

# Solar Powering Your Community

## Addressing Soft Costs and Barriers



Powered by

**SunShot**

U.S. Department of Energy

# 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

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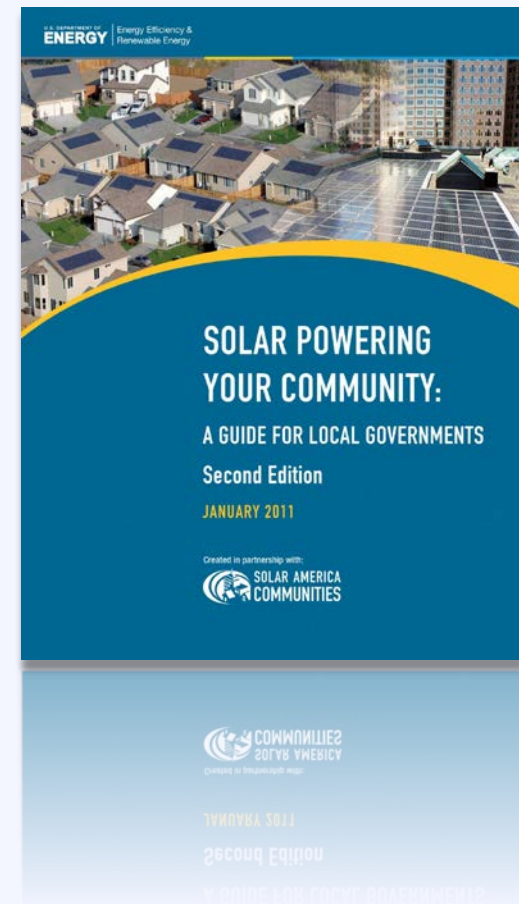
- Increase installed capacity of solar electricity in U.S. communities
- Streamline and standardize **permitting and interconnection processes**
- Improve **planning and zoning codes/regulations** for solar electric technologies
- Increase access to **solar financing options**

# 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](http://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

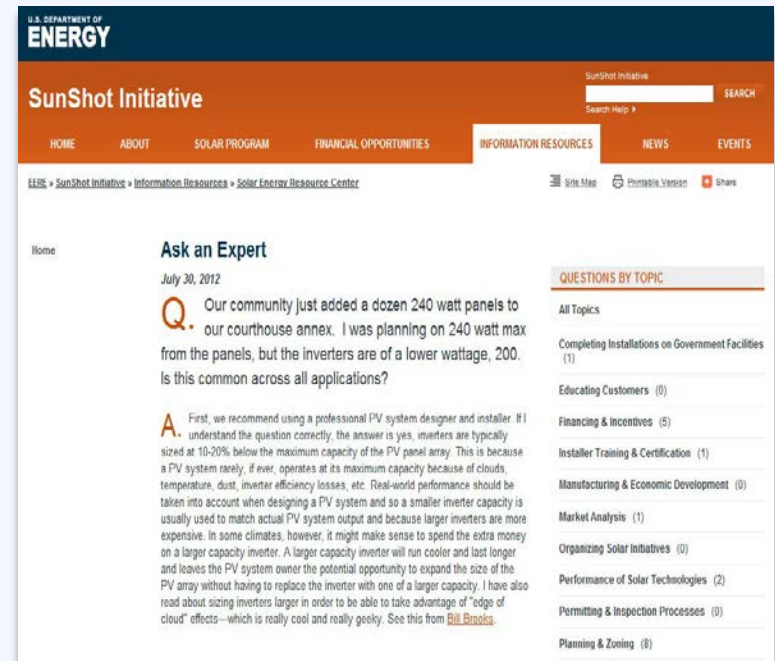
[www4.eere.energy.gov/solar/sunshot/resource\\_center](http://www4.eere.energy.gov/solar/sunshot/resource_center)



# 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



[www4.eere.energy.gov/solar/sunshot/resource\\_center](http://www4.eere.energy.gov/solar/sunshot/resource_center)

For more information email: [solar-usa@iclei.org](mailto:solar-usa@iclei.org)



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**SunShot**

U.S. Department of Energy

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Meister Consultants Group

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(617) 209 -1990

# Agenda

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- |               |   |
|---------------|---|
| 08:40 – 09:00 | Solar 101                                 |
| 09:00 – 09:50 | Creating a Regulatory Landscape for Solar |
| 09:50 – 10:00 | <i>Break</i>                              |
| 10:00 – 10:20 | Benefits and Barriers Activity            |
| 10:20 – 10:50 | Understanding Utility Regulations         |
| 10:50 – 11:20 | Understanding Solar Financing             |
| 11:20 – 11:30 | <i>Break</i>                              |
| 11:30 – 12:00 | Installing Solar on Municipal Facilities  |
| 12:00 – 12:10 | Next Steps for Solar in Region            |



# Agenda

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08:40 – 09:00

Solar 101

09:00 – 09:50

Creating a Regulatory Landscape for Solar

09:50 – 10:00

*Break*

10:00 – 10:20

Benefits and Barriers Activity

10:20 – 10:50

Understanding Utility Regulations

10:50 – 11:20

Understanding Solar Financing

11:20 – 11:30

*Break*

11:30 – 12:00

Installing Solar on Municipal Facilities

12:00 – 12:10

Next Steps for Solar in Region

# Poll

## Who's in the room?

# Poll

**What is your experience with solar?**

# Solar Technologies



**Solar Photovoltaic (PV)**



**Solar Hot Water**



**Concentrated Solar Power**

# Solar Technologies



**Solar Photovoltaic (PV)**

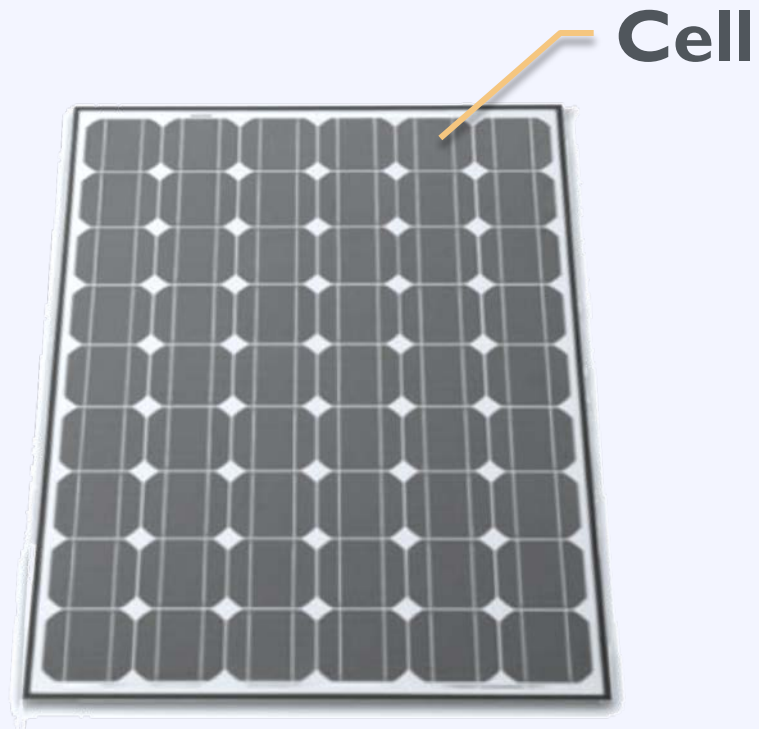


Solar Hot Water



Concentrated Solar Power

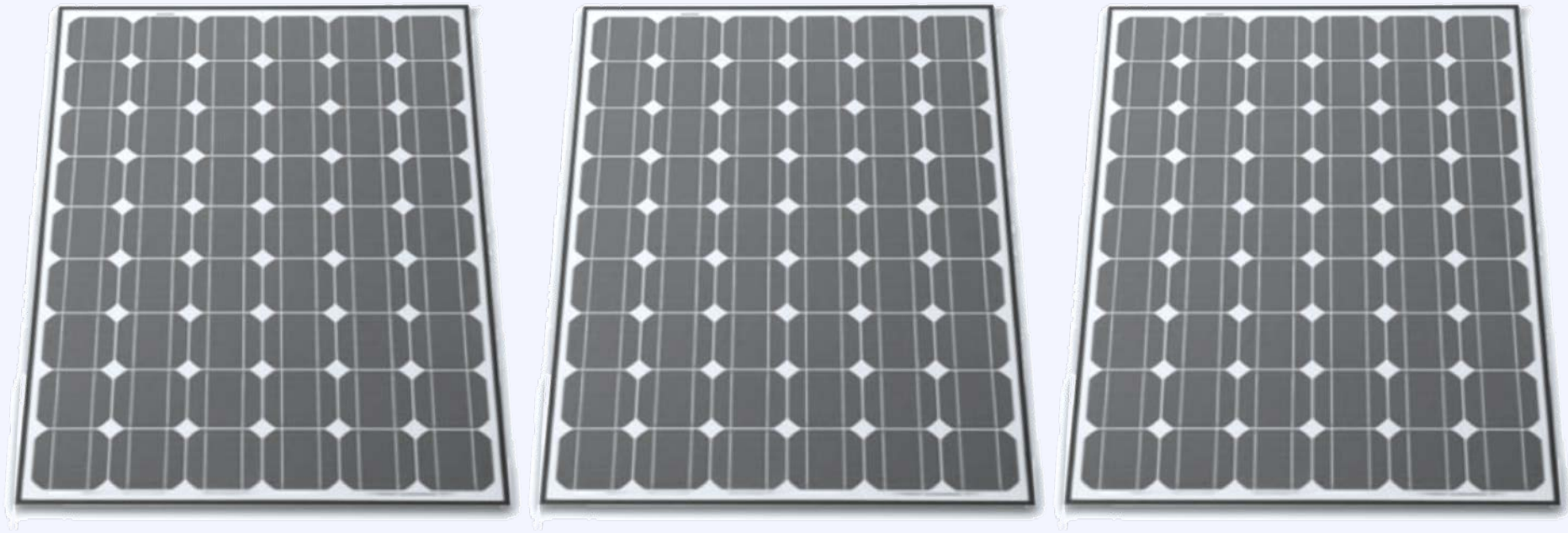
# Some Basic Terminology



**Panel / Module**

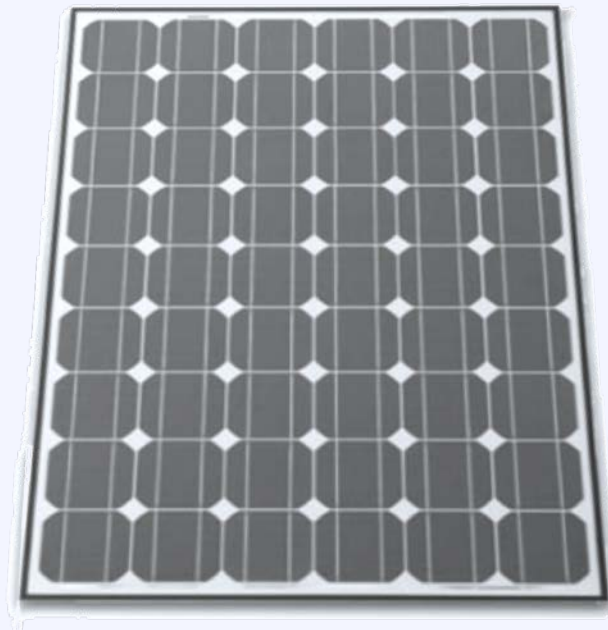
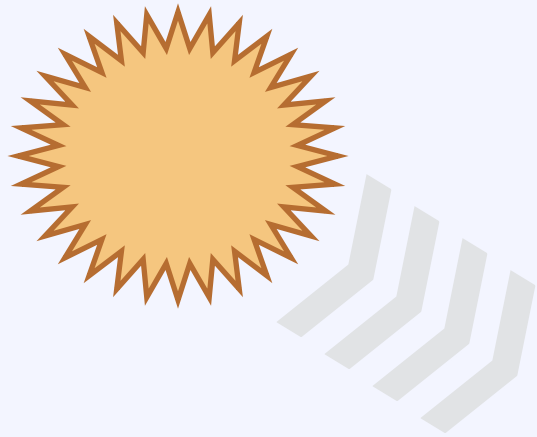


# Some Basic Terminology



**Array**

# Some Basic Terminology



**Production**  
*Kilowatt-hour (kWh)*

**Capacity / Power**  
*kilowatt (kW)*

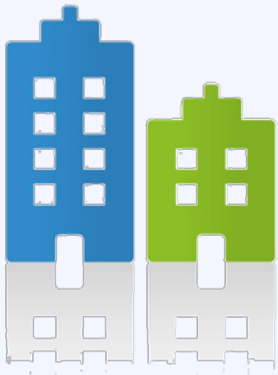
# Some Basic Terminology



**Residence**  
5 kW



**Factory**  
1 MW+



**Office**  
50 – 500 kW



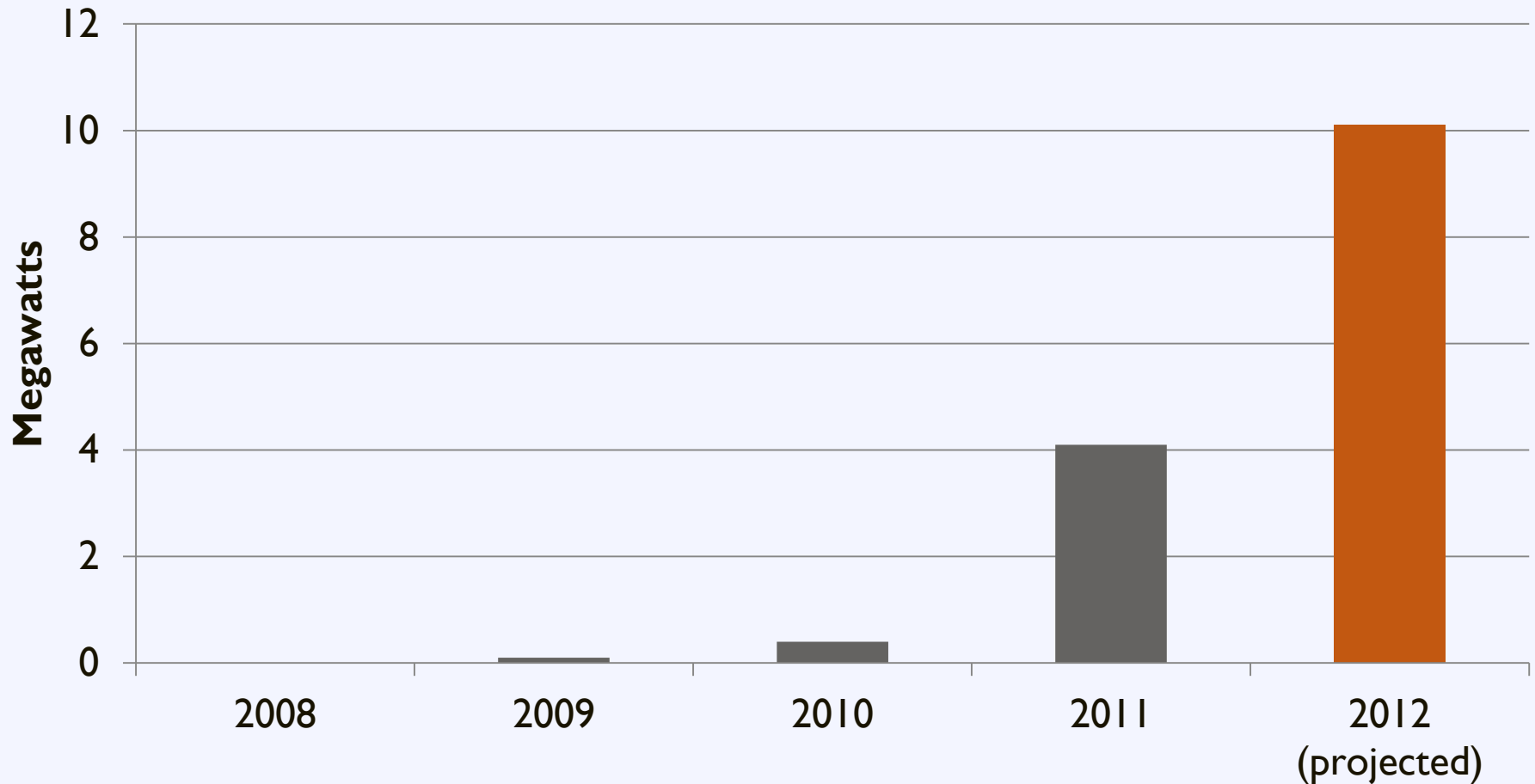
**Utility**  
2 MW+

# Workshop Goal

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

# South Carolina Solar PV Market

## Installed Capacity of Solar PV



**Explore benefits**

and

**Overcome barriers**



# Activity: Identifying Benefits

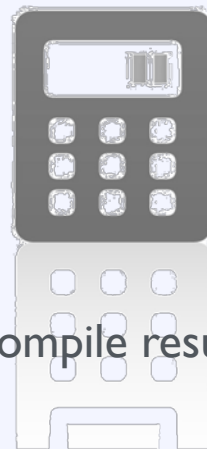
What is the greatest benefit solar can bring to your community? **[Blue Card]**

Right Now



Write answer on card

During Session



Compile results

After Break



Group discussion

# Activity: Addressing Barriers

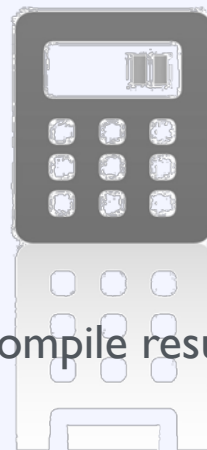
What is the greatest barrier to solar adoption in your community? **[Green Card]**

**Right Now**



Write answer on card

**During Session**



Compile results

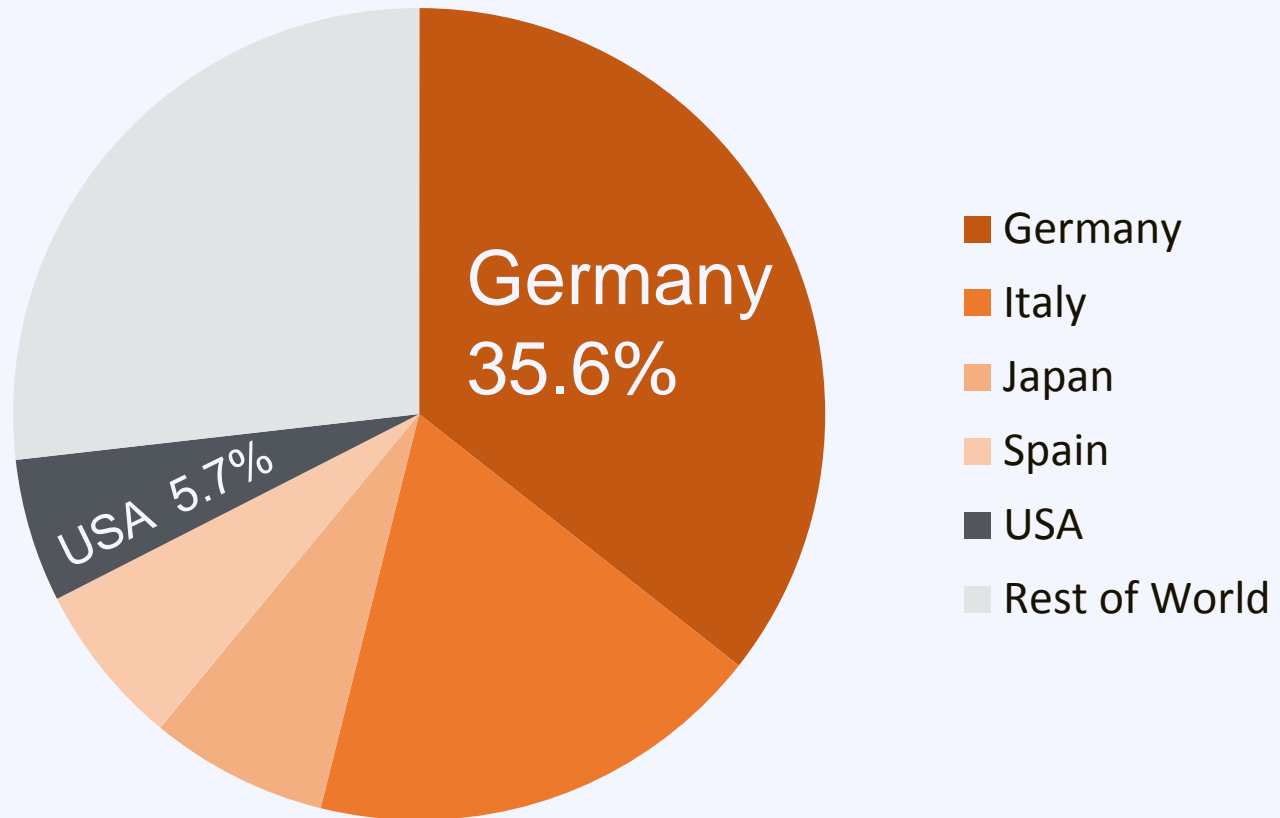
**After Break**



Group discussion

# Installed Capacity

## Top 5 Countries Solar Operating Capacity



# Installed Capacity

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Total installed solar capacity in the US

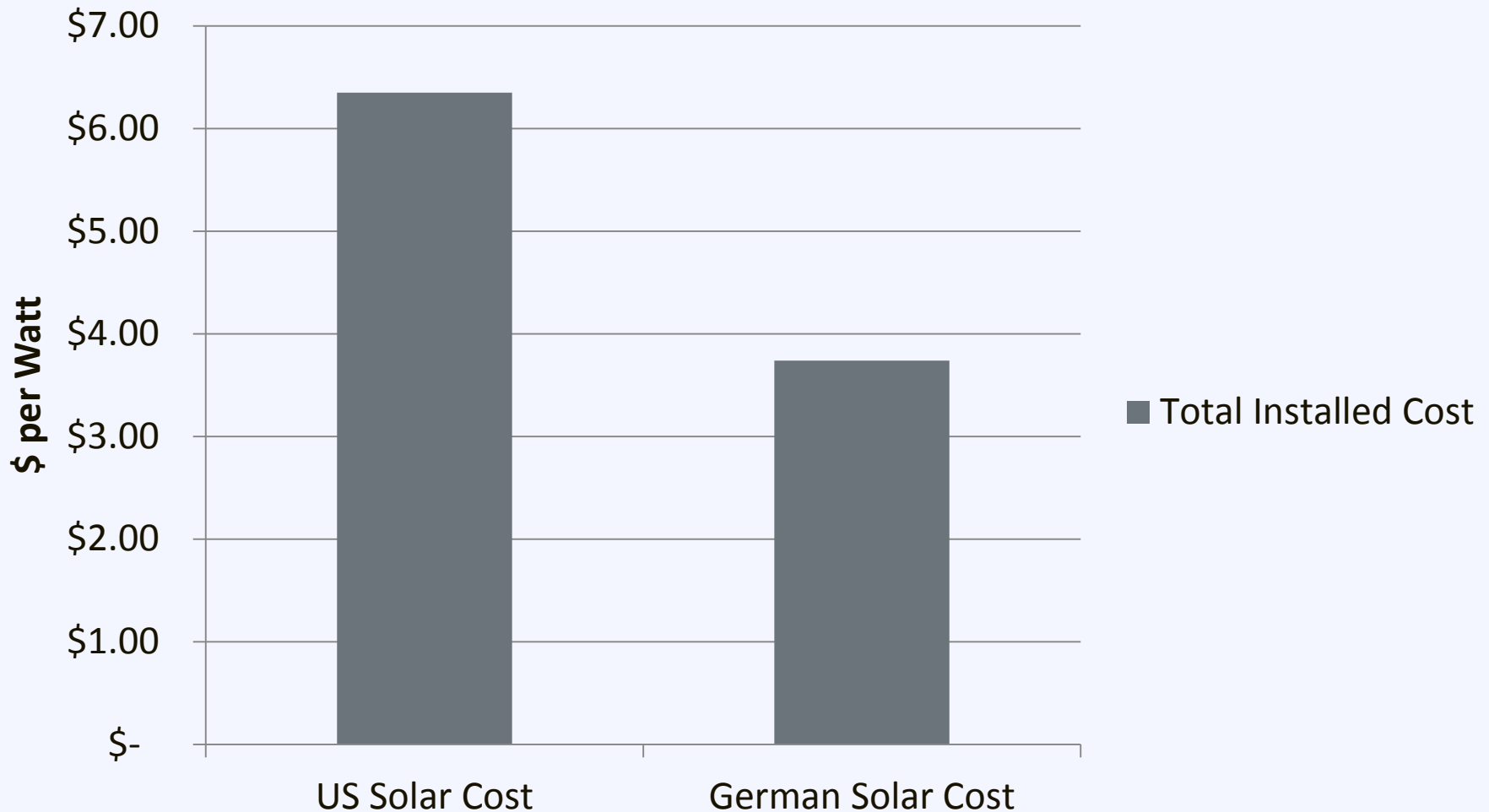
4 GW

Capacity installed in Germany in Dec 2011

4 GW

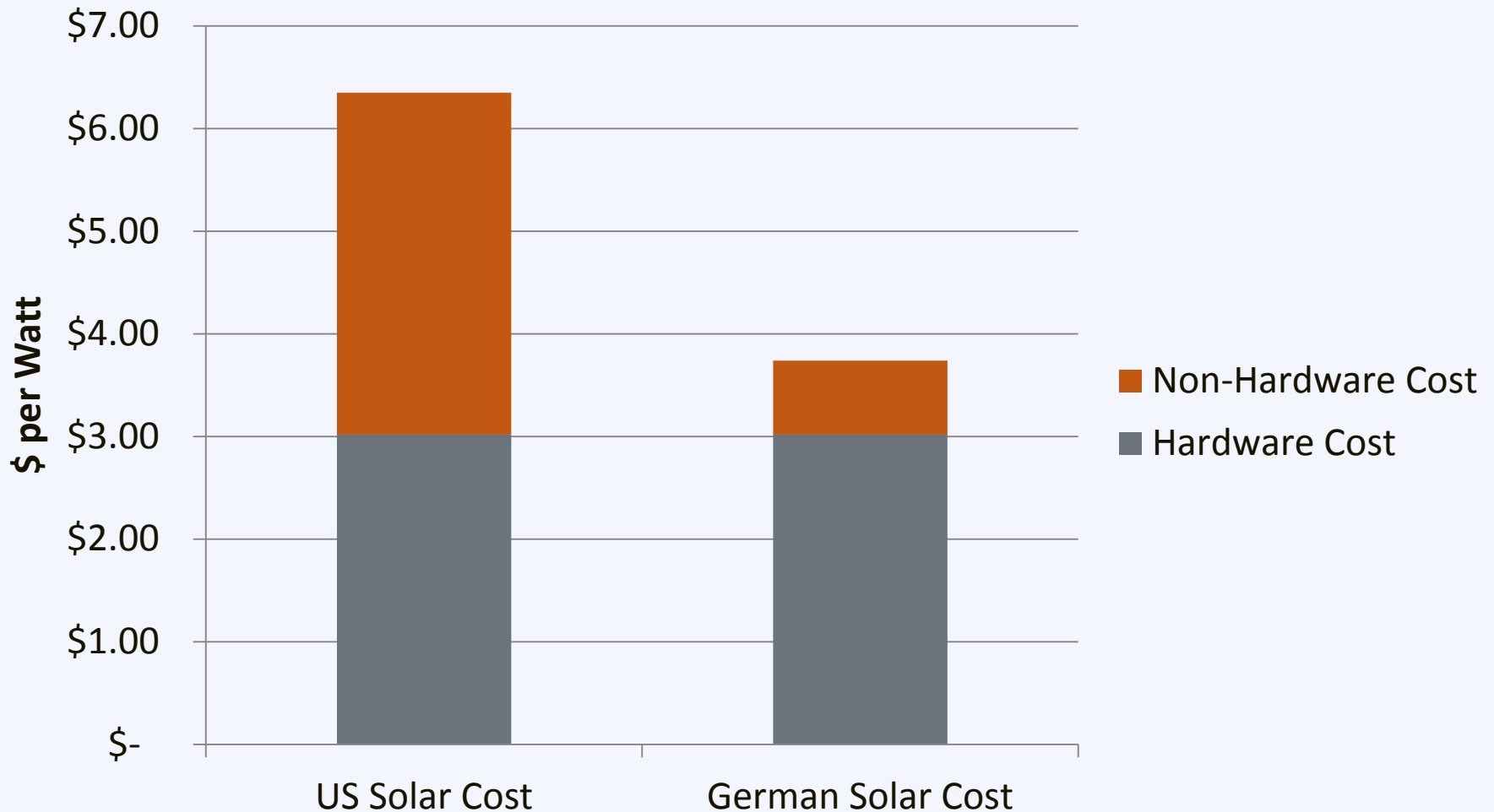
# The Cost of Solar in the US

## Comparison of US and German Solar Costs



# The Cost of Solar in the US

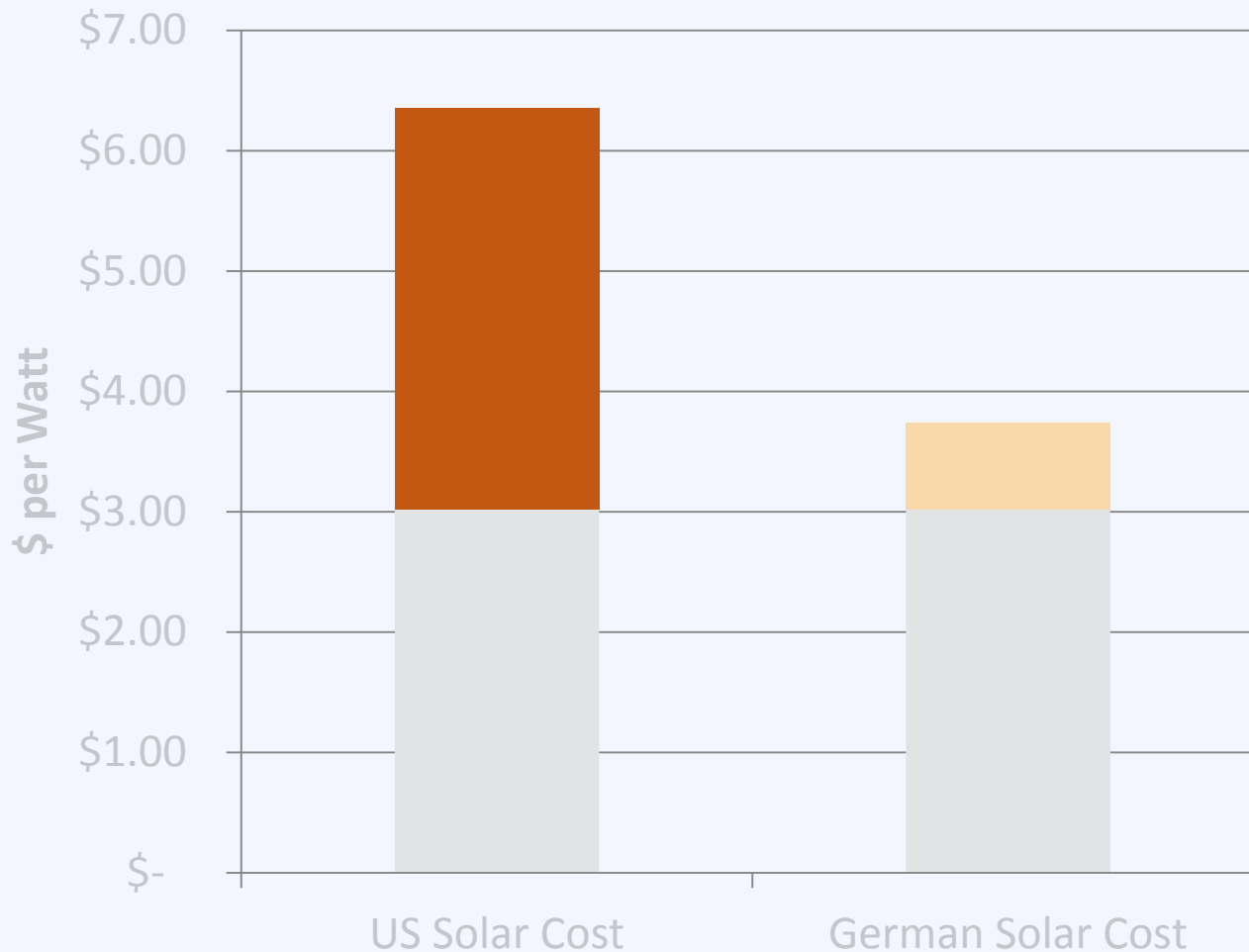
## Comparison of US and German Solar Costs





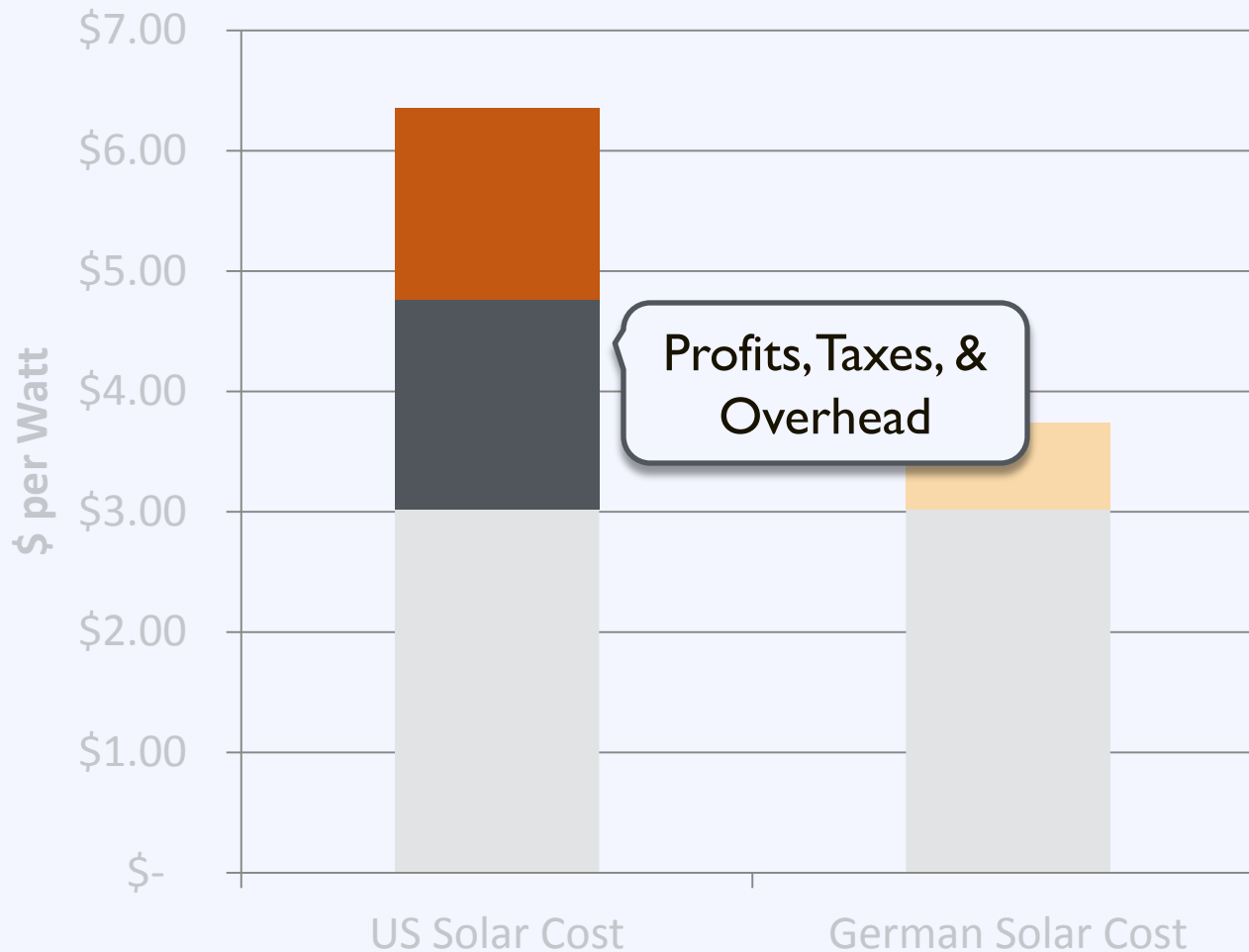
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## Comparison of US and German Solar Costs

