

Solar Powering Your Community

Addressing Soft Costs and Barriers



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SunShot
U.S. Department of Energy



Solar Powering Your Community Workshop

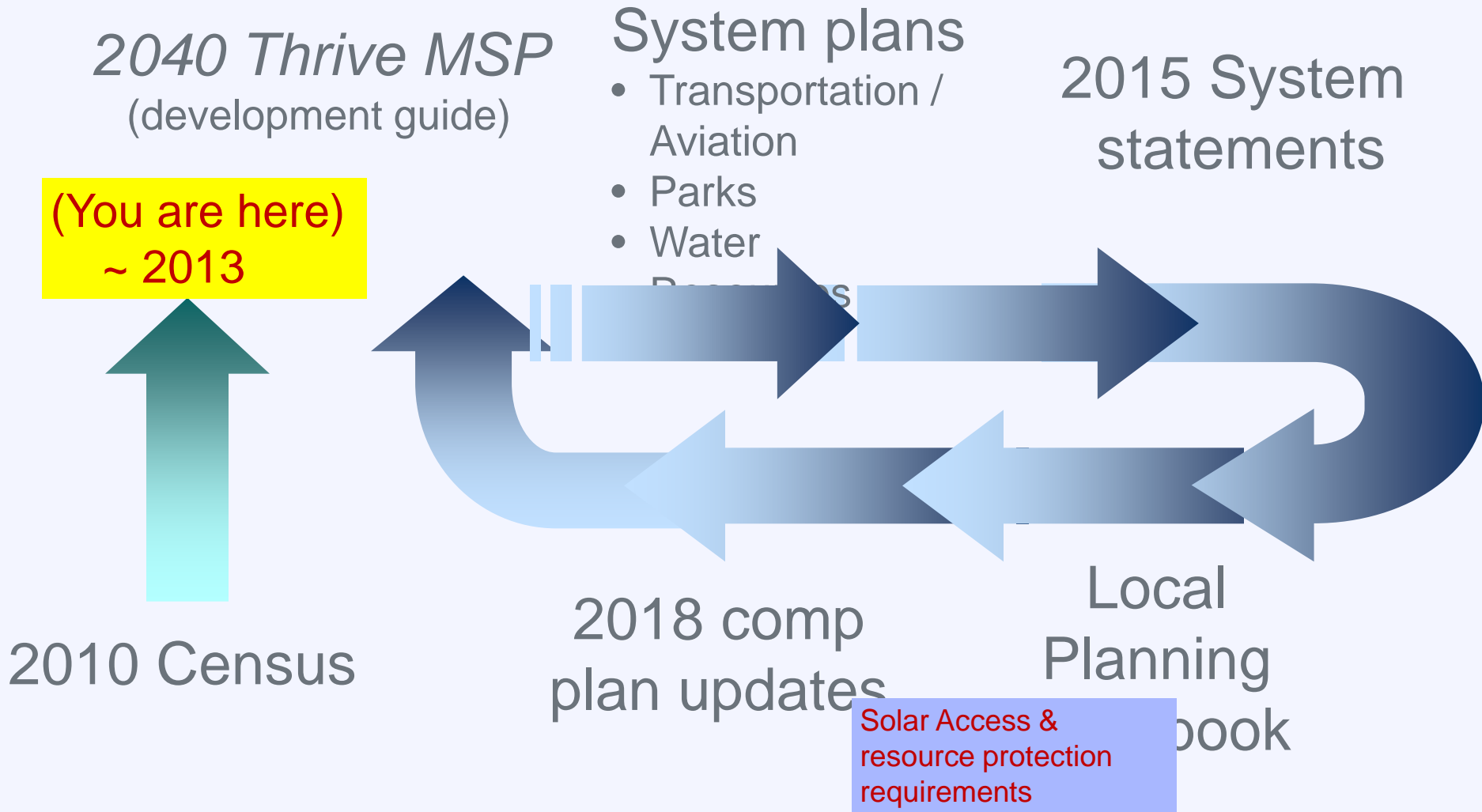
Actionable Steps for Adopting Solar in Your Community

Opening Remarks

Mark VanderSchaaf, Director

Tuesday September 10, 2013

Regional 10-year Planning Cycle



- Council will support Cities so they have an opportunity to look at solar access issues in the Comp Plan Updates which will be due in 2018

Mark VanderSchaaf, Director

For more information or specific technical information,
please contact Patrick Boylan, Sector Representative


Patrick.boylan@metc.state.mn.us

651-602-1438

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About the SunShot Solar Outreach Partnership

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

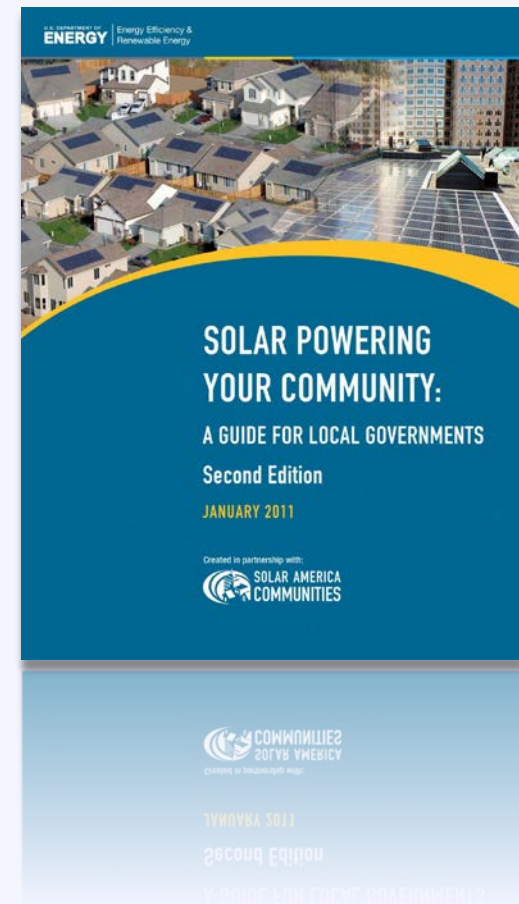
- Increase installed capacity of solar electricity in U.S. communities
- Streamline and standardize **permitting and interconnection processes**
- Improve **planning and zoning codes/regulations** for solar electric technologies
- Increase access to **solar financing options**

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.energy.gov



About the SunShot Solar Outreach Partnership

Resource Sunshot Resource Center

- Case Studies
- Fact Sheets
- How-To Guides
- Model Ordinances
- Technical Reports
- Sample Government Docs

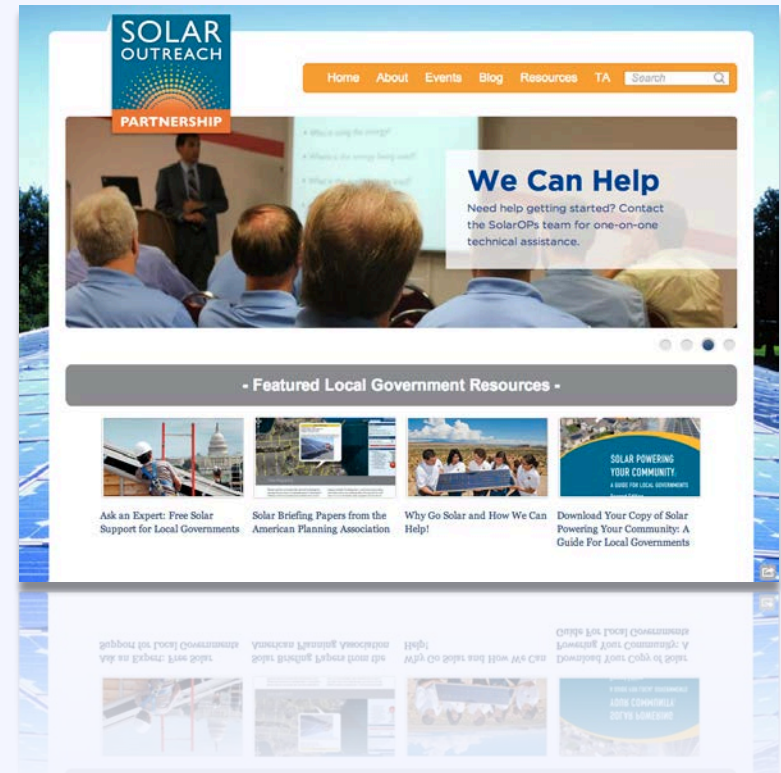
www4.eere.energy.gov/solar/sunshot/resource_center



About the SunShot Solar Outreach Partnership

Technical Support

- ‘Ask an Expert’ Live Web Forums
- ‘Ask an Expert’ Web Portal
- Peer Exchange Facilitation
- In-Depth Consultations
- Customized Trainings



www.solaroutreach.org

Poll

Who's in the room?

Poll

What is your experience with solar?

Agenda

- 08:40 – 09:00 Solar 101 for Communities
- 09:00 – 09:20 Understanding the Solar Regulatory Landscape
- 09:20 – 09:35 Creating a Solar Ready Community
- 09:35 – 09:45 *Break*
- 09:45 – 10:00 Benefits and Barriers Activity
- 10:00 – 10:30 Growing Your Local Solar Market
- 10:30 – 12:10 Local Speaker Session & Audience Discussion
- 12:10 – 12:15 Wrap Up

Agenda

08:40 – 09:00 **Solar 101 for Communities**

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Solar Technologies



Solar Photovoltaic (PV)



Solar Hot Water



Concentrated Solar Power

Solar Technologies



Solar Photovoltaic (PV)

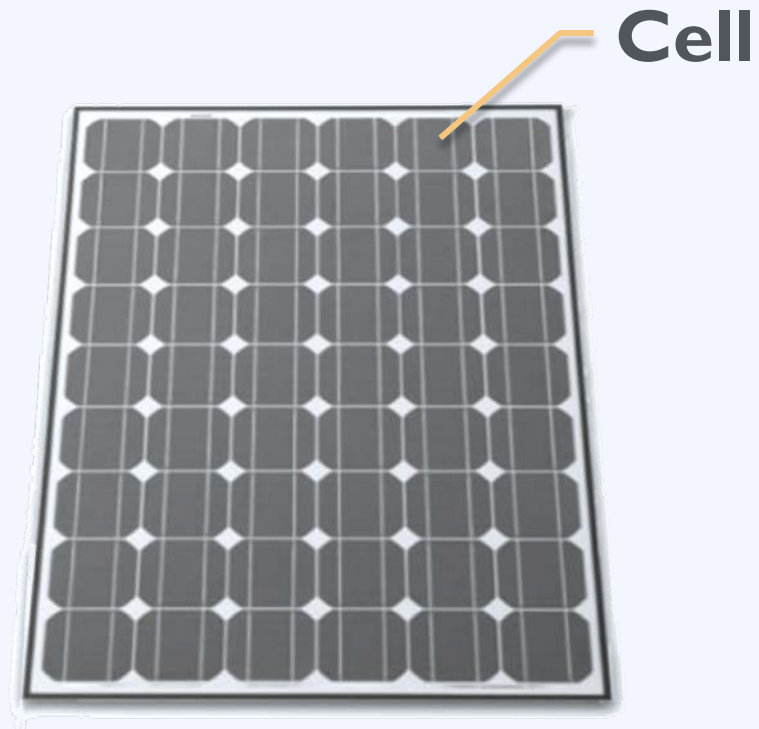


Solar Hot Water



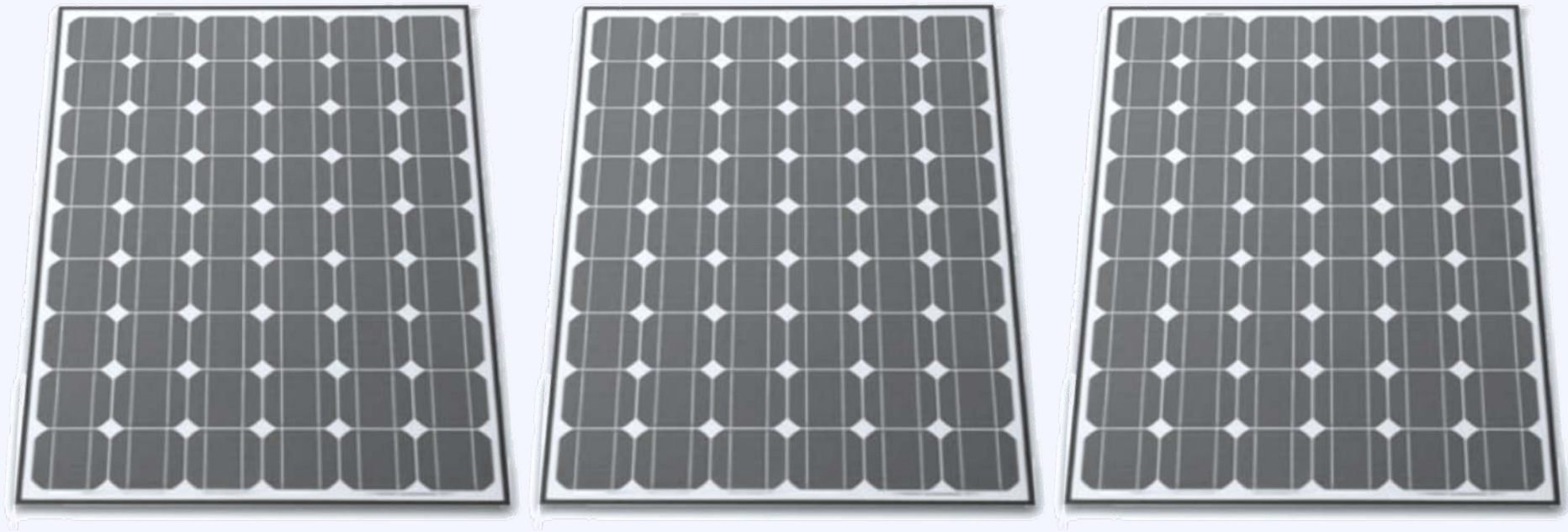
Concentrated Solar Power

Some Basic Terminology



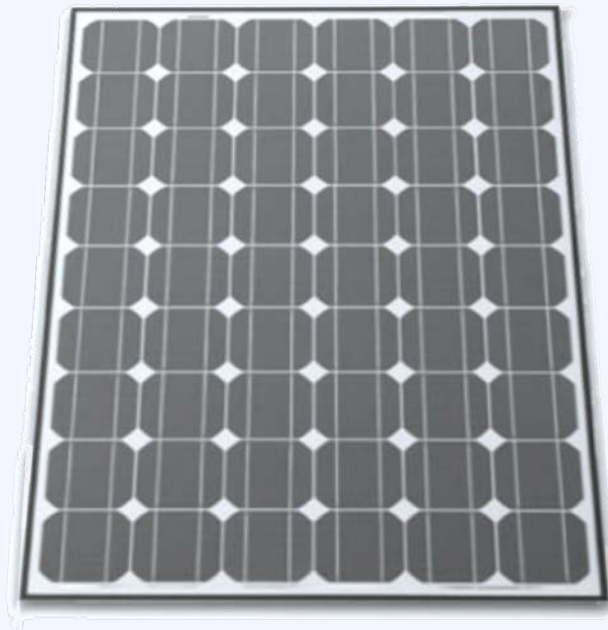
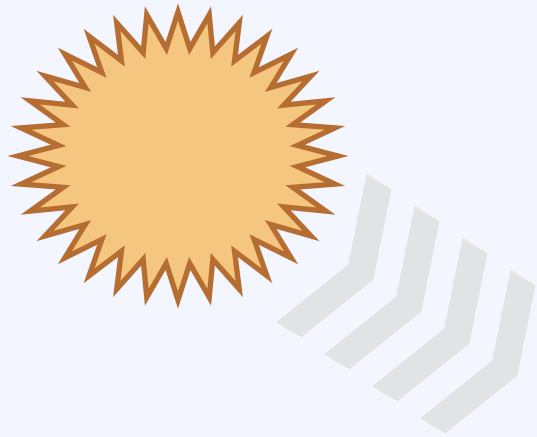
Panel / Module

Some Basic Terminology



Array

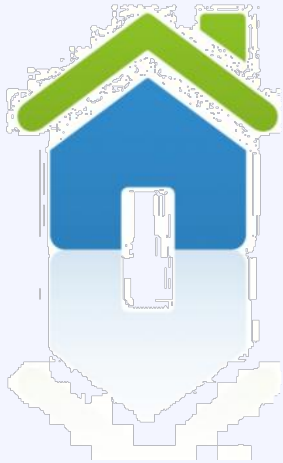
Some Basic Terminology



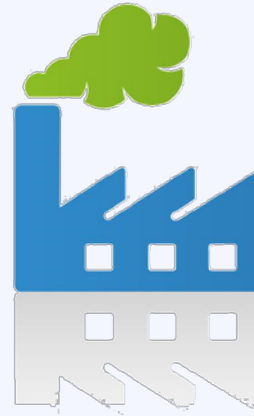
Production
Kilowatt-hour (kWh)

Capacity / Power
kilowatt (kW)

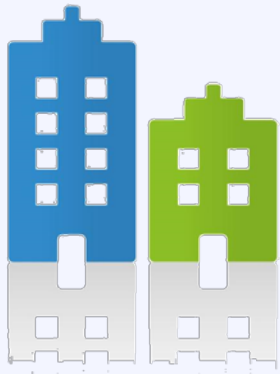
Some Basic Terminology



Residence
5 kW



Factory
1 MW+



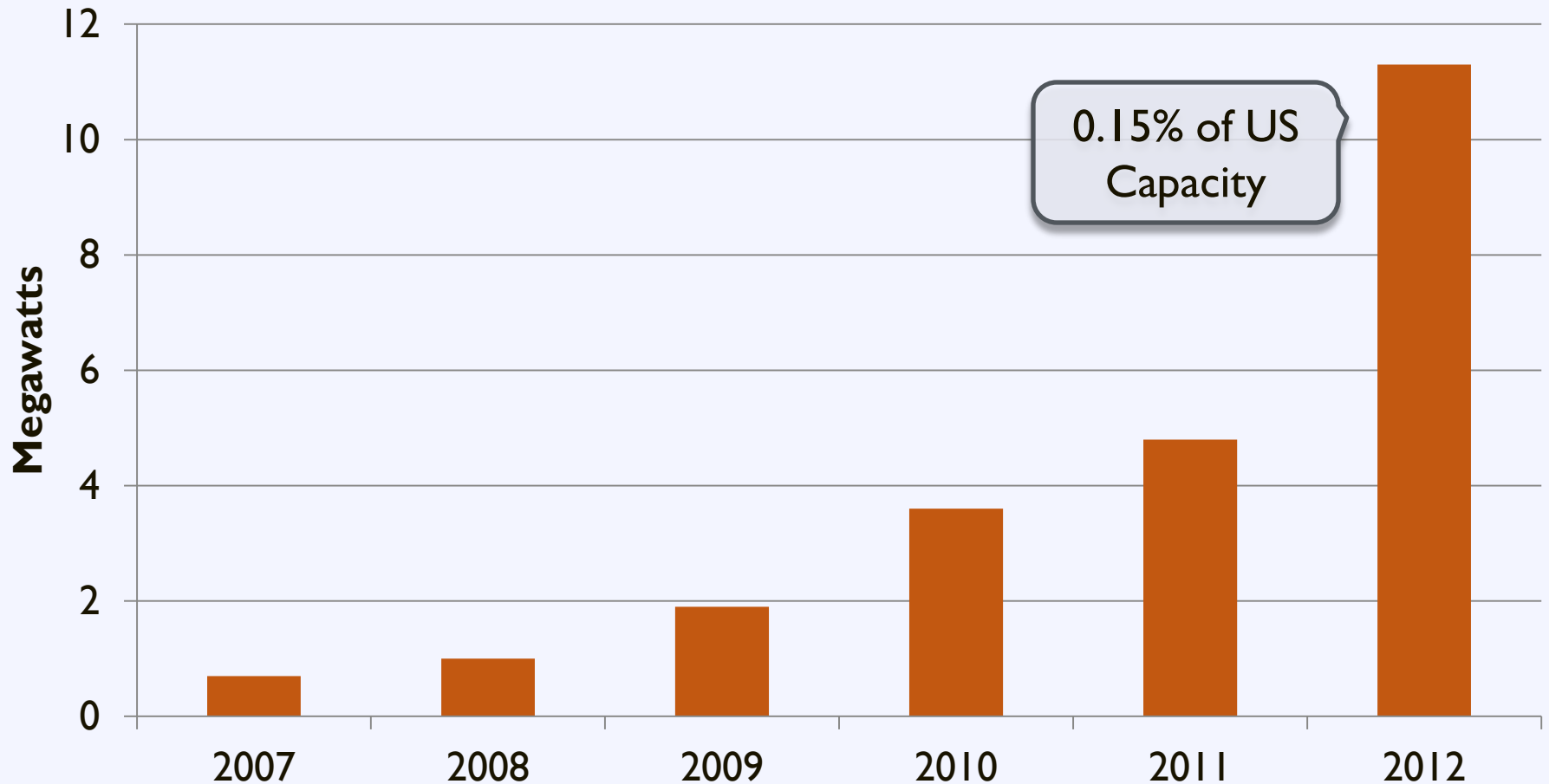
Office
50 – 500 kW



Utility
2 MW+

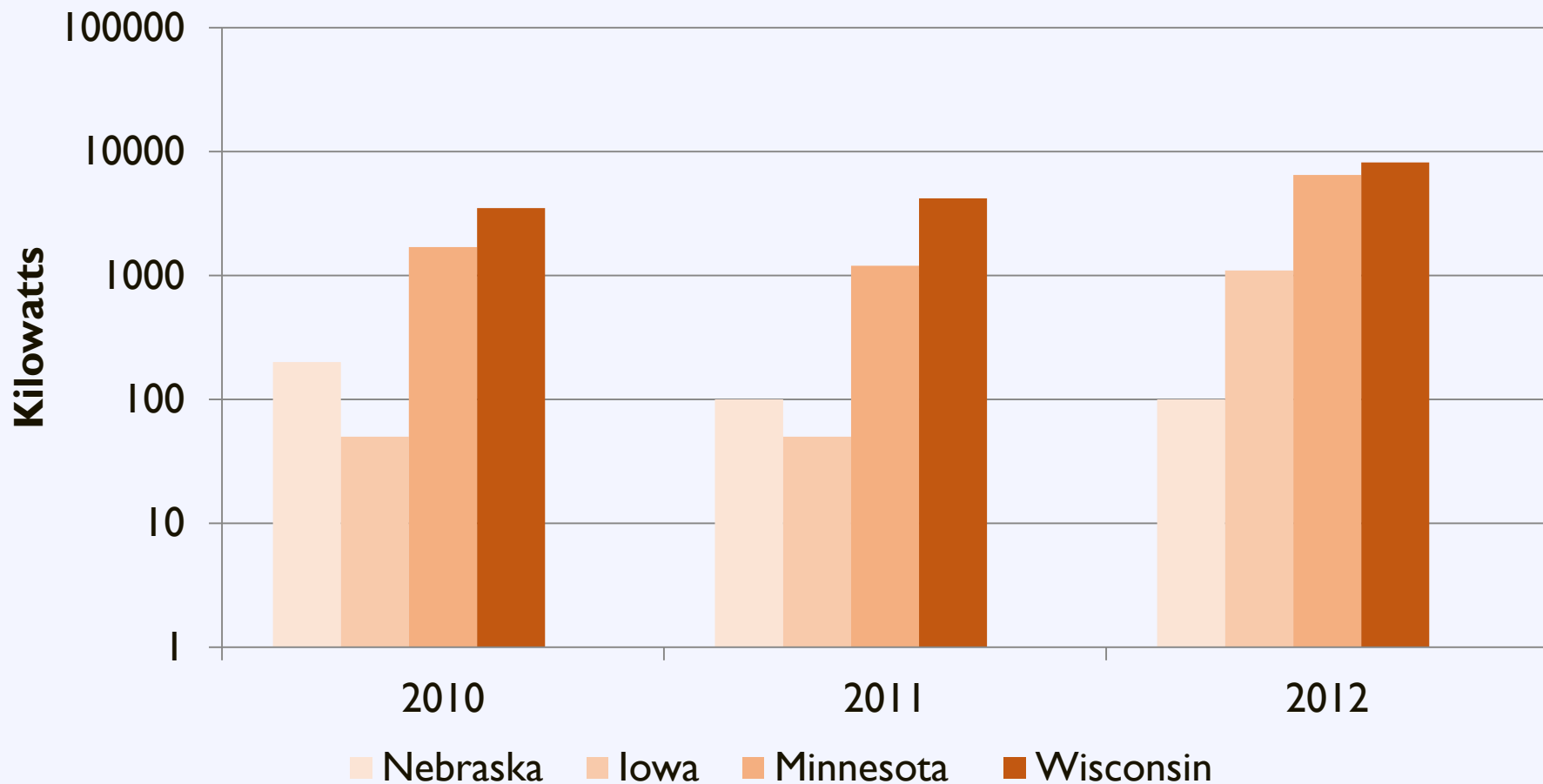
Minnesota Solar Market

Cumulative Installed PV Capacity in Minnesota



Minnesota Regional Solar Market

Annual Installed Capacity of Solar PV



Minnesota Solar Market

Minnesota



2

watts per person

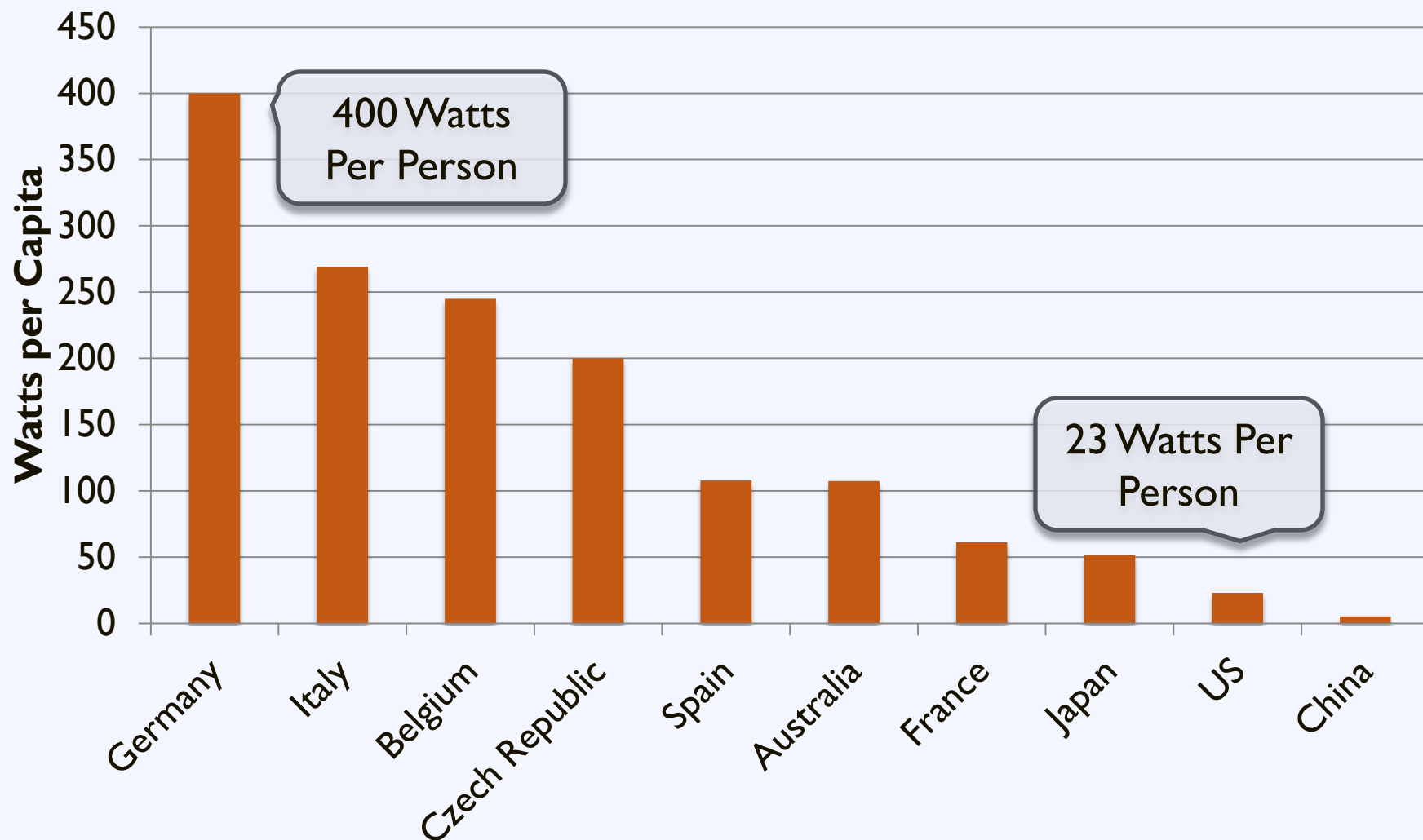
US



23

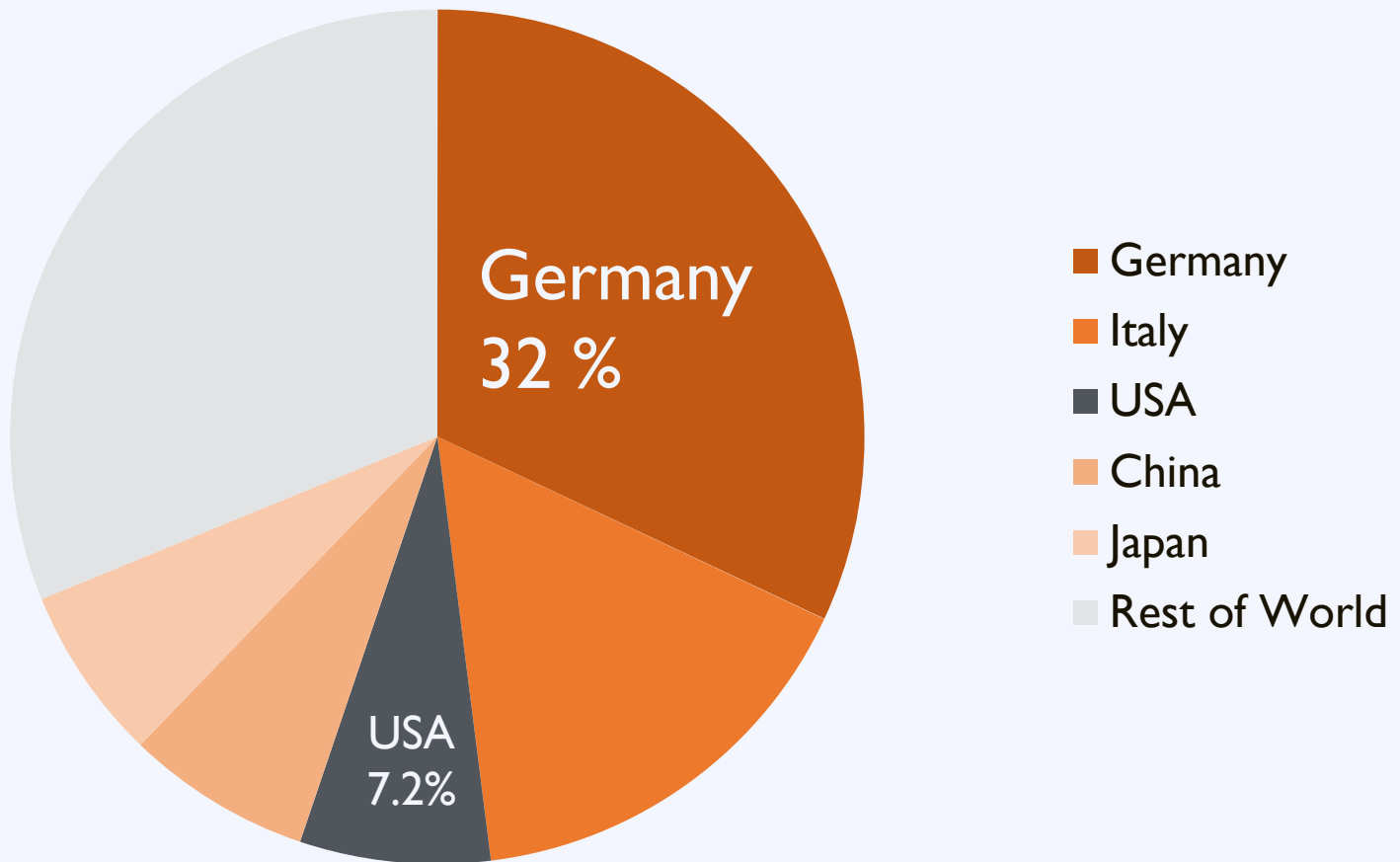
watts per person

Installed Capacity per Capita

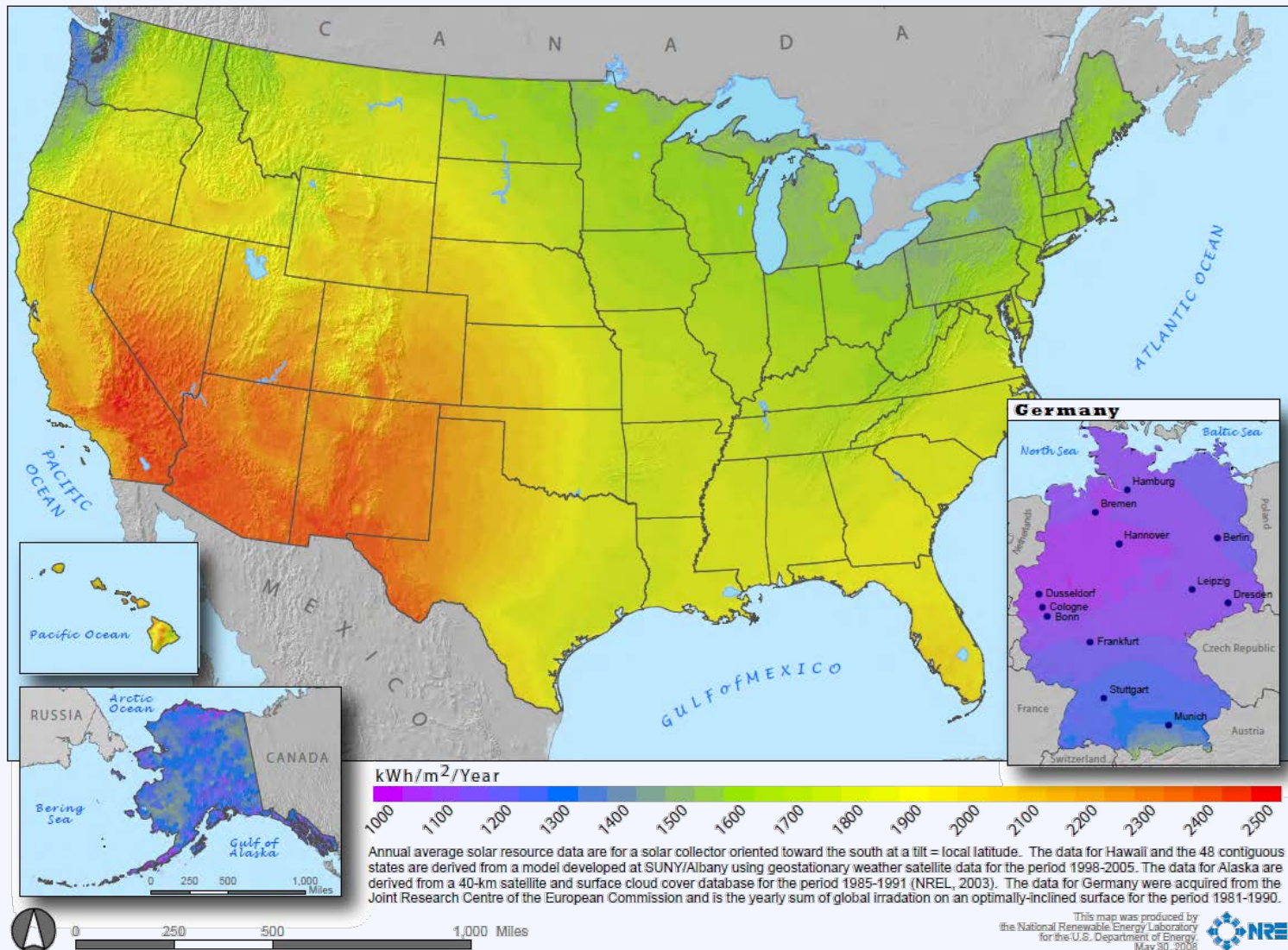


Installed Capacity

Top 5 Countries Solar Operating Capacity (2012)



US Solar Resource



Installed Capacity

Total installed solar
capacity in the US

7.7 GW

Capacity installed in
Germany in 2012
alone

7.6 GW

Explore benefits

and

Overcome barriers

Activity: Identifying Benefits

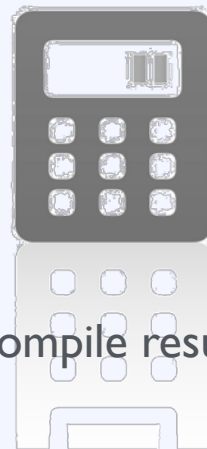
What is the greatest benefit solar can bring to your community? **[Blue Card]**

Right Now



Write answer on card

During Session



Compile results

After Break



Group discussion

Activity: Addressing Barriers

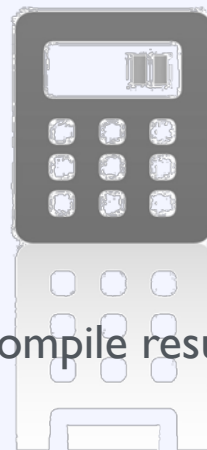
What is the greatest barrier to solar adoption in your community? **[Green Card]**

