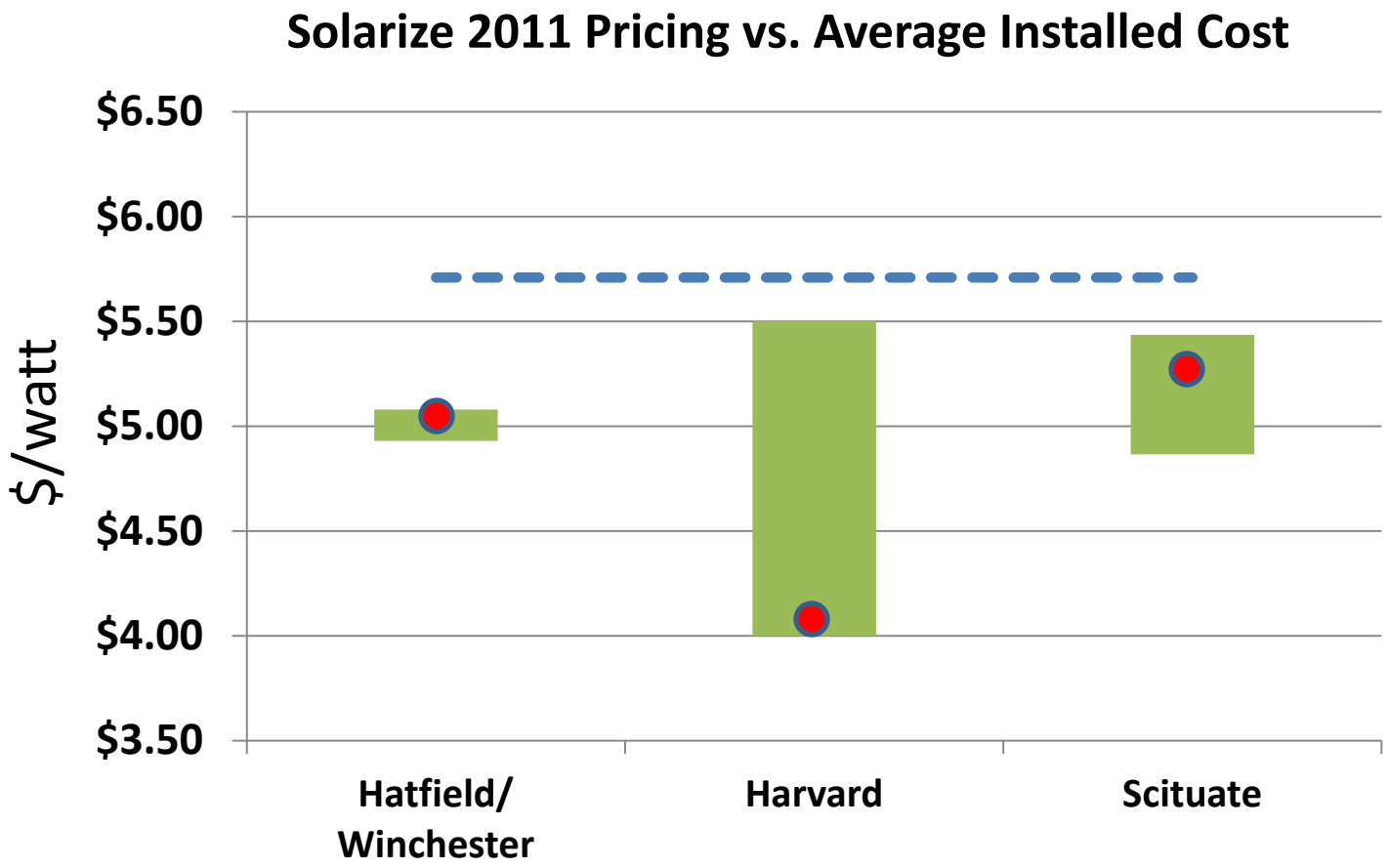
- 17 Green Communities
- Competitive Installer selection
- Tier Pricing (based on contracted capacity)
- Limited time offer – Sign Ups through Sept 30, 2012

Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
1 kW-25 kW	>25 kW-50 kW	>50 kW-150 kW	>150 kW-250 kW	250 kW+

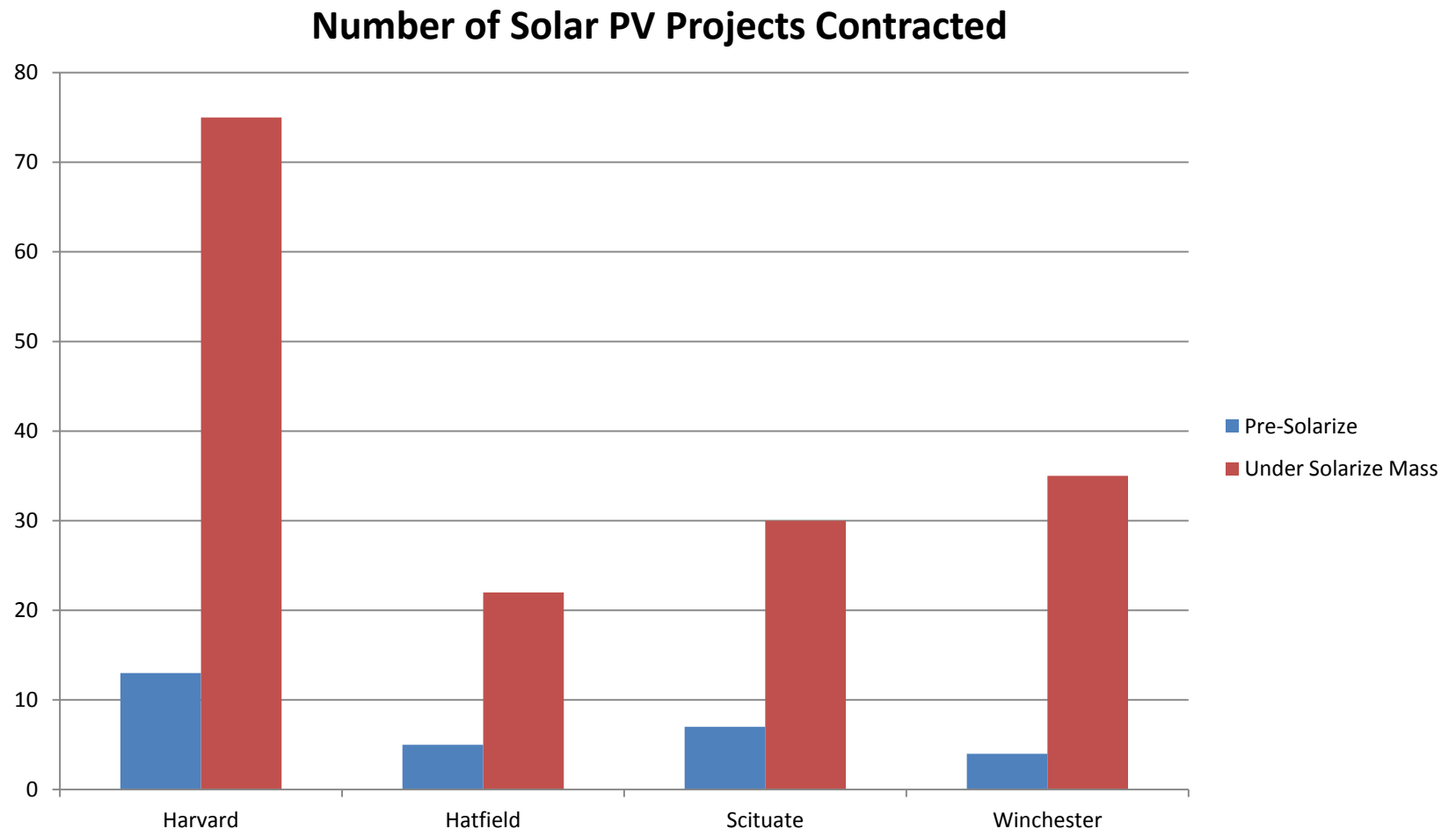
- Pilot demonstrated 8%-33% savings relative to state average


