



**Evaluating Renewable Energy
Options: Building-Integrated
Solar and Biogas Energy, Day 1**
Jay Paidipati, Navigant Consulting

Agenda

- Review Team's goals, objectives and current activities – 15 minutes
- Brainstorm project ideas – 40 minutes
- Sunshot Overview – 20 minutes
- Break – 15 minutes
- Refine and prioritize project ideas – 45 minutes
- Green Power Partnership Overview – 20 minutes
- Wrap up – 10 minutes

Meeting Objectives

- Review team's goals and objectives and refine if needed
- Obtain feedback on biogas project scope
- Develop and prioritize new project ideas
- Learn about DOE's SunShot program
- Hear about EPA's Green Power Partnership Program

Team Goals and Objectives

- **Background**
 - Based on interest from BBA members at the 2013 Efficiency Forum, as well as prior member requests, the DOE BBA plans to establish a pilot project team focused on integration of renewable energy technologies in buildings.
- **Project Team Lead: Jay Paidipati, Navigant Consulting**
- **Goals and Objectives**
 - Individual members often do not have the resources or expertise to address these very specialized issues, and vendors selling renewables projects have a vested interest in promoting their solutions.
 - Team seeks to provide unbiased advice and shared experience to help BBA members navigate complex regulations, business models, and utility policies associated with distributed renewable energy systems.
 - We deliver projects based upon member interests and needs.
- **Scope**
 - Our team's scope includes renewable energy technologies that can be installed on commercial buildings and within their project site.

Team Goals and Objectives - Discussion

- Discussion
 - Do these goals and objectives still meet your (BBA member) needs?
 - Should we add new ones?
 - How do we measure our team's success?

Current Work - Solar Decision Guide

■ Scope

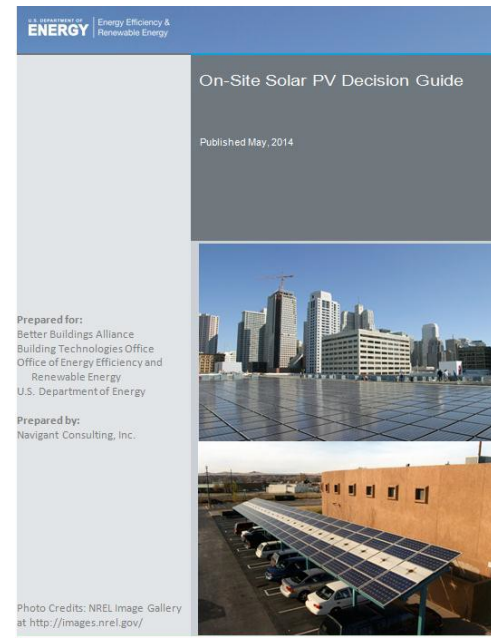
- Guidebook that contains information, tools, templates and references to help with the addition of solar PV on or at an existing building or buildings.
- Covers feasibility assessment, procurement, installation, and operation.
- The Guide's intent is to provide overviews and some level of detail, but it then points to highly detailed sources of information.

■ When to Use

- Designed for building energy, facility or property managers during investigation or implementation of on-site PV.

■ Status

- In review with DOE



1. Introduction
2. How Solar PV Can Benefit Your Facility
3. Screening for Solar PV For Your Facility
4. How to Procure Solar PV
5. Financing a Solar PV System
6. Execution of a Solar PV Project
7. How to Operate and Maintain a Solar PV System
8. Assessing Benefits

■ Scope

- Many great informational and program resources are available for biogas from wastewater treatment plants, landfills and farm waste, but not as much is available for biogas from food waste.
- This guide will focus on technology decisions, feasibility assessments, financing, procurement and operations for implementing biogas from food waste at commercial buildings.

■ When to Use

- Designed for building energy, facility or property managers to assess the feasibility of on-site biogas from food waste and then implement a project if feasible.