Right Now



Write answer on card

During Session



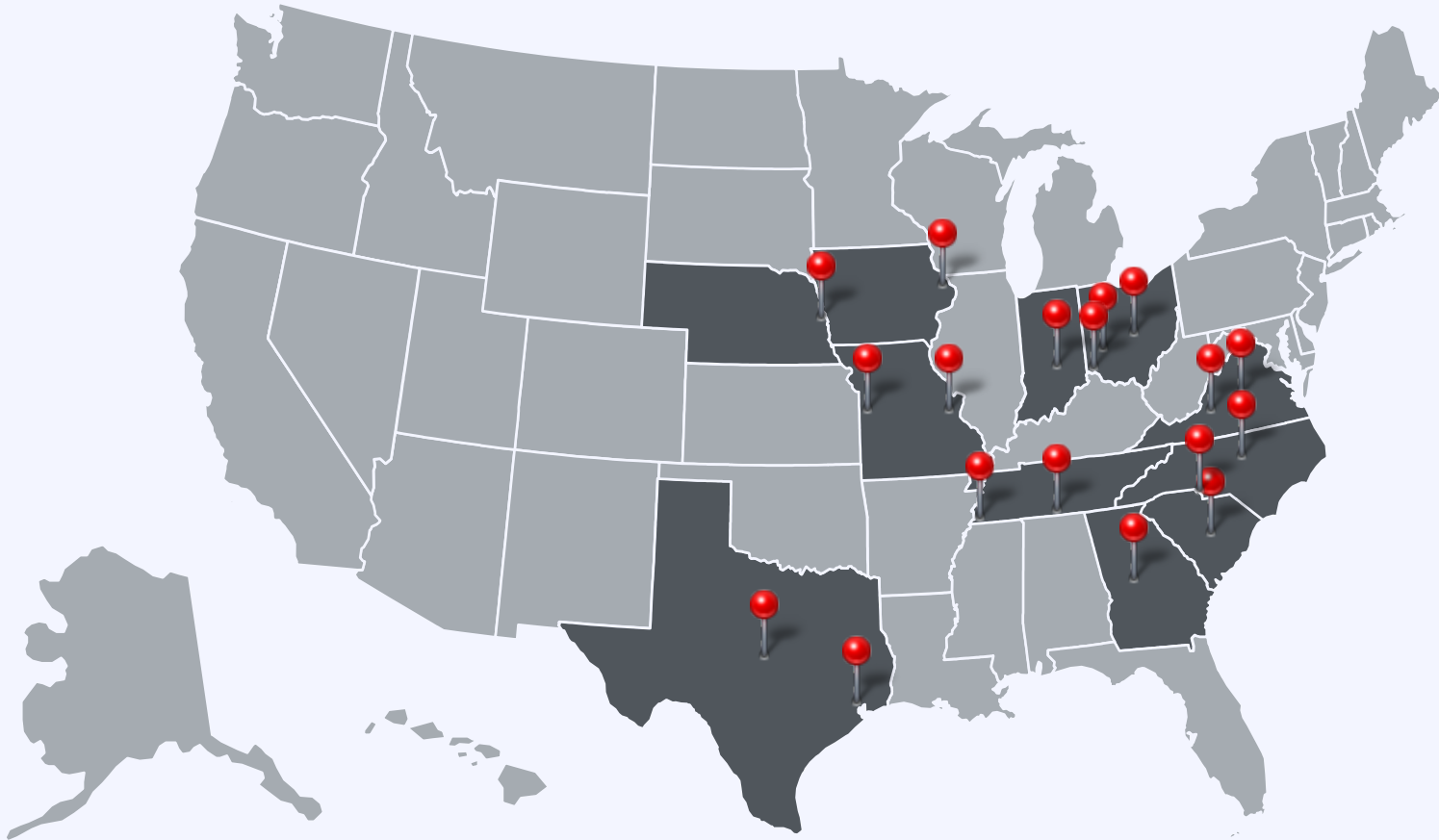
Compile results

After Break

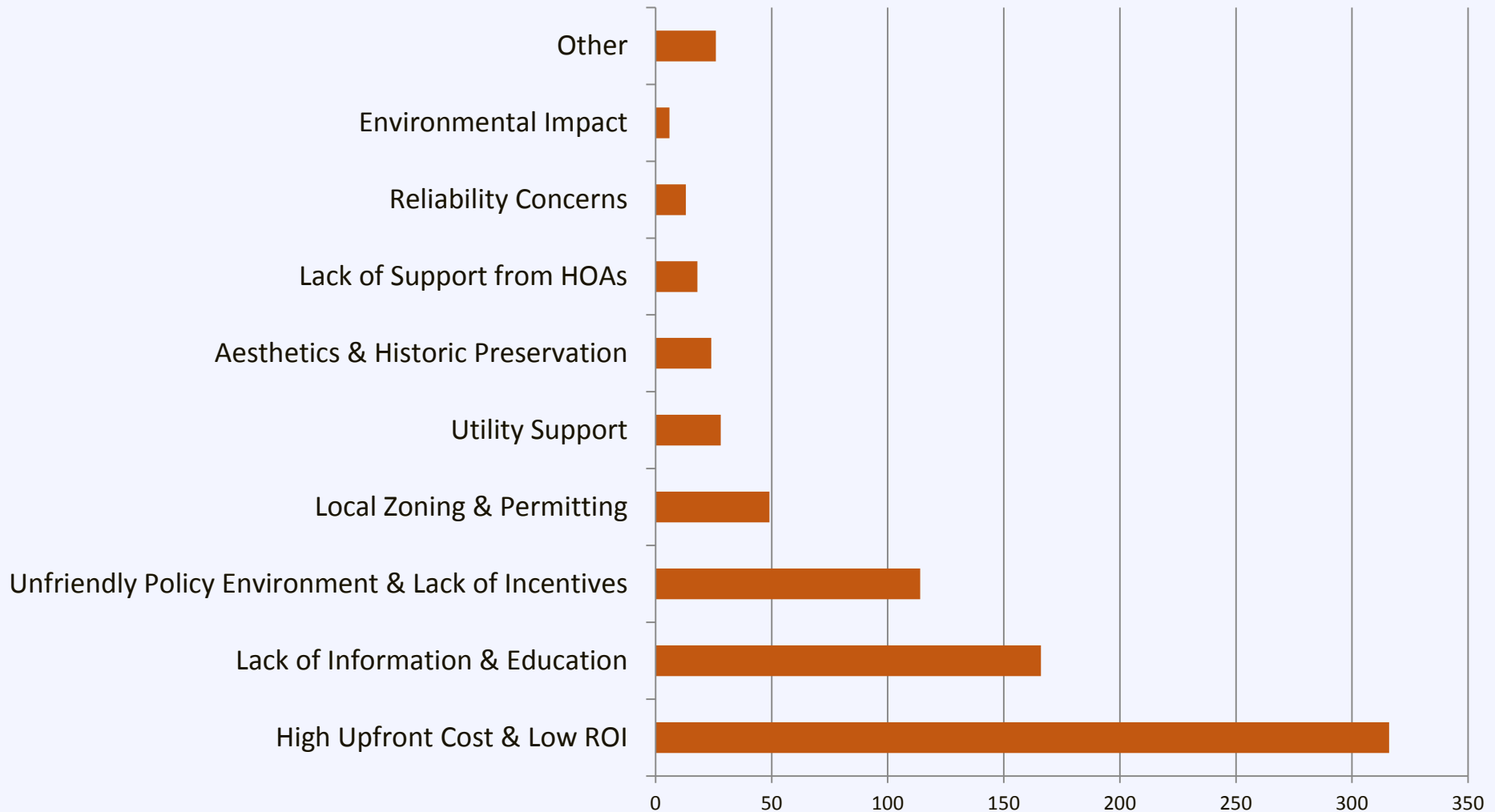


Group discussion

Activity: Addressing Barriers

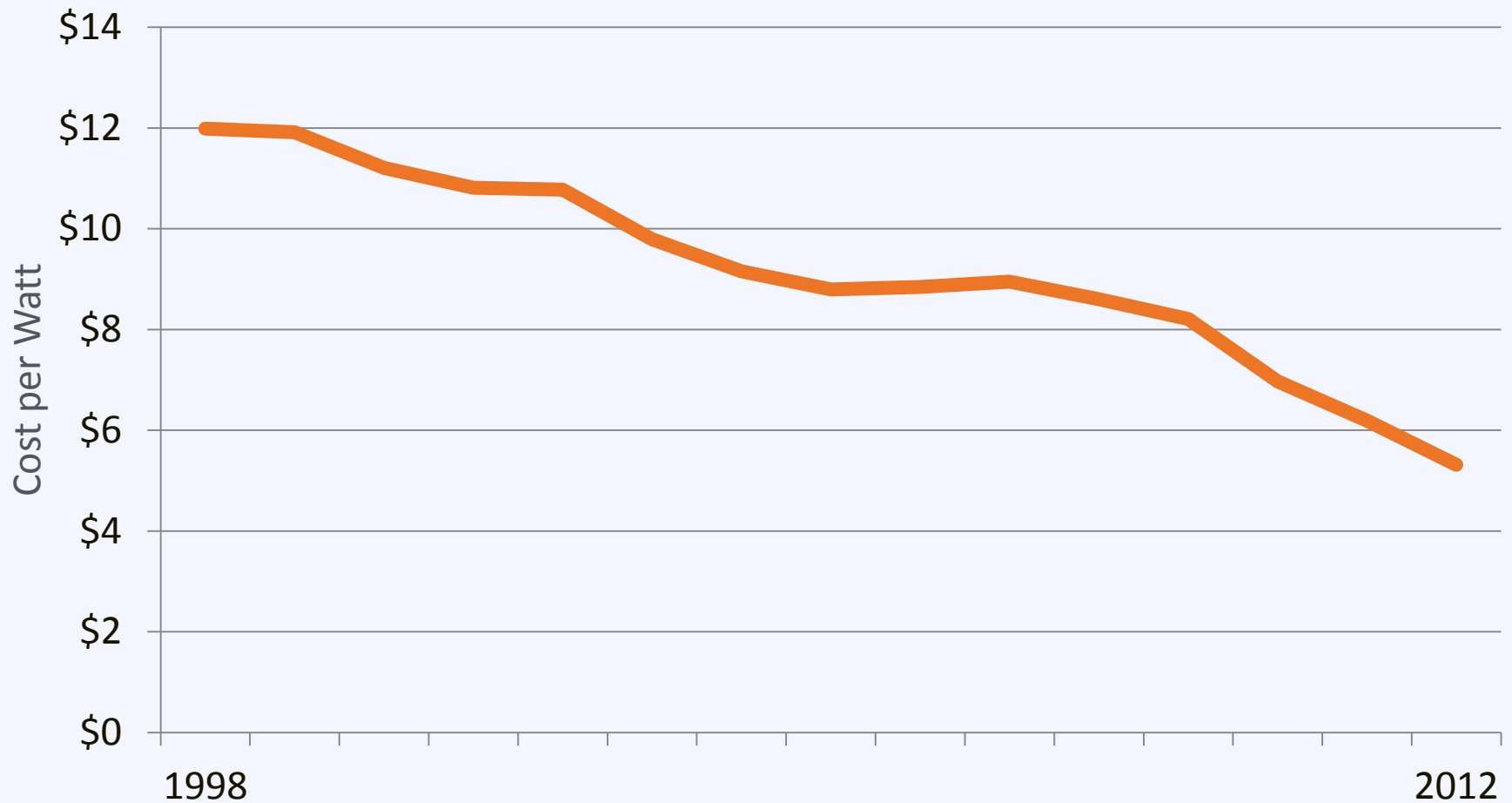


Activity: Addressing Barriers



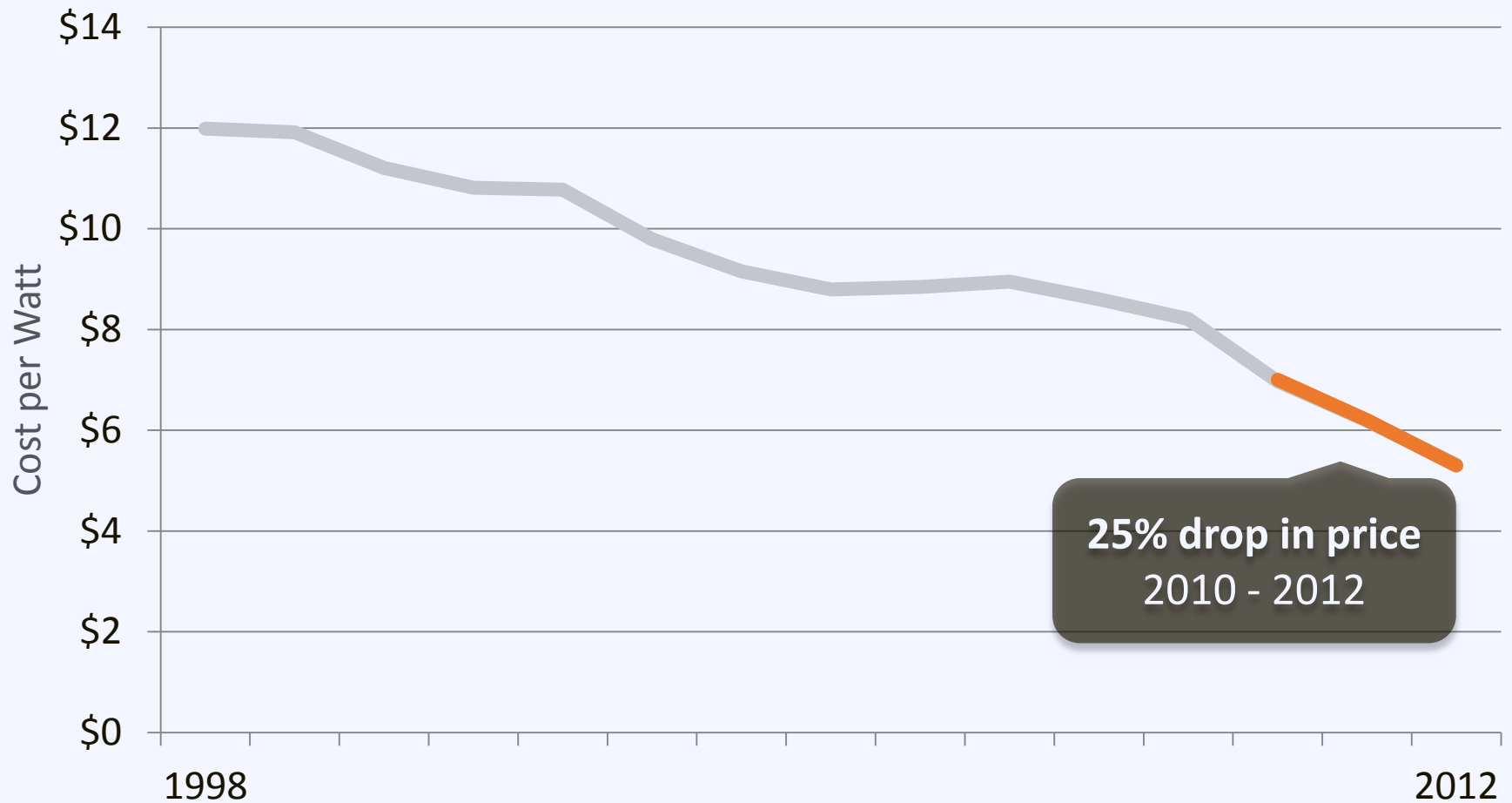
The Cost of Solar PV

US Average Installed Cost for Behind-the-Meter PV

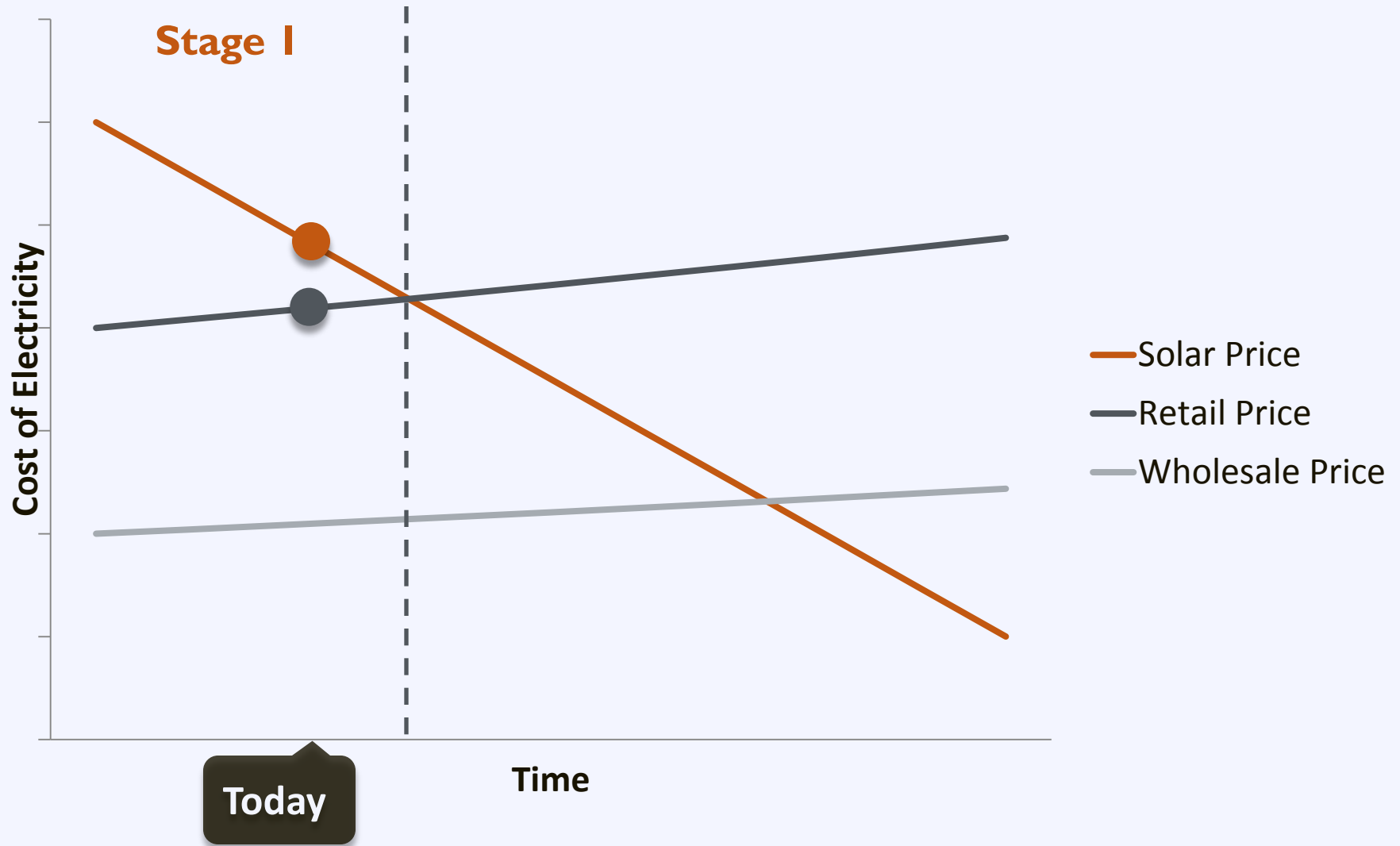


The Cost of Solar PV

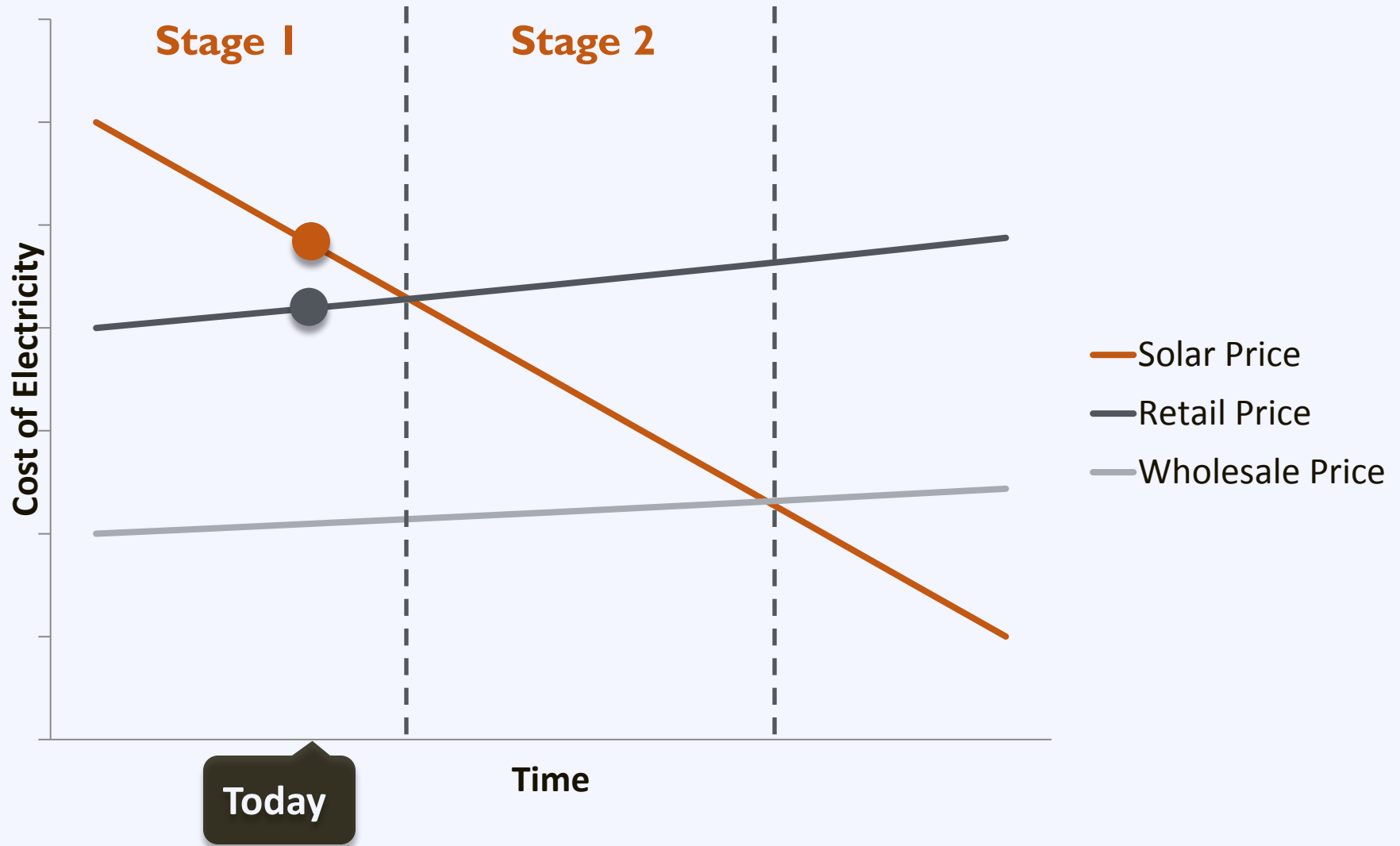
US Average Installed Cost for Behind-the-Meter PV



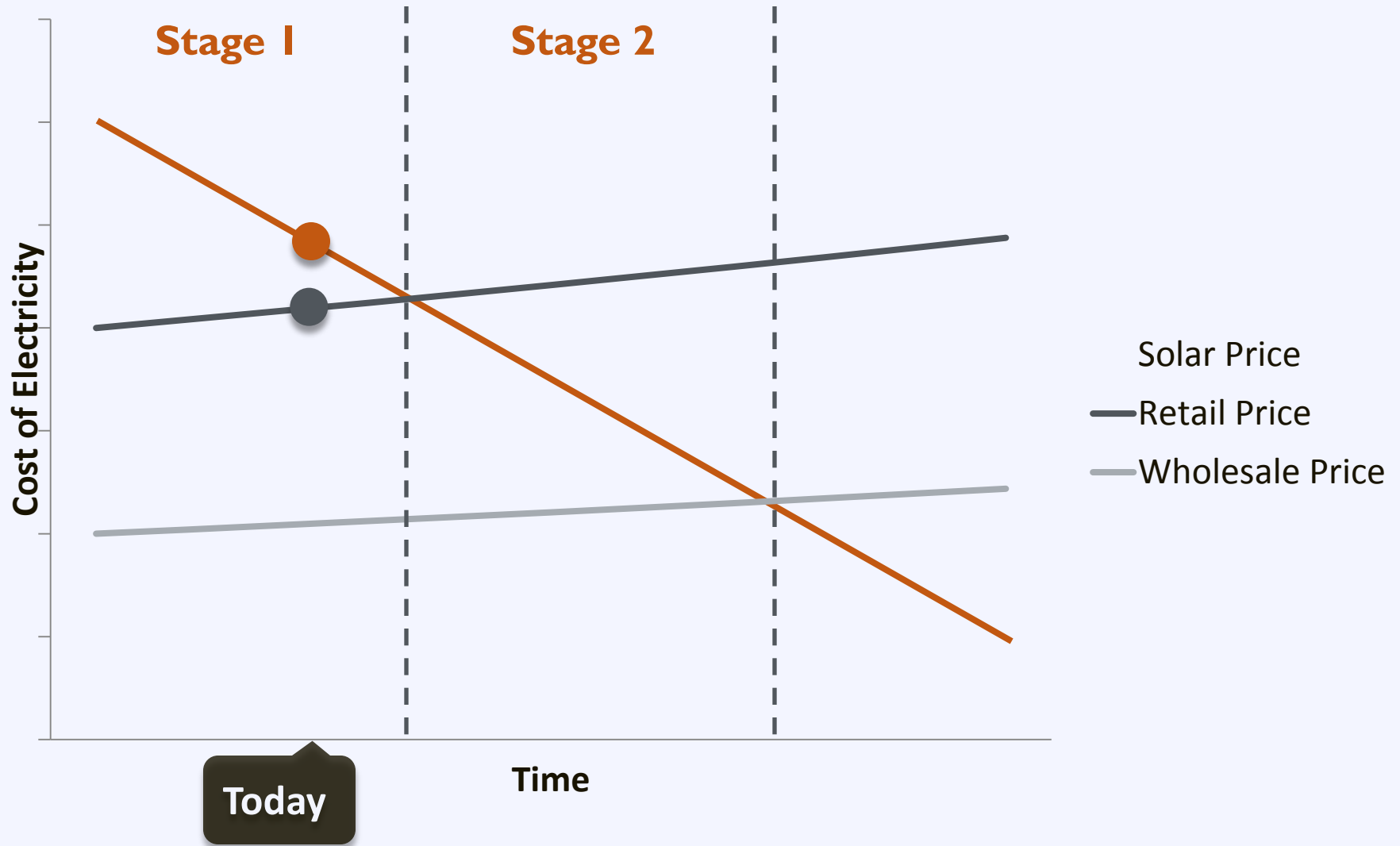
The Cost of Solar PV



The Cost of Solar PV

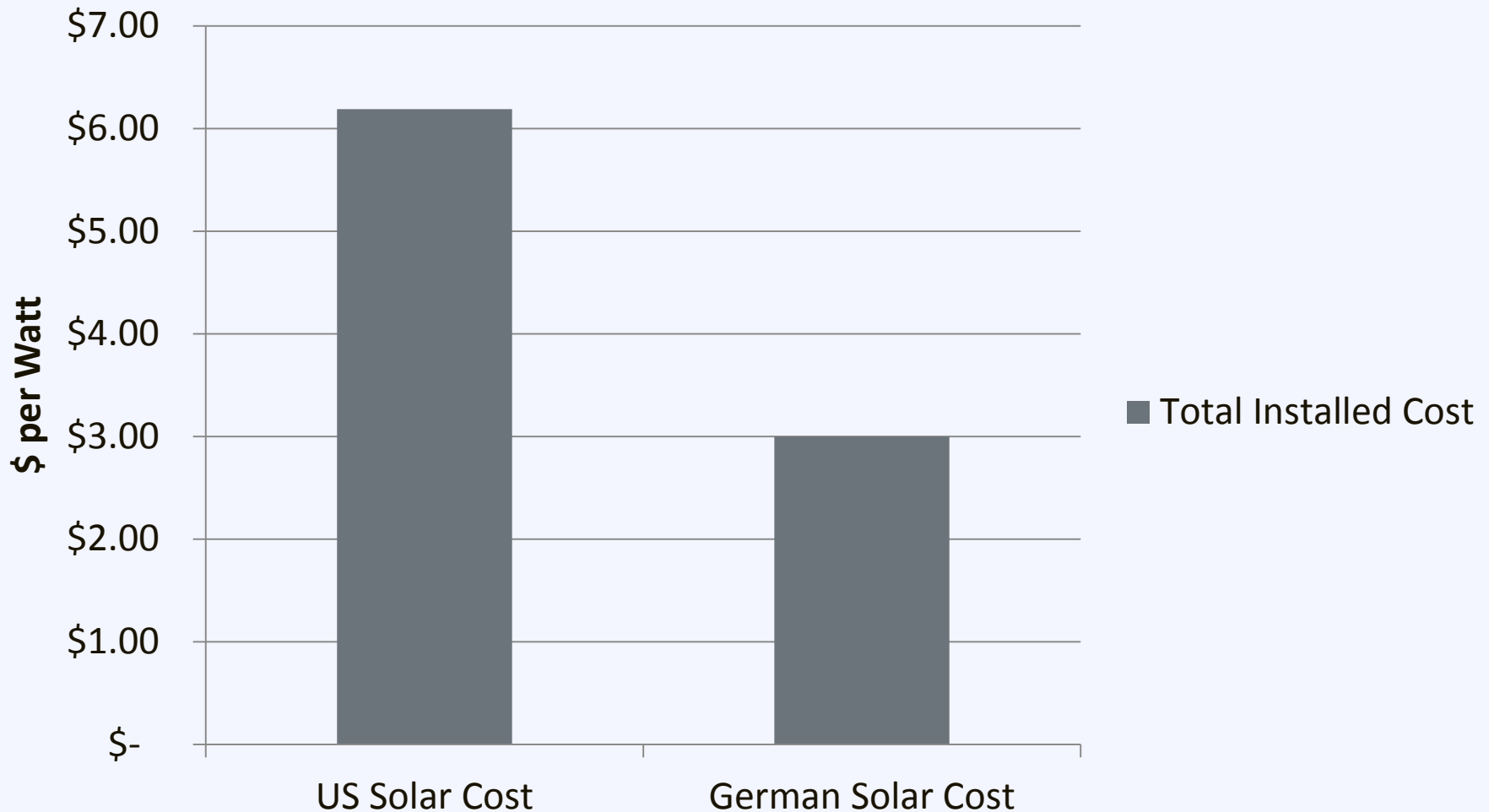


The Cost of Solar PV



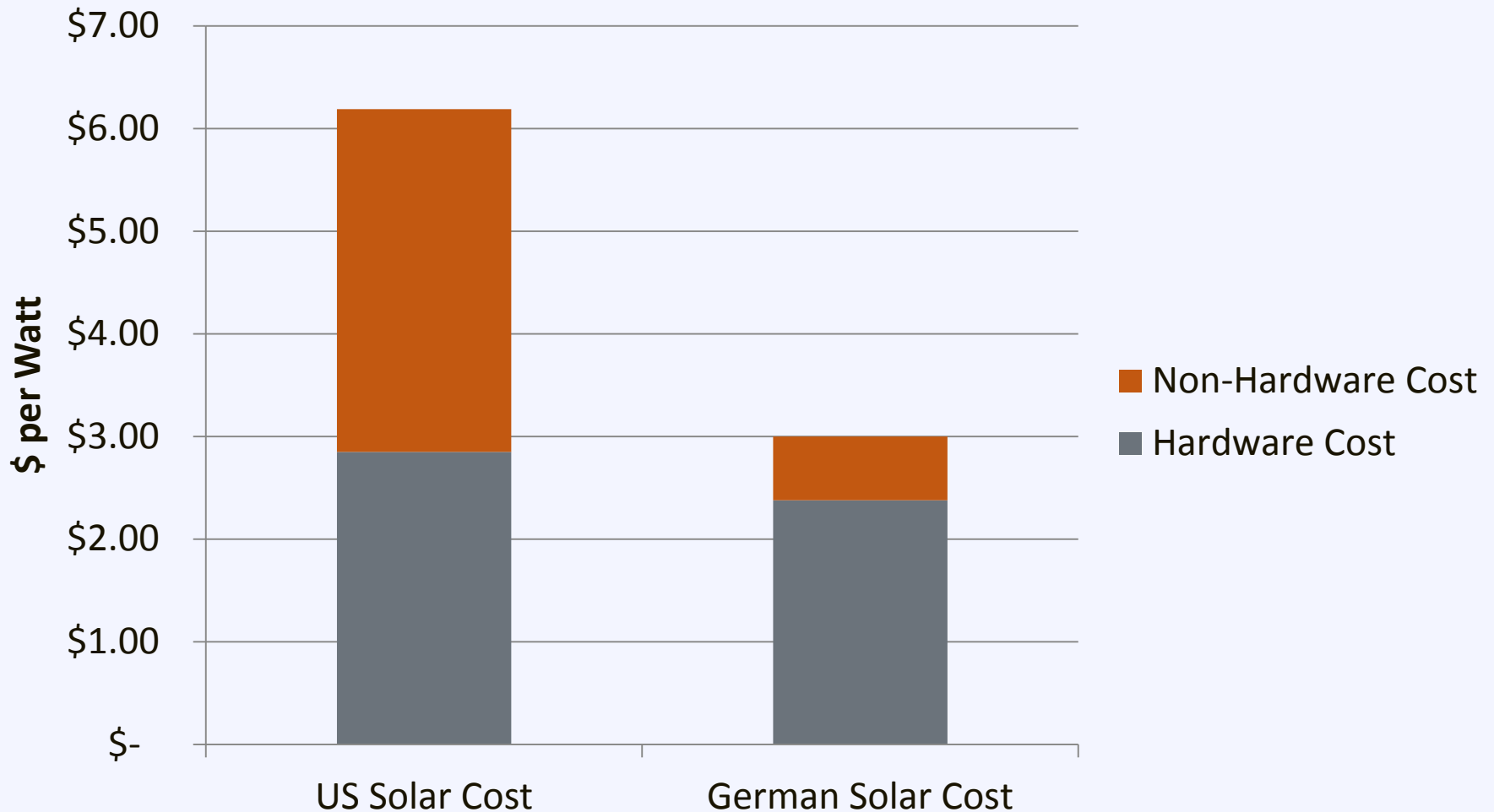
The Cost of Solar in the US

Comparison of US and German Solar Costs (NREL 2012)



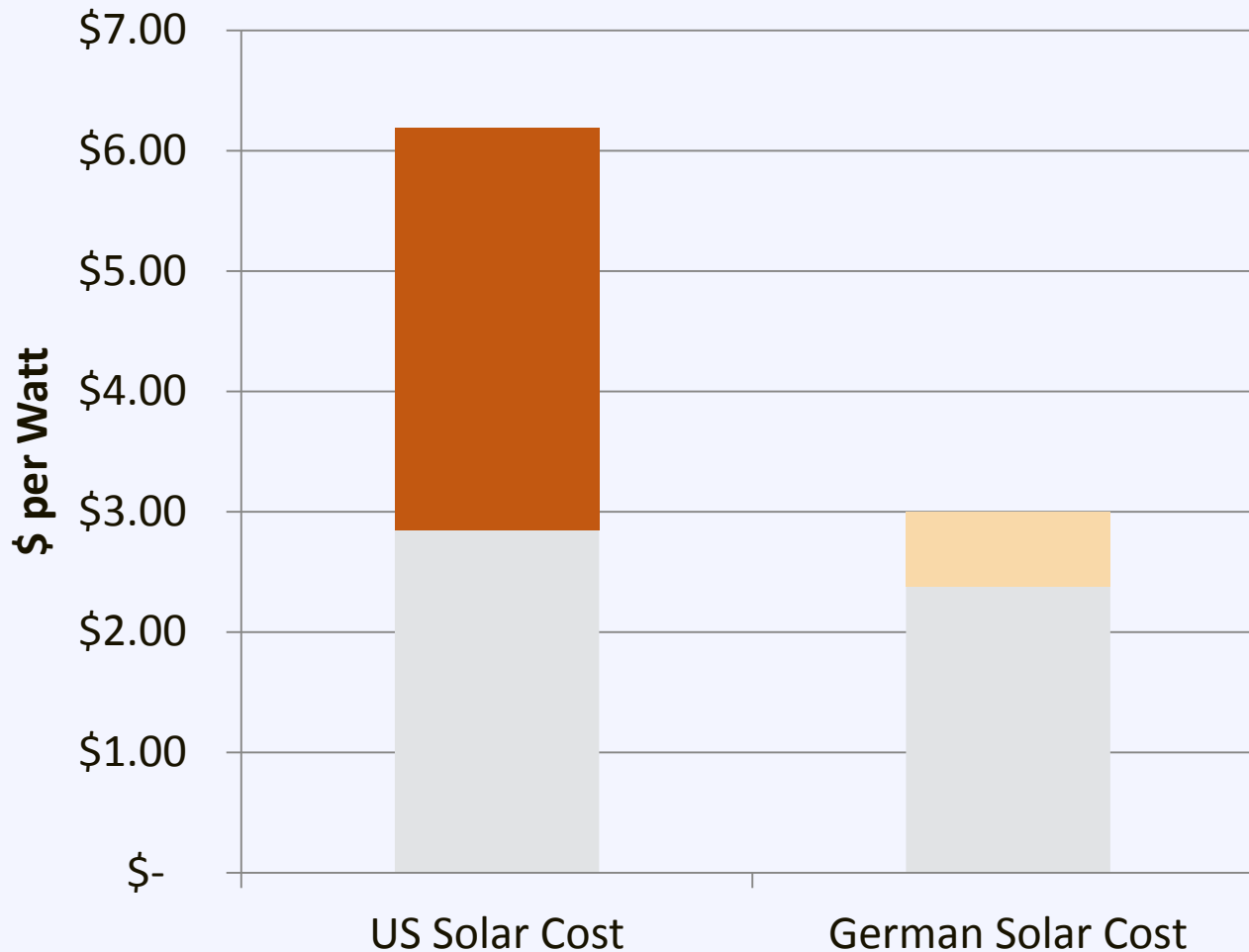
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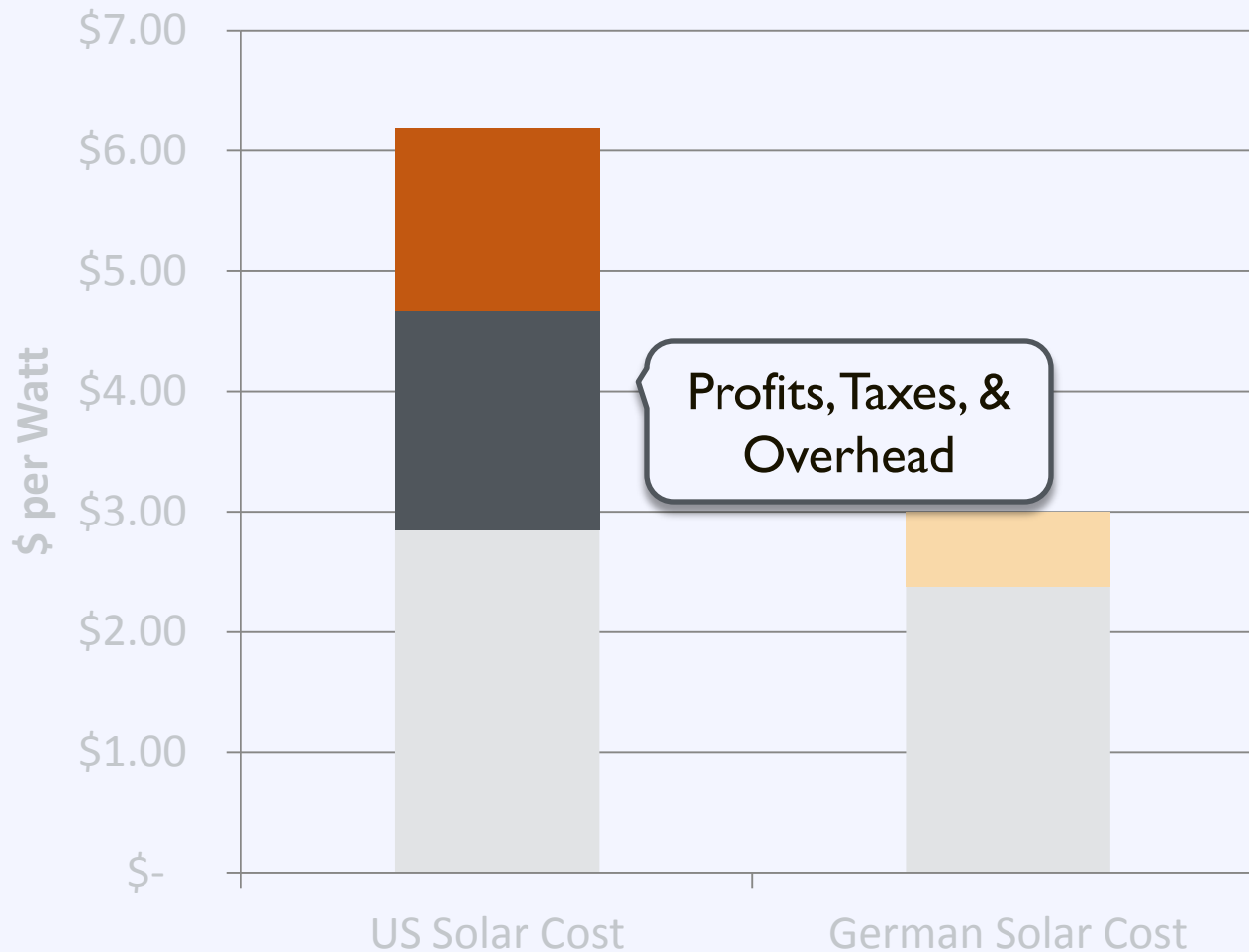
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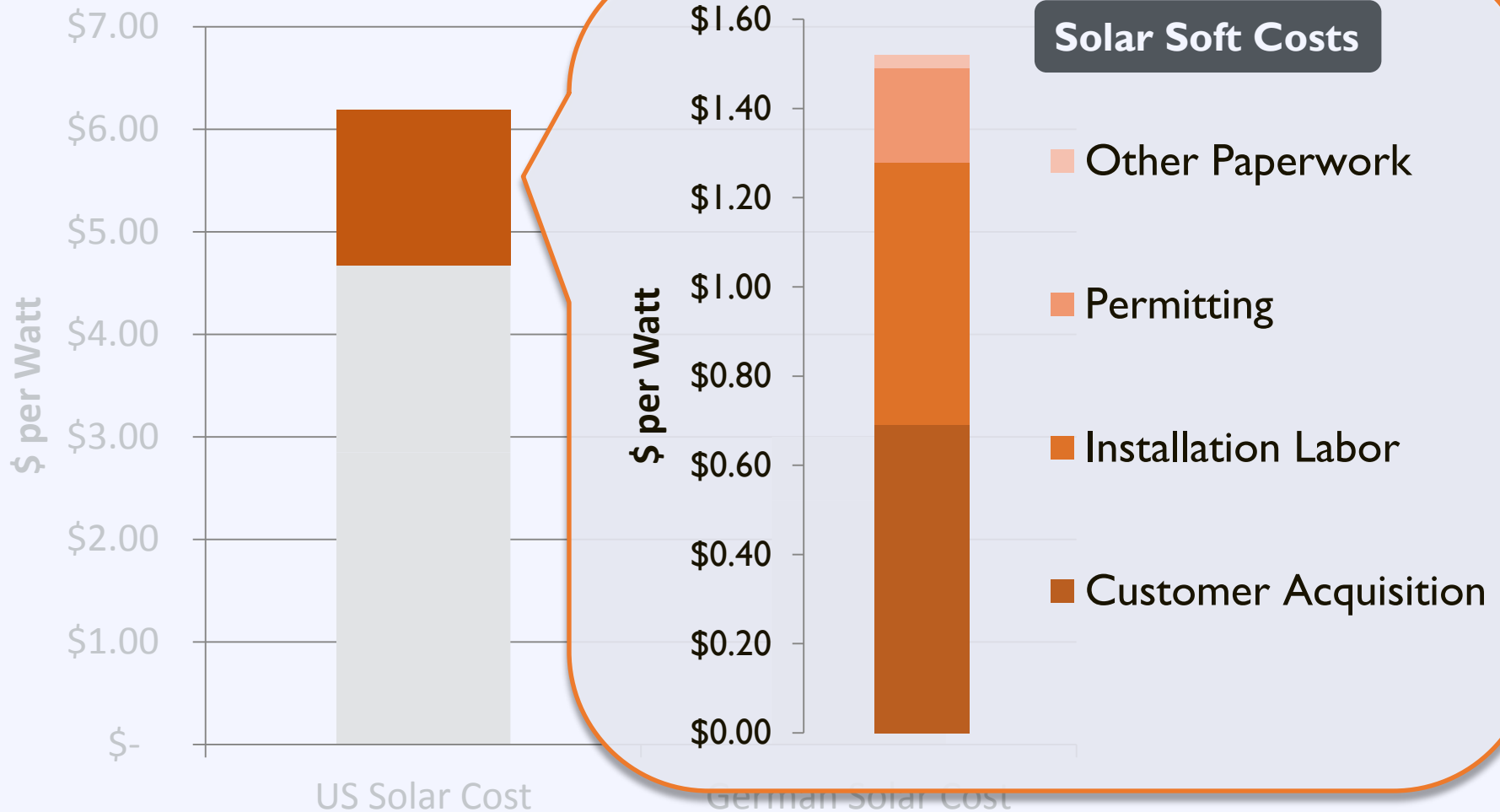
The Cost of Solar in the US

Comparison of US and German Solar Costs (NREL 2012)



The Cost of Solar in the US

Comparison of US and German Solar Costs (NREL 2012)



