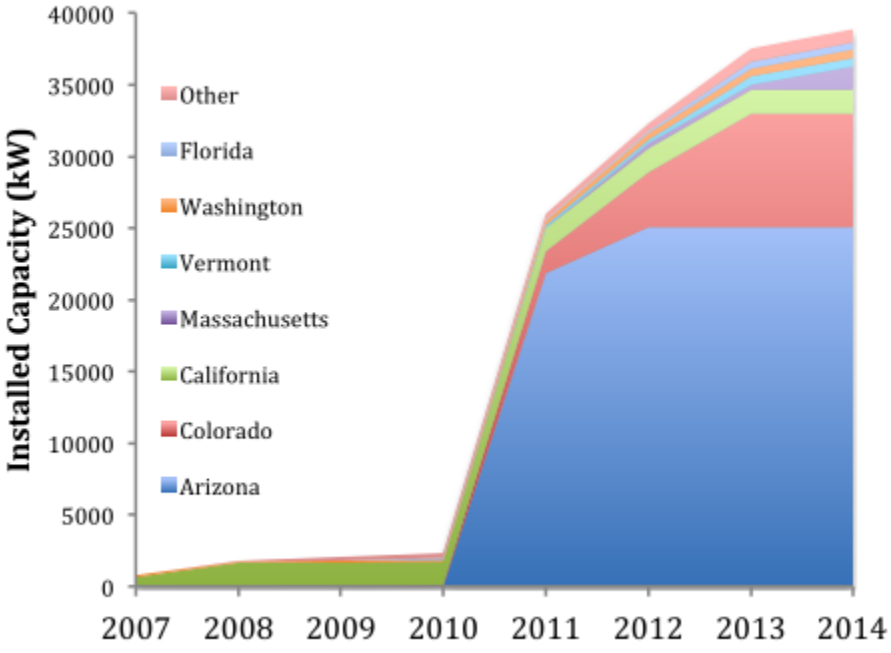
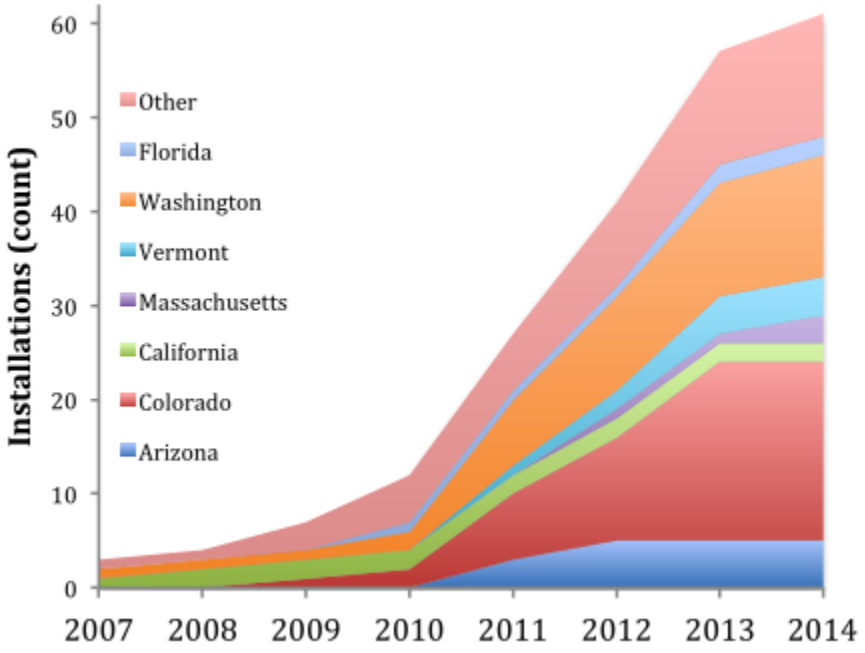
Thank You!

JOSHUA.HUNEYCUTT@EE.DOE.GOV

Capacity Installed vs Number of Projects by State





Working Paper Draft: 30 March 2015

Middle Ground in Customer-Utility Relationship? Analyzing the Drivers of Variations in Deployment Models for Community Solar

Erik Funkhouser[1], Griselda Blackburn[2*], Clare Magee[1*], and Varun Rai[1,3#]

Opportunities Beyond the Residential Rooftop

Community Solar

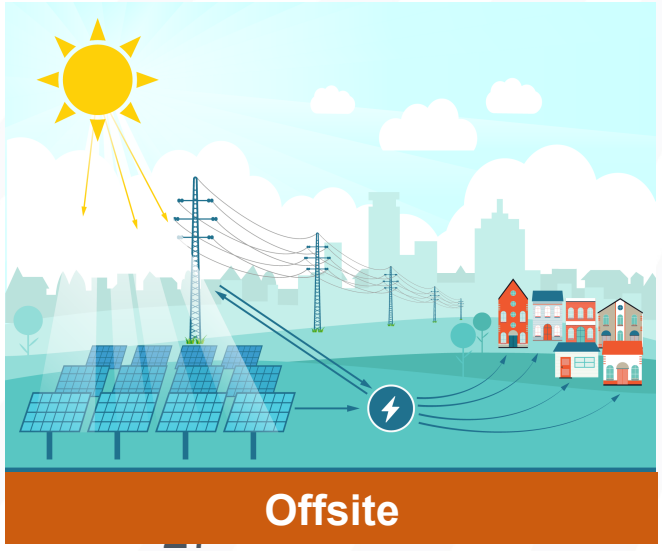
Community members work together to enable solar in their community

Group Purchasing

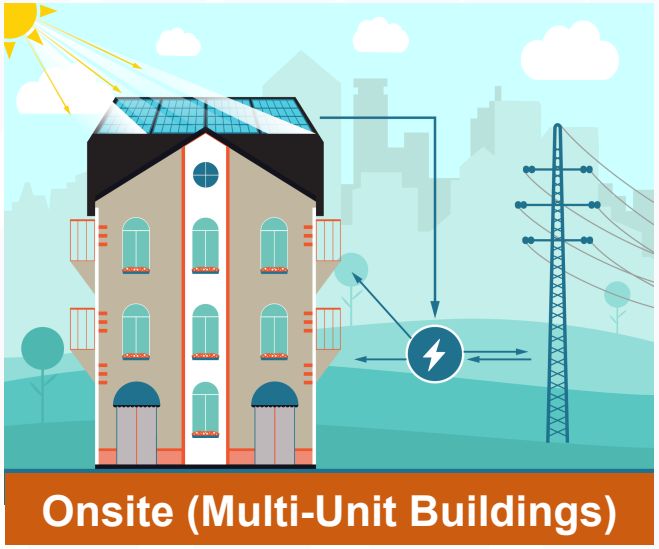
Financial (Invest or Donate)

Shared Solar

Participants own or lease panels, buy kWh blocks of generation, or own an interest in a shared system



Offsite



Onsite (Multi-Unit Buildings)

SunShot U.S. Department of Energy

Potential Benefits of Shared Solar

Market Expansion

- **Access to solar for the other 75%**: Individuals without good roofs for solar can participate
- **Lower barriers to entry (financial & technical)**
  - Minimum buy-ins can be ¼ or ½ of one PV panel
  - Enable participation by new market segments
- **Easy, engaging, potentially transferable**
  - Option to sell if moving
- **Enabling deployment**: Solar on schools, churches, nonprofits, etc.

Economies of Scale

- **Lower soft costs**: Costs are spread over larger projects
- **Siting flexibility**
  - Optimal grid integration
  - Local econ development: Community-scale projects can use **space close to load centers** unsuitable for small- or utility-scale solar
- **Focused interconnection efforts**: Utilities monitor operation of several larger arrays instead of many small systems

Opportunities for Innovation

- **Entrepreneurship opportunities:** Wide range of possible business models
- **Lower-cost financing**
  - Community-based market players can lower financing costs
- **Sector interfaces**
  - Opportunities for residential/commercial/municipal collaboration
- **Giving back to your community**

S/CS: Good for Communities

Potential Benefits

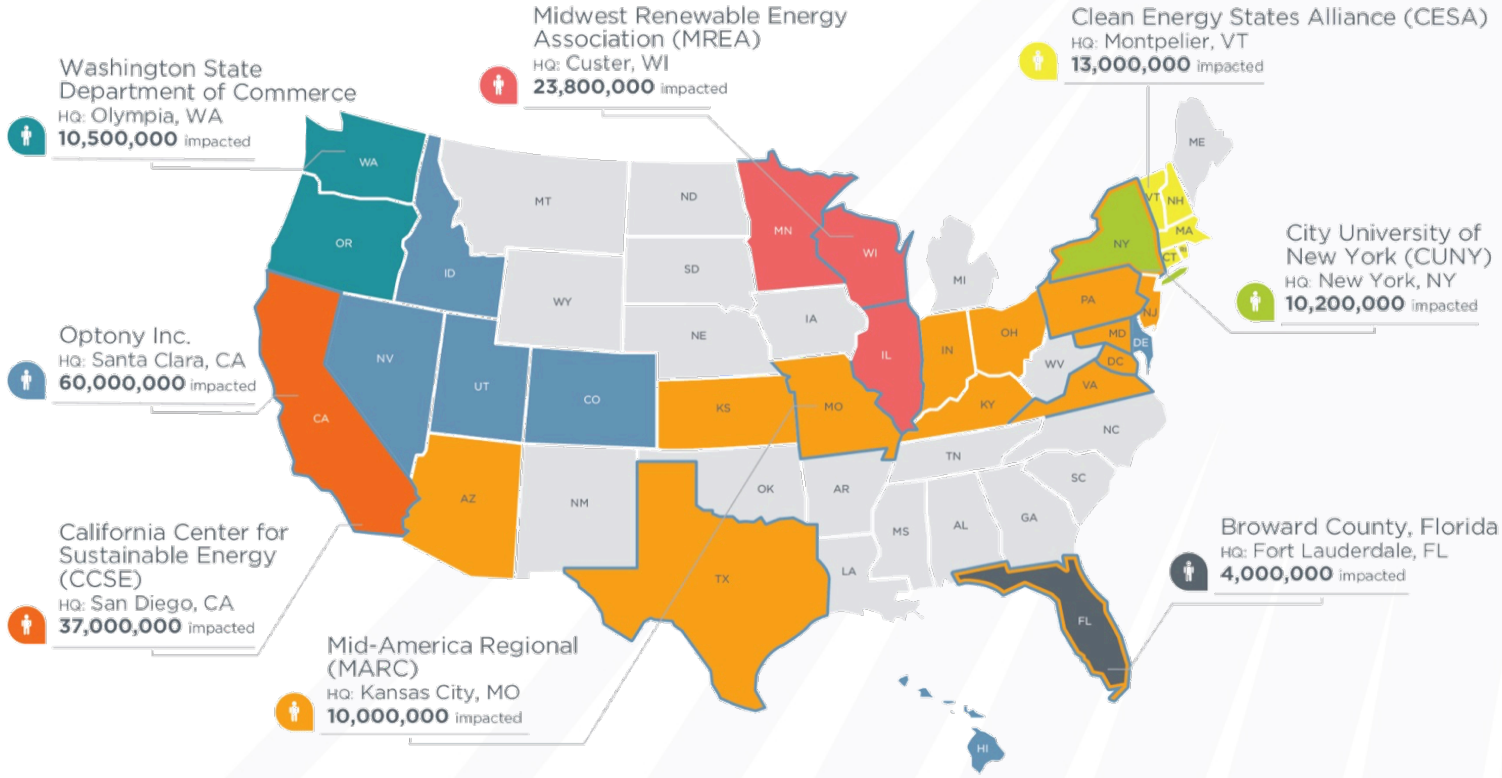
- **Enabling deployment**
  - Schools, municipal buildings, nonprofits
- **Siting:** Community-scale projects can use space near load centers that is unsuitable for small or utility-scale solar
  - (e.g., commercial rooftops, apartment buildings, brownfields, and near roads)
- **Multi-unit buildings** can host S/CS
  - Stabilize electricity costs for renters & affordable housing tenants
- **Sector interfaces**
  - Residential/commercial/municipal collaboration
- Insight on working with **intermediate system sizes**

Remaining Challenges

- **Permitting & interconnection**
  - Existing local regulations may limit the size of projects that can be easily deployed and connected to the grid
- **Enabling legislation** (virtual net metering laws)
  - Needed to distribute electricity benefits from off-site S/CS installations

In his 2013 Climate Action Plan, President Obama called for **100 MW** of renewable energy on **affordable housing** by 2020