■ Status

- Starting work in late May 2014, with September 2014 due date.
- We have developed a draft outline (next slide) and would like your feedback.

■ Proposed Outline

- Introduction
 - Overview, BBA background, technical overview of food scrap fermentation + anaerobic digestion
- Biogas digestion technology overview
 - Digester design, components and operations
- How Biogas digestion can benefit your business
 - Type of business that can use Biogas digestion, explanation of benefits – financial, marketing, environmental
- Screening for Biogas digestion at a facility
 - Technical and financial feasibility
- How to develop Biogas digestion
 - Self-owned, third party, other strategies
- Financing Biogas digestion system
 - Financing, incentives
- Execution of a Biogas digestion project
 - Assembling team, RFP, construction, commissioning
- Operation and maintenance of Biogas digestion
 - Safety, pest control, cleaning, safety, inspection, regular maintenance
- Assessing benefits

What other information would help inform your decision making?

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Project ideas

- **Goals and process**
 - As a Team, we need to develop project ideas and needs for next year.
 - We are going to use a brainstorming process to develop new ideas and then propose them to DOE for funding.
 - We'll use the following process:
 1. Brainstorm challenges to integrating RE at commercial buildings
 2. Brainstorm solutions to those challenges
 3. Refine solutions and related project ideas
 4. Prioritize project ideas
 - We'll be documenting the process and outcomes using the projector and screen
 - During the break, we will be taking our ideas and segmenting them and reviewing them against the scope of our Team
- **Ground rules**
 - All ideas are welcome, so speak up!
 - During the brainstorming process, we will not dwell on one idea for too long and save it for the refining process
 - We'll make decisions based upon consensus

Project ideas - Challenges

- Goal – discuss challenges with integrating RE in commercial buildings to help focus our discussion of solutions.
- Questions:
 - What challenges have you faced when assessing the feasibility of integrating RE?
 - Technical
 - Financial/economic
 - Regulatory
 - Internal policy
 - Staffing
 - Informational
 - What challenges have you faced with implementation and/or operation?
 - What technologies would you like to know more about?

Project ideas - Solutions

- Goal – discuss solutions to help formulate project ideas.
- Questions:
 - How have you solved these challenges in the past?
 - What tools or information would you have liked to have in the past?
 - What tools or information do you need now to help you make decisions?

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Refine

- Goal – Refine the project ideas we developed to further develop scope and objectives.
- Process:
 - Go over projects eliminated due to fit with BBA scope
 - Review each project idea and develop scope and objectives
 - We'll use the projector and screen to walk through our list of ideas

Prioritize

- Goal – Prioritize our project list to assist planning for next year.
- Process:
 - We'll use the projector and screen to walk through our list of ideas and sort them by priority.
- Questions:
 - What projects would make the biggest overall impact?
 - Would any of these projects help you with decisions you are facing now or in the near future?

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How to Get Involved

■ BBA Members

- If you are not currently part of BBA's RE Integration team, contact Jay Paidipati (jpaidipati@navigant.com, 303.728.2489) to become a member.
- We have quarterly team calls with speakers and members can help contribute to project ideas and to projects themselves by providing information, case studies, etc.

■ Stakeholders

- If you would like to contribute to a current or upcoming project, please contact Jay Paidipati to get involved.

Next Steps

■ Team Meetings

- We are planning a team meeting for mid to late July. Stay tuned for a meeting invite.

■ Projects

- We are making the Solar Decision Guide public soon. Please contact Jay Paidipati if you have comments on the version you received.
- We are starting the Biogas Decision Guide and are looking for contributors to help with case studies, subject matter experts for interviews and reviewers.
- We will work with DOE on prioritizing the project ideas we developed today.