Challenge: Installation Time



**New York City's
Goal**

100 days

from inception to completion



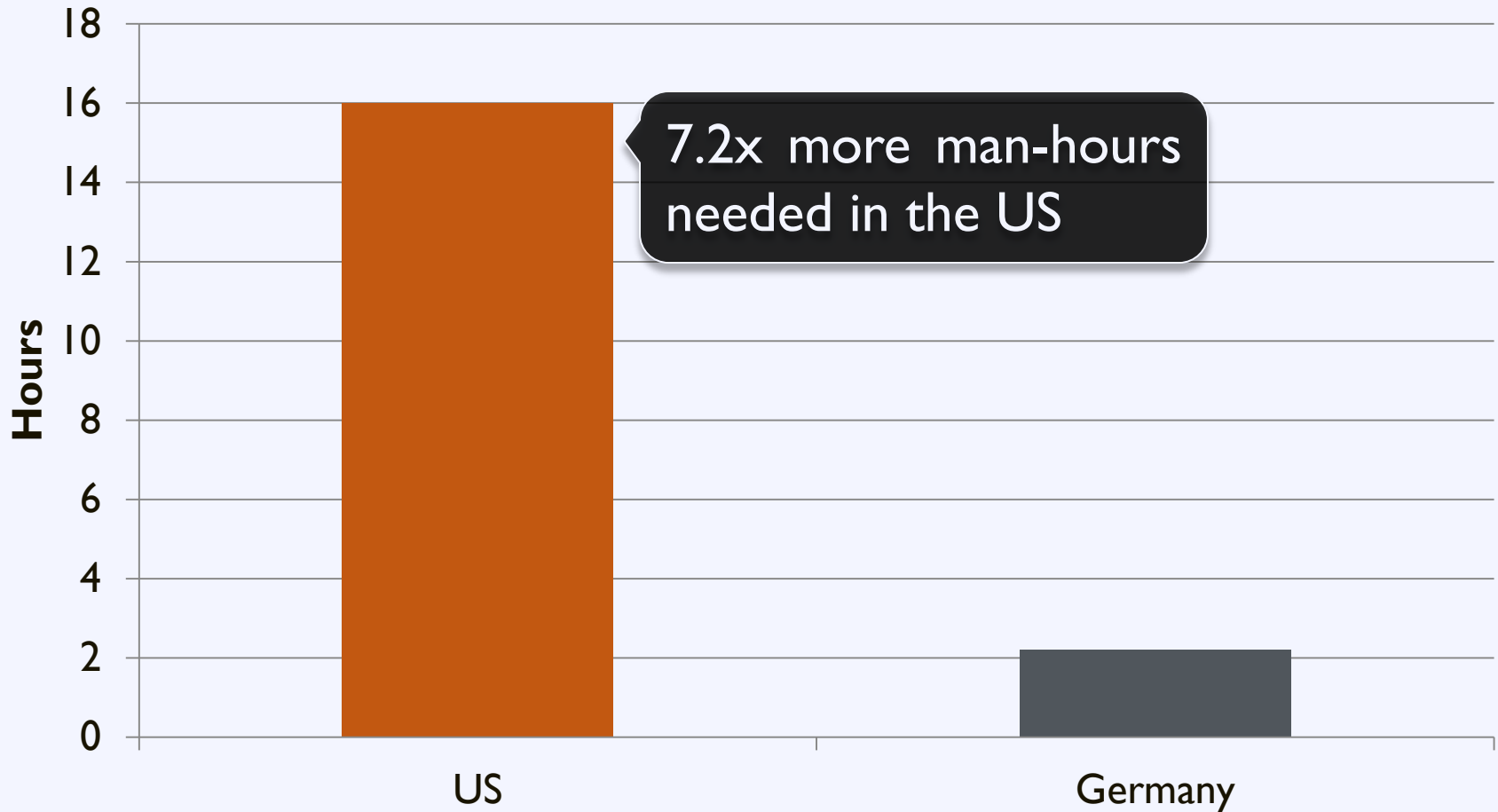
**Germany
Today**

8 days

from inception to completion

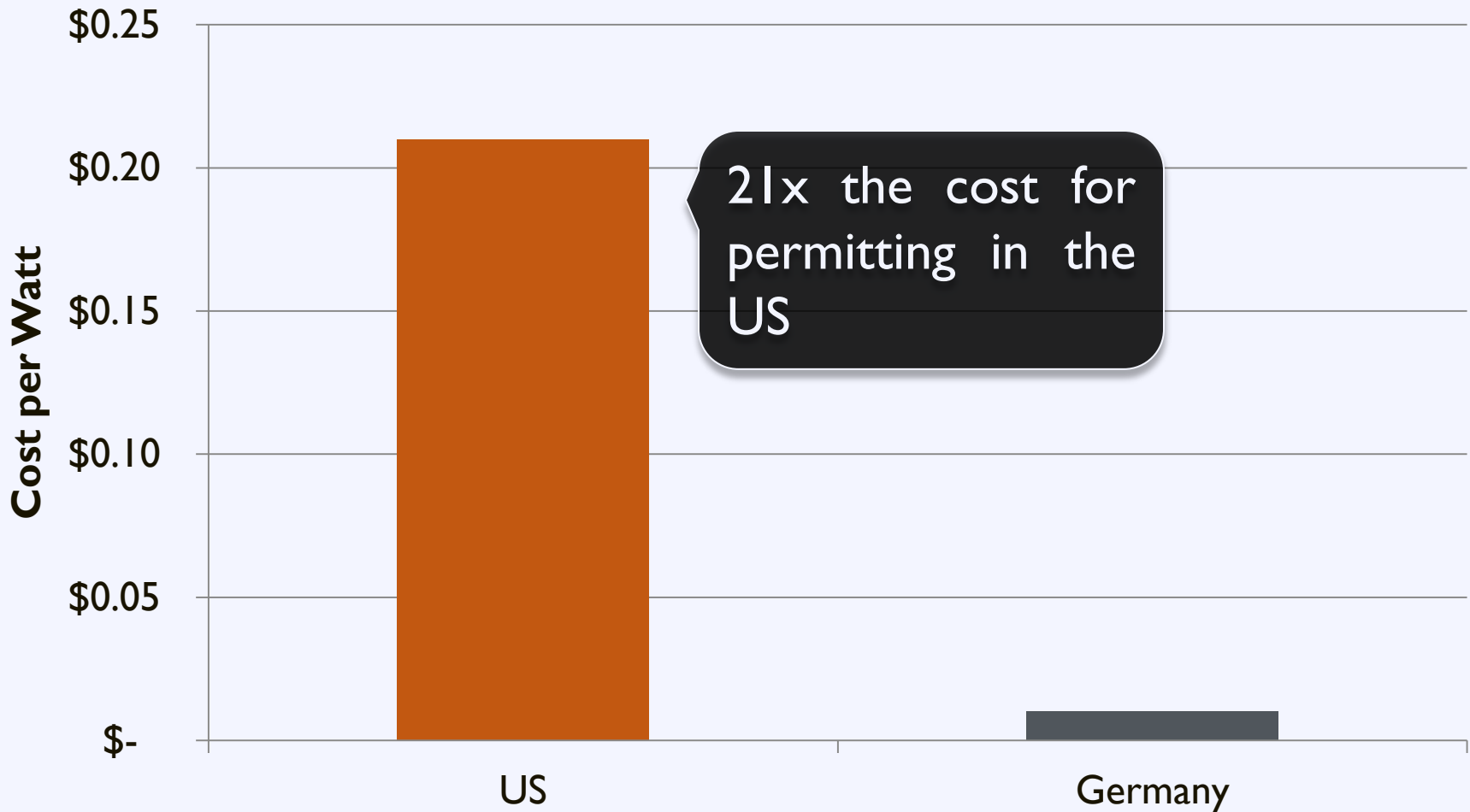
Time to Installation

Average Time to Permit a Solar Installation



Permitting Costs

Average Cost of Permitting in the US and Germany



Germany's Success

Consistency and Transparency

through

Standardized Processes

Workshop Goal

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

Agenda

08:40 – 09:00 Solar 101 for Communities

09:00 – 09:20 Understanding the Solar Regulatory Landscape

09:20 – 09:35 Creating a Solar Ready Community

09:35 – 09:45 *Break*

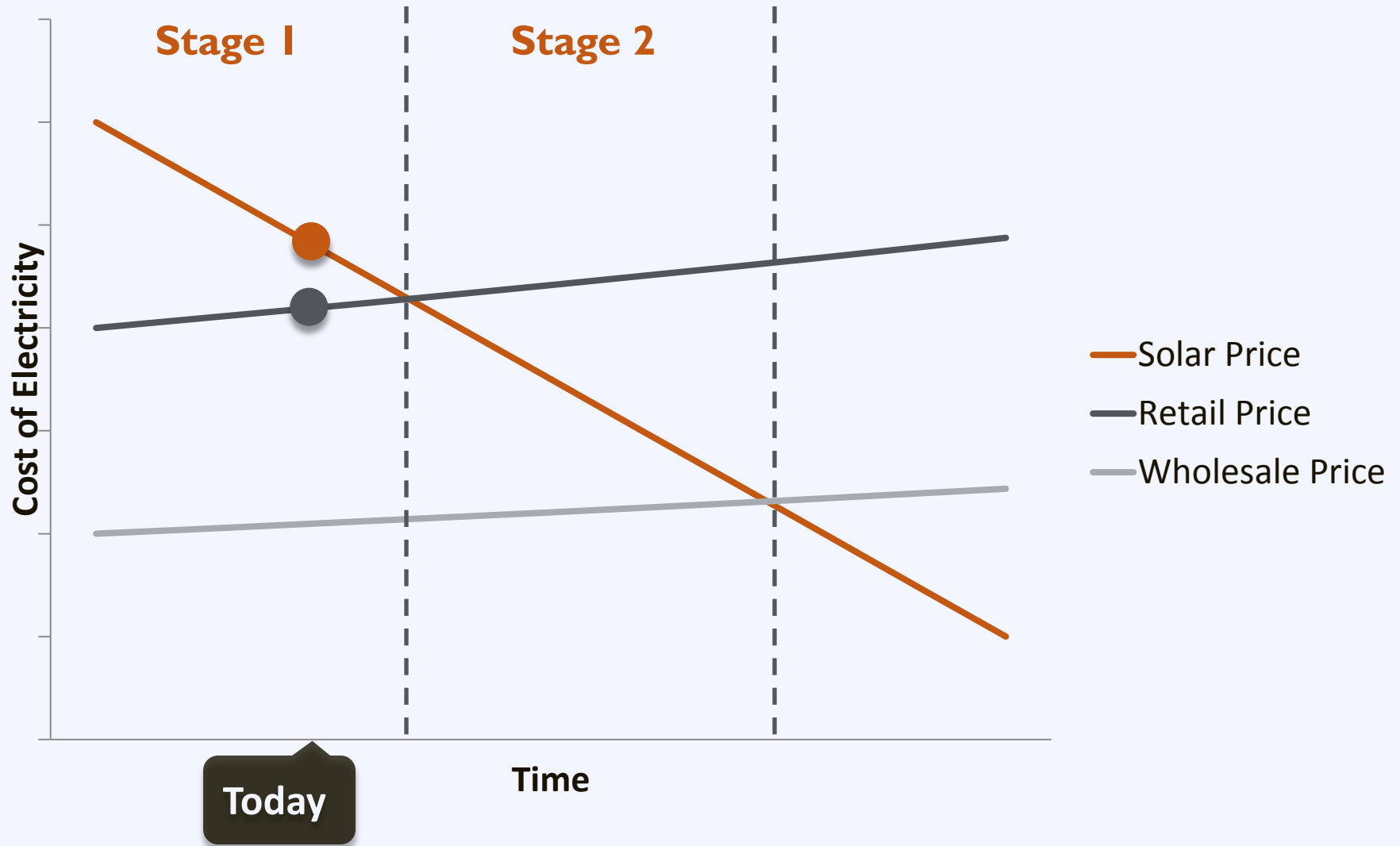
09:45 – 10:00 Benefits and Barriers Activity

10:00 – 10:30 Growing Your Local Solar Market

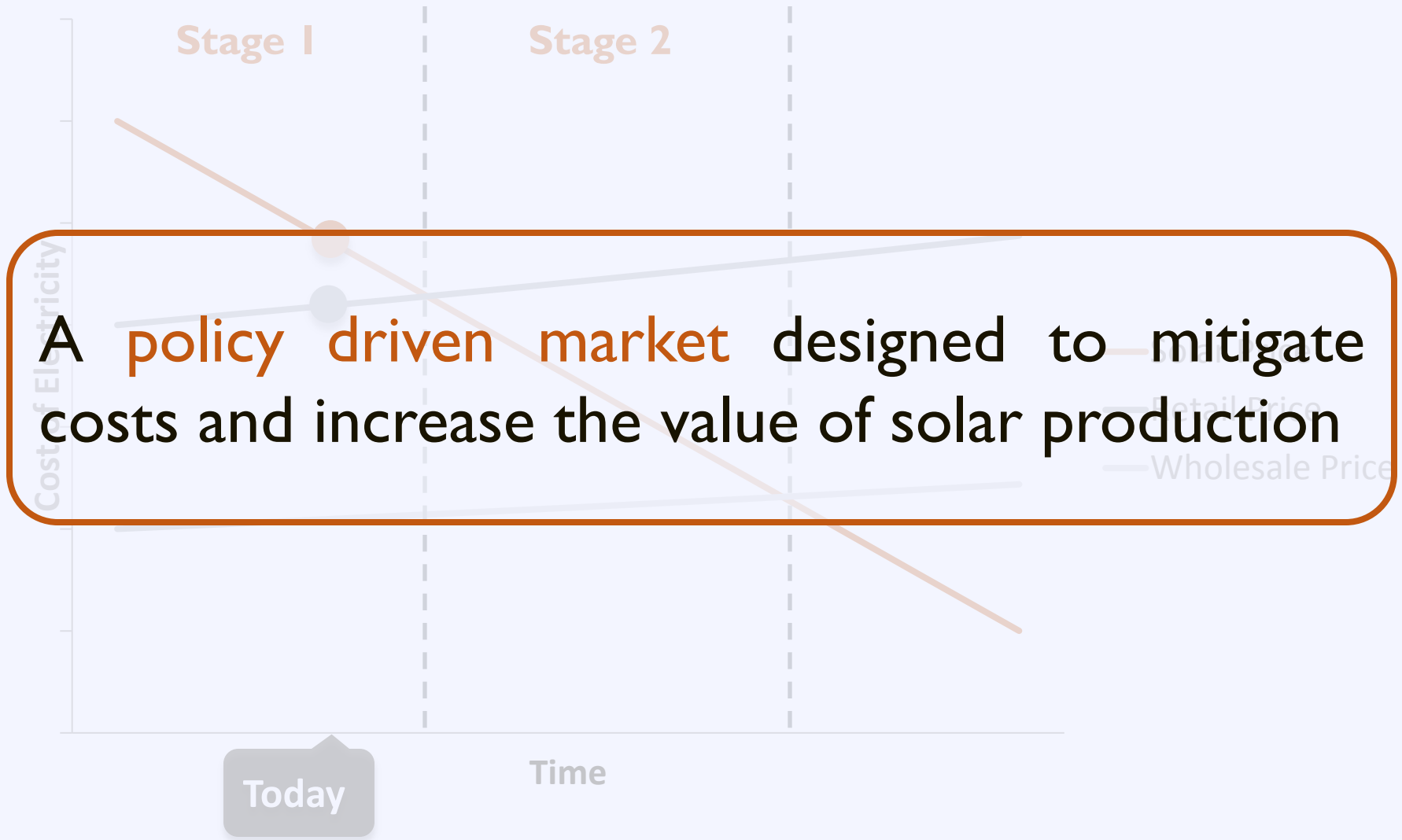
10:30 – 12:10 Local Speaker Session & Audience Discussion

12:10 – 12:15 Wrap Up

Solar Market: Trends



Solar Market: Trends



A Policy Driven Market

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

Agenda

08:40 – 09:00 Solar 101 for Communities

09:00 – 09:20 Understanding the Solar Regulatory Landscape

09:20 – 09:35 An overview of the key policies that drive growth in the Minnesota market

09:35 – 09:45 *Break*

09:45 – 10:00 Specifics on the new solar policies
Presented by Bill Grant, Deputy Commissioner of Energy and Telecommunications, MN Department of Commerce

10:00 – 10:30

10:30 – 12:10 Local Speaker Session & Audience Discussion

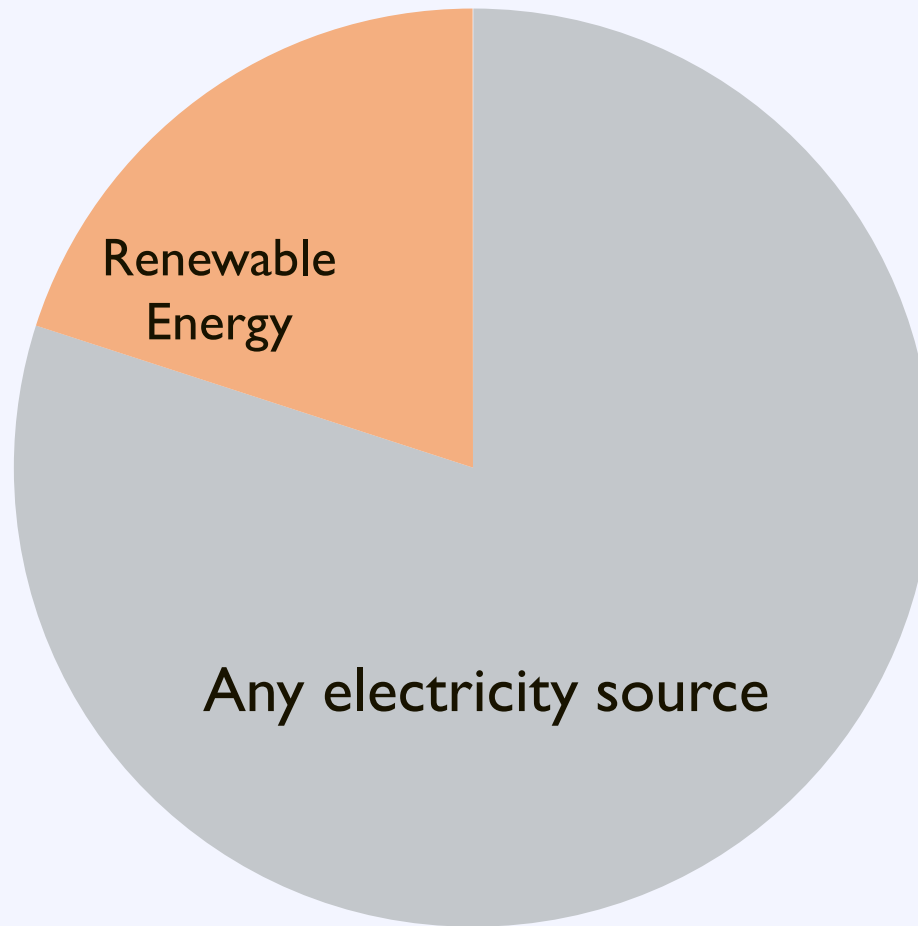
12:10 – 12:15 Wrap Up

A Policy Driven Market

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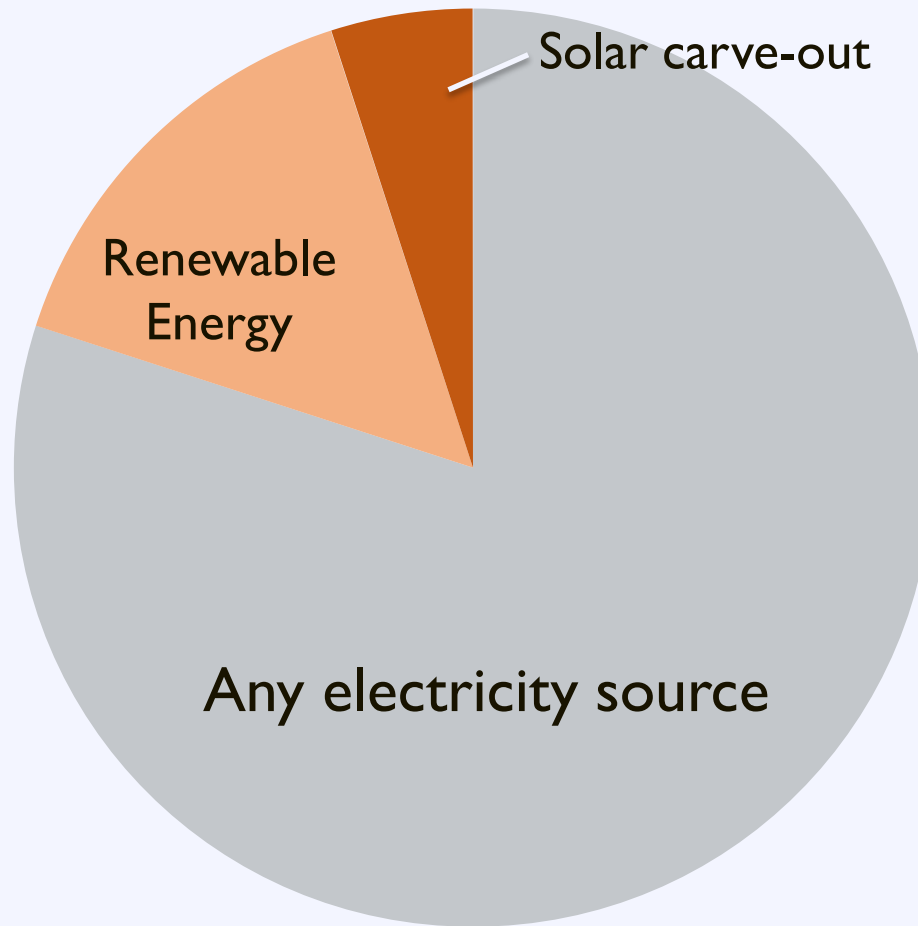
Renewable Portfolio Standard

Retail Electricity Sales

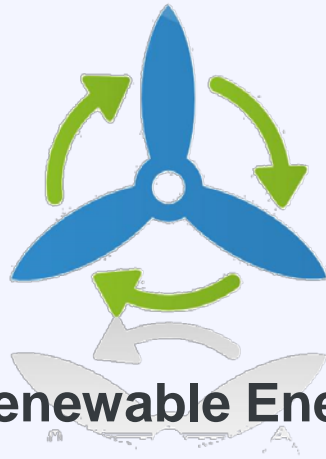


Renewable Portfolio Standard

Retail Electricity Sales



Renewable Portfolio Standard

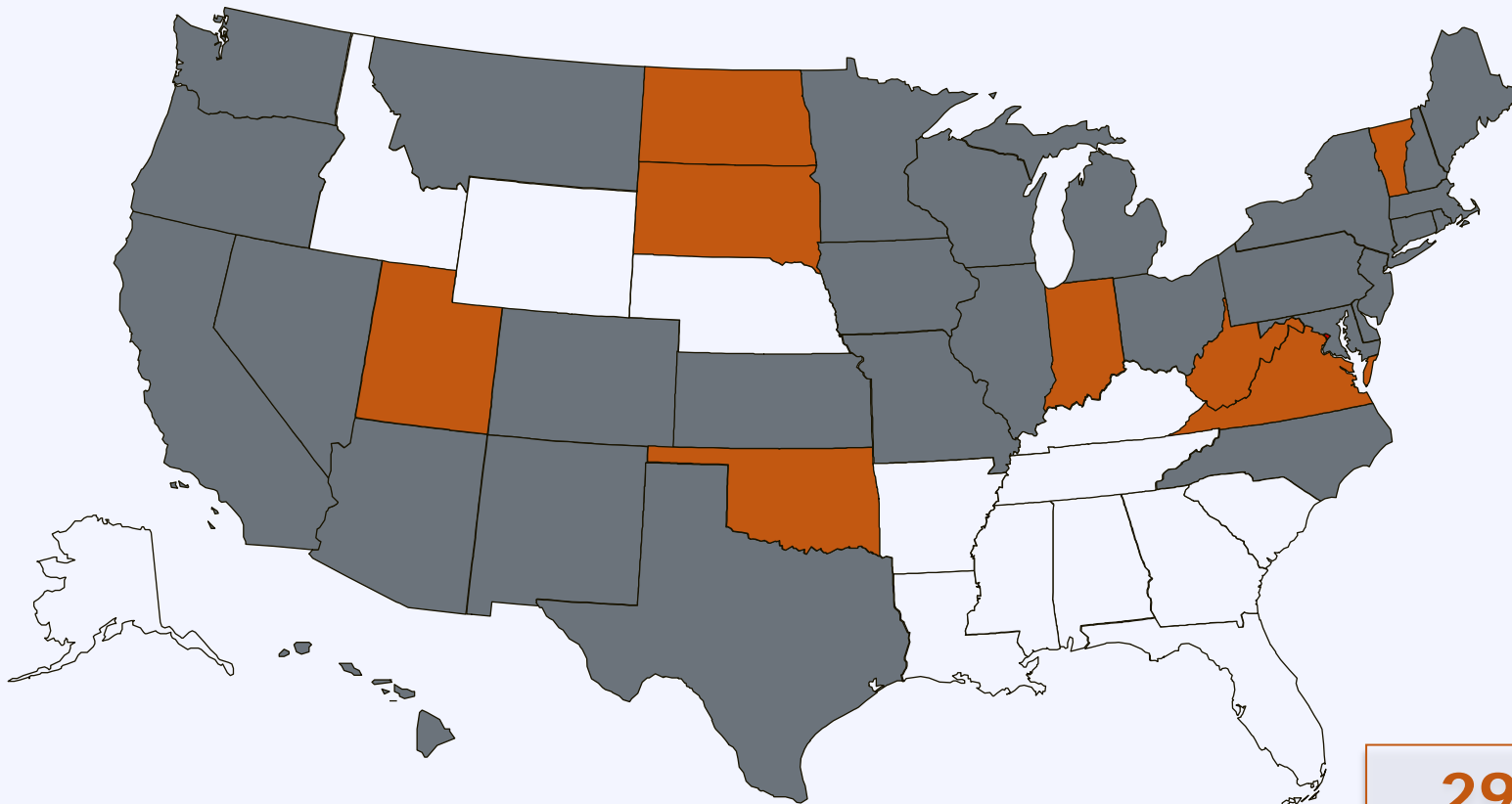




Two revenue streams



Renewable Portfolio Standard

www.dsireusa.org / August 2012



-  Renewable portfolio standard
-  Renewable portfolio goal

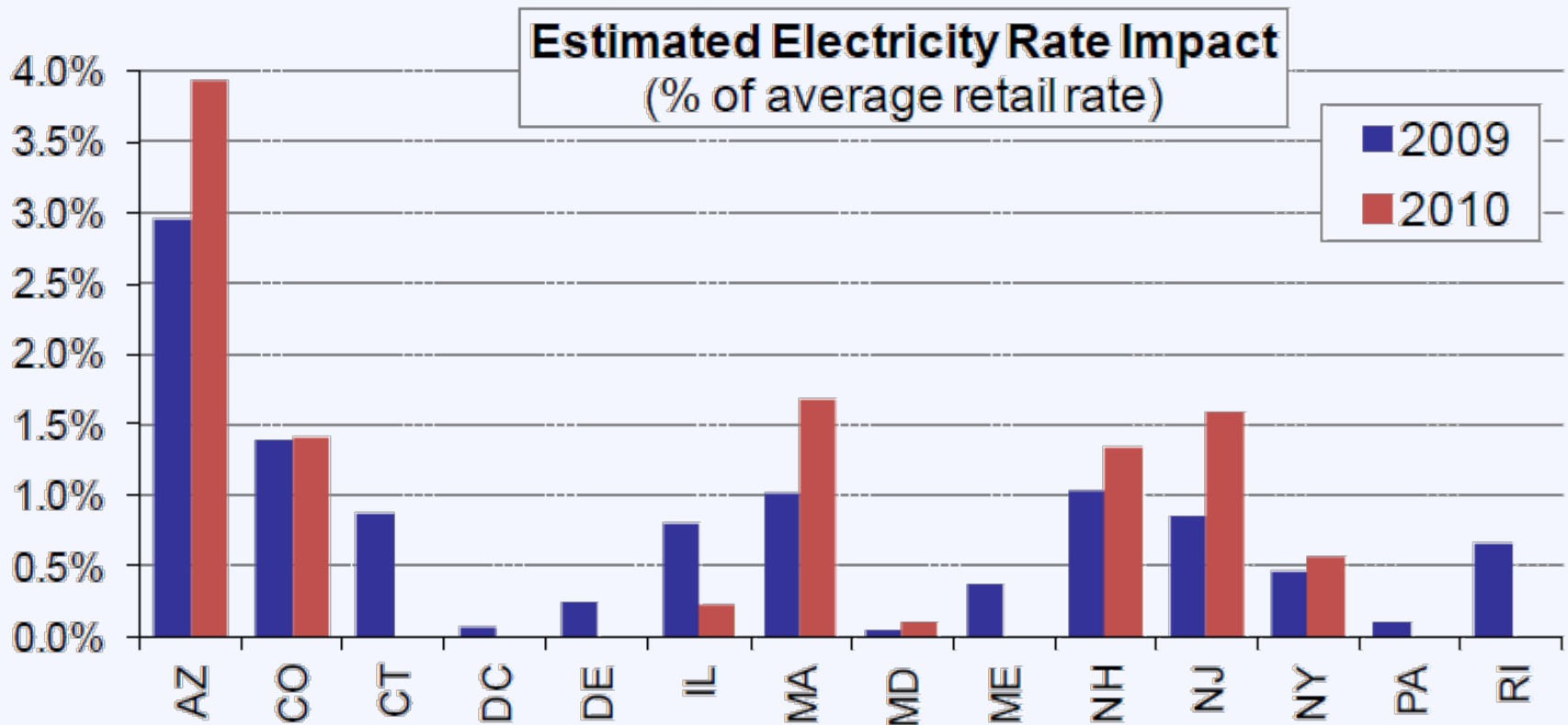
29 states +
Washington DC and 2
territories have
**Renewable Portfolio
Standards**
*(8 states and 2 territories have
renewable portfolio goals)*

RPS Impacts: Solar Deployment

RPS and Solar/DG Status of Top Ten Solar States by Cumulative Installed Capacity (as of Q4 2012)

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

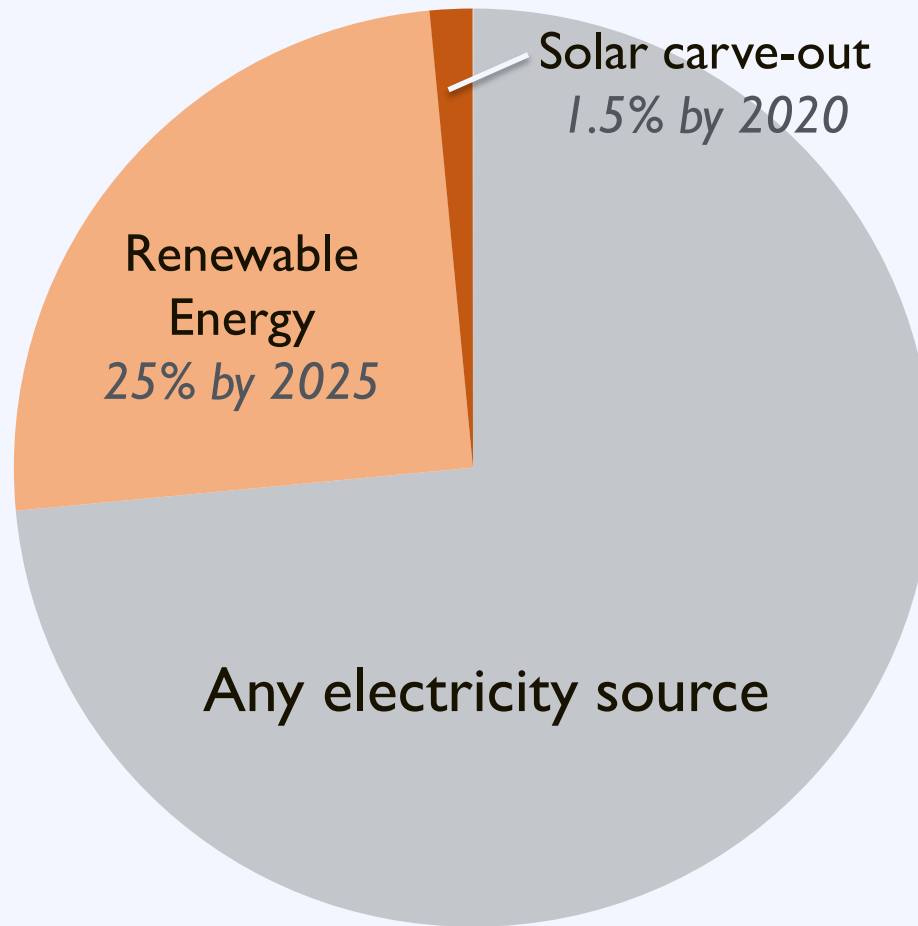
RPS Impacts: Retail Rates



States not included if data on incremental RPS compliance costs are unavailable (CA, IA, HI, MN, MT, NC, NM, NV, OH, TX, WI) or if RPS did not apply in 2009-10 (KS, MI, MO, OR, WA).

RPS: Minnesota

Investor Owned Utility Retail Electricity Sales



A Policy Driven Market

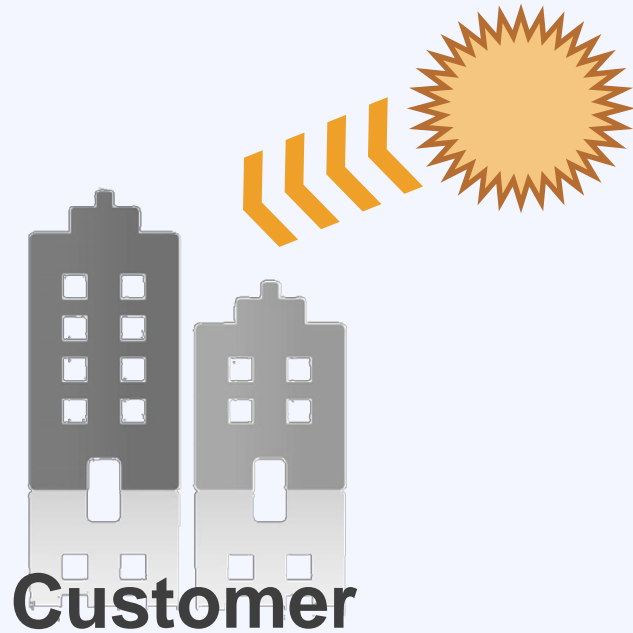
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Local	Solar Ordinance	Solarize	Property Assessed Clean Energy

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: Overview

Morning



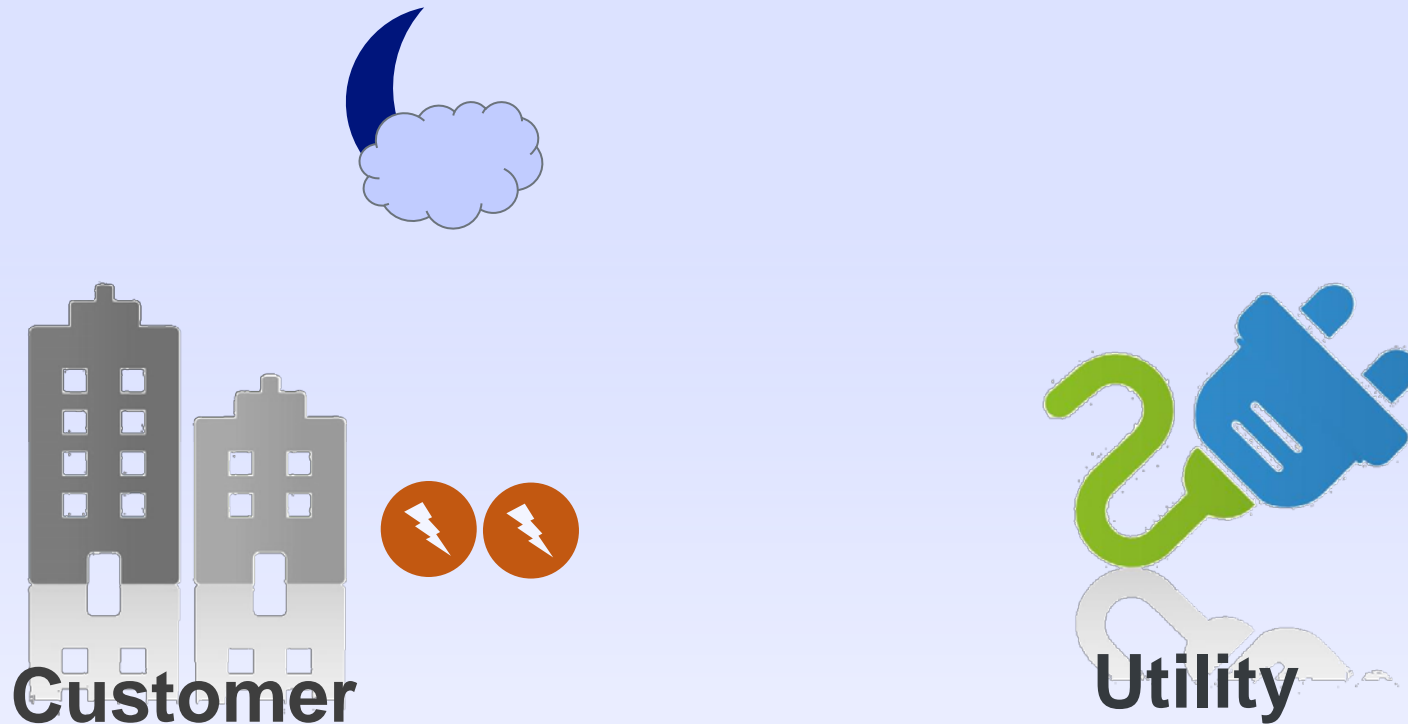
Net Metering: Overview

Afternoon



Net Metering: Overview

Night

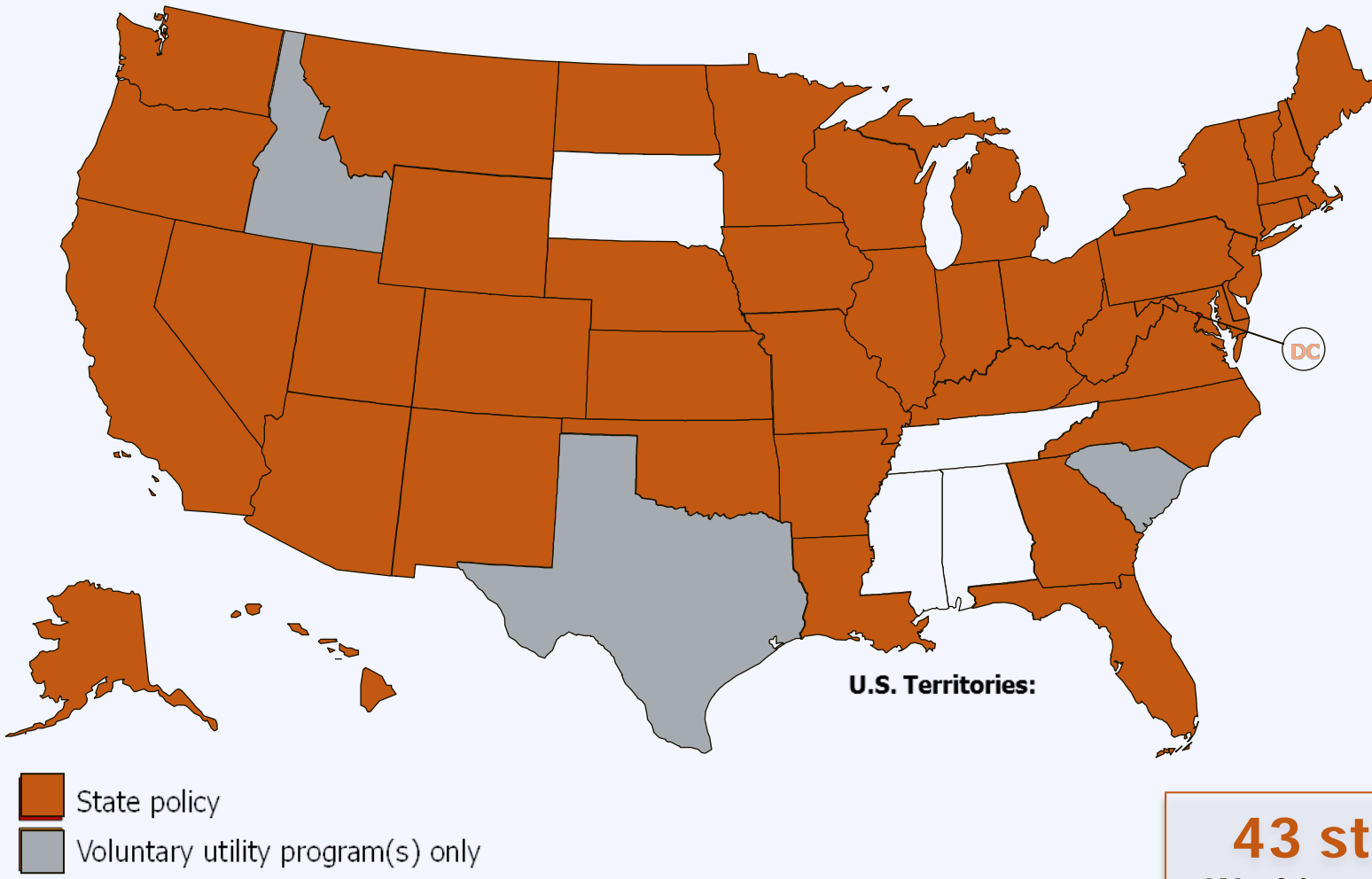


Solar covers 100% of the customer's load, even at night!