MassCEC
Installer RFP
System Rebates
Marketing/Education
Installer
Free Site Assessments
Tiered Pricing and Ownership Options
Contracting
Permitting
Rebate Application
Installation
Interconnection
Homeowner
Sign up for a site assessment
Talk to your neighbors!
Community
Installer Selection
Solar Coach
Volunteers
Outreach
SOLARIZE MASS

Solarize Mass Pilot



Solarize Mass Pilot (cont.)



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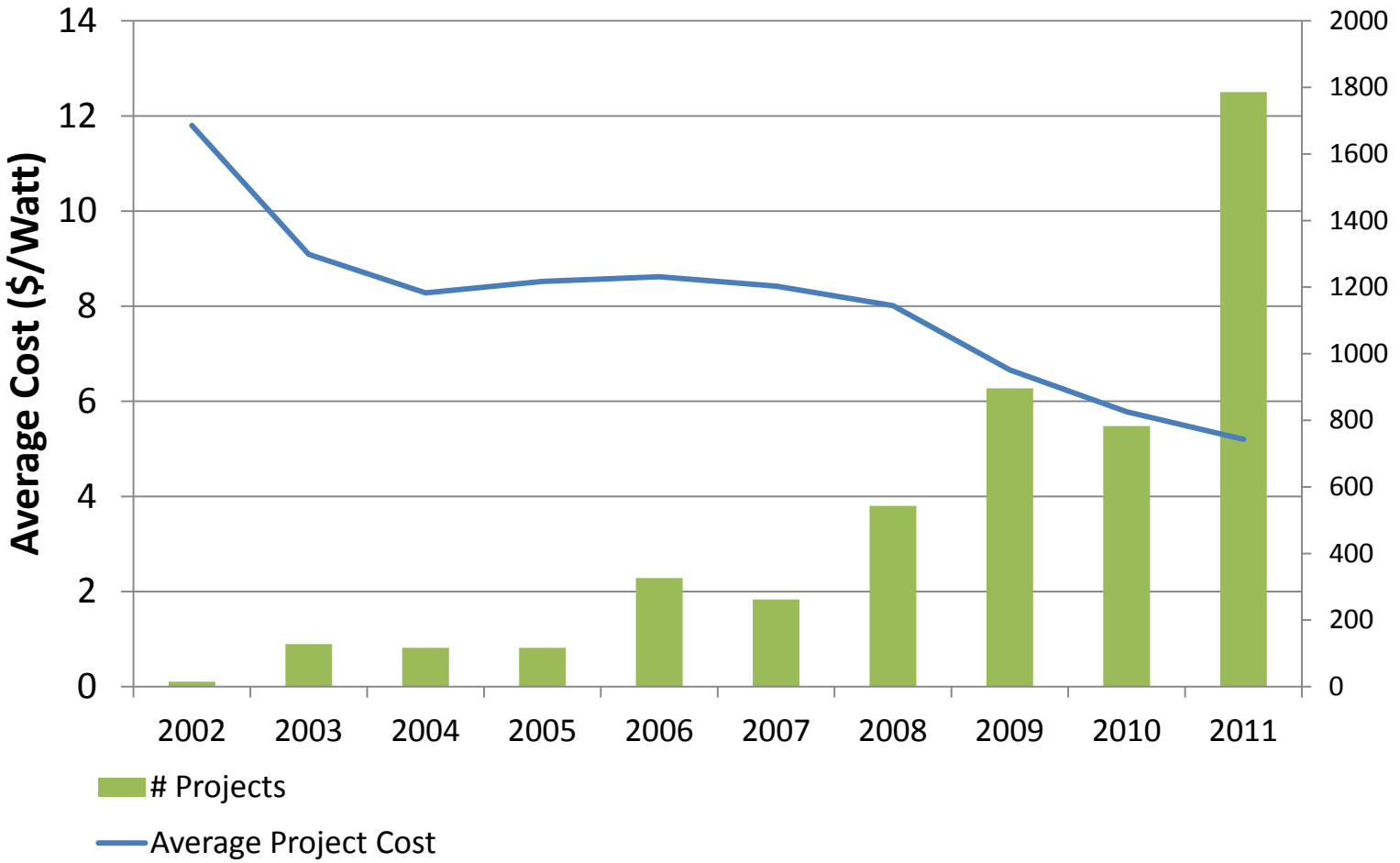
Solar PV Incentives and Finance

