

Expanding Financing for Solar PV



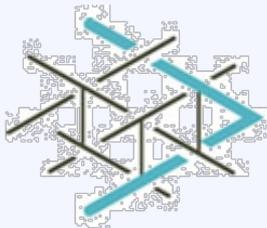
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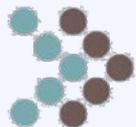


NARC

Building Regional Communities

MARC

Mid-America Regional Council



MEISTER

CONSULTANTS GROUP



Sharing capitol ideas.

Solar Ready II: Regional Partners

SOLAR READY II REGIONAL PARTNERS

Central New York Regional
Planning and Development Board >

Delaware Valley Regional
Planning Commission >

Maricopa Association
of Governments >

Metropolitan Washington
Council of Governments >

Mid-America
Regional Council >

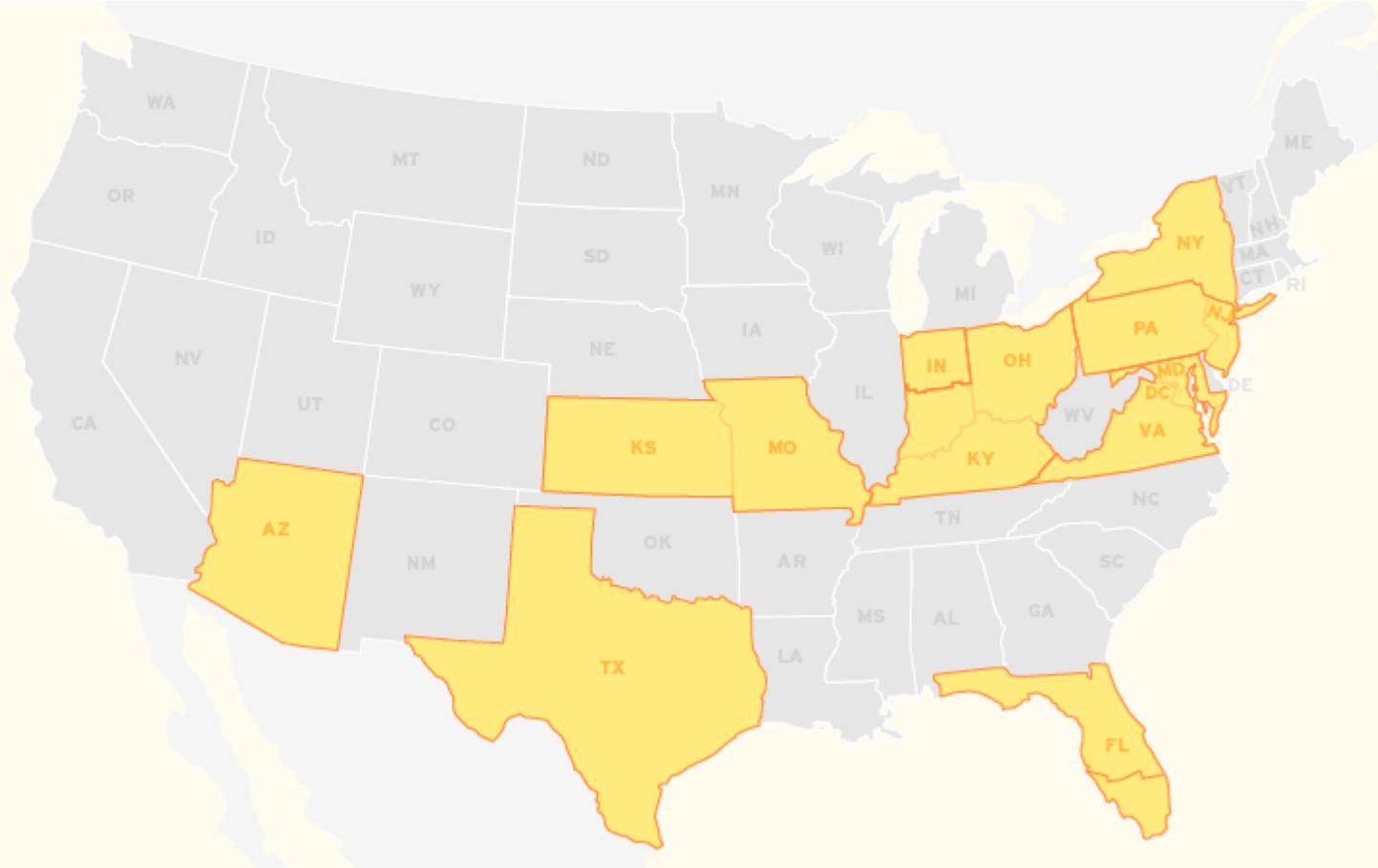
North Central Texas
Council of Governments >

Northwestern Indiana
Regional Planning Commission >

Ohio-Kentucky-Indiana
Regional Council of Governments >

Southwest Florida
Regional Planning Council >

Tampa Bay Regional
Planning Council >





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Who Are We?



Using global best practices
to inform local decisions



100 Consultants

7 offices worldwide

U.S. HQ in Boston

15 years experience



Solar Ready: Technical Assistance



One to One
Assistance



Regional
Workshops



Training
Materials



Resource
Toolkit

Agenda

Welcome & Introductions

Overview of Solar Markets

Solar Market Drivers and Finance Landscape

Why Lend for Solar?

Current Solar Financing Options

Discussion

Solar Technologies



Solar Photovoltaic (PV)



Solar Hot Water



Concentrated Solar Power

Solar Technologies



Solar Photovoltaic (PV)

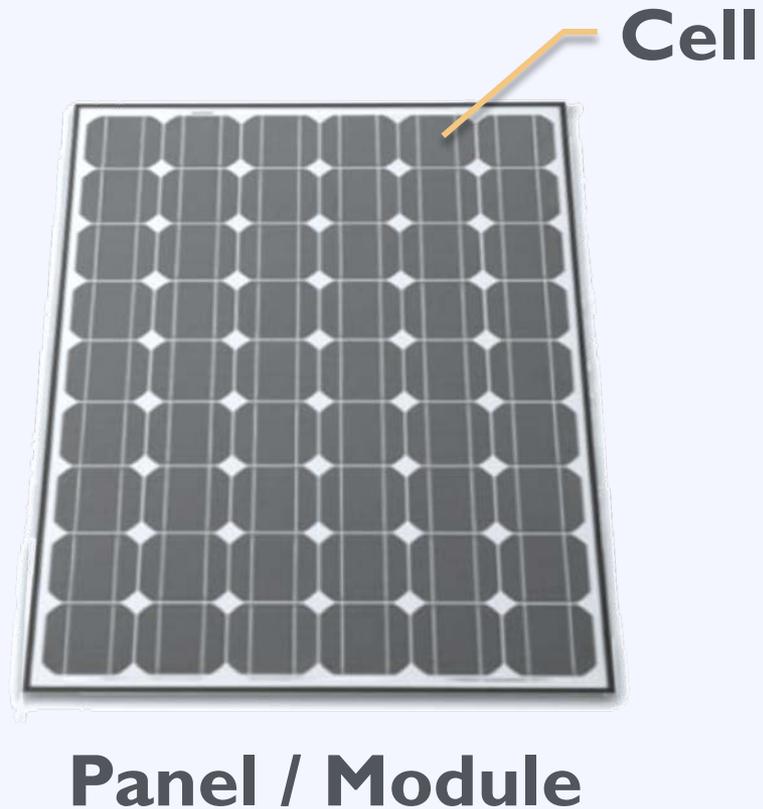


Solar Hot Water

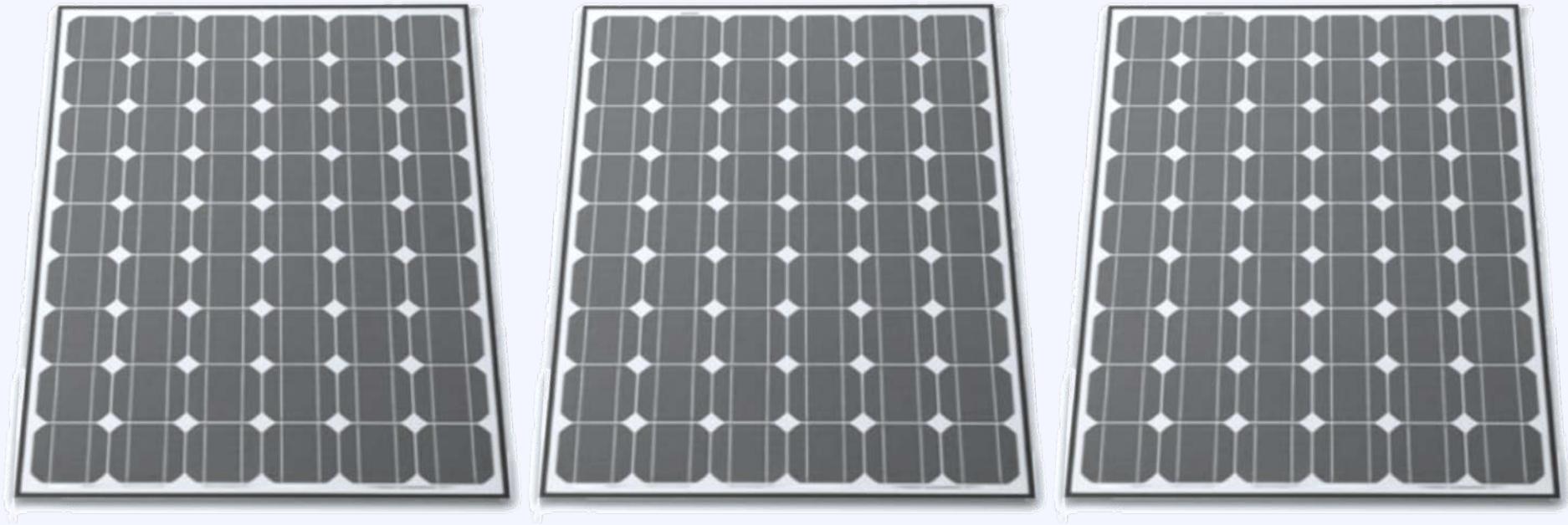


Concentrated Solar Power

Some Basic Terminology

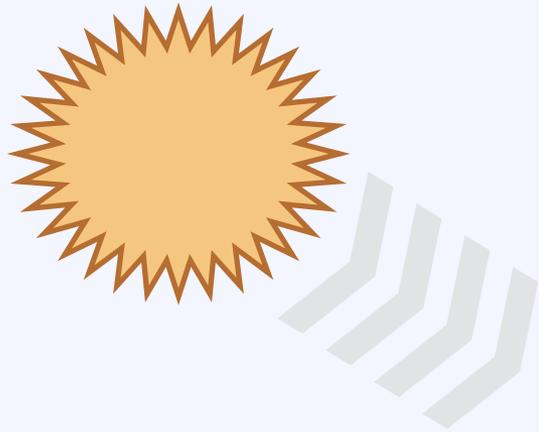


Some Basic Terminology



Array

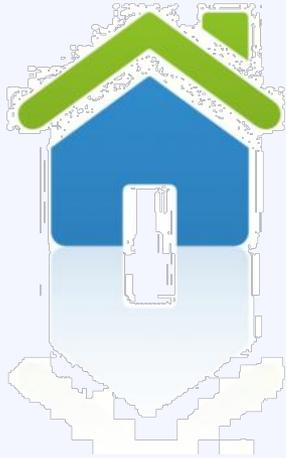
Some Basic Terminology



Production
Kilowatt-hour (kWh)

Capacity / Power
kilowatt (kW)