- Navigant
 - Jay Paidipati (project team lead) jpaidipati@navigant.com, 303-728-2489
 - William Goetzler, wgoetzler@navigant.com, 781-270-8351
- DOE
 - Amy Jiron, amy.jiron@go.doe.gov, 720-339-7475



EPA's Green Power Partnership

2014 Better Buildings Summit

May 7, 2014



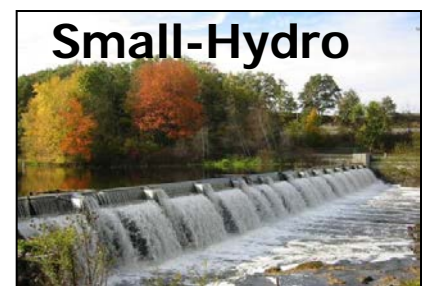
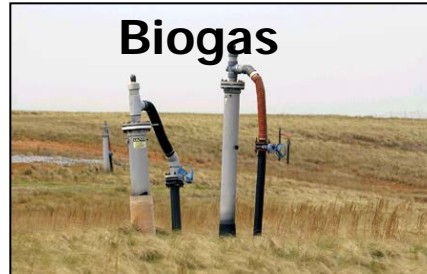
EPA's Green Power Partnership

- Voluntary program encouraging use of green power as a way to reduce environmental impacts of electricity use
 - > 1,300 partners
 - Partners include Fortune 500® companies; small and medium sized businesses; local, state, and federal governments; and colleges and universities.
 - Partners use >28 billion green power kilowatt-hours annually
 - Carbon avoidance equal to that created by the electricity use of more than 2.7 million American homes



What is Green Power?

- EPA defines green power as electricity generated from qualifying biogas, biomass, geothermal, small-hydro, solar, and wind power.
- From facilities built in last 15 years.
- Must retain RECs from on-site systems.



Green Power Procurement Options

- Renewable Energy Certificates (RECs)
 - The technology and environmental attributes of electricity generated from renewable resources (1 REC = 1 MWh)
 - Does not include the underlying electrons – “unbundled”
 - Available to all electricity users
- Green Power Electricity Products
 - Green power offered by utility suppliers that is all, or partially, generated from renewable sources
 - “Bundled” product that includes both the RECs and the underlying electrons
- On-site Generation
 - Renewable energy system installed on-site (e.g. solar panels, wind turbine)
 - Produces both electricity and RECs from the on-site source
 - Self-financed installation or via a third-party PPA
 - To claim use of green power, must retain/retire RECs
- Green Power Locator Tool:
<http://www.epa.gov/greenpower/pubs/gplocator.htm>



EPA's Green Power Partnership: Program Components

- **Credible Benchmarks & GHG Quantification**
 - Metrics for "How much green power is enough?"
 - Definition of eligible renewables & products
 - GHG reduction guidance and calculations
- **Planning & Implementation Resources**
 - Green power locator
 - Purchasing strategy guidance
 - Marketing and communications support
- **Recognition**
 - Top Partner Lists
 - Use of the Partner mark →
 - Green Power Leadership Awards
 - Promotional opportunities
- **Best Practices & Innovation**
 - Collaborative procurement
 - New contract mechanisms

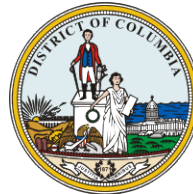


Partnership Requirements

- EPA supports Partners' procurement of green power by offering advice, technical support, tools and resources, and recognition.
- Partners agree to procure green power and provide an annual update.
- In return, EPA commits to:
 - Provide public recognition
 - Provide procurement and communications assistance, as requested
 - Provide a brief description of the Partner's green power use on EPA's website

	Partnership Benchmark	Leadership Benchmark
If your annual electricity use is:	You must, at minimum, use this much green power:	You must, at minimum, use this much green power:
Over 100,000,000 kWh	3% of your use	30% of your use
10,000,001-100,000,000 kWh	5% of your use	50% of your use
1,000,001-10,000,000 kWh	10% of your use	100% of your use
Under 1,000,000 kWh	20% of your use	N/A

EPA's 1,300+ Green Power Partners



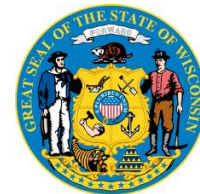
JPMORGAN CHASE & Co.



