Solar Powering Your Community

Addressing Soft Costs and Barriers

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Agenda

10:00 – 10:30	Introductions and Overview
10:30 – 11:40	Solar 101: Technology, Markets, and Policy
11:40 – 12:15	Planning and Zoning for Solar
12:15 – 12:30	*Break*
12:30 – 12:40	Interactive Activity Revisited
12:40 – 1:25	Solar Financing Strategies in the Region
1:25 – 1:35	*Break*
1:35 – 2:50	Local Discussion Panel and Audience Discussion

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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

NORTH CAROLINA
Solar Center

THE SOLAR FOUNDATION
Research and Education to Advance Solar Energy

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

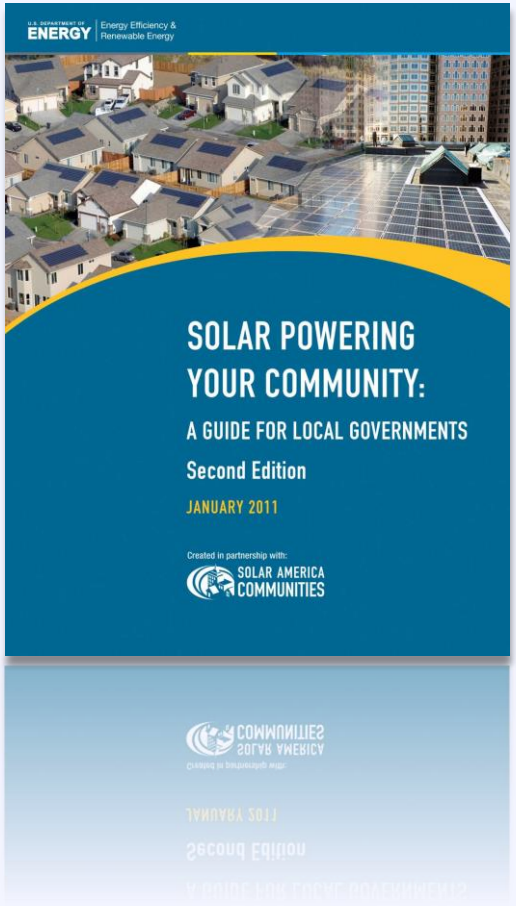
- Increase installed capacity of solar electricity in U.S. communities
- Streamline and standardize permitting and interconnection processes
- Improve planning and zoning codes/regulations for solar electric technologies
- Increase access to solar financing options

About the SunShot Solar Outreach Partnership

Resource **Solar Powering Your Community Guide**

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

www.solaroutreach.org



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U.S. Department of Energy

Complimentary Services

Technical Resources

Regional Workshops

One to One Assistance

Strategy Session

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

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

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

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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

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

Poll

Who's in the room?

Poll

What is your experience with solar?

Explore benefits

and

Overcome barriers

Activity: Identifying Benefits

What is the greatest benefit solar can bring to your community? [Blue Card]

Right Now	During Session	After Break
		
Write answer on card	Compile results	Group discussion

Activity: Addressing Barriers

What is the greatest barrier to solar adoption in your community? [Green Card]

Right Now	During Session	After Break
		
Write answer on card	Compile results	Group discussion

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Solar Technologies

Solar Photovoltaic (PV)

Solar Hot Water

Concentrated Solar Power

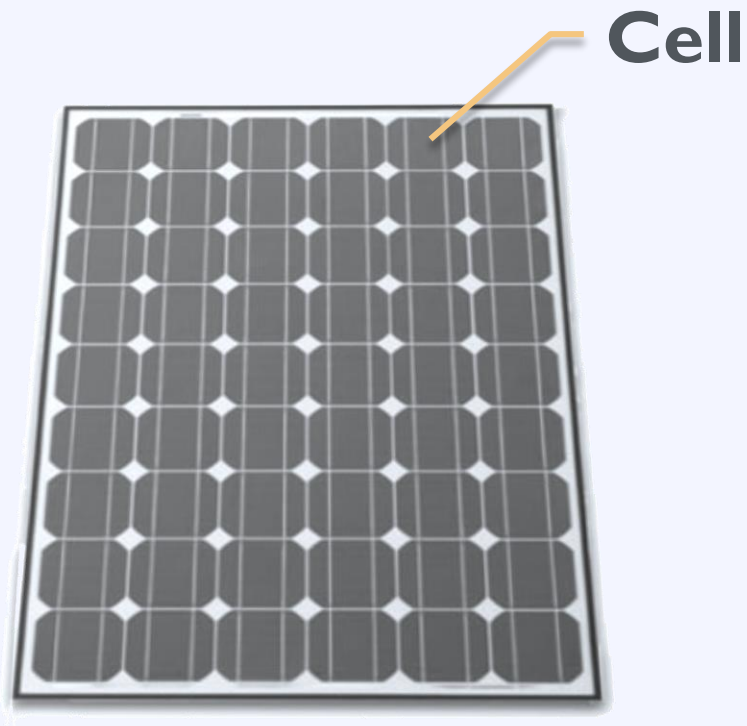
Solar Technologies

Solar Photovoltaic (PV)

Solar Hot Water

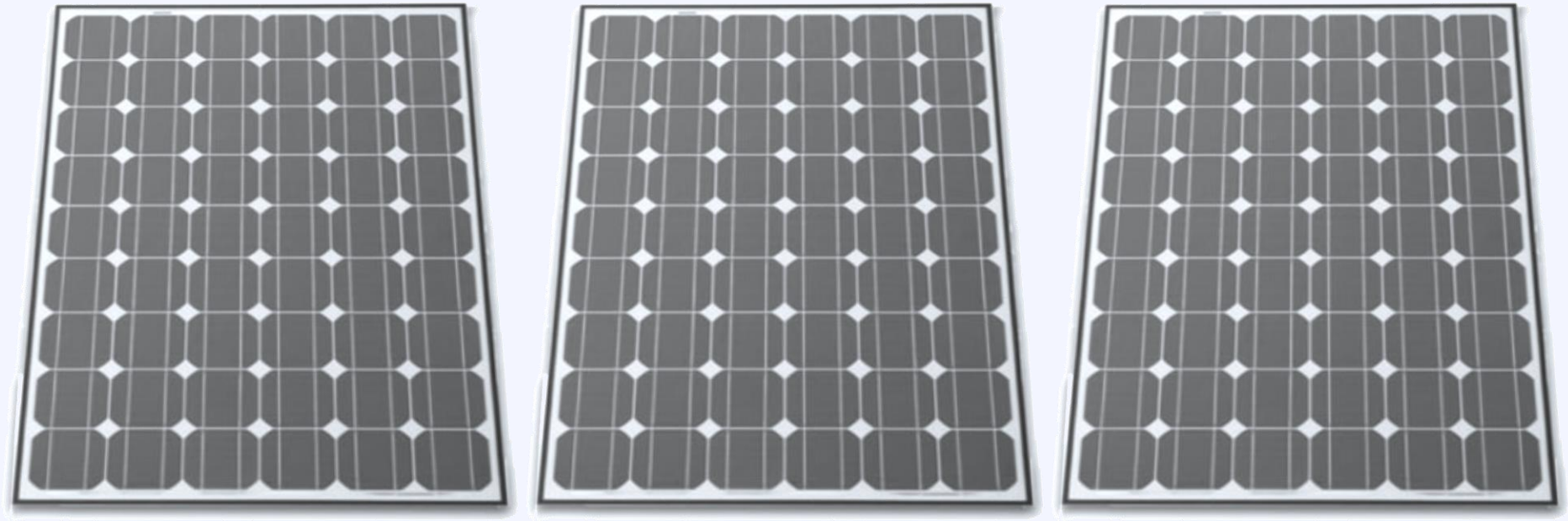
Concentrated Solar Power

Some Basic Terminology



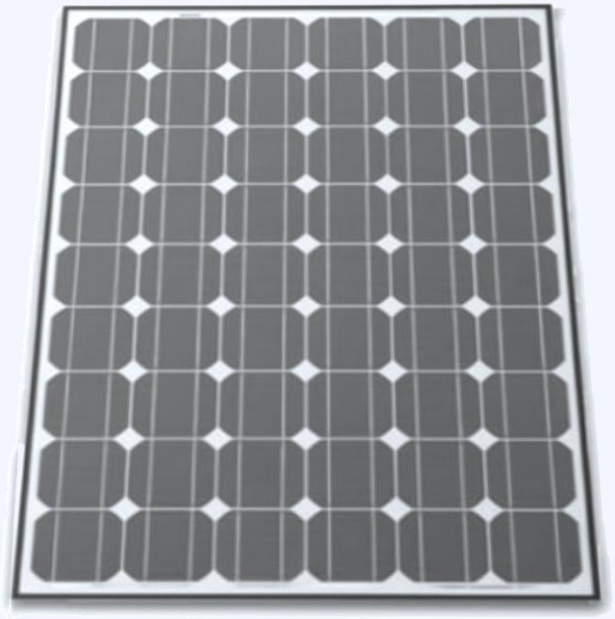
Panel / Module

Some Basic Terminology



Array

Some Basic Terminology



Capacity / Power

kilowatt (kW)

Production

Kilowatt-hour (kWh)

Some Basic Terminology

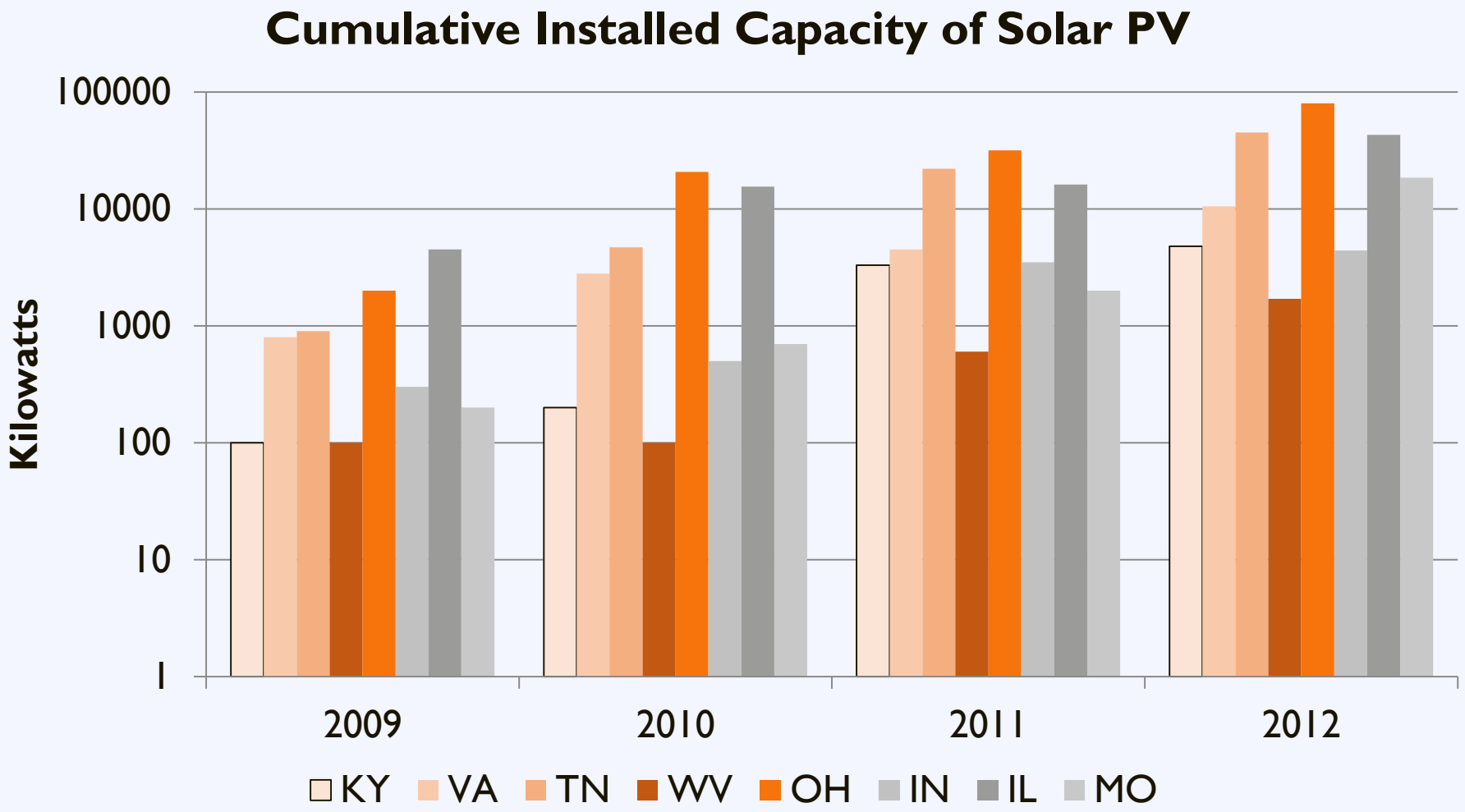
Residence
5 kW

Factory
1 MW+

Office
50 – 500 kW

Utility
2 MW+

Kentucky Solar Market



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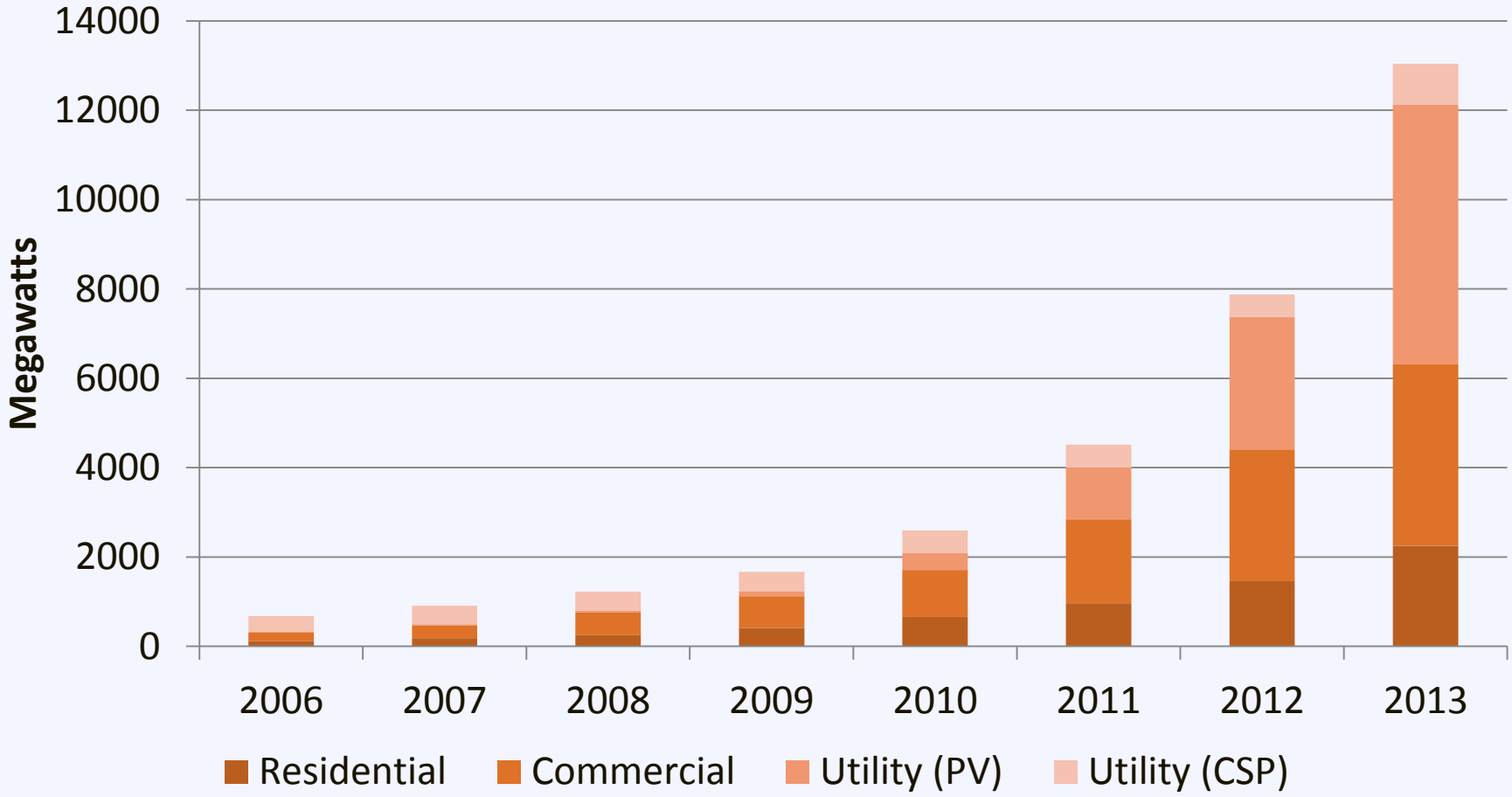
U.S. Department of Energy

Source: Interstate Renewable Energy Council, *Solar Market Trends* (2009-2012)

U.S. Cumulative Capacity Growth



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Source: Interstate Renewable Energy Council, *Solar Market Trends* (2006-2009)
Solar Energy Industries Association, *Solar Market Insight* (2010-2013)

Solar Development in the US

In 2013, the US solar industry installed

131,000 new solar installations

[that's one every four minutes]

of which

94% were residential projects

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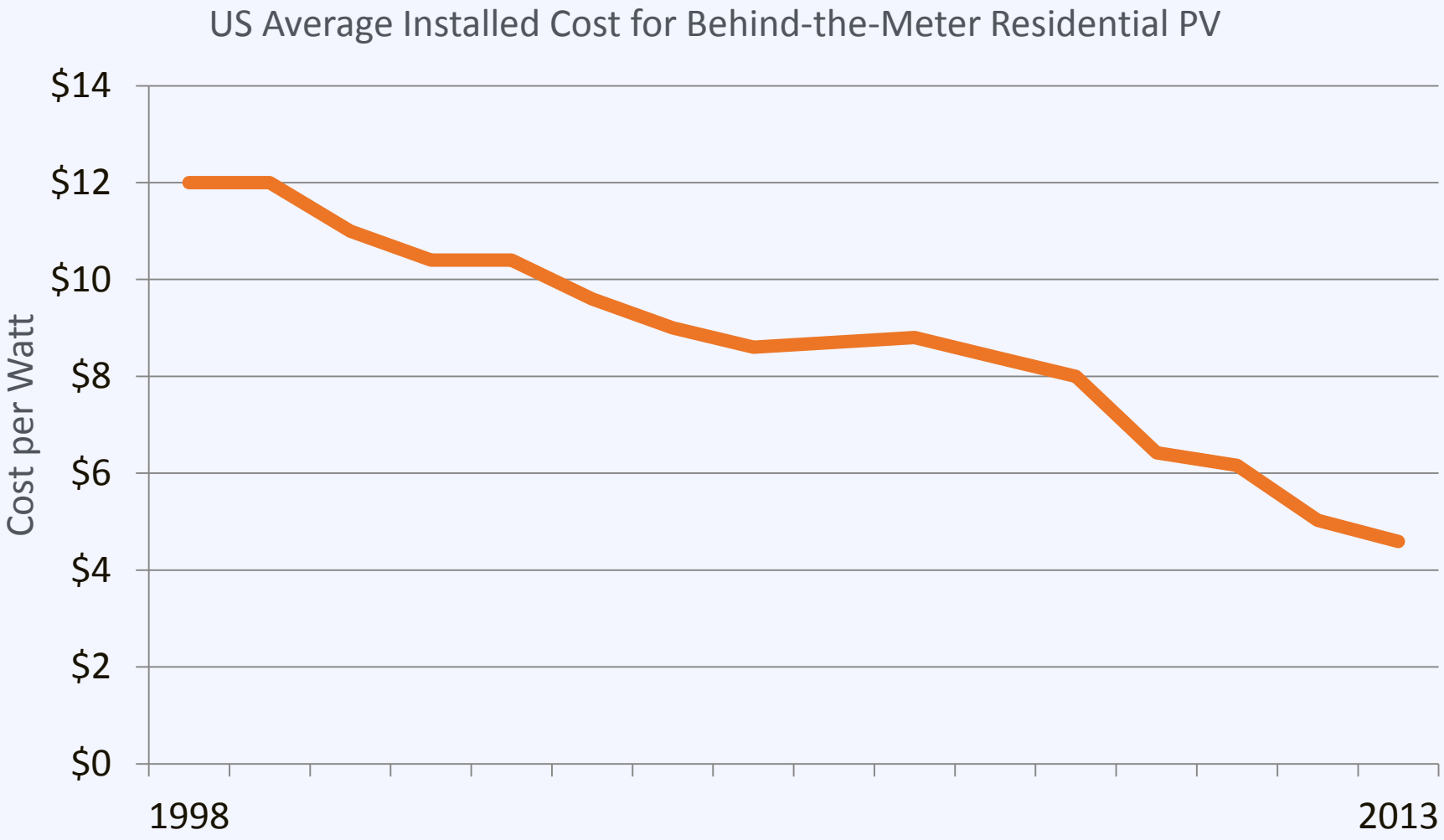
U.S. Department of Energy

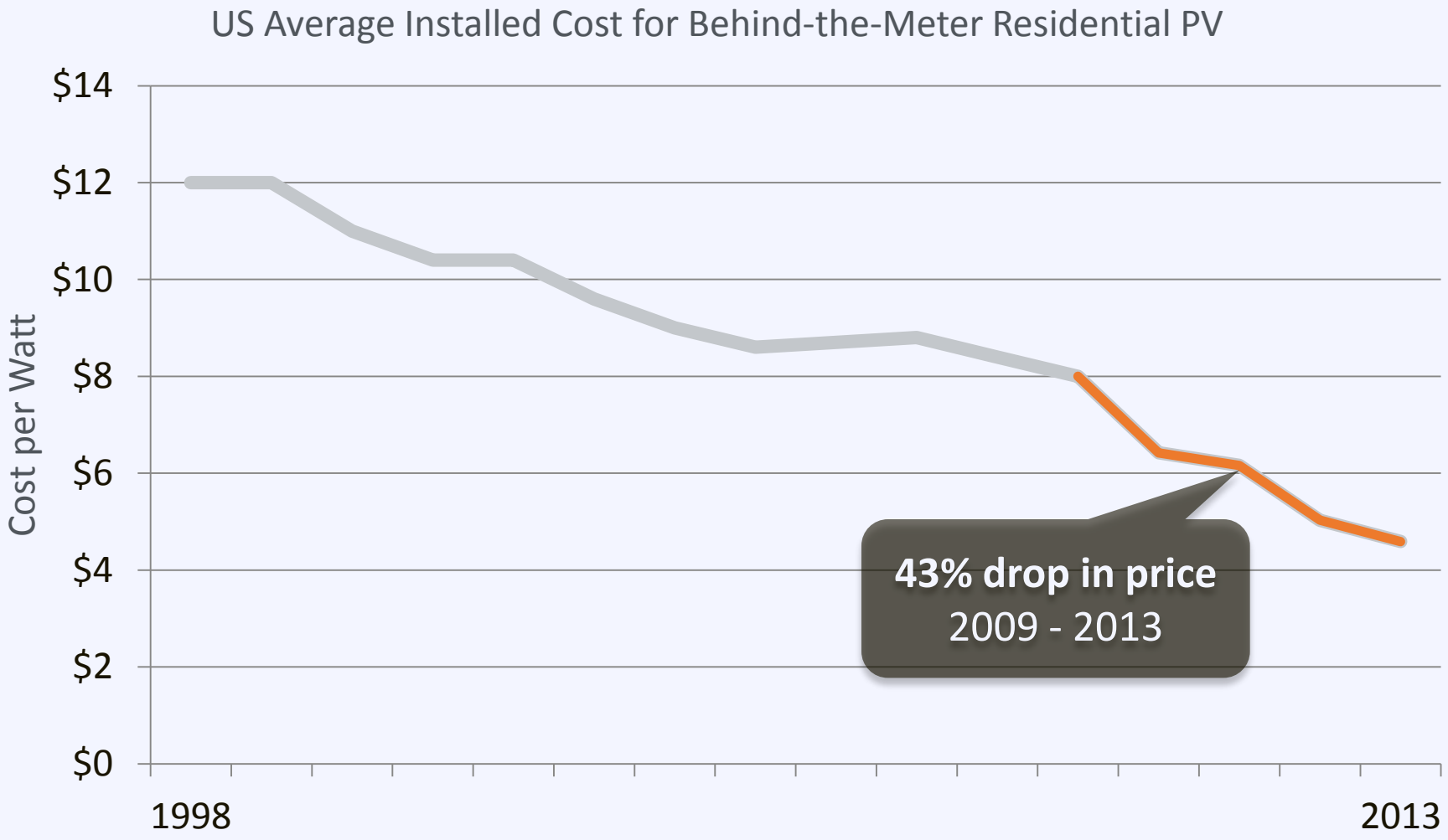
Source: GTM Research/ Solar Energy Industries Association, *U.S. Solar Market Insight 2013 Year-in-Review*

Solar Installed Costs



Tracking the Sun VI: The Installed Cost of Photovoltaics in the US from 1998-2012 (LBNL), SEIA/GTM Research *Solar Market Insight 2013 Year-in-Review.*

Solar Installed Costs



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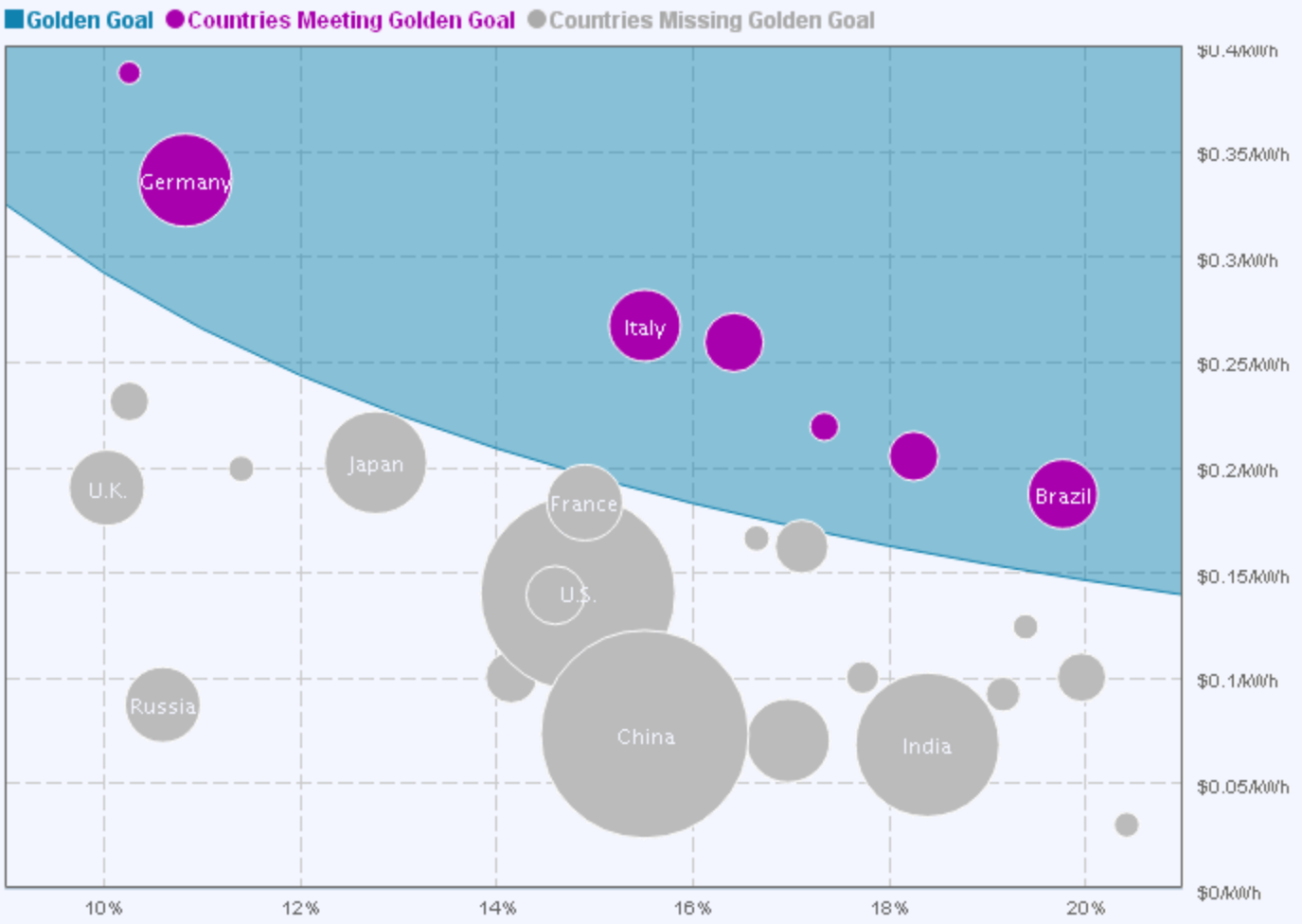
Projected Cost Competitiveness

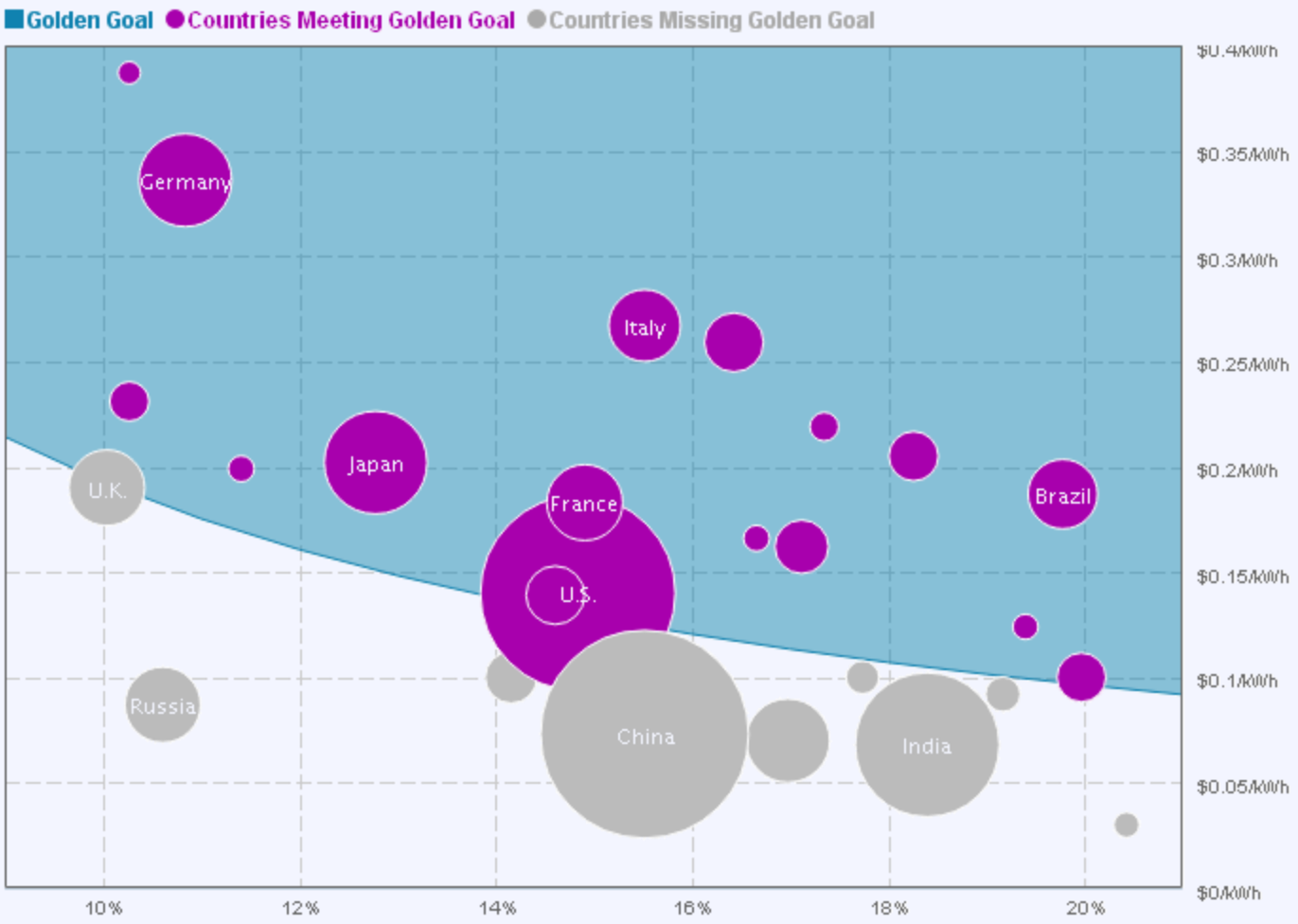
2012



Source: Bloomberg

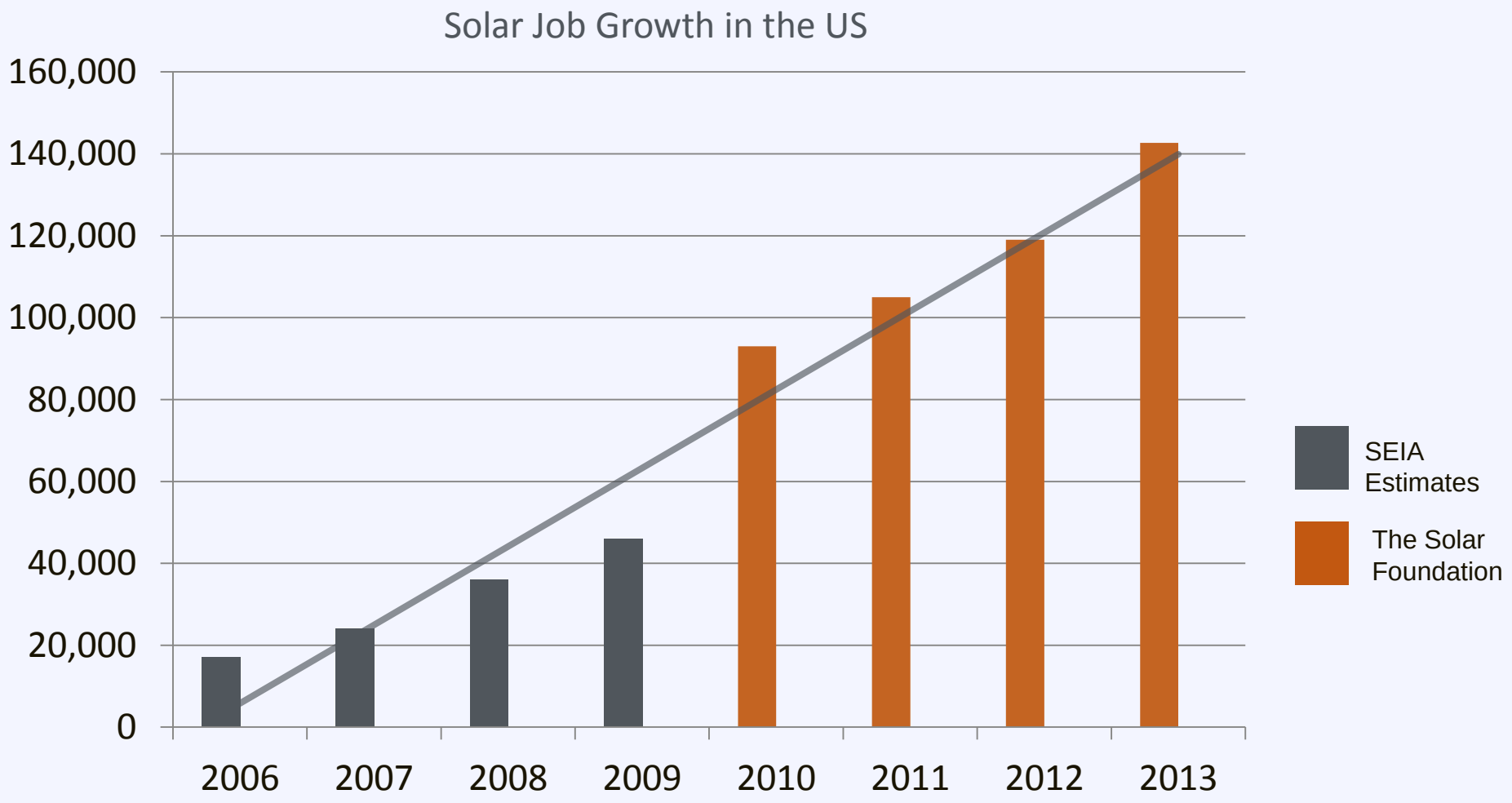
Projected Cost Competitiveness

2020



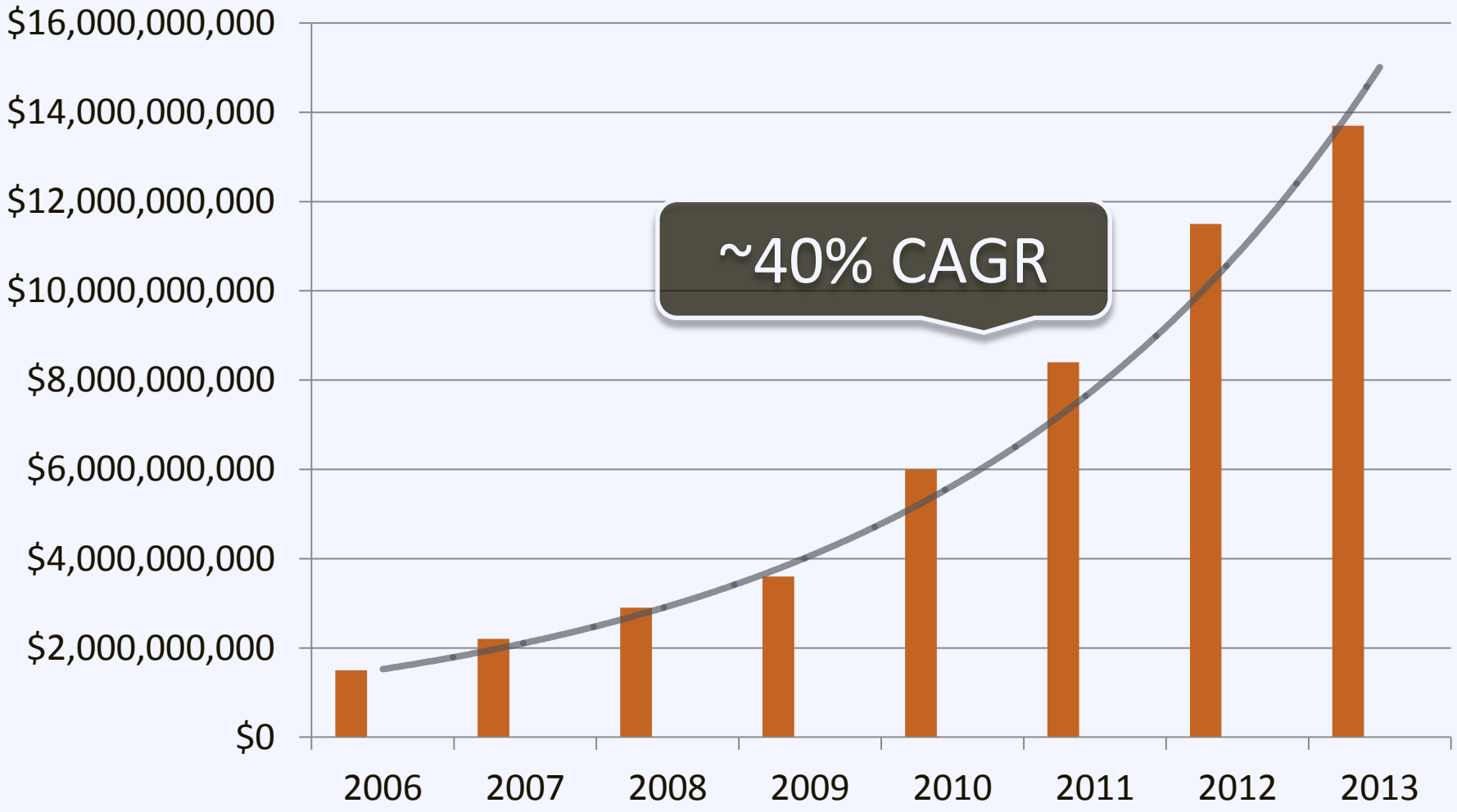
Source: Bloomberg

Solar Job Growth



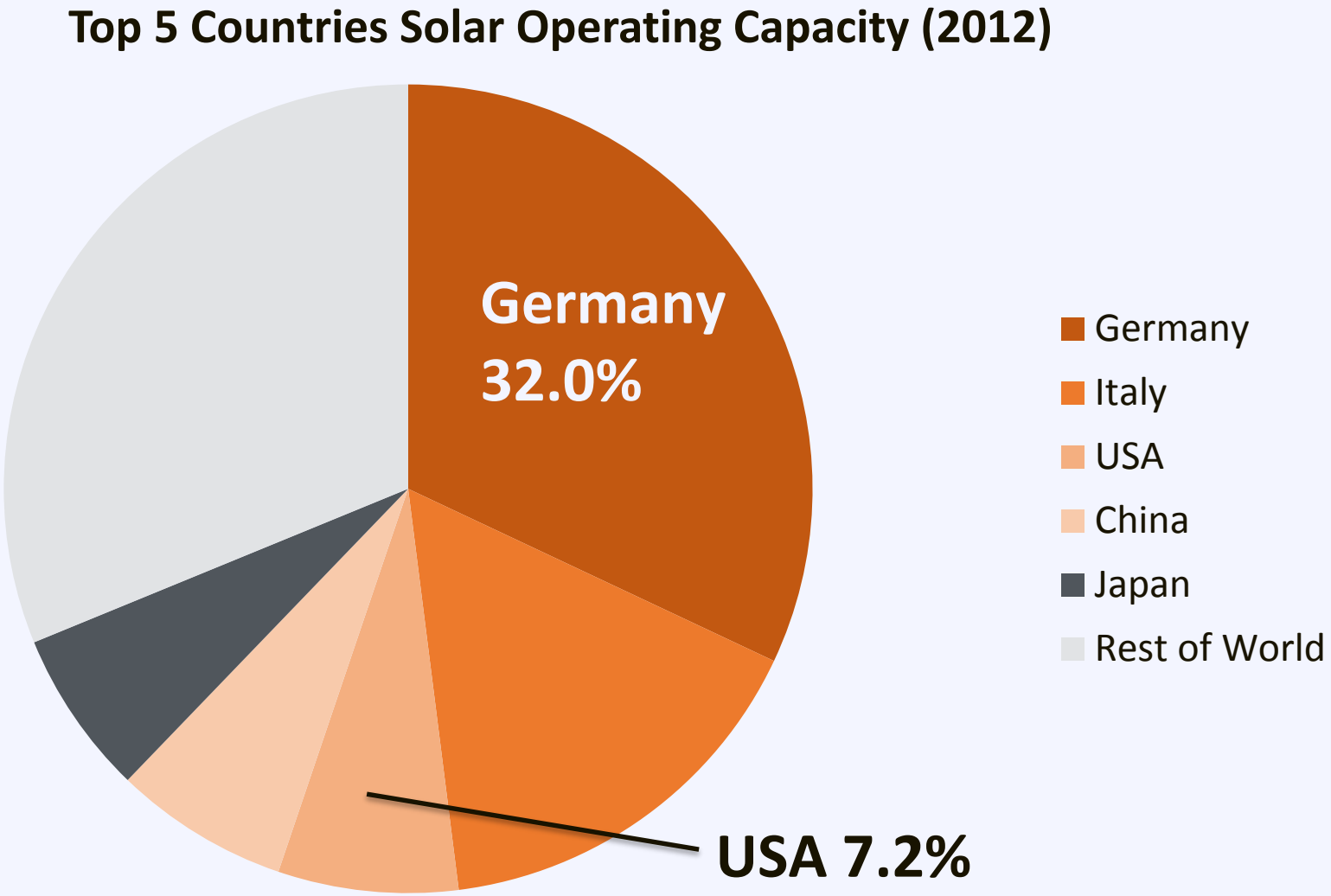
Source: SEIA Estimates (2006-2009), The Solar Foundation's National Solar Jobs Census 2010 (2010), The Solar Foundation's National Solar Jobs Census 2012 (2011-2012).

Solar Economic Growth



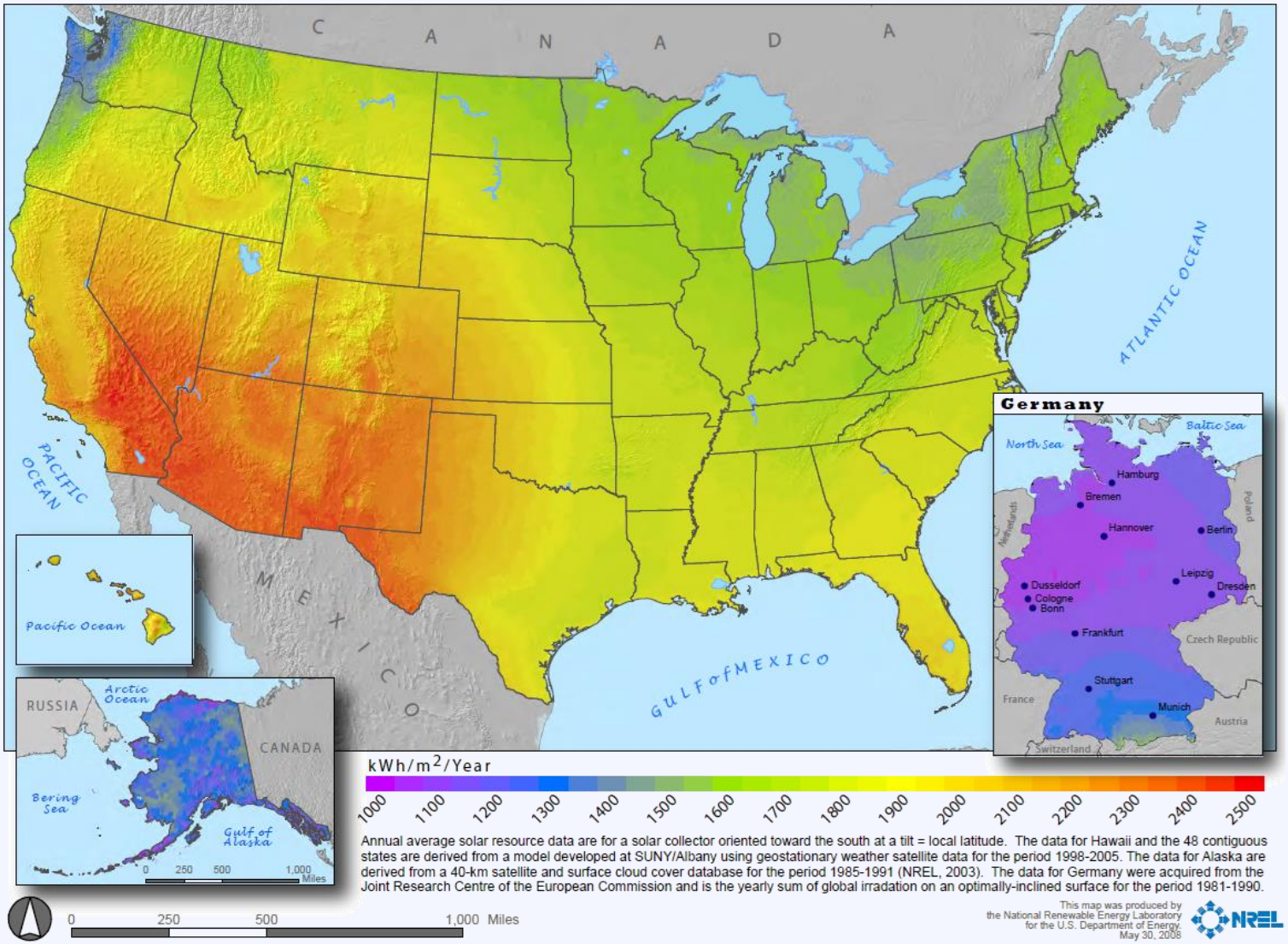
Source: SEIA/GTM Research – 2009/2010/2011/2012 Year in Review Report
http://www.seia.org/research-resources/us-solar-market-insight

Global Installed Capacity



Source: REN 21, Global Status Report 2013
(http://www.ren21.net/ren21activities/globalstatusreport.aspx)

US Solar Resource



Annual average solar resource data are for a solar collector oriented toward the south at a tilt = local latitude. The data for Hawaii and the 48 contiguous states are derived from a model developed at SUNY/Albany using geostationary weather satellite data for the period 1998-2005. The data for Alaska are derived from a 40-km satellite and surface cloud cover database for the period 1985-1991 (NREL, 2003). The data for Germany were acquired from the Joint Research Centre of the European Commission and is the yearly sum of global irradiation on an optimally-inclined surface for the period 1981-1990.