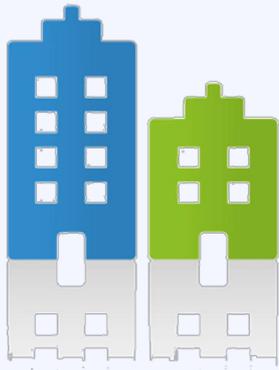
Some Basic Terminology



Residence
5 kW



Factory
1 MW+



Office
50 – 500 kW



Utility
2 MW+

Solar Development in the US

In 2013, the US solar industry installed

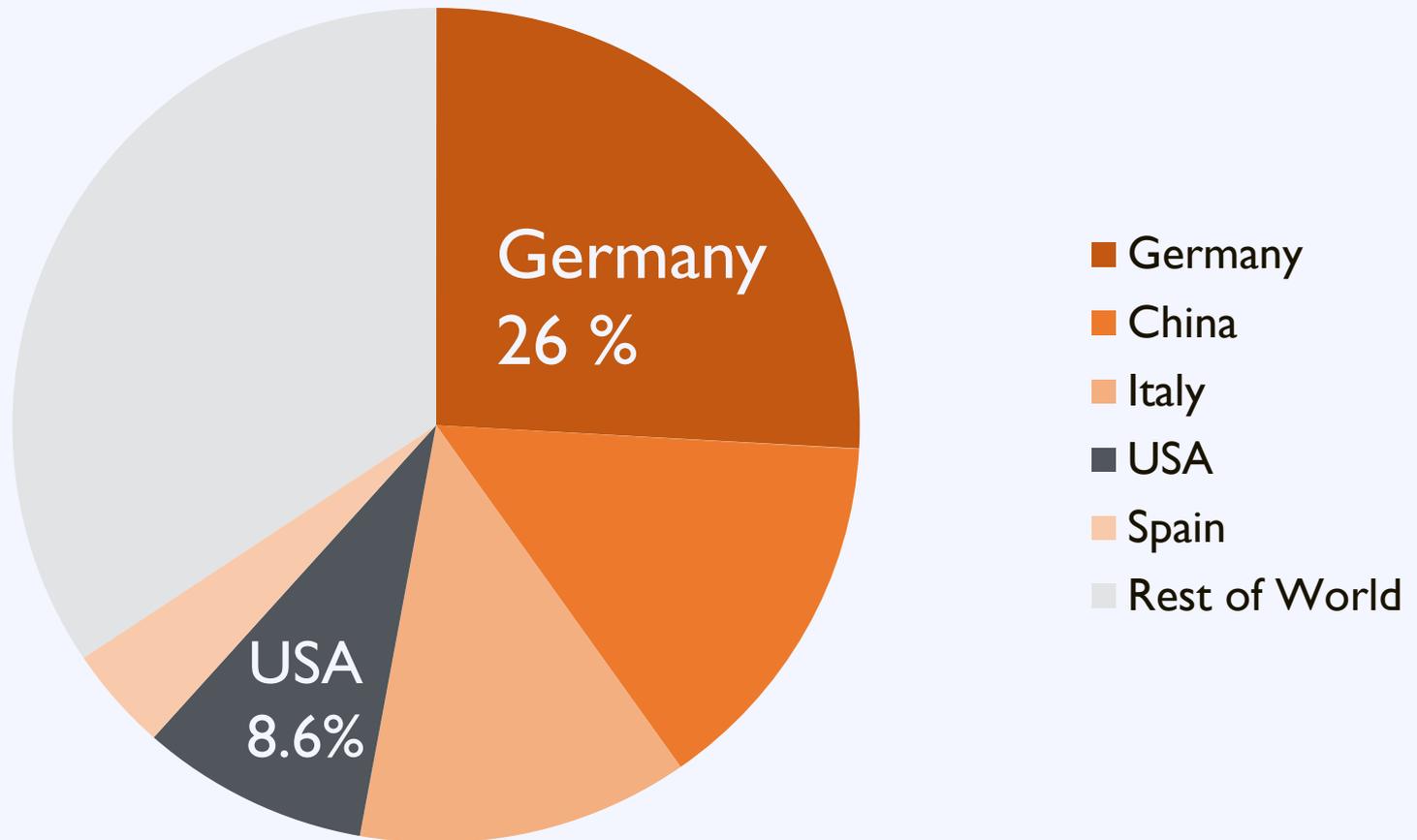
131,000 new solar installations

of which

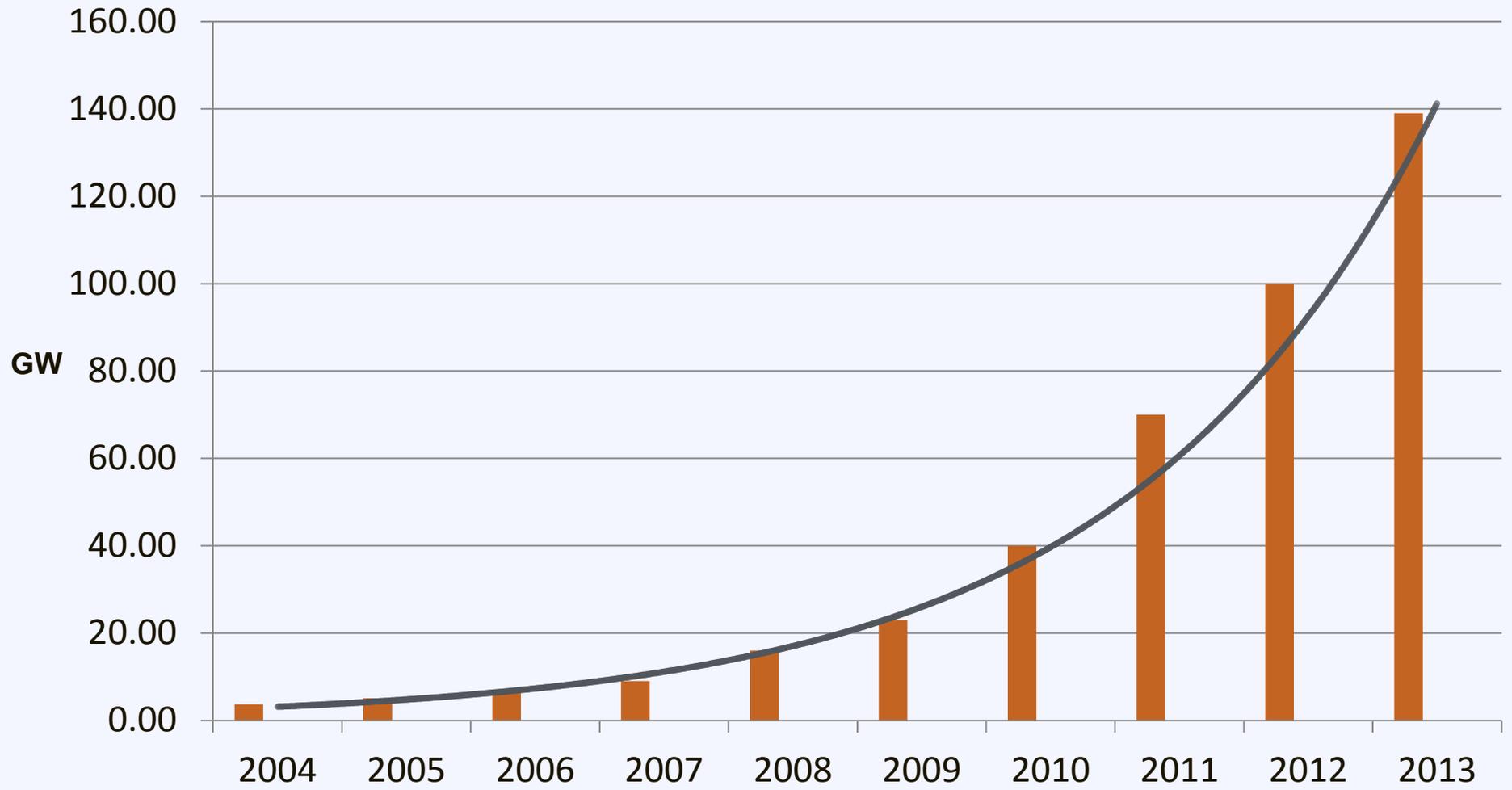
94% were residential projects

World Solar Market

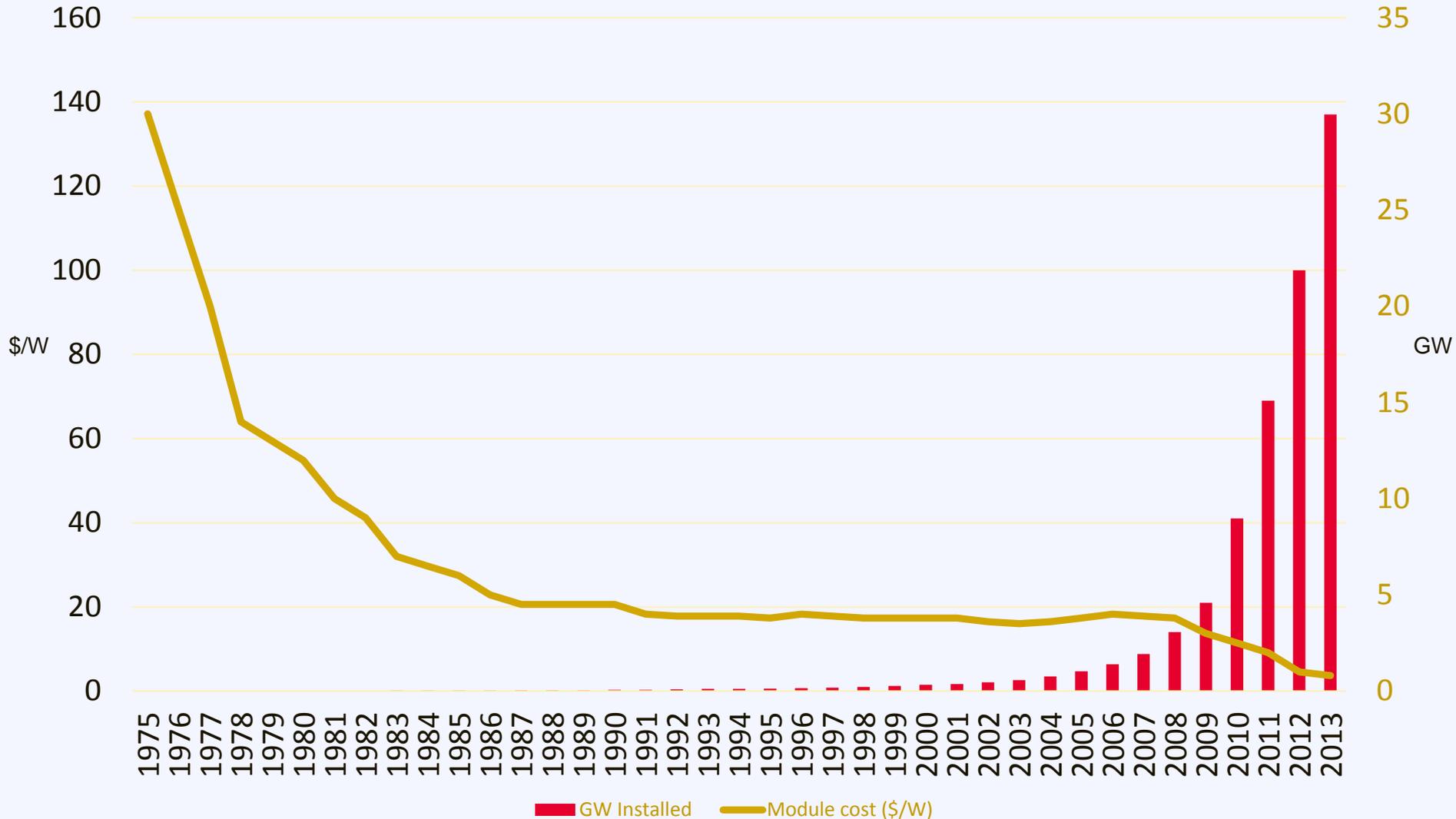
Top 5 Countries Solar Operating Capacity (2013)



Global Solar PV Capacity

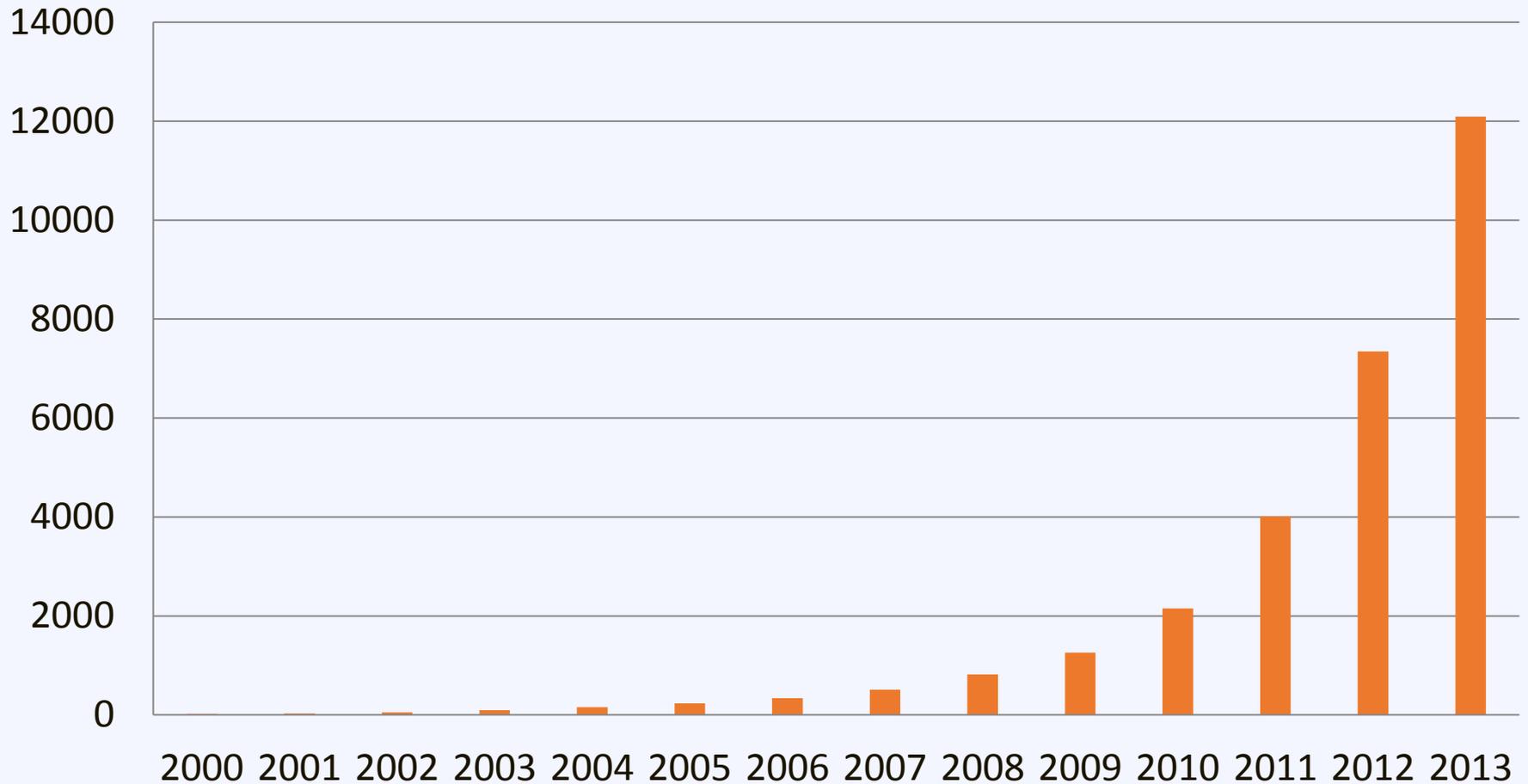


Global Market & Module Prices



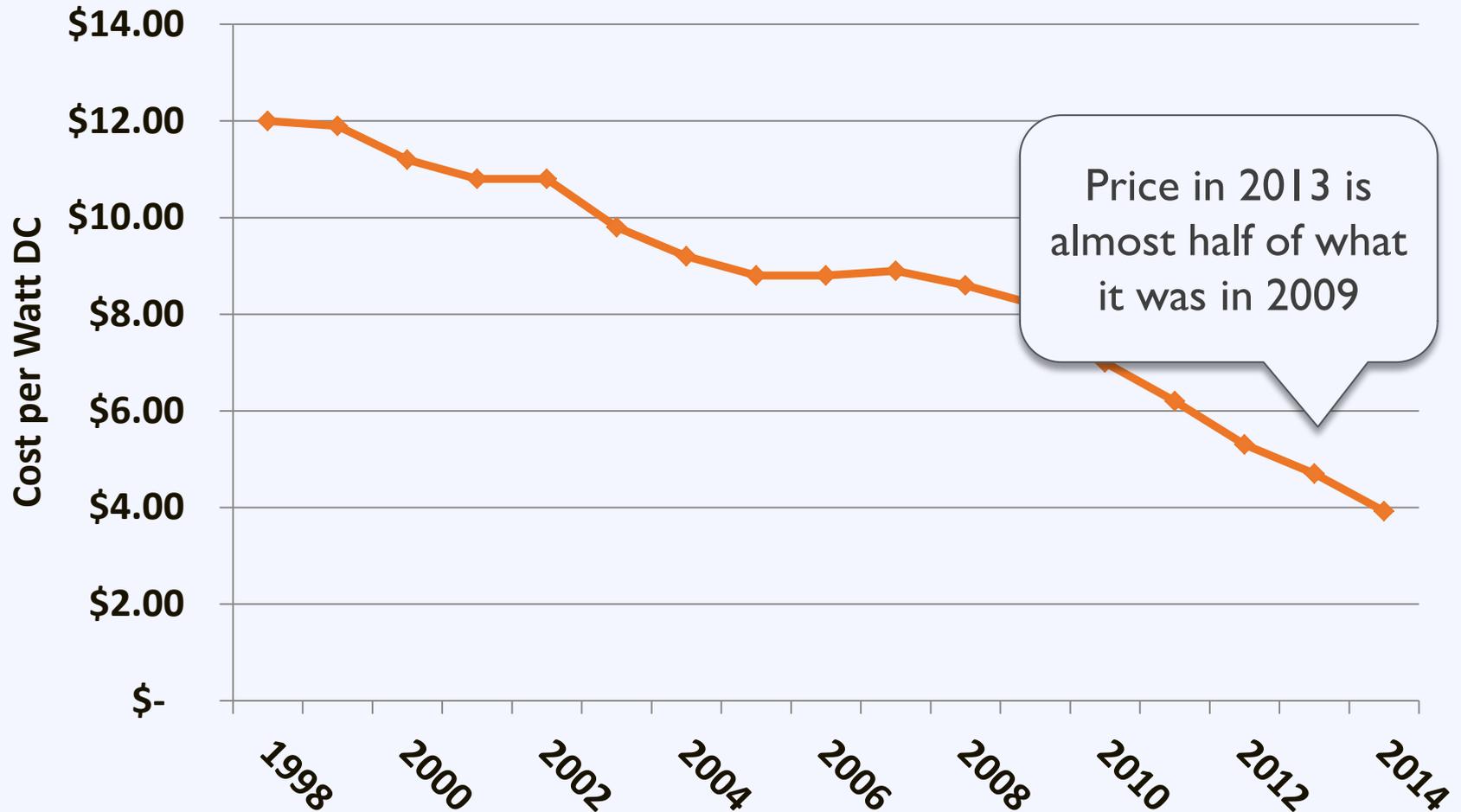
US Solar Market

US Installed PV Capacity (MW)