STATE STREET.

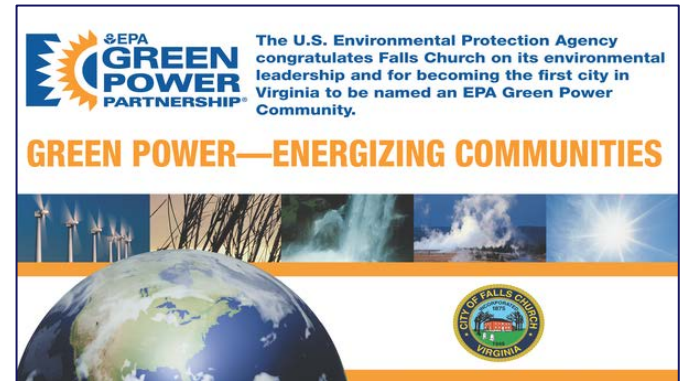


Metropolitan Pier and Exposition Authority
Managing McCormick Place Complex and Navy Pier



Green Power Communities Initiative

- EPA initiative that challenges communities to collectively procure green power in an amount that meets the Partnership's green power use benchmarks
- Intended to motivate collective action of municipal government, businesses, and citizens to reduce the community's carbon footprint by procuring green power
- 51 Green Power Communities nationwide
 - Collective green power use of ~6 billion kWh
 - Avoids ~4.2 million metric tons of CO2 emissions
 - Equal to the annual electricity use of ~630,000 average American homes



Green Schools Alliance Purchasing Consortium

- Through demand aggregation, schools can access more affordable pricing than would otherwise be available to individual schools.
- 28 schools will purchase an aggregated total of nearly 25 million kWh in 2014.
- Additional schools are welcome to join the group.
- Visit: www.greenschoolsalliance.org/programs/green-power-program



Collaborative Solar Procurement

- DC-area Collaborative Solar Procurement Initiative:
 - A platform for deploying clean energy technologies across multiple government and educational organizations, the goal is to achieve maximum impact on installed solar system capacity, local economic activity, and the regional environment.
 - More than 170 sites at 20 organizations were evaluated, and 36 sites were found to be viable for installing solar.
 - 30+ MW in the pipeline, six organizations involved.
 - The collaborative organizations are now moving into the procurement and construction phases.



GPP Updates

- GPP Webinar series: www.epa.gov/greenpower/events/index.htm
- April 21: Top Partner Rankings released:
www.epa.gov/greenpower/toplists/index.htm
- Sign up for our monthly program updates and other GPP news on our website: www.epa.gov/greenpower/contactus.htm
- [GPP LinkedIn group](#): 500+ members



Renewable Heating and Cooling

- A building must consider the thermal energy component to reduce its carbon footprint to near net-zero
 - More than 60 percent of total delivered energy consumption in the residential, commercial and industrial sectors go to heating and cooling uses
 - Studies show that an estimated 30 percent of industrial processes require heat that can be met with existing, conventional RHC technologies
- Consider Biomass, Geoexchange, or Solar for water heating, space heating, space cooling and process heat loads

Want to Know More?

- Basic Information

- Overview of the Green Power Partnership: www.epa.gov/greenpower
- Full details of program requirements:
www.epa.gov/greenpower/documents/gpp_partnership_reqs.pdf
- EPA's Green Power Locator:
www.epa.gov/greenpower/pubs/gplocator.htm

- More Questions?