Rooftop Solar Challenge II Highlights



- **REGIONAL COLLABORATIONS**
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  - CA Interconnection Portal (CSE)
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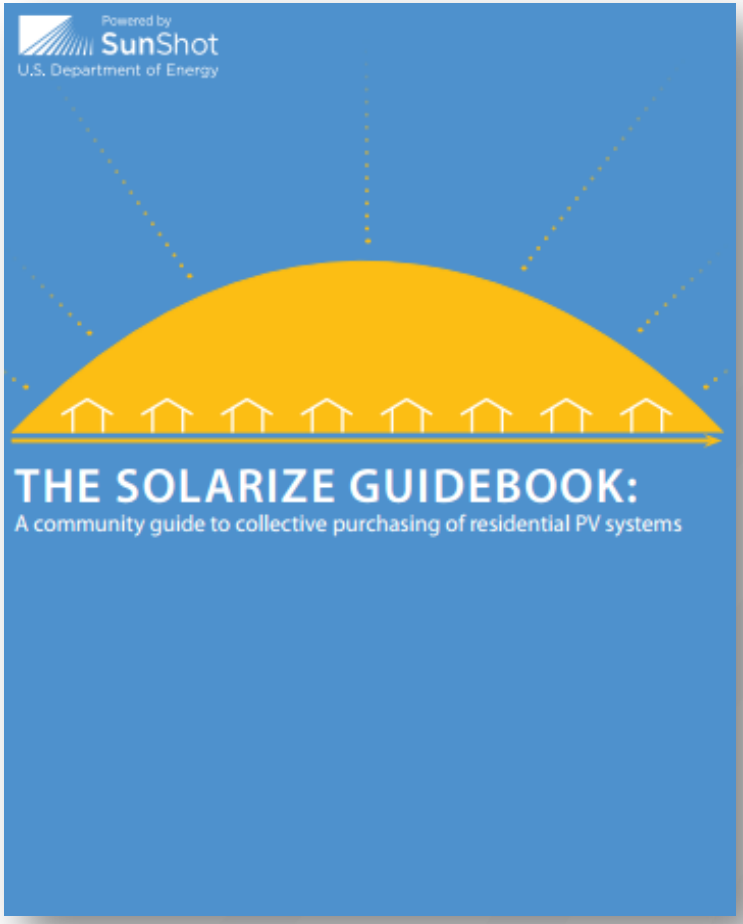
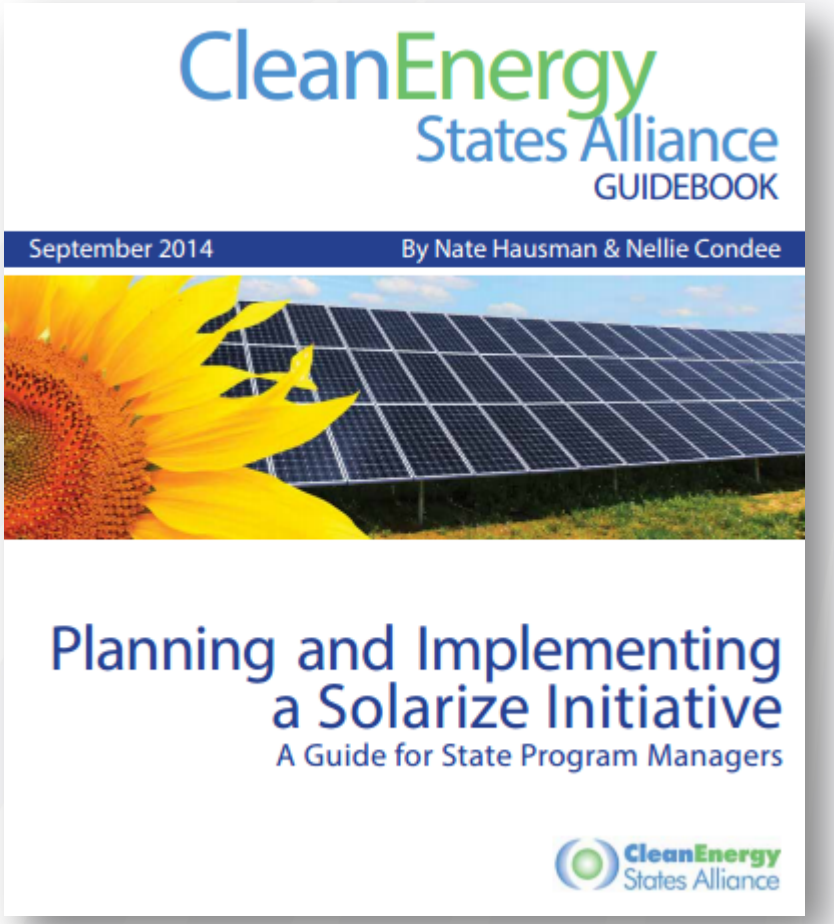
- **STATEWIDE STANDARDIZATION**
  - California Solar Permitting Guidebook (CSE)

Solarize Resources





http://solaroutreach.org/solarize/

Rooftop Solar and its Alternatives

Fewer than 25% of homes are eligible for solar*

- Structural constraints
- Insufficient roof space
- Shading
- Multitenant buildings

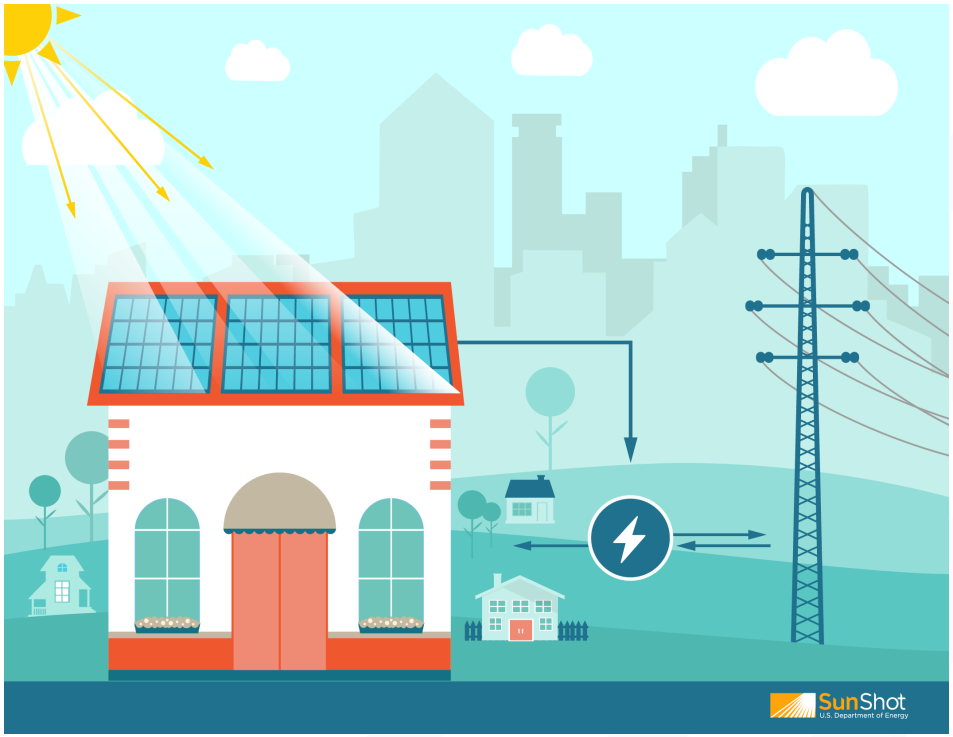
Does not account for:

- Ownership/renters
- Financial situation

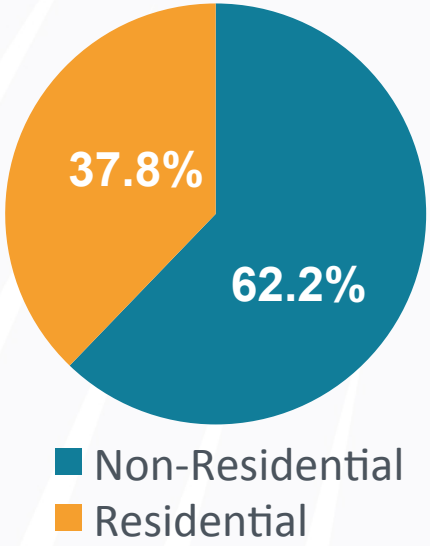
- **Mid Valley Solar Array**, 78 kW
- El Jebel, Colorado
- Partners:
  - **Holy Cross Energy** (cooperative utility)
  - **Clean Energy Collective** (developer)
- Came online in August 2010
- HCE customers (including homeowners, businesses, renters, lessees, community organizations, etc.) can purchase shares upfront at **$3.15/watt**
- Participants receive **bill credits valued 37% higher** than credit for traditional solar

- *NREL Study. *Rooftop Photovoltaics Market Penetration Scenarios*. 2008.
- Image credits: SunShot Rooftop Solar Challenge, Echos Solar, Clean Energy Collective (CEC)
- Mid Valley Solar Array info: the CEC and the "Shared Solar Program Comparison Chart" – Interstate Renewable Energy Council (IREC) & Solar Electric Power Association (SEPA)

Residential Rooftops are Limiting



U.S. Electricity Consumption by Sector



Only about ¼ of residential rooftop space can host solar

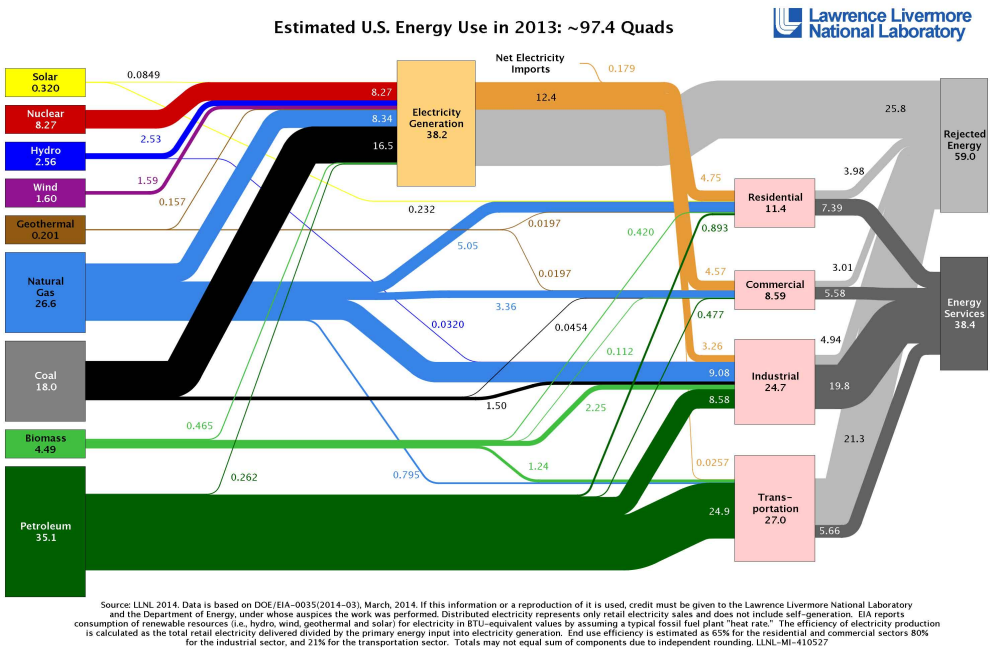
- Structural constraints
- Insufficient roof space
- Shading

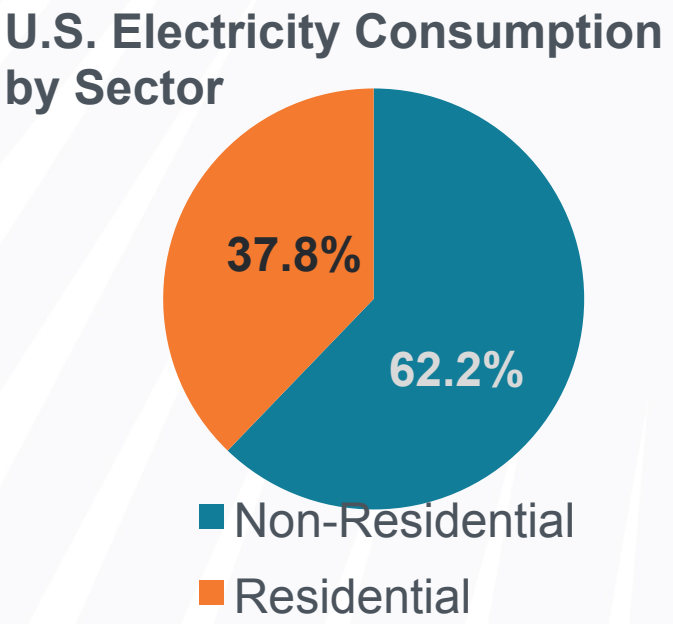
Does not account for:

- Ownership status/renters
- Financial situation

NREL Study. *Rooftop Photovoltaics Market Penetration Scenarios*. 2008.

Electricity Consumption and Access





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Does not account for:

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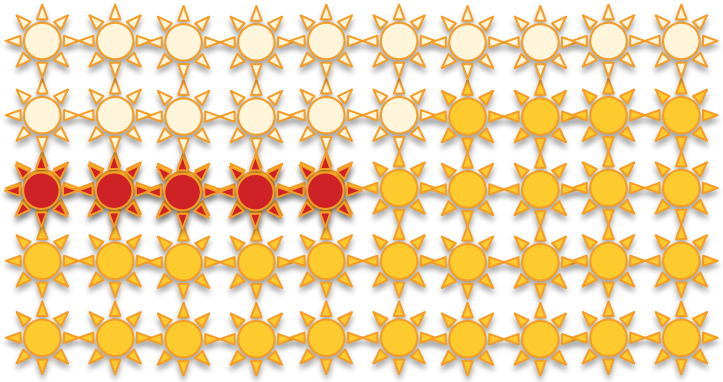
Thinking Beyond the Residential Rooftop



Currently Deployed in U.S.		By 2020*
All Solar	~16 GW →	50 GW
Shared Solar	~50 MW →	5 GW**

**SunShot Vision Study: 330 GW of solar by 2030, 715 GW by 2050*

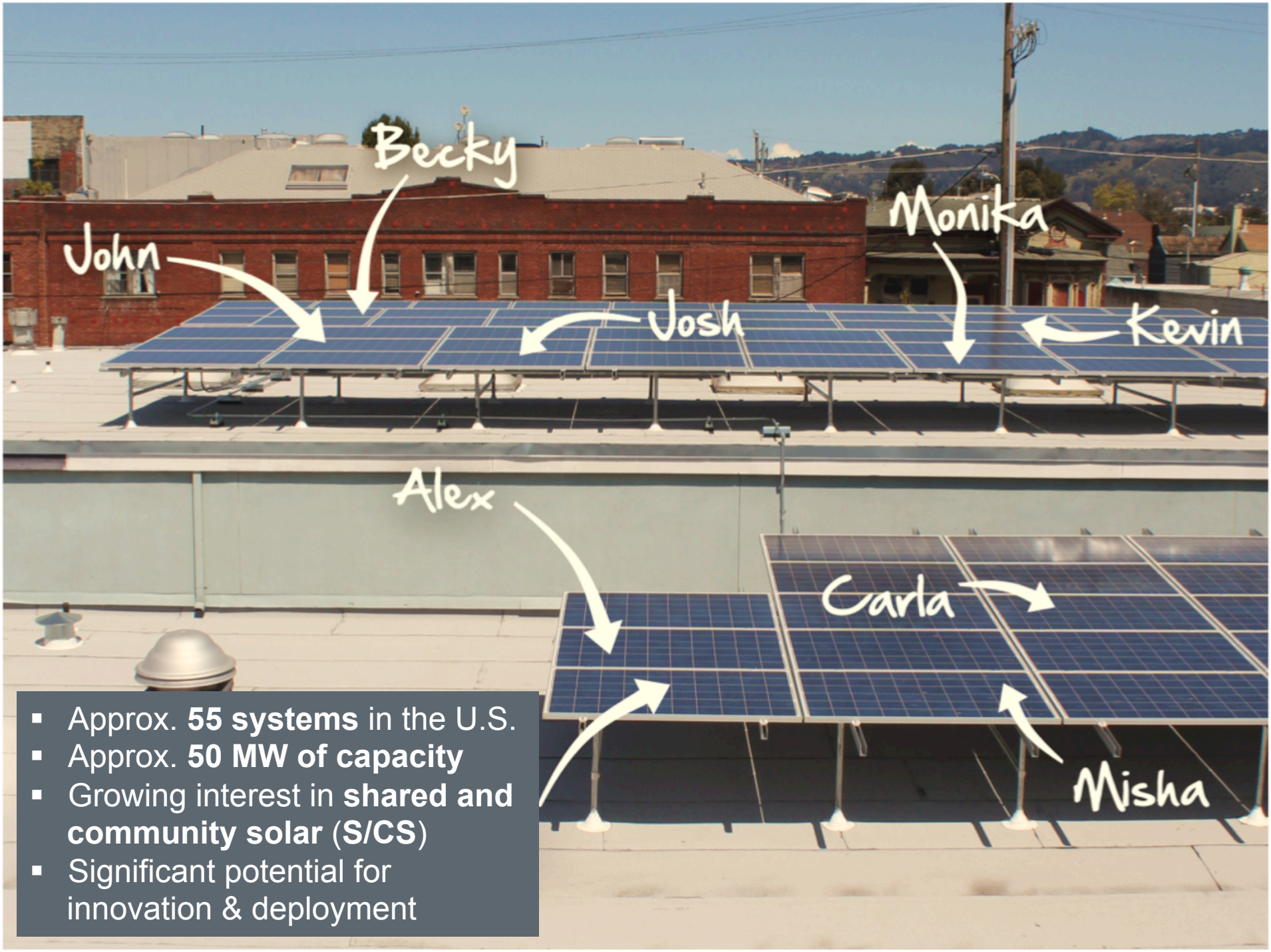
***Informal, aspirational goal*

= 1 GW (1,000 MW) = 1 nuclear or coal plant = ~130,000 homes for 1 year

New ownership models (**shared & community solar**) can:

- Enable offsite solar arrays & solar on multi-unit housing
- **Expand access** to solar
- Lower costs via **economies of scale**
- Provide **opportunities for innovation**

SunShot U.S. Department of Energy



- Approx. **55 systems** in the U.S.
- Approx. **50 MW of capacity**
- Growing interest in **shared and community solar** (**S/CS**)
- Significant potential for innovation & deployment

Mid Valley Solar Array in El Jebel, Colorado

- 78 kW array
- Partners:
  - **Holy Cross Energy** (cooperative utility)
  - **Clean Energy Collective** (developer)
- Came online in **August 2010**
- HCE customers (including homeowners, businesses, renters, lessees, community organizations, etc.) can purchase shares upfront at **$3.15/watt**
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Image credit: Clean Energy Collective (CEC)

"Shared Solar Program Comparison Chart" – Interstate Renewable Energy Council (IREC) & Solar Electric Power Association (SEPA)

Madonna Road Apartments in San Luis Obispo, CA

- 281.5 kW array
- PV modules placed on ballasted roof racking & solar awnings
- Installed on 18 buildings during property rehab project
- System designed to offset 100% of tenant and common area electrical usage

S/CS: Good for Utilities

Potential Benefits

- **Responsive** to customers
  - Fulfill desire for solar options
- **Equitable** to all rate-payers
- **Net metering / Value of Solar**
  - S/CS can aid rate design compromises
- **Utilities control their involvement**
  - Active design/system management or supporting role
- **Focused interconnection efforts**
  - Utilities monitor output & operation of several larger installations instead of many small systems
- **Siting flexibility**: Key spots on the grid
- **No capital costs**

Remaining Challenges

- Integration with utility **billing systems**
- **Lack of market research**
  - Which programs do customers like?

Over 50 MW of utility-sponsored community solar is currently available*

*SEPA, Utility Community Solar Handbook, 2013

Preliminary research indicates utilities may prefer S/CS over green power purchasing programs and residential rooftop solar**

- **Blackburn, Griselda, Clare Magee, Ben Sigrin, and Varun Rai. "Evaluating the Role of Utility-Sponsored Community Solar within the Utility Business Model." UT-Austin, 2013.

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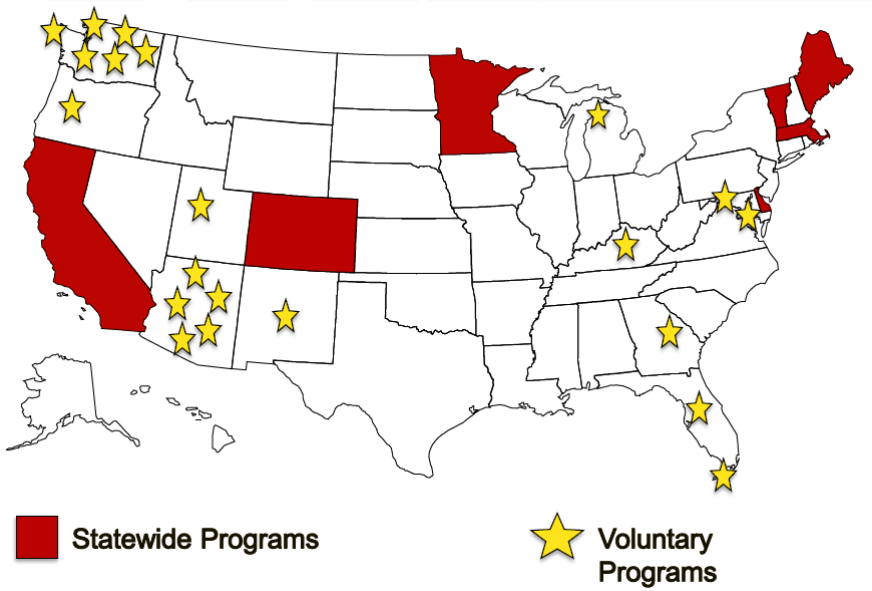
S/CS: Good for the Solar Industry

Potential Benefits

- **Lower soft costs:** costs are spread over larger projects*
  - (e.g., permitting, inspection, interconnection, installation, and customer acquisition)
- **Entrepreneurship opportunities**
  - Wide range of possible business models
- **Lower-cost financing**
  - Participation of new, community-based market players can lower financing costs
- **New market opportunities**
  - Demand exists in developed and new solar markets across the U.S.
  - Distributed CSP

Remaining Challenges

- **Legal structures**
  - Business models
  - Financing
  - Securities issues



- *According to a shared solar developer, benefits of scale come into play for projects >500 kW
- Map shows shared solar activity in the United States (Interstate Renewable Energy Council, 2013)

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S/CS: Good for Consumers

Potential Benefits

- **Access to solar for the other 75%**
  - Individuals without good roofs for solar (e.g., renters)
- **Lower barriers to entry** enable participation by new market segments
  - (e.g., lower-income consumers)
- **Easy:** Individuals can avoid operations, maintenance, and technical issues
- **Transferable:** Solar assets can be bought or sold separately from homes
- **Engaging:** Community participation encourages awareness of energy use and understanding of renewable energy options
- **Local action & advocacy** can support national deployment

Remaining Challenges

- **Education**
- **Securities laws** may limit some projects to accredited investors
- **Federal ITC** does not always apply

National, regional, & local non-profits working on S/CS include:

- The Vote Solar Initiative
- D.C. SUN
- IREC
- Solar Gardens Institute
- Northwest SEED
- Appalachian Institute for Renewable Energy
- The Resource Innovation Group

S/CS: Good for Communities

Potential Benefits

- **Enabling deployment**
  - Schools, municipal buildings, nonprofits
- **Siting:** Community-scale projects can use space near load centers that is unsuitable for small or utility-scale solar
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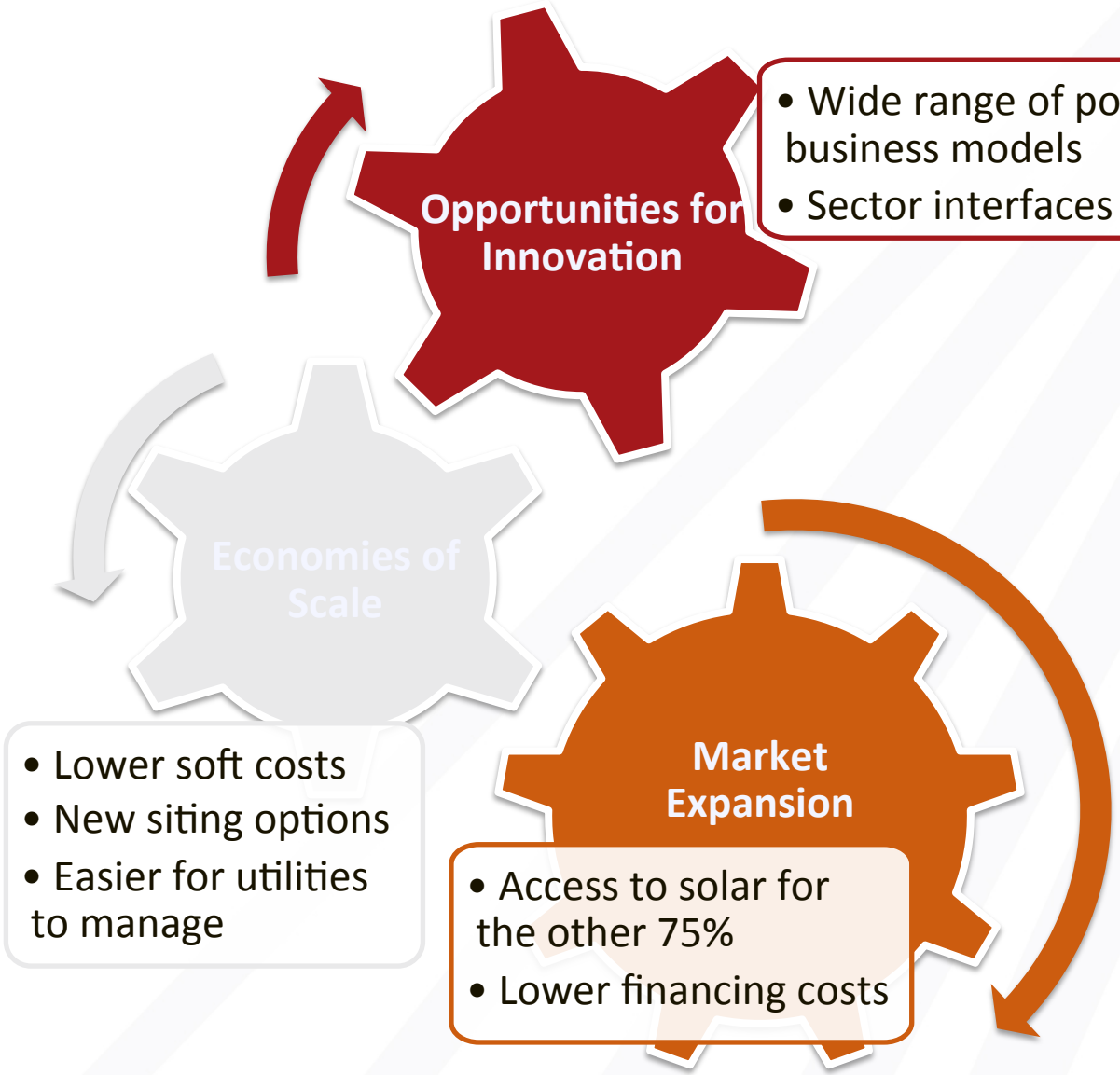
Good for SunShot: Encouraging Entrepreneurship



The Big Challenge

Plenty of demand, but low market maturity

- Locality-specific, diverse business models
- Projects often start from scratch
  - High administrative and legal costs
  - Difficult to replicate projects

Primary Questions

How can S/CS in the United States scale rapidly from the 50 MW deployed today?

Which existing approaches are replicable? How & why?

Where are opportunities for collaboration?

What can each stakeholder group do?

What are helpful role(s) for DOE?

Opportunities for Shared Solar

Scaling

- Currently: Many locality-specific, diverse business models
- Regional legal and regulatory variations
- High administrative and legal costs

Financing

- Developing financing models
- Developing precedent for:
  - Securities regulations
  - Personal Tax Credit for offsite systems

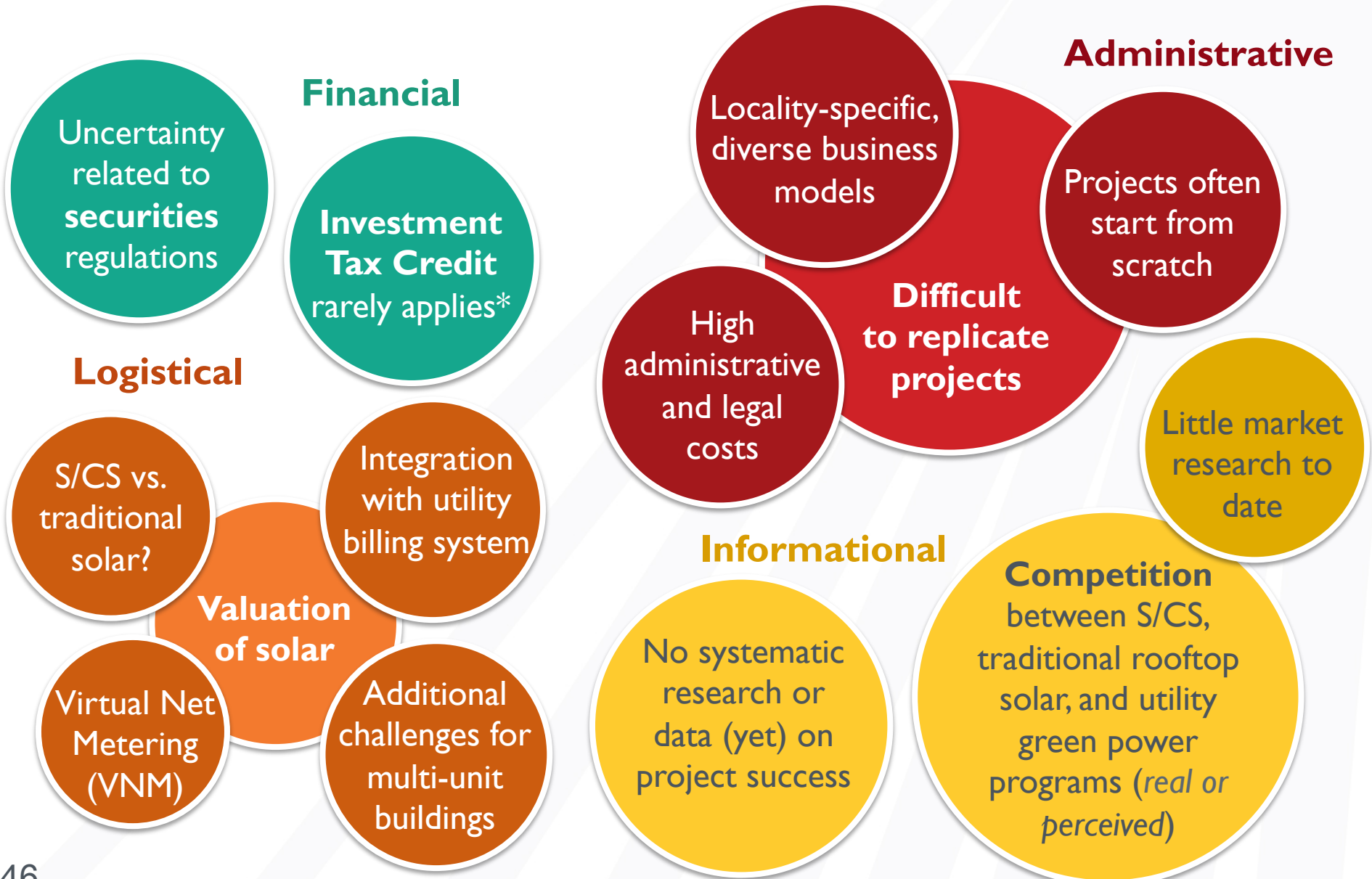
Logistical

- Integration with utility billing systems
- Developing frameworks for distributing benefits