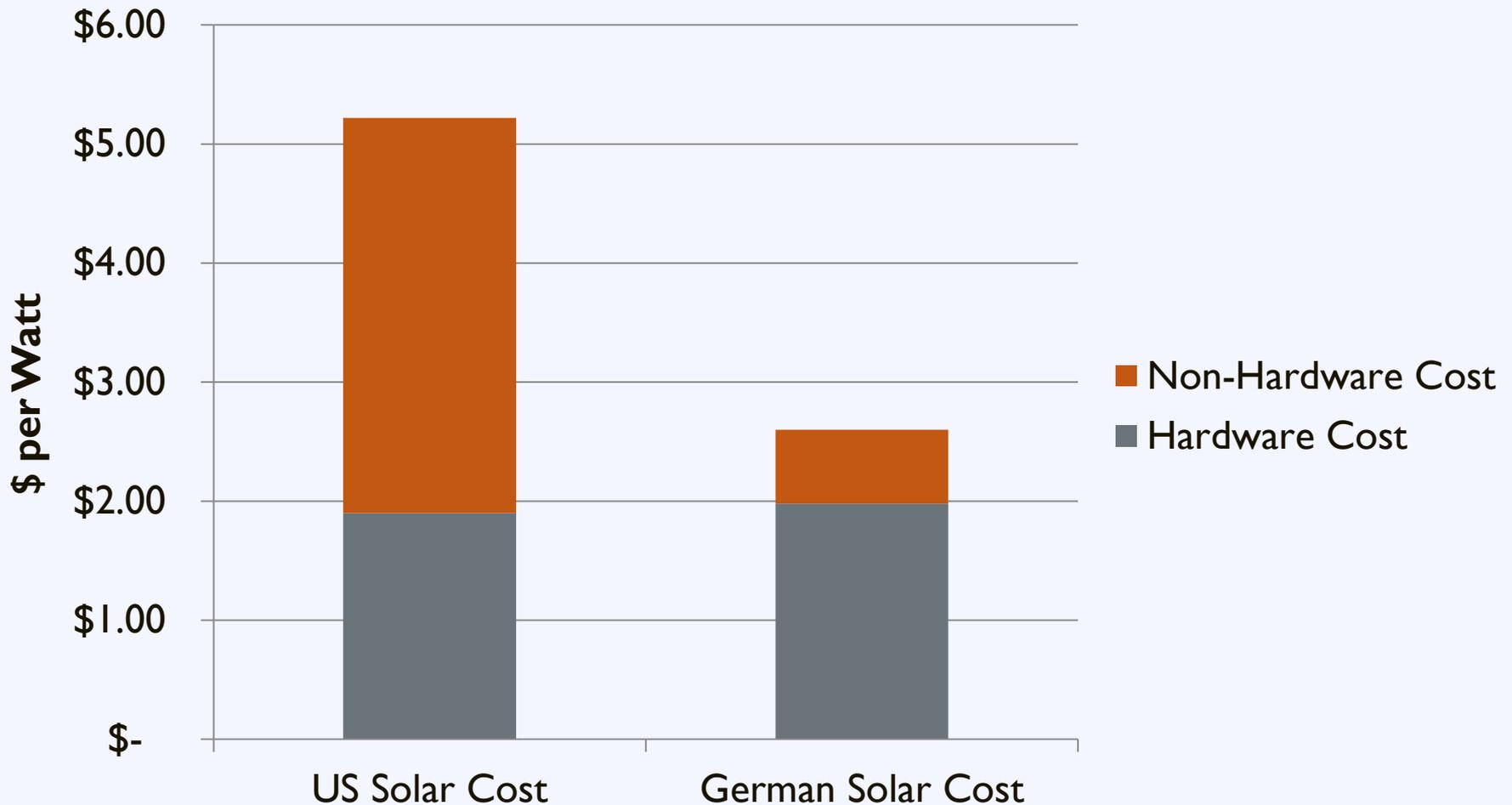
Falling PV Prices

US Average Installed Cost for Behind-the-Meter PV



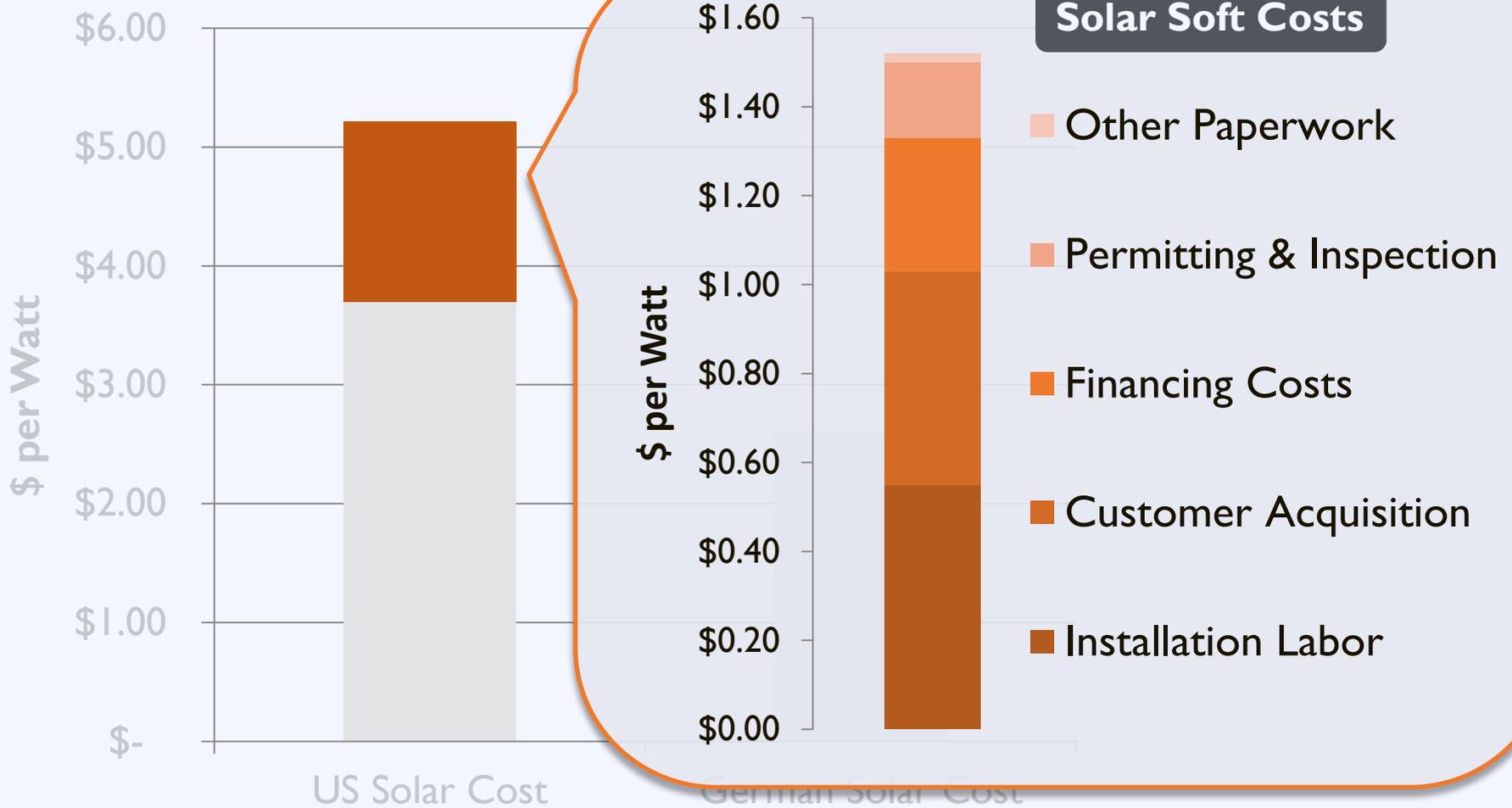
The Cost of Solar in the US

Comparison of US and German Solar Costs

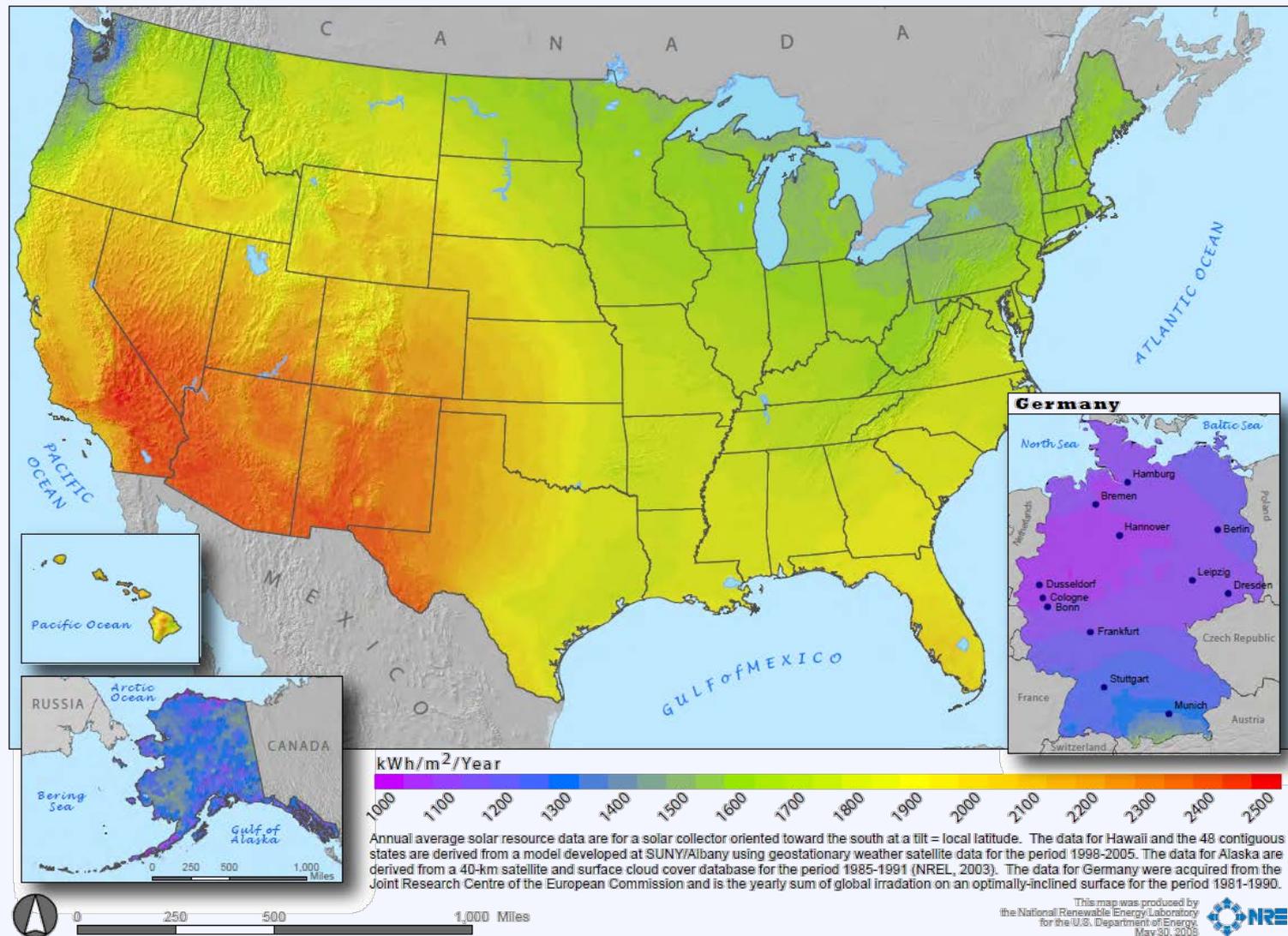


The Cost of Solar in the US

Comparison of US and German Solar Costs

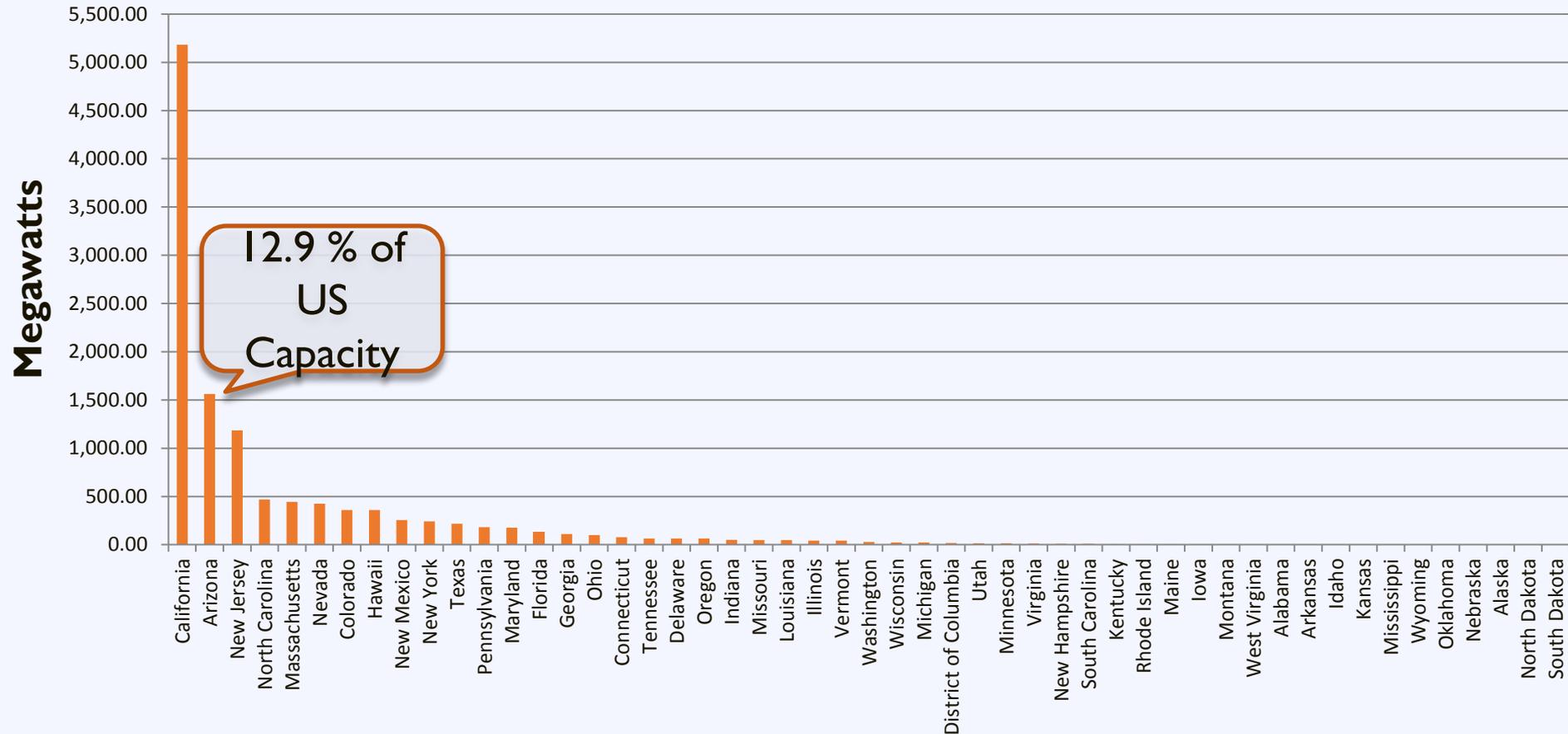


US Solar Resource



US Solar Market

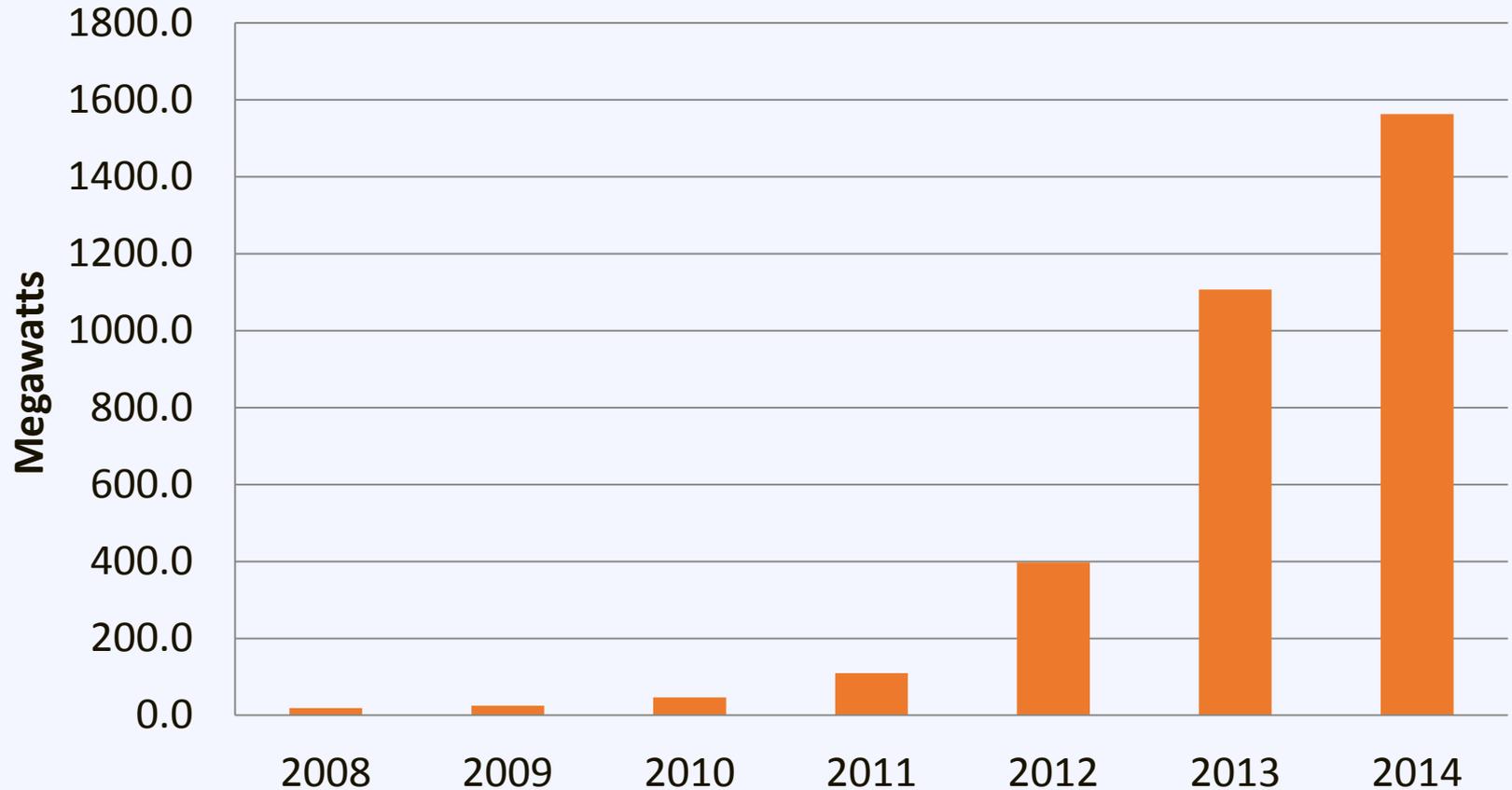
Installed Capacity (MW) 2013



Source: U.S. Solar Market Trends 2013