- James Critchfield, 202.343.9442, Critchfield.james@epa.gov
- Mollie Lemon, 202.343.9859, lemon.mollie@epa.gov





The SunShot Initiative

energy.gov/sunshot

5/8/2014



Olayinka Kolawole

Outline

The SunShot Initiative

Goals/Portfolio
Progress

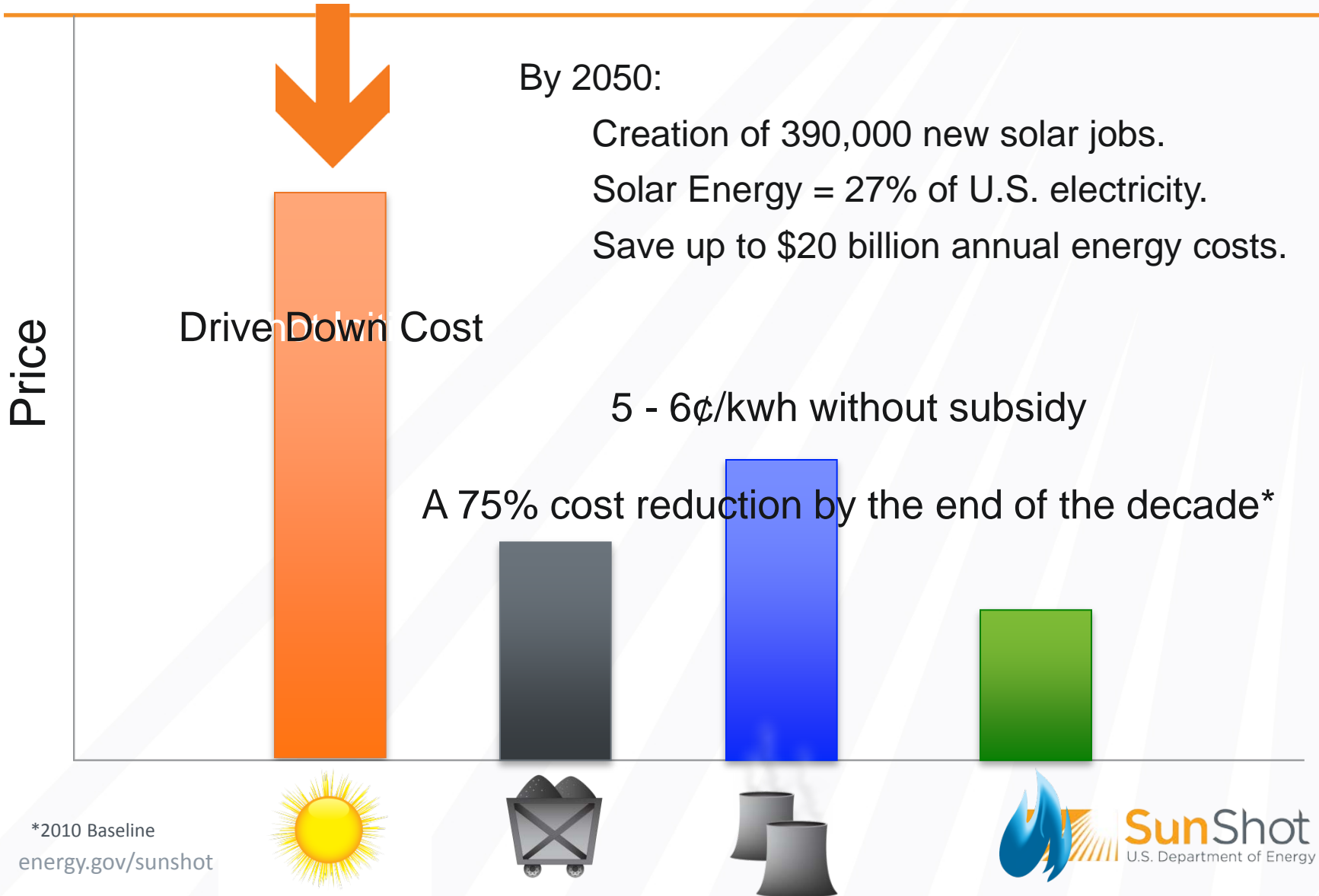
The Mid-Size Solar Market

Resources

Questions