- Strong Policy Framework
  - Gov. Patrick goal of 250 MW solar by 2017
  - 2008 Global Warming Solutions Act
  - 2008 Green Communities Act

Residential Project Trends



Ownership Models

- Outright purchase
- Power Purchase Agreement (PPA)
- Lease

Referred to as 3rd Party Ownership




Never Been a Better Time for Solar

High electricity prices + Reduced Solar PV Costs +

Numerous Incentives = Economical solar projects

Incentives
Tax Incentives: Federal (30%) State (15% up to $1,000)
Rebates from MassCEC
Net Metering
SREC Sales
Low/No money down options

www.house-power.com/blog/wp-content/uploads/2009/12/iStock_000009001180XSmall.jpg

MassCEC Rebates

- Quarterly funding blocks
- Any PV system ≤ 15 kW, rebate paid on first 5 kW
- Rebate ranges from $2,000 to $4,250 for 5kW system
- Average rebate covers ~7% of installed cost
- Rebates under Solarize Mass will equal those under normal rebate program

Block 10 Rebate Levels ($ per watt (DC @ STC))	
Base Incentive	$0.40
PLUS:	
Massachusetts Company Component Adder	$0.05
Moderate Home Value Adder **OR** Moderate Income Adder ≤ 120% of MA median income (only residential projects eligible)	$0.40

Go to www.MassCEC.com/solar to learn more.

MassCEC Rebates (cont.)

Moderate Home Value Adder Criteria

County	Property Value
Berkshire, Franklin, Hampden, and Hampshire	≤ $300,000
Bristol, Suffolk, Worcester	≤ $350,000
Barnstable, Duke, Essex, Middlesex, Nantucket, Norfolk, and Plymouth	≤ $400,000

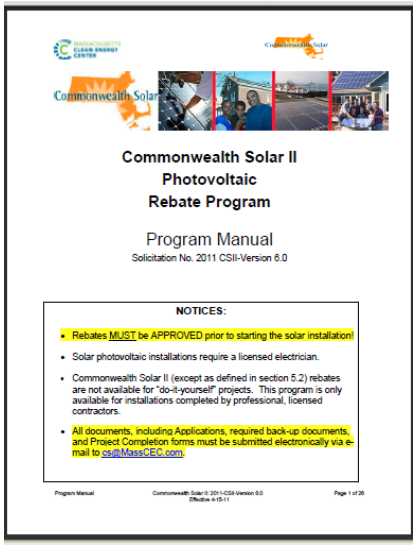
Moderate Income Adder Criteria

Income Category	Income Levels
Individual Income	≤ $75,810*
Domestic Unit Income	≤ $95,420*

* 120% of median household income as determined by the US Census Bureau

MassCEC Rebates (cont.)