Information

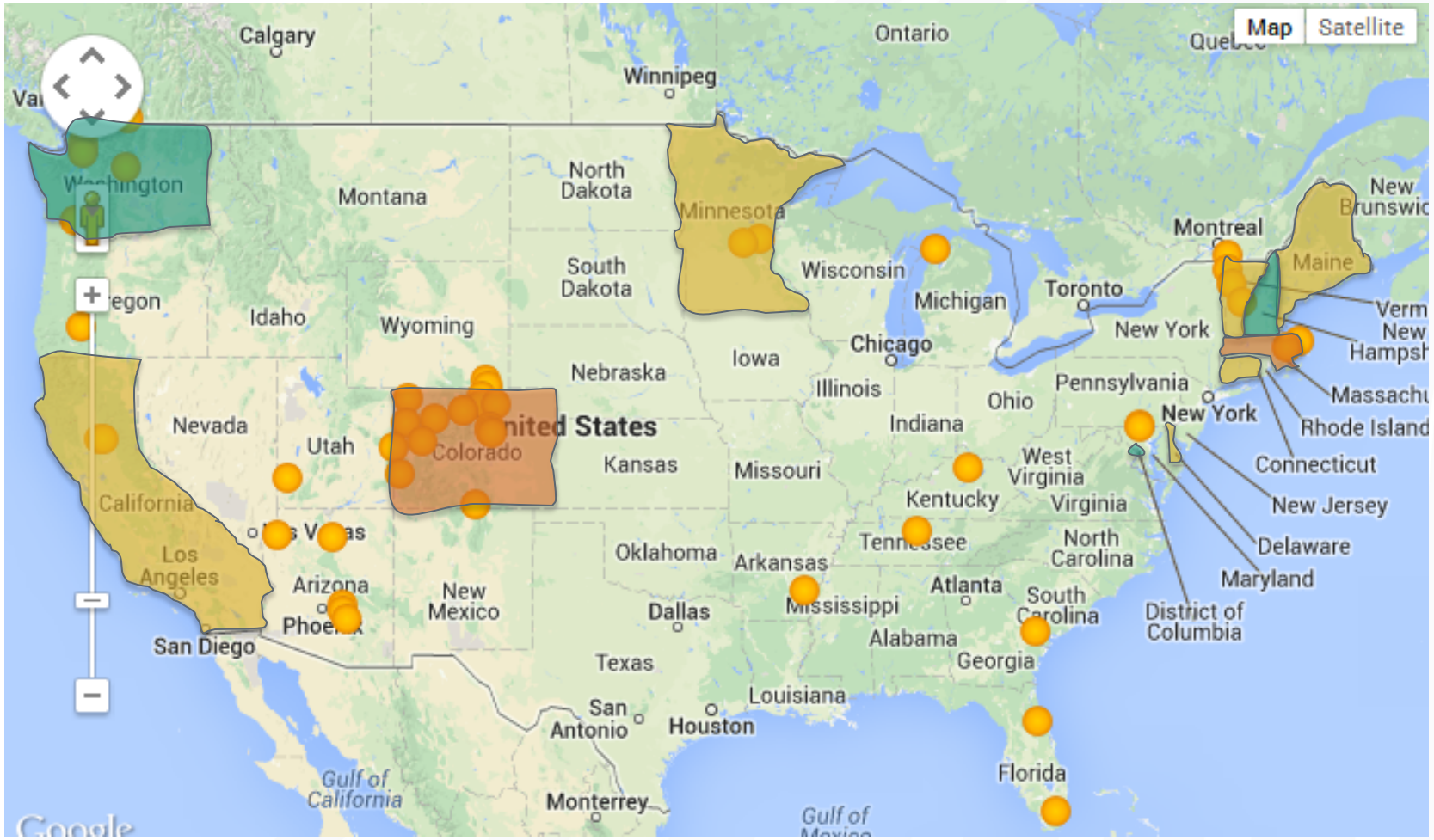
- Additional market research is needed
- Data on project success

Identified Challenges and Barriers



- *Sen. Mark Udall (D-CO) just reintroduced the Solar Uniting Neighborhoods (SUN) Act which would fix this barrier.

Where is shared solar happening?



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U.S. Department of Energy

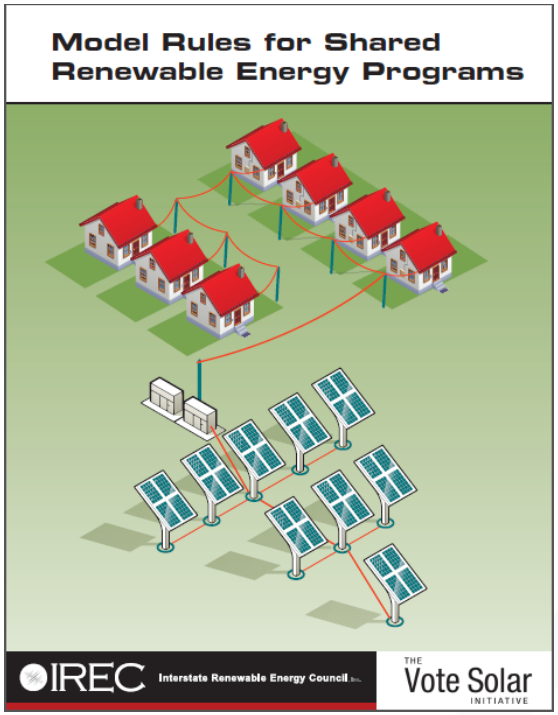
State Policies and Incentives Supporting Shared Solar

Program	Description	States
Group net metering or VNM	Enables the allocation of benefits from an electricity-generating source that is not directly connected to a customer's meter	California,[a] Connecticut,[b] Massachusetts, Maine, New Hampshire, Vermont
Statewide shared energy program	Establishes a comprehensive shared renewable energy program in the state (including VNM or value-of-solar provisions)	California,[c] Colorado, Delaware, District of Columbia,[c] Massachusetts, Minnesota
Incentives	Provides additional financial incentives for shared renewable energy programs	Washington

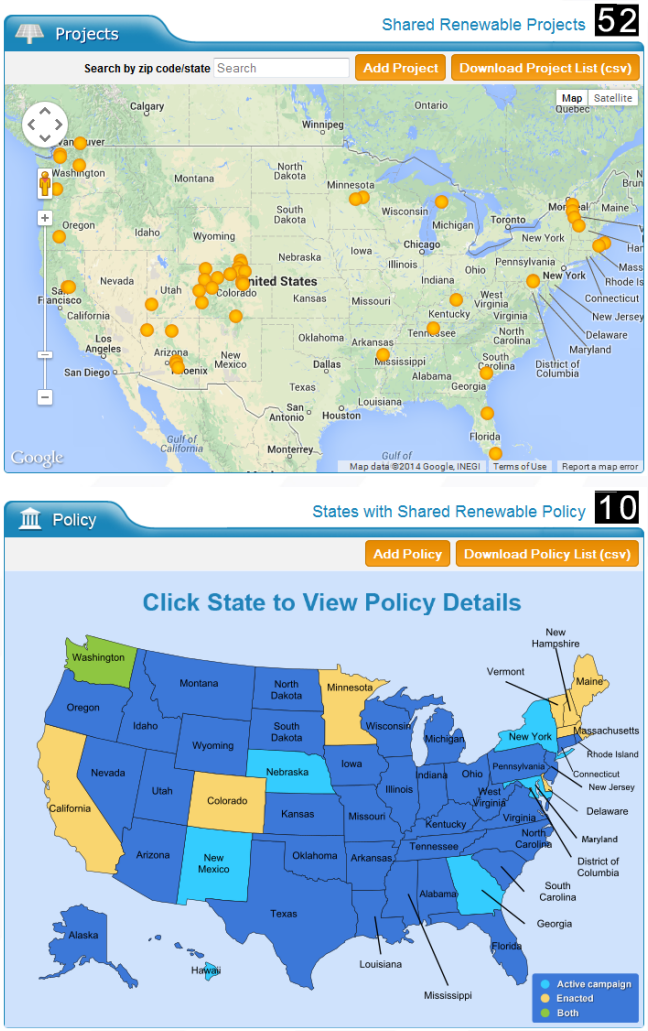
[a] Restricted to residential and commercial multi-tenant properties.
[b] Restricted to state, municipal, and agricultural customers as well as critical facilities.
[c] Specific rules are still being considered by the state regulatory commissions.

Disclaimer: General overview table may not be comprehensive and does not account for all program nuances

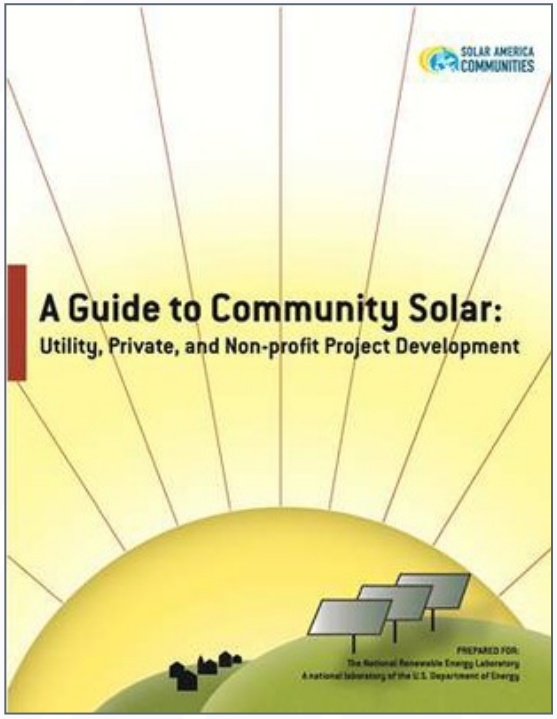
Selected Resources



Interstate Renewable Energy Council & The Vote Solar Initiative
www.irecusa.org



Shared Renewables HQ
www.sharedrenewables.org



SunShot Initiative Solar Energy Resource Center
www4.eere.energy.gov/solar/sunshot/resource_center/

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Slashing Red Tape and Driving Local Innovation

ROOFTOP SOLAR CHALLENGE

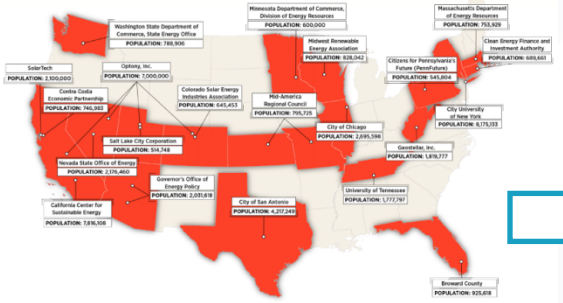
THE PROBLEM: **Inconsistent process and practices** across 18,000+ jurisdictions, 5,000+ utilities, and 50 states **slow down and raise the price** of going solar.

THE SOLUTION: **Empower teams** of local, state, and regional innovators **to make faster, easier and cheaper** to deploy solar power in communities across the country, **measure and track their progress**, and **spread winning ideas** across **regions and the country** for greater harmonization and unification of practices.

TIMELINE: ***Round 1***: Twenty-two one-year awards made in February 2012
Round 2: Eight two-and-a-half-year awards made in September 2013

THE AWARDEES:

ROUND 1
(2012-2013)

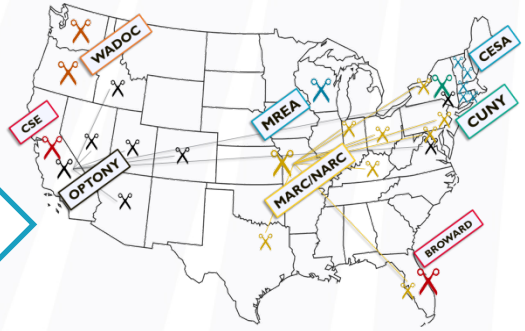


22 Awards
~50M Americans
19 States + Puerto Rico
$12M

Performance-based
Local-level innovation
Teams quantitatively tracked and scored via market maturity scorecard

Year-end results:
Fees reduced
Online permitting spreading
Statewide standards emerging
Innovative digital solutions unveiled

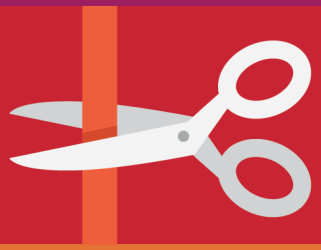
ROUND 2
(2013-2016)



