Solar Powering Your Community

Addressing Soft Costs and Barriers

Powered by SunShot

U.S. Department of Energy

Powered by SunShot

U.S. Department of Energy

Autumn Proudlove

NC Clean Energy Technology Center

afproudl@ncsu.edu

Philip Haddix

The Solar Foundation

phaddix@solarfound.org

About the SunShot Solar Outreach Partnership

ICMA
Leaders at the Core of Better Communities

APA
American Planning Association
Making Great Communities Happen

NARC
Building Regional Communities
National Association of Regional Councils

ICLEI
Local Governments for Sustainability USA

IREC
Interstate Renewable Energy Council

MEISTER
CONSULTANTS GROUP

NC CLEAN ENERGY
TECHNOLOGY CENTER
Formerly the NC Solar Center

The SOLAR FOUNDATION

SEPA
solar electric power association

The SunShot Solar Outreach Partnership (SolarOPs) is a U.S. Department of Energy (DOE) program designed to increase the use and integration of solar energy in communities across the US.

About the SunShot Solar Outreach Partnership

- Increase installed capacity of solar electricity in U.S. communities
- Streamline and standardize permitting and interconnection processes
- Improve planning and zoning codes/regulations for solar electric technologies
- Increase access to solar financing options

Complimentary Services

Technical Resources

Regional Workshops

One to One Assistance

Strategy Session

Complimentary Services

Technical Resources

Helping Policymakers Understand Best Practices:

- Case Studies
- Fact Sheets
- How-to Guides
- Toolkits

www.solaroutreach.org

One to One Assistance

Regional Workshops

Strategy Session

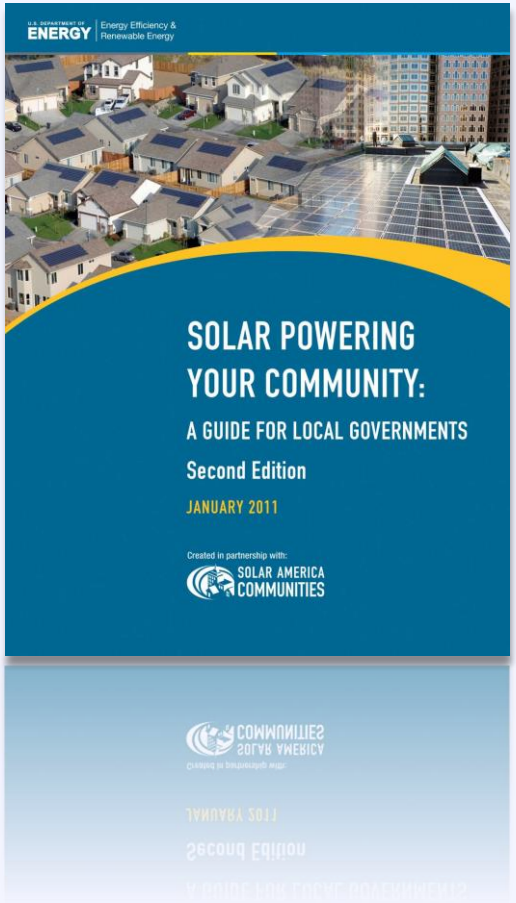
Email solar-usa@iclei.org to request a 20 minute consultation

Technical Resources

Resource **Solar Powering Your Community Guide**

A comprehensive resource to assist local governments and stakeholders in building local solar markets.

www.energy.gov



Complimentary Services

Quickly get up to speed on key solar policy issues:

- Solar 101
- Planning for Solar
- Implementing an Ordinance
- Streamlining Solar Permits
- Growing your Market

Regional Workshops

Strategy Session

Powered by SunShot U.S. Department of Energy

Email solar-usa@iclei.org to request a 20 minute consultation

Complimentary Services

Technical Resources

Regional Workshops

Develop an implementation strategy for smart solar policy

Strategy Session

Email solar-usa@iclei.org to request a 20 minute consultation

Complimentary Services

Technical Resources

Regional Workshops

One to One Assistance

Receive customized technical support on implementation of smart solar policy

Powered by SunShot U.S. Department of Energy

Email solar-usa@iclei.org to request a 20 minute consultation

After This Session

Talk to Us!

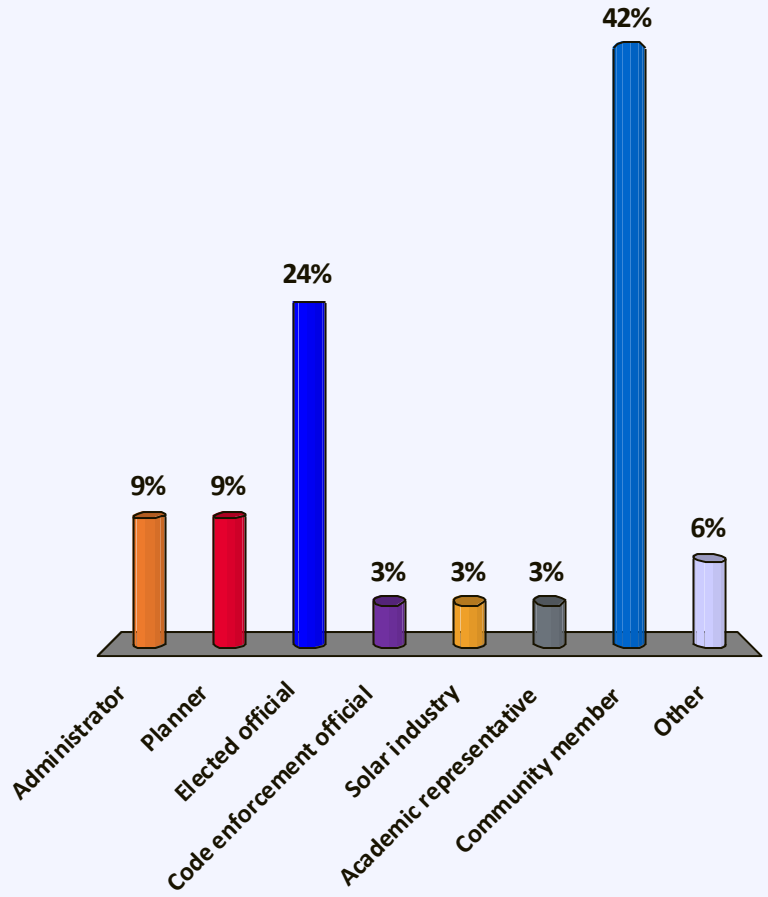
Sign up for a 20 minute consultation to learn more about our free services

See Mia Colson or Emily Dodson to sign up.

We want to get to know you better

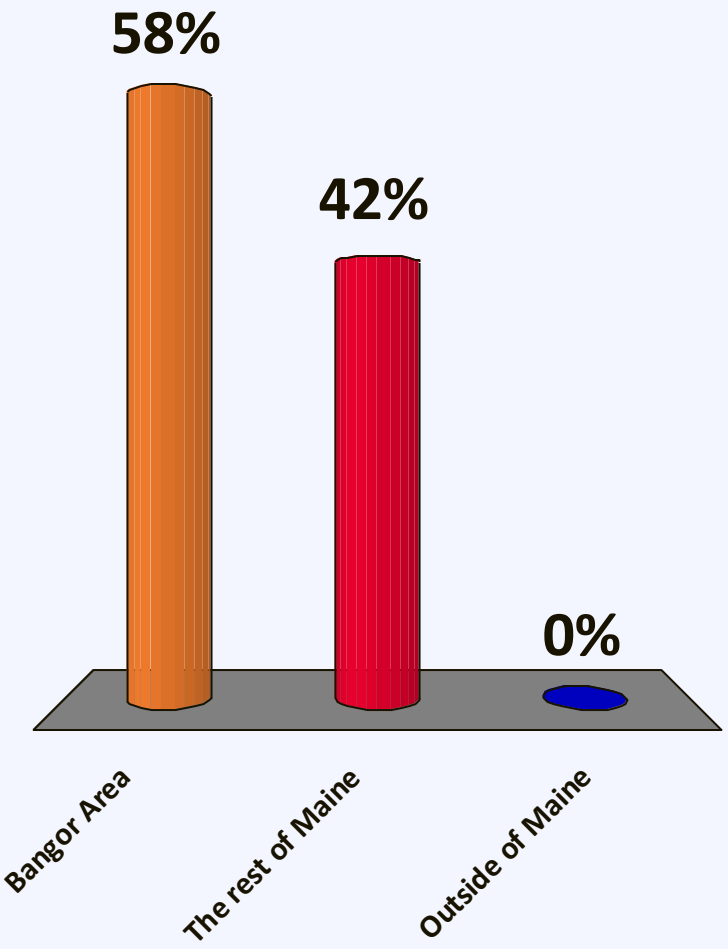
Who are you?

A. Administrator
B. Planner
C. Elected official
D. Code enforcement official
E. Solar industry
F. Academic representative
G. Community member
H. Other



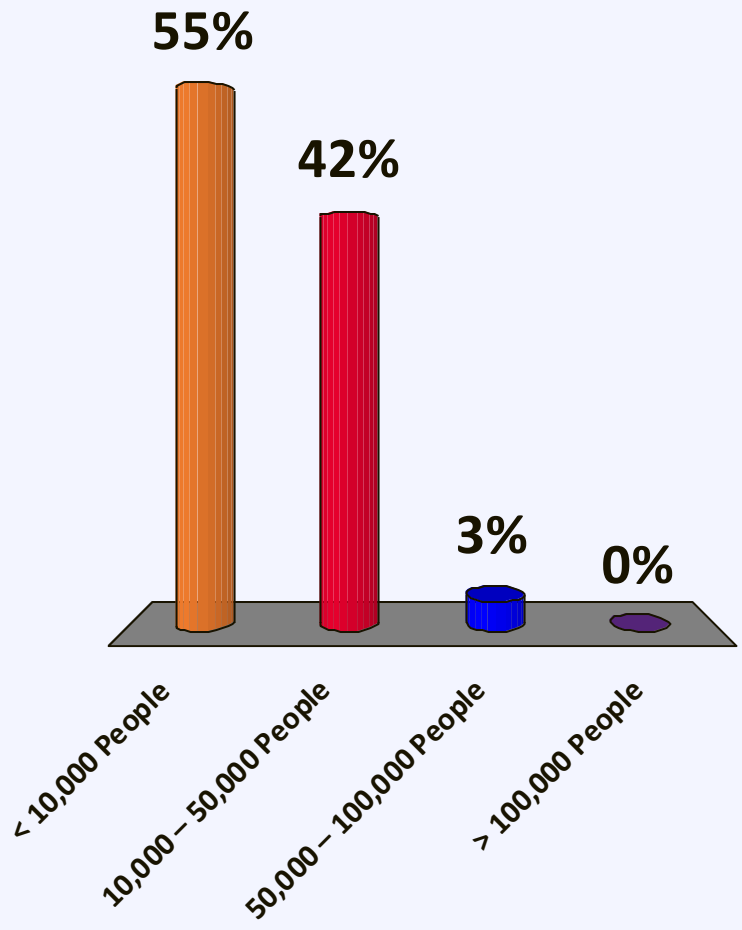
Where are you coming from?

A. Bangor Area
B. The rest of Maine
C. Outside of Maine



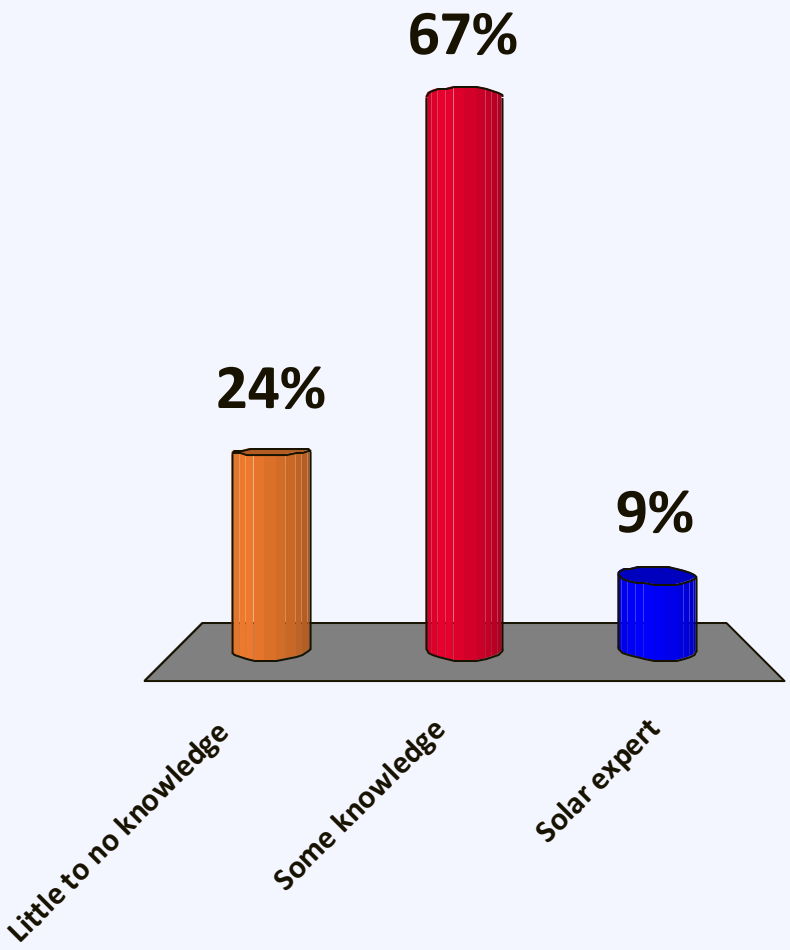
What size is your community?

A. < 10,000 People
B. 10,000 – 50,000 People
C. 50,000 – 100,000 People
D. > 100,000 People



How familiar are you with solar?

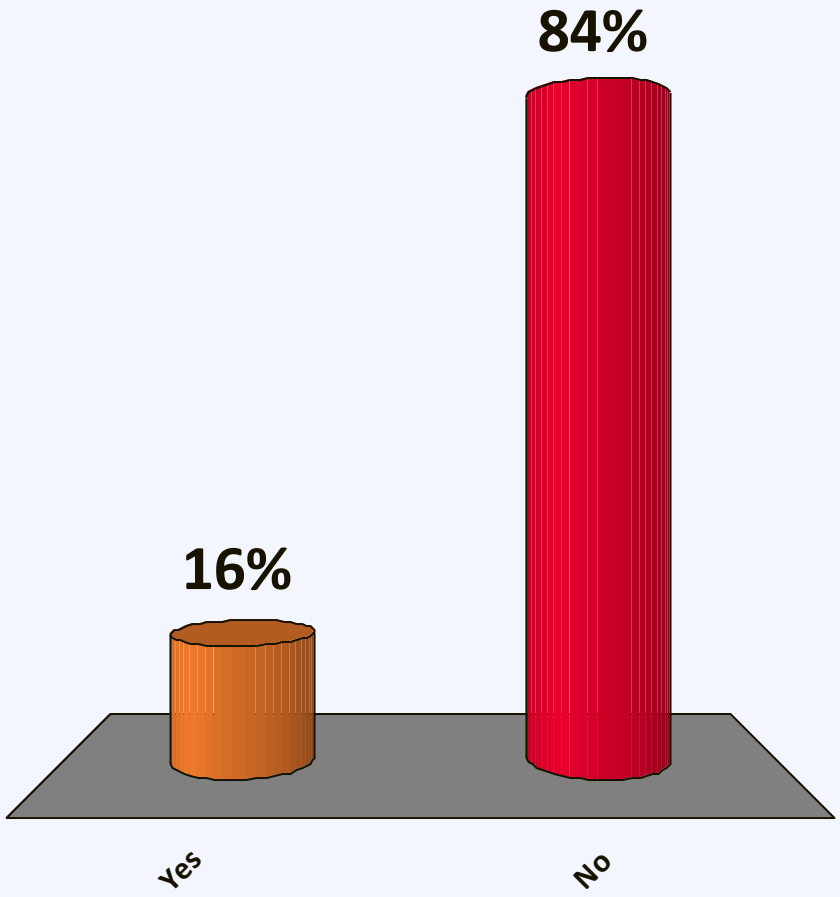
A. Little to no knowledge
B. Some knowledge
C. Solar expert



Do you have solar on your home?

A. Yes

B. No



Solar Development in the US

In 2013, the US solar industry installed

131,000 new solar installations

of which

94% were residential projects

If you do have solar on your home:

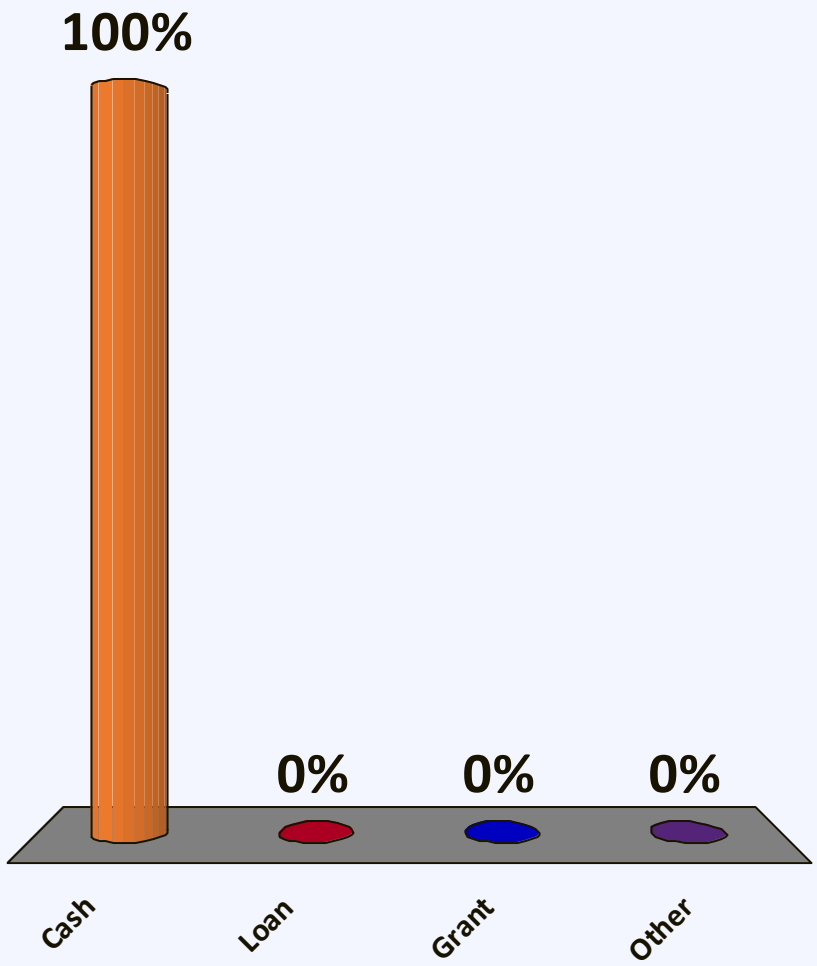
How did you finance it?

A. Cash

B. Loan

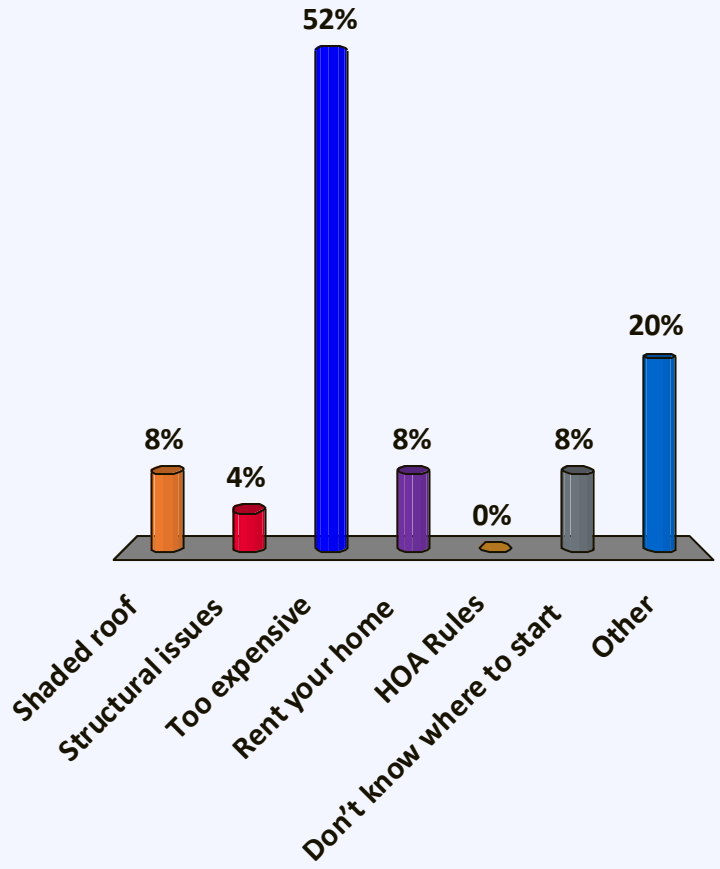
C. Grant

D. Other



If you don't have solar on your home: **Why not?**

A. Shaded roof
B. Structural issues
C. Too expensive
D. Rent your home
E. HOA Rules
F. Don't know where to start
G. Other

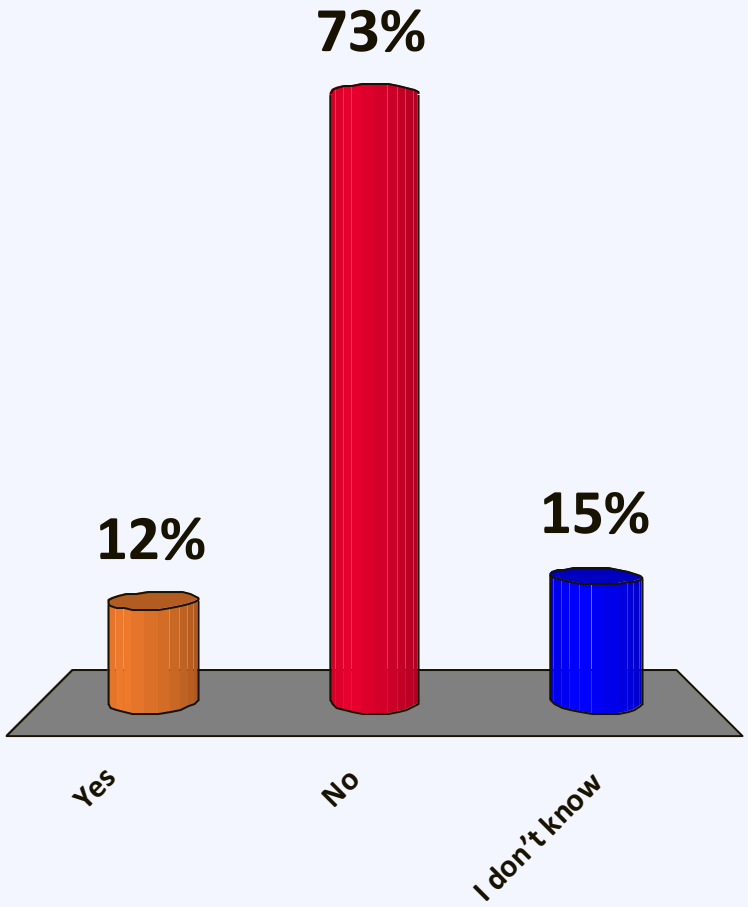


Does your local government have solar on public properties?

A. Yes

B. No

C. I don't know



Agenda

10:20 – 10:50	Putting Solar Energy on the Local Policy Agenda
10:50 – 11:20	State of the Local Solar Market
11:20 – 11:50	Federal, State, and Utility Policy Drivers
11:50 – 12:15	*Break and Grab Lunch*
12:15 – 12:45	Planning for Solar: Getting Solar Ready
12:45 – 1:20	Solar Market Development Tools
1:20 – 1:30	*Break*
1:30 – 2:15	Local Speakers
2:15– 3:00	Developing and Solar Policy Implementation Plan for Your Community and Next Steps

Agenda

10:20 – 10:50	Putting Solar Energy on the Local Policy Agenda
10:50 – 11:20	State of the Local Solar Market
11:20 – 11:50	Federal, State, and Utility Policy Drivers
11:50 – 12:15	*Break and Grab Lunch*
12:15 – 12:45	Planning for Solar: Getting Solar Ready
12:45 – 1:20	Solar Market Development Tools
1:20 – 1:30	*Break*
1:30 – 2:15	Local Speakers
2:15– 3:00	Developing and Solar Policy Implementation Plan for Your Community and Next Steps

Solar Technologies

Solar Photovoltaic (PV)

Solar Hot Water

Concentrated Solar Power

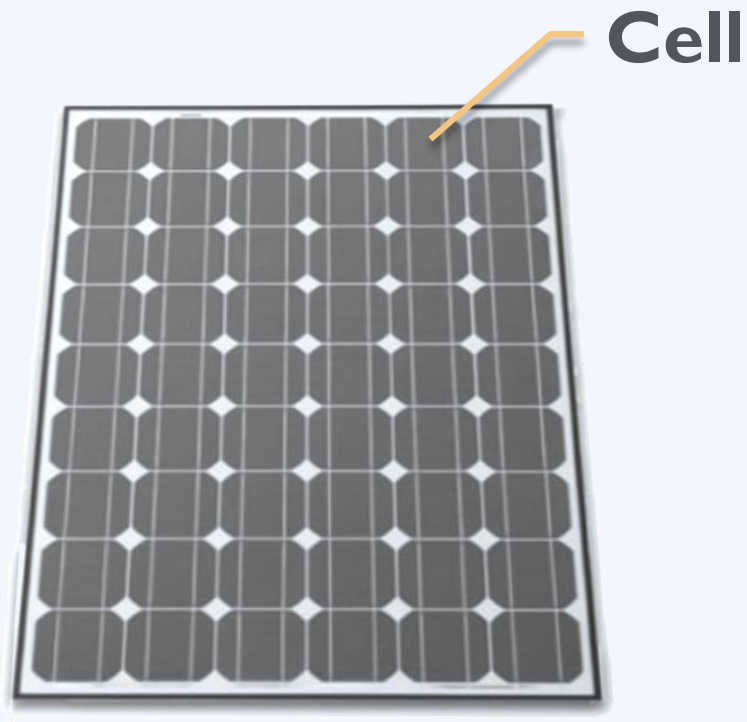
Solar Technologies

Solar Photovoltaic (PV)

Solar Hot Water

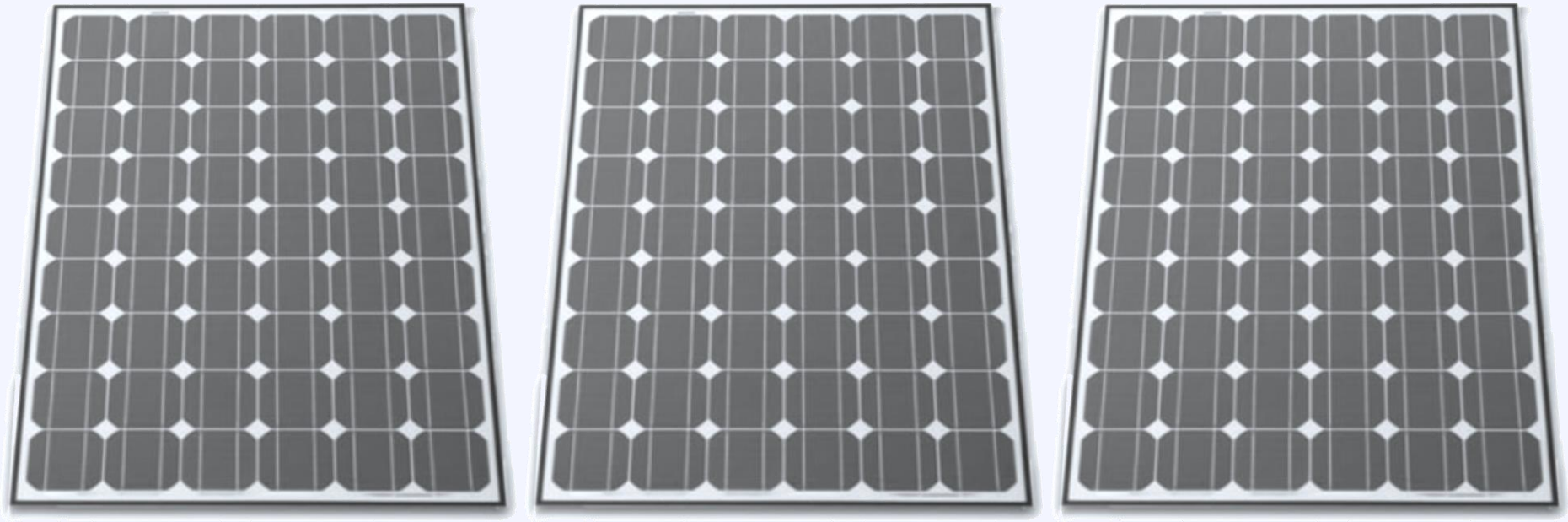
Concentrated Solar Power

Some Basic Terminology



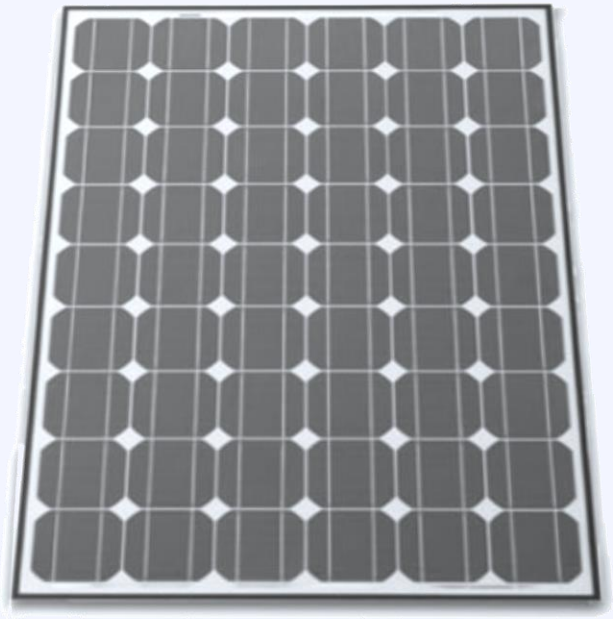
Panel / Module

Some Basic Terminology



Array

Some Basic Terminology



Capacity / Power

kilowatt (kW)

Production

Kilowatt-hour (kWh)

Some Basic Terminology

Residence
5 kW

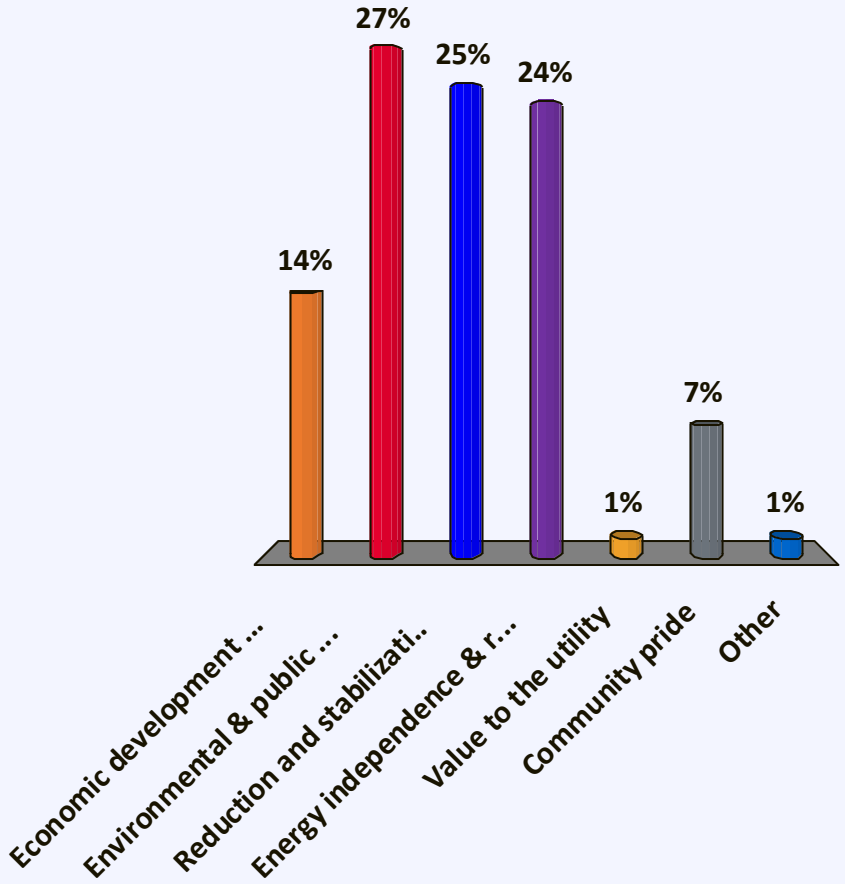
Factory
1 MW+

Office
50 – 500 kW

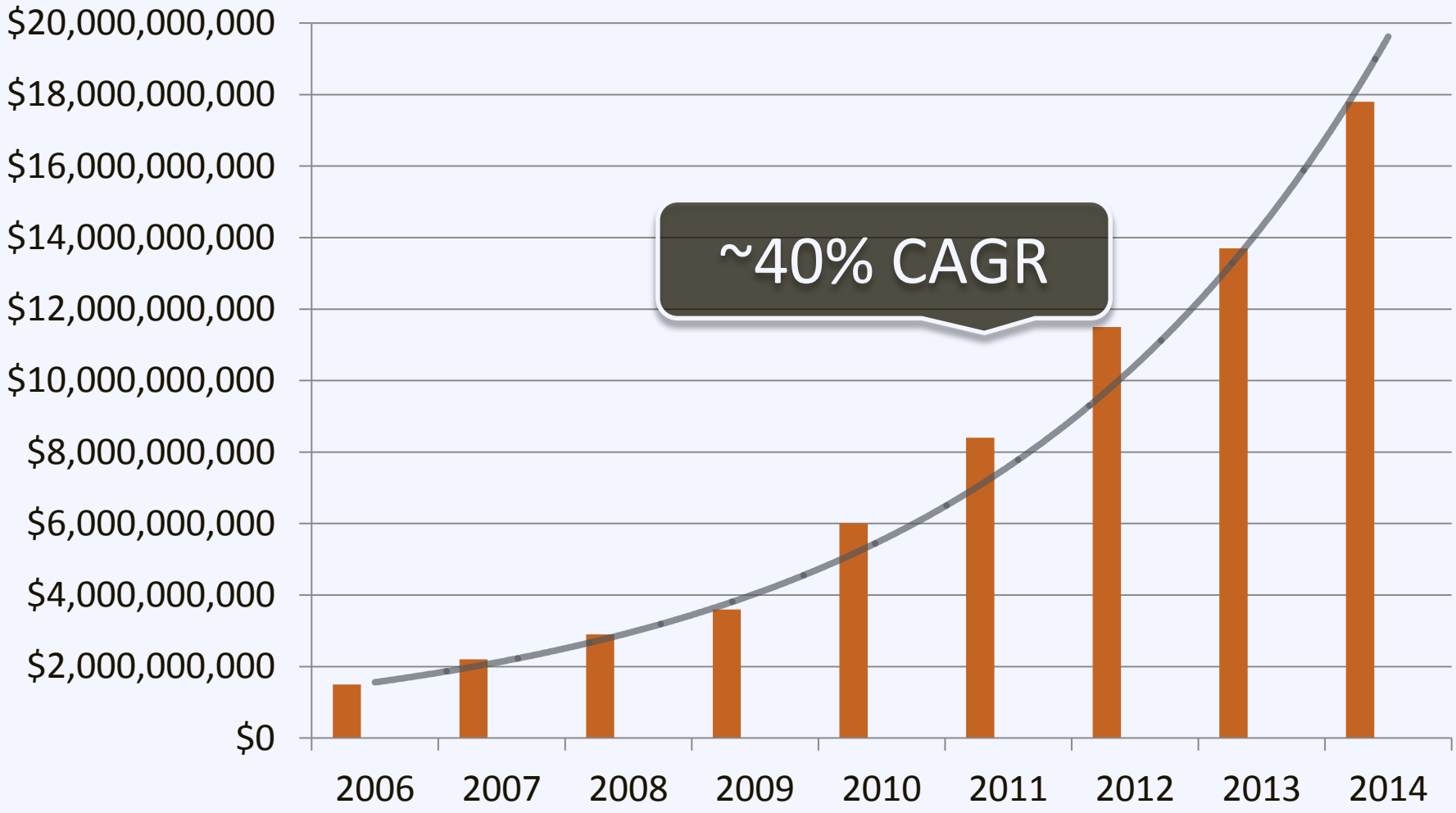
Utility
2 MW+

What are the top 3 benefits solar can bring to your community?

A. Economic development & job creation
B. Environmental & public health benefits
C. Reduction and stabilization of energy costs
D. Energy independence & resilience
E. Value to the utility
F. Community pride
G. Other



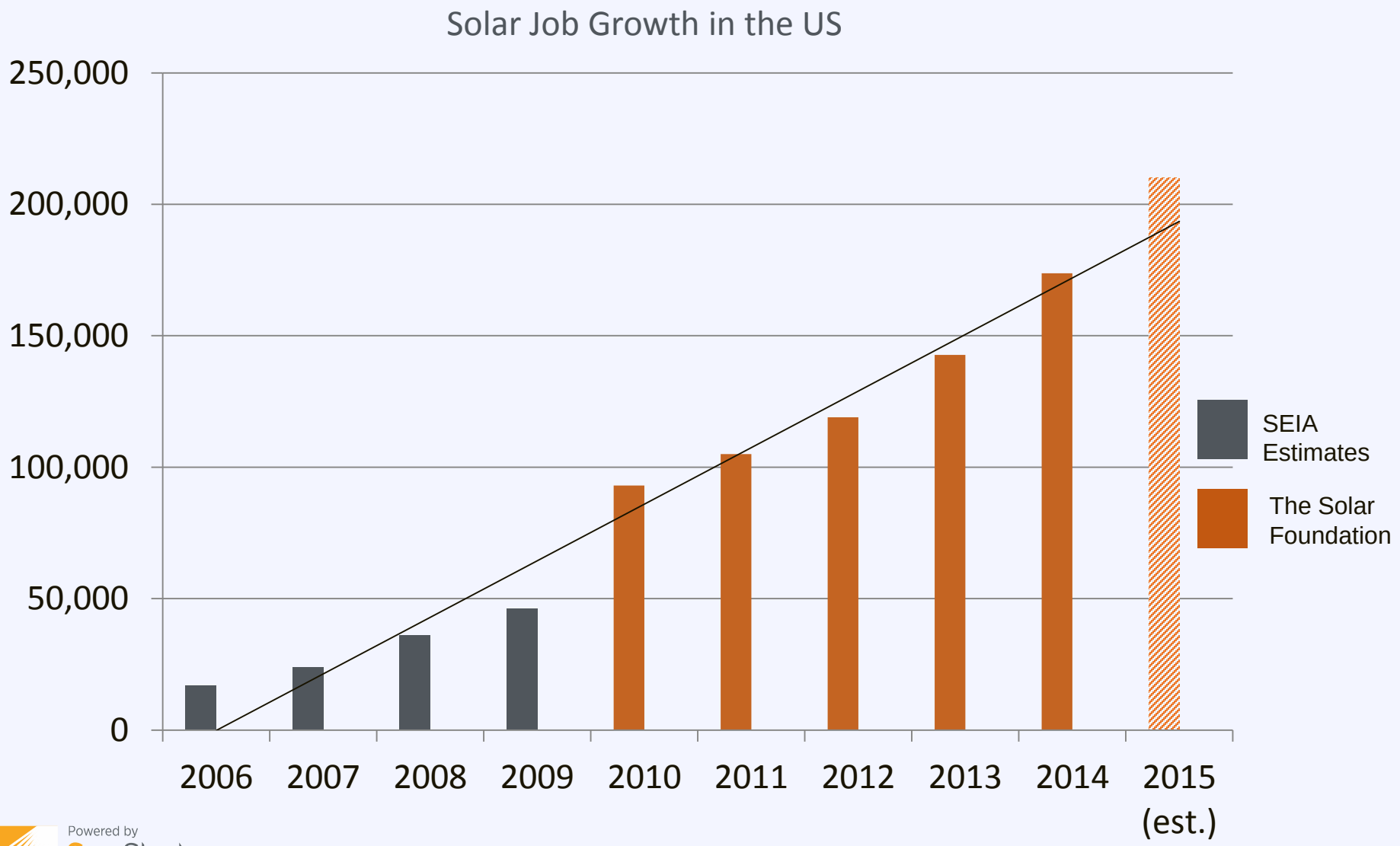
Benefits: Solar Economic Growth



Powered by SunShot U.S. Department of Energy

Source: SEIA/GTM Research – 2009/2010/2011/2012 Year in Review Report
http://www.seia.org/research-resources/us-solar-market-insight

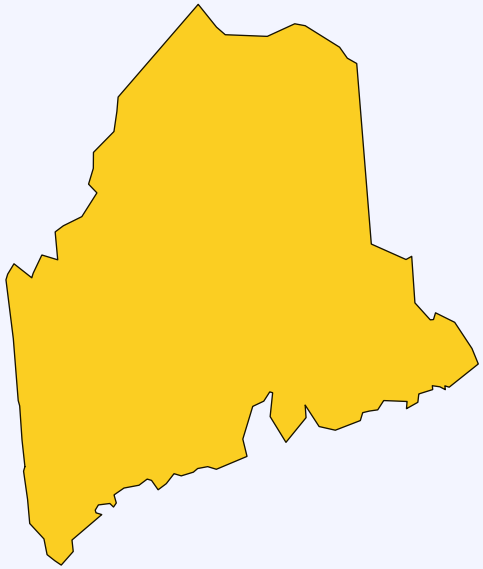
Benefits: Solar Job Growth



Source: SEIA Estimates (2006-2009), The Solar Foundation's *National Solar Jobs Census* report series

The Local Economic Opportunity

1 Megawatt of Residential Solar Development in Maine:



34 Jobs *and* **$3.7 Million**

In economic output

Powered by SunShot U.S. Department of Energy

Source: JEDI Model, NREL

Economic Development in Maine

There are currently

45 solar companies

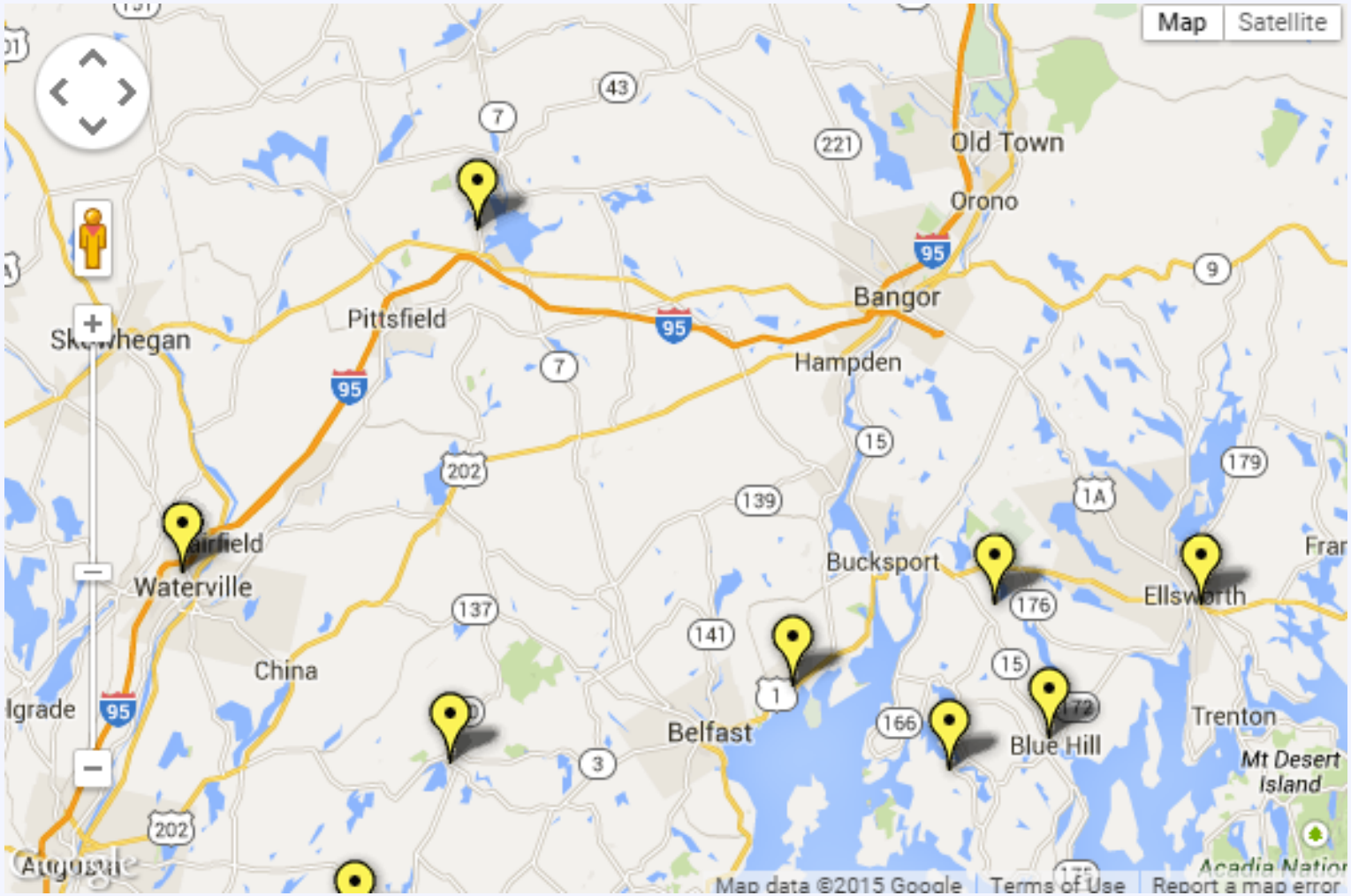
that employ

420 people

Powered by SunShot U.S. Department of Energy

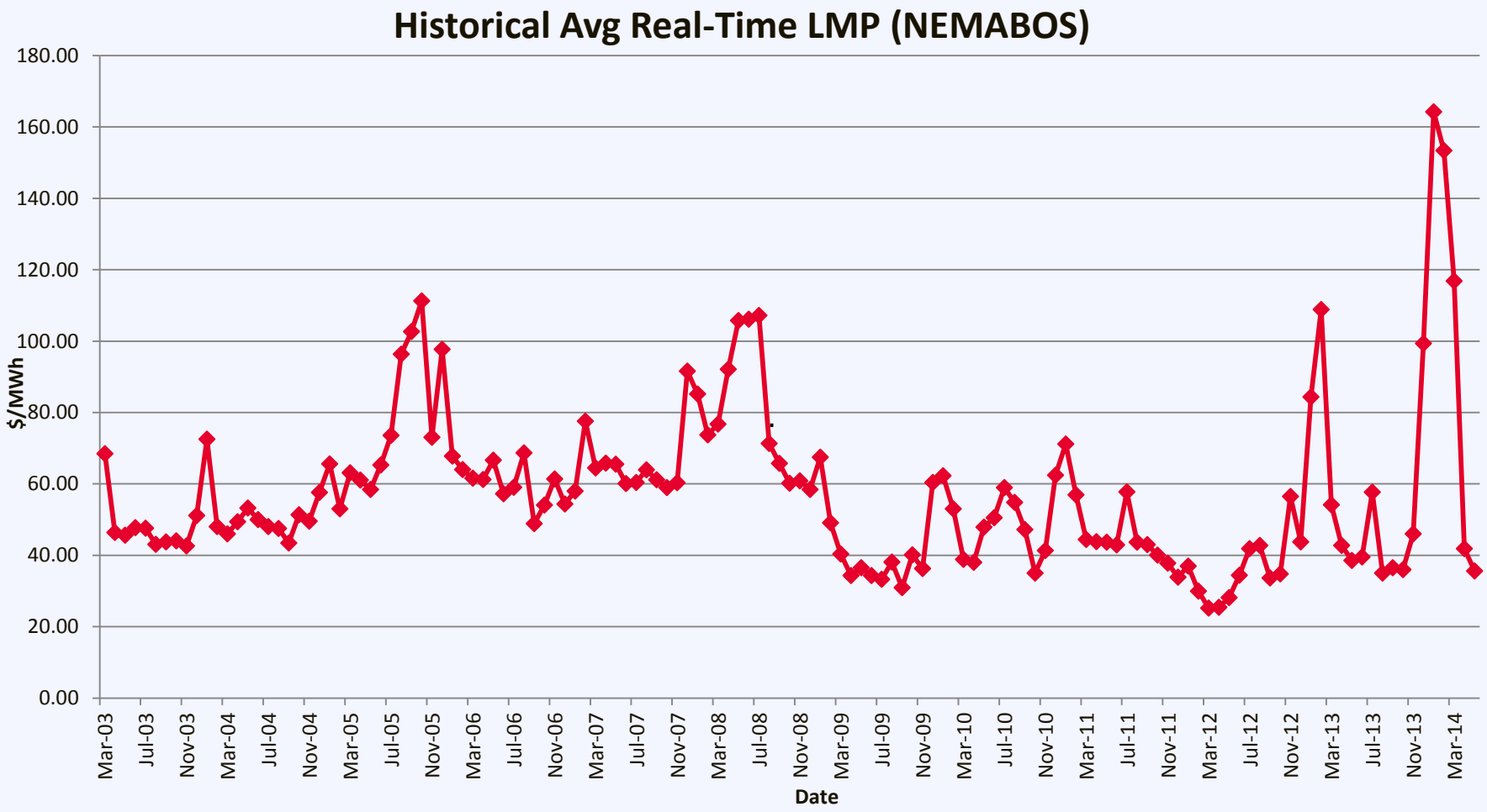
Source: SEIA, The Solar Foundation

Economic Development in Maine



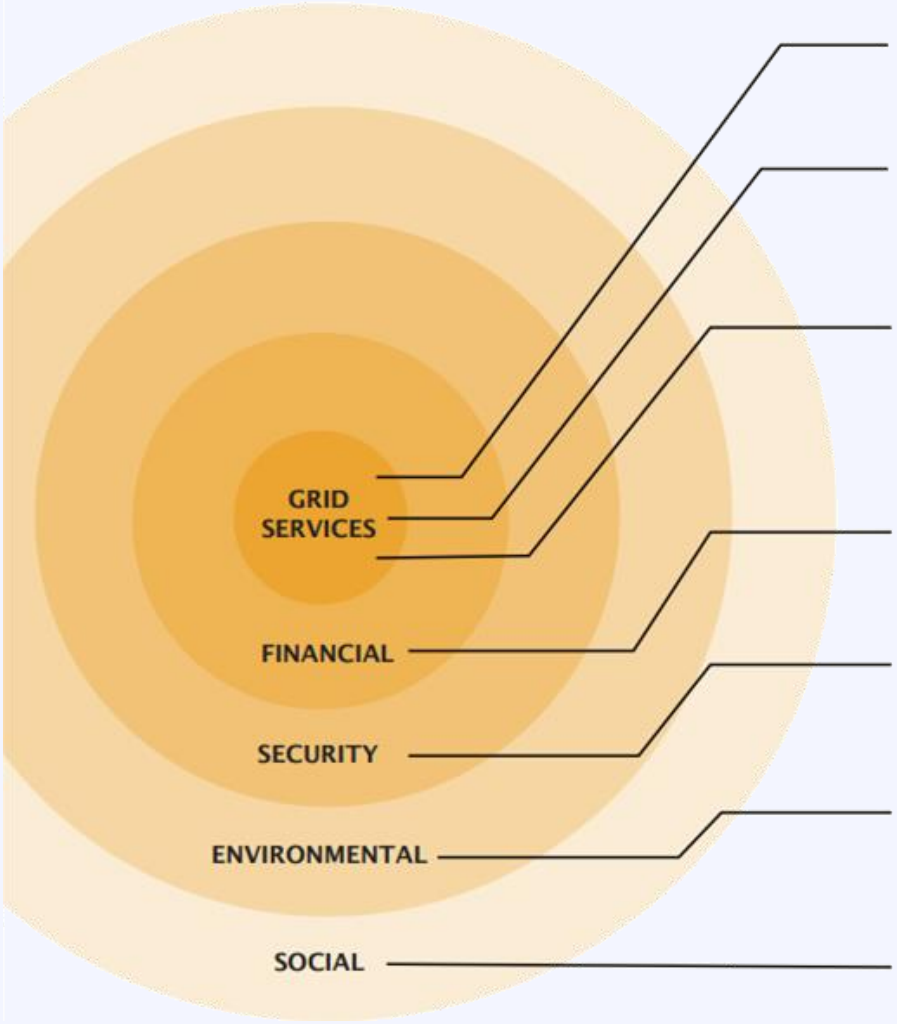
Source: SEIA

Benefit: Stabilize Energy Prices



Source: NEPOOL

Valuable to Community & Utilities



ENERGY
- energy
- energy losses

CAPACITY
- generation capacity
- transmission & distribution capacity
- DPV installed capacity

GRID SUPPORT SERVICES
- reactive supply & voltage control
- regulation & frequency response
- energy & generator imbalance
- synchronized & supplemental operating reserves
- scheduling, forecasting, and system control & dispatch

FINANCIAL RISK
- fuel price hedge
- market price response

SECURITY RISK
- reliability & resilience

ENVIRONMENTAL
- carbon emissions
- criteria air pollutants (SOx, NOx, PM10)
- water
- land

SOCIAL
- Economic development (jobs and tax revenues)

Source: Rocky Mountain Institute
(http://www.rmi.org/Content/Files/eLab-DER_cost_value_Deck_130722.pdf)