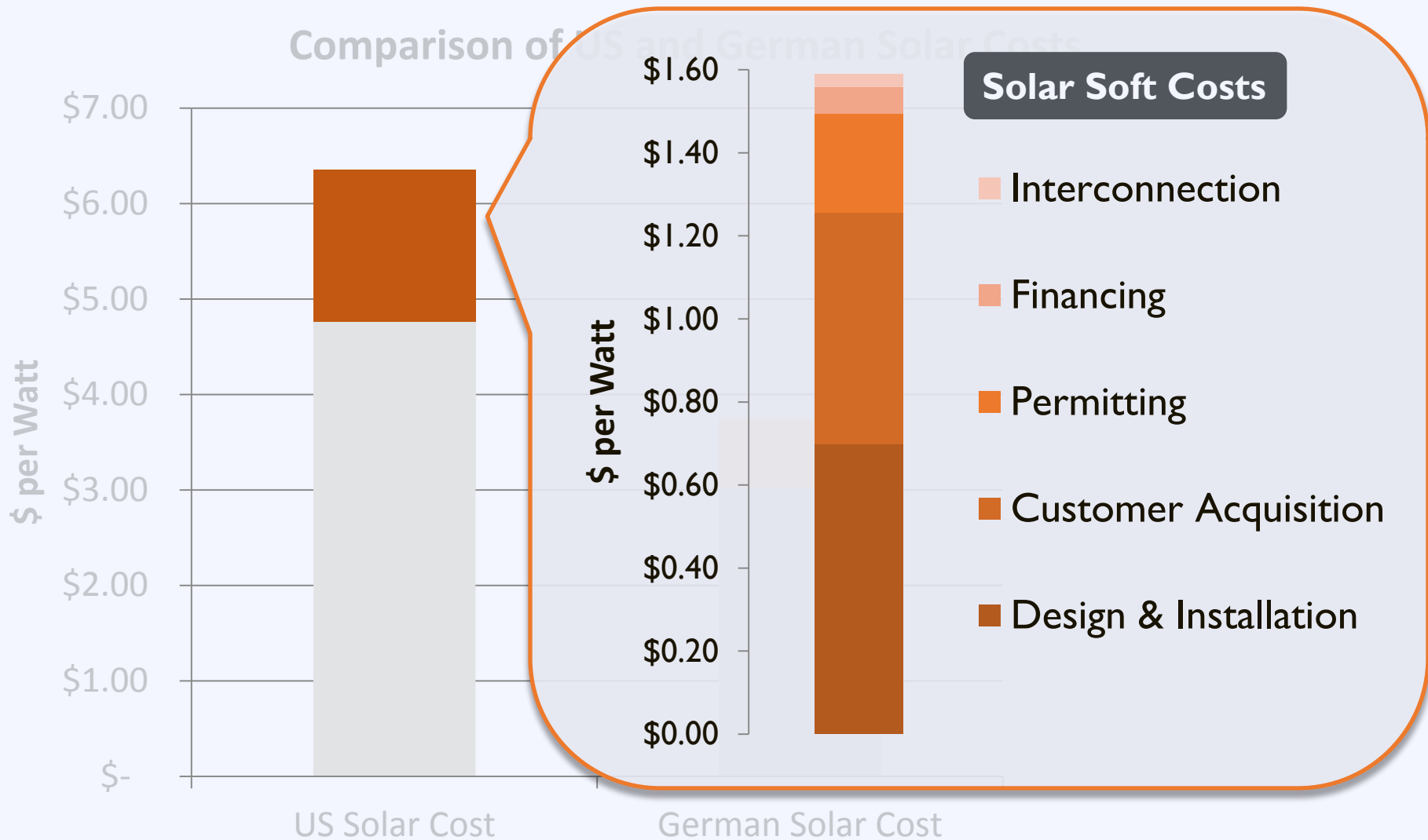


# The Cost of Solar in the US

## Comparison of US and German Solar Costs



# The Cost of Solar in the US



# Time to Installation



**New York City's  
Goal**

**100 days**

from inception to completion



**Germany  
Today**

**8 days**

from inception to completion

# Germany's Success

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Consistency and Transparency

through

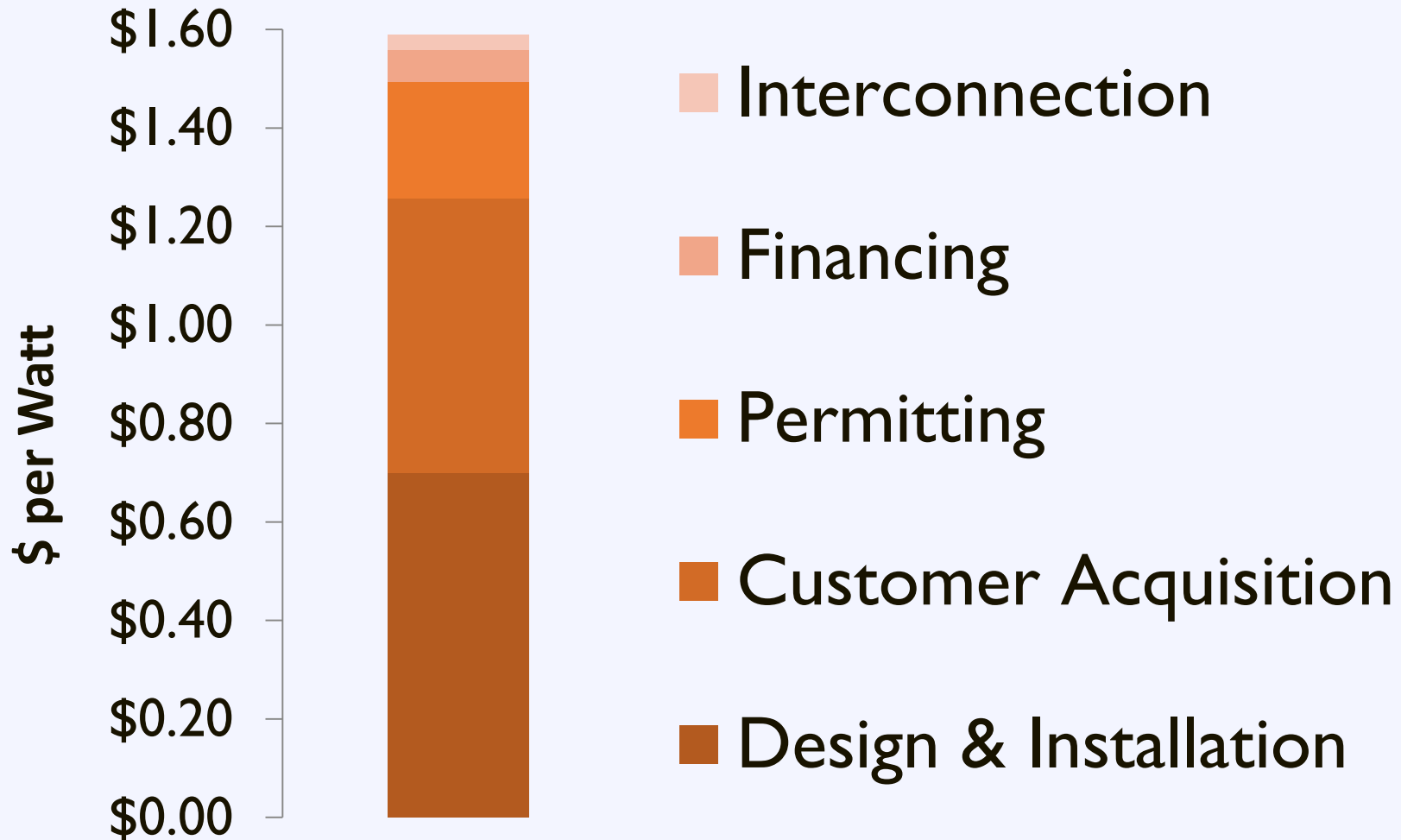
Standardized Processes

# Agenda

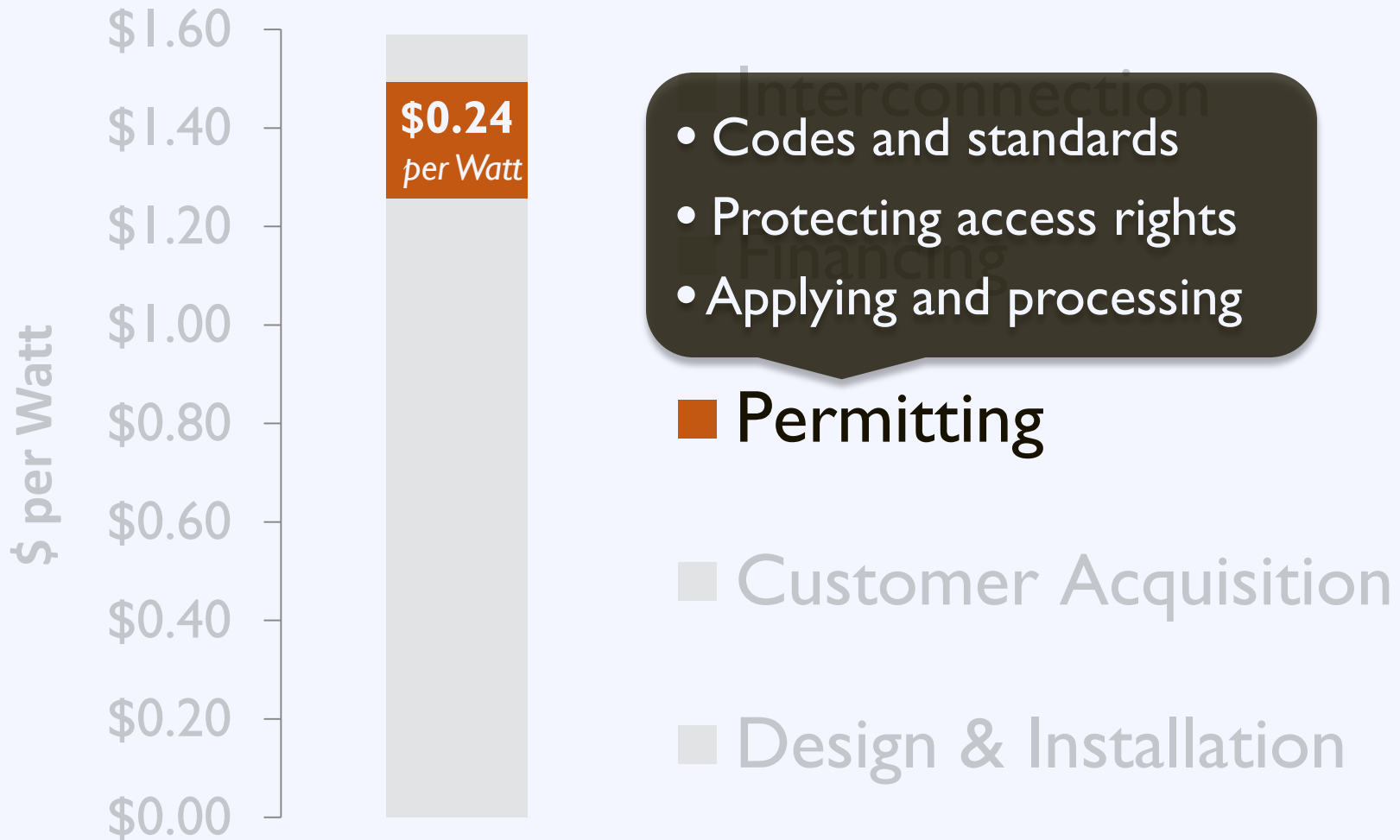
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# Mitigate Soft Costs



# Mitigate Soft Costs





# Zoning Codes: Regulations

Section	Topics to Address
<b>Permitted Uses</b>	Primary vs. accessory
<b>Dimensional Standards</b>	<ul style="list-style-type: none"><li>• Height</li><li>• Lot coverage</li><li>• Setbacks</li></ul>
<b>Development Standards</b>	<ul style="list-style-type: none"><li>• Screening</li><li>• Placement</li><li>• Site Planning</li></ul>
<b>Definitions</b>	Types of solar systems

# Zoning Codes: Small Scale Solar

## Typical Requirements:

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

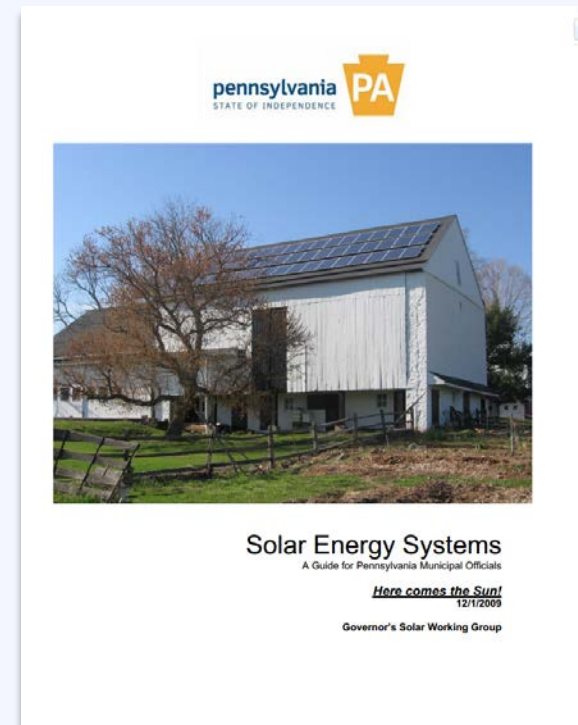


# Zoning Code: Small Scale Solar

## Resource Pennsylvania Model Ordinance

Prepared to assist local governments in establishing reasonable standards to facilitate the development of small-scale solar

[state.pa.us](http://state.pa.us)



# Zoning Codes: Large Scale Solar

## Typical Requirements:

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



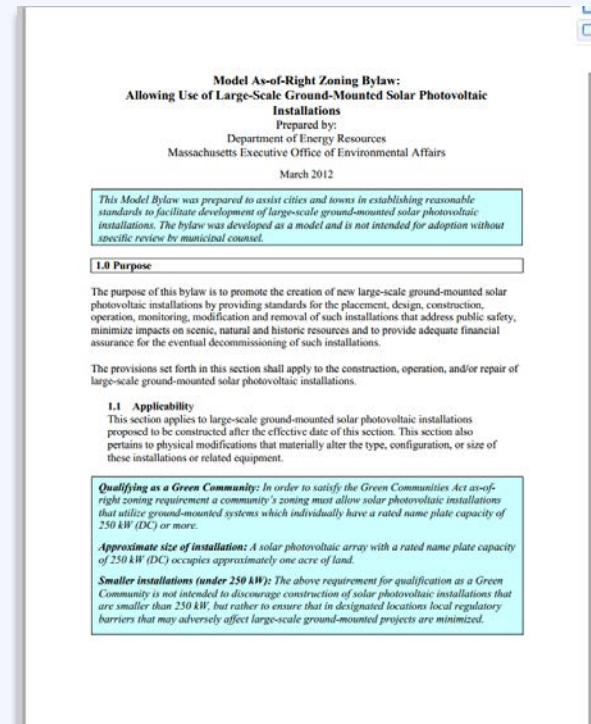
# Zoning Code: Large Scale Solar

Resource

## Massachusetts Model Ordinance

Prepared to assist local governments in establishing reasonable standards to facilitate the development of large-scale solar installations

[www.mass.gov](http://www.mass.gov)



# Solar Access

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## 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

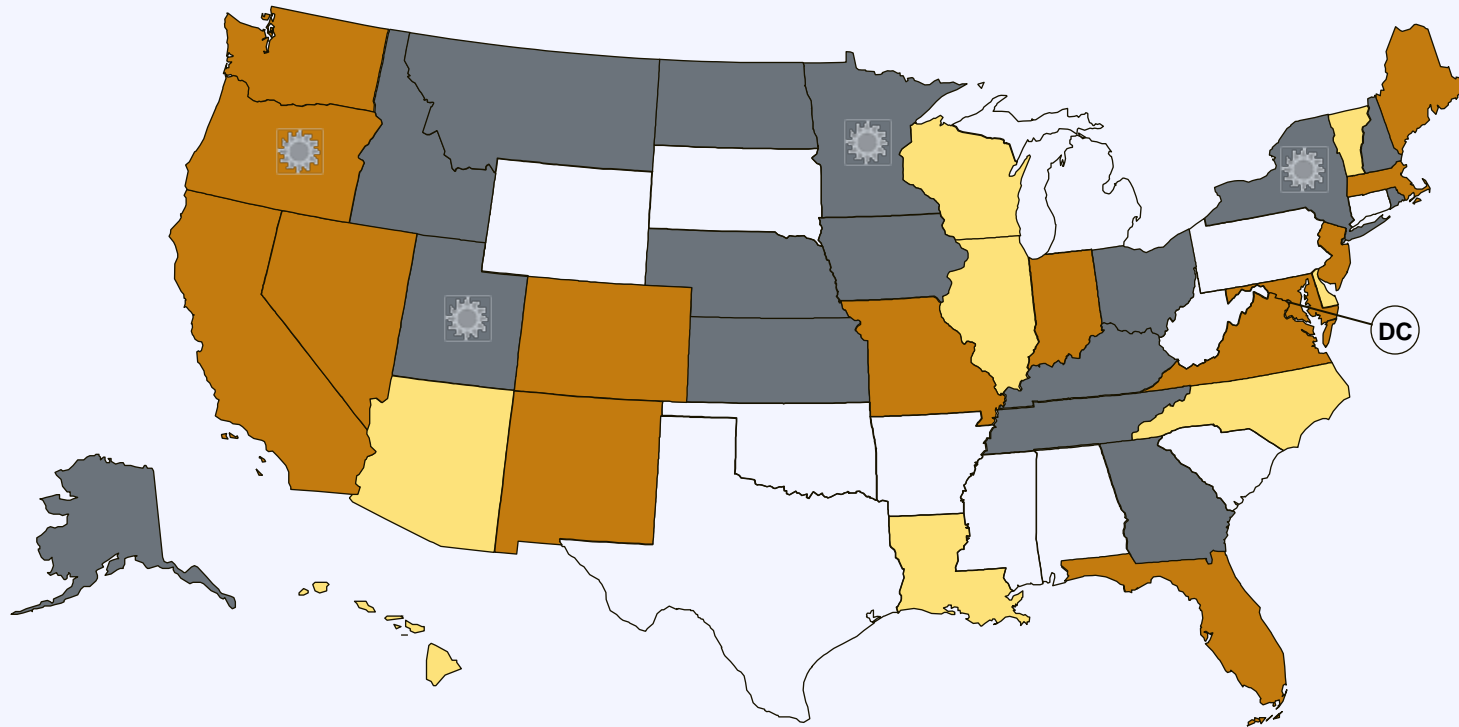


# Fontainebleau V. Eden Roc (1959)



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

# 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

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## Solar access ordinances best practices:

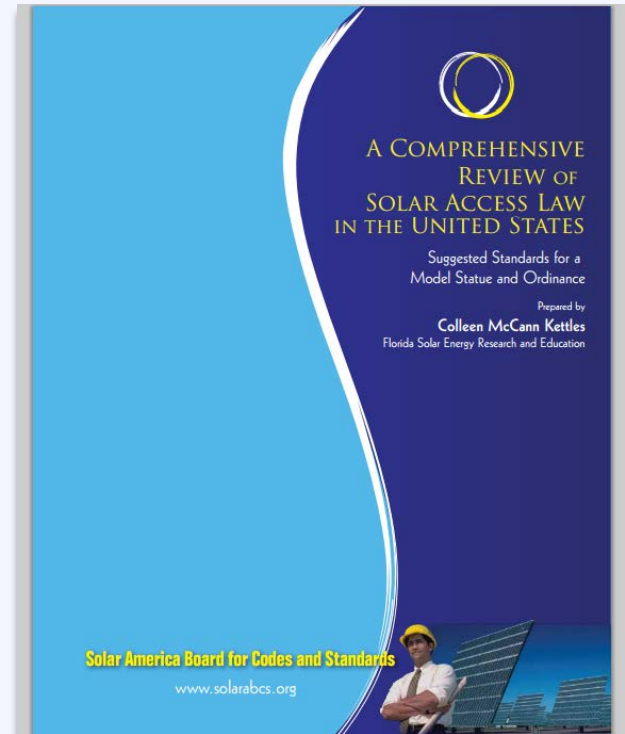
- Define the solar energy equipment protected
- Define the types of structures covered by the law
- Quantify what constitutes unreasonable restrictions
- Award costs to prevailing parties in civil action with HOA
- Don't restrict solar installations because of aesthetics

# Solar Access

## Resource Solar ABCs

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

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



# The Permitting Process: Challenges

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**18,000+** local jurisdictions  
with unique permitting requirements

# The Permitting Process: Challenges

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Local permitting processes add on average

**\$2,516**

to the installation cost of residential PV

# The Permitting Process: Challenges



# Expedited Permitting

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## Solar Permitting Best Practices:

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

# Expedited Permitting

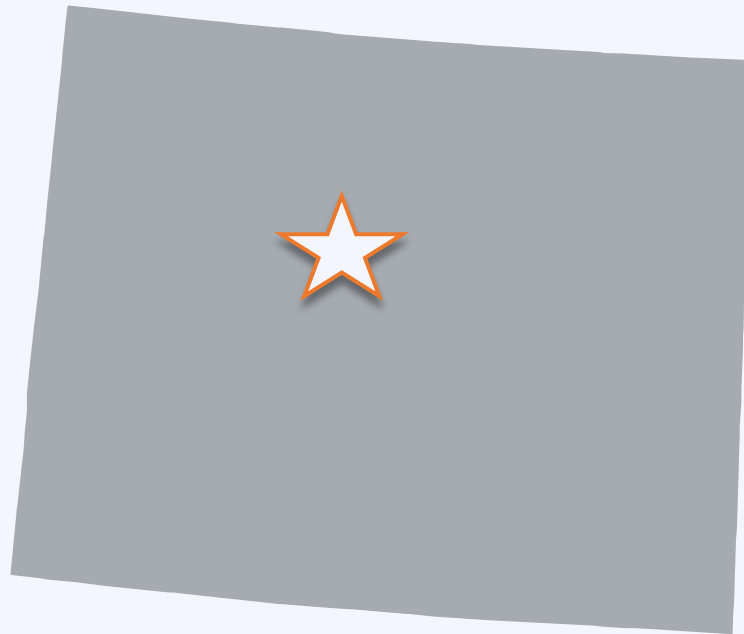
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## Solar Permitting Best Practices:

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

# Expedited Permitting: Case Study

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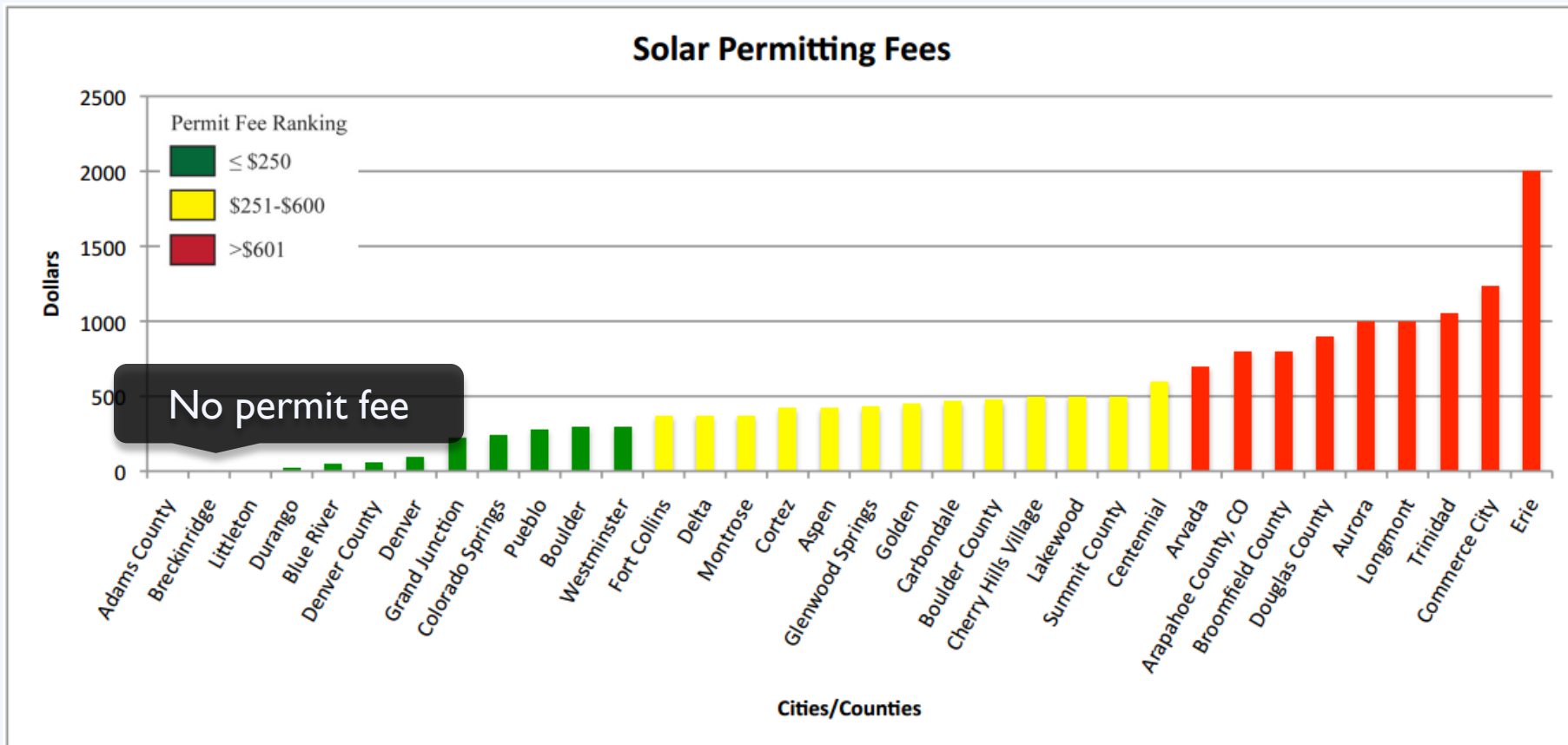
**Breckenridge, Colorado**

Population: 4,540



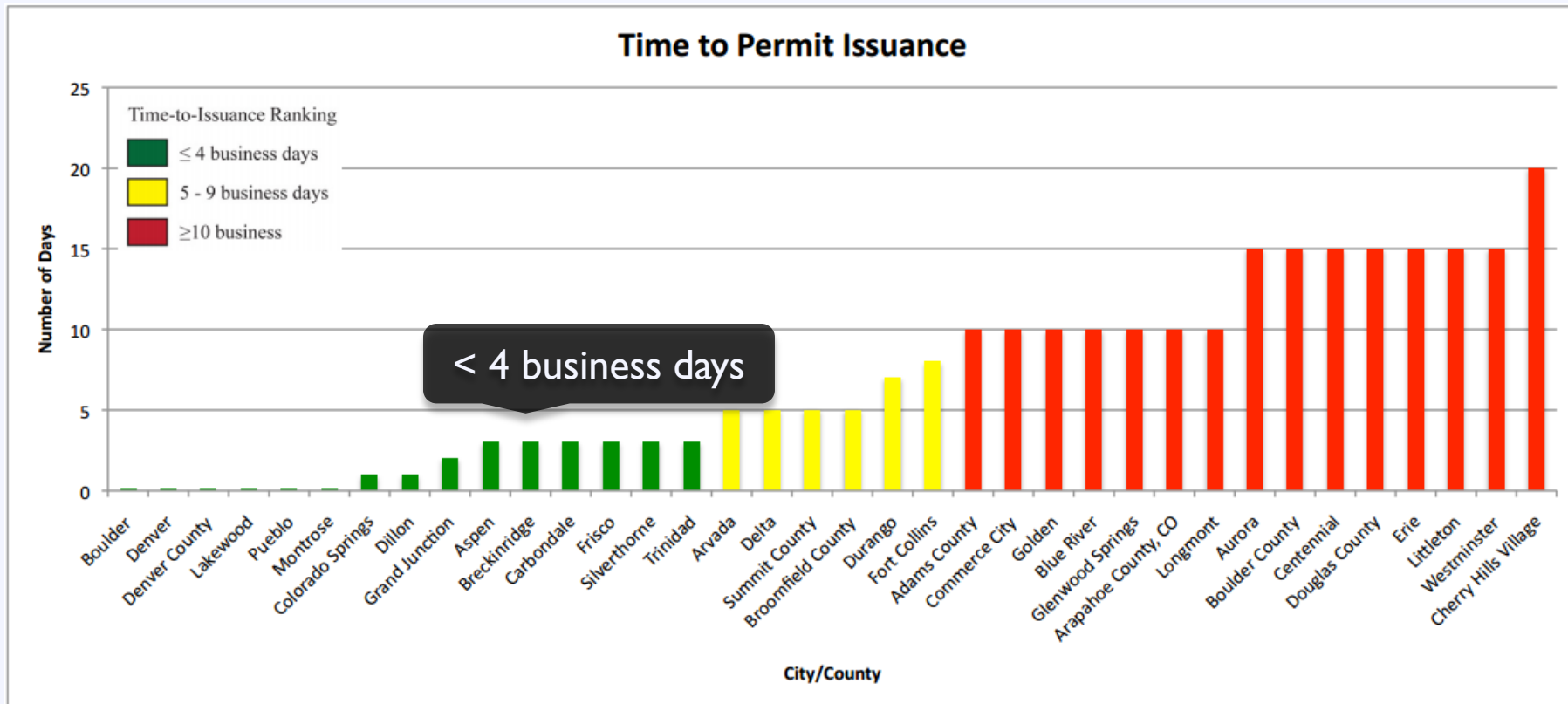
# Expedited Permitting: Case Study

Breckenridge charges no fees to file for a solar permit



# Expedited Permitting: Case Study

Breckenridge offers a short turn around time for solar permits



# Expedited Permitting: Case Study

Jobs | FREE RIDE | Forms & Documents | Town Calendar | Contact Us | Water Bill Access | Text Size + -

TOWN OF BRECKENRIDGE

BRECKENRIDGE COLORADO

Quick Links  
Search... GO

HOME ◊ ABOUT BRECKENRIDGE ◊ GOVERNMENT ◊ DEPARTMENTS & SERVICES ◊ ARTS ◊ RECREATION ◊ WHAT'S NEW ◊ I WANT TO...

**Electronic materials**

▼ Building Department

- Adopted Building Codes and Amendments
- Climactic and Geographical Design Criteria 2006 IRC Table R301.2(1)
- Permits and Applications
- Inspections
- Electrical, Mechanical & Plumbing Applications
- Hot Tub Permits
- **Solar Panel Permits**
- Frequently Asked Questions
- Contractor's Licensing

How Much Will My Permit

**Standardized permit requirements**

Solar Panel Permits

E-mail Print

**BUILDING & PLANNING DEPARTMENT REQUIREMENTS FOR PHOTOVOLTAIC (SOLAR PANEL) INSTALLATIONS**

The solar panel installer is responsible for insuring that all of the code requirements are met and permits issued.

Required permits are: Development, Building and Electrical Permits.

**Planning Department / Development Permit Requirements:**

- Outside of the Conservation District, [Class D Permit](#)
- Within the Conservation District, [Class C Minor Permit](#)
- Letter of approval from the Homeowners Association (strongly suggested)

Refer to the [Breckenridge Development Code](#), reference [Section 9-1-19, Policy 5 \(Absolute\)](#) regarding solar panel policies

**Building Department Permits / Building & Electrical Permit Requirements:**

- Meet with a Town of Breckenridge Planner (see above requirements)
- [Building Permit](#) (Submit a completed building permit application, along with two photovoltaic system electrical diagram drawings, stamped by a Colorado licensed engineer)
- [Electrical Permit](#)

**Contractor Requirements**

- Must be certified by North American Certified Energy Practitioners ([www.nabcep.org](http://www.nabcep.org))
- Must have a current Town of Breckenridge [Business License](#), available through the Town

# 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.

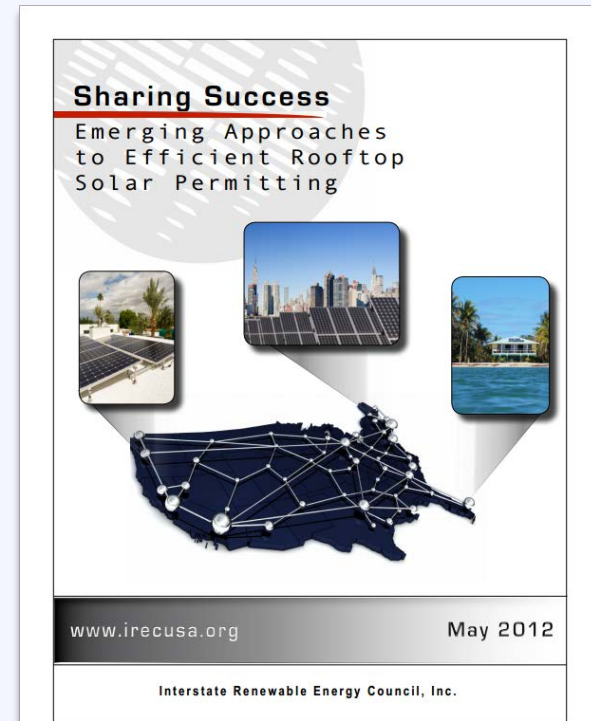
- [ASTM](#)
- [IAPMO Standards](#)
- [International Code Council](#)
- [International Electrotechnical Commission](#)
- [IEEE](#)
- [National Fire Protection Association](#)
- [SEMI](#)
- [Underwriters Laboratories](#)

# Expedited Permitting

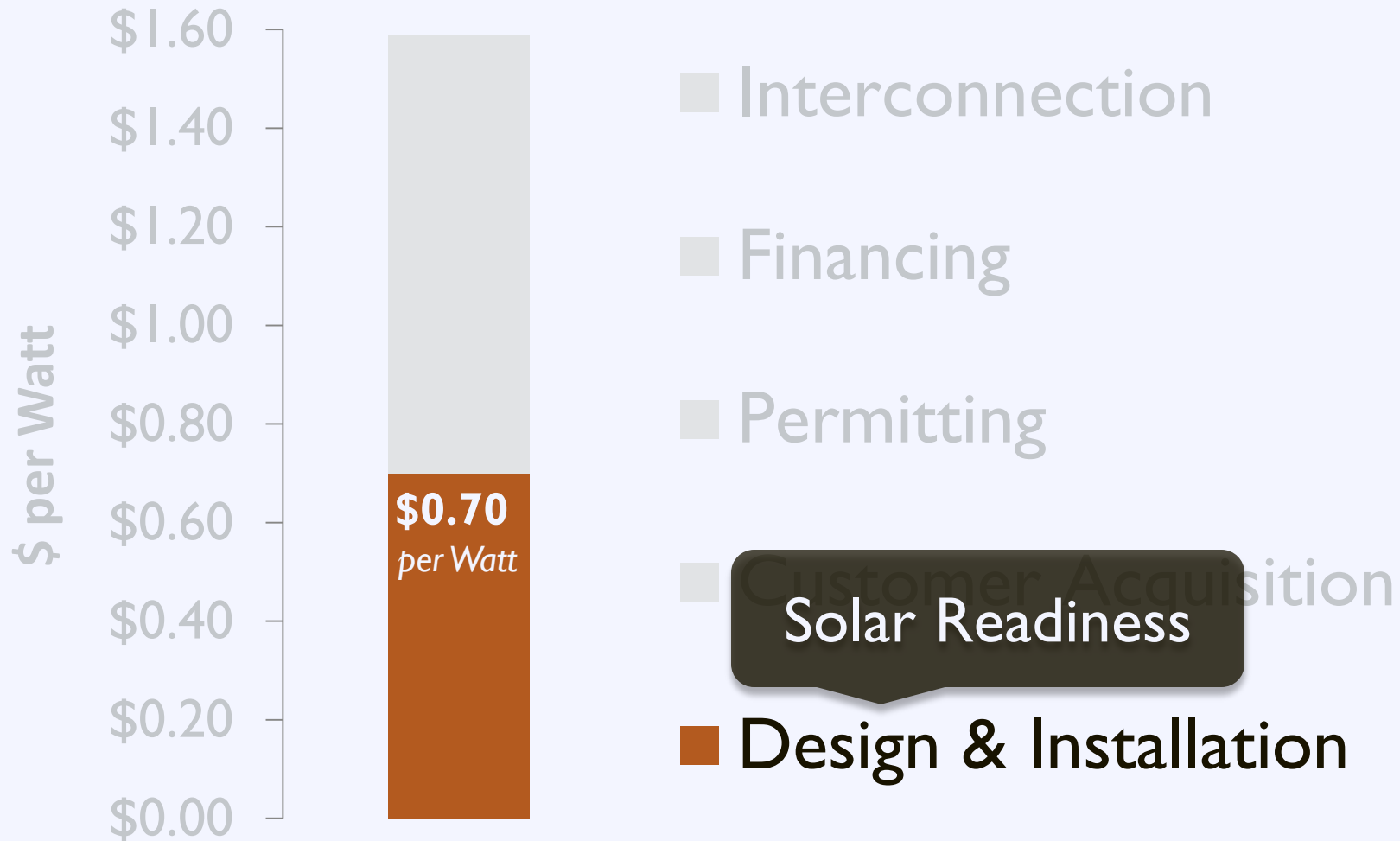
## Resource Interstate Renewable Energy Council

Outlines emerging approaches to efficient rooftop solar permitting

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



# Mitigate Soft Costs

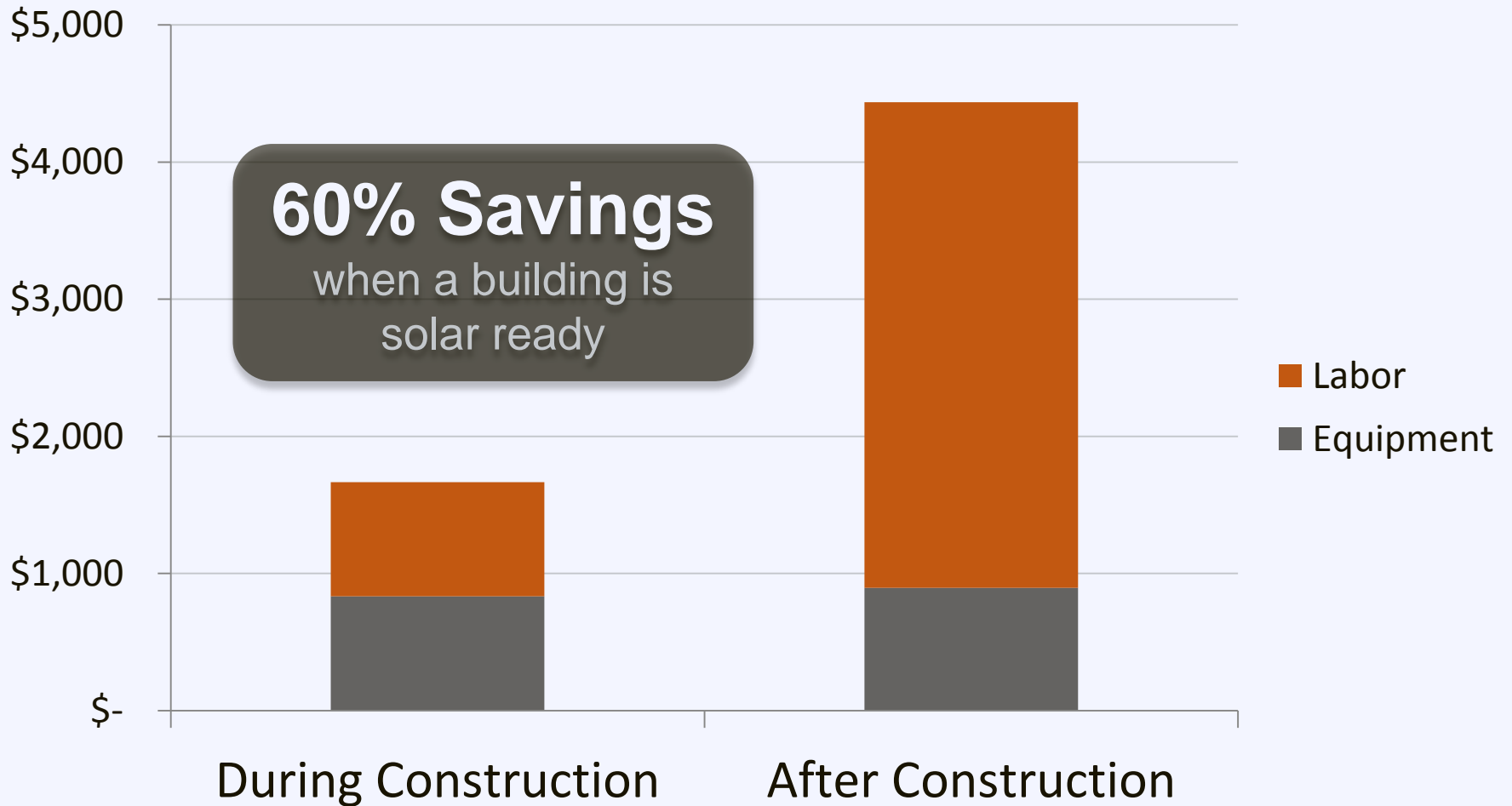


# Solar Readiness

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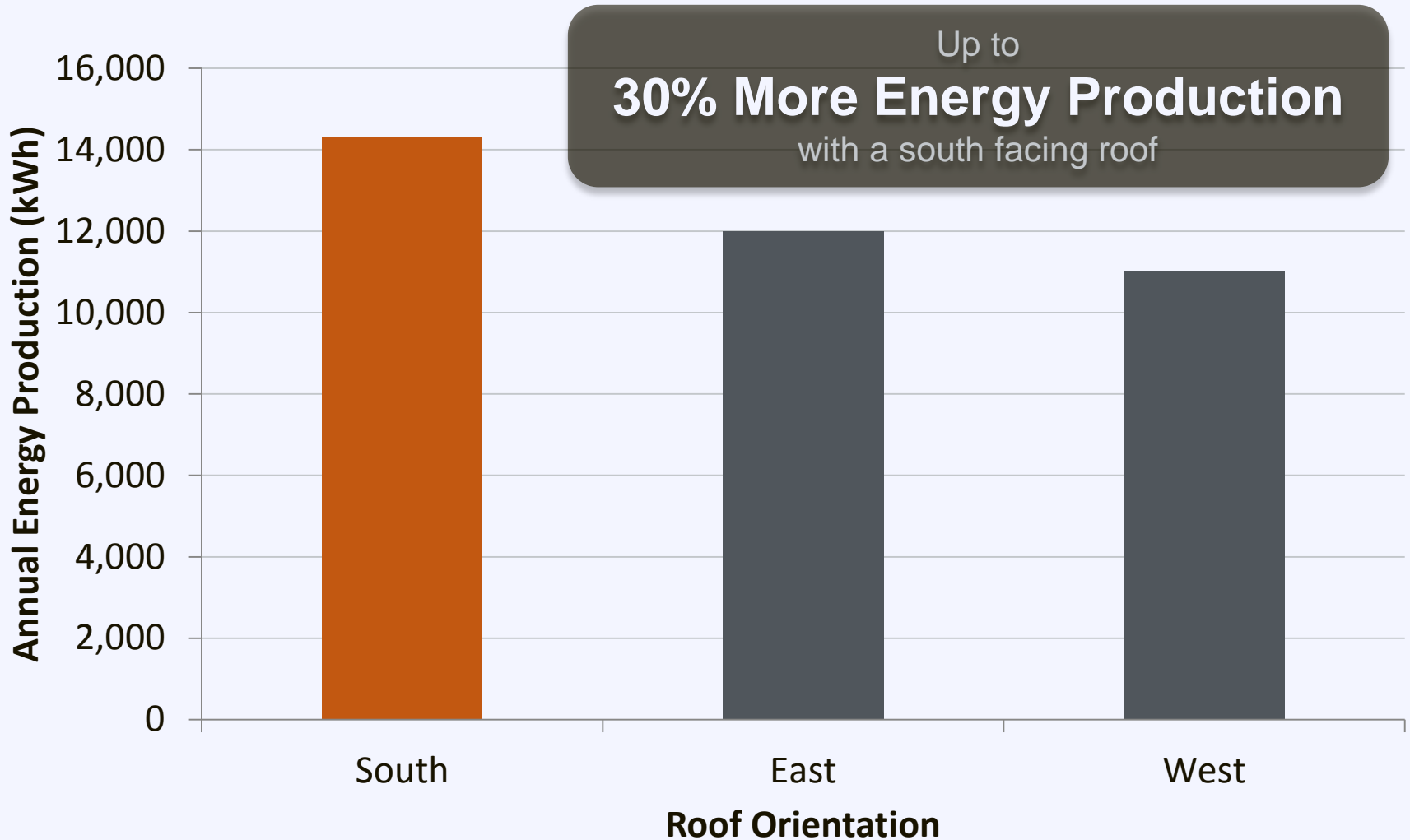
Creating solar-ready guidelines and promoting energy efficiency at the outset can help make future solar installations easier and more cost effective.