- Minimum Technical Requirements
  - Equipment must meet certain standards
  - Required warranties
    - Panels have 20 year warranties
    - Inverters have 10 year warranties
    - 5 year workmanship warranty
  - 80% of optimal system production


Commonwealth Solar II
Photovoltaic
Rebate Program

Program Manual

Solicitation No. 2011 CSII-Version 6.0

NOTICES:

- Rebates MUST be APPROVED prior to starting the solar installation!
- Solar photovoltaic installations require a licensed electrician.
- Commonwealth Solar II (except as defined in section 5.2) rebates are not available for "do-it-yourself" projects. This program is only available for installations completed by professional, licensed contractors.
- All documents, including Applications, required back-up documents, and Project Completion forms must be submitted electronically via e-mail to cs@MassCEC.com.

- Insurance
  - Incumbent on host customer to verify Installer insurance

- Tax Questions
  - MassCEC will issue 1099s to all System Owners
  - Consult tax advisor with any questions about rebate taxability or other incentives

Solar Renewable Energy Certificates (SRECs)

Electricity Pathway

- Electrons from all generation sources are physically the same
- Cannot be tracked independently on the grid

Electricity and SRECs can be, and often are, sold separately

SRECs Pathway

- SRECs represent the "green" attributes of the renewable generation source
- Utilities are required to purchase SRECs every year
- 1 SREC = 1,000 kWh
- Verified SRECs ensure that only one buyer can claim each SREC

SRECs (cont)

- Not as complicated as it sounds: Small-scale project owners will work with SREC aggregators or brokers to sell SRECs to utilities
- Projects installed in 2012 will be eligible to sell SRECs for 10 years
- SRECs generally sell between $285 - $550/SREC
- Monthly production reported to MassCEC's Production Tracking System (PTS)

Assumptions: Simple Solar Ownership Model

Assumptions	
Size:	5 kW (5,000 watts)
Panel Degradation:	1% Annually
Electricity Price:	$0.15/kWh
Electricity Price Escalator:	3% Annually
Life of System:	20 years
SREC Value:	$285.00
Timeline for SREC Sales:	10 years
Income Tax Rate:	28%
Discount Rate:	7.5%

* Assumes qualification for the base rebate incentive and is eligible for federal and state tax incentives.

Disclaimer: This financial analysis is only an estimate. Actual installed costs, savings, and revenues are subject to change and will be specific to individual projects.

Simple Solar Ownership Model

	State Average Price	Example Tier Price
Dollar Per Watt Cost	$ 5.23	$ 4.00
Total Installation Cost	$ 26,150.00	$ 20,000.00
CSII Rebate (base of $0.40/watt)	- $ 2,000.00	- $ 2,000.00
Total Upfront Cost	**$ 24,150.00**	**$ 18,000.00**
Federal Tax Credit (30% of cost)	- $ 7,245.00	- $ 5,400.00
MA Tax Credit	- $ 1,000.00	- $ 1,000.00
Total After Tax Credits	**$ 15,905.00**	**$ 11,600.00**
NPV SREC Income (over 10 yrs)	- $ 7,714.24	- $ 7,714.24
NPV Electricity Savings (over 20 yrs)	- $ 10,073.75	- $ 10,073.75
Net Project Cost	**$ (1,882.99)**	**$ (6,187.99)**
Payback after rebate & tax credits	**7-8 years**	**5-6 years**