This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy. May 30, 2008

NREL

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Source: National Renewable Energy Laboratory

Installed Capacity

Total US cumulative installed solar capacity **13.0 GW**

German solar capacity additions (2011-2013) **11.8 GW**

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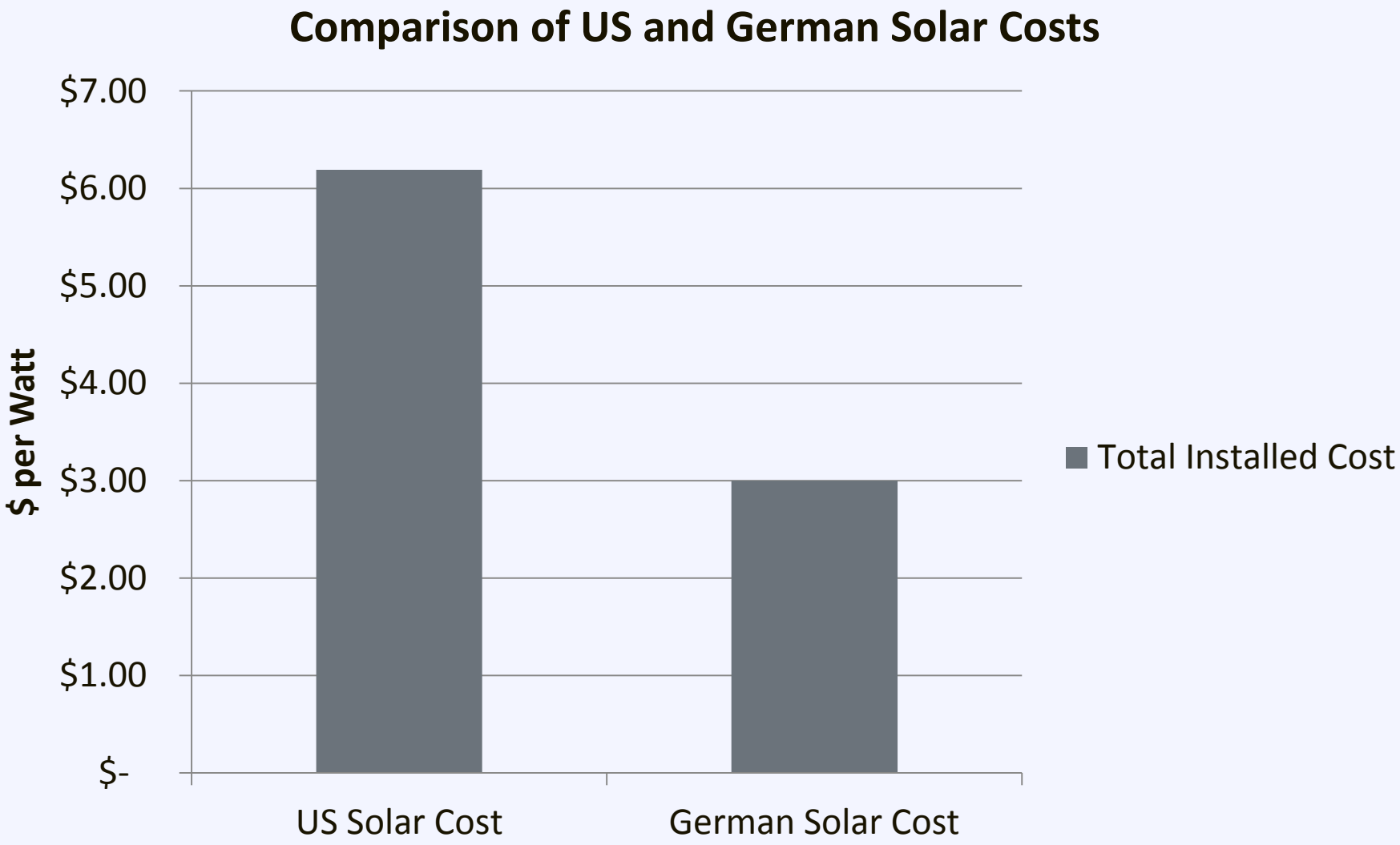
Source: (1) GTM Research/ Solar Energy Industries Association. *U.S. Solar Market Insight Report 2013 Year-in-Review*; (2) http://www.erneuerbare-energien.de/fileadmin/Daten_EE/Dokumente__PDFs_/ee_energiedaten_agee_stat.pdf ; GTM Research/ Solar Energy Industries Association. *U.S. Solar Market Insight Report Q3 2013*

The Cost of Solar in the US



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Source: NREL (http://ases.conference-services.net/resources/252/2859/pdf/SOLAR2012_0599_full%20paper.pdf) (http://www.nrel.gov/docs/fy12osti/53347.pdf) (http://www.nrel.gov/docs/fy12osti/54689.pdf)

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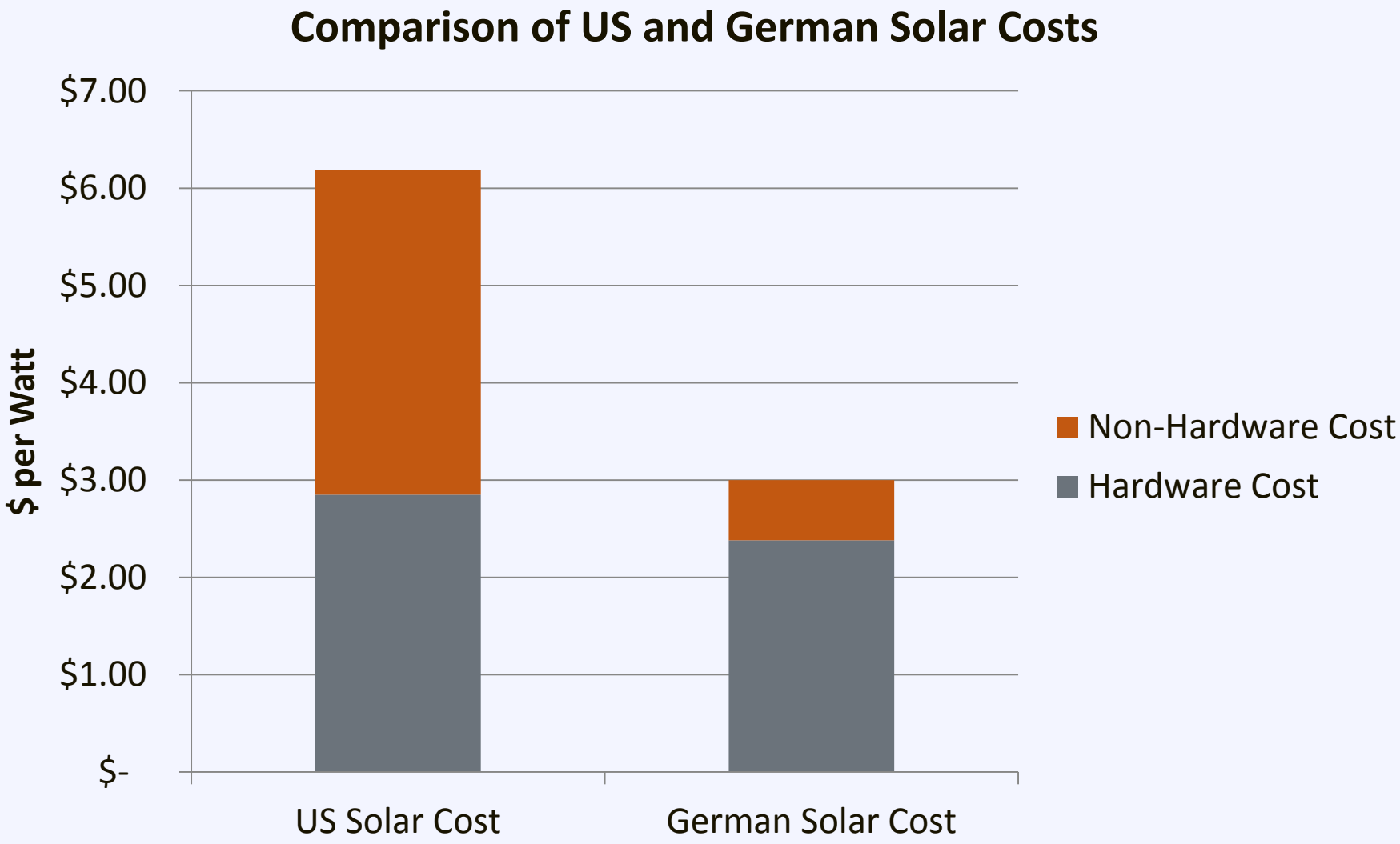

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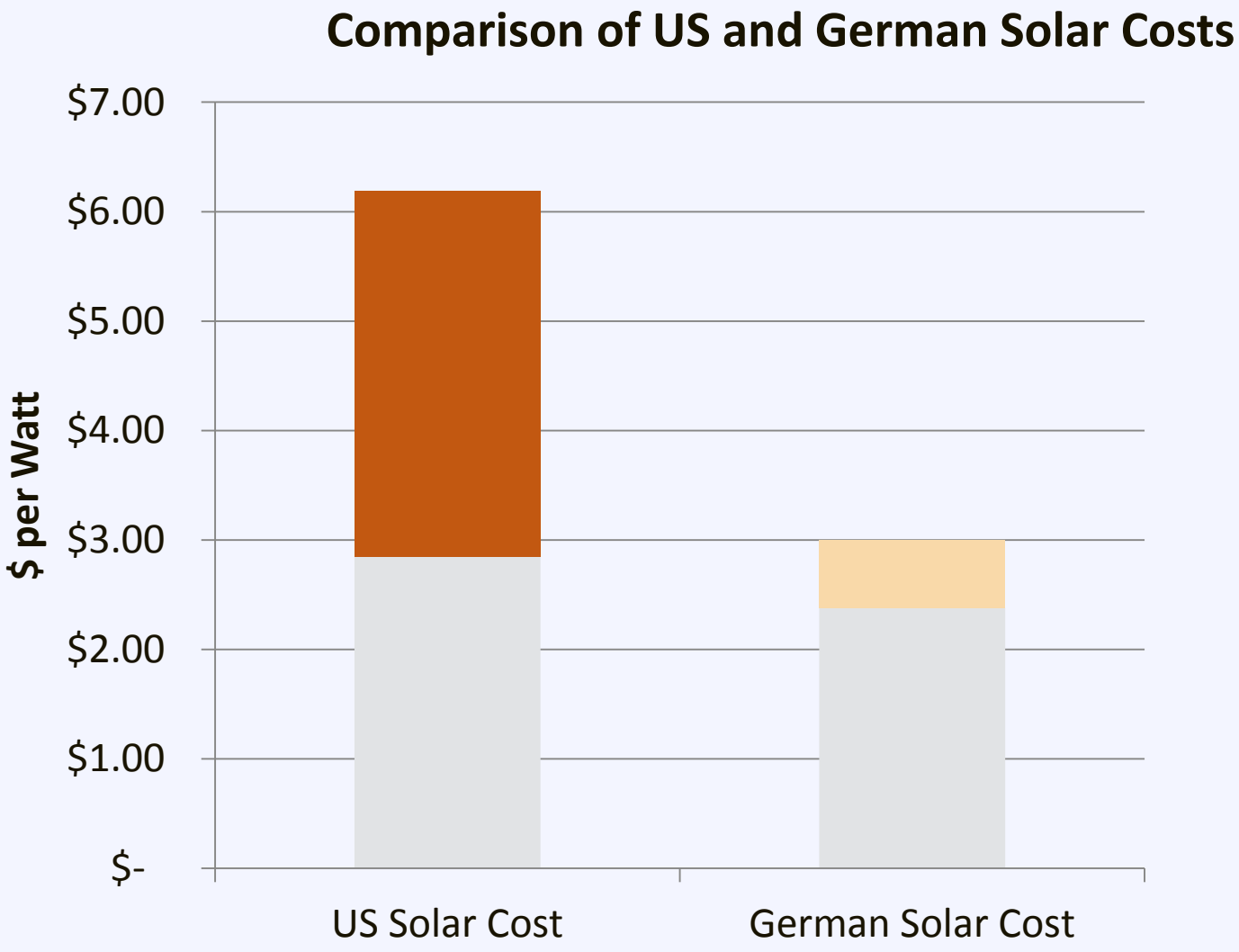

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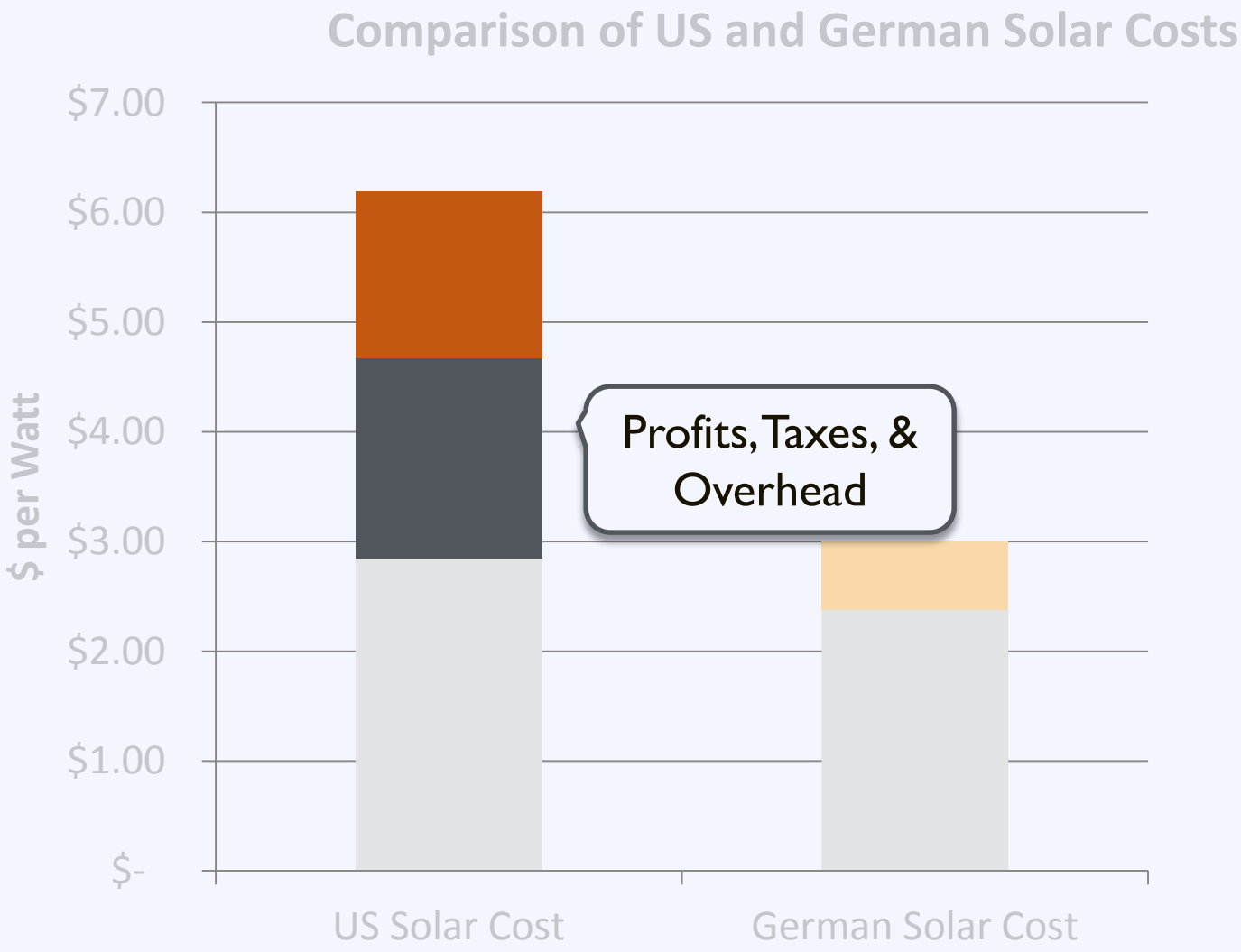

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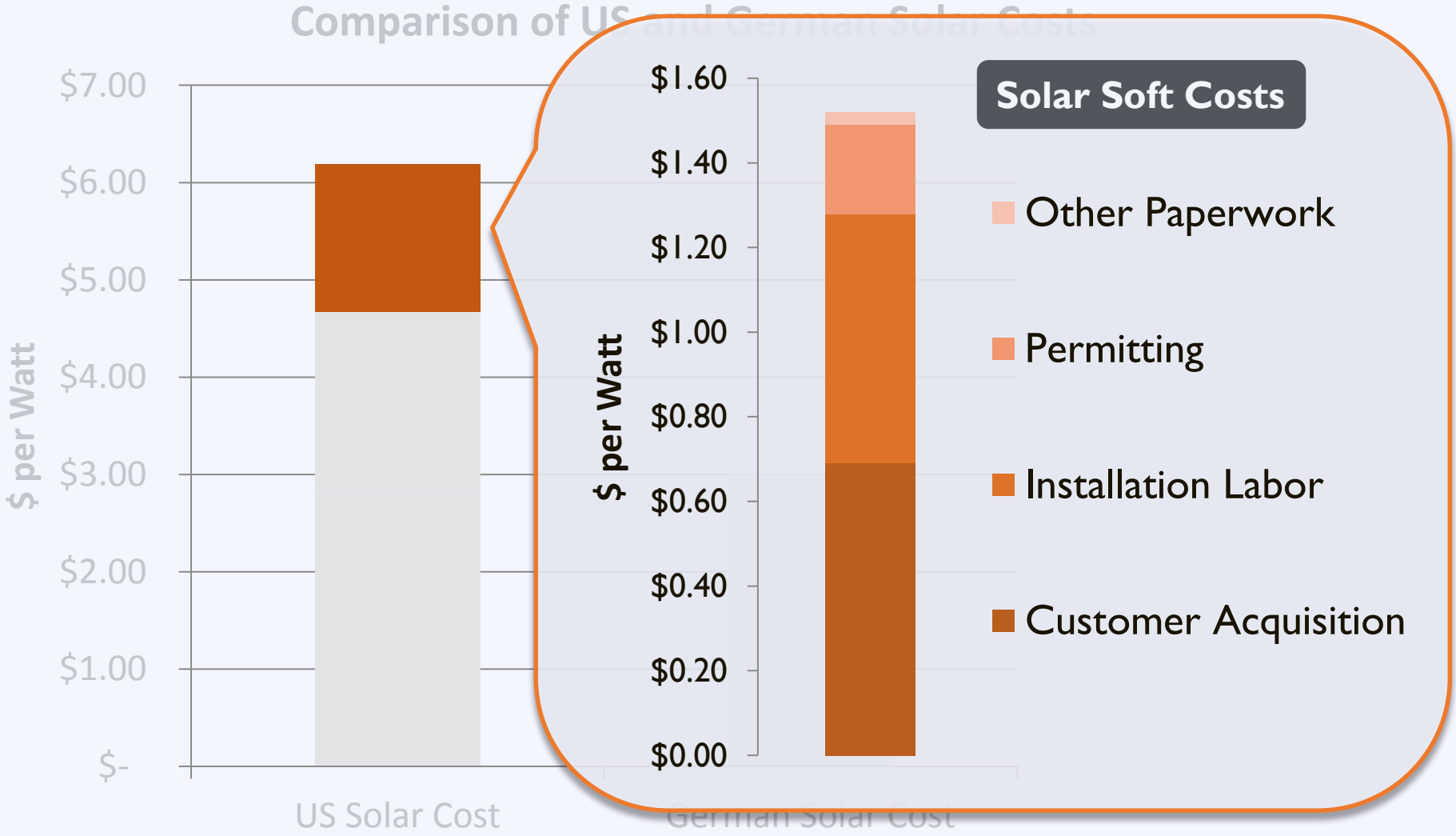

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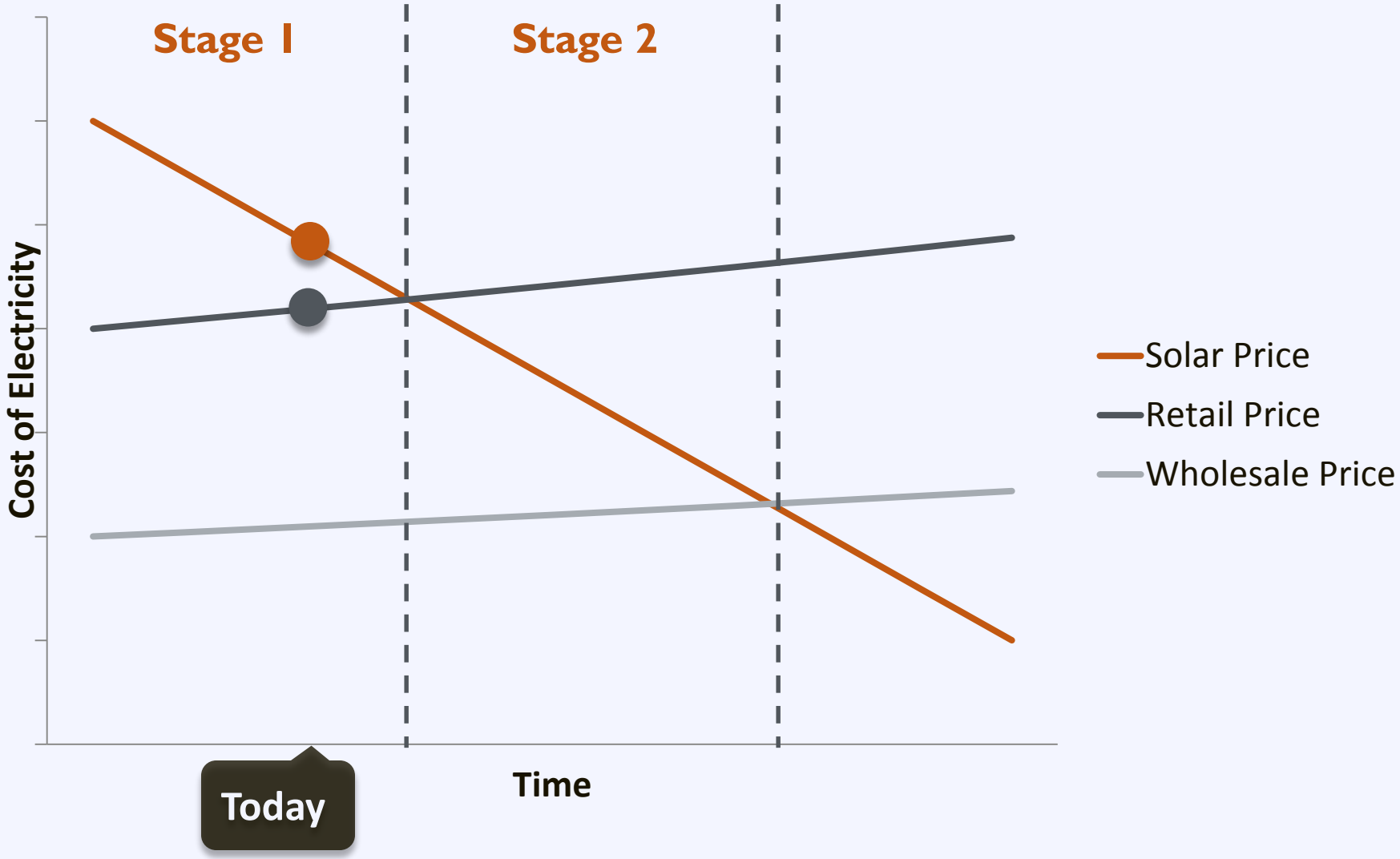
Workshop Goal

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

Solar Market: Trends



Source: Solar Electric Power Association

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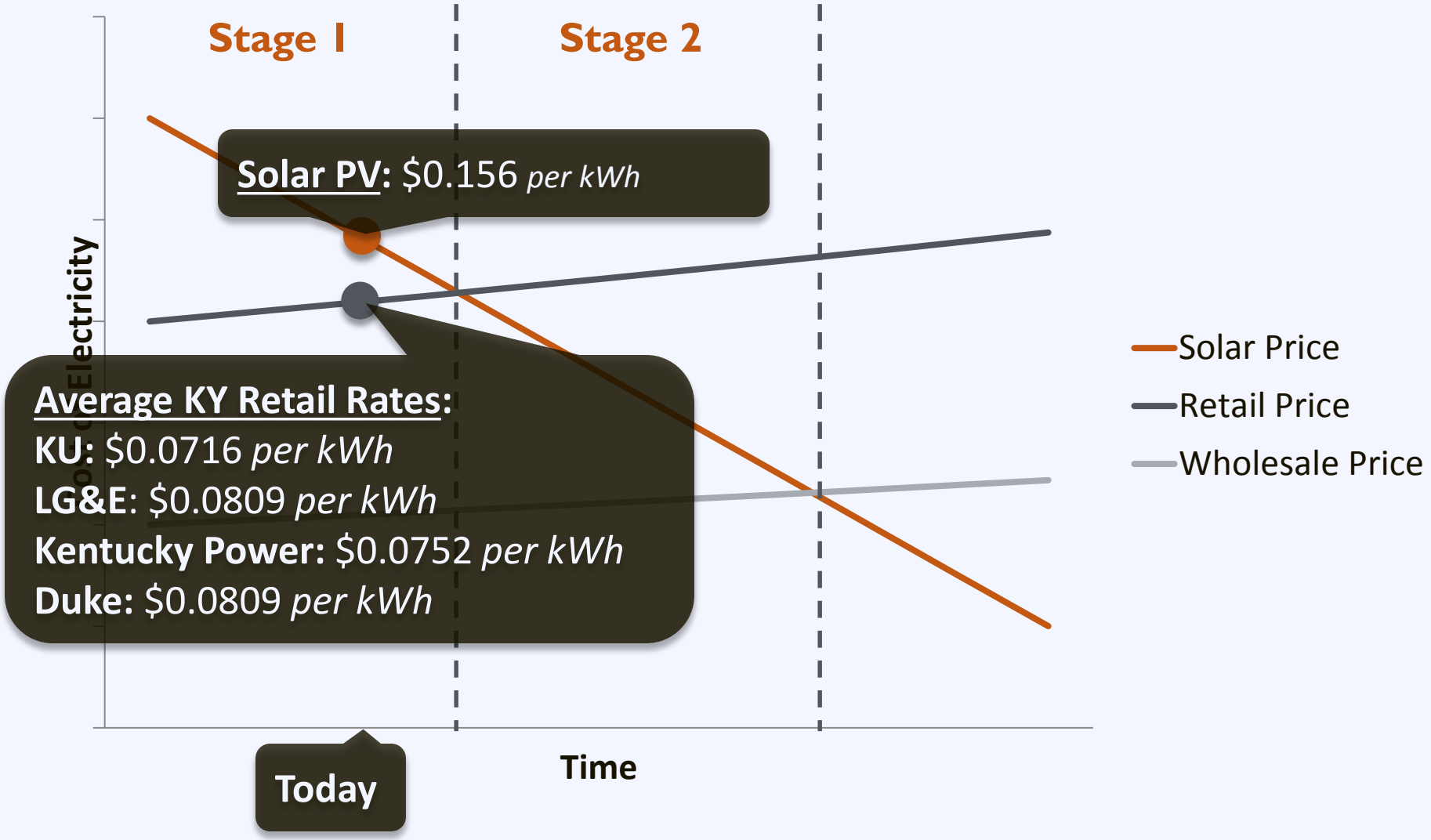
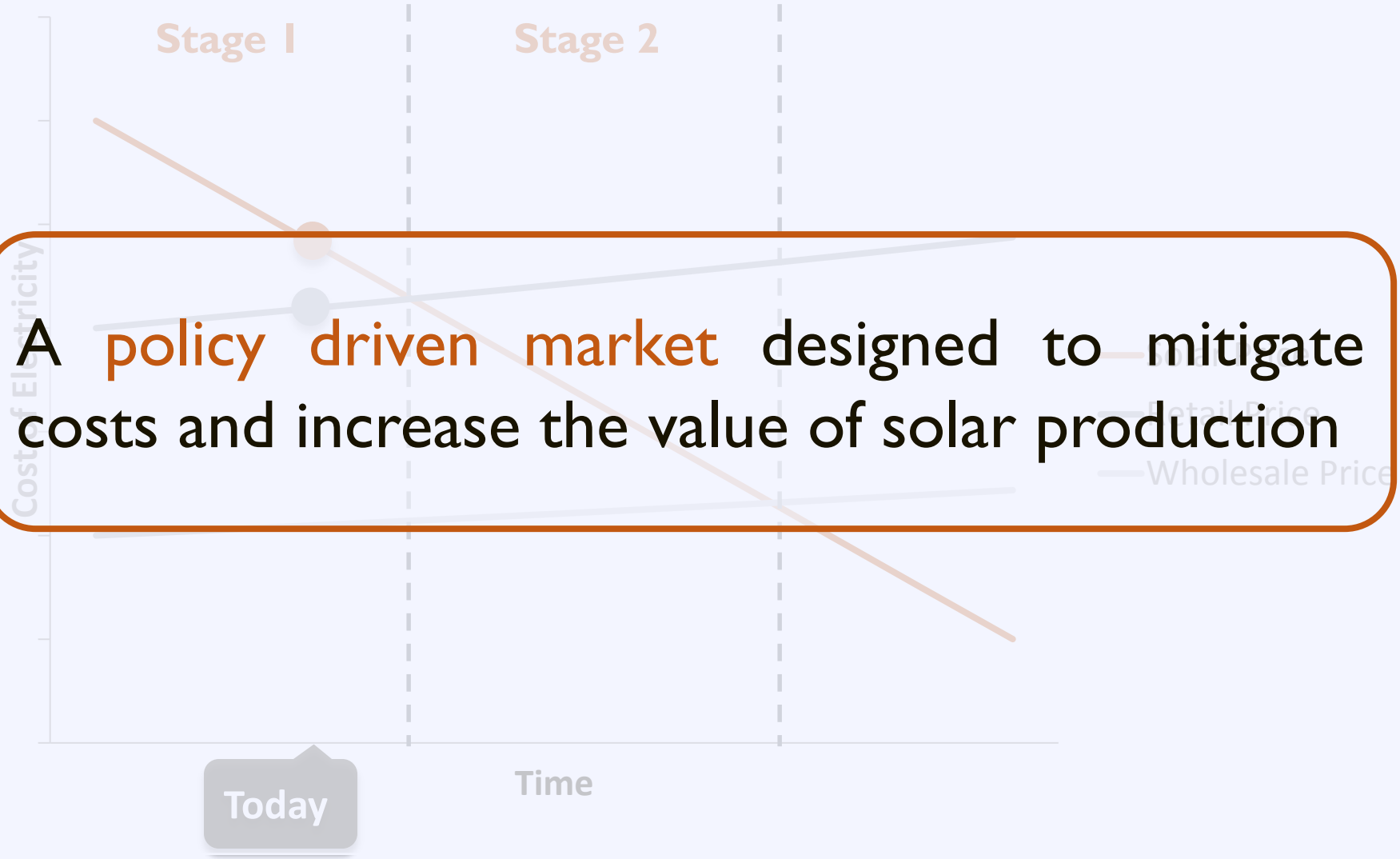


Source: Solar Electric Power Association; U.S. Energy Information Administration (Nov 2013)

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
	Permitting & Interconnection	Tax Credits & Exemptions	Direct Cash & Performance Incentives
Local	Property Assessed Clean Energy	Solarize	

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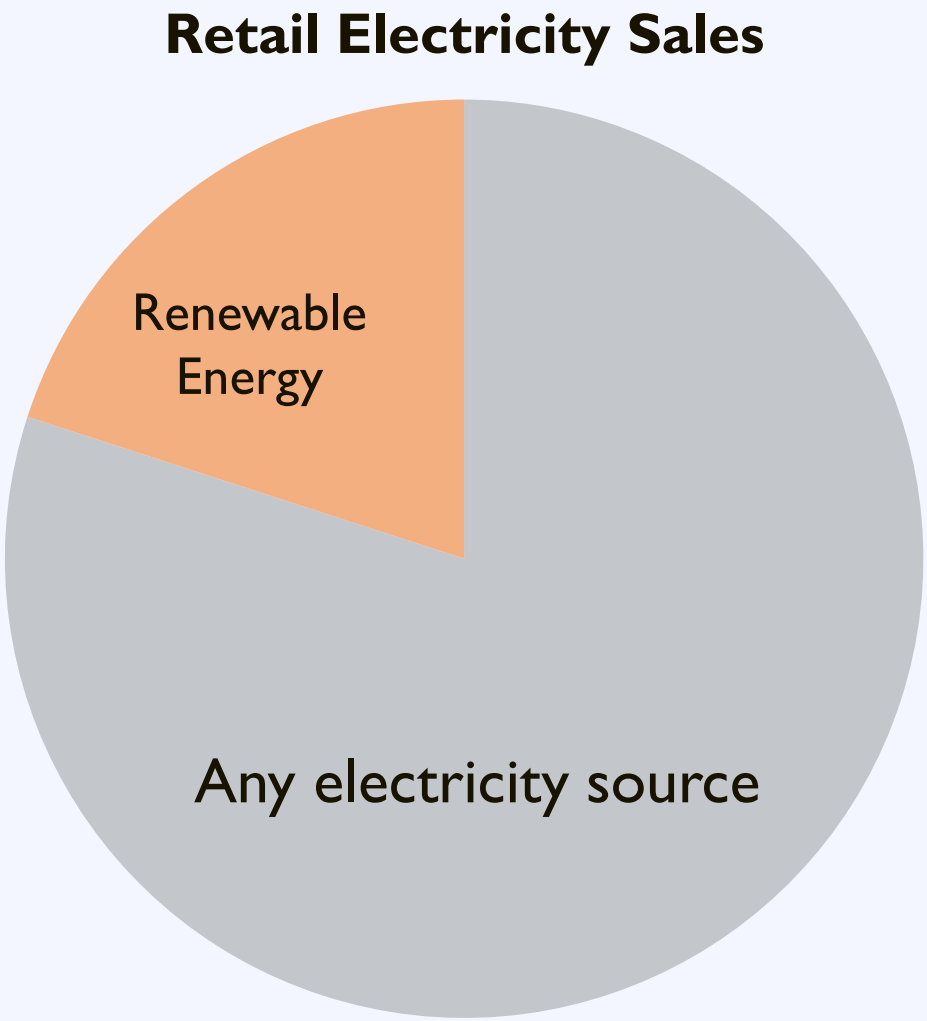
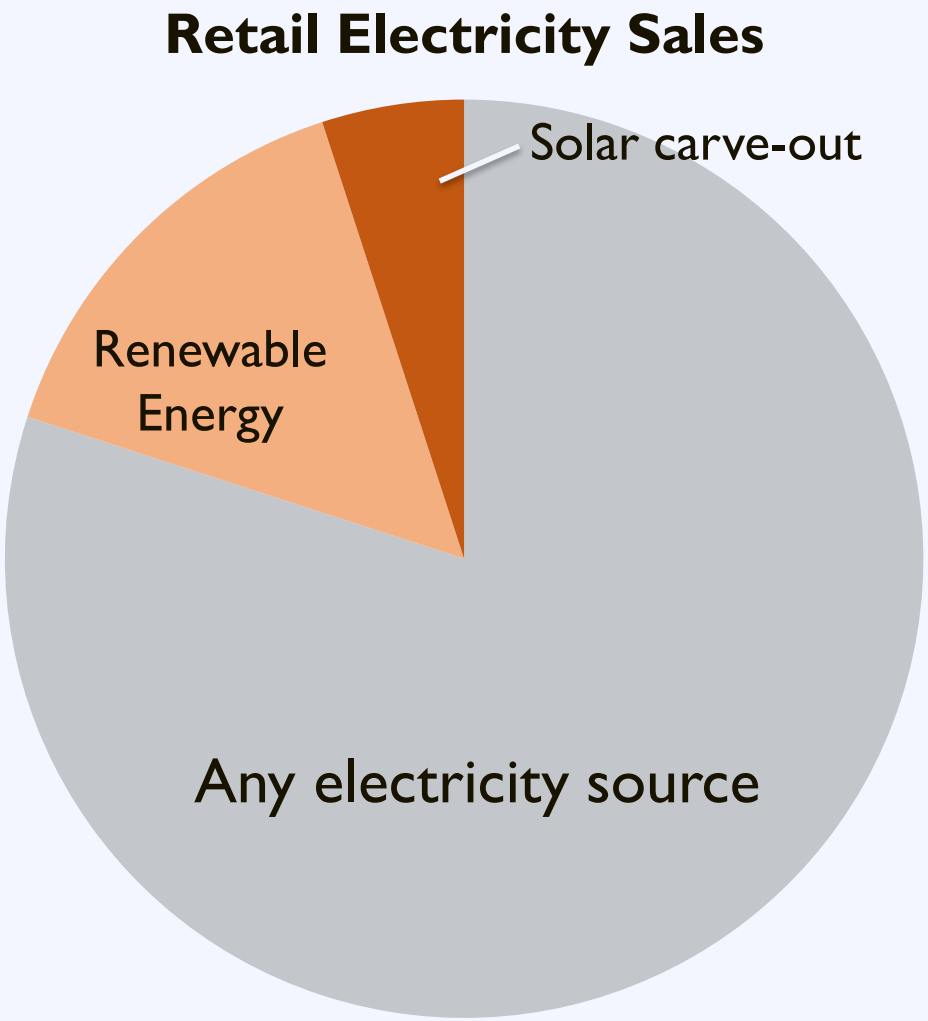
Renewable Portfolio Standard

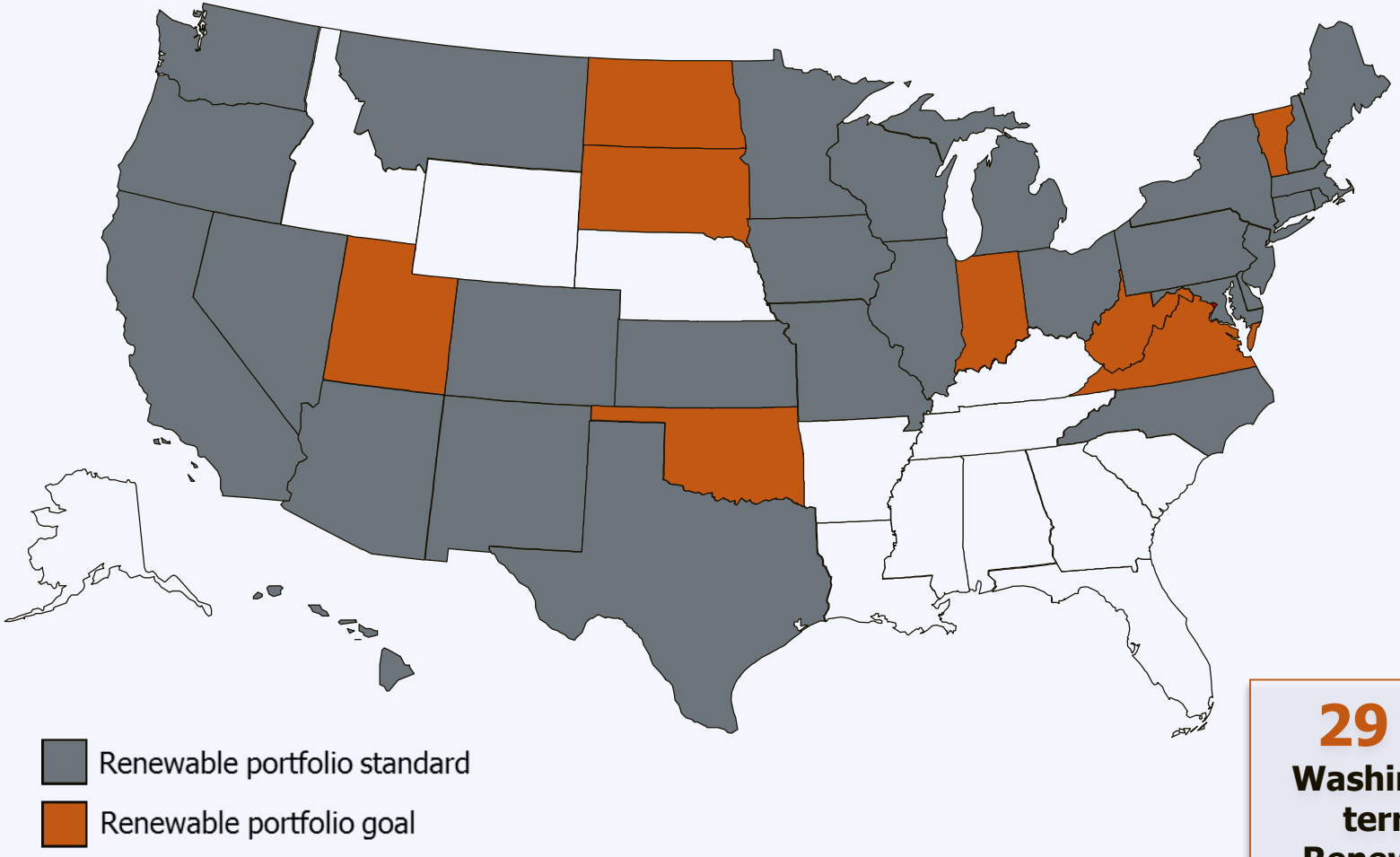


Renewable Portfolio Standard



Renewable Portfolio Standard

www.dsireusa.org / August 2012



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

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U.S. Department of Energy

RPS Impacts: Solar Deployment

RPS and Solar/DG Status of Top Ten Solar States by Cumulative Installed 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	Nevada	Y	Y
6	Massachusetts	Y	Y
7	Hawaii	Y	N
8	Colorado	Y	Y
9	New York	Y	Y
10	New Mexico	Y	Y

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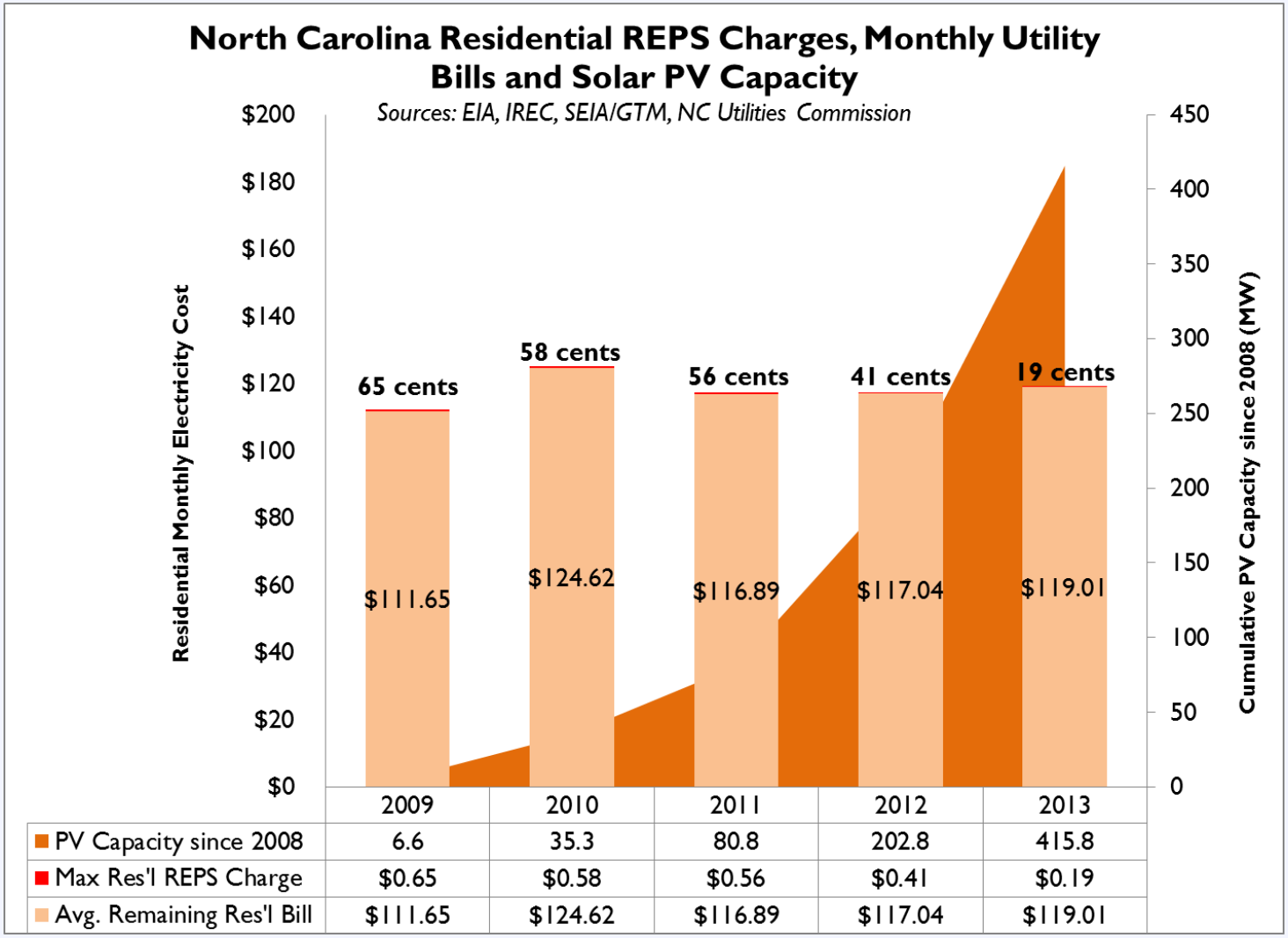
Source: DSIRE Solar (http://dsireusa.org/documents/summarymaps/Solar_DG_RPS_map.pdf); Solar Energy Industries Association/ GTM Research *Solar Market Insight 2012 Year-in-Review*

RPS Impacts: Retail Rates



Source: Various (U.S. Energy Information Administration, Interstate Renewable Energy Council, SEIA/GTM Research, NC Utilities Commission). Links available on request.

A Policy Driven Market

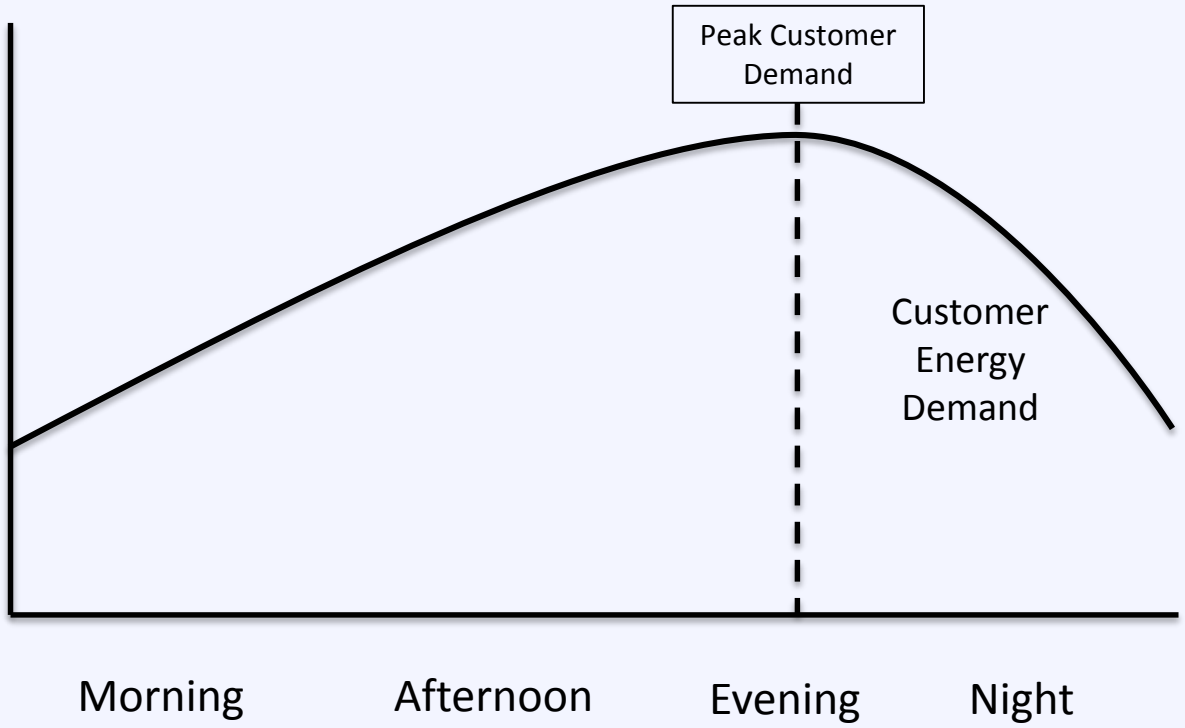
Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering/ Interconnection	Solar Access
	Permitting & Interconnection	Tax Credits & Exemptions	Direct Cash & Performance Incentives
Local	Property Assessed Clean Energy	Solarize	

Net Metering

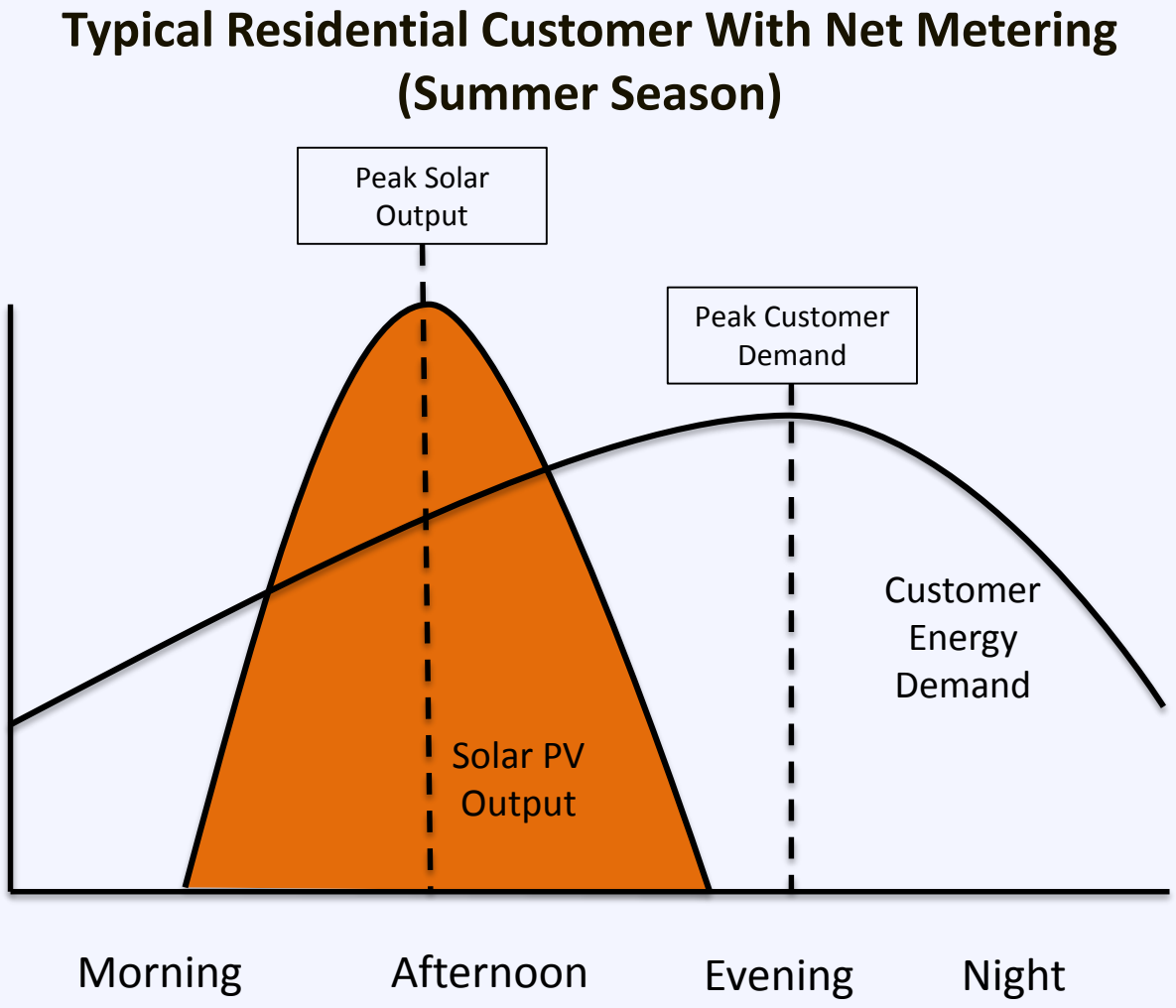
Net metering allows customers to export power to the grid during times of excess generation, and receive credits that can be applied to later electricity usage.