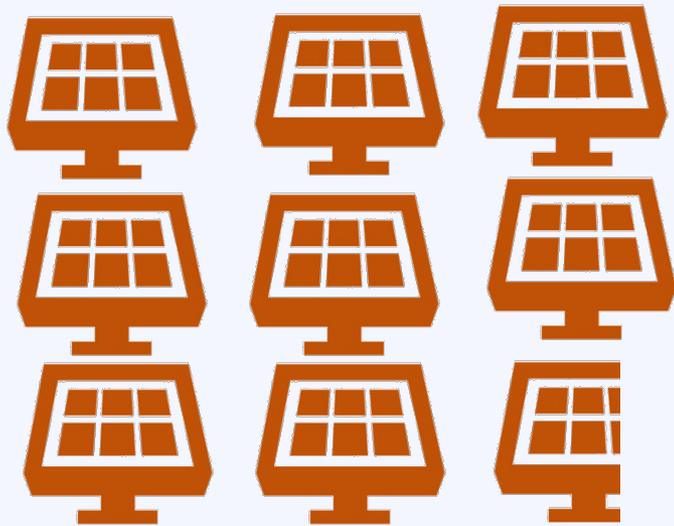
Arizona Solar Market

Cumulative Installed Capacity



Arizona Solar Market

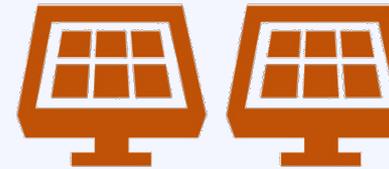
Arizona



166.9

watts per person

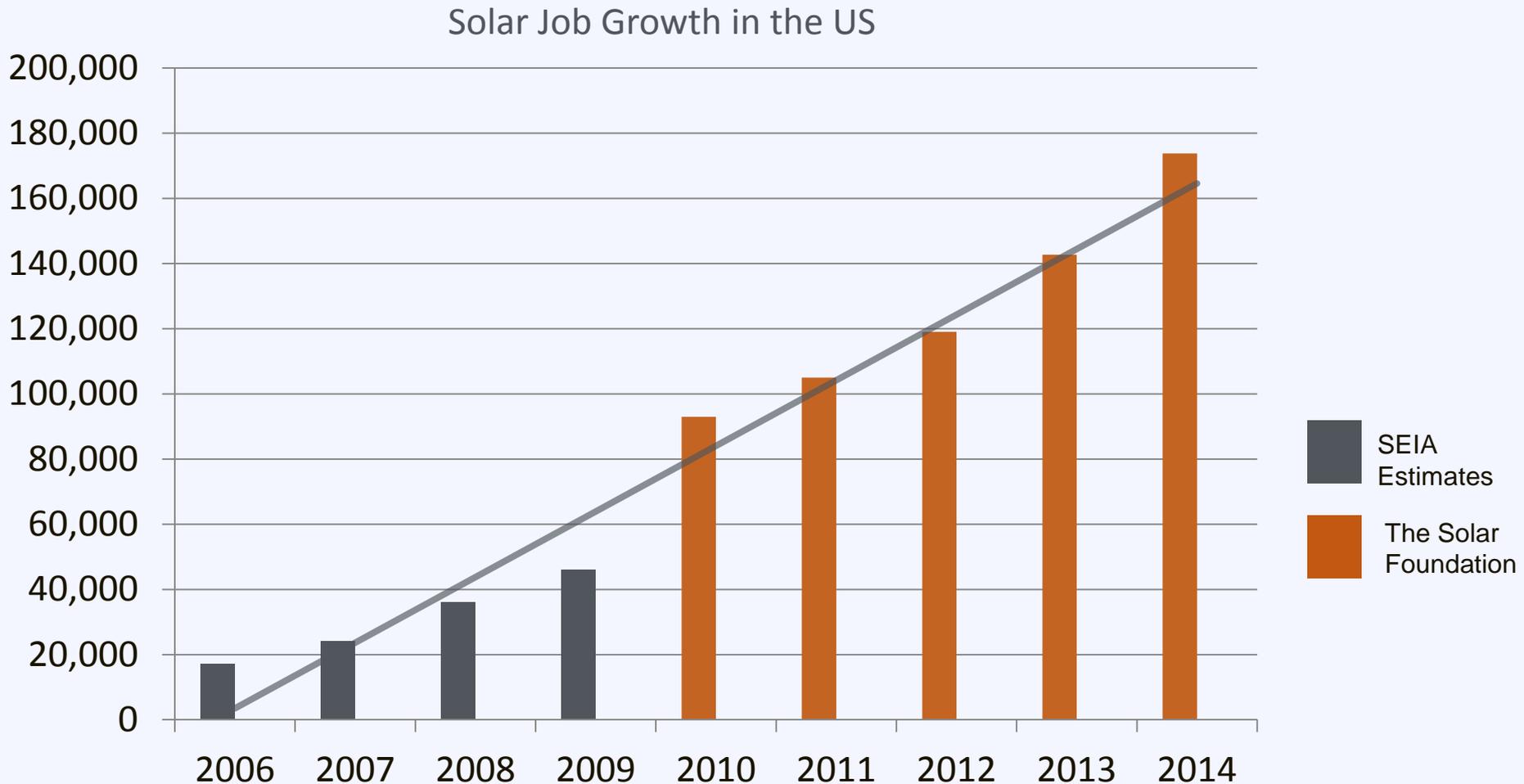
US



39

watts per person

Solar Job Growth





Solar Jobs in Arizona

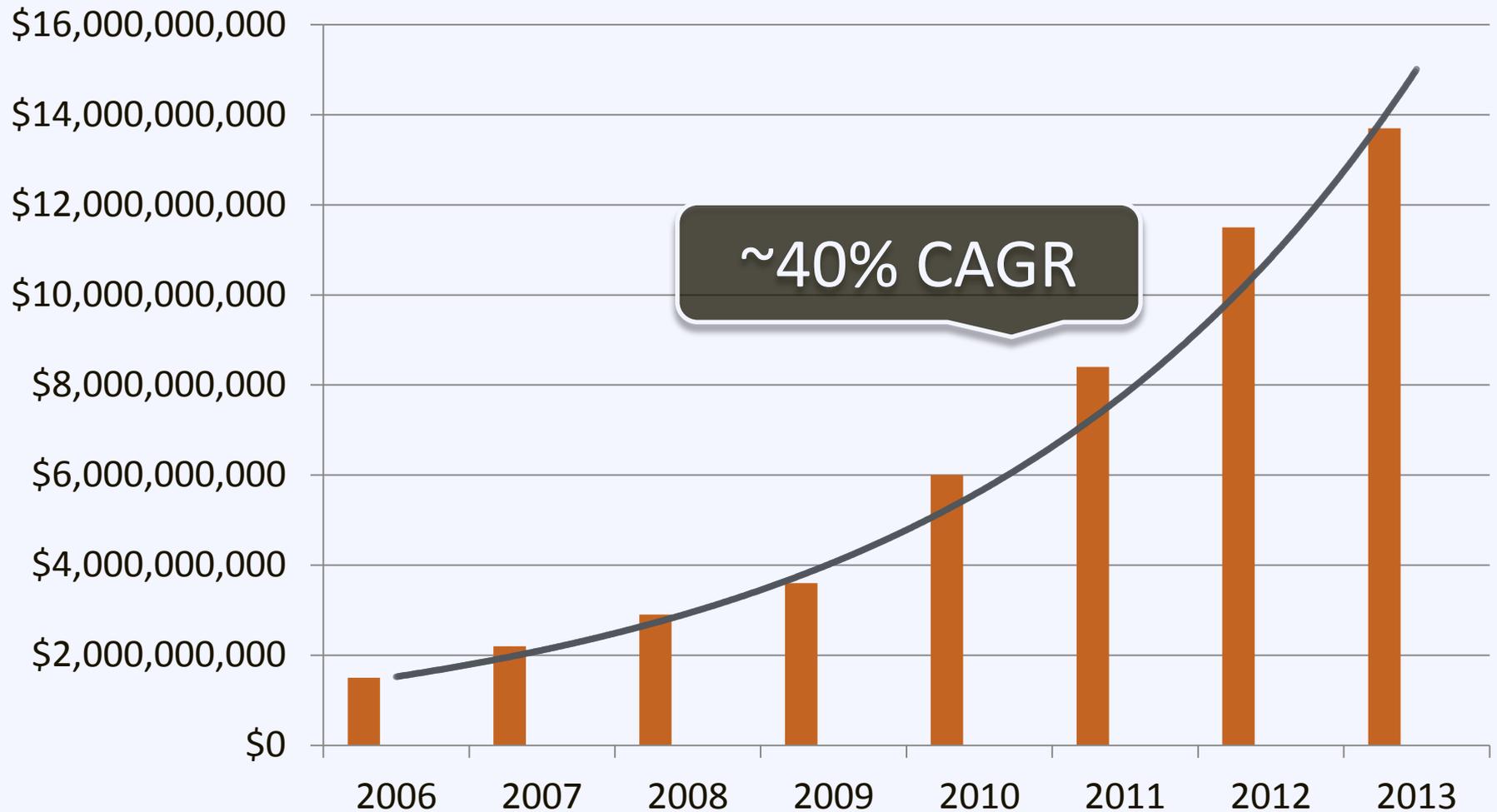
In 2013, Arizona had

8,558 solar jobs

ranking

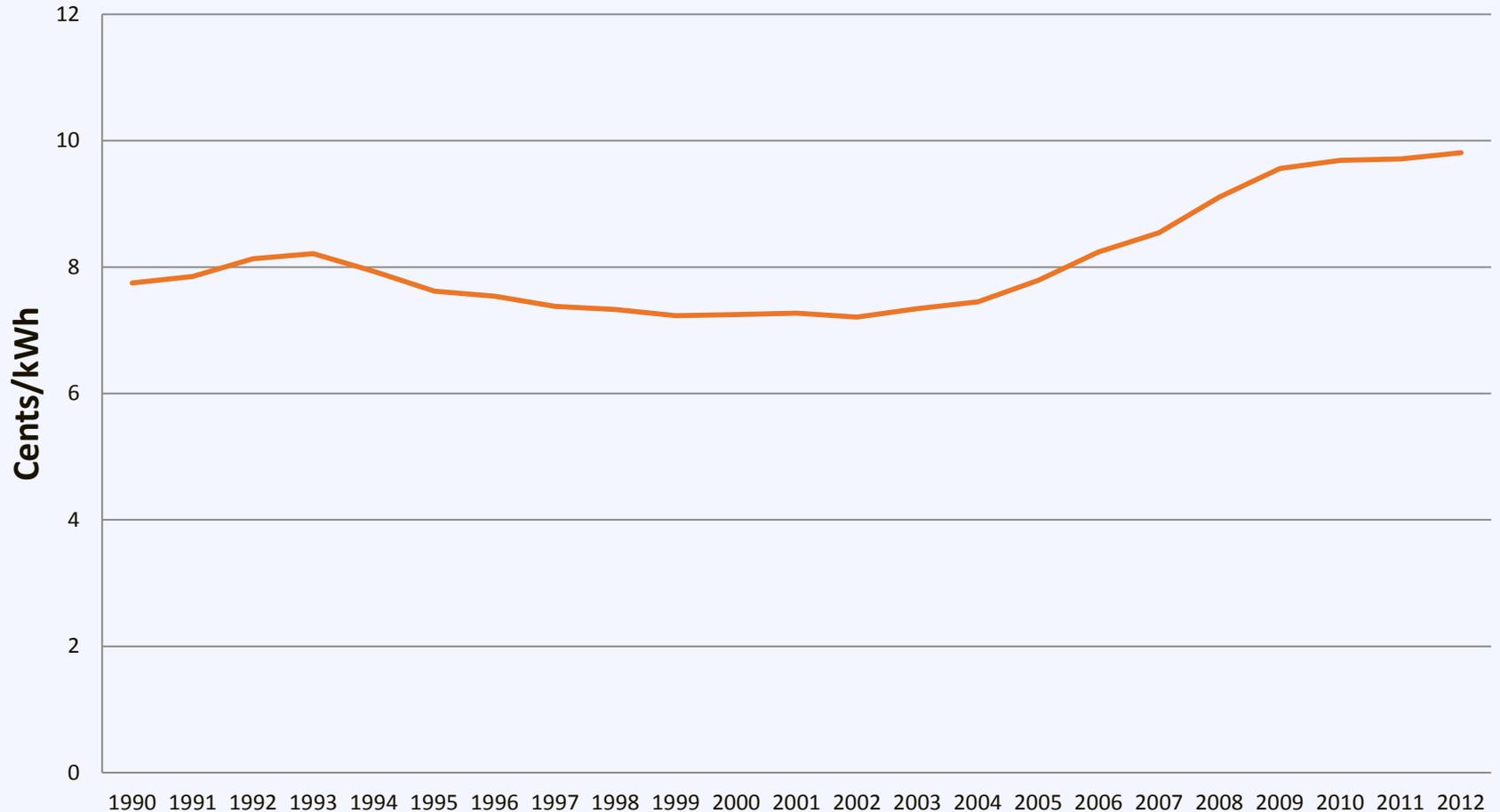
2nd in the nation

Solar Economic Growth



Benefits: Stabilize Energy Prices

Average Arizona Electricity Prices (1990-2012)