Net Metering: Market Share

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

Net Metering



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

Net Metering: Minnesota

Current Rules:

Systems up to 40 kW

Upcoming Rules:

Systems 40 kW to 1 MW



Net Excess Generation

Effective Retail Rate



Reconciliation

Monthly



Production Limit

None



Applicable Utilities

All Utilities

Net Metering: Minnesota

Current Rules:

Systems up to 40 kW



Net Excess Generation

Effective Retail Rate



Reconciliation

Monthly



Production Limit

None



Applicable Utilities

All Utilities

Upcoming Rules:

Systems 40 kW to 1 MW

Net Excess Generation

Avoided Cost

Reconciliation

Monthly

Production Limit

120% of Onsite Load

Applicable Utilities

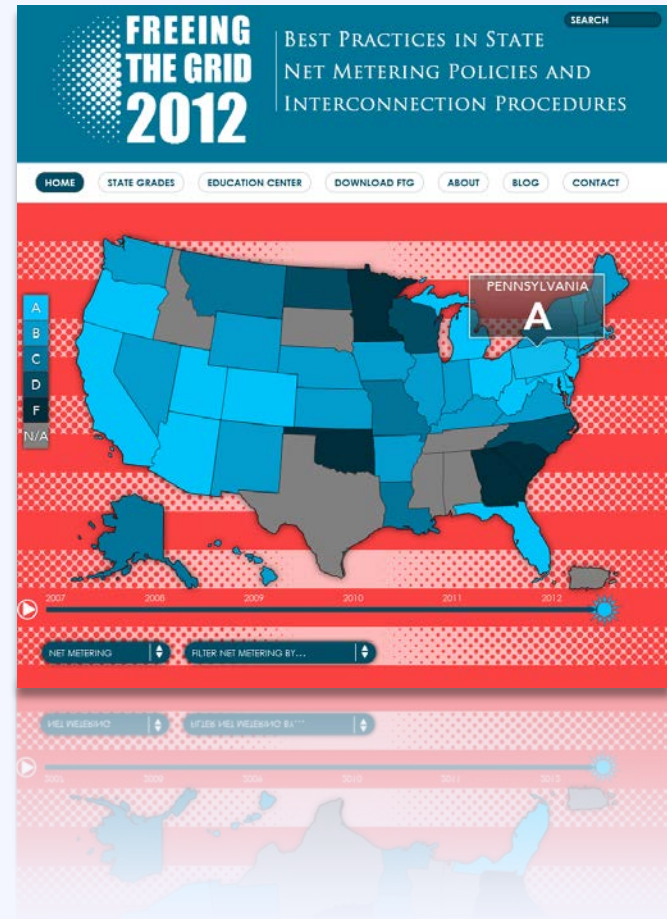
Investor Owned Utilities

Net Metering: Resources

Resource **Freeing the Grid**

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

<http://freeingthegrid.org/>



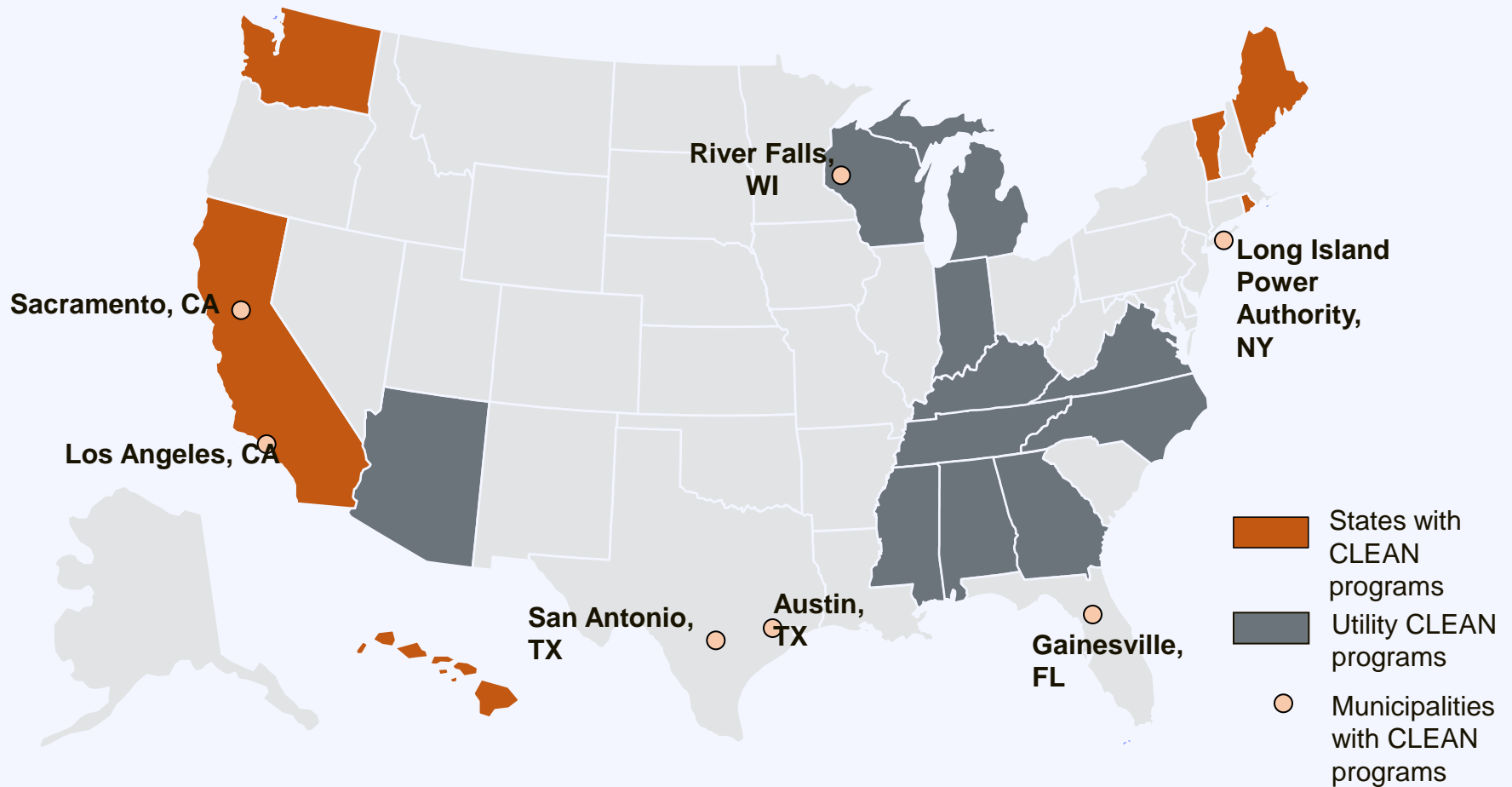
A Policy Driven Market

Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering	CLEAN Contract Option
	Solar Access	Tax Credits & Exemptions	In lieu of net metering incentives
Local	Solar Ordinance	Solarize	Property Assessed Clean Energy

CLEAN Contract (Feed-in Tariff)



CLEAN Contract (Feed-in Tariff)



CLEAN Contract (Feed-in Tariff)



CLEAN Contract: Minnesota

Purchase price is calculated as the **value of solar**

Energy

Generation capacity

Transmission and distribution value

Transmission capacity

+ Environmental Value

Value of Solar

Q & A

Agenda

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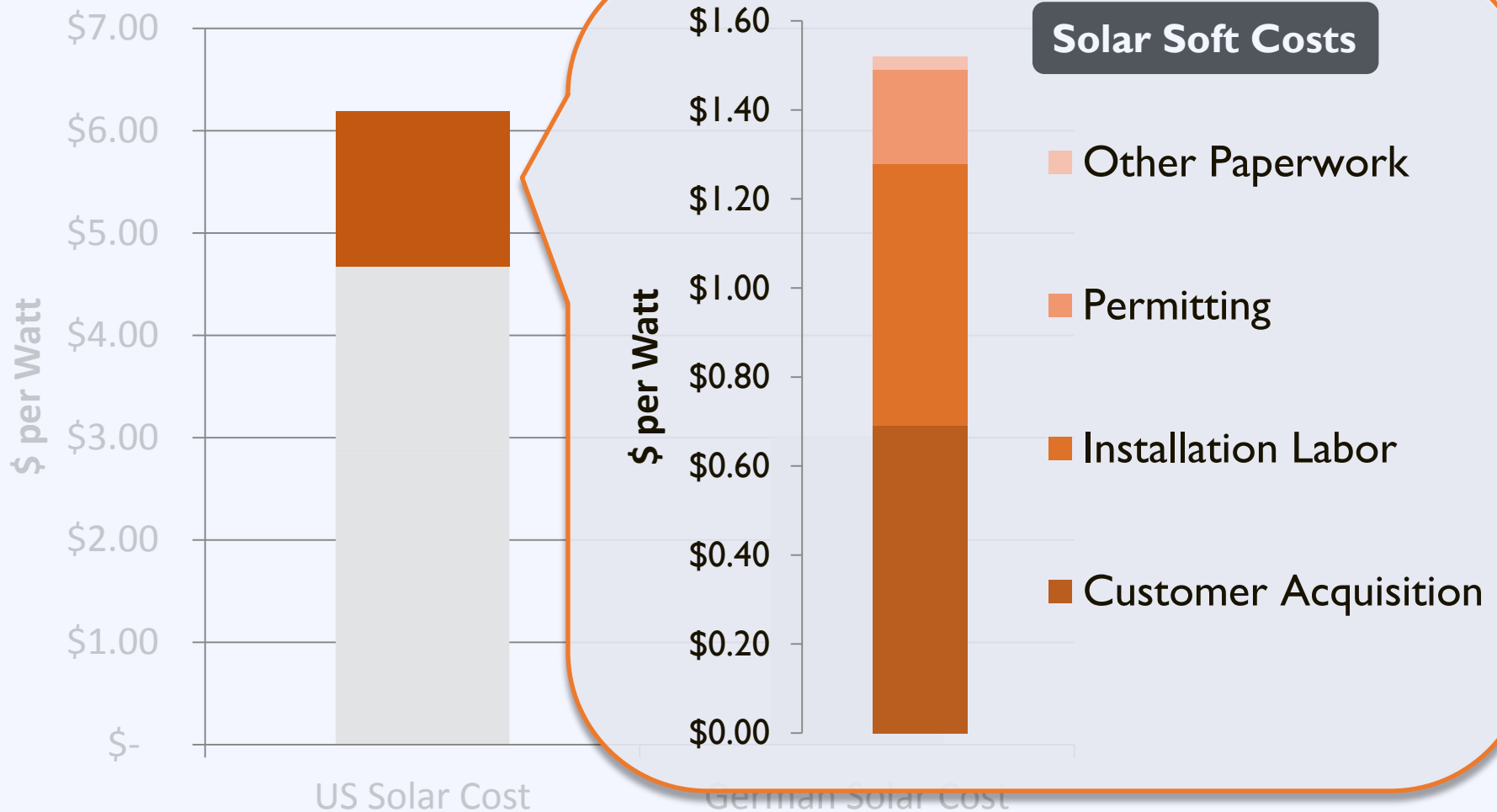
10:00 – 10:30 Growing Your Local Solar Market

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The Cost of Solar in the US

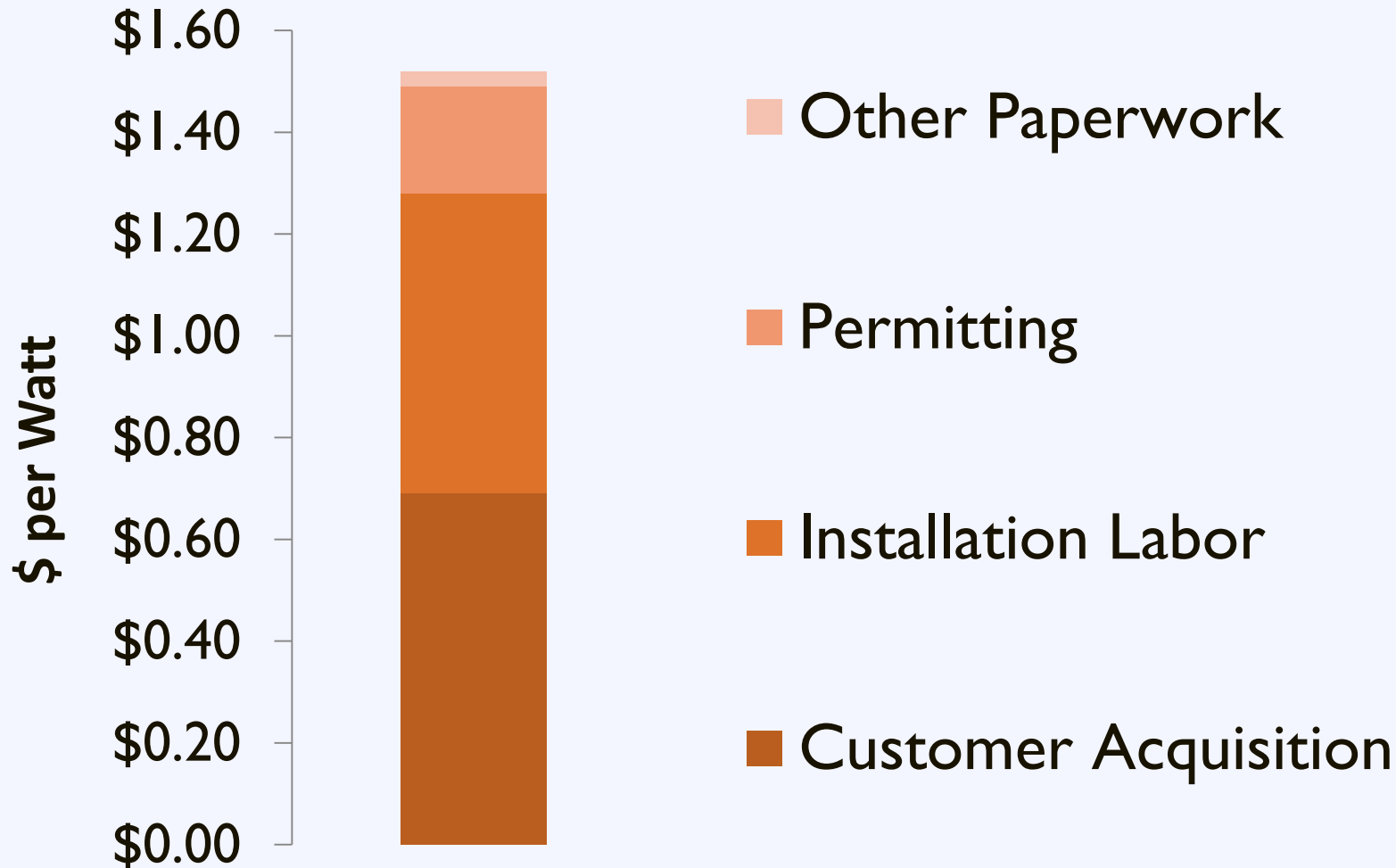
Comparison of US and German Solar Costs



A Policy Driven Market

Federal	Investment Tax Credit	Accelerated Depreciation	Qualified Energy Conservation Bond
State & Utility	Renewable Portfolio Standard	Net Metering	Solar Access
	Solar Access	Tax Credits & Exemptions	Direct Cash & Performance Incentives
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Mitigate Soft Costs



Solar Ordinance

What is a Solar Ordinance?

A regulatory framework that encourages responsible solar development while preserving the public health, safety, welfare, and character of a community.

Challenge: Inconsistency

18,000+ local jurisdictions
with unique zoning and permitting requirements

Consumer Challenges



The Opportunity

Compare this to **Germany** which has

One Unified Process

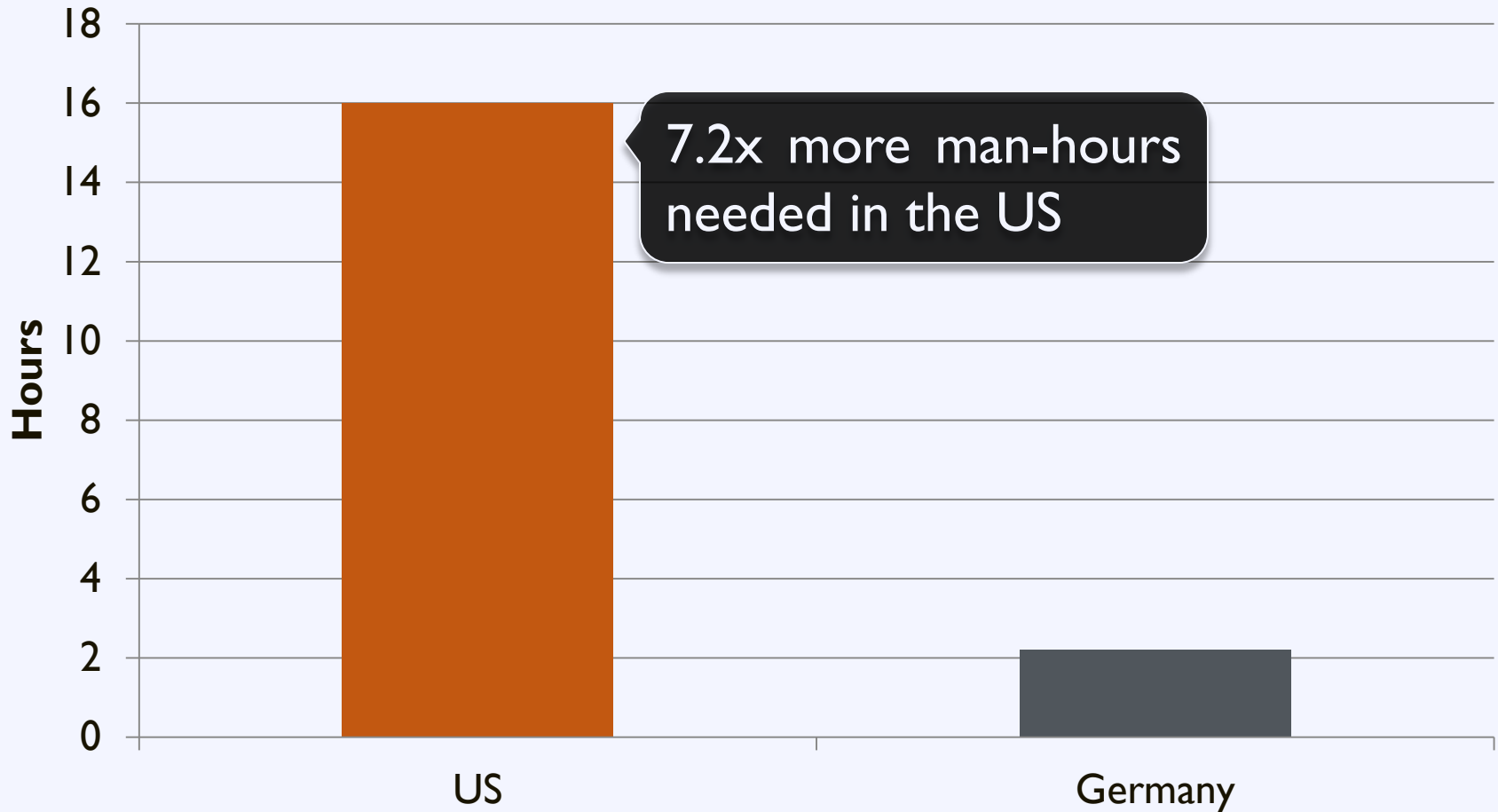
where applicants complete

A single two page form

to receive all necessary permits

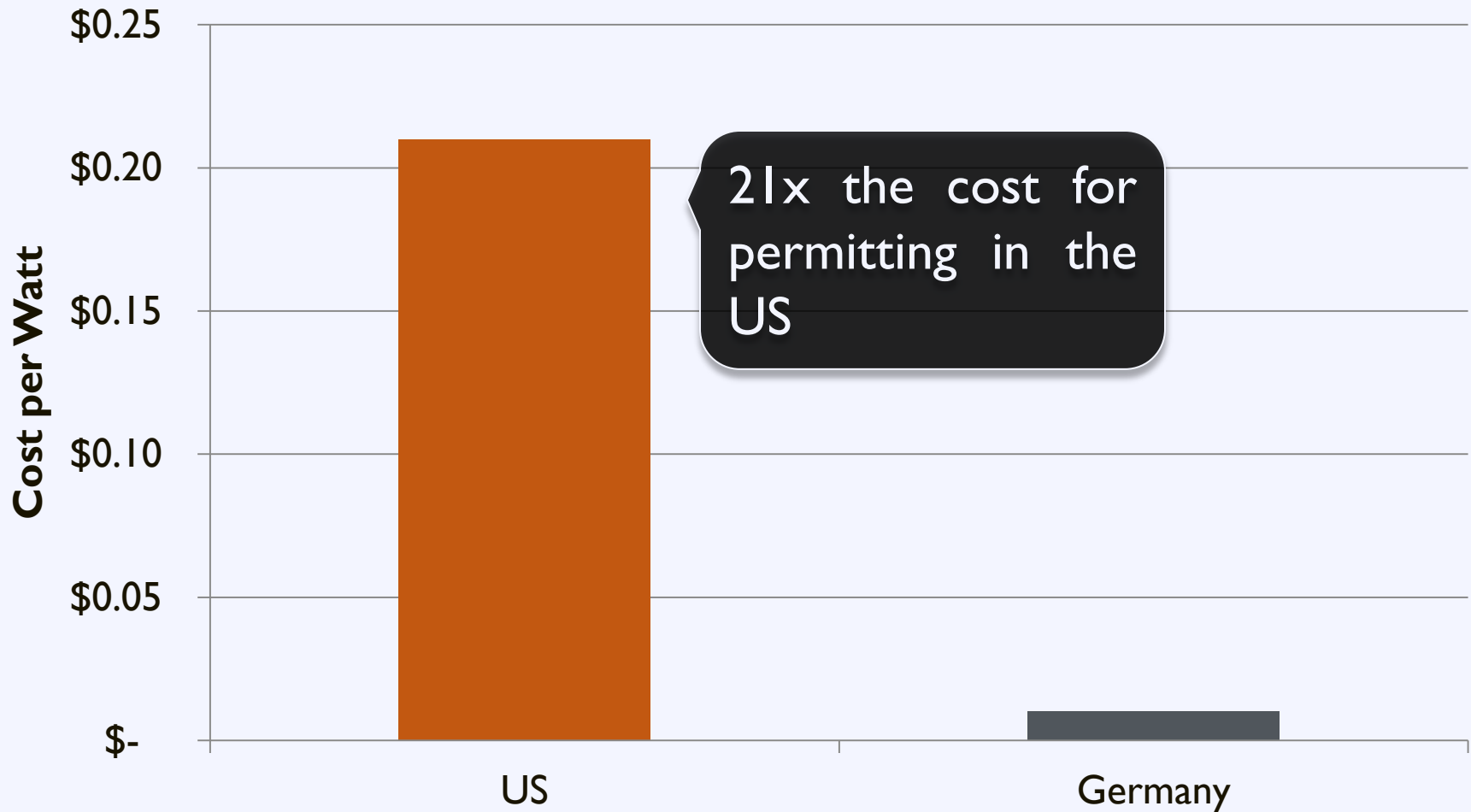
Time to Installation

Average Time to Permit a Solar Installation



Permitting Costs

Average Cost of Permitting in the US and Germany



Benefit of a Solar Ordinance

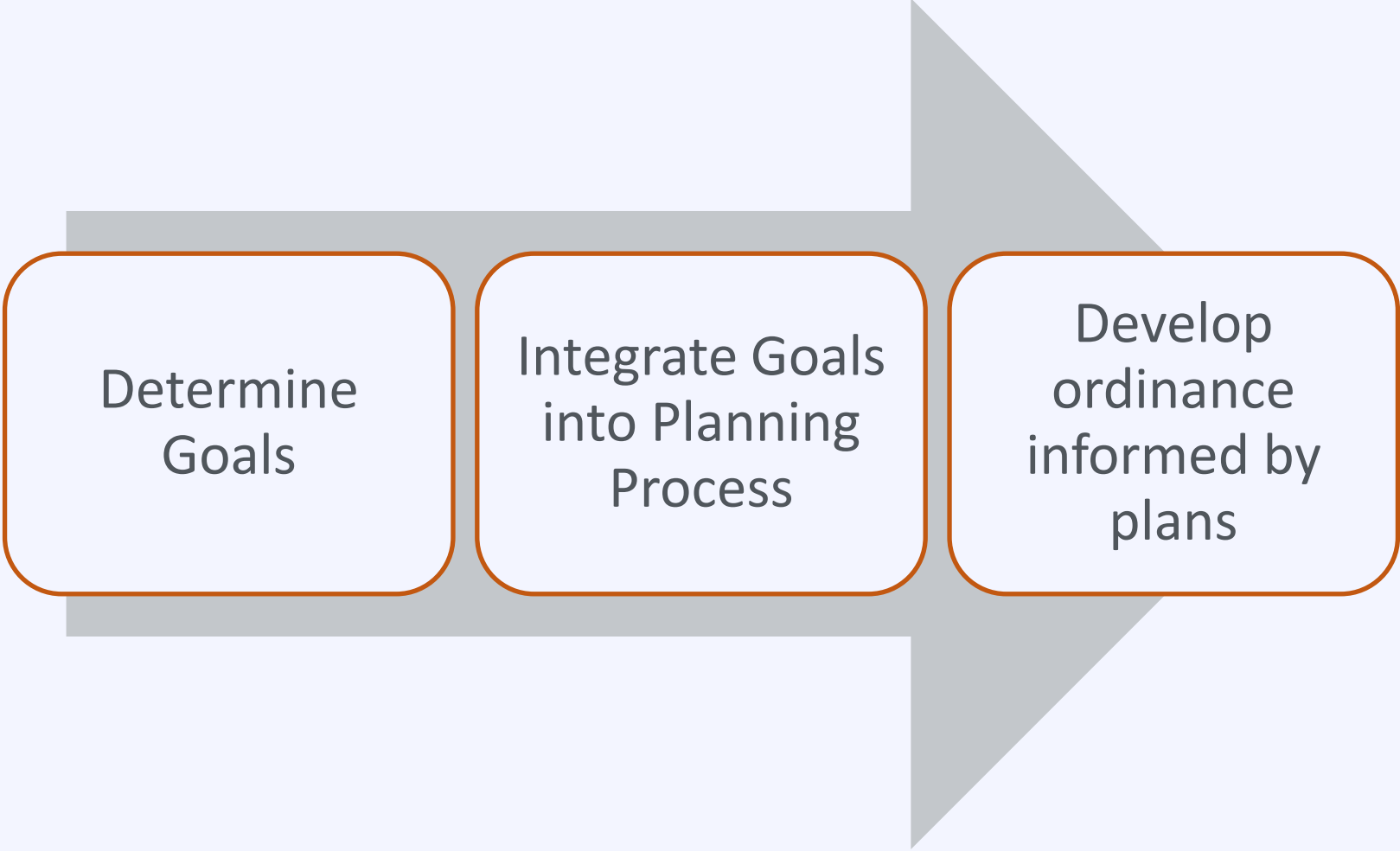
A solar ordinance helps to ensure

responsible solar development

through a

consistent and transparent process

Solar Ordinance: Process



Determine
Goals

Integrate Goals
into Planning
Process

Develop
ordinance
informed by
plans

Solar Ordinance: Components

Zoning
Standards

Solar Access

Permit
Administration

Agenda

- 08:40 – 09:00 Solar 101 for Communities
- 09:00 – 09:20 An introduction to zoning and permitting for solar PV projects
- 09:20 – 09:35 Creating a Solar Ready Community**
- 09:35 – 09:45 *Break*
- 09:45 – 10:00 Benefits and Barriers Activity
- 10:00 – 10:30 MN Best Practices for Solar Friendly Communities
Presented by Brian Ross, CR Planning
- 10:30 – 12:10 Local Speaker Session & Audience Discussion
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Solar Ordinance: Components

Zoning
Standards

Solar Access

Permit
Administration

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

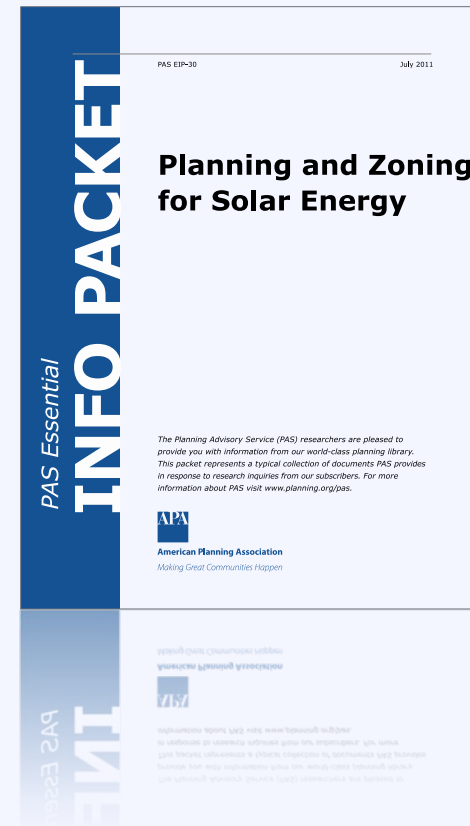


Zoning Code: Model Ordinances

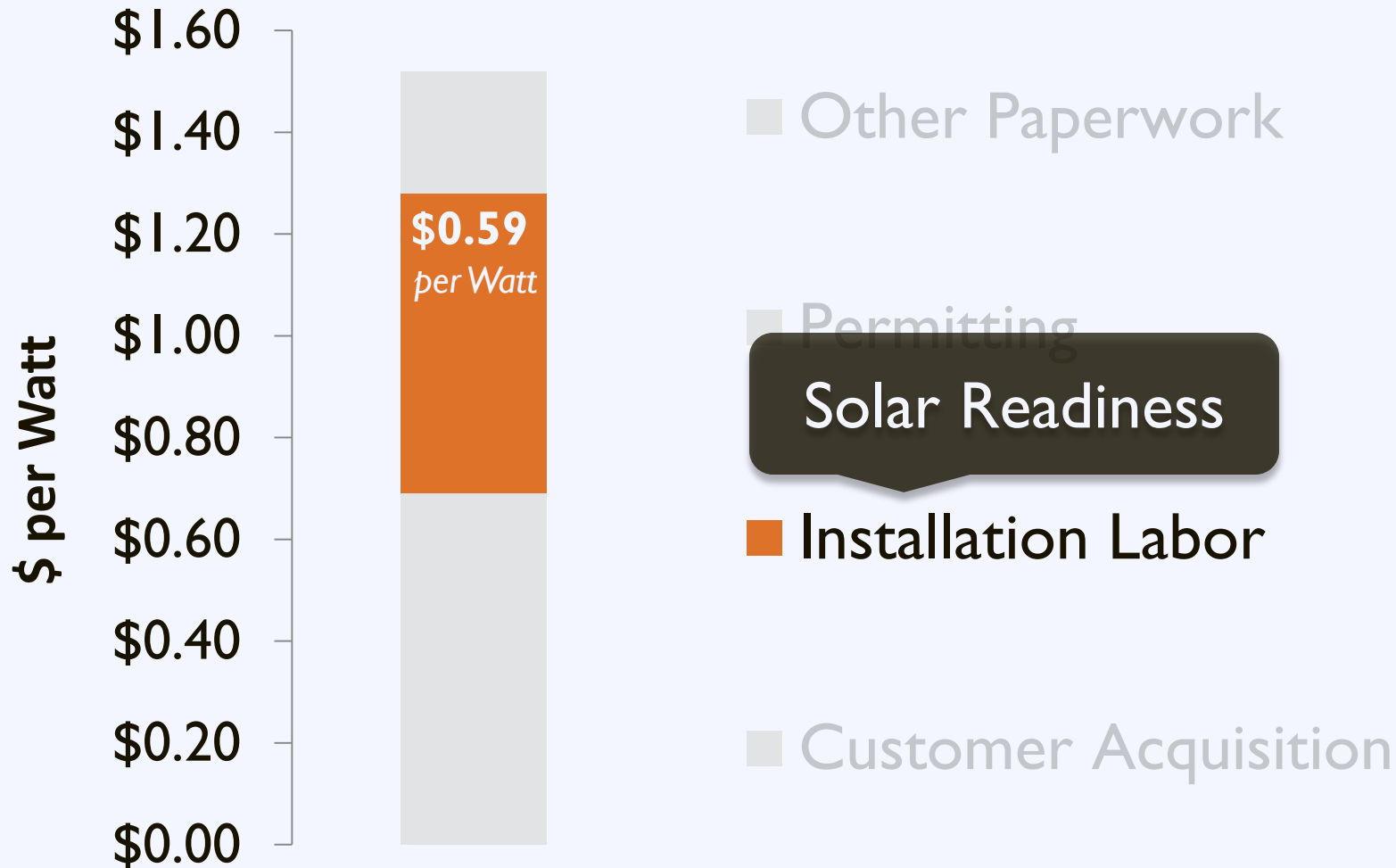
Resource Planning and Zoning for Solar Energy

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

planning.org/research/solar



Mitigate Soft Costs



Solar Readiness

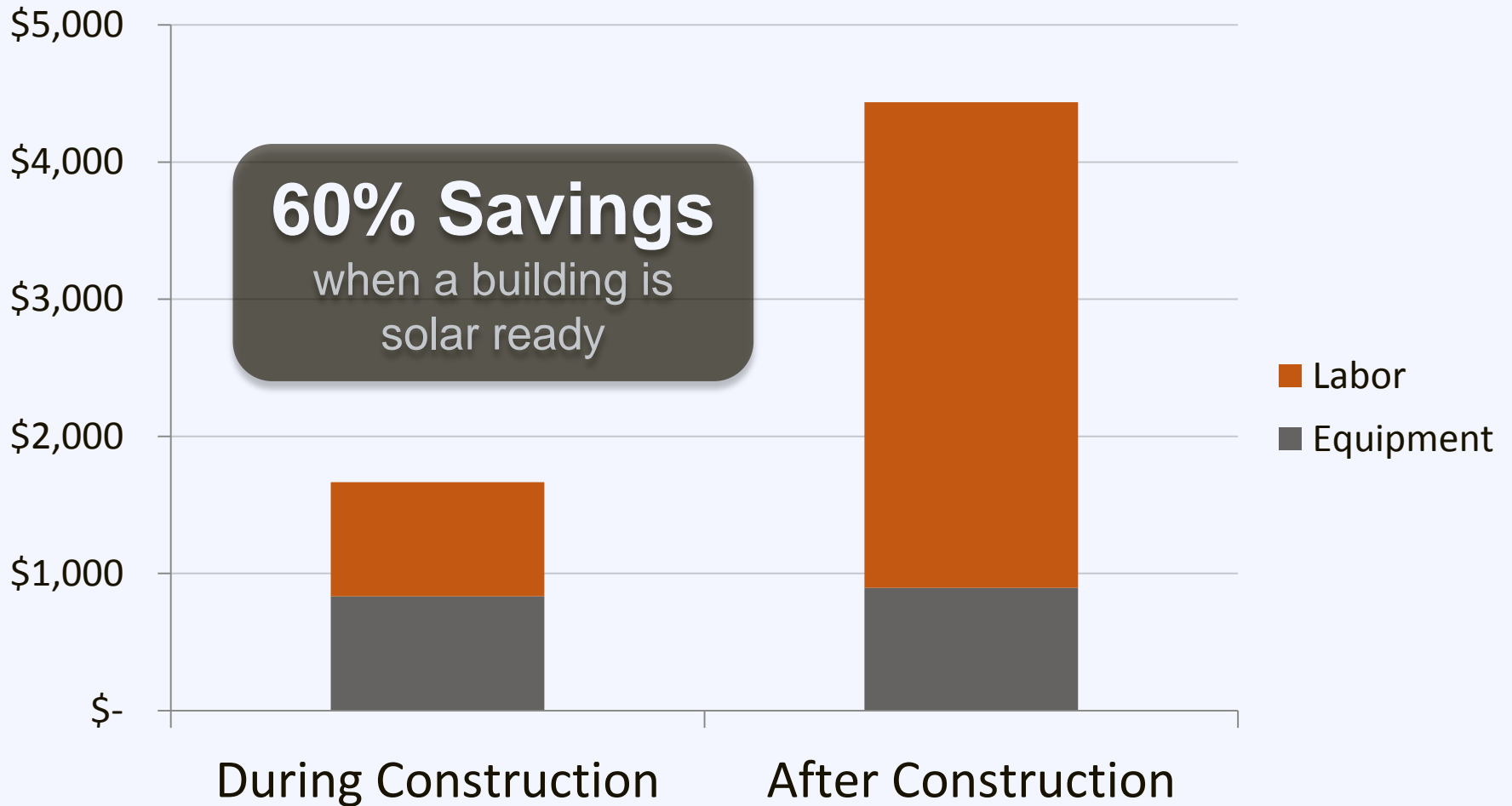
Creating solar-ready guidelines and promoting energy efficiency at the outset can help make future solar installations easier and more cost effective.

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



Solar Readiness

Resource NREL

Creating a solar ready guide for buildings:

- Legislation
- Certification programs
- Stakeholder Education

www.nrel.gov



Solar Ordinance: Components

Zoning
Standards

Solar Access

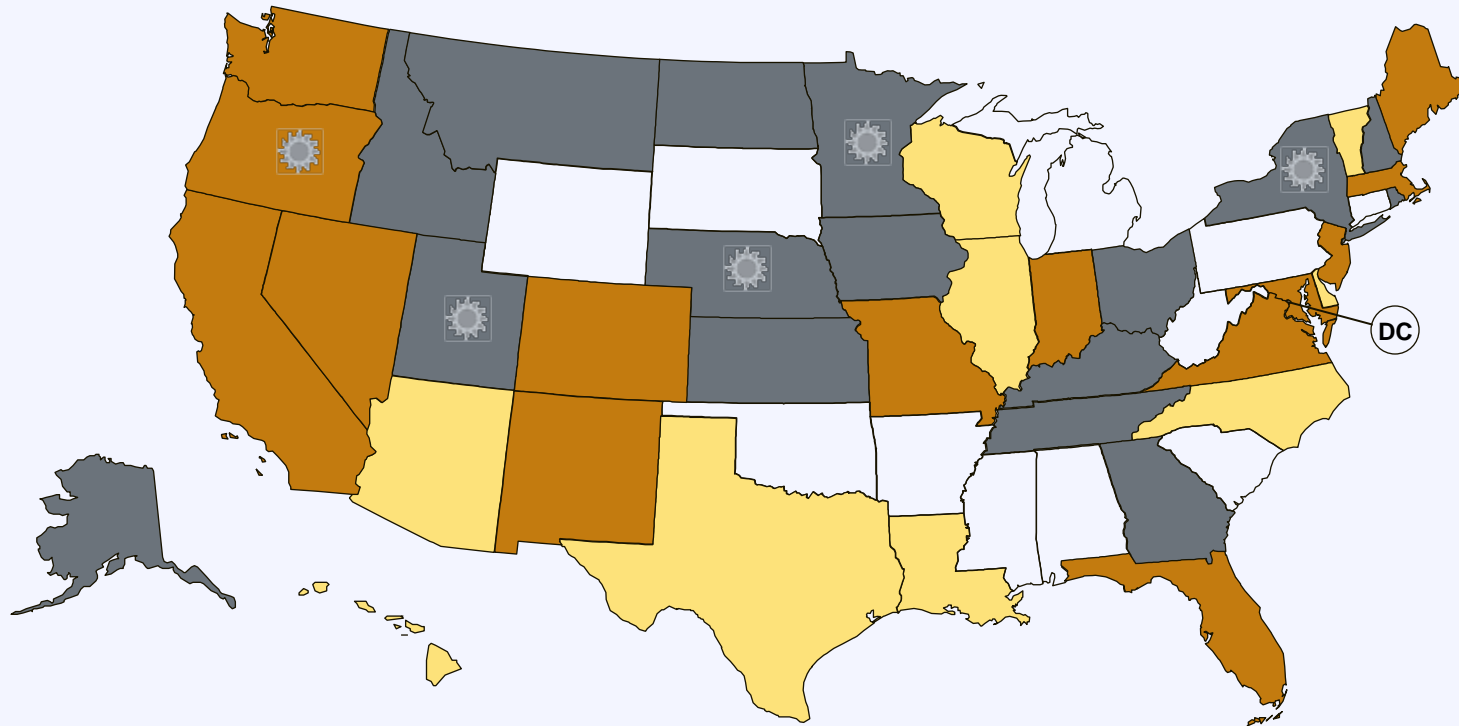
Permit
Administration

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
-  Local option to create solar rights provision
-  U.S. Virgin Islands

Solar Access: Minnesota

Solar Easement Provision (Minn Stat 500.30):

Minnesota Law provides for the voluntary creation of solar easements.

Solar Rights Provision (Minn Stat 462.357):

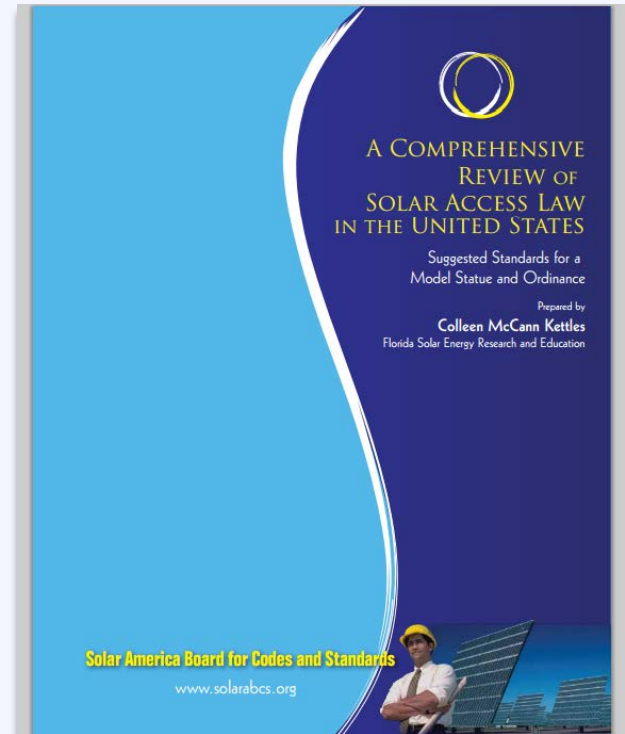
Minnesota Law allows local zoning boards to restrict development for the purposes of protecting access to sunlight.