Net Metering

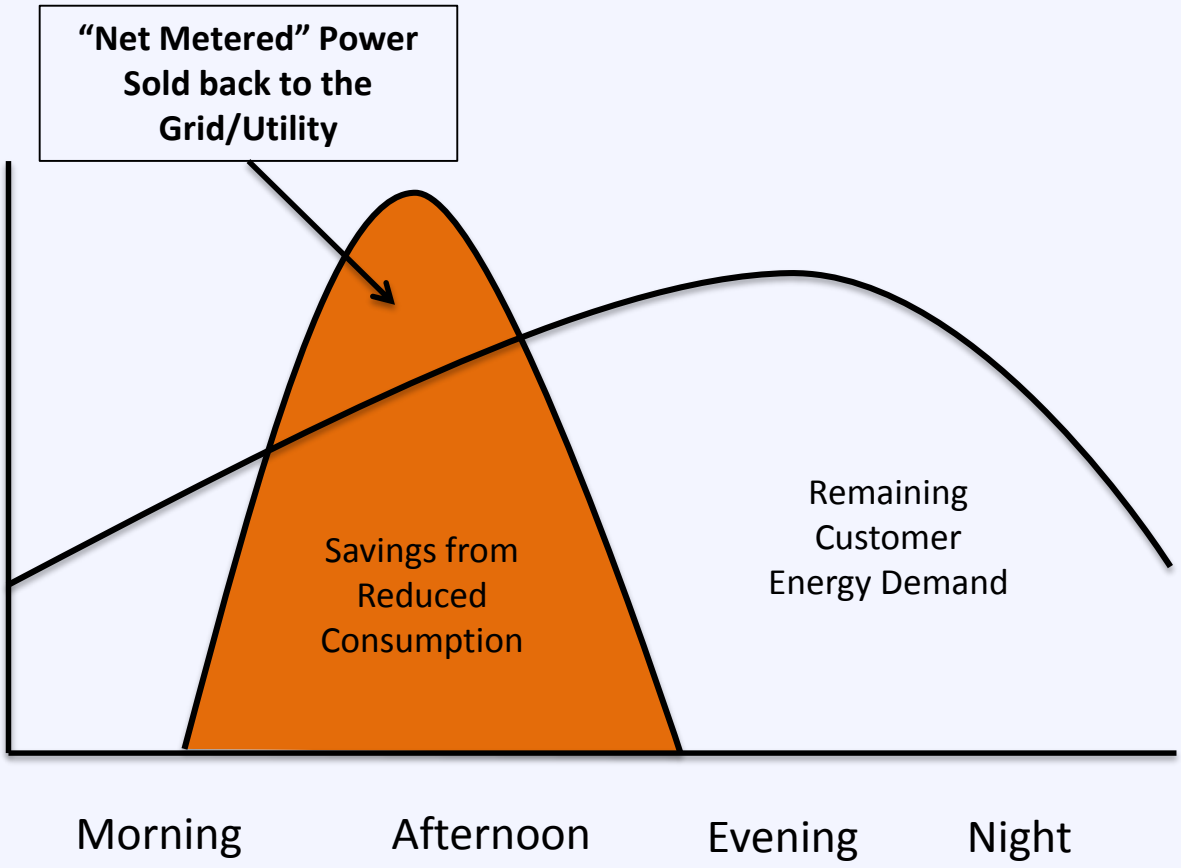
Typical Residential Customer With Net Metering (Summer Season)



Net Metering



Net Metering



The Result: Solar covers most (or all) of a customer's bill, even at night!

Net Metering: Market Share

More than **93%** of distributed PV Installations are net-metered

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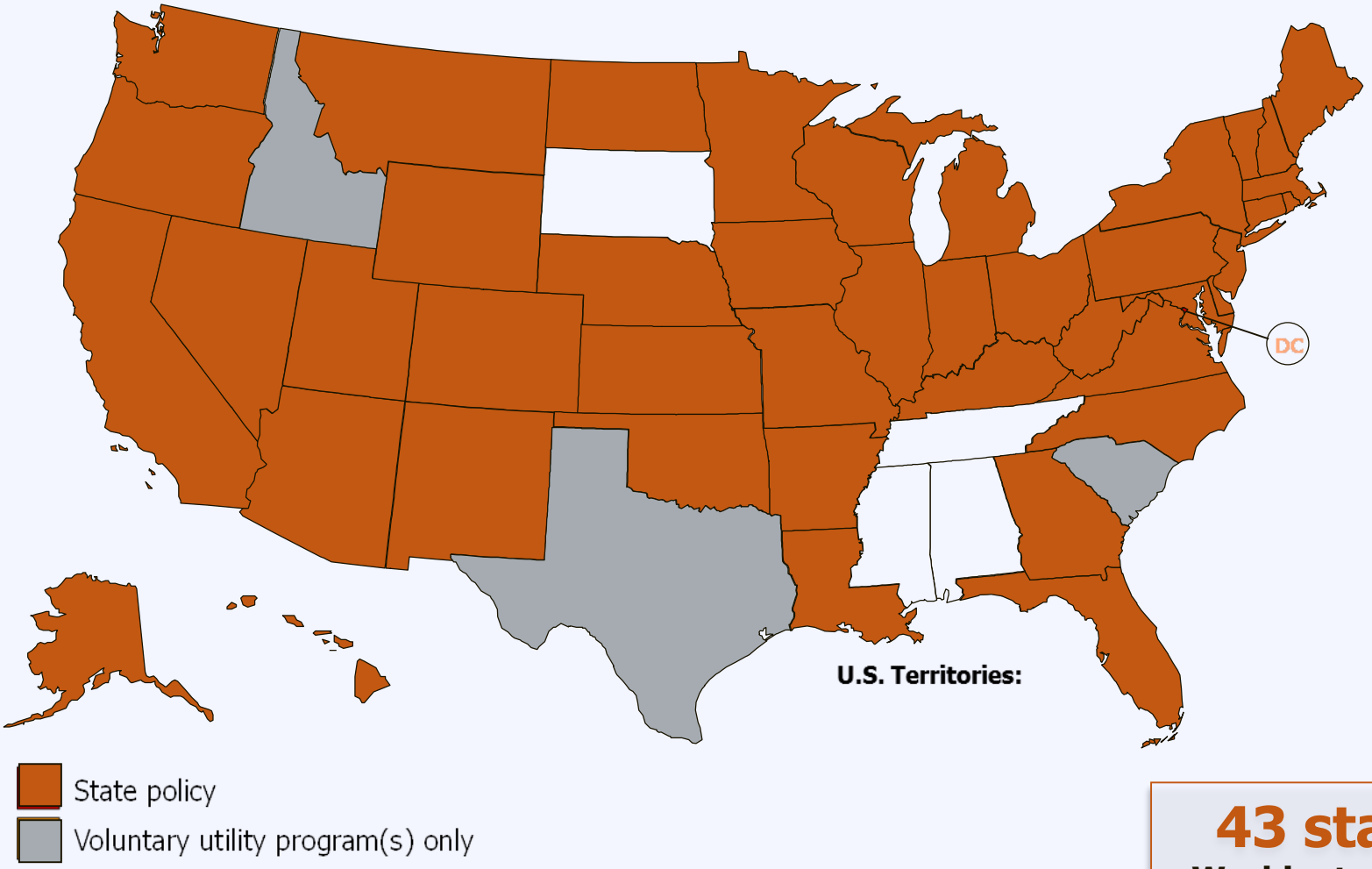
Source: IREC (http://www.irecusa.org/wp-content/uploads/IRECSolarMarketTrends-2012-web.pdf)

Net Metering



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

Source: DSIRE (July 2013)

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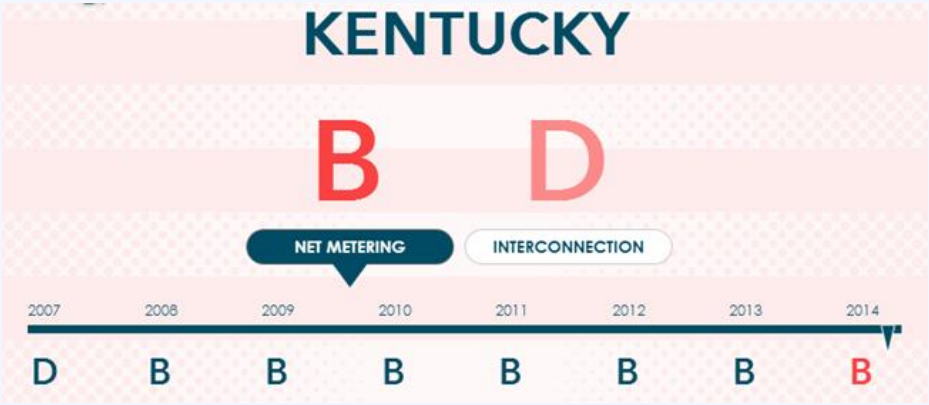
Net Metering: Kentucky



Kentucky Net Metering Policy:

Credit Value
Retail Rate

Credit Rollover
Unlimited

System Capacity Limit
30 kW

Aggregate Limit
1% of previous year utility peak load (kW)

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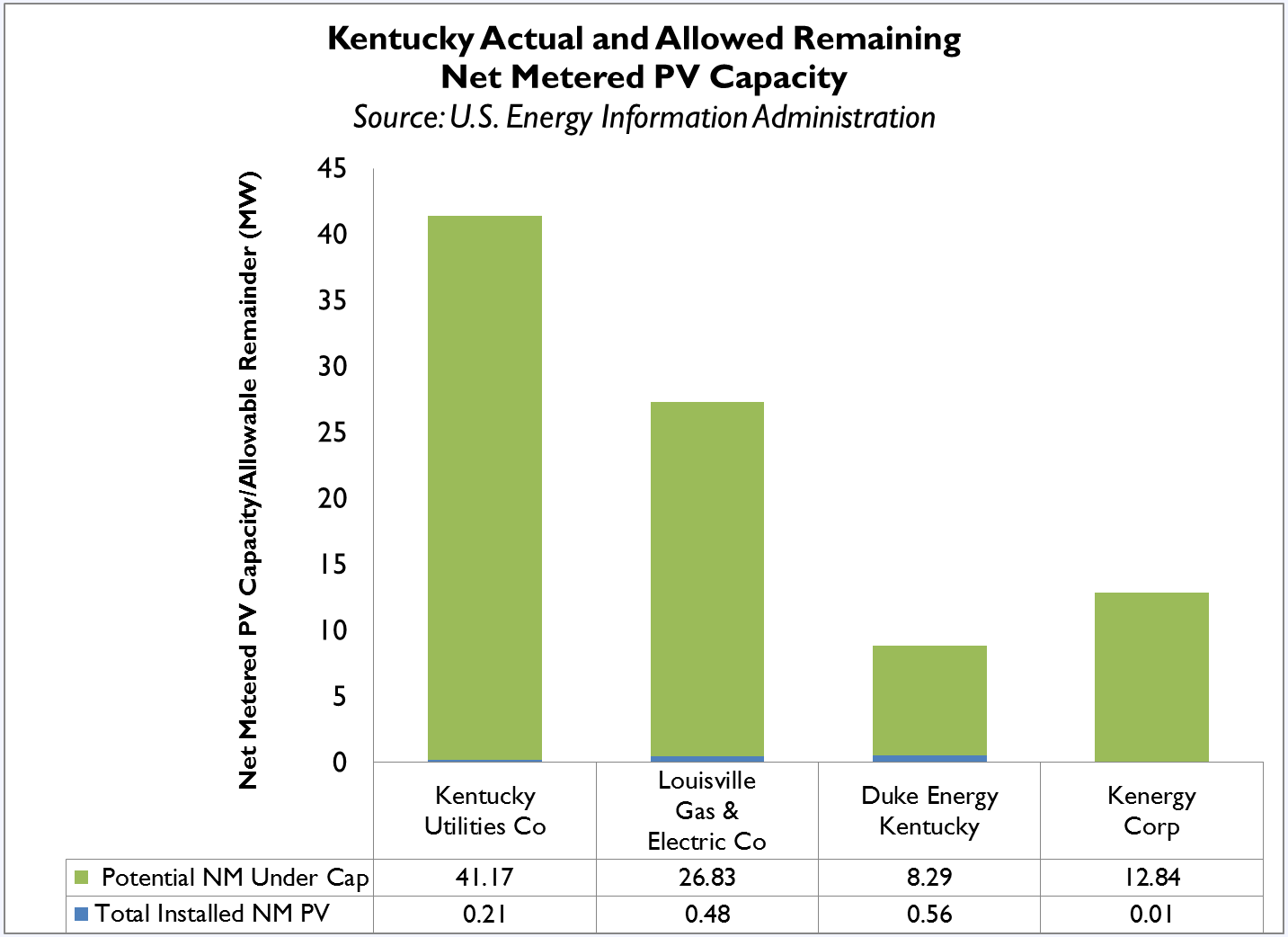
U.S. Department of Energy

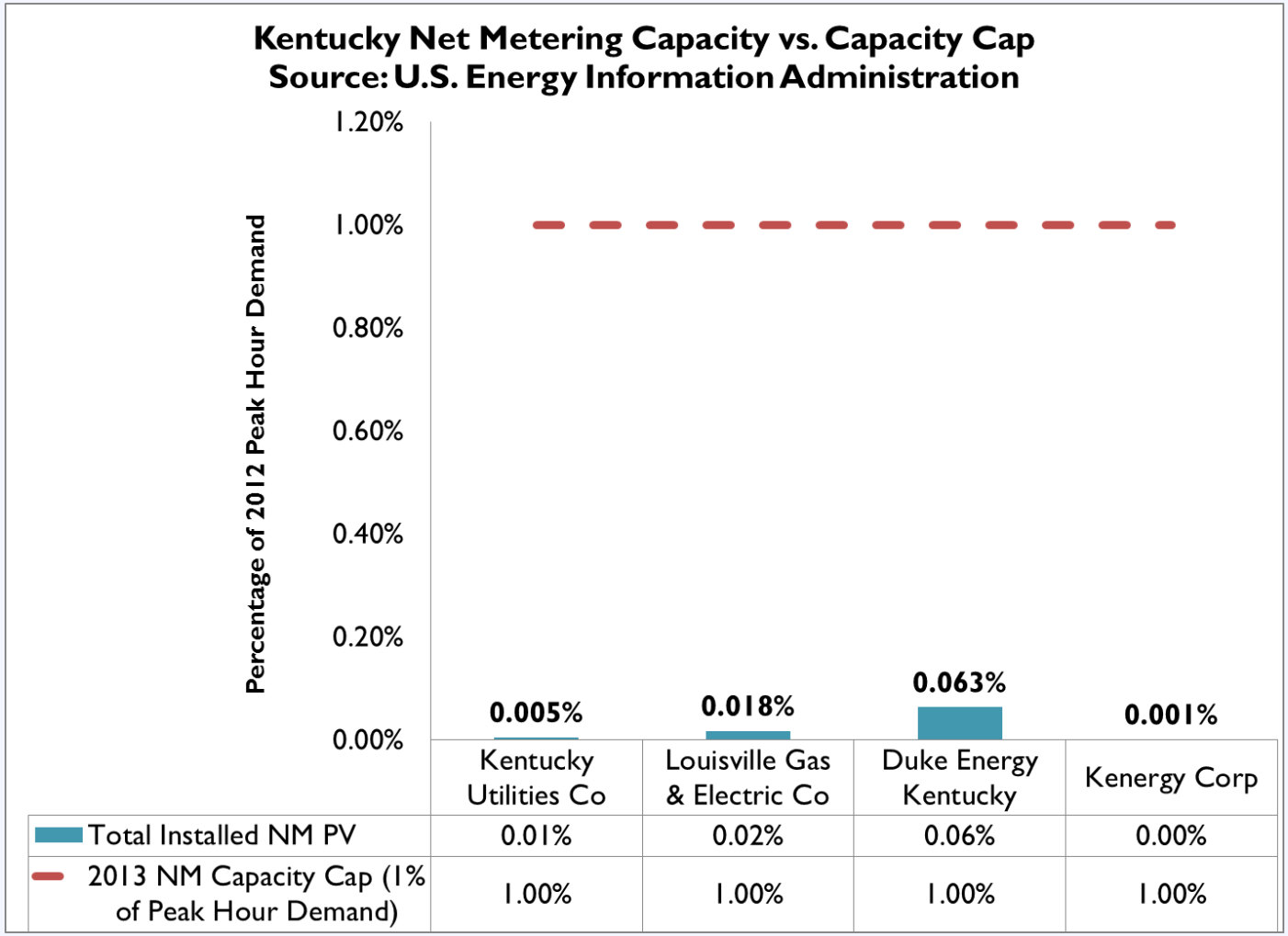
Source: Freeing the Grid

Net Metering: Current Status in Kentucky



Source: EIA Forms 826 and 861

Net Metering: Current Status in Kentucky



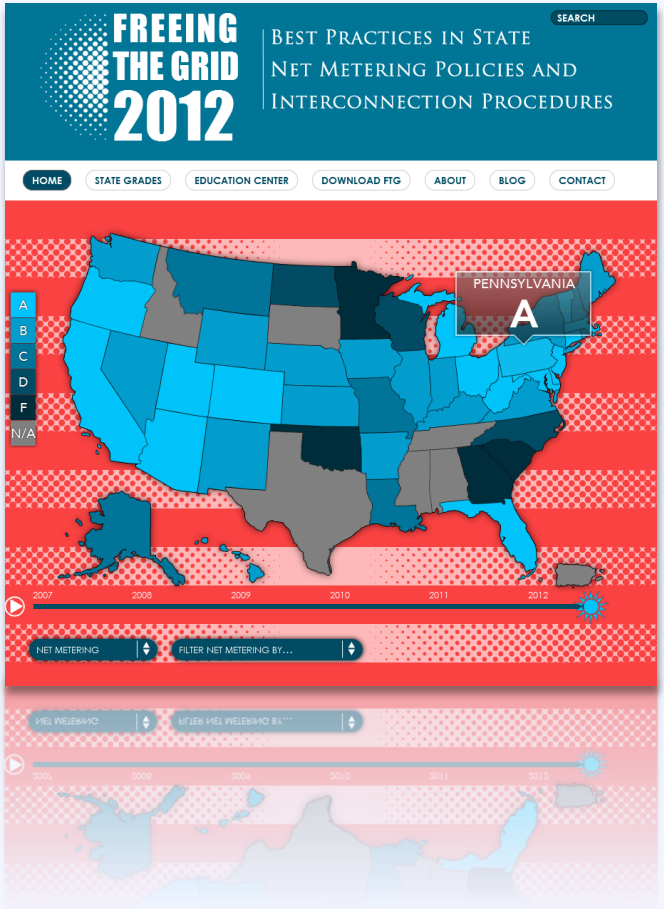
Source: EIA Forms 826 and 861

Net Metering: Resources

Resource **Freeing the Grid**

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

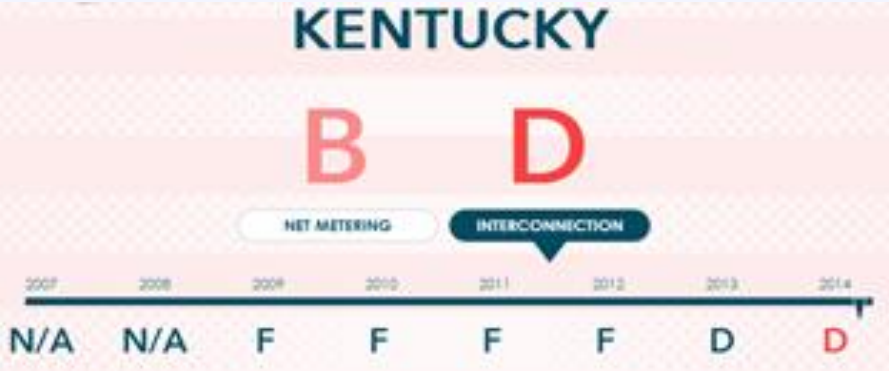
http://freeingthegrid.org/



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: Kentucky



Kentucky Interconnection Policy:

Applicable Technologies
PV, Wind, Biomass, Small Hydro

Applicable Utilities/ Customer Classes
All

System Capacity Limit
30 kW for Level 1 Scrutiny

External Disconnect Switch Requirement
Yes

Powered by SunShot U.S. Department of Energy

Source: Freeing the Grid

Interconnection: Situation and Recent Developments

- KY interconnection breakpoint at 30kW a significant barrier to development of commercial/utility-scale market.
- Federal level
  - Federal Energy Regulatory Commission (FERC) reissued its Small Generator Interconnection Procedures (SGIP) to permit greater streamlining and more rapid interconnection approvals
  - New SGIP has led Ohio to consider more streamlined interconnection procedures.

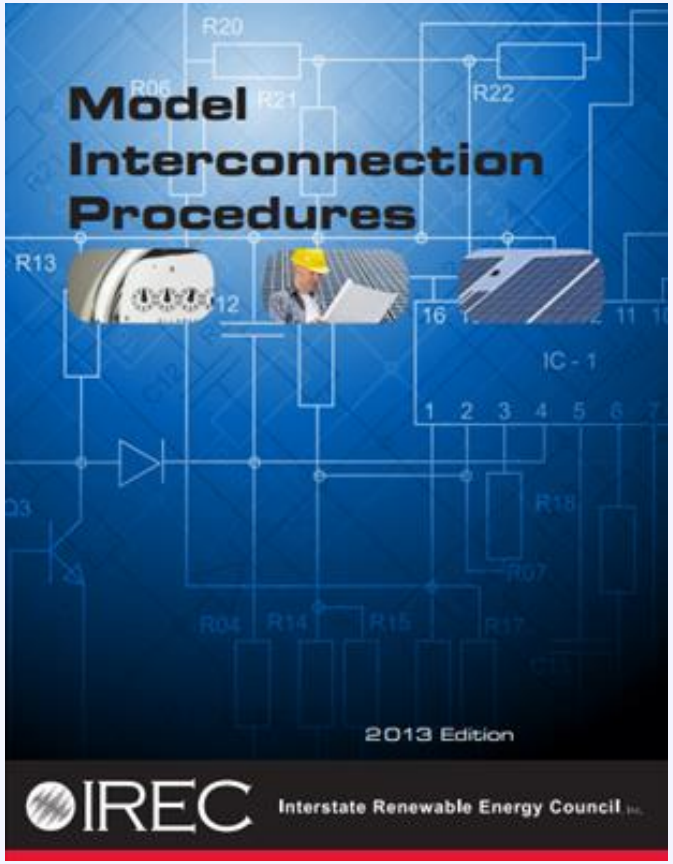
Source: Freeing the Grid

Interconnection: Resources

Resource **Interstate Renewable Energy Council**

IREC developed its model interconnection rules in an effort to capture best practices in state interconnection policies.

www.irecusa.org



A Policy Driven Market

Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering/ Interconnection	Solar Access
	Permitting & Interconnection	Tax Credits & Exemptions	Direct Cash & Performance Incentives
Local	Property Assessed Clean Energy	Solarize	

Solar Access

Solar Access Laws:

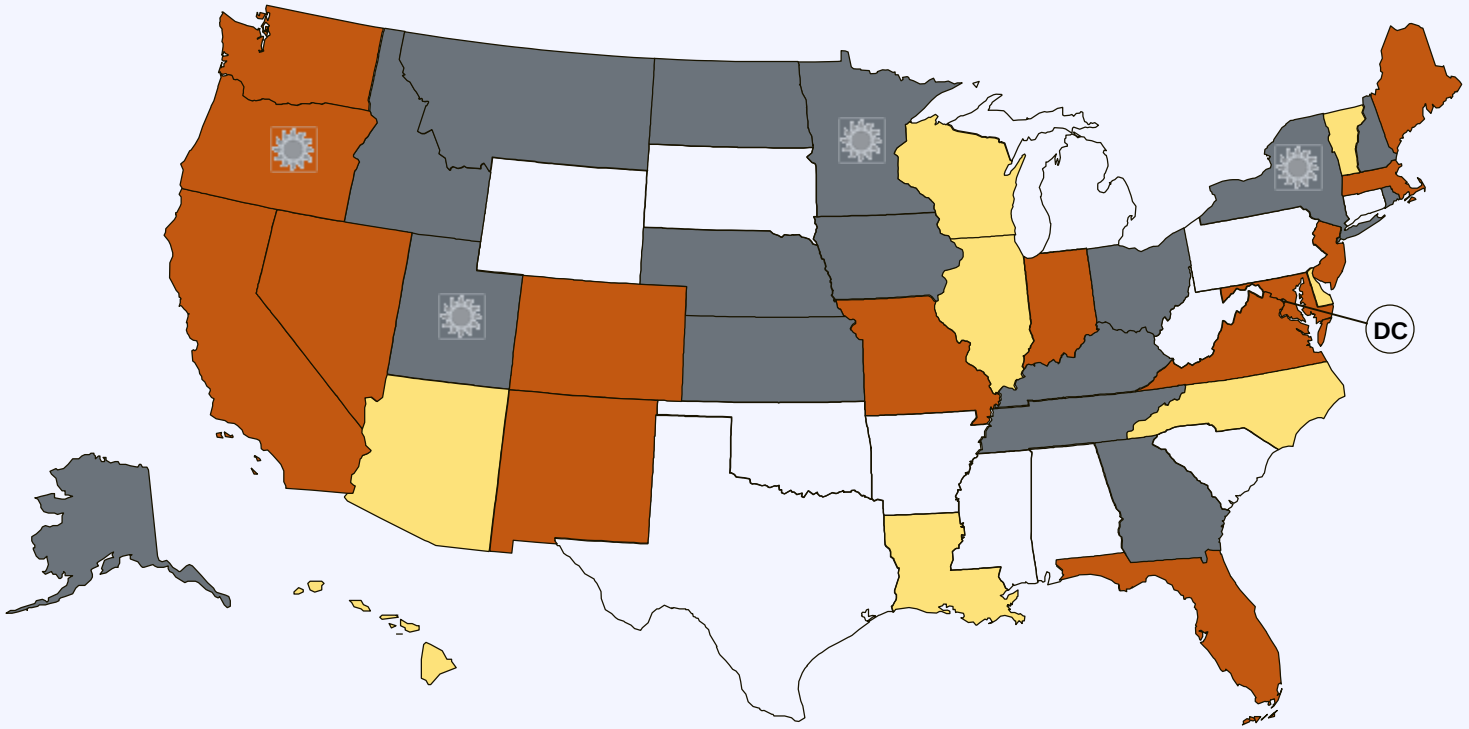
1. Increase the likelihood that properties will receive sunlight
2. Protect the rights of property owners to install solar
3. Reduce the risk that systems will be shaded after installation

Fontainebleau V. Eden Roc (1959)

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 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: DSIRE

Solar Access: Kentucky

Solar Easement Policy (KRS 381.200):

In Kentucky, solar easements may be obtained for the purpose of ensuring access to direct sunlight. Easements must be expressed in writing and will become an interest in real property that may be acquired and transferred.

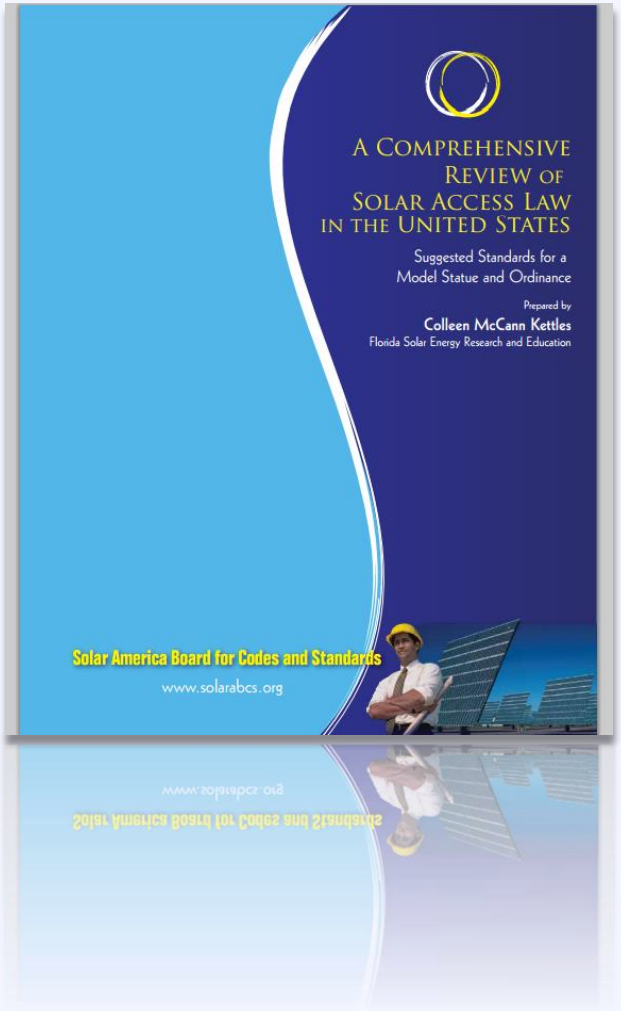
Source: DSIRE

Solar Access

Resource **Solar ABCs**

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

www.solarabcs.org



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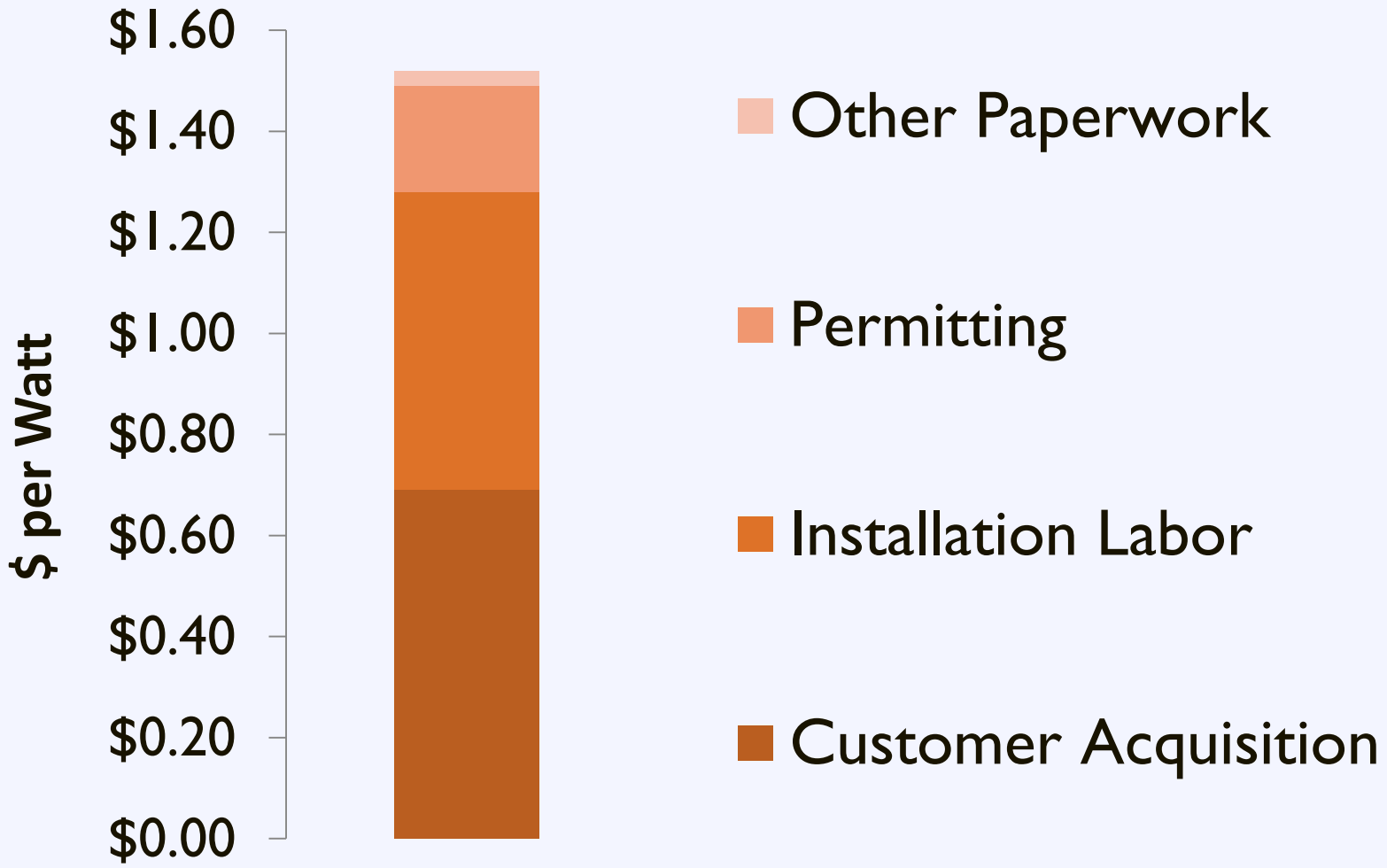
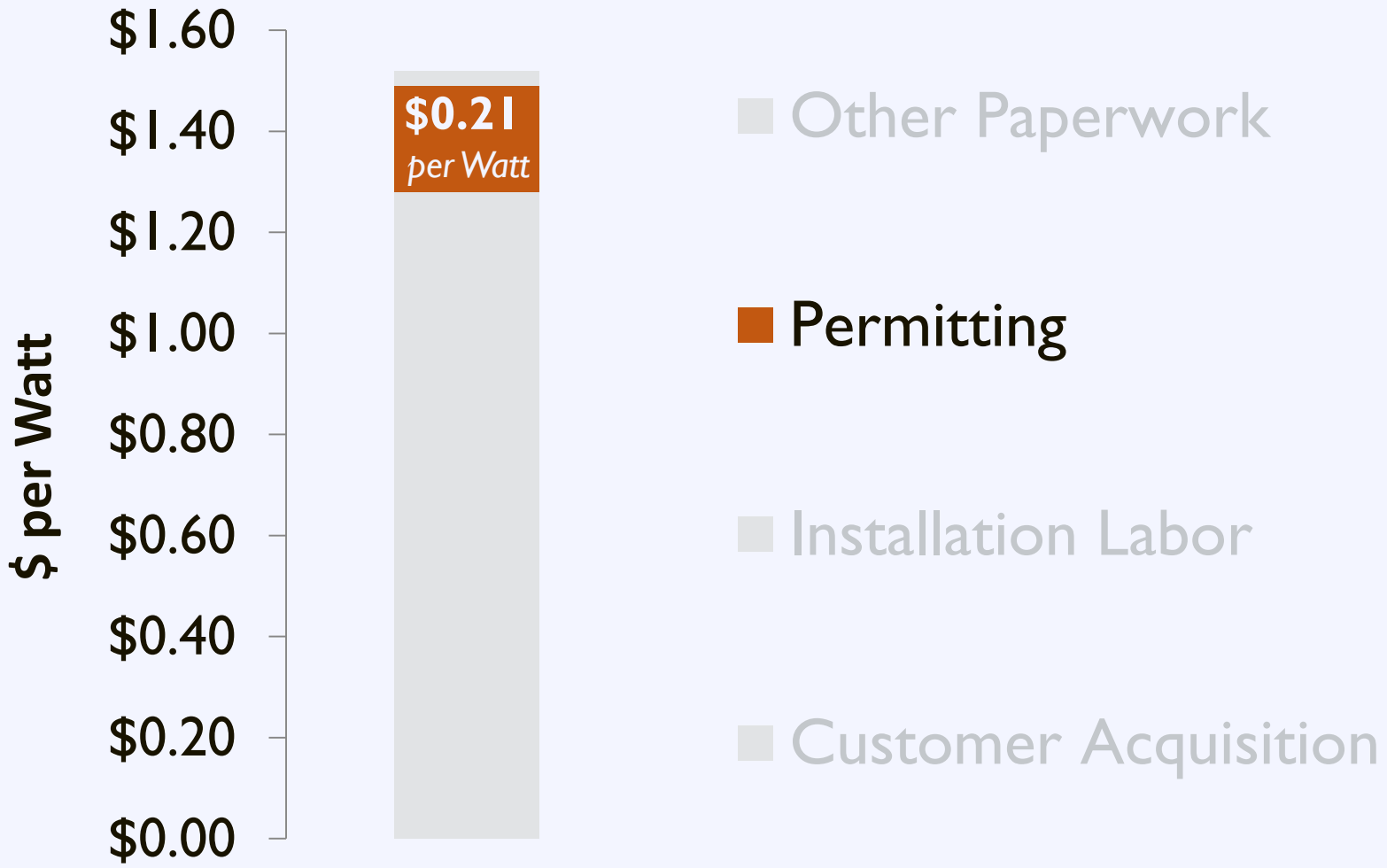
Mitigate Soft Costs



Powered by SunShot
U.S. Department of Energy

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

Mitigate Soft Costs



Powered by SunShot
U.S. Department of Energy

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

Challenge: Installation Time

New York City's Goal

100 days

from inception to completion

Germany Today

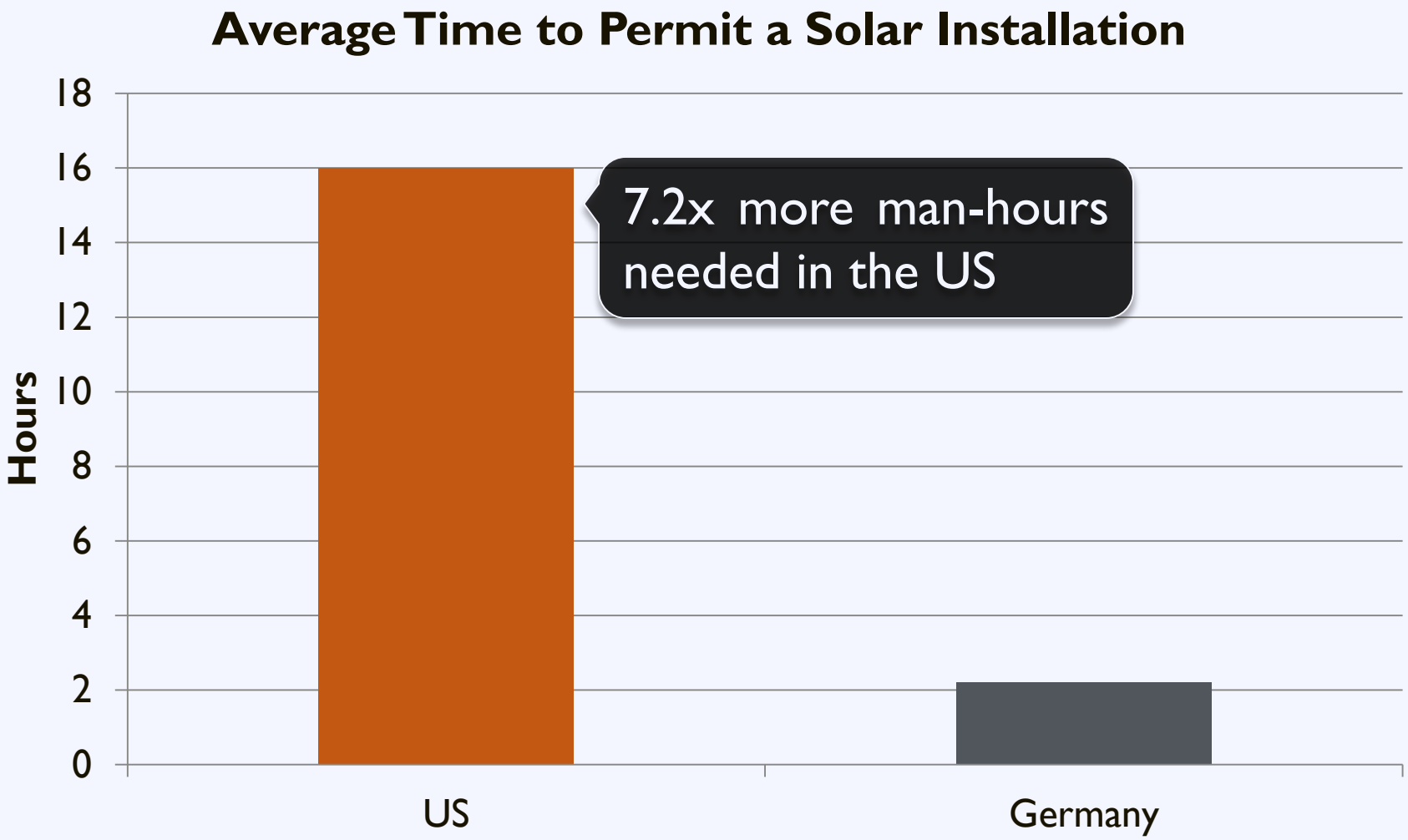
8 days

from inception to completion

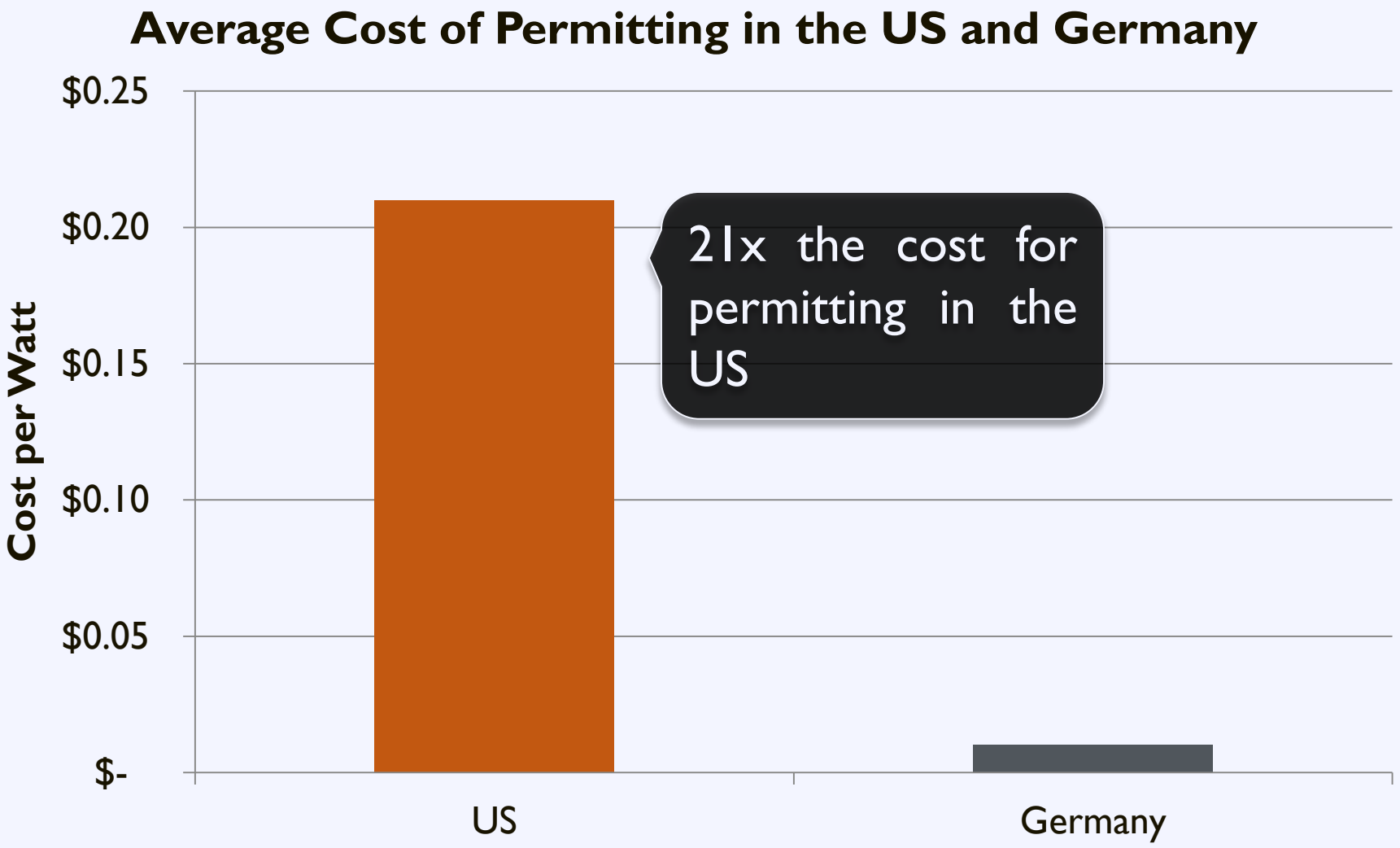
Powered by SunShot U.S. Department of Energy

Photon Magazine

Time to Installation



Permitting Costs



Source: NREL, LBNL

Germany's Success

Consistency and Transparency

through

Standardized Processes

Planning for Solar

Remove barriers by:

- Make qualified solar projects a by-right accessory use
- Modify regulations to clarify what types of solar projects are allowed where
- Streamline the permitting process

Zoning Code: Solar Framework

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

Powered by SunShot
U.S. Department of Energy

Source: American Planning Association

Zoning Codes: Small Scale Solar

Typical Requirements:

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

Zoning Codes: Large Scale Solar

Typical Requirements:

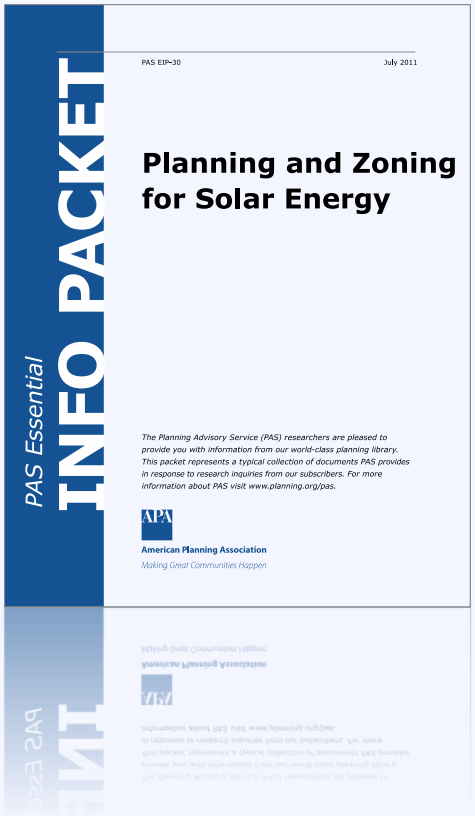
- Allowed for primary use in limited locations
- Requirements:
  - Height limits
  - Lot coverage
  - Setback
  - Fencing and Enclosure

Zoning Code: Model Ordinances

Resource **Planning and Zoning for Solar Energy**

This Essential Info Packet provides a number of articles and guidebooks to help planners plan for solar in their communities.

planning.org/research/solar



Powered by SunShot
U.S. Department of Energy

The Permitting Process: Challenges

18,000+ local jurisdictions

with unique permitting requirements

Powered by SunShot
U.S. Department of Energy

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

The Permitting Process: Challenges

Local permitting processes add on average

$2,516

to the installation cost of residential PV

Powered by SunShot U.S. Department of Energy

Source: SunRun

The Permitting Process: Challenges

Source: Forbes

Expedited Permitting

Solar Permitting Best Practices:

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

Source: Interstate Renewable Energy Council/ Vote Solar

Expedited Permitting

Solar Permitting Best Practices:

- ✓ Collect Reasonable Permitting Fees
- ✓ Do Not Require Community-Specific Licenses
- ✓ Narrow Inspection Appointment Windows
- ✓ Eliminate Excessive Inspections
- ✓ Train Permitting Staff in Solar