8 Awards
~165M Americans
27 States + DC
$12M

22
Rooftop Solar Challenge Teams

Cut red tape by
1 week

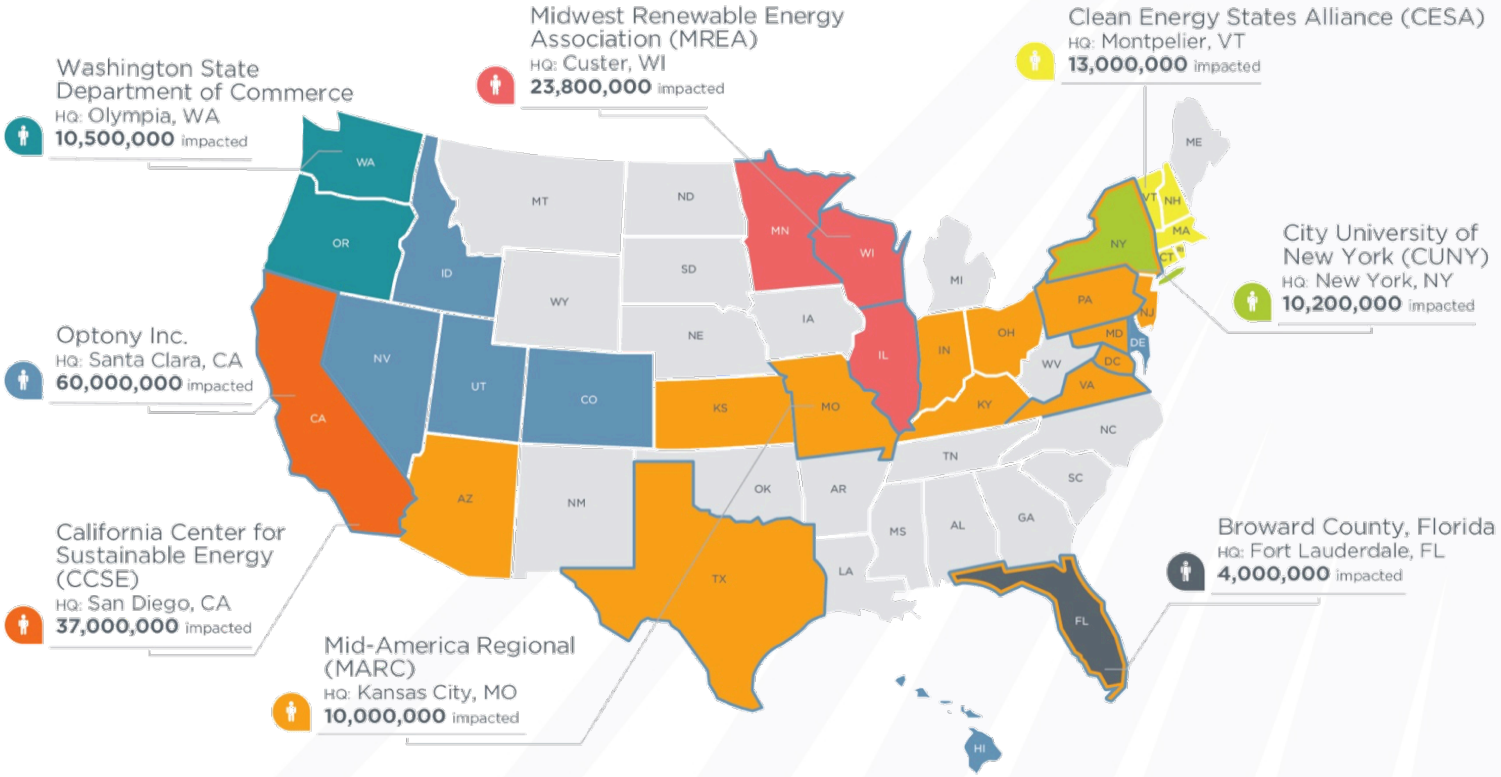


600 MW
Installed

40,000
Installations

40,000 Weeks of red tape = **768** Years of red tape = **10** Lifetimes

Rooftop Solar Challenge II Highlights



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Timely Resources and Expert Assistance for Communities

SOLAR OUTREACH PARTNERSHIP

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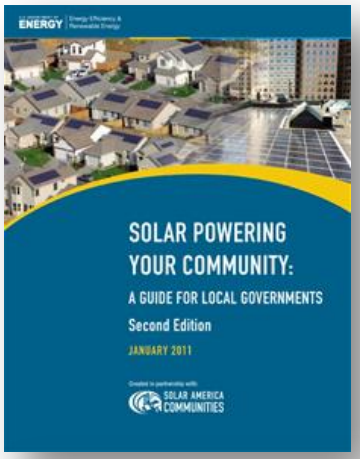
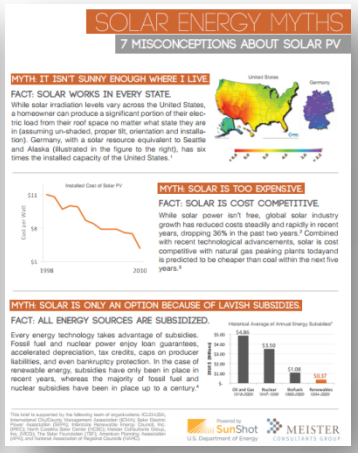
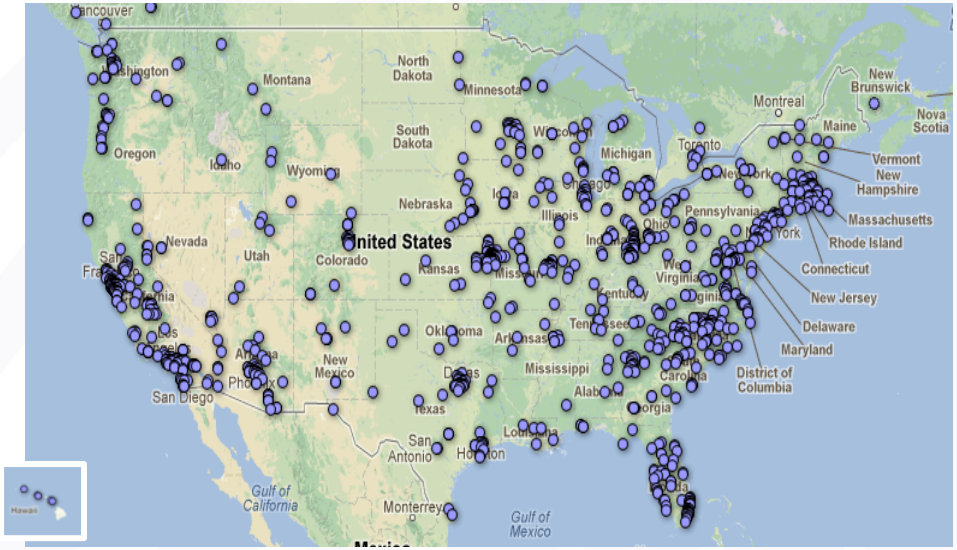
www.solaroutreach.org





ASK THE EXPERT: SOLAR ACCESS

Ask the Expert Video Podcast Series presented by the SunShot Solar Outreach Partnership.



SolarOPs has reached over 4,000 individuals, in all 50 states, representing more than 1,200 local governments through partnership workshops, e-learning activities, and technical assistance

SunShot U.S. Department of Energy

Helping Communities Lower Costs and Go Solar

SOLAR OUTREACH PARTNERSHIP

THE PROBLEM: Many of the nation's **18,000 jurisdictions** want to become more solar-friendly, but **don't know where to start** or **don't have the time** to jumpstart a solar initiative.

THE SOLUTION: By using existing tools and responding to market needs by generating crucial resources, awardees **provide targeted assistance and actionable insights to communities** looking make solar energy a local priority.

TIMELINE: SunShot made **3-year awards in August 2011**

THE AWARDEES:

ICLEI – Local Governments for Sustainability USA

ICLEI – Local Governments for Sustainability USA is the leading membership association of local governments committed to climate action, clean energy, and sustainability. ICLEI provides cutting-edge tools, national standards and protocols, trainings, and technical guidance to help local governments meet their goals. ICLEI is partnering with the Interstate Renewable Energy Council (IREC), the North Carolina Solar Center at North Carolina State University, the Solar Electric Power Association (SEPA), Meister Consultants Group, and The Solar Foundation to advance SunShot Initiative goals.

International City / County Management Association (ICMA)

Develops and advances professional local government management to create sustainable communities that improve lives worldwide. ICMA provides member support, publications, data, information, technical assistance, and training and professional development to thousands of city, town, and county managers and other local government professionals. ICMA is partnering with the American Planning Association (APA) and the National Association of Regional Councils (NARC) to advance SunShot Initiative goals.

SunShot U.S. Department of Energy

Solar Market Pathways - $14.6M, 2015-2018

Pathways awardees are developing strategies and tools to increase solar deployment, including: incorporating solar into emergency planning; leveraging collective purchasing power; expanding virtual net metering and commercial property assessed clean energy financing; developing business models for community solar; and assessing solar grid impacts and interconnection processes.

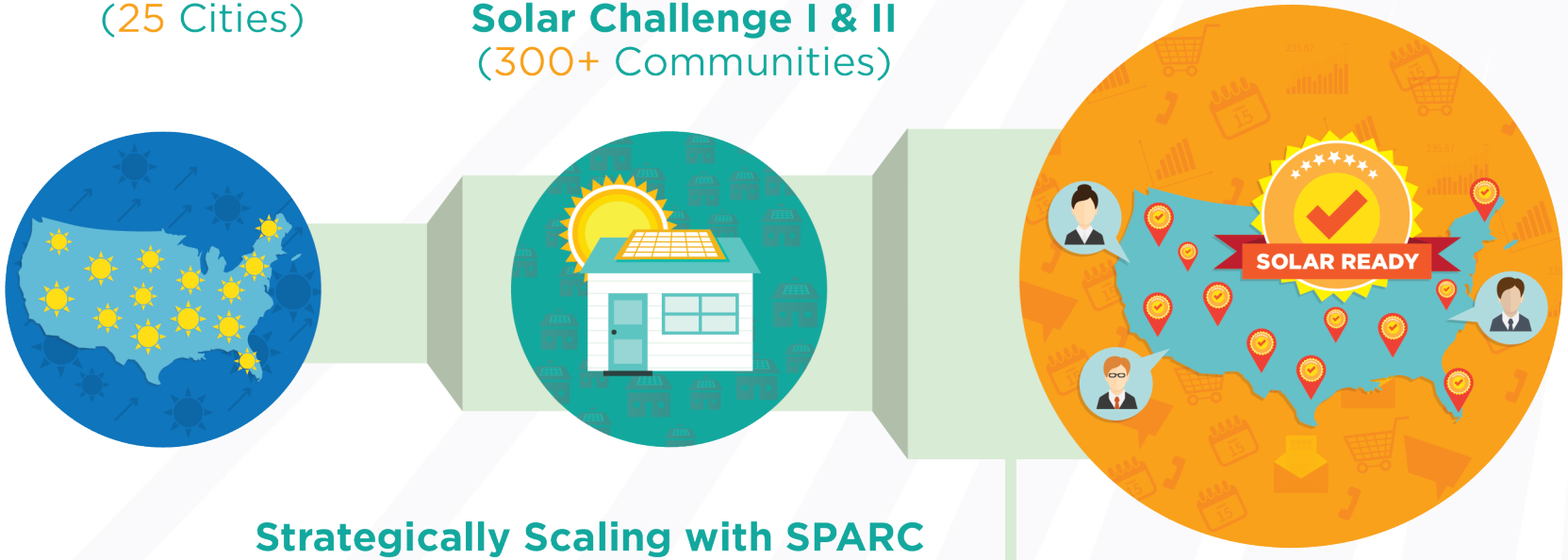
SPARC Solar Powering America by Recognizing Communities

18,000 jurisdictions,
3,000 utilities,
50 states,
with different rules and regulations.

Solar America Cities
(25 Cities)

Rooftop Solar Challenge I & II
(300+ Communities)

SPARC



Strategically Scaling with SPARC

- Solar Market Roadmaps for the self-driven
- Building a peer network of solar market leaders
- Targeted TA to boost market potential

1,000s of Communities Ready & Recognized

SunShot U.S. Department of Energy

SPARC Program Design

$13M 3 YEARS 2 TOPICS

TOPIC A
DESIGNATION PROGRAM ADMINISTRATOR
(one award @ $3M)

- Convene and Establish the Criteria Advisory Committee
- Establish and Administer the Designation
- Track metrics of participating communities, recruit additional communities to the program
- Ensure program sustainability

TOPIC B
TECHNICAL ASSISTANCE PROVIDER
(one award @ $10M)

- Provide TA on an on-demand basis, receive TA references from the DPA, and proactively seek communities
- Organize peer-to-peer networking and learning
- Produce resources (reports, webinars, case studies, trainings, etc.)

CRITERIA ADVISORY COMMITTEE

Self-governing body of experts and other solar market stakeholders to **develop and maintain criteria** for a designation on an ongoing basis. DOE will serve as ex officio heads and will provide official validation of the criteria.

Designations Work, and Government Leads

Individuals	Products	Properties	Companies	Communities

SPARC Key Objectives

Impactful through Leveraging

Aid communities in expanding solar market and lower costs, not just provide recognition.

Accessible and Expandable

Must be attainable by market leaders and new entrants alike and consideration will be given to providing designation to stakeholders beyond communities.

Compelling and Straightforward

A federal stamp of approval, an offering of access to an exclusive peer network, TA, and resources, and the competitive nature of communities will compel participation. Requirements and benefits must be clear to participating communities, citizens, and the solar industry.

Robust, Reliable

Must be validated by a distinguished body of solar experts and program evaluation/design specialists and will be updated on an ongoing basis to retain market relevance; participants and administrators will also be independently audited to ensure program integrity.

Enduring

Must establish a self-sustaining identity in order to provide consistency and reliability to program participants and to continue to incentivize market expansion.