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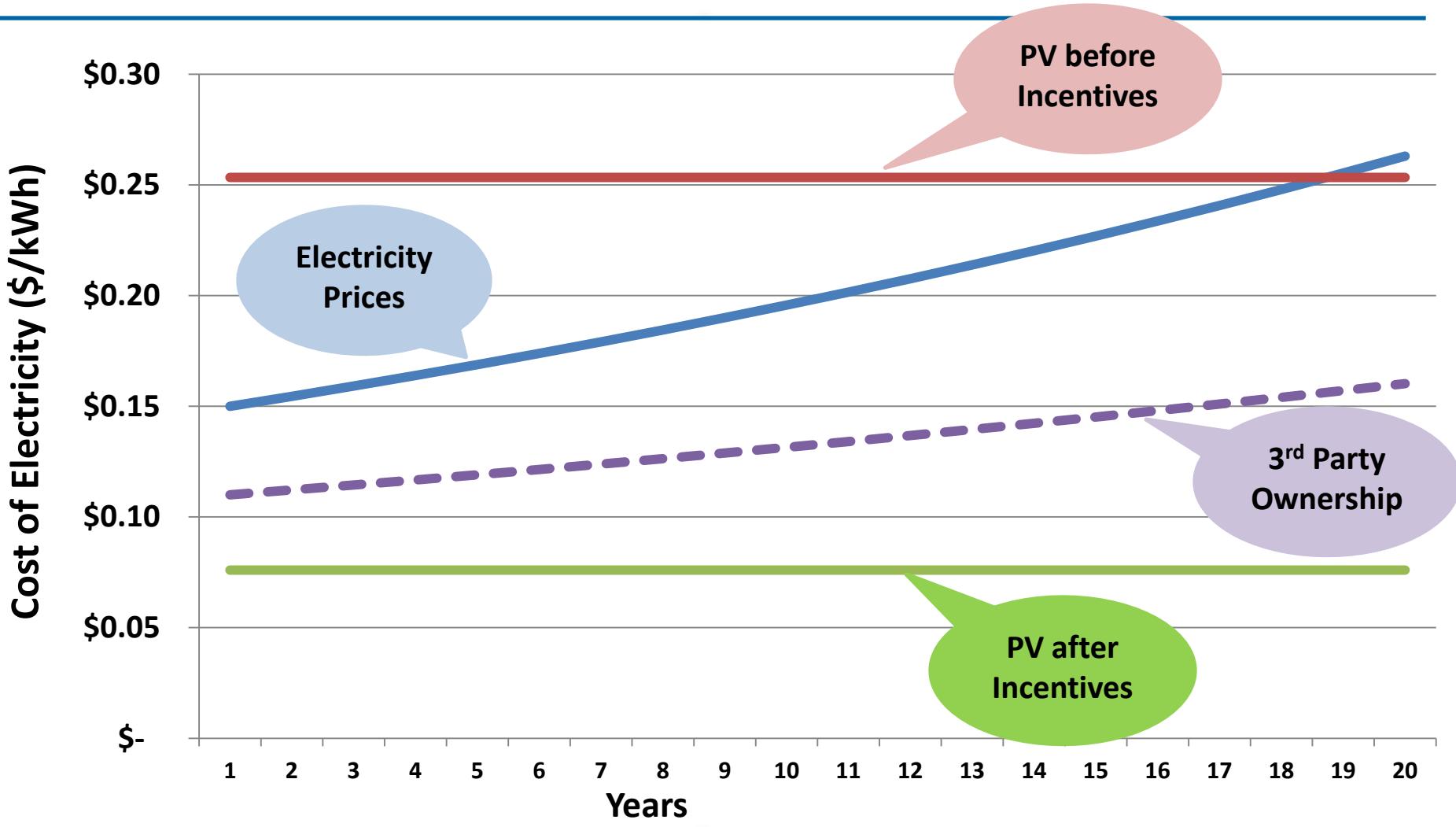