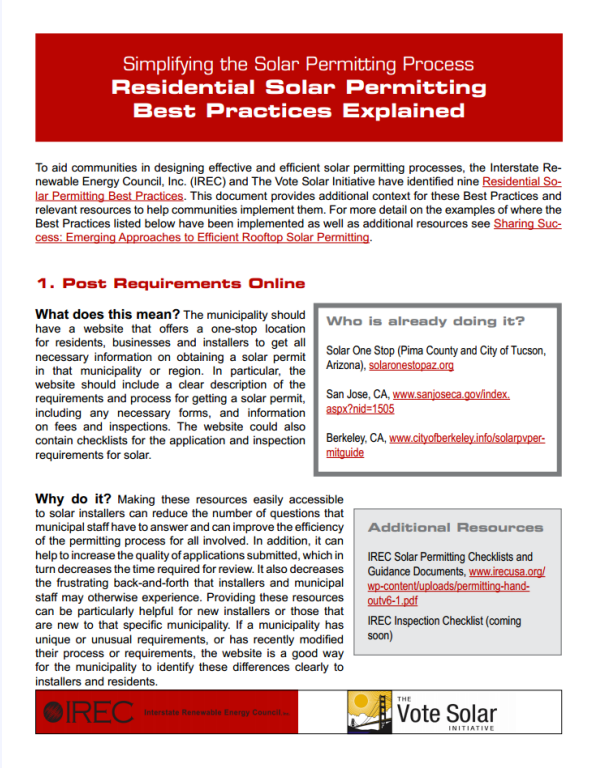
Powered by SunShot
U.S. Department of Energy

Source: Interstate Renewable Energy Council/ Vote Solar

Permitting: Best Practices

Resource **Residential Solar Permitting Best Practices**

Provides explanations of nine best practices designed to streamline local solar permitting processes, along with 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)

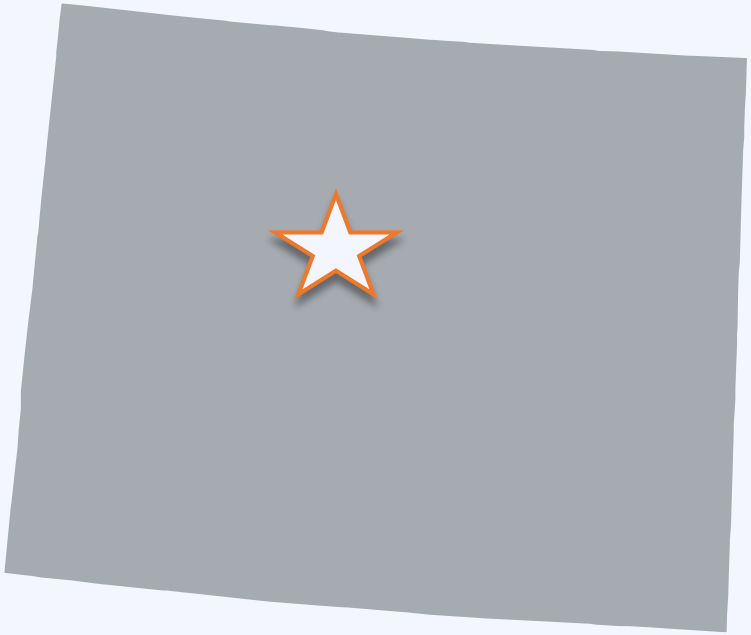
IREC Interstate Renewable Energy Council

The Vote Solar Initiative

www.irecusa.org/wp-content/uploads/2013/09/expanded-best-practices.pdf

Powered by SunShot
U.S. Department of Energy

Expedited Permitting: Case Study



Breckenridge, Colorado

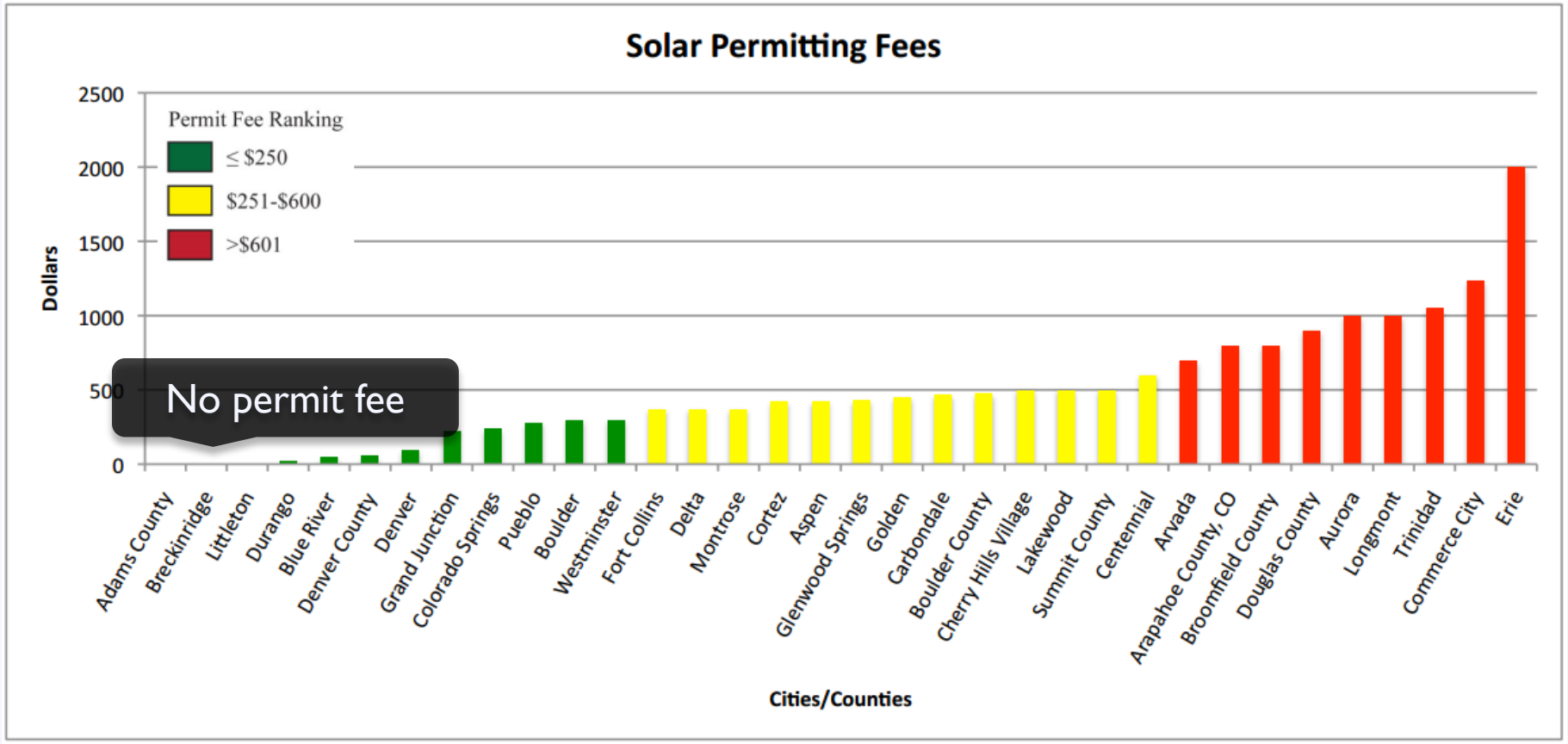
Population: 4,540

Powered by SunShot
U.S. Department of Energy

Source: Wikipedia

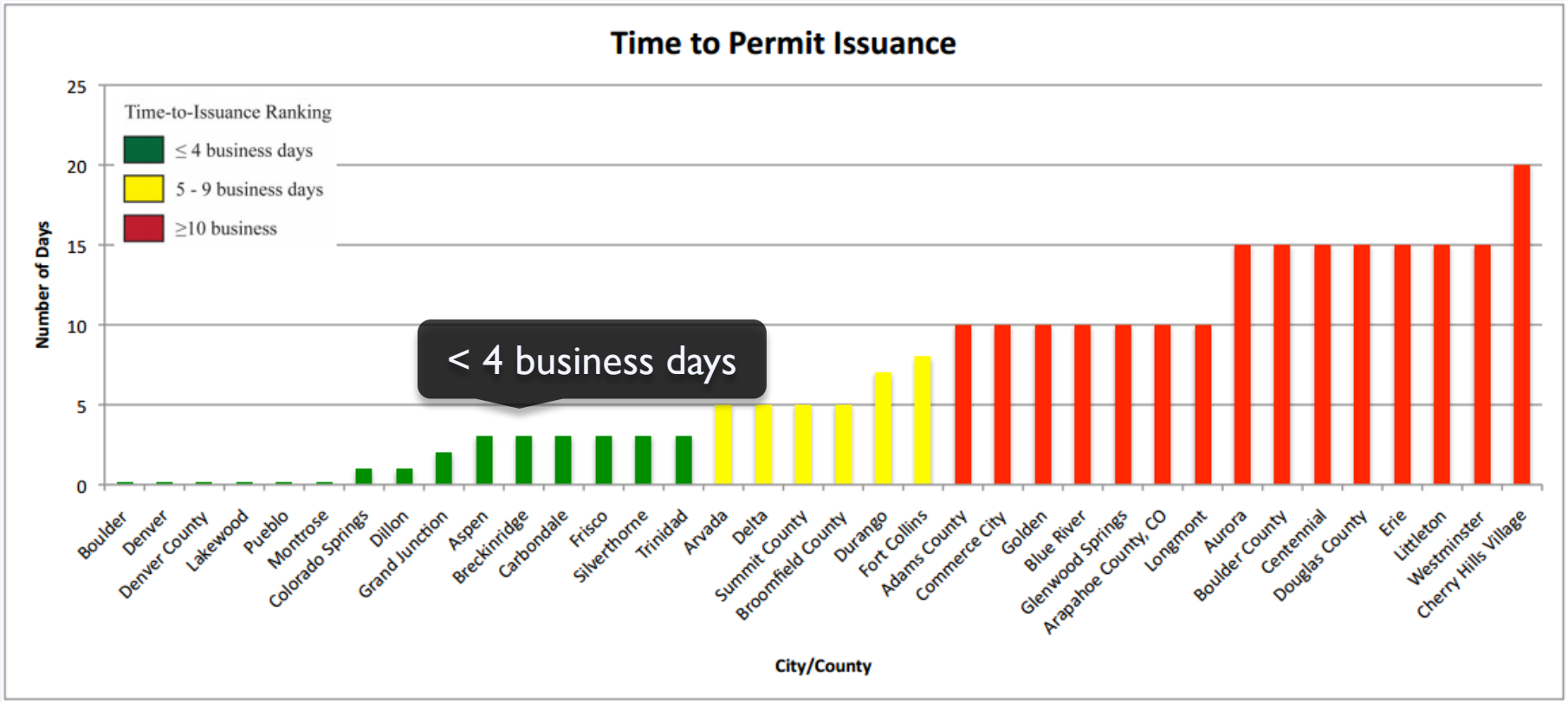
Expedited Permitting: Case Study

Breckenridge charges no fees to file for a solar permit



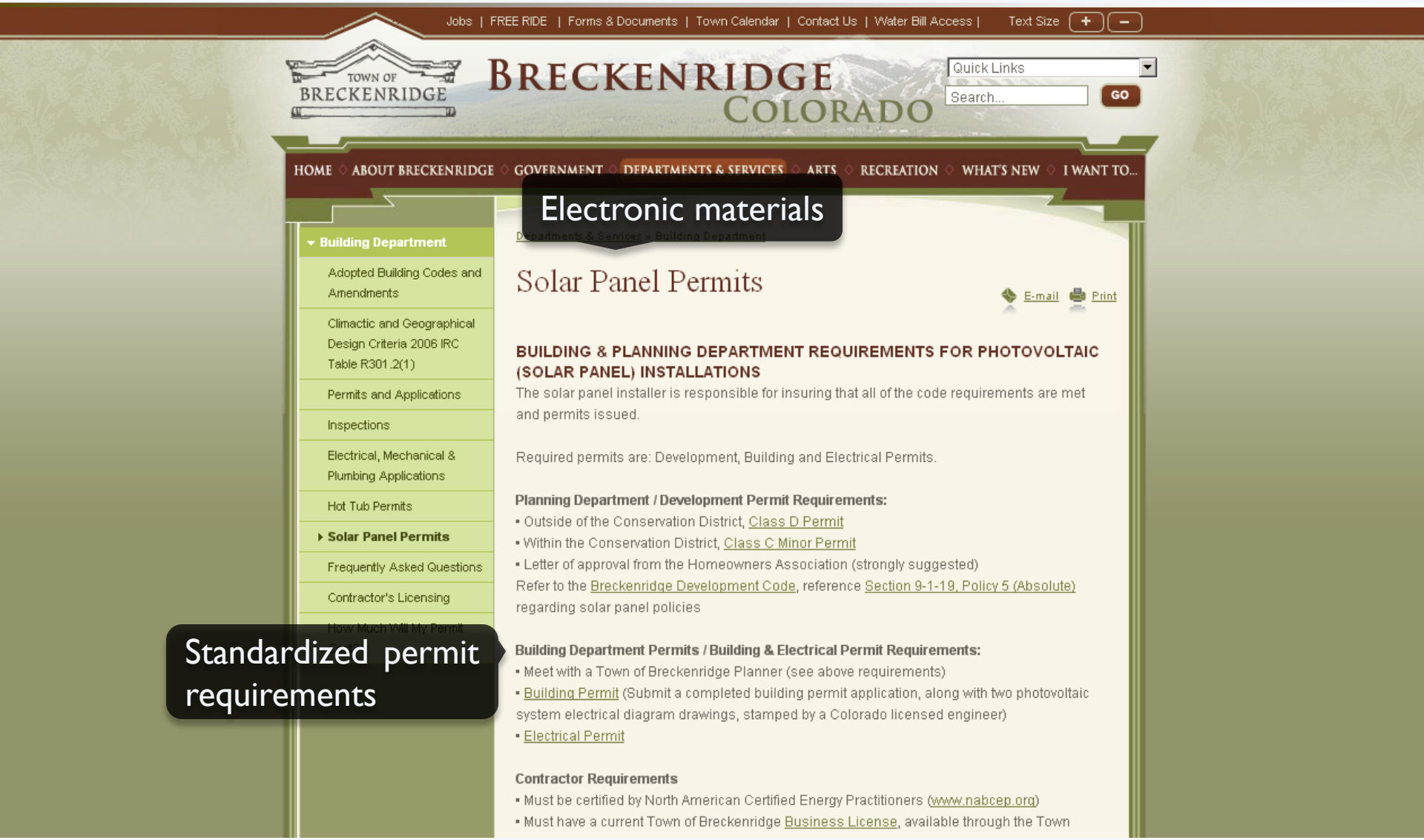
Expedited Permitting: Case Study

Breckenridge offers a short turn around time for solar permits



Source: Vote Solar (http://votesolar.org/wp-content/uploads/2011/03/COPermitReport.pdf)

Expedited Permitting: Case Study



Powered by SunShot U.S. Department of Energy

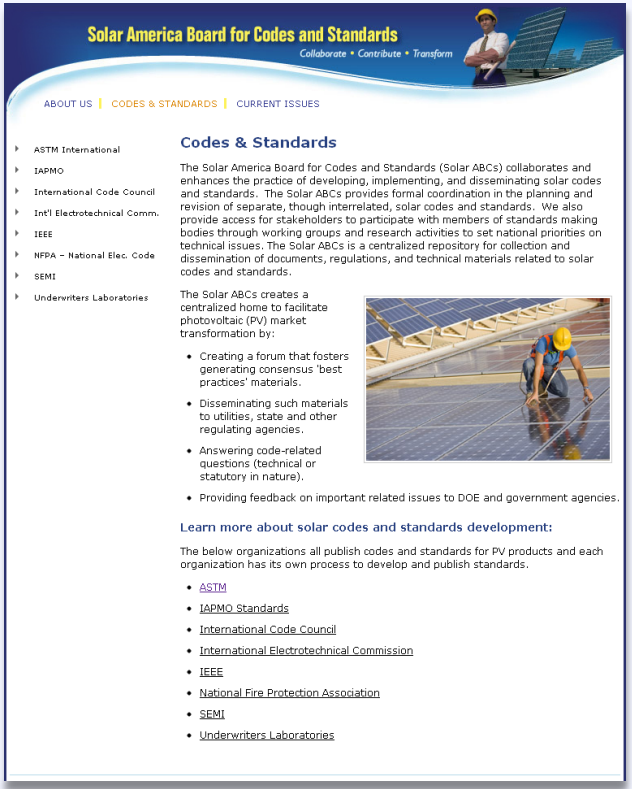
Source: Breckenridge, CO (http://www.townofbreckenridge.com/index.aspx?page=694)

Expedited Permitting

Resource **Solar ABCs**

Expedited Permitting:

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

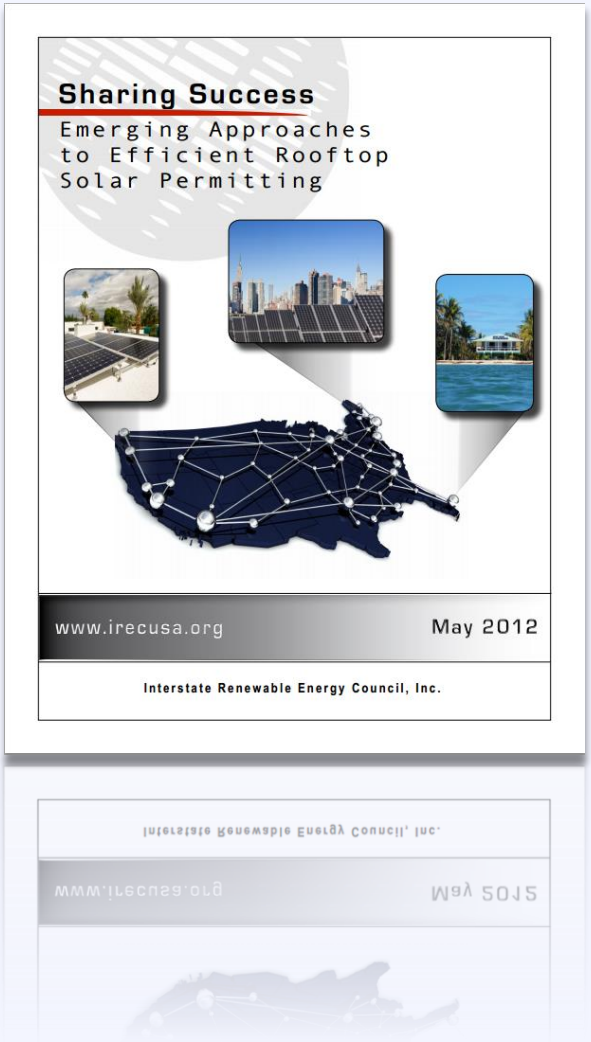


Expedited Permitting

Resource **Interstate Renewable Energy Council**

Outlines emerging approaches to efficient rooftop solar permitting

www.irecusa.org



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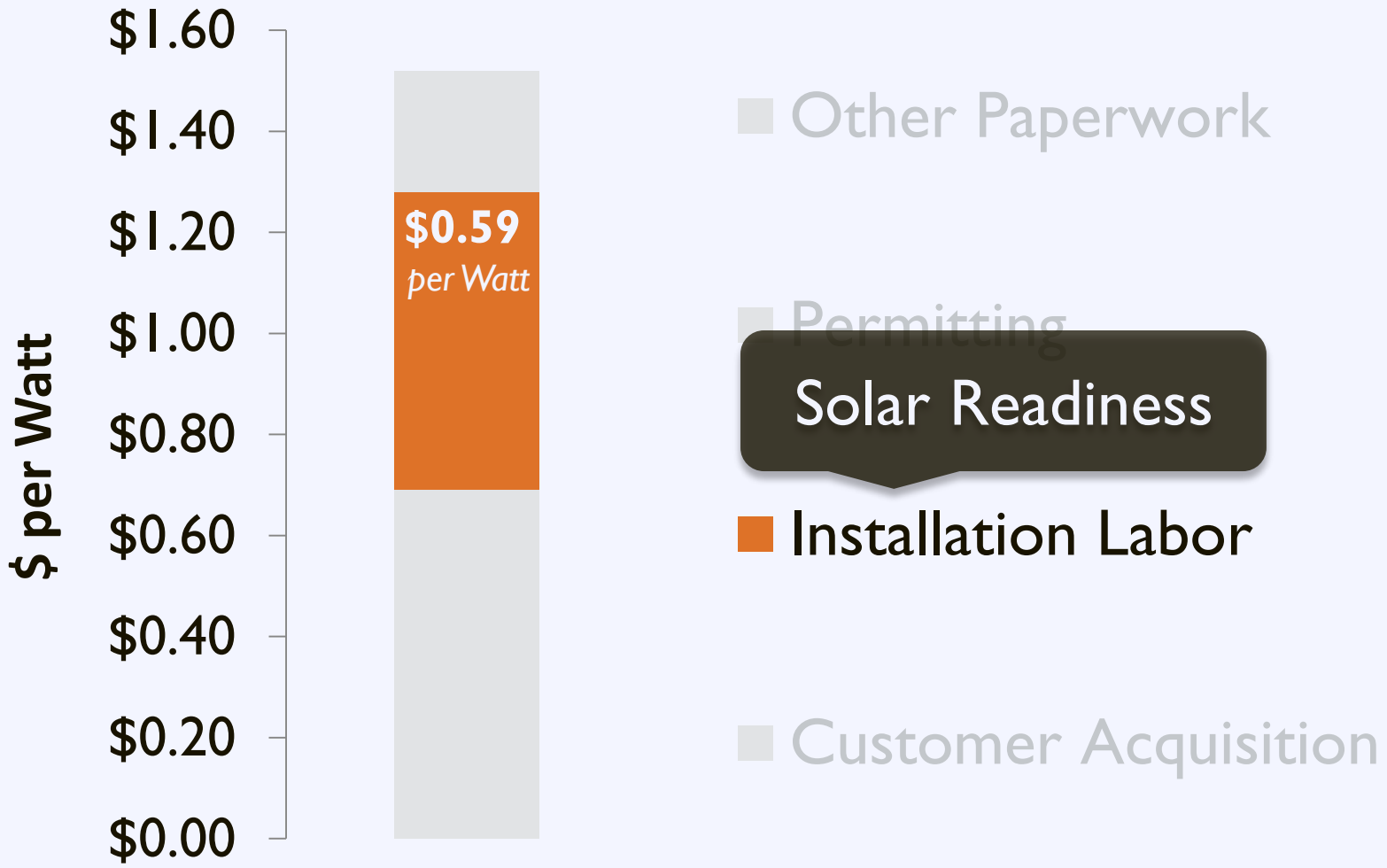
U.S. Department of Energy

Mitigate Soft Costs



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U.S. Department of Energy

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

Solar Readiness

Creating solar-ready guidelines and promoting energy efficiency at the outset can help make future solar installations easier and more cost effective.

Local Example: Owensboro Metropolitan Planning Commission

iOMPC Comprehensive Plan (Section 7)

As our limited supplies of fossil fuels become further depleted, the potential for solar energy and orientation may demand more of our time and effort. An increase in our awareness of solar issues now will help us lay the ground rules for the solar access, orientation, and compatible building designs that will be appreciated for generations to follow.

Planning for solar at the subdivision stage would greatly increase solar potential and cut the costs for its installation.

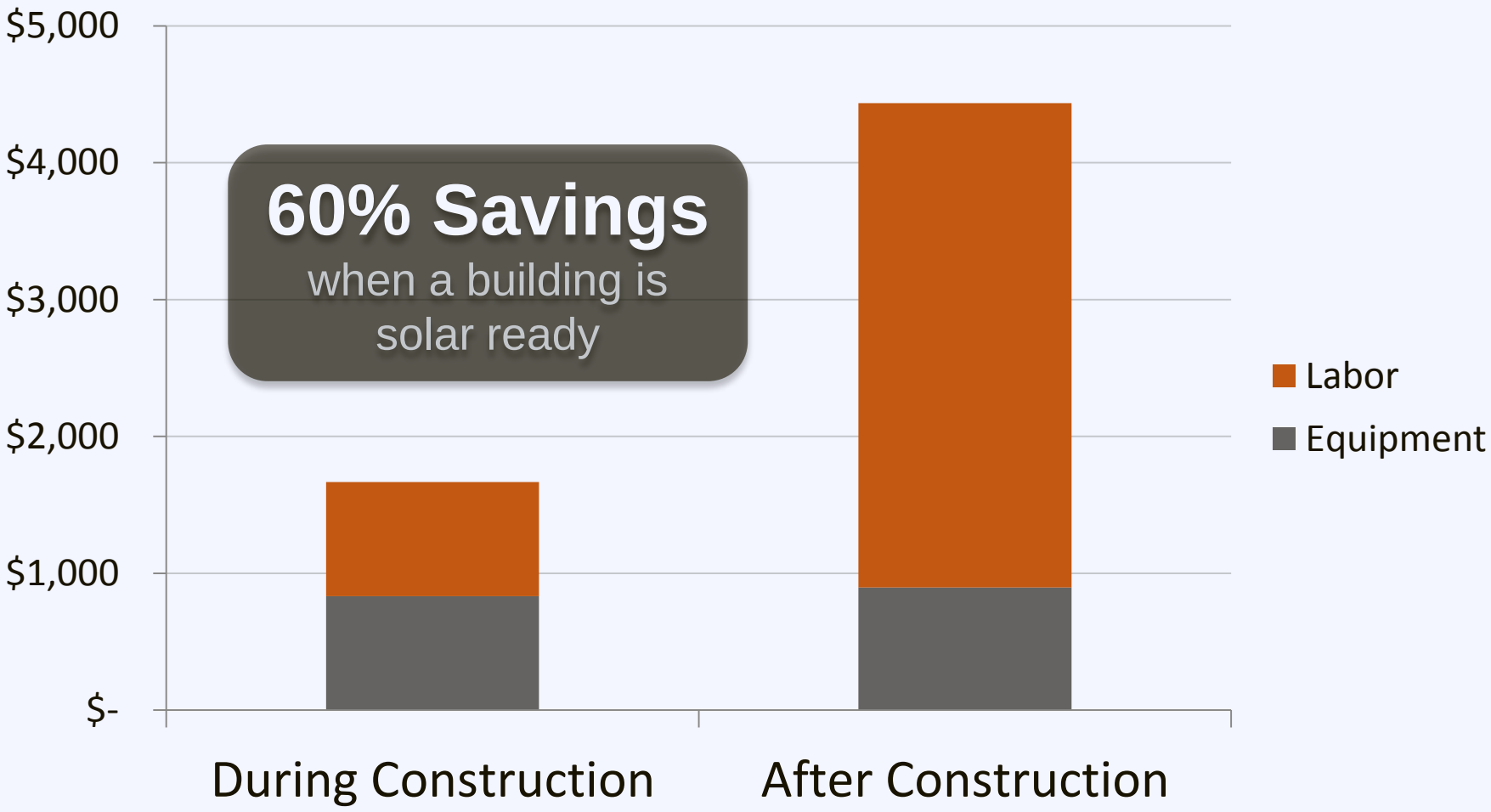
Source: http://www.iompc.org/wp-content/uploads/2013/01/Comp-Plan-Section-7-update-2012.pdf

Solar Readiness

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

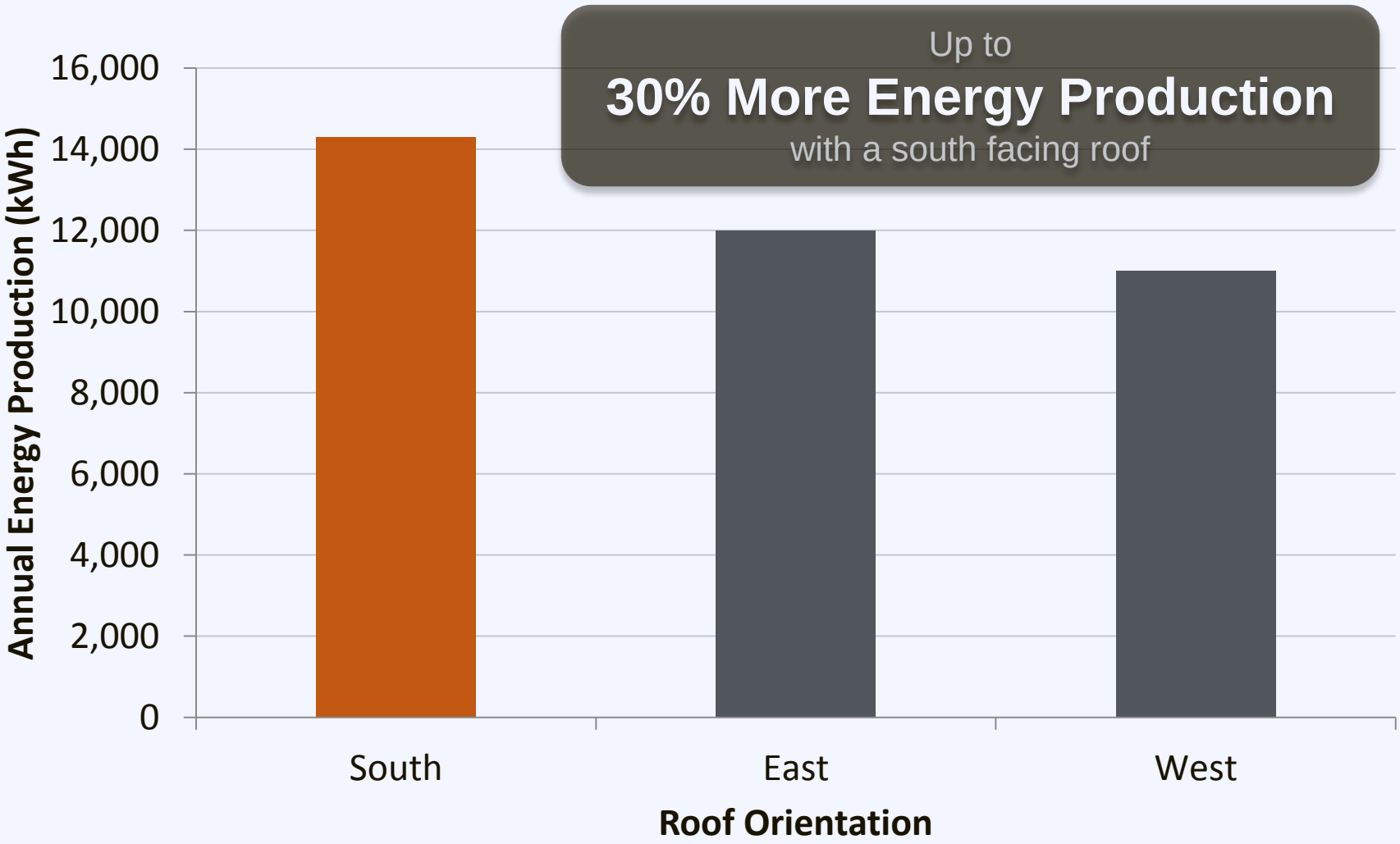
Solar Readiness



Powered by SunShot U.S. Department of Energy

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

Solar Readiness



Powered by SunShot
U.S. Department of Energy

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

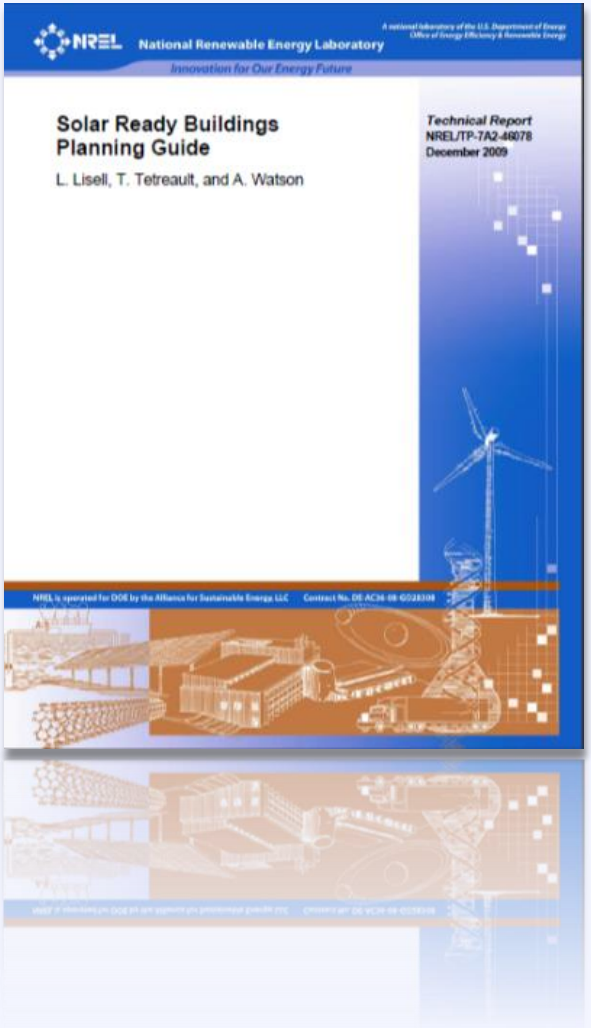
Solar Readiness

Resource **NREL**

Creating a solar ready guide for buildings:

- Legislation
- Certification programs
- Stakeholder Education

www.nrel.gov



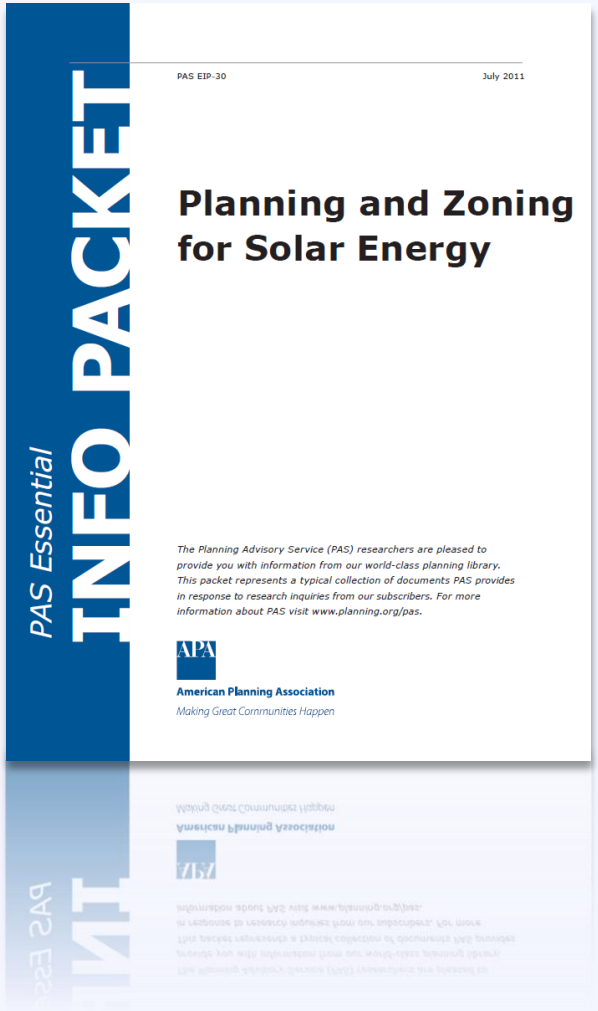
Source: NREL

Solar Readiness Model Ordinance

Resource **American Planning Association**

Includes references to ordinances requiring solar-ready homes in select communities.

www.planning.org/research/solar



Source: APA

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Activity: Identifying Benefits

What is the greatest benefit solar can bring to your community? [Blue Card]

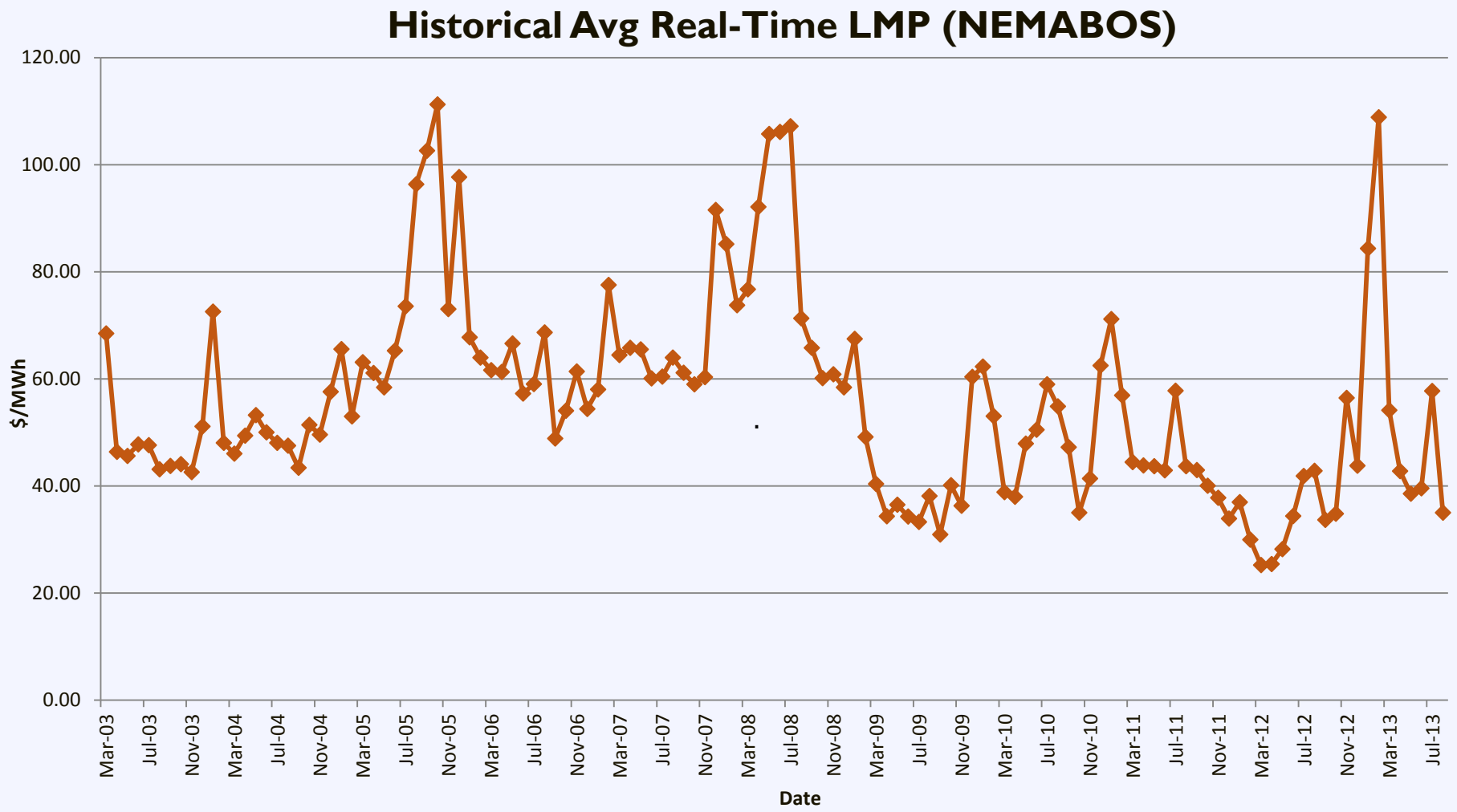
Right Now	During Session	After Break
		
Write answer on card	Compile results	Group discussion

Benefits Poll

Benefits of Solar Energy

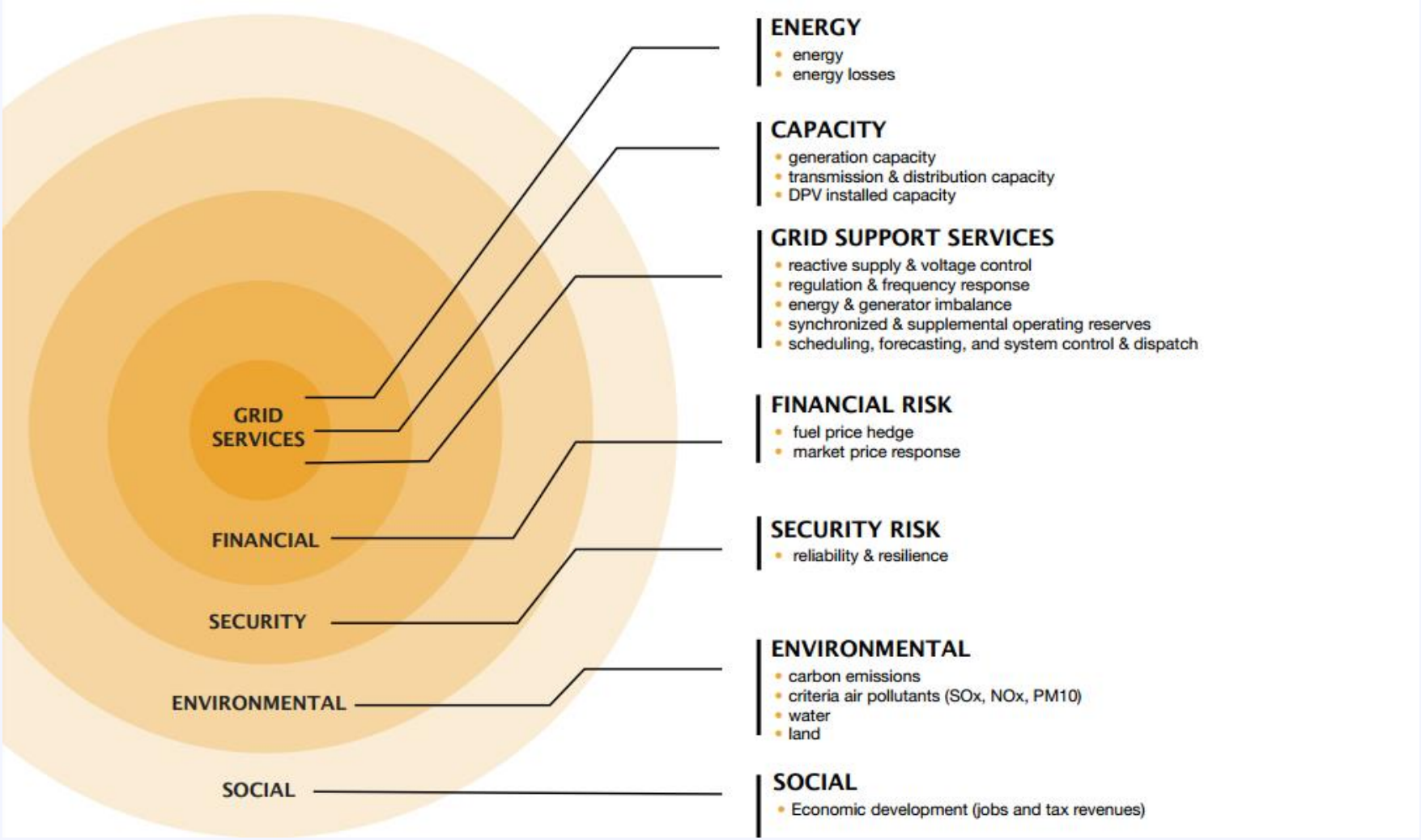
- Economic growth
- Local jobs
- Energy independence
- Stabilizes price volatility
- Valuable to utilities
- Smart investment

Benefit: Stabilize Energy Prices



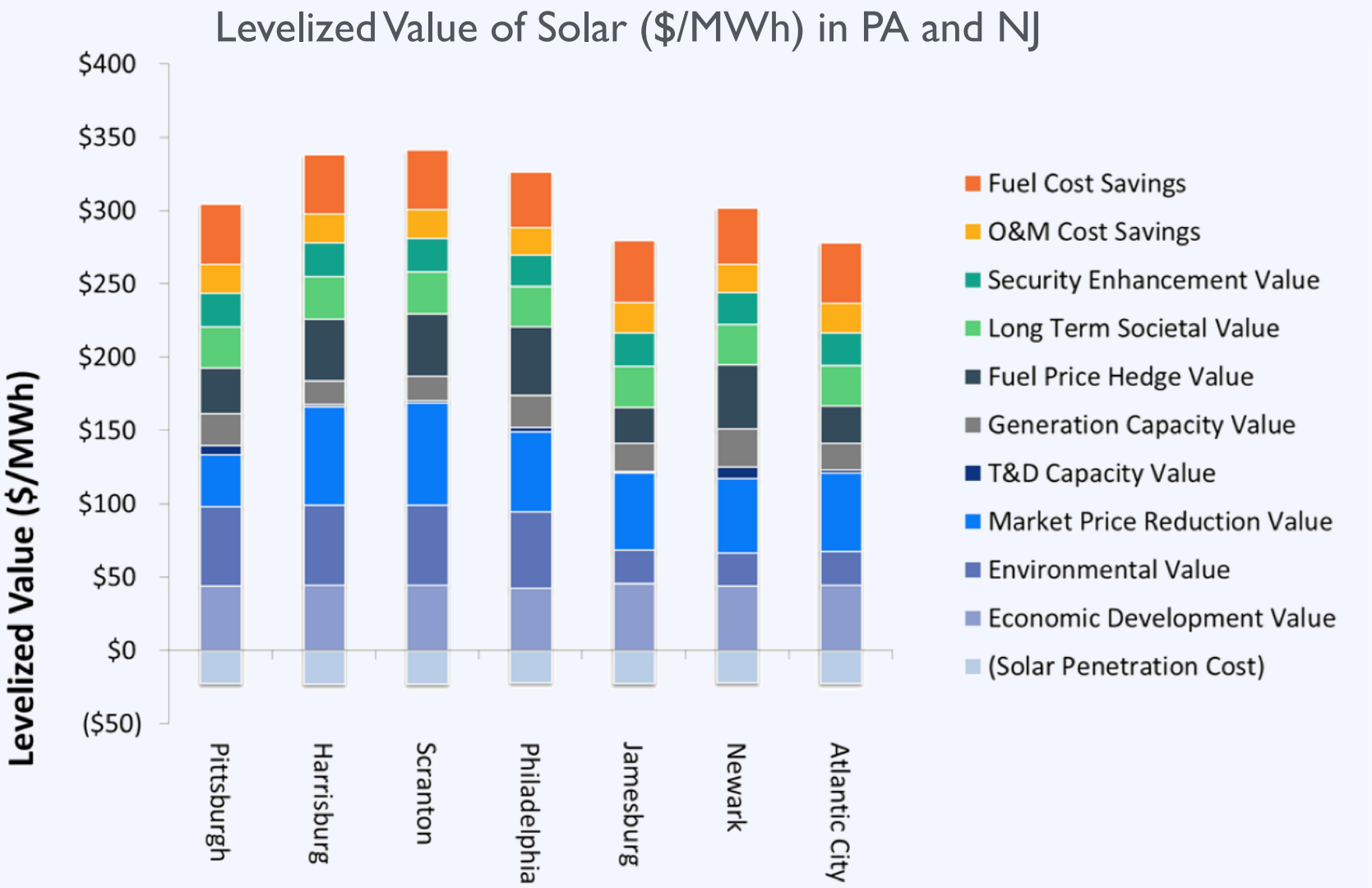
Source: ISO New England, Inc.