Valuable to Community & Utilities

Figure ES- 3. Base Case Results for CMP, BHD, and MPD – First Year

First Year		CMP $/kWh	BHD $/kWh	MPD $/kWh
Energy Supply	Avoided Energy Cost	0.061	0.061	0.061
	Avoided Gen. Capacity Cost	0.015	0.015	0.015
	Avoided Res. Gen. Capacity Cost	0.002	0.002	0.002
	Avoided NG Pipeline Cost			
	Solar Integration Cost	(0.002)	(0.002)	(0.002)
Transmission Delivery Service	Avoided Trans. Capacity Cost	0.014	0.017	0.000
Distribution Delivery	Avoided Dist. Capacity Cost			
	Voltage Regulation			
Environmental	Net Social Cost of Carbon	0.021	0.021	0.021
	Net Social Cost of SO_2	0.051	0.051	0.051
	Net Social Cost of NO_x	0.011	0.011	0.011
Other	Market Price Response	0.009	0.009	0.009
	Avoided Fuel Price Uncertainty	0.000	0.000	0.000
		0.182	0.184	0.168

Avoided Market Costs
$0.093

Societal Benefits
$0.092

Source: Maine Public Utilities Commission
(http://www.nrcm.org/wp-content/uploads/2015/03/MPUCValueofSolarReport.pdf)

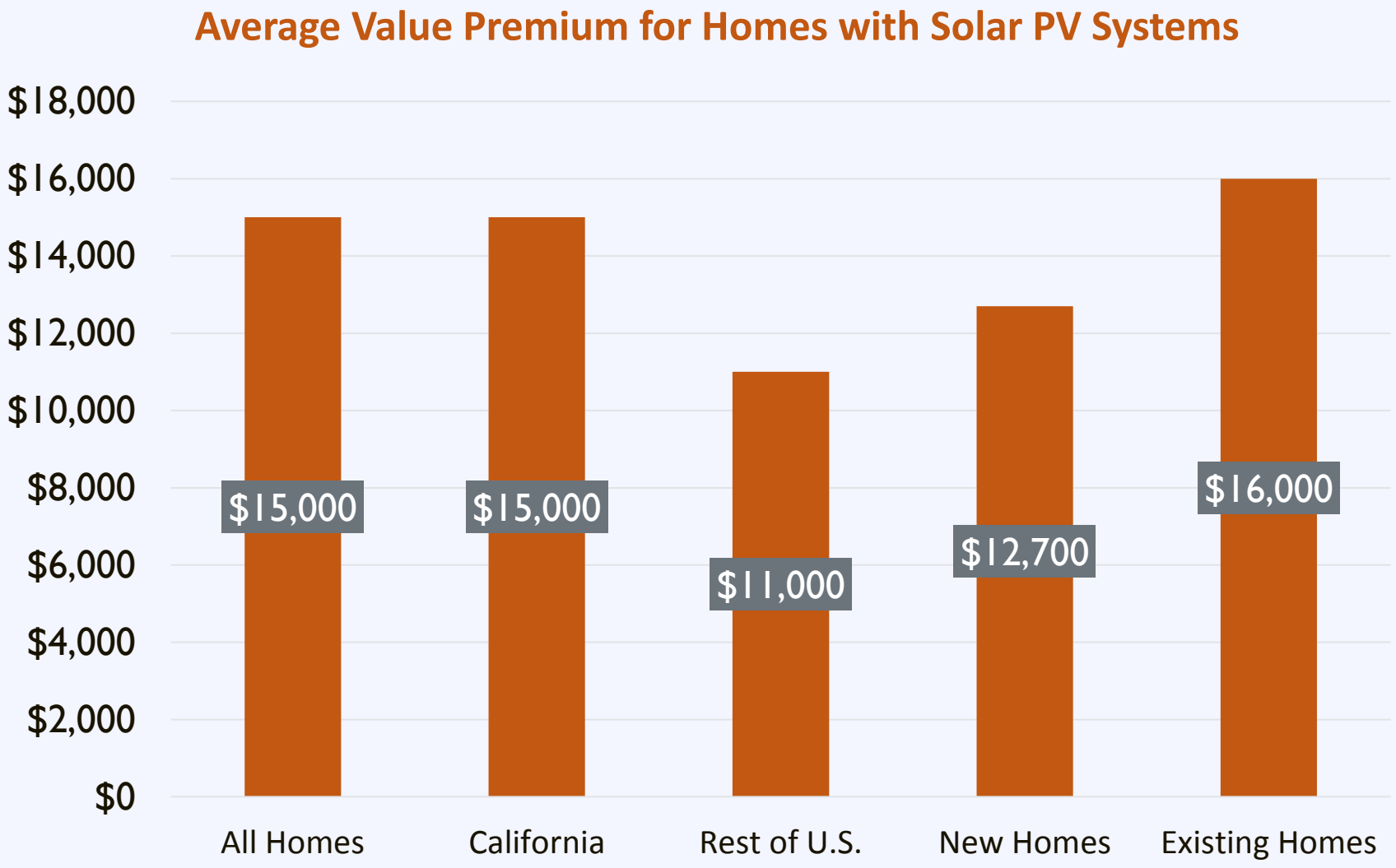
Valuable to Community & Utilities

Figure ES- 2. CMP Distributed Value – 25 Year Levelized ($ per kWh)

25 Year Levelized		Gross Value A ($/kWh)	× Load Match Factor B (%)	× Loss Savings Factor (1+C) (%)	= Distr. PV Value D ($/kWh)	
Energy Supply	Avoided Energy Cost	$0.076		6.2%	$0.081	Avoided Market Costs $0.138
	Avoided Gen. Capacity Cost	$0.068	54.4%	9.3%	$0.040	
	Avoided Res. Gen. Capacity Cost	$0.009	54.4%	9.3%	$0.005	
	Avoided NG Pipeline Cost					
	Solar Integration Cost	($0.005)		6.2%	($0.005)	
Transmission Delivery Service	Avoided Trans. Capacity Cost	$0.063	23.9%	9.3%	$0.016	
Distribution Delivery Service	Avoided Dist. Capacity Cost					
	Voltage Regulation					
Environmental	Net Social Cost of Carbon	$0.020		6.2%	$0.021	Societal Benefits $0.199
	Net Social Cost of SO_2	$0.058		6.2%	$0.062	
	Net Social Cost of NO_x	$0.012		6.2%	$0.013	
Other	Market Price Response	$0.062		6.2%	$0.066	
	Avoided Fuel Price Uncertainty	$0.035		6.2%	$0.037	
					$0.337	

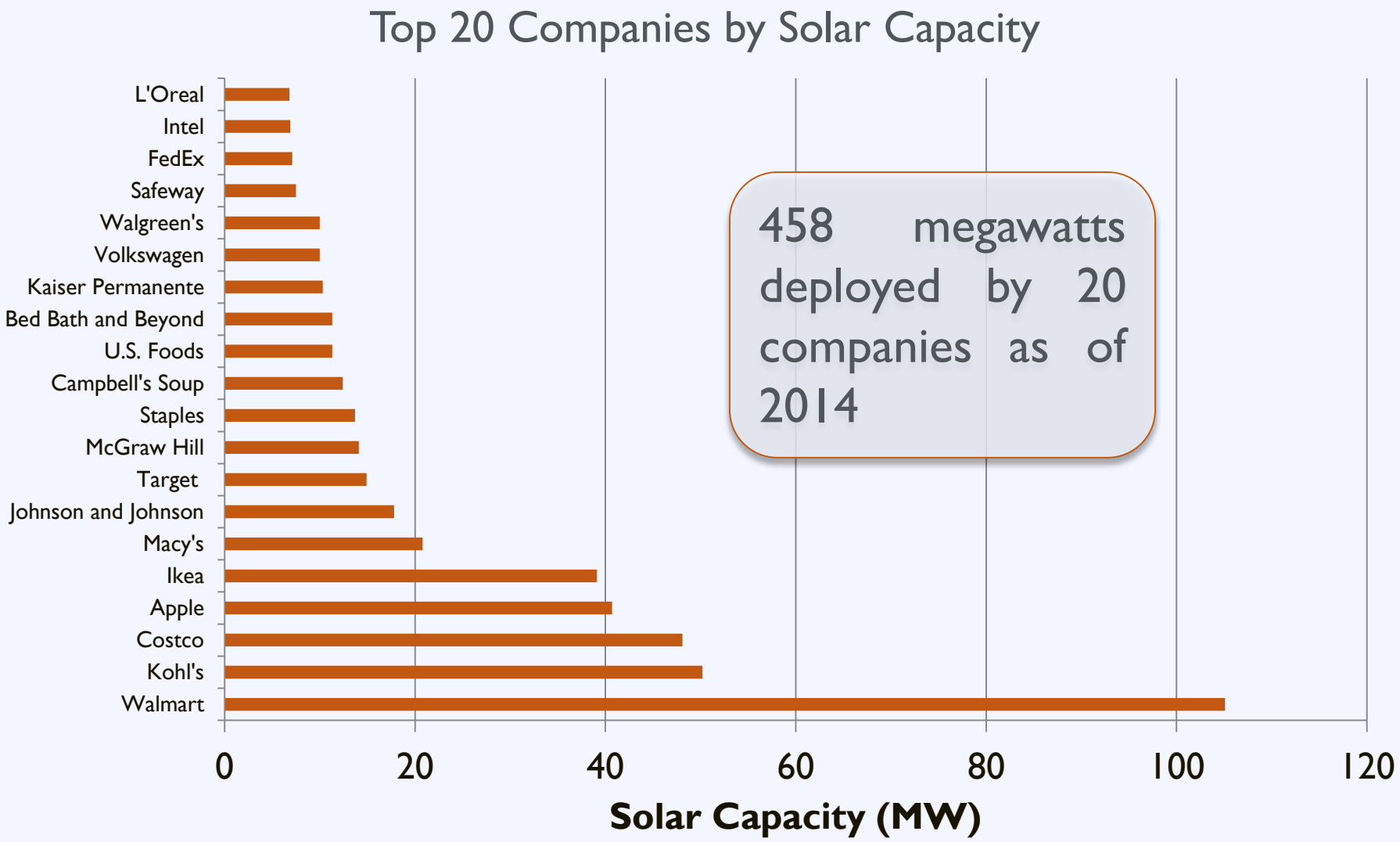
Source: Maine Public Utilities Commission
(http://www.nrcm.org/wp-content/uploads/2015/03/MPUCValueofSolarReport.pdf)

Smart Investment for Homeowners



Source: LBNL, *Selling Into the Sun* (2015)

Smart Investment for Businesses



Powered by SunShot U.S. Department of Energy

Source: Solar Energy Industries Association

Smart Investment for Governments

Source: Borrego Solar

Smart Investment for Schools

Current:

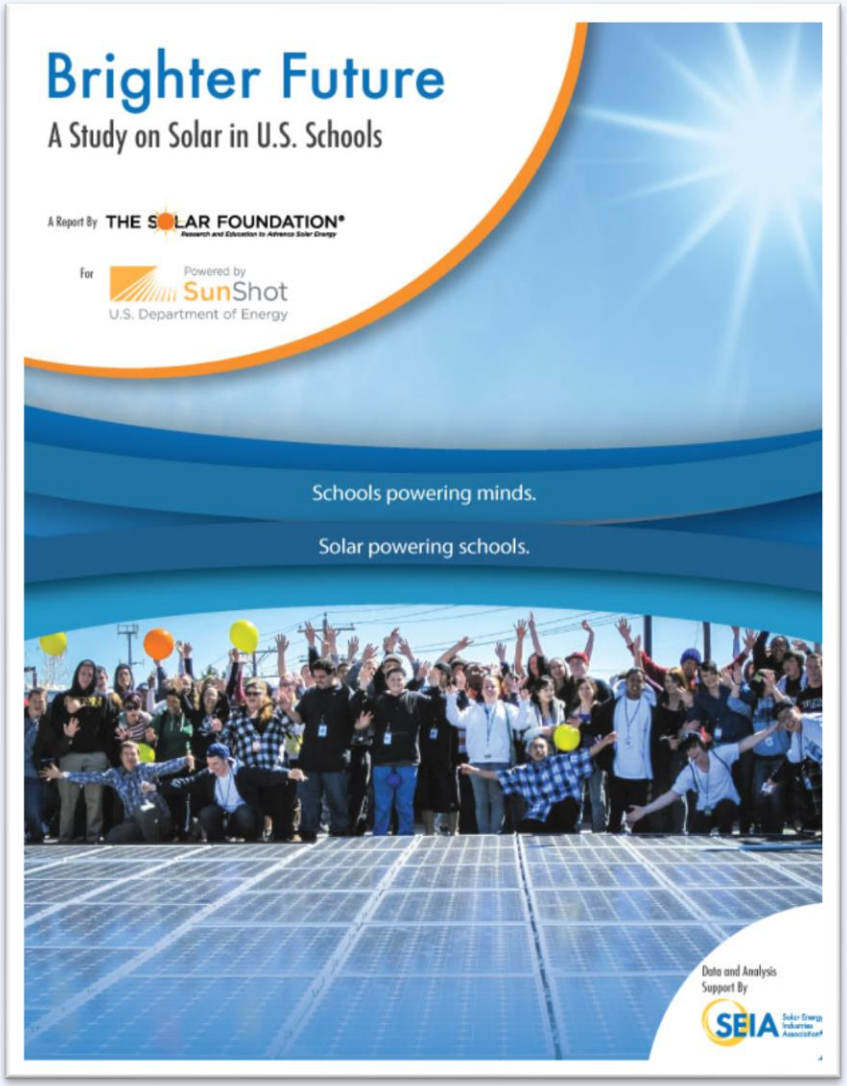
× 3,752

$ = $77.8m

Potential:

× 40,000 – 72,000

$ = $800m



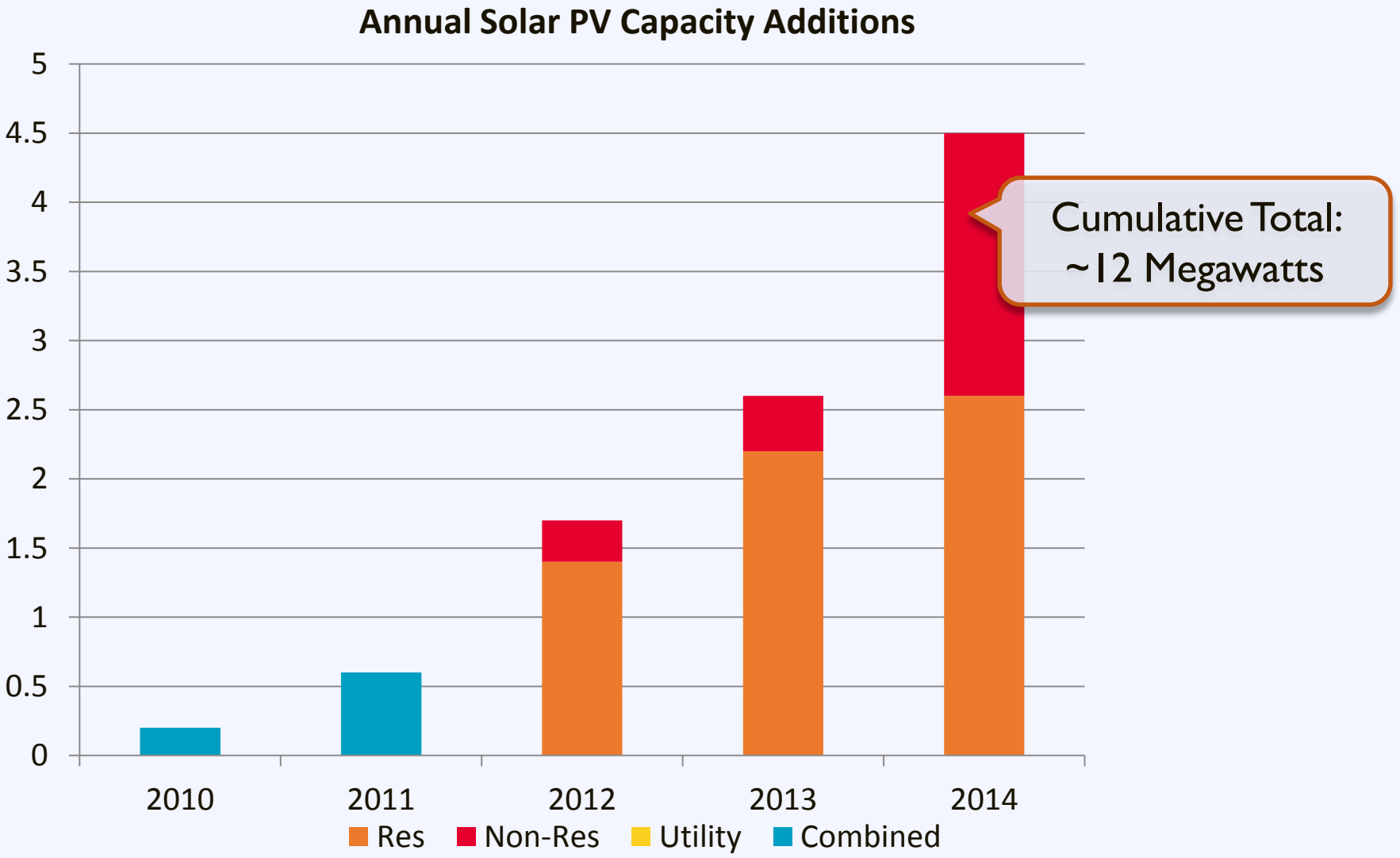
Powered by SunShot U.S. Department of Energy

Source: The Solar Foundation (http://schools.tsfcensus.org)

Agenda

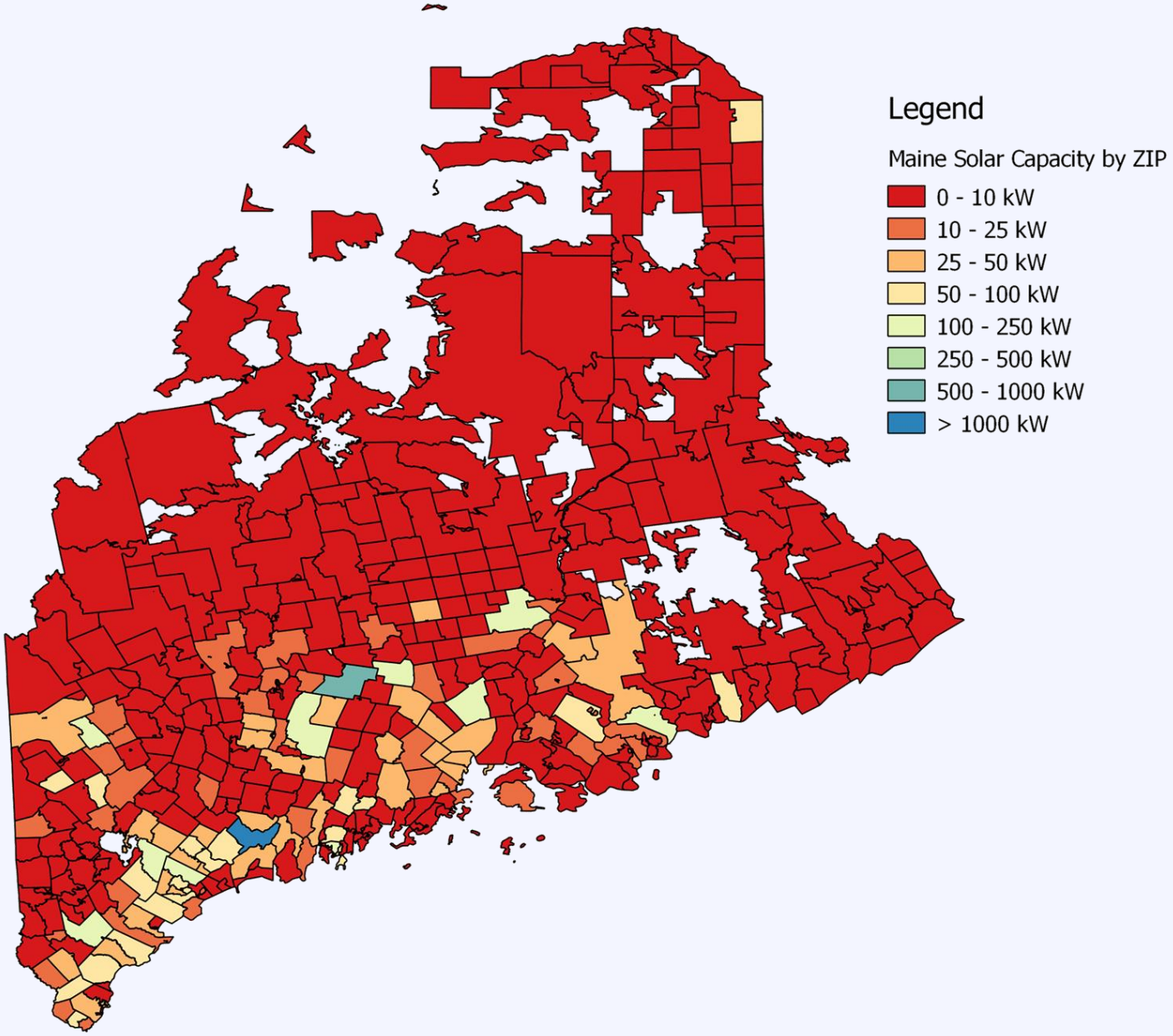
10:20 – 10:50	Putting Solar Energy on the Local Policy Agenda
10:50 – 11:20	State of the Local Solar Market
11:20 – 11:50	Federal, State, and Utility Policy Drivers
11:50 – 12:15	*Break and Grab Lunch*
12:15 – 12:45	Planning for Solar: Getting Solar Ready
12:45 – 1:20	Solar Market Development Tools
1:20 – 1:30	*Break*
1:30 – 2:15	Local Speakers
2:15– 3:00	Developing and Solar Policy Implementation Plan for Your Community and Next Steps

Maine Solar Market

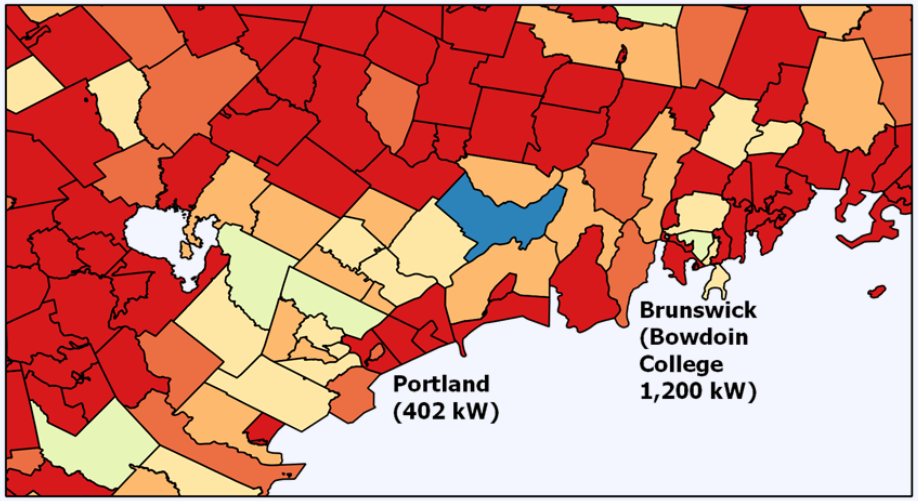


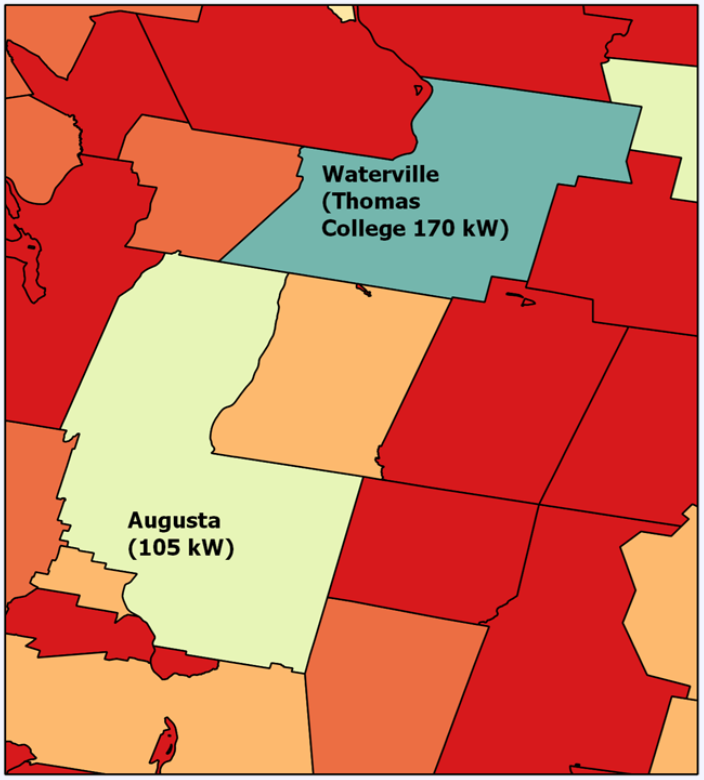
Powered by SunShot
U.S. Department of Energy

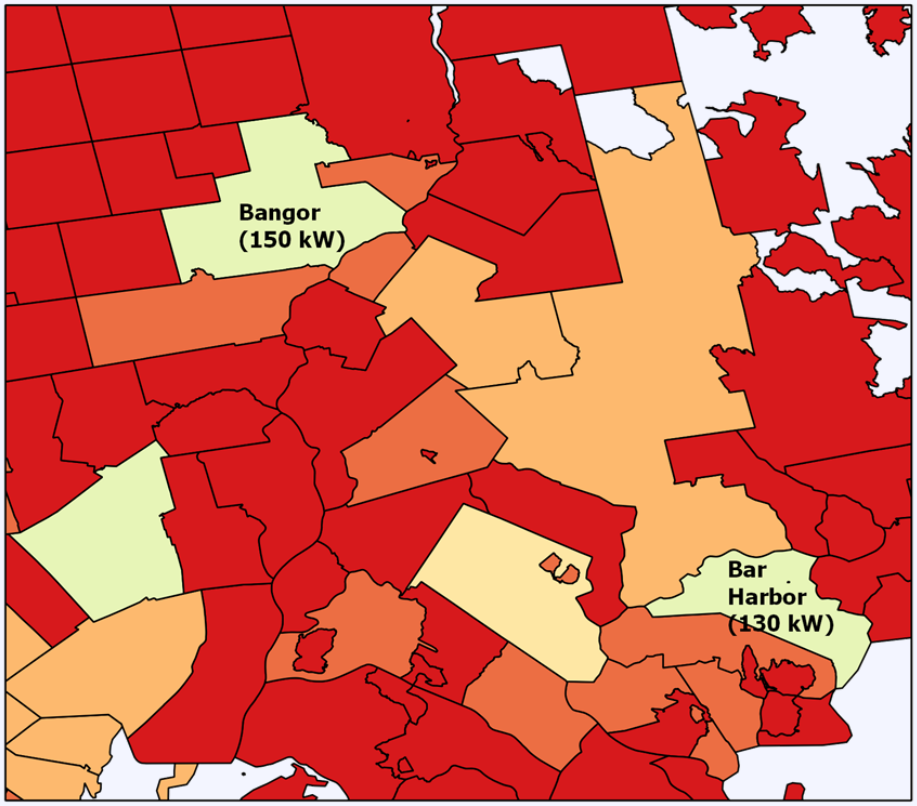
Source: SEIA/GTM Research, *Solar Market Insight*



Powered by SunShot
U.S. Department of Energy







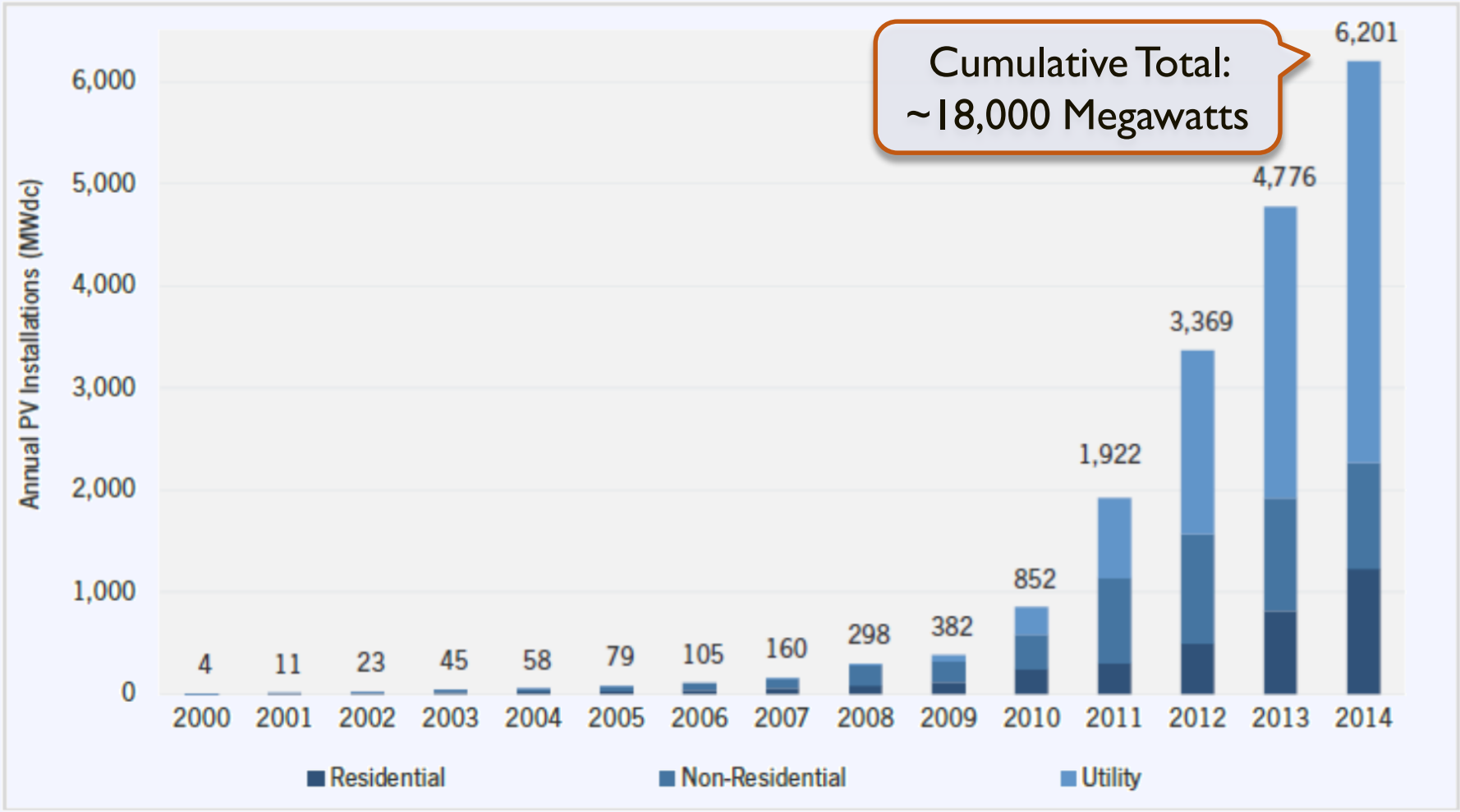
Legend

Maine Solar Capacity by ZIP

- 0 - 10 kW
- 10 - 25 kW
- 25 - 50 kW
- 50 - 100 kW
- 100 - 250 kW
- 250 - 500 kW
- 500 - 1000 kW
- > 1000 kW

Powered by SunShot
U.S. Department of Energy

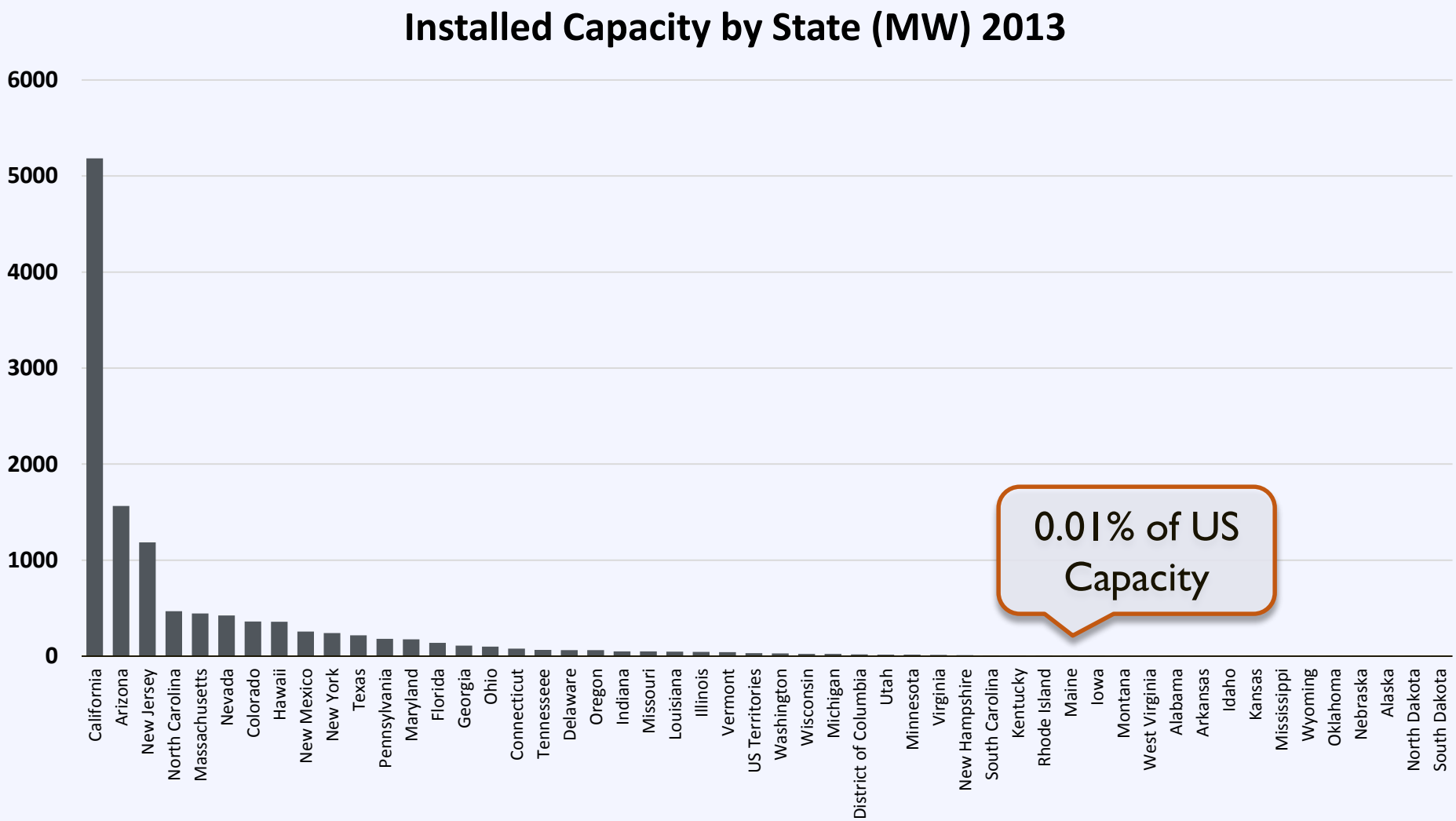
US Solar Market



Powered by SunShot U.S. Department of Energy

Source: Solar Energy Industries Association/ GTM Research, *Solar Market Insight: 2014 Year-in-Review*

US Solar Market



Powered by SunShot U.S. Department of Energy

Source: IREC, Solar Market Trends 2013

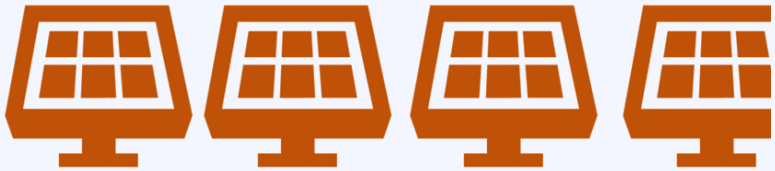
Maine Solar Market

Maine

9

watts per person

US



39

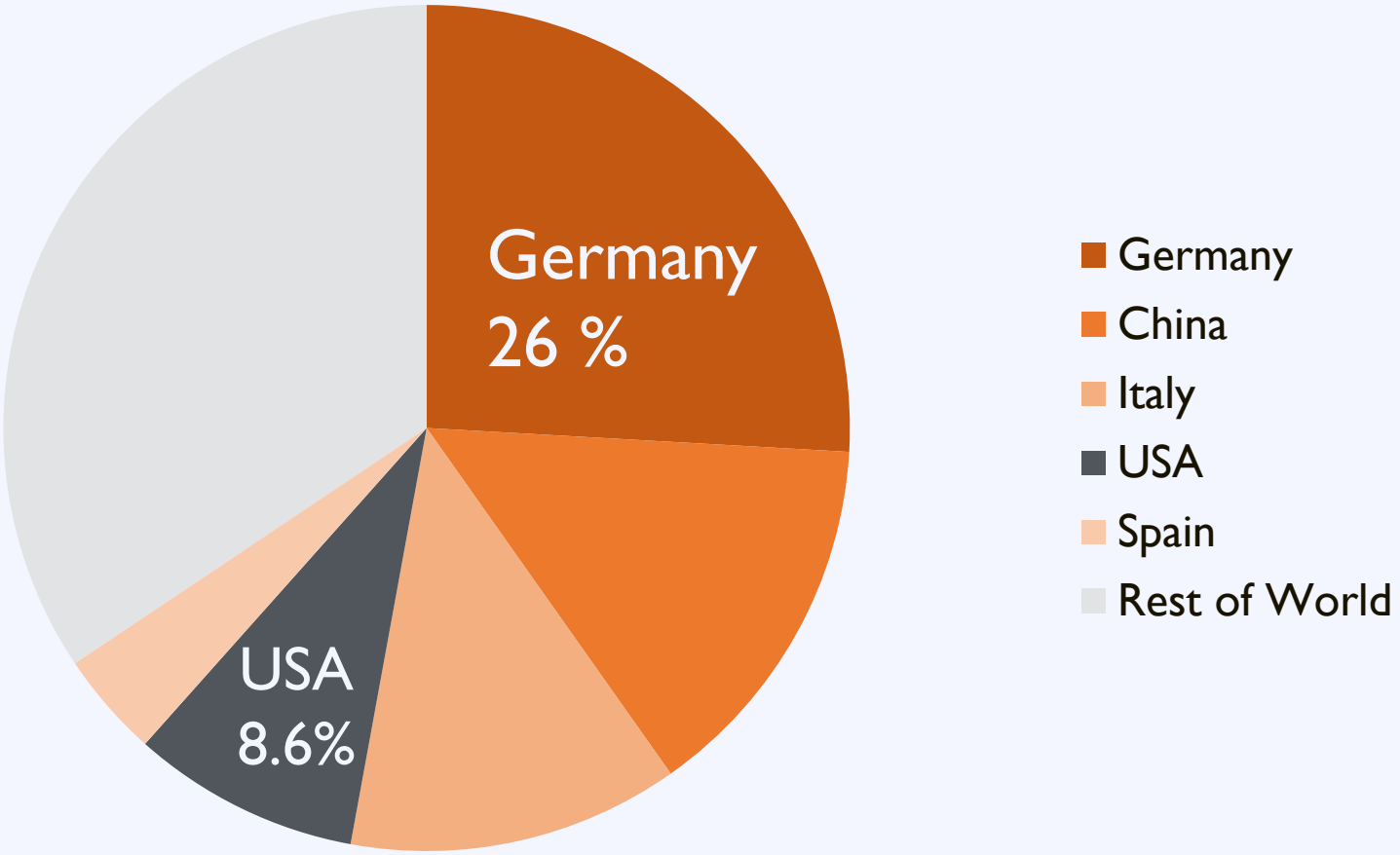
watts per person

Powered by SunShot U.S. Department of Energy

Source: IREC Solar Market Trends 2013

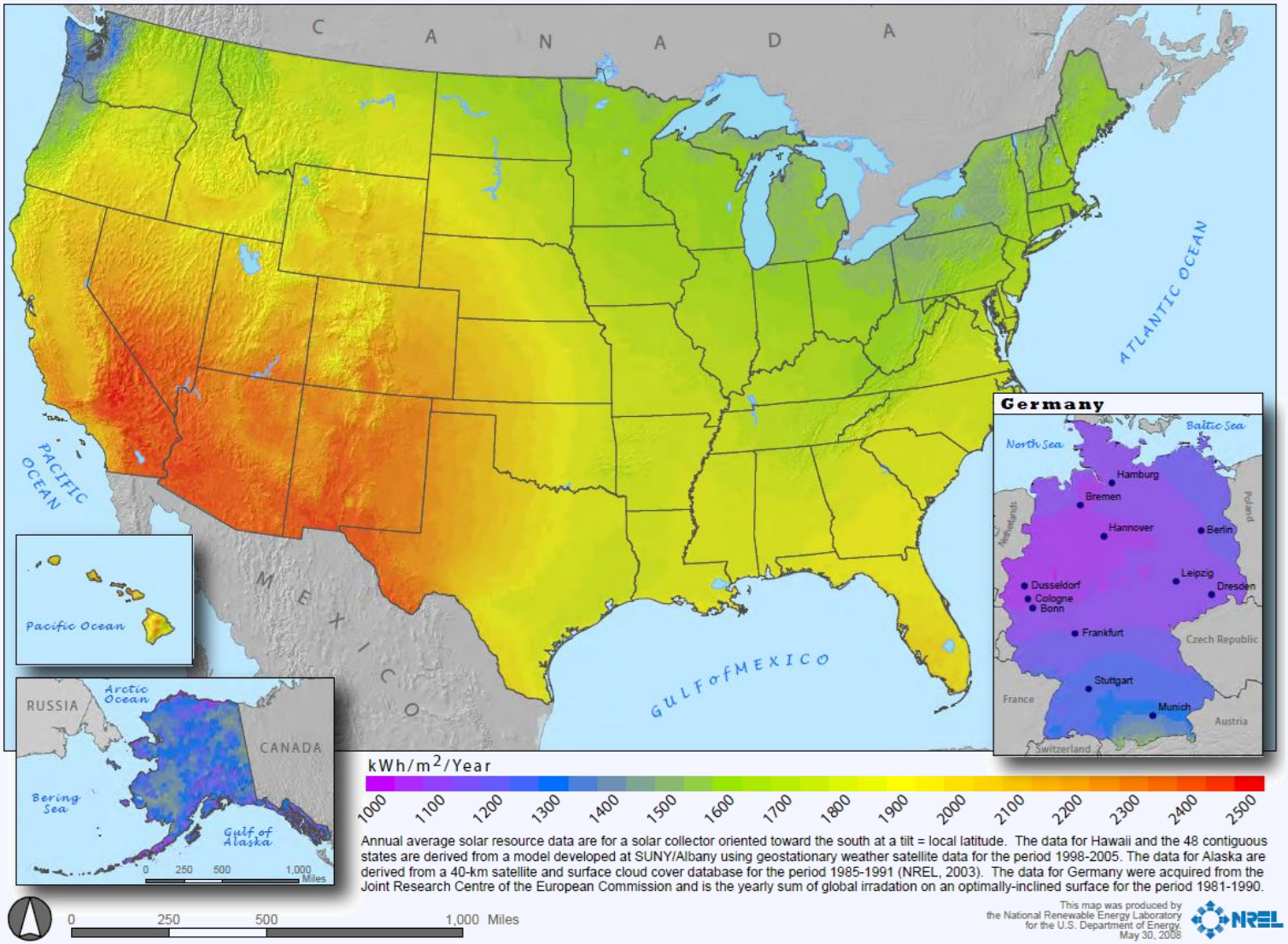
World Solar Market

Top 5 Countries Solar Operating Capacity (2013)



Source: REN 21

US Solar Resource

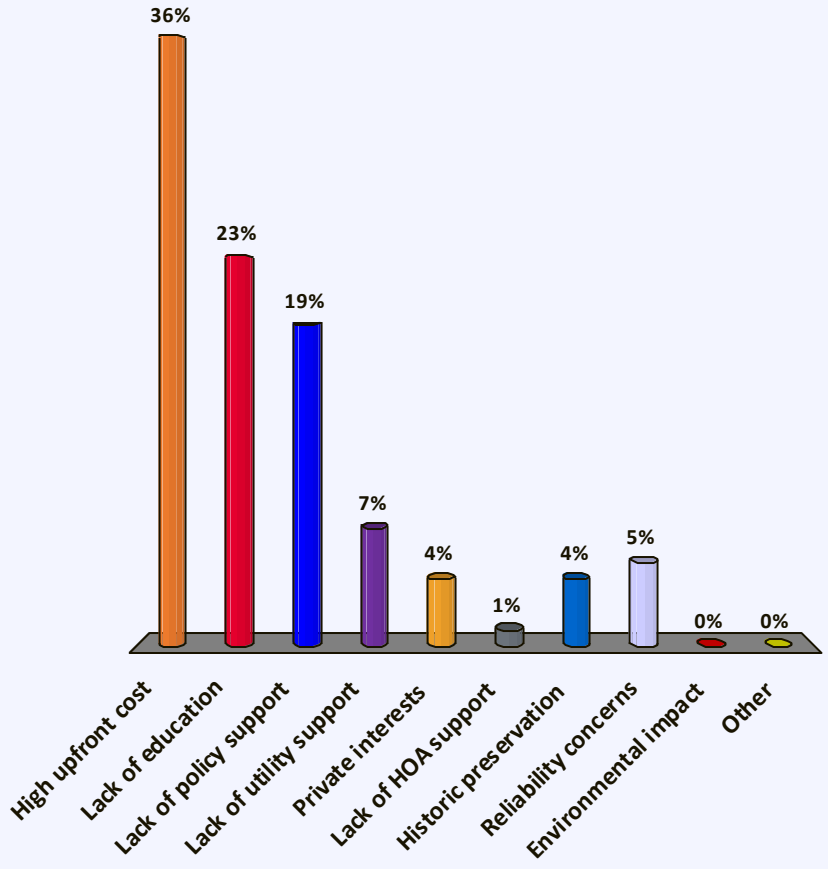


Powered by SunShot U.S. Department of Energy

Source: National Renewable Energy Laboratory

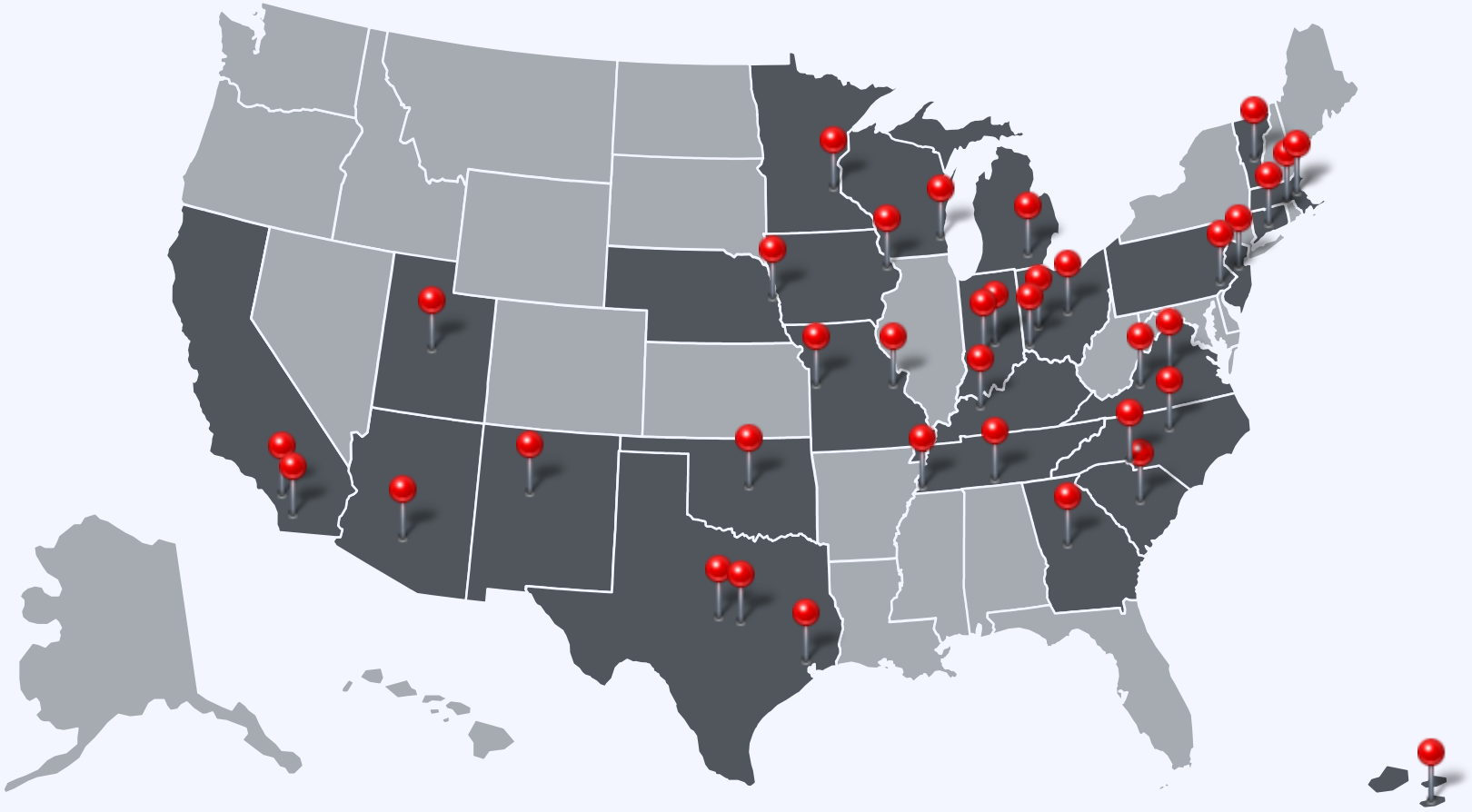
What are the top 3 barriers to solar adoption in your community?

A. High upfront cost
B. Lack of education
C. Lack of policy support
D. Lack of utility support
E. Private interests
F. Lack of HOA support
G. Historic preservation
H. Reliability concerns
I. Environmental impact
J. Other



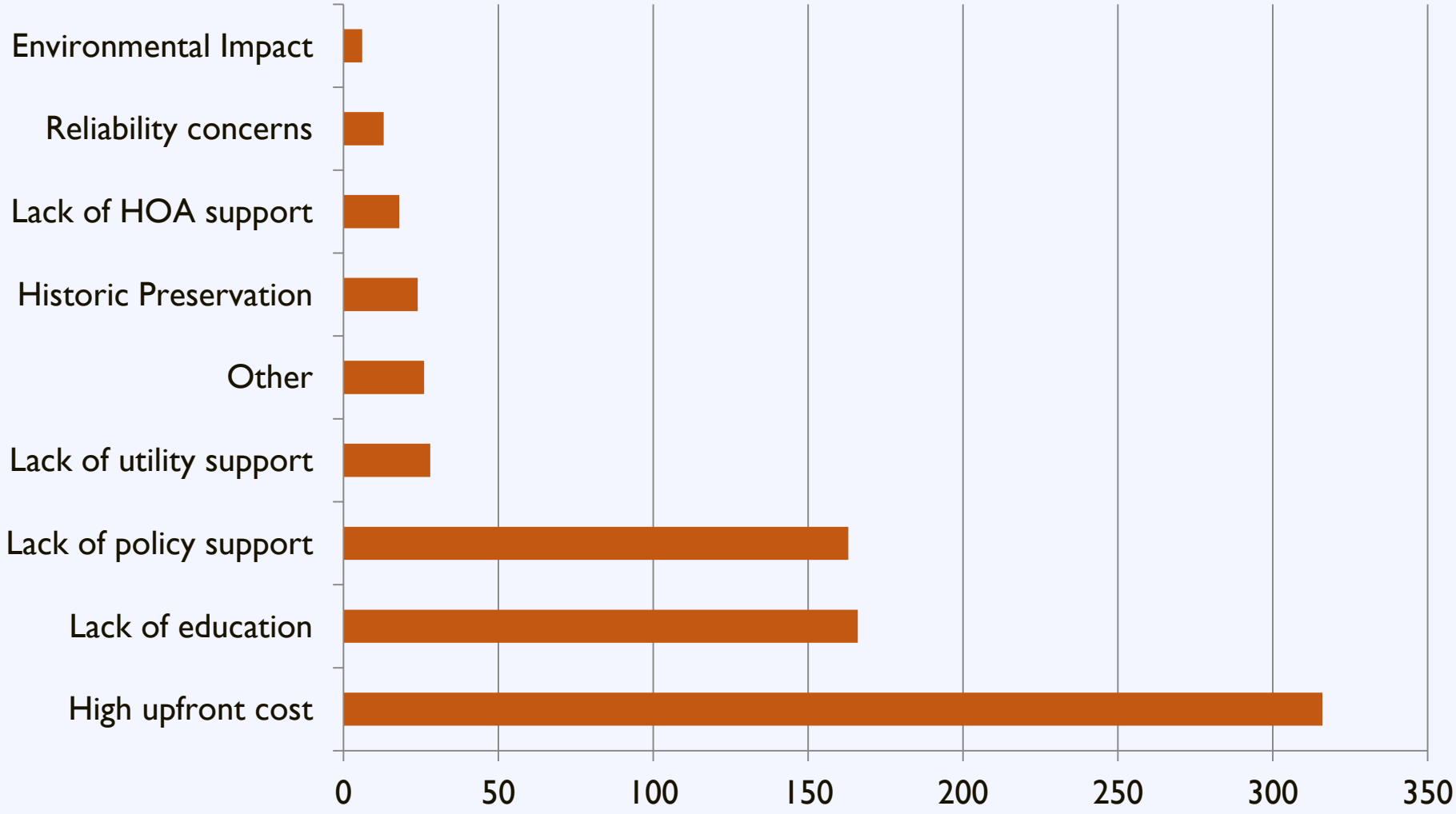
Regional Workshop Surveys

Q: What is the greatest barrier to solar adoption in your community?