Solar Access

Resource Solar ABCs

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

www.solarabcs.org



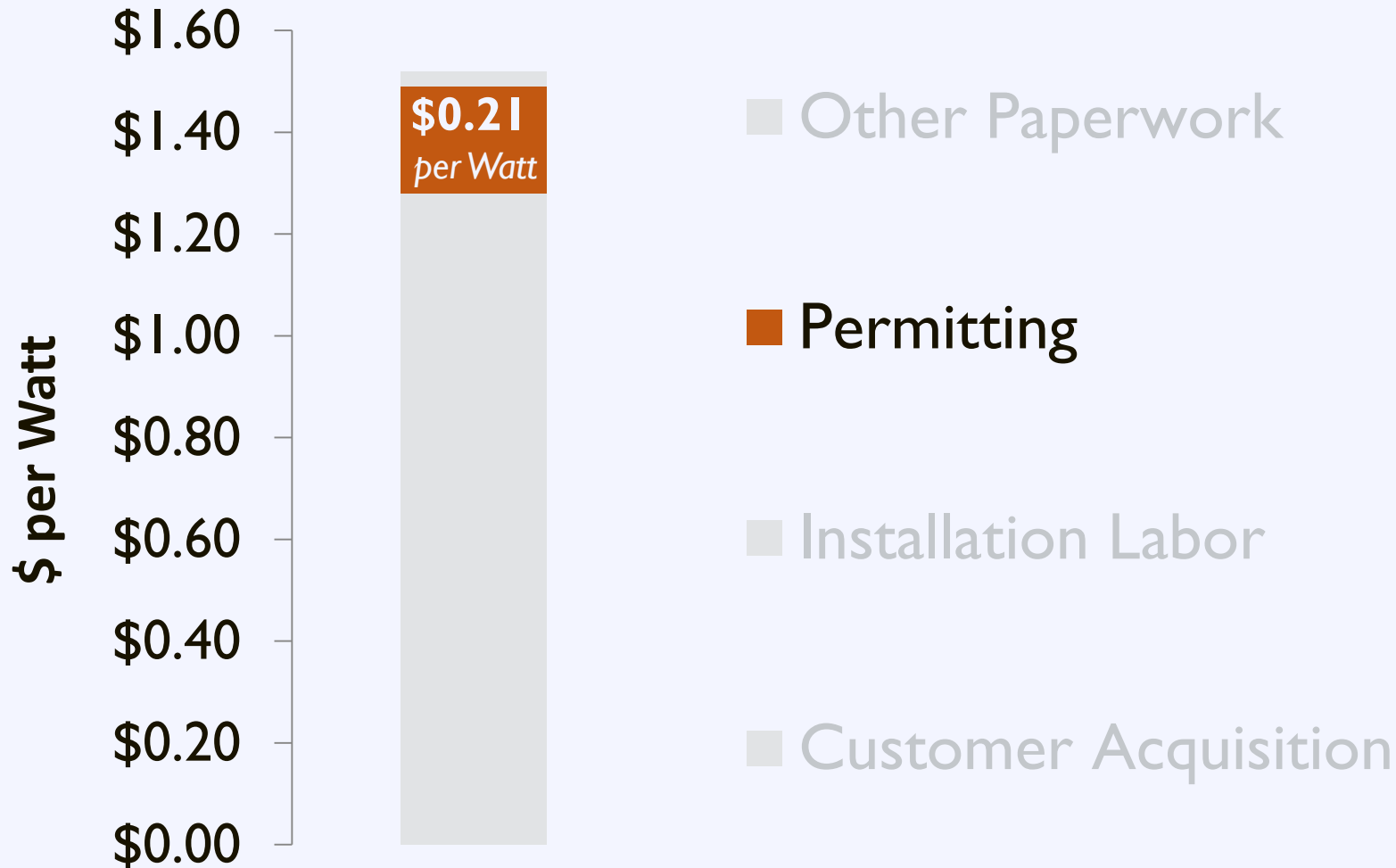
Solar Ordinance: Components

Zoning
Standards

Solar Access

Permit
Administration

Mitigate Soft Costs



Expedited Permitting: Opportunity

Communities in CA with favorable permitting practices saw

4 - 12% lower costs

and

25% shorter development time

as compared to standard communities

Expedited Permitting

Solar Permitting Best Practices:

- ✓ Fair flat fees
- ✓ Electronic or over-the-counter issuance
- ✓ Standardized permit requirements
- ✓ Electronic materials

Expedited Permitting

Solar Permitting Best Practices:

- ✓ Training for permitting staff in solar
- ✓ Removal of excessive reviews
- ✓ Reduction of inspection appointment windows
- ✓ Utilization of standard certifications

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

Solar America Board for Codes and Standards
Collaborate • Contribute • Transform

ABOUT US | CODES & STANDARDS | CURRENT ISSUES

Codes & Standards

The Solar America Board for Codes and Standards (Solar ABCs) collaborates and enhances the practice of developing, implementing, and disseminating solar codes and standards. The Solar ABCs provides formal coordination in the planning and revision of separate, though interrelated, solar codes and standards. We also provide access for stakeholders to participate with members of standards making bodies through working groups and research activities to set national priorities on technical issues. The Solar ABCs is a centralized repository for collection and dissemination of documents, regulations, and technical materials related to solar codes and standards.

The Solar ABCs creates a centralized home to facilitate photovoltaic (PV) market transformation by:

- Creating a forum that fosters generating consensus 'best practices' materials.
- Disseminating such materials to utilities, state and other regulating agencies.
- Answering code-related questions (technical or statutory in nature).
- Providing feedback on important related issues to DOE and government agencies.

Learn more about solar codes and standards development:

The below organizations all publish codes and standards for PV products and each organization has its own process to develop and publish standards.

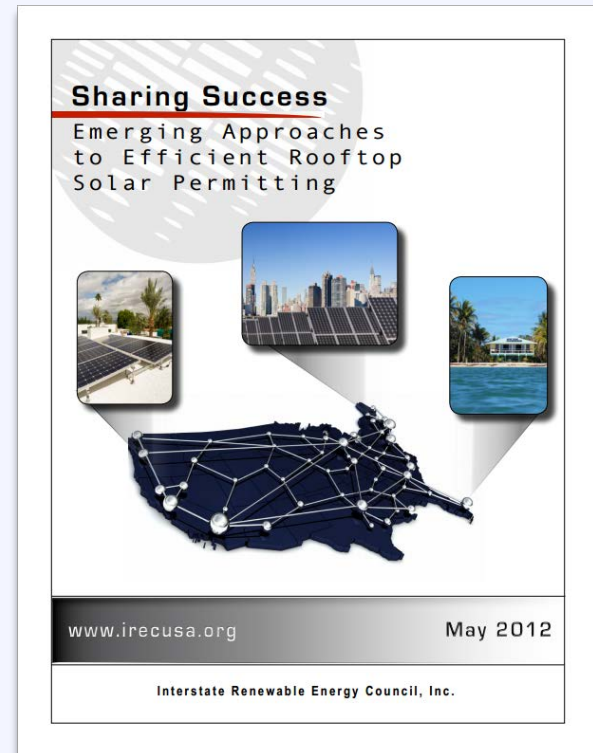
- [ASTM](#)
- [IAPMO Standards](#)
- [International Code Council](#)
- [International Electrotechnical Commission](#)
- [IEEE](#)
- [National Fire Protection Association](#)
- [SEMI](#)
- [Underwriters Laboratories](#)

Expedited Permitting

Resource Interstate Renewable Energy Council

Outlines emerging approaches to efficient rooftop solar permitting

www.irecusa.org



Q & A

Agenda

08:40 – 09:00 Solar 101 for Communities

09:00 – 09:20 Understanding the Solar Regulatory Landscape

09:20 – 09:35 Creating a Solar Ready Community

09:35 – 09:45 *Break*

09:45 – 10:00 Benefits and Barriers Activity

10:00 – 10:30 Growing Your Local Solar Market

10:30 – 12:10 Local Speaker Session & Audience Discussion

12:10 – 12:15 Wrap Up

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12:10 – 12:15 Wrap Up

Activity: Identifying Benefits

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

Right Now



Write answer on card

During Session



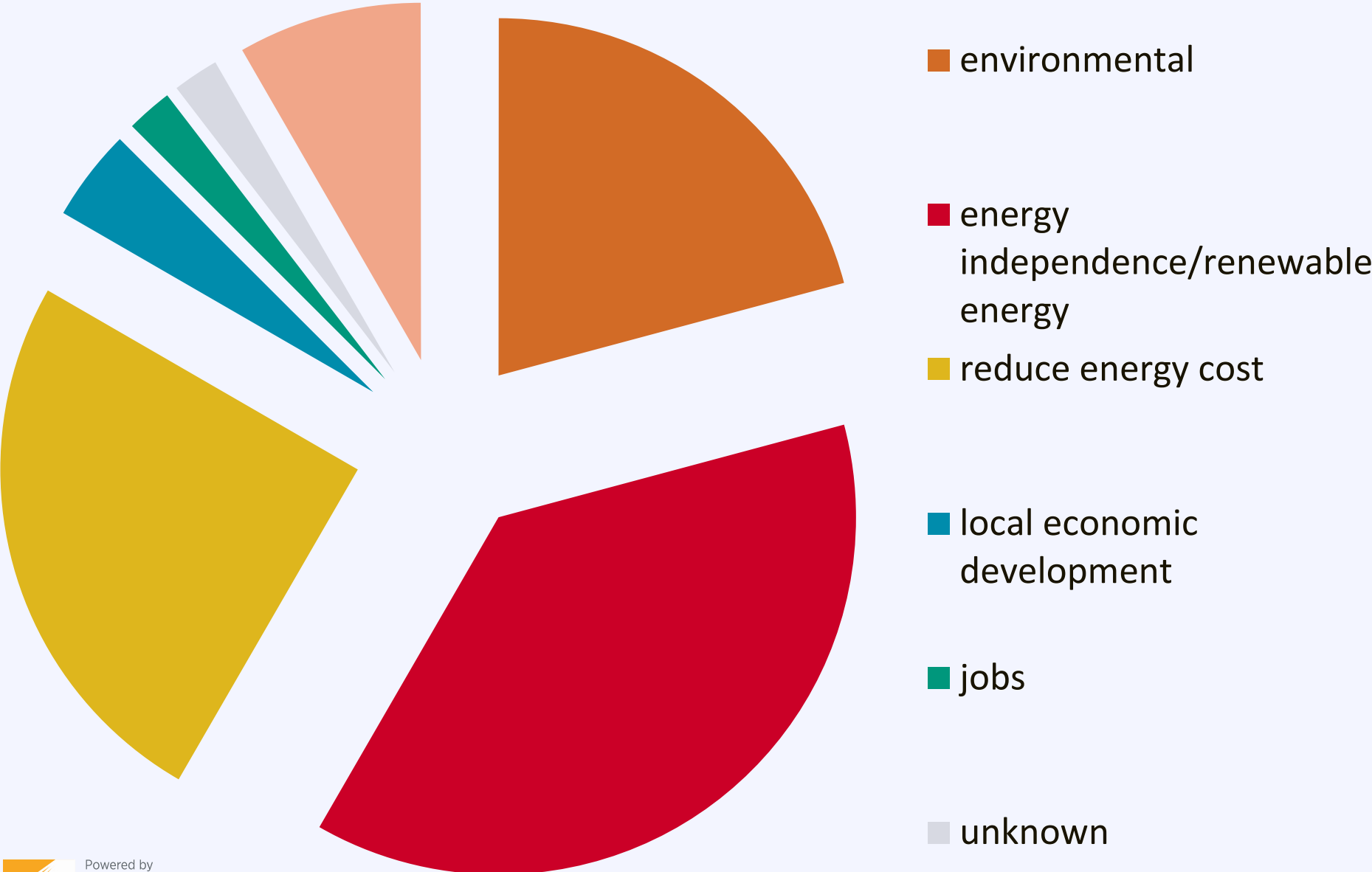
Compile results

After Break



Group discussion

Benefits Poll Results

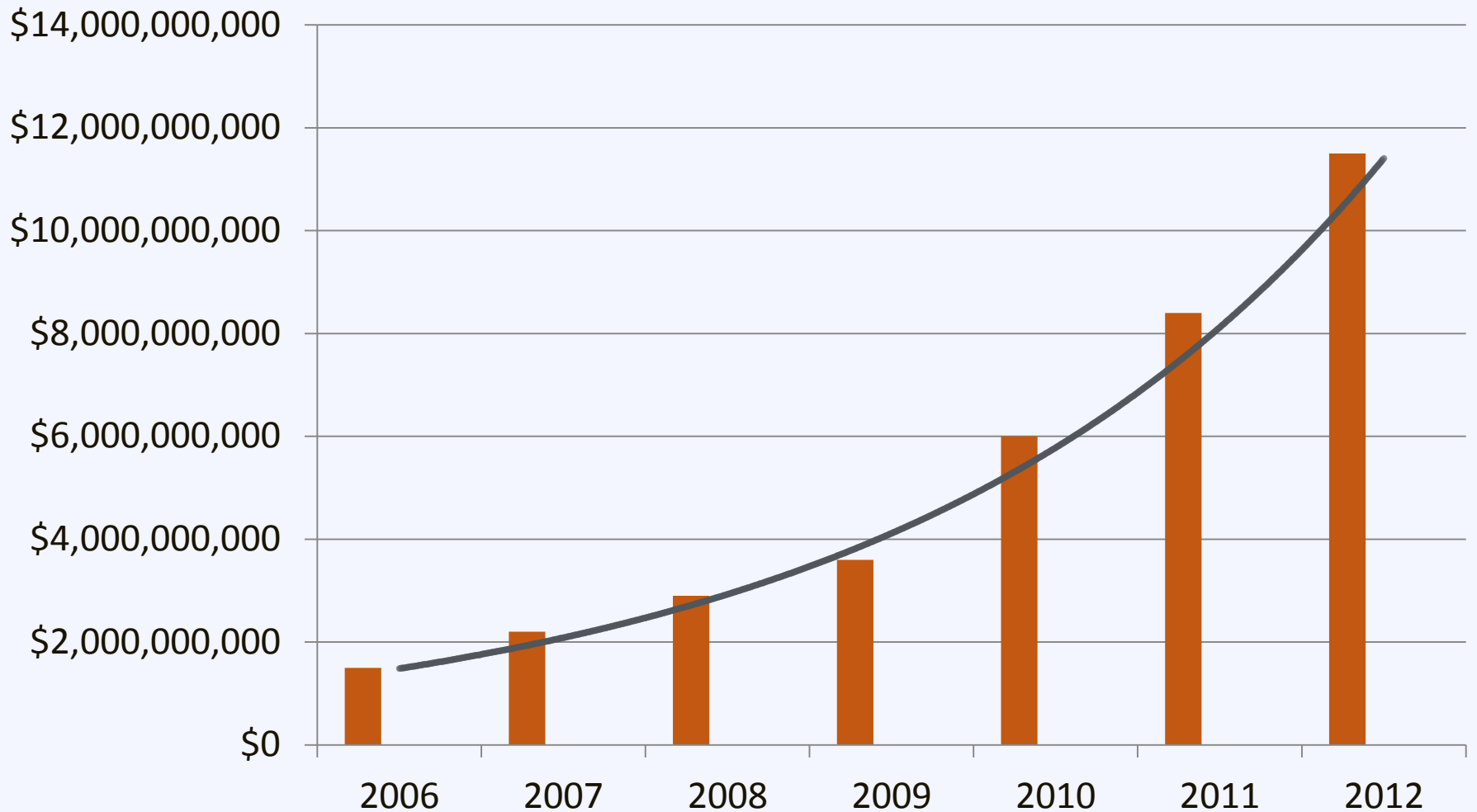


Benefits of Solar Energy

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

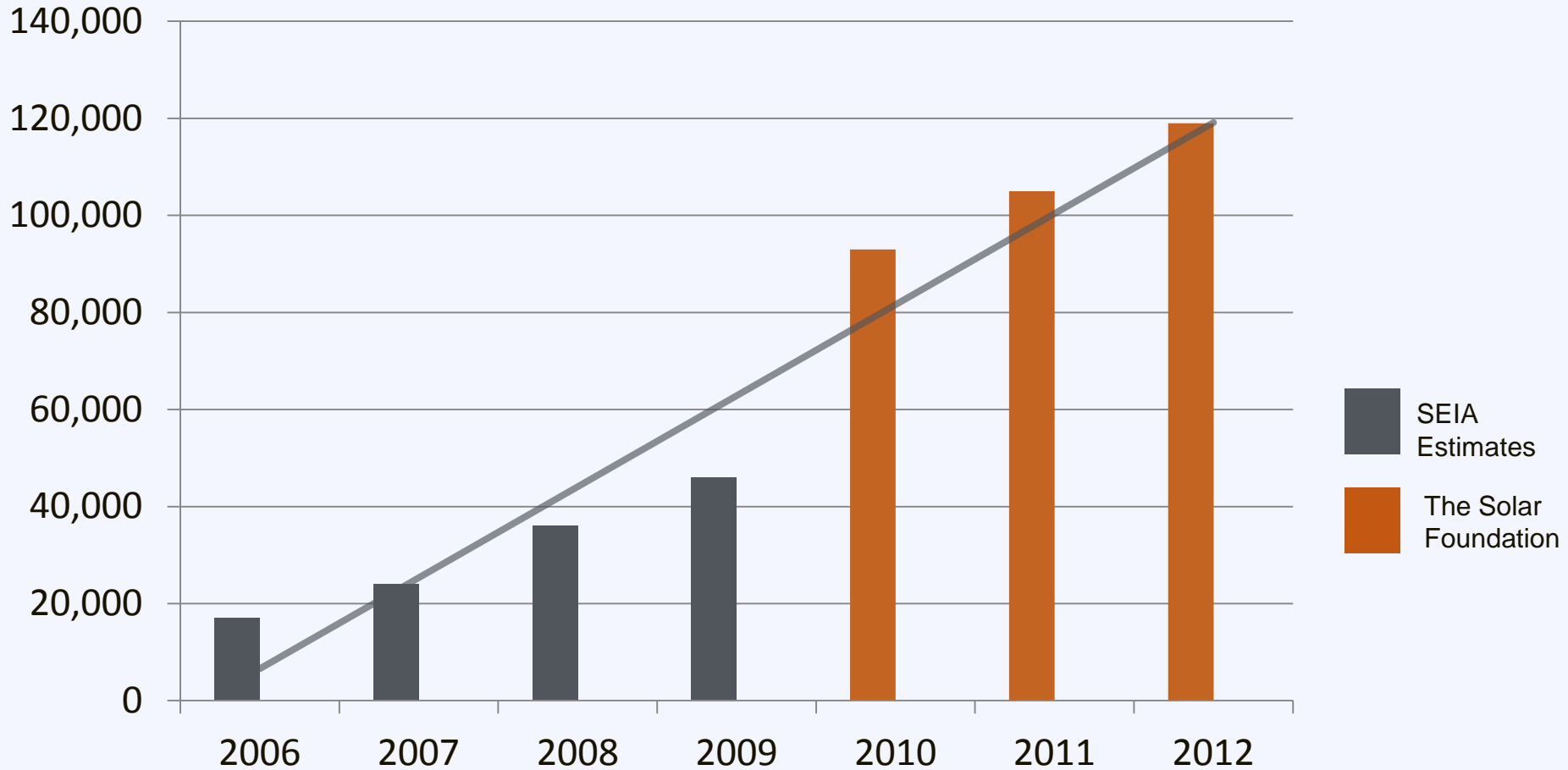


Benefit: Economic Growth



Benefit: Job Growth

Solar Job Growth in the US



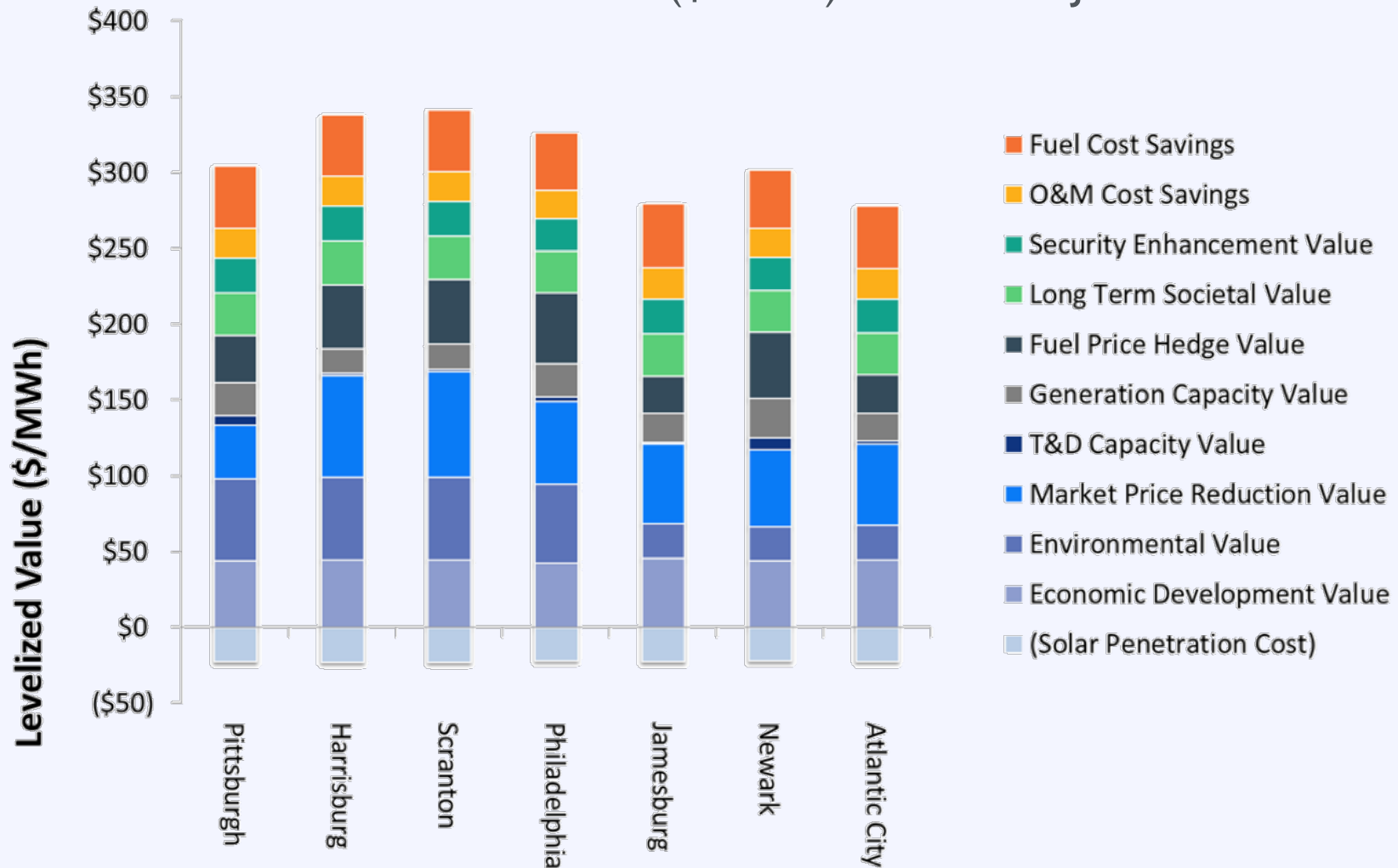
Benefit: Stabilize Energy Prices

Boston Area Average Wholesale Price



Value to Community & Utility

Levelized Value of Solar (\$/MWh) in PA and NJ



Benefit: Smart Investment for Homes

From NREL:

Solar homes sold

20% faster

and for

17% more

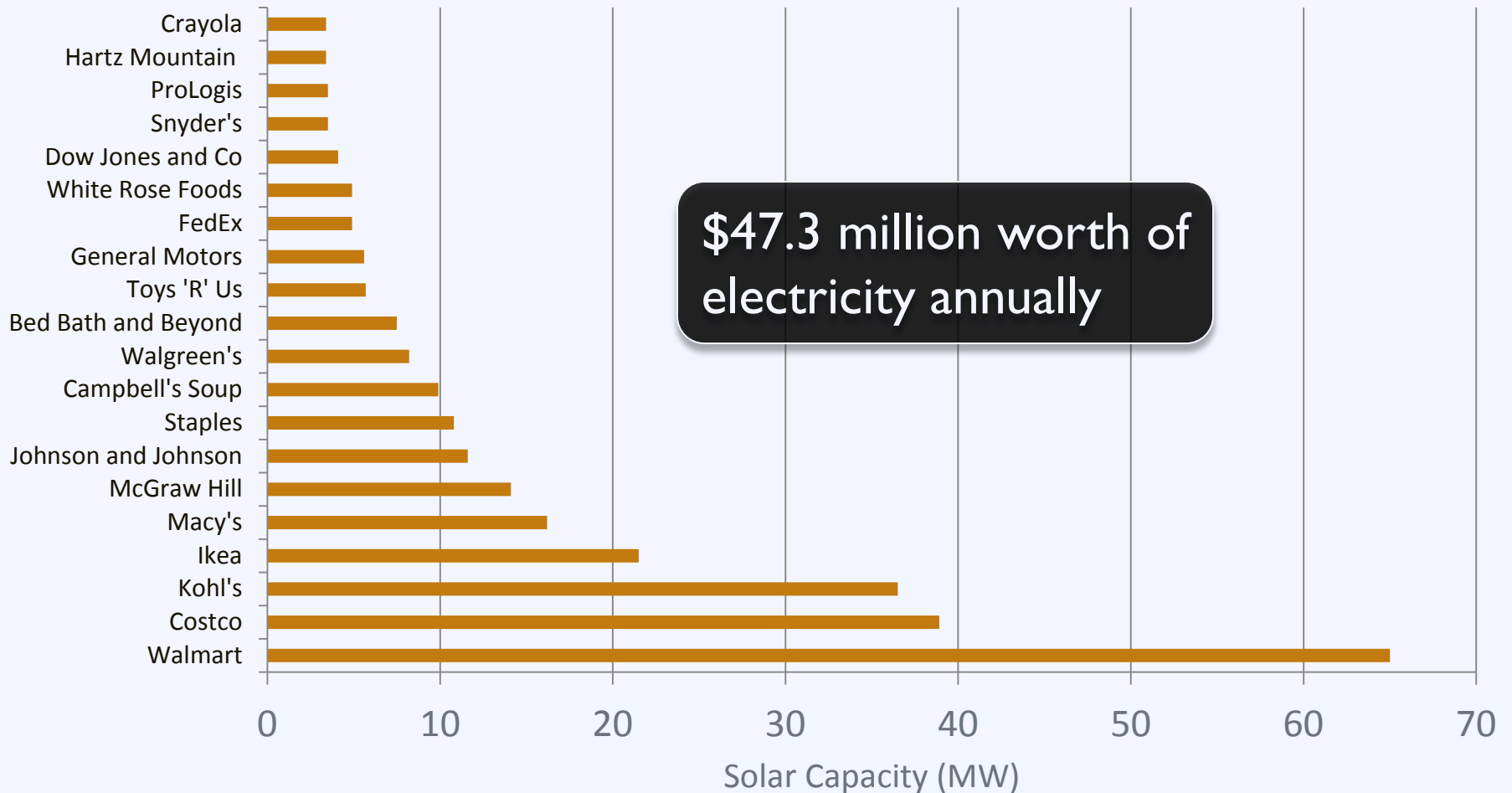
than the equivalent non-solar homes
in surveyed California subdivisions

Benefit: Smart Investment for Business



Benefit: Smart Investment for Business

Top 20 Companies by Solar Capacity



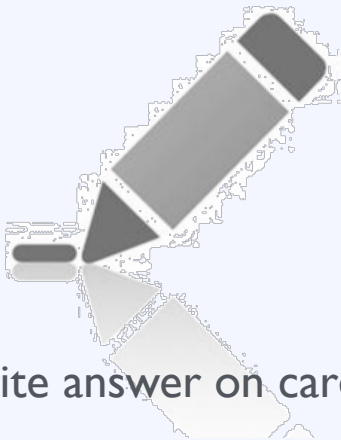
Benefit: Smart Investment for Government



Activity: Addressing Barriers

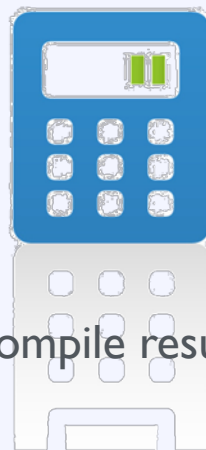
What is the greatest barrier to solar adoption in your community? **[Green Card]**