Benefits: Valuable to Utilities



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

Benefits: Valuable to Utilities



Source: Clean Power Research http://mseia.net/site/wp-content/uploads/2012/05/MSEIA-Final-Benefits-of-Solar-Report-2012-11-01.pdf

Benefit: Smart Investment for Homes

From NREL:

Solar homes sold

20% faster

and for

17% more

than the equivalent non-solar homes

in surveyed California subdivisions

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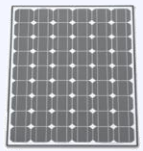
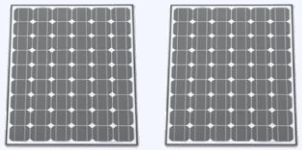
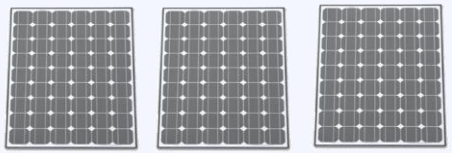
Source: http://www.nrel.gov/docs/fy07osti/38304-01.pdf

Benefit: Smart Investment for Homes

From SunRun:

3 kW  = **$ 16,500** *added sale premium*

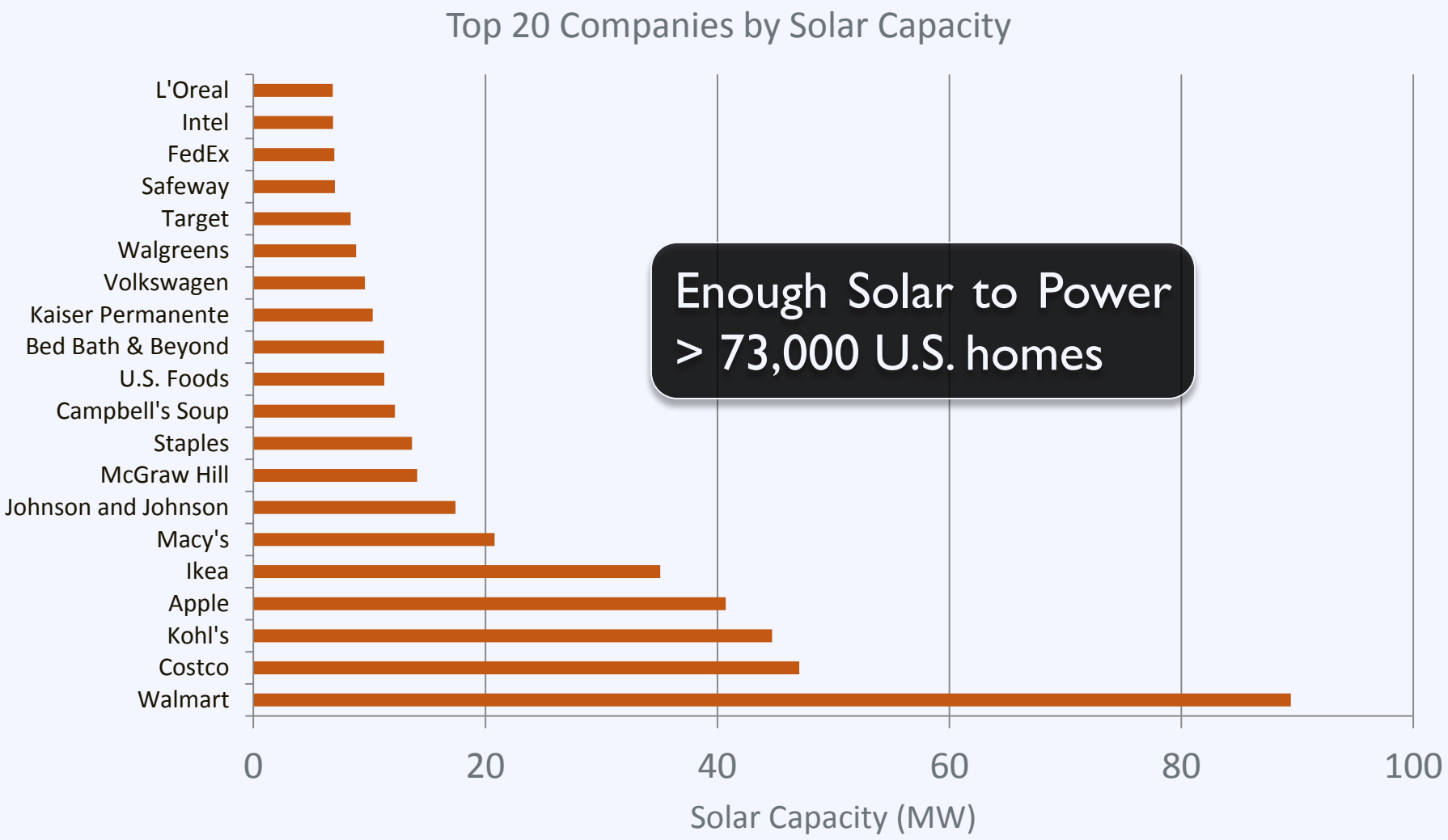
6 kW  = **$ 33,000** *added sale premium*

9 kW  = **$ 49,500** *added sale premium*

Source: Tracking the Sun IV, SunRun

Benefit: Smart Investment for Business

Benefit: Smart Investment for Business



Powered by SunShot
U.S. Department of Energy

Source: Solar Energy Industries Association

Benefit: Smart Investment for Government

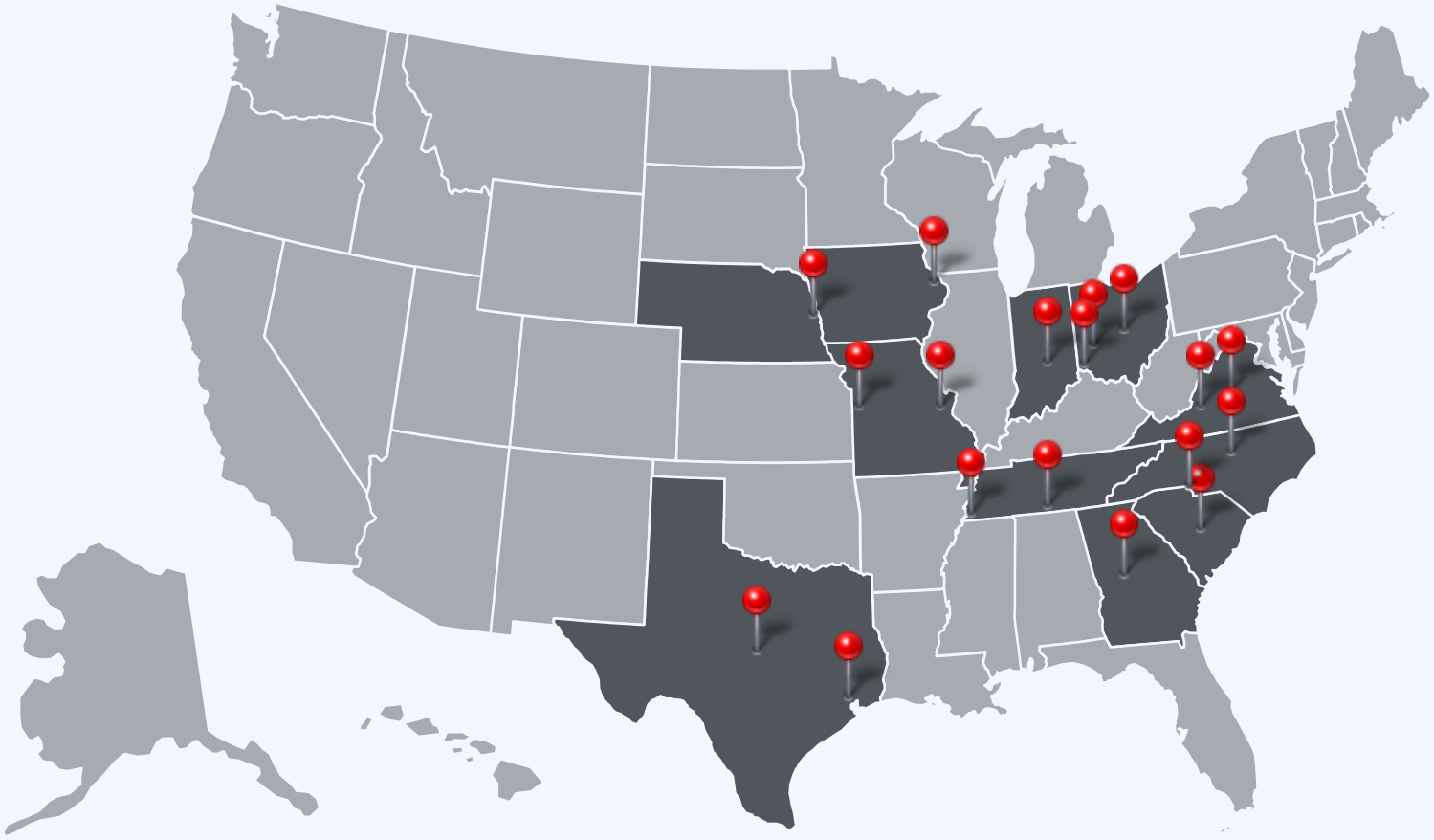
Source: Borrego Solar

Activity: Addressing Barriers

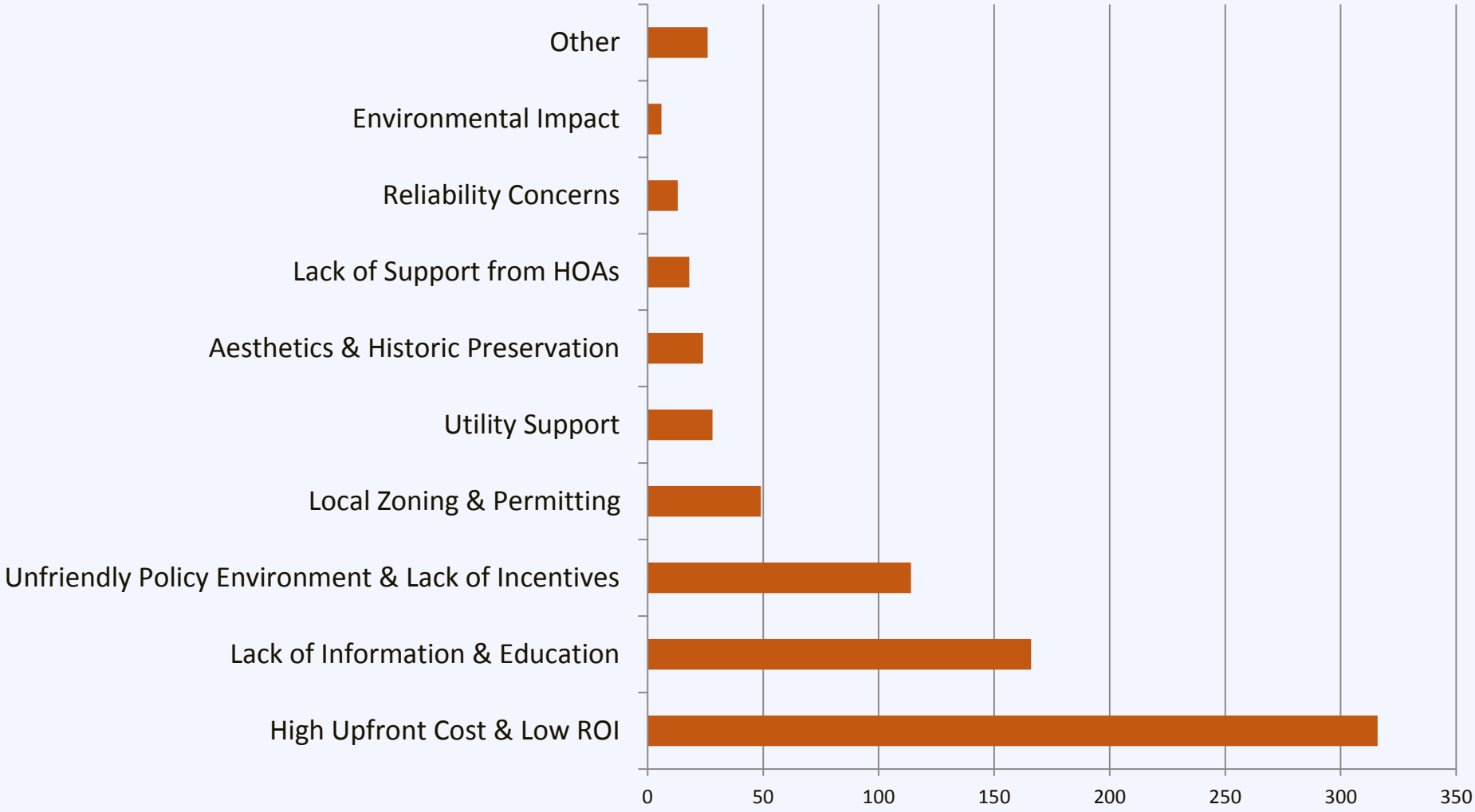
What is the greatest barrier to solar adoption in your community? [Green Card]

Right Now	During Session	After Break
		
Write answer on card	Compile results	Group discussion

Activity: Addressing Barriers



Activity: Addressing Barriers



Barriers Poll

Some things you may hear…

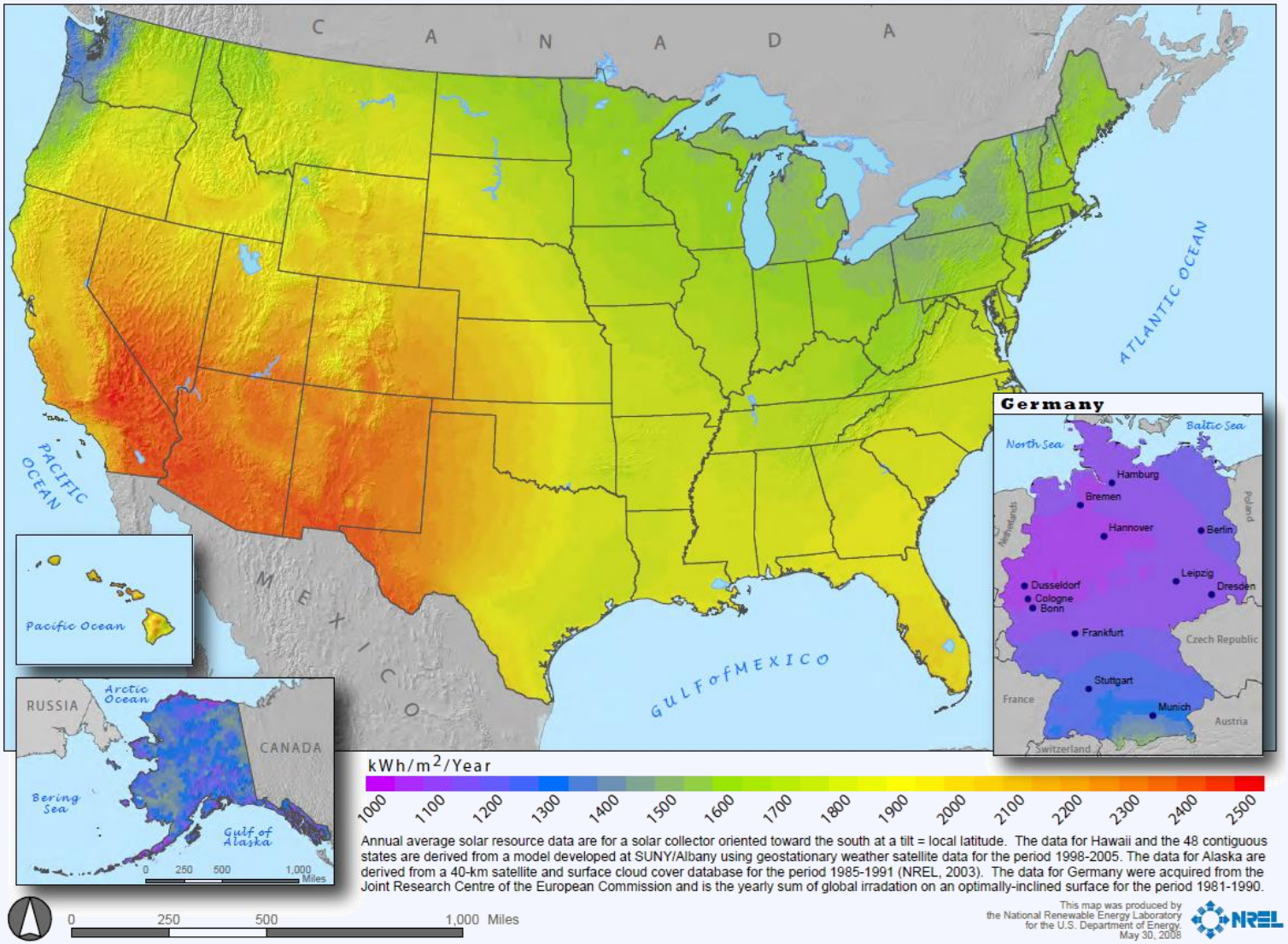
My area isn't sunny enough for solar

Going solar is too expensive

Solar is not ready to compete as a serious energy source

The government should not "pick winners and losers"

Fact: Solar works across the US



Annual average solar resource data are for a solar collector oriented toward the south at a tilt = local latitude. The data for Hawaii and the 48 contiguous states are derived from a model developed at SUNY/Albany using geostationary weather satellite data for the period 1998-2005. The data for Alaska are derived from a 40-km satellite and surface cloud cover database for the period 1985-1991 (NREL, 2003). The data for Germany were acquired from the Joint Research Centre of the European Commission and is the yearly sum of global irradation on an optimally-inclined surface for the period 1981-1990.

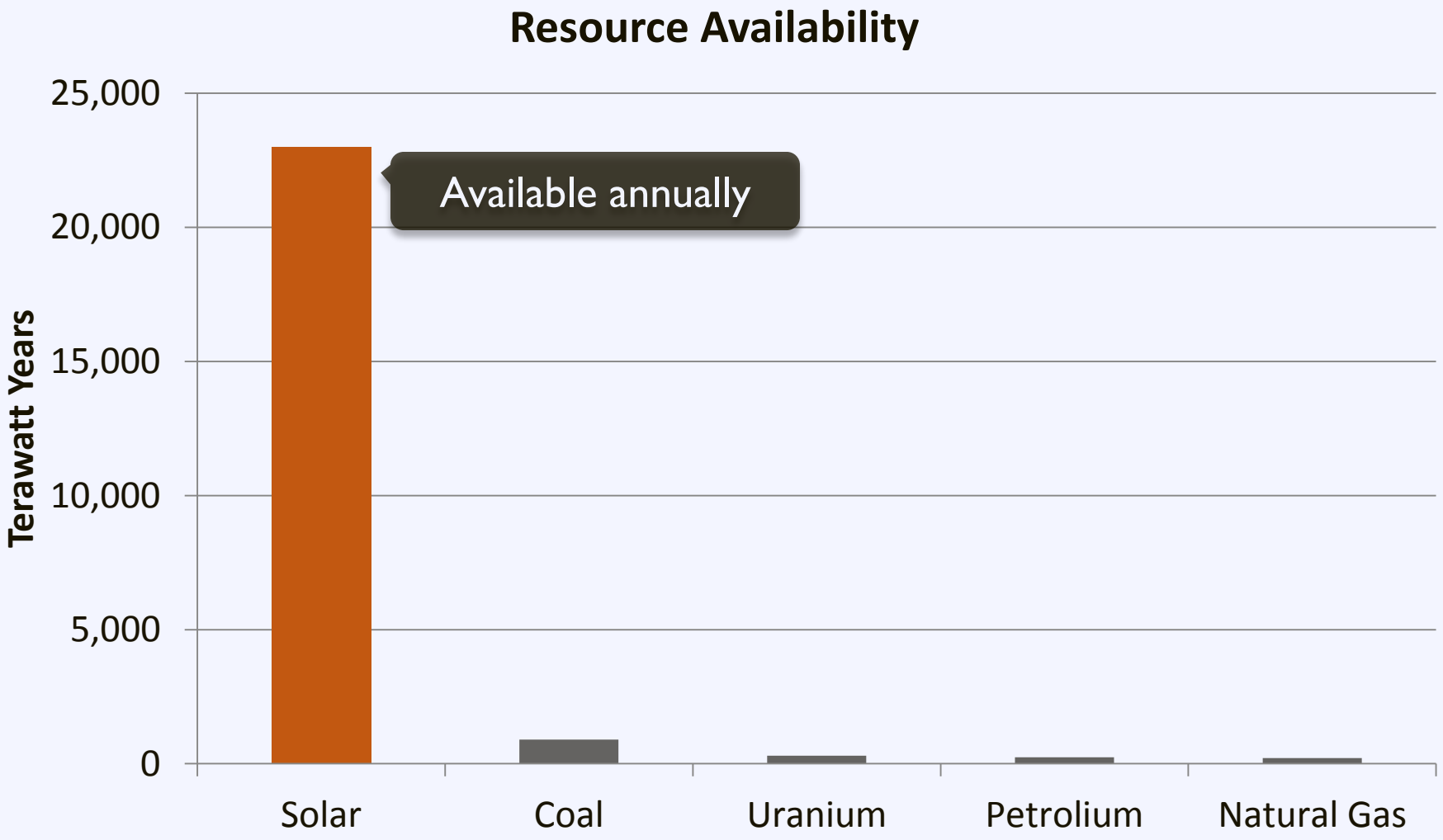
This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy. May 30, 2008

NREL

Powered by SunShot
U.S. Department of Energy

Source: National Renewable Energy Laboratory

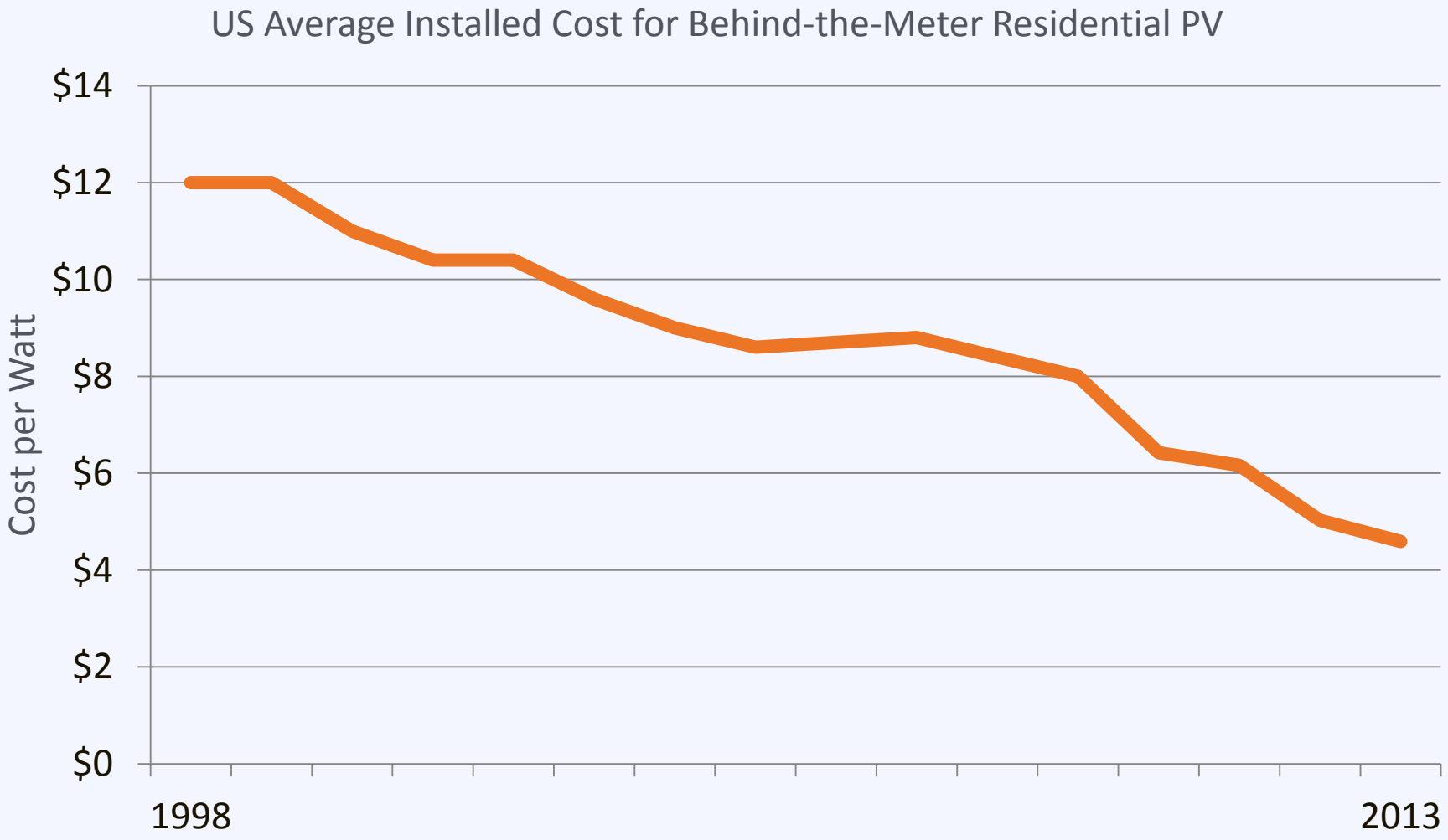
Fact: Solar is a ubiquitous resource



Powered by SunShot
U.S. Department of Energy

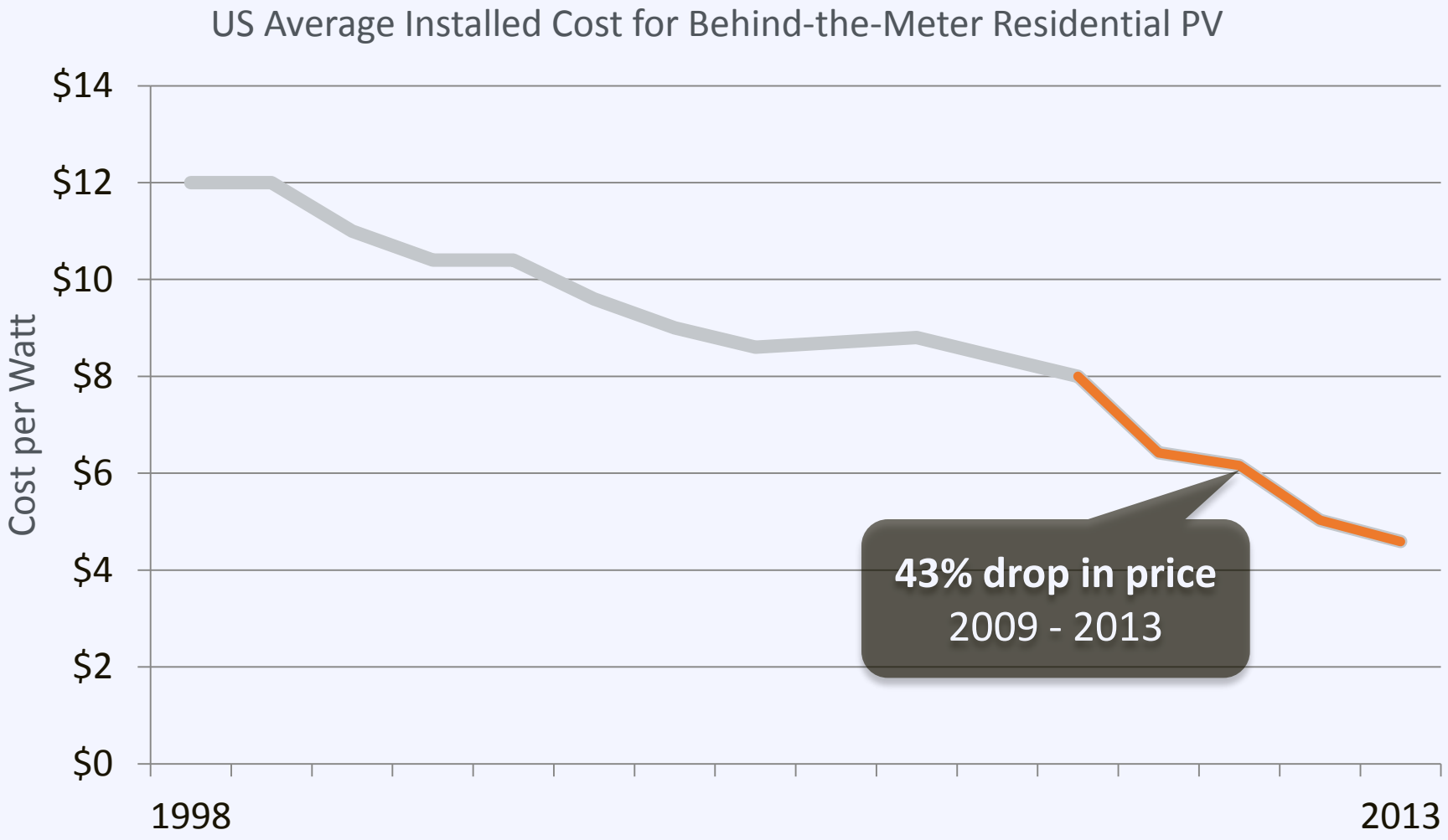
Source: Perez & Perez. 2009. *A fundamental look at energy reserves for the planet.*

Fact: Declining Solar Costs



Tracking the Sun VI: The Installed Cost of Photovoltaics in the US from 1998-2012 (LBNL), SEIA/GTM Research *Solar Market Insight 2013 Year-in-Review.*

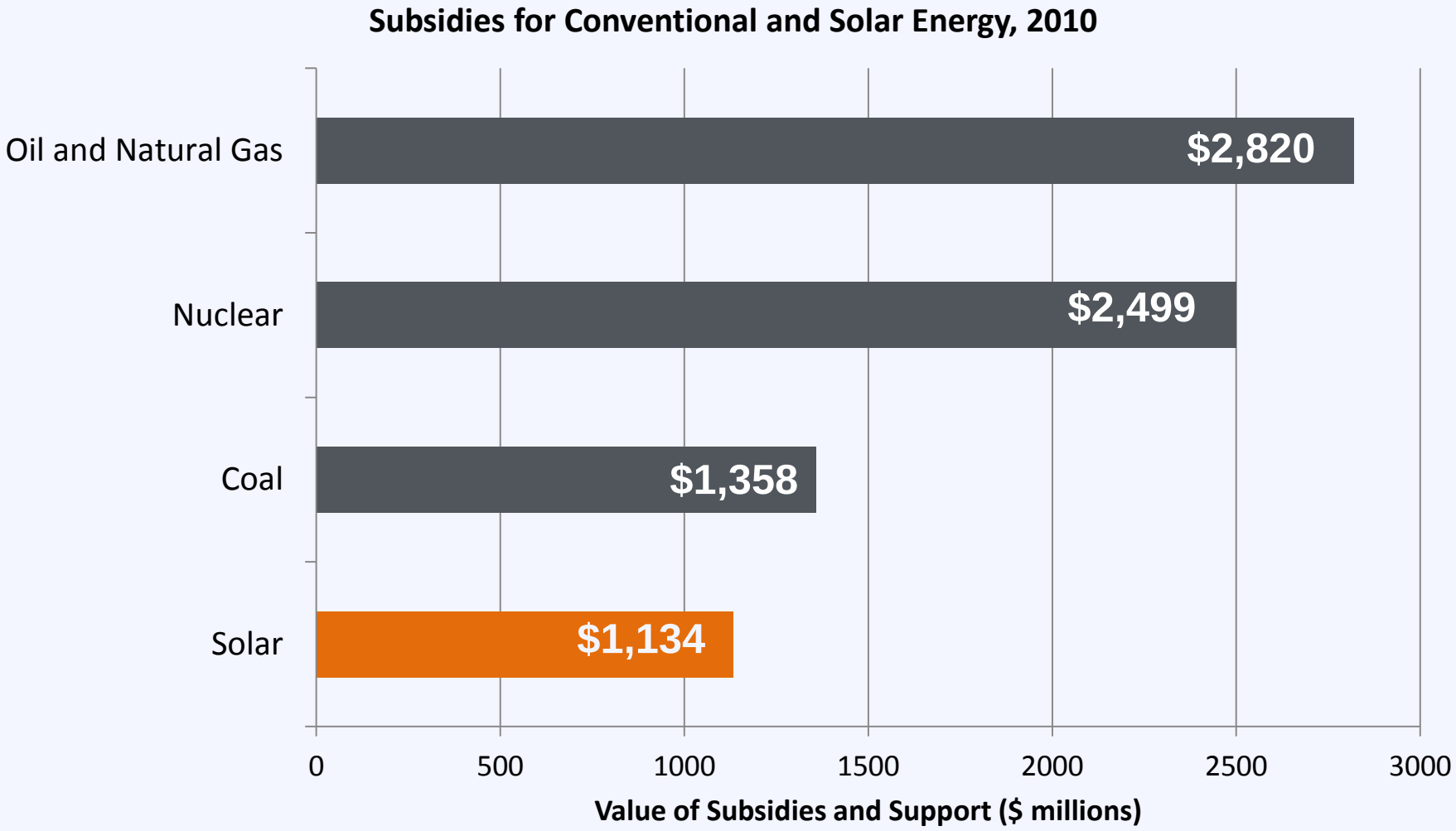
Fact: Declining Solar Costs



Tracking the Sun VI: The Installed Cost of Photovoltaics in the US from 1998-2012 (LBNL), SEIA/GTM Research *Solar Market Insight 2013 Year-in-Review.*

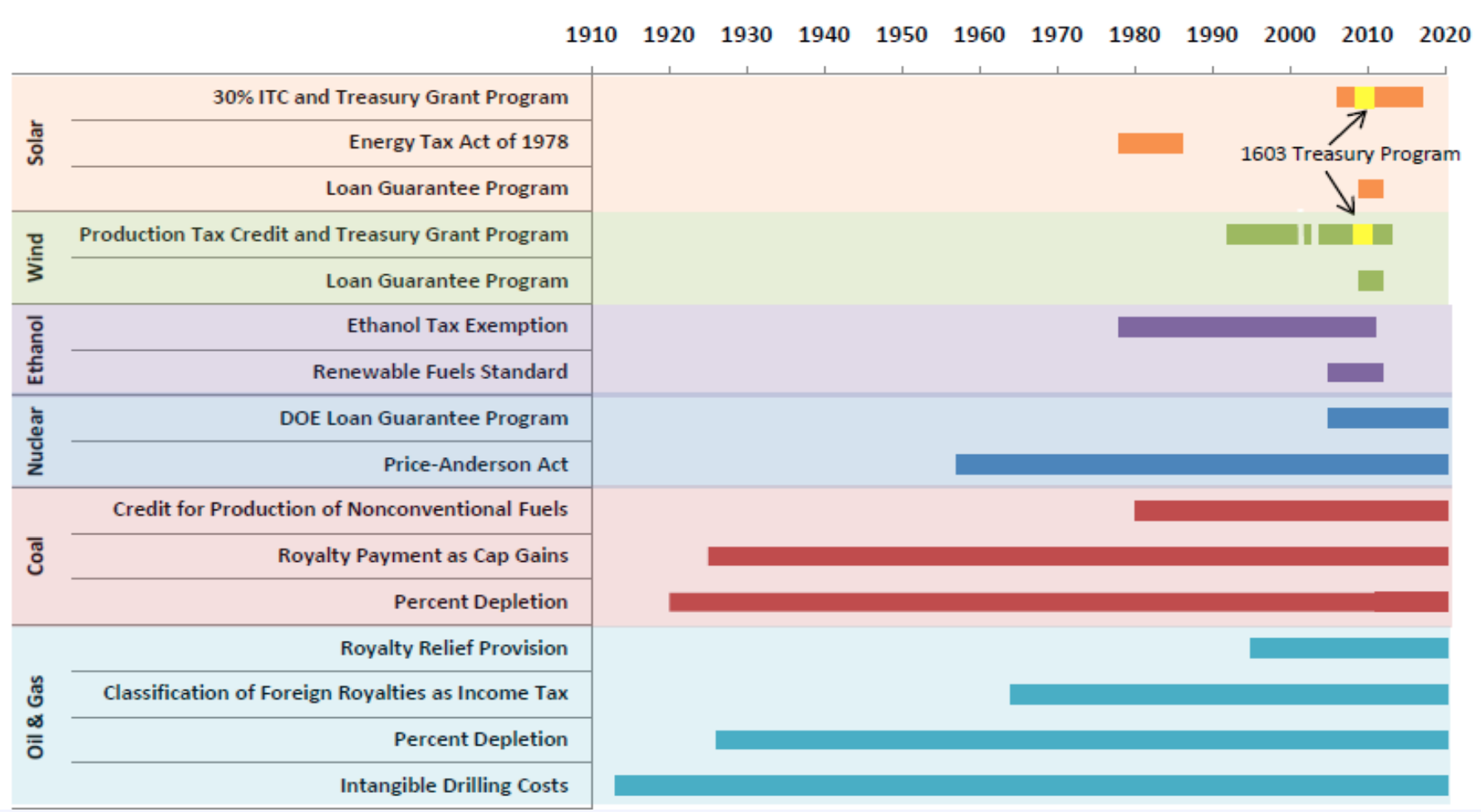
Powered by SunShot U.S. Department of Energy

Subsidies and Support



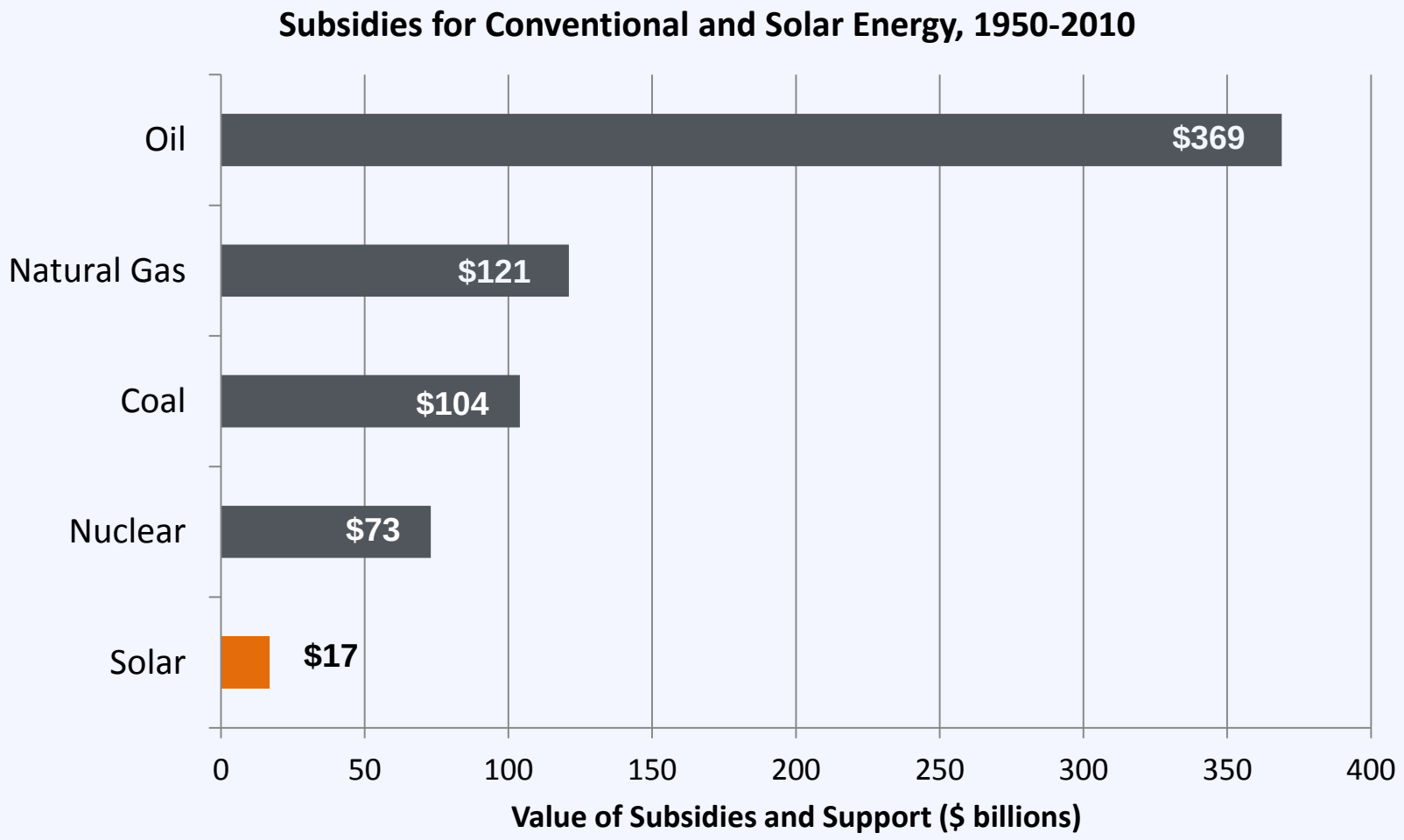
Source: U.S. Energy Information Administration. July 2011. *Direct Federal Interventions and Subsidies in Energy in Fiscal Year 2010*

Subsidies and Support



Source: SEIA, Federal Energy Incentives in the United States (2011), http://www.seia.org/galleries/pdf/Federal_Energy_Incentives_in_the_United_States.pdf

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.*

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The Solar Equation

Cost

+ Installed Cost

+ Maintenance

- Direct Incentive

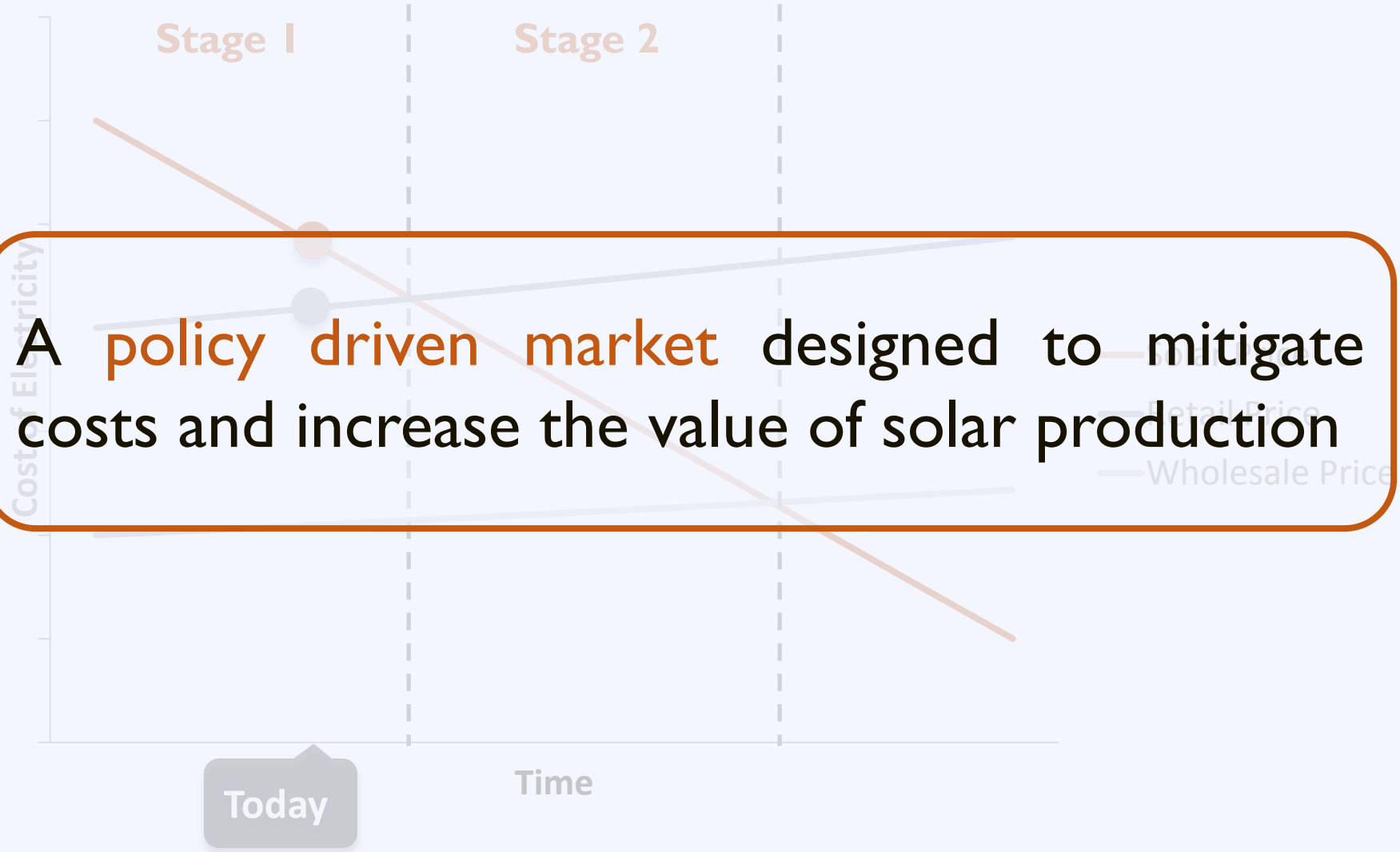
Benefit

+ Avoided Energy Cost

+ Excess Generation

+ Performance Incentive

Solar Market: Trends



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

Source: Solar Electric Power Association

The Solar Equation

Cost

+ Installed Cost

+ Maintenance

- Direct Incentive

Benefit

+ Avoided Energy Cost

+ Excess Generation

+ Performance Incentive

A Policy Driven Market

Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering/ Interconnection	Solar Access
	Permitting & Interconnection	Tax Credits & Exemptions	Direct Cash & Performance Incentives
Local	Solarize	Property Assessed Clean Energy	

Investment Tax Credit

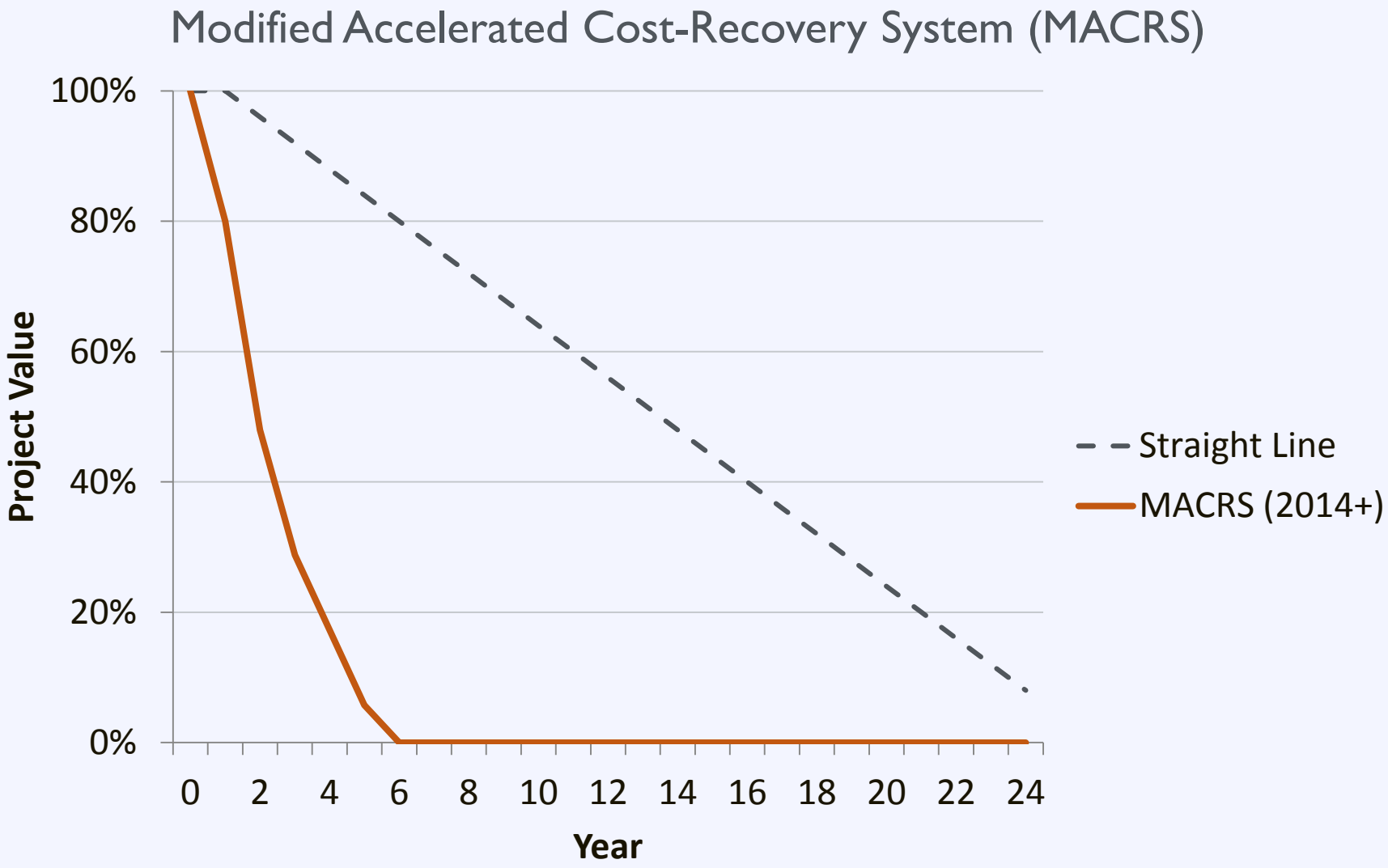
Type: Tax Credit

Eligibility: For-Profit Organization

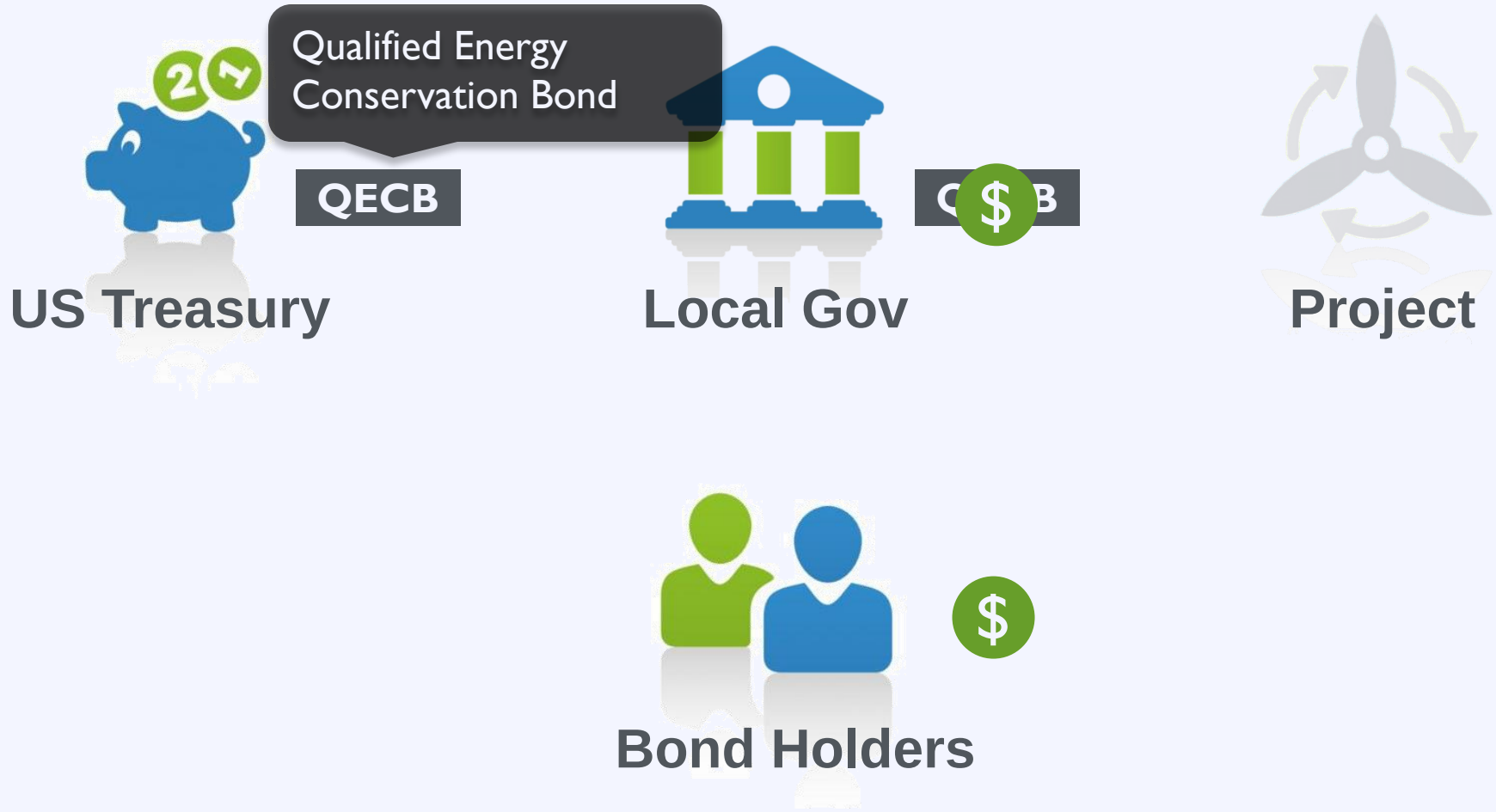
Value: 30% of the installation cost

Availability: Through 2016

Accelerated Depreciation

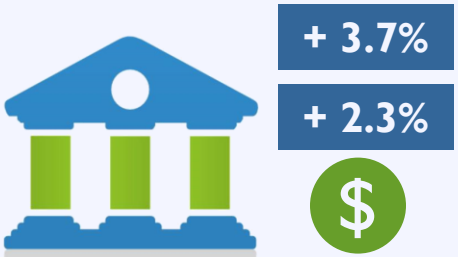


Qualified Energy Conservation Bond

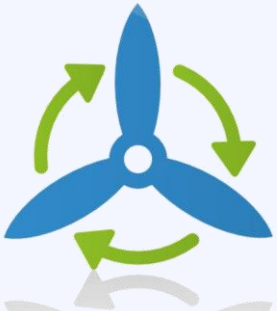


Qualified Energy Conservation Bond

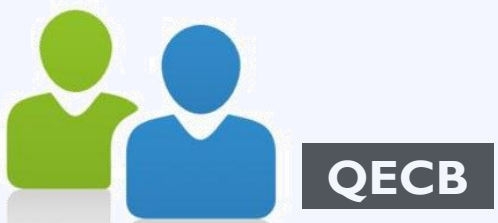
US Treasury



Local Gov



Project



Bond Holders

A Policy Driven Market

Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering/ Interconnection	Solar Access
	Permitting & Interconnection	Tax Credits & Exemptions	Direct Cash & Performance Incentives
Local	Solarize	Property Assessed Clean Energy	

State Corporate Tax Credit – for Systems

Type: Passive Solar Space Heat, Solar Water Heat, Solar Space Heat, Solar PV, Wind, Geothermal Heat Pumps, Combination Active Solar Space-Heating and Water Heating System

Eligibility:

Value: $3/W DC for PV, up to $1,000 per taxpayer for installations on multi-family residential rental units or commercial property; $500 for single family residential rental unit

Requirements: Must be installed by a North American Board of Certified Energy Practitioners (NABCEP)-certified installer. PV panels and inverters must meet National Electrical Code (NEC) and be certified by Underwriters Laboratories (UL).