# Solar Readiness





# Solar Readiness



# Solar Readiness

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## 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: Case Study

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**Oro Valley, Arizona**  
Population: 40,195

# Solar Readiness: Case Study

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## Oro Valley Requirements:

- Installation of conduit or sleeve for wiring
- A space near the service equipment to mount additional PV equipment
- Installation of a circuit breaker that can be back-fed from a PV system

# Solar Readiness

## Resource NREL

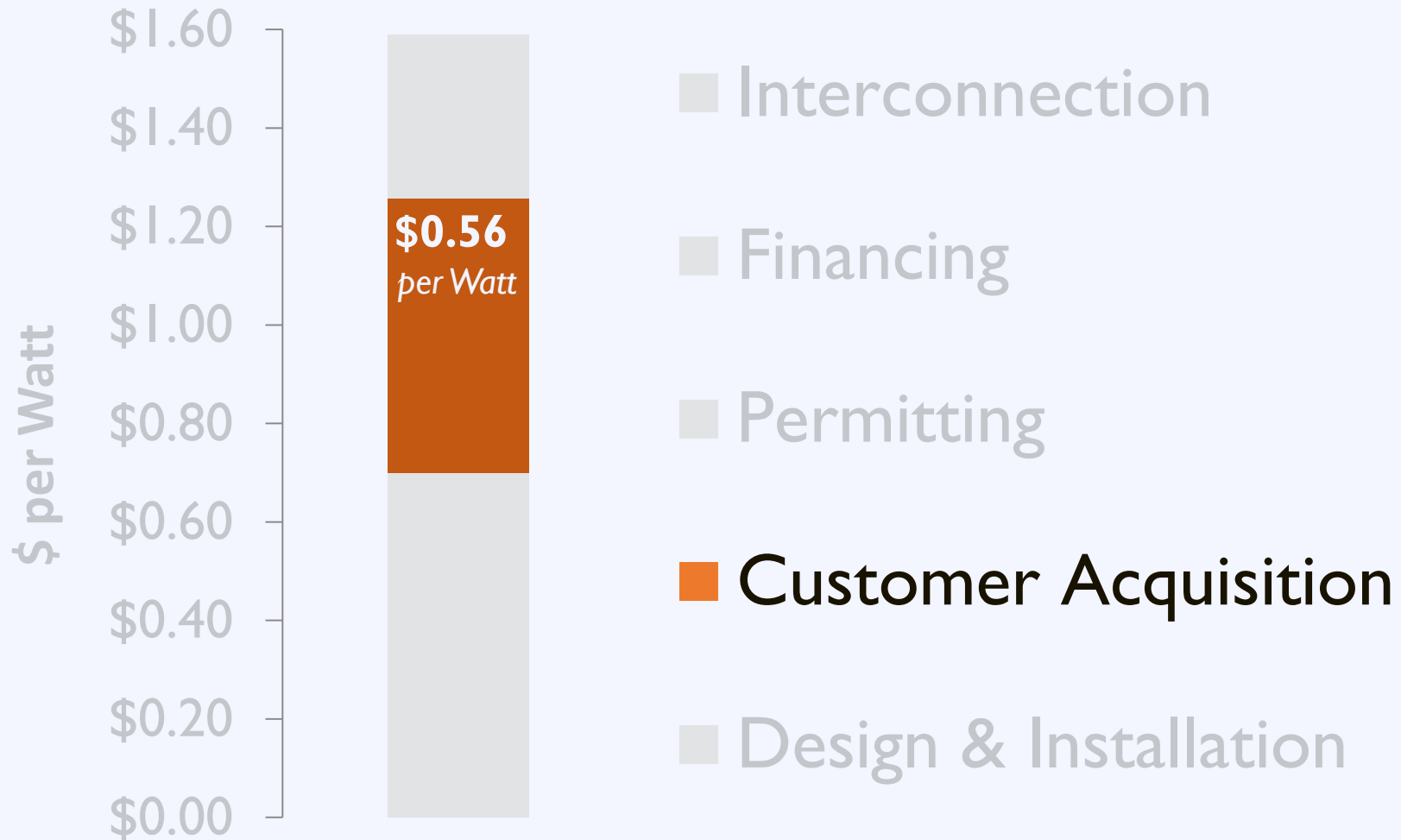
Creating a solar ready guide for buildings:

- Legislation
- Certification programs
- Stakeholder Education

[www.nrel.gov](http://www.nrel.gov)



# Mitigate Soft Costs



# Customer Acquisition



**Solarize**  
Group Purchasing

**solarize portland**



# Solarize: Advantages

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## Barriers

High upfront cost



## Solutions

Group purchase

Complexity



Community outreach

Customer inertia



Limited-time offer



# Solarize: Advantages

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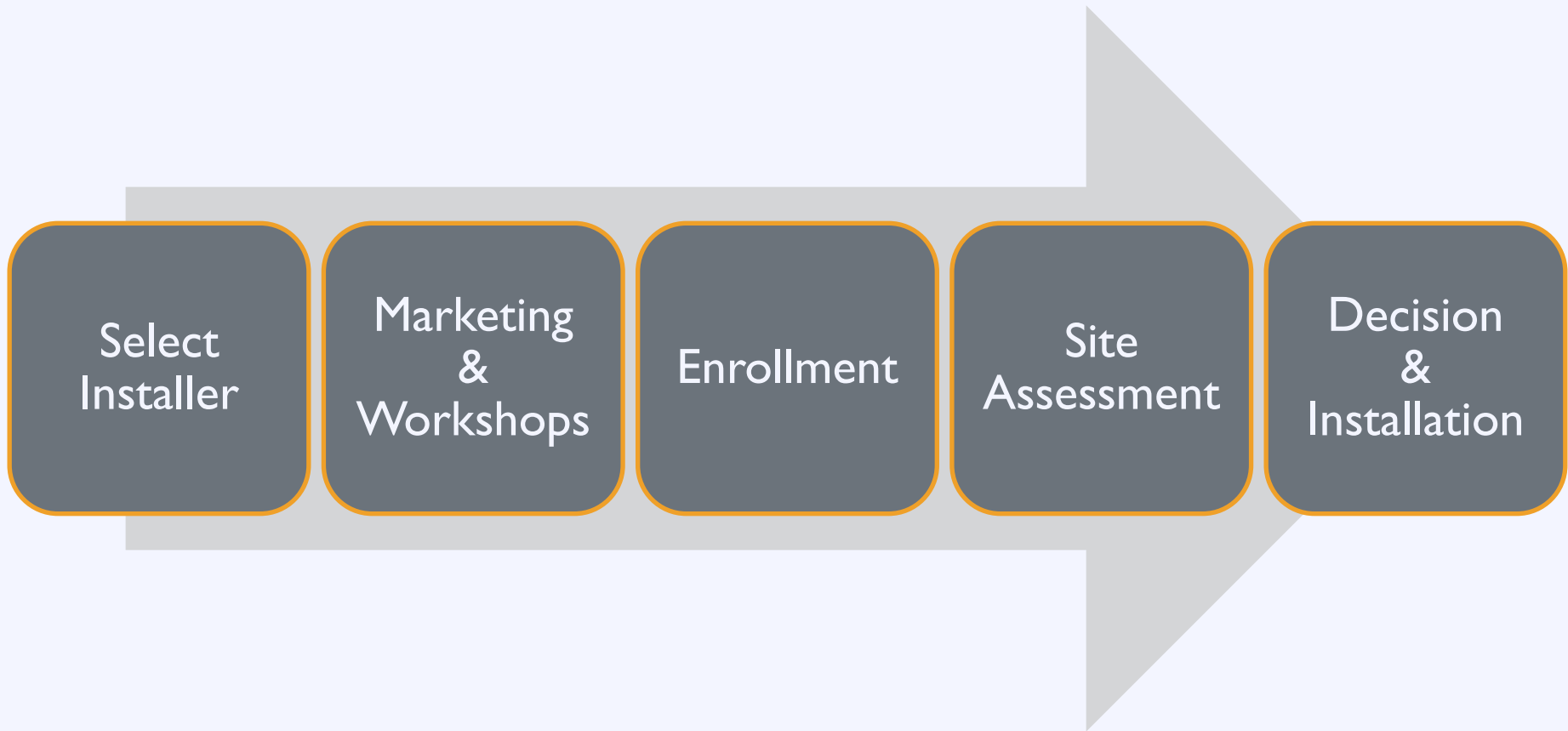
## Benefits to Local Government:

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

Quick turn-around: 9 Months

Long-term impact: Sustainable ecosystem

# Solarize: Process



# Solarize: Case Study

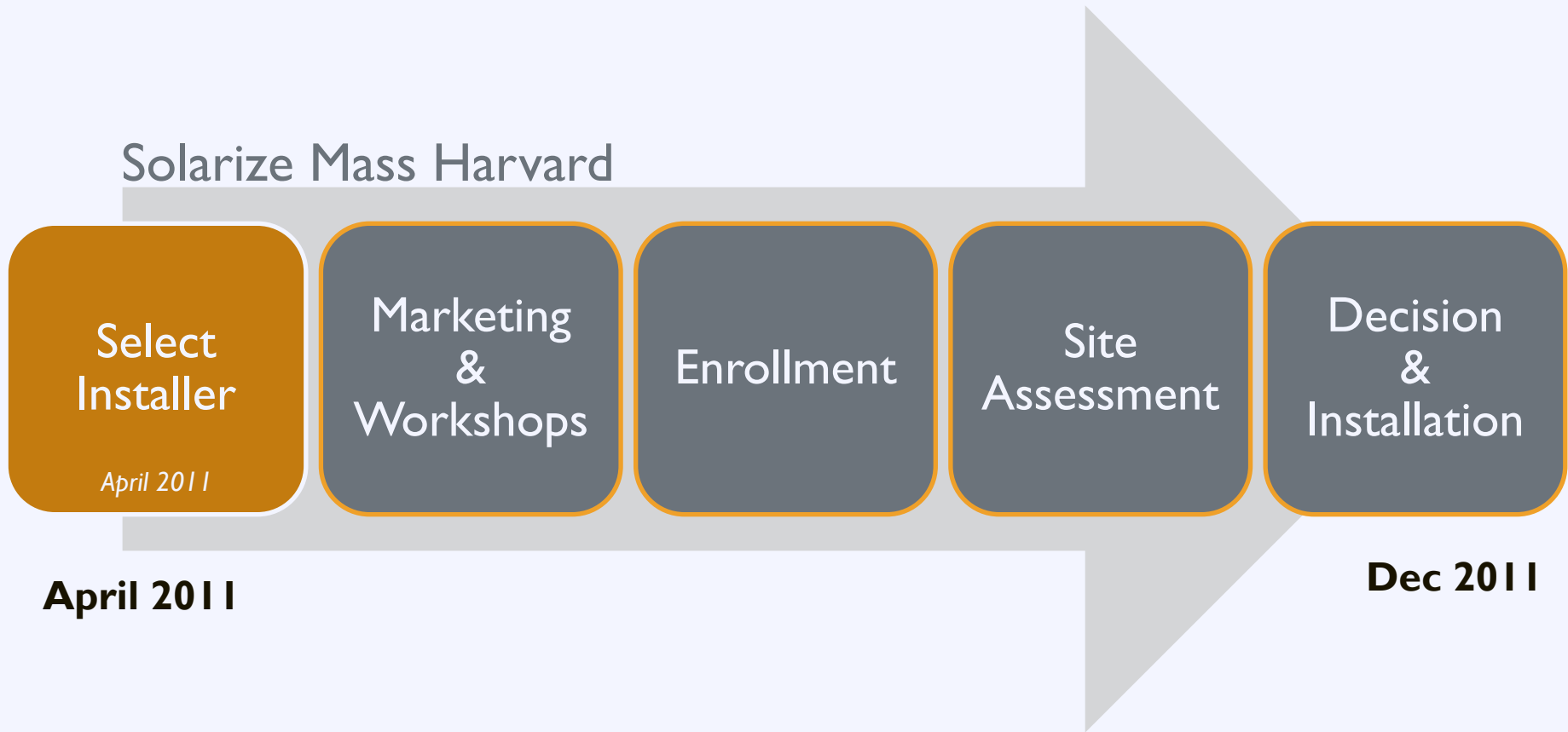
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**Harvard, Massachusetts**  
Population: 6,520

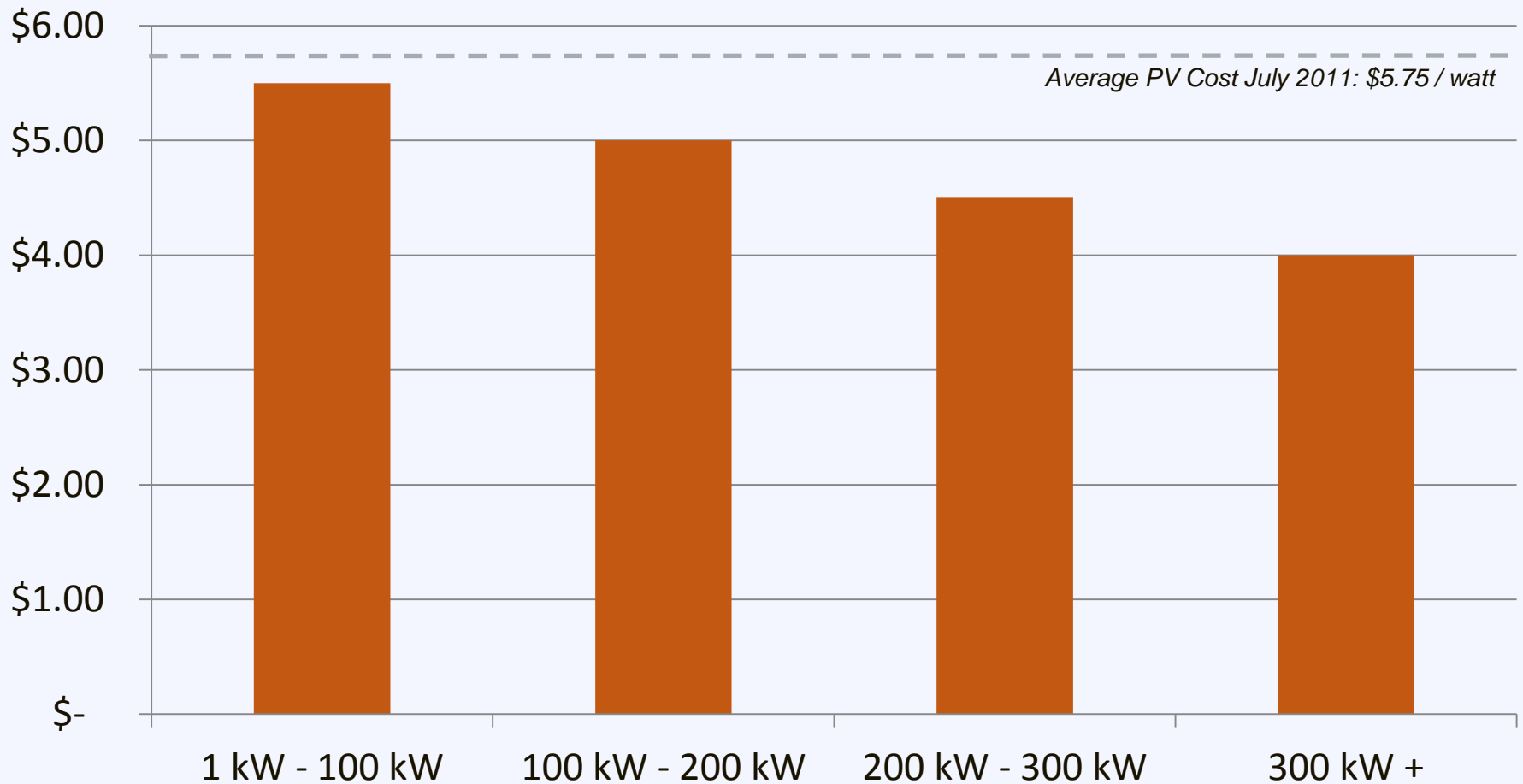
# Solarize: Case Study

## Solarize Mass Harvard



# Group Purchasing

## Harvard Mass Group Purchasing Tiers



# Solarize: Case Study

## Solarize Mass Harvard

Select  
Installer

**April 2011**

Marketing  
&  
Workshops

*May – July 2011*

Enrollment

Site  
Assessment

Decision  
&  
Installation

**Dec 2011**

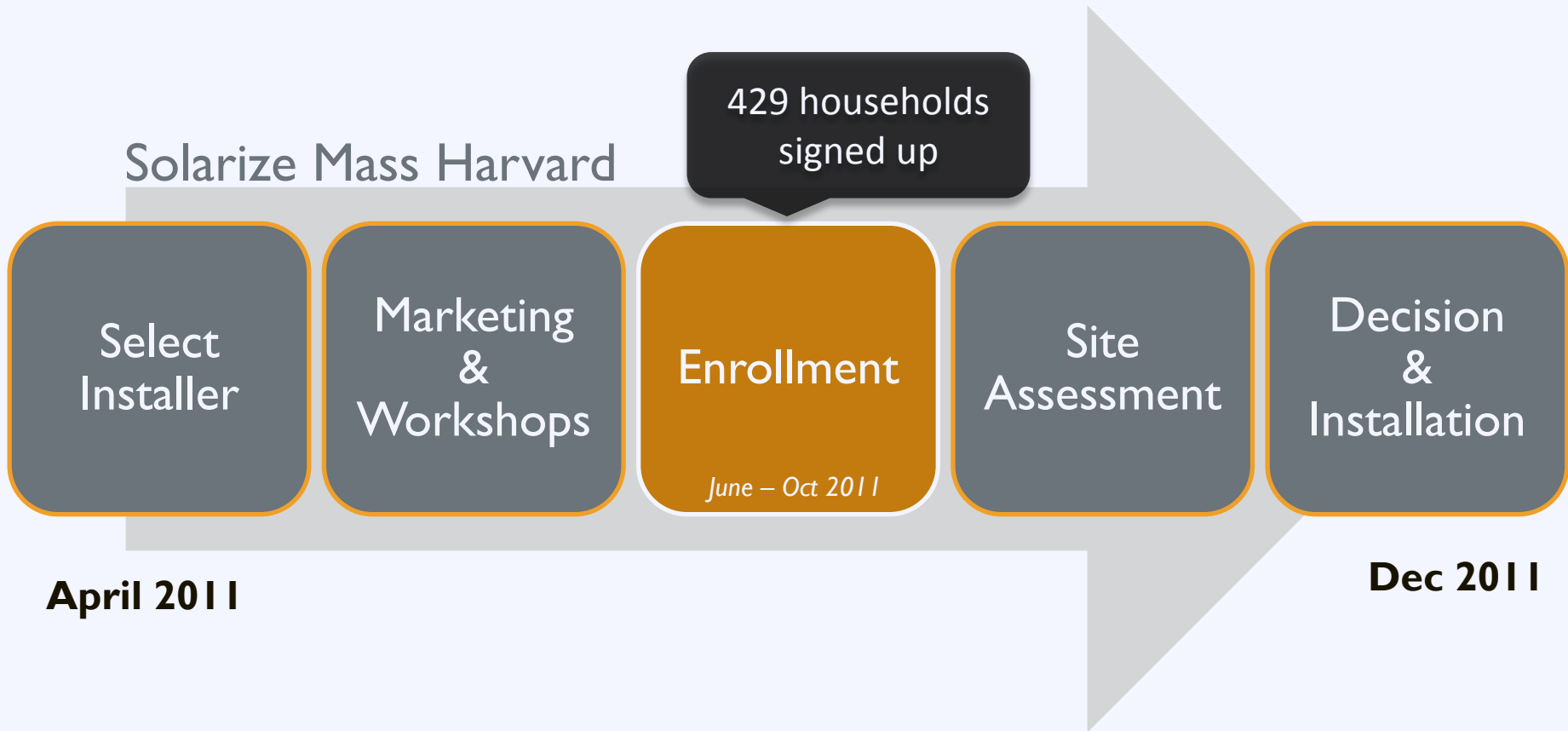
# Solarize: Case Study

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## 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

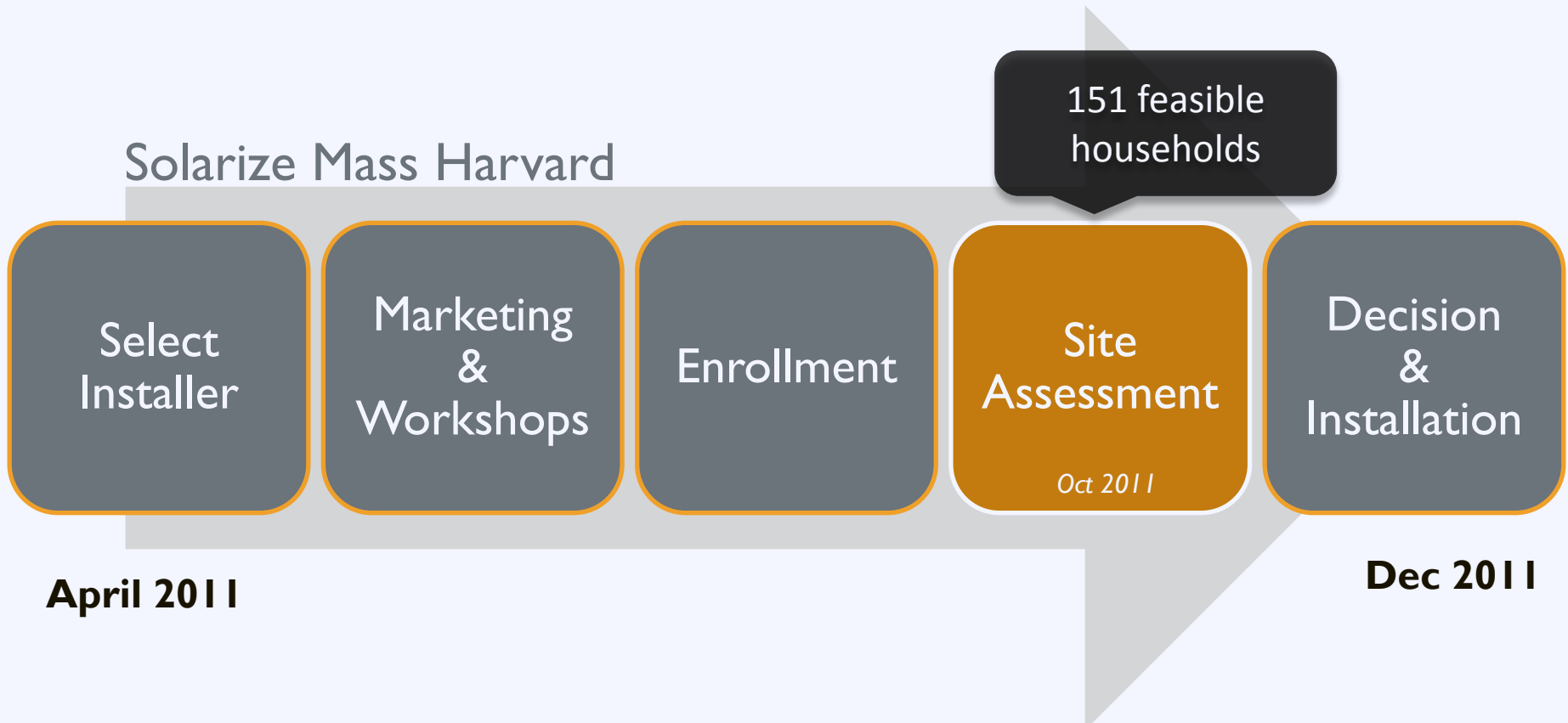
# Solarize: Case Study





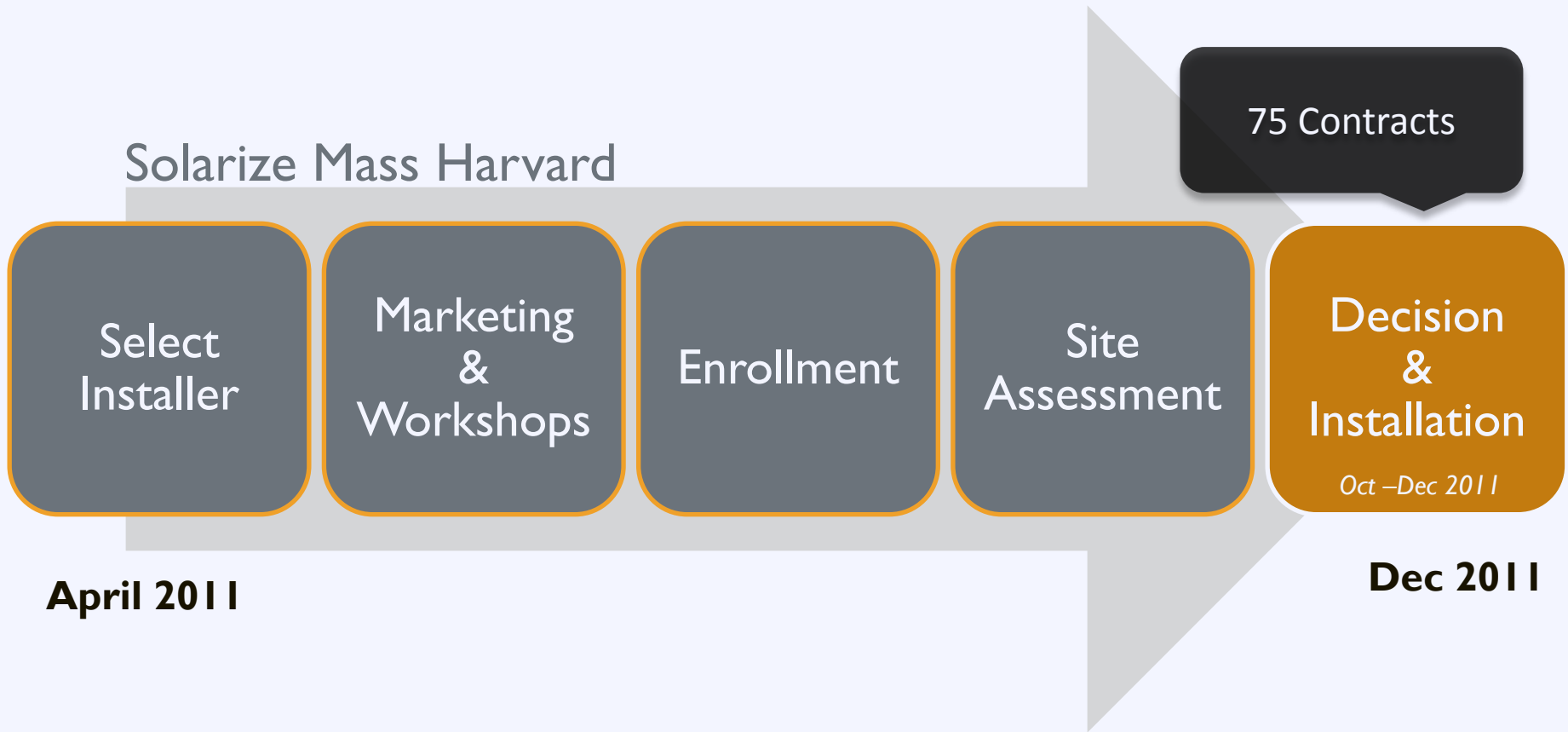
# Solarize: Case Study

## Solarize Mass Harvard



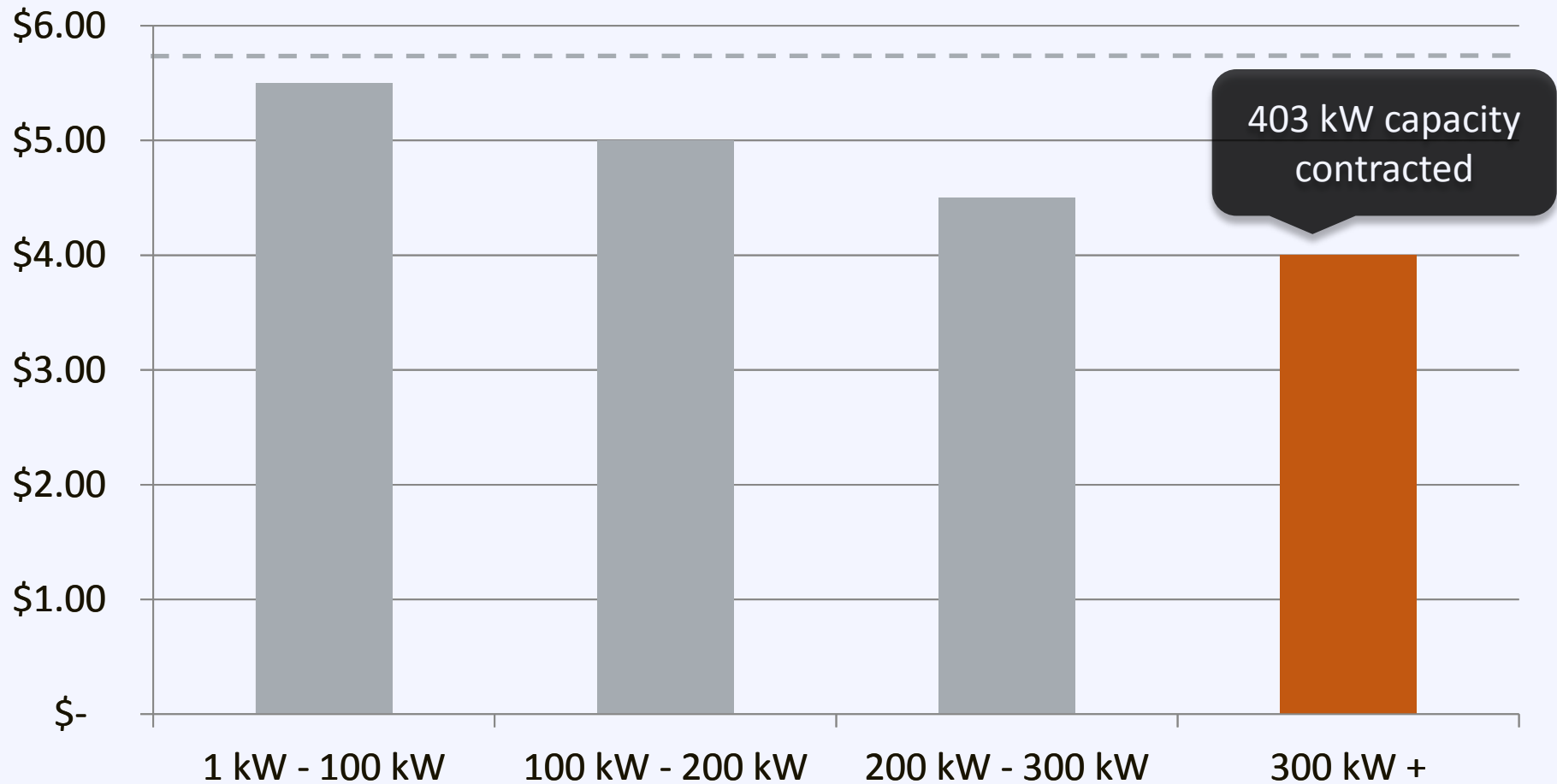
# Solarize: Case Study

## Solarize Mass Harvard



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## Harvard Mass Group Purchasing Tiers