Right Now



Write answer on card

During Session



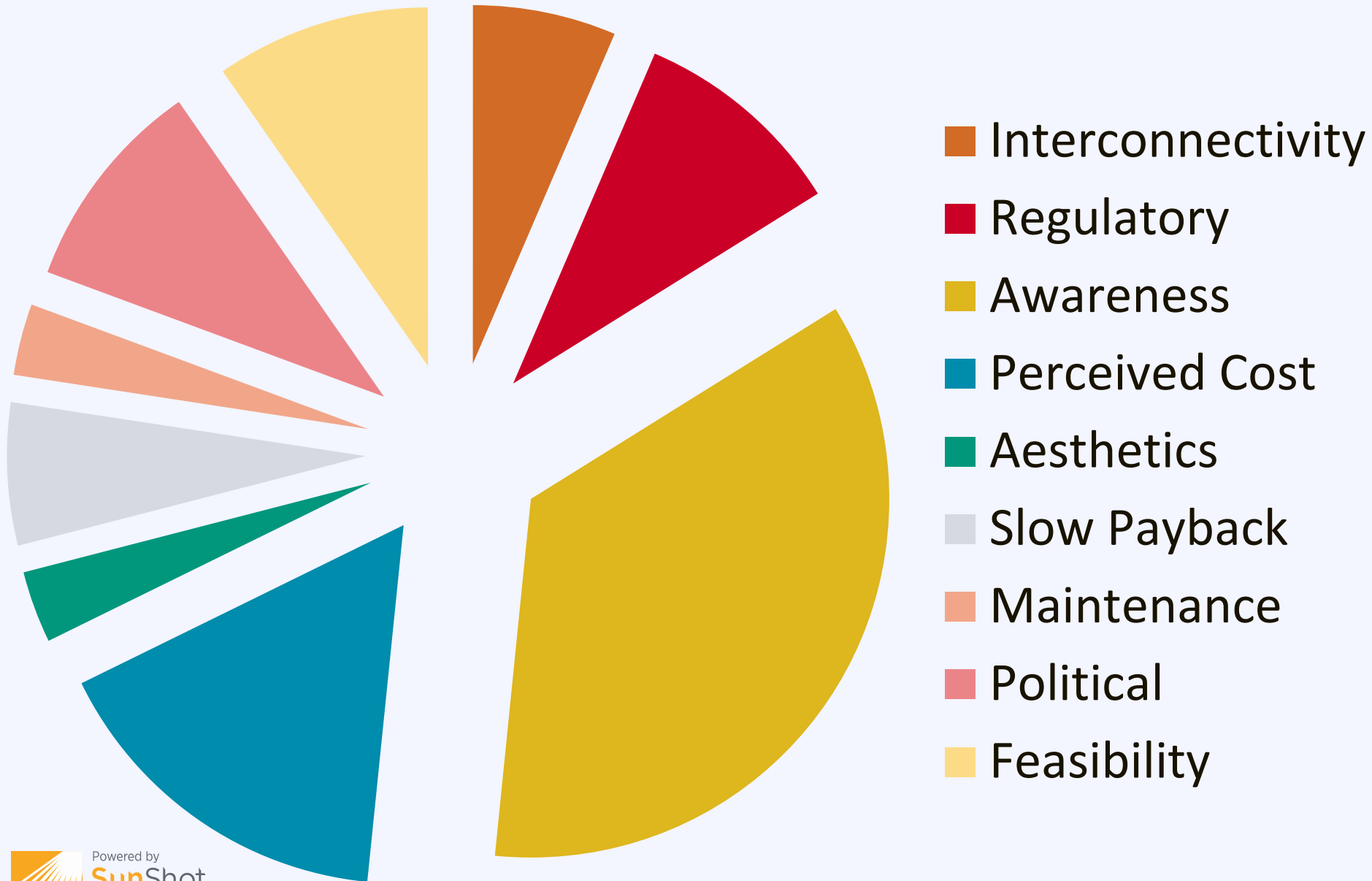
Compile results

After Break

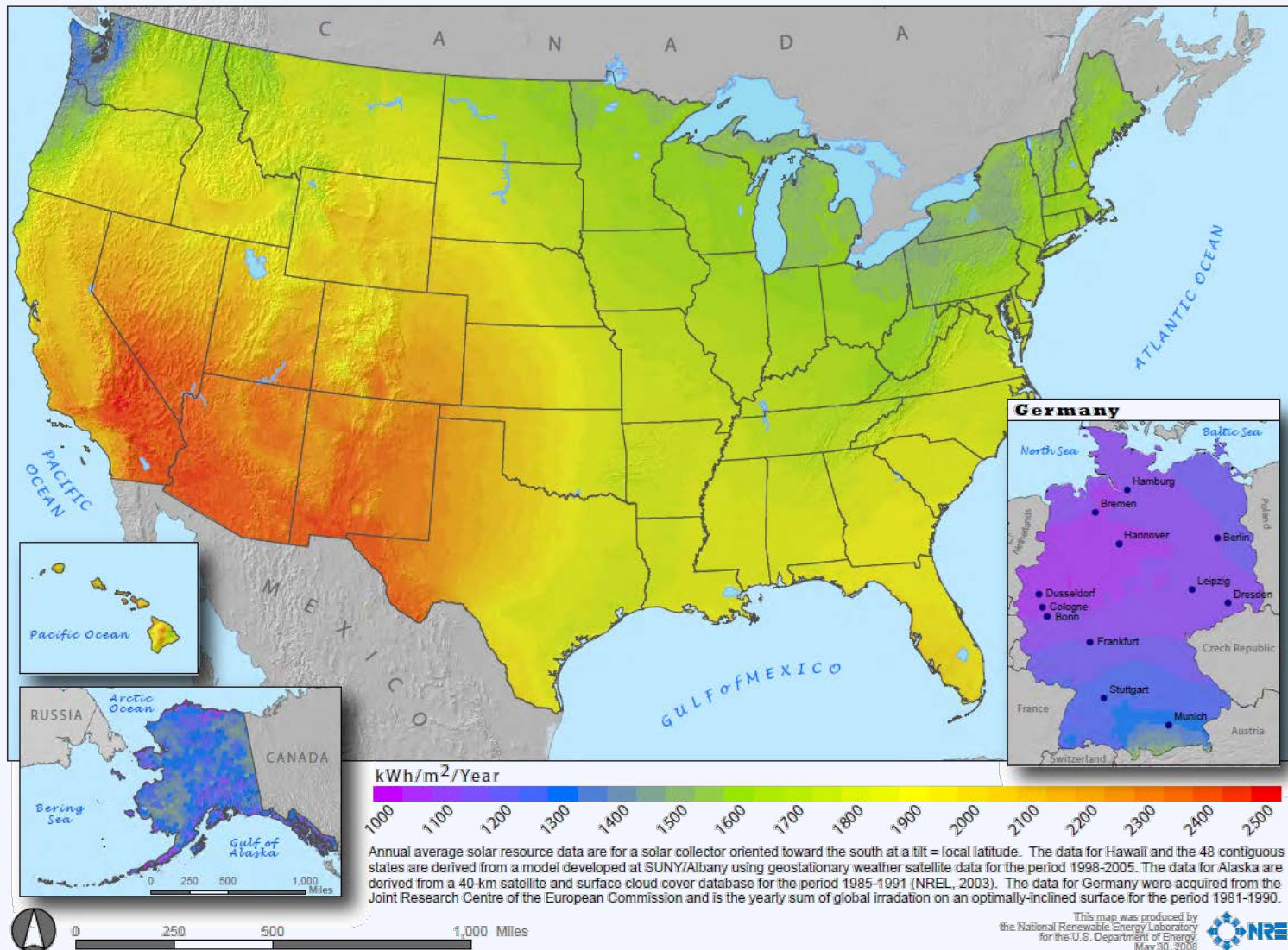


Group discussion

Barriers Poll Results

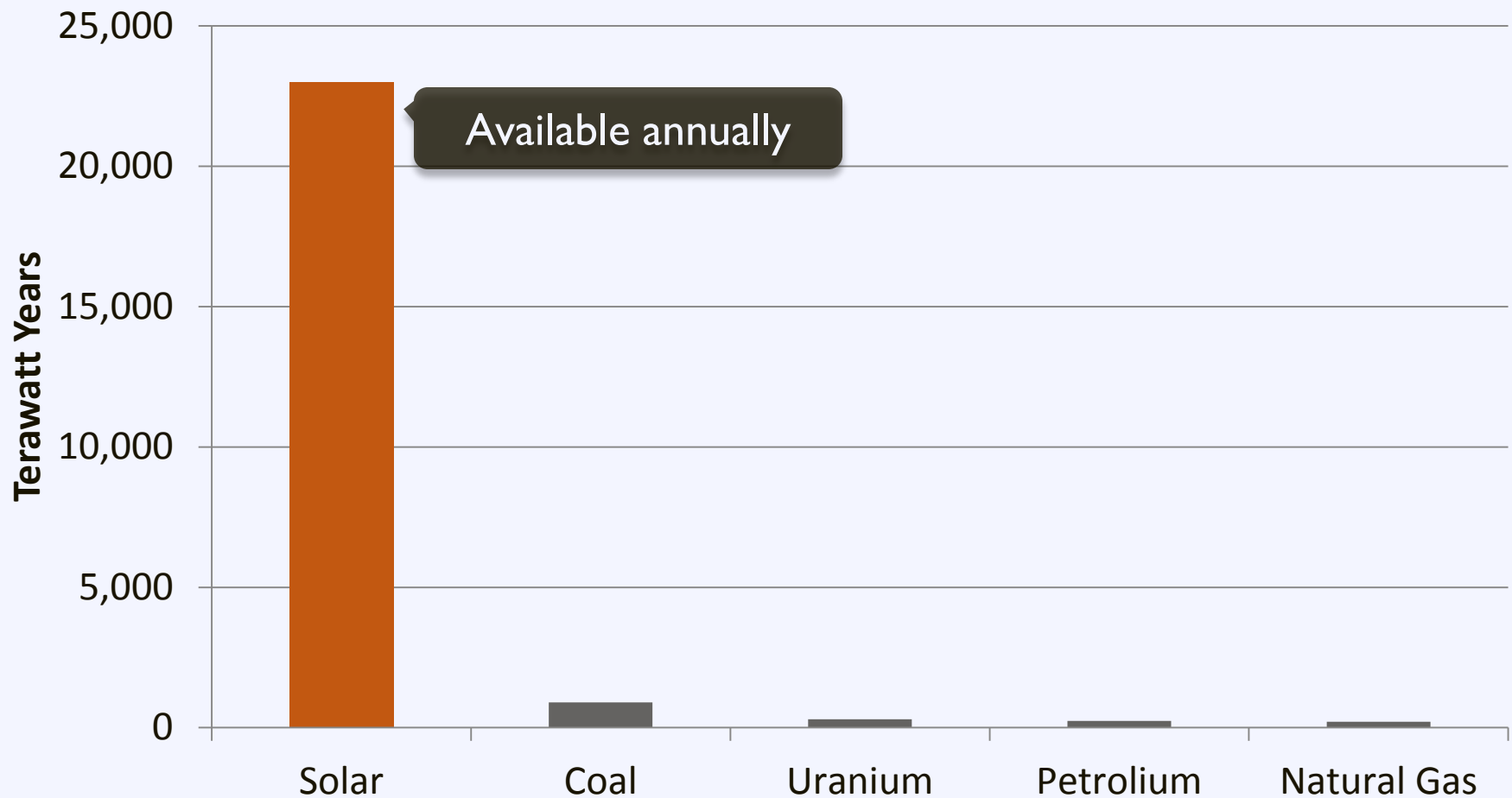


Fact: Solar works across the US



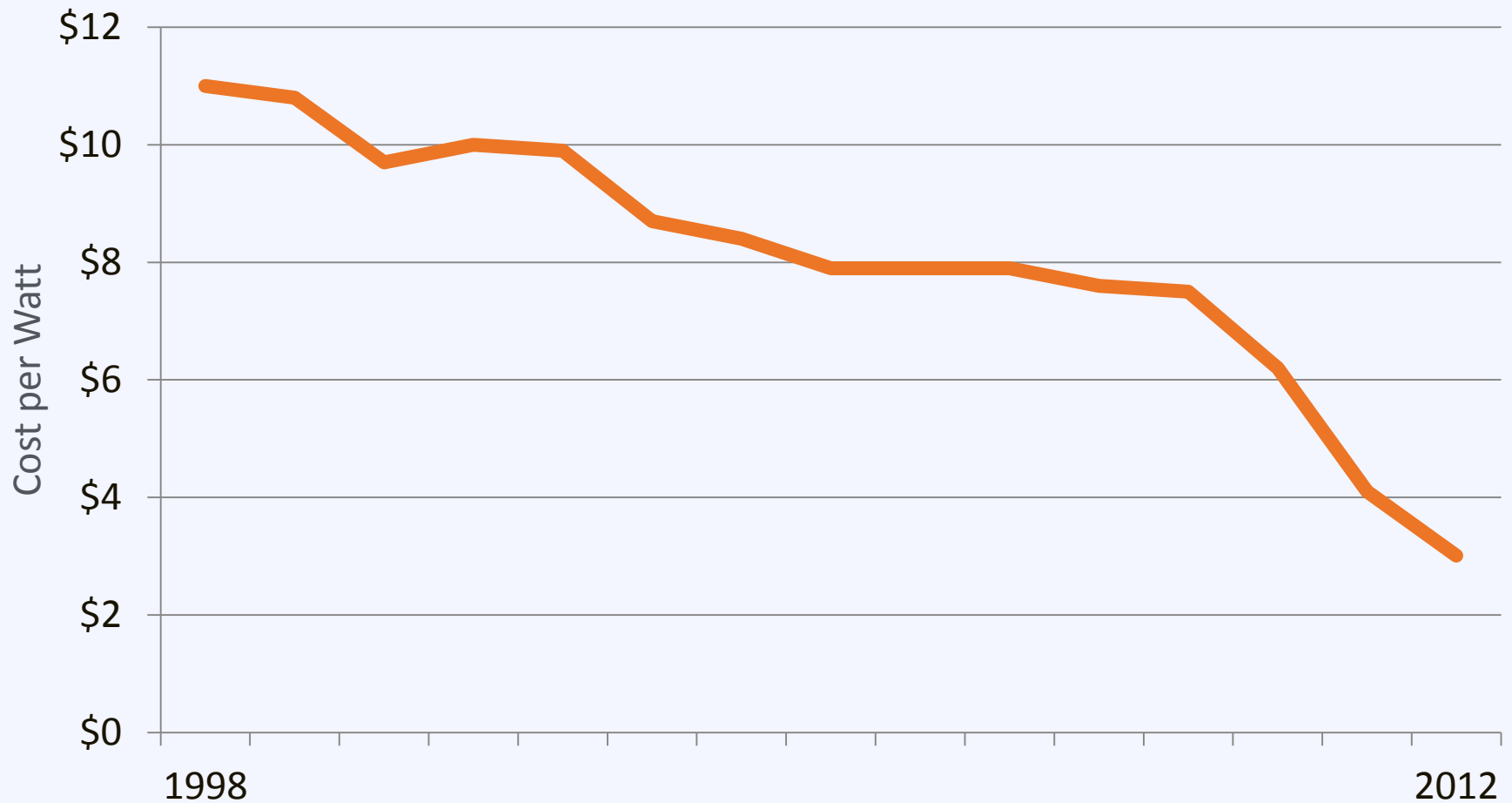
Fact: Solar is a ubiquitous resource

Resource Availability



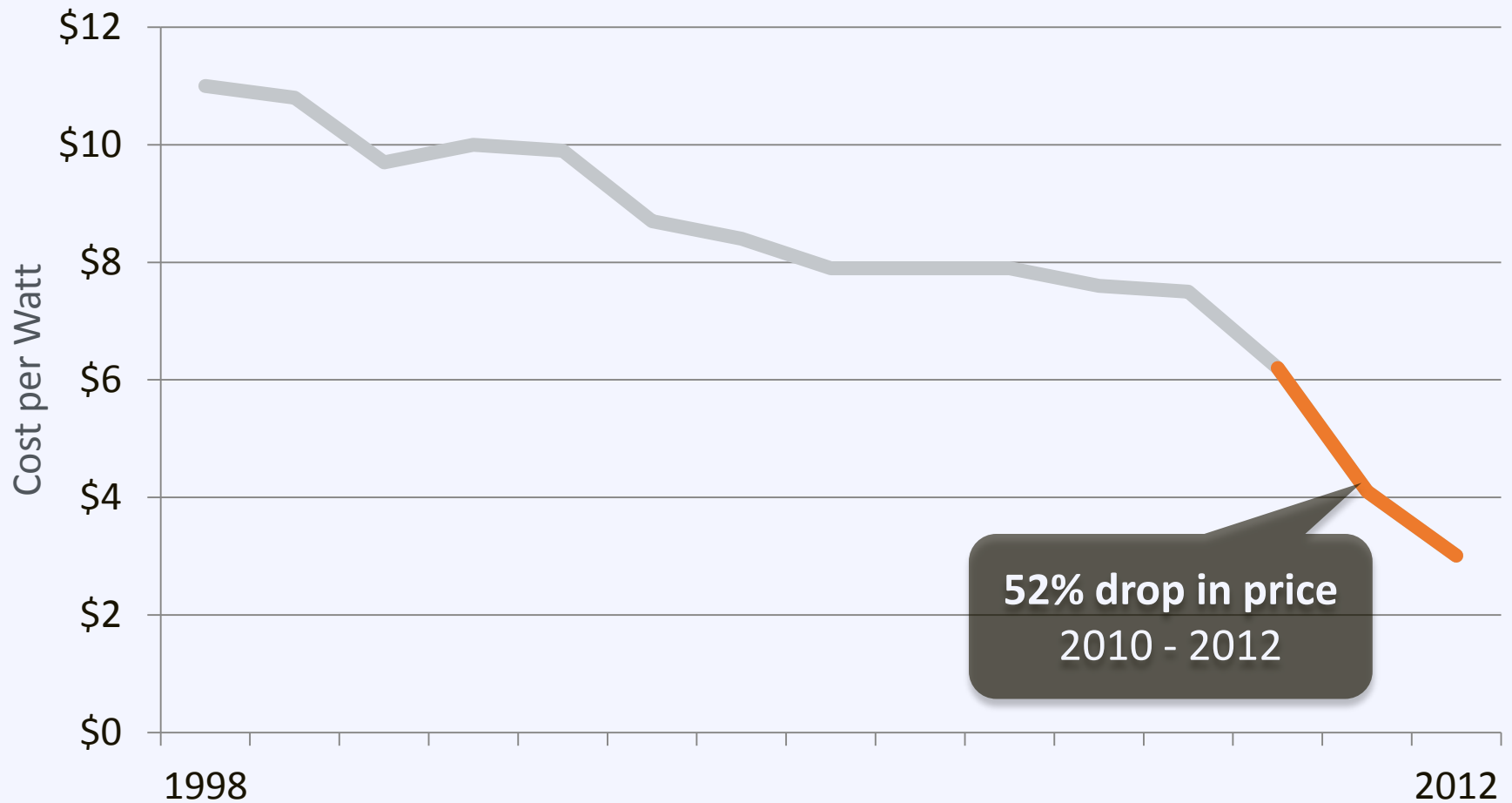
Fact: Solar is cost competitive

US Average Installed Cost for Behind-the-Meter PV



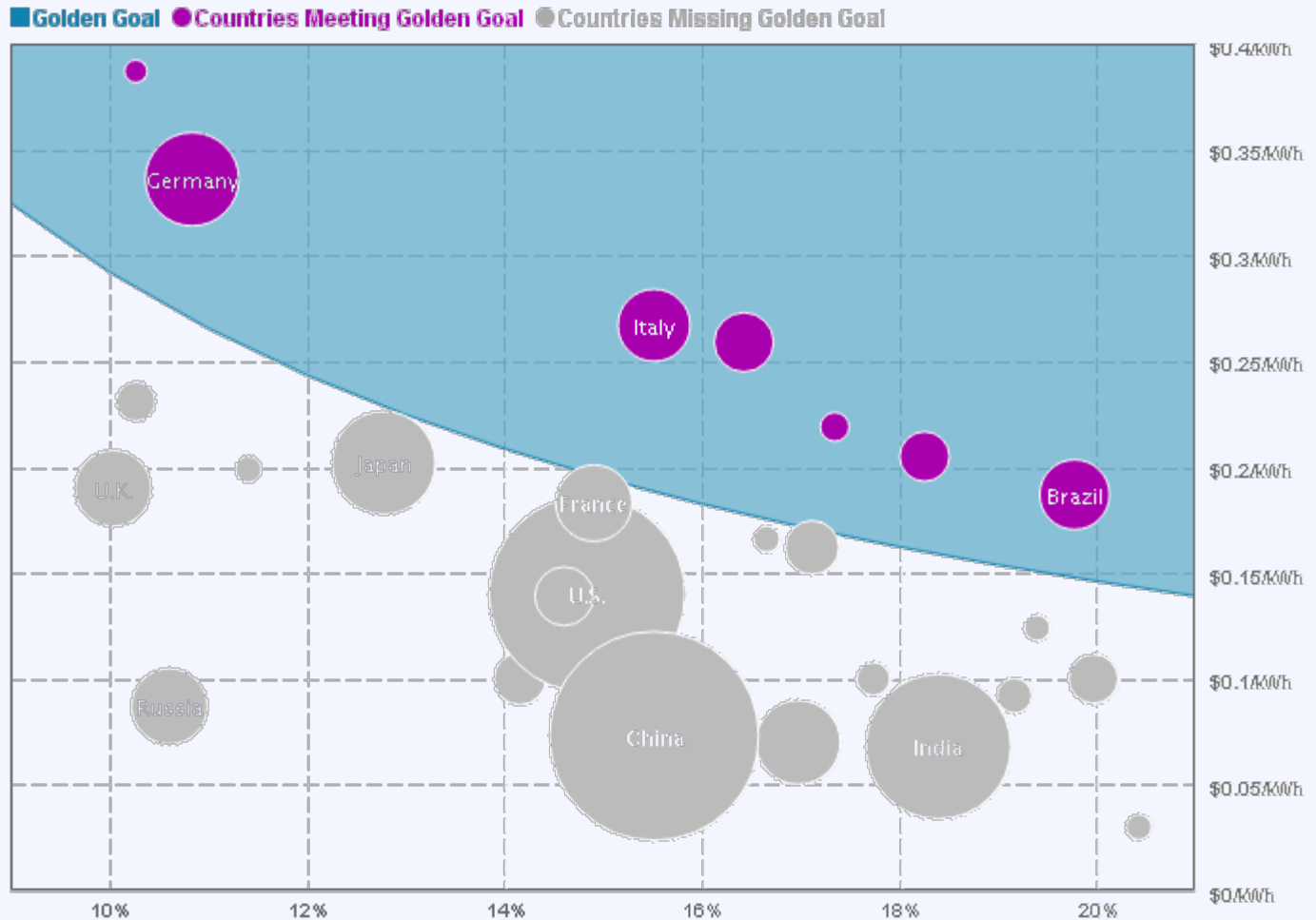
Fact: Solar is cost competitive

US Average Installed Cost for Behind-the-Meter PV



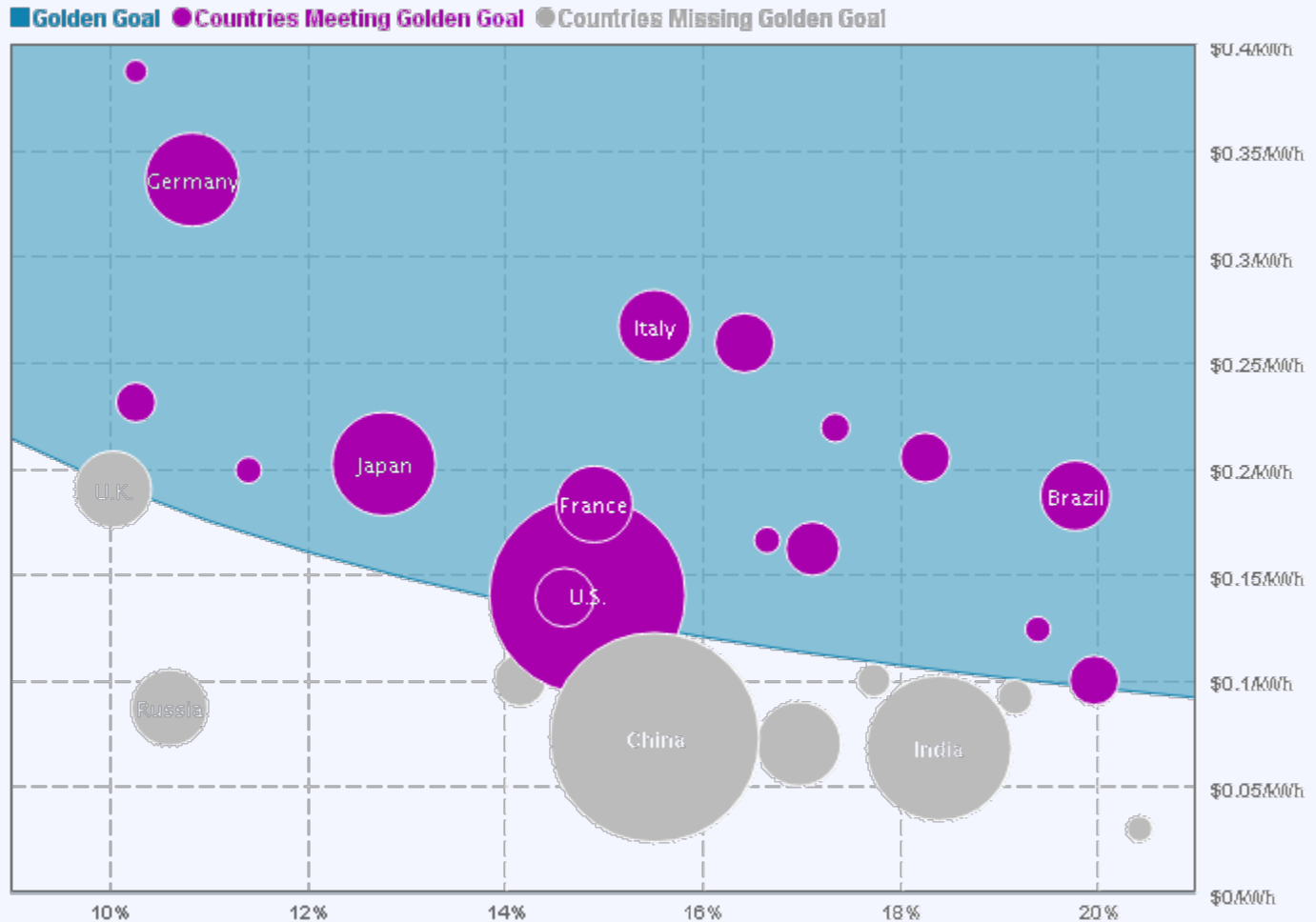
Fact: Solar is cost competitive

2012



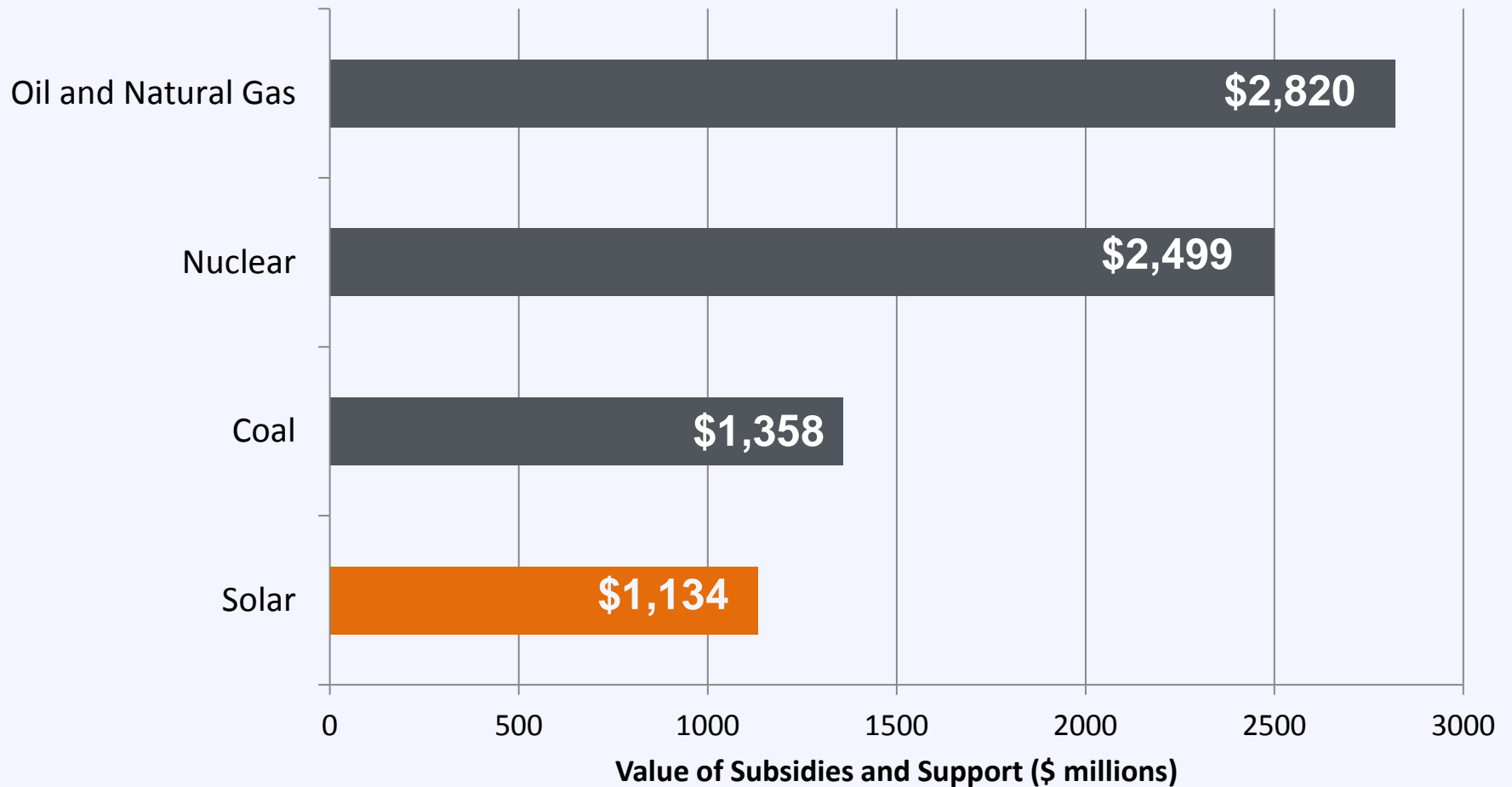
Fact: Solar is cost competitive

2020

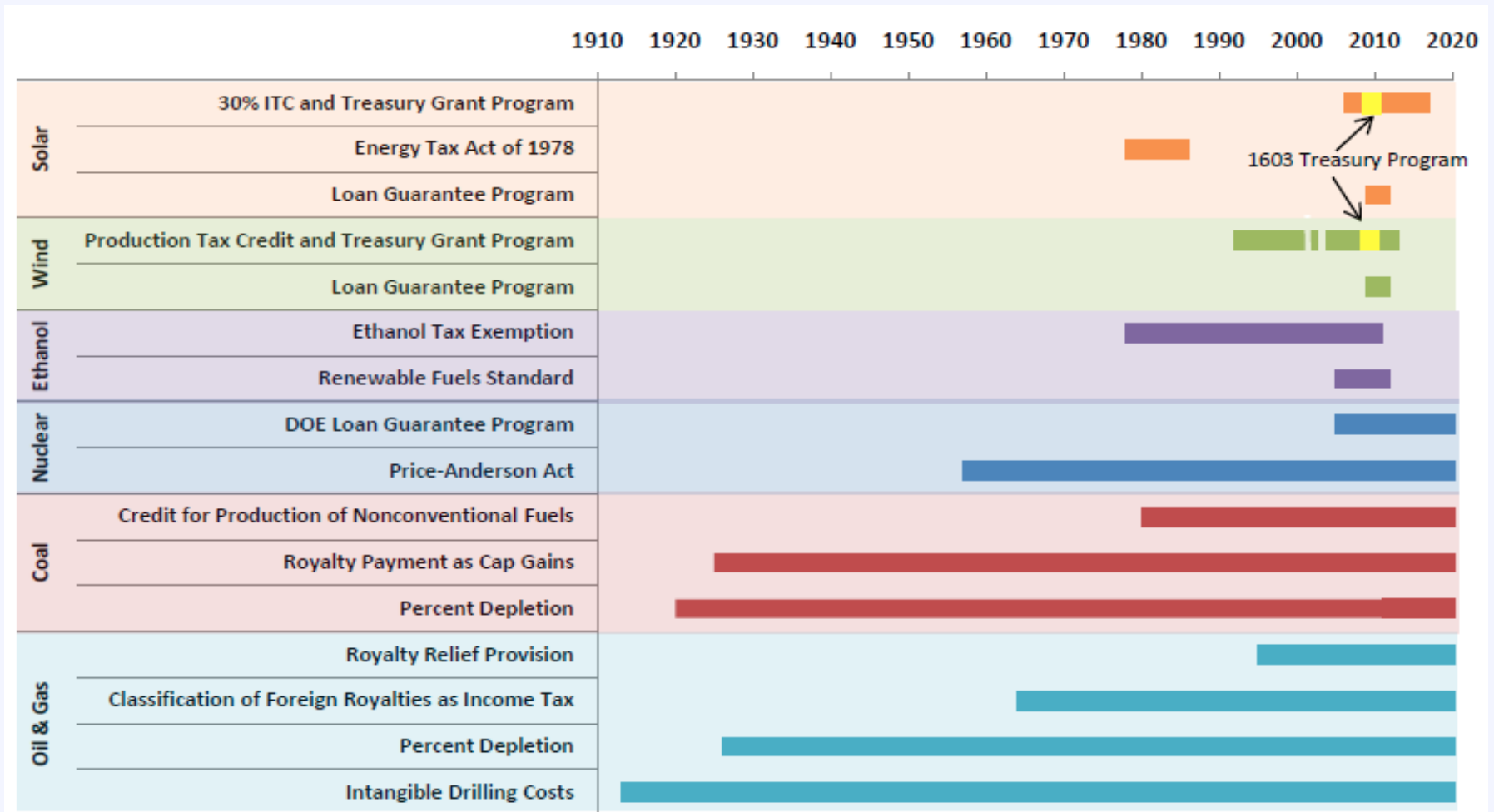


Subsidies and Support

Subsidies for Conventional and Solar Energy, 2010



Subsidies and Support



Agenda

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10:00 – 10:30 Growing Your Local Solar Market

10:30 – 12:10 • Costs and Revenue & Audience Discussion

• Solar Project Finance

12:10 – 12:15 • Local Solar Programs

The Solar Equation

Cost

- + Installed Cost
- + Maintenance
- Direct Incentive

Benefit

- + Avoided Energy Cost
- + Excess Generation
- + Performance Incentive

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	CLEAN Contract Option
	Solar Access	Tax Credits & Exemptions	Direct Cash & Performance Incentives
Local	Solar Ordinance	Solarize	Property Assessed Clean Energy

Investment Tax Credit

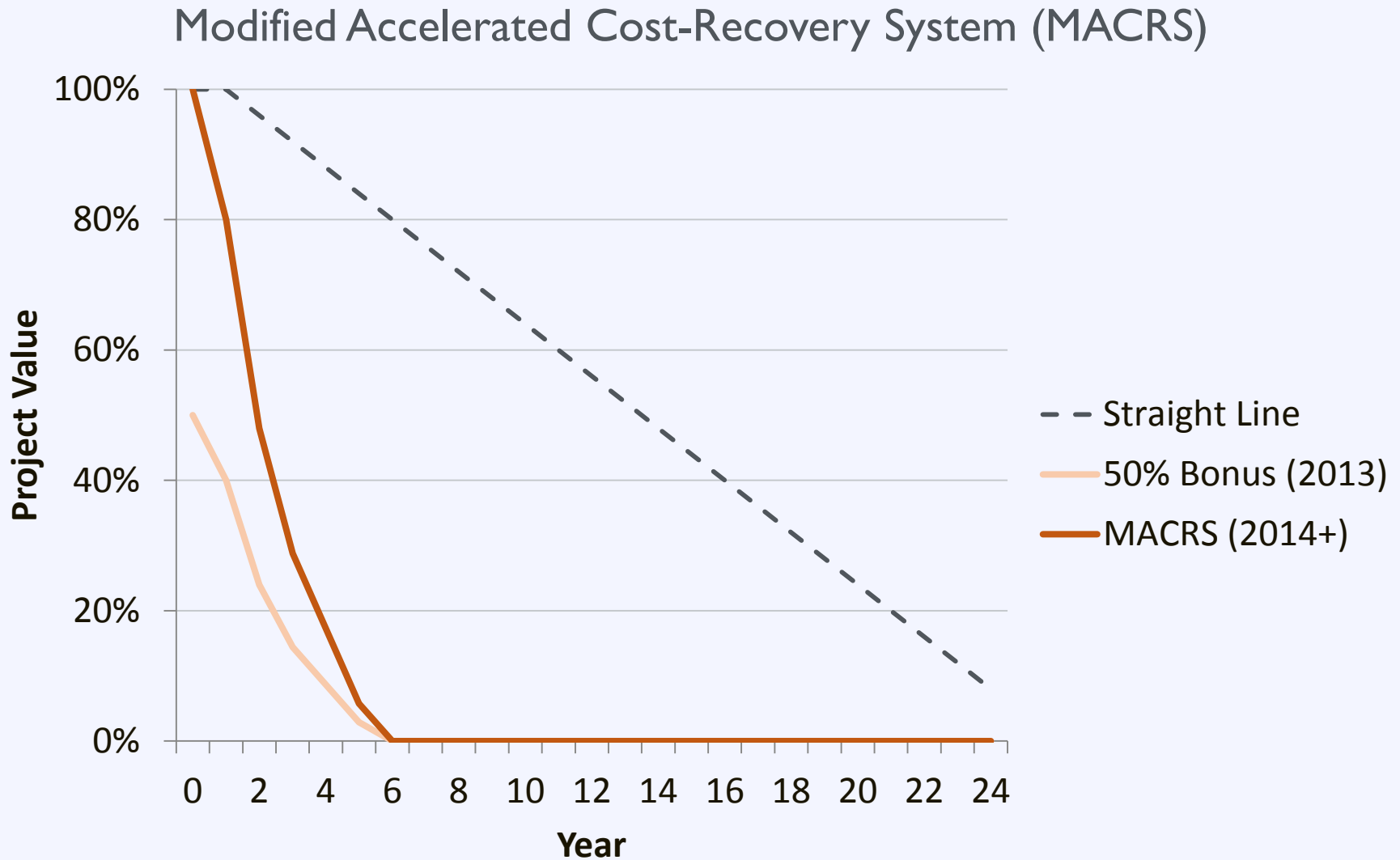
Type: Tax Credit

Eligibility: For-Profit Organization

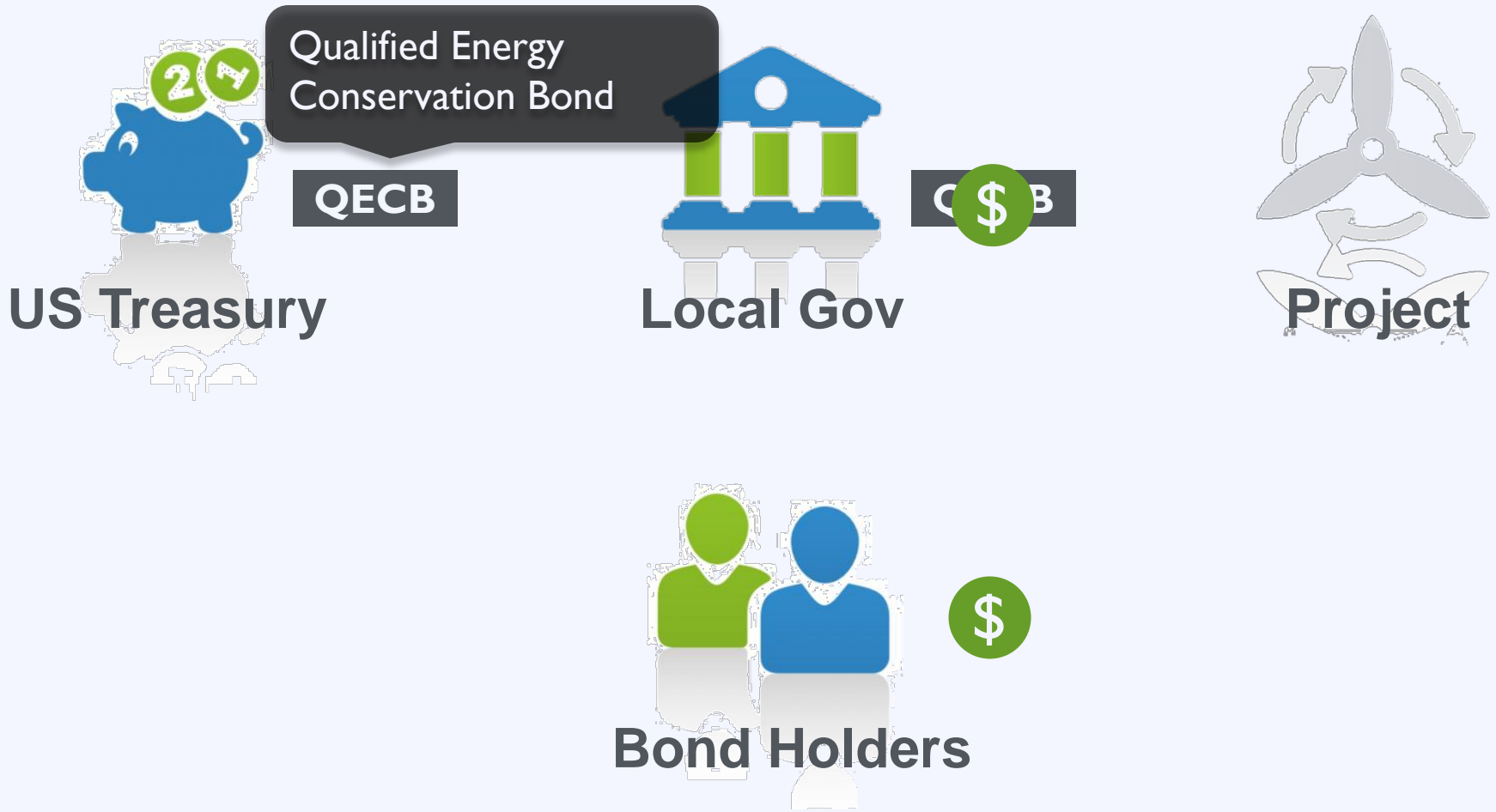
Value: 30% of the installation cost

Availability: Through 2016

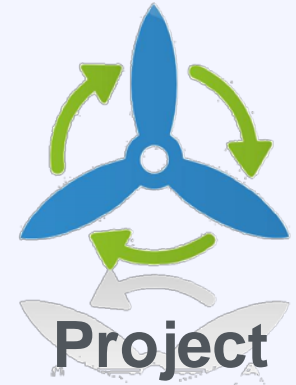
Accelerated Depreciation



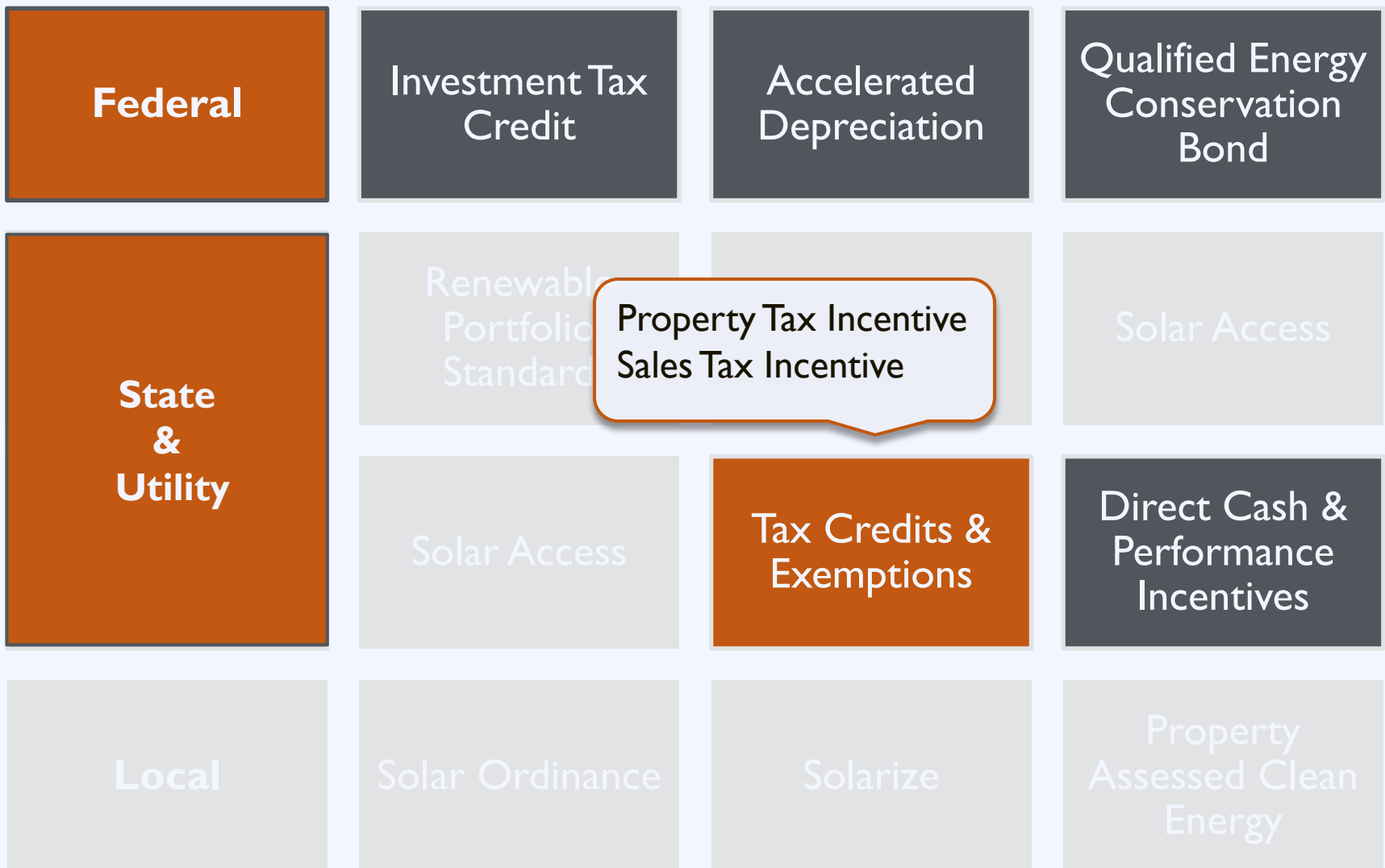
Qualified Energy Conservation Bond



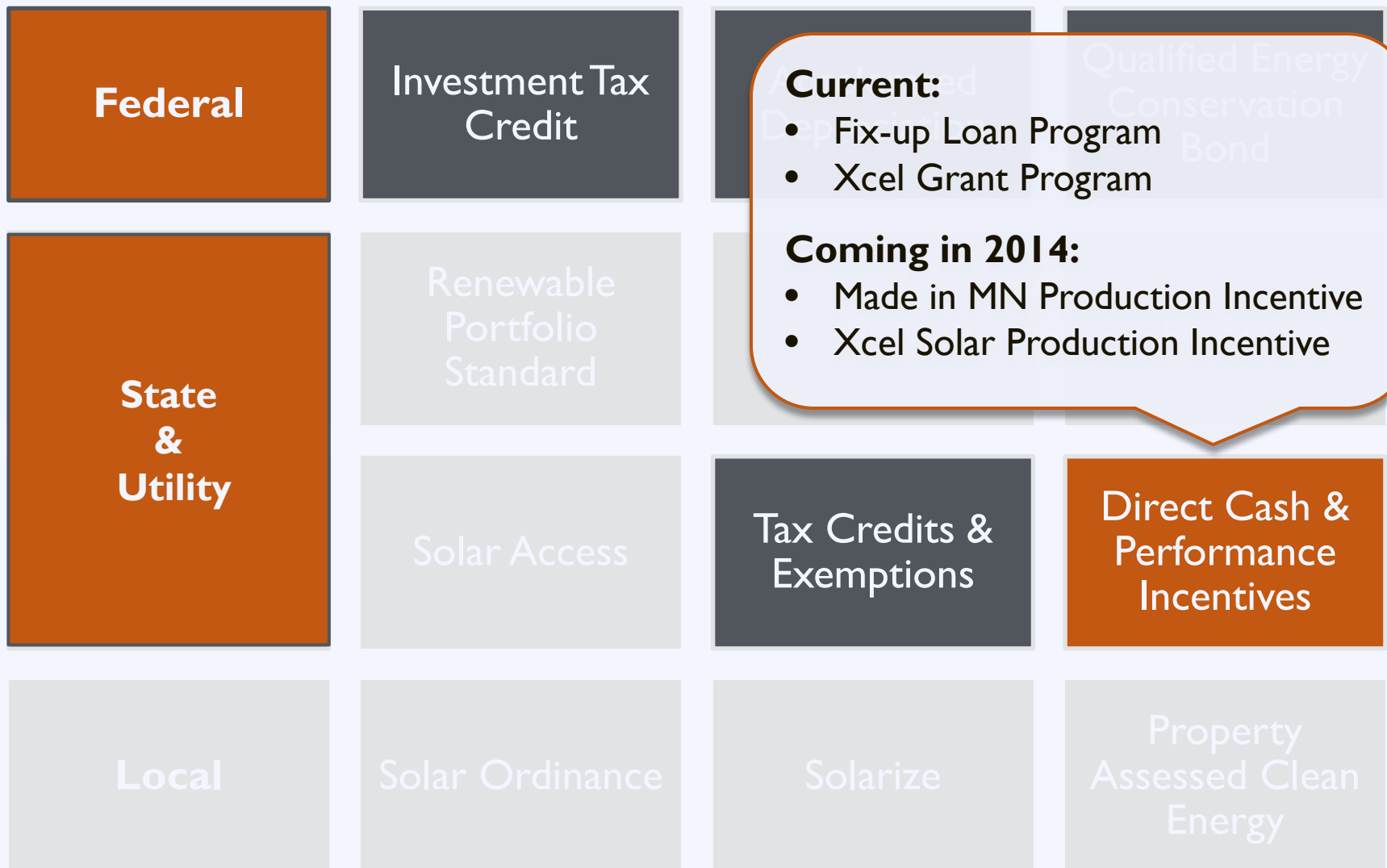
Qualified Energy Conservation Bond



A Policy Driven Market



A Policy Driven Market



Available Incentives in MN

Resource

Database for State Incentives for Renewables And Efficiency

A comprehensive database of state and utility renewable energy and energy efficiency policies and incentives



www.dsireusa.org

Ownership Options

Direct
Ownership

Third-Party
Ownership

Community
Ownership

Direct Ownership



Direct Ownership

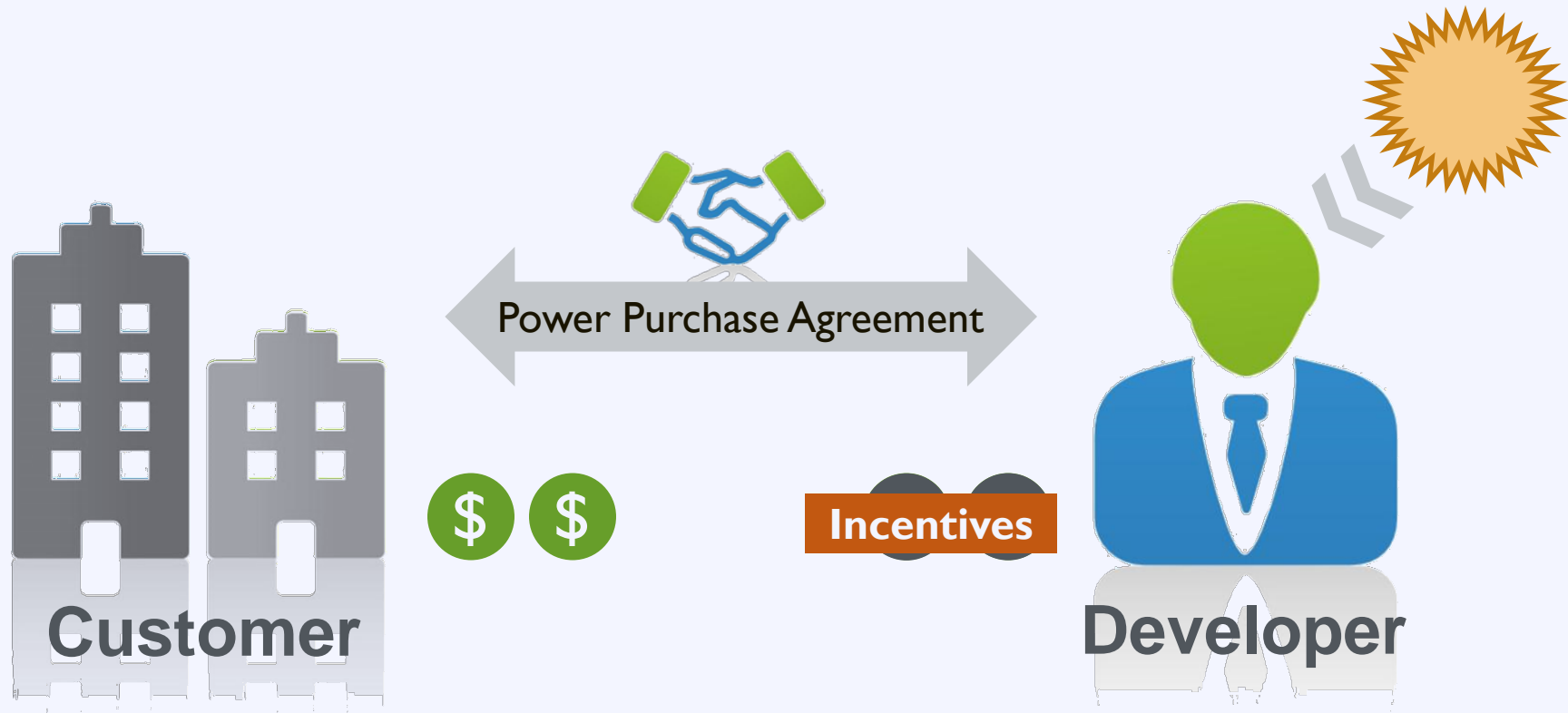
Benefits

- 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

Third Party Ownership



Third Party Ownership

Benefits

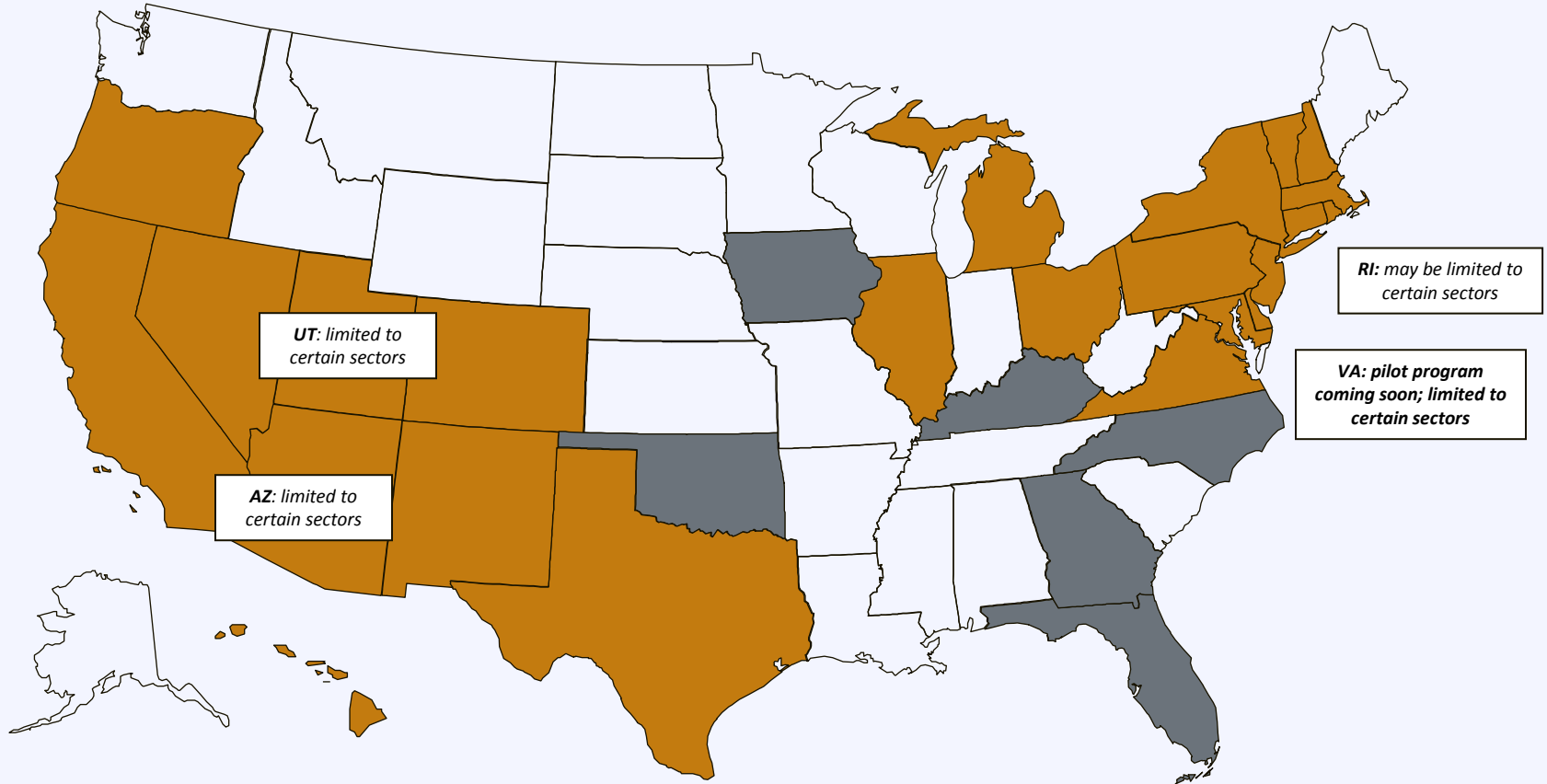
- No upfront cost
- No O&M costs
- Low risk
- Predictable payments
- Tax benefits

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.