Source: DSIRE

State Corporate Tax Credit – for Facilities

Type: Solar Thermal Electric, Solar PV, Landfill Gas, Wind, Biomass, Hydroelectric, Renewable Fuels

Eligibility: $500 for solar and wind installations; $250 for geothermal installations.

Value: $3/W DC

Requirements: All tax credits combined may not exceed 50% of the capital investment in the project. Negotiated incentive package may not exceed 25 years.

Source: DSIRE

State Personal/Individual Tax Credit

Type: Passive Solar Space Heat, Solar Water Heat, Solar Space Heat, Solar PV, Wind, Geothermal Heat Pumps, Combination Active Solar Space-Heating and Water Heating System

Eligibility: Residential, Multi-Family Residential

Value: $3/W DC, up to $500 for solar and wind installations

Requirements: Must be installed by a North American Board of Certified Energy Practitioners (NABCEP)-certified installer. PV panels and inverters must meet National Electrical Code (NEC) and be certified by Underwriters Laboratories (UL).

Source: DSIRE

Performance-Based Incentive: TVA Green Power Providers

Type: Solar PV, Wind, Biomass, Small Hydroelectric

Eligibility: Commercial, Residential, Nonprofit, Local Government, State Government, Fed. Government, all directly served TVA customers

Value: $1,000 upon installation, with Years 1-10: retail electric rate + premium payment, and Years 11-20: retail electric rate. 2014 premium rate for PV: 4 cents/kWh.

Requirements: The system must comply with environmental regulations and national standards, be certified by a licensed electrician, and comply with all applicable codes. PV installations approved by TVA in Calendar Year 2013 must be installed by a renewable energy professional with entry-level NABCEP certification.

Source: DSIRE

Performance-Based Incentive: TVA Solar Solutions Initiative

Type: Solar PV

Eligibility: 36 MW of systems sized to: 50 kW-1 MW.

Value: 10-year incentive of $0.06/kWh.

Requirements: The system must comply with environmental regulations and national standards, be certified by a licensed electrician, and comply with all applicable codes. PV installations approved by TVA in Calendar Year 2013 must be installed by a renewable energy professional with entry-level NABCEP certification.

http://www.tva.com/renewablestandardoffer/ssi_faq.htm

Source: DSIRE

Sales Tax Incentive

Type: Solar PV

Eligibility: 50 kW minimum, with minimum capital investment of $1M, and capped at 50% of project cost.

Value: Up to 100% of sales and use tax.

Ownership Options

Direct Ownership

Third-Party Ownership

Community Ownership

Direct Ownership

Benefits

- Low – cost electricity
- REC revenue
- Utilize cheap debt
  - Bonds
  - Low interest loans

Drawbacks

- Large upfront cost
- Long term management
- Can't take tax benefits
- Development risk
- Performance risk

A Variation on Direct Ownership: Energy Service Performance Contracting

- How it works
  - Energy services company (ESCO) sells an interested customer a package of energy efficiency measures (lighting, HVAC, etc.)
  - Package can include measures with both rapid and slower payback periods
  - The ESCO guarantees a certain level of electric bill savings for the customer backed up by the efficiency measures.
- What Role Can Solar Play in a Performance Contract?
  - Solar PV can act as an energy efficiency measure.
  - PV, as a longer-payback energy efficiency measure, can be offered as part of a package of longer- and shorter-payback ESCO-offered incentives that saves larger customers money.
- Could also be offered as a bundled 3rd party PPA

A Variation on Direct Ownership: Energy Service Performance Contracting

Benefits

- Low – cost electricity
- REC revenue
- Utilize cheap debt
  - Bonds
  - Low interest loans

Drawbacks

- Large upfront cost
- Long term management
- Can't take tax benefits
- Development risk
- Performance risk

Third Party Ownership

Benefits

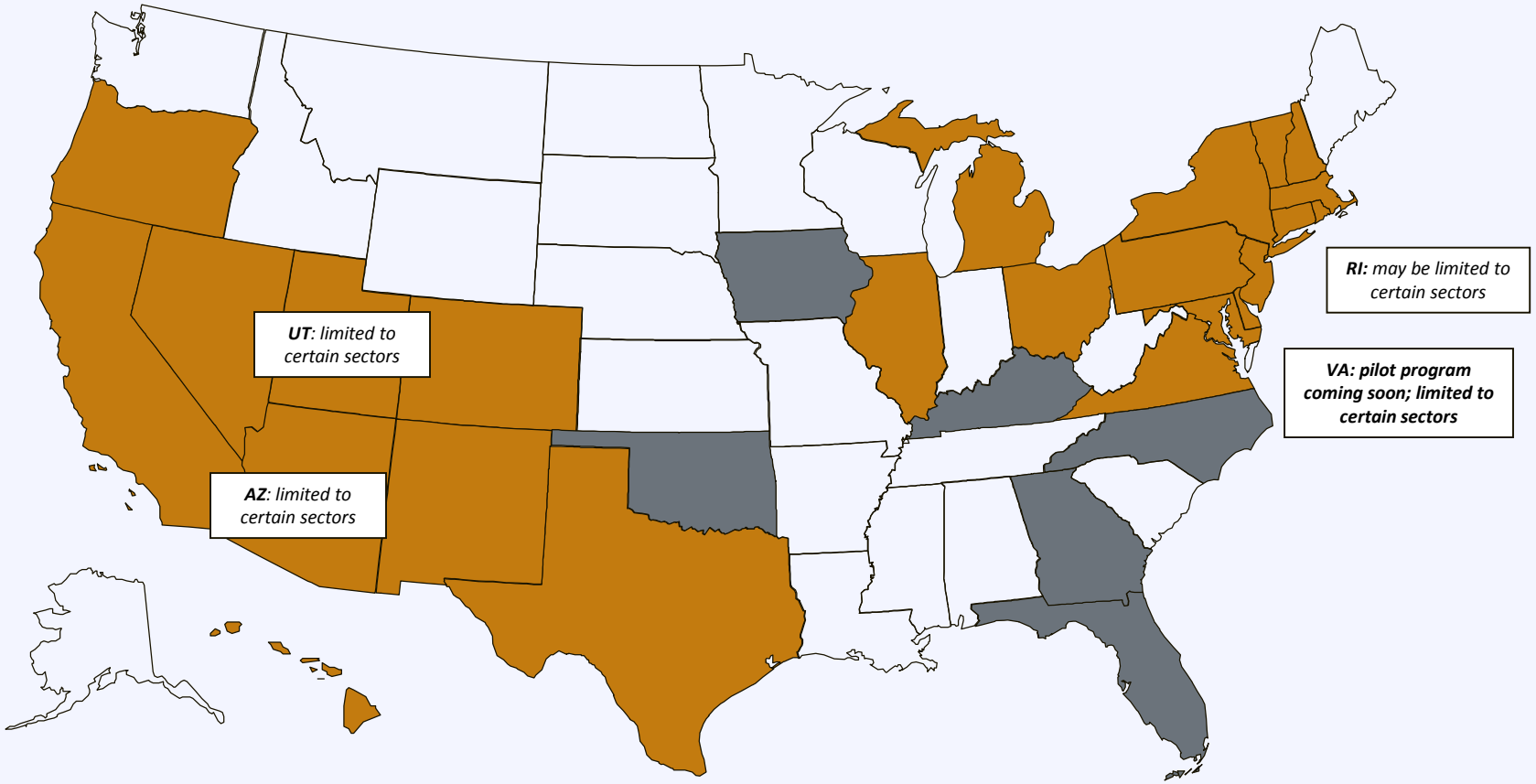
- No upfront cost
- No O&M costs
- Low risk
- Predictable payments
- Tax benefits

Drawbacks

- Don't keep RECs
- Higher ROI for investor
- Can't use bonds
- Not available in all states

Third Party Ownership: State Policy

www.dsireusa.org / February 2013



Authorized by state or otherwise currently in use, at least in certain jurisdictions within in the state

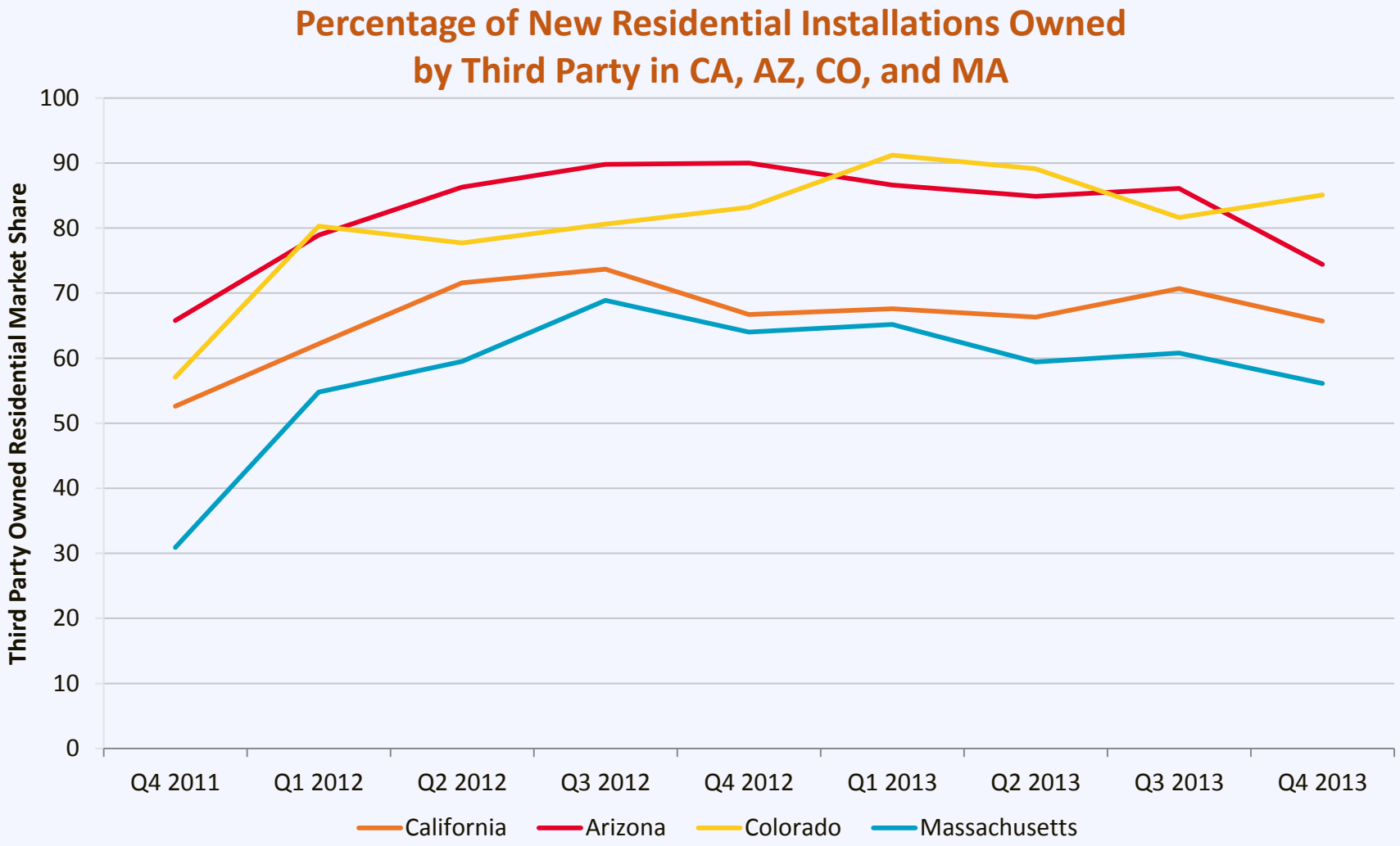
Apparently disallowed by state or otherwise restricted by legal barriers

Status unclear or unknown

Puerto Rico

Note: This map is intended to serve as an unofficial guide; it does not constitute legal advice. Seek qualified legal expertise before making binding financial decisions related to a 3rd-party PPA. See following slides for additional important information and authority references.

Benefits of PPAs



Powered by SunShot U.S. Department of Energy

Source: GTM Research/ Solar Energy Industries Association, *U.S. Solar Market Insight 2012 Year-in-Review*

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Activity: Next Steps

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

Next Steps

What do you do next?

Sign up for a 20 minute consultation to learn more about how we can help you.

Speak with one of our trainers after the workshop, or email solar-usa@iclei.org

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U.S. Department of Energy

Jim Kennerly

North Carolina Solar Center

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(919) 513-0792

Philip Haddix

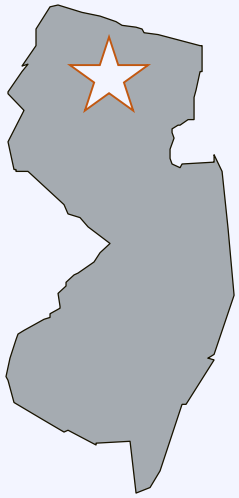
The Solar Foundation

phaddix@solarfound.org

(202) 469-3743

Appendix

Bond-PPA Hybrid

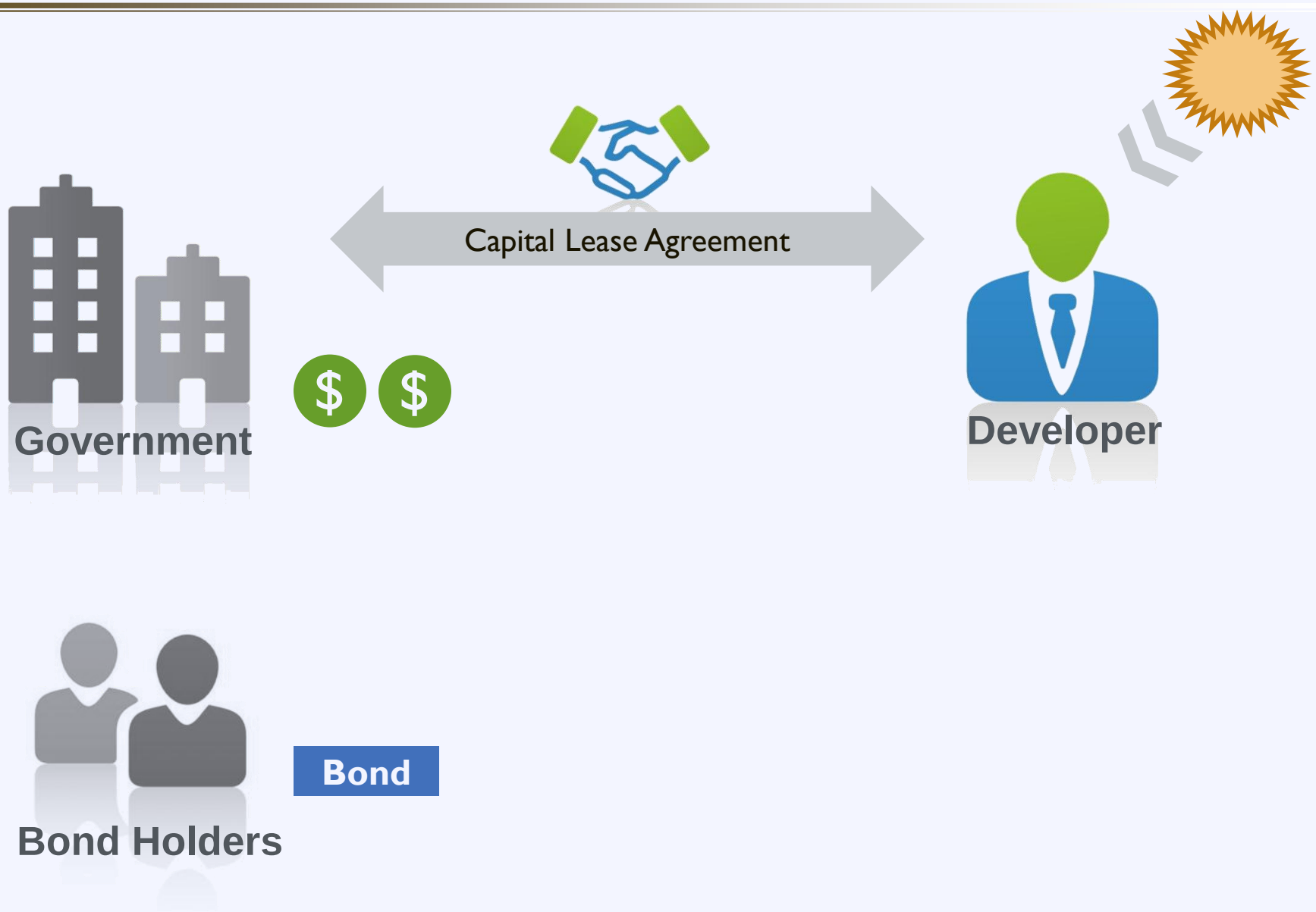


Morris County, New Jersey

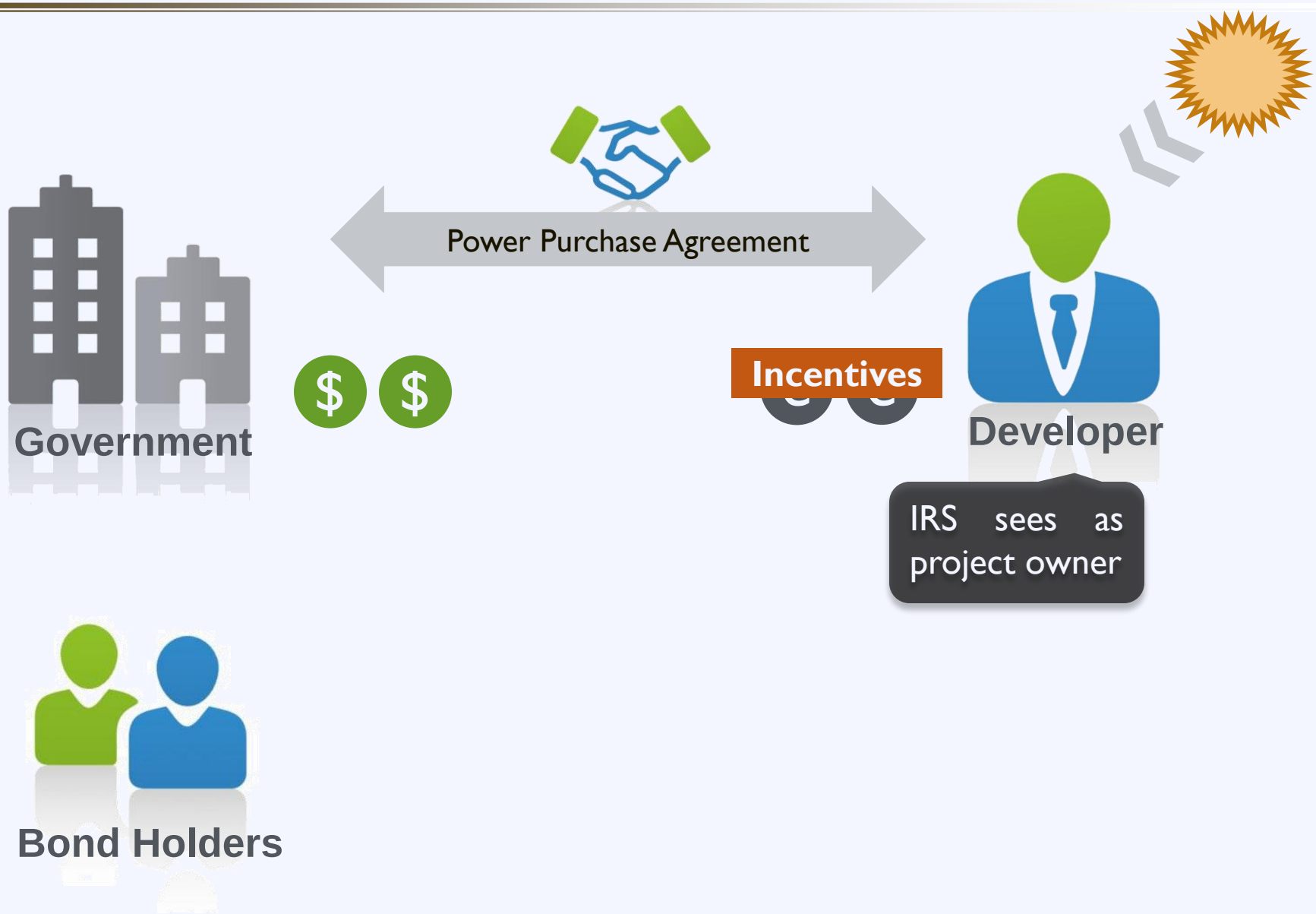
Population: 492,276

Bond-PPA Hybrid

Bond-PPA Hybrid



Bond-PPA Hybrid



Bond-PPA Hybrid

Pros

- No upfront cost
- No O&M costs
- Low risk
- Predictable payments
- Tax benefits
- Utilize low cost bonds

Cons

- Don't keep RECs

Replication of "Morris Model"

- Legality of PPA Model
- Laws Governing Public Contracts
- Laws Governing Bonding
- Laws Governing Procurement

Powered by SunShot
U.S. Department of Energy

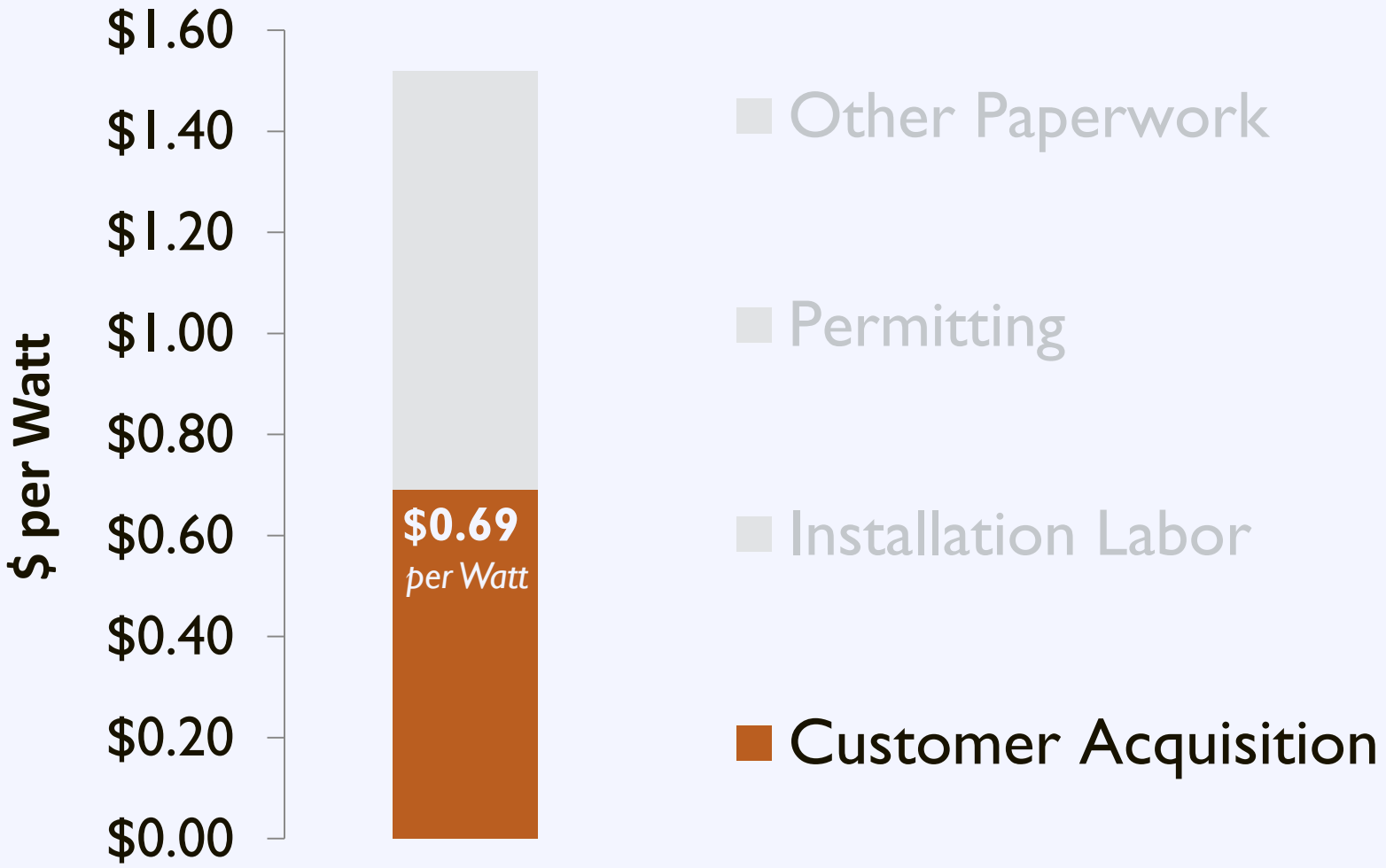
Source: NREL . 2011. Financing Solar PV at Government Sites with PPAs and Public Debt

Solarize

Solarize

Group Purchasing

Solarize: Mitigate Soft Costs



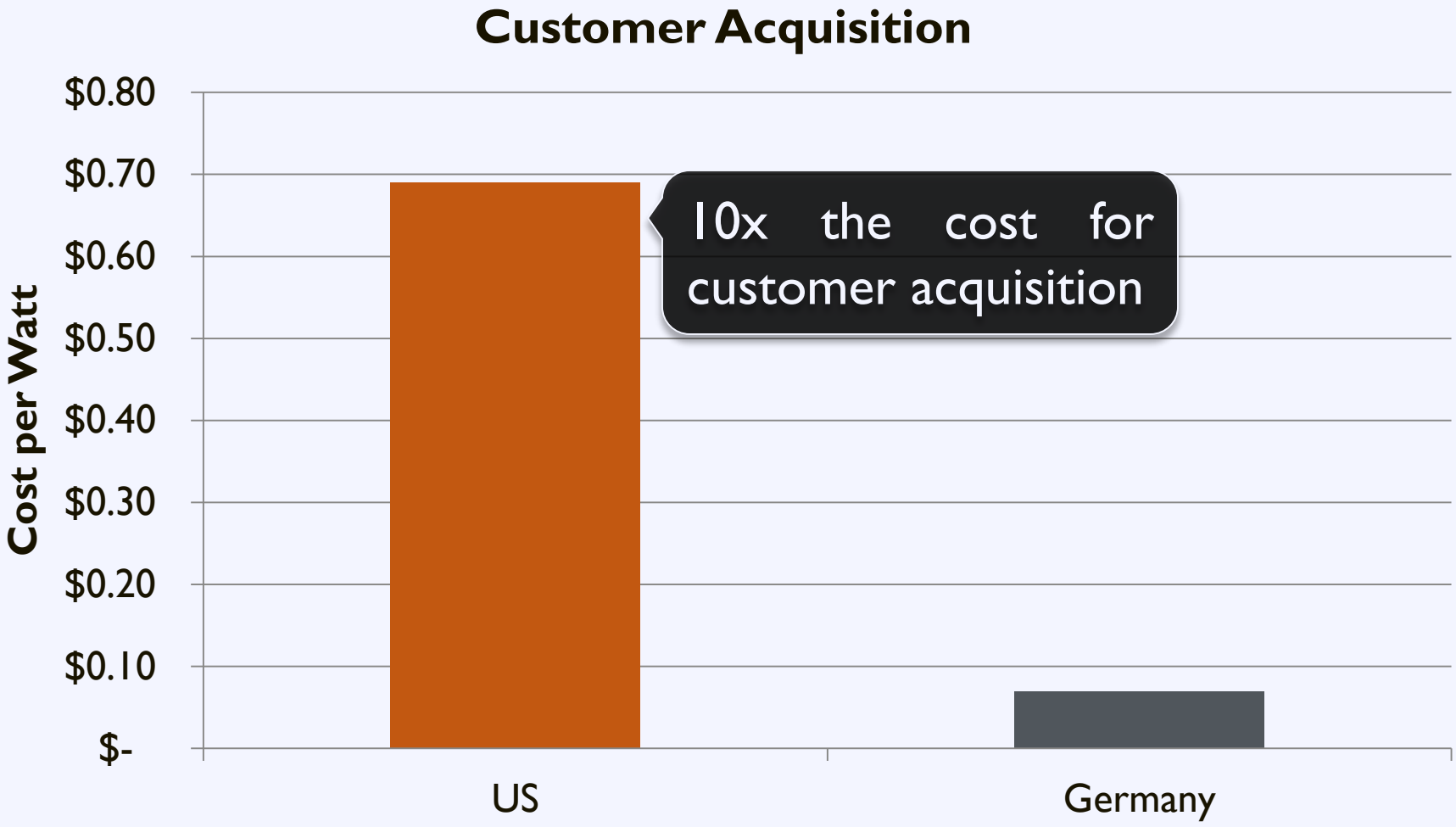
Powered by SunShot
U.S. Department of Energy

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

Solarize: Advantages

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

Solarize: Advantages



Source: NREL, LBNL

Solarize: Advantages

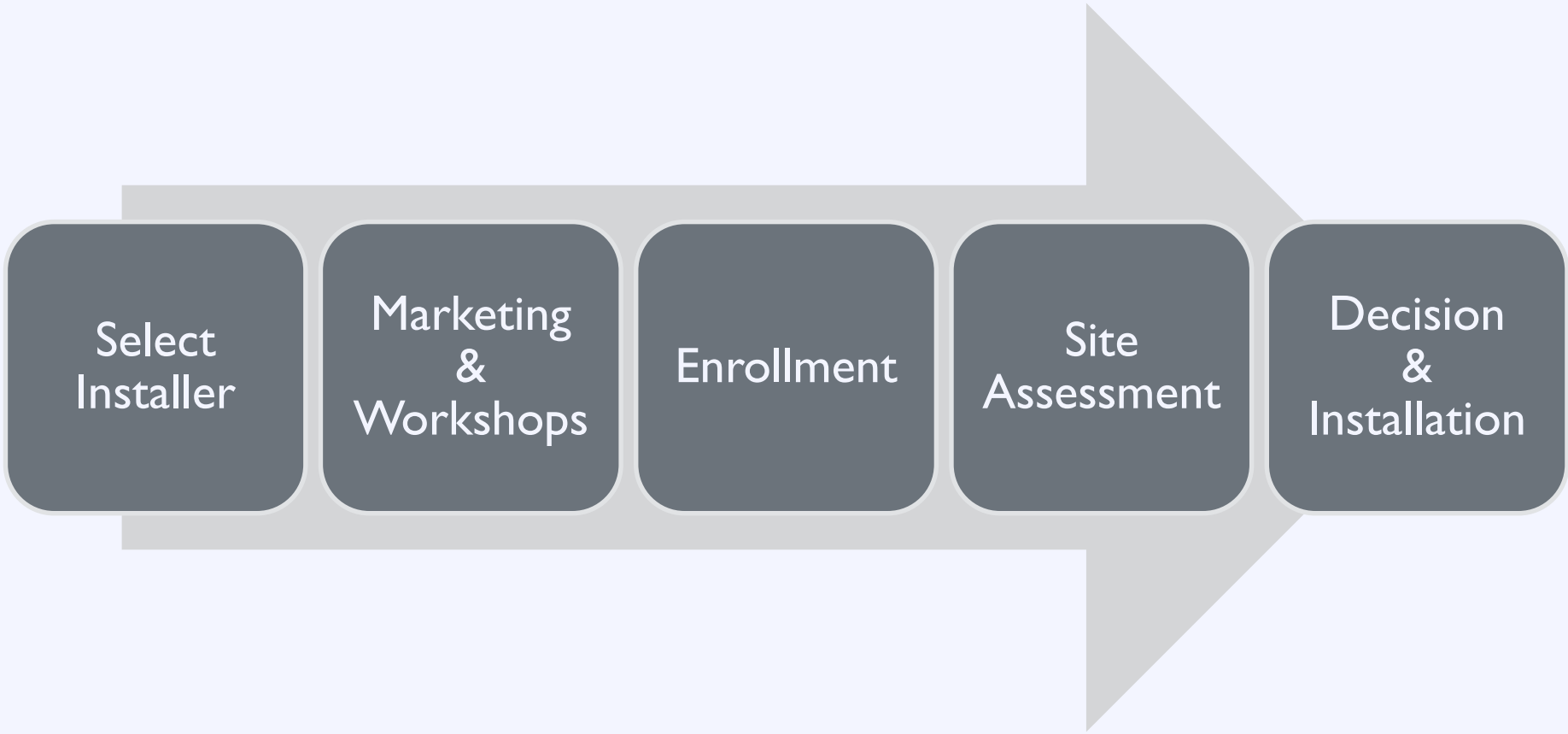
Benefits to Local Government:

Low implementation cost: $5,000 - $10,000

Quick turn-around: 9 Months

Long-term impact: Sustainable ecosystem

Solarize: Process



Solarize: Case Study

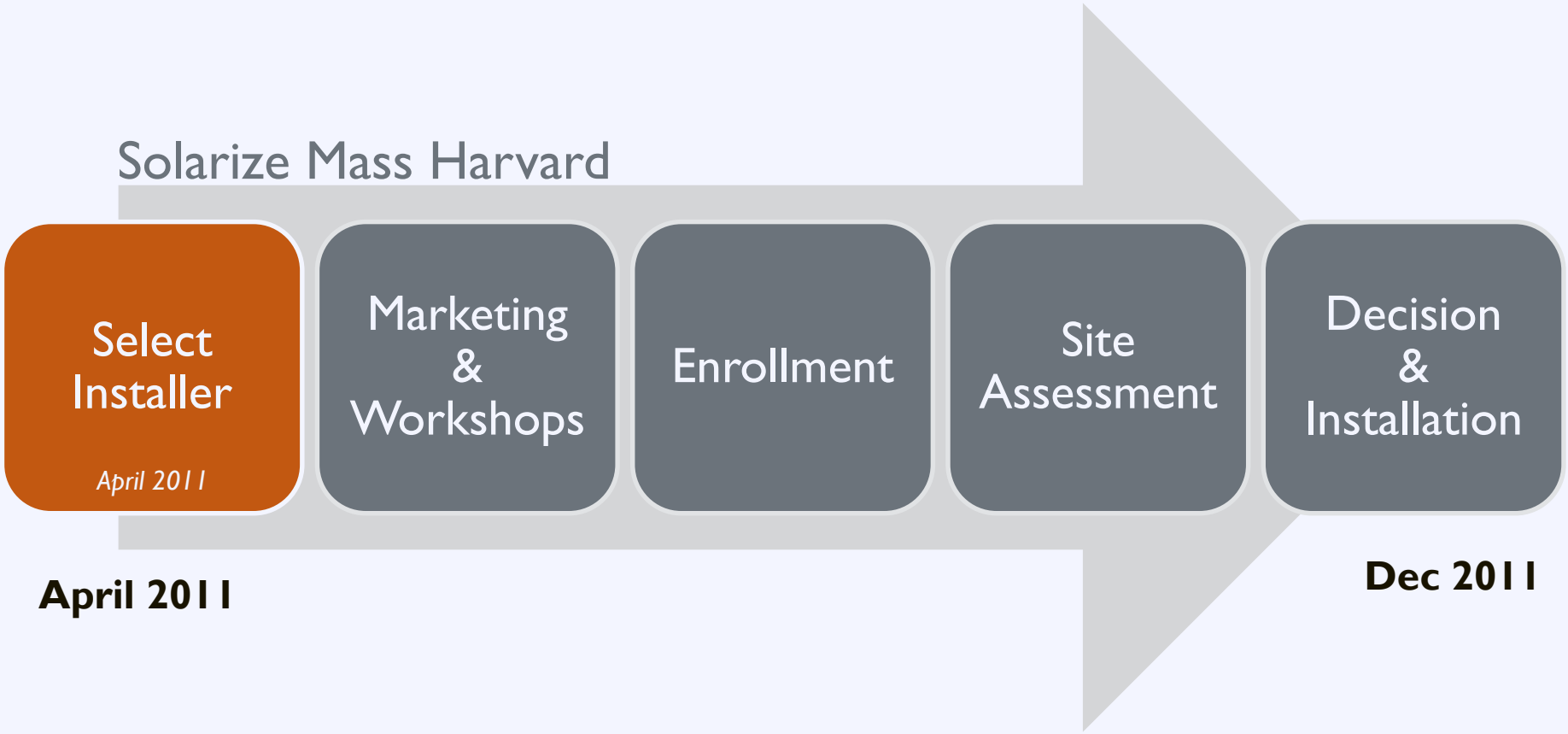
Harvard, Massachusetts

Population: 6,520

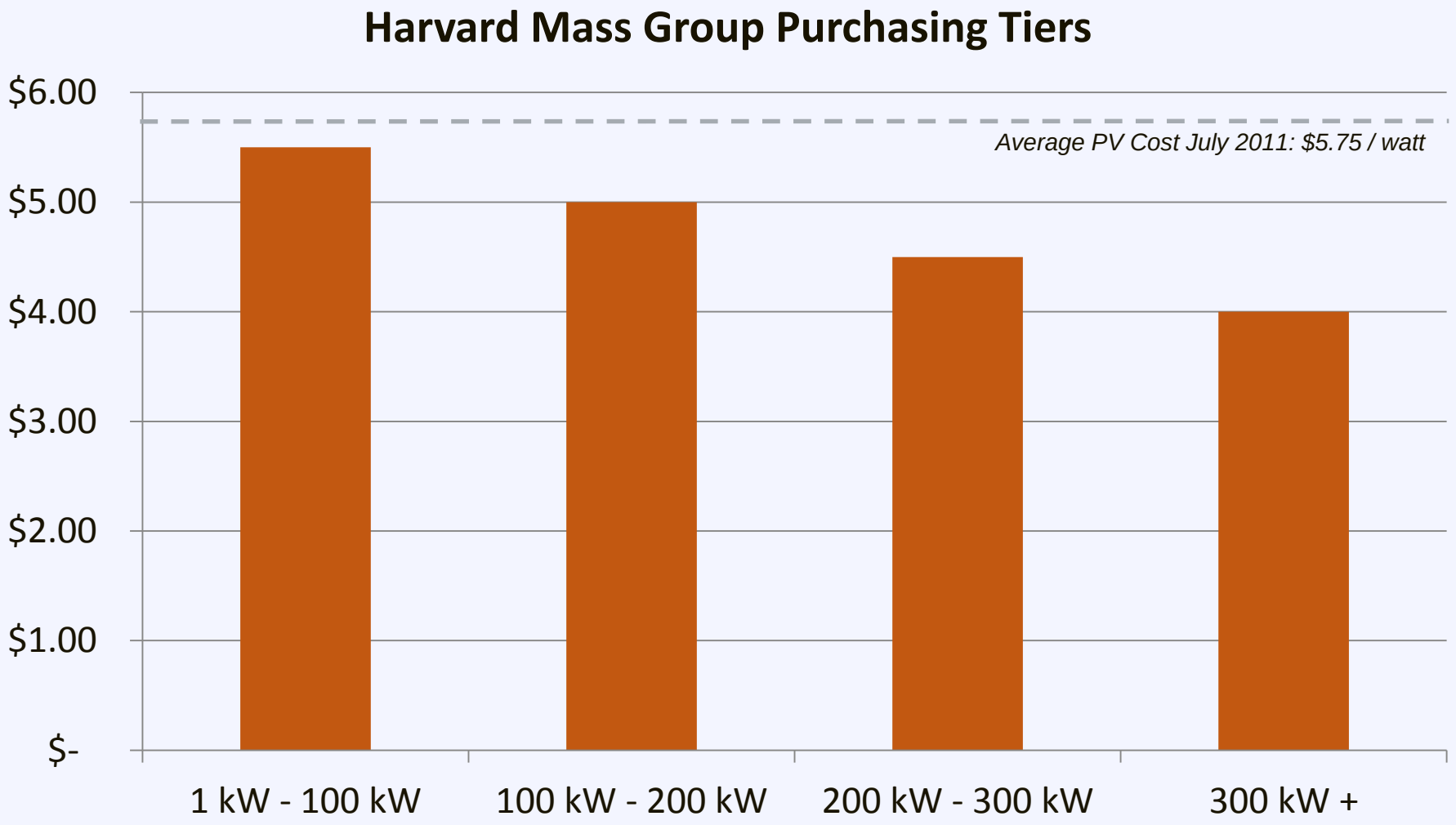
Powered by SunShot
U.S. Department of Energy

Source: Wikipedia

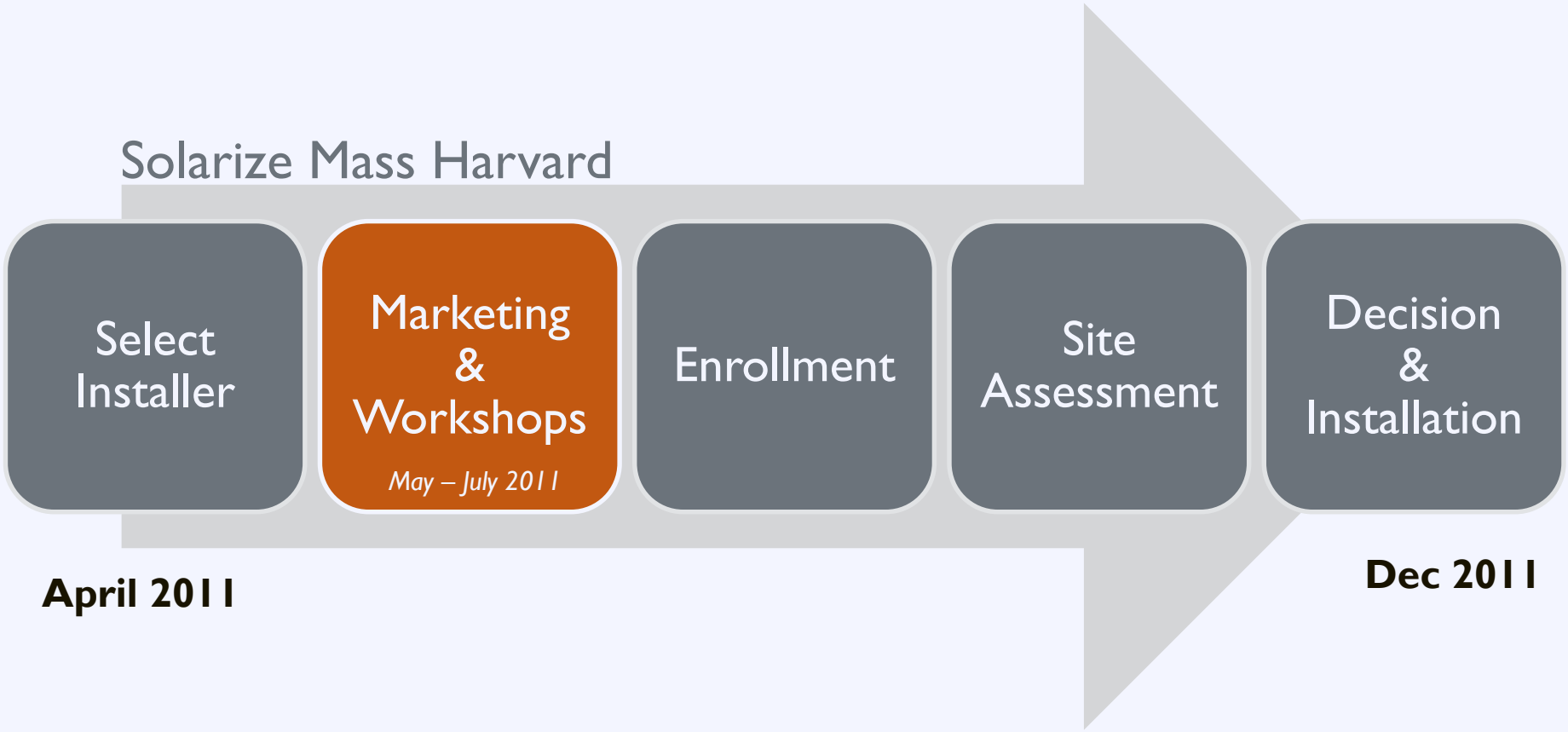
Solarize: Case Study



Group Purchasing



Solarize: Case Study



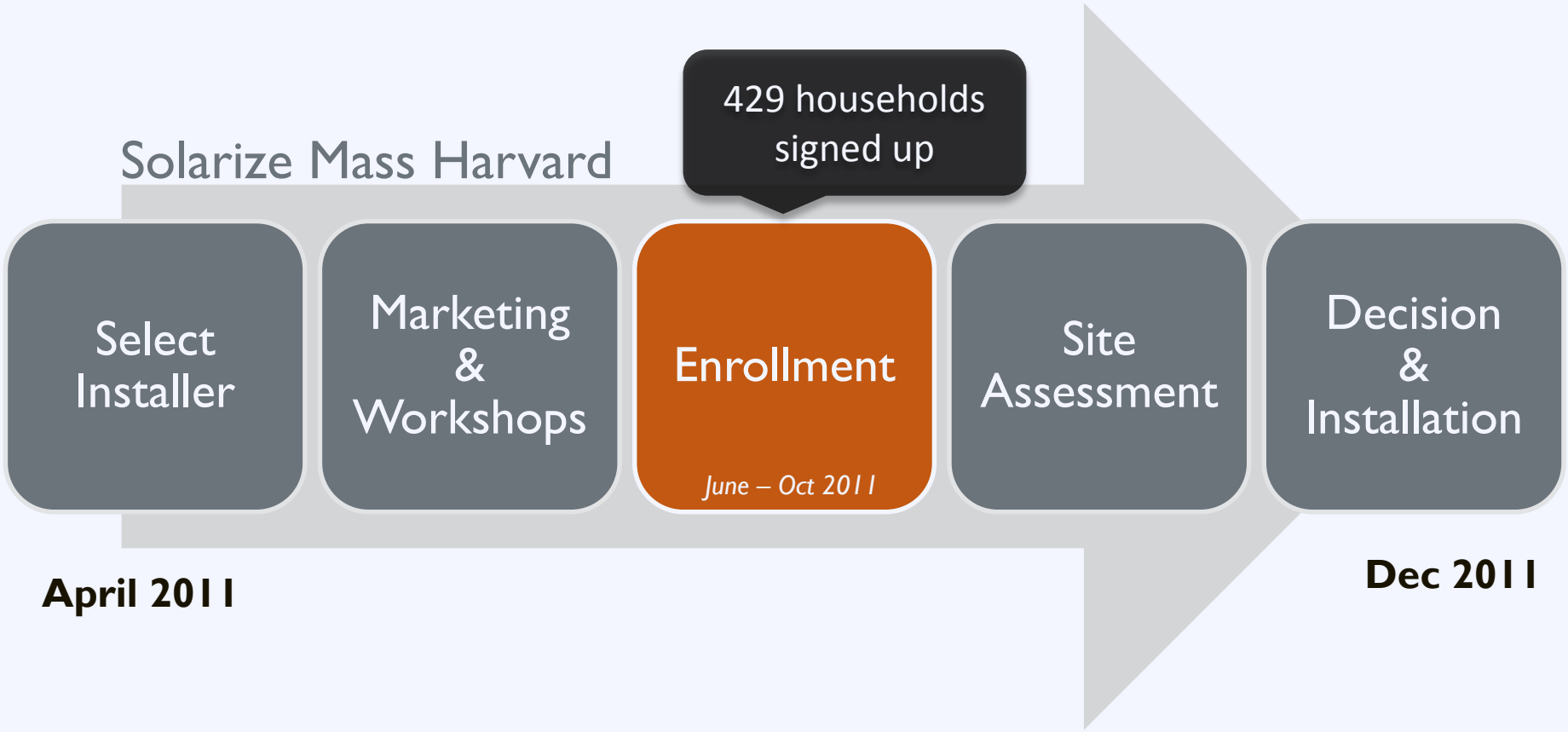
Solarize: Case Study

Marketing Strategy:

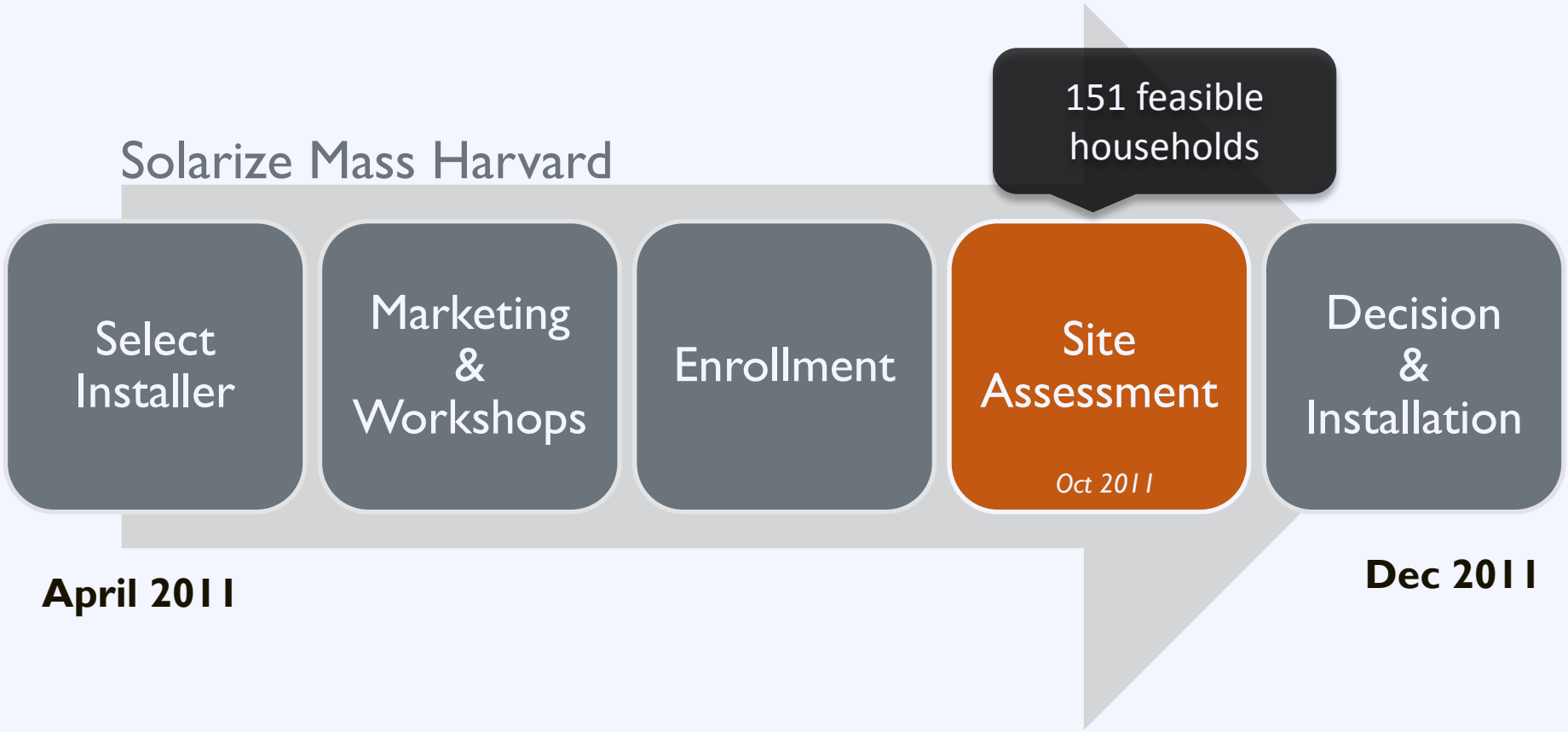
- Electronic survey of 1,100 households
- Email newsletters and direct mailings
- Float in July 4 parade
- Articles and advertisements in local newspaper
- Facebook page and online discussion board

Source: Vote Solar

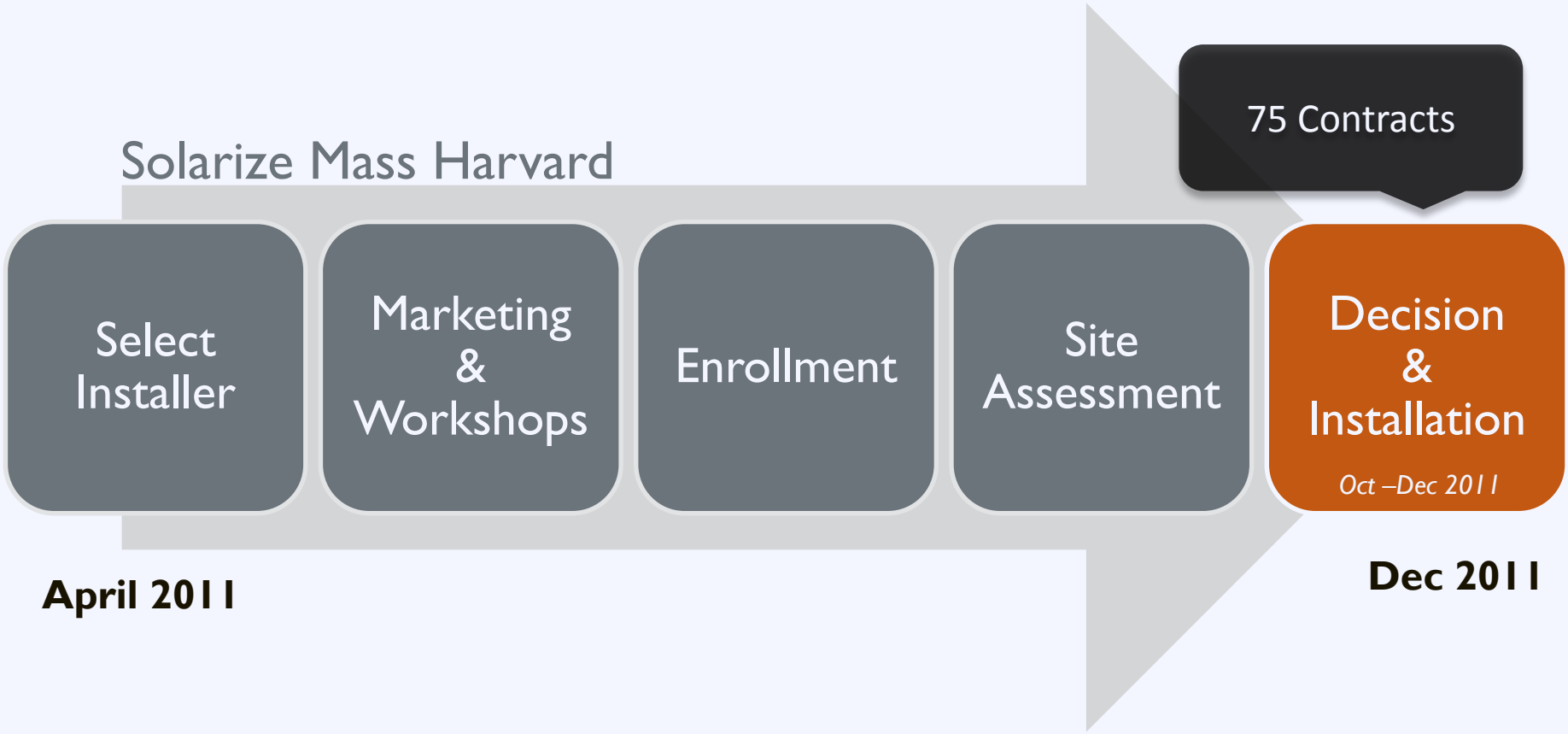
Solarize: Case Study



Solarize: Case Study



Solarize: Case Study



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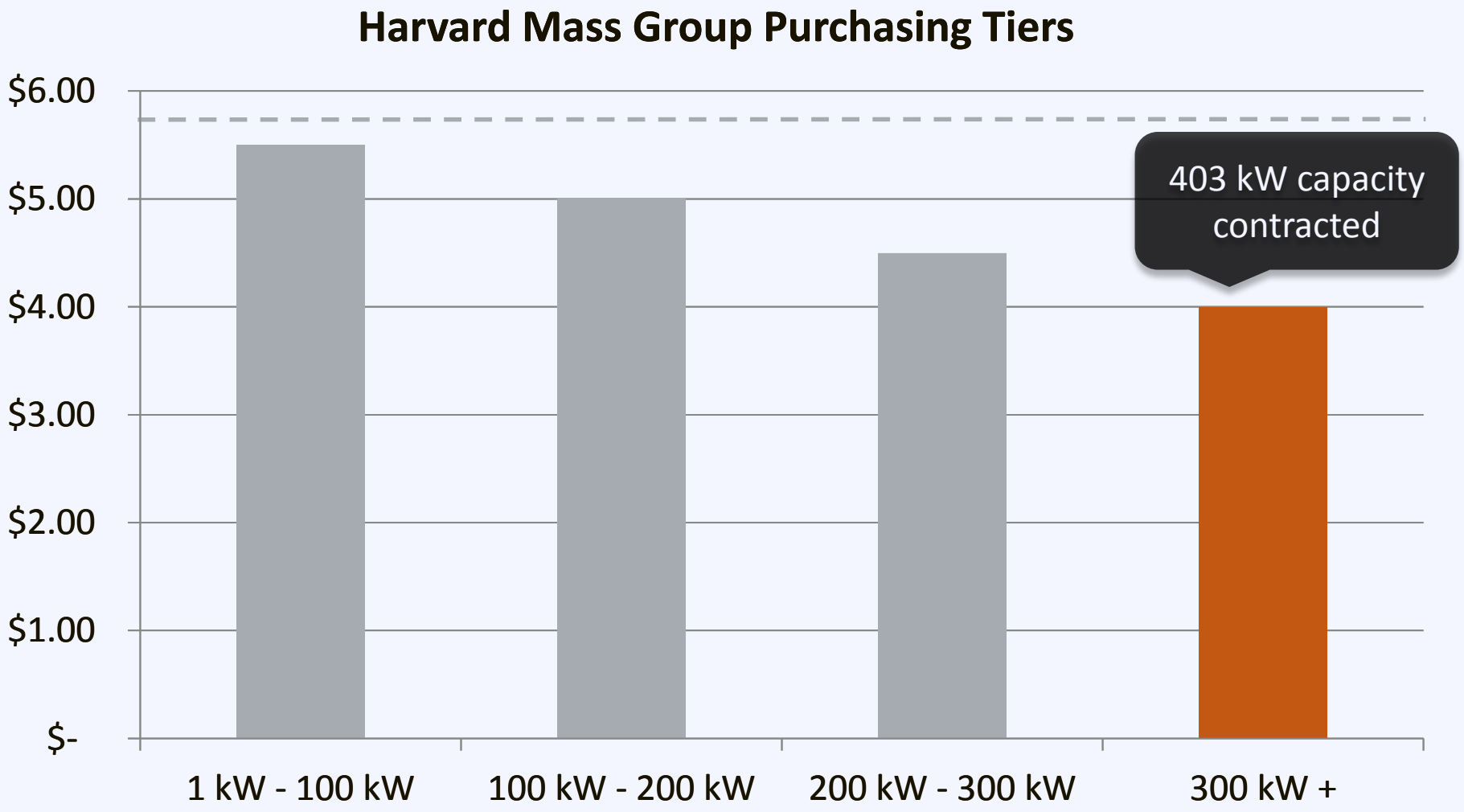


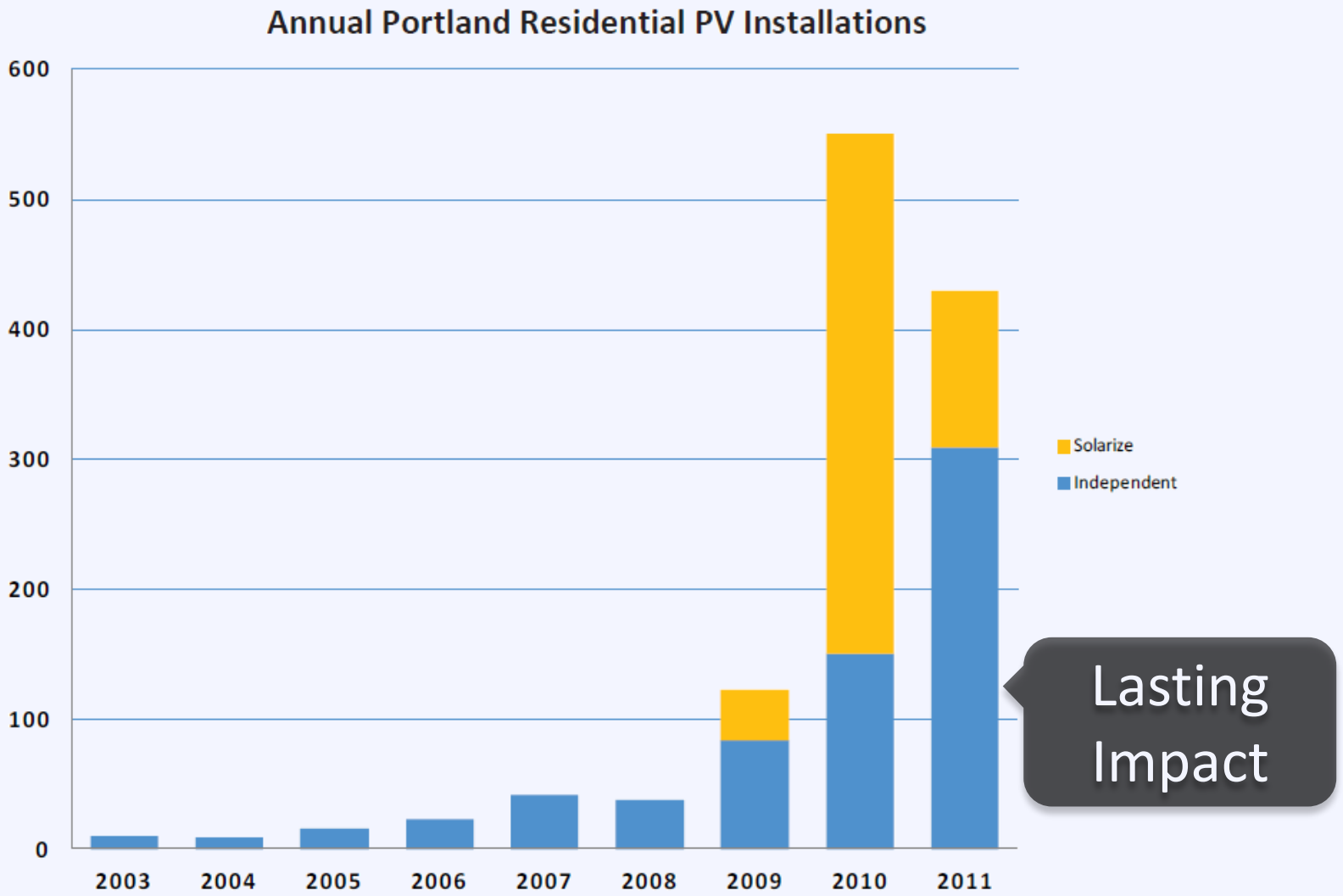
Solarize: Case Study

75 new installations totaling 403 kW

30% reduction in installation costs

575% increase in residential installations

Solarize: Lasting Impact



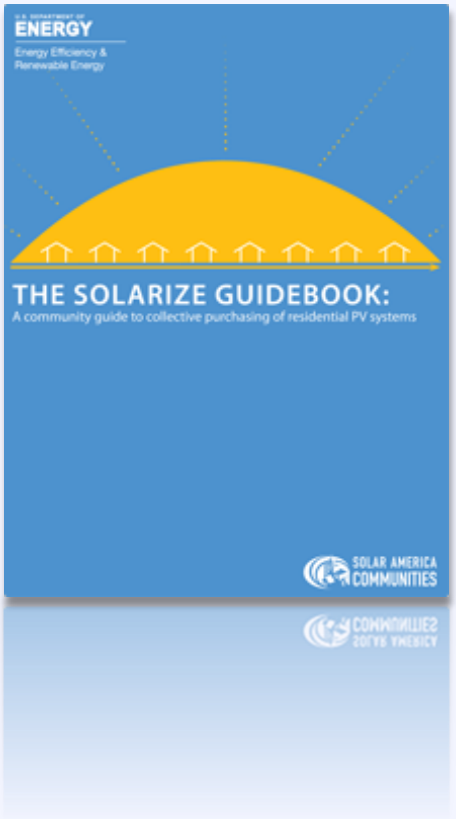
Source: NREL

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



MIDWEST CLEAN
ENERGY ENTERPRISE, LLC

Benefits and Barriers of Solar Adoption

A presentation for:

Solar Powering Your Community Workshop
Owensboro, Kentucky

By: Jason Delambre, CEM

March 27, 2014

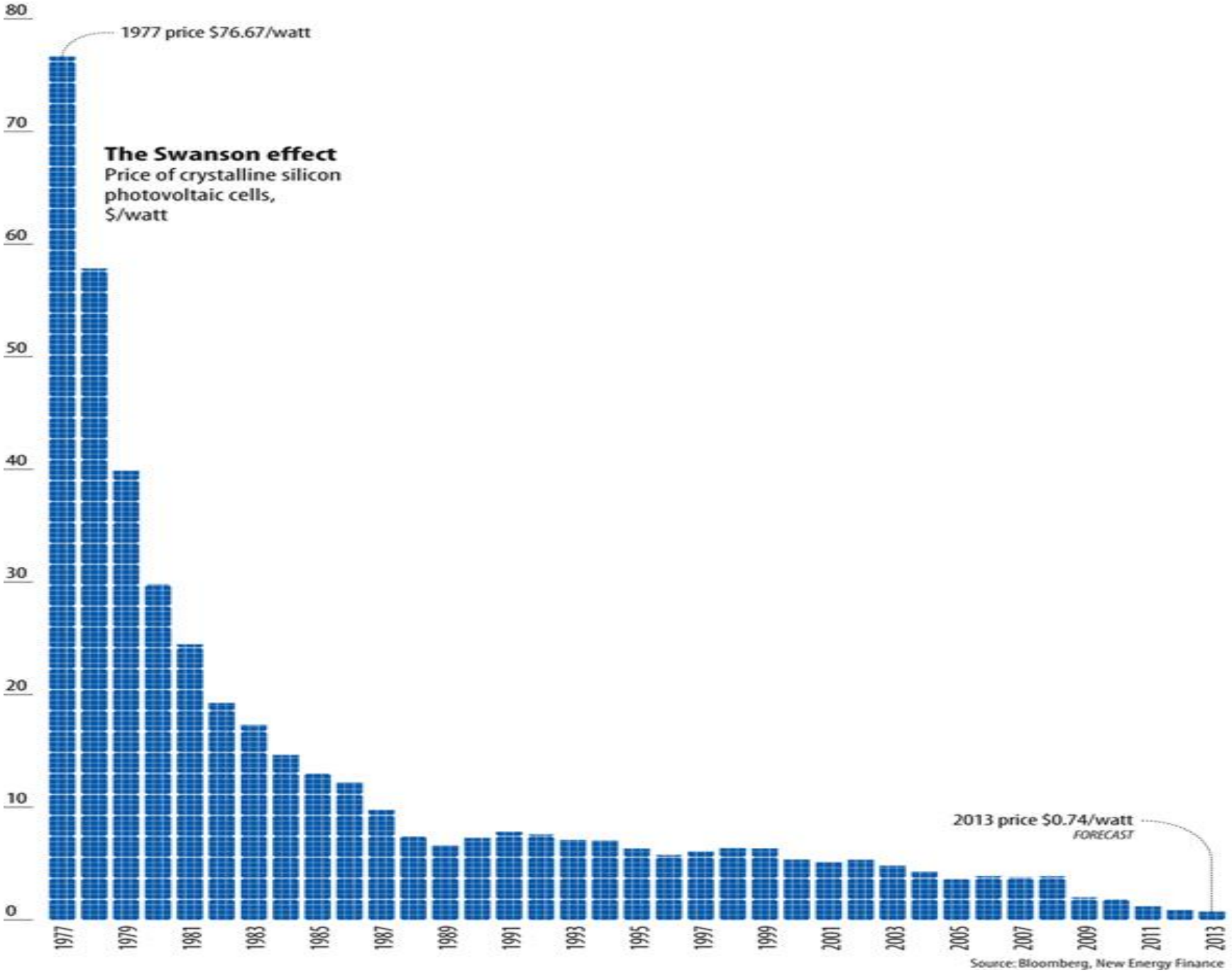
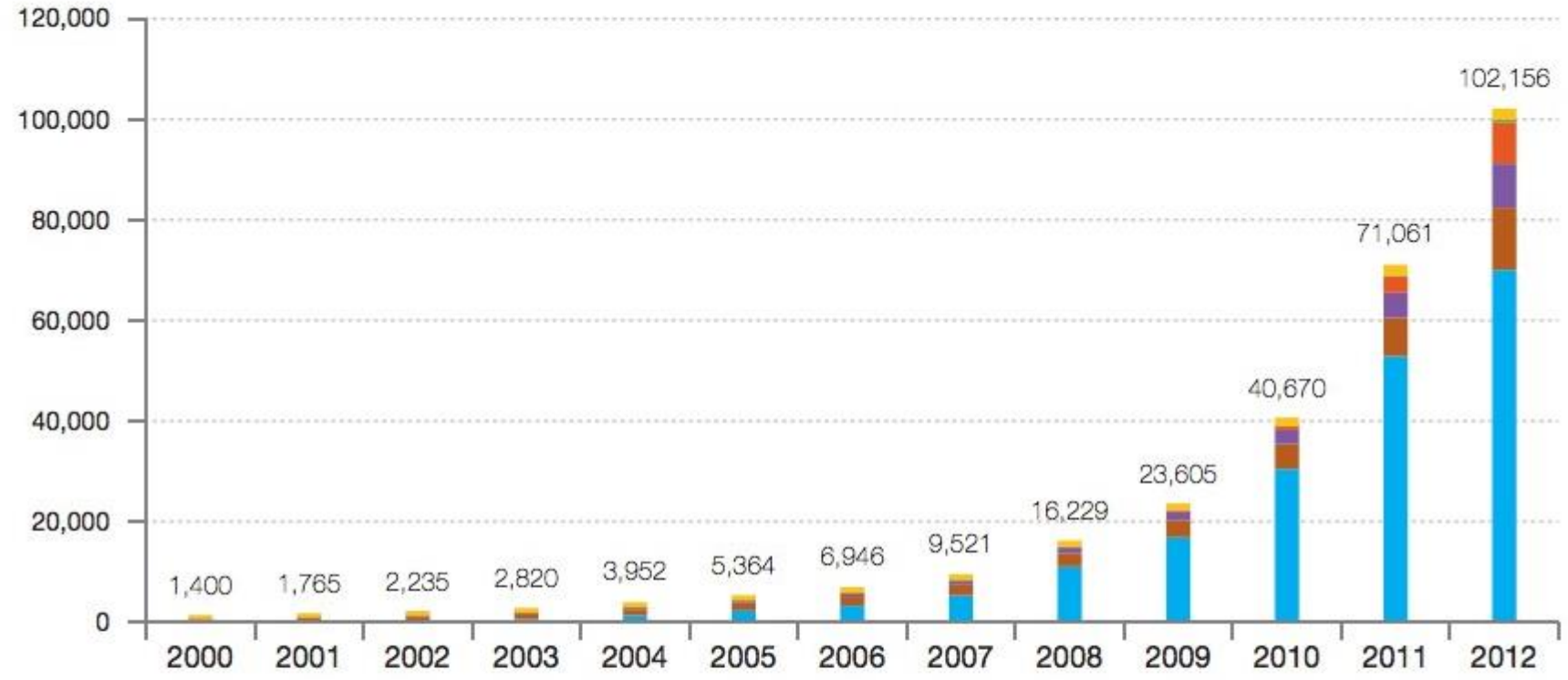

80
70
60
50
40
30
20
10
0
1977 price $76.67/watt
The Swanson effect
Price of crystalline silicon photovoltaic cells, $/watt
2013 price $0.74/watt
FORECAST
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
Source: Bloomberg, New Energy Finance

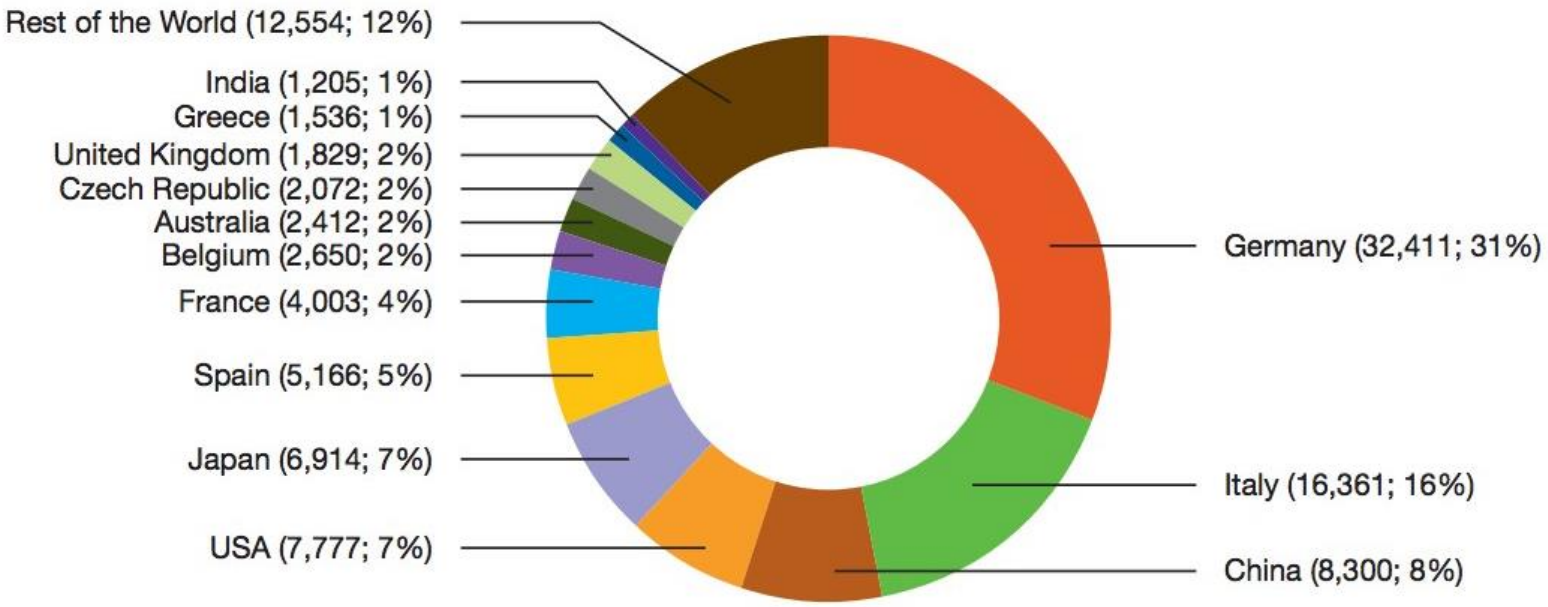
Figure 1 - Evolution of global PV cumulative installed capacity 2000-2012 (MW)

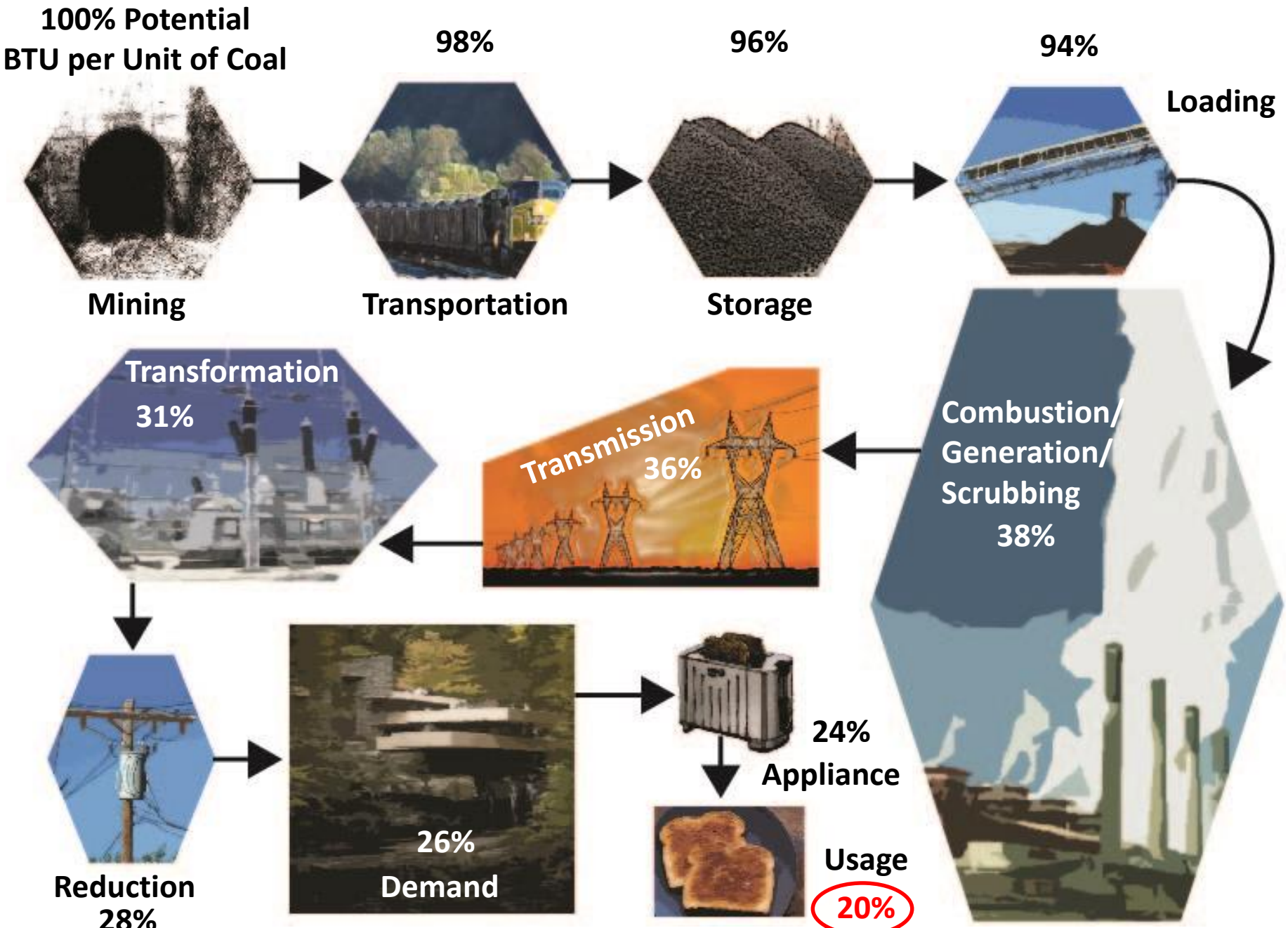


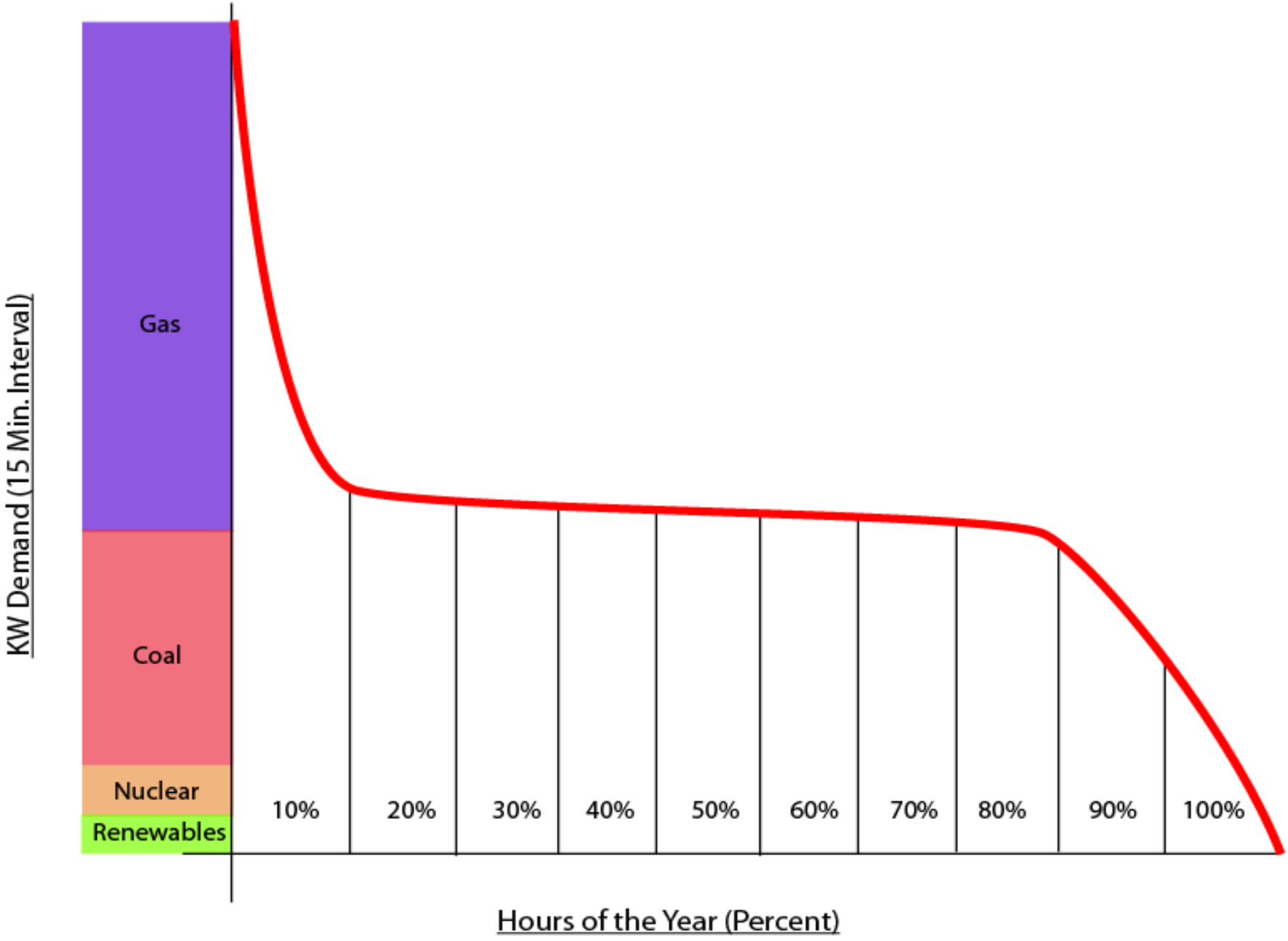
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
ROW	751	807	887	964	993	1,003	1,108	1,150	1,226	1,306	1,590	2,098	2,098
MEA	n/a	n/a	n/a	n/a	1	1	1	2	3	25	71	192	601
China	19	24	42	52	62	70	80	100	140	300	800	3,300	8,300
Americas	146	178	225	290	394	501	650	863	1,209	1,752	2,780	4,959	8,717
APAC	355	495	686	916	1,198	1,500	1,825	2,096	2,631	3,373	4,956	7,628	12,397
Europe	129	262	396	598	1,305	2,289	3,281	5,310	11,020	16,850	30,472	52,884	70,043
Total	**1,400**	**1,765**	**2,235**	**2,820**	**3,952**	**5,364**	**6,946**	**9,521**	**16,229**	**23,605**	**40,670**	**71,061**	**102,156**

ROW: Rest of the World. MEA: Middle East and Africa. APAC: Asia Pacific.

Figure 19 - Global PV cumulative installed capacity share in 2012 (MW; %)

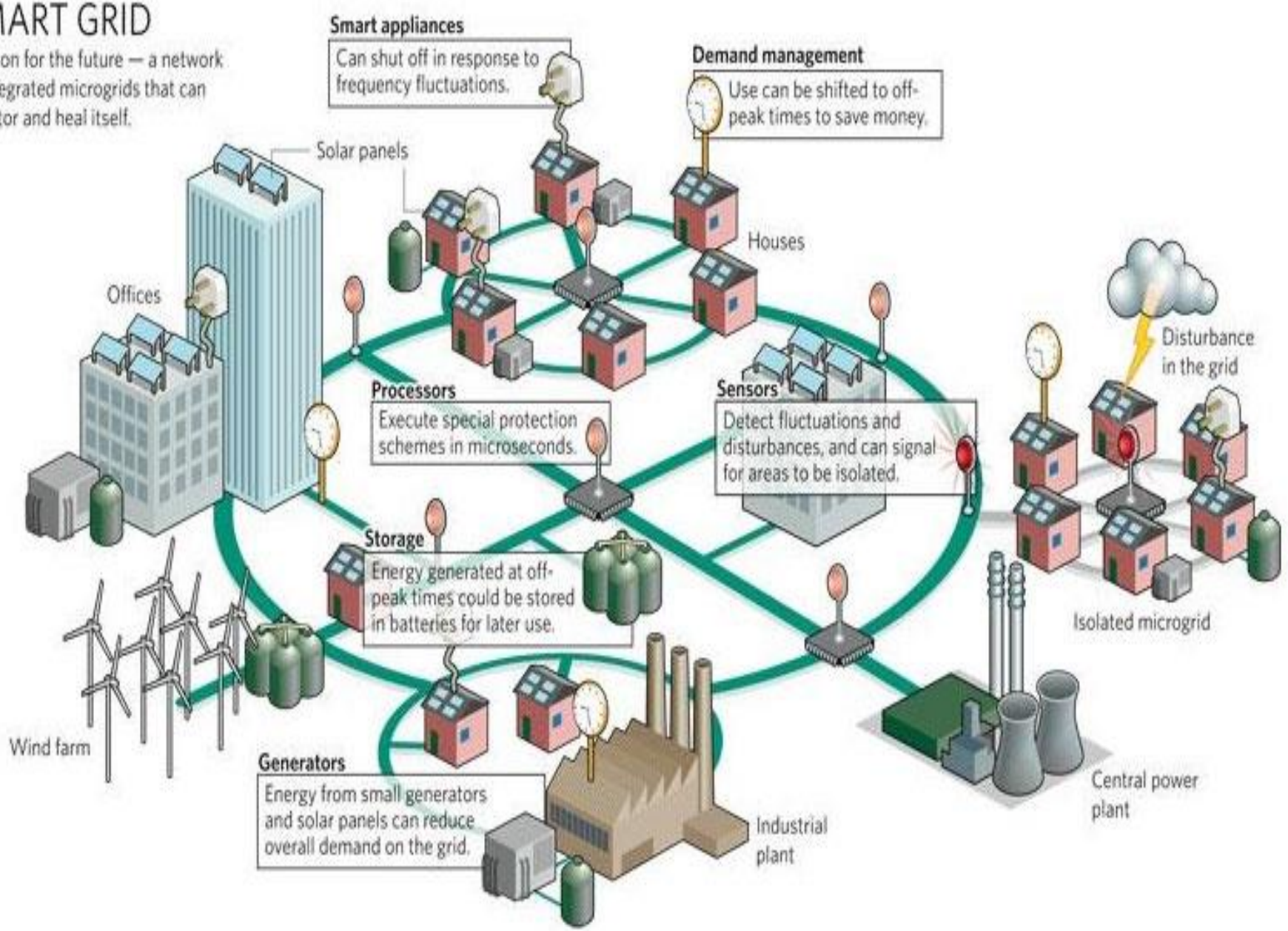



100% Potential
BTU per Unit of Coal
98%
96%
94%
Loading
Mining
Transportation
Storage
Transformation
31%
Transmission
36%
Combustion/
Generation/
Scrubbing
38%
Reduction
28%
26%
Demand
24%
Appliance
Usage
20%


KW Demand (15 Min. Interval)
Gas
Coal
Nuclear
Renewables
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Hours of the Year (Percent)

SMART GRID

A vision for the future — a network of integrated microgrids that can monitor and heal itself.



#1

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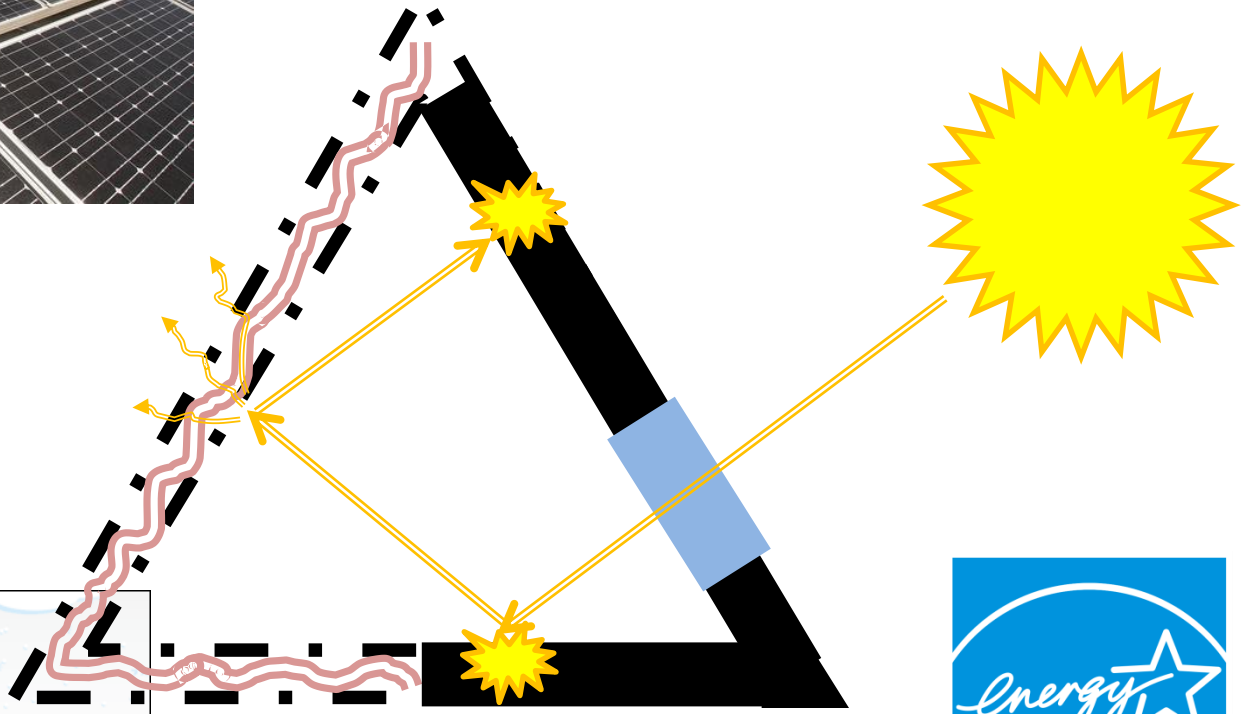
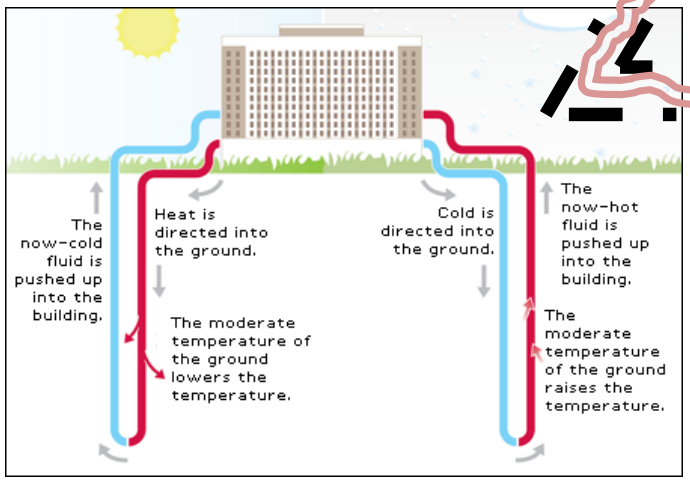
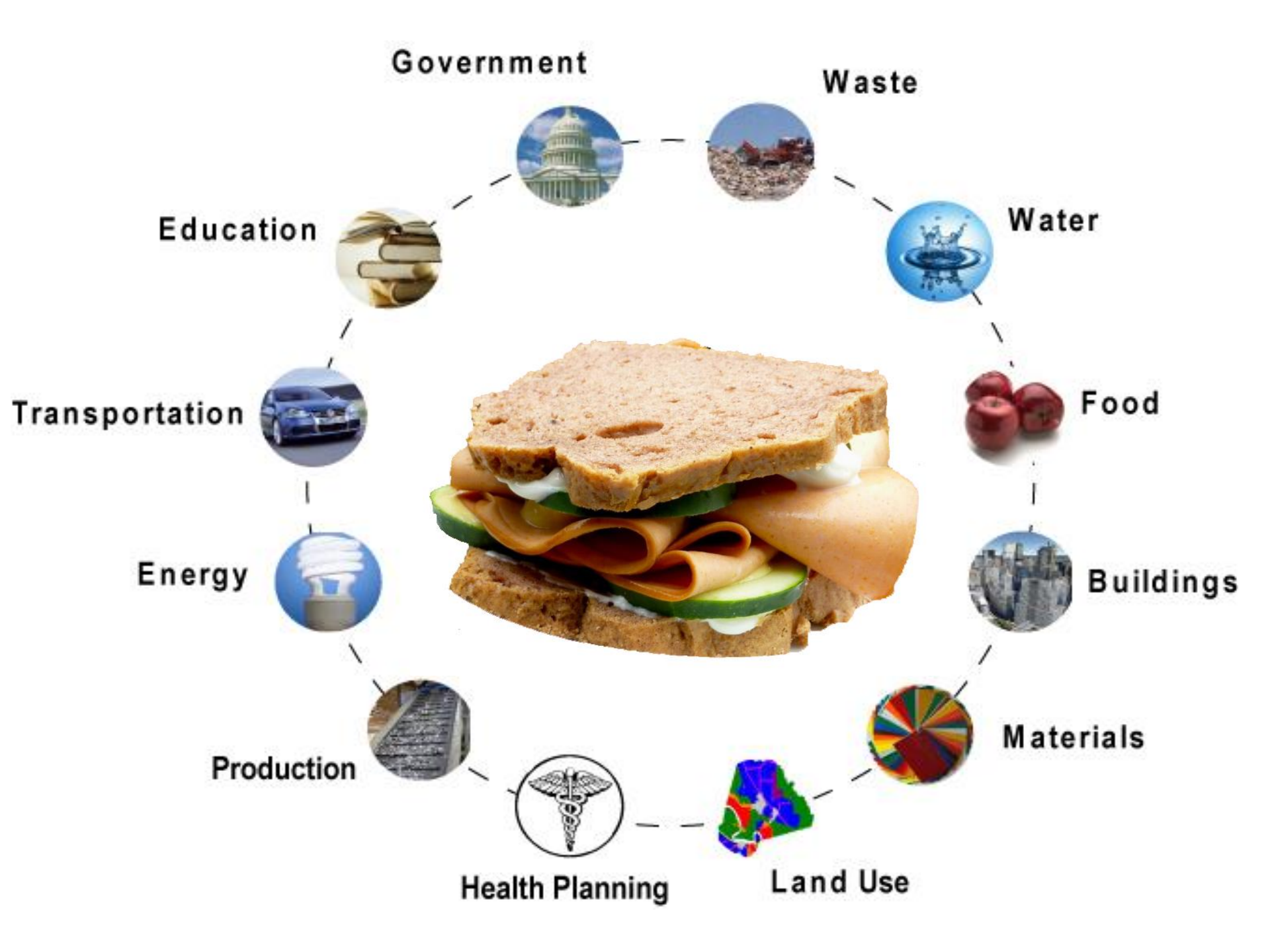



The now-cold fluid is pushed up into the building.
Heat is directed into the ground.
Cold is directed into the ground.
The now-hot fluid is pushed up into the building.
The moderate temperature of the ground lowers the temperature.
The moderate temperature of the ground raises the temperature.