# Solarize: Case Study

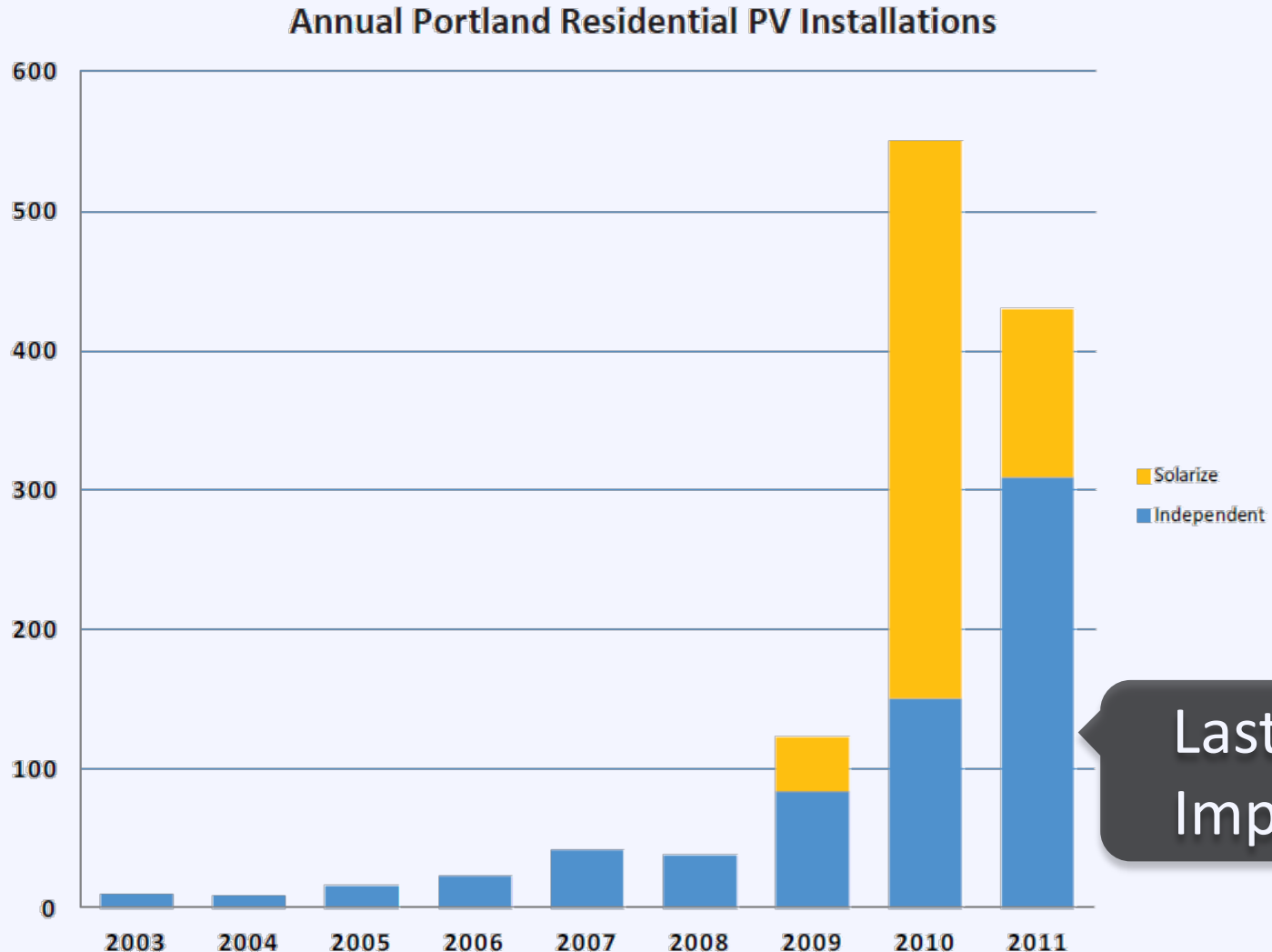
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**75** new installations totaling 403 kW

**30% reduction** in installation costs

**575% increase** in residential installations

# Solarize: Lasting Impact



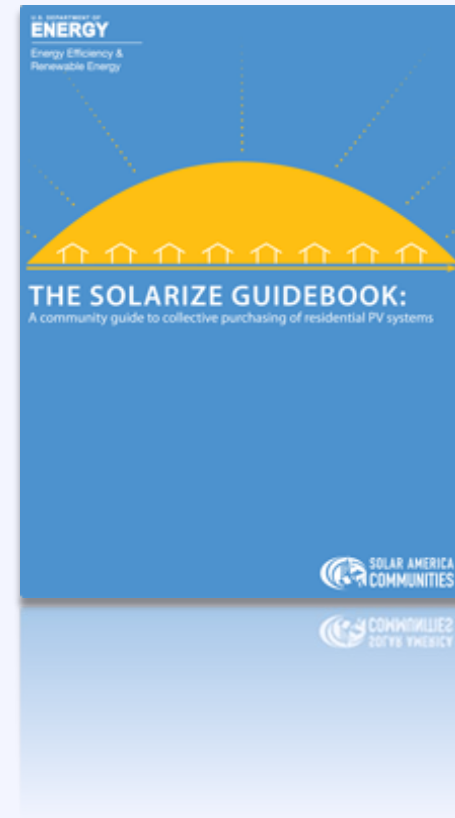
Lasting  
Impact

# Solarize: Resources

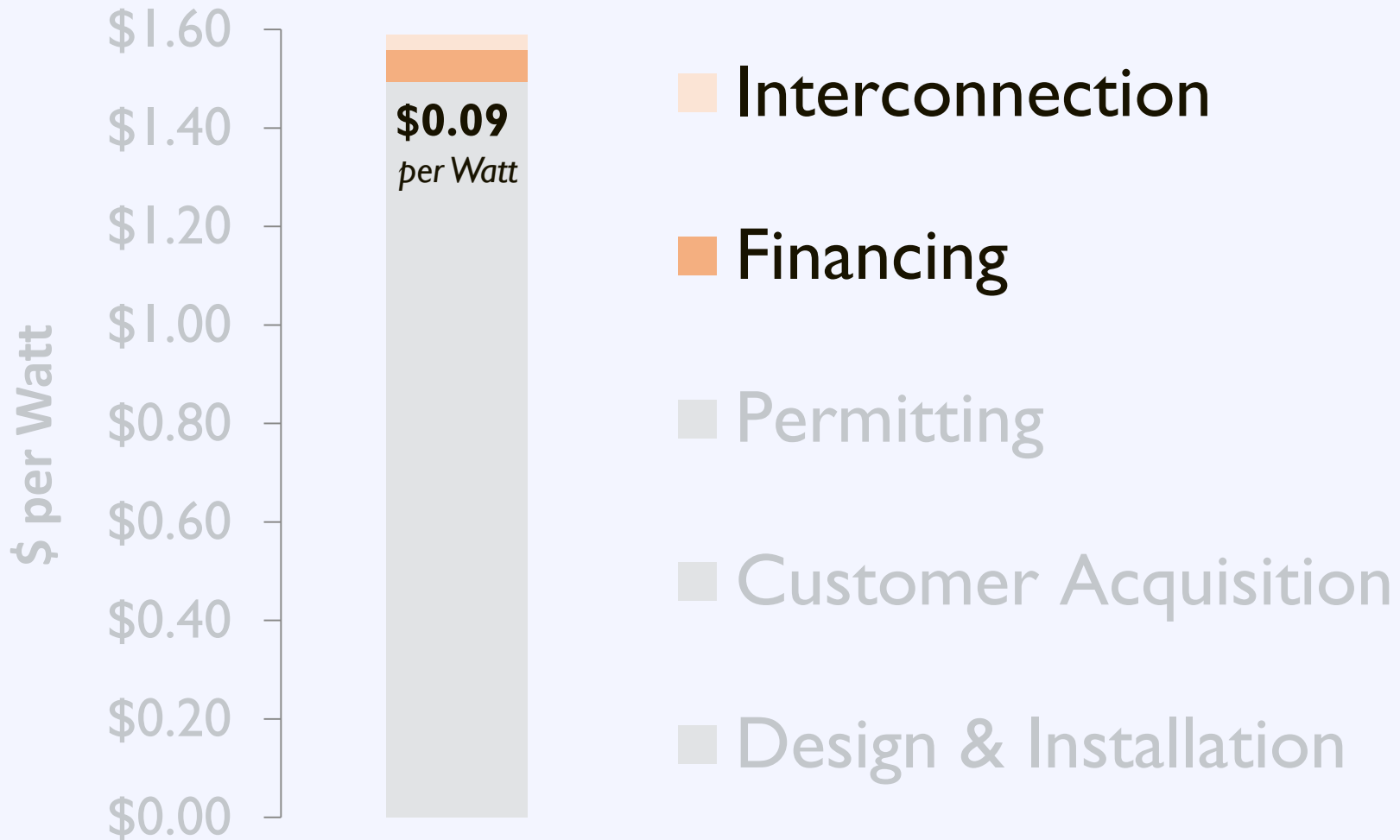
## Resource The Solarize Guidebook

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

[www.nrel.gov](http://www.nrel.gov)



# Mitigate Soft Costs



# Q & A



# Agenda

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# Activity: Identifying Benefits

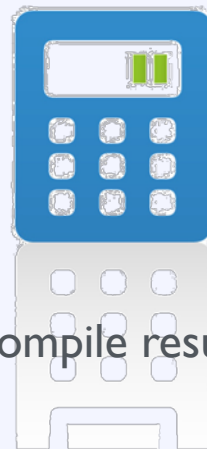
What is the greatest benefit solar can bring to your community? **[Blue Card]**

Right Now



Write answer on card

During Session



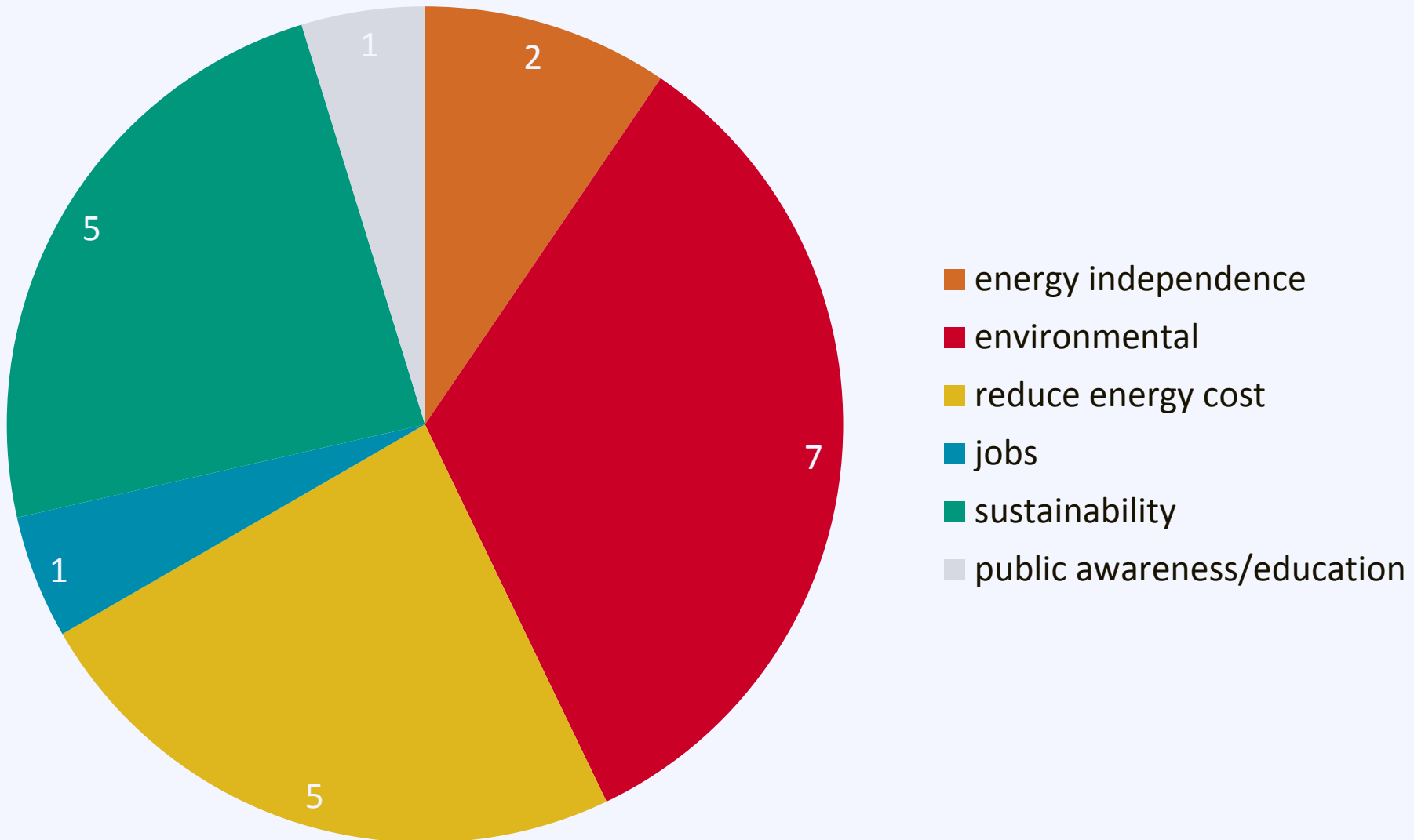
Compile results

After Break



Group discussion

# Benefits

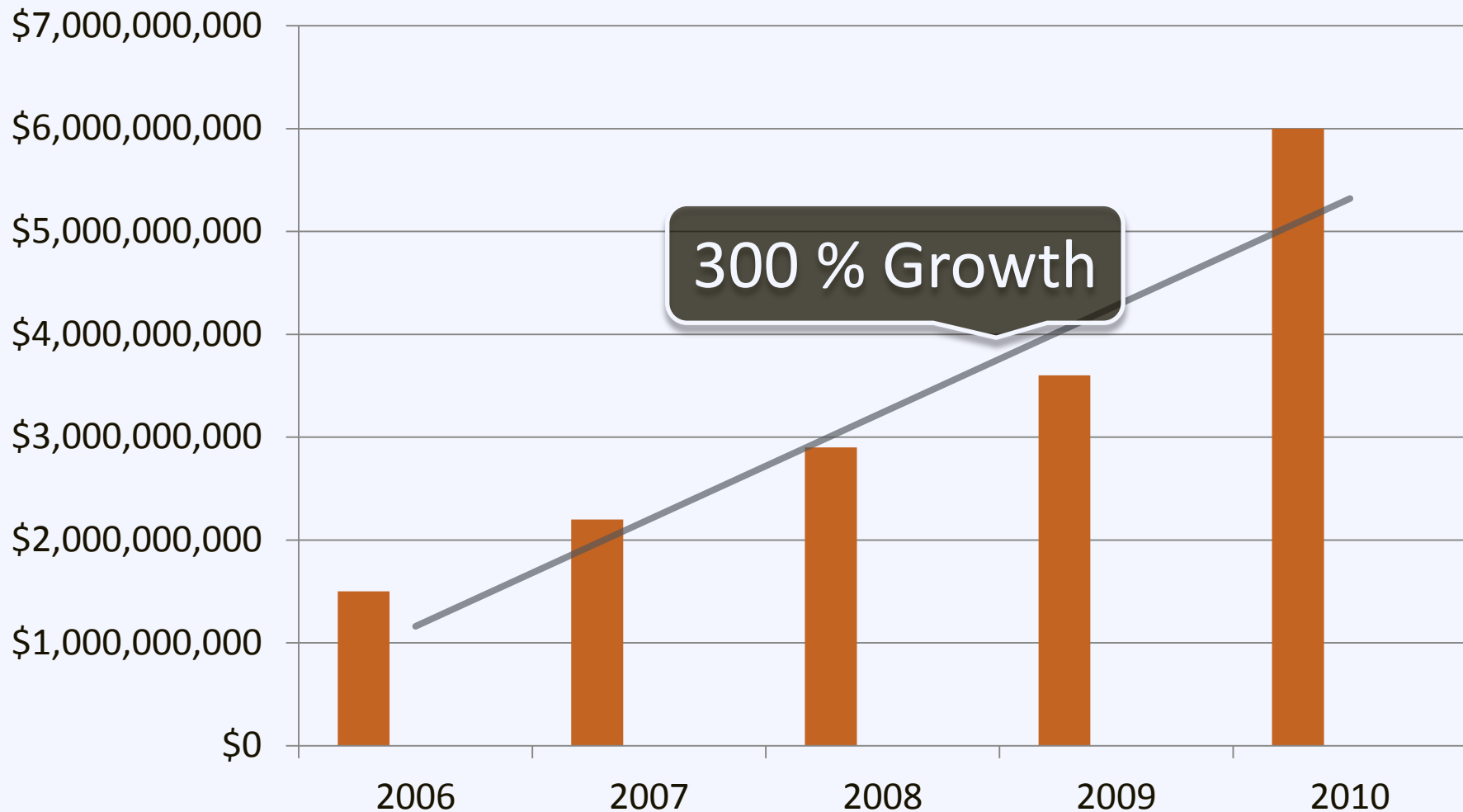


# Benefits of Solar Energy

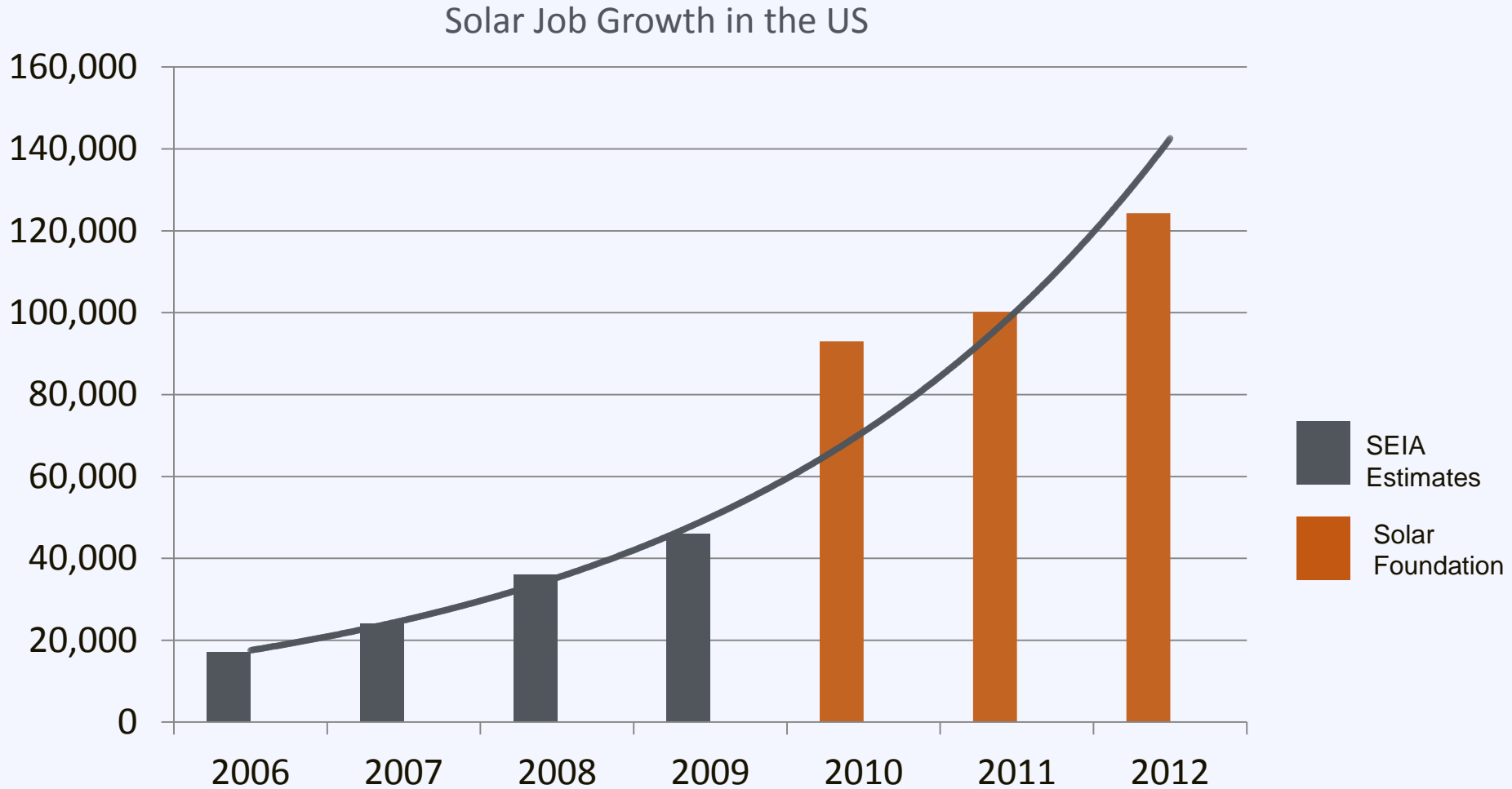
- Local economy growth
- Local jobs
- Energy independence
- Stabilizes price volatility
- Valuable to utilities
- Smart investment



# Benefit: Economic Growth

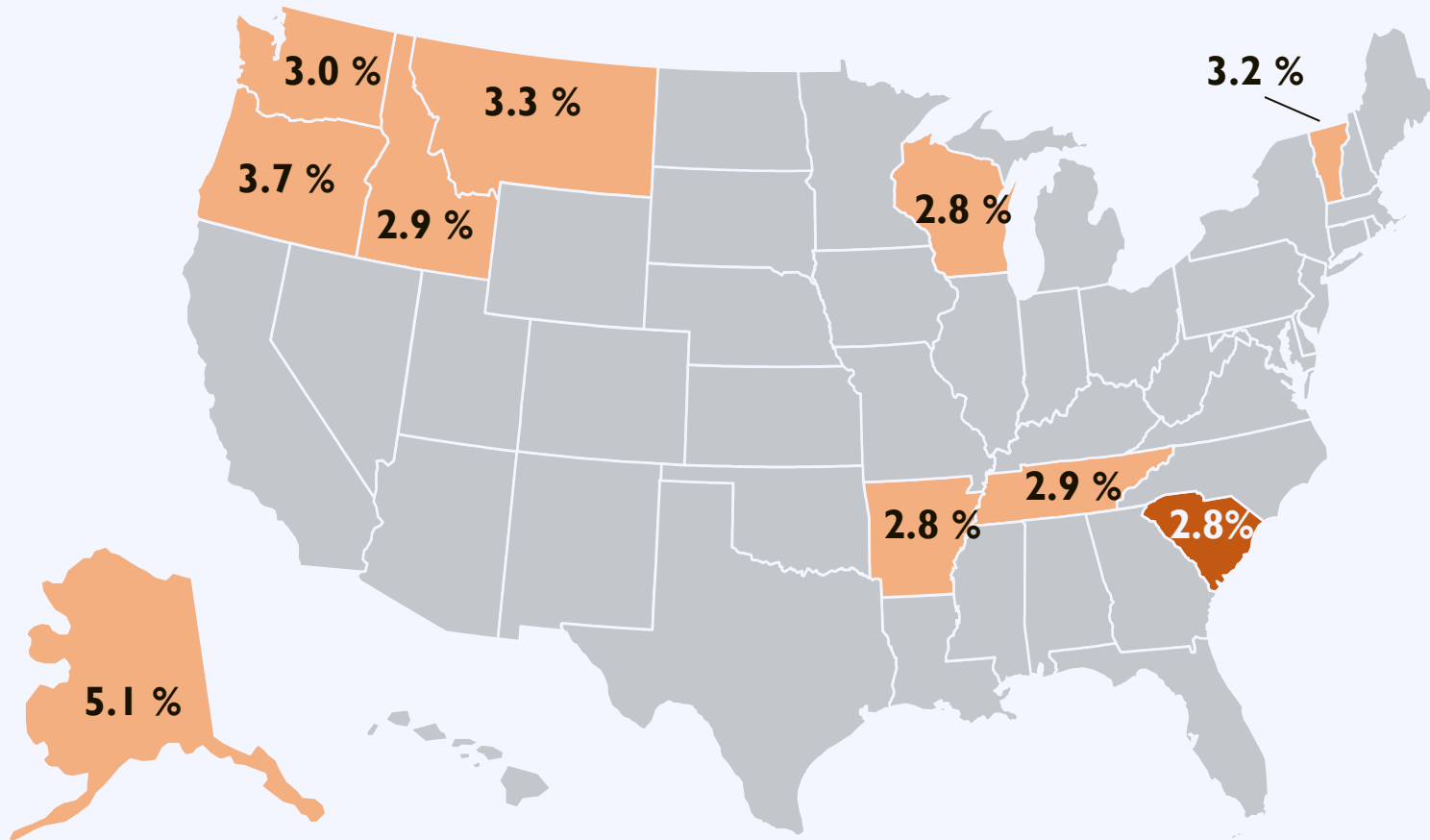


# Benefit: Job Growth



# Benefit: Job Growth

Top 10 States: Cleantech Jobs as a Percentage of the Total Work Force





# Benefit: Stabilize Energy Prices

Boston Area Average Wholesale Price



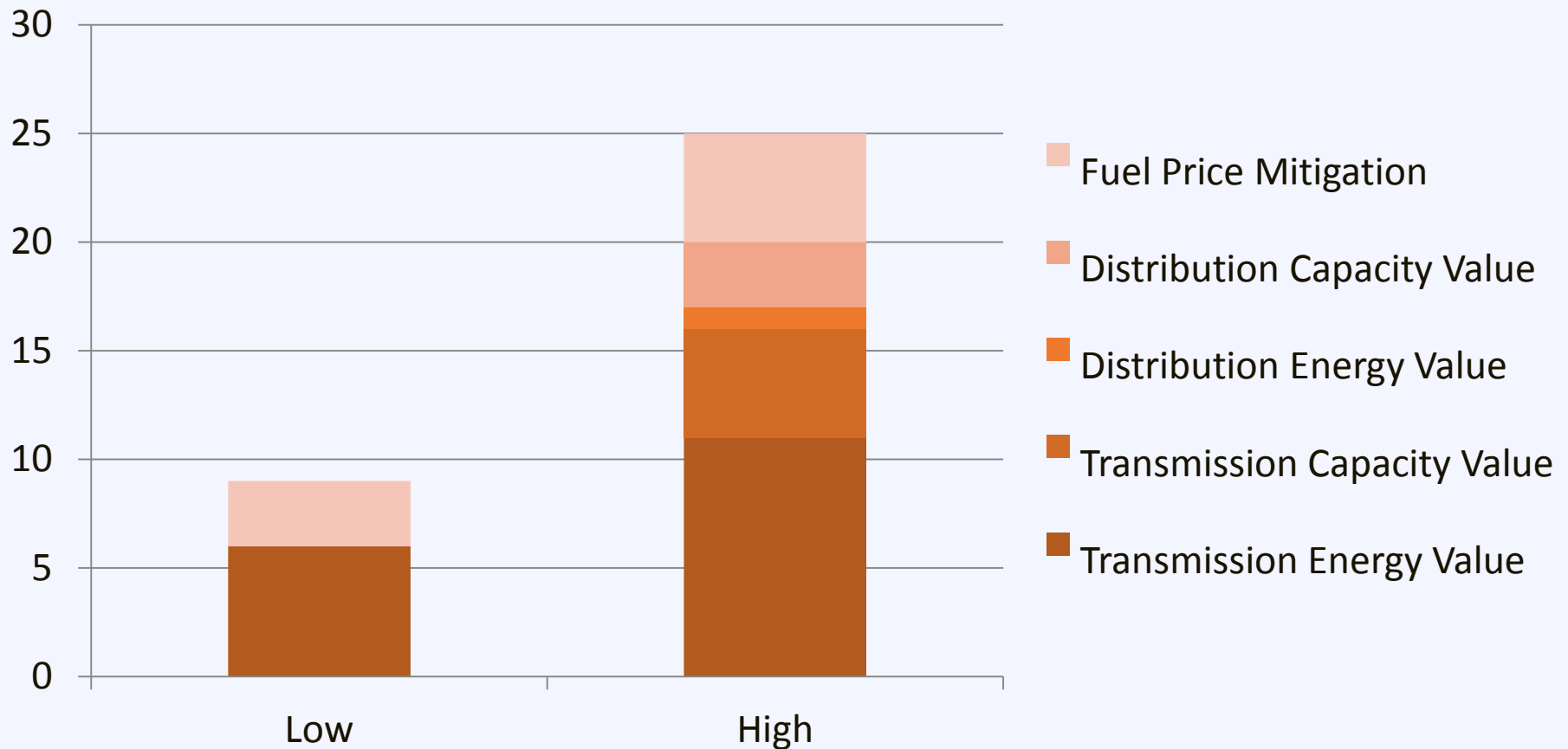
# Benefits: Valuable to Utilities

- Avoided Energy Purchases
- Avoided T&D Line Losses
- Avoided Capacity Purchases
- Avoided T&D Investments
- Fossil Fuel Price Impacts
- Backup Power



# Benefits: Valuable to Utilities

Value to the utility is **10 to 25 cents** beyond the value of the electricity



# Benefit: Smart Investment for Homes

From NREL:

Solar homes sold

**20% faster**


and for

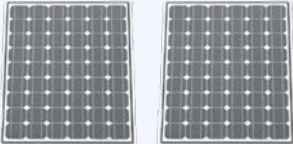
**17% more**

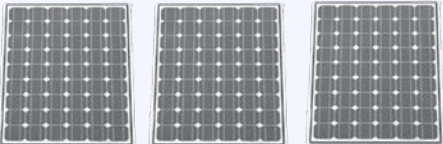
than the equivalent non-solar homes  
in surveyed California subdivisions

# Benefit: Smart Investment for Homes

From SunRun:

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

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

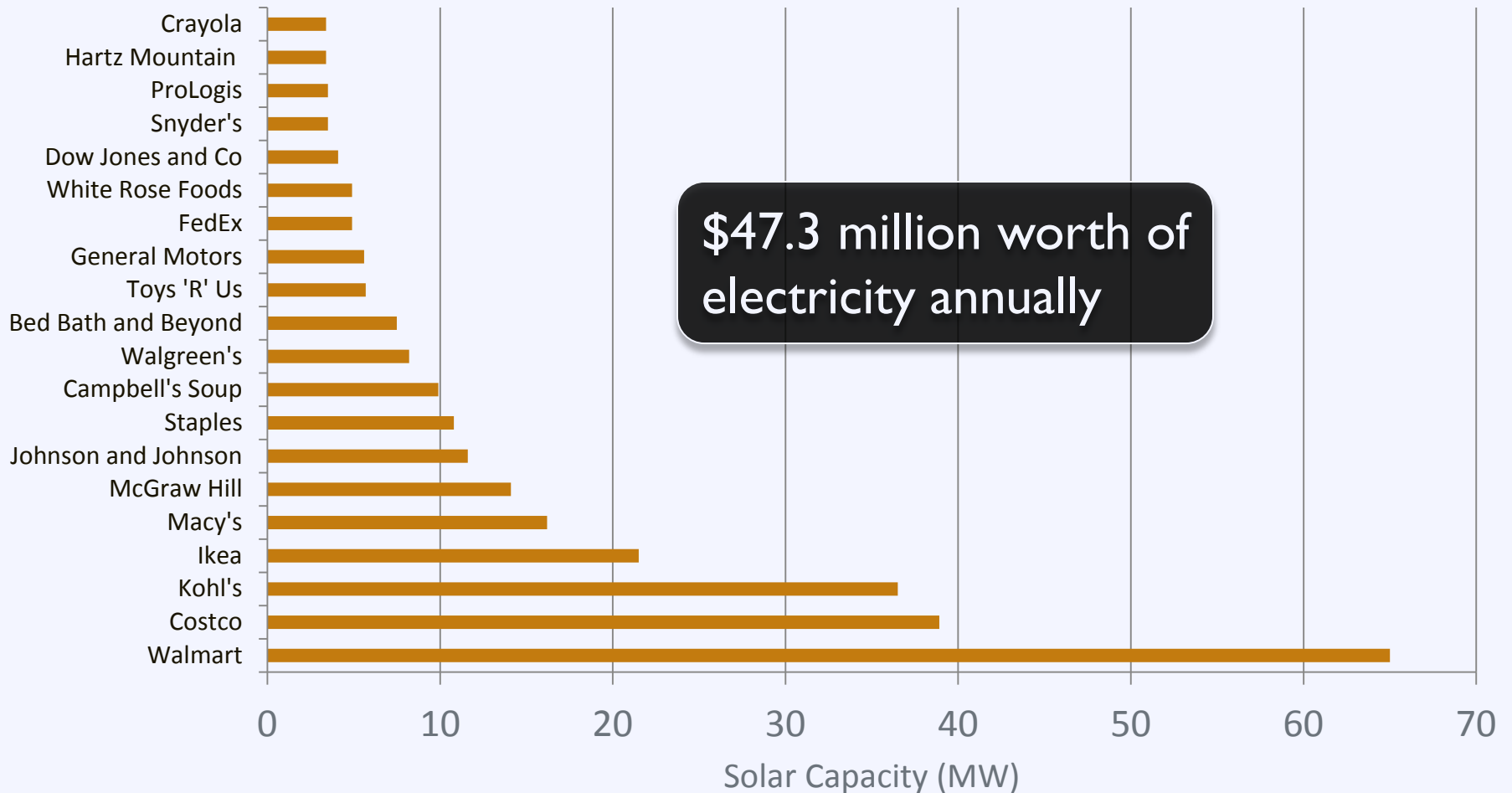
9 kW  = \$ 49,500 *added sale premium*

# Benefit: Smart Investment for Business



# Benefit: Smart Investment for Business

Top 20 Companies by Solar Capacity





# Benefit: Smart Investment for Government





# Activity: Addressing Barriers

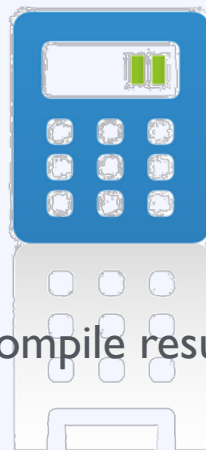
What is the greatest barrier to solar adoption in your community? **[Green Card]**