Bond-PPA Hybrid

A financing option by which a public entity issues a government bond at a low interest rate and transfers that low-cost capital to a developer in exchange for a lower PPA price.

Bond-PPA Hybrid

Benefits

- No upfront cost
- No O&M costs
- Can use bonds
- Predictable payments
- Tax benefits

Drawbacks

- Don't keep RECs
- Higher transaction cost

Bond-PPA Hybrid: Resources

Resource

Financing Solar PV at Government Sites with PPAs and Public Debt

A fact sheet on how the hybrid bond-PPA model works.

www.nrel.gov



Financing Solar PV at Government Sites with PPAs and Public Debt

Historically, state and local governmental agencies have employed one of two models to deploy solar photovoltaic (PV) projects: (1) self-ownership (financed through a variety of means) or (2) third-party ownership through a power purchase agreement (PPA). Morris County, New Jersey, administrators recently presented a way to combine many of the benefits of self-ownership and third-party PPAs through a bond-PPA hybrid, frequently referred to as the Morris Model. At the request of the Department of Energy's Solar Market Transformation group, NREL examined the hybrid model. This fact sheet:

- Describes how the hybrid model works
- Assesses the model's relative advantages and challenges as compared to self-ownership and the third-party PPA model
- Provides a quick guide to project implementation
- Assesses the replicability of the model in other jurisdictions across the United States.

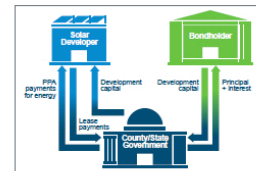


Figure 1. Money flows in the hybrid model

The Bond-PPA Hybrid

The hybrid model is a financing option by which a public entity issues a government bond at a low interest rate and transfers that low-cost capital to a developer in exchange for a lower PPA price.¹ To date, the model has been used to finance solar PV projects on schools, colleges, county administrative buildings, and other public buildings in several jurisdictions in New Jersey. Implementers have achieved notable energy cost savings as compared to projections of their local electricity rate; the four portfolios that have been finalized to date have saved between \$3 million and \$14.6 million on a net present value (NPV) basis. The model has potential to be transferred to other states, but it is unknown at this point if governments in other states are planning to implement the model.

Under the model, a public entity (the administrator) issues a request for proposals (RFP) seeking a solar developer to build, operate, and own a solar project or portfolio of projects on public buildings (local hosts). The administrator sells bonds to finance the development costs of the PV installation. The administrator then enters into both a lease-purchase agreement with the winning bidder² and a PPA (on behalf of the local host) to buy the electricity from the PV system. Figure 1 shows the relationships and money flows between the bondholder, administrator, and solar developer.

¹ These types of arrangements are not unique to New Jersey. For example, the City of Denver provided low-interest capital (raised through appropriation) to a developer to build two Denver International Airport solar projects in 2009 (Morrissey 2010). The city did not provide a construction loan, instead, capital was provided after plant construction.

² The lease-purchase agreement transfers ownership of the project to the solar developer for federal tax purposes.

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

Community Ownership

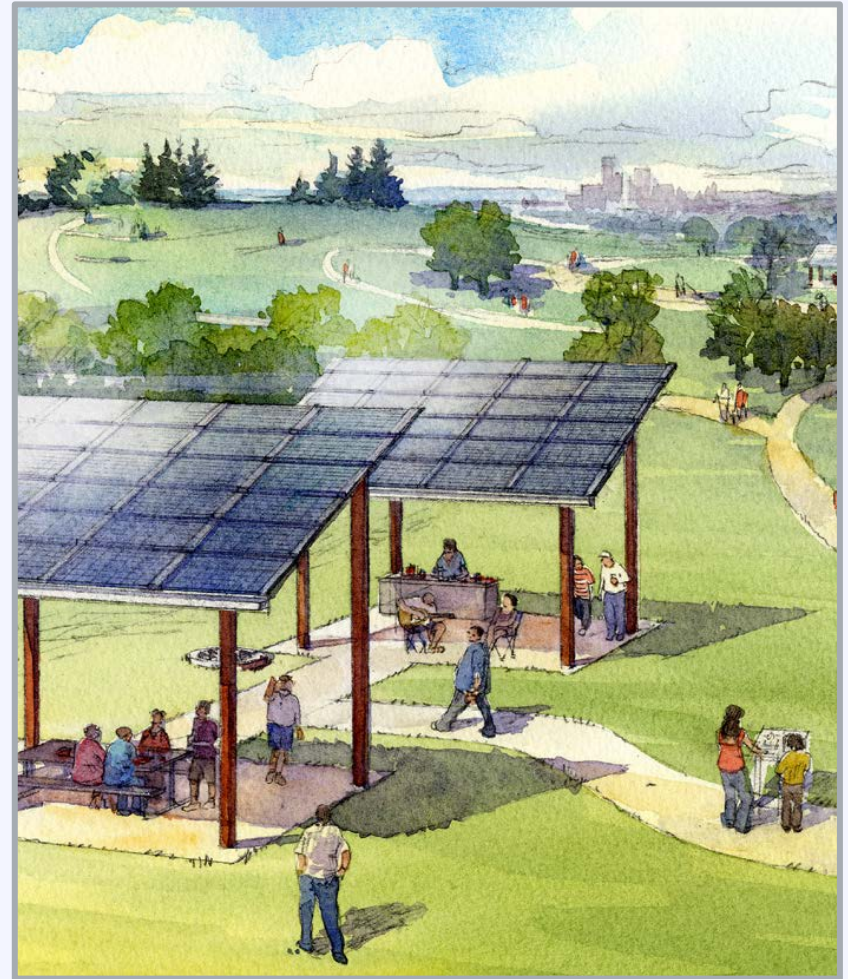


Community solar projects provides renters and homeowners without a feasible project the opportunity to invest in solar

Community Ownership

Program Models:

- SPE Model
- Investment Model
- Utility Model



Community Ownership

Benefits

- Accessible for everyone
- Economies of scale

Drawbacks

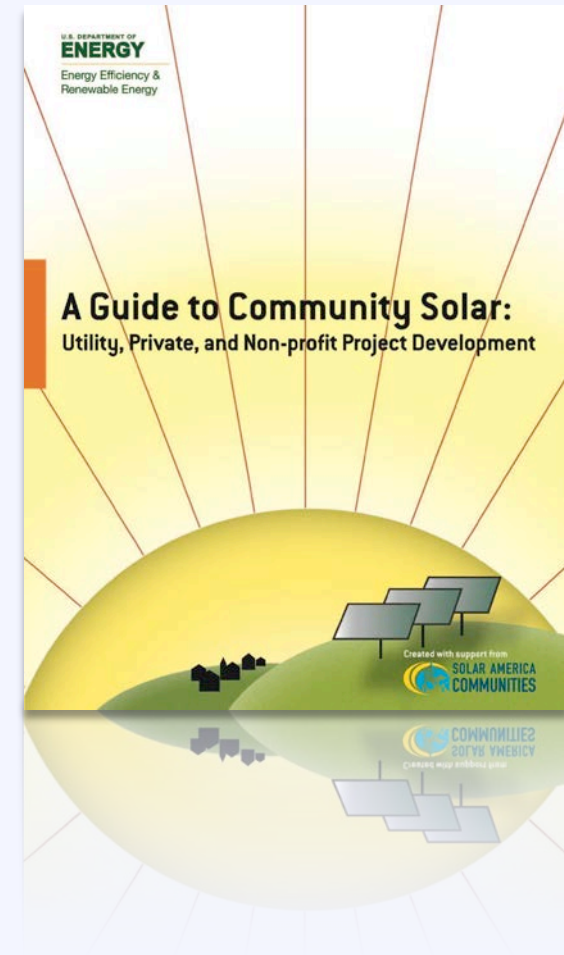
- Administrative challenge
- Tax credit issues

Community: Resources

Resource **A Guide to Community Solar**

A resource for community organizers and local government leaders who want to develop community solar projects.

www.nrel.gov



A Policy Driven Market

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

Solarize

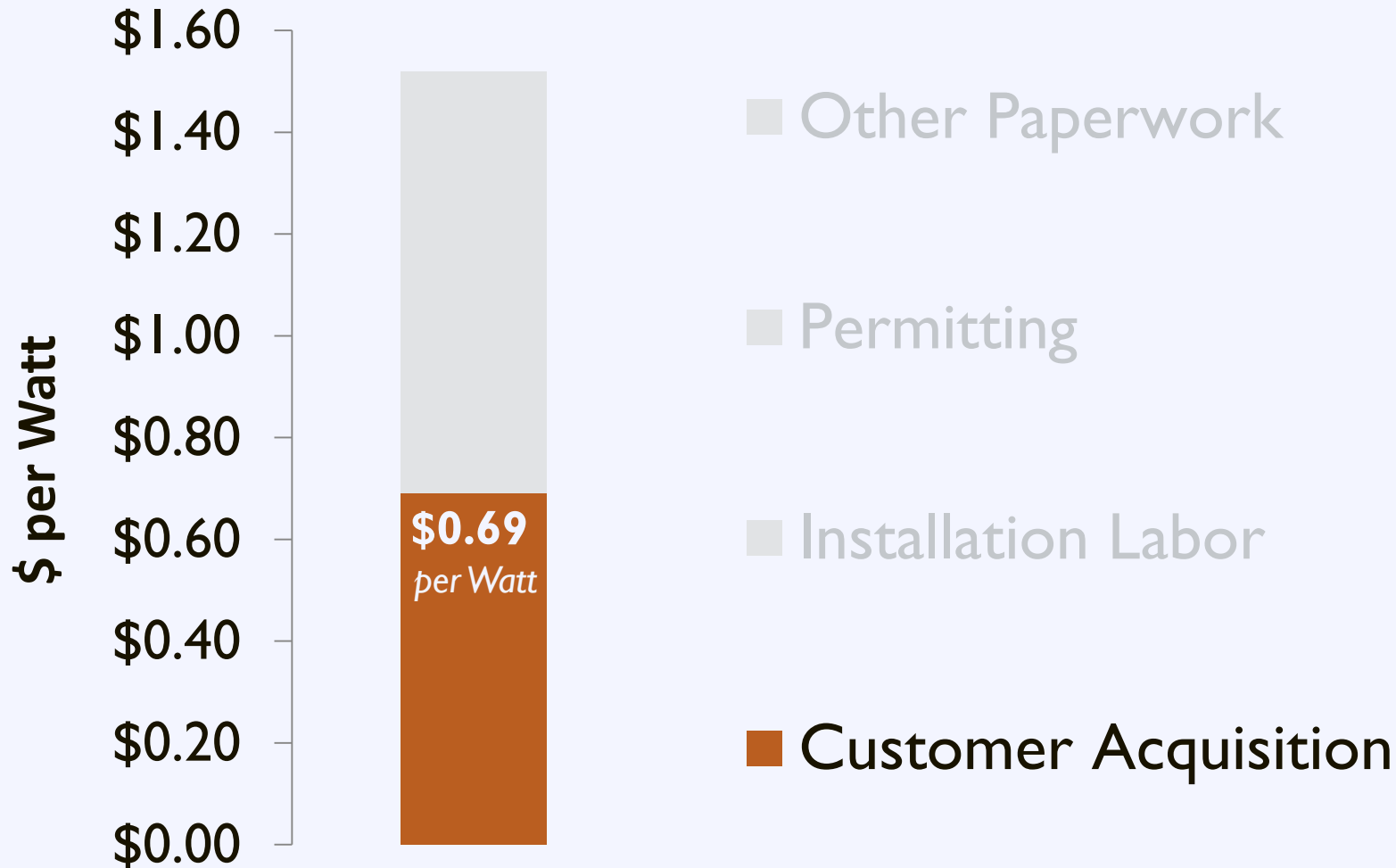
Solarize Group Purchasing



solarize portland →



Solarize: Mitigate Soft Costs



Solarize: Advantages

Barriers

High upfront cost



Solutions

Group purchase

Complexity



Community outreach

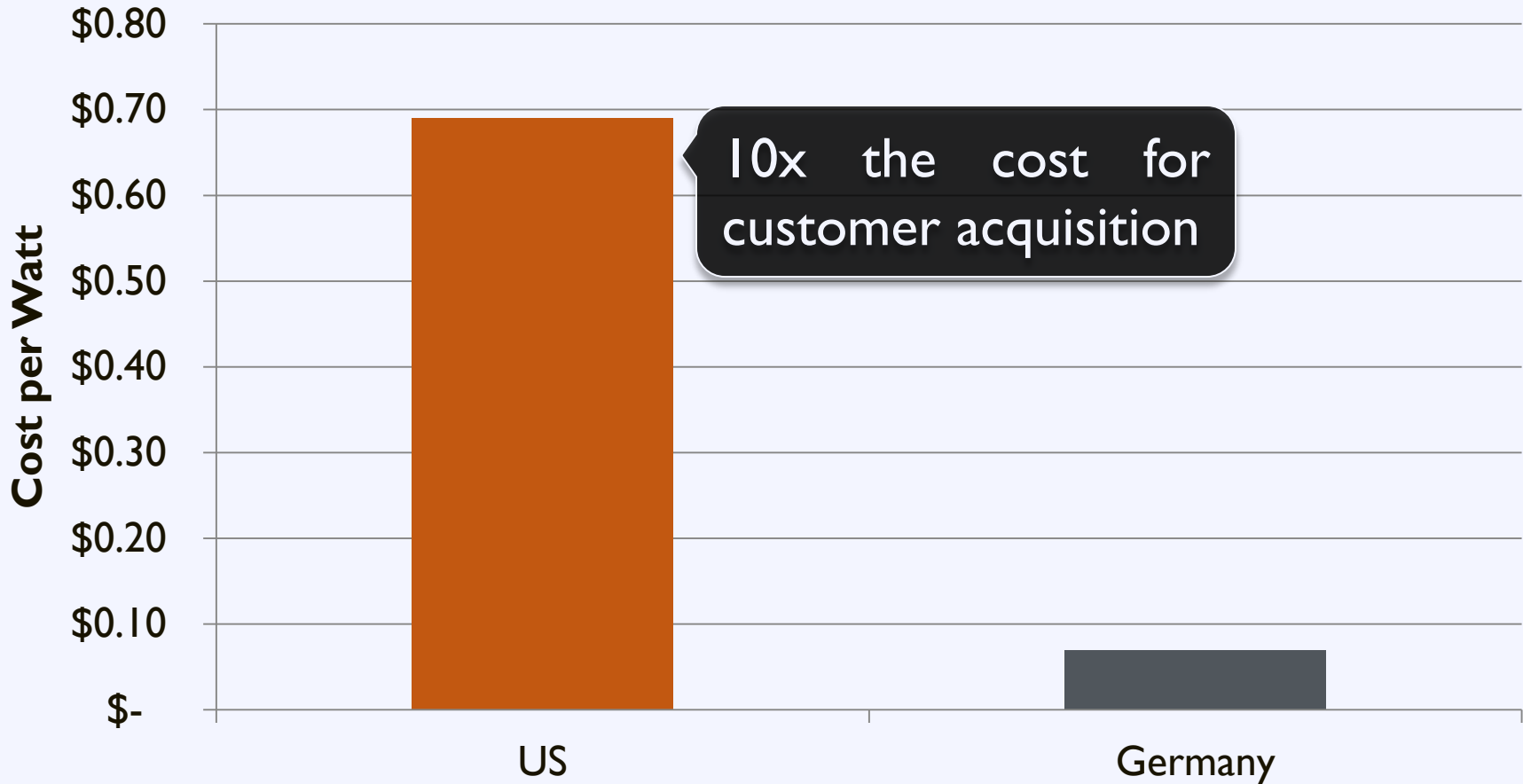
Customer inertia



Limited-time offer

Solarize: Advantages

Customer Acquisition



Solarize: Advantages

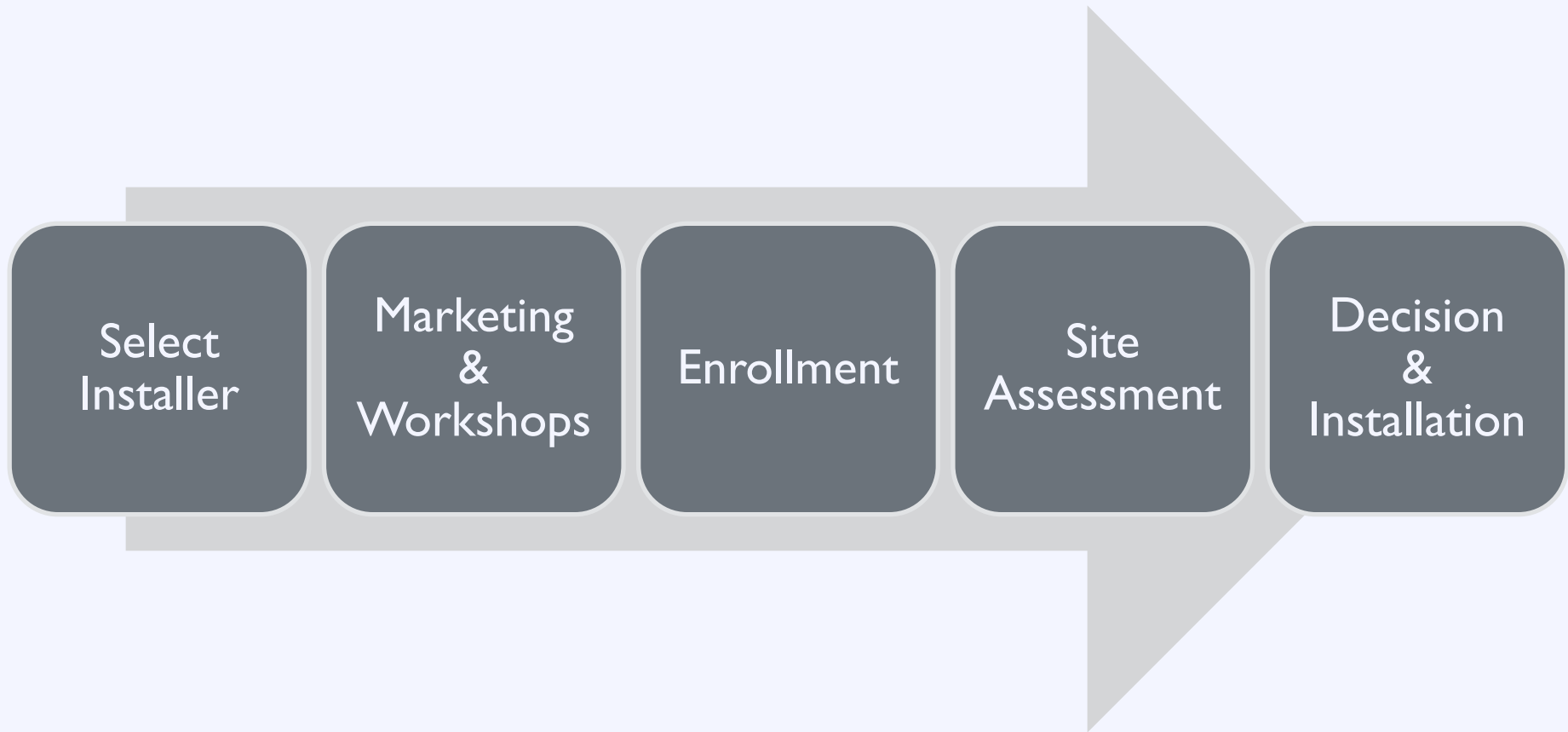
Benefits to Local Government:

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

Quick turn-around: 9 Months

Long-term impact: Sustainable ecosystem

Solarize: Process

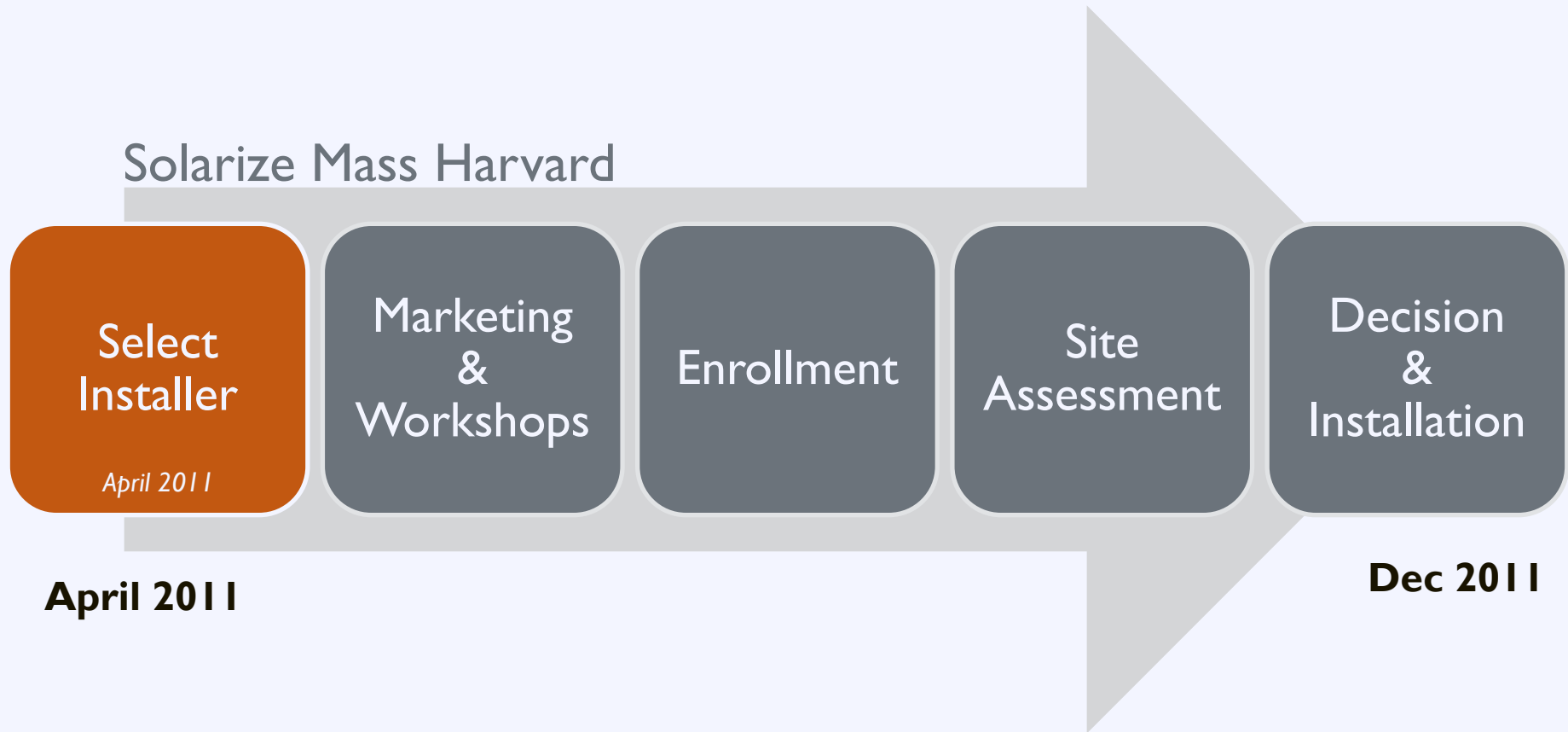


Solarize: Case Study



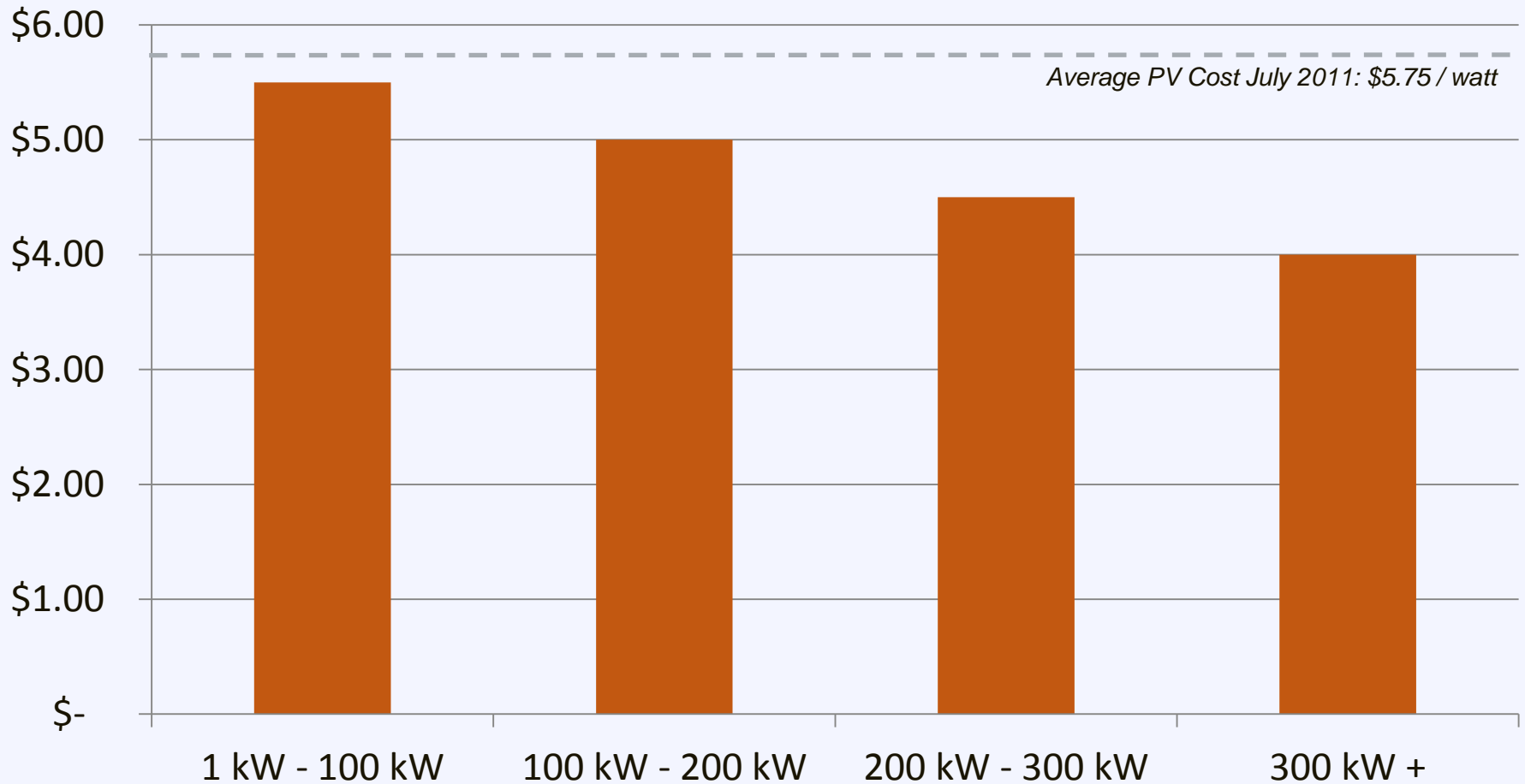
Harvard, Massachusetts
Population: 6,520

Solarize: Case Study

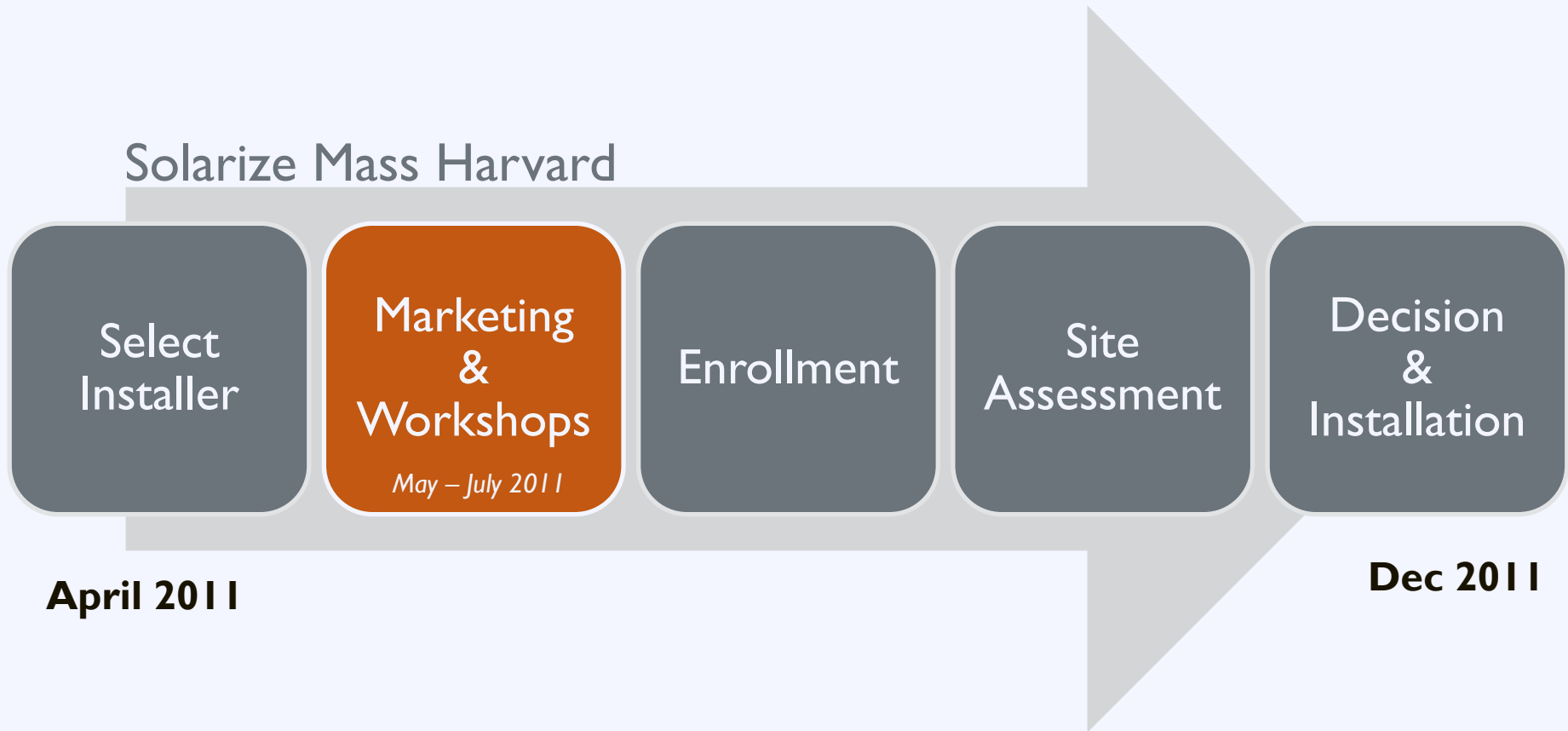


Group Purchasing

Harvard Mass Group Purchasing Tiers



Solarize: Case Study

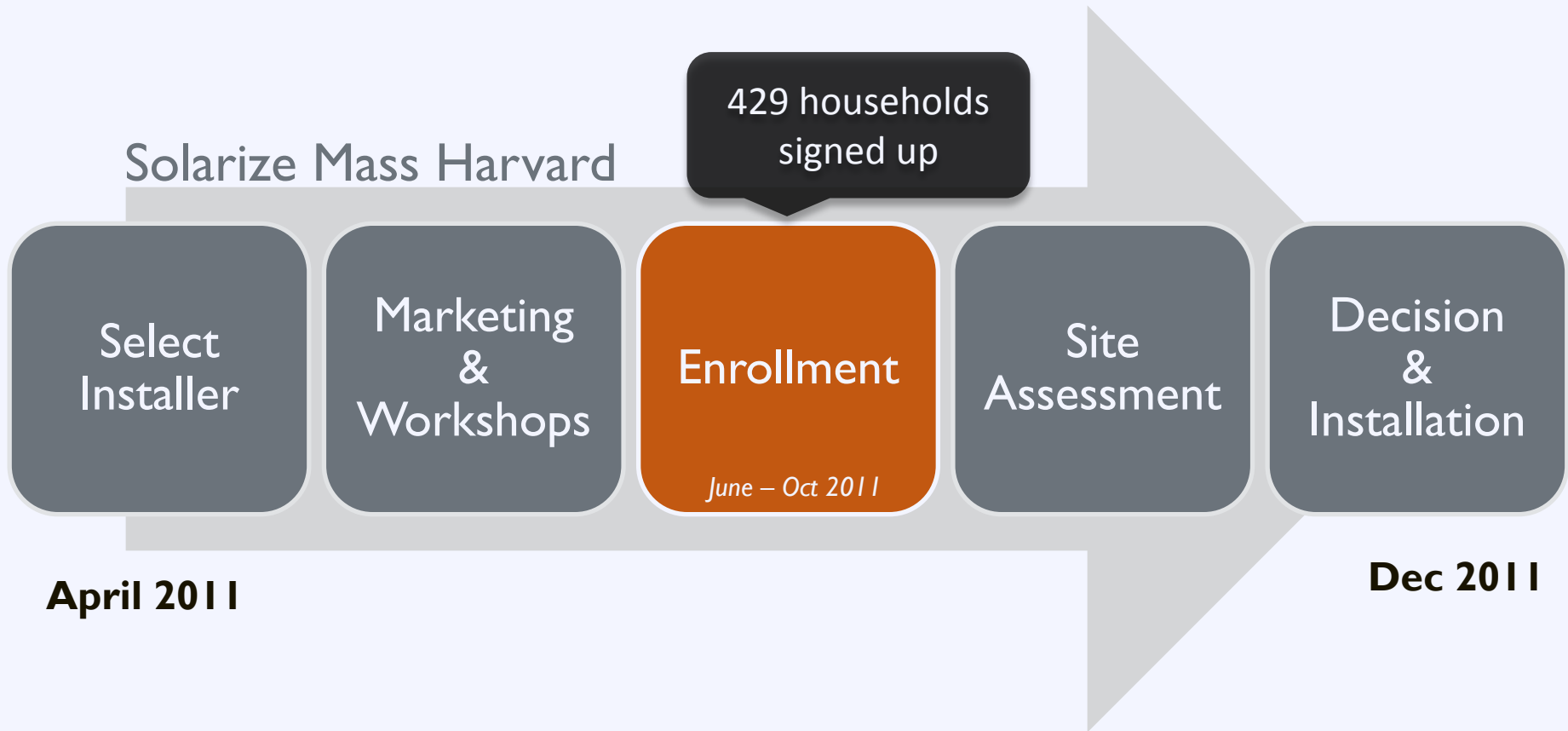


Solarize: Case Study

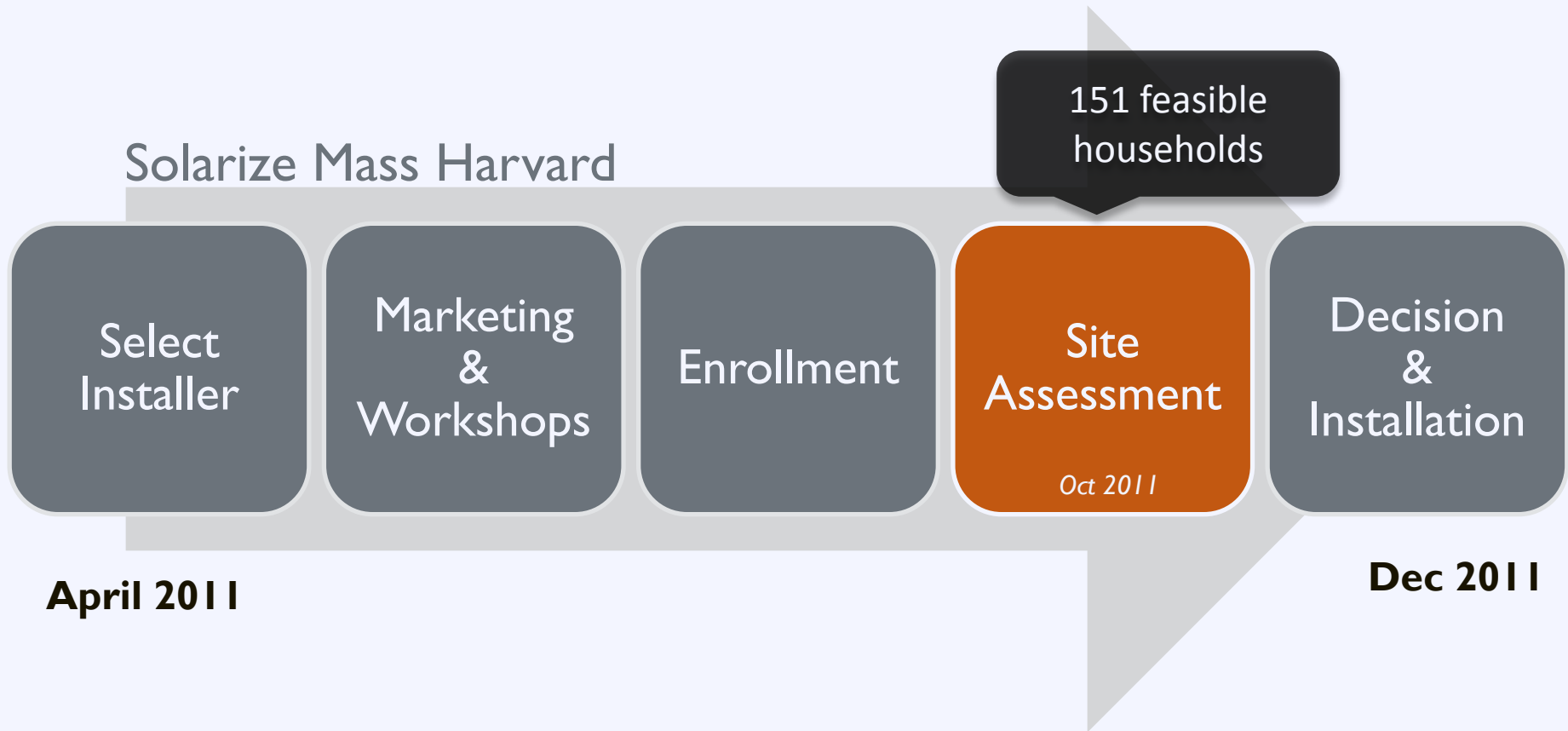
Marketing Strategy:

- 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

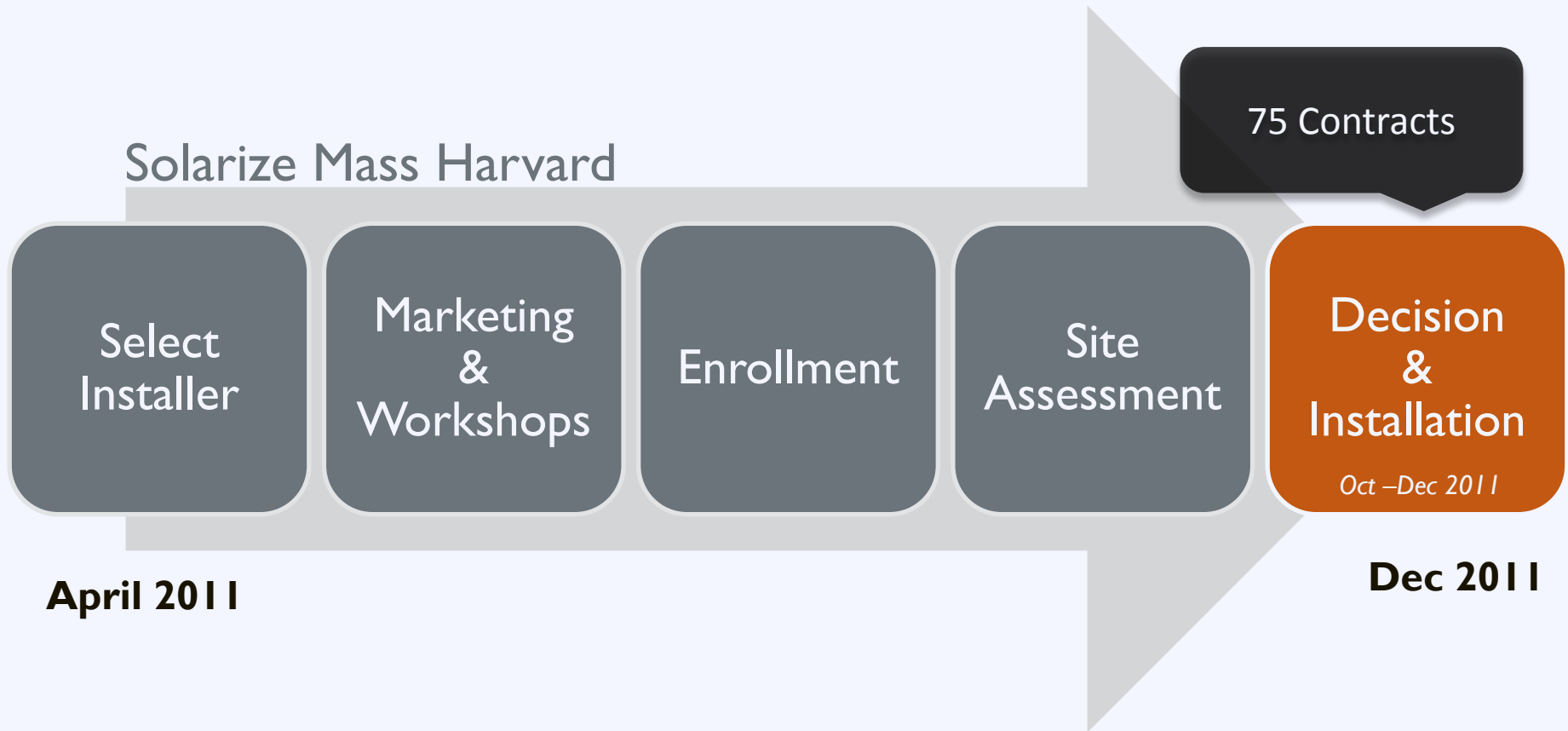
Solarize: Case Study



Solarize: Case Study

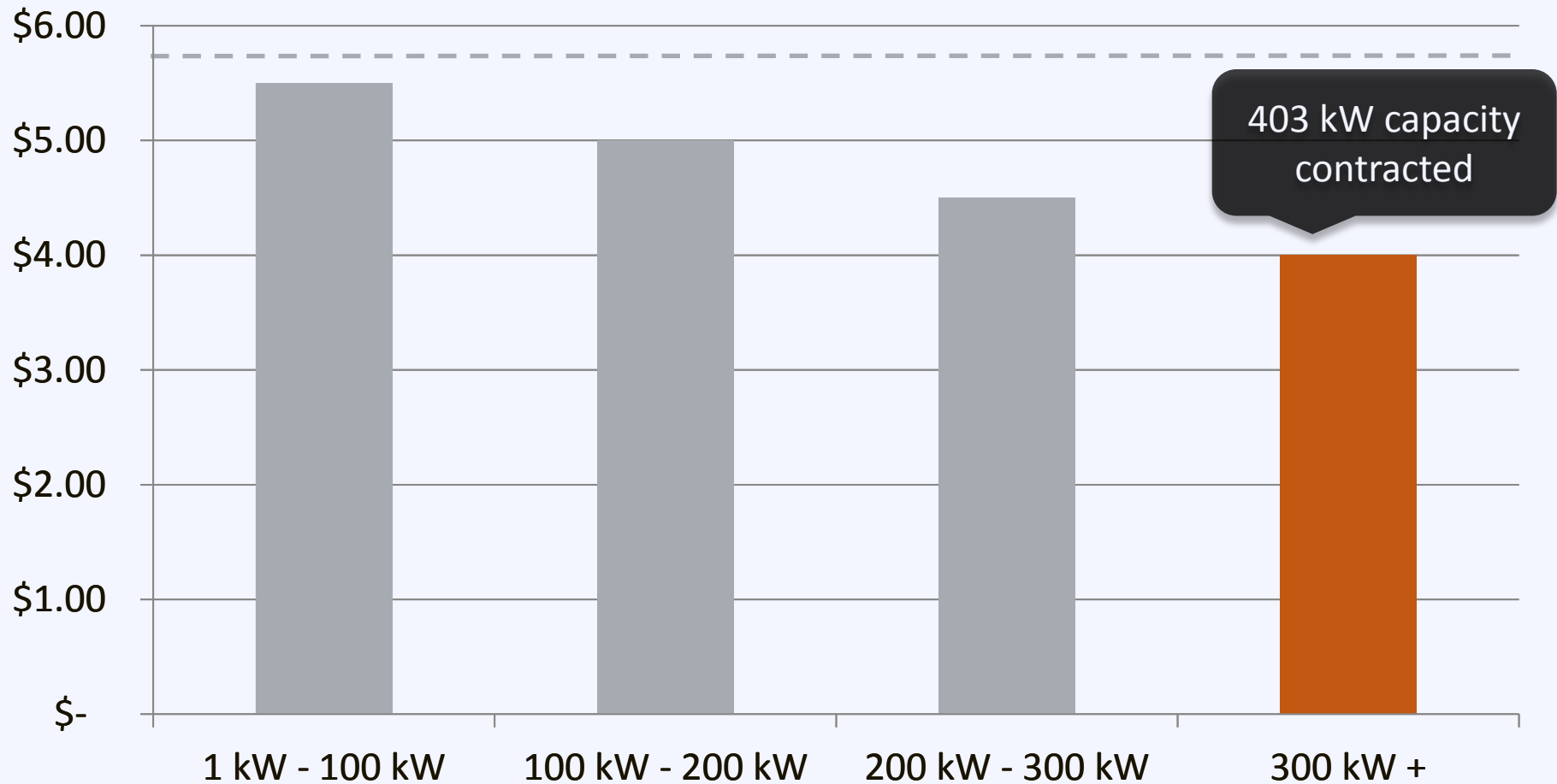


Solarize: Case Study



Group Purchasing

Harvard Mass Group Purchasing Tiers



Solarize: Case Study

75 new installations totaling 403 kW

30% reduction in installation costs

575% increase in residential installations

Solarize: Lasting Impact

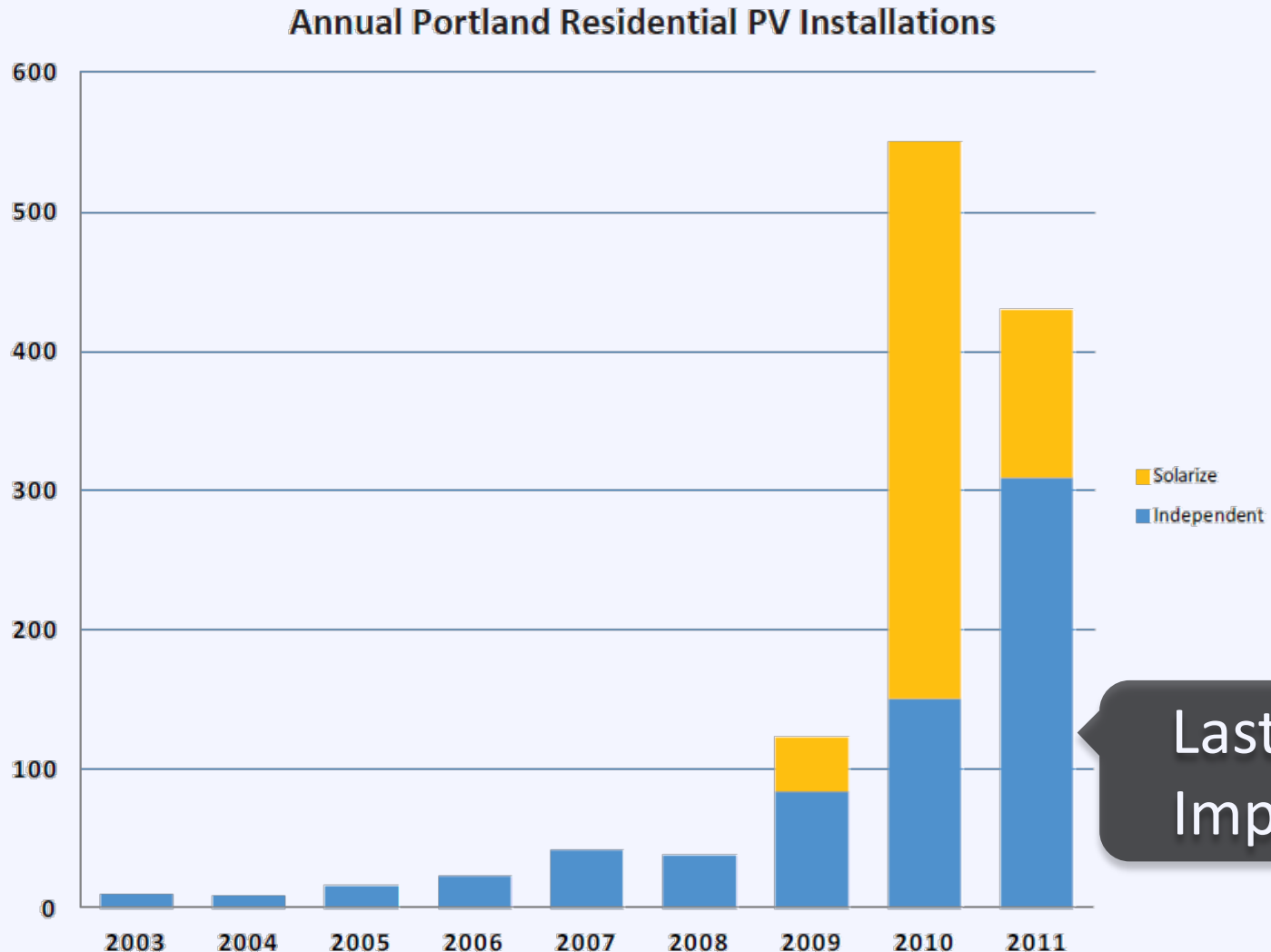
A household is

0.78% more likely to adopt solar

for

each additional installation in their zip code

Solarize: Lasting Impact

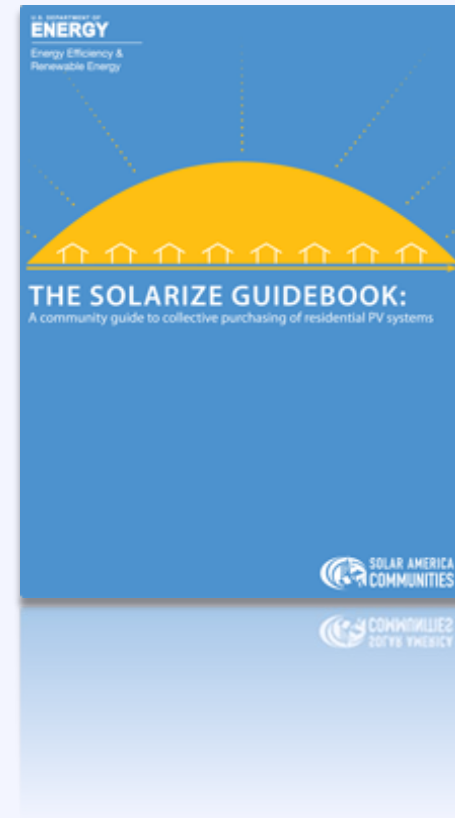


Solarize: Resources

Resource **The Solarize Guidebook**

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

www.nrel.gov



A Policy Driven Market

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

Property Assessed Clean Energy

The local government finances the up-front costs of the energy investment, which is repaid through a special property tax assessment.

Property Assessed Clean Energy

City creates type of land-secured financing district or similar legal mechanism



Property owners voluntarily sign-up for financing and make energy improvements



Proceeds from revenue bond or other financing provided to property owner to pay for energy project



Property owner pays assessment through property tax bill (up to 20 years)



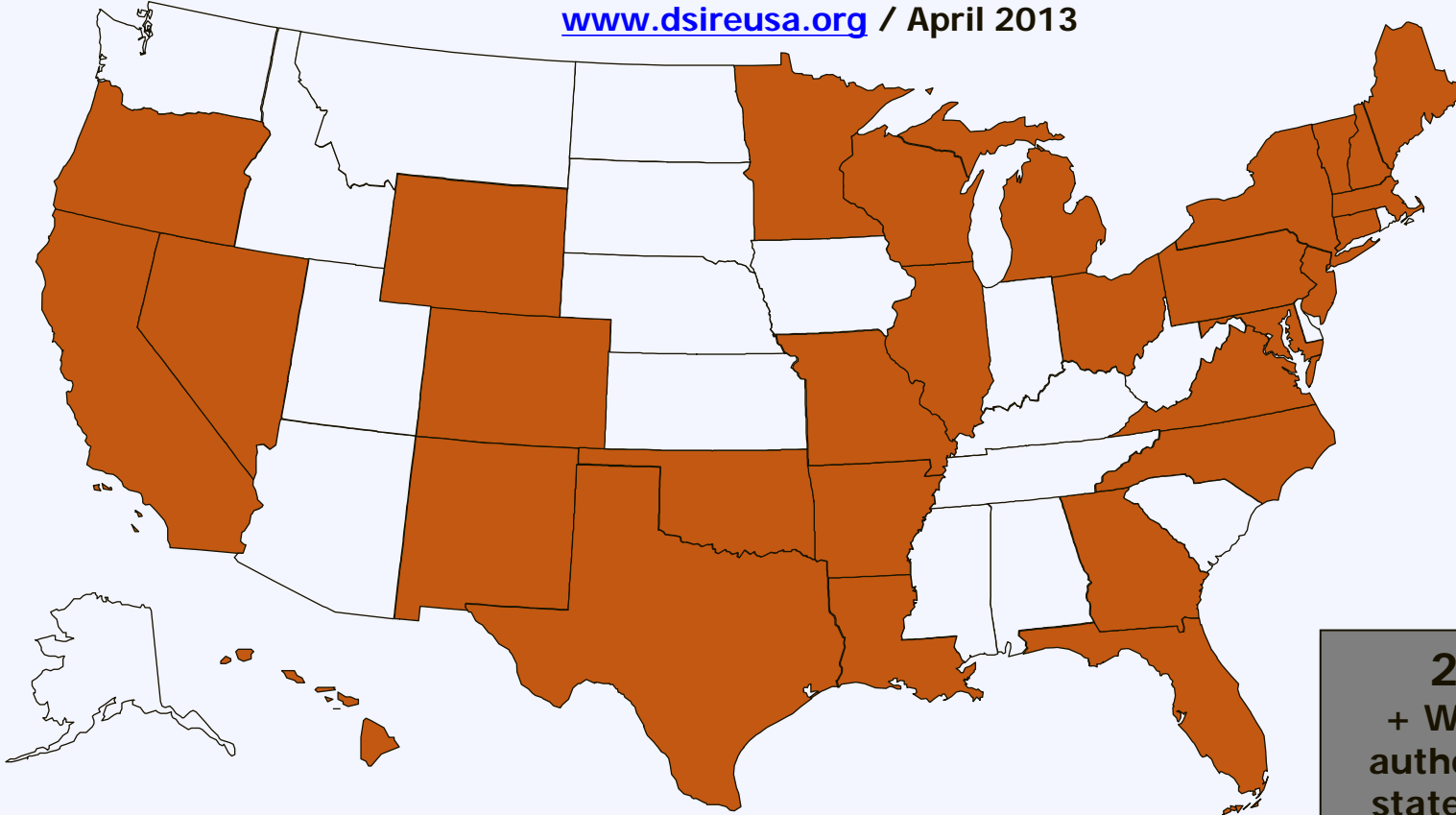
Property Assessed Clean Energy

Advantages Over Conventional Loan:

- Longer (20 year) term
- Repayment transfers with ownership
- Low interest rates
- Interest is tax deductible
- Lower transaction costs

Property Assessed Clean Energy

www.dsireusa.org / April 2013



 PACE financing authorized by the state*

29 states,
+ Washington DC,
authorize PACE (27
states have passed
legislation and HI
permits it based on
existing law).

PACE: Minnesota Example

Edina Emerald Energy Program:

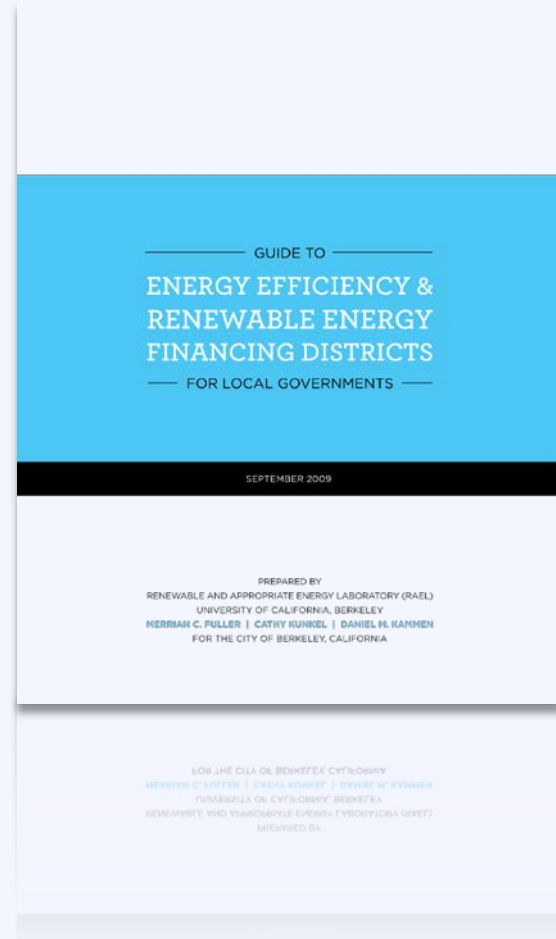
- Financing for clean energy projects
- Total cost to implement the program: \$11,500
- To participate:
 - Must be commercial or industrial property
 - Project cost must exceed \$2,500
 - Application period takes 15 days

PACE: Resources

Resource PACE How to Guide for Local Governments

This report is designed for local government officials in getting a PACE program established in their region.

rael.berkeley.edu



Q & A

Agenda

- 08:40 – 09:00 Solar 101 for Communities
- 09:00 – 09:20 Understanding the Solar Regulatory Landscape
- 09:20 – 09:35 Creating a Solar Ready Community
- 09:35 – 09:45 *Break*
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- 12:10 – 12:15 Wrap Up



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U.S. Department of Energy

Bill Grant

Deputy Commissioner of Energy
and Telecommunications, MN
Department of Commerce

Mayor Peter Lindstrom

Mayor
City of Falcon Heights

Jason Lindahl

Planner
City of Rosemount

Brian Ross

Owner
CR Planning

Minnesota 2013 Legislative Update

Solar Powering Your Community Workshop
September 10, 2013



Bill Grant, Deputy Commissioner
Minnesota Department of Commerce,
Division of Energy Resources

DG Workshops: Fall 2011

Introduction and Overview (9/29/2011)

DG Overview: Solar, Wind, and CHP

Contractual Issues (10/11/2011)

Standby, Interconnection, Power Purchase Agreements, 3rd-party ownership

Net Metering (11/11/2011)

Small Group Discussions

(11/8/2011)



DG Workshops: 2012-2013

Technical Interconnection Standards (5/31/12)

DG Baselines and Benchmarking Webinar
(8/15/12)

Costs, Values, Benefits
(10/11/12)

Value of Solar
(1/9/13)



2013
Legislative
Update

2013 Legislative Update

Omnibus Energy Bill

HF729, 4th Engrossment

Signed into Law:

May 23, 2013



2013 Legislative Update

Solar Policies

- Solar Energy Standard
- Net Metering
- Community Solar
- Value of Solar Tariff
- Xcel Solar* Rewards
- Made in Minnesota Solar Incentives

2013 Legislative Update

Renewable Energy Studies

- Transmission and Renewable Energy Integration
- Scoping for a Renewable Energy Future
- Utility-managed, on-site energy storage
- Solar thermal

Solar Energy Standard

1.5% solar by 2020

- Applies to Public Utilities (IOUs)
- Mining & Paper Mills exempted
- Approx. 400 MW by 2020 (estimate)
- 10% carve out for smaller solar (< 20 kW)

Goal of 10% solar by 2030



Net Metering

- All utilities, net metering <40 kW is unchanged
- **Public utilities only:**
 - Net metering cap raised to 1 MW
 - Single-customer meter aggregation on contiguous property
 - No standby charges < 100kW,
 - PUC to review standby charges ≥ 100 kW
 - Systems 40 kW - 1,000 kW
 - Solar & other DG: sized 120% to **energy**
 - wind: sized 120% to **load**



Community Shared Solar (CSS)

- Xcel to file CSS program by **Sept. 30, 2013**
- Projects <1MW
- Subscribers may live in a contiguous county
- Subscribers receive on-bill credit.



Value of Solar

Due Jan 31, 2014:

- Department of Commerce to develop methodology to quantify value components of solar electricity
- Public Utilities may file VOS tariff in lieu of Net Metering for solar
- 20 year fixed rate contracts



Value of Solar Workshops

1: Overview of National Efforts (9/17/2013)

solar photovoltaic benefit and cost studies, Q&A

2: Methodologies and Perspectives (10/1/2013)

Proposed approach & stakeholder perspectives

3: Stakeholder Discussion (10/15/2013)

Resolution of key issues

4: Draft methodology (11/19/2013)

Presentation and discussion of initial draft

Xcel Solar*Rewards

- Starting in **2014** for systems <20kW
- 10 year performance based incentives
- \$5 M/yr for 2014 - 2018.
- Shifts funding from CIP to RDF.



Made in Minnesota (MiM)

- Program expanded to all IOUs
- 10 year performance based incentives
- \$15 M/yr for **2014 - 2023** from CIP and RDF
- Includes \$250k for Solar Thermal
- Residential and commercial systems <40kW



Transmission and Renewable Energy Integration Study

Due Nov 1, 2014:

- Transmission plan and solutions to critical issues for 40% by 2030 and higher levels.
- Completed by utilities and transmission providers under the direction of the Department of Commerce.
- Commissioner appoints a 15 person technical review committee to review study assumptions, etc.



Scoping Study for Renewable Energy Future

Due January 1, 2014:

- Study scope to develop a strategy for Minnesota to meet all energy needs using the state's abundant renewable energy resources.
- Study scope to be developed by the Department of Commerce in consultation with stakeholders and the Legislative Energy Commission.



Additional Studies

Due January 1, 2014:

- Costs, benefits, barriers, and potential incentive strategies for:
 - **utility-managed, on-site energy storage**
 - **solar thermal energy**



Thank You.
Questions?



**2/3rds of
City Hall**



Is powered by

SOLAR

SOLAR BULK PURCHASING...

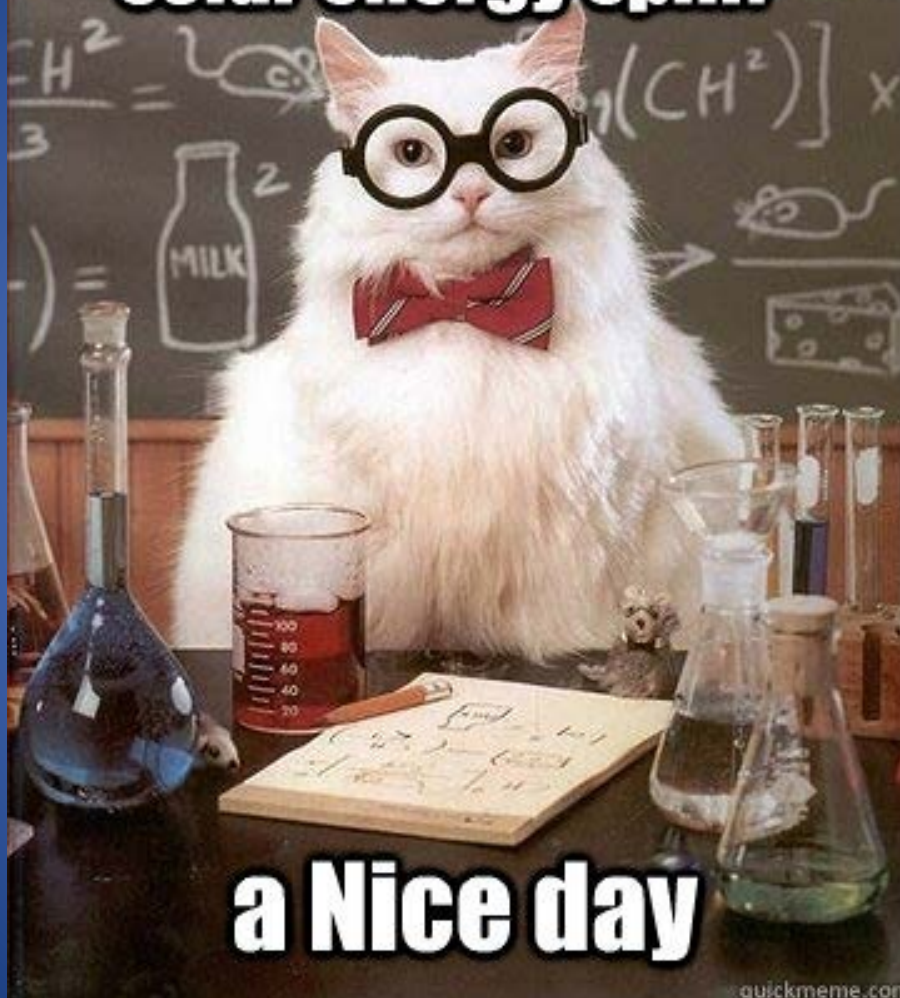


SAVES OVER 20%



SOLAR
FOR
EVERYONE

**what do u call a MASSIVE
solar energy spill?**



a Nice day

Minnesota Best Practices for Solar Friendly Communities



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SunShot

U.S. Department of Energy



Solar Friendly Communities



- 1. Comprehensive Plans** that address solar resources
- 2. Development Regulations** that explicitly address solar development in its varied forms.
- 3. Permitting Processes** that are predictable and clear
- 4. Public Sector Investment** in the community's solar resources

Solar Friendly Communities



Comprehensive Plans that address solar resources and acknowledge solar development benefits and opportunities in the community.



Planning Best Practices

Metropolitan Land Planning Act

Subd. 2. **Land use plan.** (b) A land use plan shall contain a protection element, as appropriate, for historic sites, the matters listed in the water management plan required by section 103B.235, and an element for protection and development of access to direct sunlight for solar energy systems.



Solar Friendly Communities



Development Regulations that explicitly address solar development in its varied forms, creates as-of-right installation opportunities, and sets clear and predictable standards for balancing solar resources with other resources.



Development Regulation Best Practices

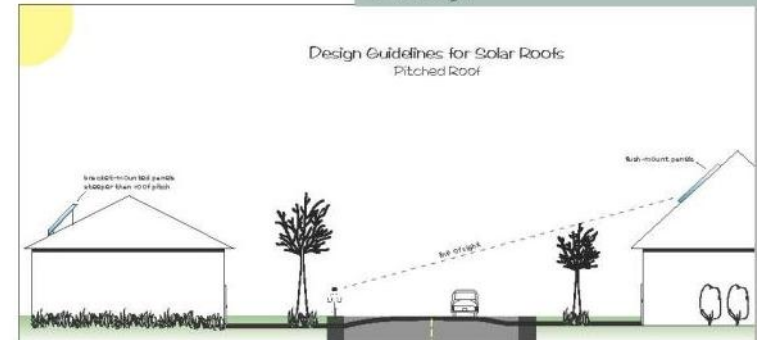
Solar Energy Standards

land use or performance standards for the district in which the building is located.

2. **Solar Energy Systems with Mounting Devices** - Solar energy systems using roof mounting devices or ground-mount solar energy systems shall not be restricted if the system is not visible from the closest edge of any public right-of-way other than an alley. Roof-mount systems that are visible from the nearest edge of the street frontage right-of-way shall not have a highest finished pitch steeper than the roof pitch on which the system is mounted, and shall be no higher than twelve (12) inches above the roof.
 3. **Coverage** - Roof or building mounted solar energy systems, excluding building-integrated systems, shall allow for adequate roof access to the south-facing or flat roof upon which the panels are mounted. The surface area of pole or ground mount systems shall not exceed half the building footprint of the principal structure.
 4. **Historic Buildings** - Solar energy systems on buildings within designated historic districts or on locally designated historic buildings (exclusive of State or Federal historic designation) will require an administrative variance, as provided in this ordinance.
- D. **Approved Solar Components** - Electric solar energy system components must have a UL listing and solar hot water systems must have an SRCC rating.
- E. **Plan Approval Required** - All solar energy systems shall require administrative plan approval by Model Community zoning official.
1. **Plan Applications** - Plan applications for solar energy systems shall be accompanied by to-scale horizontal and vertical (elevation) drawings. The drawings must show the location of the system on the building or on the property for a ground-mount system, including the property lines.
 - a. **Pitched Roof Mounted Solar Energy Systems** - For all roof-mounted systems other than a flat roof the elevation must show the highest finished slope of the

Coverage

Roof coverage limitations are generally not necessary, as some of the roof is likely to be shaded or otherwise not suitable for solar energy. Coverage is an issue of concern in order to ensure ready roof access in the event of a fire. Coverage limits can be a percentage limitation, such as 80% of the total south-facing roof, or a required setback from one or more edges.



Solar Friendly Communities



Permitting Processes with predictable and clear submittal requirements, review timeframes, and permit fees.

Solar America Board for Codes and Standards

EXPEDITED PERMIT PROCESS FOR PV SYSTEMS
A Standardized Process for the Review of Small-Scale PV Systems

Bill Brooks
Brooks Engineering

Expedited Permit Process for PV Systems
A Standardized Process for the Review of Small-Scale PV Systems

Study Report Overview

This fact sheet summarizes the findings and recommendations of a new study report from the Solar America Board for Codes and Standards (Solar ABCs), *Expedited Permit Process for PV Systems - A Standardized Process for the Review of Small-Scale PV Systems*. The permit process presented in this report was created to meet the needs of the growing, small-scale photovoltaic (PV) market in the U.S. and applicable nationwide. It takes advantage of the many common characteristics inherent in most of the small-scale PV systems installed today to streamline both the application and award of permits.

This study report describes a process that has advantages throughout the permitting cycle. Use of this process simplifies the technical requirements for PV contractors submitting the application for construction of a new PV system while also facilitating the efficient review of the application's electrical and structural content by the local jurisdiction awarding the permit.

Key Findings

Local jurisdictions are responsible for establishing the permitting requirements for new PV system construction and installation in their territory. While jurisdictions everywhere share most of the same challenges in ensuring the safety of new PV systems, experience with PV has led many to implement unnecessarily complex and inefficient permitting procedures. In these cases, barriers of time and expense brought about by requiring multiple departments to review the same application severely inhibit the timely and efficient construction of new PV systems.

At the same time, the majority of residential-sized PV systems installed in the United States share many similarities of design. It is the similarity and commonality of these designs that would allow for a nationally standardized expedited permit process for small-scale PV systems.

Solar ABCs Recommendation

The solution is to begin with a consistent starting point and using the nationally standardized Expedited Permit Process. Jurisdictions can be assured that they are consistent in their application of codes and standards. Contractors can also be assured that the requirements for permitting will not vary dramatically among jurisdictions. Both of these assurances result in safe, cost-effective installations and accelerate PV technology use.

The term "expedited permit process" refers to an organized permitting process by which a majority of small PV systems can be permitted quickly and easily. It is not intended to apply to all types of PV systems. The primary need and use for this process is for systems of less than 10kW maximum power output. The expedited permit process is intended to simplify the structural and electrical review of a small PV system proposal and minimize the need for detailed engineering studies and unnecessary delays.

The majority of PV systems installed in the U.S. meet the eligibility requirements outlined in this process and will benefit from the

CITY OF PORTLAND OREGON - BUREAU OF DEVELOPMENT SERVICES

LAND DIVISION
INFORMATIONAL GUIDE

Solar Access Regulations, Ch 33.639

The solar access regulations encourage variation in the width of lots to maximize solar access for single dwelling detached development and minimize shade on adjacent properties.

Do the solar access requirements apply to my site?

The approval criteria of the solar access chapter apply to lots for single dwelling detached development created as part of a land division proposal in all zones.

What are the solar access criteria?

The solar access approval criteria focus on the width of individual lots. All of the following approval criteria must be met:

- On streets that are within 30 degrees of a true east-west axis (see Figure 639-1). The narrowest lots should be:
 - Interior lots on the south side of the street (see Figure 639-2); and
 - Corner lots on the north side of the street (see Figure 639-3).
- On streets that are within 30 degrees of a true north-south axis, the widest lots should be interior lots on the east or west side of the street (see Figure 639-4).

Frequently asked questions

Q What if I can't meet the solar access approval criteria?
A Where it is not practicable to meet both the approval criteria of the solar access chapter and approval criteria of other chapters in the 6300s, the regulations of the other chapters supersede the approval criteria of the solar access chapter.

Q What if I'm creating lots in a Commercial zone and will sell them to builders, so I don't know if they will be developed with detached or attached houses?
A The Solar Access regulations will only apply to lots we know will be developed with detached housing.

Q Does this apply to land divisions that have a common green instead of a regular street?
A Yes. A common green is defined as a street.

Fig. 639-1. Axis within 30° of North-South and East-West

Fig. 639-2. Interior lots on South side of street

Fig. 639-3. Corner lots on North side of street

Fig. 639-4. Interior lots on East and West side of street

SOLAR ACCESS REGULATIONS
1801 SW FOURTH AVENUE, PORTLAND, OREGON 97201 • 503-823-7526 • www.bds.ci.portland.or.us

Solar Friendly Communities



Permitting best practice goals

1. Reduce time spent on acquiring permits and conducting inspections
2. Make the permit process transparent and predictable to both staff and applicants
3. Ensure the permit process reflects industry best practices
4. Establish a permit fee that appropriately covers local government review and inspection costs



Sample Permit Application



Revised 6/2013 _____ DATE _____

ROOFTOP SOLAR PHOTOVOLTAIC APPLICATION / PERMIT
CITY in MINNESOTA
BUILDING CODE DIVISION

JOB SITE ADDRESS _____

NAME OF BUILDING OWNER _____

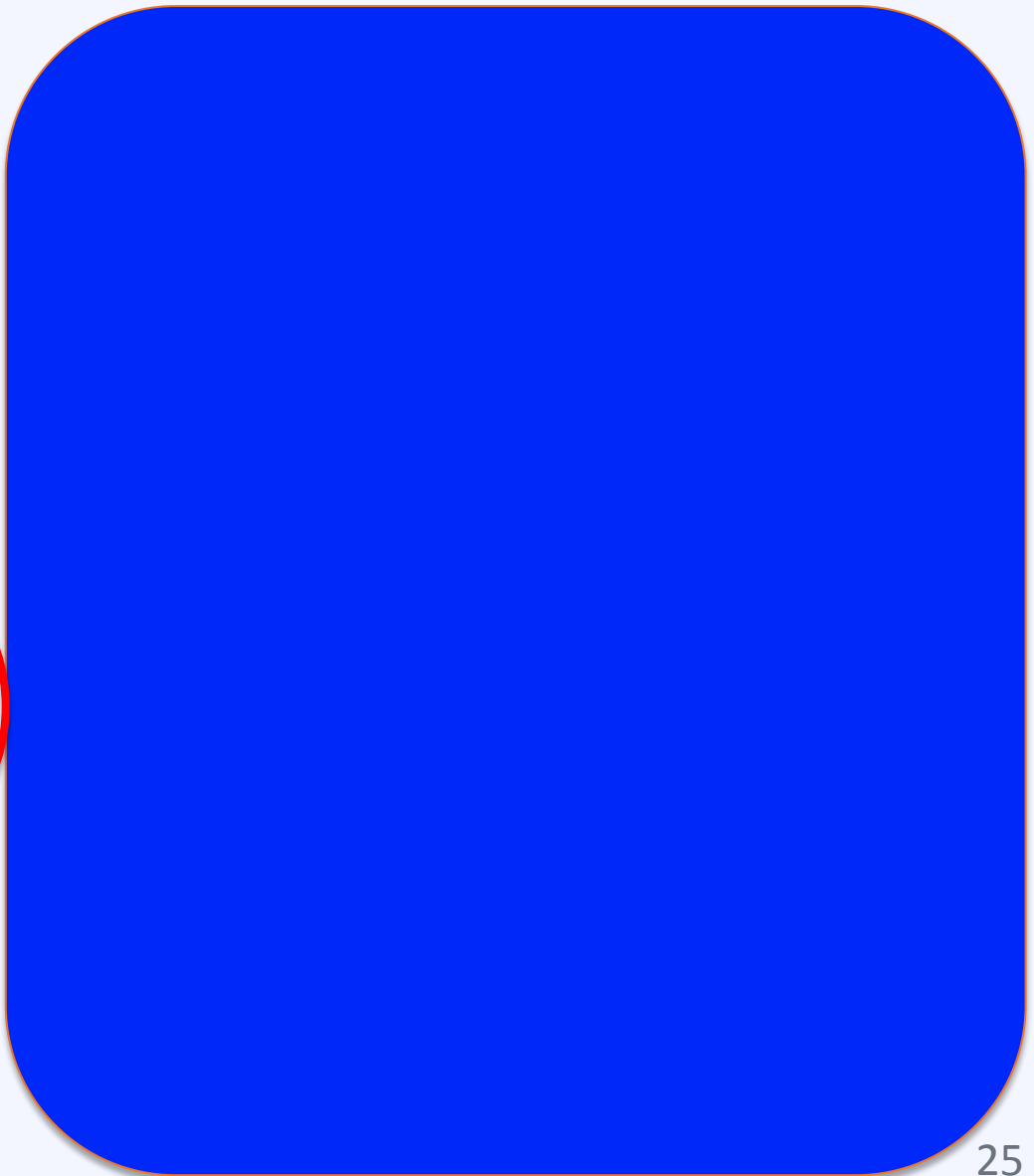
JOB VALUATION _____

Installation	Name _____
	Address _____
Contractor	City _____ State _____ Zip _____
	State License No. _____
	Phone _____

- Required Information for Permit:
1. Site plan showing location of major components on the property and a framing cross section that identifies type of support (rafter or truss), spacing, span dimension, and approximate roof slope. The drawings need not be exactly to scale, but it should represent relative location of components.
 2. Specification sheets and installation manuals for all manufactured components including, but not limited to, PV modules, inverter(s), combiner box, disconnects, and mounting system.
 3. *If city manages electric permit process* - Electrical diagram showing PV array configuration, wiring system, overcurrent protection, inverter disconnects, required ground and AC connection to building (see accompanying standard electrical diagram).

- Step 1: Structural Review of PV Installation Mounting System
1. Is the solar installation to be mounted on pitched roof in good condition, without visible sag or deflection, no cracking or splintering of support, or other potential structural defect? Yes No
For truss systems, additional information may be needed to ascertain the truss' design loads. Please contact the building official for standards on when structural analysis will be needed.
 2. Is the equipment to be flush-mounted to the roof such that the collector surface is parallel to the roof? Yes No
 3. Is the roofing type lightweight? Yes (composition, lightweight masonry, metal, etc...) No
 4. Does the roof have a single layer roof covering? Yes No
- If No to any of questions 1 -4 above, additional documentation may be required demonstrating the structural integrity of the proposed solar installation and all proposed structural modifications, or a statement stamped by a Minnesota licensed/certified structural engineer, and possibly other information. Please contact the building official to determine additional information requirements.
5. Provide method and types of weatherproofing for roof penetrations (e.g. flashing, caulk).

- Mounting System Information:
6. Is the mounting structure an engineered product designed to mount PV modules with no more than an 18" gap between the module frames? Yes No
If No, provide details of structural attachment certified by a design professional. Manufacturer's engineering specifications are sufficient to meet this requirement.
 7. For manufactured mounting systems, fill information on the mounting system below:
 - a. Mounting System Manufacturer _____



Permitting Best Practices

Report of Findings for Development of Standards for Rooftop Solar Thermal Retrofits on Minneapolis and Saint Paul Residential Buildings

Minneapolis Saint Paul Solar America Cities
Management and Operating Contractor for the
National Renewable Energy Laboratory (NREL)

Subcontract No. LGG-1-11883-01
Under
Prime Contract No. DE-AC36-08G028308
with

BKBM Engineers
5930 Brooklyn Boulevard
Minneapolis, MN 55429
BKBM Project No. 11130.20

April 27, 2011

[http://mn.gov/commerce/energy/
images/SolarRoofsReport.pdf](http://mn.gov/commerce/energy/images/SolarRoofsReport.pdf)



Solar Friendly Communities



Public Sector Investment in the community's solar resources to demonstrate viability, community commitment, technological elements.



Agenda

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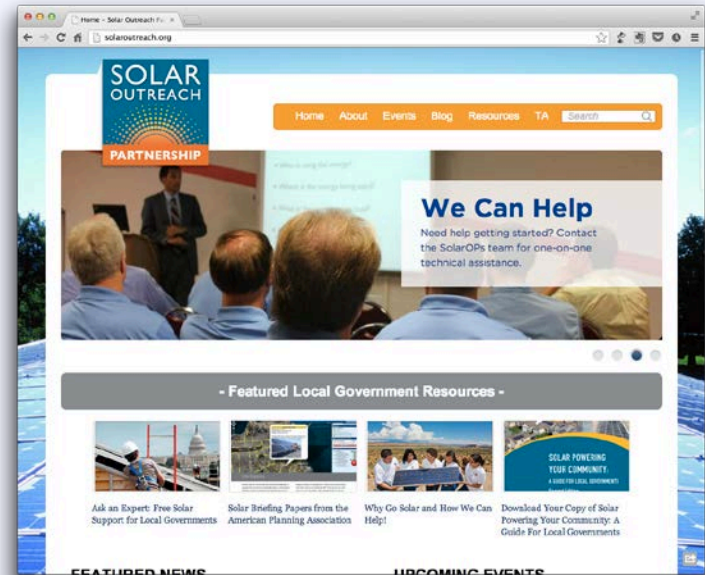
Activity: Next Steps

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

About the SunShot Solar Outreach Partnership

Technical Support

- 'Ask an Expert' Live Web Forums
- 'Ask an Expert' Web Portal
- Peer Exchange Facilitation
- In-Depth Consultations
- Customized Trainings



www.solaroutreach.org

For more information email: solar-usa@iclei.org



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U.S. Department of Energy

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