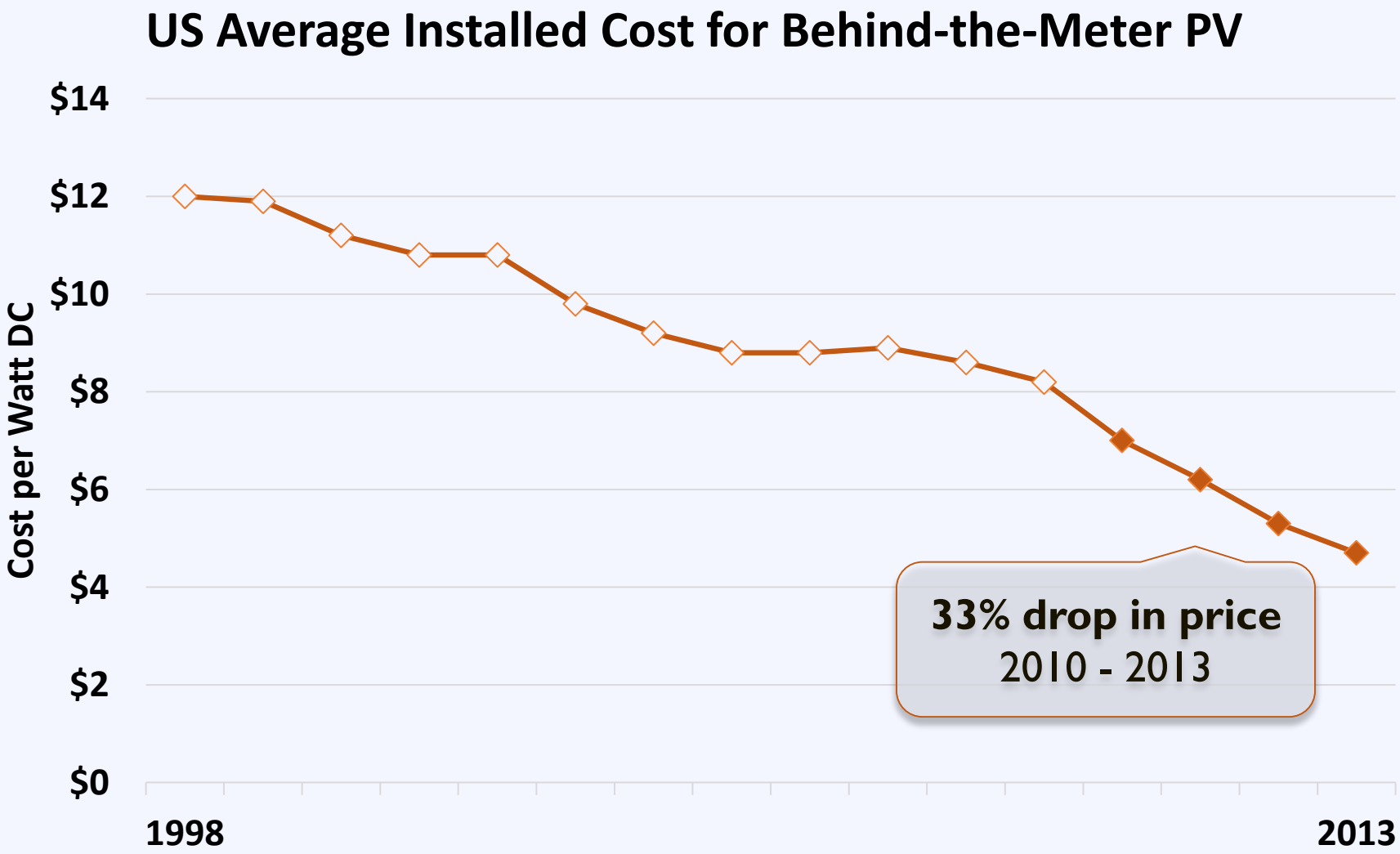


Powered by SunShot
U.S. Department of Energy

Activity: Addressing Barriers



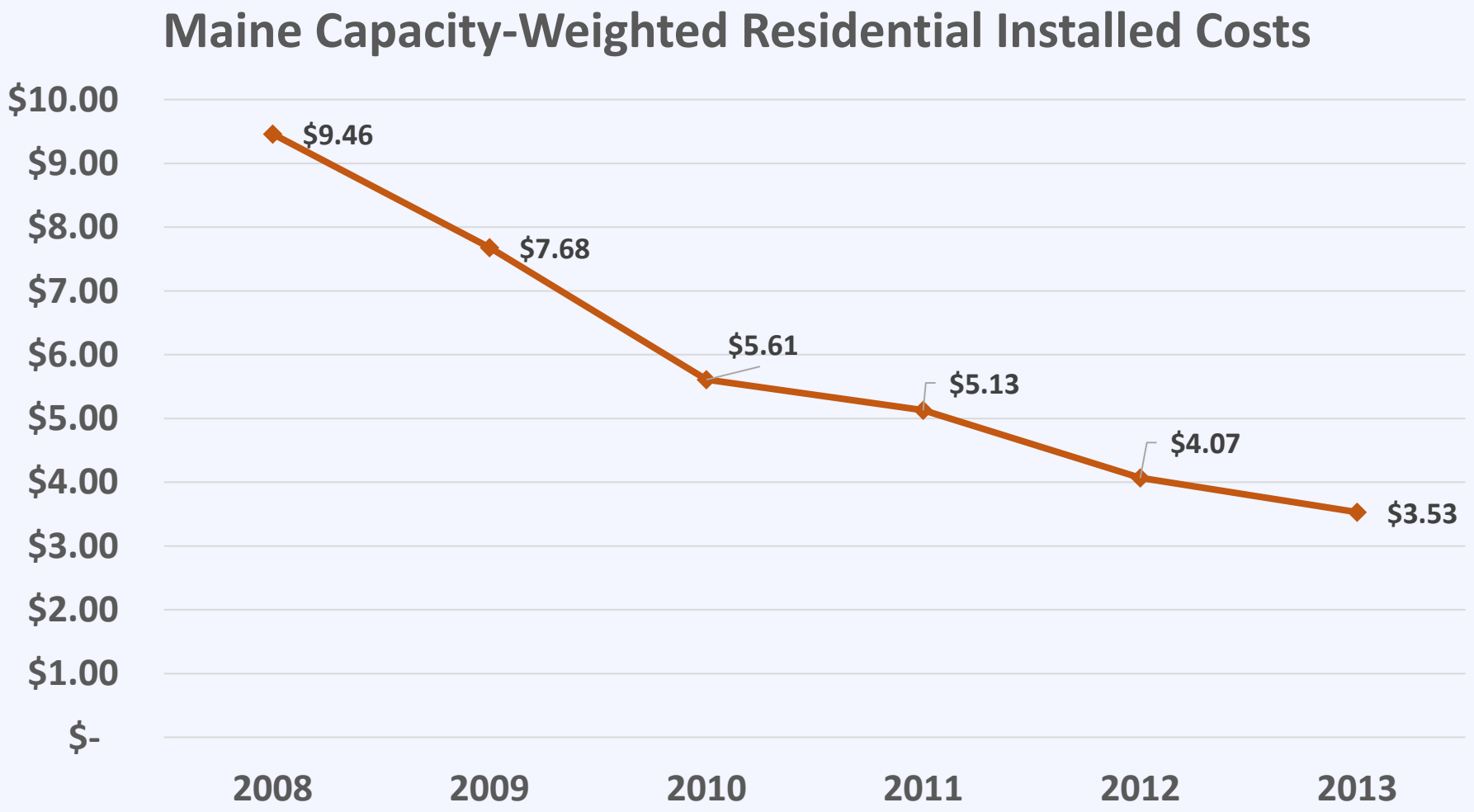
The Cost of Solar PV



Powered by SunShot U.S. Department of Energy

Tracking the Sun VII: The Installed Cost of Photovoltaics in the US from 1998-2013 (LBNL)

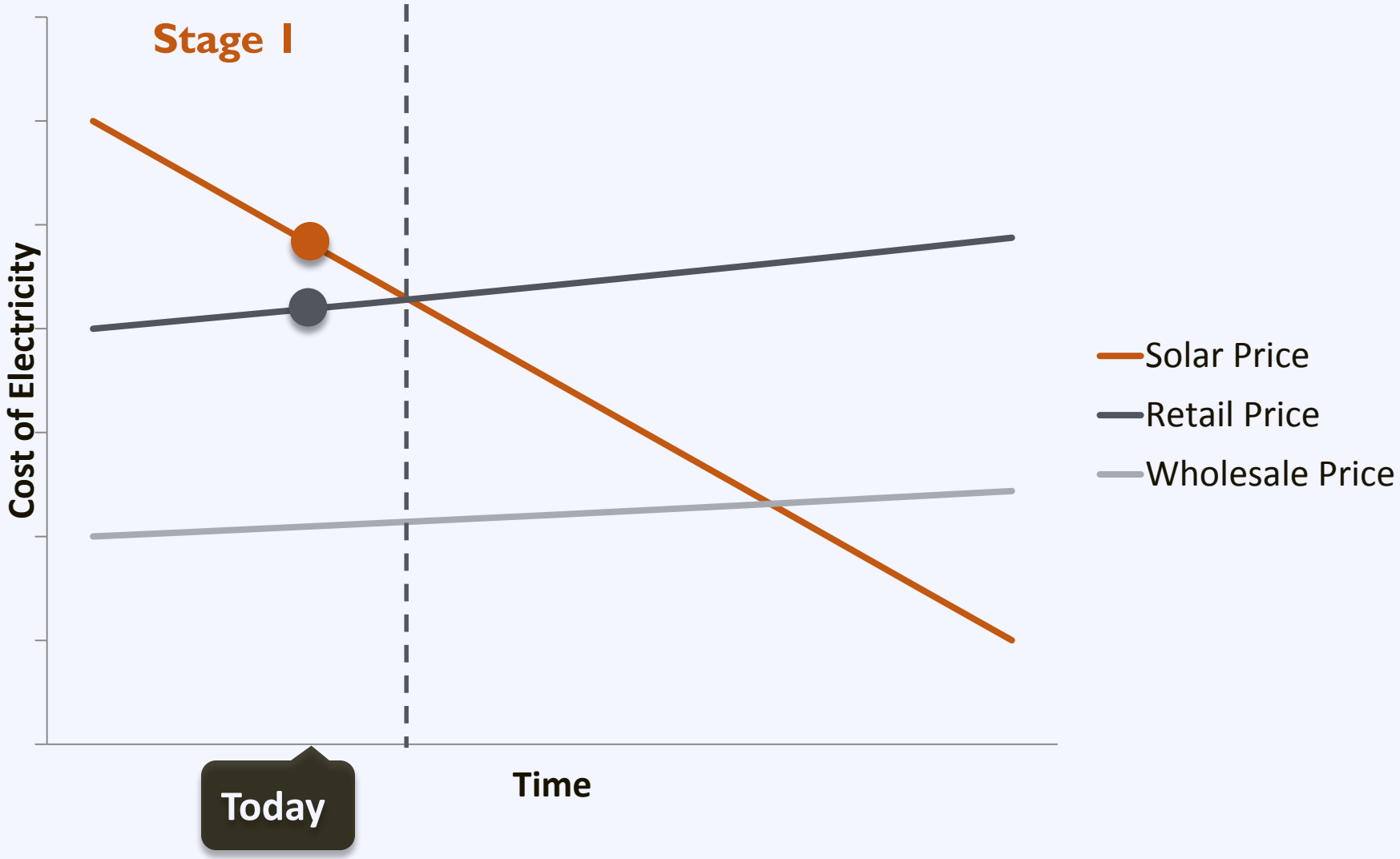
The Cost of Solar PV



Powered by SunShot U.S. Department of Energy

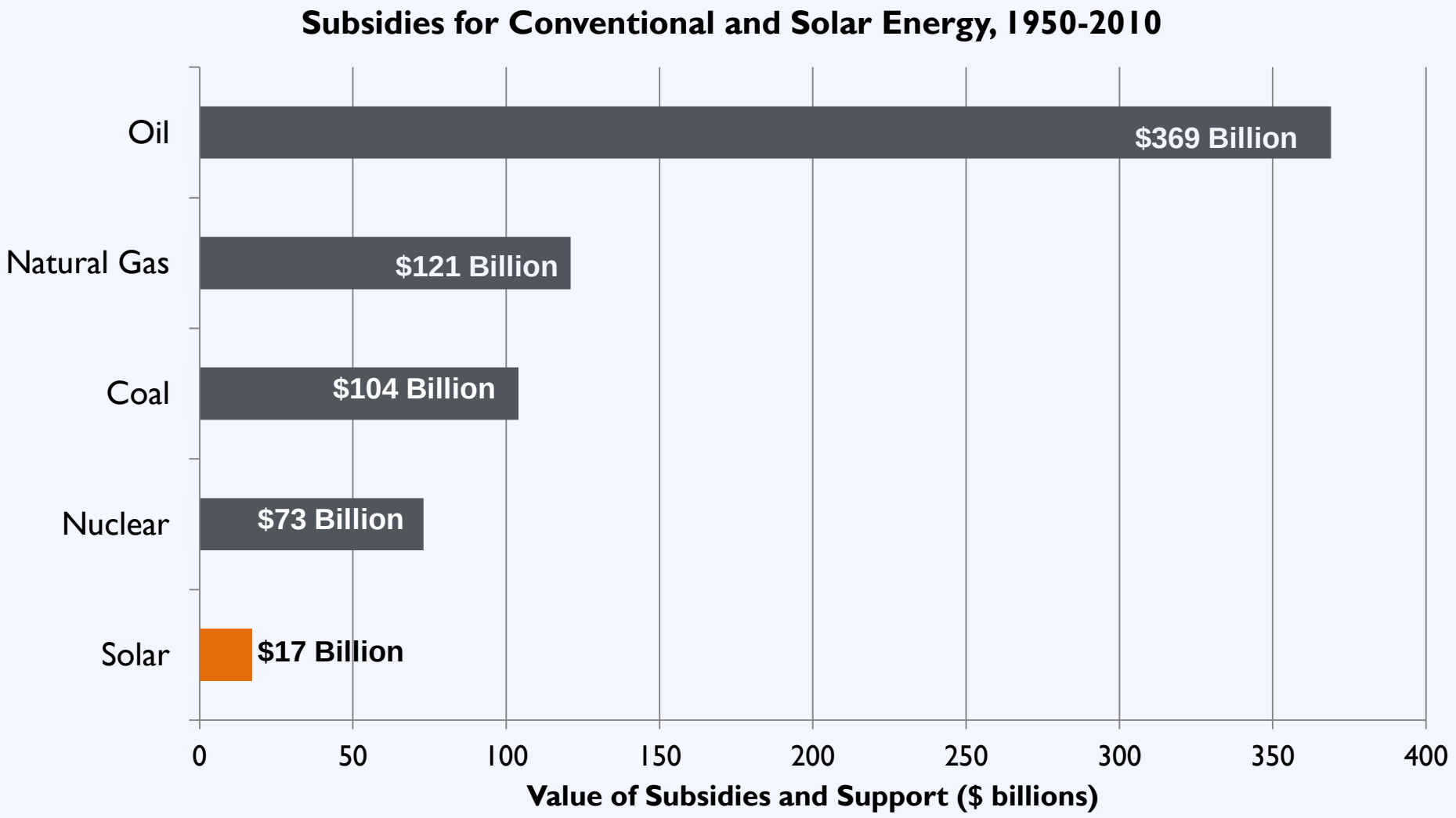
Source: OpenPV (https://openpv.nrel.gov/search?state=ME&zipcode=)

The Cost of Solar PV



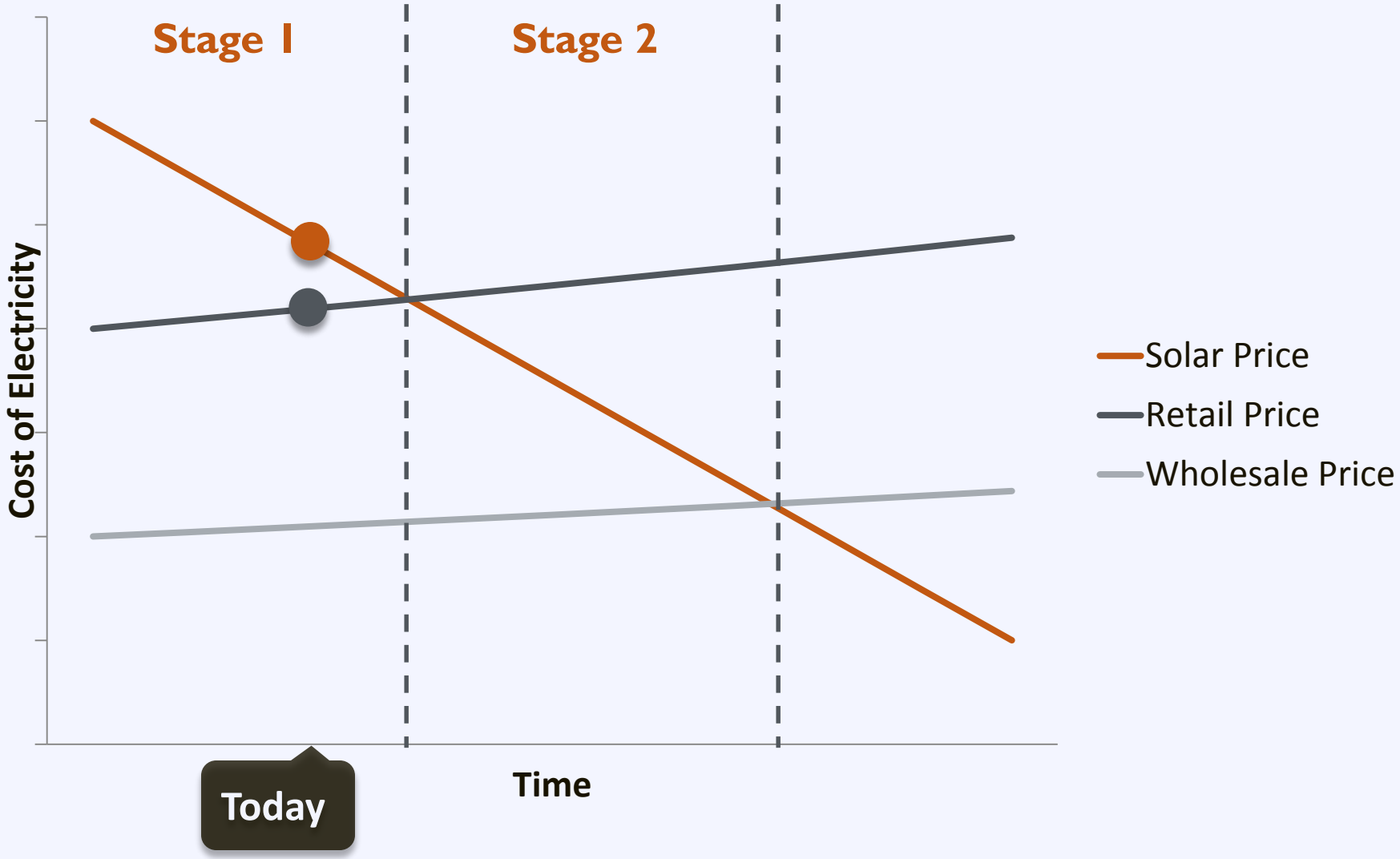
Source: Solar Electric Power Association

Subsidies and Support



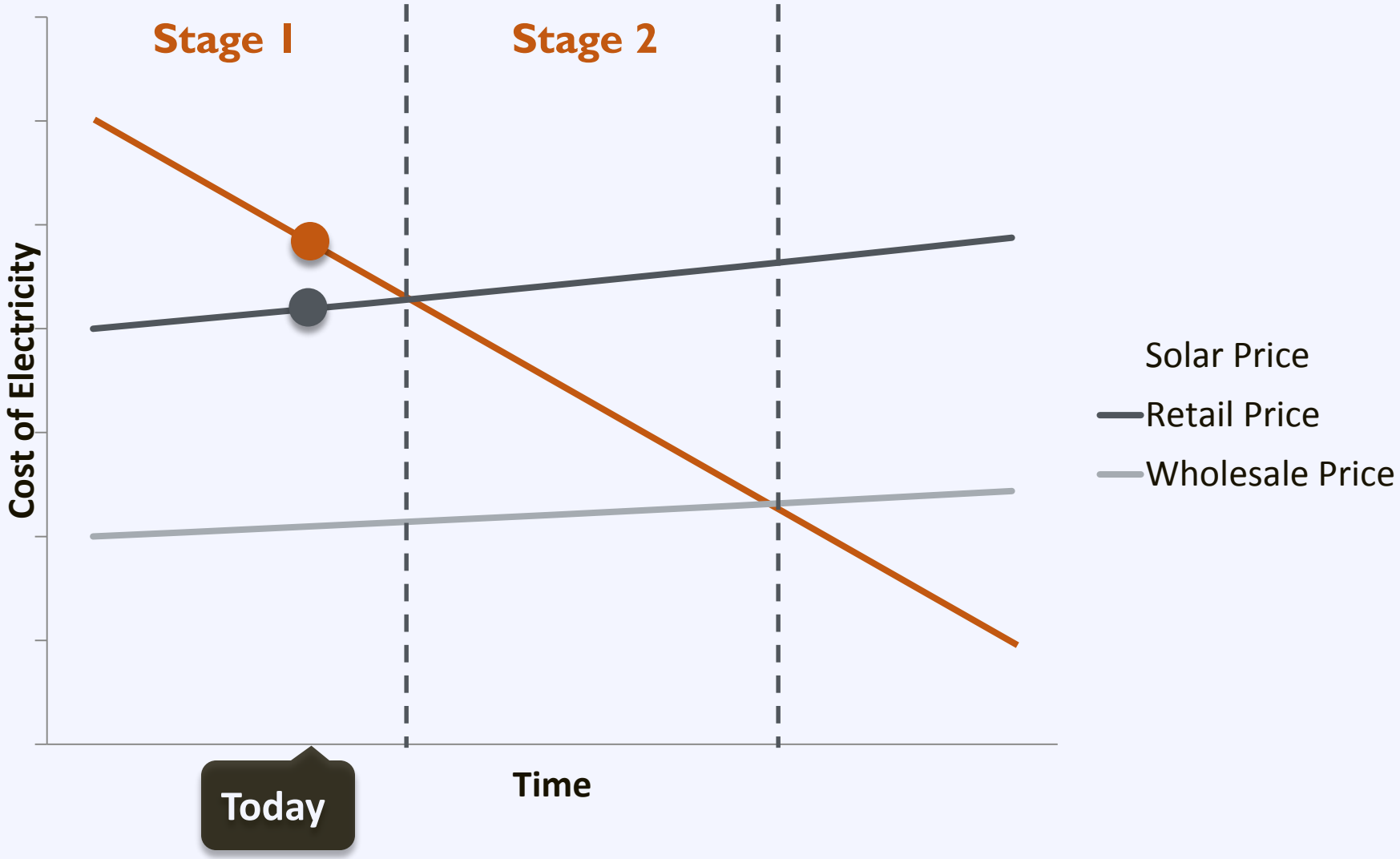
Source: Management Information Services, Inc. October 2011. *60 Years of Energy Incentives: Analysis of Federal Expenditures for Energy Development*; SEIA, May 1, 2012. *Federal Energy Incentives Report.*

The Cost of Solar PV



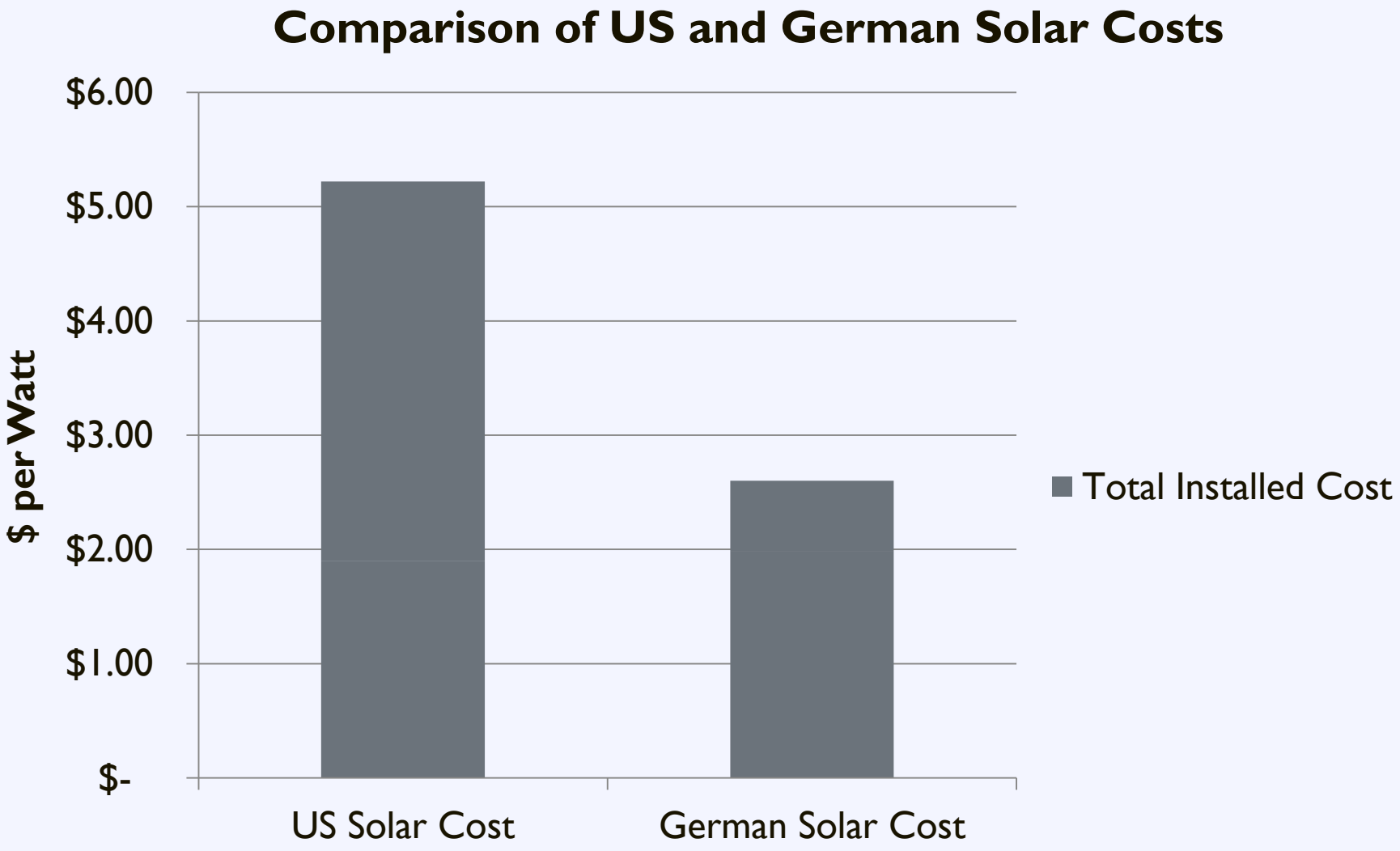
Source: Solar Electric Power Association

The Cost of Solar PV



Source: Solar Electric Power Association

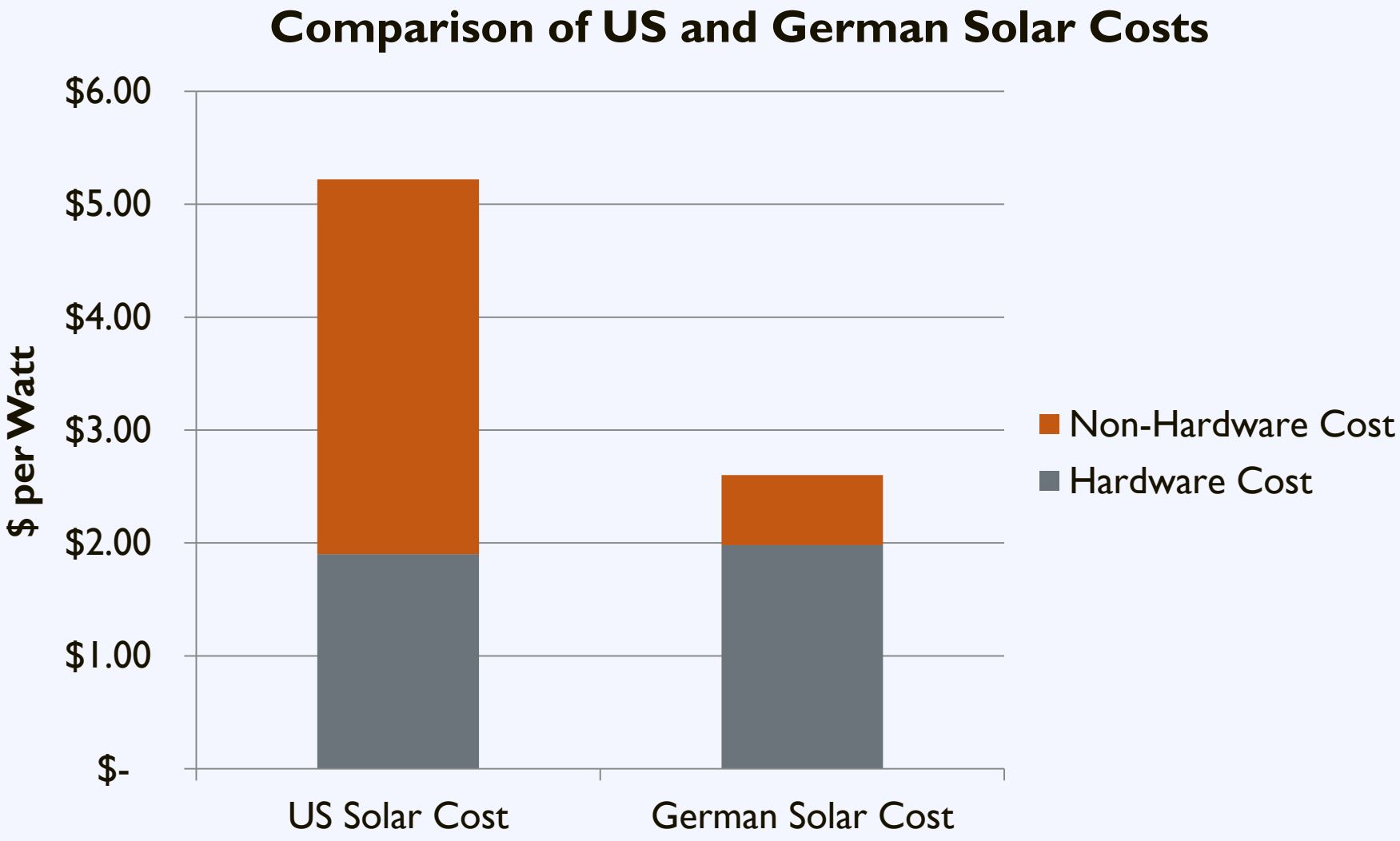
The Cost of Solar in the US



Source: NREL (http://www.nrel.gov/docs/fy14osti/60412.pdf)
LBNL (http://emp.lbl.gov/sites/all/files/lbnl-6350e.pdf)(http://www1.eere.energy.gov/solar/pdfs/sunshot_webinar_20130226.pdf)

Powered by SunShot U.S. Department of Energy

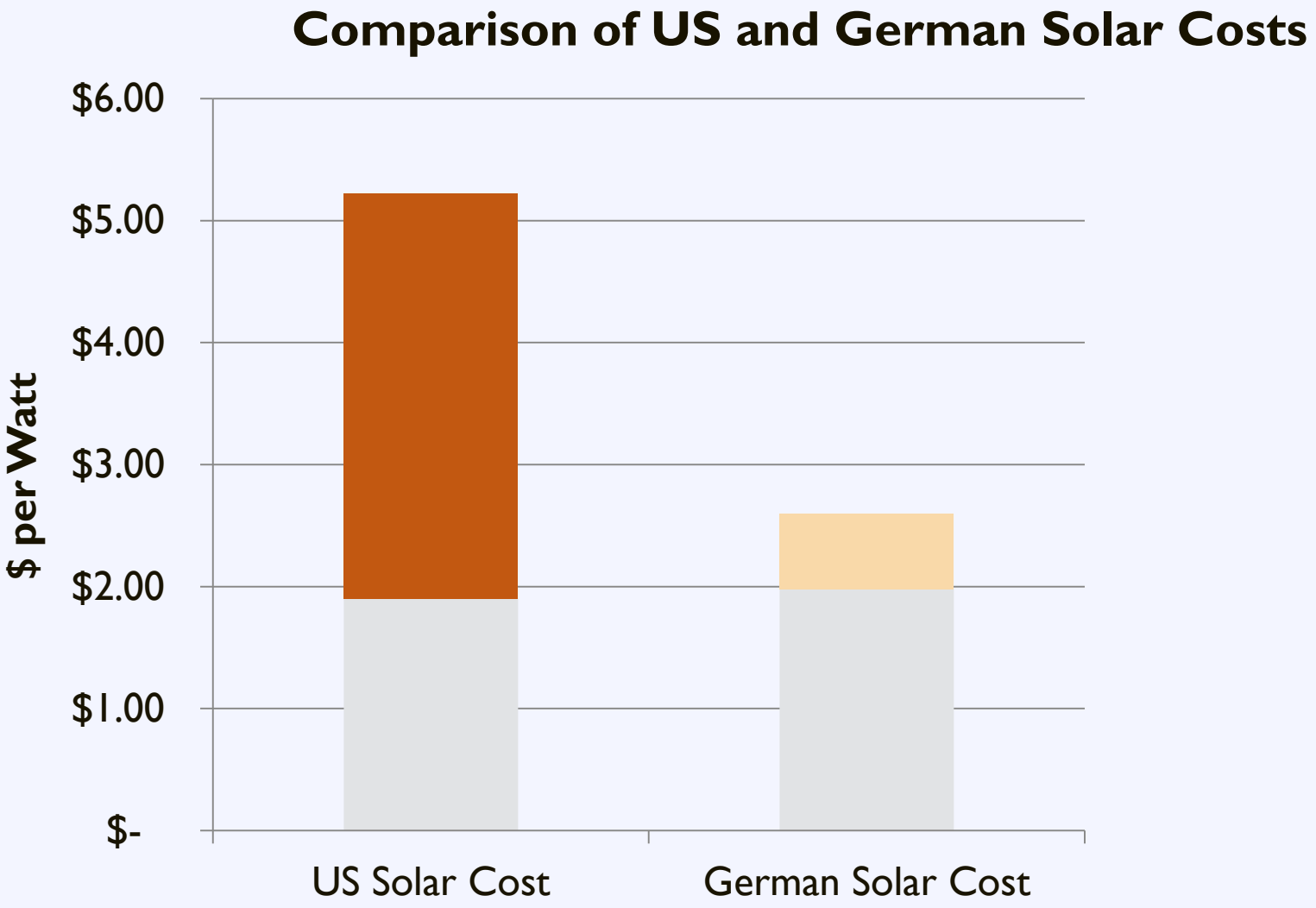
The Cost of Solar in the US



Source: NREL (http://www.nrel.gov/docs/fy14osti/60412.pdf)
LBNL (http://emp.lbl.gov/sites/all/files/lbnl-6350e.pdf)(http://www1.eere.energy.gov/solar/pdfs/sunshot_webinar_20130226.pdf)

Powered by SunShot U.S. Department of Energy

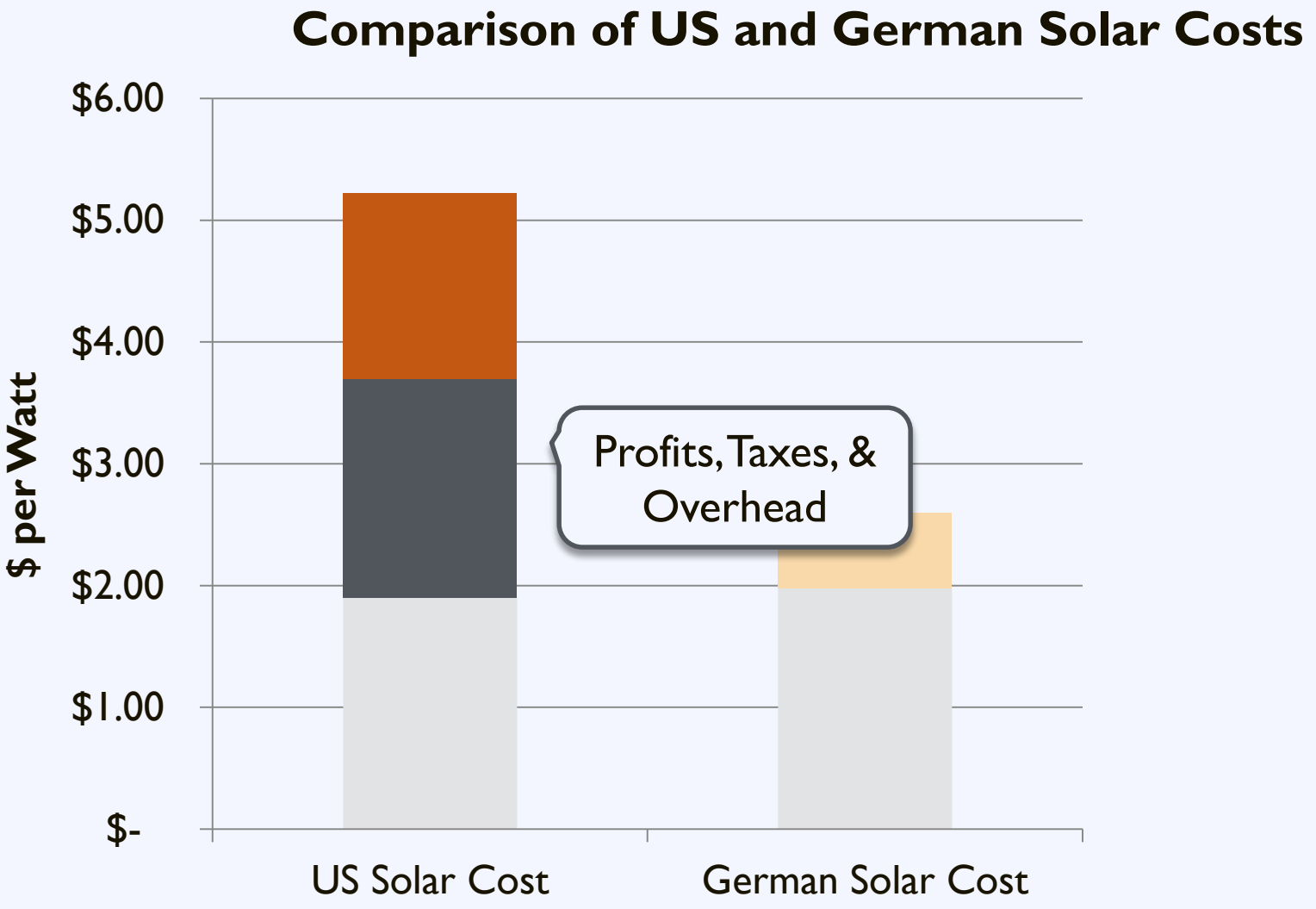
The Cost of Solar in the US



Powered by SunShot U.S. Department of Energy

Source: NREL (http://www.nrel.gov/docs/fy14osti/60412.pdf)
LBNL (http://emp.lbl.gov/sites/all/files/lbnl-6350e.pdf)(http://www1.eere.energy.gov/solar/pdfs/sunshot_webinar_20130226.pdf)

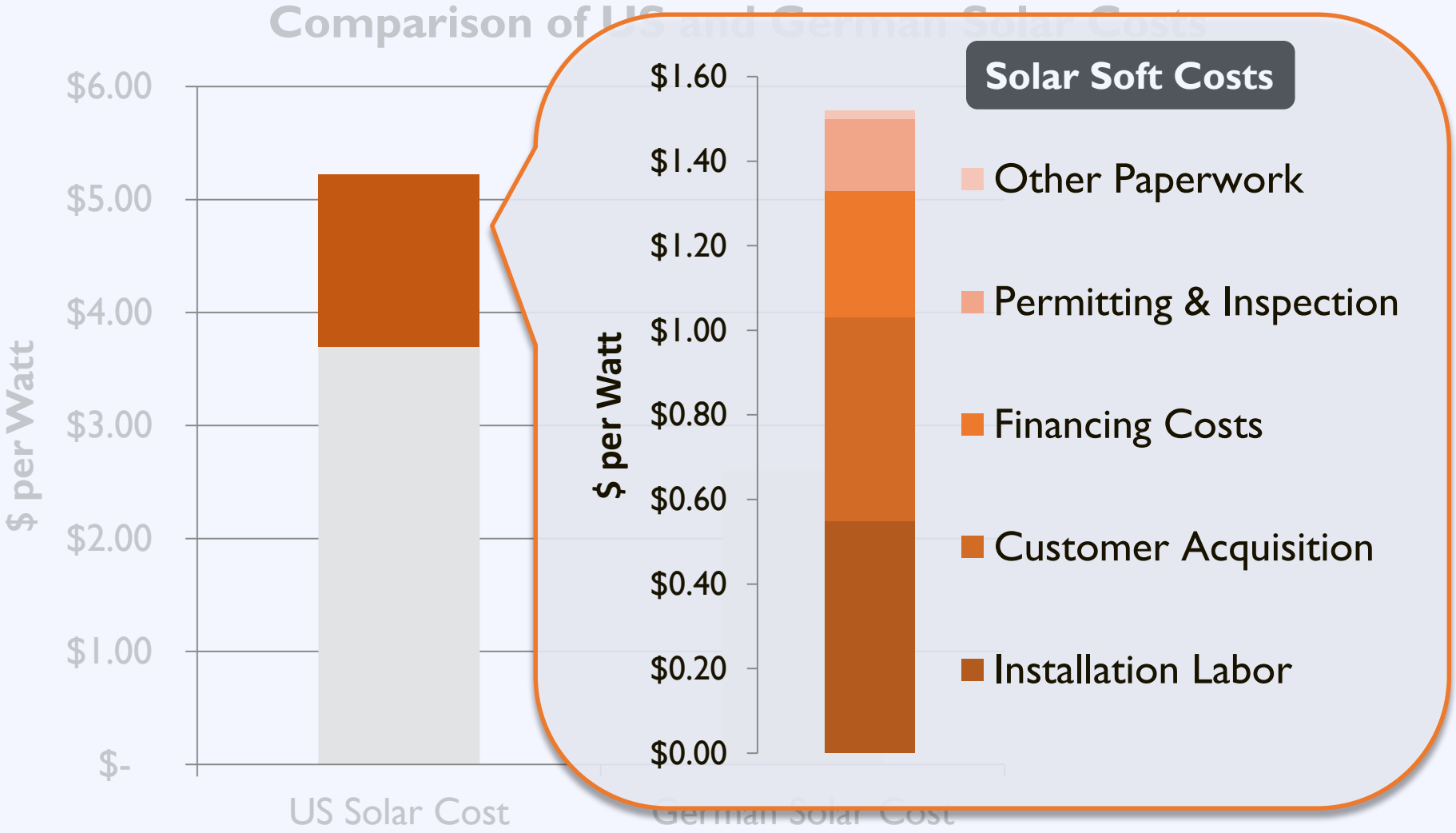
The Cost of Solar in the US



Source: NREL (http://www.nrel.gov/docs/fy14osti/60412.pdf)
LBNL (http://emp.lbl.gov/sites/all/files/lbnl-6350e.pdf)(http://www1.eere.energy.gov/solar/pdfs/sunshot_webinar_20130226.pdf)

Powered by SunShot U.S. Department of Energy

The Cost of Solar in the US



Powered by SunShot U.S. Department of Energy

Source: NREL (http://www.nrel.gov/docs/fy14osti/60412.pdf)
LBNL (http://emp.lbl.gov/sites/all/files/lbnl-6350e.pdf)(http://www1.eere.energy.gov/solar/pdfs/sunshot_webinar_20130226.pdf)

Challenge: Installation Time

New York City's Goal

100 days

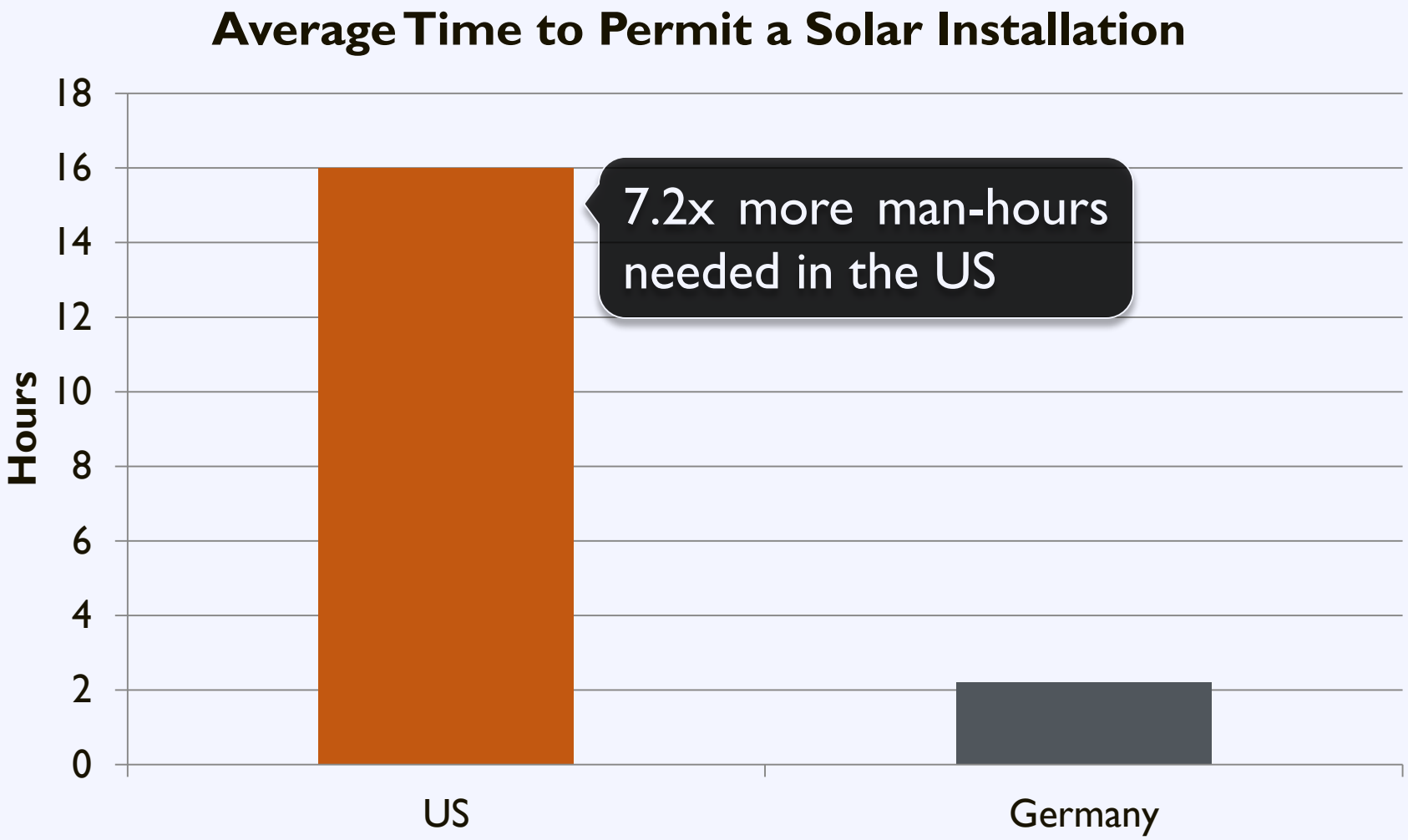
from inception to completion

Germany Today

8 days

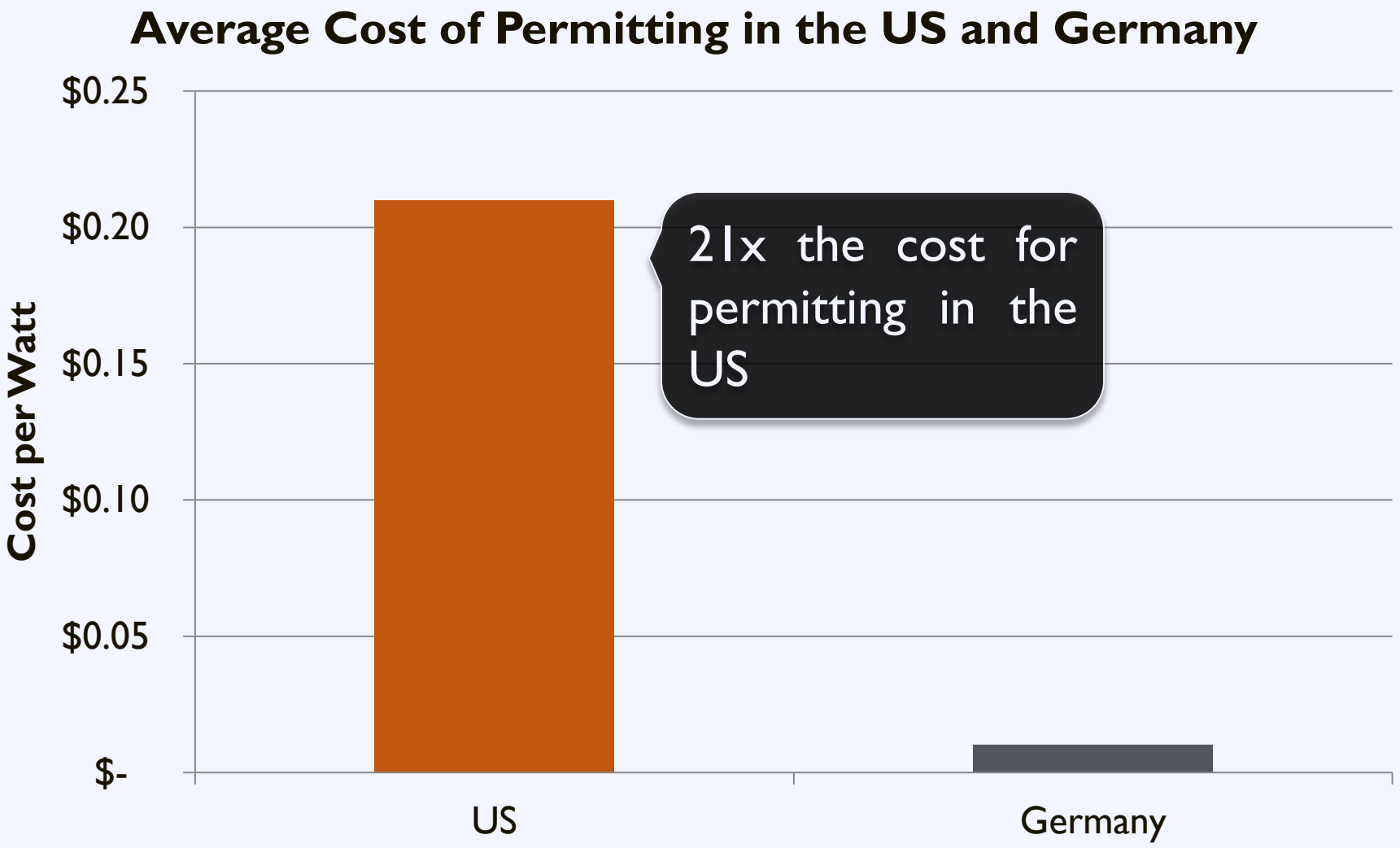
from inception to completion

Time to Installation



Source: NREL, LBNL

Permitting Costs



Source: NREL, LBNL

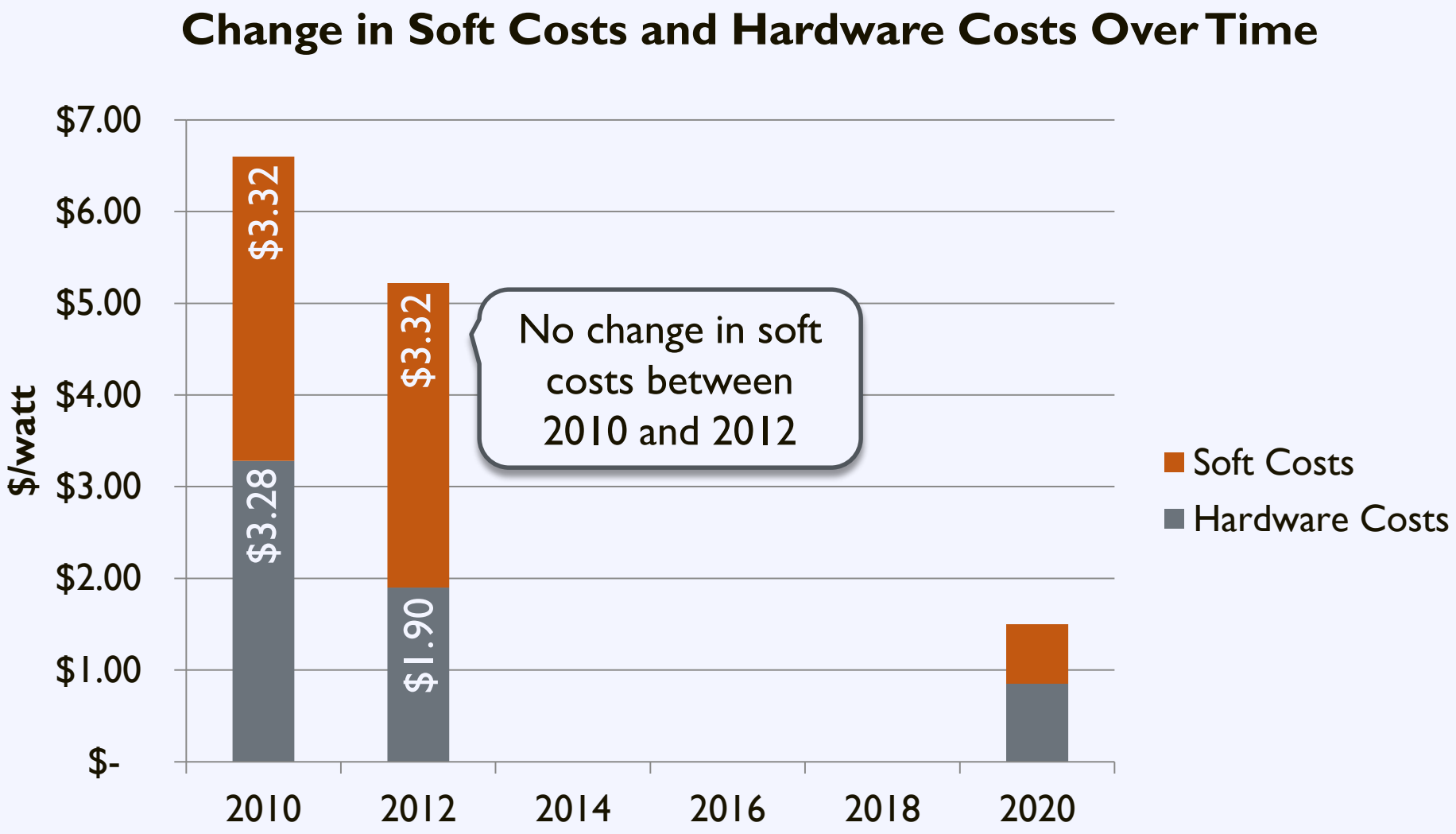
Germany's Success

Consistency and Transparency

through

Standardized Processes

The Cost of Solar in the US



Powered by SunShot
U.S. Department of Energy

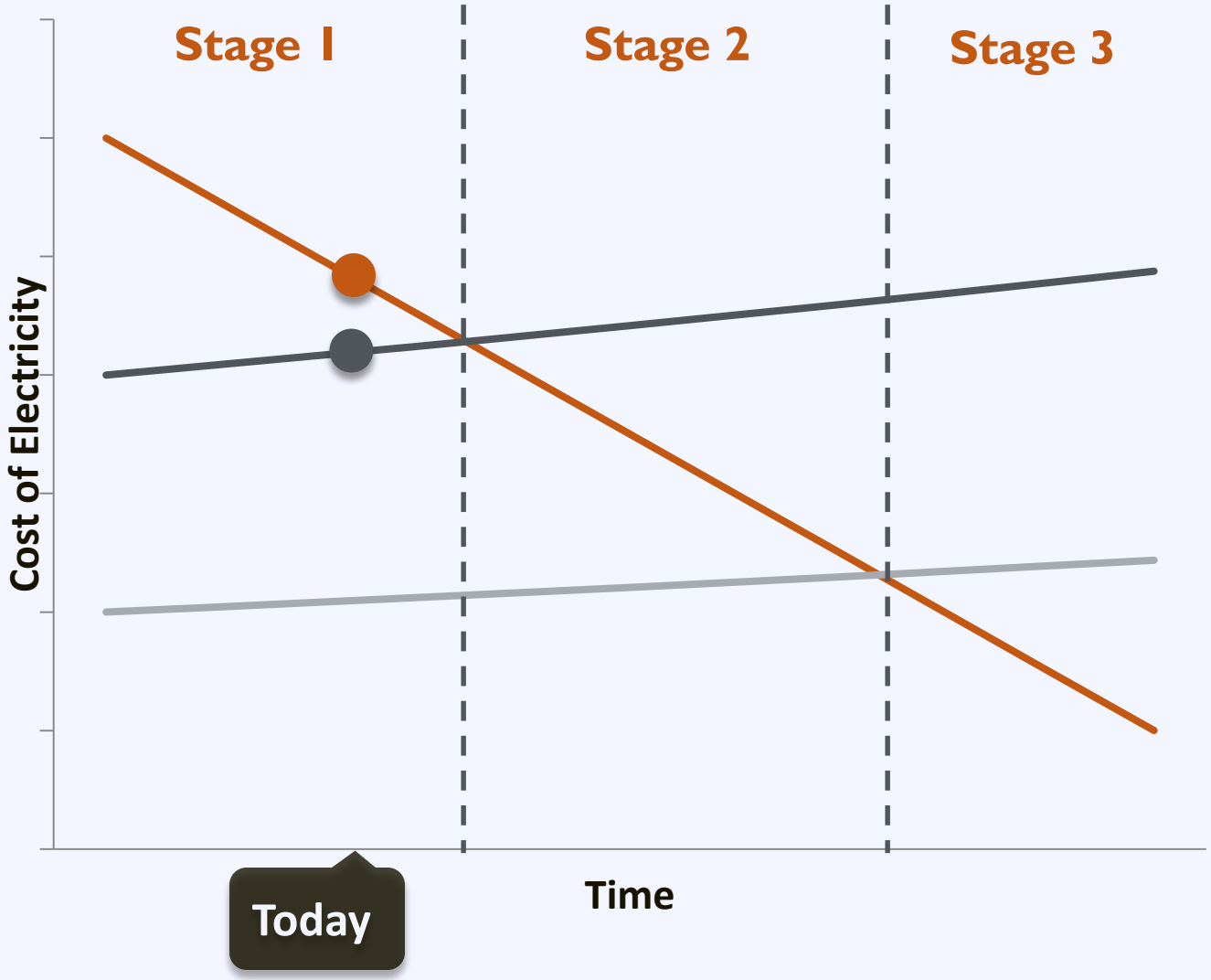
Workshop Goal

Enable local governments to replicate successful solar practices to reduce soft costs and expand local adoption of solar energy