Right Now



Write answer on card

During Session



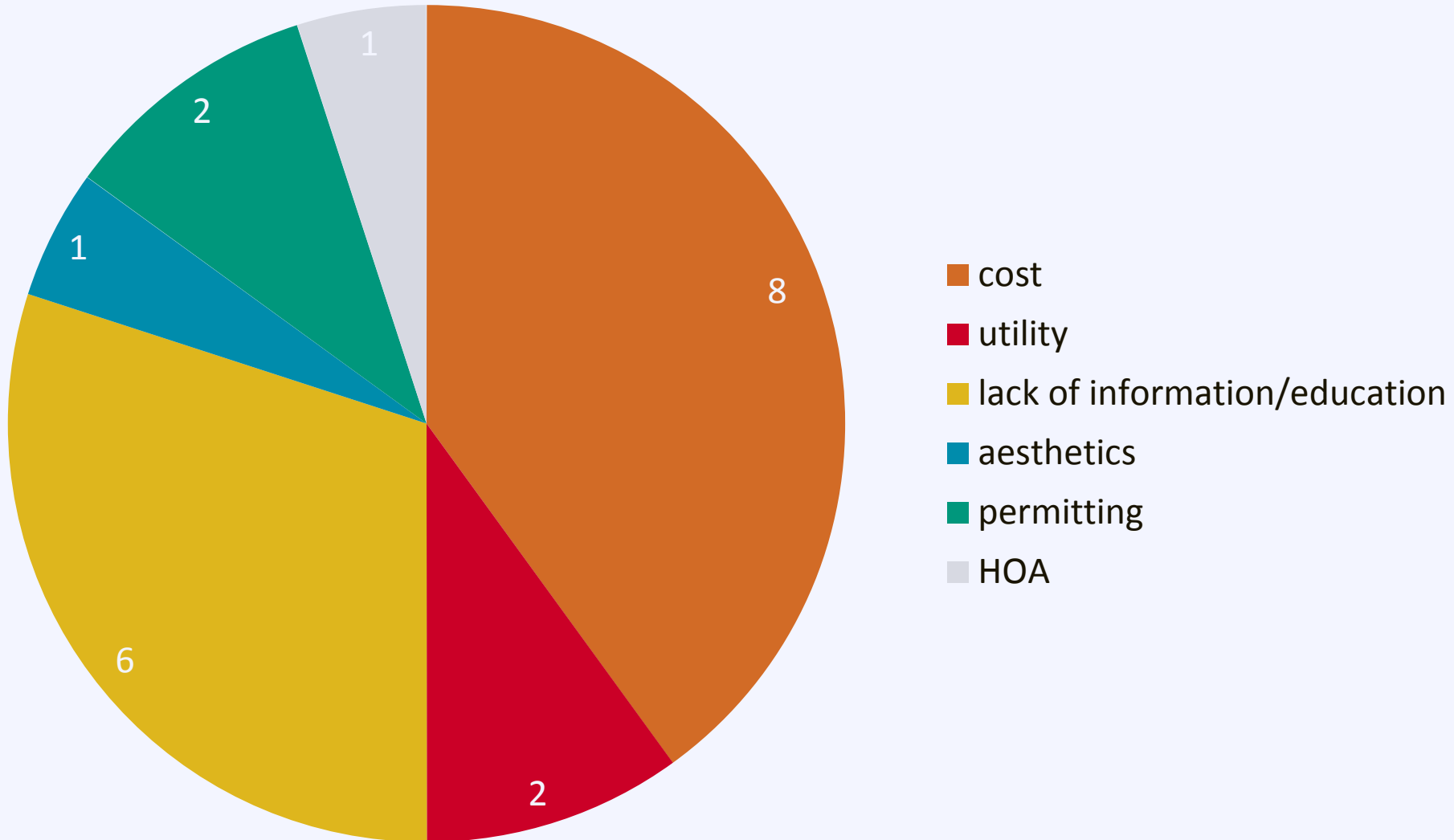
Compile results

After Break



Group discussion

# Barriers



# Some things you may hear...

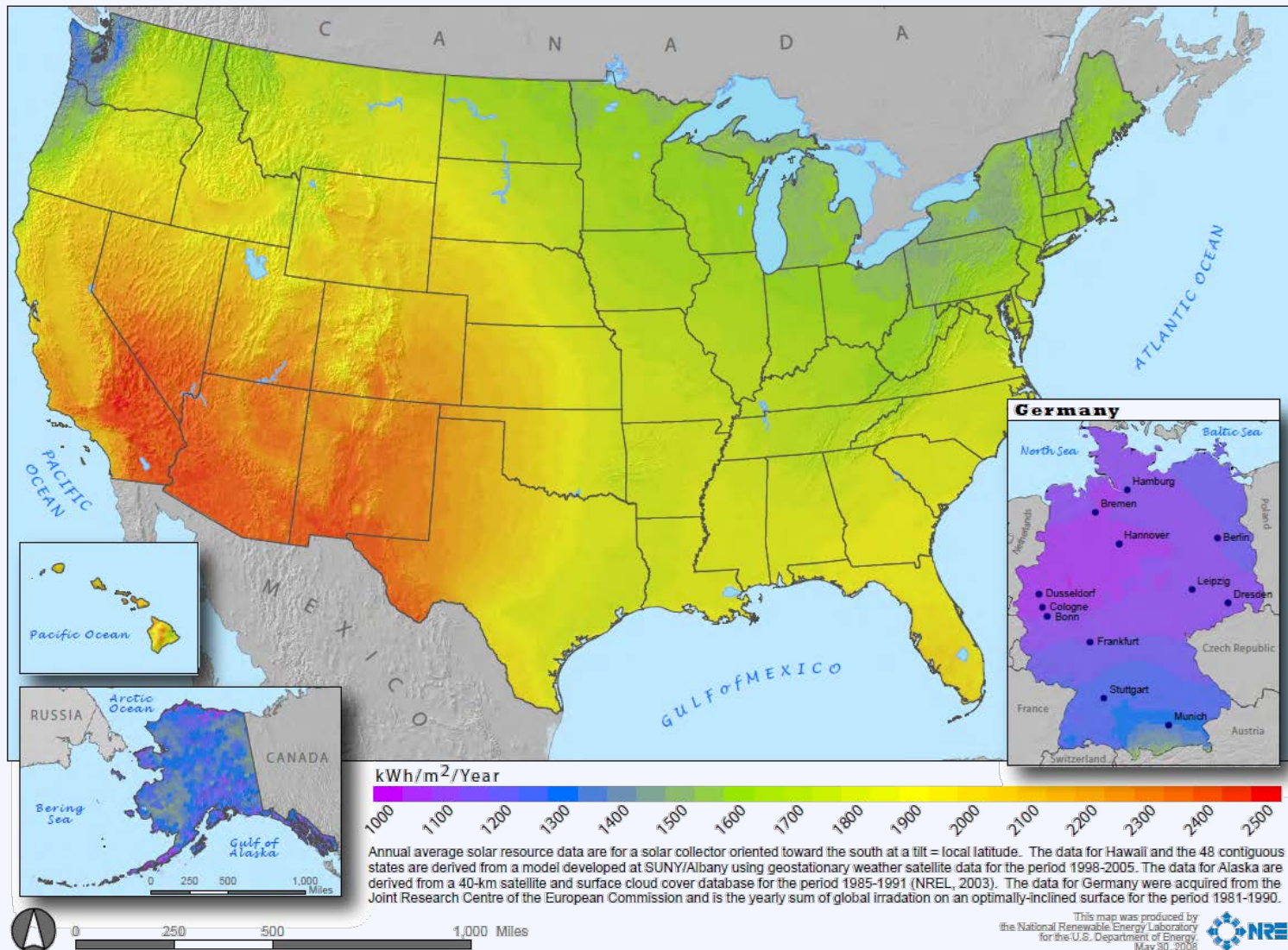
My area isn't sunny enough for solar

Going solar is too expensive

Solar is not ready to compete as a serious energy source

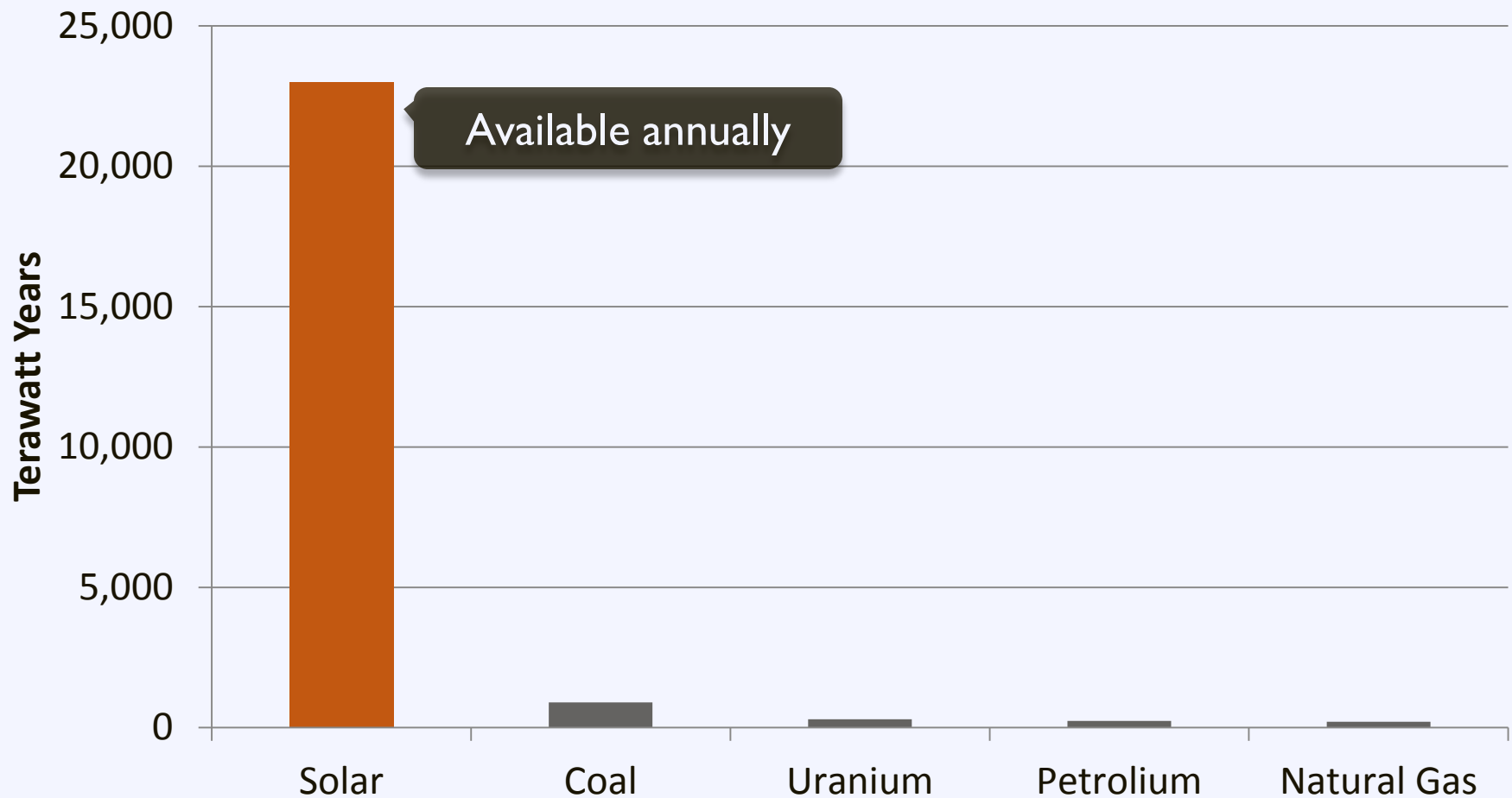
The government should not "pick winners and losers"

# Fact: Solar works across the US



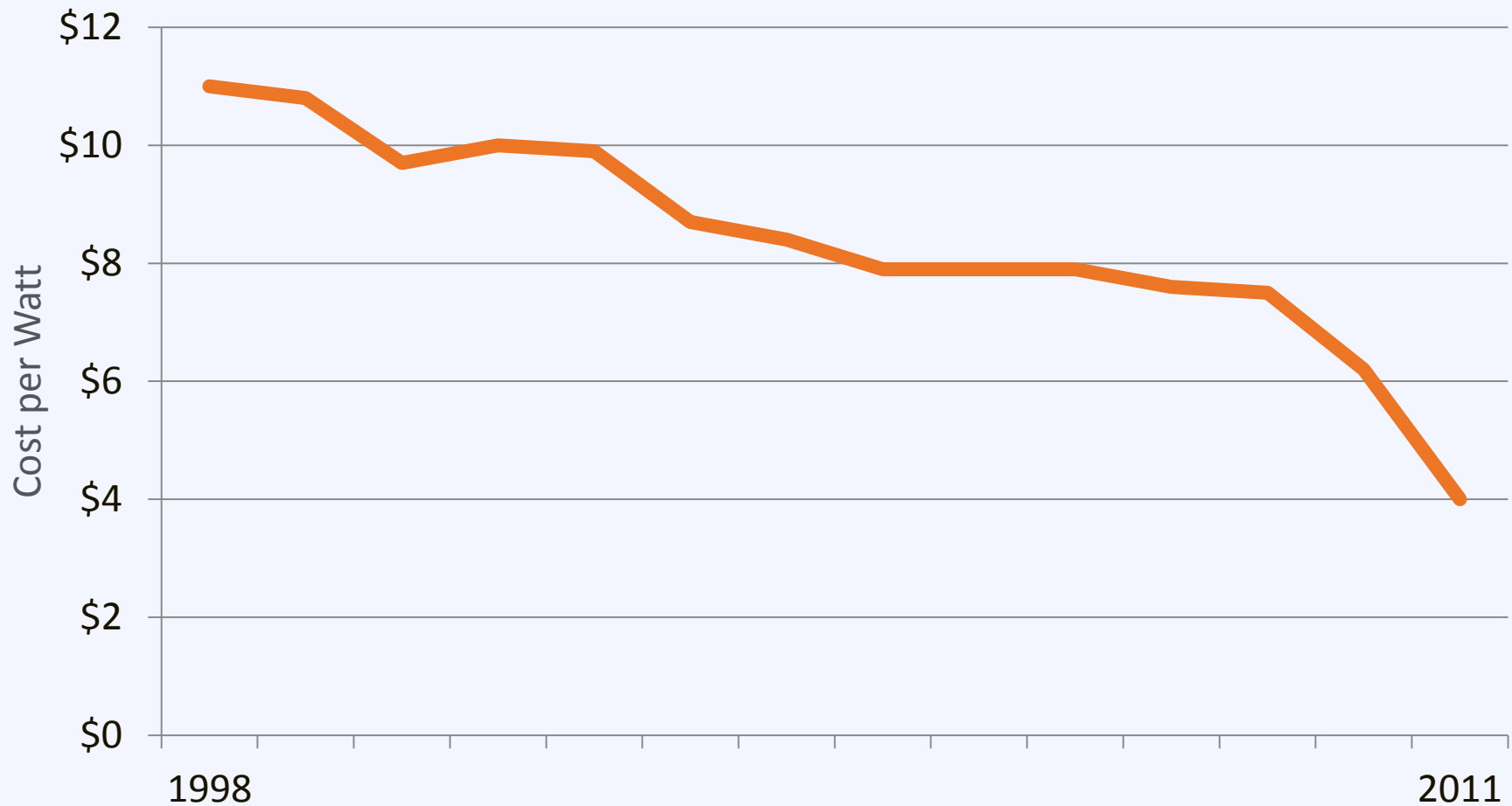
# Fact: Solar is a ubiquitous resource

Resource Availability



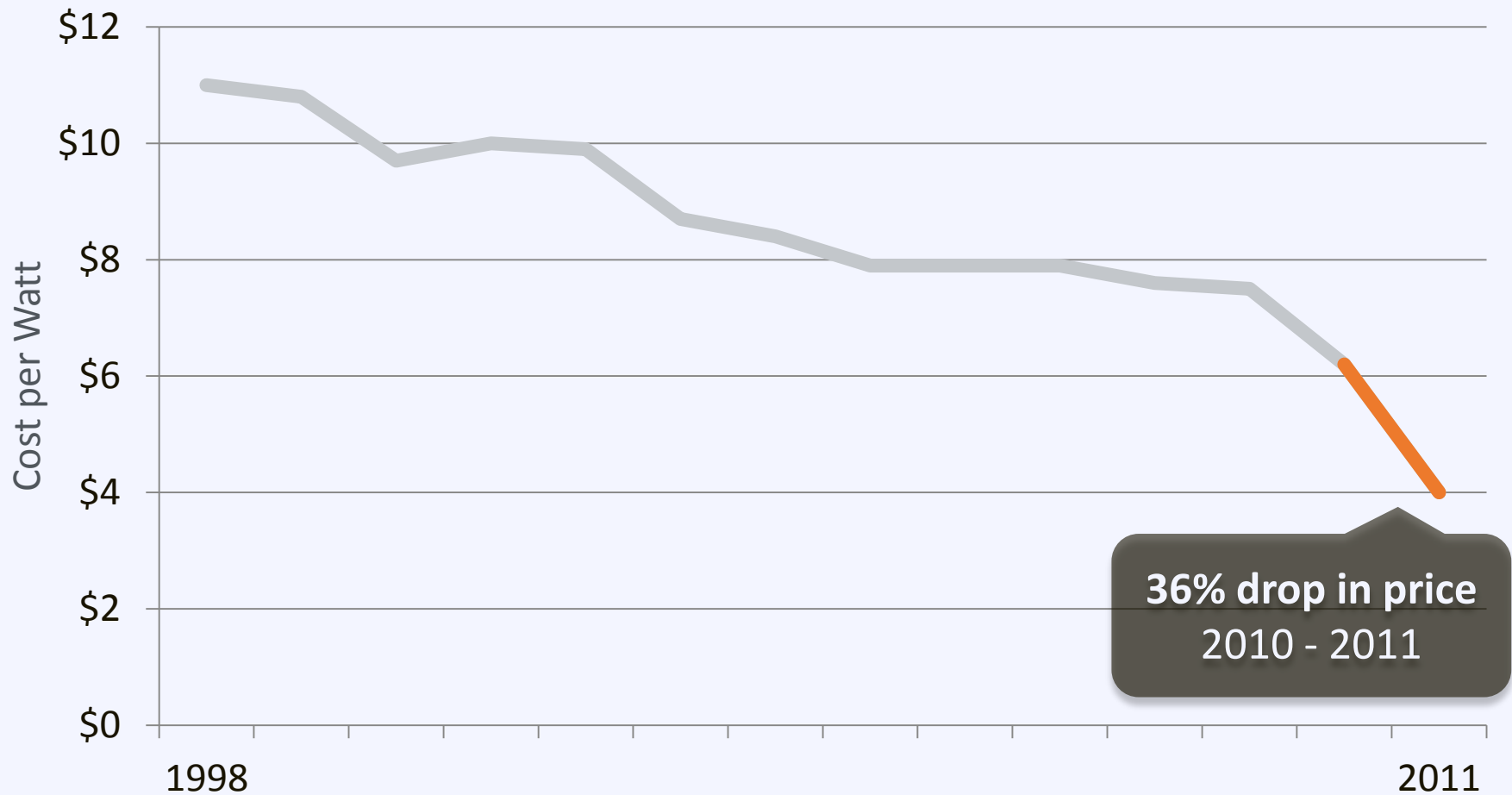
# Fact: Solar is cost competitive

US Average Installed Cost for Behind-the-Meter PV



# Fact: Solar is cost competitive

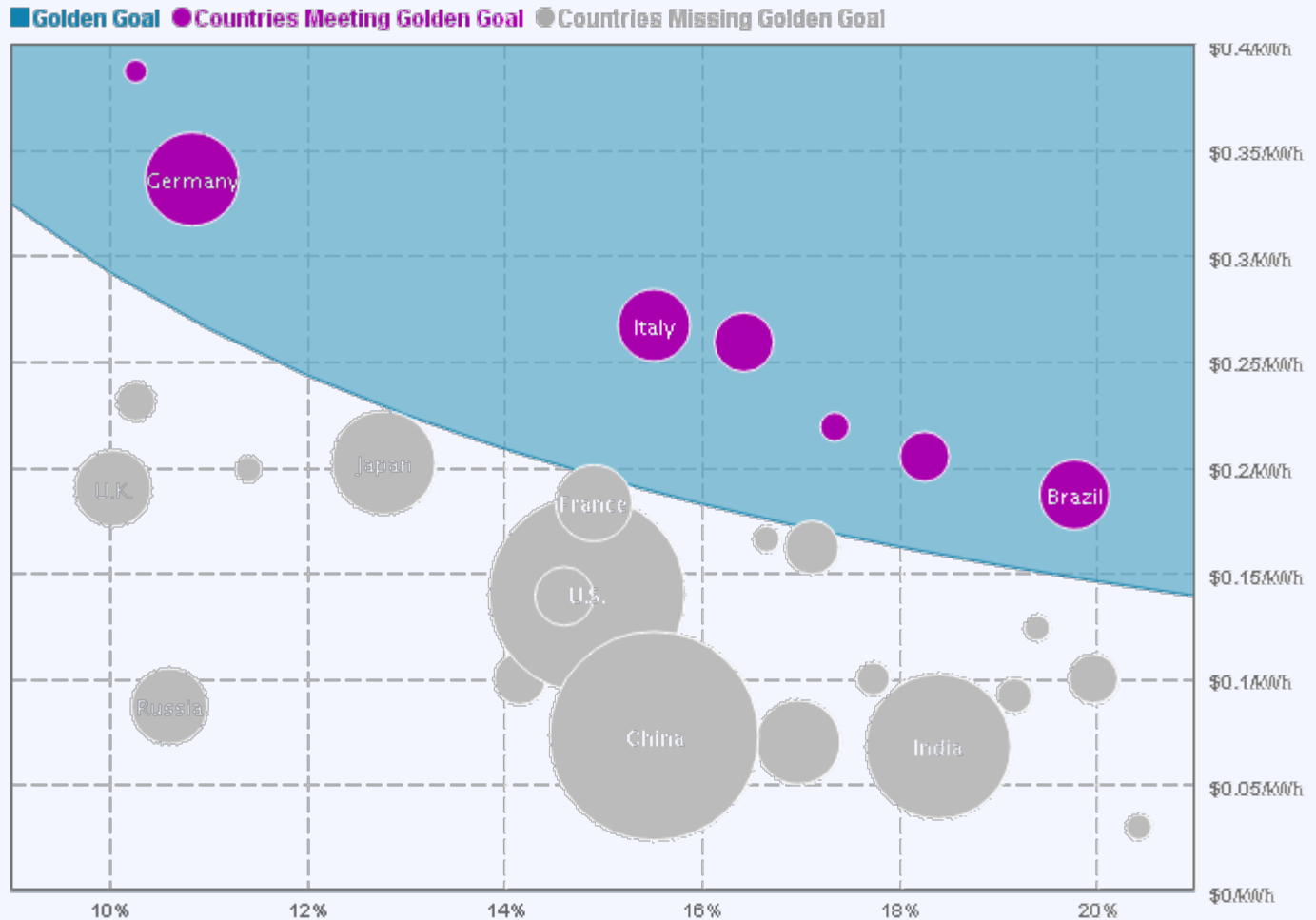
US Average Installed Cost for Behind-the-Meter PV



**36% drop in price  
2010 - 2011**

# Fact: Solar is cost competitive

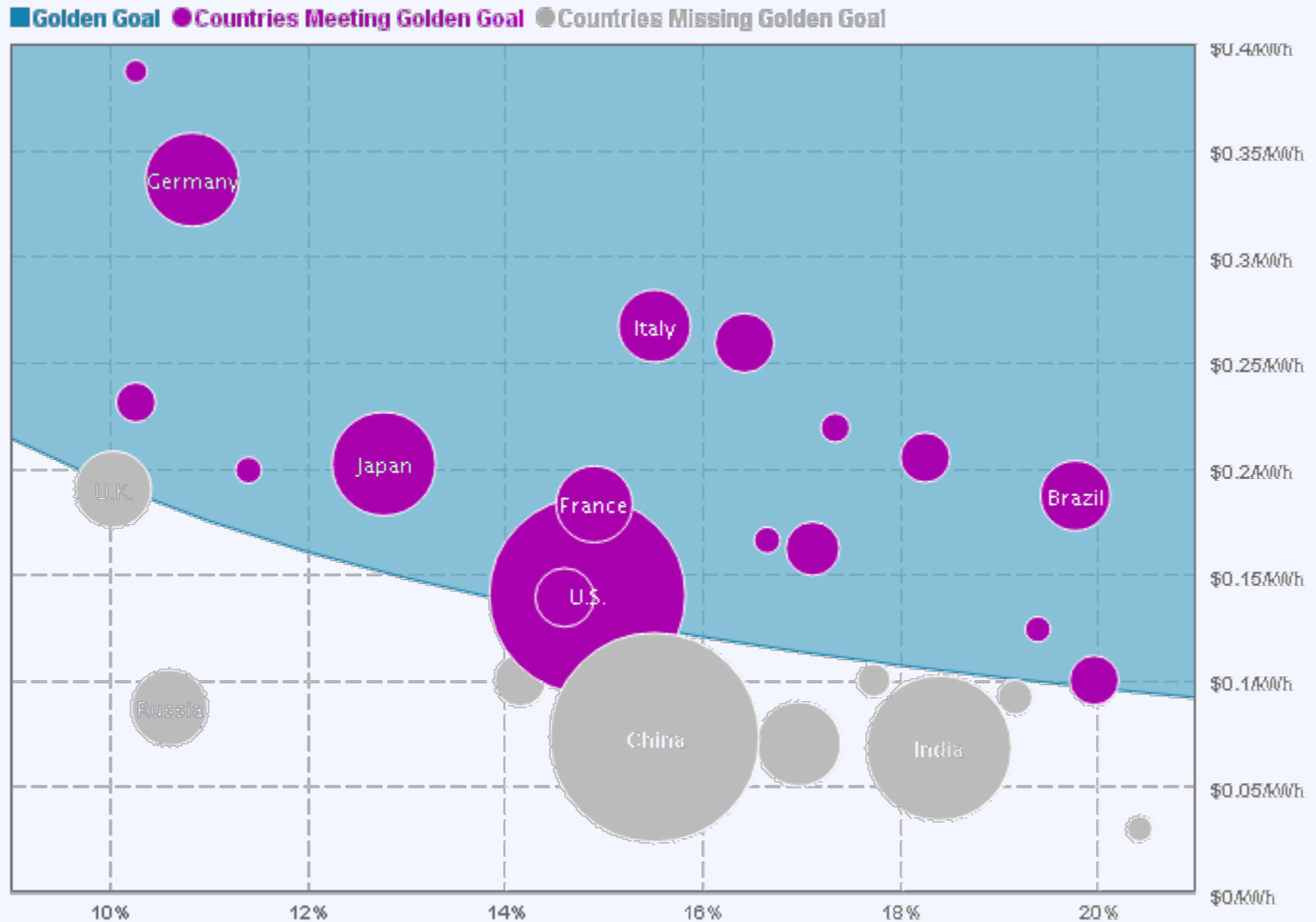
2012





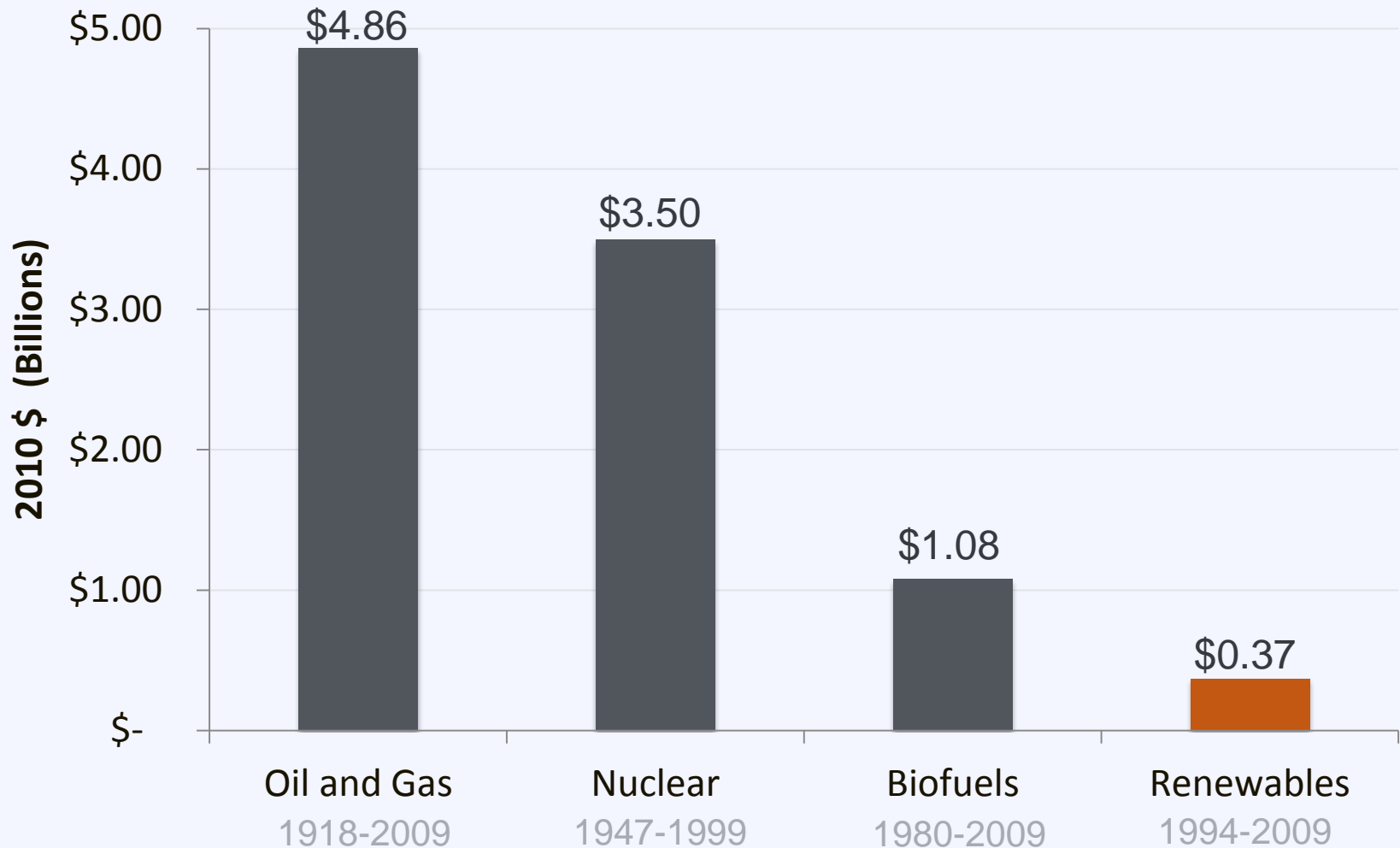
# Fact: Solar is cost competitive

2020

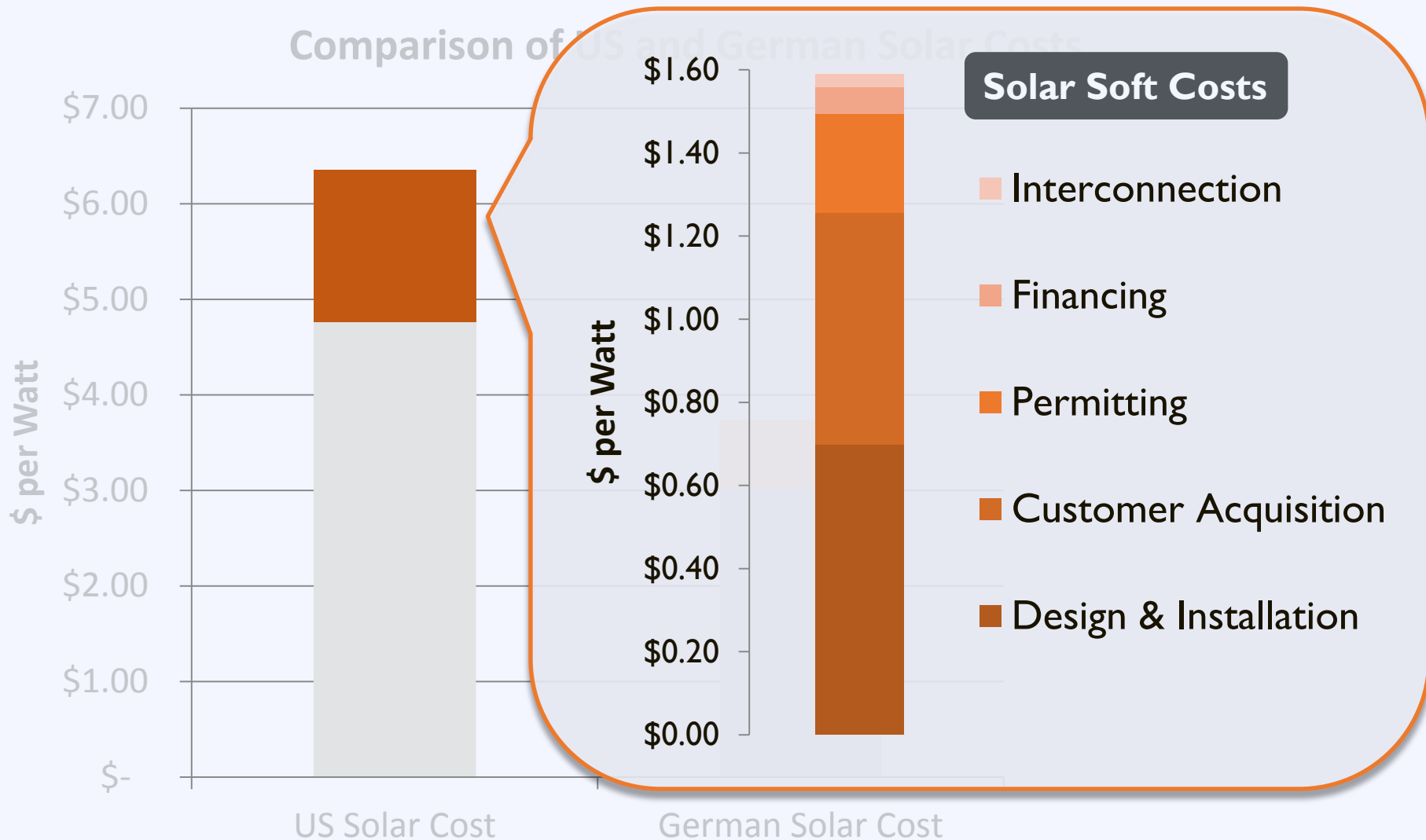


# Fact: All energy is subsidized

## Historical Average of Annual Energy Subsidy



# Barriers Still Exist



# Q & A

# Agenda

---

08:40 – 09:00	Solar 101
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# Electric Market Status (2010)

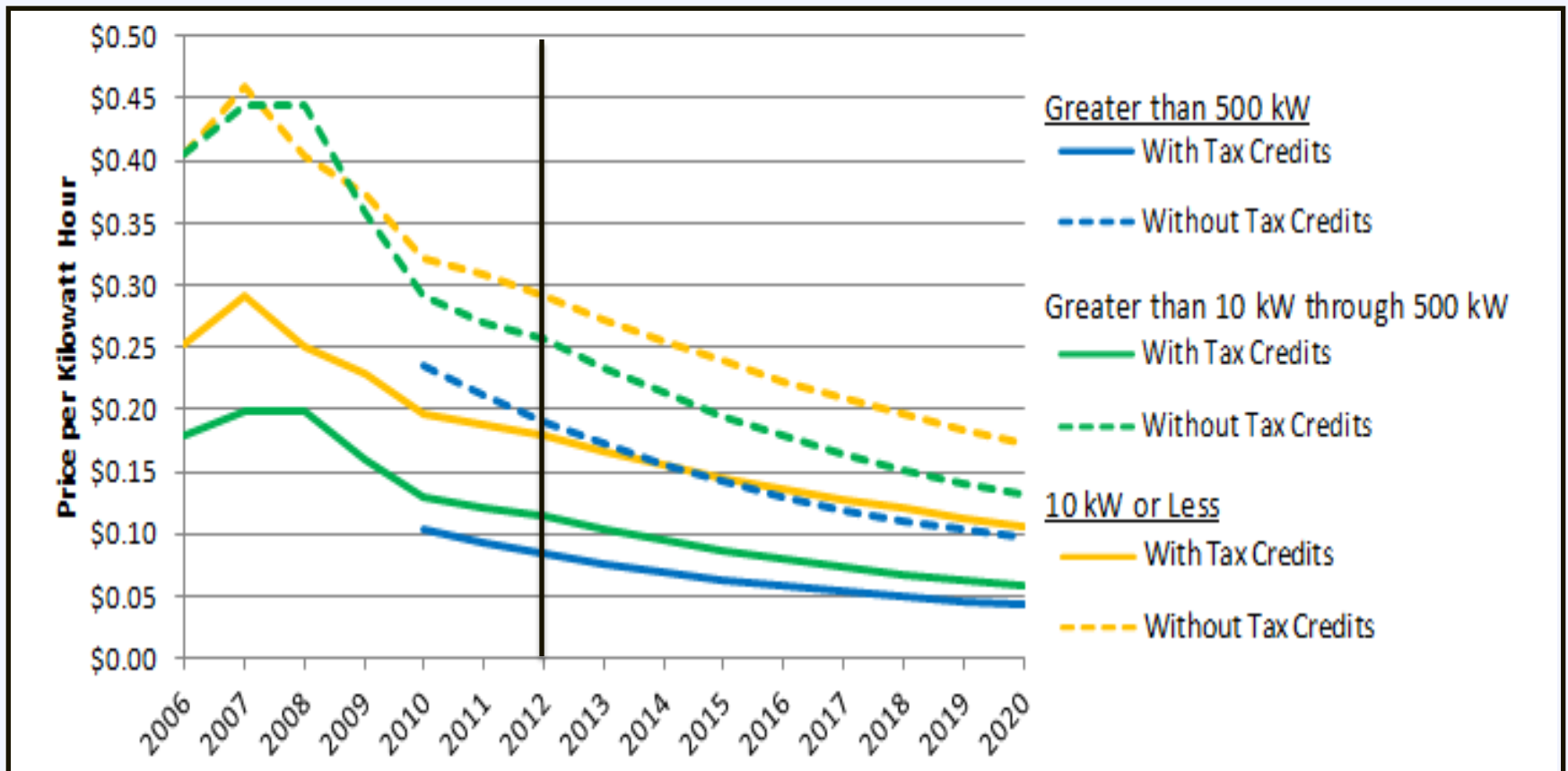
Retail Sales	Investor-Owned	Municipal	Rural Coops	TOTAL
South Carolina	62.4%	18.5%	19.2%	82.5 M MWh
North Carolina	74.2%	12.1%	13.7%	136.4 M MWh
Georgia	62.0%	8.6%	29.5%	140.7 M MWh

# Customers	Investor-Owned	Municipal	Rural Coops	TOTAL
South Carolina	56.4%	13.9%	29.7%	2,434,144
North Carolina	66.9%	12.1%	21.0%	4,841,173
Georgia	51.1%	7.3%	41.5%	4,615,805

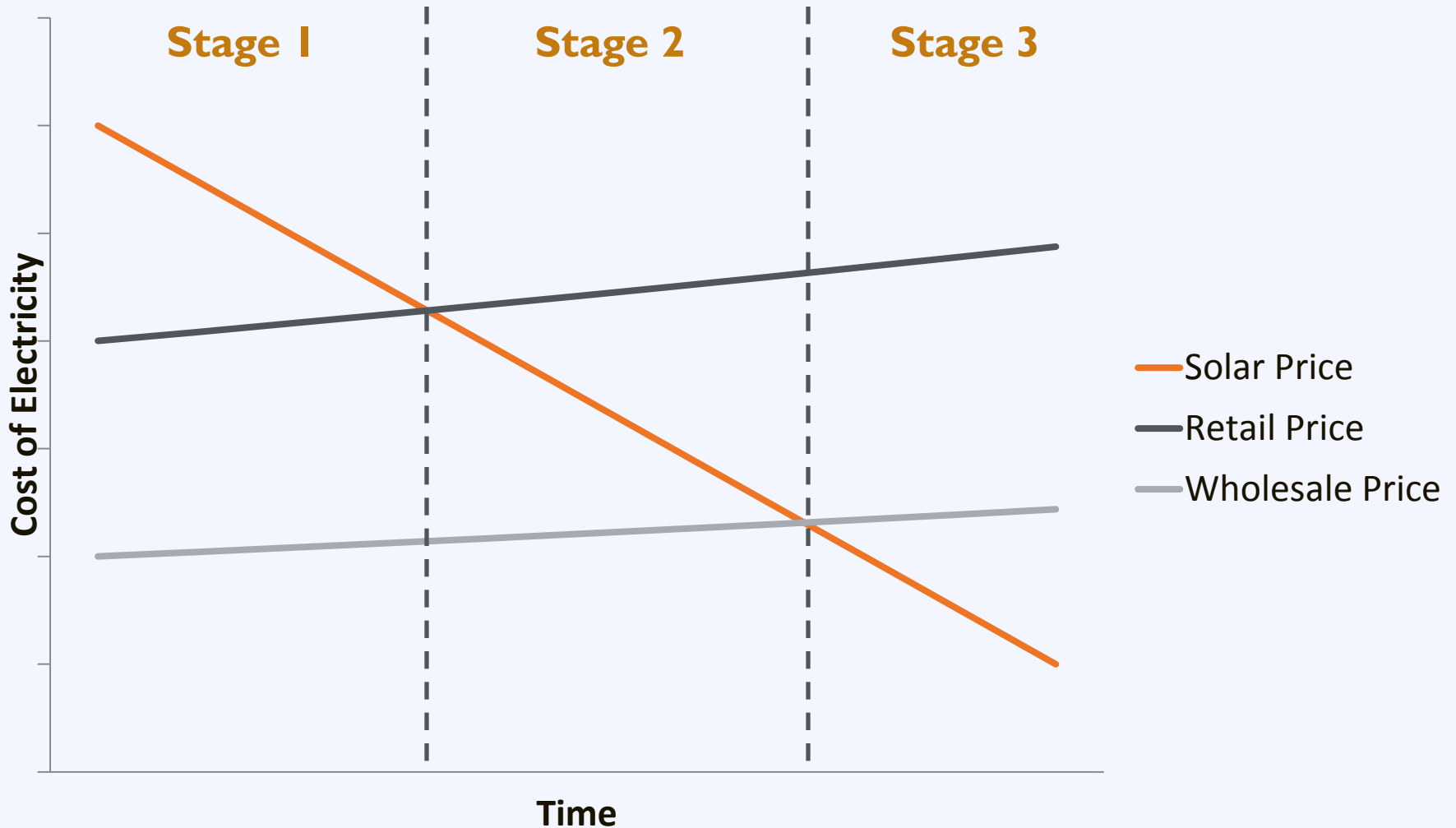
Prices	Investor-Owned	Municipal	Rural Coops	Average
South Carolina	8.13¢/kWh	7.40¢/kWh	10.71¢/kWh	8.49¢/kWh
North Carolina	8.10¢/kWh	10.20¢/kWh	10.40¢/kWh	8.67¢/kWh
Georgia	8.61¢/kWh	8.41¢/kWh	9.55¢/kWh	8.87¢/kWh

