Solar Powering Your Community
Addressing Soft Costs and Barriers

Powered by SunShot
U.S. Department of Energy
## Agenda

<table>
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Justin Barnes
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Philip Haddix
The Solar Foundation
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(202) 469-3743
About the SunShot Solar Outreach Partnership

The SunShot Solar Outreach Partnership (SolarOPs) is a U.S. Department of Energy (DOE) program designed to increase the use and integration of solar energy in communities across the US.
About the SunShot Solar Outreach Partnership

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

Resource Solar Powering Your Community Guide

A comprehensive resource to assist local governments and stakeholders in building local solar markets.

www.energy.gov
About the SunShot Solar Outreach Partnership

Resource Sunshot Resource Center

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

www4.eere.energy.gov/solar/sunshot/resource_center
About the SunShot Solar Outreach Partnership

Technical Support

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

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

For more information email: solar-usa@iclei.org
Poll
Who’s in the room?
Poll
What is your experience with solar?
Workshop Goal
Enable local governments to replicate successful solar practices and expand local adoption of solar energy
Explore benefits and Overcome barriers
Activity: Identifying Benefits

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

**Right Now**
- Write answer on card

**During Session**
- Compile results

**After Break**
- Group discussion
Activity: Addressing Barriers

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

Right Now
Write answer on card

During Session
Compile results

After Break
Group discussion
Installed Capacity

Top 5 Countries Solar Operating Capacity

- Germany: 35.6%
- USA: 5.7%
- Italy
- Japan
- Spain
- Rest of World

Source:
Installed Capacity

Total installed solar capacity in the US: 4 GW

Capacity installed in Germany in Dec 2011: 4 GW

The Cost of Solar in the US

Comparison of US and German Solar Costs

The Cost of Solar in the US

Comparison of US and German Solar Costs

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

- Interconnection
- Financing
- Permitting
- Customer Acquisition
- Design & Installation

Source: NREL
(http://ases.conference-services.net/resources/252/2859/pdf/SOLAR2012_0599_full%20paper.pdf)
(http://www.nrel.gov/docs/fy12osti/53347.pdf)
(http://www.nrel.gov/docs/fy12osti/54689.pdf)
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Solar Technologies

Solar Photovoltaic (PV)  Solar Hot Water  Concentrated Solar Power
Solar Technologies

Solar Photovoltaic (PV)

Solar Hot Water

Concentrated Solar Power
Some Basic Terminology

Panel / Module

Cell
Some Basic Terminology

Array
Some Basic Terminology

- **Capacity / Power**: kilowatt (kW)
- **Production**: Kilowatt-hour (kWh)
Some Basic Terminology

- **Residence**: 5 kW
- **Office**: 50 – 500 kW
- **Factory**: 1 MW+
- **Utility**: 2 MW+
Benefits of Solar Energy

- Local economy growth
- Local jobs
- Energy independence
- Stabilizes price volatility
- Valuable to utilities
- Smart investment
Fact: Solar works across the US

Source: National Renewable Energy Laboratory
## Comparison: Regional PV Financial Incentives

<table>
<thead>
<tr>
<th></th>
<th>Ohio</th>
<th>Kentucky</th>
<th>Indiana</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rebates</strong></td>
<td>AEP Ohio: $1.50/W up to 50% of cost or $12k/$75k</td>
<td>-</td>
<td>IP&amp;L Rebate: $2.00/W up to 19.9kW</td>
</tr>
<tr>
<td><strong>State Grants</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>State Loans</strong></td>
<td>ECO-Link; Energy Loan Fund</td>
<td>Revolving Loans for State Agencies</td>
<td>-</td>
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<tr>
<td><strong>PACE Financing</strong></td>
<td>Local Option</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Prod. Incentives</strong></td>
<td>SRECs</td>
<td>TVA Programs</td>
<td>IP&amp;L Rate REP NIPSCO Feed-in Tariff</td>
</tr>
<tr>
<td><strong>Corp. Tax Credits</strong></td>
<td></td>
<td>$3.00/W; Max. $1,000</td>
<td>-</td>
</tr>
<tr>
<td><strong>Pers. Tax Credits</strong></td>
<td></td>
<td>$3.00/W; Max. $500</td>
<td>-</td>
</tr>
<tr>
<td><strong>Prop. Tax Incentives</strong></td>
<td>OAQDA Incentives; Commercial/ Utility Exemptions</td>
<td>-</td>
<td>Assessed value of PV system is exempt from Res/Com/Ind Prop. Tax</td>
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Ohio State Loan Programs

Energy Conservation for Ohioans (ECO-Link):

Offers homeowners reduced interest rates on loans for renewable energy or energy efficiency upgrades offered by participating banks; maximum incentive = 3% rate reduction for up to $50,000 and 7 years of the bank loan.