Agenda

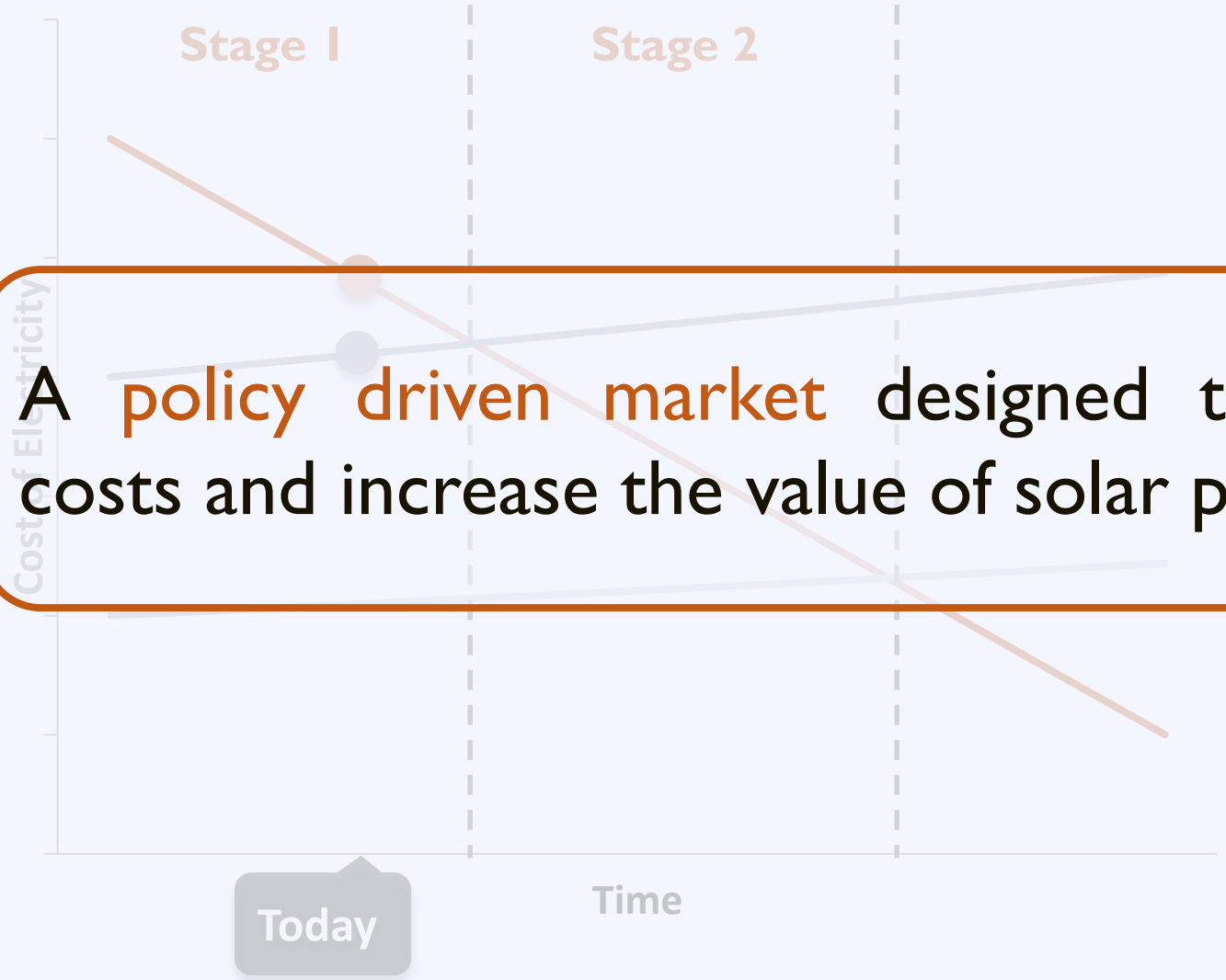
10:20 – 10:50	Putting Solar Energy on the Local Policy Agenda
10:50 – 11:20	State of the Local Solar Market
11:20 – 11:50	Federal, State, and Utility Policy Drivers
11:50 – 12:15	*Break and Grab Lunch*
12:15 – 12:45	Planning for Solar: Getting Solar Ready
12:45 – 1:20	Solar Market Development Tools
1:20 – 1:30	*Break*
1:30 – 2:15	Local Speakers
2:15– 3:00	Developing and Solar Policy Implementation Plan for Your Community and Next Steps

Solar Market: Trends



Source: Solar Electric Power Association

Solar Market: Trends



A policy driven market designed to mitigate costs and increase the value of solar production

Source: Solar Electric Power Association

A Policy Driven Market

Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering	Interconnection
	Solar Access	Property Tax Exemption	Value of Solar

A Policy Driven Market

Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering	Interconnection
	Solar Access	Property Tax Exemption	Value of Solar

Investment Tax Credit

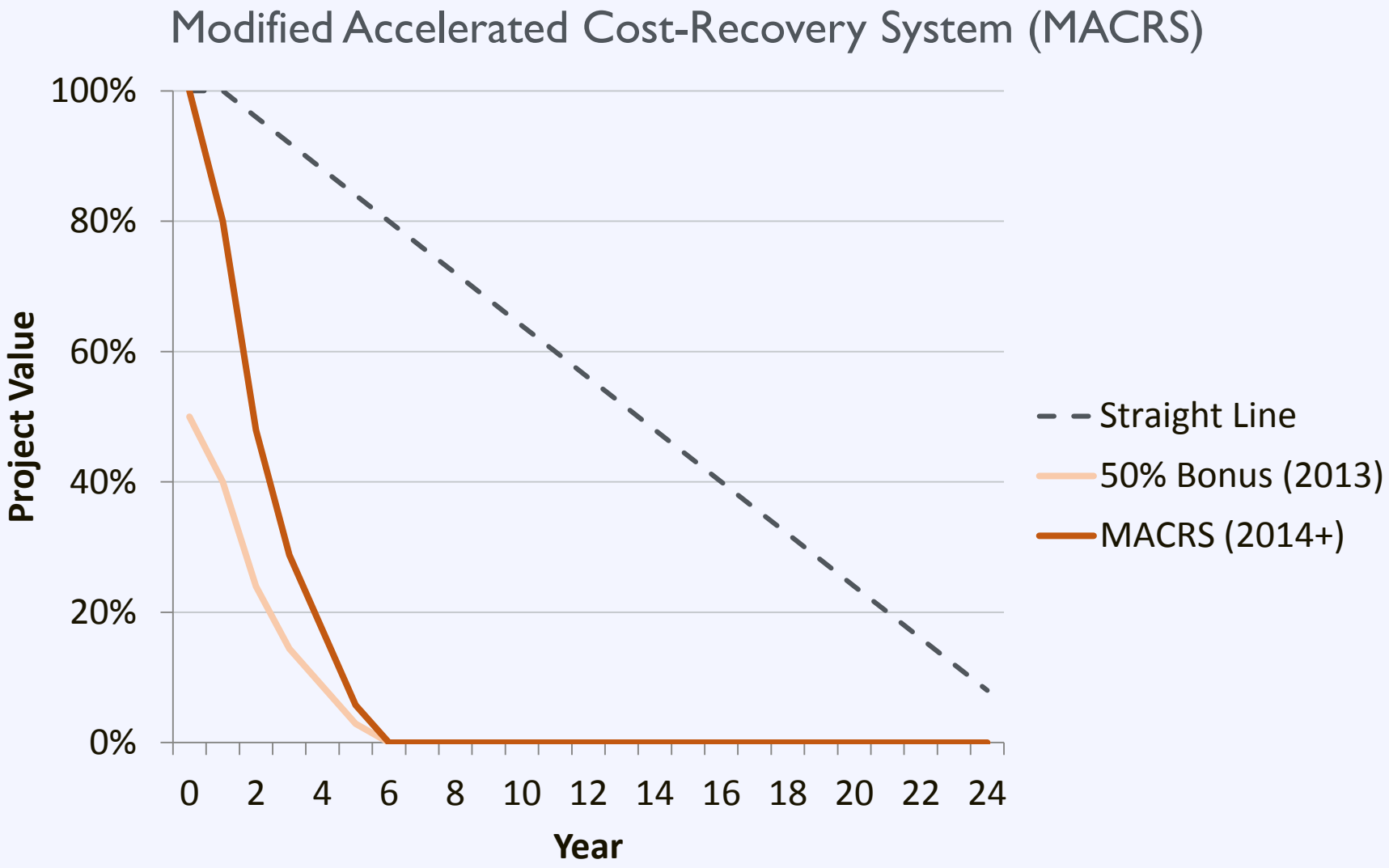
Type: Tax Credit

Eligibility: For-Profit Organization

Value: 30% of the installation cost

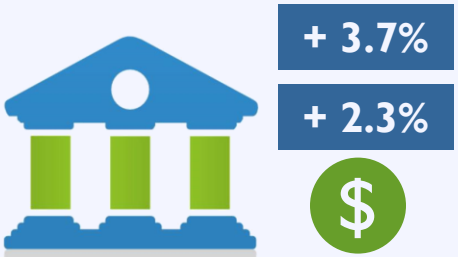
Availability: Through 2016

Accelerated Depreciation

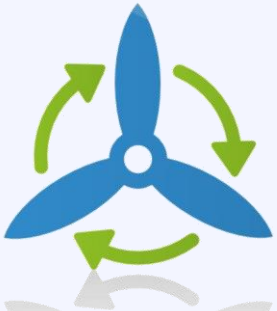


Qualified Energy Conservation Bond

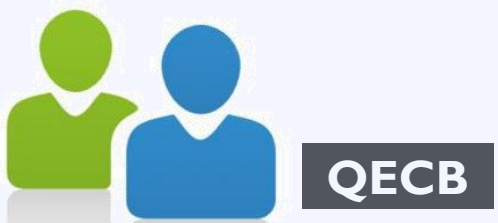
US Treasury



Local Gov



Project



Bond Holders

Qualified Energy Conservation Bond

Local Government	Amount	Use
Portland Housing Authority	$4,097,100	Energy efficiency improvements
Total Used	$4,097,100	
Total Remaining	**$9,559,900**	

Powered by SunShot U.S. Department of Energy

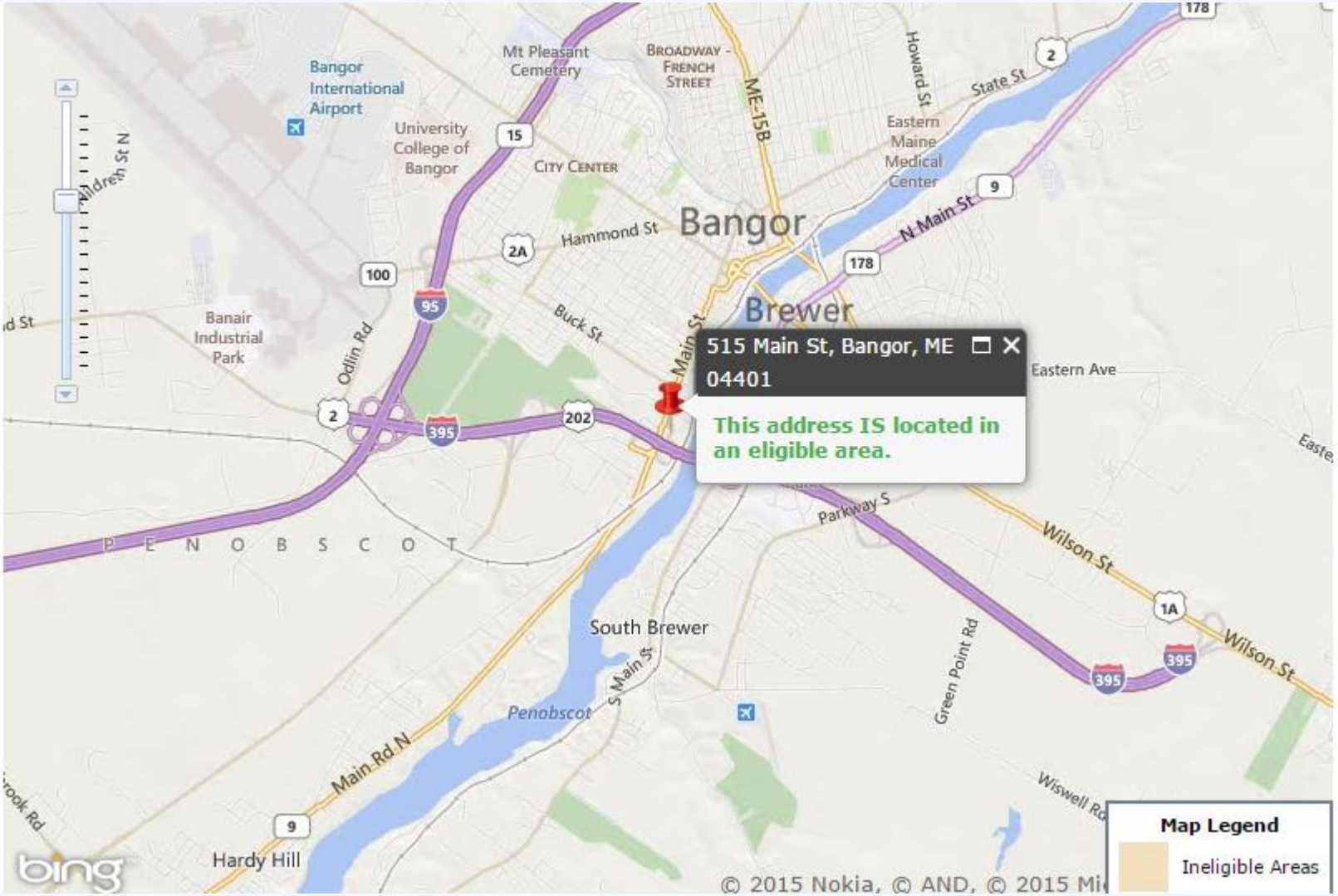
Source: Energy Programs Consortium (June 2014)

USDA REAP

- USDA Rural Energy for America Program (REAP)
  - Guaranteed loan financing and grant funding for agricultural producers & rural small businesses to install renewable energy systems
  - Grants: $2,500-$500,000
  - Loan Guarantees: $5,000-$25 million
    - Up to 85% loan guarantee

Source: http://www.rd.usda.gov/programs-services/rural-energy-america-program-renewable-energy-systems-energy-efficiency

USDA REAP

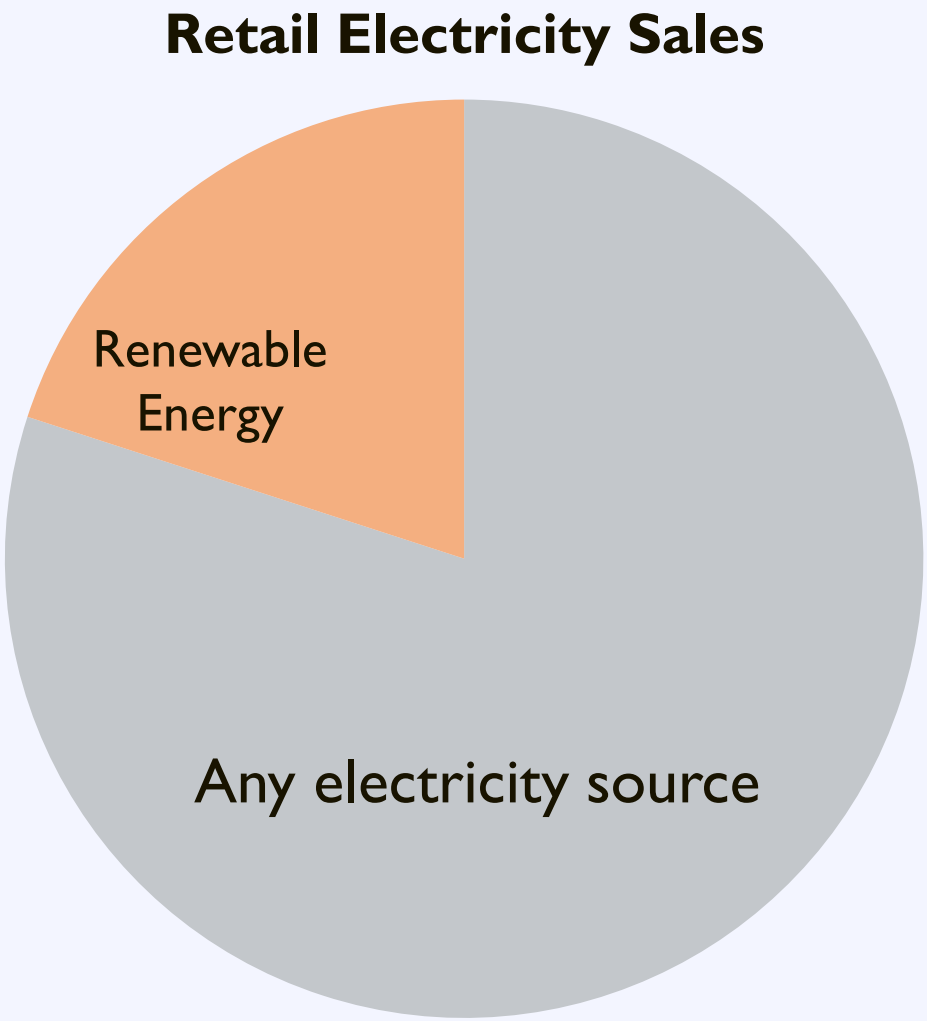


Powered by SunShot
U.S. Department of Energy

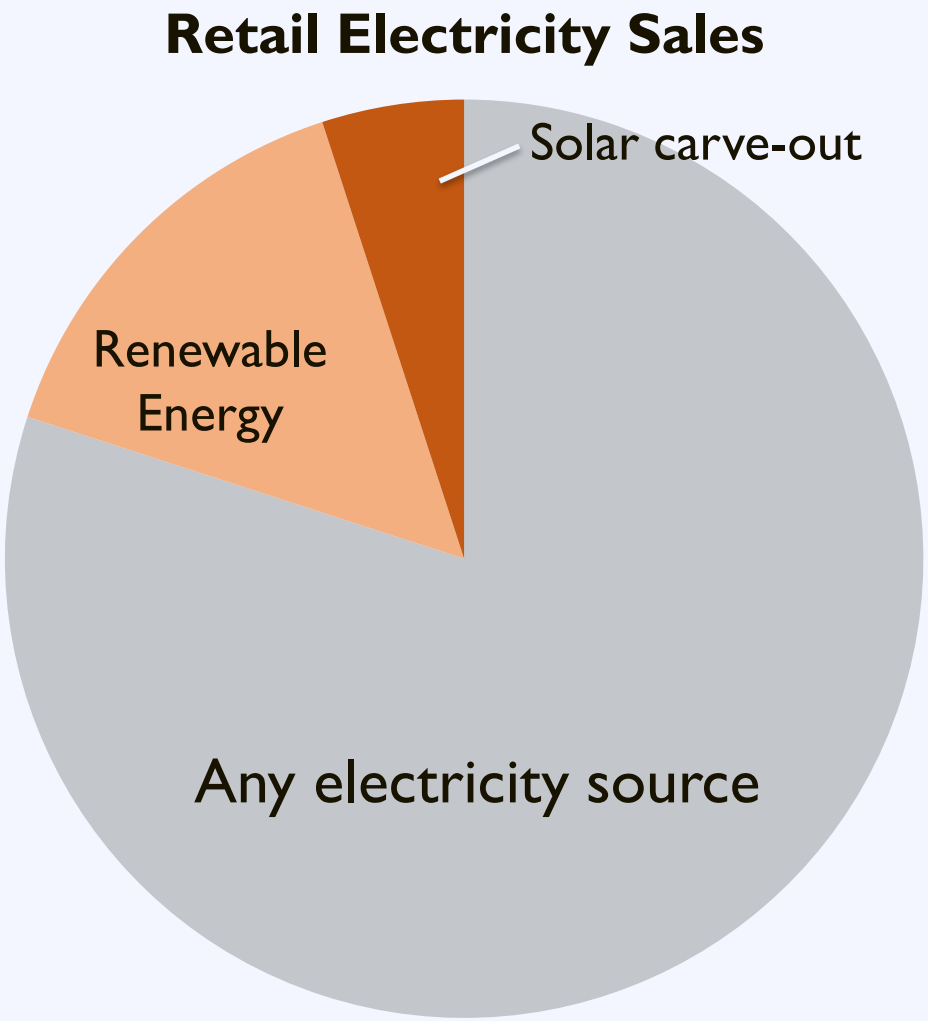
A Policy Driven Market

Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering	Interconnection
	Solar Access	Property Tax Exemption	Value of Solar

Renewable Portfolio Standard

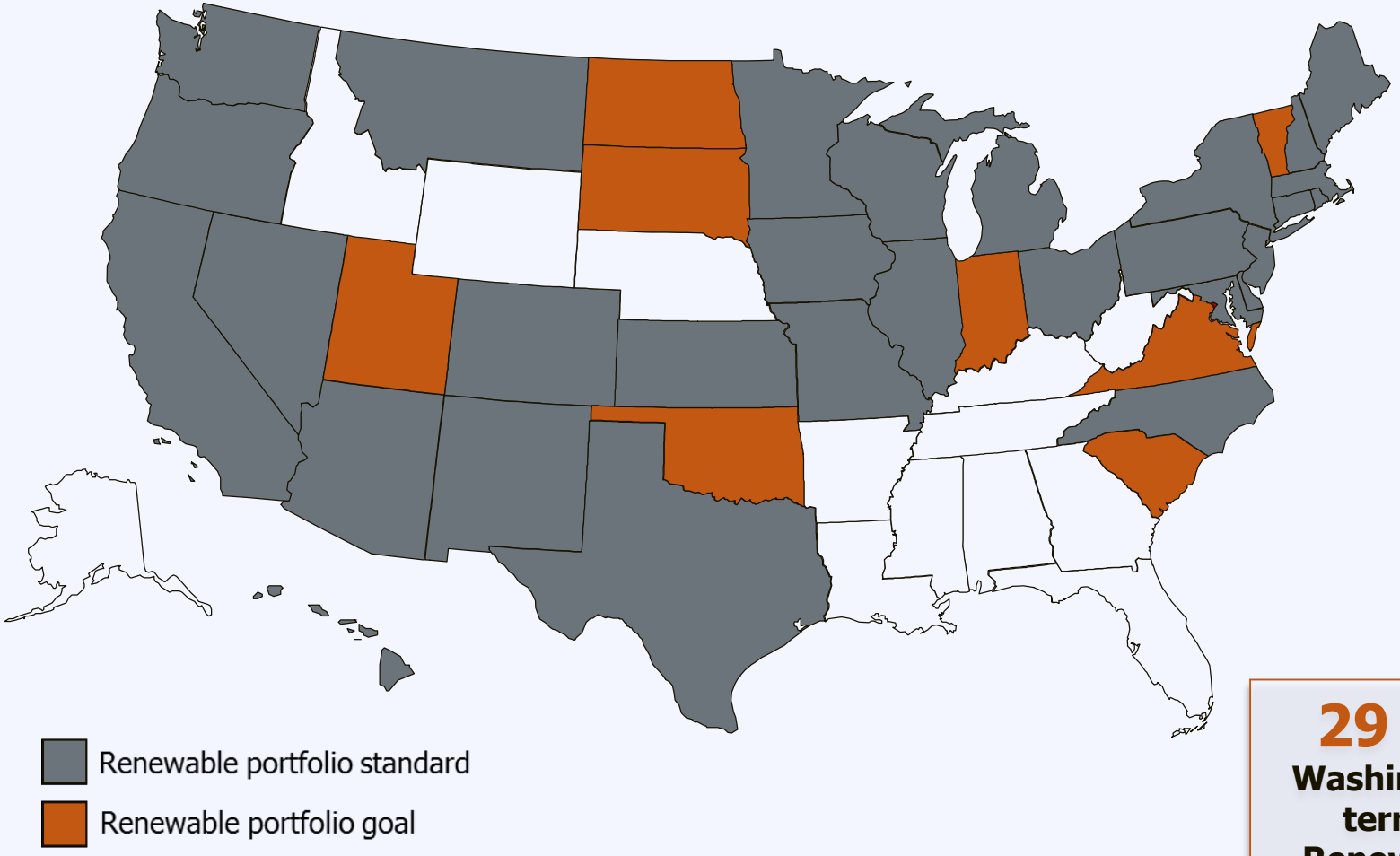


Renewable Portfolio Standard



Renewable Portfolio Standard

www.dsireusa.org / April 2015



29 states, +
Washington DC and 2 territories have Renewable Portfolio Standards
(8 states and 2 territories have renewable portfolio goals)

Powered by SunShot
U.S. Department of Energy

RPS Impacts: Solar Deployment

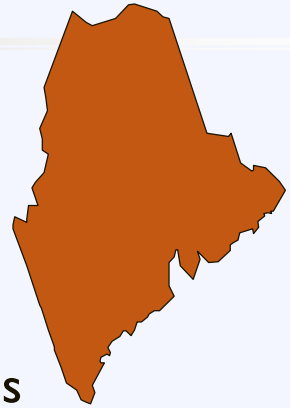
RPS and Solar/DG Status of Top Ten Solar States by Cumulative Installed Grid-Connected PV Capacity (as of Q4 2013)

Ranks	State	RPS?	Solar/DG Provision?
1	California	Y	N
2	Arizona	Y	Y
3	New Jersey	Y	Y
4	North Carolina	Y	Y
5	Massachusetts	Y	Y
6	Nevada	Y	Y
7	Colorado	Y	Y
8	Hawaii	Y	N
9	New Mexico	Y	Y
10	New York	Y	Y

Powered by SunShot U.S. Department of Energy

Source: DSIRE Solar (http://dsireusa.org/documents/summarymaps/Solar_DG_RPS_map.pdf); IREC, U.S. Solar Market Trends 2013 (http://www.irecusa.org/annual-u-s-solar-market-trends-report/)

RPS: Maine Overview



- 40% of retail electricity sales by 2017
  - 10% Class I Resources
    - Fuel cells, tidal, solar, wind, geothermal, hydro, biomass
    - New renewables (must have come online after Sept. 1, 2005)
  - 30% Class II Resources
    - Also includes existing renewables, municipal solid waste, and combined heat & power (>100MW)
    - Less stringent hydro requirements
- 1.5 credit multiplier for community-based renewable energy projects

Source: DSIRE

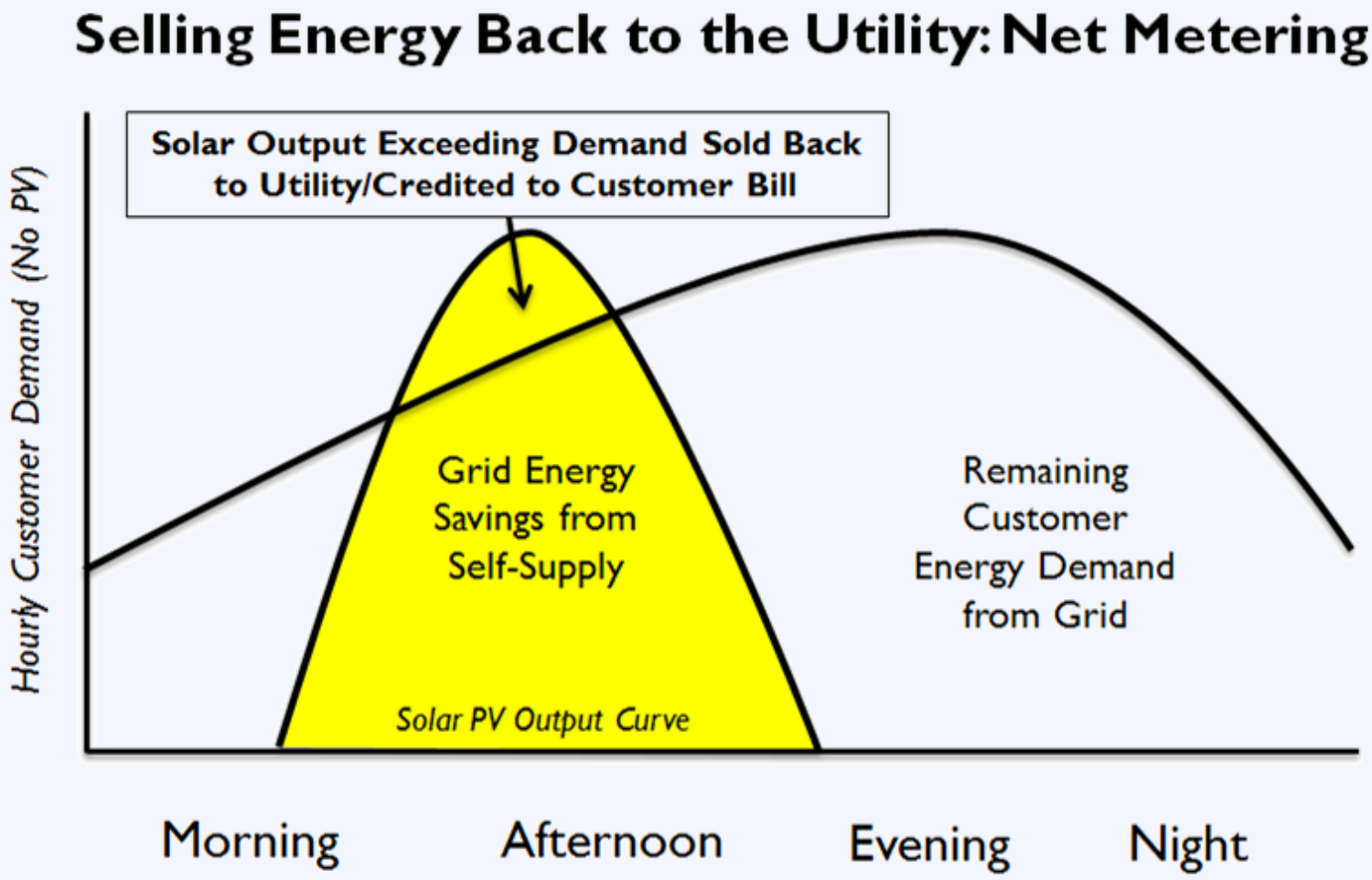
A Policy Driven Market

Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering	Interconnection
	Solar Access	Property Tax Exemption	Value of Solar

Net Metering

Net metering allows customers to export power to the grid during times of excess generation, and receive credits that can be applied to later electricity usage.

Net Metering



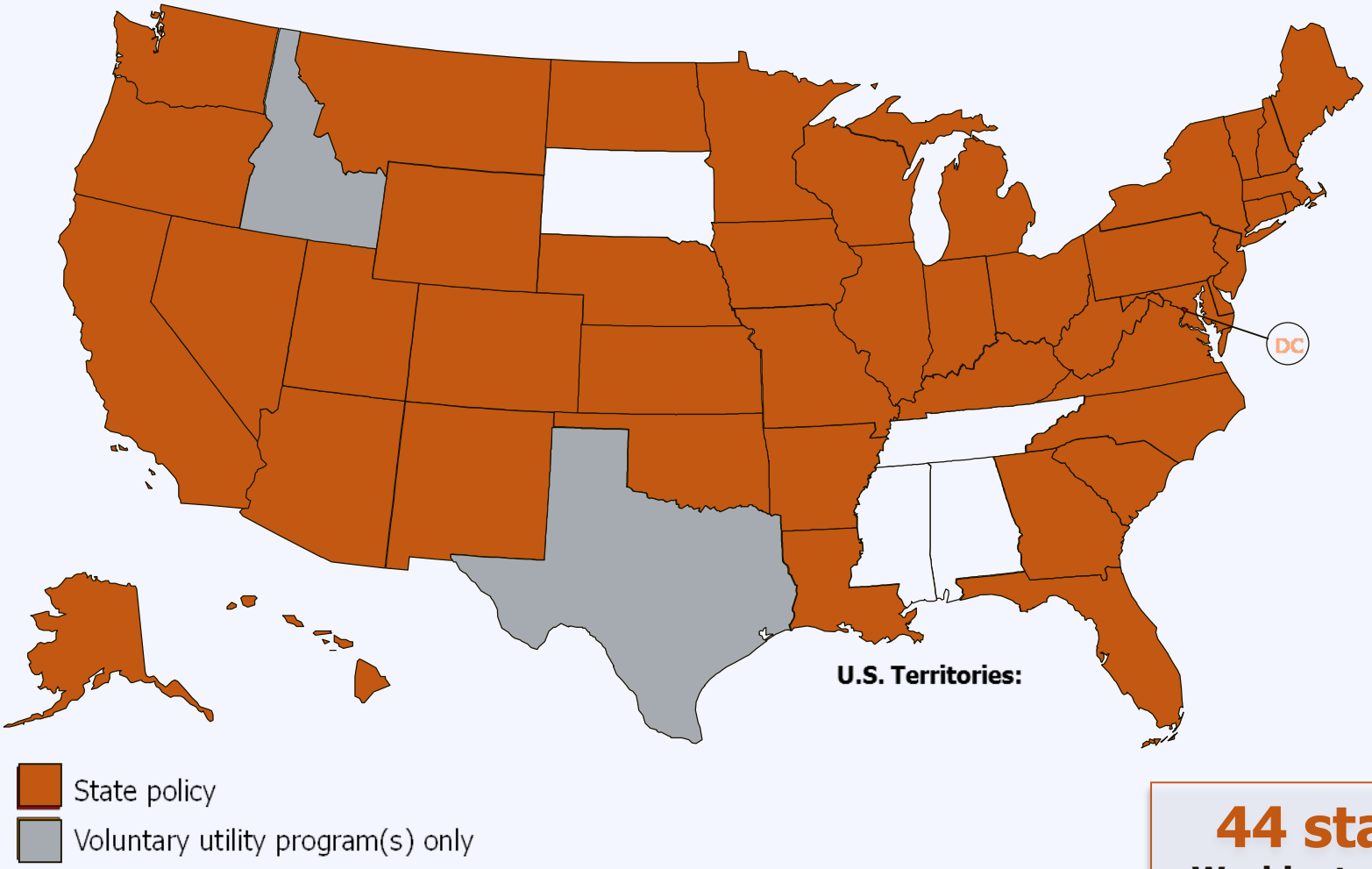
Net Metering: Market Share

More than **95%** of distributed PV Installations are net-metered

Powered by SunShot U.S. Department of Energy

Source: IREC, *U.S. Solar Market Trends 2013* (http://www.irecusa.org/annual-u-s-solar-market-trends-report/)

Net Metering

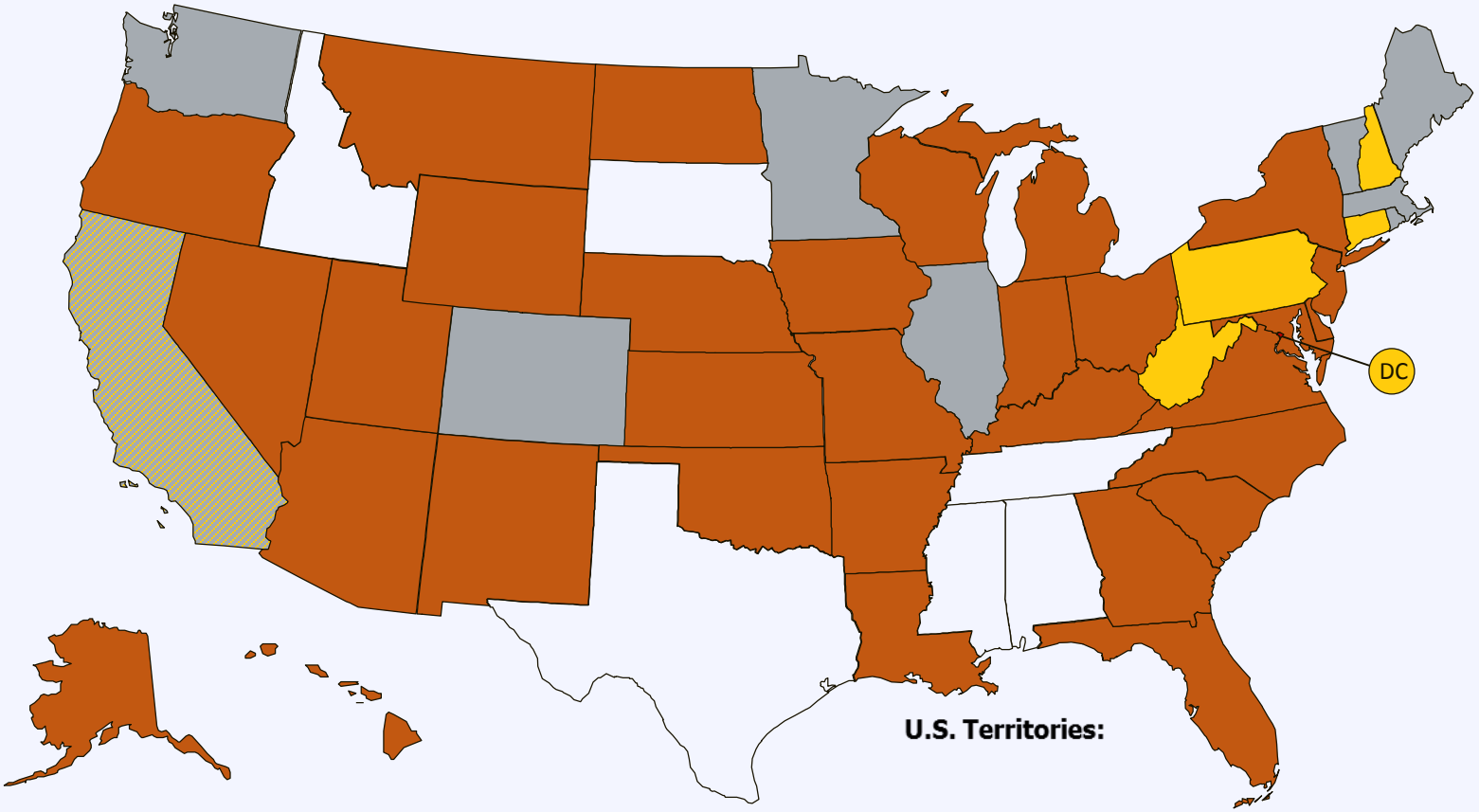


44 states, + Washington DC and 4 territories have Net Metering Policies

Source: DSIRE (April 2015)

Net Metering: Virtual

Enhanced Net Metering



Powered by SunShot
U.S. Department of Energy

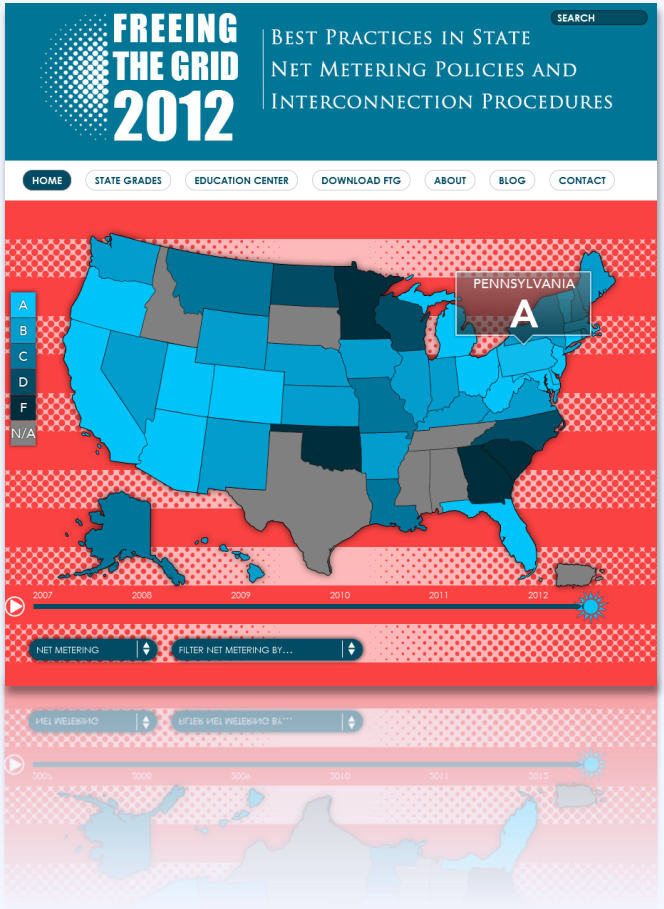
Source: DSIRE (April 2015)

Net Metering: Resources

Resource **Freeing the Grid**

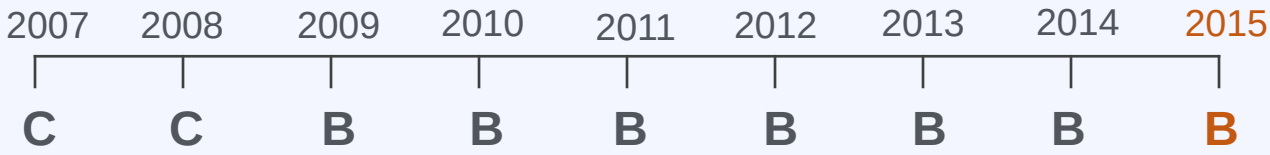
Provides a "report card" for state policy on net metering and interconnection

http://freeingthegrid.org/



Net Metering: Maine

B



Net Excess Credit Value
Retail Rate
Credits granted to utility every 12 months

Applicable Utilities
All utilities

System Capacity Limit
660 KW- IOU customers
100 kW- Muni/Co-op customers

Meter Aggregation
Allowed

Powered by SunShot U.S. Department of Energy

Source: Freeing the Grid

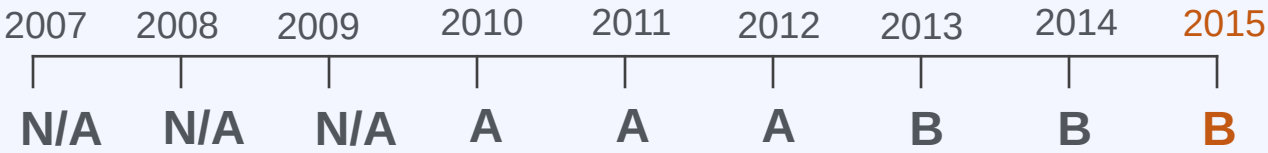
A Policy Driven Market

Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering	Interconnection
	Solar Access	Property Tax Exemption	Value of Solar

Interconnection

Standardized interconnection rules require utilities to provide a fair and transparent pathway for customer-generators and other developers of distributed energy resources to interconnect with the utility's grid.

Interconnection: Maine



Applicable Technologies
Most renewable/DG technologies

Applicable Utilities
All transmission & distribution utilities

System Capacity Limit
Not specified

Bonus
Insurance waived for generators up to 25 kW

Powered by SunShot U.S. Department of Energy

Source: Freeing the Grid

A Policy Driven Market

Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering	Interconnection
	Solar Access	Property Tax Exemption	Value of Solar

Solar Access

A landowner does not have any legal right to the free flow of light and air across the adjoining land of his neighbor

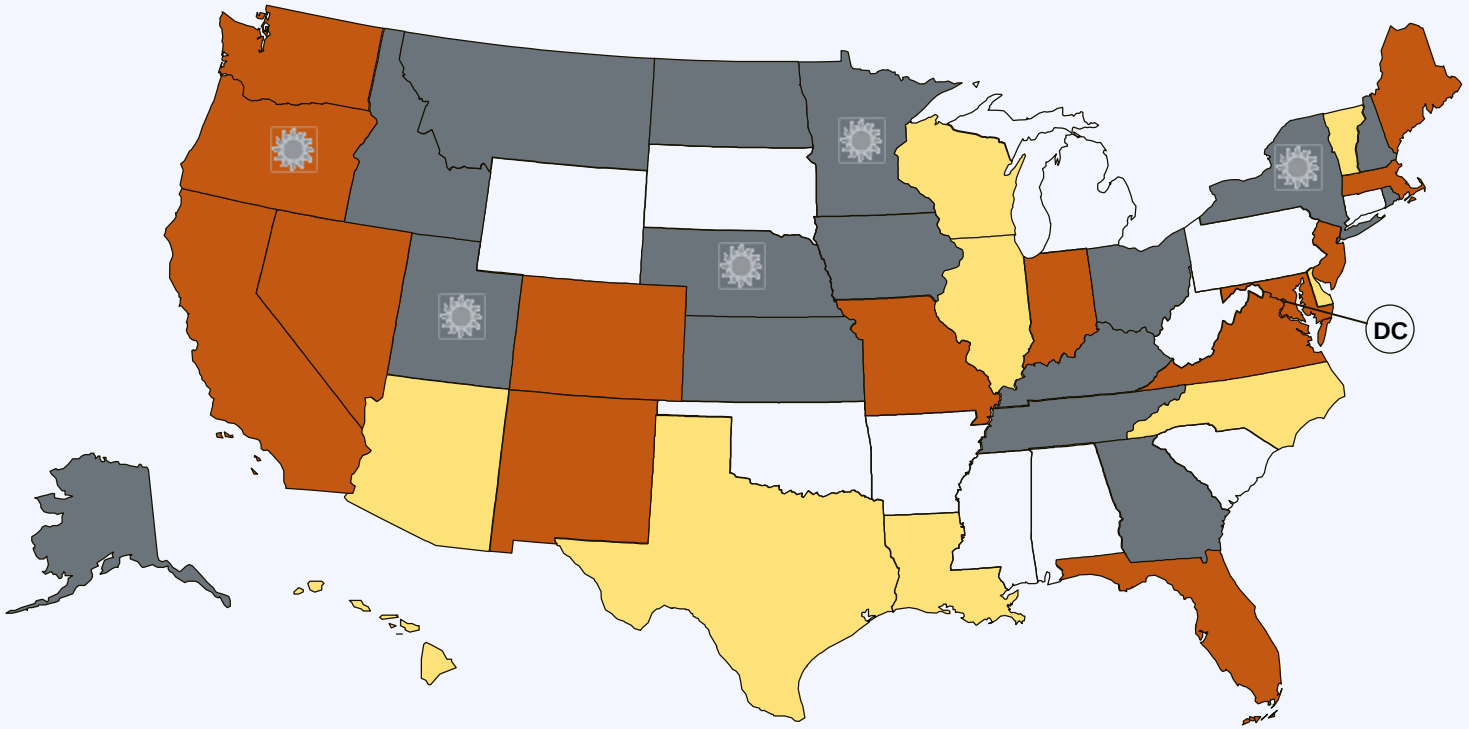
Source: Google Earth

Solar Access

Solar Access Laws:

1. Increase the likelihood that properties will receive sunlight
2. Protect the rights of property owners to install solar
3. Reduce the risk that systems will be shaded after installation

Solar Access



Solar Easements Provision

Solar Rights Provision

Solar Easements and Solar Rights Provisions

U.S. Virgin Islands

Local option to create solar rights provision

Powered by SunShot
U.S. Department of Energy

Source: Database of State Incentives for Renewables & Efficiency (www.dsireusa.org)

Maine Solar Access Law

Solar Rights Provision:

- Municipal & HOA regulations cannot prohibit a person from installing/using a solar energy device (including clotheslines and drying racks) on their own property
- However, municipalities & HOAs may reasonably restrict the installation & use of solar energy devices to protect:
  - Public health & safety
  - Buildings from damage
  - Historic/aesthetic values (when a comparable alternative is available)
  - Shorelands
- May also restrict on:
  - Residential property that is commonly owned
  - Common areas of condominiums

Maine Solar Access Law

Solar Easements:

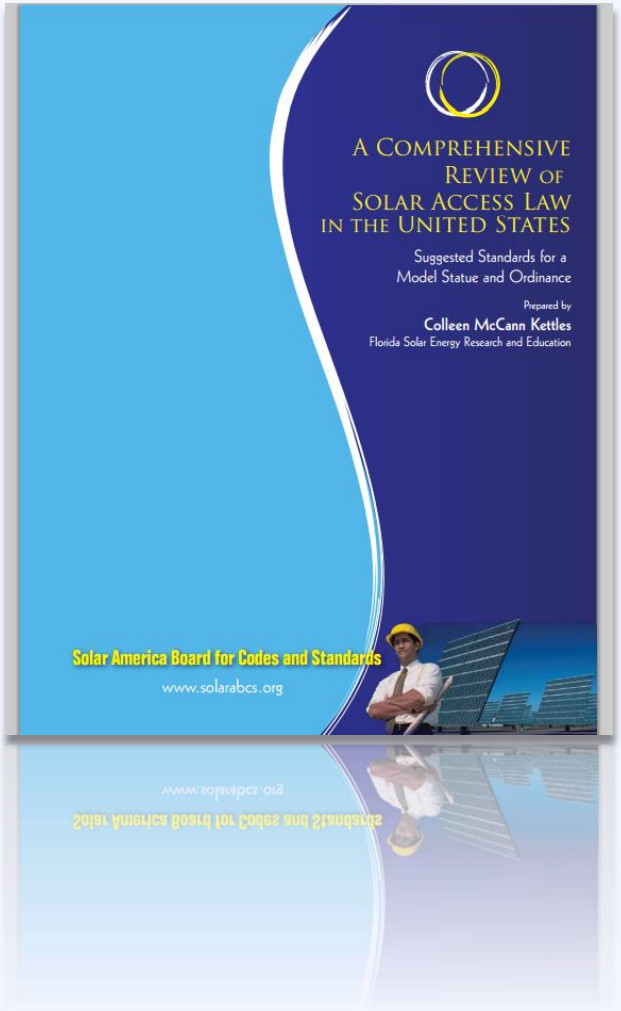
- Maine allows for the creation of solar easements between property owners
- Easements may commonly include:
  - Description of the space affected
  - Terms & conditions of the easement
  - Map showing affected properties

Solar Access

Resource **Solar America Board for Codes & Standards**

A comprehensive review of solar access law in the US – Suggested standards for a model ordinance

www.solarabcs.org



Powered by SunShot
U.S. Department of Energy

A Policy Driven Market

Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering	Interconnection
	Solar Access	State Tax Incentives	Value of Solar

State Tax Incentives

- State Tax Credits: None
- Property Tax Exemption: None
  - Must pay property tax on value added by a solar PV system
- Sales Tax Exemption: None
  - Must pay 5.5% sales tax on solar PV systems

A Policy Driven Market

Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering	Interconnection
	Solar Access	State Tax Incentives	Value of Solar

Value of Solar: Maine

- S.P. 644 (April 2014) directed the Maine Public Utilities Commission to prepare a report on the value of distributed solar energy generation to the state.
- Final study was released on March 3, 2015
  - First-year value of distributed solar = $0.182 per kWh
  - Long term (25-year levelized) value = $0.337 per kWh.