# Illustration: Where Are We?

## Levelized Cost of Solar in North Carolina (20 Yr)



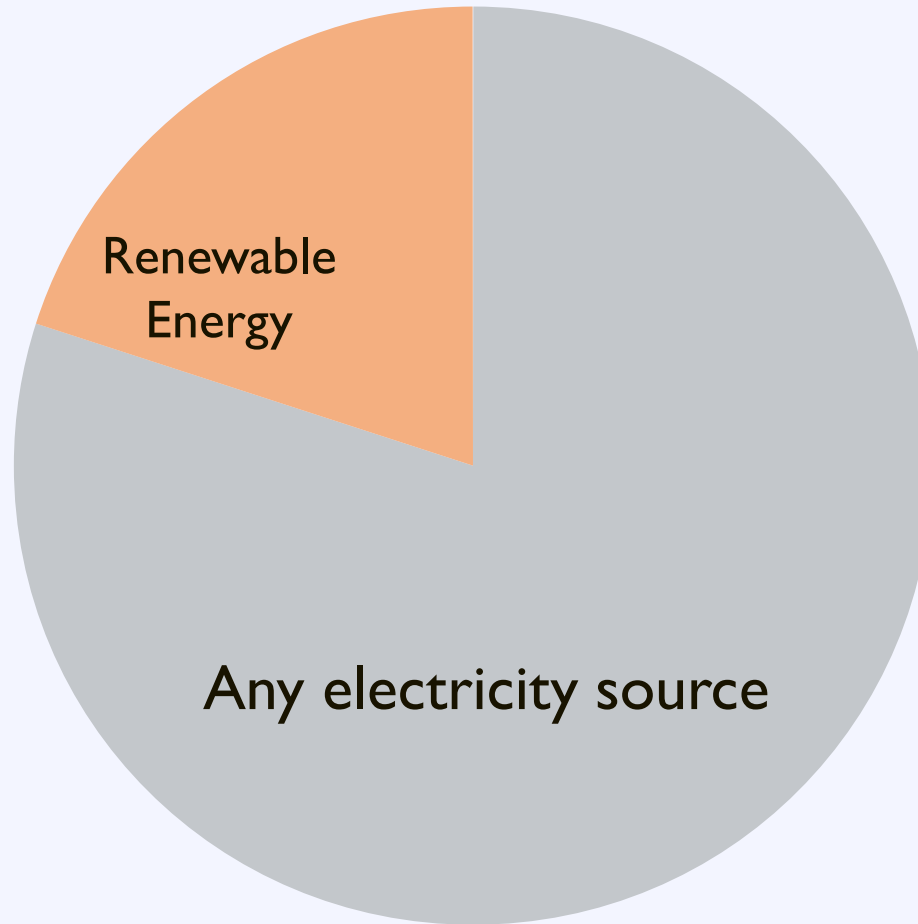
# Utility Market Stages





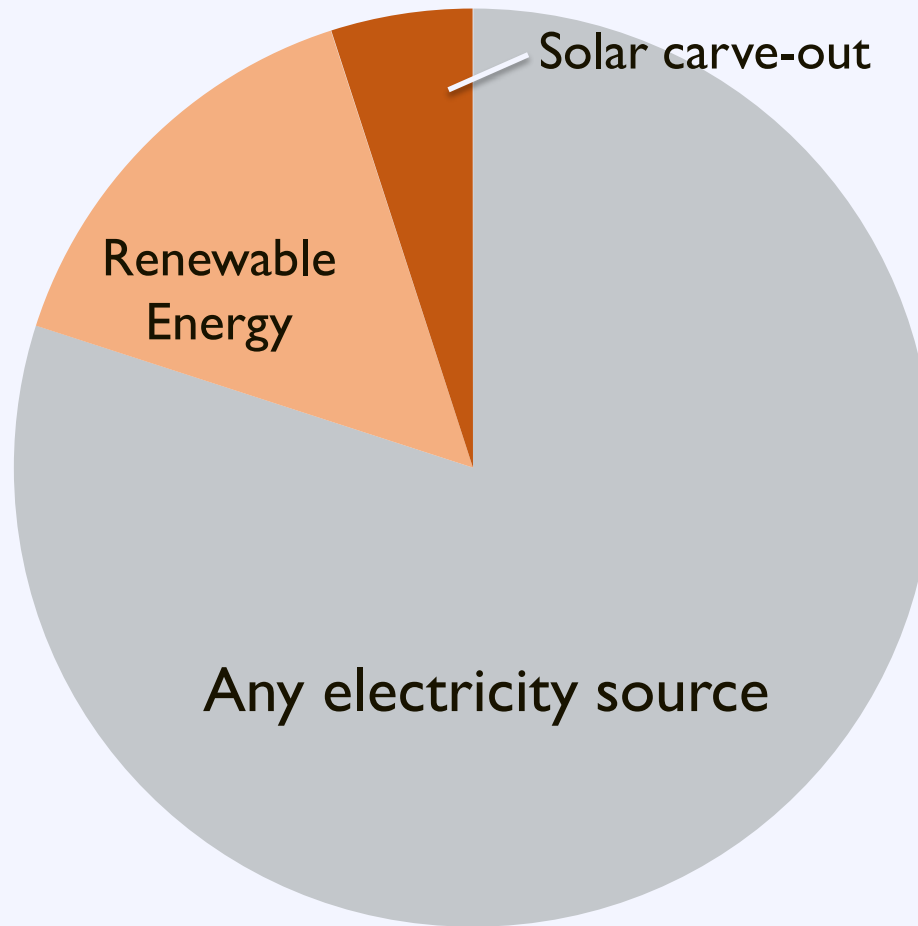
# Renewable Portfolio Standard

## Retail Electricity Sales

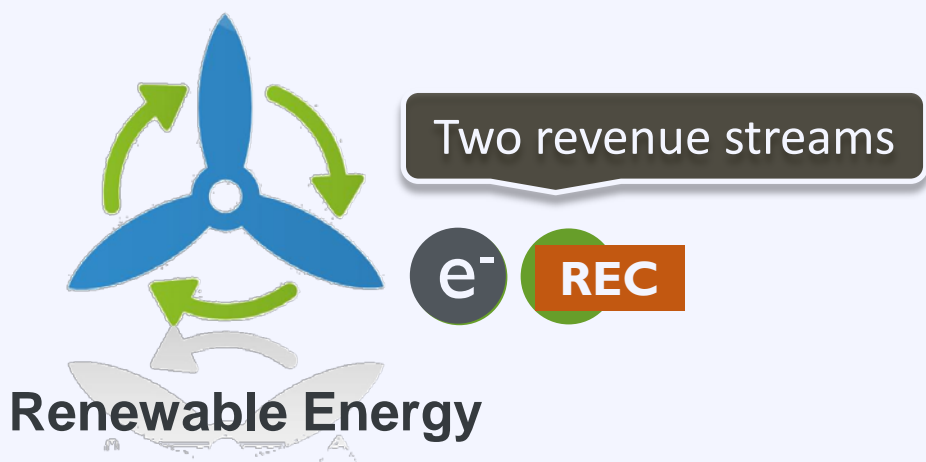


# Renewable Portfolio Standard

## Retail Electricity Sales

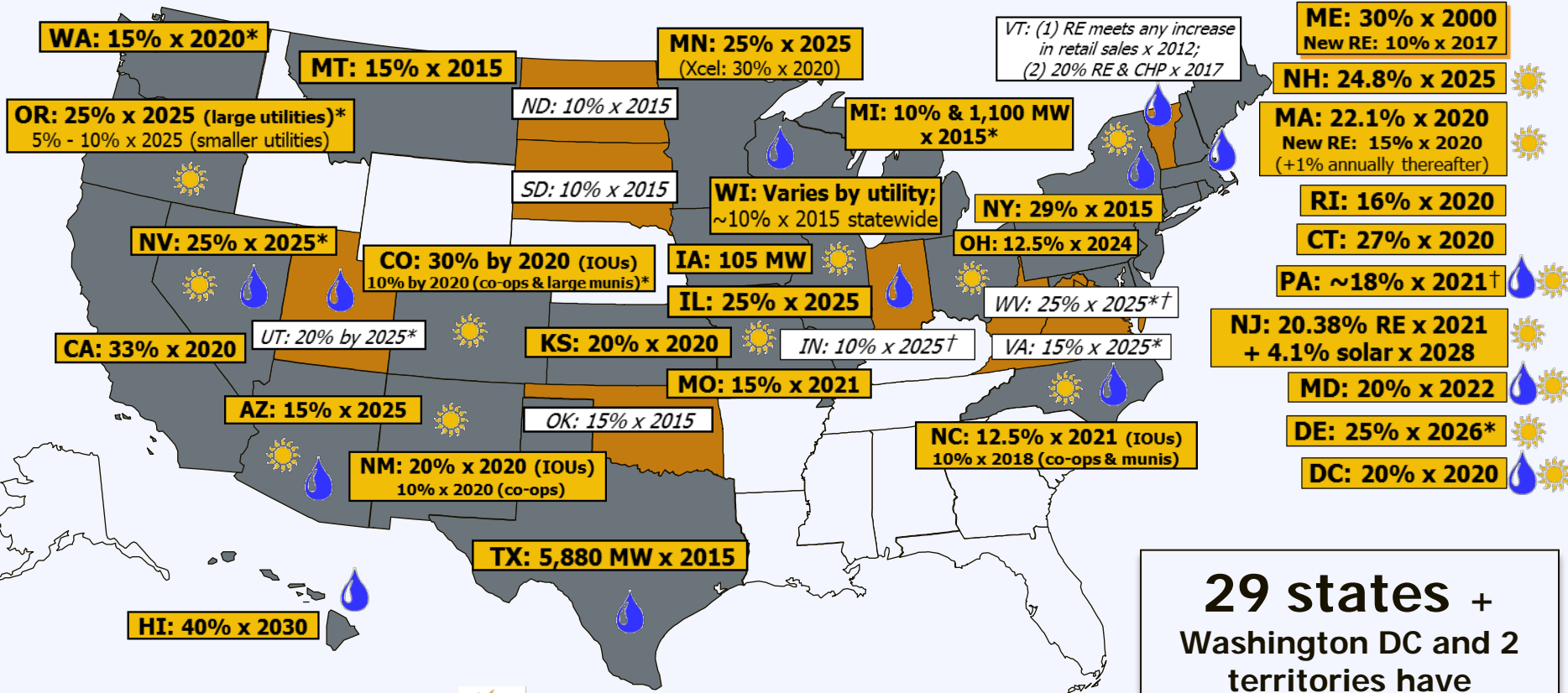


# Renewable Portfolio Standard



# Renewable Portfolio Standard

www.dsireusa.org / August 2012



- Renewable portfolio standard
- Renewable portfolio goal
- Solar water heating eligible
- Minimum solar or customer-sited requirement
- Extra credit for solar or customer-sited renewables
- Includes non-renewable alternative resources

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

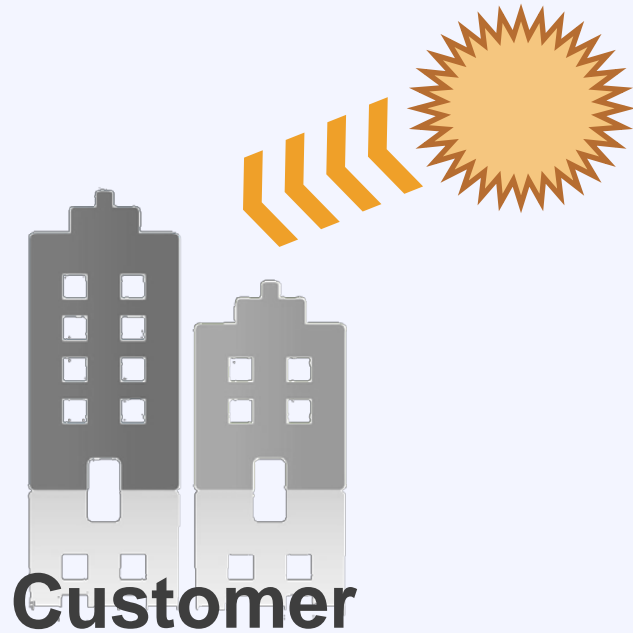
# Net Metering

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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*



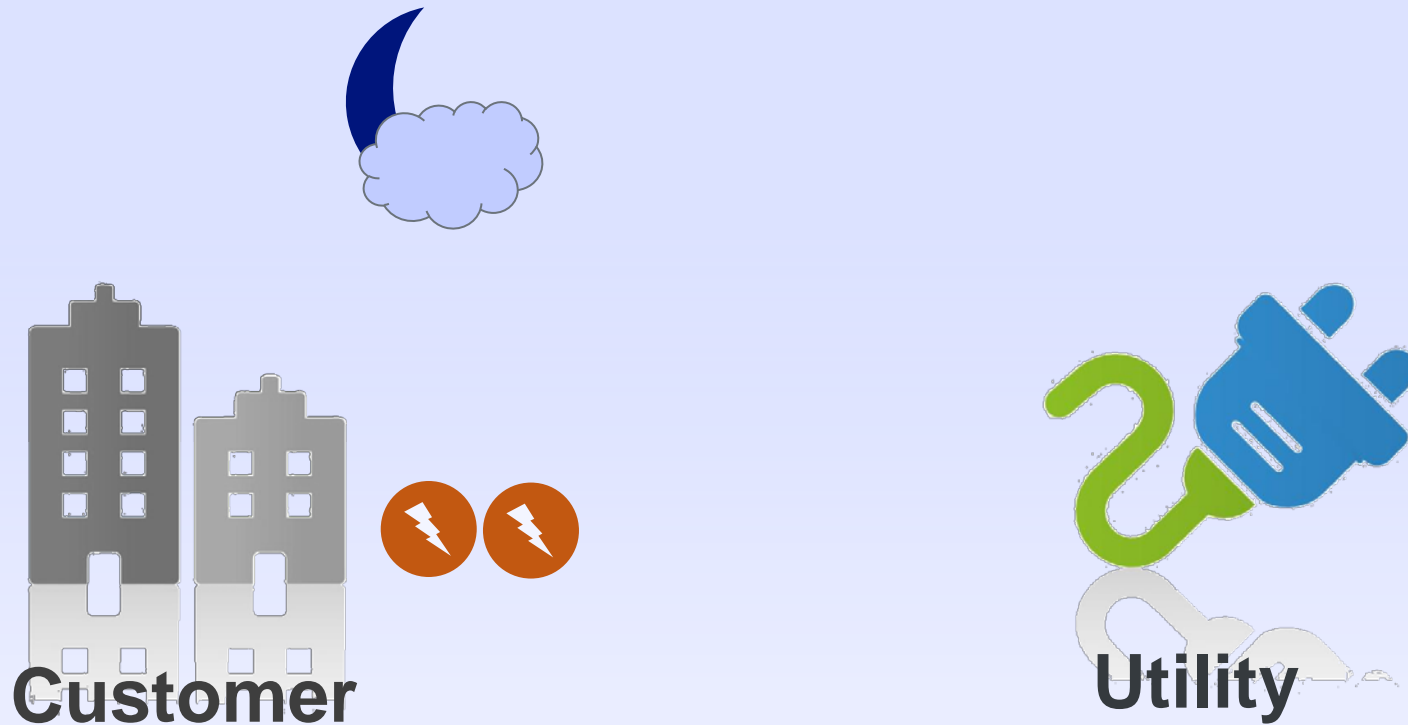
# Net Metering: Overview

*Afternoon*



# Net Metering: Overview

*Night*

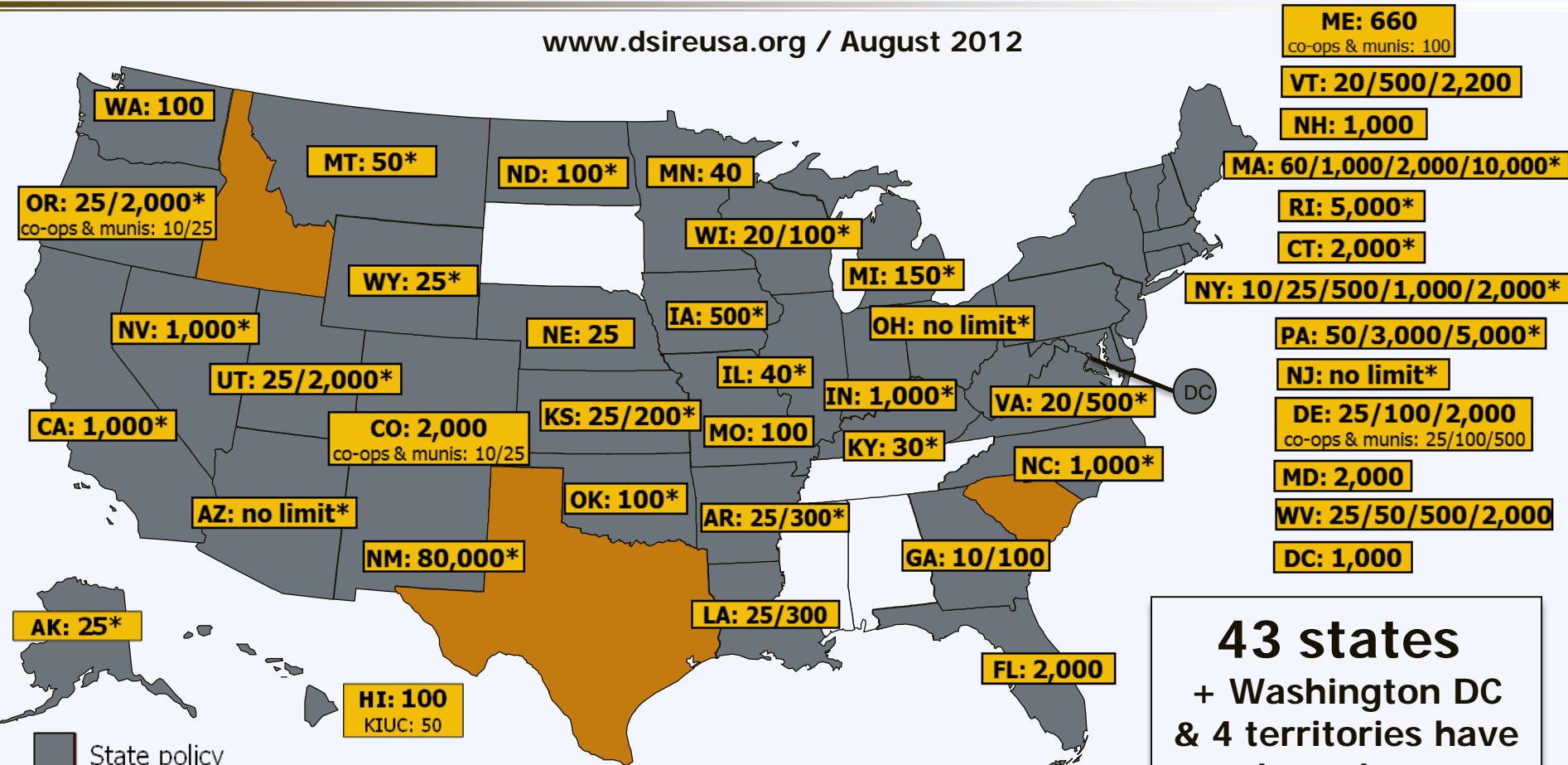


Solar can cover 100% of a customer's load - even at night



# Net Metering: State Policies

www.dsireusa.org / August 2012



**43 states  
+ Washington DC  
& 4 territories have  
adopted a net  
metering policy**

- State policy
- Voluntary utility program(s) only
- \*** State policy applies to certain utility types only (e.g., investor-owned utilities)

*Note: Numbers indicate individual system capacity limit in kilowatts. Some limits vary by customer type, technology and/or application. Other limits might also apply. This map generally does not address statutory changes until administrative rules have been adopted to implement such changes.*

# Net Metering: Market Share

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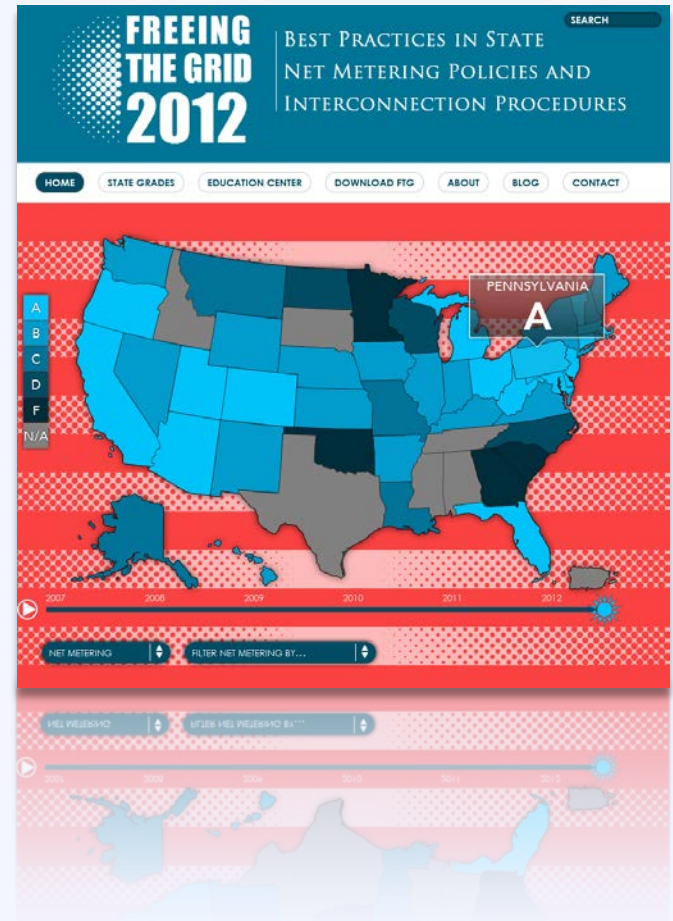
More than **93%** of distributed  
PV Installations are net-metered

# Net Metering: Resources

## Resource **Freeing the Grid**

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

<http://freeingthegrid.org/>



# Net Metering: South Carolina

Net Metering				
-	-	-	F	F
2007	2008	2009	2010	2011

<b>Eligible Renewable/ Other Technologies:</b>	Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Small Hydroelectric
<b>Applicable Sectors:</b>	Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, State Government, Tribal Government, Fed. Government, Agricultural, Institutional
<b>Applicable Utilities:</b>	Duke Energy, Progress Energy, SCE&G
<b>System Capacity Limit:</b>	100 kW for non-residential; 20 kW for residential
<b>Aggregate Capacity Limit:</b>	0.2% of utility's SC jurisdictional retail peak demand for previous calendar year
<b>Net Excess Generation:</b>	Credited to customer's next bill at applicable time-of-use rate or less; granted to utility (annually) at beginning of each summer
<b>REC Ownership:</b>	Not addressed
<b>Meter Aggregation:</b>	Not addressed

# Net Metering: South Carolina

Net Metering				
-	-	-	F	F
2007	2008	2009	2010	2011

<b>Eligible Renewable/ Other Technologies:</b>	Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Small Hydroelectric
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# Net Metering: South Carolina

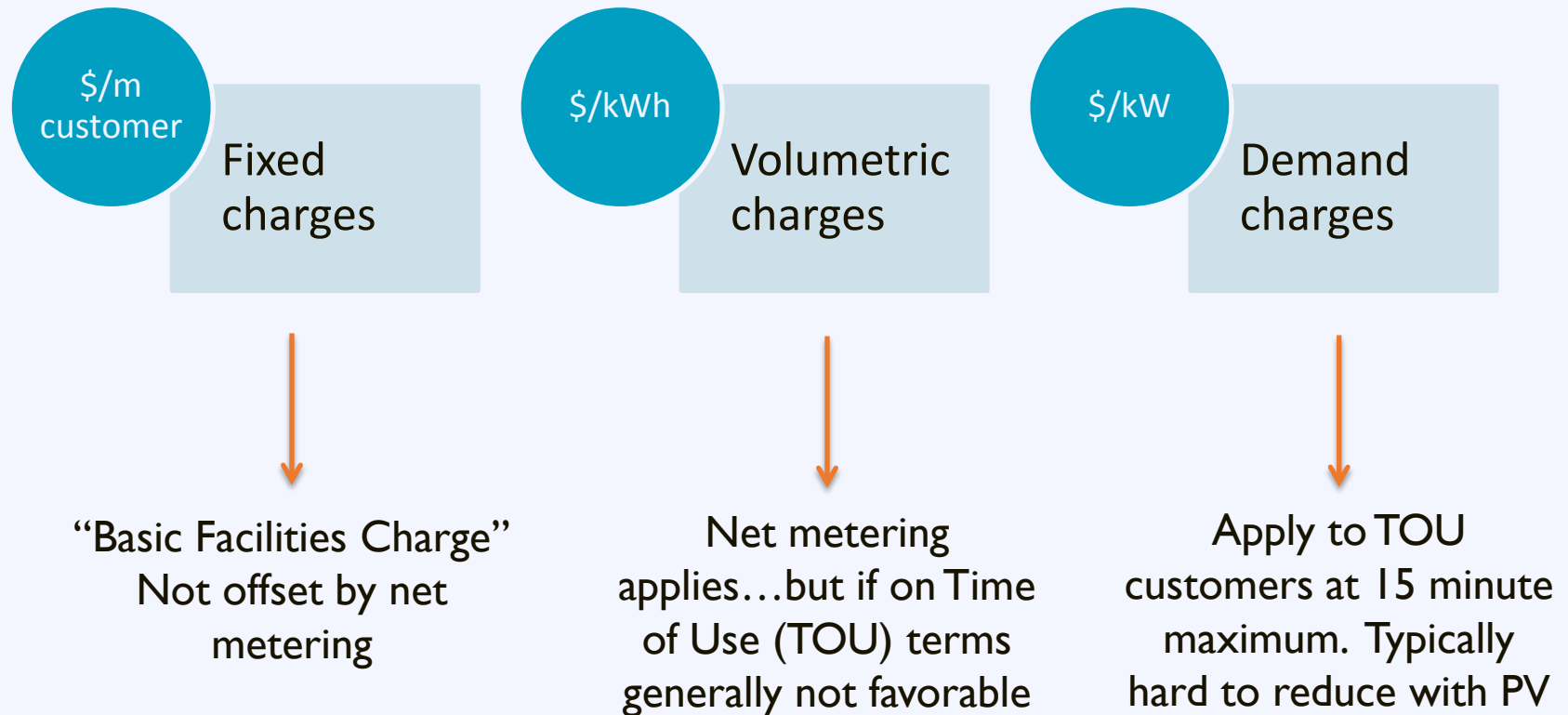
## Positives

- IOUs permit it in general
- Some customer options exist
- 20 kW residential limit sufficient for most customers
- Monthly retail rollover available (with caveats)

## Negatives

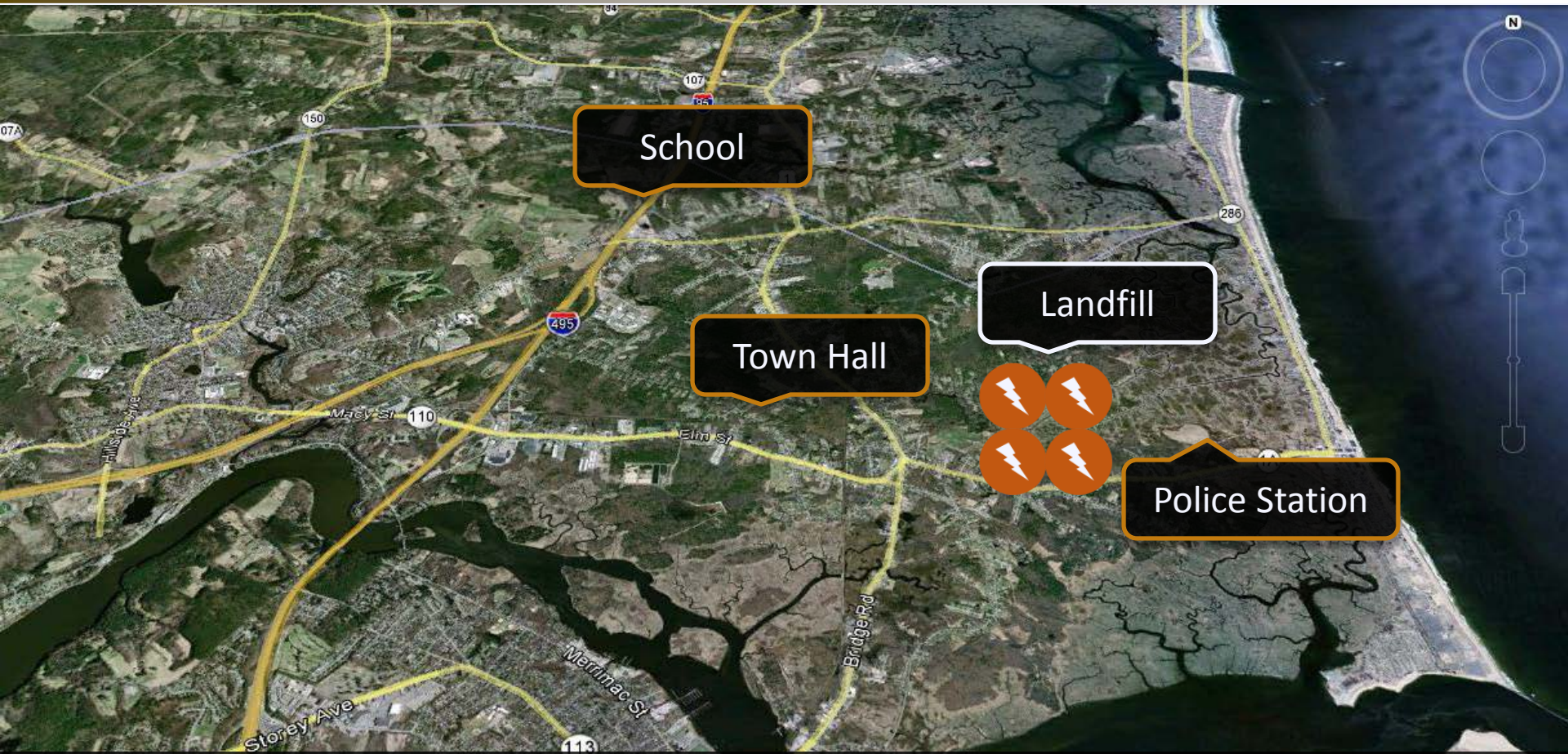
- Not truly standardized for IOUs
- Annual forfeiture of NEG (June)
- Limited to 100 kW for non-residential
- REC forfeiture possible
- Coops and munis represent 44% of electric customers

# Net Metering and Rate Structure





# Net Metering: Virtual



No direct connection necessary

Image: MassGIS, Commonwealth of Massachusetts EOE  
Data: SIO, NOAA, U.S. Navy, NGA, GEBCO  
© 2012 Google

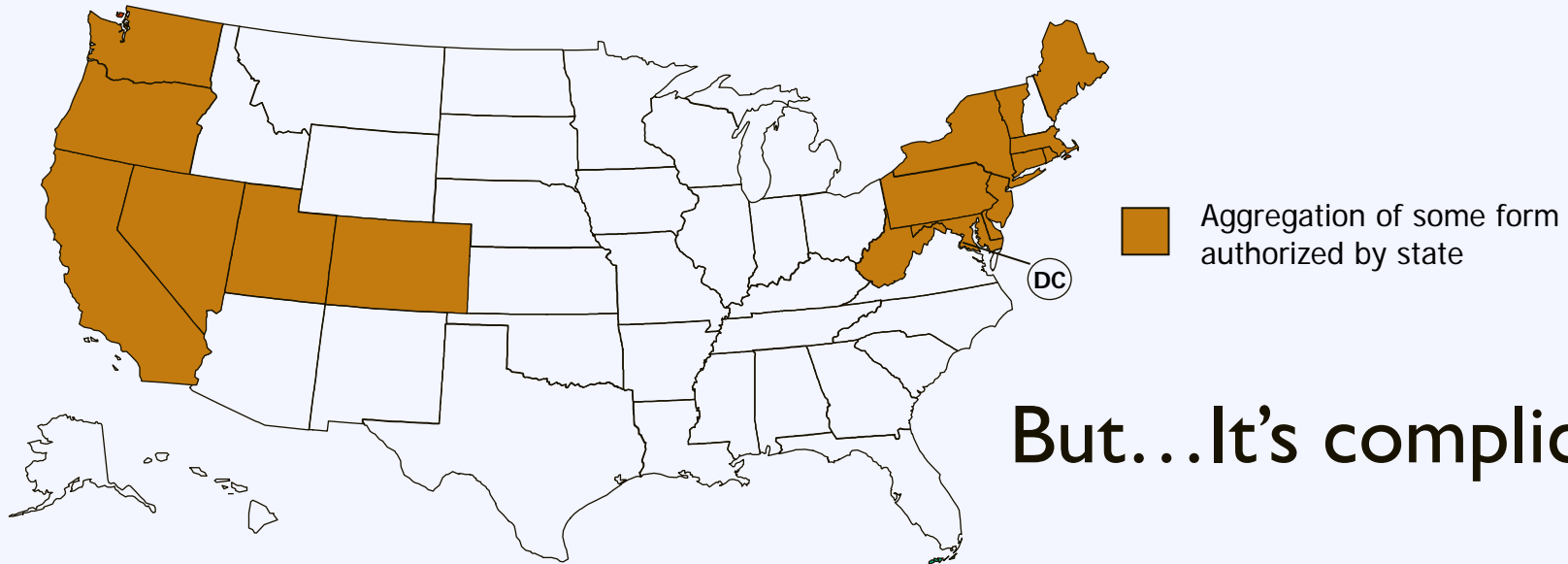
Google earth

Date: 4/9/2008 1992 lat: 42.841484 lon: -70.875865 elev: 21 ft

Eye alt: 25725 ft



# Net Metering: Meter Aggregation



But...It's complicated

- Ownership requirements
- Contiguous vs. non-contiguous properties
- Multiple customers
- Multiple generators
- Modified system/aggregate system size limits
- Rollover rates
- Distance limitations
- Number of accounts
- How to address accounts on different tariffs

# Net Metering: South Carolina

Net Metering				
-	-	-	F	F
2007	2008	2009	2010	2011

## Recommendations:

- The state should adopt IRECs net metering rules

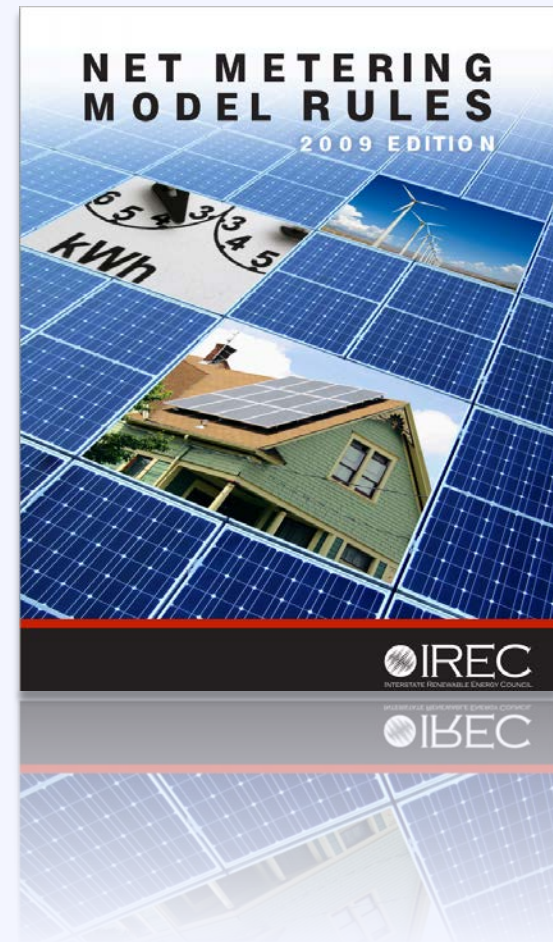
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REC Ownership:	Not addressed
Meter Aggregation:	Not addressed

# Net Metering: Resources

## Resource Interstate Renewable Energy Council

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

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



# Interconnection

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**5,000+** utilities

with unique interconnection procedures

# Interconnection: Background

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**2000:** NREL finds that interconnection is a significant barrier to customer sited DG

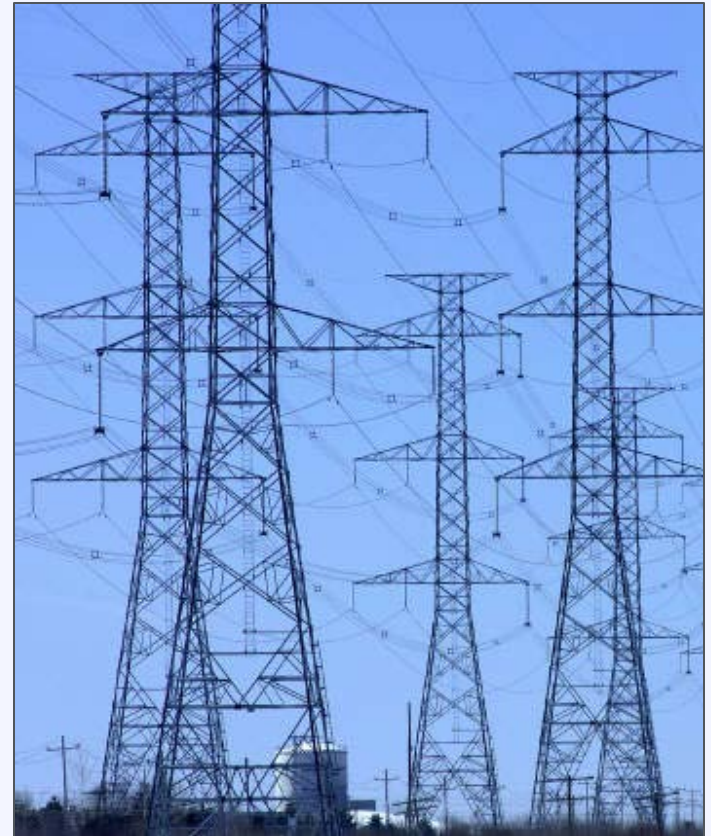
**2005:** Congress requires state regulator authorities to consider an interconnection standard (IEEE 1547)