Energy Loan Fund:

Offers public entities, manufacturers, and small businesses loans for RE and EE upgrades

Public and nonprofit entities:

90% of project costs or $1 million
AEP Ohio: Solar Rebates

- Multi-Sector, esp. Residential, Commercial, Public, Nonprofit
- $1.50/W
- Max incentive: 50% of system costs up to $12,000 (Residential) or $75,000 (Non-residential)
- Net metering and Interconnection to AEP grid
- Surrender RECs (15 yrs.)
Renewable Portfolio Standard

Retail Electricity Sales

Renewable Energy

Any electricity source
Renewable Portfolio Standard

Fossil Fuel

Renewable Energy

Two revenue streams
Renewable Portfolio Standard

Retail Electricity Sales

- Renewable Energy
- Solar carve-out

Any electricity source
Solar Renewable Energy Credits (SRECs)

Three Requirements:

RPS solar carve out

Unbundled, tradeable credits

Penalty for non-compliance
  – solar alternative compliance payment (SACP)
Alternative Energy Portfolio Standard

- 12.5% from *renewables* by 2024 for IOUs and retail suppliers
- At least half of this renewable energy must be generated at facilities in Ohio
- 12.5% from *advanced energy resources* by 2024
- Solar carve-out of 0.5% of total electricity supply by 2024
SRECs in Ohio

SACP: $350/MWh (2012 and 2013); declines by $50 bi-annually

Two Markets:
- In-State (50%)
- Out-of-State (50%)

PA, IN, KY, WV, MI

![OH Auction Price Graph](graph.png)
Renewable Portfolio Standards

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

WA: 15% x 2020*
MT: 15% x 2015
MN: 25% x 2025
(Next: 30% x 2020)
MI: 10% & 1,100 MW x 2015*
SD: 10% x 2015
WI: Varies by utility;
~10% x 2015 statewide
NY: 29% x 2015
OH: 12.5% x 2024
VA: 15% x 2025*
VT: (1) RE meets any increase in retail sales x 2012;
(2) 20% RE & CHP x 2017
ME: 30% x 2000
New RE: 10% x 2017
NH: 24.8% x 2025
MA: 22.1% x 2020
New RE: 15% x 2020
(+1% annually thereafter)
RI: 16% x 2020
CT: 27% x 2020
PA: ~18% x 2021†
NJ: 20.38% RE x 2021
+ 4.1% solar x 2028
MD: 20% x 2022
DE: 25% x 2026*
DC: 20% x 2020

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

Source: www.dsireusa.org / August 2012

29 states + Washington DC and 2 territories have Renewable Portfolio Standards (8 states and 2 territories have renewable portfolio goals).
Indianapolis Power & Light
Rate Renewable Energy Production (REP)

15 year contract; $0.24/kWh (20 kW – 100 kW);
$0.20/kWh (100 kW – 10 MW)

NIPSCO Feed-in Tariff:

15 year max. contract term; $0.30/kWh (10 kW or less);
$0.26/kWh (10 kW – 2 MW); 500 kW allocated for small
scale solar (≤ 10 kW)
Performance Incentives: KY

TVA Generation Partners:
Up to 50 kW; $1,000 + $0.12/kWh above retail;
10-yr. contract;

TVA Mid-Size Program Standard Offer:
50 kW – 20 MW; variable seasonal/TOD rates from $0.035/kWh - $0.16/kWh; Avg. $0.055/kWh (3% escalation);
10 to 20-yr. contract
Net Metering

Net metering allows customers to export power to the grid during times of excess generation, and receive credits that can be applied to later electricity usage.
Net Metering: Overview
Net Metering: Overview