ENERGY TRANSITION INITIATIVE

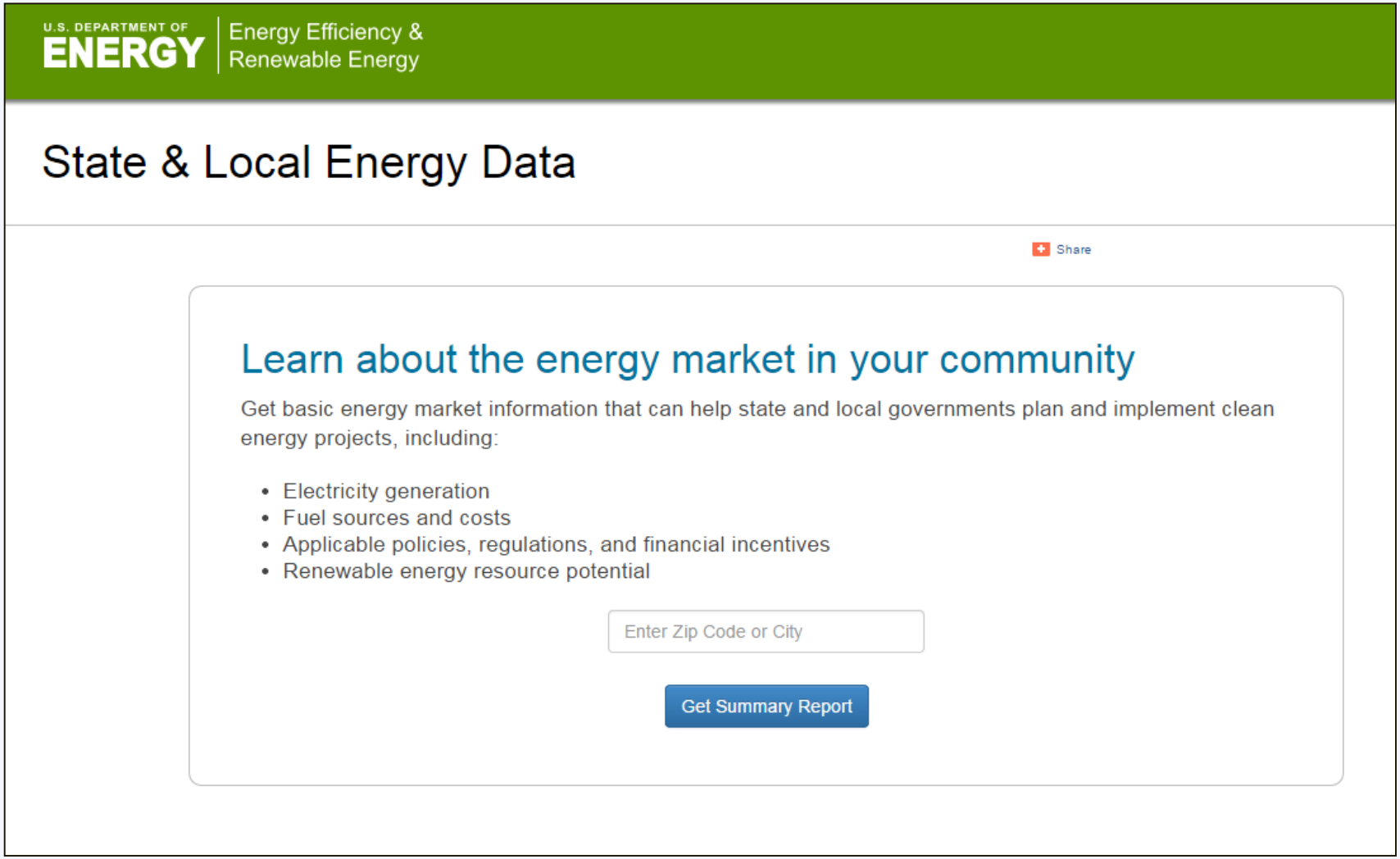
State & Local Energy Data (SLED)

DOE EERE SLED Overview

- Centrally aggregates a broad array of rich data sets in real-time on regional energy systems, demands, and resources
- Gives decision makers the information they need for a clearer understanding of a market's energy picture
- Allows for more effective planning and implementation of clean energy projects

SLED Overview

www.eere.energy.gov/sled



SLED Overview

http://youtu.be/VAzAGlX1zag

Electricity Generation

Energy Efficiency

Renewable Energy

Transportation

Community Planning

Data Sources

New Search

Enter Zip Code or City, State

Start Over

Download PDF of this Page

Electricity Generation Summary for 80020

This section provides details on the electric utilities that serve your area and the related average electricity costs. Trends in electricity rates over time are presented as well as details on the mix of fuel sources used and electricity use by sector in your area.

Electric Utility Names

Public Service Co of Colorado

Source: National Renewable Energy Laboratory, 2012 [1]

Average Retail Electricity Rates ($/kWh)

Download Chart

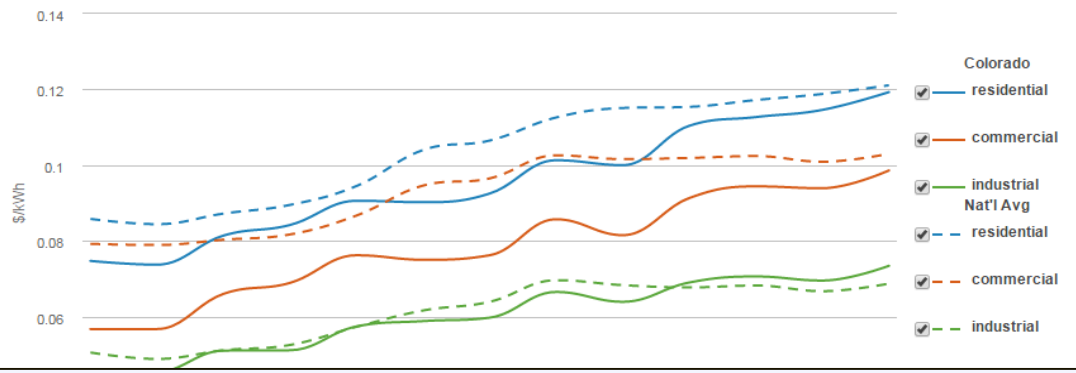
	Public Service Co of Colorado	Colorado Avg.	Nat'l Avg.
Residential	0.1105	0.1211	0.1211
Commercial	0.0916	0.1030	0.1030
Industrial	0.0604	0.0687	0.0687

Note: Contact your utility or search the Utility Rate Database for specific rate schedules

Source: Energy Information Administration, 2013 [2, 3]

State and National Retail Electricity Rate Trends

Download Chart



Agenda

10:20 – 10:50	Putting Solar Energy on the Local Policy Agenda
10:50 – 11:20	State of the Local Solar Market
11:20 – 11:50	Federal, State, and Utility Policy Drivers
11:50 – 12:15	*Break and Grab Lunch*
12:15 – 12:45	Planning for Solar: Getting Solar Ready
12:45 – 1:20	Solar Market Development Tools
1:20 – 1:30	*Break*
1:30 – 2:15	Local Speakers
2:15– 3:00	Developing and Solar Policy Implementation Plan for Your Community and Next Steps

Agenda

10:20 – 10:50	Putting Solar Energy on the Local Policy Agenda
10:50 – 11:20	State of the Local Solar Market
11:20 – 11:50	Federal, State, and Utility Policy Drivers
11:50 – 12:15	*Break and Grab Lunch*
12:15 – 12:45	Planning for Solar: Getting Solar Ready
12:45 – 1:20	Solar Market Development Tools
1:20 – 1:30	*Break*
1:30 – 2:15	Local Speakers
2:15– 3:00	Developing and Solar Policy Implementation Plan for Your Community and Next Steps

Effective Local Solar Policy

Local Solar Policy

Planning for Solar

Solar in Development Regulation

Effective Solar Permitting Process

Solar Market Development Tools

Effective Local Solar Policy

Local Solar Policy

Planning for Solar

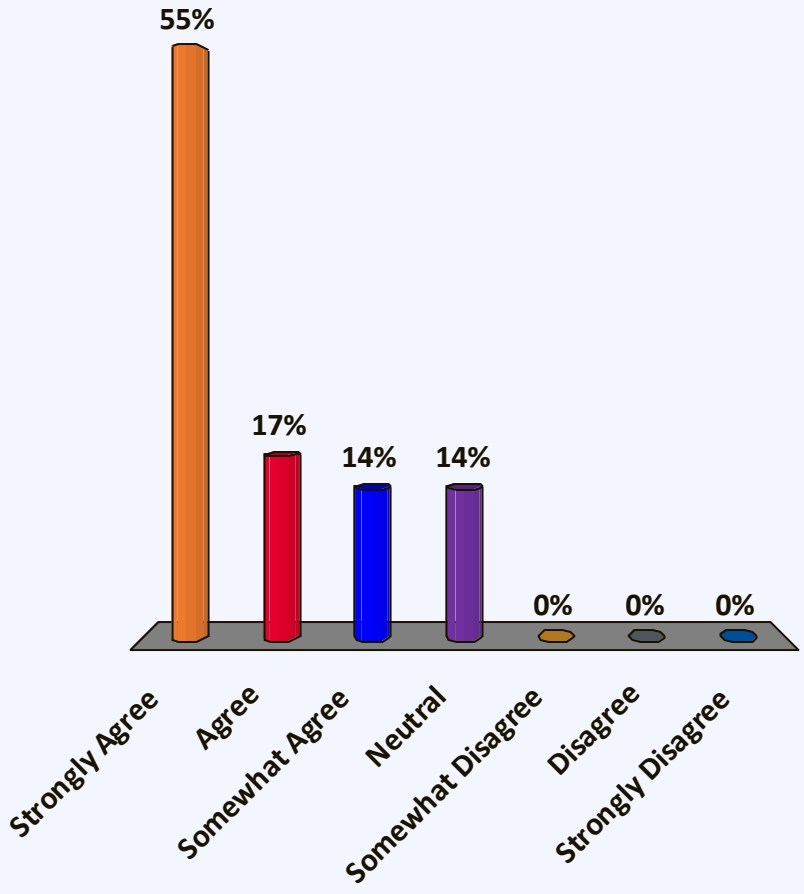
Visioning & goal setting

Effective Solar Permitting Process

Solar Market Development Tools

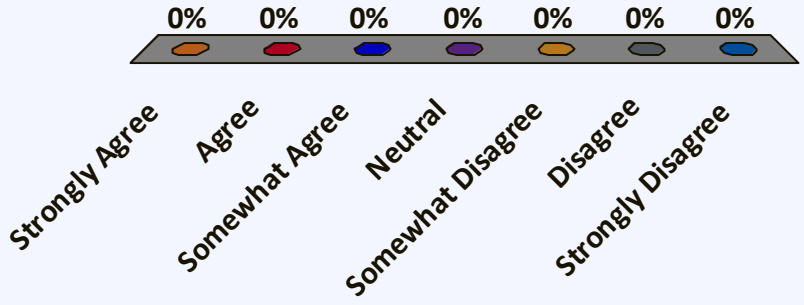
Solar advances your energy goals

A. Strongly Agree
B. Agree
C. Somewhat Agree
D. Neutral
E. Somewhat Disagree
F. Disagree
G. Strongly Disagree



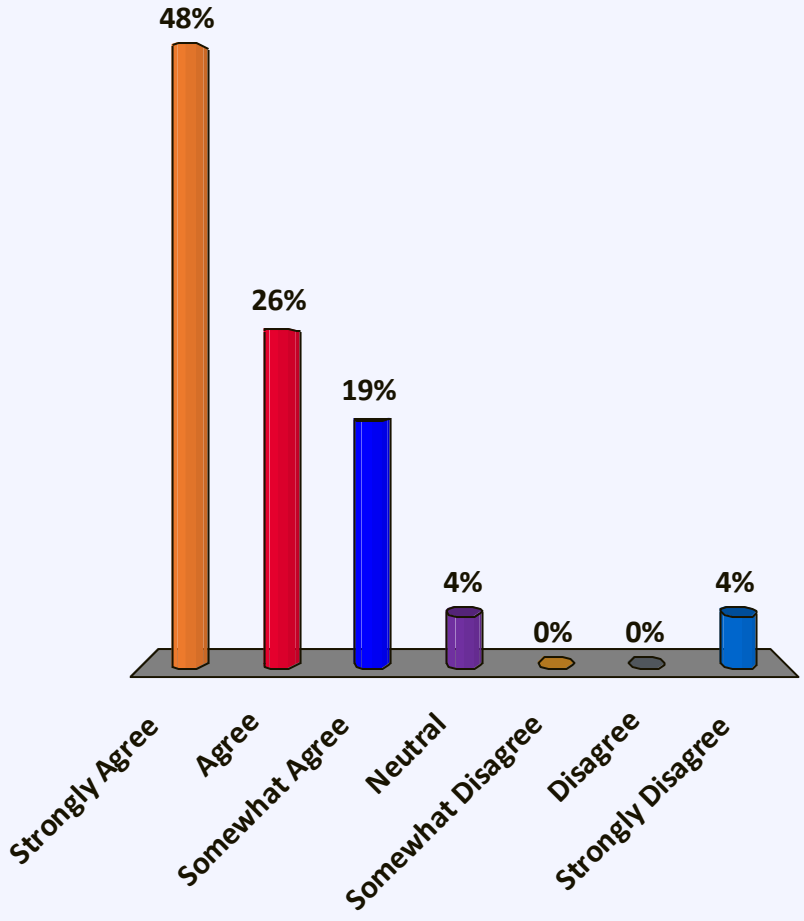
Solar advances your economic development goals

A. Strongly Agree
B. Agree
C. Somewhat Agree
D. Neutral
E. Somewhat Disagree
F. Disagree
G. Strongly Disagree



Solar advances your environmental & health goals

A. Strongly Agree
B. Agree
C. Somewhat Agree
D. Neutral
E. Somewhat Disagree
F. Disagree
G. Strongly Disagree



Visioning: Scales & Contexts

Poll

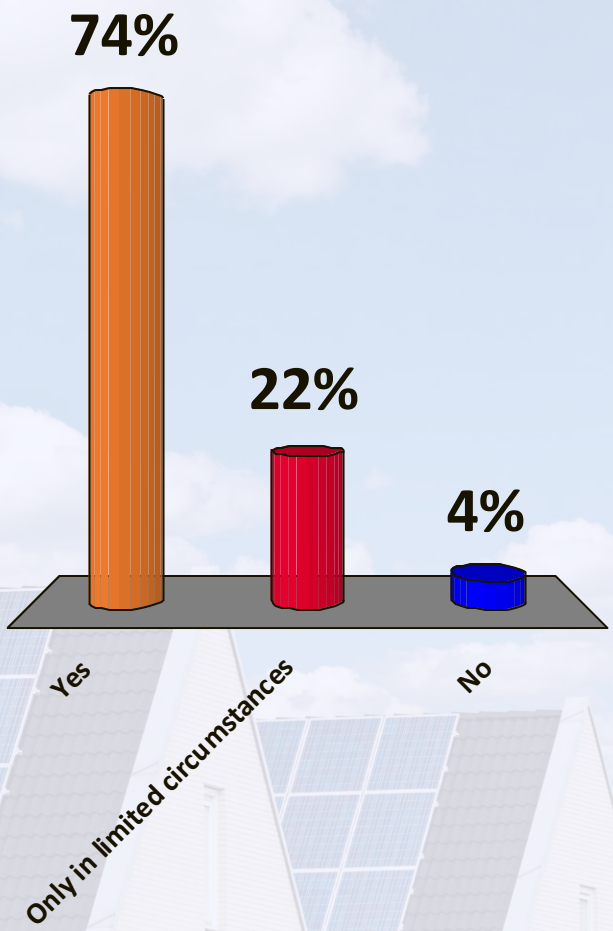
Is solar on residential rooftops appropriate for your community?

Visioning: Scales & Contexts

Poll

Is solar on residential rooftops appropriate for your community?

A. Yes
B. Only in limited circumstances
C. No



Visioning: Scales & Contexts

Poll

Is solar on commercial rooftops appropriate for your community?

Visioning: Scales & Contexts

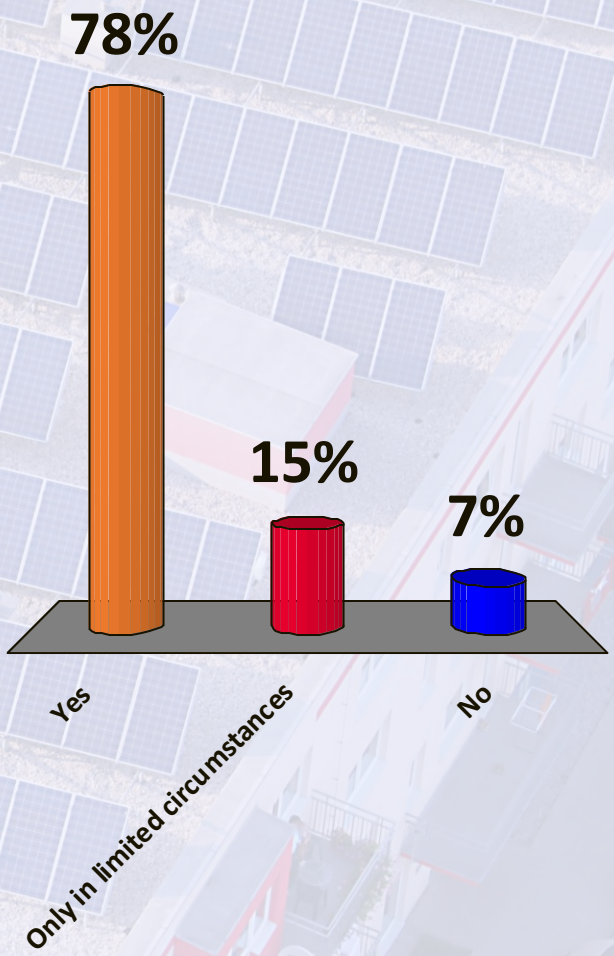
Poll

Is solar on commercial rooftops appropriate for your community?

A. Yes

B. Only in limited circumstances

C. No



Visioning: Scales & Contexts

Poll

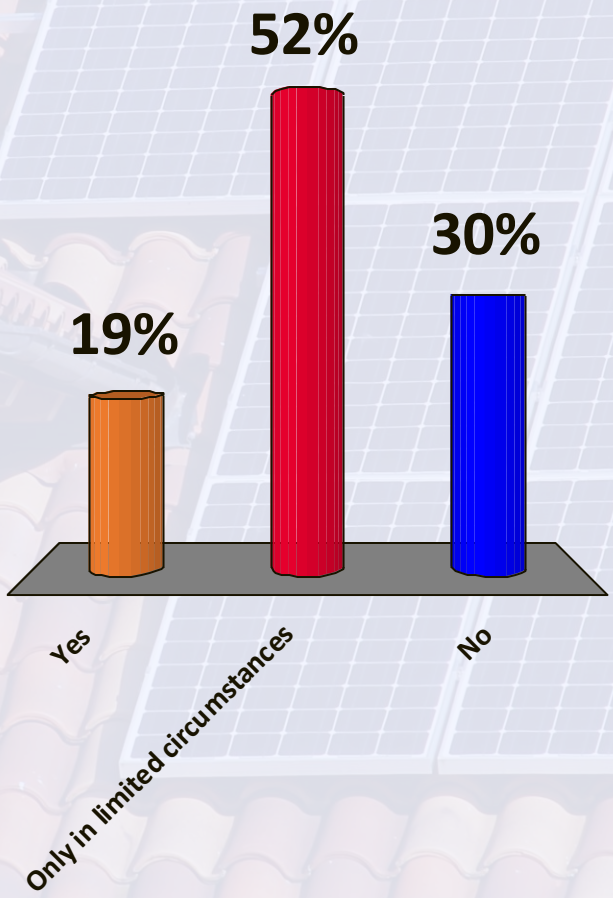
Is solar on historic structures appropriate for your community?

Visioning: Scales & Contexts

Poll

Is solar on historic structures appropriate for your community?

A. Yes
B. Only in limited circumstances
C. No



Visioning: Scales & Contexts

Poll

Is solar on brownfields appropriate for your community?

Visioning: Scales & Contexts

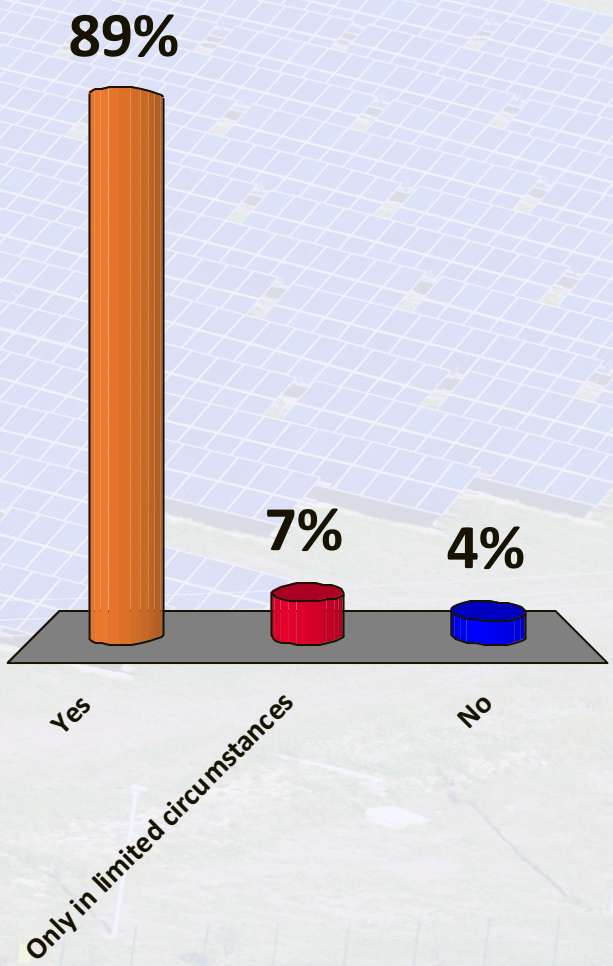
Poll

Is solar on brownfields appropriate for your community?

A. Yes

B. Only in limited circumstances

C. No



Visioning: Scales & Contexts

Poll

Is solar on greenfields appropriate for your community?

Visioning: Scales & Contexts

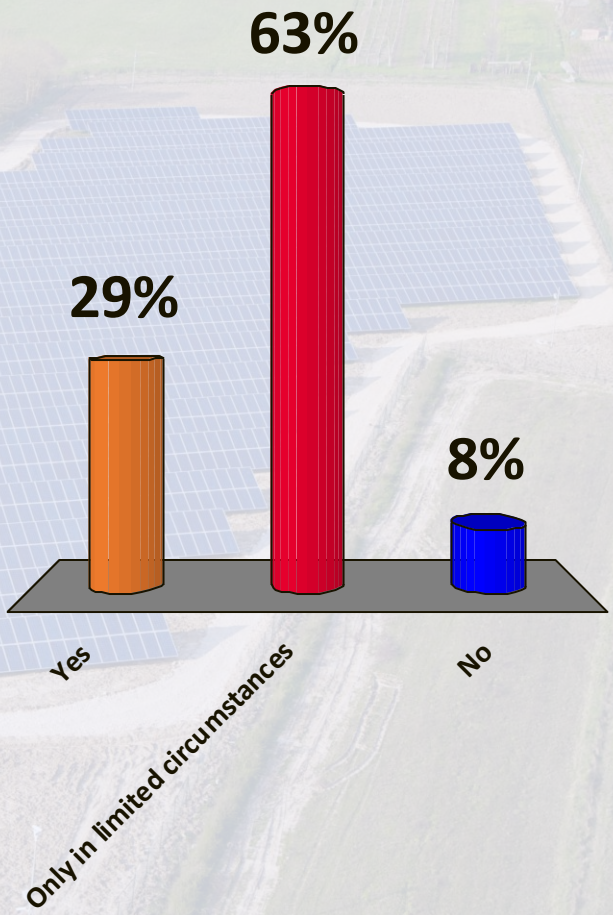
Poll

Is solar on greenfields appropriate for your community?

A. Yes

B. Only in limited circumstances

C. No



Visioning: Scales & Contexts

Poll

Is solar on parking lots appropriate for your community?

Visioning: Scales & Contexts

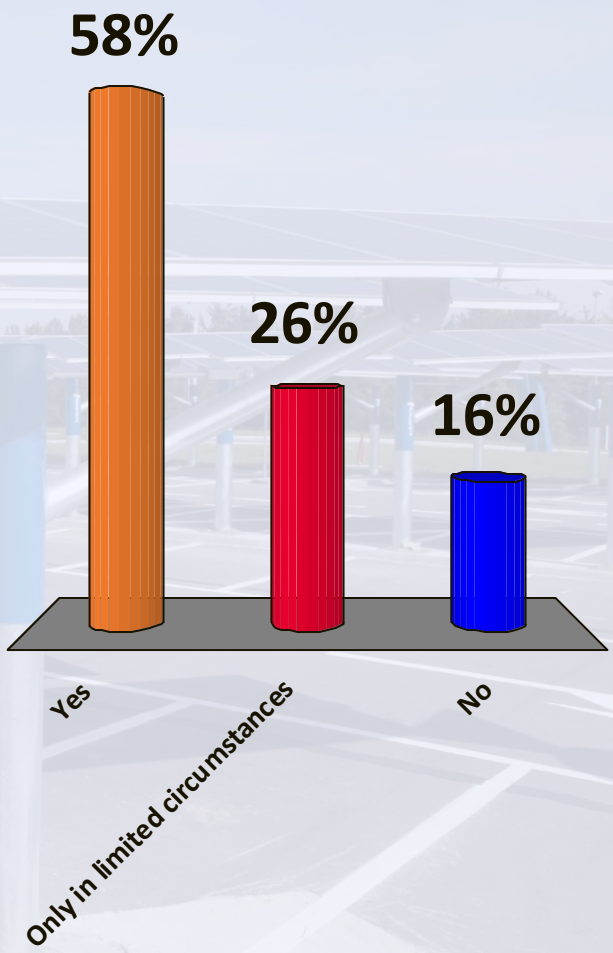
Poll

Is solar on parking lots appropriate for your community?

A. Yes

B. Only in limited circumstances

C. No



Visioning: Scales & Contexts

Poll

Is building-integrated solar appropriate for your community?

Visioning: Scales & Contexts

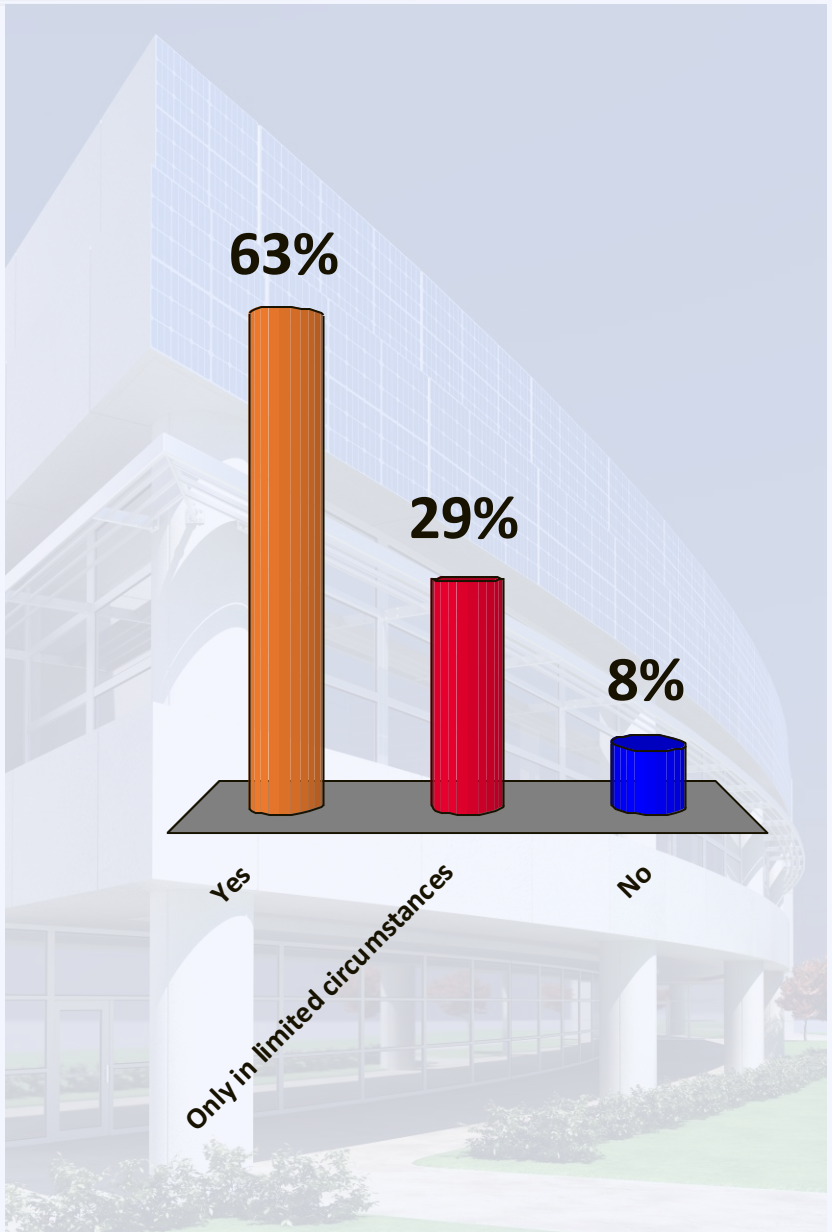
Poll

Is building-integrated solar appropriate for your community?

A. Yes

B. Only in limited circumstances

C. No



Planning for Solar Development

Communitywide Comprehensive Plan

Neighborhood Plans	Corridor Plans	Special District Plans
Green Infrastructure Plans	Energy Plan	Climate Action Plan

Powered by SunShot
U.S. Department of Energy

Source: American Planning Association

Technical Resources

Resource **Planning for Solar Energy**

A guide for planners on determining and implementing local solar goals, objectives, policies, and actions

www.planning.org

Powered by SunShot
U.S. Department of Energy

Effective Local Solar Policy

Local Solar Policy

Planning for Solar

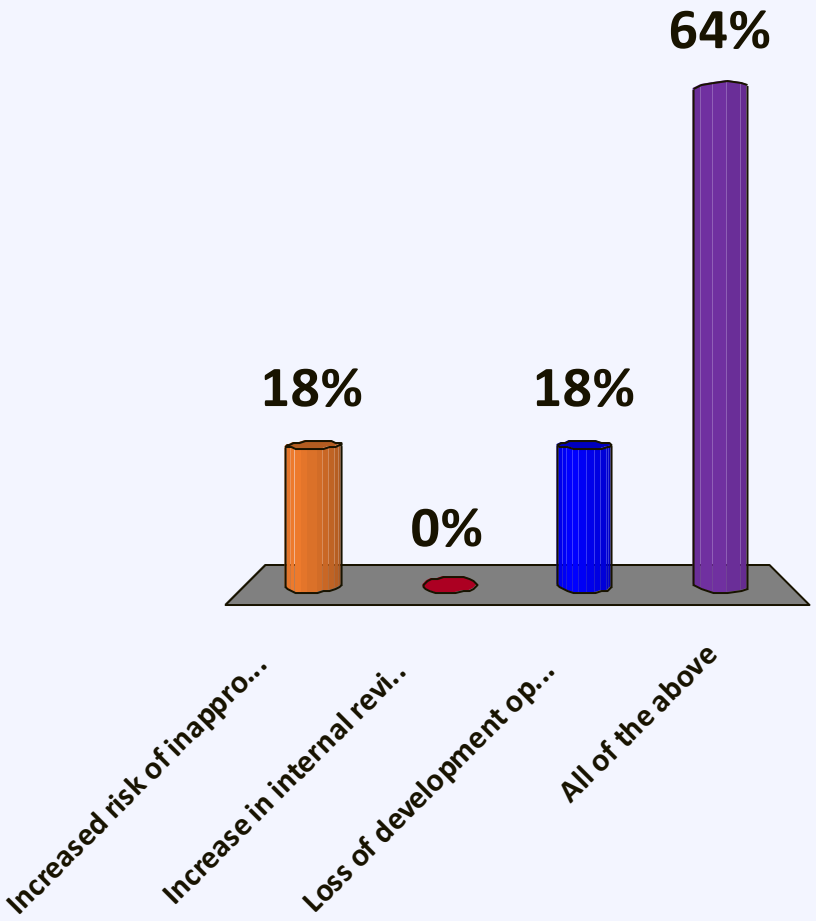
Solar in Development Regulation

Effective Solar Permitting Process

Solar Market Development Tools

What is the cost of convoluted regulations or "regulatory silence"?

A. Increased risk of inappropriate development
B. Increase in internal review costs
C. Loss of development opportunities
D. All of the above



Zoning Standards

Section	Topics to Address
Definitions	Define technologies & terms
Applicability	Primary vs. accessory use
Dimensional Standards	• Height • Size • Setbacks • Lot coverage
Design Standards	• Signage • Disconnect • Screening • Fencing

Source: American Planning Association

Zoning Standards: Small Solar

Typical Requirements:

- Permitted as accessory use
- Minimize visibility if feasible
- Requirements:
  - District height
  - Lot coverage
  - Setback

Zoning Standards: Large Solar

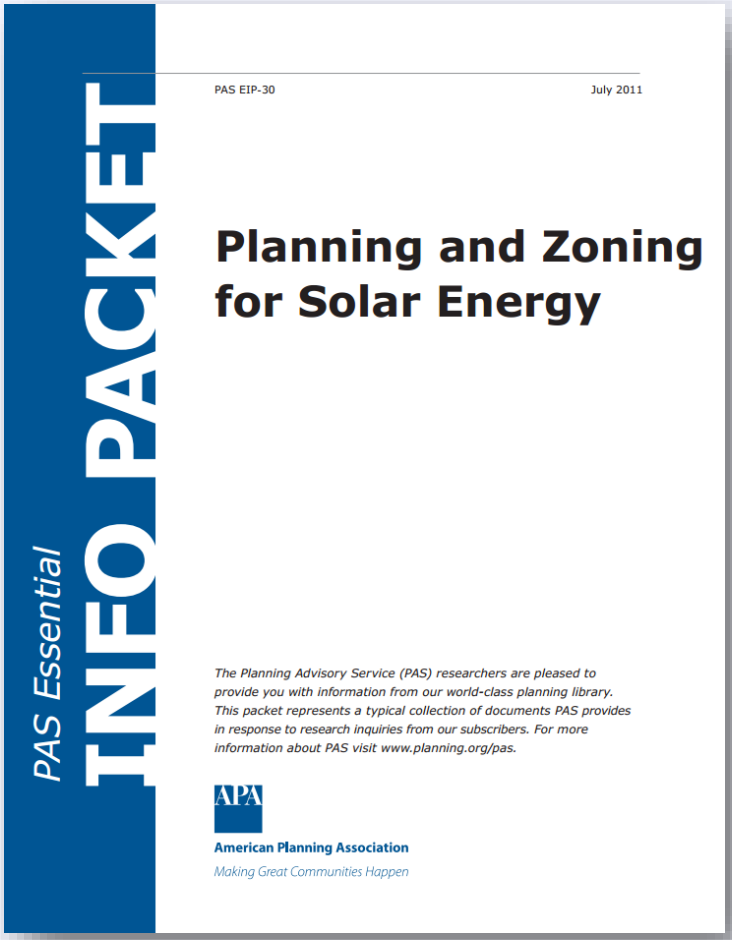
Typical Requirements:

- Allowed for primary use in limited locations
- Requirements:
  - Height limits
  - Lot coverage
  - Setback
  - Fencing and Enclosure

Zoning Standards: Model Ordinances

Resource **American Planning Association**

This Essential Info Packet provides example development regulations for solar.



https://www.planning.org/pas/infopackets/open/pdf/30intro.pdf

Zoning Standards: Historic

Typical Requirements:

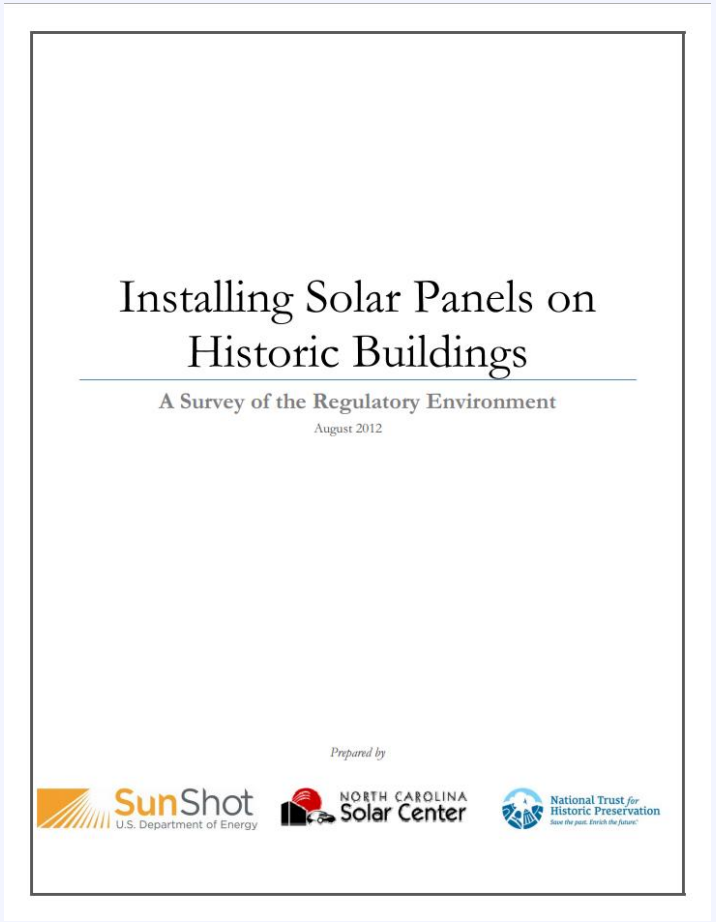
- Prevent permanent loss of "character defining" features
- Possible design requirements
  - Ground mounted
  - Flat roof with setback
  - Panels flush with roof
  - Blend color

Source: SolarCentury

Zoning Standards: Historic

Resource **North Carolina Clean Energy Technology Center**

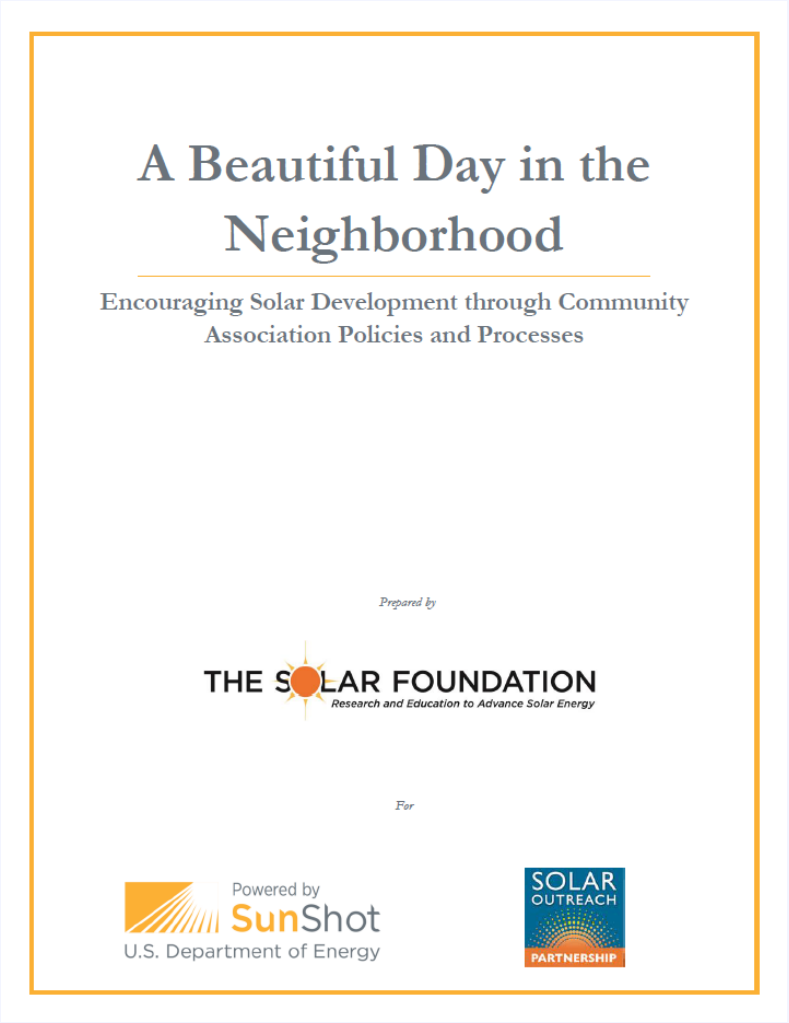
Provides sample design principles and example regulations incorporating historic preservation into sustainability and energy projects.



Private Rules on Residential Solar

Resource **The Solar Foundation**

Guide for HOAs on solar access law and simple recommendations for reducing barriers to solar in association-governed communities.



Powered by SunShot U.S. Department of Energy

www.solaroutreach.org

Solar in HOAs: Best Practices

- ✓ Provide clear, unambiguous design guidelines
- ✓ Post rules and requirements online
- ✓ Provide a list of all required documents
- ✓ Waive design rules that significantly increase cost or decrease performance
- ✓ Allow exceptions from tree removal rules for solar

Update Building Code

Solar Ready Construction:

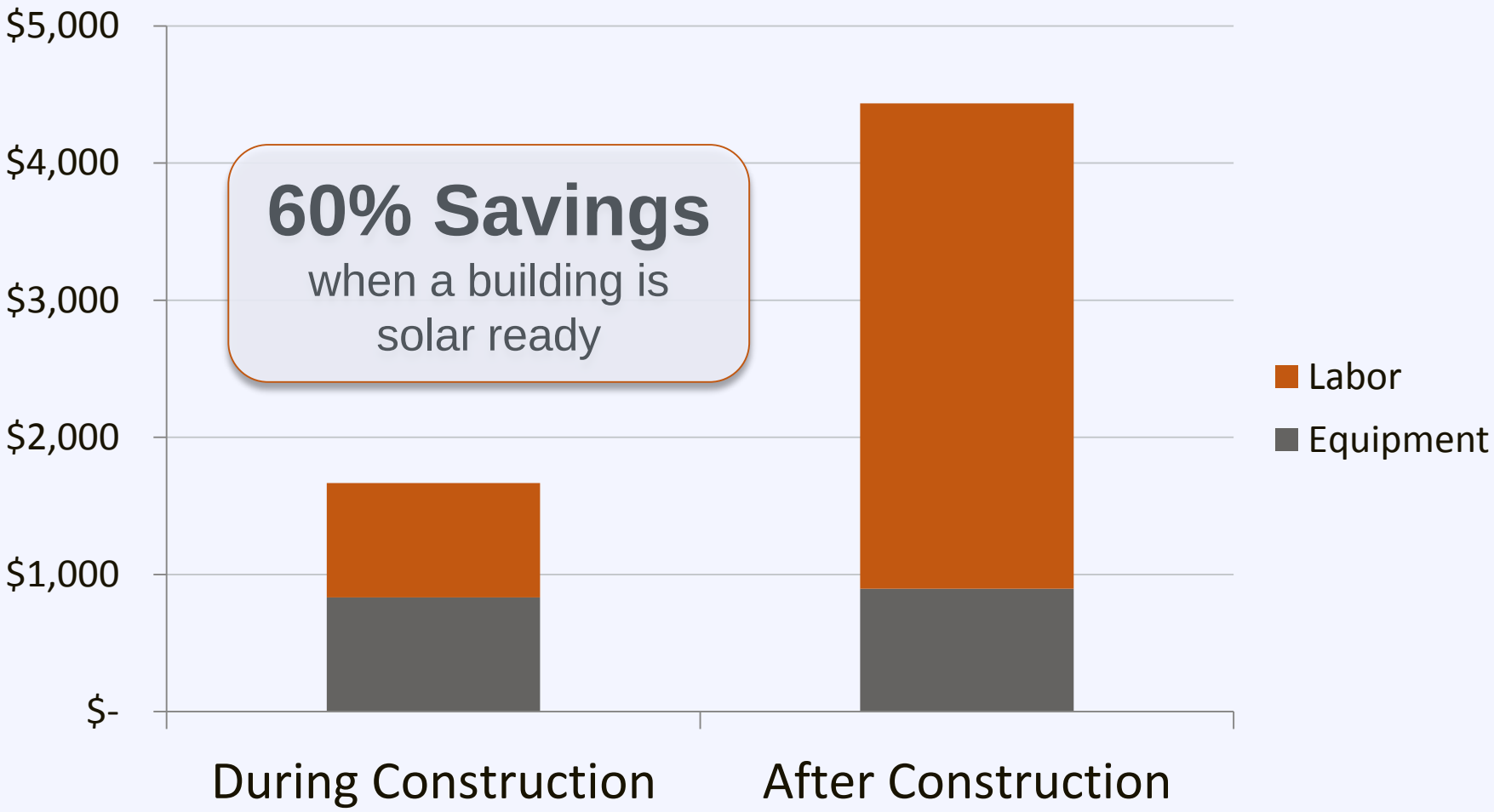
Preparing a building for solar at the outset can help make future solar installations easier and more cost effective.

Update Building Code

Require builders to:

- ✓ Minimize rooftop equipment
- ✓ Plan for structure orientation to avoid shading
- ✓ Install a roof that will support the load of a solar array
- ✓ Record roof specifications on drawings
- ✓ Plan for wiring and inverter placement

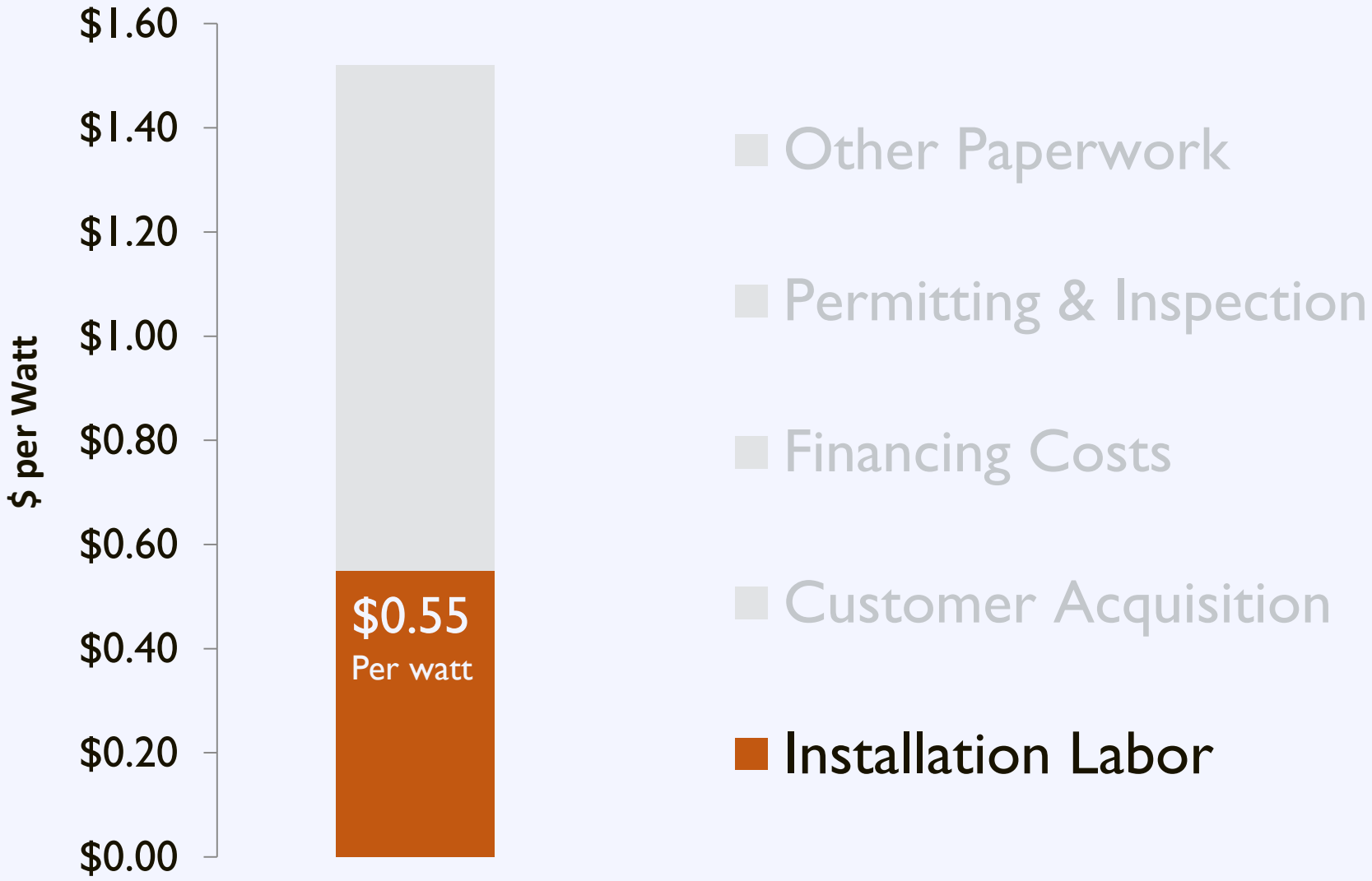
Update Building Code



Powered by SunShot U.S. Department of Energy

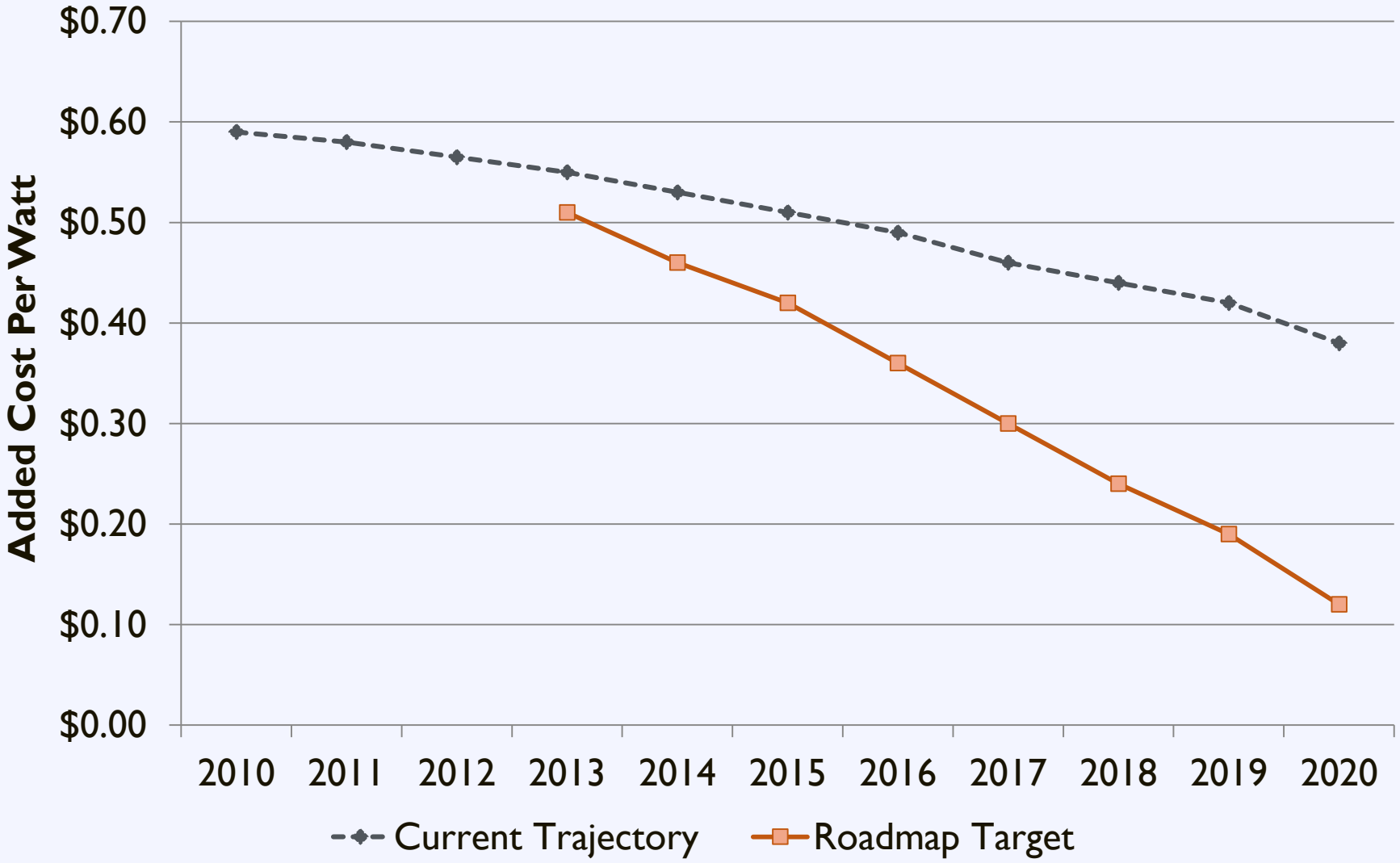
Source: Solar Ready: An Overview of Implementation Practices [Draft]. NREL, Feb. 18, 2011.