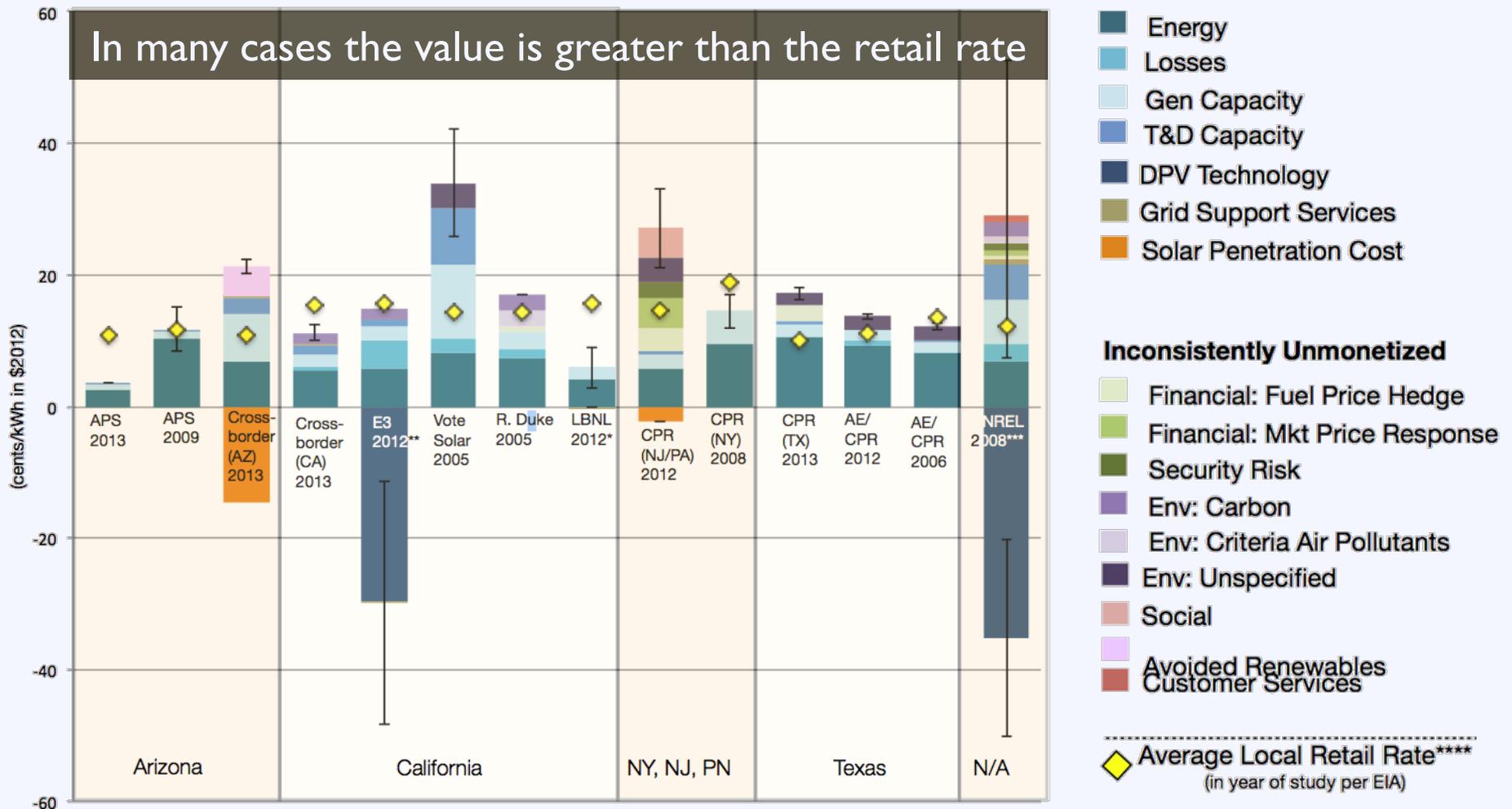
Benefits: Valuable to Electric Grid

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

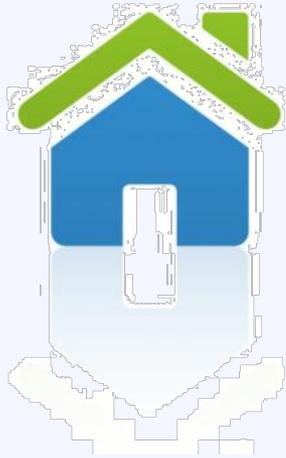


Value of Solar

BENEFITS AND COSTS OF DISTRIBUTED PV BY STUDY



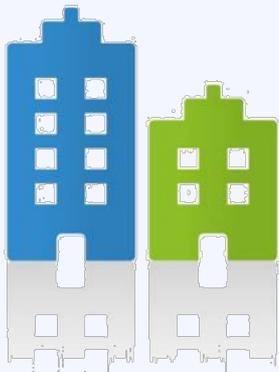
Scales: 1 Megawatt



100 - 200
Homes



1
Industrial

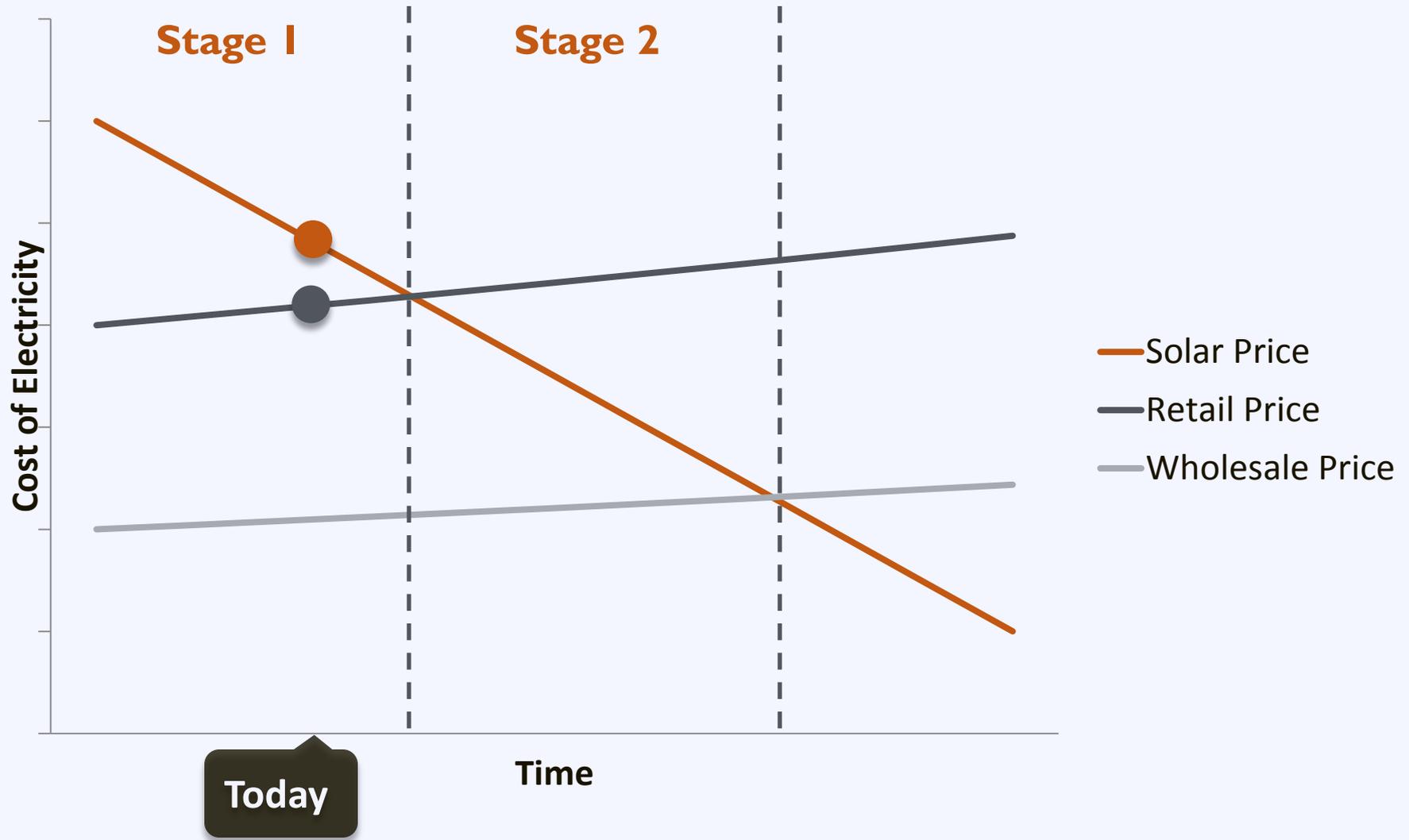


5 - 10
Commercial

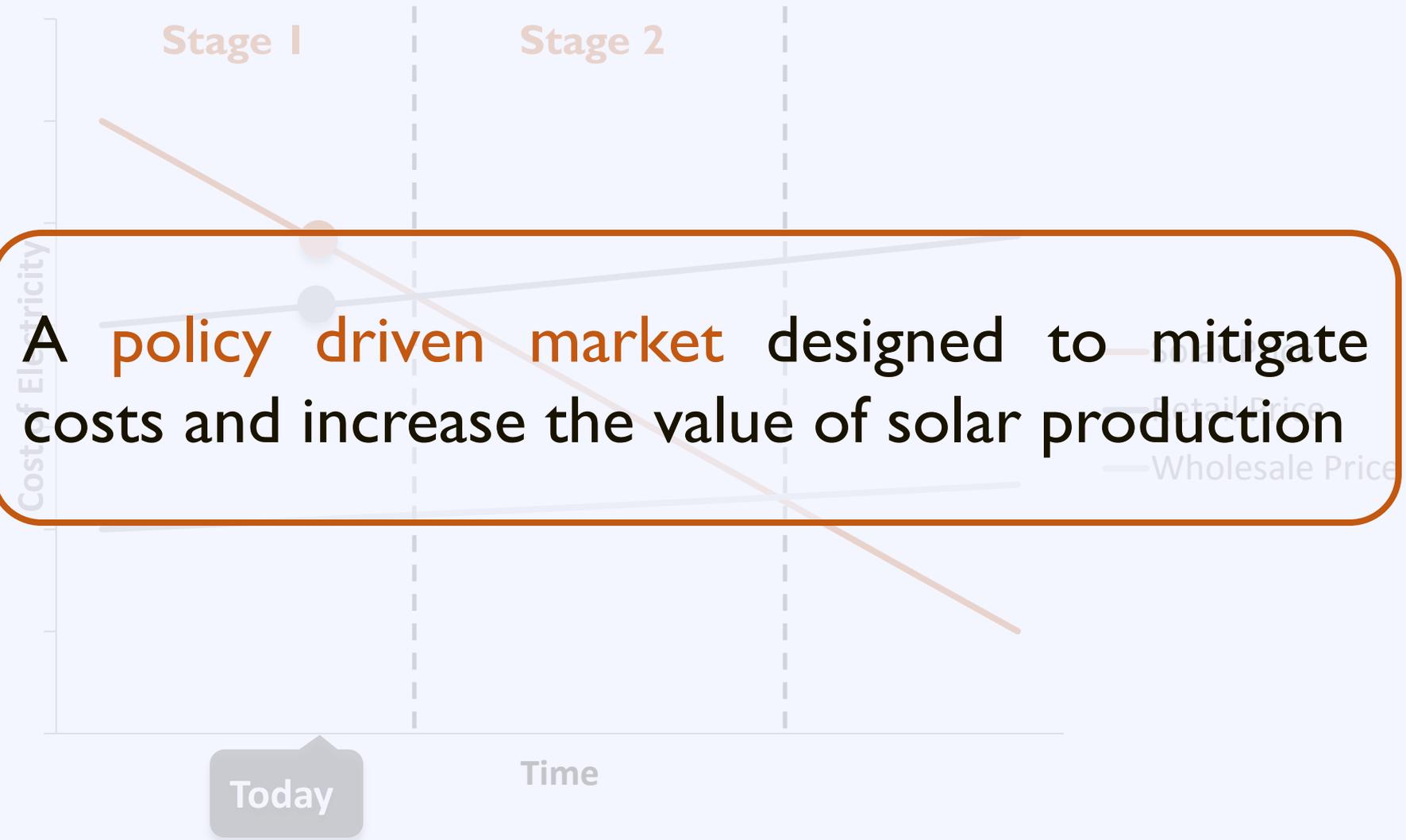


< 1
Utility

Solar Market: Trends



Solar Market: Trends



Agenda

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Why Lend for Solar?

Current Solar Financing Options

Discussion



A Policy Driven Market

Federal

Investment Tax
Credit

Accelerated
Depreciation

Qualified Energy
Conservation
Bond

State
&
Utility

Renewable
Portfolio
Standard

Net Metering

Interconnection

Solar Access

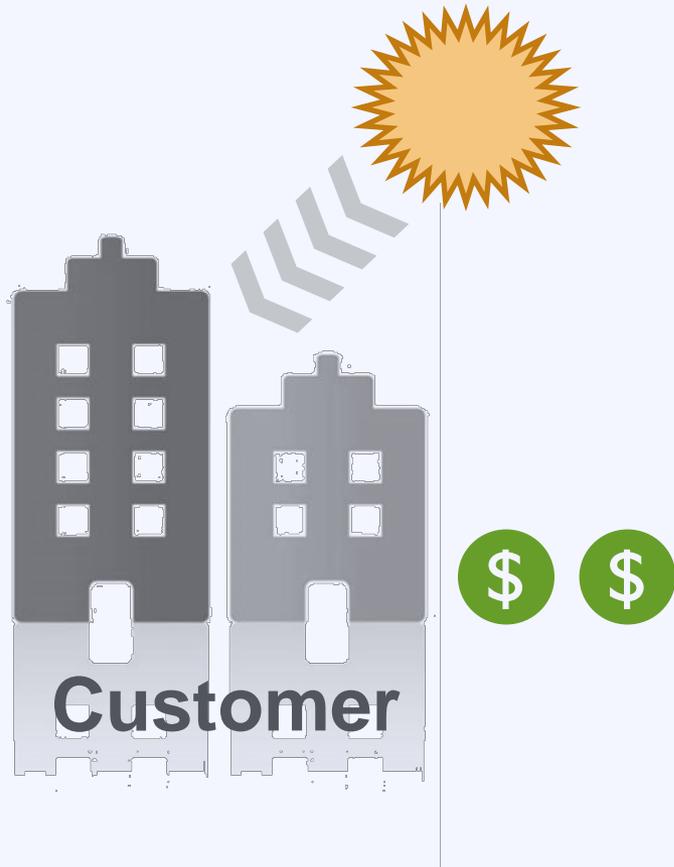


The Current Financing Landscape

Direct
Ownership

Third-Party
Ownership

Direct Ownership



Direct Ownership: Equation

Cost

- + Installed Cost
- + Maintenance
- Direct Incentive

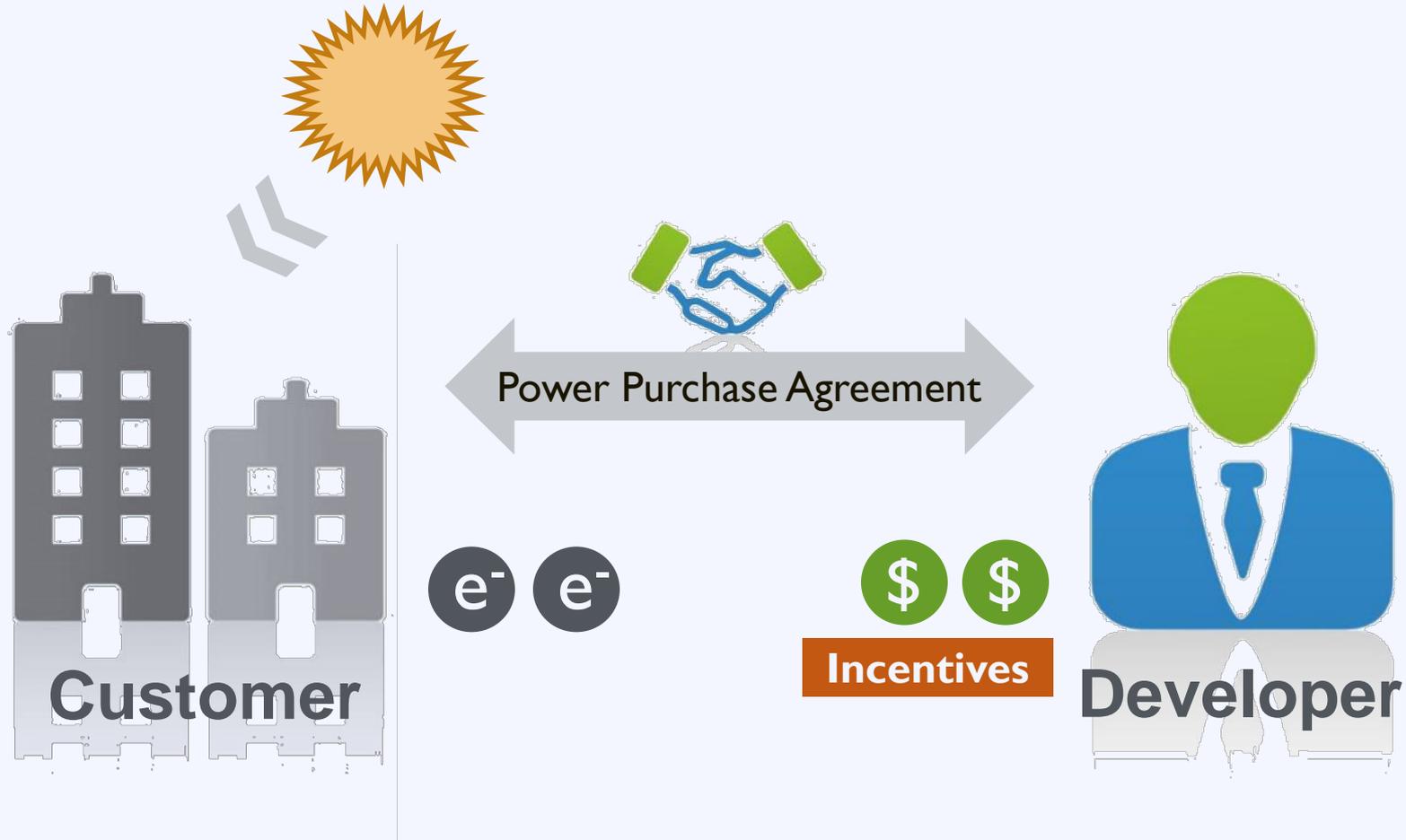
Benefit

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

Direct Ownership: Benefits

	Direct Ownership	Third Party Ownership
Upfront Cost	High	
O&M Costs	Yes	
Electricity Costs	None	
Development Risk	Yes	
Performance Risk	Yes	
Difficulty	Complex	
Value to Customer	Higher ROI for Customer	
Availability	Everywhere	