Customer

Excess Credits

Utility

Afternoon
Net Metering: Overview

Solar covers 100% of the customer’s load, even at night!
43 states & 4 territories have adopted a net metering policy.
Net Metering: Market Share

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

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

http://freeingthegrid.org/
# Net Metering: Ohio

<table>
<thead>
<tr>
<th>Year</th>
<th>NET METERING</th>
<th>INTERCONNECTION</th>
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<tbody>
<tr>
<td>2007</td>
<td>B</td>
<td>C</td>
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<tr>
<td>2008</td>
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<td>B</td>
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<td>2009</td>
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<td>2012</td>
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Source: Freeing the Grid
## Net Metering: Ohio

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<th>Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Fuel Cells, Small Hydroelectric, Microturbines</th>
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Source: Freeing the Grid
Net Metering: Ohio

Recommendations:

- Credit Net Excess Generation at the retail rate and provide the option of indefinite rollover
- Adopt safe harbor language to protect customer-sited generators from extra and/or unanticipated fees
- Specify that RECs belong to the customer

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Source: Freeing the Grid
IREC developed its model rules in an effort to capture best practices in state net metering policies.
Interconnection

5,000+ utilities with unique interconnection procedures

Source: NREL (http://www.nrel.gov/docs/fy12osti/54689.pdf)
Interconnection: Best Practices

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

Recommendations:

- Remove requirements for redundant external disconnect switch
- Expand interconnection procedures to all utilities (i.e., munis and co-ops)

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<td>Applicable Utilities:</td>
<td>Investor-owned utilities</td>
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<tr>
<td>System Capacity Limit:</td>
<td>20 MW</td>
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<td>Standard Agreement:</td>
<td>Yes</td>
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<td>Insurance Requirements:</td>
<td>Additional liability insurance not required</td>
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<tr>
<td>External Disconnect Switch:</td>
<td>Required</td>
</tr>
<tr>
<td>Net Metering Required</td>
<td>No</td>
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IREC developed model interconnection procedures in an effort to capture emerging best practices in this vital area.

www.irecusa.org
Ohio Air Quality Development Authority
Air-Quality Improvement Tax Incentives

Qualifying projects (including PV) financed through OAQDA bonds or notes can receive a 100% exemption from personal and real property taxes.

Qualified Energy Property Tax Exemptions:
- Systems ≤ 250 kW exempt from utility real and property taxes.
- Systems > 250 kW also exempt, but requires payment in lieu of taxes of $7,000/MW.

Applies to facilities that generate electricity for sale to 3rd parties.
Solar Access

Solar Access Laws:

1. Increase the likelihood that properties will receive sunlight
2. Protect the rights of property owners to install solar
3. Reduce the risk that systems will be shaded after installation
Solar Access

Source: DSIRE

- Solar Easements Provision
- Solar Rights Provision

U.S. Virgin Islands

Local option to create solar rights provision

Source: DSIRE
Ohio law allows property owners to create binding solar easements for the purpose of protecting and maintaining proper access to sunlight. Easements must be executed in writing and are subject to the same conveyance and recording requirements as other easements.
A comprehensive review of solar access law in the US – Suggested standards for a model ordinance

www.solarabcs.org
Q & A
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Understanding Solar Financing

Financing

Private
- PACE
- PPA/Lease
- Sponsored Loan
- QECBs

Public
- PPA/Lease
- Non-QECB Debt

New Model?
Morris Model
Third Party Ownership

Customer ➔ Power Purchase Agreement ➔ Developer

$ e^- REC
Third Party Ownership

Pros

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

Cons

- Market electricity price risk
- Opportunities may be limited in some locations
- Don’t keep RECs
At least 22 states + PR authorize or allow 3rd-party solar PV PPAs

- Authorized by state or otherwise currently in use, at least in certain jurisdictions within the state
- Apparently disallowed by state or otherwise restricted by legal barriers
- Status unclear or unknown

Note: This map is intended to serve as an unofficial guide; it does not constitute legal advice. Seek qualified legal expertise before making binding financial decisions related to a 3rd-party PPA. See following slides for additional important information and authority references.
Qualified Energy Conservation Bonds