ENERGY STAR


Government
Waste
Education
Water
Transportation
Food
Energy
Buildings
Production
Materials
Health Planning
Land Use


Government
Waste
Education
Water
Transportation
Food
Energy
Buildings
Production
Materials
Health Planning
Land Use

MIDWEST CLEAN
ENERGY ENTERPRISE, LLC

Solar Financing

A presentation for:

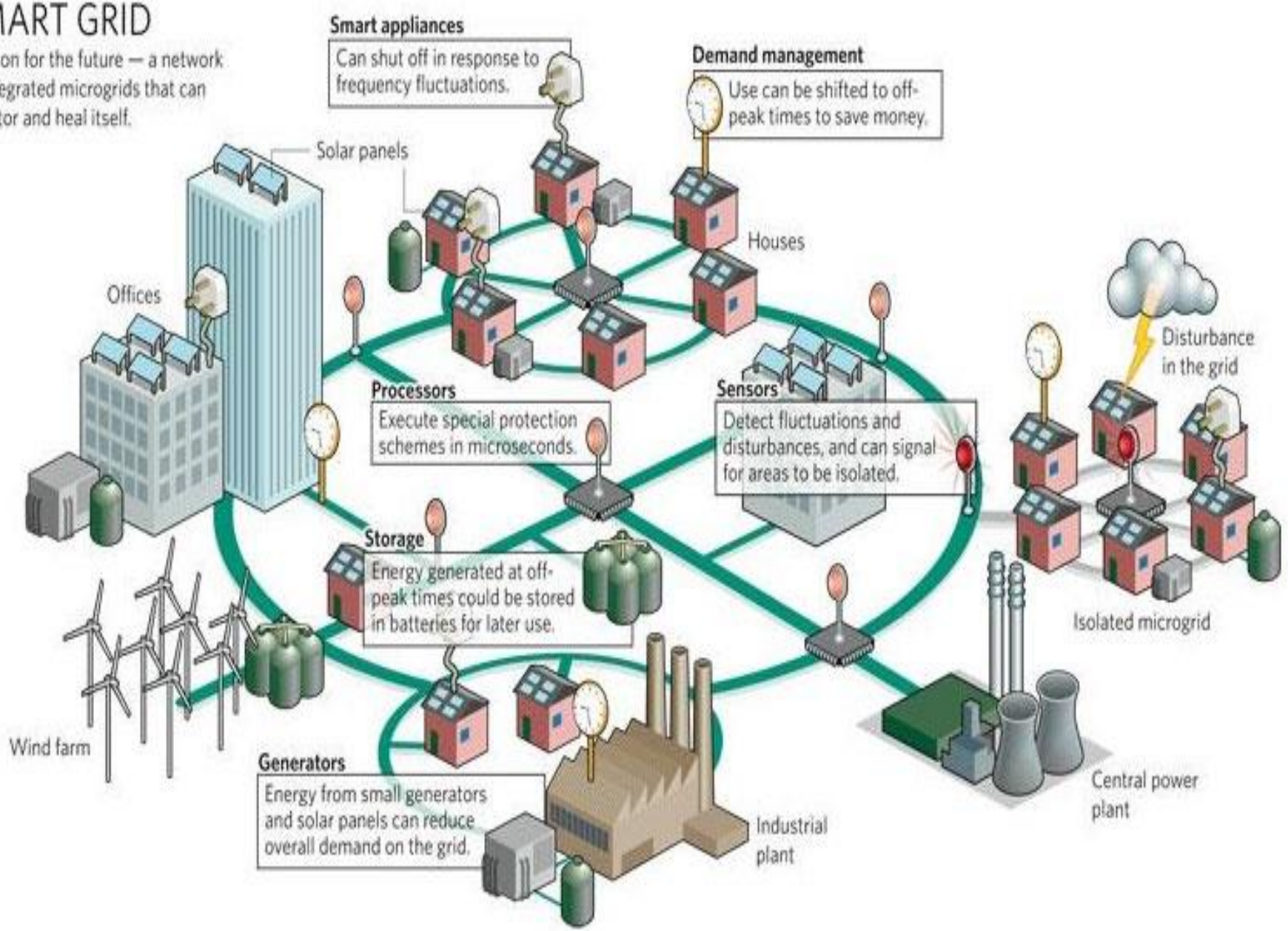
Solar Powering Your Community Workshop
Owensboro, Kentucky

By: Jason Delambre, CEM &
Robert Clark

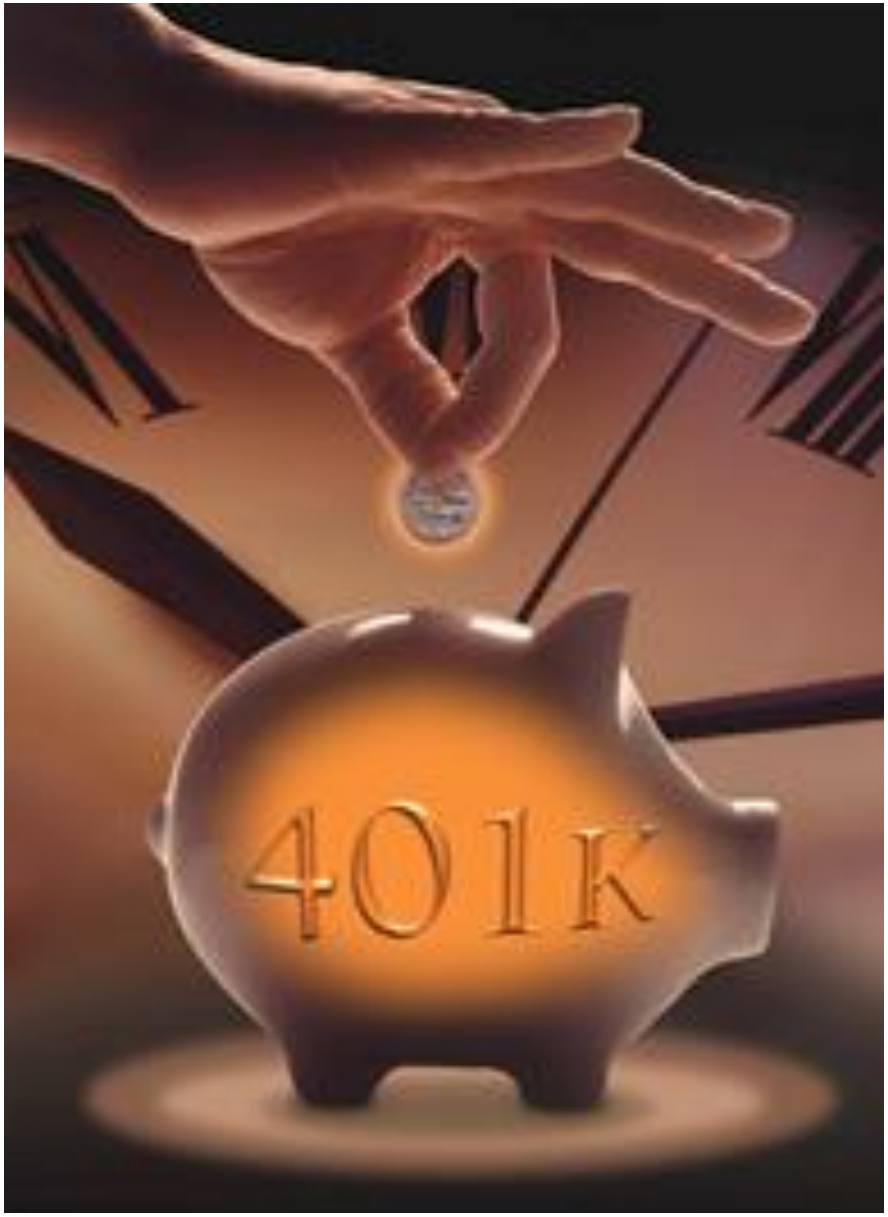
March 27, 2014

SMART GRID

A vision for the future — a network of integrated microgrids that can monitor and heal itself.



Committed to the future of rural communities.


401K

FORT KNOX ENERGY BRIEF

Fort Knox Energy Program
One of the Nation's Best

Mr. R.J. Dyrdek, Energy Manager, DPW

FORT KNOX ENERGY BRIEF

Our Second Largest bill on Post behind the labor bill !!

1308111000007020

PLEASE RETURN THIS PORTION WITH YOUR PAYMENT

Summary Account Number	Payment Due Date	Amount Due By Due Date	Previous Balance	Amount Due 3 Days After Due Date	Amount Enclosed
3000-0000-1580	08/24/11	$1,421,040.00	$0.00	$1,435,270.53	$

Contact Phone # (502) 624-8358

☐ Check here if plans(s) requested on back of stub

LG&E
a PPL company

PO BOX 538612
ATLANTA, GA 30353-8612

#722300058 4#
US GOVT. - FORT KNOX
FORT KNOX - MEREDITH
ATTN: GARY MEREDITH
BLDG 1110 125 SIXTH AVE / ENERGY
FORT KNOX KY 40121-5719

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FORT KNOX ENERGY BRIEF

http://www.youtube.com/watch?v=e4FaGDpX3xA&vq=medium

FORT KNOX ENERGY BRIEF

FOX 41 Fort Knox Energy Video

FORT KNOX ENERGY BRIEF

2.1 MegaWatt Solar Array

- Nolin RECC, our Electrical Privatization Contractor, is constructing a 2.1 MW Solar Array on post.
- Nolin is financing the project over 25 years. Fort Knox will pay for KWH produced at a rate comparable to our blended electric rate.
- This green renewable power will supplant electricity generated by LG&E coal-fired power plants. The rate we pay for this solar power is extremely cheap for green power.
- This will support EPACT 2005 mandate of >7.5% renewable energy by 2013
- The Solar Array will be located in a 10 acre field west of Bldg #6034.
- Fort Knox has an additional 1.56 MW of solar power installed at various locations on post.

FORT KNOX ENERGY BRIEF

Performance of the 2,100 kW solar field.

	Budgeted Output		Actual Energy Output		Estimated Demand		LG&E Bill	
	Energy (kWh)	Financial	Energy (kWh)	Demand (kW)	Reduction Savings	Unit Cost	Savings	Net Savings
Jun-13		N/A						
Jul-13	Partial Month	N/A	23,800			$1,356.60		
Aug-13	250,919	$13,623.64	373,120	1,284	$18,842.38	$21,267.84	$34,403.46	$13,135.62
Sep-13	231,636	$12,576.66	238,720	1,148	$16,844.45	$13,607.04	$25,836.18	$12,229.14
Oct-13	231,104	$12,547.78	157,440	1,229	$15,182.00	$8,974.08	$20,842.99	$11,868.91
Nov-13	157,873	$8,571.72	176,640	332	$4,095.85	$10,068.48	$10,961.95	$893.47
Dec-13	150,291	$8,160.04	85,120	0	$0.00	$4,851.84	$3,262.52	-$1,589.32
Jan-14	165,795	$9,001.82	134,400	0	$0.00	$7,660.80	$5,331.95	-$2,328.85
Feb-14	185,807	$10,088.40	146,560	0	$0.00	$8,353.92	$6,019.18	-$2,334.74
Mar-14	240,076	$13,034.92						
Apr-14	245,929	$13,352.71						
May-14	255,595	$13,877.52						

Notes: Unit cost is the current yearly average cost of energy per kWh. This is presently 5.7¢/kWh

FORT KNOX ENERGY BRIEF

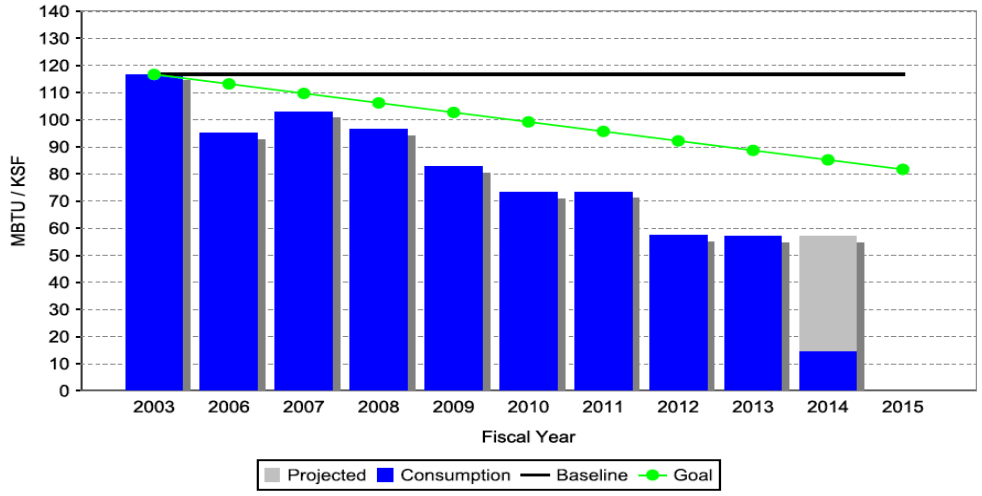
Fort Knox Energy Cost Trends and Statistics

Fiscal Year	KSF	Total Utility Costs	Total Energy (MMBtu)	Total HDD	Total CDD	$/MMBtu	MMBtu/KSF (AEWRS)
FY2012	17,941	$13,913,551.00	1,079,927	3,408	1,854	$12.88	58
FY2011	17,590	$15,613,089.00	1,345,229	4,187	1,725	$11.61	72
FY2010	17,988	$15,833,449.00	1,512,596	4,409	2,026	$10.47	72
FY2009	16,329	$15,340,898.00	1,473,176	4,165	1,294	$10.41	82
FY2008	15,779	$16,208,852.00	1,464,183	4,702	1,265	$11.07	97
FY2005	15,514			4,406	1,496		118

PROGRESS GRAPH
For FORT KNOX

22 January 2014 Page 1 of 1

21405 FORT KNOX



-More than 6M SF use Geothermal HVAC
-1.57 MW of Solar on roofs
-2.1 MW ground mntd solar
-All buildings over 7.5K Sq Ft. metered and controlled
-Bldg Energy Monitoring System using “Mock Billing” monthly.
-Energy Security Project underway to sustain Post energy requirements without outside utilities

FORT KNOX ENERGY BRIEF

Maude Complex Geothermal Pond

FORT KNOX ENERGY BRIEF

NO #1 in CONUS as reported by IMCOM – EOY 2013

Energy per Unit Area Comparison

Installation	FY03 (MBTU/KSF)	FY13 (MBTU/KSF)	% Change
USAG SCHINNEN	85.48	26.69	-68.78
USAG HEIDELBERG	62.77	30.33	-51.68
FORT KNOX	116.73	57.15	-51.04
PICATINNY ARSENAL	269.47	153.64	-42.98
USAG LIVORNO	71.99	41.73	-42.04

- We had 50 buildings score in the top 75 percentile in 2013
- In 2013 our 2012- 49 Energy Star buildings put just short of the top 25 cities
- Building 6434-1/2/3/5 all got 2013 awards and 6434- 6 got a 2014 Award

FORT KNOX ENERGY BRIEF

Program Results

- Improved comfort measured by decreased comfort complaints (90% red.)
- Decreased energy consumption (51% from 2003 baseline)
- Annually saves Fort Knox over $10 million due to energy initiatives
- Funding invested in energy conservation far exceeds funding spent on utility bills.
- Decreased pollutants: Geothermal systems have greatly reduced # of boilers. Over 63 gas & fuel oil boilers & hw heaters rated 1-10 MMBTU eliminated since 2006.
- Reduced maintenance expenditures & extended useful life of HVAC systems. Over 20 MY reduction in Boiler operation and maintenance personnel.
- Currently 52 buildings on Fort Knox are certified “Energy Star”. Anticipate another 110 will be rated Energy Star when the application process is completed.
- Decreased Water Consumption by 8% over the past year.
- Fort Knox has been recognized as a leader within the Army and local community for their energy conservation practices

FORT KNOX ENERGY BRIEF

INSTALLATION MANAGEMENT COMMAND

"Sustain, Support and Defend"

Mr. R.J. Dyrdek, Energy Manager,
DPW

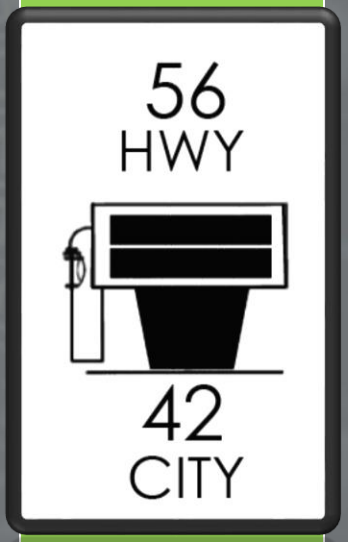
When ‘Zero’ Means Everything!

Affordable & Obtainable
Net Zero Energy Design Strategies

Kenny Stanfield, AIA, LEED® AP

Sherman·Carter·Barnhart
WWW.SCBARCHITECTS.COM

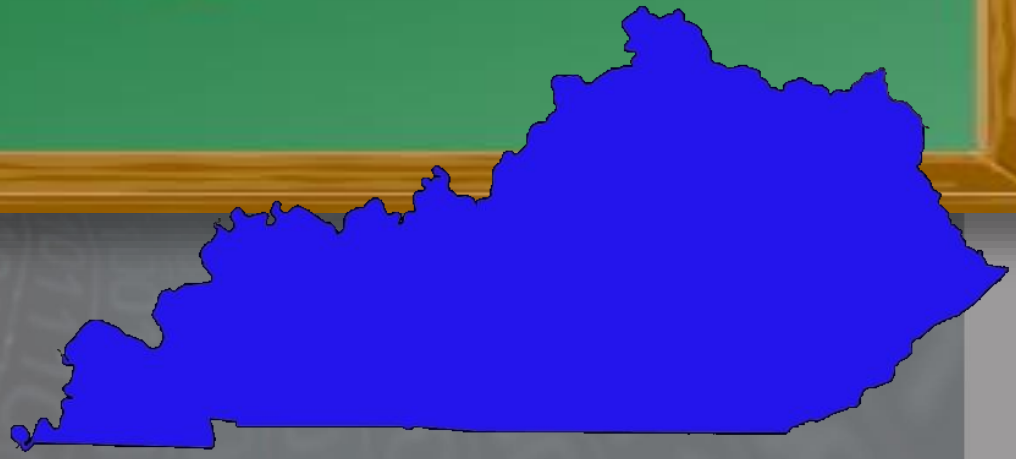
An automobile's energy performance is measured in miles per gallon (MPG) – the HIGHER the BETTER, or more EFFICIENT.



A building's energy performance is measured in 1,000 British Thermal Units (kBtu)- the LOWER the BETTER, or more EFFICIENT.

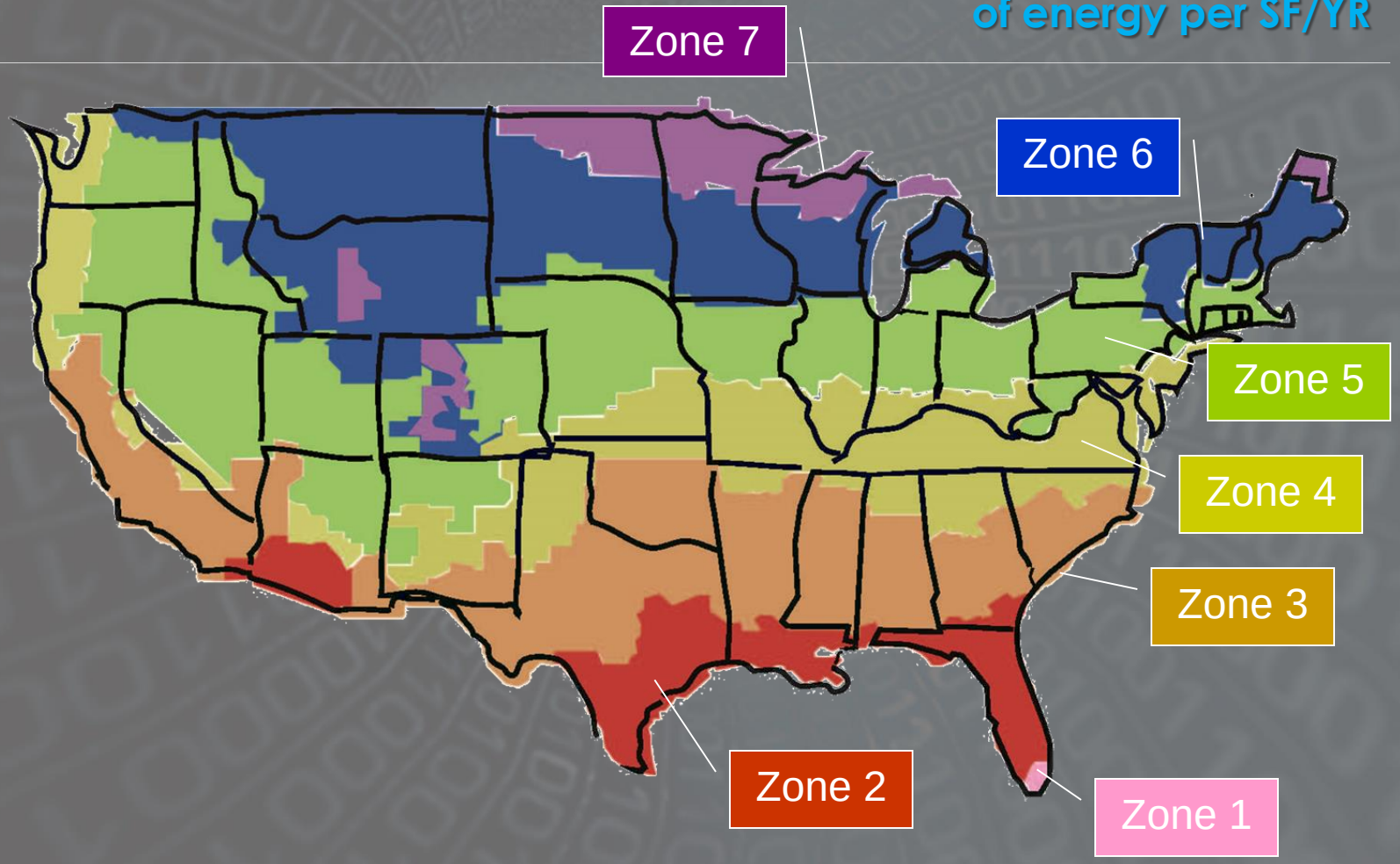
Energy Costs

In Kentucky,
the average cost of
1 kBtu of energy = $2,500.00



Energy Use – Climate Zone 4

The average school consumes **73 kBtus**
of energy per SF/YR



The Average Annual Cost Of Energy For A Typical 72,000SF Elementary School In Kentucky …

$182,500.00

How "Green" is Green?

Climate Zone 4
73 kBtus annually

73

Energy Star - 25% improvement
54 kBtus annually

54

LEED® Certified Buildings
51 kBtus annually

51

How "Green" is Green?

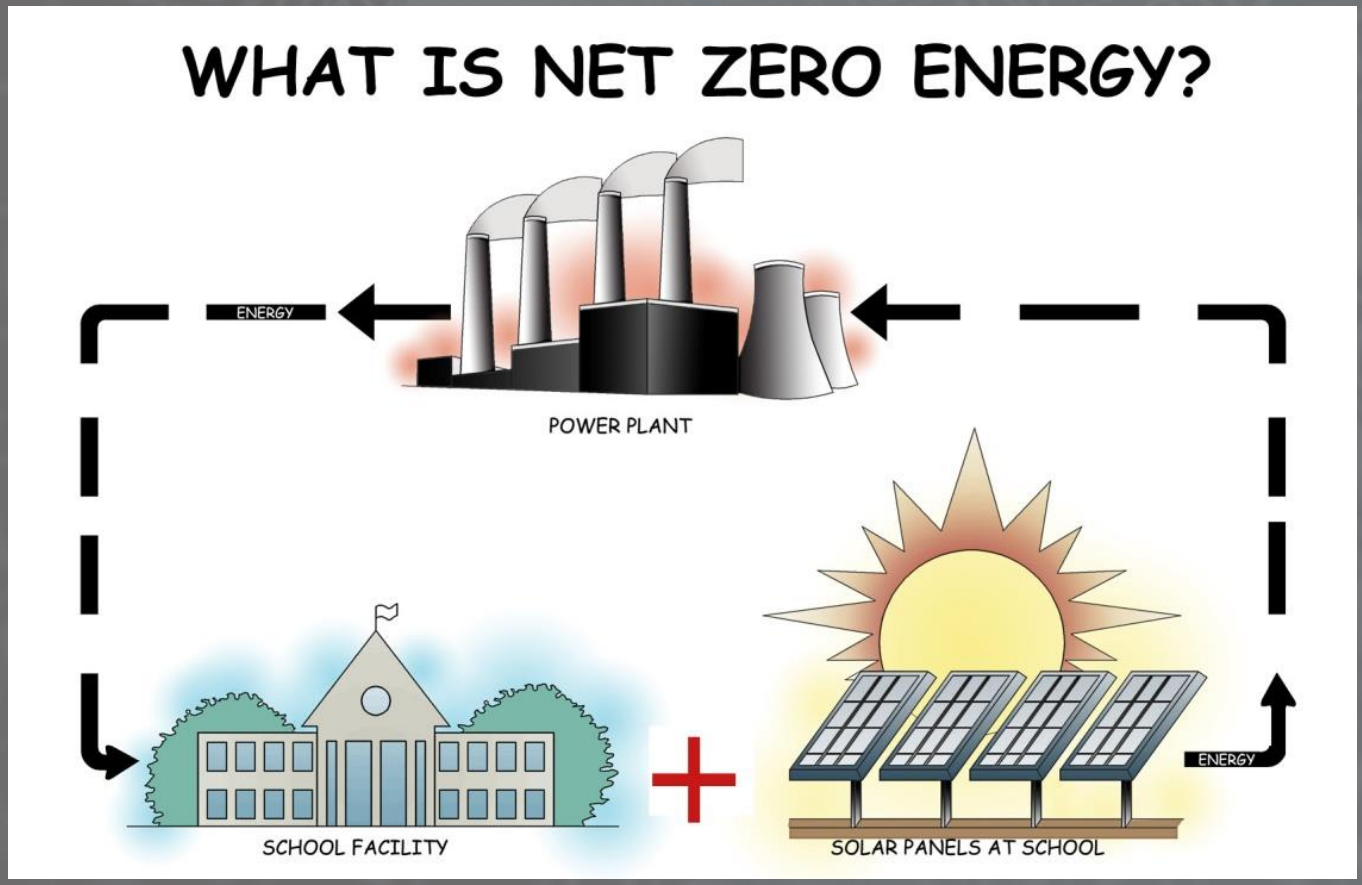
AEDG 50% Reduction
(From ASHRAE 90.1)
36.5 kBtus annually

25 kBtus annually

Richardsville Elementary

What Is A Net Zero Building?

A **Net Zero Energy Building** Has A Net Site Energy Consumption Of Zero Over A Typical Year Of Operation - (25 kBtu Max)



Richardsville Elementary

Warren County Schools

The Nation's First Net Zero Public School

72,285 SF
500 Students
$168.00 SF w/out Solar
$206.50 SF w/ Solar

Richardsville Elementary

Warren County Schools

The Nation's First Net Zero Public School

In 2012,

NO Energy Costs

+

TVA paid WCPS

$37,277.31

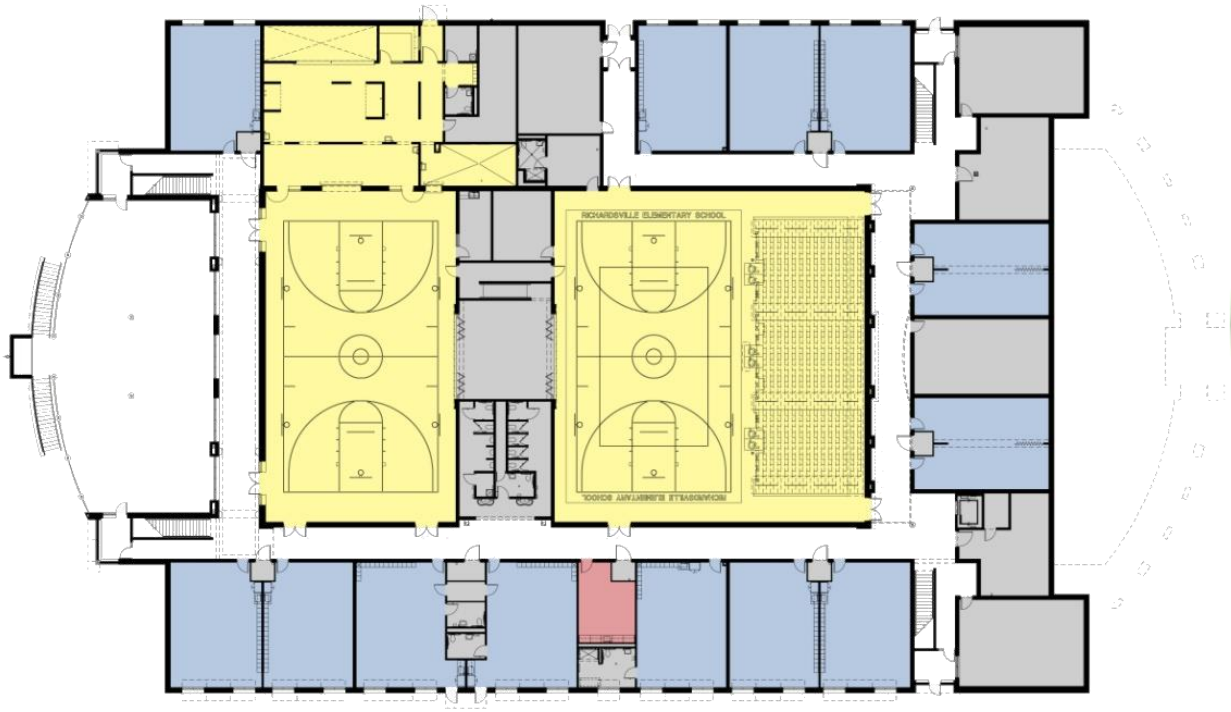
the solutions

Site Design & Building Orientation

- north/south building orientation provides active daylighting in academic spaces
- filter storm water run-off
- native, drought-resistant landscaping reduces irrigation
- permeable paving reduces storm water run-off
- reduce or eliminate detention basins
- outdoor educational opportunities for students and faculty

Energy Efficient Systems

- compact building volume reduces area of exposed exterior surfaces
- super-insulated exterior wall and roof systems
- eliminate external air infiltration
- reduce or eliminate large, uninsulated mechanical platforms
- occupancy sensors
- energy efficient HVAC systems
- dual compressor heat pumps and distributive pumping system reduces energy demand
- reduce make-up air in unoccupied or partially occupied spaces
- distributive utility metering



2011 AS&U's Special Citation –

This is an ***exceptional demonstration of a net-zero school—****they have delivered on this commitment.* ***It simply puts to rest the statement 'It can't be done.'"***

—2011 jury

AWARD WINNING & ENERGY EFFICIENT DESIGN

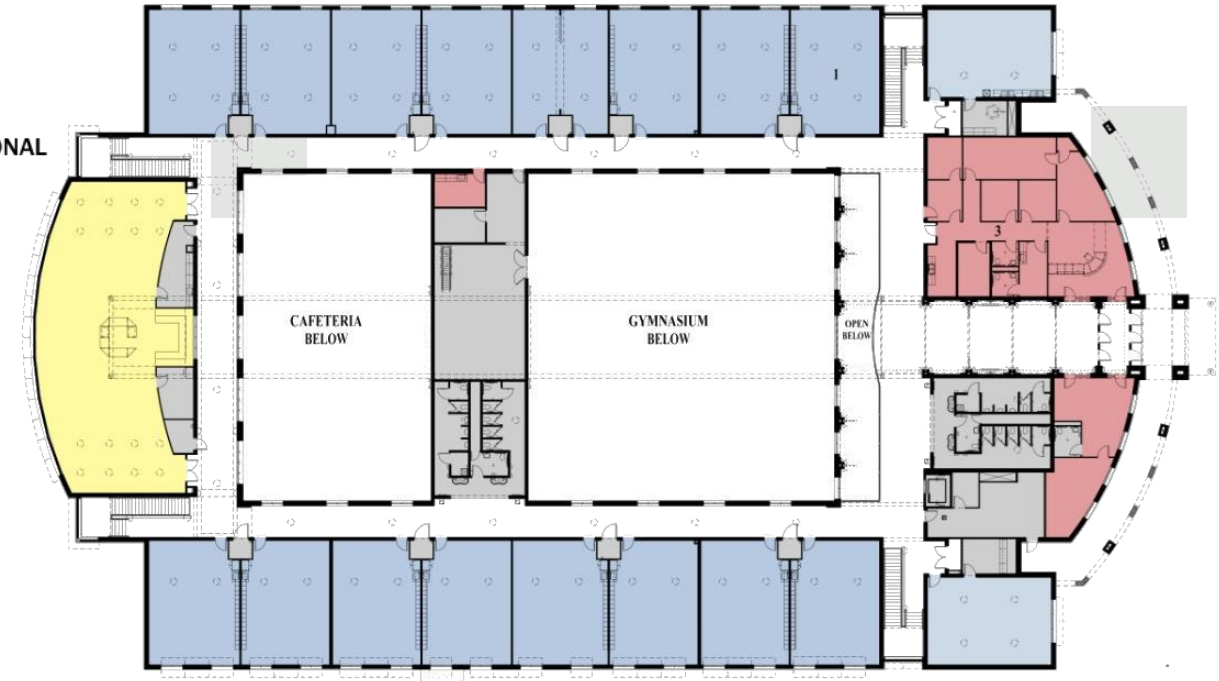
2008 Outstanding Design Concept for an Elementary School
COUNCIL FOR EDUCATIONAL FACILITIES PLANNERS INTERNATIONAL

2011 & 2008 Special Citation Award
AMERICAN SCHOOL & UNIVERSITY

2011 Outstanding Energy Efficiency
KENTUCKY SUSTAINABLE ENERGY ALLIANCE

ENERGY STAR School
Recipient of the U.S. Environmental Protection Agency's prestigious ENERGY STAR for superior energy efficiency

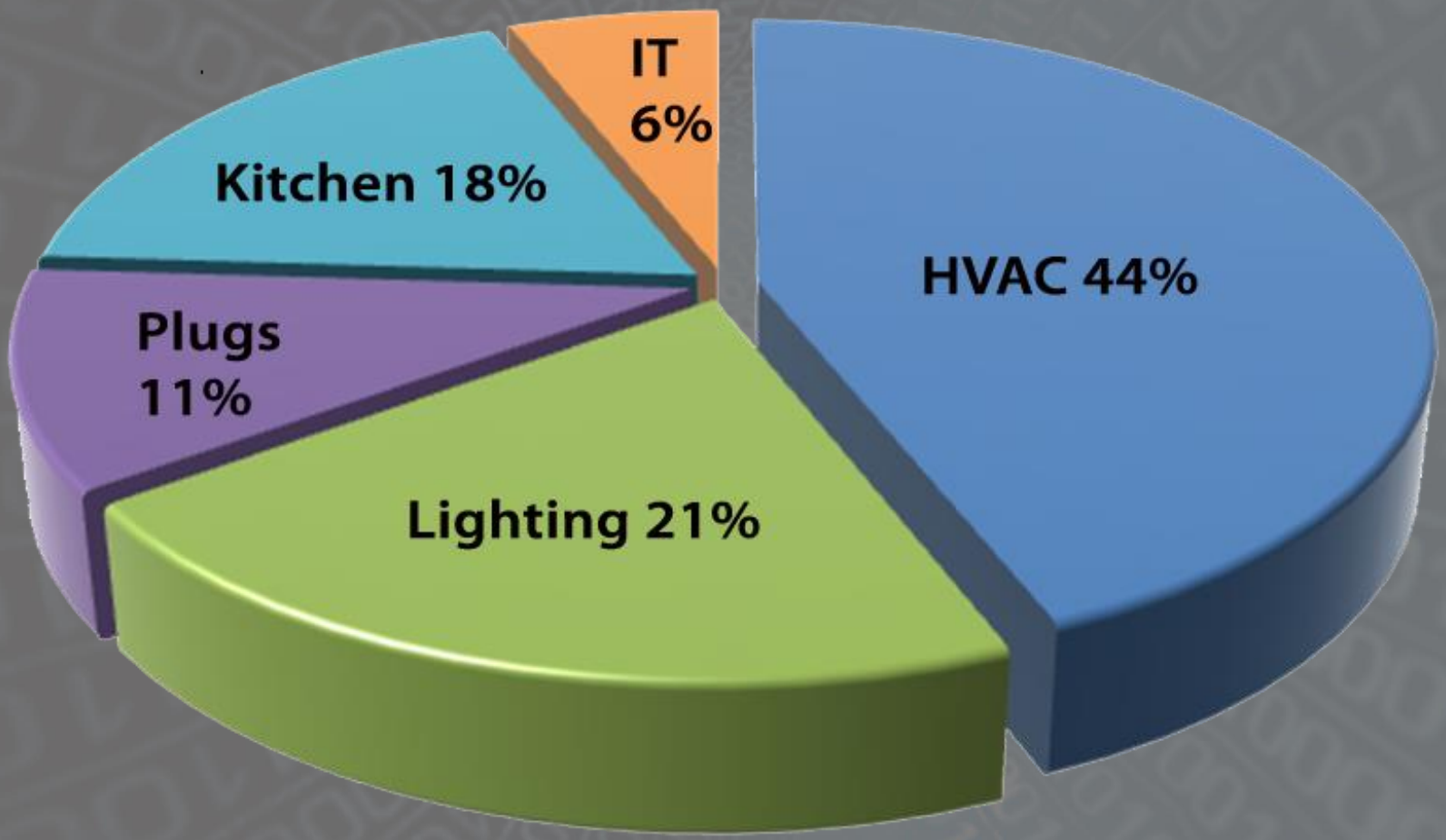
LEED Gold Registered
Pursuing U.S. Green Building Council Gold Certification



High Performance Thermal Envelope

- Compact Building Volume Reduces Areas Of Exposed Exterior Surfaces
- Super Insulated Exterior Wall & Roof Systems
- Reduce External Air Infiltration
- Reduce Or Eliminate Large Mechanical Platforms

Richardsville: Energy Usage



18.2 kBtu/sf yr

Geothermal HVAC System

- Dual Compressor Or Two-Speed Heat Pump Units
- Part Load Efficiency
- Distributive Pumping
- One Heat Pump Per Two Classrooms

Outside Air Ventilation

- Dedicated Outside Air Systems (DOAS)
- Heat Recovery Wheel
- Demand Control Ventilation Based On CO_2 And Occupancy
- Occupant Diversity

Daylight Harvesting

- reflect natural light into classrooms
- reduce glare at work surfaces
- automated dimming reduces artificial lighting requirements
- interior solar tubes supplement daylighting
- sloped ceilings project natural light into the classroom
- aerogel insulated glazing and low-e coating reduces solar heat gain

Lighting – Unoccupied

- Dark Sky Approach
- Local Police Collaboration
- Façade Lighting Controls
- Eliminate Building Night Lighting

Healthy Kitchen Design

- Test Kitchen Evaluation & Recommendations
- ENERGY STAR Appliances
- Eliminate Type I Hood – Type II Hoods
- Healthy Foods & Locally Grown

ENERGY STAR

Energy Free Lunches

ED EFFICIENCIES

ENERGY TAKES A LUNCH BREAK

Warren County's energy-free lunches promote fun and responsibilit

By Jennifer Wahlleb
Staff Writer

Sam Dorris, who will be a second-grader at Natcher Elementary in Warren County, spent a happy lunch period toward the end of this past school year, spelling out his name with a bag of Scrabble Cheez-it crackers while munching through the rest of his lunch.

He and his classmates were enjoying the novelty of eating a bag lunch in the cafeteria instead of the usual hot plate lunch on a tray. And the fact that this lunch was saving energy?

"I like that, too," he said.

Elementary schools in Warren County held four "energy-free lunch" days this spring, which had the cafeterias shutting down ovens and fryers, turning off heat lamps and running other kitchen equipment at minimal levels.

"We found that 22 percent of the energy in our schools was being consumed by the kitchens," said Food Services Manager Gina Howard, who said the district made that discovery as it planned and built Richardsville Elementary, the nation's first public school built to be net-zero energy, completed last year.

Howard said the idea for energy-free lunches came from an article in the *School Nutrition Journal*, and students and staff have eaten it up.

"It's actually a lot easier (to make) than a regular menu," said Plano Elementary Cafeteria Manager Paula Hale. "Other than making the sandwiches, everything else is less time consuming. It's easier and the kids have more fun. It's like a picnic lunch for them."

Instead of picking up a tray when they go through the lunch line, students get a brown paper bag and fill it with a sandwich, fresh fruits and vegetables, cracker packs, or even a salad in a bag that has proven wildly popular with students.

"Salad is one of the harder things to get kids to eat," Howard said. "The last time we did this, we sold 200 salads in a bag. It's presented to them in a different way and students like that. They just open it, pour in their dressing and eat it out of the bag."

School board Chairman Mike Wilson said the program has been successful on several levels.

"Students know why we're doing this," he said. "They understand the rationale behind not having the kitchen all fired up that day. And this is also a new way to engage in nutrition. You may not like one item, but if it's presented to you in a different way or in a different setting, you may try something you previously thought you didn't like and find out you do like it. It broadens students' horizons."

Natcher Elementary fourth-grader Melek Muradova said there are several things she likes about the energy-free lunches.

"I like the energy savings," she said. "I like how they give out the carrots (in little bags) because carrots are really good. It's more fun to eat this way and you don't have to do trays."

Above, students at Natcher Elementary fill their brown bags as part of an energy-free lunch day.

Right, Plano Elementary student Elijah Burckhard, relishes an apple during lunch. Students say the fresh fruits and vegetables are one their favorite parts of the energy-free lunches.

Jay Wilson, Warren County's energy manager, said the energy savings from these few days can't be determined, but efforts like these are still important.

"Definitely, it is important for our food services to serve such meals for the nutritional-educational benefits," he said. "It also displays the overall support from Mrs. Howard and her food service personnel for the district's ever-evolving energy conservation program."

Board member Mike Wilson said being energy conscious is just good policy for school boards.

"You build a building one time, but you heat it, cool it, and equip it every day for the next 40 or 50 years," Wilson said. "Seven or eight years ago when we entered into our energy education program, we wanted to be good stewards for the taxpayers' dollars and be as efficient as possible. Every dollar we save in energy costs goes back into teachers, salaries, textbooks, and other areas that directly impact students' learning." ⌘

DARK IS THE NEW GREEN

At Walton-Verona Independent Schools, green isn't only the color of money and conservation, but it is also becoming the color of safety. By turning off the lights at night, the district is both turning on savings and increasing safety.

All the district's lights, from the classroom to the parking lots, are on motion sensors at night.

"When police come by doing their patrol and they see lights on in the building they know that there's a problem because it should be dark," said Superintendent Bill Boyle.

The district has had a dark campus since 2008.

"We wanted to do it years ago, but back then, building codes required a certain amount of light in buildings at night," he said. "That's changed. The building codes have caught up with energy savings. We can now have all lights off in the building when it's closed, except for the ones by an entrance. So 99 percent of our building is dark. When some one walks into our building, it trips the motion sensor."

The same goes for parking lots, making it easy for police and others to spot anyone who shouldn't be there at night.

Boyle said because Walton-Verona is a growth district, trying to determine the savings from this is like trying to hit a moving target. But he said the change has been effective.

"We've gone the opposite way in terms of the old prevailing wisdom that said the more light the better, and we haven't had any incidents so far. We didn't want the lights on for the criminals to be able to see what they are doing," Boyle said, laughing. ⌘

Computers

- TVA Test Case
- 7.5% Of Energy In "Tested" School Was Consumed By Computers
- Wireless Technology Throughout
- Laptop Carts In Lieu Of Computer Labs
- Equipment Off At Night
- Reduces Power Consumption By 50%

Richardsville PV System Phase I

- 60% Of Required Generation
- Operational February 2011
- 208 kW Thin Film
- 245 MWh/yr Electric Production

Richardsville PV System Phase II

- 100% Required Generation
- Operational September 2011
- 138 kW On Shade Structure
- Delayed For Old School Demolition
- 163 MWh/YR Electric Production

Solar Electric Generation Cost

- Solar Package & Shade Structure
  - $2,766,664 - $7.93/kW
  - January 2010
- Awarded $1,380,000 Grant
  - Stimulus Funds
- TVA Pays $0.12/kWh
  - Greater Than the Selling Price

Net Zero Energy MWh Summary

Read Date 2012	MWh Consumed	MWh Generated	MWh Difference
December	30.2	20.1	10.1
November	37.1	29.7	7.4
October	33.2	24.6	-1.4
September	[illegible]	[illegible].1	0.5
August	[illegible]	[illegible]	-17.3
July	[illegible]	[illegible]	-29.4
June	[illegible]	[illegible]	-29.5
May	[illegible]	[illegible]	-6.8
April	[illegible]	[illegible].5	-5.5
March	[illegible]	31.9	-1.3
February	33.8	19.5	14.3
January	26	14.9	11.1
Total	**396**	**443.8**	**-47.8**

Richardsville generated 47.8 MWh more than it consumed!

Net Zero Energy Cost Summary

Read Date 2012	Consumption Cost	Generation Cost	Monthly Cost
December	$4,233	($4,315)	($82)
November	$4,856	($6,477)	($1,621)
October	$4,[illegible]	($7,529)	($2,574)
September	[illegible]	[illegible]86)	($3,653)
August	[illegible]	[illegible]01)	($6,564)
July	[illegible]	[illegible]	($8,353)
June	[illegible]	[illegible]	($8,171)
May	[illegible]	[illegible]	($4,693)
April	[illegible]	[illegible]6)	($3,356)
March	[illegible]	[illegible]05)	($2,563)
February	$4,[illegible]	($4,166)	$691
January	$4,010	($3,235)	$775
Total	**$56,350**	**($96,514)**	**($40,164)**

Zero

energy costs & earned

$40,164

in 2012!

Three Dimensional Teaching Tool

Every hallway has an energy related theme. The Geothermal Hall demonstrates how water heats and cools the school.

Green Screens demonstrate the school's daily energy use.

Growing Minds… Energy Teams

- The Energy Initiative Is Spreading District Wide
- Each School Has An Energy Team With An Energy Kit To Monitor Consumption & To Perform Energy Audits For Efficiency
- Teams Focus On Energy Awareness, Student Achievement (Math And Science) And Building Energy Leaders

Warren County energy teams recognized in Frankfort

Utility Bills Don't Lie…

WARREN RURAL ELECTRIC COOPERATIVE CORPORATION

www.wrecc.com

A Touchstone Energy® Cooperative

Bowling Green	Franklin	Leitchfield	Morgantown	Pay by Phone
(270) 842-6541	(270) 586-3443 (800) 844-1664	(270) 259-3161	(270) 526-3384 (800) 844-1707	(270) 842-3234 (866) 319-3234

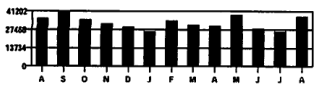
ACCOUNT NUMBER	397917042	METER LOCATION	RICHARDSVILLE RD 1775

SERVICE FROM	SERVICE TO	NO. DAYS	READING PREVIOUS	READING PRESENT	MULT	KWH USAGE	CHARGES
07/16/12	08/16/12	31	0	0	1	36894	2,056.30
DEMAND:	READING		ACTUAL	BILLED			
	210.780		210.780	210.780			
							2,199.47
TVA FUEL COST			0.024300			36894	886.02
DISTRIBUTION CHARGE							40.00
POWER GENERATION CREDIT							-11,901.51
SCHOOL TAX							155.45
CURRENT CHARGES FOR SERVICE							-6,564.27
PREVIOUS BALANCE							-27,009.71

Current Bill Due Date Does Not Apply To The Previous Balance — CR BAL DO NOT PAY

Customer Name	BILLING DATE	PAYMENT DUE DATE	TOTAL DUE NOW:	-33573.98
WARREN CO BD OF ED	08/22/12	09/05/12	AFTER DUE DATE PAY:	-33573.98

HISTORY GRAPH - COMPARE YOUR USAGE



MESSAGES

- Failure to receive bill does not relieve customer's payment obligations.
- Any previous unpaid balance is subject to disconnect without further notice.

RETAIN THIS COPY FOR YOUR RECORDS

PLEASE DETACH AND RETURN THIS PORTION WITH PAYMENT KY05350R

Warren Rural Electric Cooperative Corporation
951 Fairview Avenue, P.O. Box 1118
Bowling Green, Kentucky 42102
ADDRESS SERVICE REQUESTED

Address:
City State Zip
Telephone: Email
Please indicate change of address or telephone number here
Charge to: MasterCard ☐ VISA ☐
Account No
Exp Date
Signature

Account Number
397917042
Date Due
09/05/12
Total Due Now
-33573.98
After Due Date Pay
-33573.98

WARREN CO BD OF ED
NEW RICHARDSVILLE SCHOOL
PO BOX 51810
BOWLING GREEN KY 42102-6810

WRECC
PO Box 3200
Hopkinsville, KY 42241-3200

Thank you

Kenny Stanfield, AIA, LEED® AP

Sherman·Carter·Barnhart
WWW.SCBARCHITECTS.COM