**2012:** 43 States & DC have adopted interconnection standards

- CA Rule 21
- MADRI Procedures
- FERC SGIP
- IREC Procedures

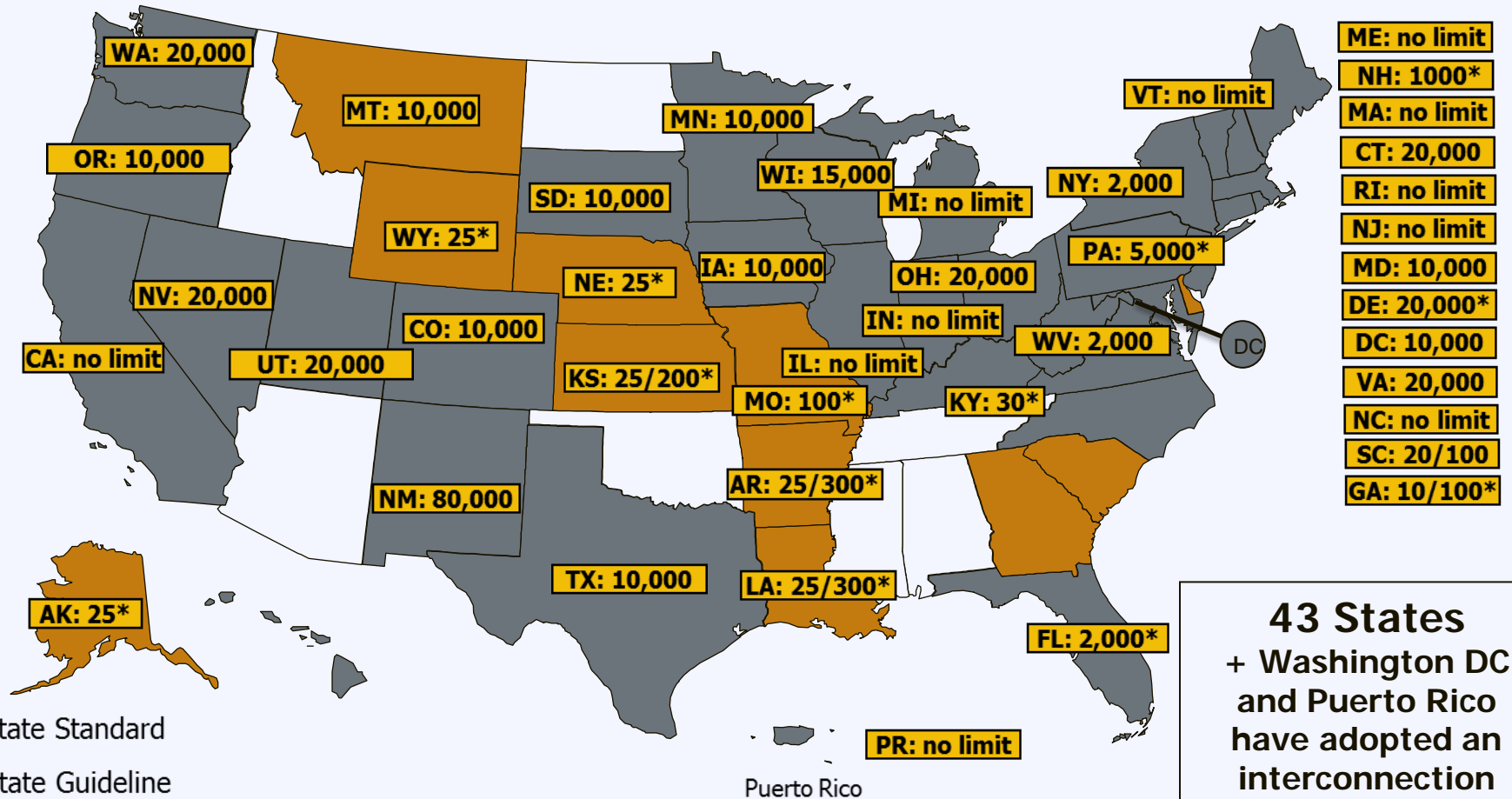
# Interconnection: Best Practices

1. Use standard forms and agreements
2. Implement expedited process
3. Implement simplified procedure for small solar arrays



# Interconnection: State Policies

www.dsireusa.org / August 2012



*Notes: Numbers indicate system capacity limit in kW. Some state limits vary by customer type (e.g., residential versus non-residential). "No limit" means that there is no stated maximum size for individual systems. Other limits may apply. Generally, state interconnection standards apply only to investor-owned utilities.*

# Interconnection: South Carolina

Interconnection				
-	F	F	F	F
2007	2008	2009	2010	2011

<b>Eligible Renewable/Other Technologies:</b>	Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Fuel Cells, Municipal Solid Waste, CHP/ Cogeneration, Anaerobic Digestion, Small Hydroelectric, Microturbines, Other Distributed Generation Technologies
<b>Applicable Sectors:</b>	Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, State Government, Fed. Government, Agricultural, Institutional
<b>Applicable Utilities:</b>	Investor-owned utilities
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<b>Standard Agreement:</b>	Yes
<b>Insurance Requirements:</b>	Vary by system size and/or type; levels established by commission
<b>External Disconnect Switch:</b>	Required
<b>Net Metering Required:</b>	No



# Interconnection: South Carolina

Interconnection				
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2007	2008	2009	2010	2011

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# Interconnection: South Carolina

## Positives

- Standard contracts
- Homeowner insurance can cover residential installations
- Mutual indemnification
- Relatively modest fees (\$100 for residential, \$250 for non-residential)

## Negatives

- Not fully comprehensive
- Coops and munis represent 44% of electric customers
- Capacity limitations (100 kW for non-residential)
- Redundant EDS required
- No standards for dispute resolution
- No use of FERC Screens

# Interconnection: South Carolina

Interconnection				
-	F	F	F	F
2007	2008	2009	2010	2011

## Recommendations:

- Adopt IREC's model interconnection procedures

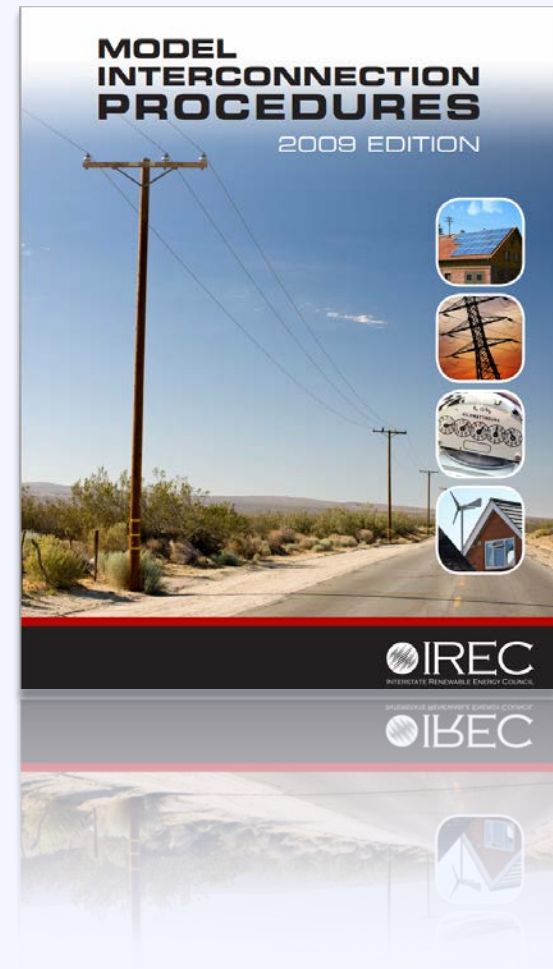
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# Interconnection: Resources

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Q & A

# Agenda

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# Understanding Solar Financing

**Direct Cash  
Incentives**

RPS/SRECs

Rebates

PBIs/FITs

**Financing**

3<sup>rd</sup> Party  
Ownership

QECBs

PACE

**Other  
Incentives**

Sponsored  
Loans

Community  
Shared Solar

Property &  
Sales Taxes

# Understanding Solar Financing

**Direct  
Incentives**

RPS/SRECs

Tax Credits

PBIs/FITs

**Financing**

3<sup>rd</sup> Party  
Ownership

QECBs

PACE

**Other  
Incentives**

Sponsored  
Loans

Community  
Shared Solar

Property &  
Sales Taxes



# Comparison: PV Financial Incentives

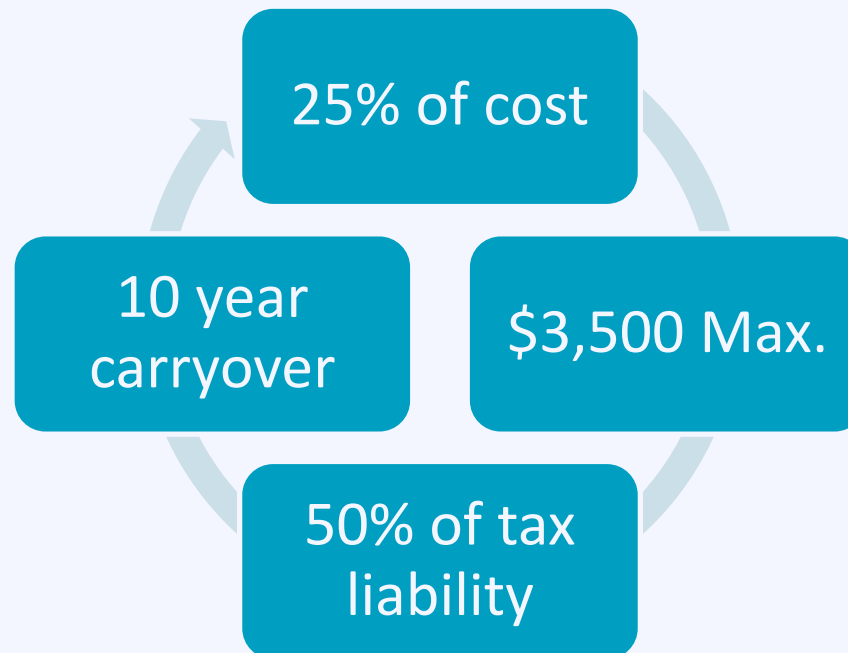
North Carolina		
-	State Rebates	-
-	State Grants	-
-	State Loans	-
-	PACE Financing	-
✓	Prod. Incentives	Duke, Progress, TVA, NC Greenpower
✓	Corp. Tax Credits	35% up to \$2.5 million
✓	Pers. Tax Credits	35% up to \$10,500
✓	Prop. Tax Incentives	80% abatement, R basically exempt

South Carolina		
-	State Rebates	-
-	State Grants	-
✓	State Loans	\$50K – \$500K (govt, schools, NP)
-	PACE Financing	-
✓	Prod. Incentives	Duke, Progress, PaCE
✓	Corp. Tax Credits	25% up to \$3,500
✓	Pers. Tax Credits	25% up to \$3,500
-	Prop. Tax Incentives	-

# Tax Credits

**Federal Tax Credits:** 30% of cost for businesses and personal income tax payers, through 2016.

## State Tax Credits (Personal and Corporate)



# Performance Incentives

---

## Duke Standard Offer:

\$0.005/kWh; 35 – 10,000 RECs annually; 5 – 15 Yr. contracts; rate subject to change; RECs only

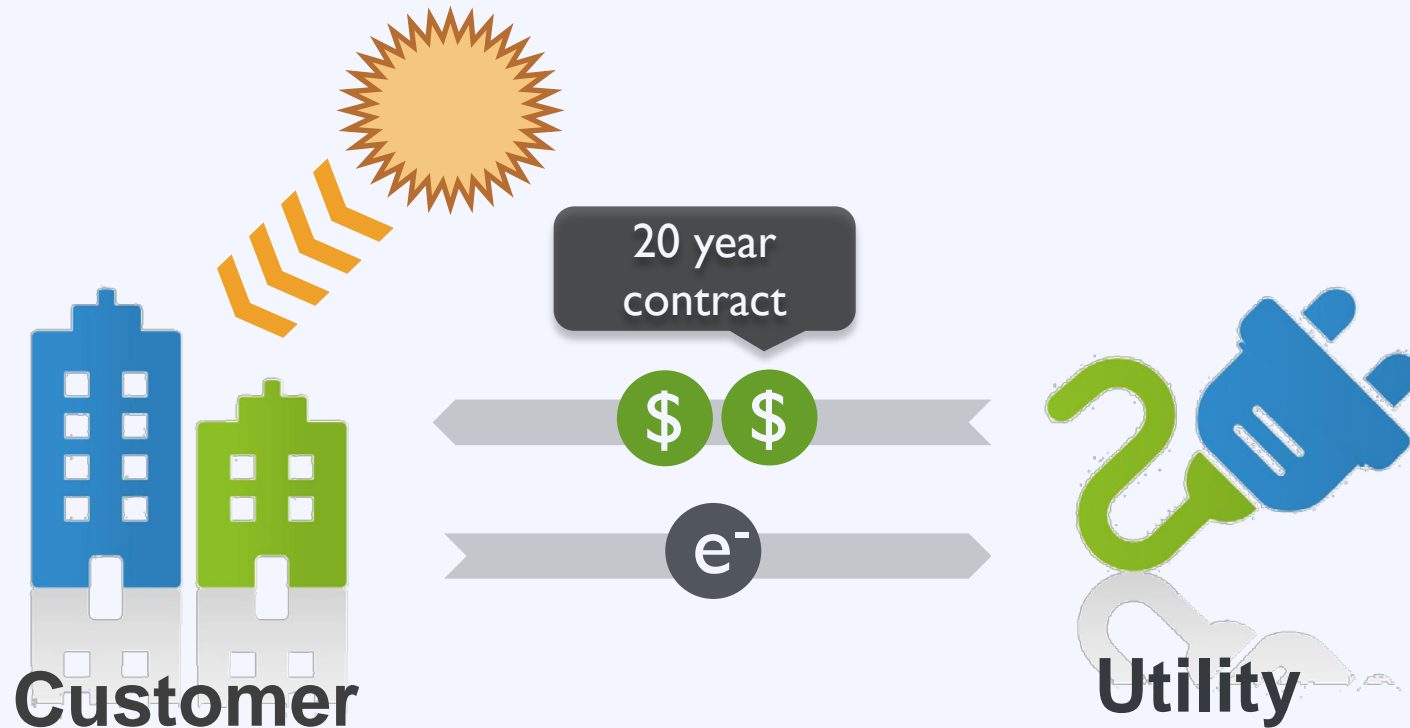
## Progress Commercial SunSense:

\$0.15/kWh (energy + RECs); 20-Yr. contracts.; 11 – 500 kW;  
Guaranteed! (Expected to re-open December 2012)

## Palmetto Clean Energy (PaCE):

Currently \$0.10/kWh premium for RECs; 6 kW or less;  
competitive for larger systems; up to 3-Yr. contract (funding contingent); power sold to utility (rates vary)

# What is a Feed in Tariff?



# Components of a Feed in Tariff

- Fixed price payment
- Long term contract
- Guaranteed power purchase
- Price based on generation cost



# Understanding Solar Financing

Direct Cash  
Incentives

RPS/SRECs

Rebates

PBIs/FITs

**Financing**

3<sup>rd</sup> Party  
Ownership

QECBs

PACE

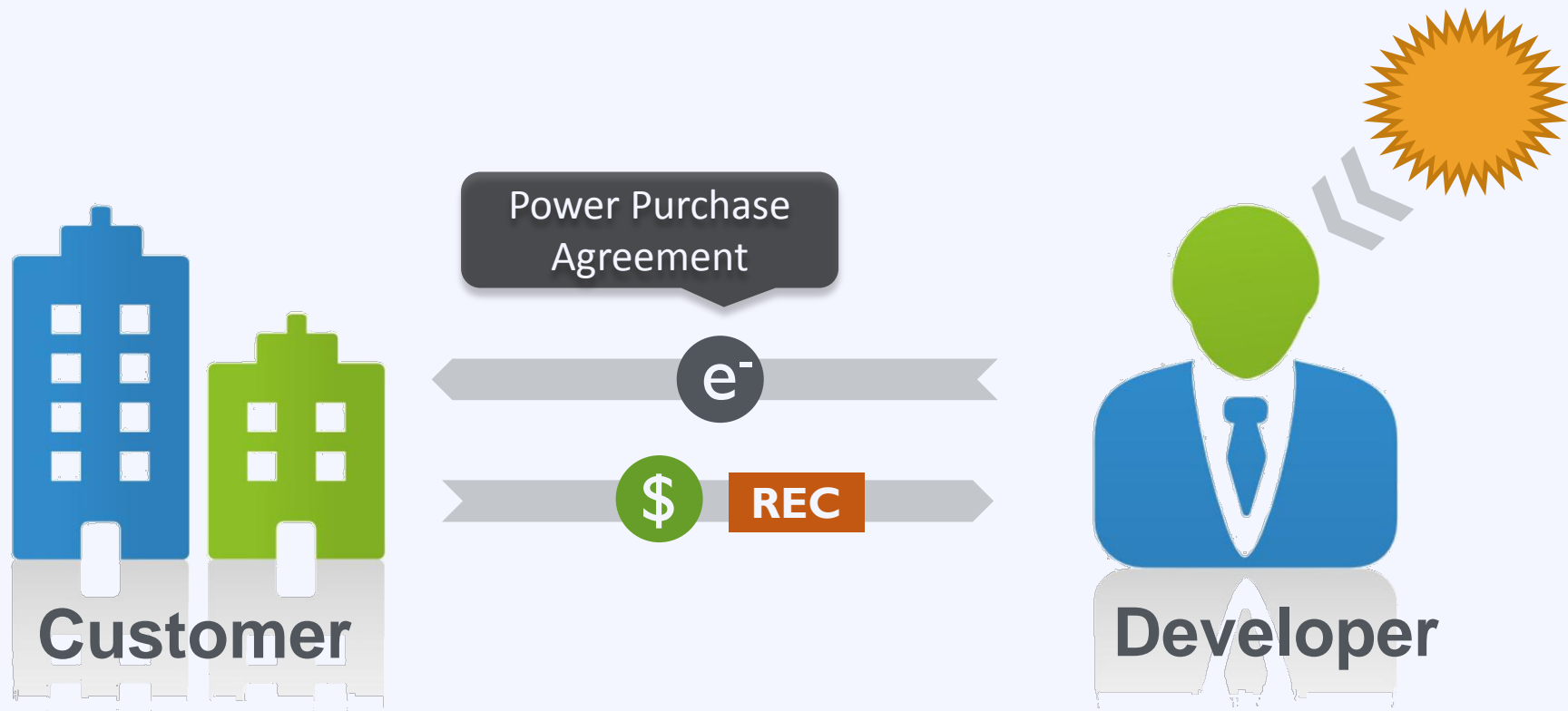
Other  
Incentives

Sponsored  
Loans

Community  
Shared Solar

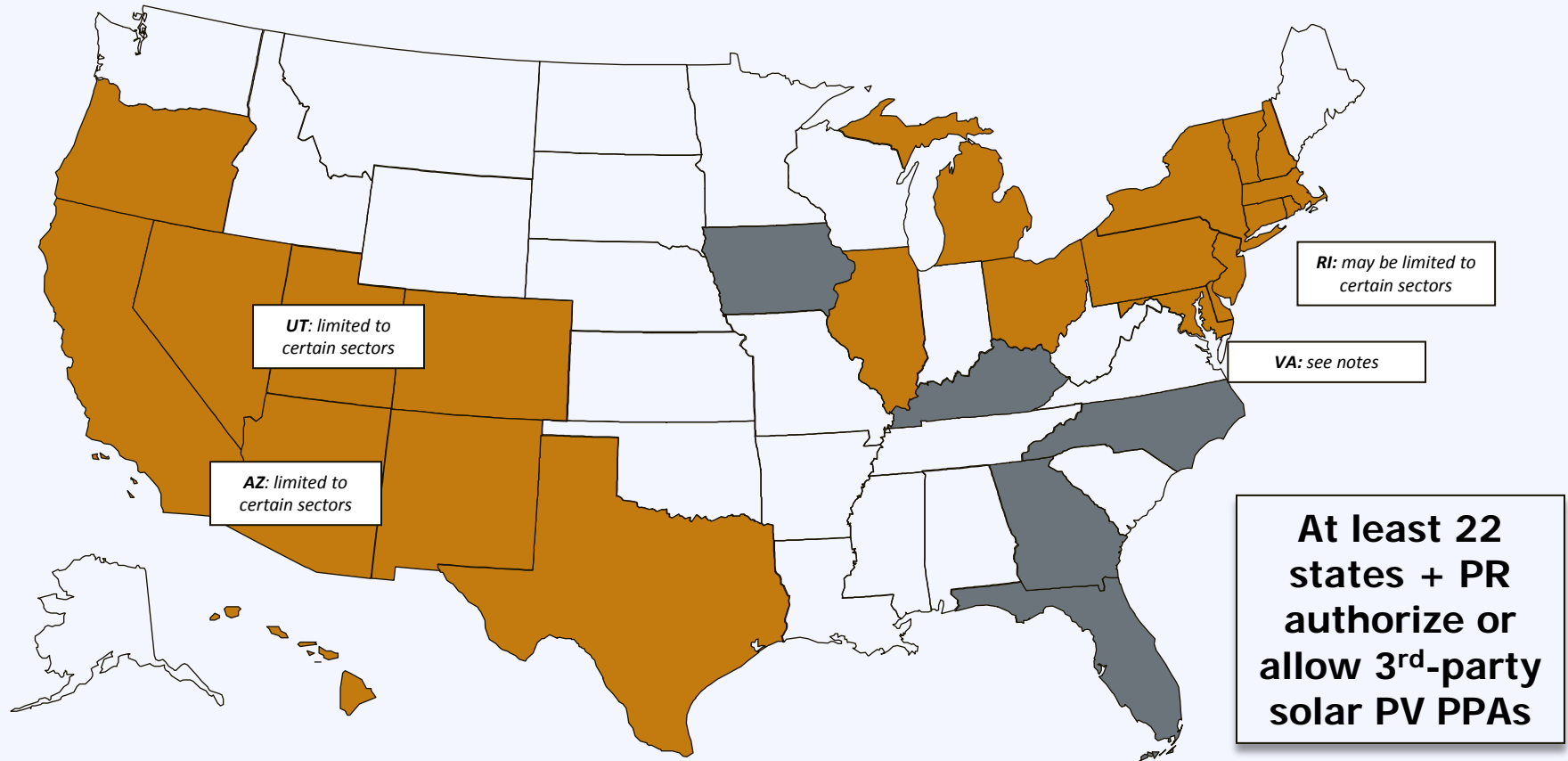
Property &  
Sales Taxes

# Third Party Ownership



# 3<sup>rd</sup>-Party Solar PV Power Purchase Agreements (PPAs)

www.dsireusa.org / August 2012



- 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 3<sup>rd</sup>-party PPA. See following slides for additional important information and authority references.

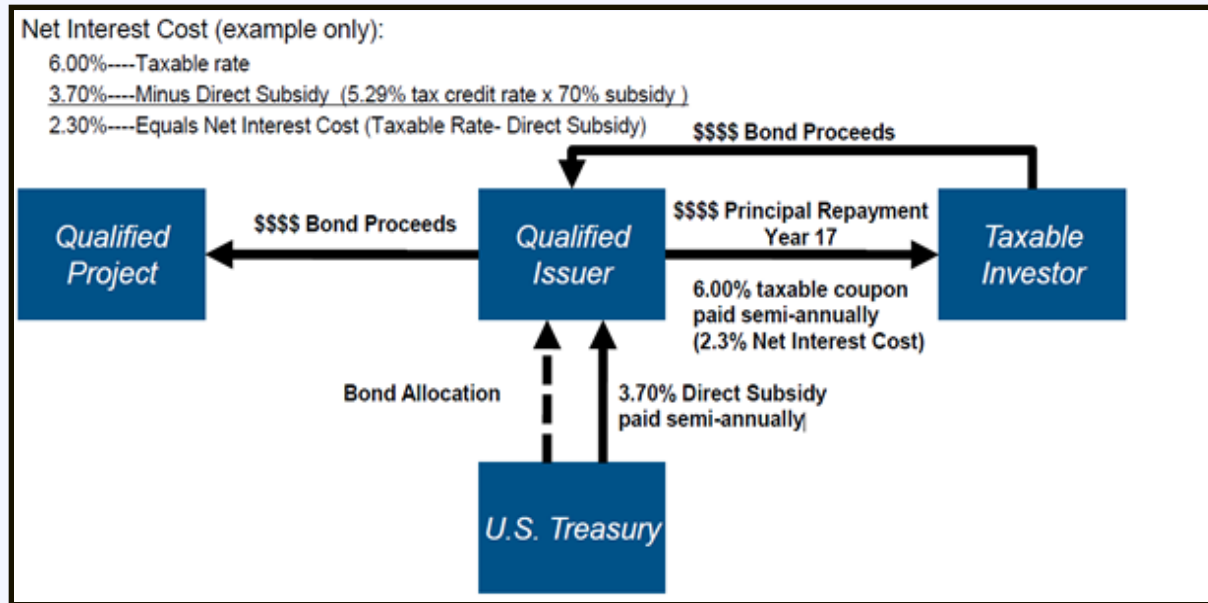


# Qualified Energy Conservation Bonds

---

- What?
  - Tax credit or direct payment subsidy
- Why?
  - Subsidy lowers the effective cost of capital
- Relevance for Solar?
  - Financing public facilities (numerous)
  - “Green Community” programs (a few)
- How?
  - State allocation (large local governments) or automatic allocation

# Qualified Energy Conservation Bonds



## Local Examples:

- None issued in SC to our knowledge. Total state allocation of \$46.5M.

# Property Assessed Clean Energy

City creates type of land-secured financing district or similar legal mechanism (a special assessment district)



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)



# Understanding Solar Financing

Direct Cash  
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Incentives

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Loans

Community  
Shared Solar

Property &  
Sales Taxes

# Financing: Attractive Loan Options

---

- Local governments and utilities can develop loan programs:
  - direct loans (e.g., revolving loan fund)
  - loans through private lenders (e.g., credit enhancement)
- Benefits and drawbacks exist for both approaches
- The goal is to increase **access** to financing or induce **additional** improvements
- Various funding options exist

# Community Shared Solar



# Property & Sales Tax Exemptions

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- No exemptions currently in place
- 6% state sales tax + up to 3% local sales tax

## Property Taxes????

# Q & A



# Agenda

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08:40 – 09:00	Solar 101
09:00 – 09:50	Creating a Regulatory Landscape for Solar
09:50 – 10:00	<i>Break</i>
10:00 – 10:20	Benefits and Barriers Activity
10:20 – 10:50	Understanding Utility Regulations
10:50 – 11:20	Understanding Solar Financing
<b>11:20 – 11:30</b>	<b><i>Break</i></b>
11:30 – 12:00	Installing Solar on Municipal Facilities
12:00 – 12:10	Next Steps for Solar in Region

# Agenda

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# Process

Decide on  
Ownership  
Structure

**Option 1:** Direct Ownership

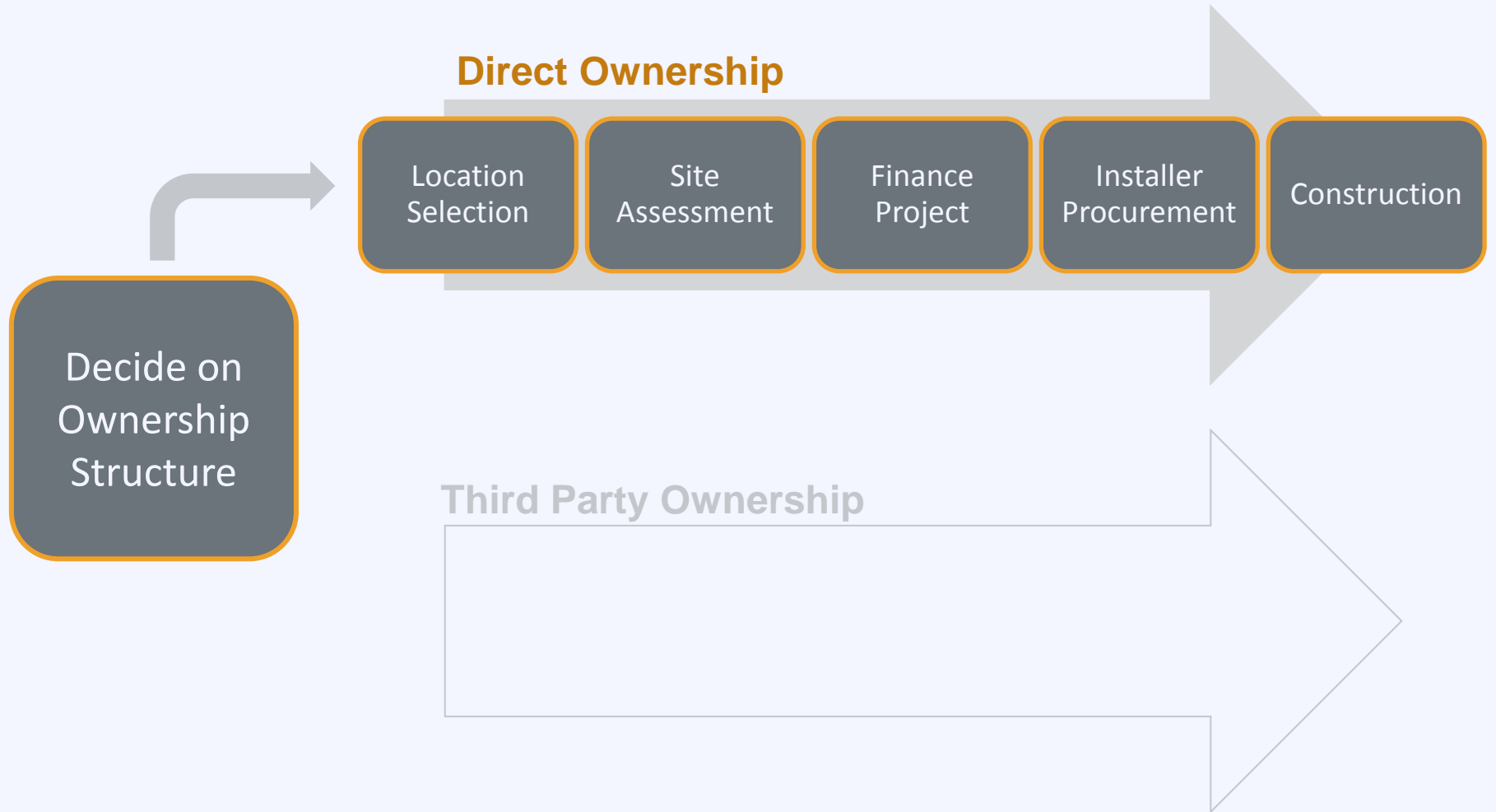
**Option 2:** Third Party Ownership

# Ownership Structure Decision

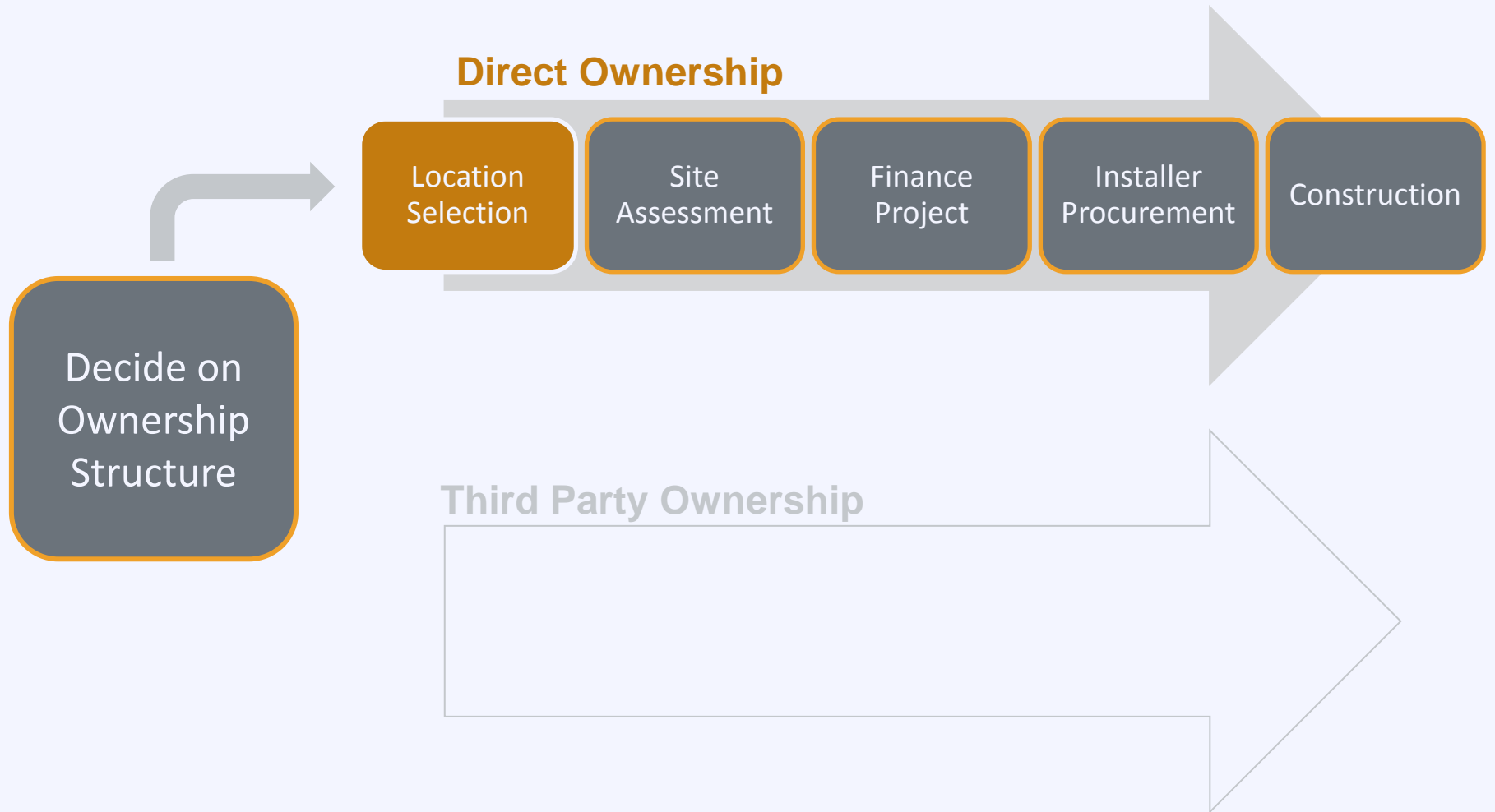
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- Are you a taxpaying entity?
- Do you have access to financing or available cash?
- How does this compare to other opportunities?
- Can you enter into long-term contracts?
- Do you want to own the system?
- Do you have a municipal utility?
- Do you need the RECs for compliance?

# Process



# Process



# Step 1: Location Selection

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- Who is using the energy?
- Where is the energy being used?
- What is the user's energy load?
- What is the user's energy cost?