Third Party Ownership



Third Party Ownership: Equation

Cost

+ PPA or Lease

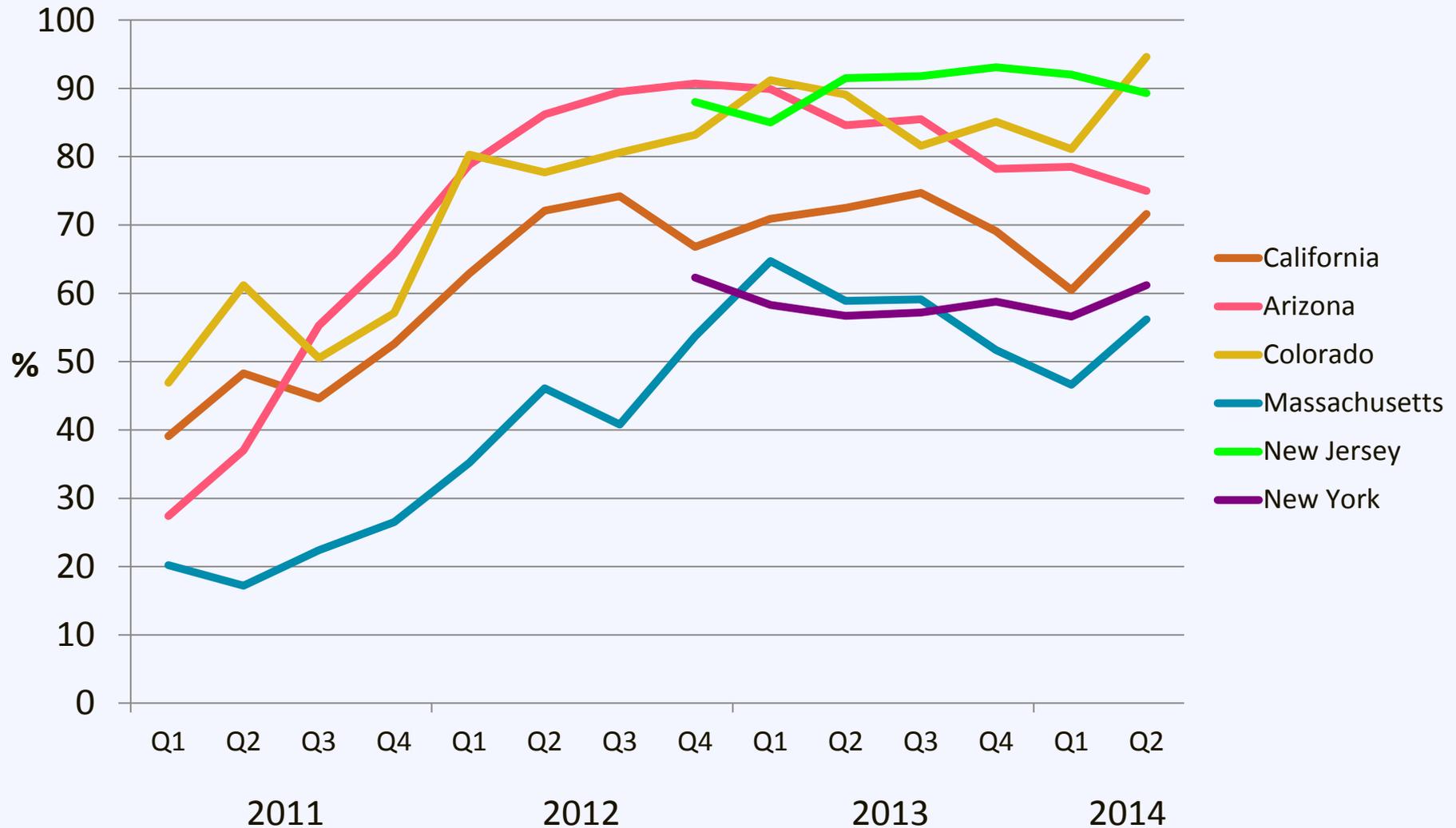
Benefit

+ Avoided Energy Cost

Third Party Ownership: Benefits

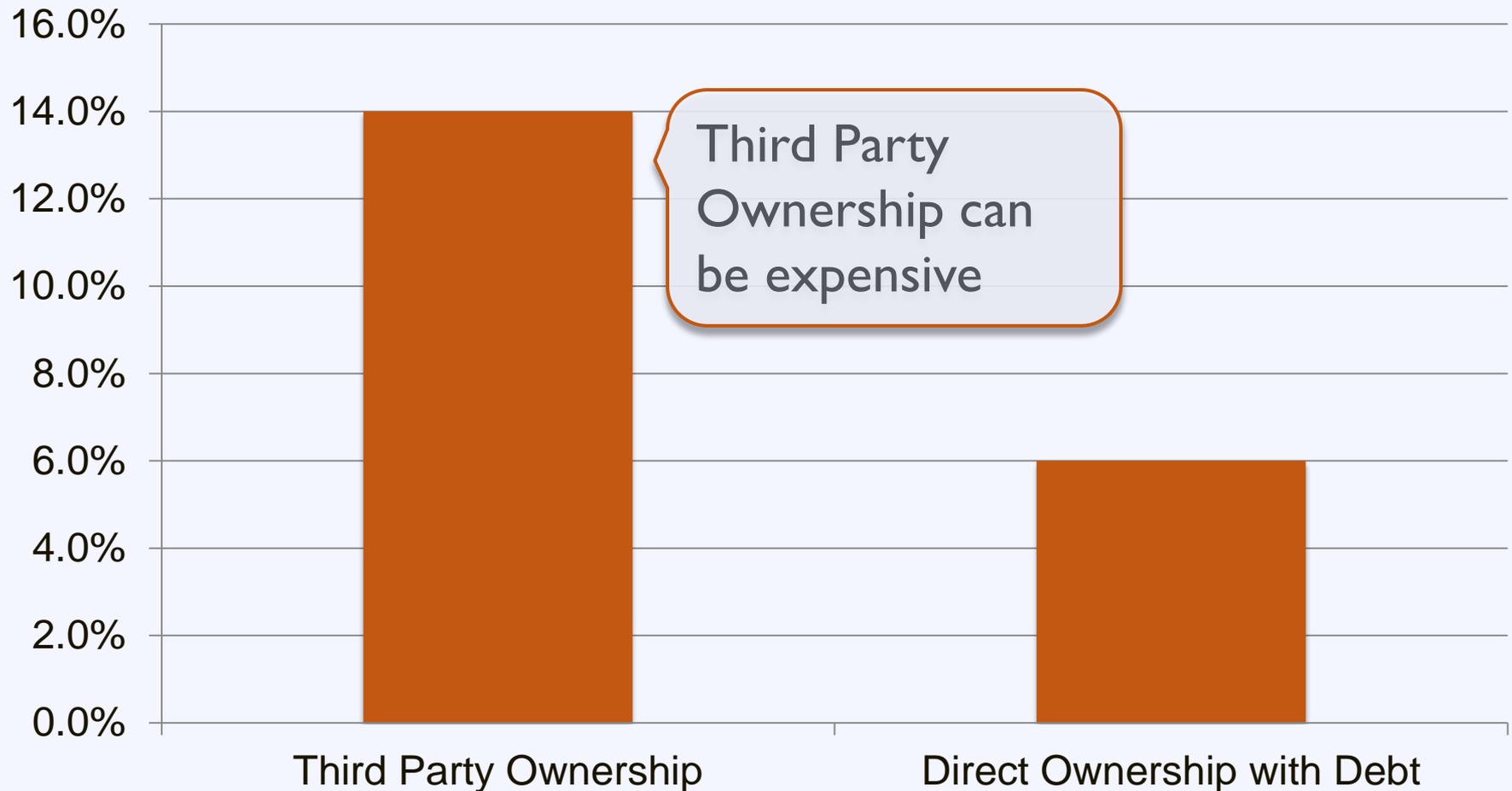
	Direct Ownership	Third Party Ownership
Upfront Cost	High	Low to None
O&M Costs	Yes	No
Electricity Costs	None	Predictable Payments
Development Risk	Yes	No
Performance Risk	Yes	No
Difficulty	Complex	Easy
Value to Customer	Higher ROI for Customer	Shared Benefits
Availability	Everywhere	Only in some states

Third Party Ownership

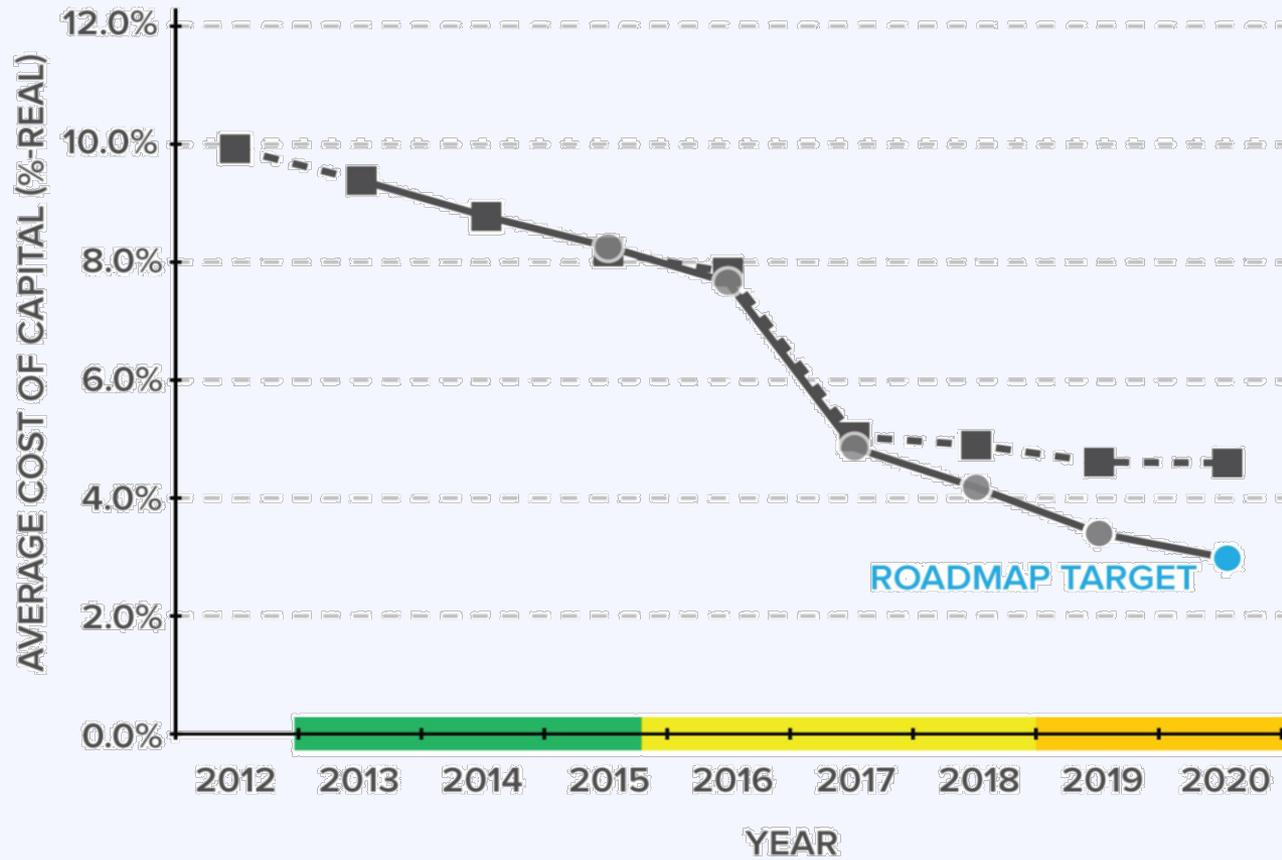


Third Party Ownership: Cost

Weighted Average Cost of Capital

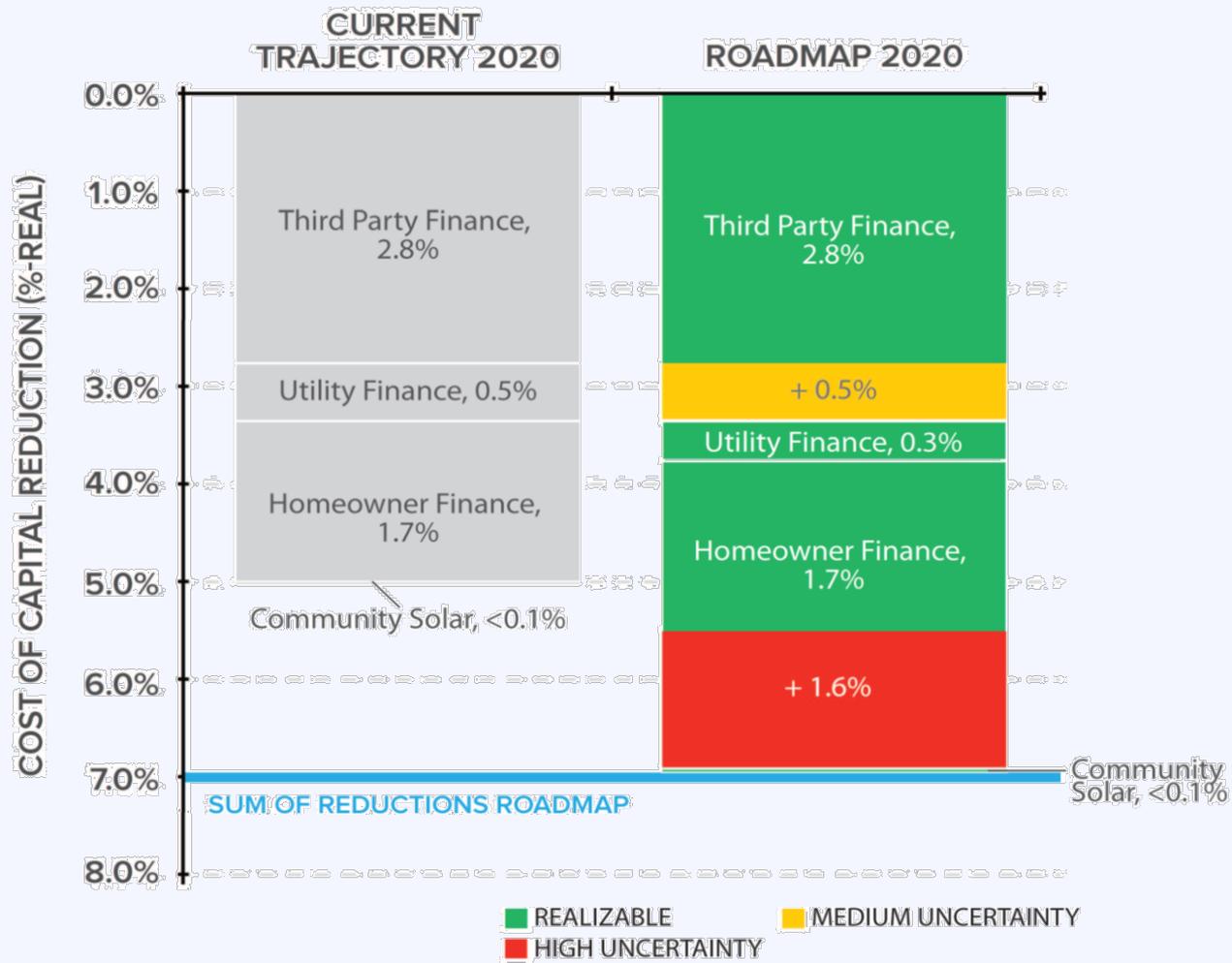


DOE WACC Targets



- CURRENT TRAJECTORY
- ROADMAP
- REALIZABLE
- LOW UNCERTAINTY
- MEDIUM UNCERTAINTY

DOE WACC Targets



Over 20 years Loans can beat PPA

CASH PURCHASE

Pay an installer for turnkey installation, get much of it back in the first year through rebates and tax credits. Benefits generated by offsetting your electric bill and receiving incentives.

\$0 Monthly Payment

\$18,000 Net Cost ?

\$2,400 First Year Savings ?

\$42,000 20 Year Net Savings ?

6.9 Years Payback



\$0-DOWN LOAN

No money down, often a reduced monthly bill and own it outright after loan term. Get the same rebates and incentives as cash purchase without the upfront cost.

\$180 Monthly Payment

\$0 Out-of-Pocket Cost

\$200 First Year Net Savings ?

\$16,000 20 Year Net Savings ?

Immediate Payback



\$0-DOWN LEASE/PPA

Turnkey installation with no money down and immediate savings. The solar company owns and maintains the solar panel system, but you get the electricity.

\$170 Monthly Payment

\$0 Out-of-Pocket Cost

\$360 First Year Net Savings ?

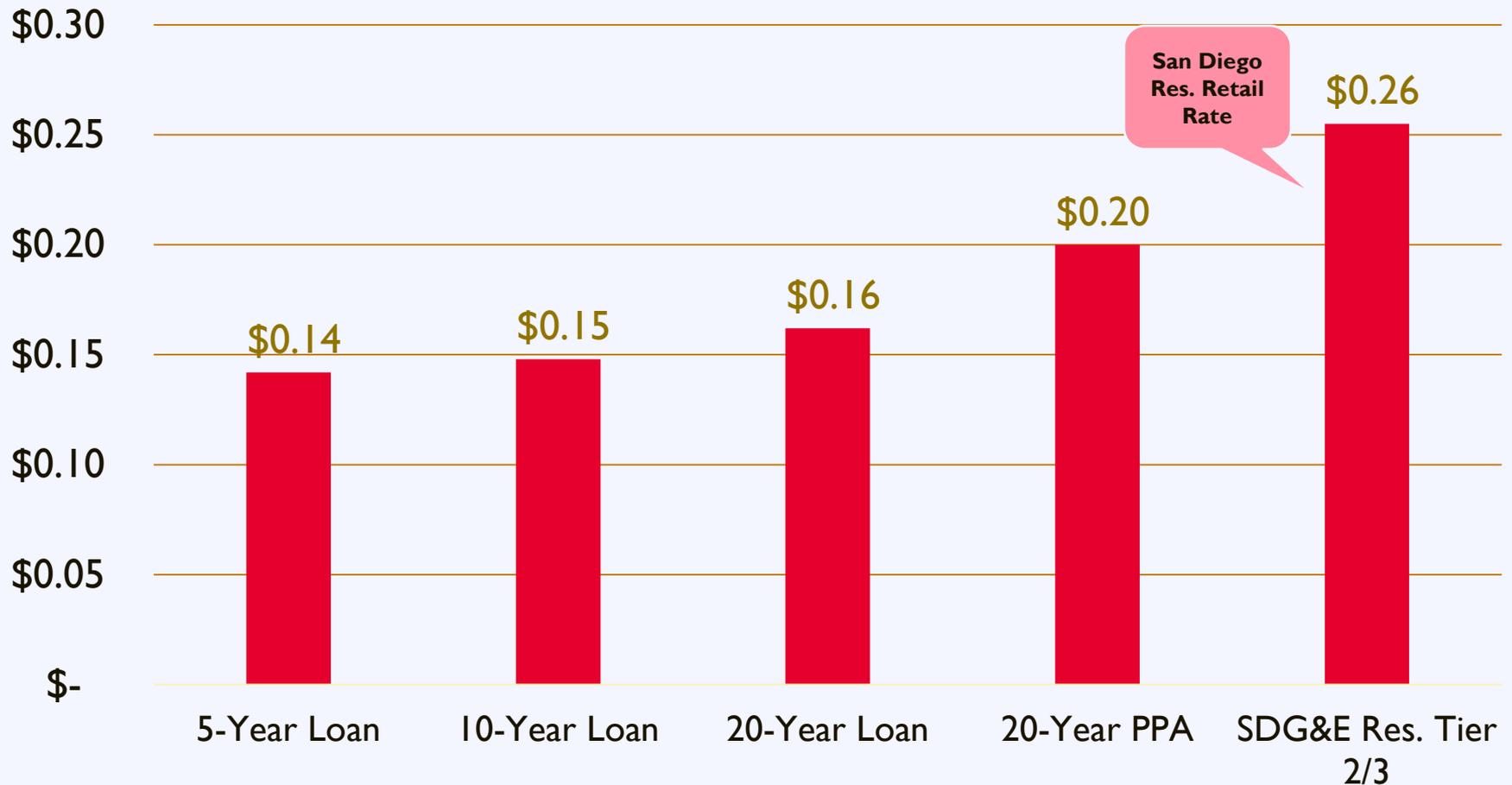
\$5,800 20 Year Net Savings ?