PERFORMANCE METRICS

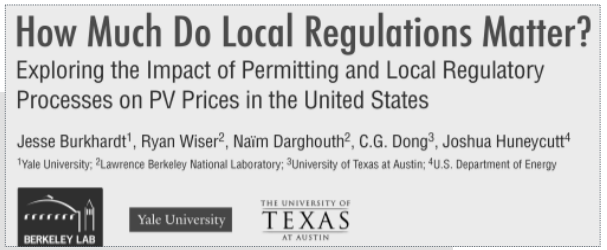
- # communities participating and population impact
- Local metrics tracked and improvements demo'd
- Designation maintains high standards and awareness
- New resources, case studies, and events produced
- Transitions to sustainability

IMPACT METRICS

- More installers doing business in more locations
- Uniform and streamlined local practices
- Lower costs in communities
- Solar more accessible to range of consumers and communities

PROGRAM EVALUATION

- Rigorous tracking of program metrics
- Teaming with academic partners
  - Randomized encouragement design (UC-Berkeley)
  - Follow-up econometric analysis of impact (LBNL/Yale/UT-Austin/SunShot)



SunShot Prize Race to 7-Day Solar

Going Solar: An Arduous Experience

The value of delays is $4 million/day for 2015 PV deployment levels

Pre-Contract

1st Hurdle

Permitting

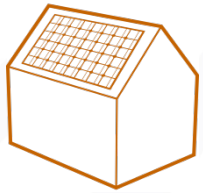
Installation

Inspection

Interconnection

2nd Hurdle

Post-Integration



Total Time

Best Practice Highlights

1-day permit in Chicago

½ -day installation by Vivint Solar

1-day consolidated inspection in Broward county, Florida

10-day Interconnection National Grid San Diego G&E

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SUNSHOT PRIZE: **RACE TO 7-DAY SOLAR**

$10 MILLION PRIZE COMPETITION

Inefficient processes and uncoordinated administration obstacles make going solar in the U.S. long and arduous

Customers could wait

180 days

or longer to obtain a solar installation

The process to go solar can be made faster, easier, and more affordable for Americans nationwide

It is possible for customers to obtain solar in just

7 days

SunShot Prize: *Race to 7-Day Solar* *$10m (2015-17)*

THE GOAL	Using the America COMPETES prize authority to inspire innovative elimination of time delays and process uncertainty in deploying PV. The goal is to reduce permit-to-plug-in times towards seven days for PV systems ≤100kW (small system contest) or seven weeks for PV systems ≤1 MW (large system contest) for cash prizes totaling $10 million.
THE CHALLENGE	Contestants can compete in two contests and need to demonstrate innovative solutions at scale by installing a number of PV systems time efficiently during a set 18-month period that aggregates to minimum 10 MW (small system contest) or 15 MW (large system contest). Contestants will be evaluated based on their performance using quantitative scores. Contestants with best scores will be eligible for grant cash prizes.
THE PRIZE	The program runs two contests for 18 months and award two cash grand prizes in each contest by the end based on performance. In each contest, the first place grand prize is $3 million and the second place grand prize is $1 million. Another set of cash prizes totaling $2 million will split among up to 20 entrants who seek in-progress prize rewards while taking steps towards achieving the goals of the small or large system contests throughout this 18-month period
THE PROCESS	• DOE provides seed funding (up to $100k) to up to 20 teams to compete. Funding is given as cash prizes in three tranches ($25k, $25k, $50k) based on progress in the first 8 months. • Teams deploy and accumulate points during a set18 month period based on quantitative metrics (repeatability, time performance, replicability (i.e. geographic diversity of installation) • Teams with highest total points above a minimum threshold win grand prizes after verification at the end of 18-month period.
THE ELIGIBILITY	Any U.S. legal entity can compete provided that one of its team members are actively involved in PV system deployments (e.g. permitting, installation, interconnection). Local governments, utilities, solar developers, companies, and non-profit organizations are all eligible to compete.
THE TIMELINE	Start date: 03/04/15 ● Letter of intent due: date: 04/02/15 (optional) ● Initial registration due date: 05/24/15 (optional) Entrance application due date: 07/22/15 ● Performance period: 09/15 – 03/17 ● Winner announcements: 06/2017
CONTACTS	Email: sunshot.prize@ee.doe.gov Web: go.usa.gov/3rqkR

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Solar Energy Evolution and Diffusion Studies (SEEDS)
Solar Technology Diffusion Research (2013-2016)

Under the SEEDS program, DOE supports projects that advance and apply cutting-edge **strategies for accelerating solar adoption**.

Four teams are creating the next generation of social and behavioral science for solar energy's spread.

	Yale	NREL	Sandia National Laboratories	The University of Texas at Austin
Foundational Scientific Advances	tracing **social networks** that spread solar	evolution of **motivations** beyond early adopters	**agent-based modeling** of innovation diffusion	**micro-level data** and analysis of energy consumers
Real-world Market Applications	spreading **community solar** through CT	four **pilot experiments** in CA, AZ, NY & NJ	testing economic + **social incentives** in San Diego	new **incentive structures** piloted with TX utilities
Research and **Market** Partners	Yale, NYU, SmartPower, **CT Clean Energy Finance and Investment Authority**	Portland State U, U of A, LBNL, CU-Boulder, MichState , UMich, Social and Environmental Research Inst., **Clean Power Finance**	UPenn-Wharton, Vanderbilt, NREL , **California Center for Sustainable Energy**	**Austin Energy, Frontier Associates**

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SEEDS Solar Technology Evolution Research (2013-2016)

Under the SEEDS program, DOE supports three new projects that advance cutting-edge strategies for **tracking and predicting solar innovation**.

Text Analytics of Solar Literature

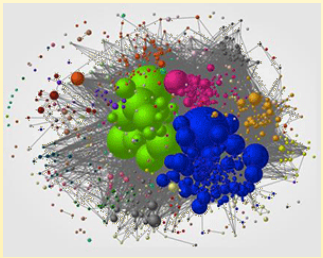
SRI International

Helios

- Advancing natural language processing techniques
- "Reading" in decade's worth of solar literature
- Uncovering hidden tech bottlenecks & breakthroughs
- Pointing a path forward for specific solar techs

Better Tech Forecasts

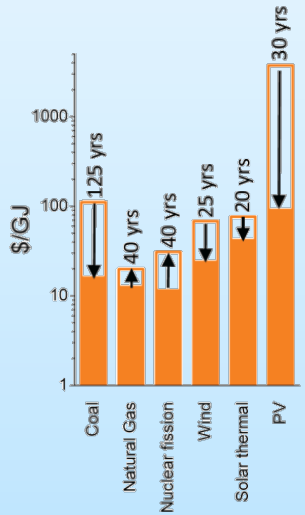
ASU · UNC Charlotte · University of Oxford



- Applying network science into tech ecosystems
- Connecting innovation databases (USPTO, NAICS, NETS)
- Using finance theory for R&D investment portfolios

Why is PV Different?

MIT



- Developing a single mathematical framework that captures different theories of tech evolution

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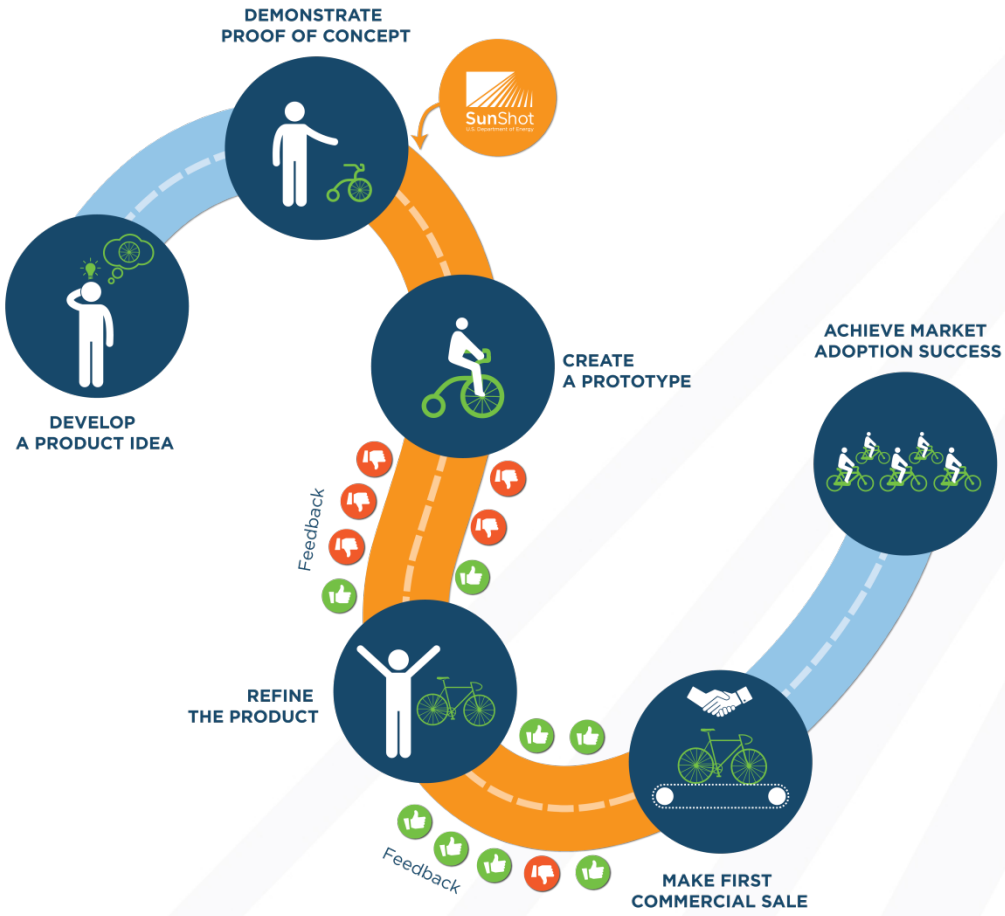
Solar Bankability Data to Advance Transactions and Accessibility (DATA) FOA

~$5m (2015-17)

THE GOAL	Support the industry in creating a rick data marketplace and economy by convening strategic stakeholders, defining data standards, protocols, and codes of conduct and help transform records into cloud-ready data marketplaces
REQUEST FOR INFORMATION	April 10, 2015 is the due date for Request for Information responses. RFI online at http://go.usa.gov/3jEtA
FOA STATUS	In development, and expected to be released by end of April 2015
CONTACTS	Email: solardata@ee.doe.gov

SunShot Incubator



- Provides early-stage assistance to help startup companies cross technological barriers to commercialization while encouraging private sector investment.
- 61 startup companies have received a total of 74 awards to participate in the SunShot Incubator program since it began in 2007.
- Most projects are cooperative agreements that last from twelve to eighteen months with payment made upon completion and verification of aggressive project deliverables.

SunShot Incubator Soft Costs Portfolio

VillagePower
Your Community. Your Solar.

Clean Power Research

sighten

energysage

Clean Energy COLLECTIVE

kWh analytics

aurora
smart solar power

SUNVESTMENT group

GENABILITY

QADO energy

FOLSOM LABS

Sungage Financial
Your solar, your savings.

DEMETER POWER GROUP

solarnexus
Accelerating Your Solar Business

MOSAIC

SUNRUN

SunShot
U.S. Department of Energy

Ideation Contest

Top 5 • $1,000 per winner

Business Innovation Contest

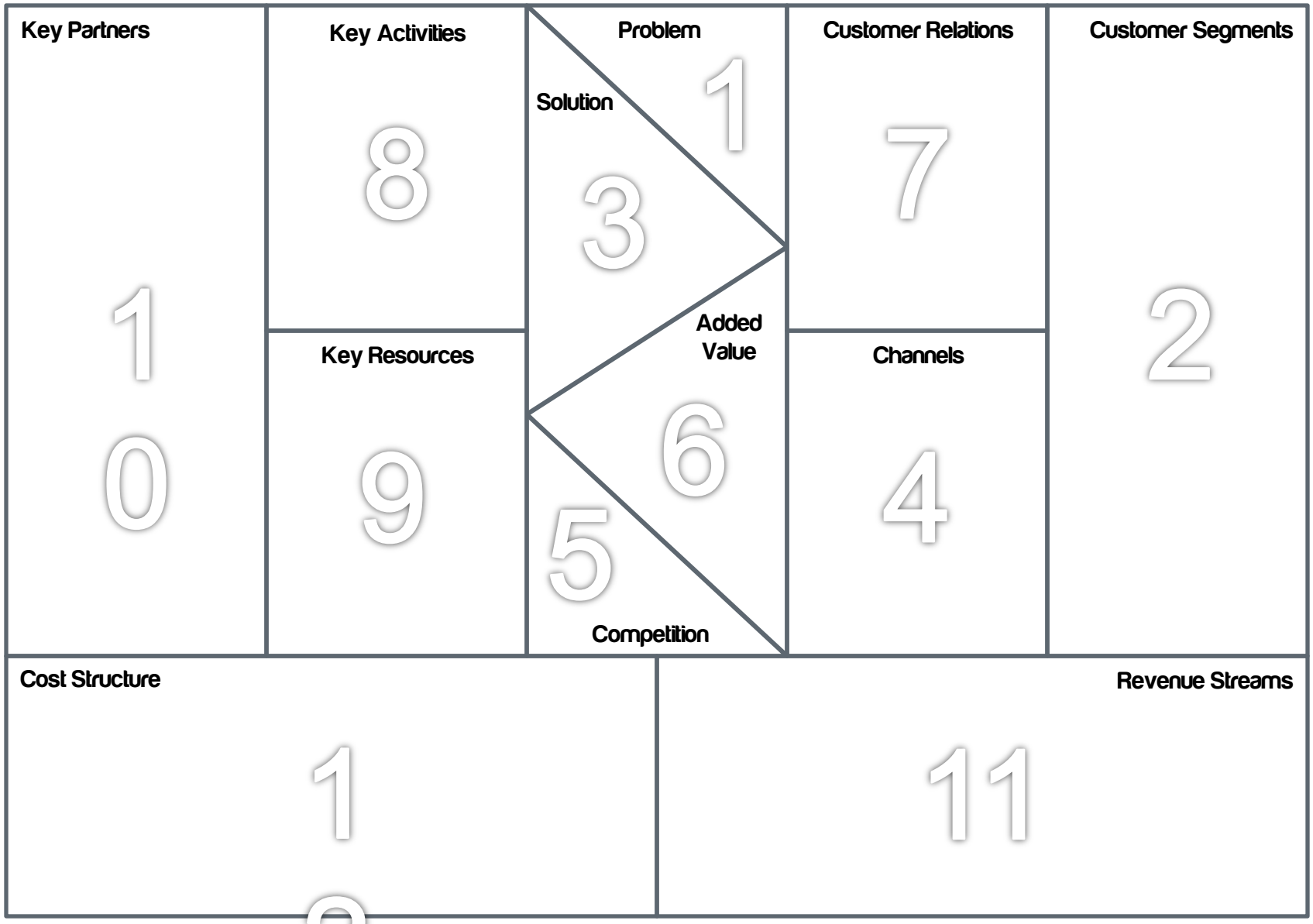
Top 20 • $25,000 per winner

Prototyping

20 Finalist

Incubation Contest

Top 5 • $100,000 per winner



The How

- **MVP Readiness**: How confident are you that your topcoder requirements will produce a product that you are satisfied with?
- **Business goals**: What are the key customer value assumptions that your MVP will allow you to test? What are the metrics that will help you validate your assumptions?
- **Pitch Readiness**: Think of 3 measures of customer feedback that would be impactful to share with the judges on demo day?
- **Team Readiness:** Who are your team members and what is their percent time dedicated? Are there roles and expectations? Is there a schedule with deliverables?
- **Customer Feedback:** Do you have existing customer feedback?
  - If Yes: What features of your product do they desire most?
  - If No: What is your strategy for engaging customers? What can you do now to get feedback on your value hypothesis?
- **Private Investment**: Have you spoken with investors?
- **Mentors & Partners:** Are you seeking external feedback from mentors and advisors on your value hypothesis or growth strategy? Have you established any beneficial partnerships or relationships that could lead to such partnerships?