▪ What?
  – Tax credit or direct payment subsidy

▪ Why?
  – Subsidy lowers the effective cost of capital

▪ Relevance for Solar?
  – Financing public facilities (numerous)
  – “Green Community” programs (a few)

▪ How?
  – State allocation or automatic allocation
Qualified Energy Conservation Bonds

Local Examples???
- Kentucky: Allocation mostly gone ($3M left)
- Ohio: 11 issuances to date ($95M left)
- Indiana: 2 issuances to date ($8.4M in state allocation remaining)

Property Assessed Clean Energy

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

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

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

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

www.dsireusa.org / August 2012

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

*The Federal Housing Financing Agency (FHFA) issued a statement in July 2010 concerning the senior lien status associated with most PACE programs. In response to the FHFA statement, most local PACE programs have been suspended until further clarification is provided.
Innovative: Morris Model

Replication of Morris Model

- Legality of PPA Model
- Laws Governing Public Contracts
- Laws Governing Bonding
- Laws Government Procurement

Innovative: PACE + PPA

Mitigate Soft Costs

Source: NREL (http://www.nrel.gov/docs/fy12osti/54689.pdf)

$0.56 per Watt

- Interconnection
- Financing
- Permitting
- Customer Acquisition
- Design & Installation
Customer Acquisition

Solarize
Group Purchasing

SOLARIZE

solarize portland

I helped
solarize pendleton
Oregon

Powered by
SunShot
U.S. Department of Energy
**Barriers**

- High upfront cost
- Complexity
- Customer inertia

**Solutions**

- Group purchase
- Community outreach
- Limited-time offer
Solarize: Advantages

Benefits to Local Government:

Low implementation cost: $10,000 - $20,000

Quick turn-around: 9 Months

Long-term impact: Sustainable ecosystem
Solarize: Process

- Select Installer
- Marketing & Workshops
- Enrollment
- Site Assessment
- Decision & Installation
Solarize: Case Study

Harvard, Massachusetts
Population: 6,520

Solarize: Case Study

Solarize Mass Harvard

Select Installer
April 2011

Marketing & Workshops

Enrollment

Site Assessment

Decision & Installation

April 2011 — Dec 2011
Group Purchasing

Harvard Mass Group Purchasing Tiers

Average PV Cost July 2011: $5.75 / watt
Solarize: Case Study

Select Installer

Marketing & Workshops
May – July 2011

Enrollment

Site Assessment

Decision & Installation

April 2011

Solarize Mass Harvard

Dec 2011
Solarize: Case Study

Marketing Strategy:

- Electronic survey of 1,100 households
- Email newsletters and direct mailings
- Float in July 4 parade
- Articles and advertisements in local newspaper
- Facebook page and online discussion board

Source: Vote Solar
Solarize: Case Study

Select Installer

Marketing & Workshops

Enrollment

Site Assessment

Decision & Installation

April 2011

June – Oct 2011

Dec 2011

Solarize Mass Harvard

429 households signed up

429 households signed up
Solarize: Case Study

Solarize Mass Harvard

Select Installer
Marketing & Workshops
Enrollment
Site Assessment
Decision & Installation

April 2011
Oct 2011
Dec 2011

151 feasible households
Solarize: Case Study

Solarize Mass Harvard

- Select Installer
- Marketing & Workshops
- Enrollment
- Site Assessment
- Decision & Installation

April 2011

75 Contracts

Oct – Dec 2011

Dec 2011
Group Purchasing

Harvard Mass Group Purchasing Tiers

- 1 kW - 100 kW: $6.00
- 100 kW - 200 kW: $5.00
- 200 kW - 300 kW: $4.00
- 300 kW +: $5.00

403 kW capacity contracted
Solarize: Case Study

75 new installations totaling 403 kW

30% reduction in installation costs

575% increase in residential installations
Solarize: Lasting Impact

Annual Portland Residential PV Installations

Source: NREL
Solarize: Resources

Resource The Solarize Guidebook

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

www.nrel.gov
Q & A
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OKI Solar Workshop