Immediate Payback



LCOE of Loans vs. PPA

LCOE for Residential Solar PV based on Financing



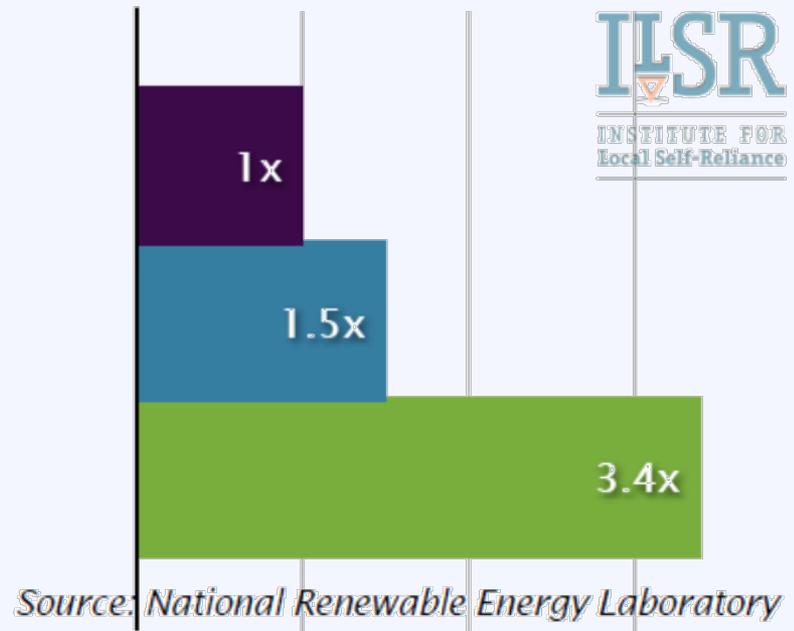
Additional Local Benefits

Local Ownership Means More Jobs & More Local Economic Impact

Job Impact of Local Ownership



Economic Impact of Local Ownership



Source: National Renewable Energy Laboratory

■ Absentee-owned ■ Locally-owned (low) ■ Locally-owned (high)

Barriers

- Ongoing tax discussions in AZ for TPO systems
 - Department of Revenue – Tax on 20% of depreciated cost of equipment
 - Pending lawsuit
- Home Value and Solar Systems
 - Studies link increase values with owned systems
 - Less clear for TPO
- Salt River Project Demand Charge

Agenda

Welcome & Introductions

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Solar Market Drivers and Finance Landscape

Why Lend for Solar?

Current Solar Financing Options

Discussion

Lending for Solar

Is lending for



different from lending for



or



Why Lend for Solar?

Cost

+ Installed

Generates Savings

+ Maintenance

- Direct Incentive

Generates Revenue

Benefit

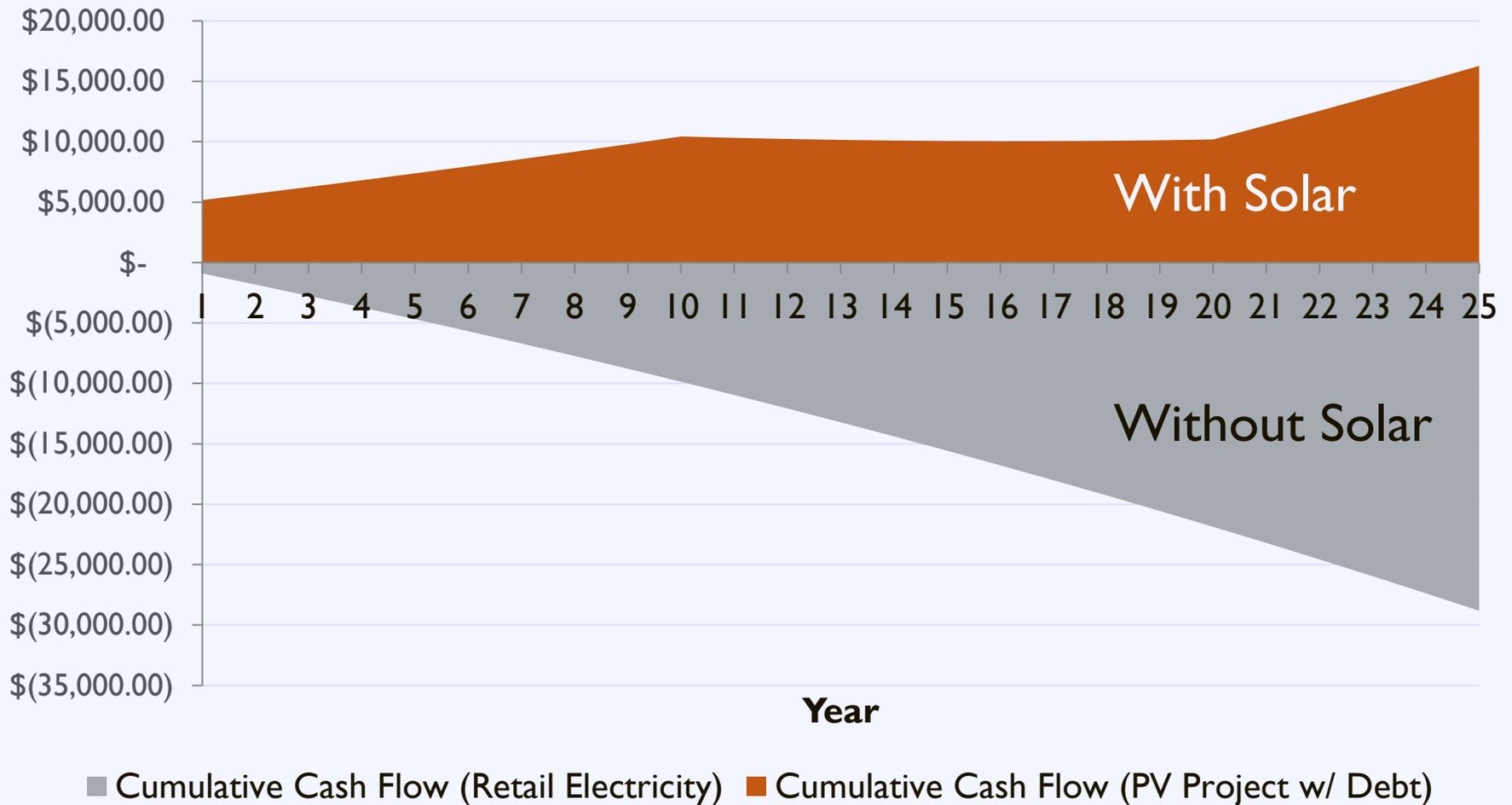
+ Avoided Energy Cost

+ Excess Generation

+ Performance Incentive

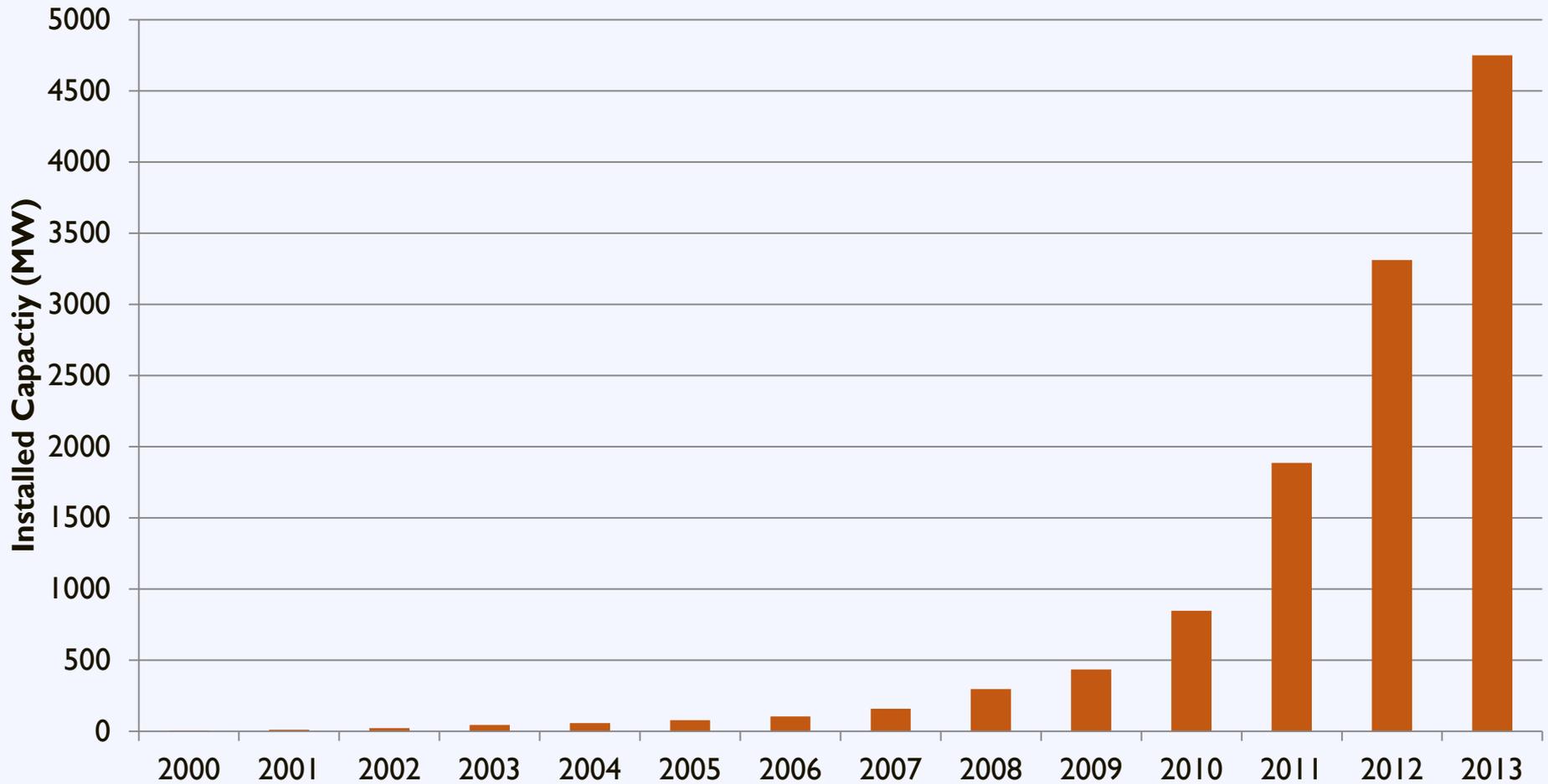
Solar = Positive Cash Flow

Estimated Cumulative Cash Flow from a Hypothetical 5 kW Project



Growing Market Opportunity

US Annual PV Installation Capacity



Customers Want Solar

131,000 new solar installations in 2013

94% were in the **residential market**

Total market size valued at **\$13.7 Billion**



New Lending Product Opportunity

Fewer than **5%**

of the

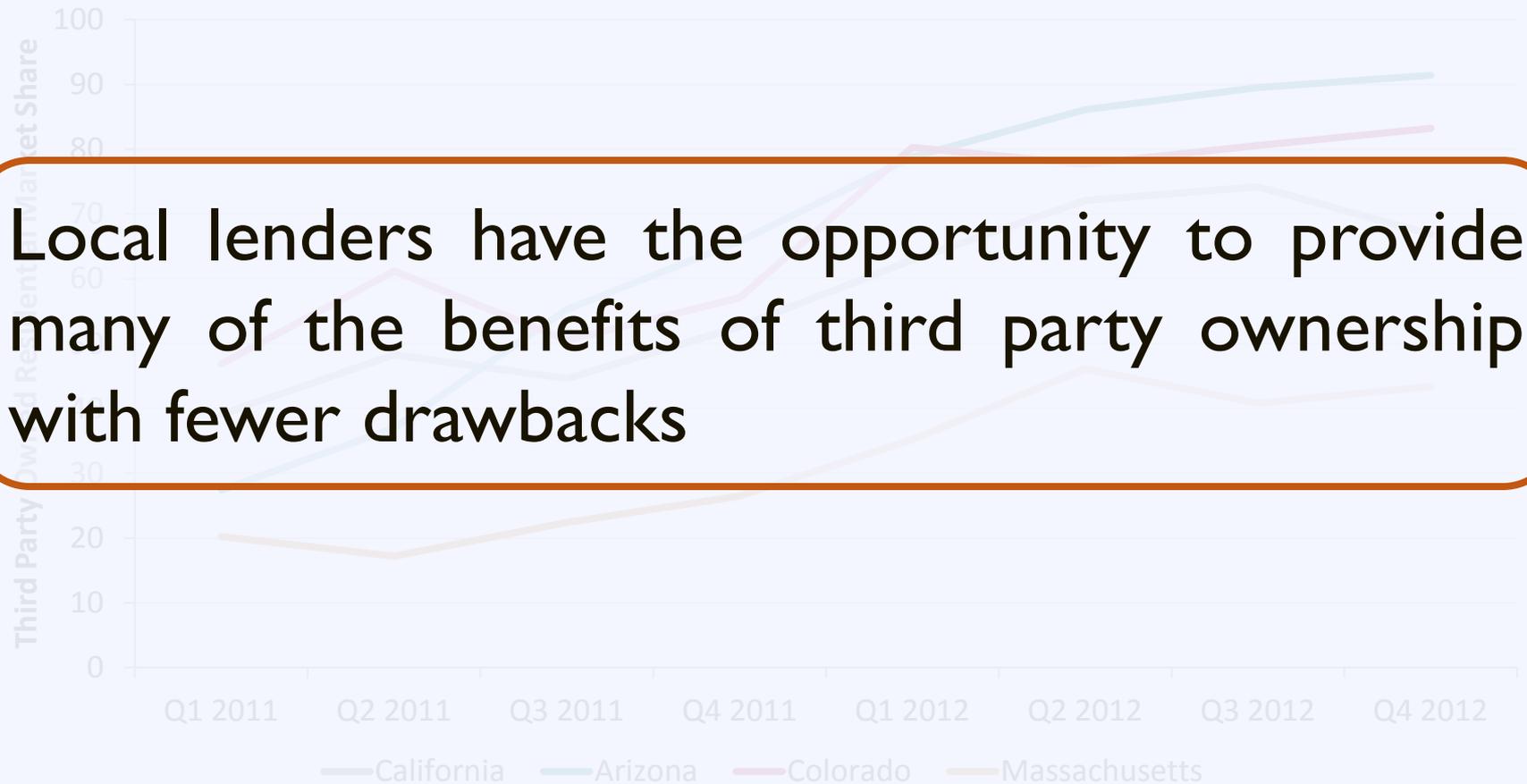
6,500 banks in the US

are

actively financing solar PV projects

Why Lend for Solar?

Percentage of New Residential Installations Owned by Third Party in CA, AZ, CO, and MA



Local lenders have the opportunity to provide many of the benefits of third party ownership with fewer drawbacks

Why Lend for Solar?