Installation Soft Costs



Powered by SunShot
U.S. Department of Energy

Installation Labor Roadmap

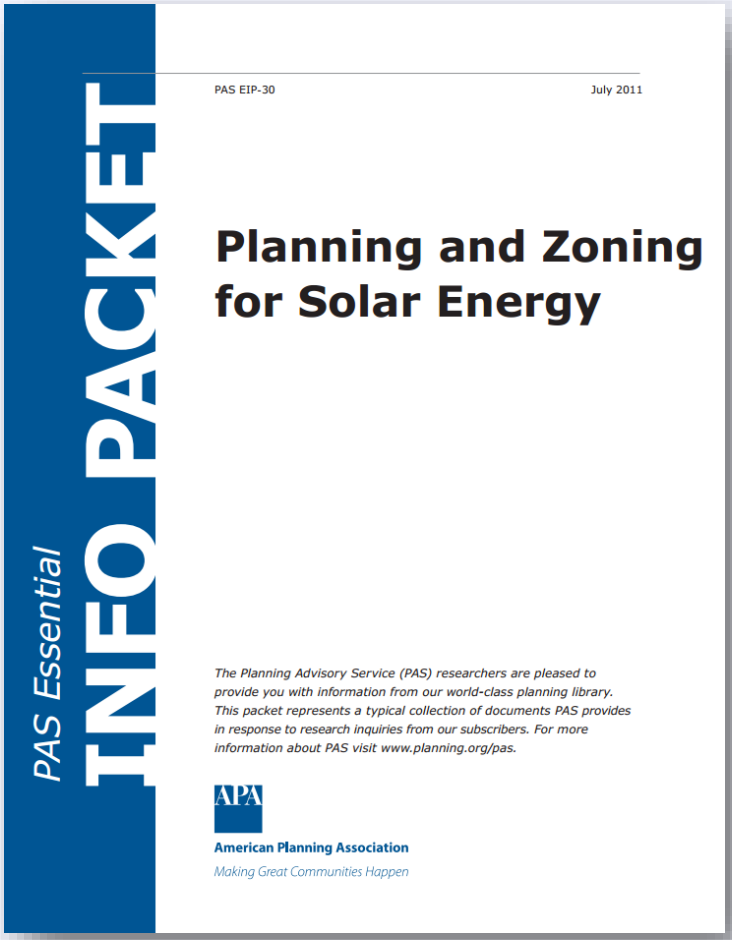


Source: NREL (http://www.nrel.gov/docs/fy13osti/59155.pdf)

Zoning Standards: Model Ordinances

Resource **American Planning Association**

This Essential Info Packet provides example development regulations for solar.



Powered by SunShot U.S. Department of Energy

https://www.planning.org/pas/infopackets/open/pdf/30intro.pdf

Effective Local Solar Policy

Local Solar Policy

Planning for Solar

Solar in Development Regulation

Effective Solar Permitting Process

Solar Market Development Tools

Challenge: Inconsistency

18,000+ local jurisdictions

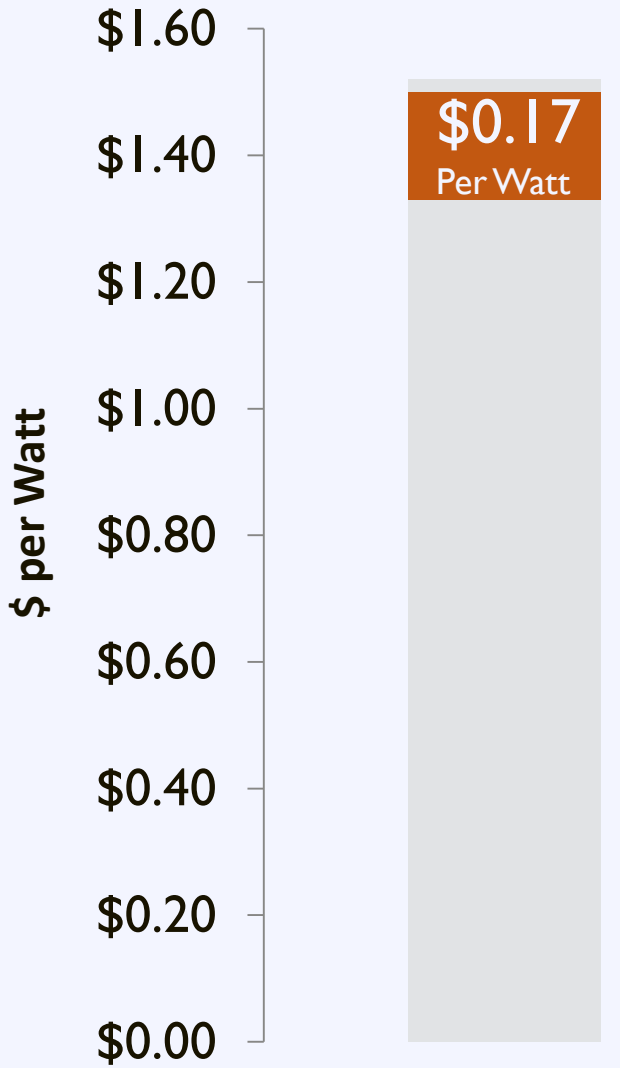
with unique zoning and permitting requirements

Source: http://www.nrel.gov/docs/fy12osti/54689.pdf

Consumer Challenges

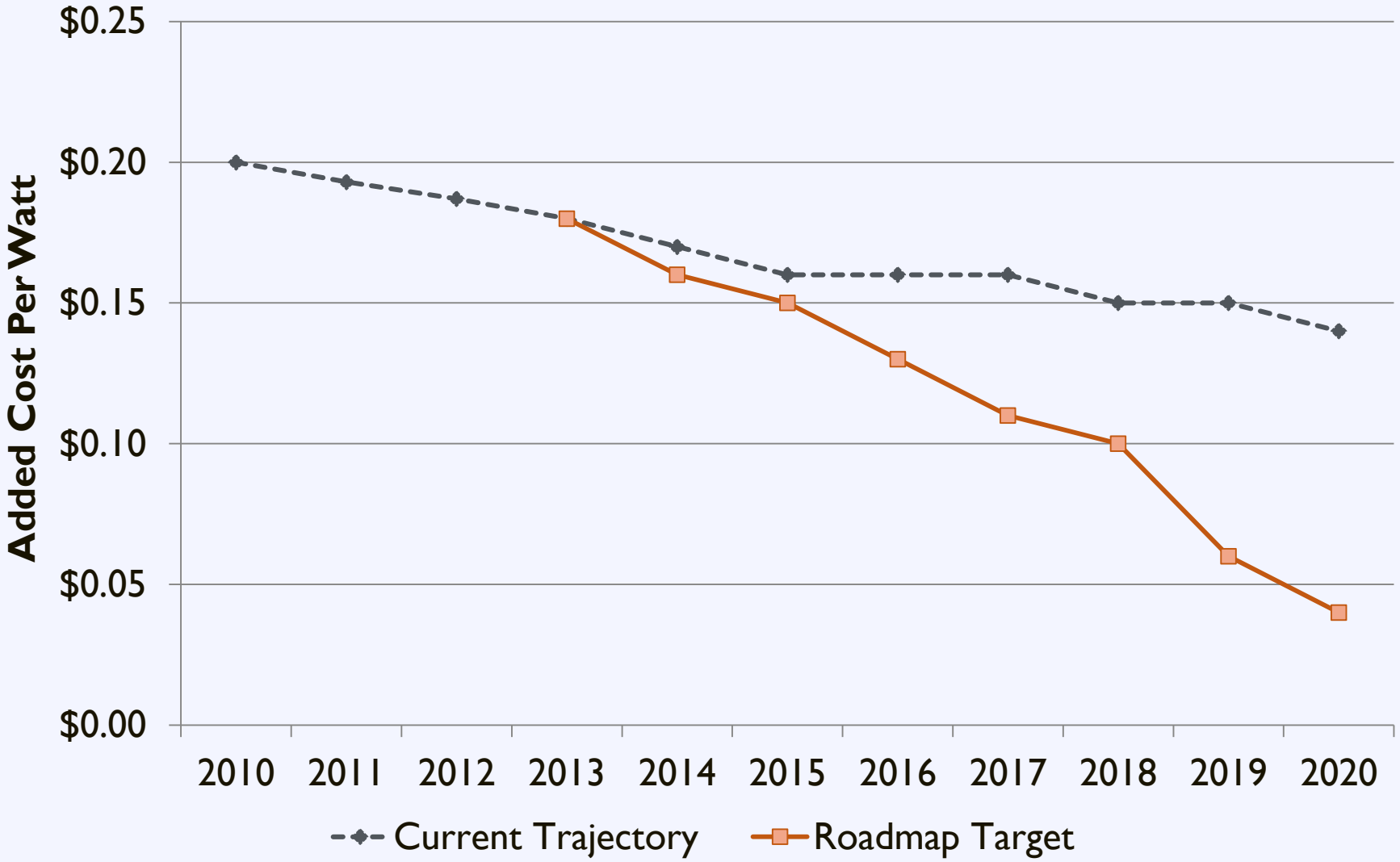
Source: Forbes

Regulatory Barriers



Powered by SunShot
U.S. Department of Energy

Planning & Permitting Roadmap



Powered by SunShot
U.S. Department of Energy

Expedited Permitting

Solar Permitting Best Practices:

- ✓ Post Requirements Online
- ✓ Implement an Expedited Permit Process
- ✓ Enable Online Permit Processing
- ✓ Ensure a Fast Turn Around Time

Powered by SunShot
U.S. Department of Energy

Source: IREC/ Vote Solar

Expedited Permitting

Solar Permitting Best Practices:

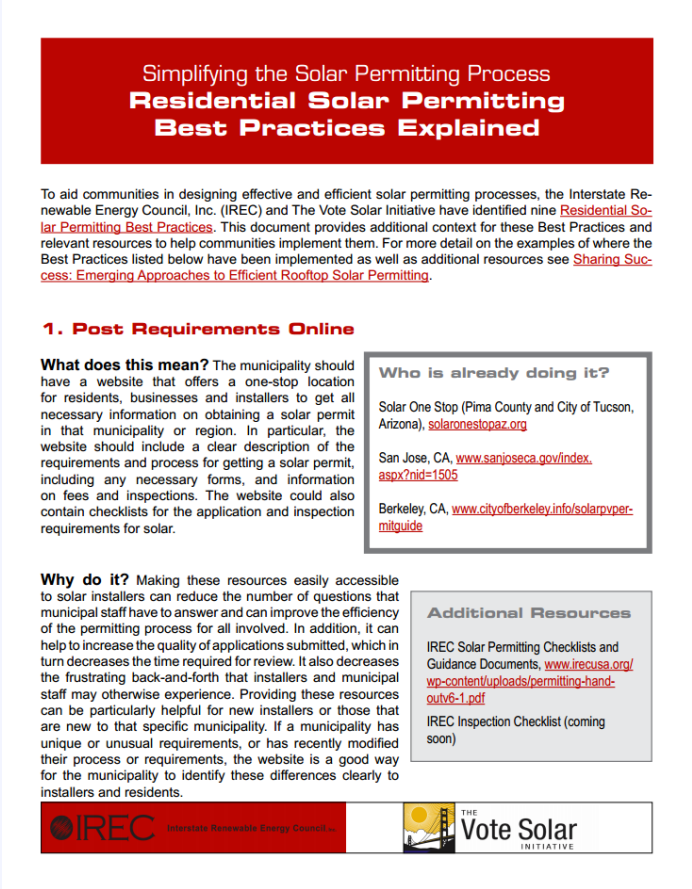
- ✓ Collect Reasonable Permitting Fees
- ✓ No Community-Specific Licenses
- ✓ Narrow Inspection Appointment Windows
- ✓ Eliminate Excessive Inspections
- ✓ Train Permitting Staff in Solar

Source: IREC/Vote Solar

Permitting: Best Practices

Resource **Interstate Renewable Energy Council**

Outlines leading best practices in residential solar permitting and provides examples of implementation.



Simplifying the Solar Permitting Process
Residential Solar Permitting Best Practices Explained

To aid communities in designing effective and efficient solar permitting processes, the Interstate Renewable Energy Council, Inc. (IREC) and The Vote Solar Initiative have identified nine Residential Solar Permitting Best Practices. This document provides additional context for these Best Practices and relevant resources to help communities implement them. For more detail on the examples of where the Best Practices listed below have been implemented as well as additional resources see Sharing Success: Emerging Approaches to Efficient Rooftop Solar Permitting.

1. Post Requirements Online

What does this mean? The municipality should have a website that offers a one-stop location for residents, businesses and installers to get all necessary information on obtaining a solar permit in that municipality or region. In particular, the website should include a clear description of the requirements and process for getting a solar permit, including any necessary forms, and information on fees and inspections. The website could also contain checklists for the application and inspection requirements for solar.

Who is already doing it?

Solar One Stop (Pima County and City of Tucson, Arizona), solaronestopaz.org

San Jose, CA, www.sanjoseca.gov/index.aspx?nid=1505

Berkeley, CA, www.cityofberkeley.info/solarpvpermitguide

Why do it? Making these resources easily accessible to solar installers can reduce the number of questions that municipal staff have to answer and can improve the efficiency of the permitting process for all involved. In addition, it can help to increase the quality of applications submitted, which in turn decreases the time required for review. It also decreases the frustrating back-and-forth that installers and municipal staff may otherwise experience. Providing these resources can be particularly helpful for new installers or those that are new to that specific municipality. If a municipality has unique or unusual requirements, or has recently modified their process or requirements, the website is a good way for the municipality to identify these differences clearly to installers and residents.

Additional Resources

IREC Solar Permitting Checklists and Guidance Documents, www.irecusa.org/wp-content/uploads/permitting-hand-outv6-1.pdf

IREC Inspection Checklist (coming soon)

IREC Interstate Renewable Energy Council

THE Vote Solar INITIATIVE

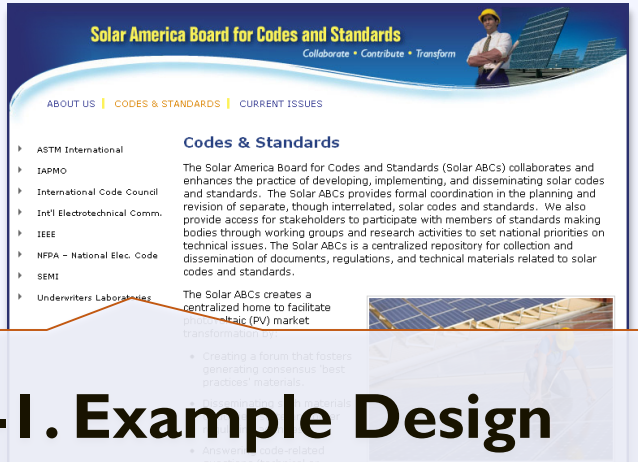
http://projectpermit.org/wp-content/uploads/2013/04/Expanded-Best-Practices-7.23.13_VSI.pdf

Model Permitting Process

Resource **Solar America Board for Codes & Standards**

Expedited Permitting:

- Simplifies requirements for PV applications
- Facilitates efficient review of content
- Minimize need for detailed studies and unnecessary delays



1-1. Example Design Criteria:

- Size < 10-15 kW
- Code compliant
- Weight < 5 lb / sqft
- 4 strings or less

Powered by SunShot
U.S. Department of Energy

Agenda

10:20 – 10:50	Putting Solar Energy on the Local Policy Agenda
10:50 – 11:20	State of the Local Solar Market
11:20 – 11:50	Federal, State, and Utility Policy Drivers
11:50 – 12:15	*Break and Grab Lunch*
12:15 – 12:45	Planning for Solar: Getting Solar Ready
12:45 – 1:20	Solar Market Development Tools
1:20 – 1:30	*Break*
1:30 – 2:15	Local Speakers
2:15– 3:00	Developing and Solar Policy Implementation Plan for Your Community and Next Steps

Powered by SunShot
U.S. Department of Energy

Effective Local Solar Policy

Local Solar Policy

Understanding solar financing

Expanding financing options

Addressing customer acquisition

Effective Solar Permitting Process

Solar Market Development Tools

Financing

- Other Paperwork
- Permitting & Inspection
- **Financing Costs**
- Customer Acquisition
- Installation Labor

The Solar Equation

Cost

+ Installed Cost

+ Maintenance

- Direct Incentive

Benefit

+ Avoided Energy Cost

+ Excess Generation

+ Performance Incentive

Ownership Options for Solar

Direct Ownership

Third-Party Ownership

Direct Ownership

Direct Ownership

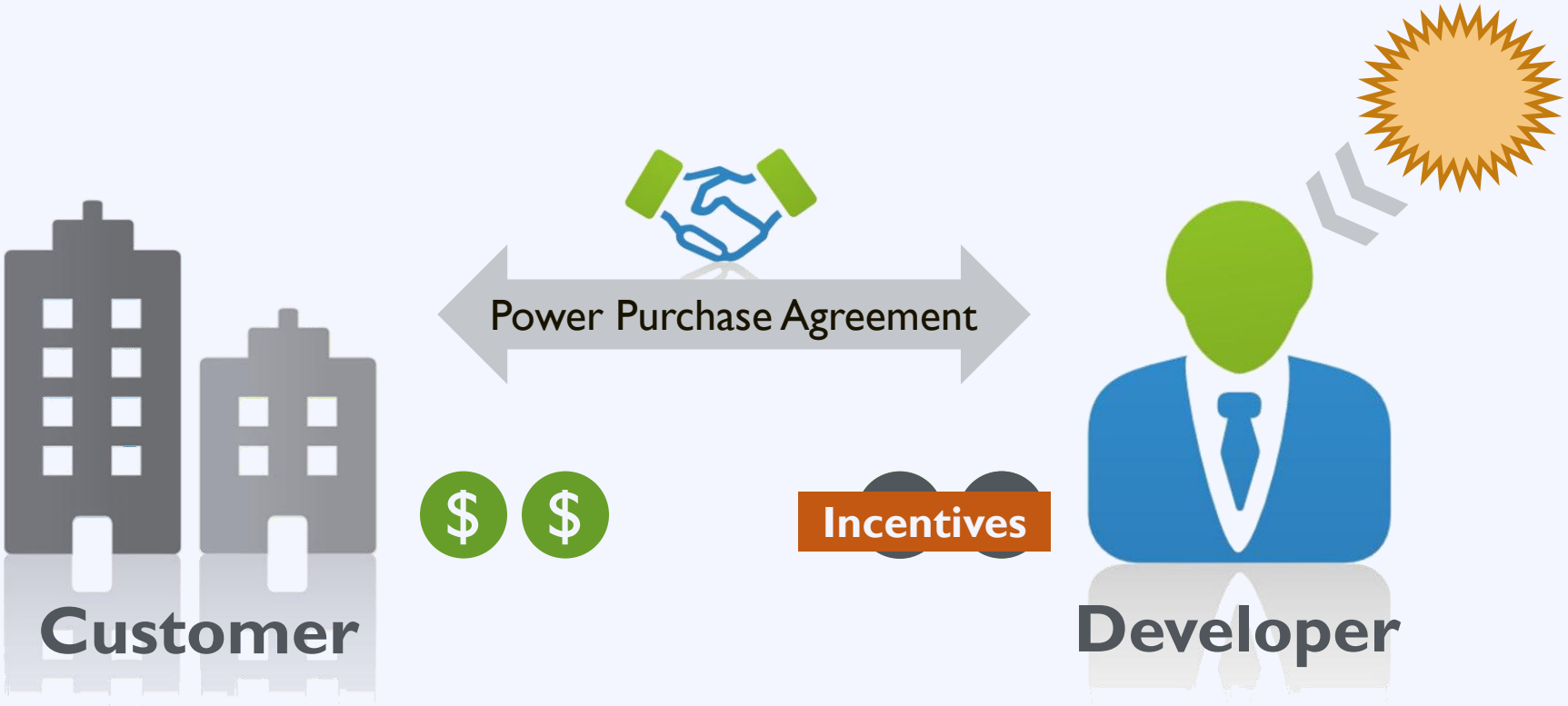
Pros

- Low-cost electricity
- REC revenue

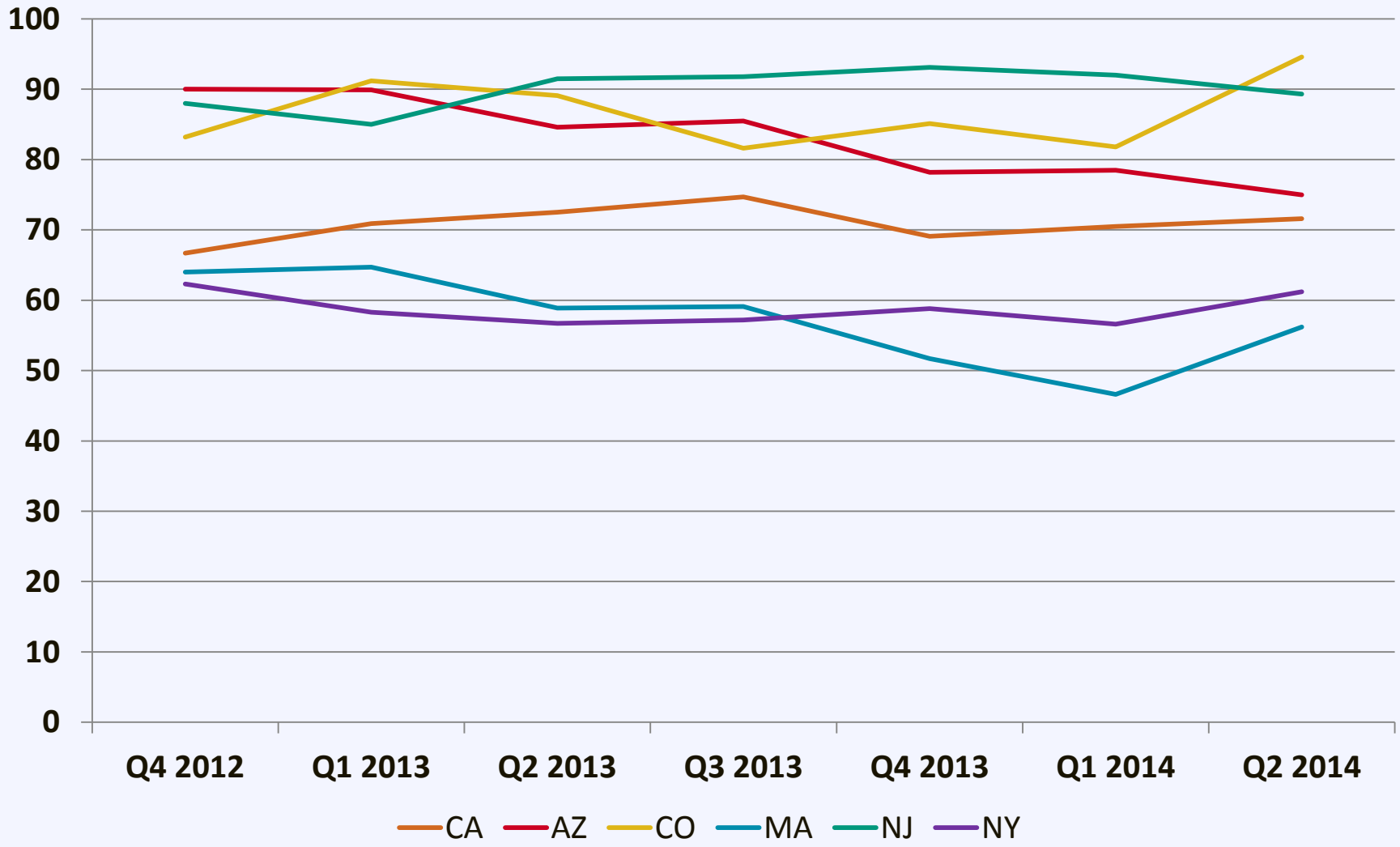
Cons

- Large upfront cost
- Long term management
- Development risk
- Performance risk

Third Party Ownership



Third Party Ownership



Powered by SunShot
U.S. Department of Energy

Source: GTM Research/ Solar Energy Industries Association, *U.S. Solar Market Insight Q2 2014*

Third Party Ownership

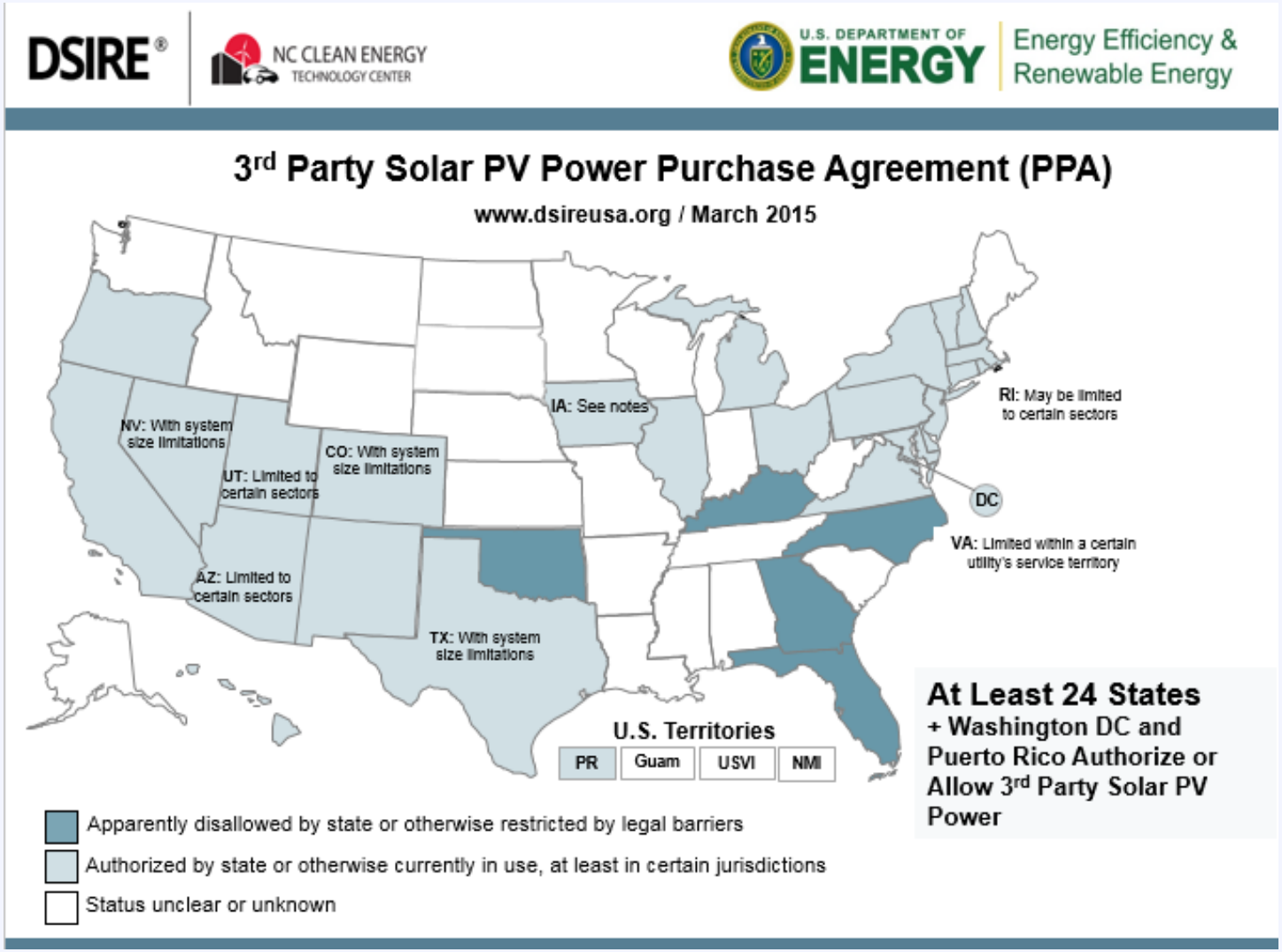
Benefits

- No upfront cost
- No O&M costs
- Low risk
- Predictable payments

Drawbacks

- Not available in all states
- Investor needs higher ROI

Financing: Third Party PPAs



Powered by SunShot U.S. Department of Energy

Source: Database of State Incentives for Renewables and Efficiency (DSIRE)

Ownership Options for Solar

Direct Ownership

Third-Party Ownership

Expand direct ownership options by engaging local lenders

Engage Local Lenders

Fewer than **5%**

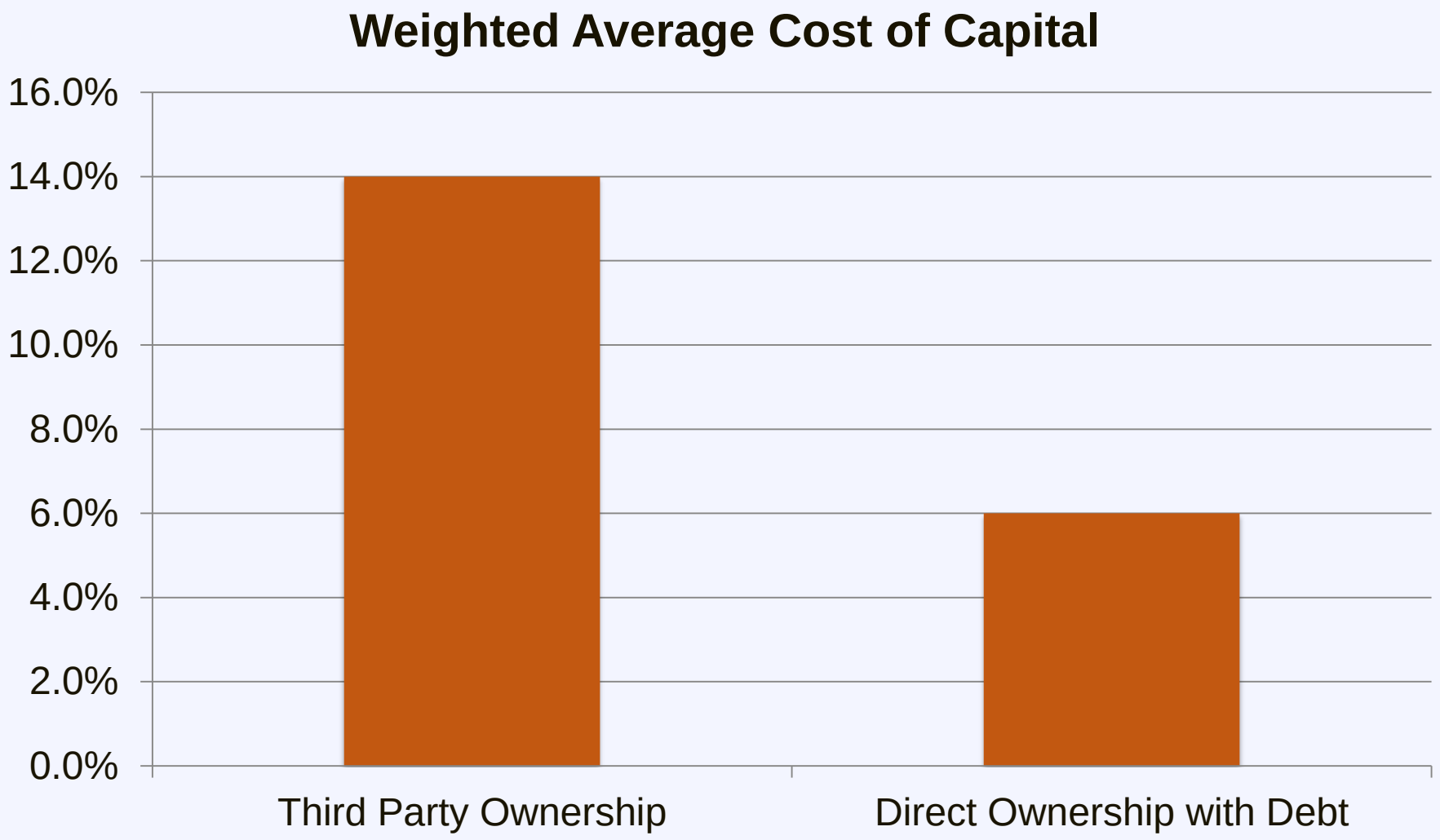
of the

6,500 banks in the US

are

actively financing solar PV projects

Third Party Ownership: Cost



Engage Local Lenders: Resources

Resource **Local Lending for Solar PV**

A guide for local governments seeking to engage financial institutions

www.solaroutreach.org

Powered by SunShot
U.S. Department of Energy

Customer Acquisition

Source: National Renewable Energy Laboratory

Customer Acquisition

5 % of homeowners that request a quote choose to install solar.

Customer Acquisition

Barriers

High upfront cost

Complexity

Customer inertia

The Solarize Program

Group purchasing for residential solar PV

SOLARIZE MASS

Solarize CONNECTICUT

solarize ASHEVILLE

solarize portland

Solarize Blacksburg

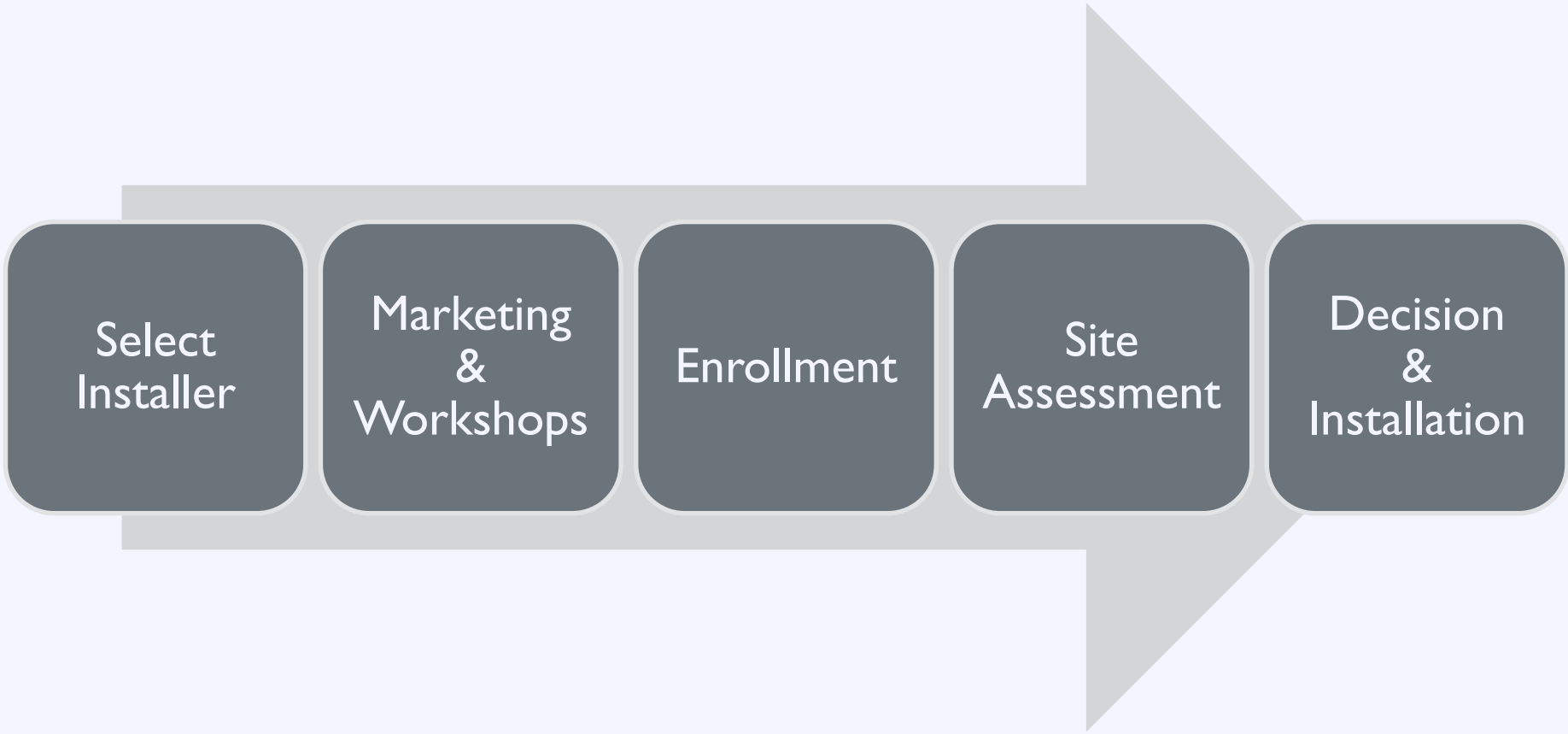
SOLARIZE ROANOKE

Powered by SunShot
U.S. Department of Energy

Solarize: Partnership

Program Sponsor	Community ties Technical knowledge
Solar Contractor	Solar installations Volume discounts
Citizen Volunteers	Campaign support Neighborhood outreach
Community Residents	Program participation Word of mouth

Solarize: Process



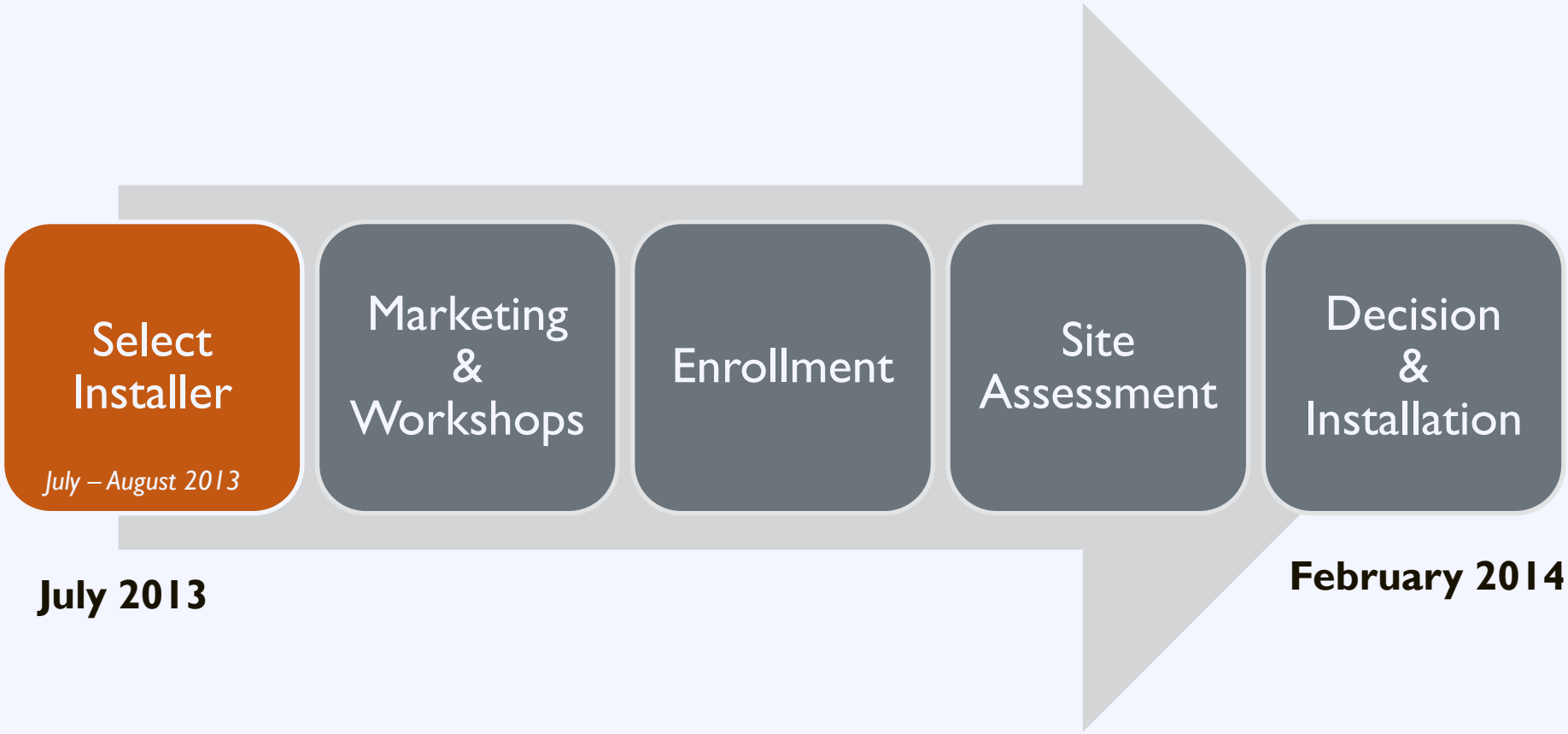
Solarize Plano: Case Study

Plano, Texas

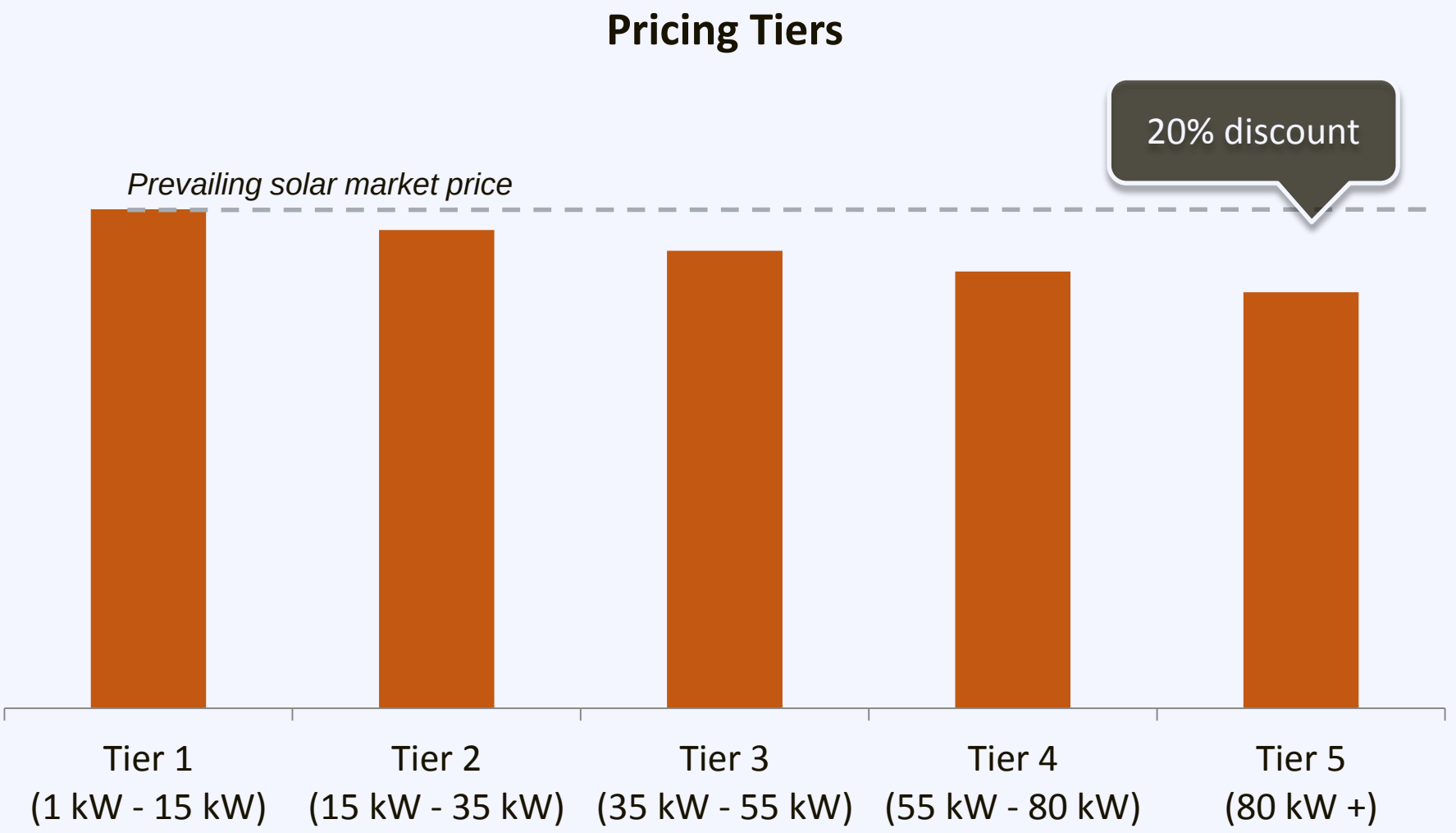
Population: 272,000

Powered by SunShot
U.S. Department of Energy

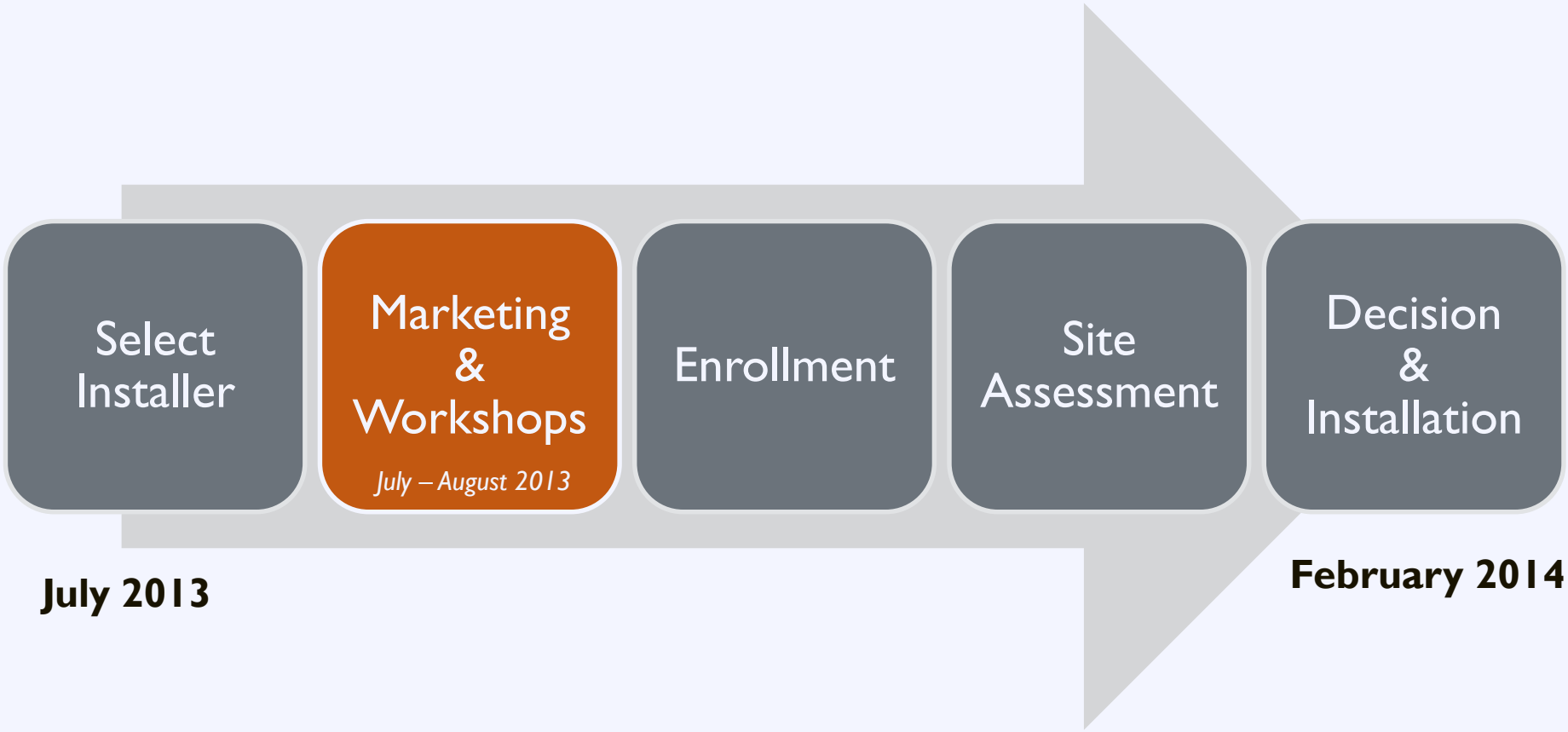
Solarize Plano: Case Study



Solarize Plano: Case Study



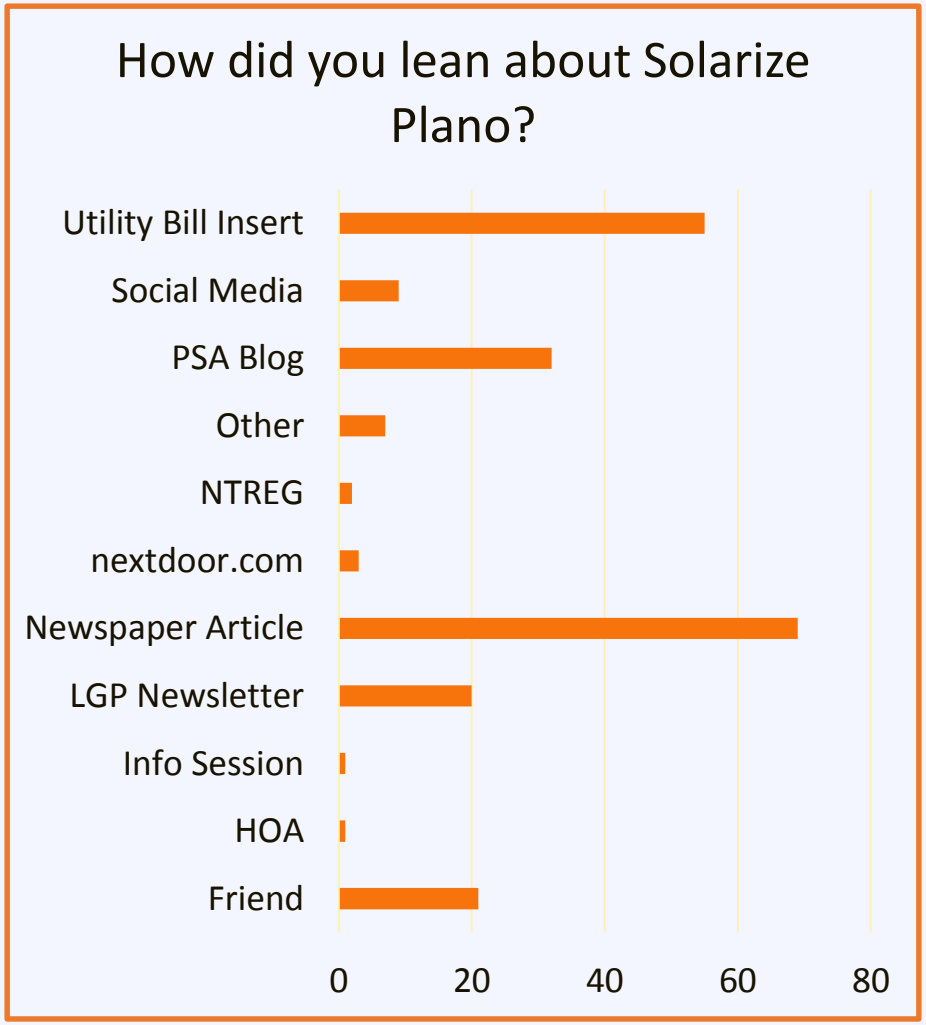
Solarize Plano: Case Study



Solarize Plano: Case Study

Marketing Strategy:

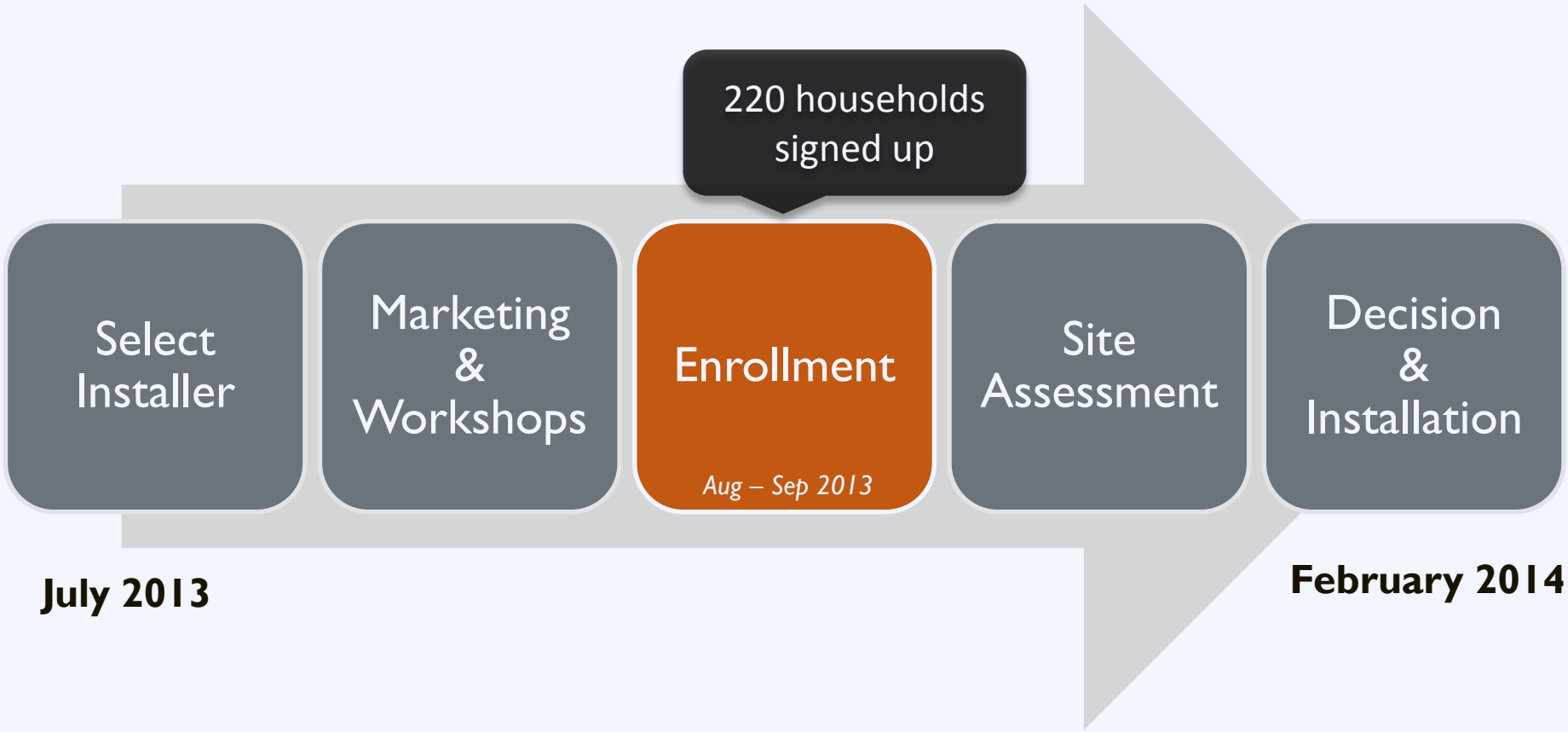
- Used Google for online communications
- Online Solar 101 presentations and videos
- Local newspaper and media
- Utility bill insert