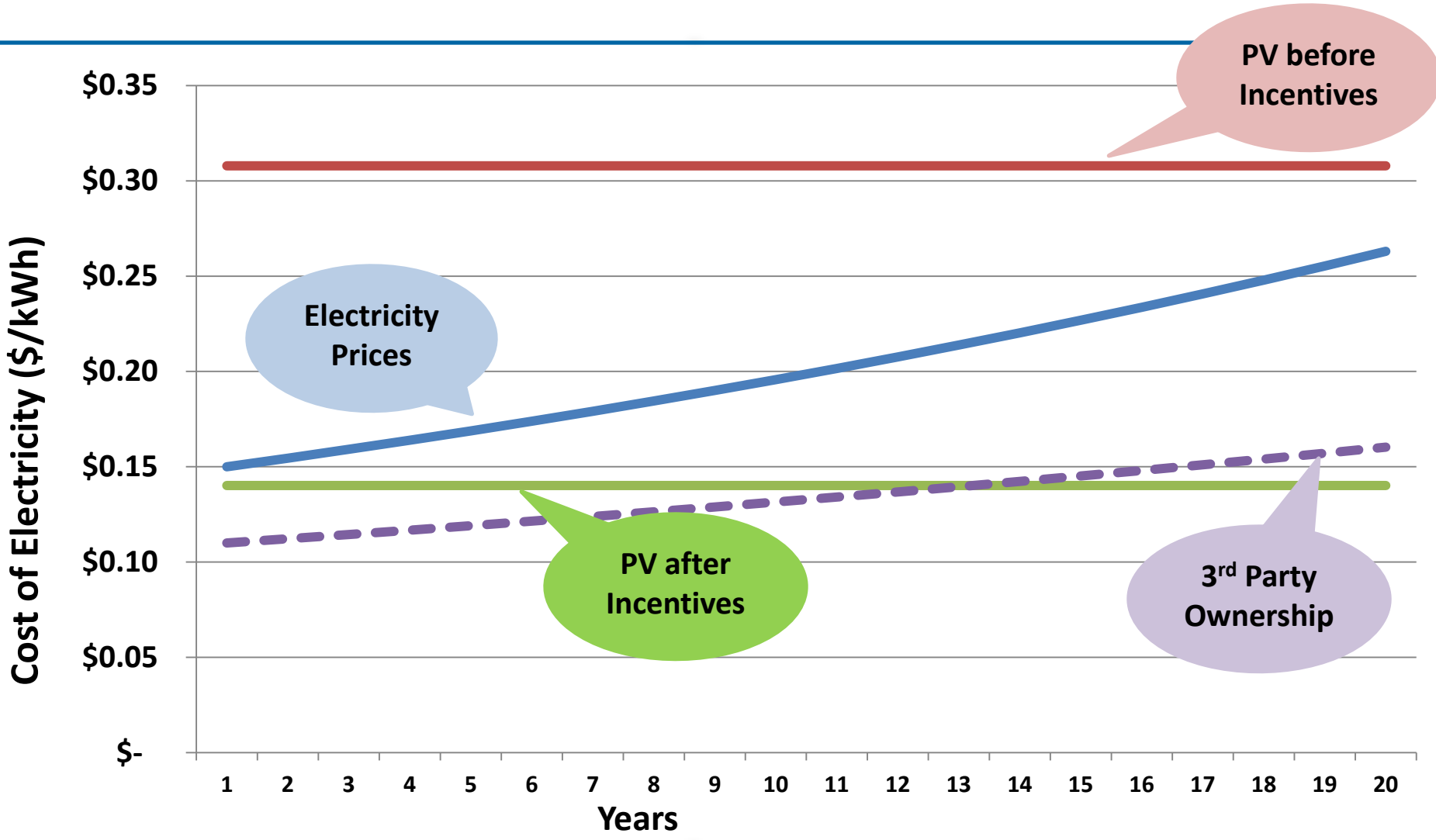
Levelized Cost of Solar PV (w/o Financing)