	Direct Ownership	Third Party Ownership
Upfront Cost	High	Low to None
O&M Costs	Yes	No
Electricity Costs	None	Predictable Payments
Development Risk	Yes	No
Performance Risk	Yes	No
Difficulty	Complex	Easy
Value to Customer	Higher ROI	Shared Benefits
Availability	Everywhere	Only in some states

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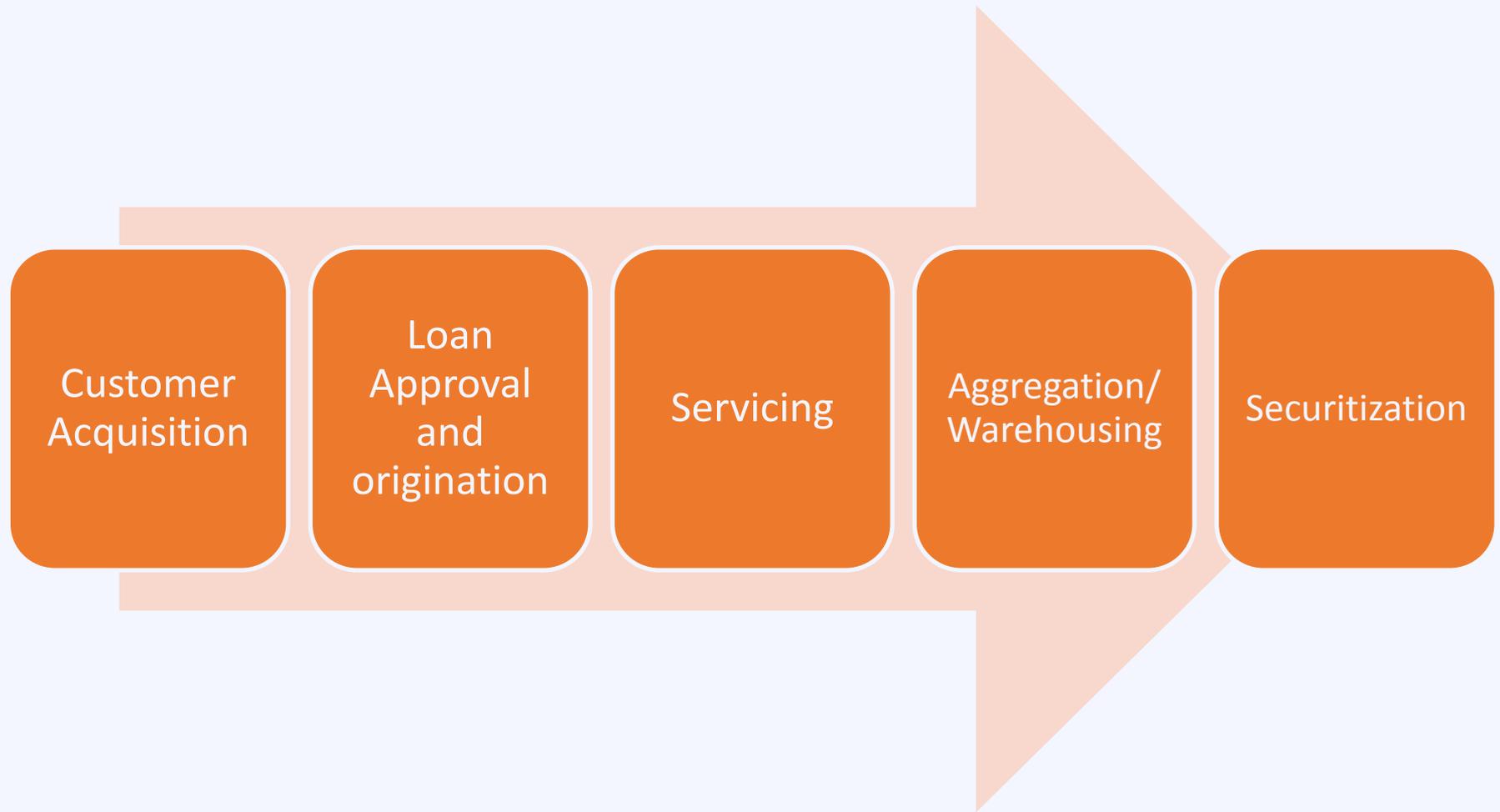
Discussion

Loan Options



- Solar specific (2.5-8%)
- Title I HUD (3-9%)
- Home equity loan (4.5%+)
- Home equity line of credit (4.5%+)
- On-bill (3%+)
- PACE (5-8%)
- Commercial loan (3.25-6.85%)

Process



Value Chain for Solar Loans

- Installation
- Operations and Maintenance
 - Bundled within the loan (Mosaic, Dividend Solar)
 - Responsibility of system owner (Admirals, PACE)

Challenges to lending to Solar PV asset class

- Lack of historical performance and credit data
- Regulatory treatment of solar loans
 - Tax deduction if home equity loan
 - PPA is off-balance sheet
- Complications with the characterization of solar assets as fixtures versus personal property
- Rights of secured lender in foreclosure situations
- Experience
- Longer amortization schedules



Examples

Between October 2013 and October 2014 at least **nine new solar-specific** loan programs were announced and several more have begun operations.

- Admirals Bank; Digital Credit Union (with SunPower and Sungage); Dividend Solar; Lightstream; Mosaic; OneRoof Energy; SolarCity; Sungage Financial; WJ Bradley (with SunEdison)



Admirals Bank



Secured

- Up to \$25,000
- Up to 20 year term
- Fixed rate 4.95% - 9.95%
- Secured by 1st or 2nd position lien

Unsecured

- Up to \$15,000
- Up to 10 year term
- Fixed rate 9.99% - 11.99%
- Bridge loan



National Bank of Arizona

- Funded through APS and SRP Customers
- Home Performance with EnergySTAR program
 - EnergySTAR audit required
- Secured and unsecured loans for 24-120 months
- Maximum \$15,000 (SRP)





SunPower Loan Program

- Panel manufacturer partnered with Admirals
- Up to \$60,000 dollars for 5-20 year terms
- Preferred interest rates from Admirals
- Bundled with 25-year performance guarantee and warranty



SUNPOWER



Unsecured Loan: Example



- Low to middle income
- Up to \$10,000
- Up to 7 years
- Fixed rate 5-6%
- Bridge loan

HUD Energy Efficient Mortgage

- The dollar amount of cost-effective energy improvements, plus cost of report and inspections, or
- The lesser of 5% of:
 - The value of the property, or
 - 115% of the median area price of a single family dwelling, or
 - 150% of the conforming Freddie Mac limit.



Title I Home Improvement Loan

Maximum Loan Amount:

- Single family house - \$25,000.
- Multifamily structure - an average of \$12,000 per living unit, up to a total of \$60,000.

Maximum Loan Term:

- 20 years.

Loan Security: Over \$7,500 must be secured by a mortgage or deed of trust on the property.



HUD FHA PowerSaver



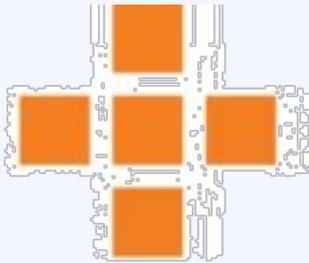
- For single family homes
- Up to \$25k for terms of 15 (or in some cases 30) years
- Interest rates between 5-7% and secured by mortgage or deed
- 11 participating lenders
- Available through 5/4/2015

SolarCity MyPower Loan



- 4.5% over 30 years
- Customer takes the 30% federal tax credit
- Monthly payment based on amount of energy the system produces
- Offered in Arizona, California, Colorado, Connecticut, Hawaii, Massachusetts, New York and New Jersey

Mosaic Home Solar Loan Program



MOSAIC

- Crowdfunding provider
- Up to 20 year terms with no money down
- Integrates ITC into loan payment
- Bundled with Enphase O&M package
- Interest rates vary
- Nationwide online portal

Lightstream Home Improvement Loan

- Division of Suntrust
- Unsecured home improvement loans for energy projects
- Up to \$100,000
- Terms up to 7 years
- Rates from 4.99-9.24%
- Some loans available for small business
- Nationwide



GreenSky Home Improvement Loan



GreenSky™

- Online credit provider
- Unsecured home improvement loans for range of credit scores
- Rates begin at 3.99%
- 6-144 month terms
- No income verification for up to \$25,000



Digital Federal Credit Union

- Up to \$50,000 dollars
- Separate no interest loan for tax credit
- Second full-term loan
- \$100 million dollar facility for residential solar
- Nationwide for members





Empower Loan

- Enables institutional investors to access residential solar market
 - Climate Bonds Initiative
- Direct lending service
- No money down
- Rates begin at 6.5%
- Bundled with 15-year production guarantee, warranties and monitoring
- Nationwide online intake platform



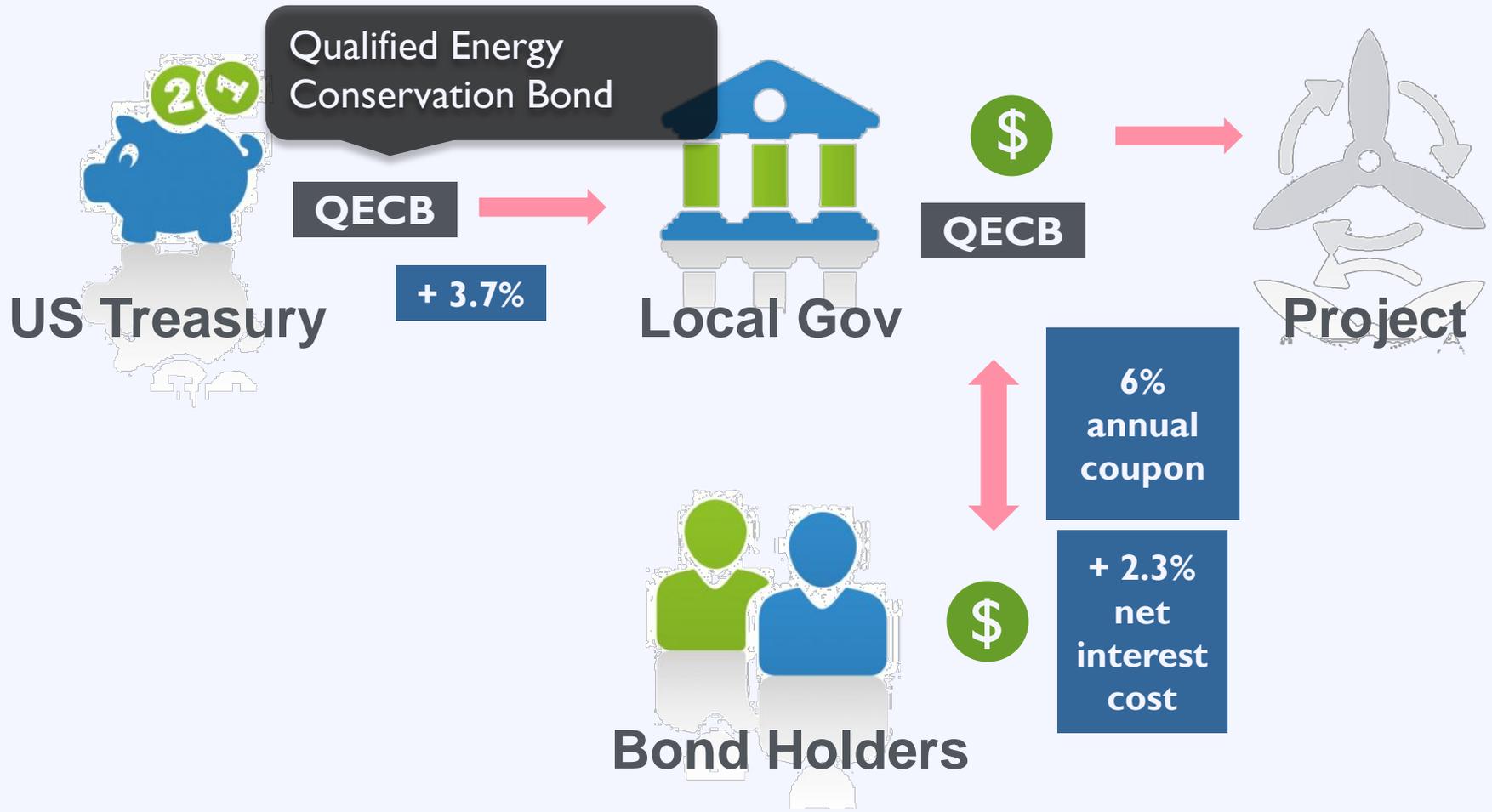
Qualified Energy Conservation Bonds

- QECBs are similar to Build America Bonds (BABs)
- Interest on QECBs is taxable but the federal government offers a direct cash subsidy to the bond issuer to subsidize the interest costs.
 - Subsidy of 70% of the Qualified Tax Credit Bond Rate

Qualified Energy Conservation Bonds

- Reduce energy consumption in publically owned building by at least 20%
- Implement green community programs
- Rural development
- Renewable energy facilities (wind, solar, biomass)
- For certain mass commuting projects
- Local governments and municipalities with 100,000 or more in population

Qualified Energy Conservation Bond



Arizona QECB Allocation

- \$67,436,000 allocated
- \$16,023,804 issued (23.76%)
- \$51,412,196 remaining

Learn More

Resource EPC QECB Guide

- Monthly updates to QECB utilization and case studies

QUALIFIED ENERGY CONSERVATION BONDS (QECBS)



December 2014



Nothing contained in this issue paper should be construed or relied upon as legal advice. Instead, this issue paper is intended as a general introduction to the subject of the use of qualified energy conservation bonds to finance energy and mass transit projects, from which better informed requests for advice can be formulated.

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NREL Solar Access to Public Capital Working Group

- NREL Solar Access to Public Capital (SAPC) working group
 - Developed standard residential lease and commercial power purchase agreement (PPA) contracts
 - Working Group
 - PV project development standards
 - Unofficial ratings guidance for rating agencies
 - Collecting performance and credit data
 - Technical Reports and Analysis



https://financere.nrel.gov/finance/solar_security_public_capital_finance

SAPC Analysis

- Master Limited Partnerships
- Real Estate Investment Trusts (REITs)
- YieldCos
- Solar Securitization
- Securitization Library:

<https://financere.nrel.gov/finance/content/securitization-library>



Renewable Energy Finance

Solar Securitization: A Status Report

Value Proposition

The U.S. solar industry is an \$11.5 billion market¹ with over 360,000 systems in place.² Securitization of the cash flows associated with distributed solar systems (i.e., those serving residential and commercial customers) represents an emerging investment opportunity for institutional money managers.

Background

Every day, more energy falls on the United States—in the form of sunshine—than the country uses in an *entire year*.³



Figure 1. U.S. solar energy intensity⁴

The ability to convert solar energy into cost-effective electricity via photovoltaic (PV) technology has been refined over the last 50 years.⁵ Since 2000, the cost of installing a PV system has declined by 6%–7% per year due to improving conversion efficiencies, manufacturing economies of scale, and deployment advancements adopted by the industry.⁶

Over that same time period, annual deployment grew dramatically from roughly 700 to 90,000 installations per year.⁷ The industry is currently on pace to install one PV system every four minutes.⁸

Continued Industry Growth and Cash Flows

The U.S. Department of Energy's (DOE) Sunshot Initiative has targeted an additional two-thirds cost reduction by 2020 and set a goal of solar energy production fulfilling 14% of total U.S. electricity needs by 2030, up from less than 1% currently.⁹ Meeting this generation target will require sustained growth of 25% per year, consistent with near-term independent projections.¹⁰

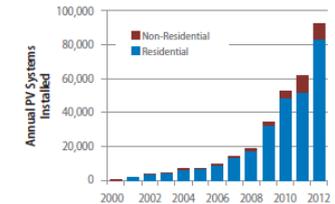


Figure 2. Distributed solar systems installed (2000–2012)

Improving economics, in part driven by lower cost of capital, and strong demand due to state Renewable Portfolio Standards (RPS) and customer desire for clean energy will help drive that growth. RPS programs—which require increasing levels of renewable energy generation in the electricity mix—are currently instituted in 29 states and Washington, D.C.¹¹

The capital investment to construct a solar system is generally repaid through a lease or power purchase agreement (PPA) contract. At present, cash flows from these contracts represent roughly \$93 million per year in the United States.¹²

NREL is a national laboratory of the U.S. Department of Energy,
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Renewable Energy Finance
Solar Securitization:
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Continued Industry Growth and Cash Flows
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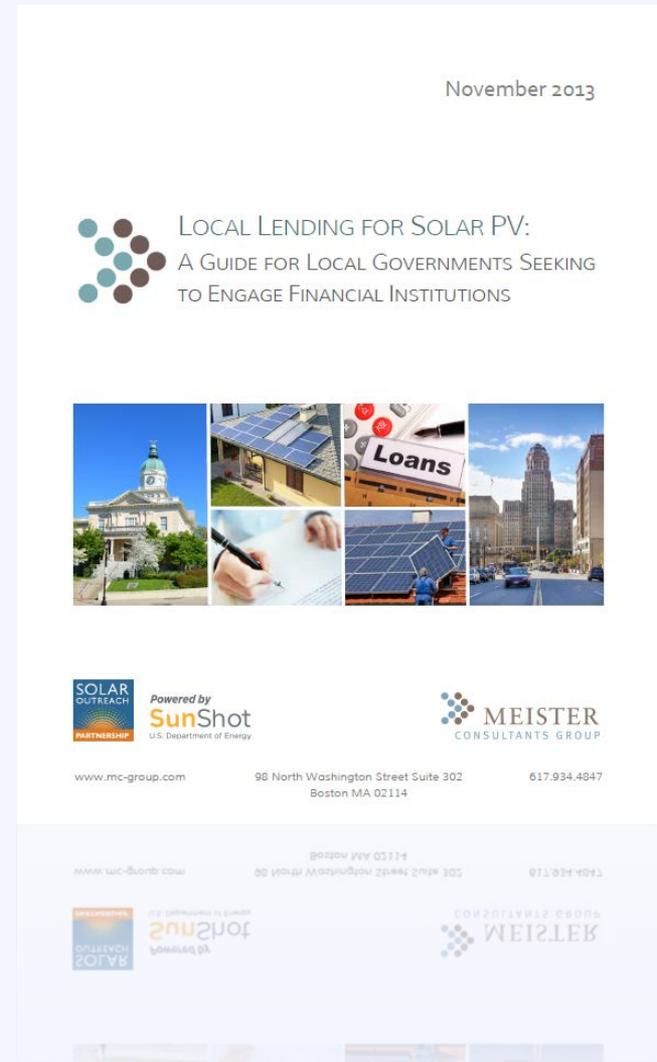
- Open Source Performance and Reliability Clearinghouse
- <http://www.sunspec.org/osparc/>
- a nationwide network of solar PV power plants that report daily in order to answer the question of how solar PV performs over the long term

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Resource Local Lending for Solar PV

A guide for local governments seeking to engage financial institutions.

www.solaroutreach.org



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Resource **NREL Analysis**

Analysis and overview of banking and lending opportunities for US Solar PV market.



Banking on Solar: An Analysis of Banking Opportunities in the U.S. Distributed Photovoltaic Market

David Feldman and Travis Lowder
National Renewable Energy Laboratory

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Technical Report
NREL/TP-6A20-62605
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Agenda

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