# Step 1: Location Selection



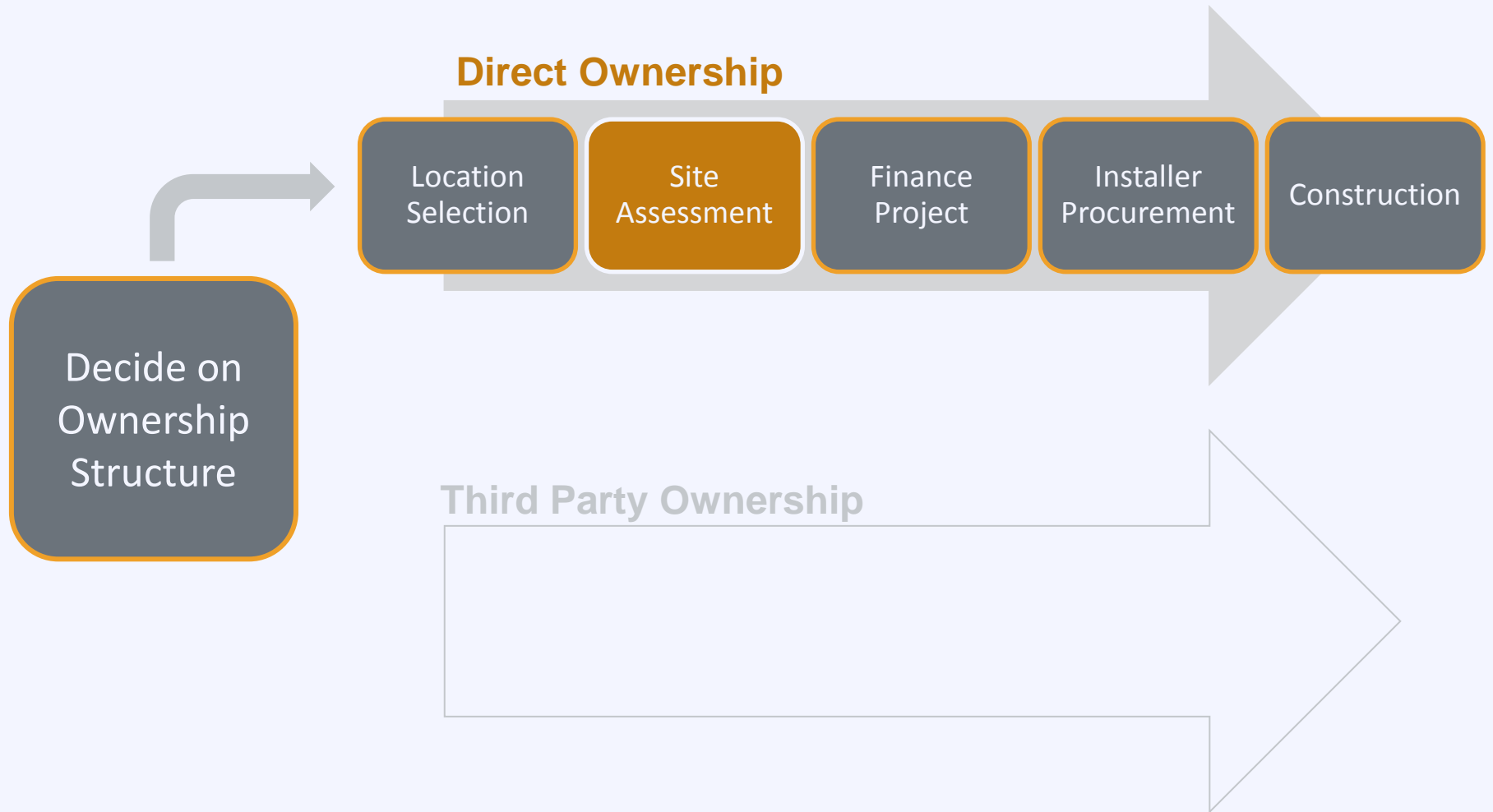
**Rooftop**



**Ground**



# Process



# Step 2: Site Assessment

- Solar Access Rights
- Interconnection
- Wind loading
- Roof age, type, & warranty
- Electrical configuration
- Slope, Shading and orientation

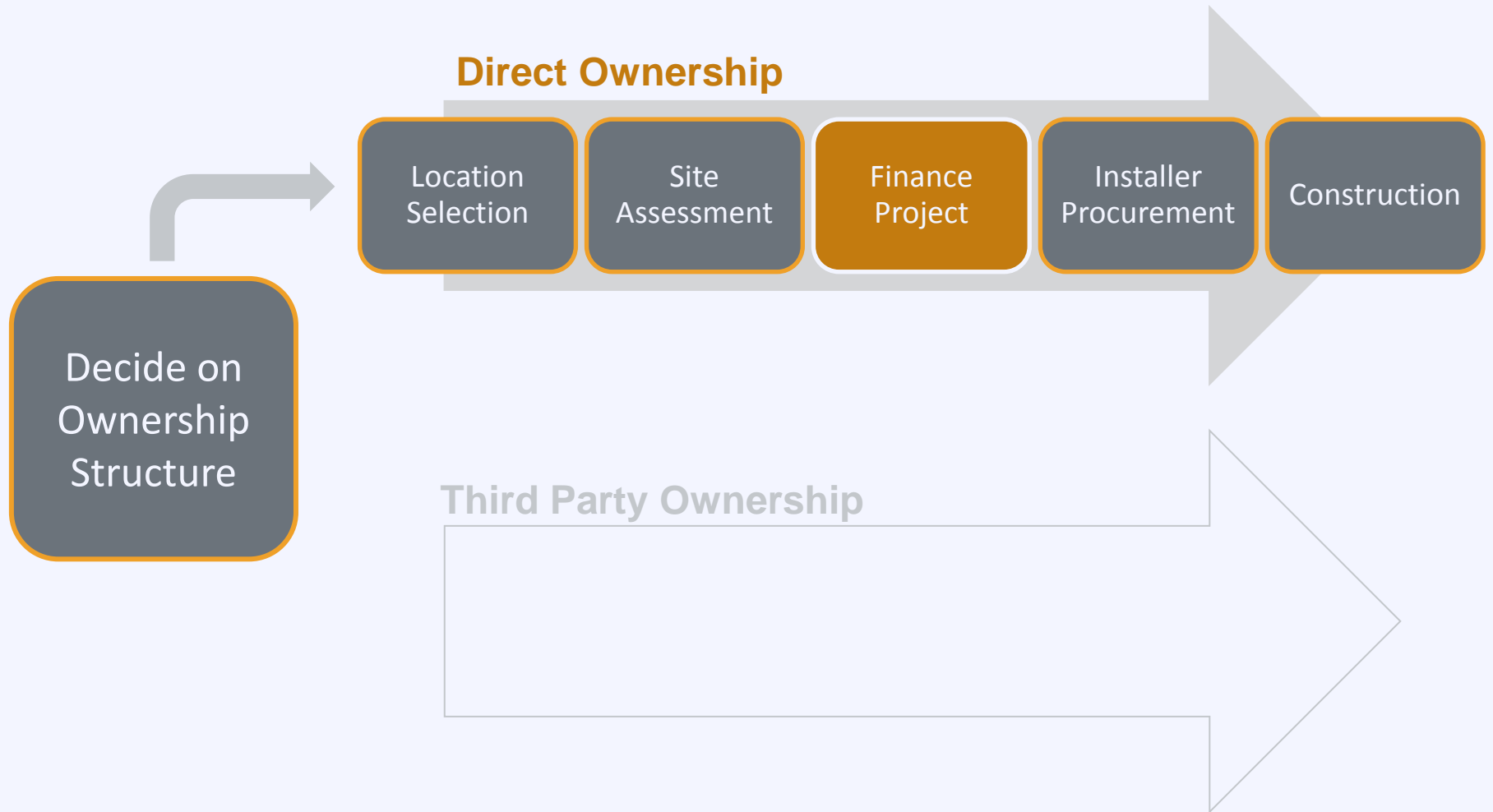


# Step 2: Site Assessment

- Usable acreage
- Slope
- Distance to transmission lines
- Distance to graded roads
- Conservation areas



# Process

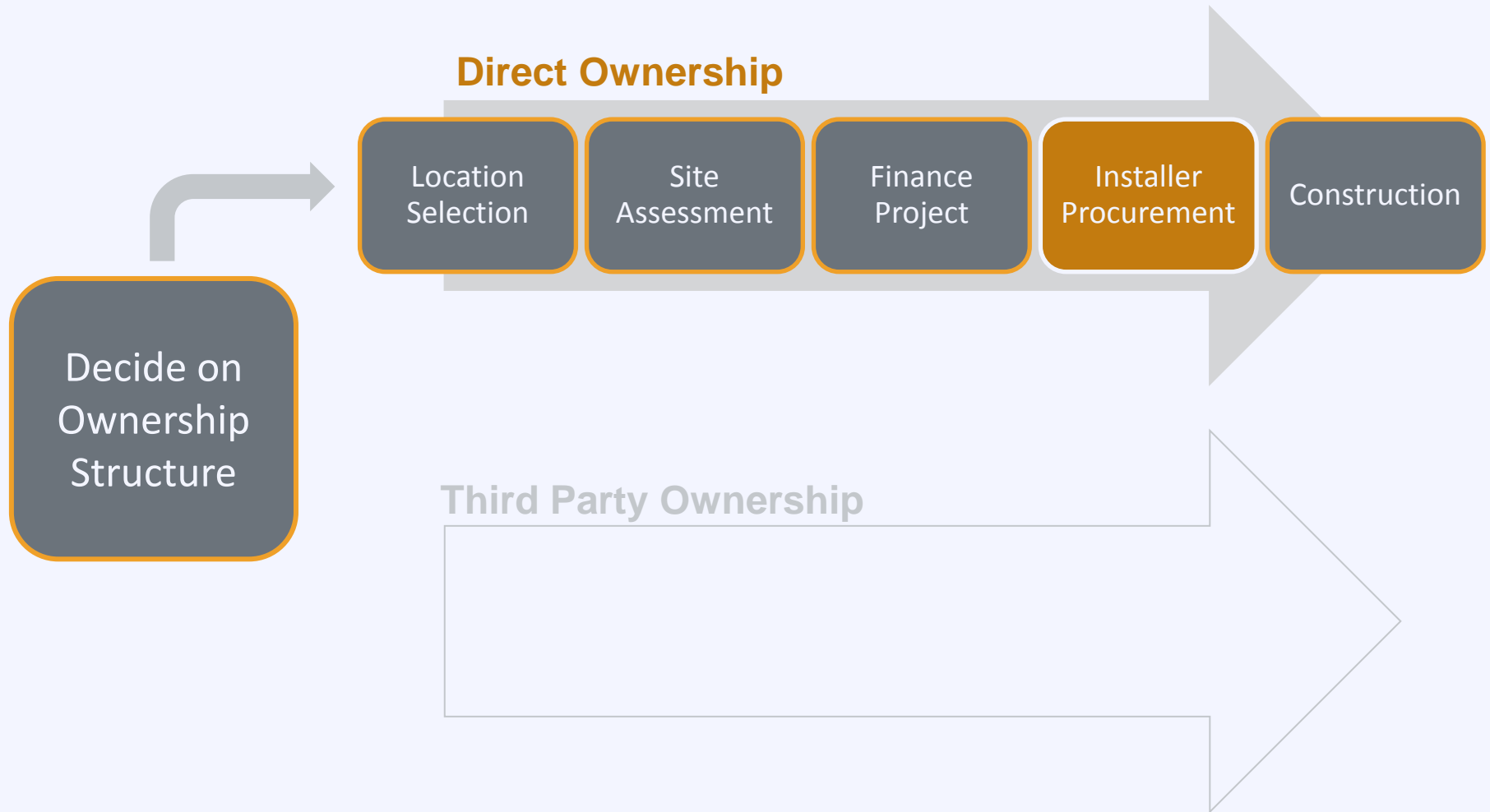


# Step 3: Finance Project

---

- Direct purchase
- Grant financed
- ESCO/performance contracting
- Loans
- Bonds

# Process



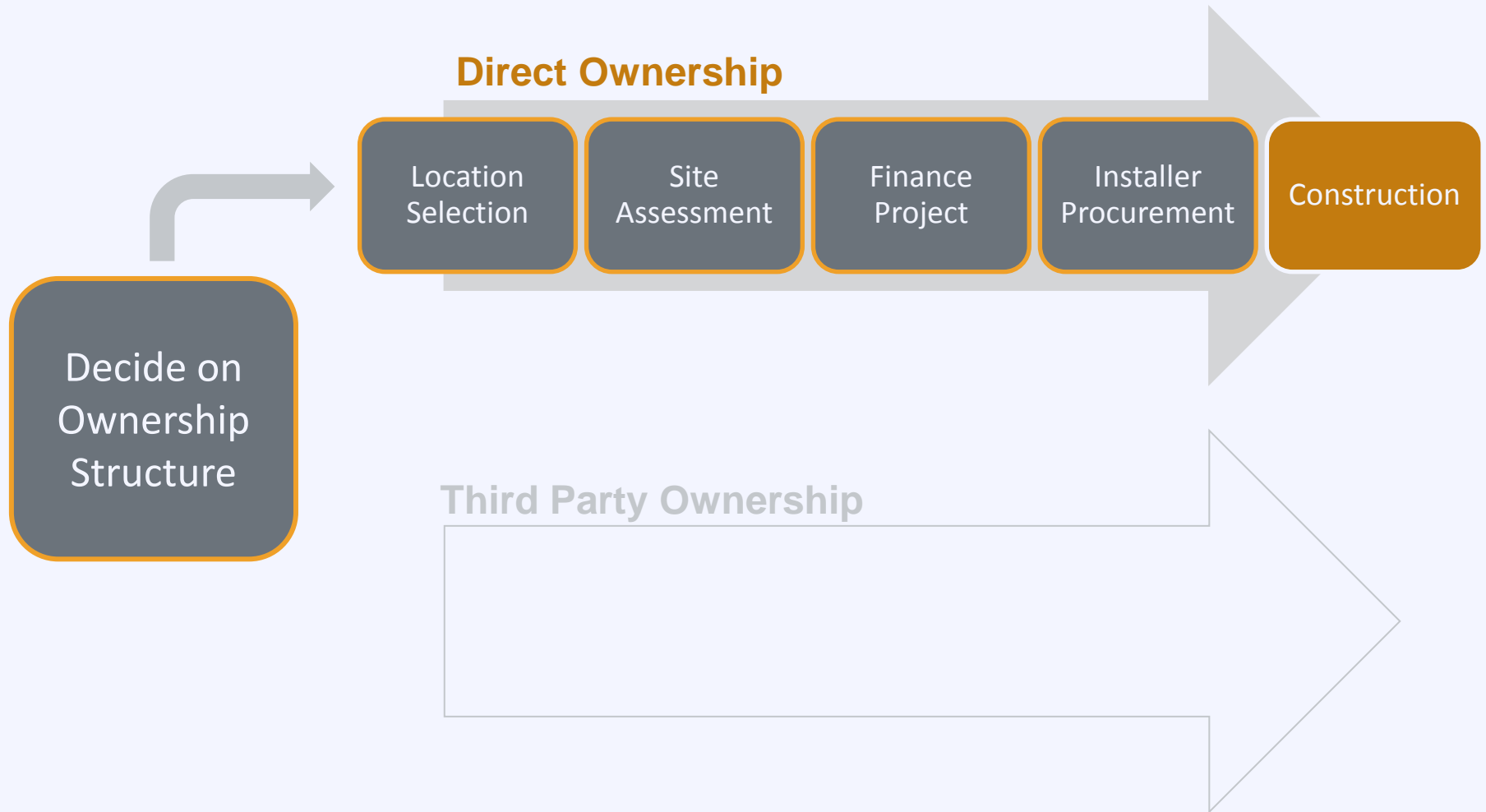
# Step 4: Installer Procurement

---

EPC = Engineer, Procure, Construct

- Designs the project
- Completes necessary permitting requirements
- Works with the utility to file for interconnection
- Assists in procuring components
- Applies for incentives
- Manages project construction

# Process





# Direct Ownership

---

## Pros

- Low – cost electricity
- REC revenue
- Maximize underutilized spaces

## Cons

- Large upfront cost
- Long term management
- Can't take all incentives
- Development risk
- Performance risk

# Third Party Ownership

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## Pros

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

## Cons

- Market electricity price risk
- Limited opportunity in SC
- Don't keep RECs

Q & A

# Agenda

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<b>12:00 – 12:10</b>	<b>Next Steps for Solar in Region</b>

# Activity: Next Steps

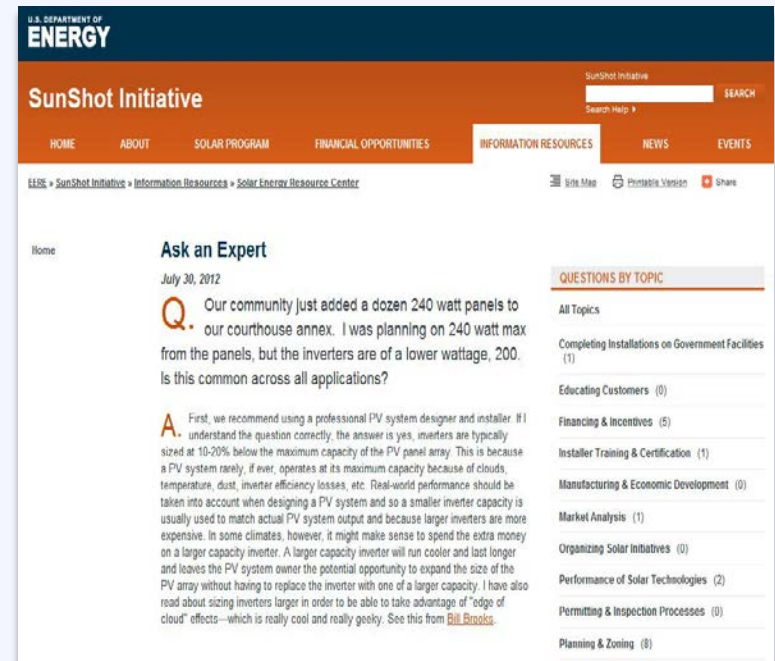
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**What do you pledge to do when you leave today's workshop? [Orange Card]**

# 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



The screenshot shows the SunShot Initiative website interface. At the top, there is a navigation bar with the U.S. Department of Energy logo and the SunShot Initiative title. Below the navigation bar, there is a search bar and a menu with options like HOME, ABOUT, SOLAR PROGRAM, FINANCIAL OPPORTUNITIES, INFORMATION RESOURCES, NEWS, and EVENTS. The main content area features a section titled 'Ask an Expert' with a date of July 30, 2012. A question is posed: 'Our community just added a dozen 240 watt panels to our courthouse annex. I was planning on 240 watt max from the panels, but the inverters are of a lower wattage, 200. Is this common across all applications?'. An answer follows, starting with 'First, we recommend using a professional PV system designer and installer. If I understand the question correctly, the answer is yes, inverters are typically sized at 10-20% below the maximum capacity of the PV panel array. This is because a PV system rarely, if ever, operates at its maximum capacity because of clouds, temperature, dust, inverter efficiency losses, etc. Real-world performance should be taken into account when designing a PV system and so a smaller inverter capacity is usually used to match actual PV system output and because larger inverters are more expensive. In some climates, however, it might make sense to spend the extra money on a larger capacity inverter. A larger capacity inverter will run cooler and last longer and leaves the PV system owner the potential opportunity to expand the size of the PV array without having to replace the inverter with one of a larger capacity. I have also read about sizing inverters larger in order to be able to take advantage of "edge of cloud" effects—which is really cool and really geeky. See this from Bill Brooks.' To the right of the question and answer is a 'QUESTIONS BY TOPIC' sidebar with a list of categories and their respective counts: All Topics, Completing Installations on Government Facilities (1), Educating Customers (0), Financing & Incentives (5), Installer Training & Certification (1), Manufacturing & Economic Development (0), Market Analysis (1), Organizing Solar Initiatives (0), Performance of Solar Technologies (2), Permitting & Inspection Processes (0), and Planning & Zoning (8).

[www4.eere.energy.gov/solar/sunshot/resource\\_center](http://www4.eere.energy.gov/solar/sunshot/resource_center)

For more information email: [solar-usa@iclei.org](mailto:solar-usa@iclei.org)

# Q & A



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**SunShot**

U.S. Department of Energy

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(919) 513 - 0792

**Jayson Uppal**

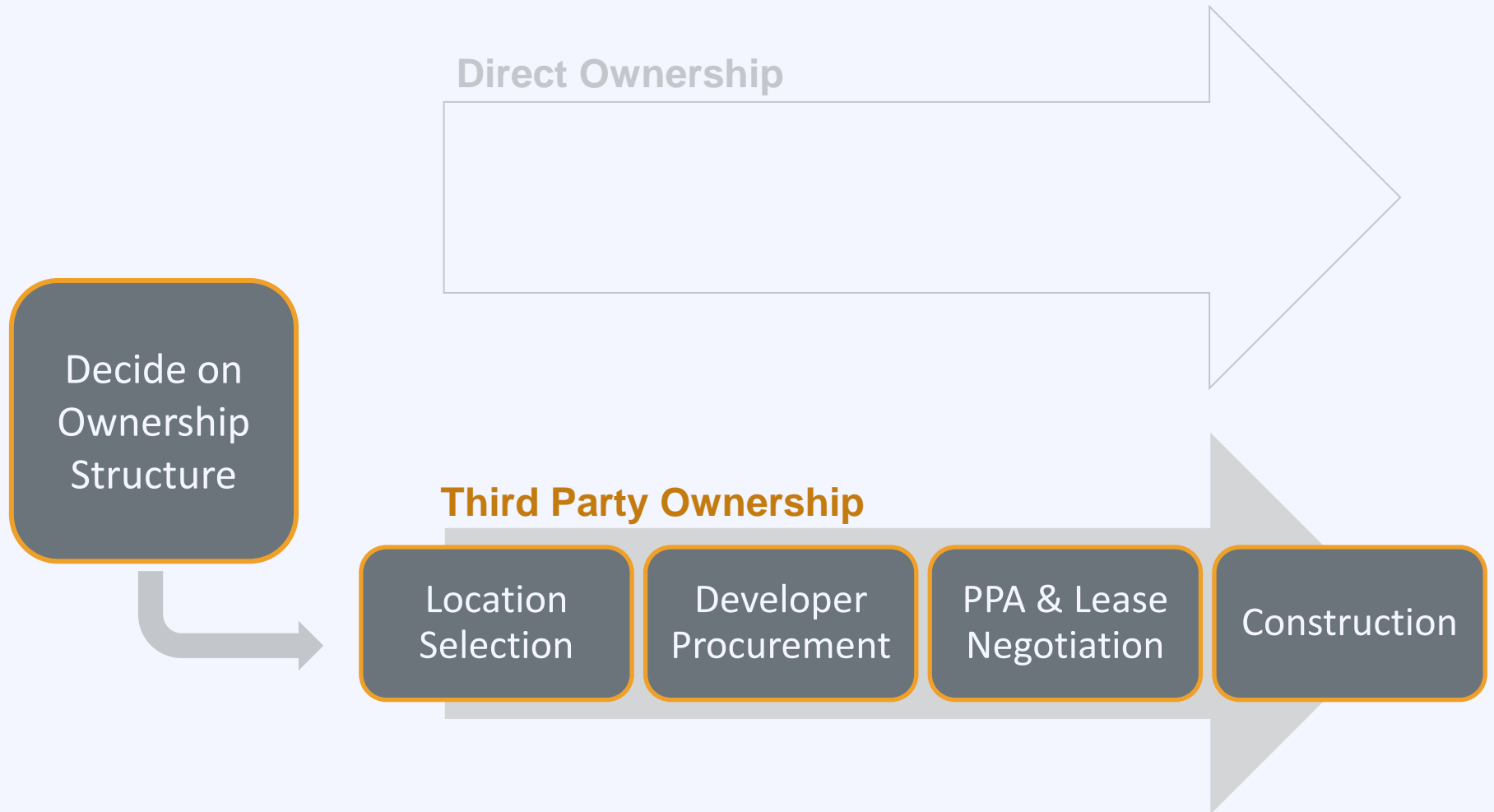
Meister Consultants Group

[jayson.uppal@mc-group.com](mailto:jayson.uppal@mc-group.com)

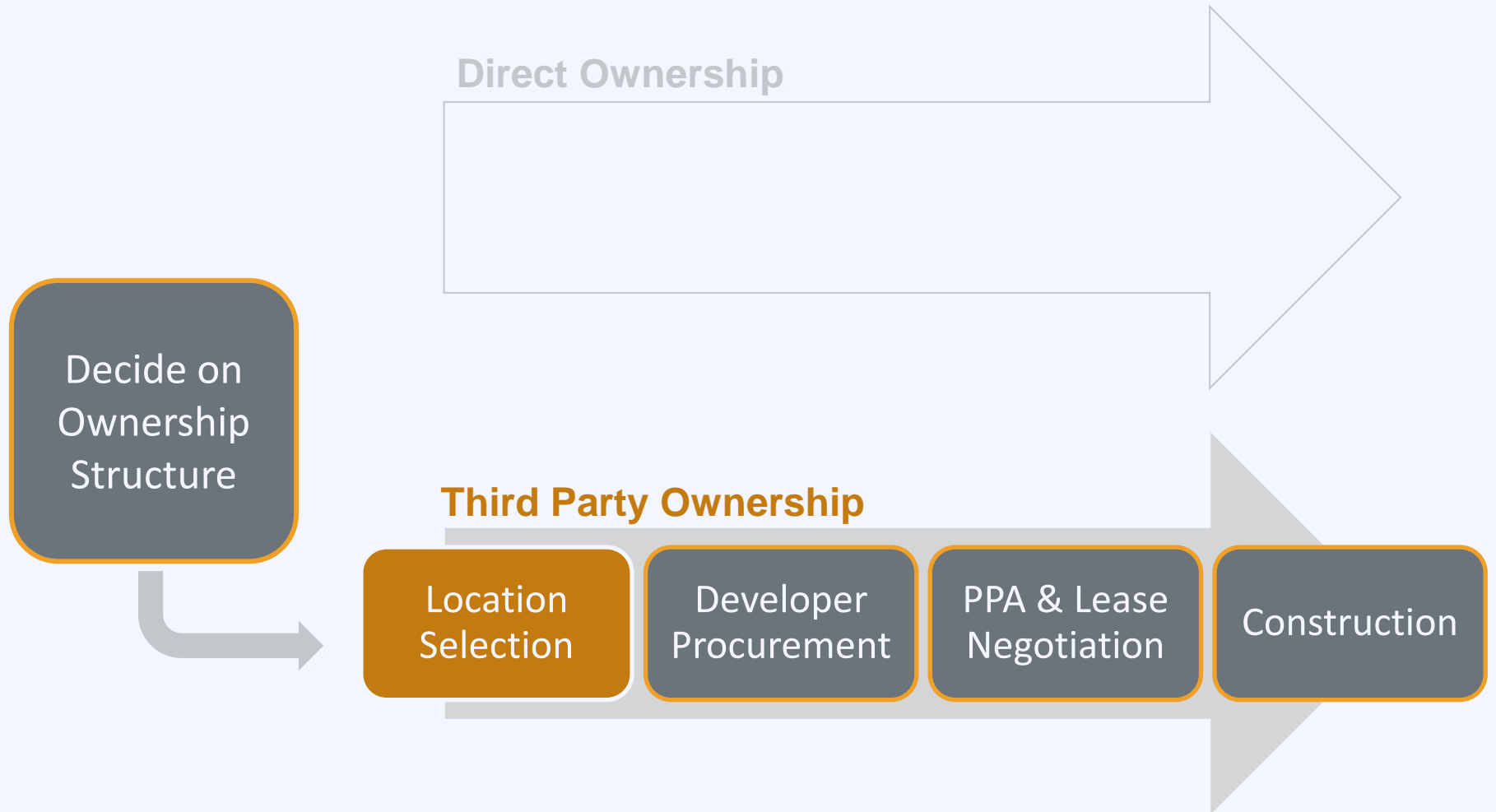
(617) 209 -1990



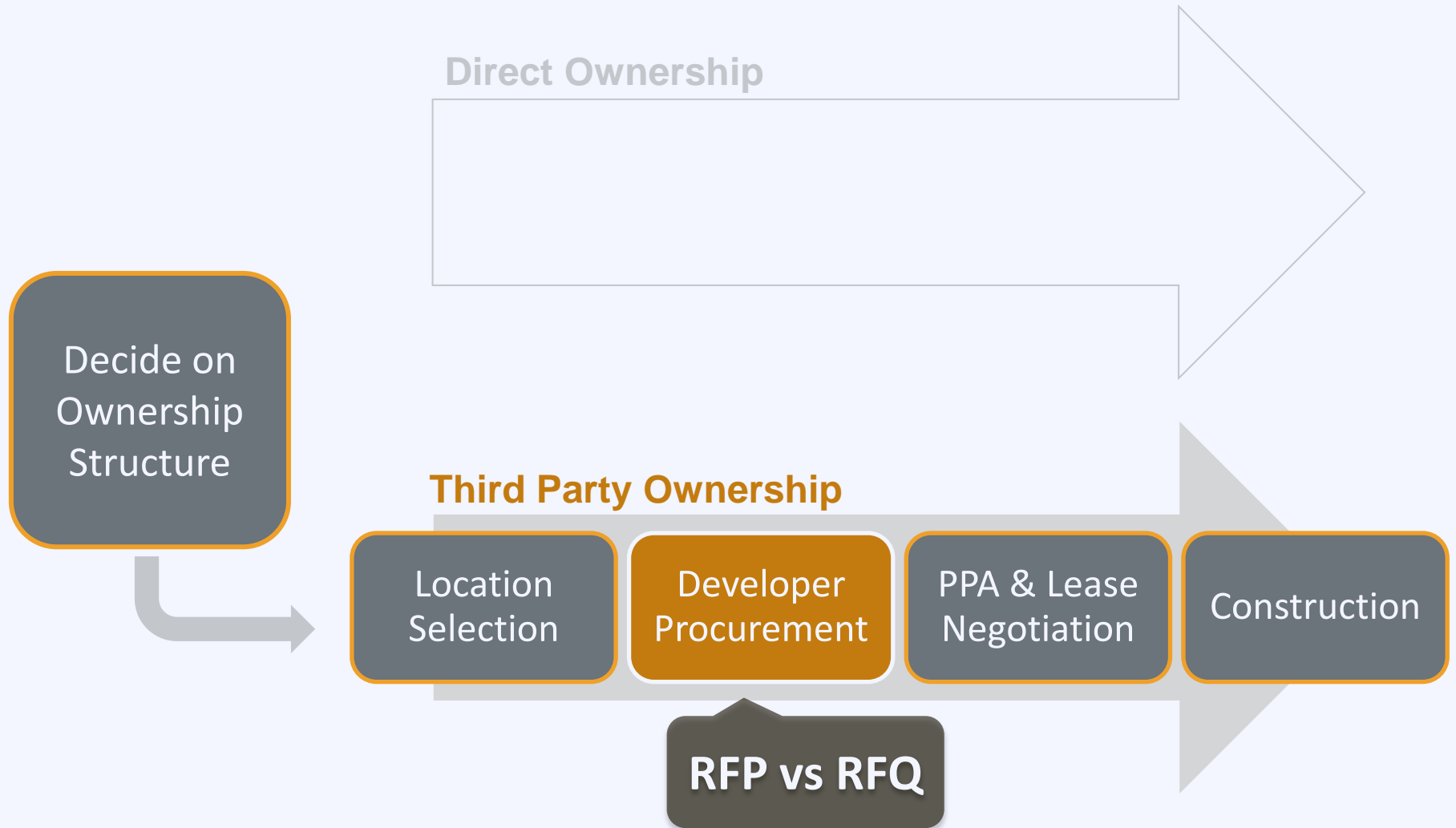
# Process



# Process



# Process



# Step 2: Developer Procurement

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## Avoid Five Common Pitfalls:

- RFP/RFQ specifications are too restrictive or too unstructured
- Competing measures of system efficiency
- Finding sufficient number of qualified bidders
- Lack of effective O&M program
- Lack of strong monitoring program

# Step 2: Developer Procurement

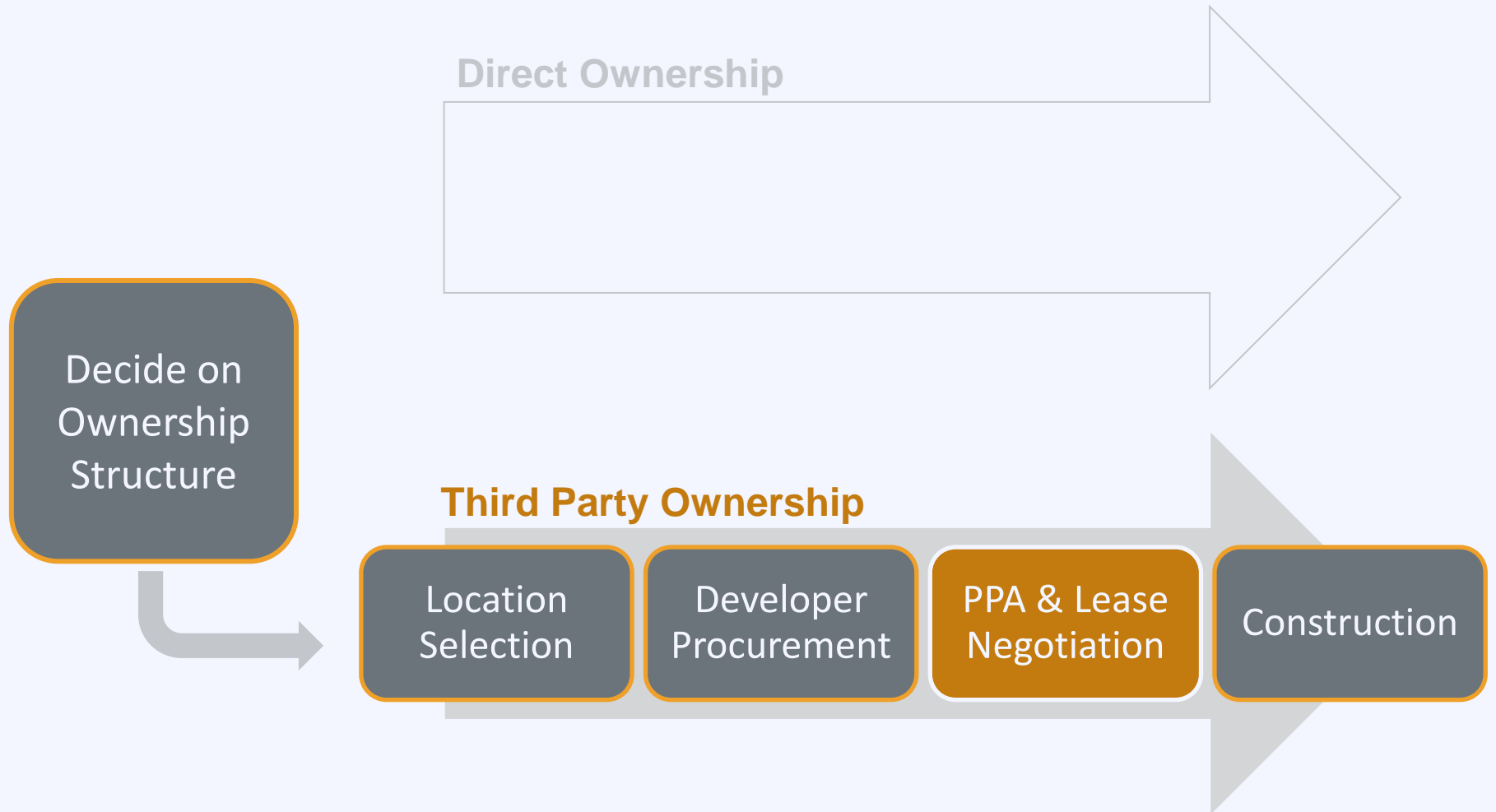
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In Santa Clara County, CA, nine municipalities collaboratively bid out 47 sites. Benefits include:

**50%** savings in administrative costs

**10-15%** reduction in energy cost

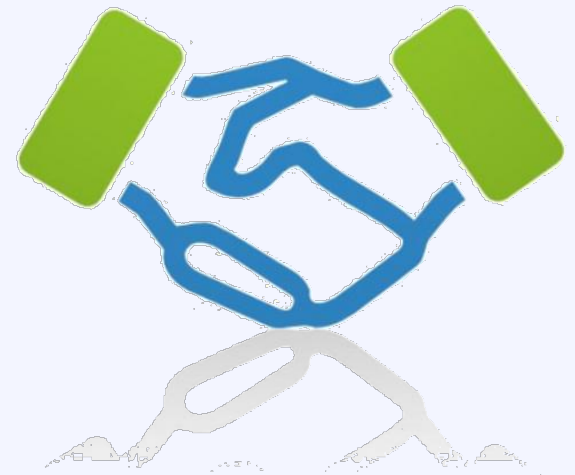
# Process



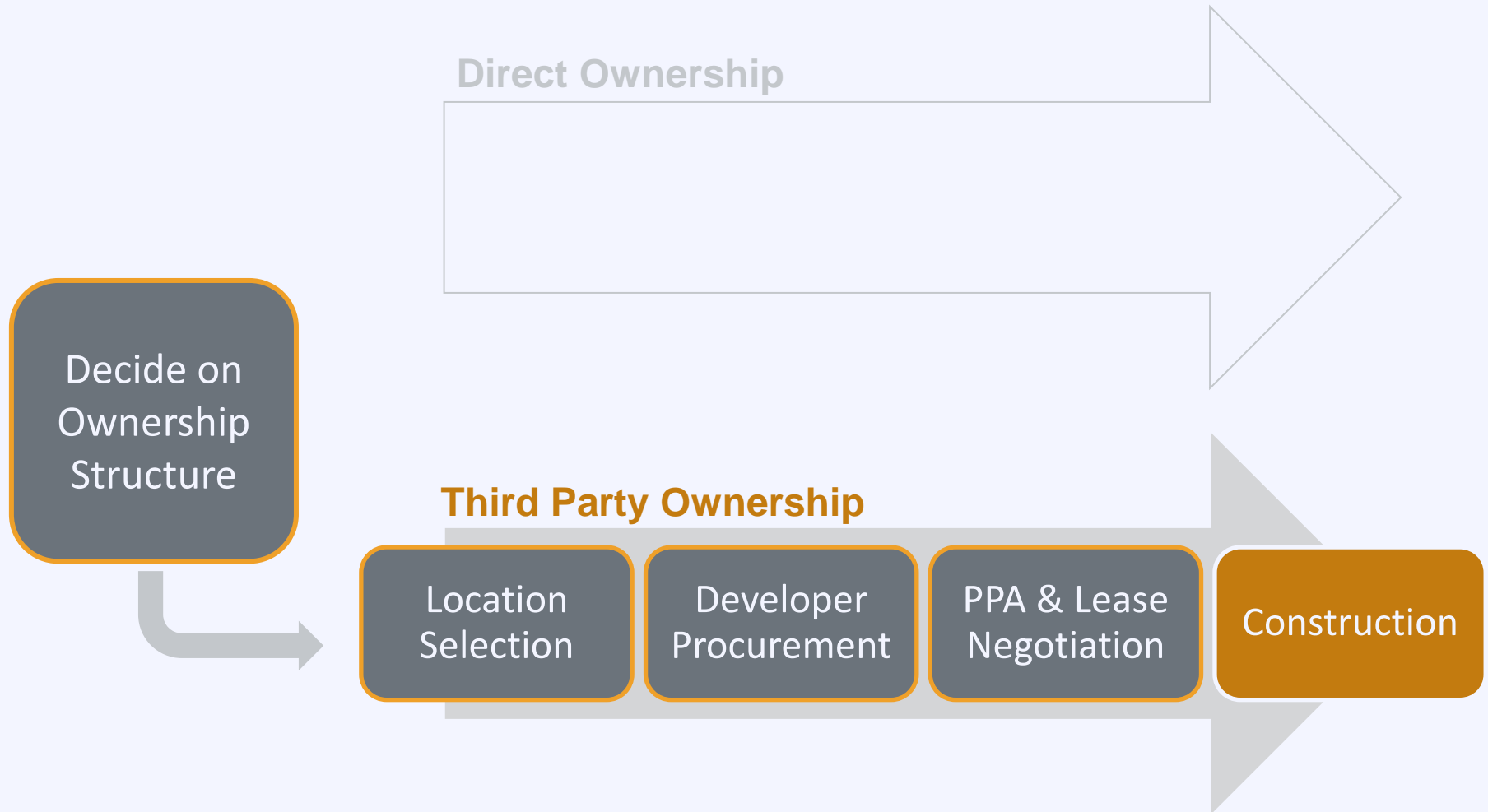
# Step 3: Contract Negotiation

## Negotiation points:

- Fixed or floating electricity price
- Price escalator
- Contract term length
- Property taxes
- Liability
- Performance guarantee
- Regulatory risk



# Process





# Factors PPA Providers Look For

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- States that allow PPA providers to operate without being regulated as utility
- State financial incentives – tax credit or rebate
- REC market
- Good net metering and interconnection
- PPA providers allowed to net meter



**Brockton Brightfields**  
**Type of Site: Remediated Landfill**  
**Location: Brockton, MA**

**Size of PV system: 425 kW**  
**Photo credit: AECOM**



**Exelon City Solar**

**Type of Site: Remediated Industrial Brownfield**

**Location: Chicago, IL**

**Size of PV system: 10 MW**

**Photo credit: Exelon**