Levelized Cost of Solar PV (w/ 5% Financing)



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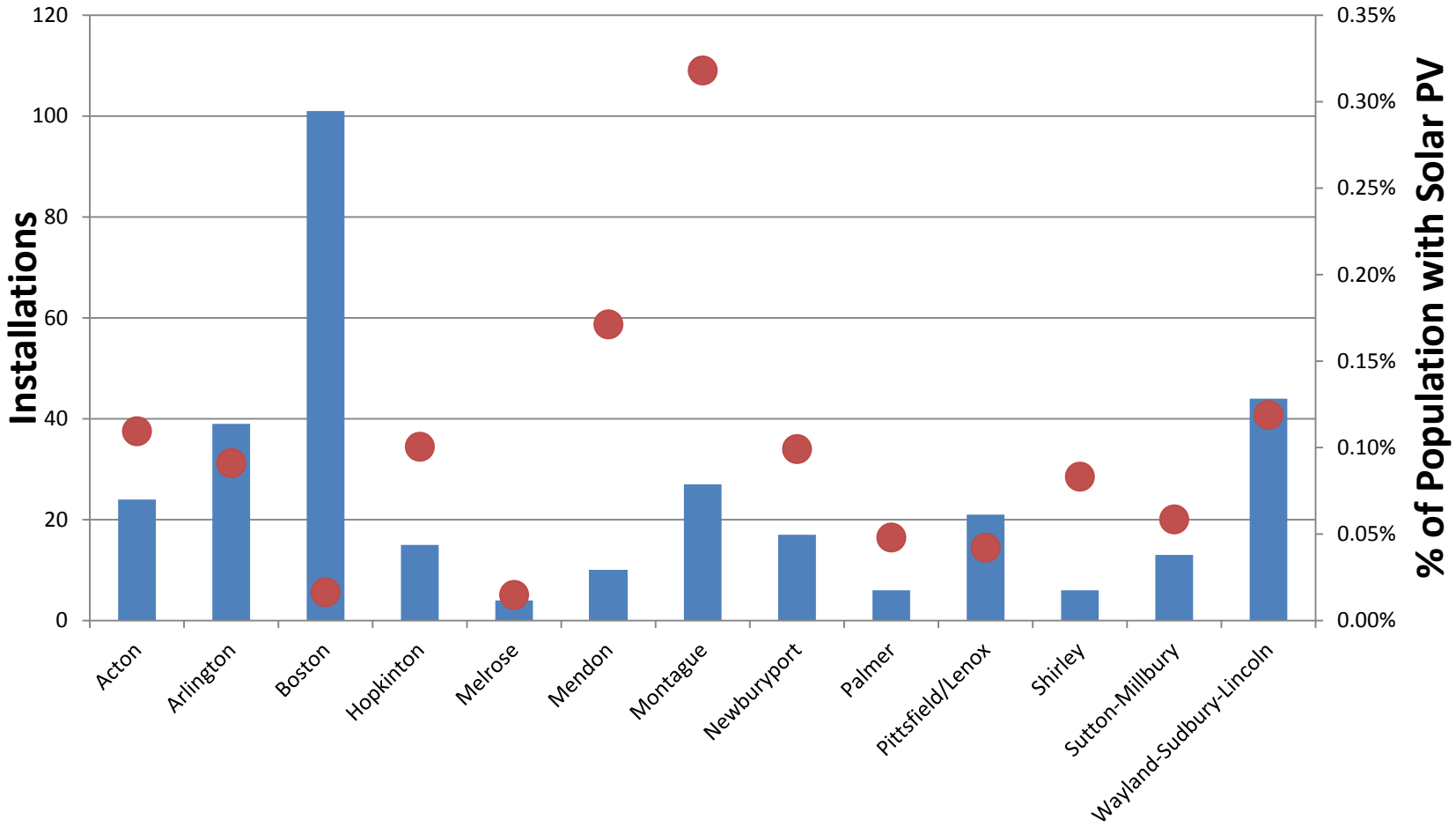
Solarize 2012 Starting Line



Next Steps

- Sign up at **www.SolarizeMass.com** or with sign-up sheet
- When selected, Installer will contact you about doing a free site assessment
  - Nothing is binding at this point
- Consider other options if solar PV is not feasible
- **Tell your friends and neighbors!**

Thank you!

www.SolarizeMass.com

(617) 315-9306

MassCEC: solarize@MassCEC.com

Or

Solar Coach: shirleysolar1@gmail.com