Powered by SunShot U.S. Department of Energy

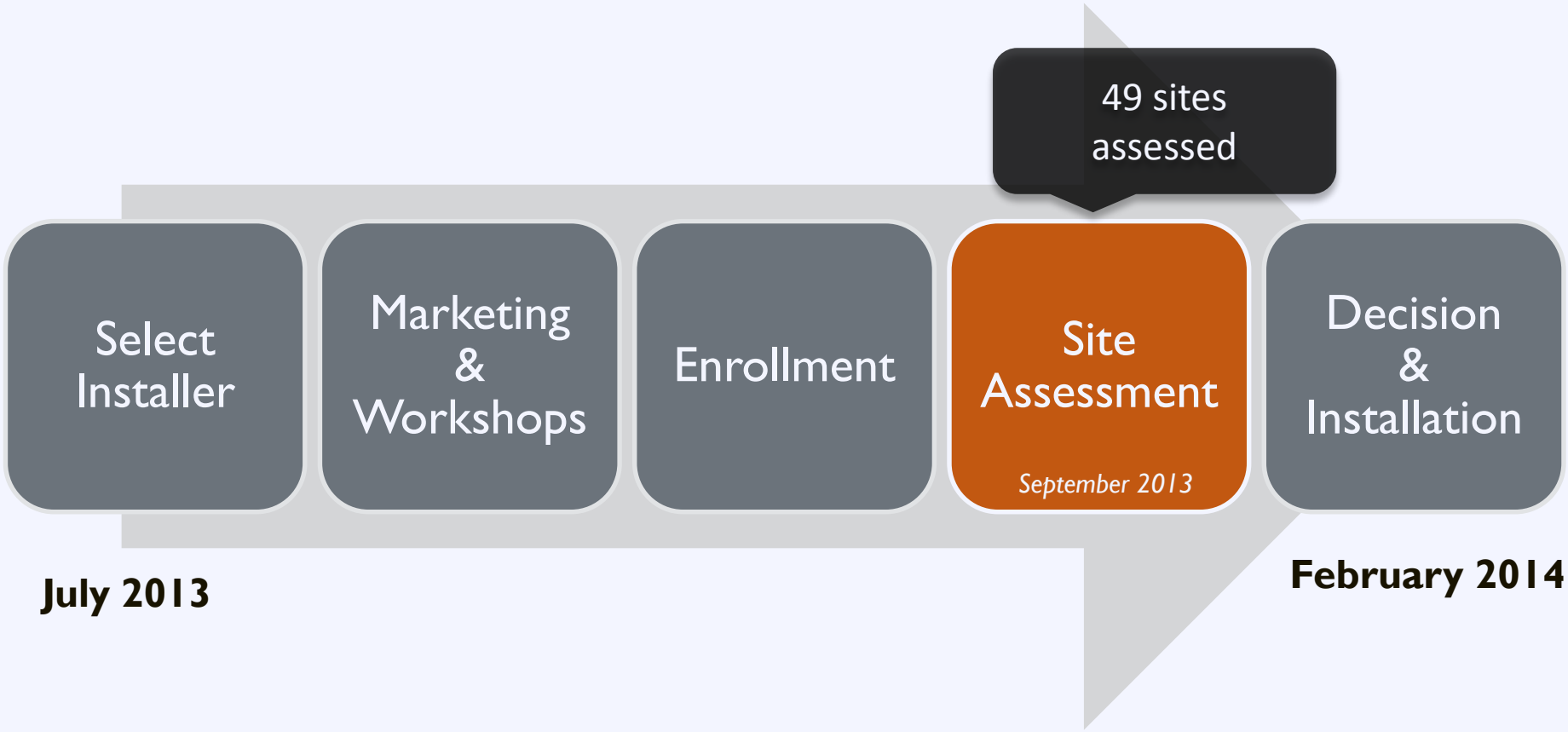
Source: Solarize Plano & NCTCOG

Solarize Plano: Case Study

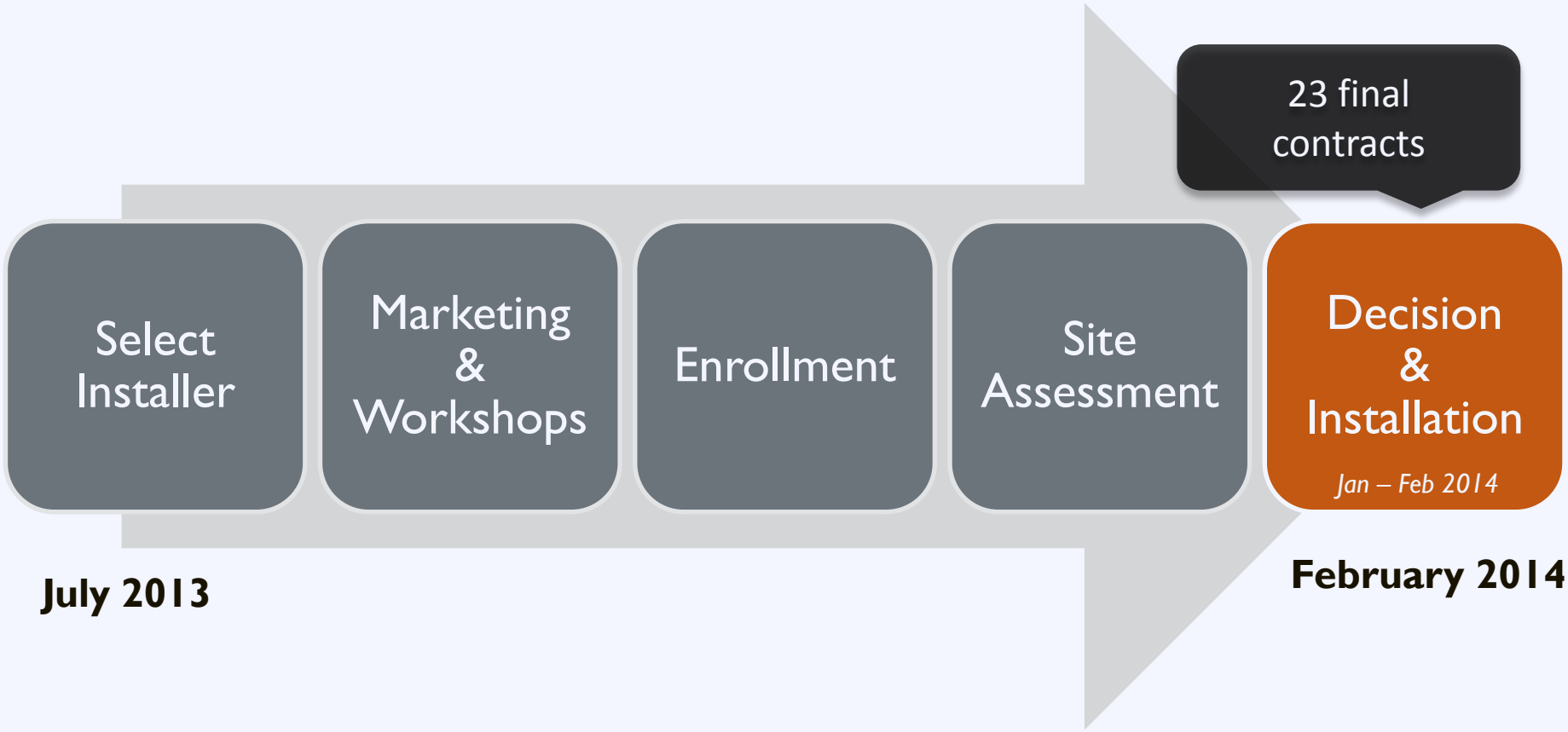


Powered by SunShot
U.S. Department of Energy

Solarize Plano: Case Study



Solarize Plano: Case Study



Solarize Plano: Case Study

Results:

23 new installations totaling 112 kW

45% of assessed sites signed contracts

20% reduction in solar price

Round 2 of Solarize Plano in 2014

5 new Solarize communities in Texas

The Solarize Program

Barriers		Solutions
High upfront cost	→	Group purchase
Complexity	→	Community outreach
Customer inertia	→	Limited-time offer

Solarize: Lasting Impact

A household is

0.78% more likely to adopt solar

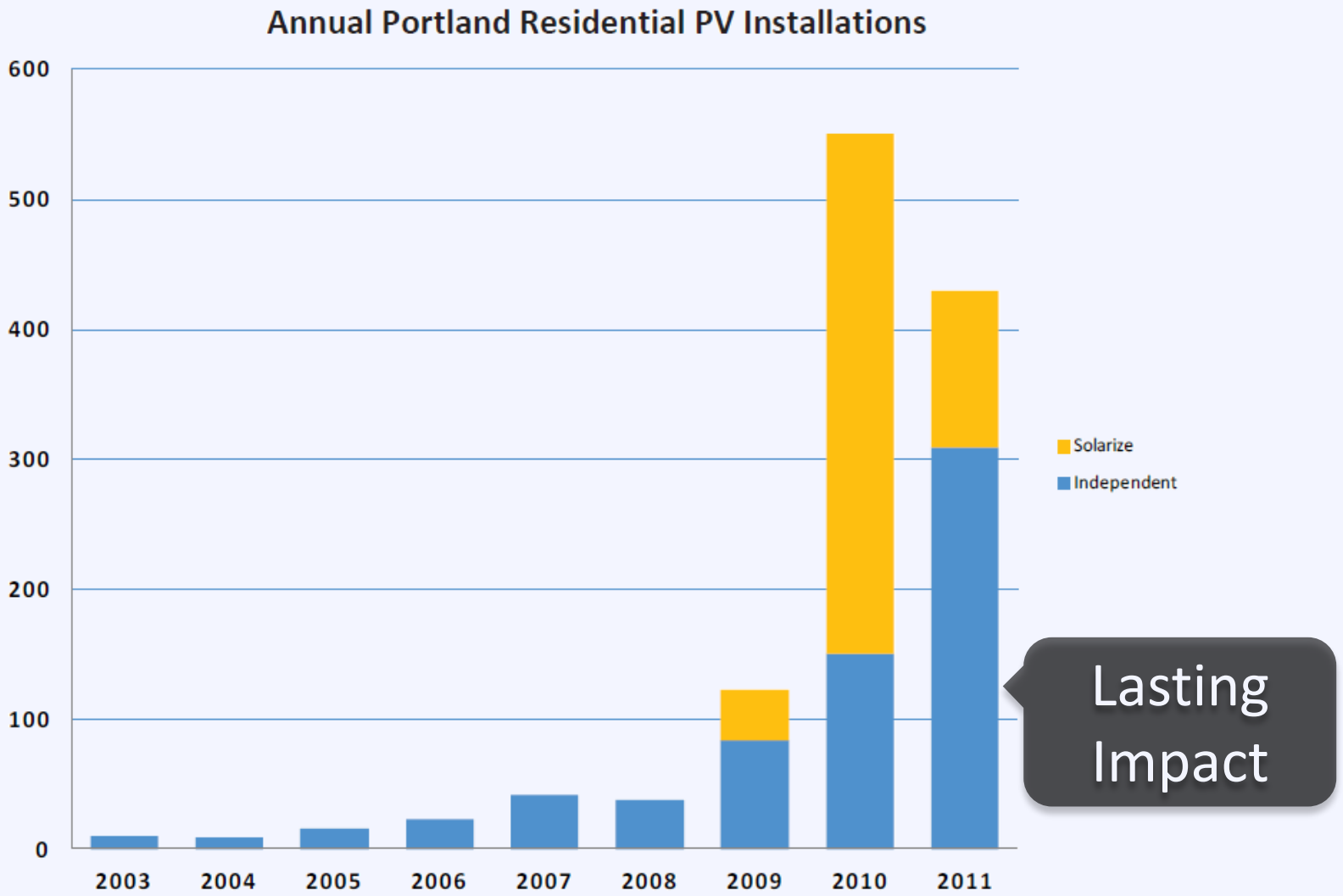
for

each additional installation in their zip code

Powered by SunShot
U.S. Department of Energy

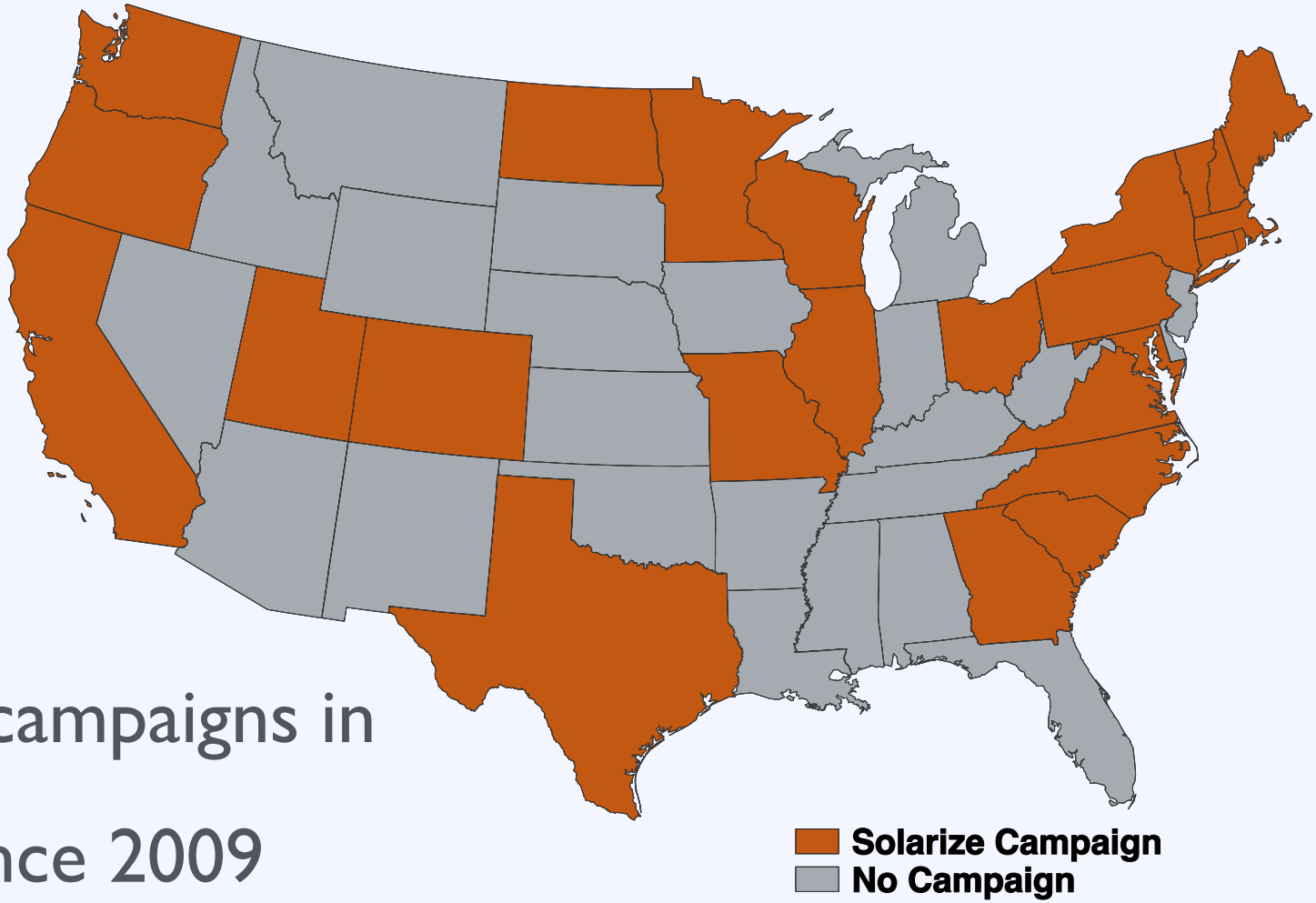
Source: NYU Stern and Yale School of Forestry – Peer Effects in the Diffusion of Solar Panels

Solarize: Lasting Impact



Source: NREL

Solarize: National Growth



Over 150 campaigns in

25 states since 2009

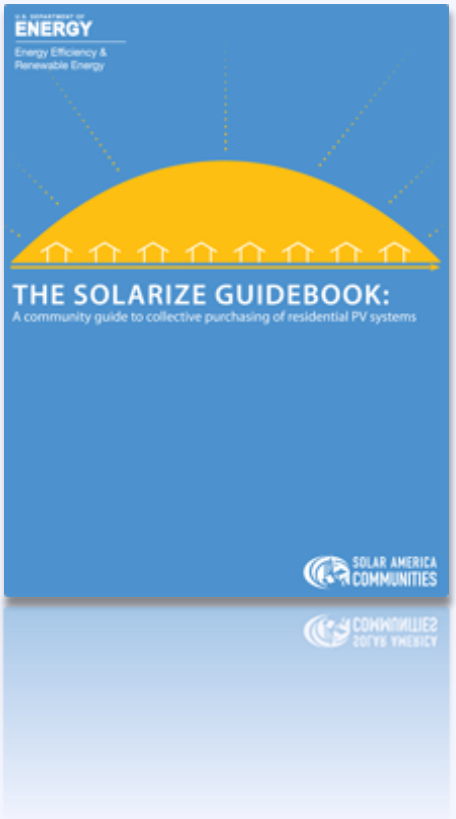
Powered by SunShot
U.S. Department of Energy

Solarize: Resources

Resource **The Solarize Guidebook**

A roadmap for project planners and solar advocates who want to create their own successful Solarize campaigns.

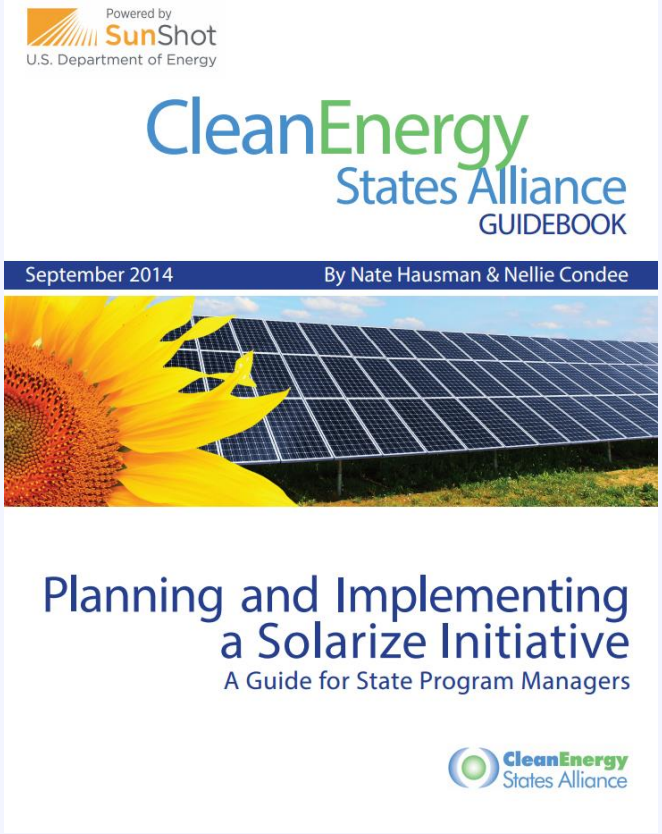
www.nrel.gov



Solarize: Resources

Resource **Planning and Implementing a Solarize Initiative**

Presents two successful state-driven Solarize programs (Solarize Mass and Solarize Connecticut) to provide best practices to stakeholders interested in replicating these successes.



Powered by SunShot U.S. Department of Energy

http://solaroutreach.org/wp-content/uploads/2014/04/CESA-Solarize-Guide-September-2014-Final.pdf

Agenda

10:20 – 10:50	Putting Solar Energy on the Local Policy Agenda
10:50 – 11:20	State of the Local Solar Market
11:20 – 11:50	Federal, State, and Utility Policy Drivers
11:50 – 12:15	*Break and Grab Lunch*
12:15 – 12:45	Planning for Solar: Getting Solar Ready
12:45 – 1:20	Solar Market Development Tools
1:20 – 1:30	*Break*
1:30 – 2:15	Local Speakers
2:15– 3:00	Developing and Solar Policy Implementation Plan for Your Community and Next Steps

Agenda

10:20 – 10:50	Putting Solar Energy on the Local Policy Agenda
10:50 – 11:20	State of the Local Solar Market
11:20 – 11:50	Federal, State, and Utility Policy Drivers
11:50 – 12:15	*Break and Grab Lunch*
12:15 – 12:45	Planning for Solar: Getting Solar Ready
12:45 – 1:20	Solar Market Development Tools
1:20 – 1:30	*Break*
1:30 – 2:15	Local Speakers
2:15– 3:00	Developing and Solar Policy Implementation Plan for Your Community and Next Steps

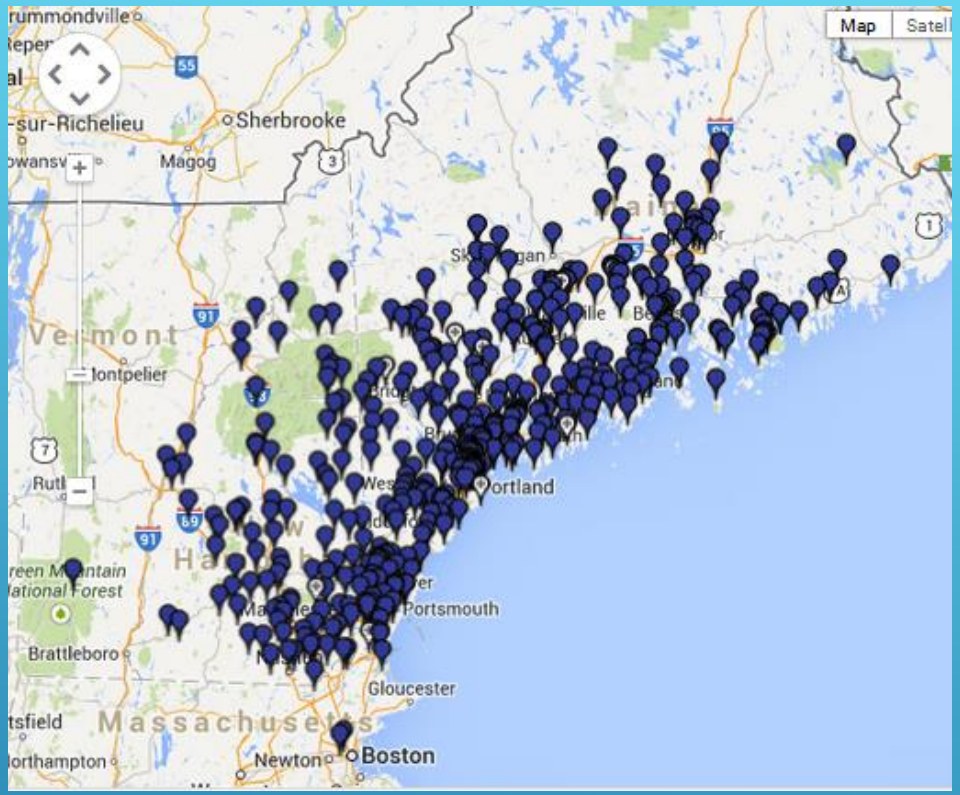
Solar Powering Your Community

Cost-effective clean energy for schools, non-profits, municipalities, and communities

Bill Behrens, ReVision Energy Managing Partner
Bangor, Maine
May 2, 2015

Who is ReVision Energy?

- **Northern New England's most experienced renewable energy installer—more than 2,500 solar hot water & solar electric systems in Maine & NH.**
- **Expertly designed systems installed by our certified professional solar team. Master trade licenses and NABCEP certification carried in-house, supporting our full service mechanical contractor approach.**



Locations :

- Liberty, ME, Portland, ME , Exeter, *NH*
- *Serving* all of Maine and New Hampshire and SEVT and Northern MA

ReVision Energy

Professional design, installation and service of renewable energy systems.

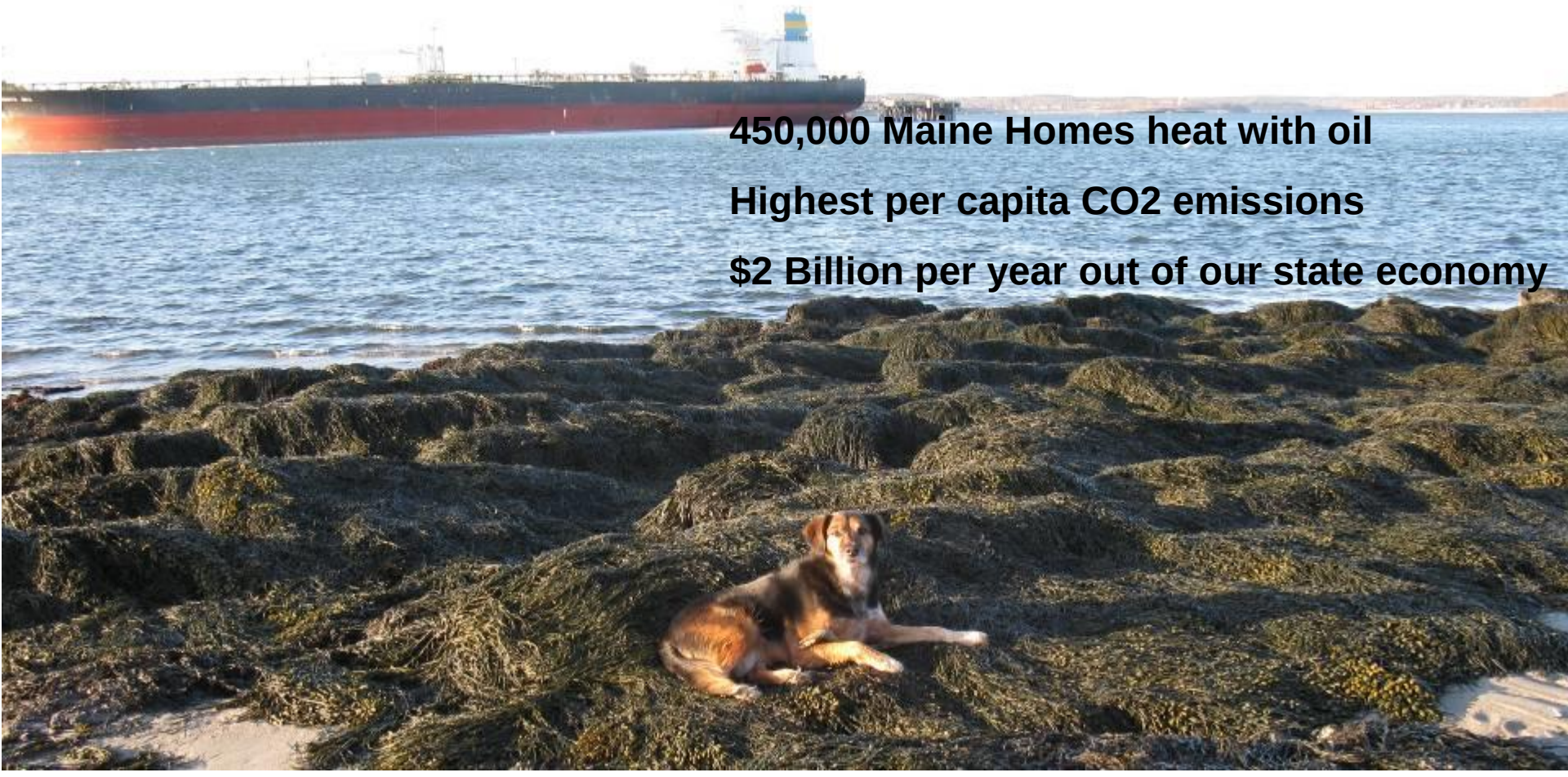
ReVision Energy's Mission…

To accelerate the transition to clean, renewable energy sources. To help local governments and non-profits access renewable energy through advantageous financing partnerships. To help communities access solar power through community solar farms.

74 kw array, Proctor Academy

Why do we need solar energy?

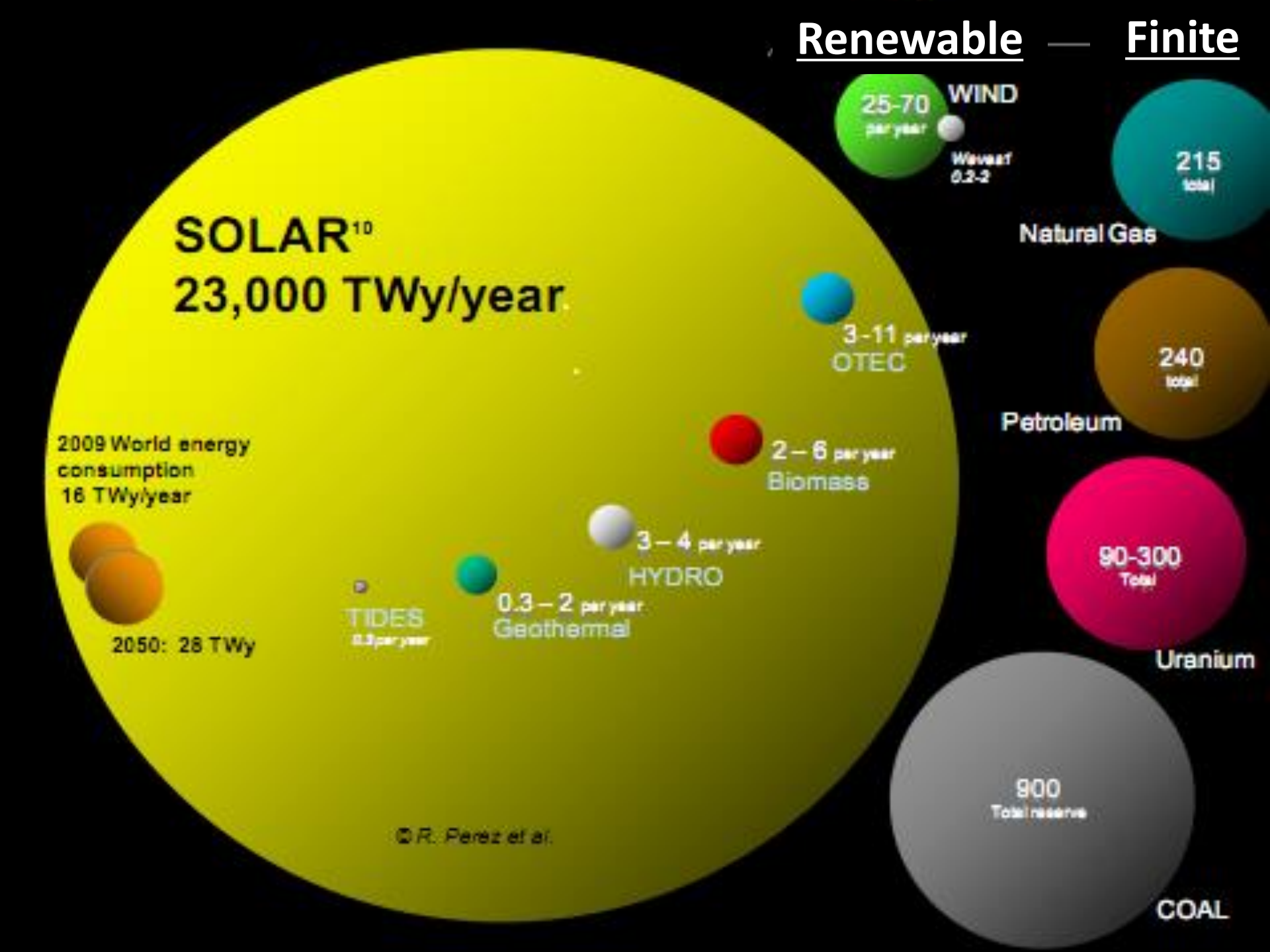
Northern New England's Carbon Situation



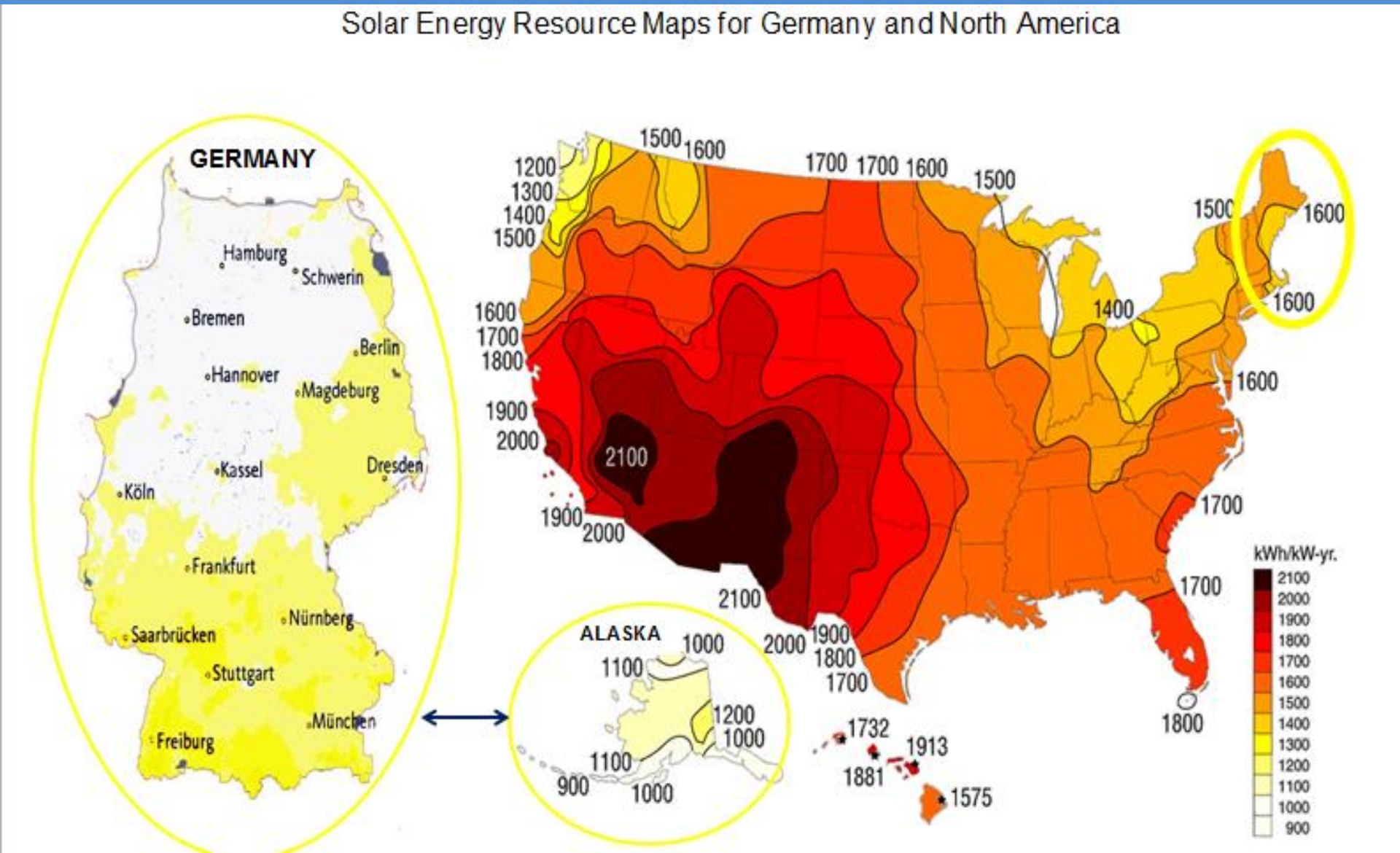
450,000 Maine Homes heat with oil

Highest per capita CO2 emissions

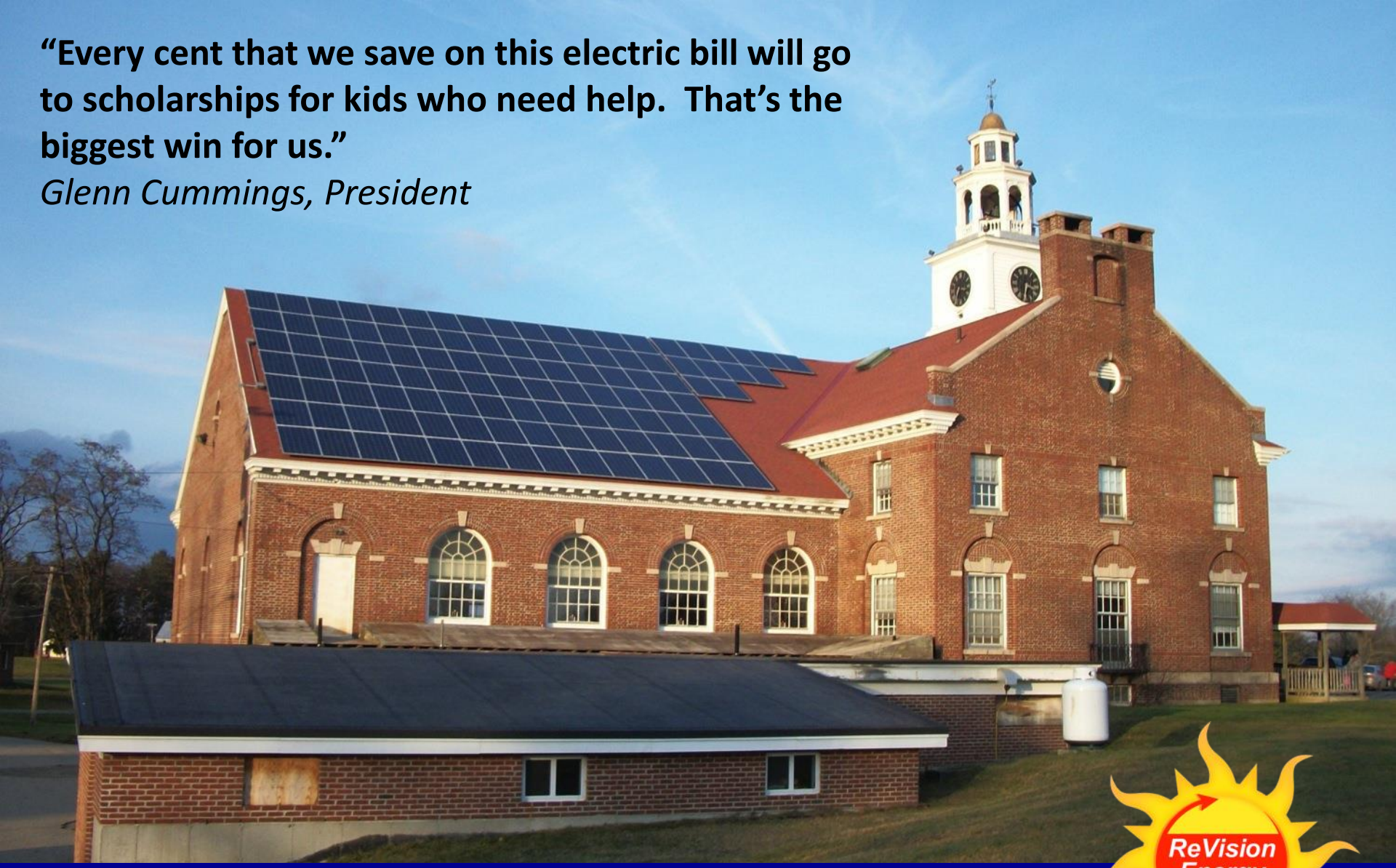
$2 Billion per year out of our state economy


Renewable — Finite
SOLAR[10]
23,000 TWy/year
2009 World energy consumption
16 TWy/year
2050: 26 TWy
25-70 per year
WIND
Wavesf 0.2-2
3-11 per year
OTEC
2 – 6 per year
Biomass
3 – 4 per year
HYDRO
0.3 – 2 per year
Geothermal
TIDES
0.3 per year
© R. Perez et al.
215
total
Natural Gas
240
total
Petroleum
90-300
Total
Uranium
900
Total reserve
COAL

ME & NH receive 33% more sunshine per year than Germany, the world leader in solar energy deployment



“Every cent that we save on this electric bill will go to scholarships for kids who need help. That’s the biggest win for us.”
Glenn Cummings, President



Good Will Hinckley School

25 kilowatt Grid-Tied Solar PPA

“That [energy] plan seeks to provide Thomas College with diverse renewable energy sources that will lower long-term energy expenses and keep tuition costs down. " *Laurie Lachance, President*

Thomas College – Waterville, ME

170 kilowatt Grid-Tied Solar PPA

Solar for Maine and New Hampshire Towns

110 kW – Boothbay, Maine

119 kW - Durham, NH

41 kW - Eliot, Maine

40 kW – Windham, Maine

28 kW - Yarmouth, Maine

21 kW - South Portland, Maine

Fire Station – Windham, ME

40 kilowatt Grid-Tied Solar PPA

Public Works– Eliot, ME

41 kilowatt Grid-Tied Solar PPA

A Cost Effective Path to Ownership

Capturing Tax Subsidies for Municipalities and Non-Profits Using *PPAs*

THE COMMUNITY SOLAR FARM: A BUYERS' CO-OPERATIVE APPROACH TO RENEWABLE ENERGY:

ReVision Energy

Professional design, installation and service of renewable energy systems.

The CSF project allows shared ownership of a single solar array using virtual net metering.

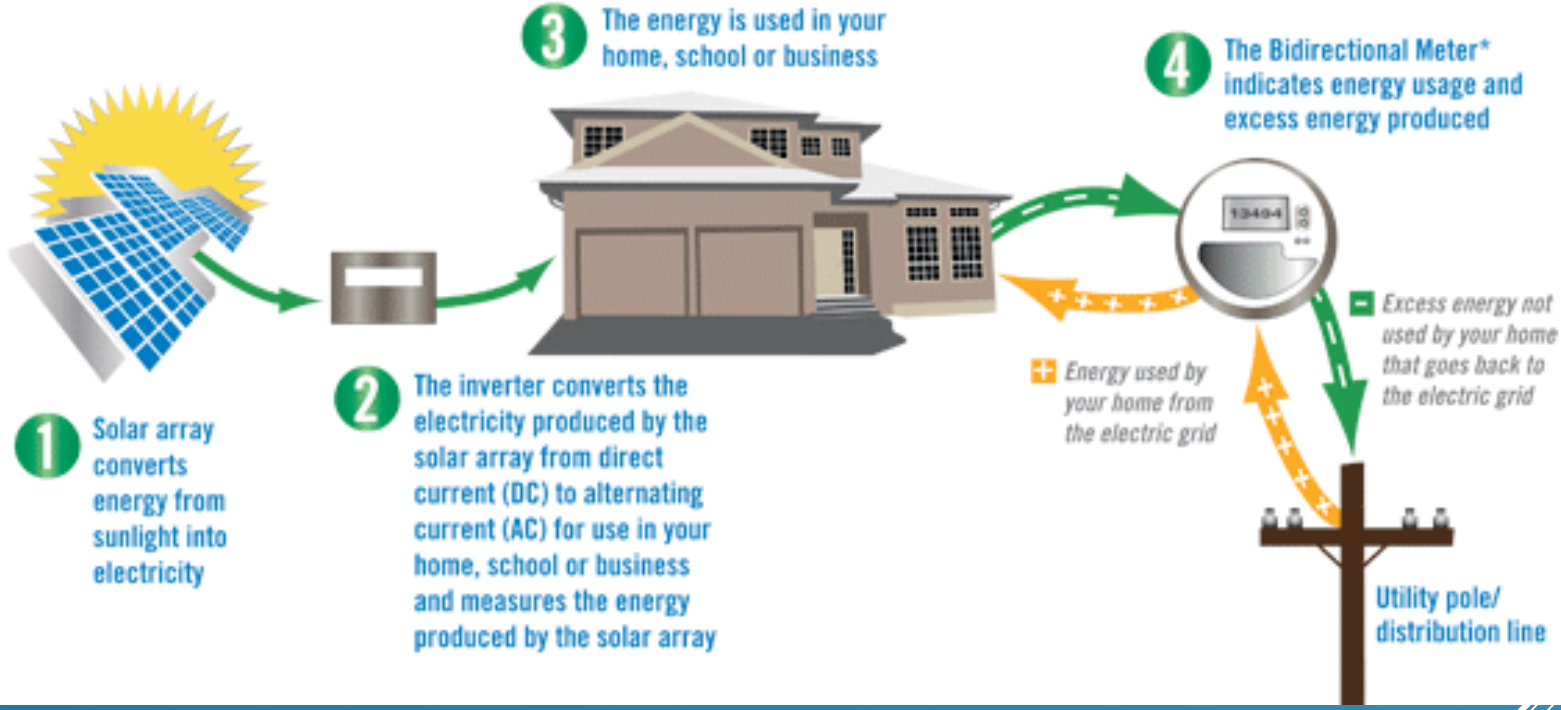
Estimated output of 63,800 kWh / year

ReVision Energy

Professional design, installation and service of renewable energy systems.

Understanding NET METERING

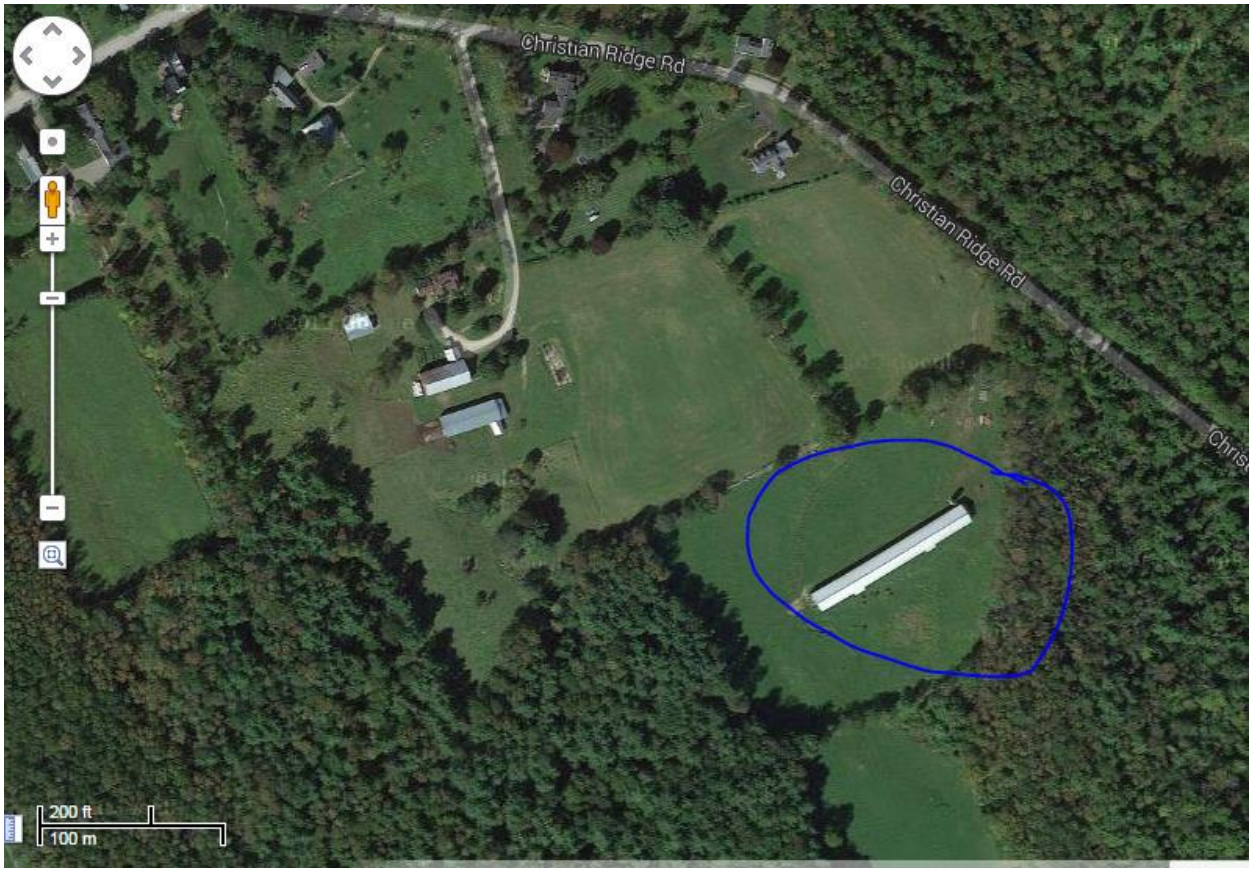
Solar Photovoltaic Array Example



ReVision Energy

Professional design, installation and service of renewable energy systems.

Site:



- Roughly 6,000 ft2 of south facing barn roofs, on Christian Ridge Road, Paris Maine.
- Site efficiency is about 90.3% compared to a perfect south-facing roof.

ReVision Energy

Professional design, installation and service of renewable energy systems.

ReVision Energy

Professional design, installation and service of renewable energy systems.

200 modules, 5 inverters, 52 kW

ReVision Energy

Professional design, installation and service of renewable energy systems.

ReVision Energy

Professional design, installation and service of renewable energy systems.

Community Solar Trends and Opportunities

Sharon Klein
Assistant Professor
School of Economics
University of Maine

May 2, 2015
Solar Powering Your Community Workshop
Bangor, Maine

My background

RESEARCH

- Comparing technical, economic, environmental and social implications of:
  - Concentrated solar power
  - Thermal energy storage
  - Biofuels from woody biomass
  - Wind
  - Hydro
  - Residential Solar PV and water heating
- Community energy

Teaching

- Citizens, Energy, and Sustainability
- Sustainable Energy Economics & Policy
- Building Sustainable Energy Communities Through Service Learning

Engineering and Public Policy (PhD); Environmental Science (BS)
5 yrs teaching middle and high school

My Motivation

- Interdisciplinary education (Environmental Science, Engineering & Public Policy, Economics)
- Americorps volunteer
- Earth day/science fair organizer
- Researcher (knowledge to action)
- Educator (service learning)
- Service – Land Grant Institution
- Mother
- Homeowner
- Bangor resident


Monkey See!
Monkey Do!

Overall Research Question

- How can we harness the power of the people to achieve more sustainable energy change at a faster rate than traditional methods?

Overall Hypothesis

- … through community energy
  - Economies of scale
  - Group purchasing power
  - More effective education
    - Learning by doing
    - Learning by seeing

What is community energy?