Cincinnati Zoo Solar Canopy Case Study

September 26, 2012

Solar Makes Sense in Our Communities and Businesses

The City of Powell
St. Paris
Washington Court House
The City of Xenia
City of Athens
The City of Cincinnati

Siobhan C. Pritchard
Regional Development Manager
## Agenda

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Activity: Identifying Benefits

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

Right Now: Write answer on card
During Session: Compile results
After Break: Group discussion
[Results from Survey]
Activity: Addressing Barriers

What is the greatest barrier to solar adoption in your community? [Green Card]
[Results from Survey]
Activity: Next Steps

What do you pledge to do when you leave today’s workshop? [Orange Card]
Net Metering: Virtual

No direct connection necessary
Net Metering: Meter Aggregation

But…It’s complicated

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

Aggregation of some from authorized by state
Process

Option 1: Direct Ownership

Option 2: Third Party Ownership

Decide on Ownership Structure
Ownership Structure Decision

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

**Direct Ownership**

1. Location Selection
2. Site Assessment
3. Finance Project
4. Installer Procurement
5. Construction

**Third Party Ownership**

**Decide on Ownership Structure**
Process

Direct Ownership

Location Selection  Site Assessment  Finance Project  Installer Procurement  Construction

Third Party Ownership

Decide on Ownership Structure
Step 1: Location Selection

- Who is using the energy?
- Where is the energy being used?
- What is the user’s energy load?
- What is the user’s energy cost?
Step 1: Location Selection

Rooftop

Ground
Process

Direct Ownership

Location Selection  Site Assessment  Finance Project  Installer Procurement  Construction

Third Party Ownership

Decide on Ownership Structure
Step 2: Site Assessment

- Solar Access Rights
- Interconnection
- Wind loading
- Roof age, type, & warranty
- Electrical configuration
- Slope, Shading and orientation
Step 2: Site Assessment

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

Direct Ownership

Location Selection
Site Assessment
Finance Project
Installer Procurement
Construction

Third Party Ownership

Decide on Ownership Structure
Step 3: Finance Project

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

Direct Ownership

Location Selection  Site Assessment  Finance Project  Installer Procurement  Construction

Third Party Ownership

Decide on Ownership Structure
Step 4: Installer Procurement

EPC = Engineer, Procure, Construct

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

Direct Ownership

Location Selection → Site Assessment → Finance Project → Installer Procurement → Construction

Option 2: Third Party Ownership

Decide on Ownership Structure

Third Party Ownership
Direct Ownership

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

Cons
- Large upfront cost
- Long term management
- Can’t take all incentives
- Development risk
- Performance risk
Process

Direct Ownership

Third Party Ownership

Decide on Ownership Structure

Location Selection
Developer Procurement
PPA & Lease Negotiation
Construction
Process

Direct Ownership

Third Party Ownership

Location Selection  
Developer Procurement  
PPA & Lease Negotiation  
Construction

Decide on Ownership Structure
Process

Direct Ownership

Third Party Ownership

- Location Selection
- Developer Procurement
- PPA & Lease Negotiation
- Construction

RFP vs RFQ

Decide on Ownership Structure
Avoid Five Common Pitfalls:

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

Source: NREL Webinar “Procuring and Implementing Solar Projects on Public Buildings: How to Avoid Common Pitfalls” December 8, 2010
Step 2: Developer Procurement

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

- **50%** savings in administrative costs
- **10-15%** reduction in energy cost

Source: NREL Webinar “Procuring and Implementing Solar Projects on Public Buildings: How to Avoid Common Pitfalls” December 8, 2010
Step 3: Contract Negotiation

Negotiation points:

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

Direct Ownership

Third Party Ownership

- Location Selection
- Developer Procurement
- PPA & Lease Negotiation

Construction

Decide on Ownership Structure
Third Party Ownership

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

**Cons**
- Market electricity price risk
- Limited opportunity in PA
- Don’t keep RECs
Factors PPA Providers Look For

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

The City will lease 40 – 80 rooftop grid connected 25 kW solar PV installations

Source: Solar Ready KC
Case Study: Kansas City

Direct Ownership

Third Party Ownership

Decide on Ownership Structure

Location Selection

Developer Procurement

PPA & Lease Negotiation

Construction

Proposals due July 2012

Proposals due July 2012