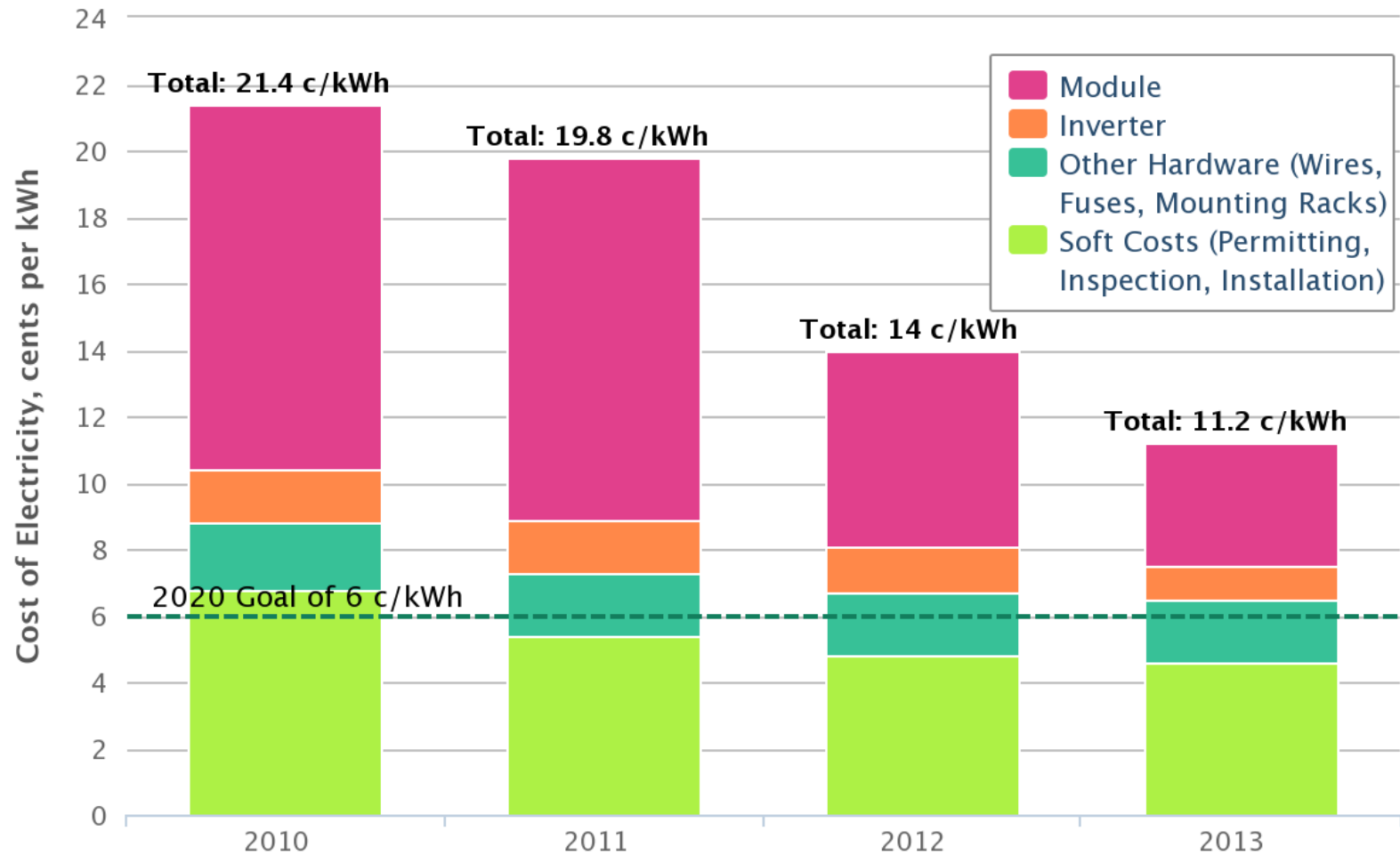
The Solar Energy Technologies Office (SETO) drives research, manufacturing, and market solutions through its management of the DOE [SunShot Initiative](#), which is a collaborative national initiative to make solar energy cost-competitive with other forms of energy by the end of the decade.