SunShot Catalyst Prize

~$3m (2014-16)

THE GOAL	Using the America COMPETES prize authority to inspire the public to rapidly create and develop software products and solutions that address near-term problems in the U. S. solar marketplace. Each cycle of the Catalyst program consists of four contest (Ideation, Business innovation, Prototyping, Incubation) with value awarded to all winning contestants totaling $1 million which includes $0.5 million in cash prizes.
THE PROCESS	*Step 1. Ideation:* Post solar problems online. Up to 5 submissions may receive $1k per based on Step 4 results. *Step 2. Business Innovation:* Propose a business solution to any problem online. Top selected 20 teams advance to Step 3. *Step 3. Prototyping:* A selected team receive $25k in services from Topcoder to build a software minimum viable product (MVP) in 60-days while receiving mentoring from DOE and NREL in preparation for Step 4. *Step 4. Incubation:* Demo your MVP in front of a panel. Top 5 teams receive $30k per and another $70k based on 6-month performance.
THE ELIGIBILITY	U.S. legal entities only
THE TIMELINE	Ideation is open year round with a number of 45-day open public voting campaigns every 6 months. Business innovation is open for 60-days ● Prototyping is a 90-day contest ● Incubation is a 6 month contest. Catalyst I
1ST COHORT CATALYST 1	130 Problem statements online in the Ideation contest 37 Business Innovation submissions addressing customer acquisition, financing, asset management, grid operations, and supply chain. 17 teams advanced to the Prototyping (in progress). See full list online at catalyst.energy.gov
CONTACTS	Email: sunshot.catalyst@ee.doe.gov Web: catalyst.energy.gov

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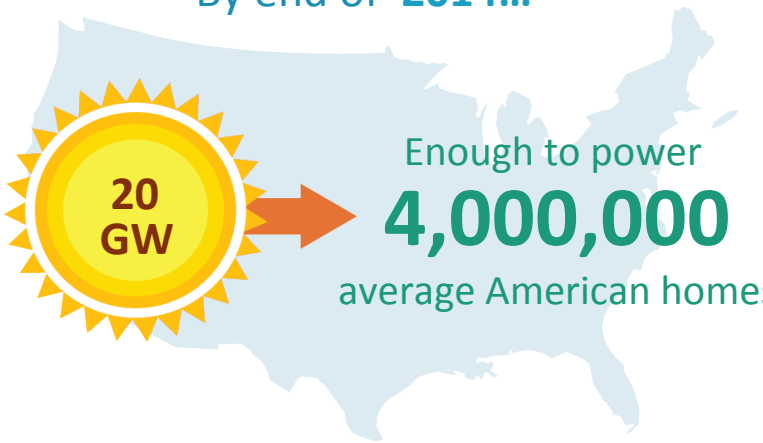
SunShot Workforce and Training

INCREASING CAPACITY, LOWERING COSTS

By end of **2014…**



CREATING JOBS, ECONOMIC GROWTH

Nearly **174,000** workers

22% in 2014

10%

17,000 Veterans

86,122 workers
STEEL MANUFACTURING

142,177 workers
AUTOMOBILE & LIGHT TRUCK MANUFACTURING

53,459 workers
OILSEED & GRAIN FARMING

SOLAR READY VETS TRAINING PILOT PROGRAM

- **3 military bases --** Camp Pendleton, CA; Fort Carson, CO; Naval Station Norfolk, VA. ***Expanding to 10 total.***
- Intensive 4-6 week PV installation training course; guaranteed job interviews with at least 5 solar companies
- First class graduated Feb. 13

BUILDING A SKILLED SOLAR WORKFORCE

- DOE's **Solar Instructor Training Network** is supporting professional development of solar PV & solar heating and cooling technologies trainers and instructors in **49 states based at more than 400 community colleges**.
- Since 2011, **~30,000** students received solar instruction from SITN campuses, on the way to 75,000 trained PV professionals by 2020.

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GEARED regional centers for technology engagement

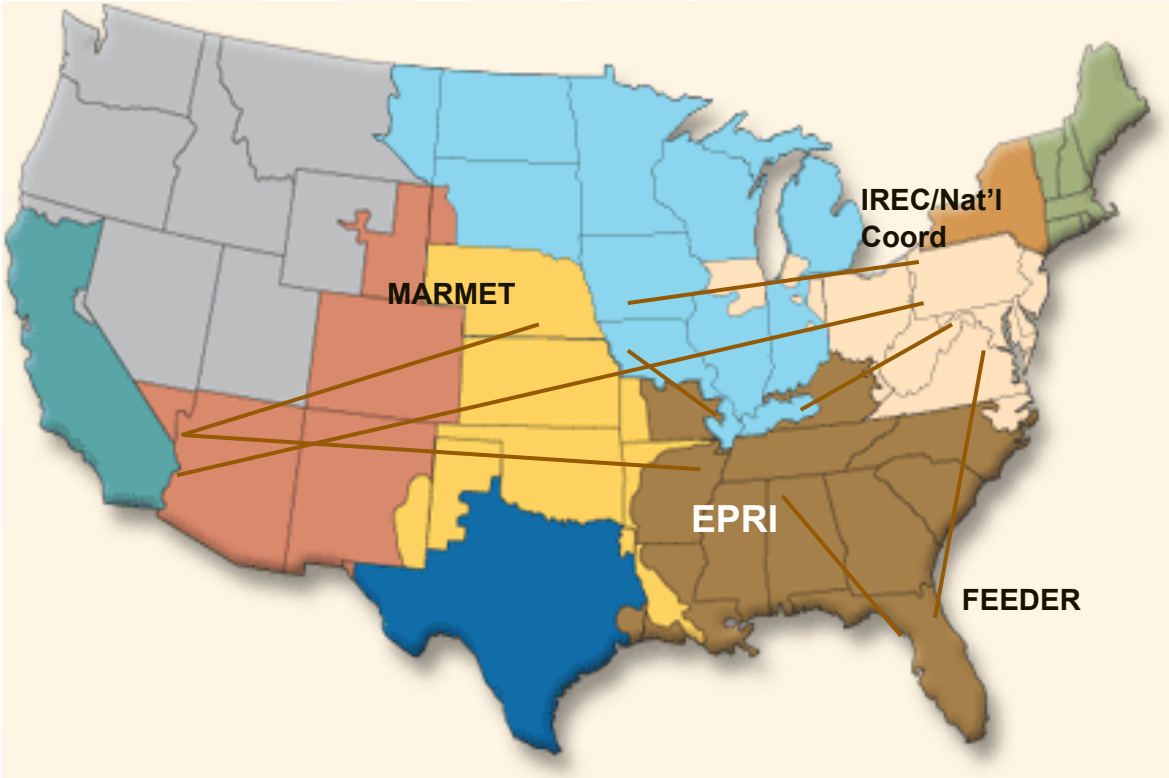
- Each Consortia brings together: **utilities**, **grid operators, university faculty, manufacturers and analysts**
- Consortia focuses students on **Distributed power** and cyber-physical systems analysis
- Consortia offer **training** programs: **internships** & coops, continuing education, **research exchange**, **executive training**, support for IP development

SunShot:

- **5 year program**
- **National Coordination**

GEARED

42 Universities 18 Utilities **~3,600 Students**
4 National Labs 12 Solar Companies



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SUNRISE FOA: Solar Utility Network Deployment Acceleration (SUNDA) *~$3.6m (2013-17)*

THE GOAL	Accelerate PV maturity at electric co-ops through standardized designs, streamlined financing, packaged insurance, and extensive training and outreach. The Project's standardized designs and suite of tools will culminate in a National Purchasing Hub for Utility-Owned Solar PV.
THE TEAM	National Rural Electric Cooperative Association (lead) Power Secure (Design and engineering) National Rural Utilities Cooperative Finance Corporation (Finance) Federated Rural Electric Insurance Exchange (Insurance) Team of 15 co-ops in 17 states (3 G&T and 12 distribution cooperative) with 7.5 million customers.
THE PROJECT	• Block designs for 0.25MW, 0.5MW and 1MW. • 23.75 MW utility deployment with 15 co-ops in17 states covering more than 150 counties in three phases with phase evaluation and improvement .Aggressive 3-phase cost reductions targets ($1.6/w) • Group purchasing aggregation. • Specialized expertise in engineering, finance, insurance, deployment, and O&M. • Extensive training, high potentials for replicating progress in rural cooperatives.
THE PROGRESS	Block designs for 1MW, 0.5MW and 0.25MW completed, tested and adapted. ~ 3 MW deployed or underway in phase 1(MN, NJ, TX) ~ 10 MW in active planning for phase 2 (CA, NC, WI, NC, VT) ~ 10 MW in initial planning for phase 3 (KY, CO, GA, AR, NY) National Discount Program with solar panel manufactures, inverter and racking companies (Sunvia, REC Americas, Advanced Energy, and Game Change Extensive training and outreach to ~900 co-ops
DETAILS	http://www.nreca.coop/what-we-do/bts/renewable-distributed-energy/sunda-project/

NREL: Advanced Financing Mechanisms

Goals

- Expand availability of capital
- Lower cost of capital
- Reduce transaction cost, time to access capital

DOE Awarded Actions

Solar Access to Public Capital (SAPC):

- Standard Documents
- Mock Ratings Filing
- Actuarial Database of Plant Performance

Open Solar Performance and Reliability Clearinghouse (oSPARC database)

Analysis of opportunities and barriers

Facilitate capital market investment and retail (community) bank lending

SunShot U.S. Department of Energy

Unlocking Capital for EE&RE deployment:

- Expand access to capital
- Increase market transparency
- Engage and educate potential technology adopters
- Improve consumer protection
- Reduce risk through data aggregation
- Create market for Insurance and Warranty products to lower costs
- Speed market relevant product development by providing feedback on performance

Breaking down barriers in the mid-scale market

PROBLEM: The mid-Scale market consist of multiple sector and building specific market barriers that make it challenging for one-size fits all solutions.

SOLUTION: Target sector and sector specific barriers; provide technical assistance and resources to leverage across the broader market.

OUTCOME: A portfolio of resources to address interwoven challenges for mid-scale market stakeholders leading to decreased costs and increased utilization of PV as an energy resource.

- state
- Healthcare
- Retail
- Food Service
- Grocery
- Education
- Government
- Mixed-Use

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Opportunities Beyond the Residential Rooftop

Community Solar

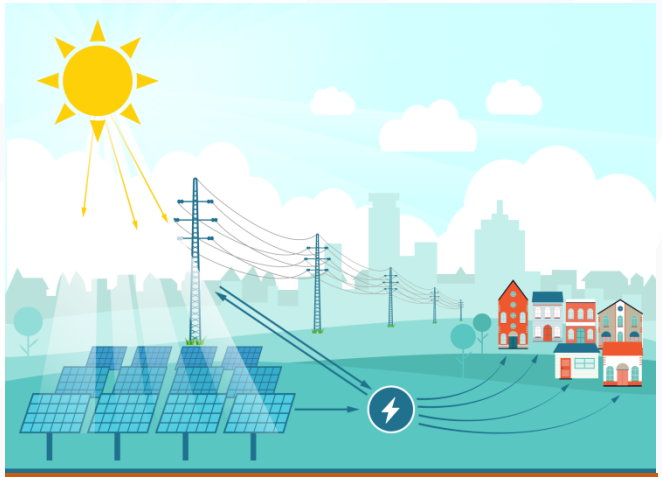
Community members work together to enable solar in their community

Group Purchasing

Financial (Invest or Donate)

Shared Solar

Participants own or lease panels, buy kWh blocks of generation, or own an interest in a shared system



Offsite

Onsite (Multi-Unit Buildings)

Thank you!

SunShot
U.S. Department of Energy

- Centralized portal for all community solar projects
- Project tools for EPCs, utilities, and individuals
- Now anyone can create a community solar project

Powered by Clean Energy COLLECTIVE

Community Sourced Funding

- Transparency and standardization in the mid-market project finance process
- Broadening the investor base by making project ownership easily accessible to community inspired investors
- Streamlined and efficient due diligence process to reduce the cost of capital

SUNVESTMENT group

- What We Offer:
  - -- Local solar crowdfunding platform for community organizations
  - -- Accesses lower cost of capital
  - -- Platform integrates whole project lifecyle
  - -- Automated services for development, contracting, asset management
  - -- Freemium model drives network value

- Who We Serve:
  - *** Solar Customers:** Churches, schools, clubs, universities, businesses and municipalities
  - *** Investors:** Community members first; co-investment from crowdfunders & institutional investors
  - *** Secret Weapon:** Empowered community champions, independent energy consultants, municipal leaders, "community solar" developers

  - www.villagepowerfinance.com

Browse Projects

My Projects

All Projects (74)

- Seeking Funding (1)

- Funded (2)

- In Development (70)

Browse Projects

70 In Development

In Development

Projects in local development, coming soon.

San Francisco, CA

Goal: $0

Size: 0 kW

KEEP ME POSTED

Emeryville, CA

Goal: $351,789

Size: 98 kW

KEEP ME POSTED

Oakland, CA

Goal: $0

Size: 49 kW

KEEP ME POSTED

VillagePower BETA

Your Community. Your Solar.

Call Us Today
(855) 786-4376

First Baptist Church

Location: Selma, CA **Size:** 60 kW **Goal:** $229,254

Primary Champion
David Odishoo
Manteca, CA

Invite Friends | Contact Champions | Follow Project

Progress

Be first to pledge in this project!