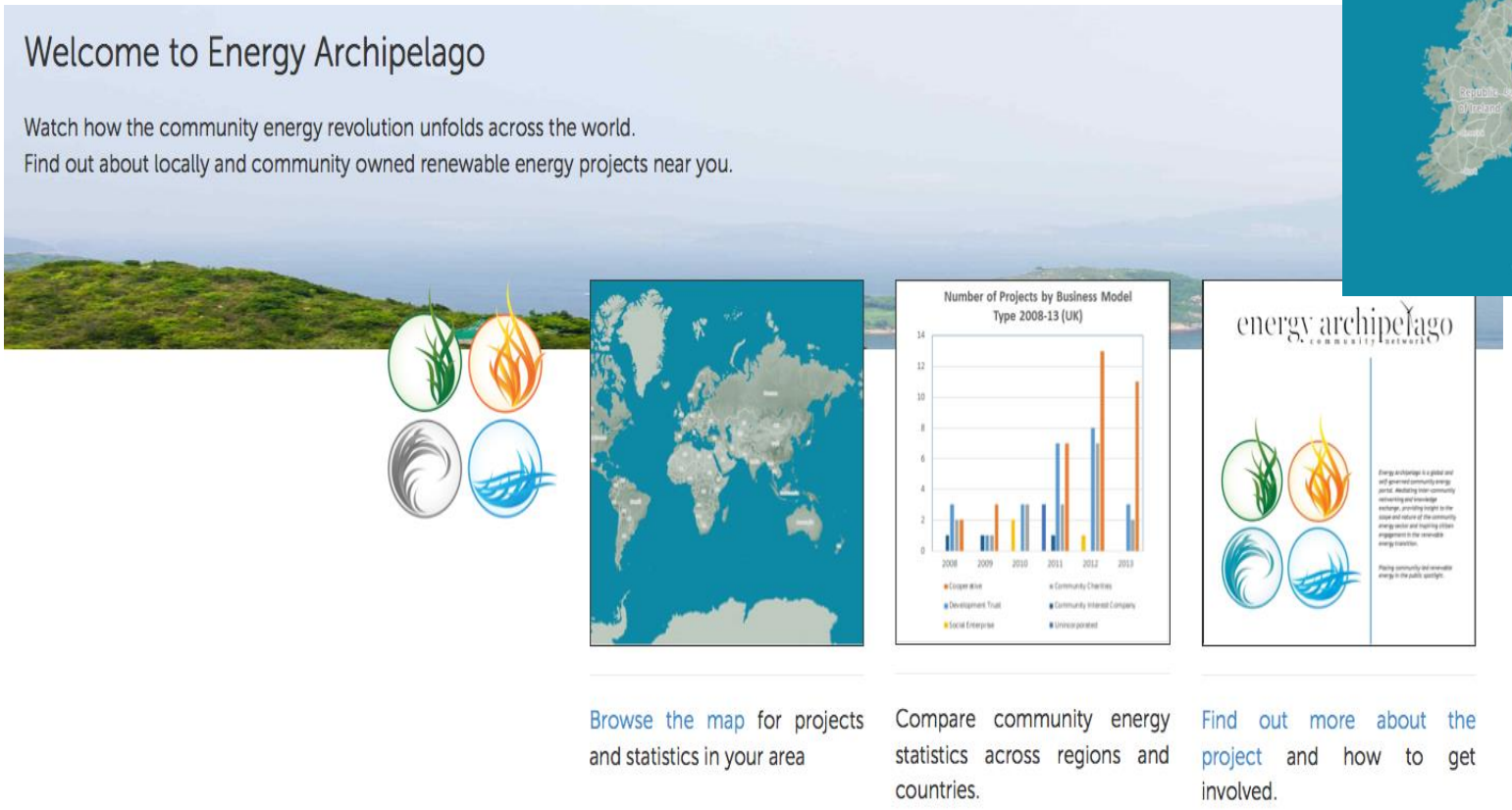
A project or program initiated by a group of people united by a common local geographic location (town level or smaller) and/or set of common interests *(Canadian Secretariat of the Commission for Environmental Cooperation, 2010; U.S. Department of Energy, 2011)*; in which some or all of the benefits and costs of the initiative are applied to this same group of people *(Walker & Devine-Wright, 2008)*; and which incorporates a distributed energy generation technology (for electricity, heat, or transportation) based on renewable energy resources (solar, wind, water, biomass, geothermal) and/or energy conservation/efficiency methods/technologies

CRE3: Community Renewable Energy and Energy Efficiency

http://energyefficiencymarkets.com/pushes-community-solar-now-utilities/

U.S. Community Energy Database
(a work in progress)

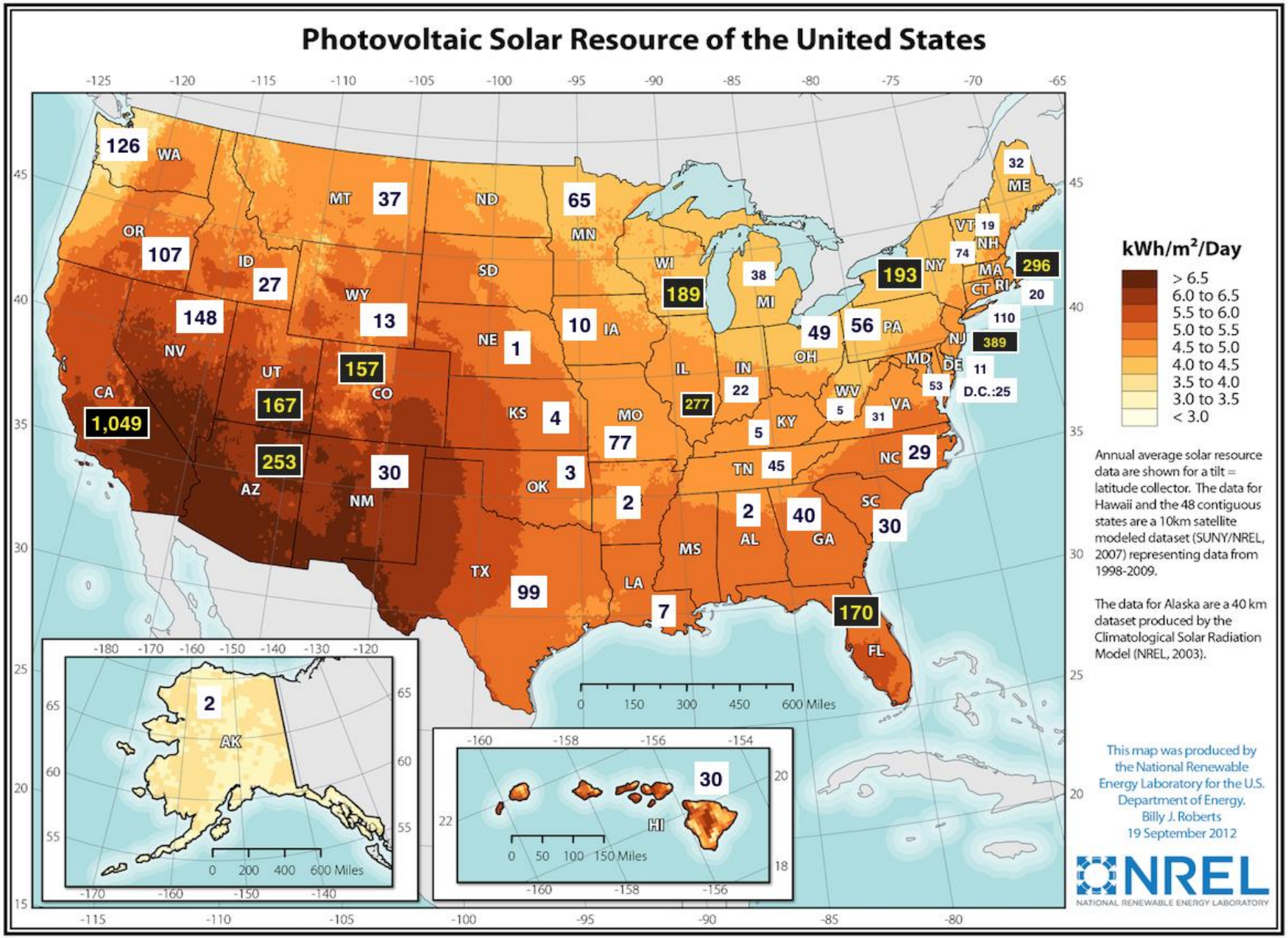
To be integrated internationally



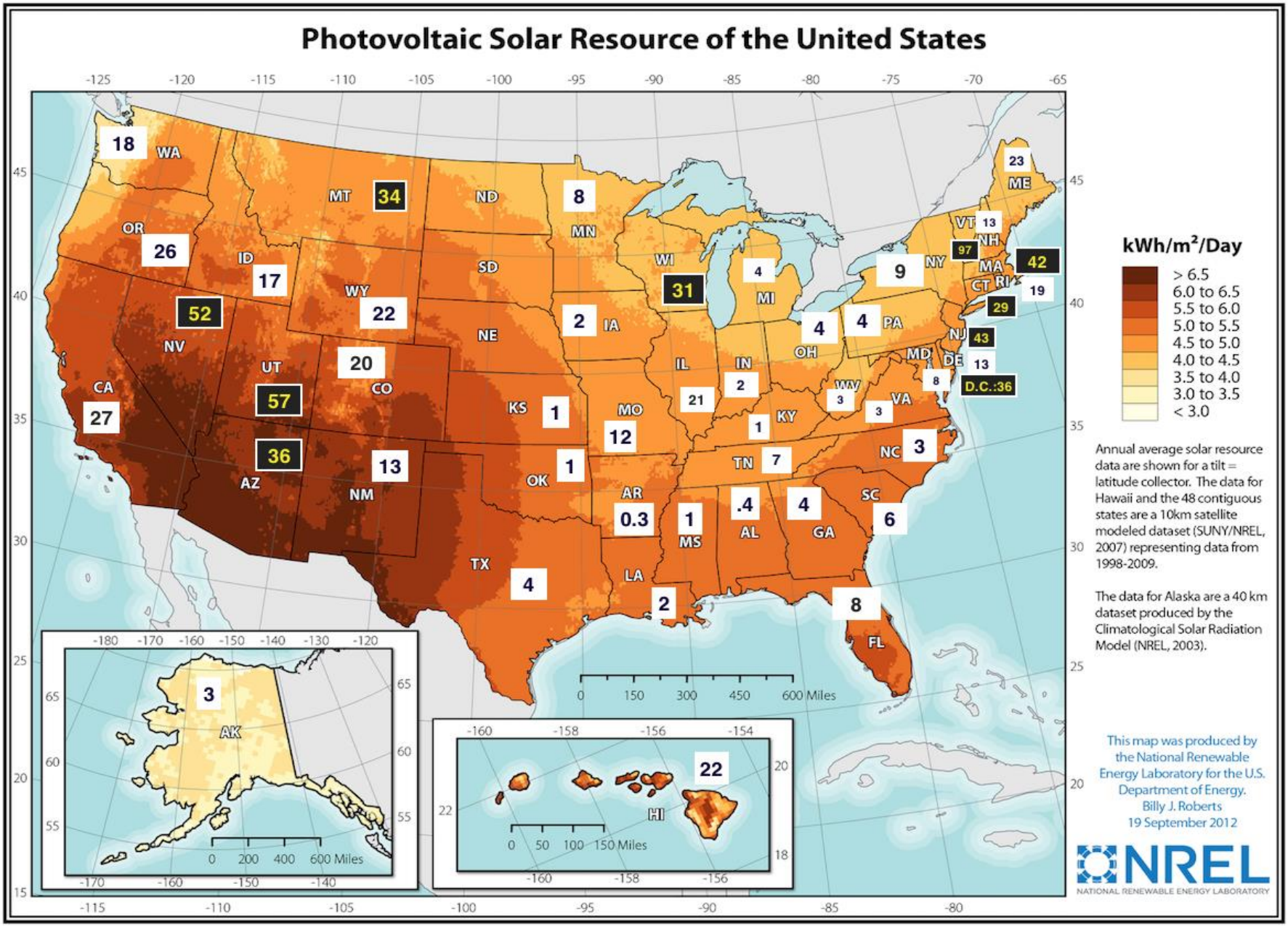
Where in the US is Community Energy happening? (CRE3 Database)

- Transition US
- EPA Climate Showcase Communities
- EnergySage
- Vermont Energy and Climate Network (VECAN)
- Community Energy Inc
- The Solar Gardens Institute
- Solarfoundation.org (list of K-12 schools with solar panels)
- Lots and lots of web-based search!

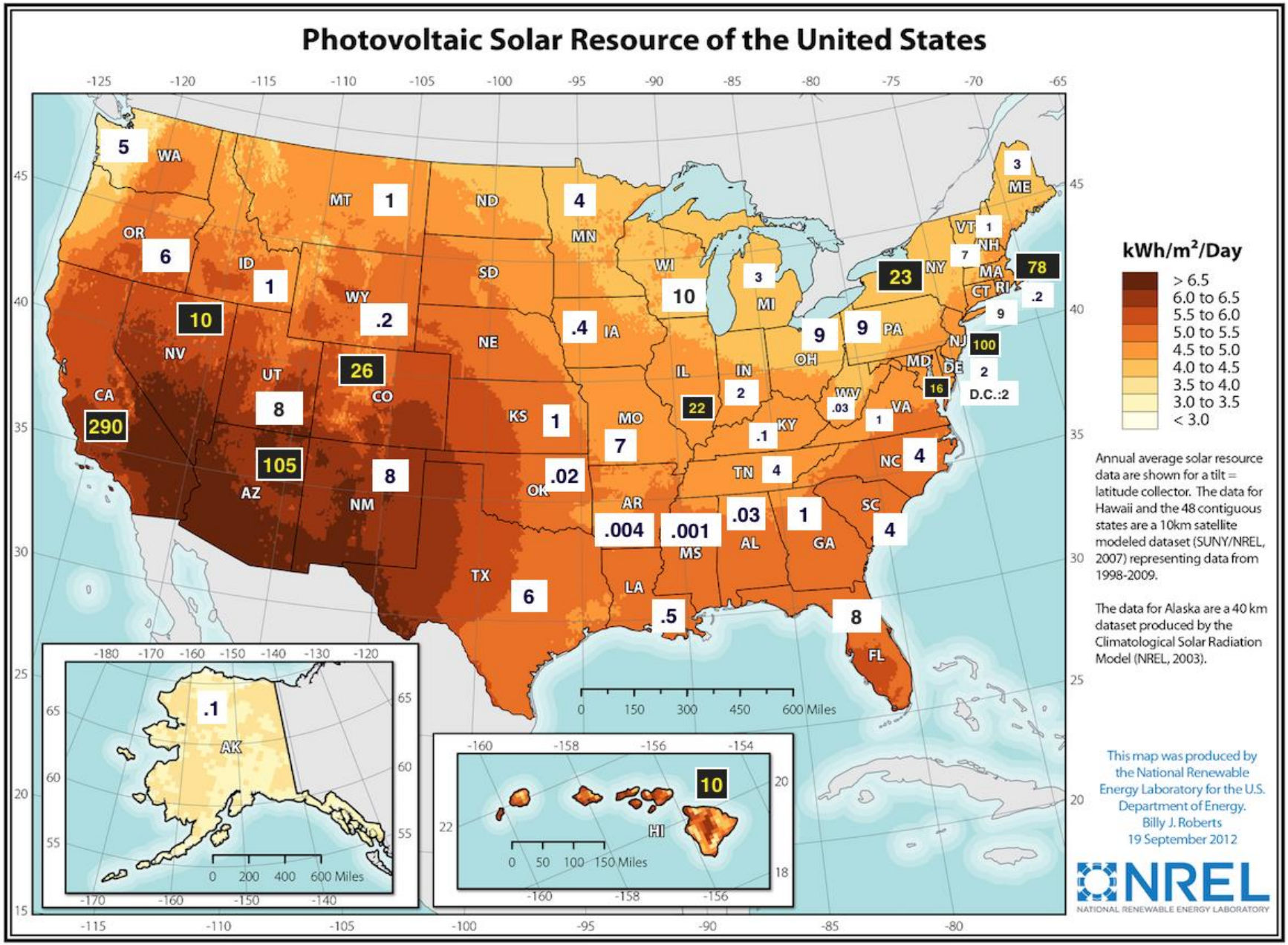
Number of Community Solar Projects by State



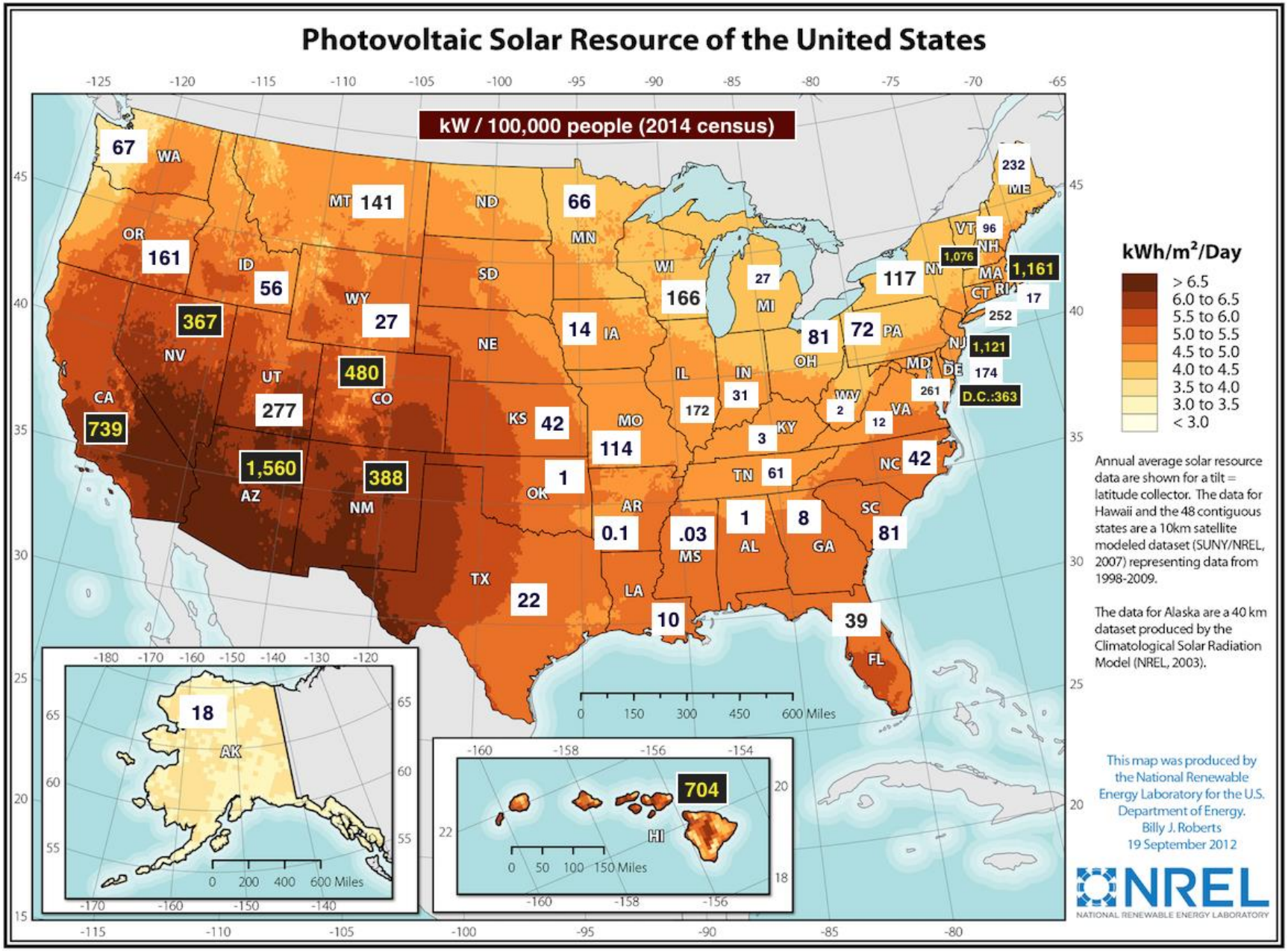
Number of Community Solar Projects by State per Capita (million people)



Installed Capacity (MW) from Community Solar Projects by State



Installed Capacity (kW) from Community Solar Projects by State per Capita (100,000 people)



Top 5 states Overall

- Arizona
- California
- Colorado
- Massachusetts
- New Jersey

Host Categories

Host	Number of projects
School (K-12)	**3,819**
University/college	210
Individual residences (buying groups)	**128**
Municipal property-town	**103**
Utility (municipal, cooperative, private)	93
Other non-profit	83
Religious Organization (i.e., church, temple, etc)	73
Undefined	41
Municipal property-county	**16**
Corporation	11
Farm	11
Other	10
Limited Liability Corporations	8
Tribal	3

Financial Categories

Financial Model	Description	Number of Solar Projects
One-Time Funds	**Tax revenues, donations/grant money, or other internal funds; Examples: government property, K-12 school, college, university, church, other non-profit, cooperative utilities/businesses**	**1,932**
Not Specified	Not specified in the information we were able to access	1,719
PPA -Possible Lease	Not sure if lease is part of PPA or not	565
PPA	Power purchase agreement; a developer (usually a limited liability company (LLC) created specifically for this purpose or a private or public utility) owns, operates, and maintains the system on its own property or on the property of a host organization (usually a non-profit organization) and sells electricity generated from the RE system to customers (usually the host organization or utility customers) for a specified period of time (often 20-25 yrs); Often referred to as Solar Gardens	134
Shared Ownership	A developer (usually a LLC, corporation, private or public utility) constructs a RE installation and then sells it in blocks to people who live in the vicinity of the installation or who are customers of the same utility; Often referred to as Solar Gardens	94

Financial Categories

Financial Model	Description	Number of Solar Projects
Buying Group 1 - Installation	**Individuals form a group to take advantage of reduced installation costs through bulk purchasing from a single supplier or a set of pre-approved competitors; Individuals pay for their own installations through private funds and/or loans; Examples: Solarize, RE Cooperatives**	**80**
PPA lease	Same as PPA, but at the end of the PPA, the host customer has the option to buy the system at the depreciated values; Often referred to as Solar Gardens	35
Intentional Sustainable Communities	A group of people with similar morals, ethics, and/or beliefs choose to live in the same geographic area and agree on a set of guiding principles related to sustainability, including adopting renewable energy	20
Green Planned Housing Development	An external investor/contractor constructs a housing development or planned community with attention to green building practices, which may include CRE3 options, and sells it to individual homebuyers	14
Buying Group 2 - Electricity	**Municipalities form public agencies to buy RE generation for their residents, allowing residents to opt-in or -out of RE power purchase; the buying group may select a single supplier or allow customers to choose between a pre-approved set of competitors; Examples: Community Choice Aggregation, Green Pricing**	**8**

Number of Installations on Town/County Property (non-school)

- **119 total**
- TOP 5 STATES PER CAPITA (million people)
  - OR: 6.3
  - UT: 5.8
  - VT: 3.2
  - WA: 2.5
  - MA: 2.2

ME: 0.8

Funding for Installations on Town/County Property (non-school)

- 83 One-time funds (i.e., grants, donations, tax dollars)
- 30 PPA (6 with lease/possible lease)
- 3 Unknown
- 1 Green planned housing development
- 1 Shared ownership

Number of Installations on Schools

- **3,819 total**
- TOP 5 STATES PER CAPITA (100,000 people)
  - AZ: 8
  - VT: 6
  - NV: 5
  - NJ: 4
  - UT: 3

ME: 2

Funding for Installations on Town/County Property (non-school)

- 1,537 One-time funds (i.e., grants, donations, tax dollars)
- 1,703 Unknown
- 577 PPA (566 with lease/possible lease)
- 1 Shared ownership

Number of Buying Groups - Electricity (i.e., Community Choice Aggregation)

- **8 total**
  - CA: 3
  - MA: 2
  - IL: 1
  - OH: 1
  - PA: 1

ME: 0

Maine: 32 projects

- Host Organization:
  - 22 Schools K-12 - complete
  - 4 University/College (Unity College - complete)
  - 3 Farms (Humble Farm PV & Hot Water – complete; Sunny Croft Farm)
  - 1 Individual residence in an Intentional Sustainable Community (Belfast Cohousing and Ecovillage – complete)
  - 1 Municipal property – town (Sanford Economic Growth Council – planning)
  - 1 Other Non-Profit (Riding on the Top Therapeutic Riding Stables – complete)

Maine Schools K-12

Mary Hurd School
Goodwill Hinckley School
COCOONS INC
GEORGE B WEATHERBEE SCHOOL
KENNEBUNKPORT CONSOLIDATED SCH
FRYEBURG ACADEMY
EAST END COMMUNITY SCHOOL
PEMETIC ELEMENTARY SCHOOL
Town of Swampscott
Good Will Hinckley School
FALMOUTH HIGH SCHOOL
YARMOUTH HIGH SCHOOL
GRAY-NEW GLOUCESTER HIGH SCHOOL
BANGOR HIGH SCHOOL
GREELY HIGH SCHOOL
WINTHROP HIGH SCHOOL
PORTLAND ARTS & TECHNOLOGY H S
MARSHWOOD HIGH SCHOOL
TROY A HOWARD MIDDLE SCHOOL
MIDDLE SCHOOL OF THE KENNEBUNKS
FALMOUTH MIDDLE SCHOOL
LINCOLN MIDDLE SCHOOL

Maine: Possible Upcoming Projects/Need to add to Database

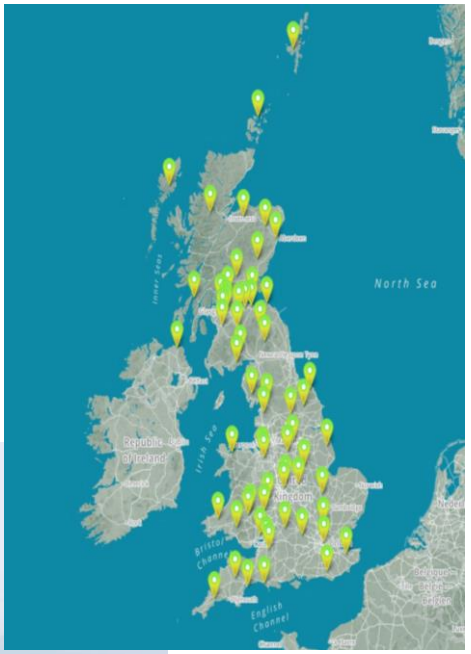
- Solarize
  - Freeport, ME
  - Insource Renewables
  - ReVision
- Maine Islands (Island Institute Energy Conf.)
  - Long Island
  - MDI
  - Fox Islands: Vinalhaven & North Haven
  - Monhegan
  - Matinicus
  - Peaks Island
  - Star Island (already complete?)
  - Isle au Haut
- Town of Orono – geothermal

Maine: Possible Upcoming Projects/Need to add to Database

- PPAs – ReVision Energy & Others?

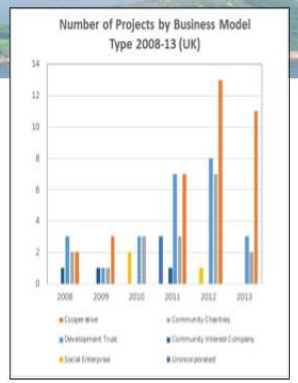
What else is not yet documented?

- sharon.klein@maine.edu



Welcome to Energy Archipelago

Watch how the community energy revolution unfolds across the world.
Find out about locally and community owned renewable energy projects near you.



Browse the map for projects and statistics in your area

Compare community energy statistics across regions and countries.

Find out more about the project and how to get involved.

Summer 2015: ME vs MA

- What current impact is it having on energy sustainability in ME and MA?
- What potential impact could it have?
- What factors are encouraging community energy?
- What factors are preventing it?
- What are the implications of different community energy models?
- How does community energy interact with top-down policies?
- How can we harness grassroots momentum to make community energy more efficient at achieving a sustainable energy future?

My Goals

- Provide unbiased research
- Provide accessible resources for citizens, community groups
- Educate students & community members
- Get students engaged in community projects
  - Around 30-100 students per year
- Help people make connections & access resources

A Few Examples of State Policies that Incentivize CRE

- **Maine: Community Based Renewable Energy Production Incentive (Pilot Program)**
  - Renewable energy projects designated as "community" can chose between a 1.5 REC multiplier, or a $.10/kWh performance based incentive for the energy they generate
- **Vermont: Green Mountain Power Solar Performance Incentive**
  - Customers receive a credit of $.06/kWh in addition to net metering rates for electricity generated by solar photovoltaic systems up to 500 kW capacity
- **Minnesota: Community Based Energy Development Tariff**
  - Requires municipal and investor owned utilities to make a "good faith effort" to consider community RE projects when looking to add RE to their supply mix. Projects designated as "community" will receive a feed in tariff, determined by the utility company.

Maine Solar Policy – the good news

- 58 resolves/bills presented to State Legislature related to solar 1999-2014
- 23 signed into law:
  - 18 before 2011
  - 5 after 2011 (1 without Governor's signature)

What is stopping Maine?

- 58 resolves/bills presented to State Legislature related to solar 1999-2014
- 23 signed into law:
  - 18 before 2011
  - 5 after 2011 (1 without Governor's signature)

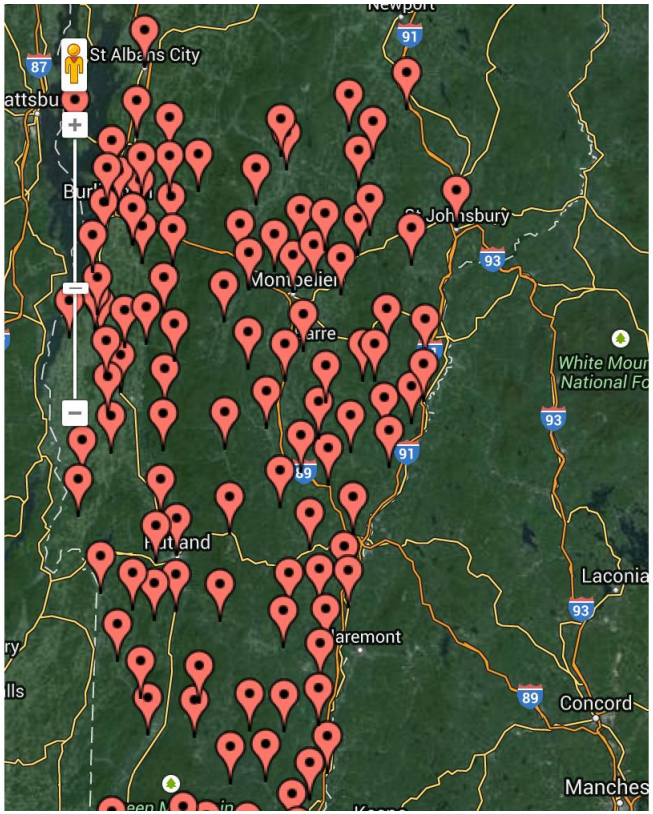
What is stopping Maine?

- 58 resolves/bills presented to State Legislature related to solar 1999-2014
- 35 didn't become law because:
  - 28 didn't pass Senate (2003-2013)
  - 3 vetoed by Governor LePage
  - 2 didn't pass House (2014)
    - LD1085: Feed-in Tariff
    - LD 646: Remove 100-MW limit
  - 2 Not sure (1999)
- LD1652 An Act to Support Solar Energy Development in Maine (MPUC study) became public law without Governor's signature (2014) – sponsored by Senator Eloise Vitelli (voted out of office)

What is stopping Maine?

- **Maine: Community Based Renewable Energy Production Incentive (Pilot Program)**
  - **Arbitrary limit of 9 people plus the host**
- **Virtual net metering limit: 660kW**
- Bills to “study” solar seem to pass
- Bills to take financial action fail
- Now we have studied solar (MPUC)
- Time to take more concrete action

Grassroots Solution: VECAN (or MECAN…?



- BARNARD ENERGY COMMITTEE
- BARRE ENERGY ACTION RESOURCE
- BELVIDERE ENERGY COORDINATOR
- BENNINGTON ENERGY COMMITTEE
- BENSON ENERGY COMMITTEE
- BERLIN ENERGY COMMITTEE
- BRADFORD ENERGY COMMITTEE
- BRAINTREE ENERGY COMMITTEE
- PEACHAM ENERGY COMMITTEE
- PERU ENERGY COMMITTEE
- PITTSFORD ENERGY COMMITTEE
- PLAINFIELD ENERGY COMMITTEE
- POULTNEY ENERGY PROJECT
- PUTNEY ENERGY COMMITTEE
- RANDOLPH ENERGY ADVISORY COMMITTEE
- READING ENERGY COMMITTEE

VECAN is a network of statewide Vermont organizations helping communities across the Green Mountain State to reduce energy costs and climate impacts through conservation, increased energy efficiency and conversion to renewable energy sources.

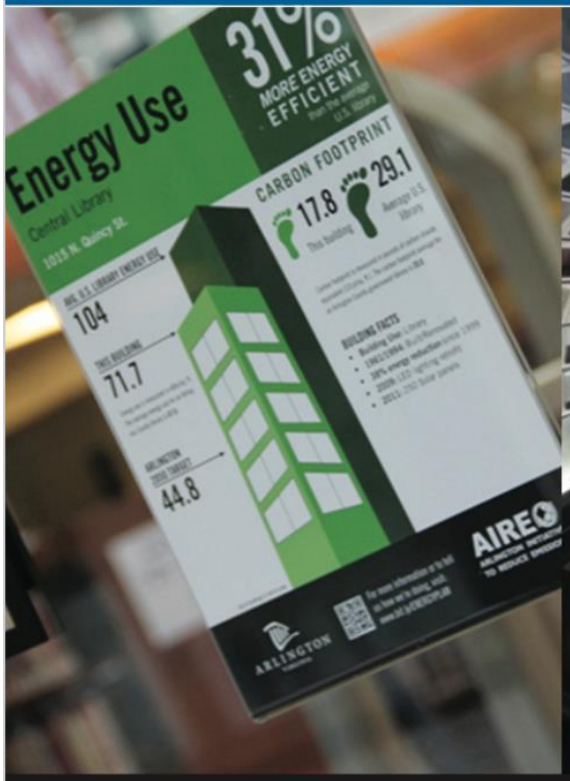
http://www.vecan.net/about/

Resources

- Tool for evaluation building performance, sustainability tradeoffs: http://www.nist.gov/el/economics/20141007_birds.cfm
- 12 Best Practices: A Roadmap to a Solar Friendly Community: http://solarcommunities.org/12-best-practices/

ARLINGTON COUNTY, VIRGINIA

Community Energy Plan



ARLINGTON
VIRGINIA

AN ELEMENT OF ARLINGTON COUNTY'S
COMPREHENSIVE PLAN
ADOPTED - JUNE, 2013

http://ilsr.org/community-solar-power-obstacles-and-opportunities/

Community Solar Power

Obstacles and Opportunities

JOHN FARRELL
jfarrell@ilsr.org

Revised November 2010

A publication of

THE NEW RULES PROJECT

New Rules Project
1313 5th St. SE, Suite 303
Minneapolis, MN 55414

612-379-3815
www.newrules.org

District Heating:
http://www.districtenergy.org/community-energy-planning-development-and-delivery/

Maine Solar Energy Association Annual Workshops

FALL 2011

THE MAINE SUN

NEWSLETTER of the Maine Solar Energy Association

A Surprise Trip to the Amazon

by Richard Komp

I had planned to spend the entire summer working in Maine; but in early June I got a call from one of the students from the University of Dayton in Ohio. Only he wasn't in Ohio, he was in a small village called Porto de Moz on the Xingo River, a large tributary of the Amazon in Brazil. In September of 2009, John Burke and I gave a solar workshop for the ETHOS group at the University of Dayton where we taught the students how to build

Maine Solar Tours 2011

This will be the 21st year that MeSEA has offered this tour, which is always on the first Saturday in October. This year that is the 1st of October and we have more than 50 homes in six Tours. As has always been the case since we started the tours with Real Goods back in 1990, the self guided tours are free and each sie will have a host to show you around and answer your questions about using solar energy in your own life.

mainesolar.org

Figure ES- 2. CMP Distributed Value – 25 Year Levelized ($ per kWh)

25 Year Levelized		Gross Value A ($/kWh)	× Load Match Factor B (%)	× Loss Savings Factor (1+C) (%)	= Distr. PV Value D ($/kWh)	
Energy Supply	Avoided Energy Cost	$0.076		6.2%	$0.081	Avoided Market Costs $0.138
	Avoided Gen. Capacity Cost	$0.068	54.4%	9.3%	$0.040	
	Avoided Res. Gen. Capacity Cost	$0.009	54.4%	9.3%	$0.005	
	Avoided NG Pipeline Cost					
	Solar Integration Cost	($0.005)		6.2%	($0.005)	
Transmission Delivery Service	Avoided Trans. Capacity Cost	$0.063	23.9%	9.3%	$0.016	
Distribution Delivery Service	Avoided Dist. Capacity Cost					
	Voltage Regulation					
Environmental	Net Social Cost of Carbon	$0.020		6.2%	$0.021	Societal Benefits $0.199
	Net Social Cost of SO_2	$0.058		6.2%	$0.062	
	Net Social Cost of NO_x	$0.012		6.2%	$0.013	
Other	Market Price Response	$0.062		6.2%	$0.066	
	Avoided Fuel Price Uncertainty	$0.035		6.2%	$0.037	
					$0.337	

Powered by SunShot U.S. Department of Energy

Source: Maine Public Utilities Commission
(http://www.nrcm.org/wp-content/uploads/2015/03/MPUCValueofSolarReport.pdf)

(From Phillip's Presentation – thank you!)

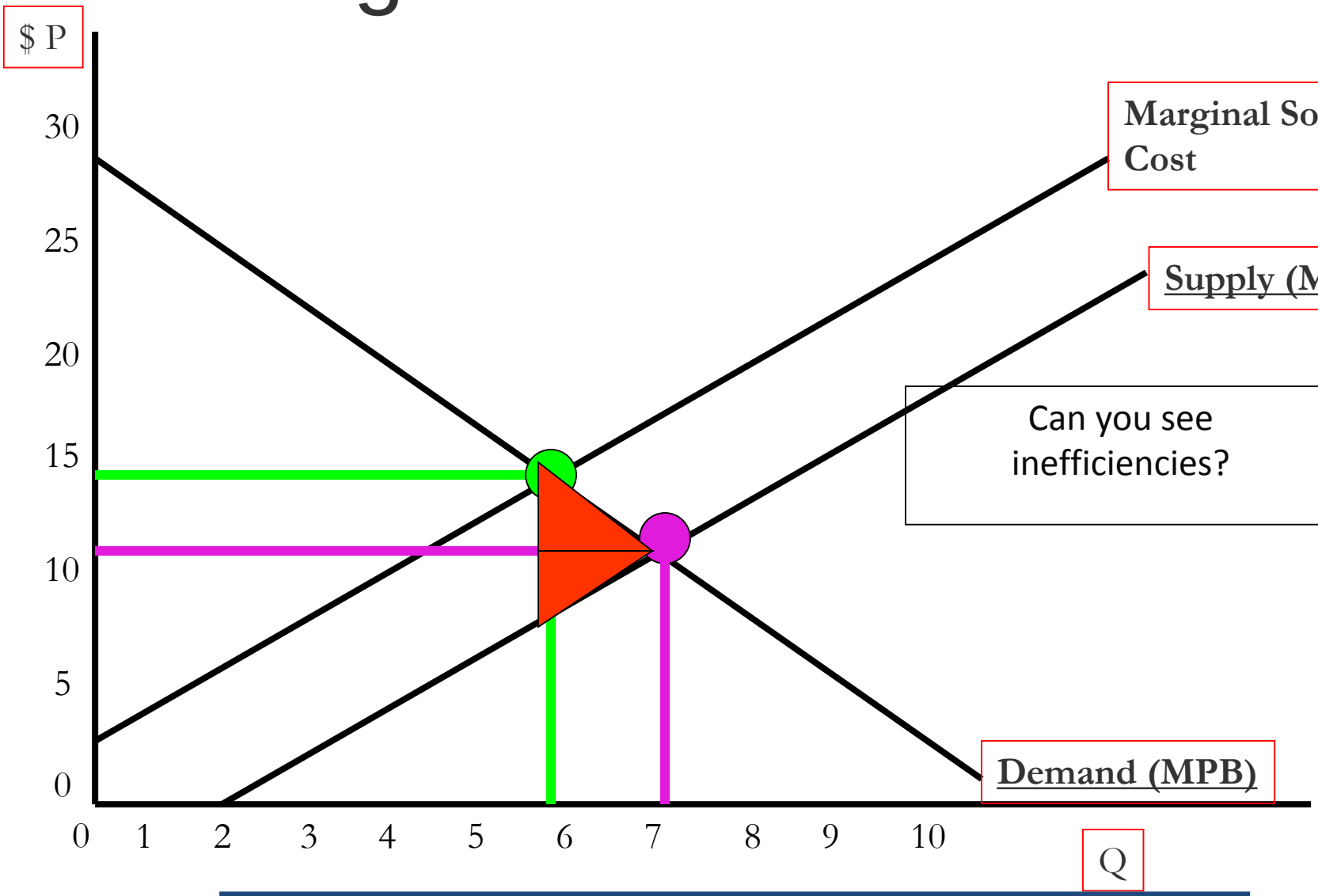
Externality

- Spillover effect associated with production or consumption that extends to a third party outside of the market.

- Types of Externalities:
  - Positive externality (e.g., external benefits)
  - Negative externality (e.g., external costs)

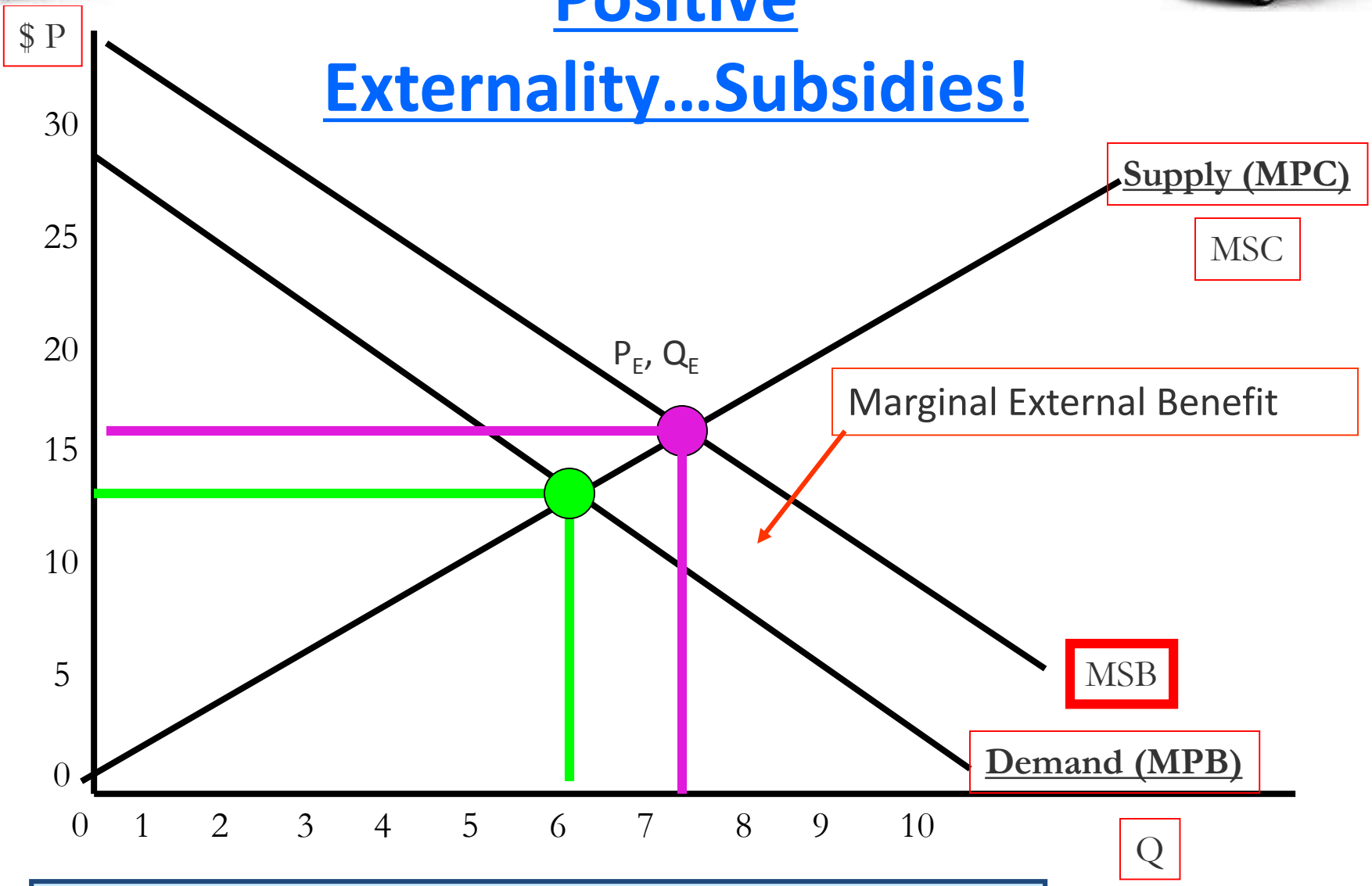
If economic transaction imposes costs or benefits on individuals ***who are not part of the transaction***, ……Adam Smith's invisible hand will fail to lead to an efficient outcome
– G. Mankiw

Negative Externalities



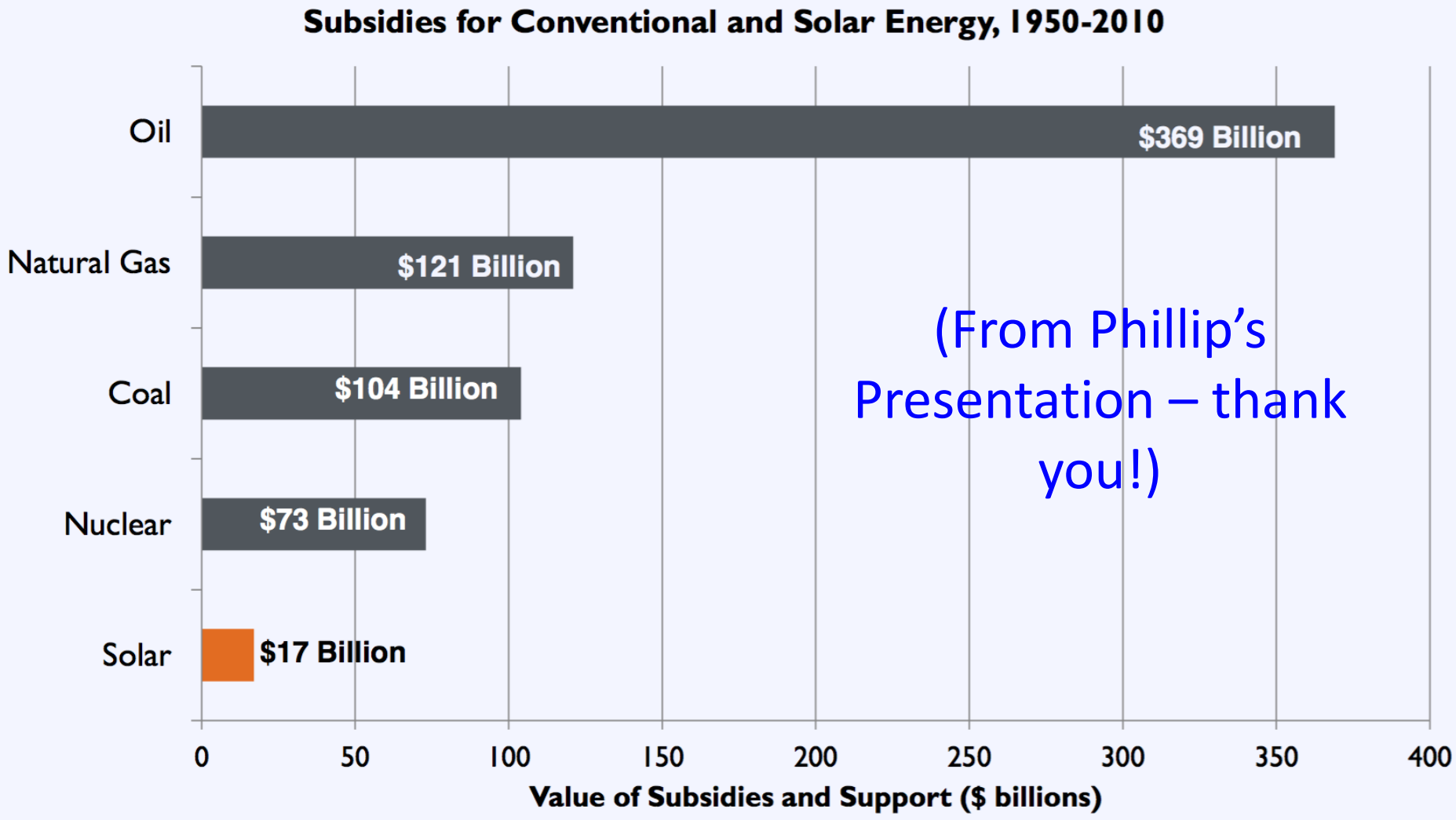
How do we get people to think of Marginal Social Cost?

Positive Externality…Subsidies!



How do we get people to think of Marginal Social Benefit?

Subsidies and Support

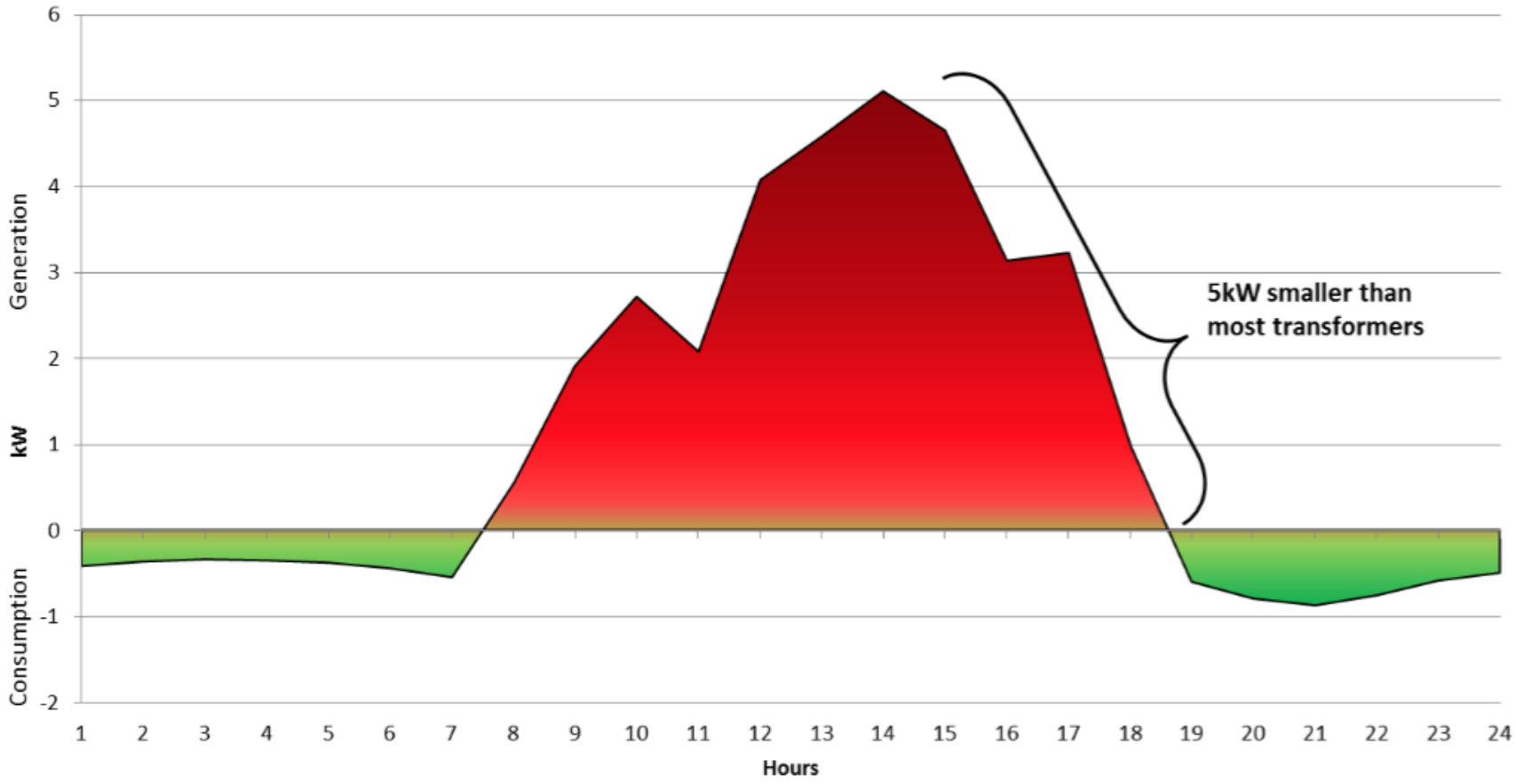


(From Phillip's Presentation – thank you!)

Powered by SunShot U.S. Department of Energy

Source: Management Information Services, Inc. October 2011. *60 Years of Energy Incentives: Analysis of Federal Expenditures for Energy Development*; SEIA, May 1, 2012. *Federal Energy Incentives Report.*

Residential Net – Peak Solar



Thank you – Jeff Jones, Emera, Maine

Emera Maine

Utilities

- Mismatch of load vs generation with solar
  - Highest demand: winter for heating
  - Highest production: summer
- Utilities sell electricity; Solar PV works well with:
  - Heat pumps
  - Electric vehicles
  - Smartgrid technologies

QUESTIONS?

Sharon.klein@maine.edu

Agenda

10:20 – 10:50	Putting Solar Energy on the Local Policy Agenda
10:50 – 11:20	State of the Local Solar Market
11:20 – 11:50	Federal, State, and Utility Policy Drivers
11:50 – 12:15	*Break and Grab Lunch*
12:15 – 12:45	Planning for Solar: Getting Solar Ready
12:45 – 1:20	Solar Market Development Tools
1:20 – 1:30	*Break*
1:30 – 2:15	Local Speakers
2:15– 3:00	Developing and Solar Policy Implementation Plan for Your Community and Next Steps

Activity: Solar in Your Community

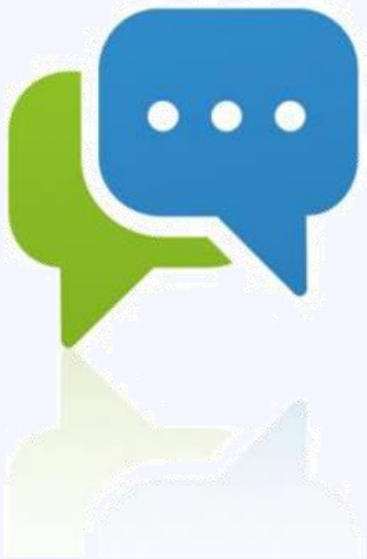
1. Recognize successes
2. Identify opportunities
3. Select strategies & best practices
4. Outline implementation plan
5. Discuss barriers to implementation

Activity: Solar in Your Community

Part 1: Take 5 minutes to complete the questions in the *Developing Effective Solar Policies in Your Community* handout.

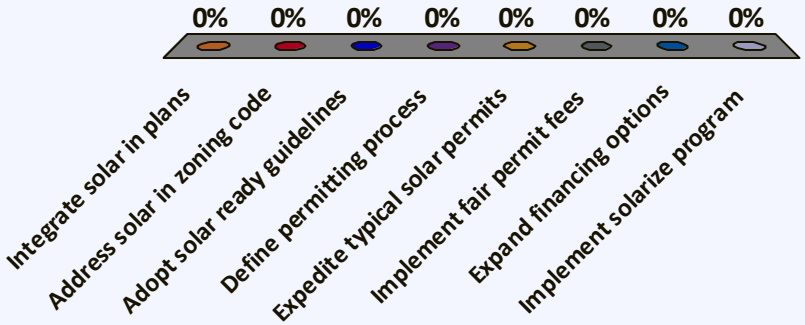
Activity: Solar in Your Community

Part 2: Spend the next 10 minutes discussing your responses to Questions 8 – 12 with the others at your table. Discuss strategies for overcoming potential obstacles to implementation.



Which “best practice” did you select to pursue first?

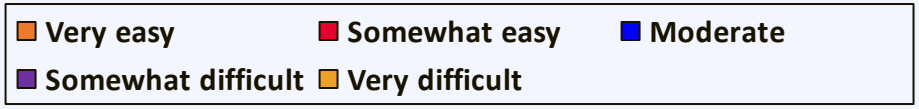
A. Integrate solar in plans
B. Address solar in zoning code
C. Adopt solar ready guidelines
D. Define permitting process
E. Expedite typical solar permits
F. Implement fair permit fees
G. Expand financing options
H. Implement solarize program



How difficult will it be to implement this policy/program?

1. Very easy
2. Somewhat easy
3. Moderate
4. Somewhat difficult
5. Very difficult

0%



Discussion

What obstacles stand in the way of implementation?

Discussion

What are possible strategies to overcome those obstacles?

Activity: Next Steps

What do you pledge to do when you leave today's workshop? [Orange Card]

Powered by SunShot

U.S. Department of Energy

Autumn Proudlove

NC Clean Energy Technology Center

afproudl@ncsu.edu

Philip Haddix

The Solar Foundation

phaddix@solarfound.org