The SunShot Initiative...



Progress...

The Falling Price of Utility-Scale Solar Photovoltaic (PV) Projects



The Mid-Size Market...

Rooftop solar is an option for **less than** $\frac{1}{4}$ of the residential market*

Larger, more diverse
in the U.S. than
residential

Larger System Sizes

Economies of Scale

New Business Models/Opportunities

Load Profile Alignment with Resource

Enhanced
Resiliency

Economic Development

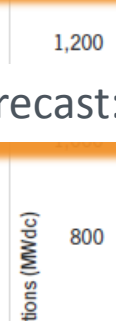
Financial
Certainties

Economic Benefits

The Mid-Size Market...

By end of Q3 2013, **2.9 GW** deployed in the non-residential sector*.

Forecast: **11 – 12 GW** by 2017.



Total Commercial Rooftop Potential : 348 GW**

Total US Generation Capacity: ~ 1000 GW***

*GTM Research - U.S. Solar Market Insight Report Q3 2013

"Non-residential" = projects on the customer side of the meter with a retail, non-residential power purchaser.

**NREL Technical Report NREL/TP-6A0-44073

***EIA: <http://www.eia.gov/electricity/capacity/energy.gov/sunshot>

Solar Utility Networks Replicable Innovations in Solar Energy

One of the 1st SunShot projects to directly engage utilities to reduce BOS in 17

Standardized PV deployments to establish de facto standards for cost effective utility