Pledge to Invest

Returns
(Tax Equity Investors)

IRR: 14.6%
ROI: 84.5%

Payback time: 3 years

Return on $10,000 invested: $8,450

Returns
(Non Tax Equity Investors)

IRR: 4.4%
ROI: 54.2%

Payback time: 13 years

Return on $10,000 invested: $5,420

Overview | Gallery | Downloads | Bulletin | Champions | Financials | Investors | Invitations

Edit This Section

Explosive solar growth is driving tremendous market opportunity

Utility

190x

2008-14 (CAGR 140%)

Commercial

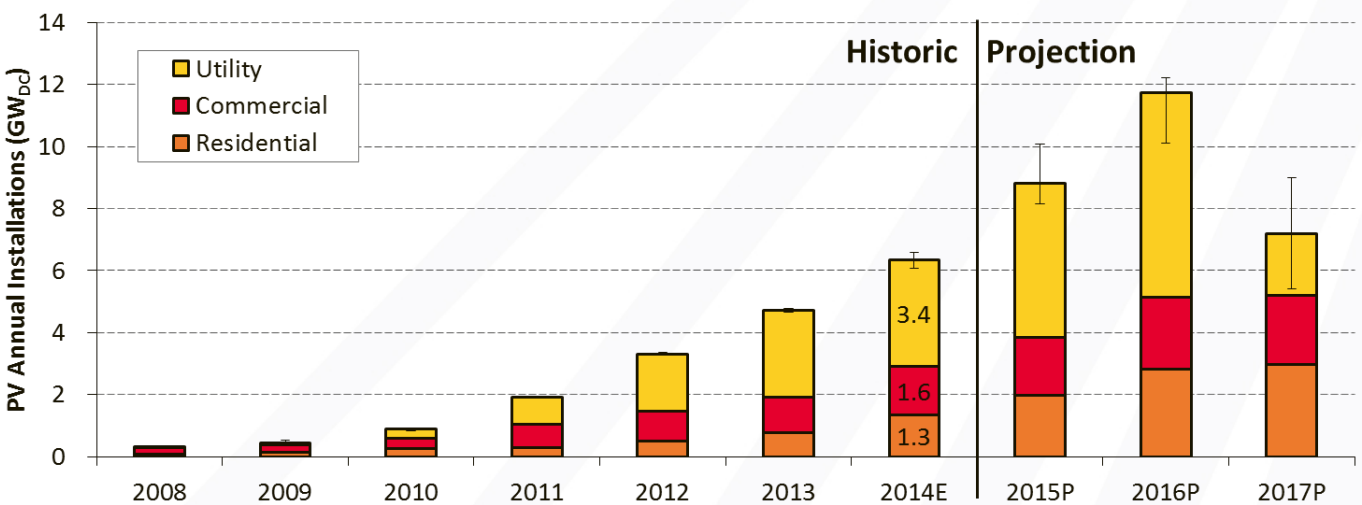
8x

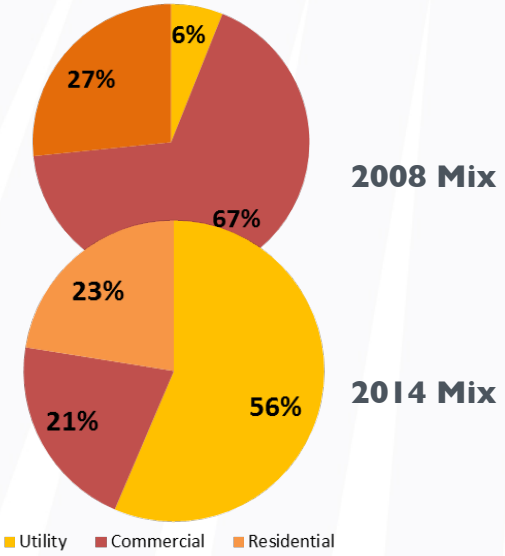
2008-14 (CAGR 41%)

Residential

17x

2008-14 (CAGR 60%)



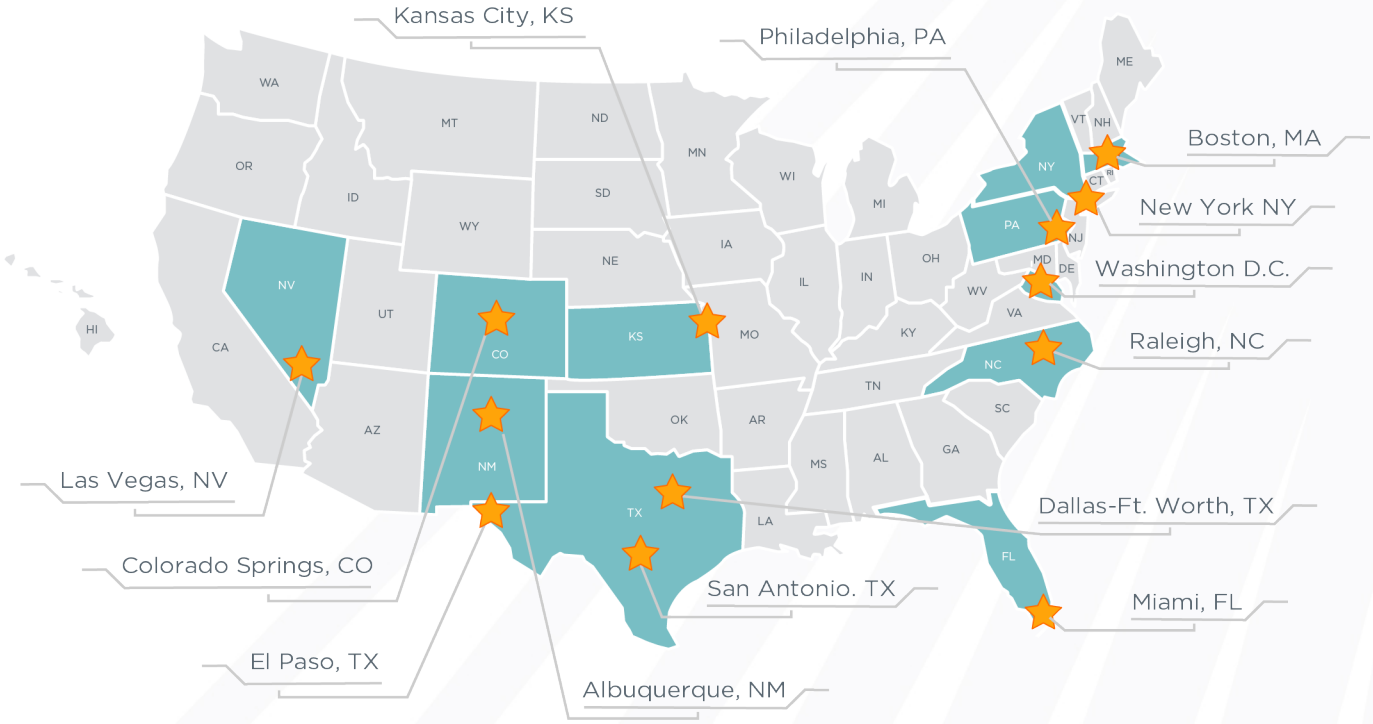


Note: E=estimate; P = projection. **The graphic in this slide uses a smaller dataset than what is used in previous slides (due to the limited amount of analysts which divide market sectors), therefore the median values are different.**

Sources: data displayed represents the median figures from the following sources: BNEF (11/04/14), Goldman Sachs (01/06/15), GTM/SEIA SMI (Q3 '14).

Americans are Choosing Solar Energy

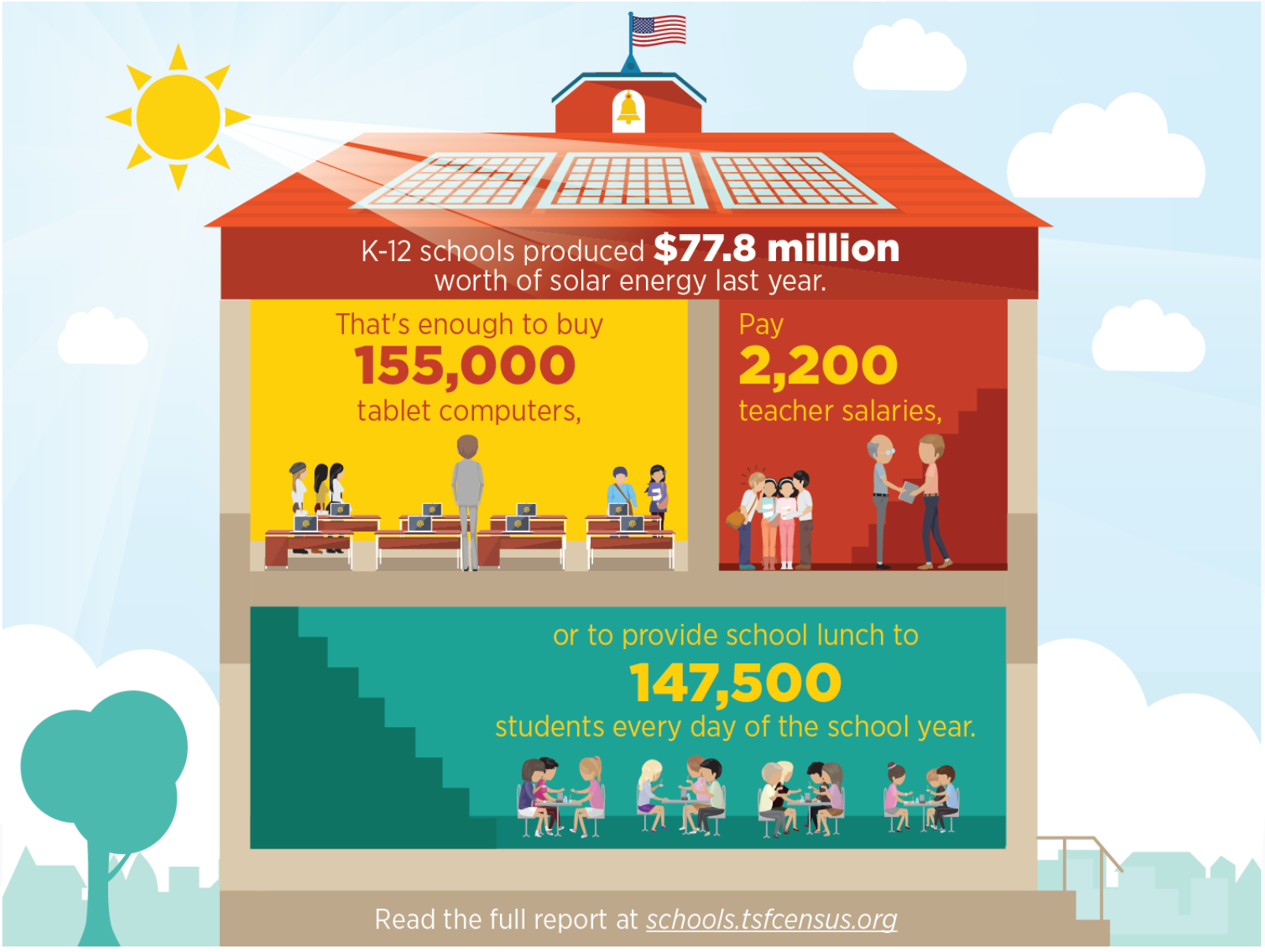
Most Affordable Solar Cities for Homeowners



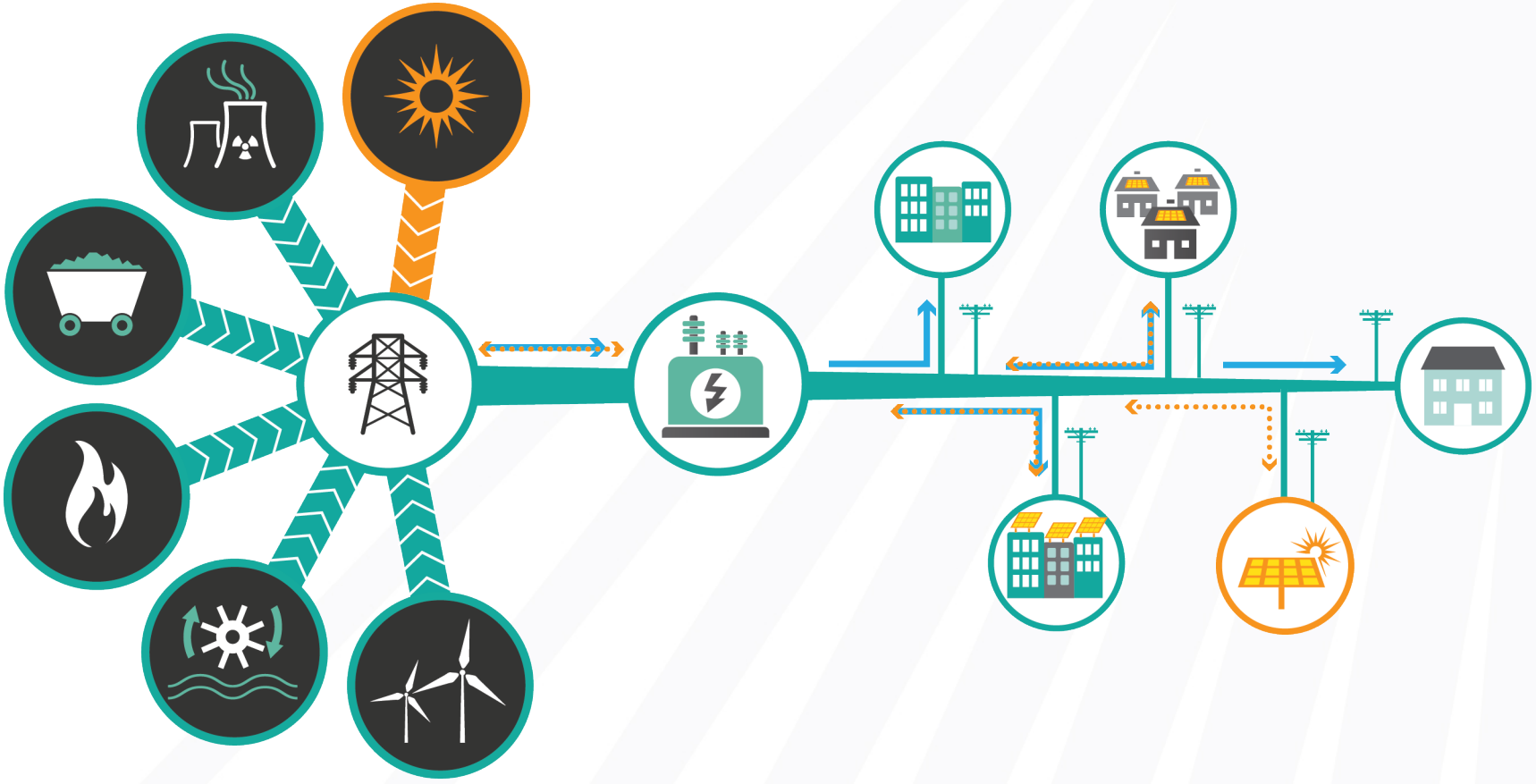
Middle Class Americans are Solar Customers

Incomes **$40K-$90K**

Solar Powers U.S. Schools



Today's Power System: Two-Way Power Flow



SUNSHOT GOAL: THE FINAL PUSH