7.5 million
customers

110 impacted
co-ops

3 G&T co-ops

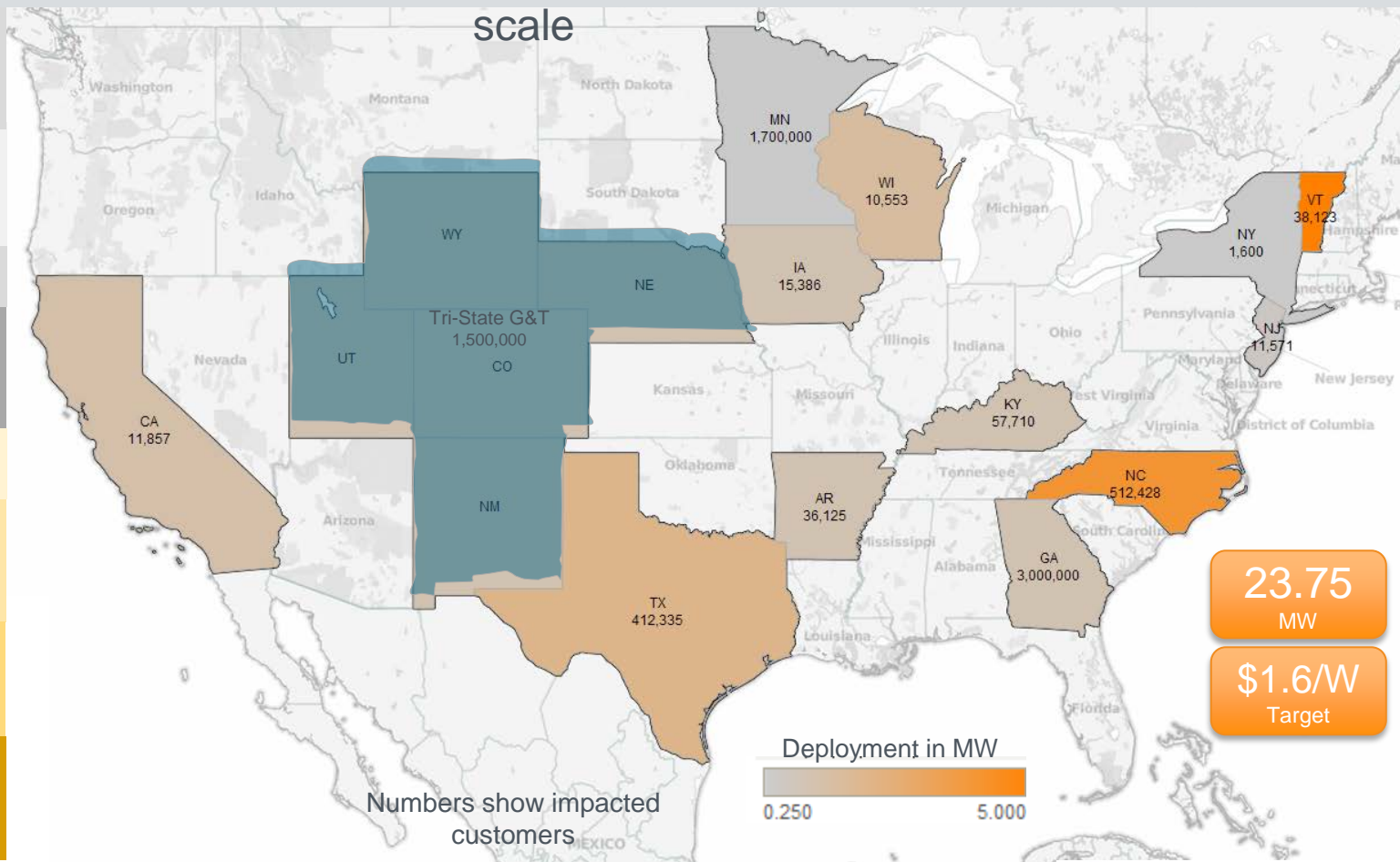
12 Distribution
co-ops

Block Designs

Standardized
Financing

Aggregated
Purchasing

Knowledge
Exchange



23.75
MW

\$1.6/W
Target



Resource: 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
- 200 Members and Growing

Open Solar Performance and Reliability Clearinghouse (oSPARC database)

Analysis of opportunities and barriers

Facilitate capital market investment and retail (community) bank lending

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 $\frac{1}{4}$ or $\frac{1}{2}$ of one PV panel
 - Enable participation by new market segments
- **Potentially transferable**
 - Option to sell if moving
- **Enabling deployment:** Solar on schools, churches, nonprofits, etc.

Economies of Scale

- **Lower soft costs:** Costs spread over larger projects
- **Siting flexibility**
 - Optimal grid integration
 - Community-scale projects can use **space close to load centers** unsuitable for small- or utility-scale solar
 - (e.g., highway medians, brownfields, commercial rooftops)
- **Focused interconnection efforts:** Utilities monitor operation of several larger arrays instead of many small ones

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
- Insight on working with **intermediate system sizes**

Solar Technology Diffusion Research

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

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

SunShot Incubator Program

Accelerating innovation

- Provides early-stage assistance to help start-up businesses cross technological barriers to commercialization.

Making solar more affordable and accessible

- Projects focus on two key areas
 - advancing solar **hardware** technologies and
 - reducing the **non-hardware** “soft costs” of solar

High-impact, cost-effective

- Encourages private sector investment to maximize its impact. Since Incubator launched in 2007, 71 projects have leveraged more than \$1.8 billion in venture capital and private equity **investment—a \$16 return for every \$1 of federal support.**

<http://www1.eere.energy.gov/solar/sunshot/incubator.html>



SunShot Prize Snapshot

THE GOAL

Break the barrier of \$1/W price to plug-in rooftop solar

THE PRIZE

\$10 Million dollars

THE CHALLENGE

5,000 new rooftop PV systems before 2015 and 1,000 more before 2016

THE RULES

Three set of Rules for technical, financial, and sustainability specifications

THE TIMELINE

Submit a Concept Paper before October 2014 to register. PV systems installed before registration do not count. Claim your award before December 31, 2014

REGISTRATION

Visit us online: eere.energy.gov/solar/sunshot/prize.html

Thank you.

Olayinka Kolawole

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<http://energy.gov/eere/sunshot/sunshot-initiative>