Solar Powering Your Community

Solar on Brownfields

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Jayson Uppal

Meister Consultants Group

jayson.uppal@mc-group.com
(617) 209-1990

Philip Haddix

The Solar Foundation

phaddix@solarfound.org
(202) 469-3750

David Morley

American Planning Association

dmorley@planning.org
(312) 786-6392

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

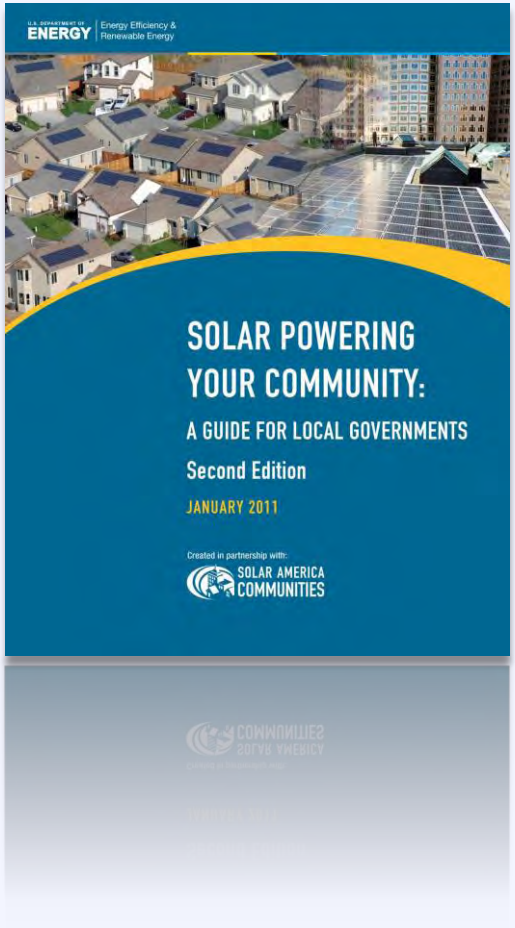
- Increase installed capacity of solar electricity in U.S. communities
- Streamline and standardize permitting and interconnection processes
- Improve planning and zoning codes/regulations for solar electric technologies
- Increase access to solar financing options

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.

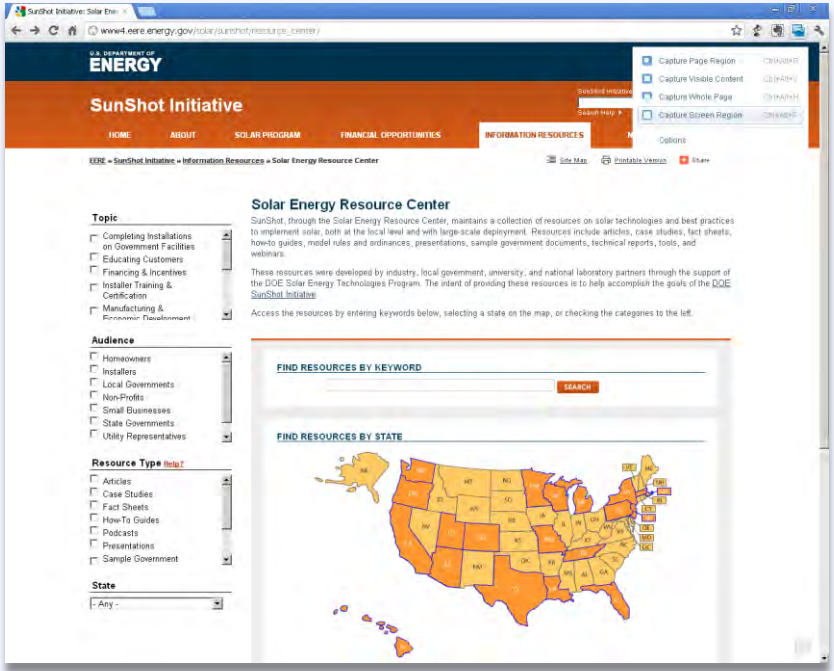
www.energy.gov



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

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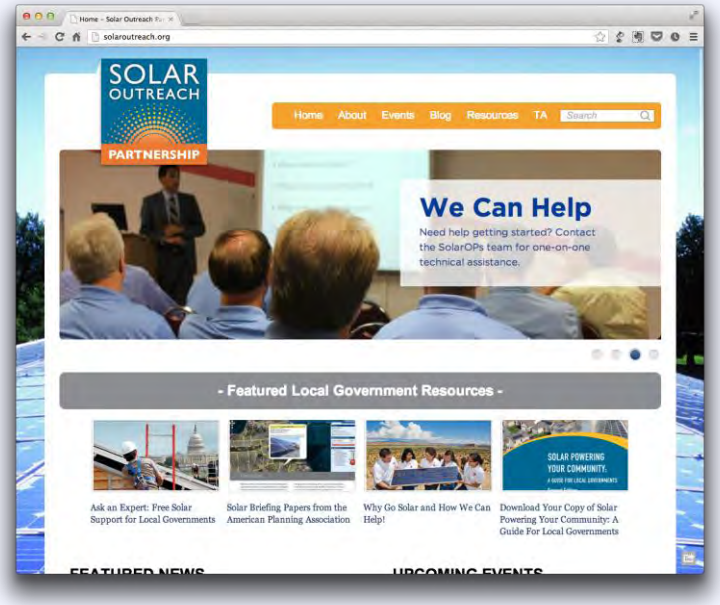
About the SunShot Solar Outreach Partnership

Technical Support

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



www.solaroutreach.org

For more information email: solar-usa@iclei.org

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Poll

Who's in the room?

Poll

What is your experience with solar?

Workshop Goals

You should leave today's workshop with:

1. Knowledge of the planning process for brownfield redevelopment

2. An understanding of how to screen potential sites to determine feasibility for solar

3. An awareness of policies and incentives that support solar development

Agenda

8:40 – 8:45	Solar 101
8:45 – 9:05	Planning for Solar on Vacant Land
9:05 – 9:20	Screening Potential Sites
9:20 – 9:30	Exercise Part 1
9:30 – 9:50	Financing Solar Projects on Brownfield Sites
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Solar Technologies

Solar Photovoltaic (PV)

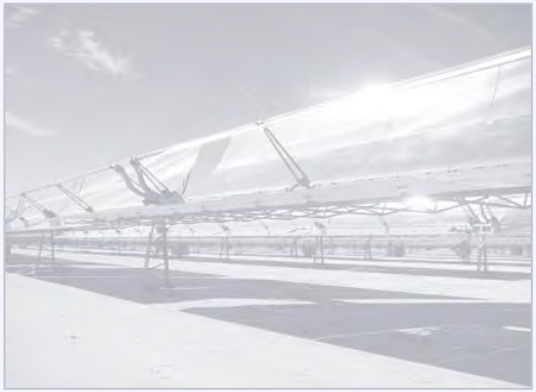
Solar Hot Water

Concentrated Solar Power

Solar Technologies

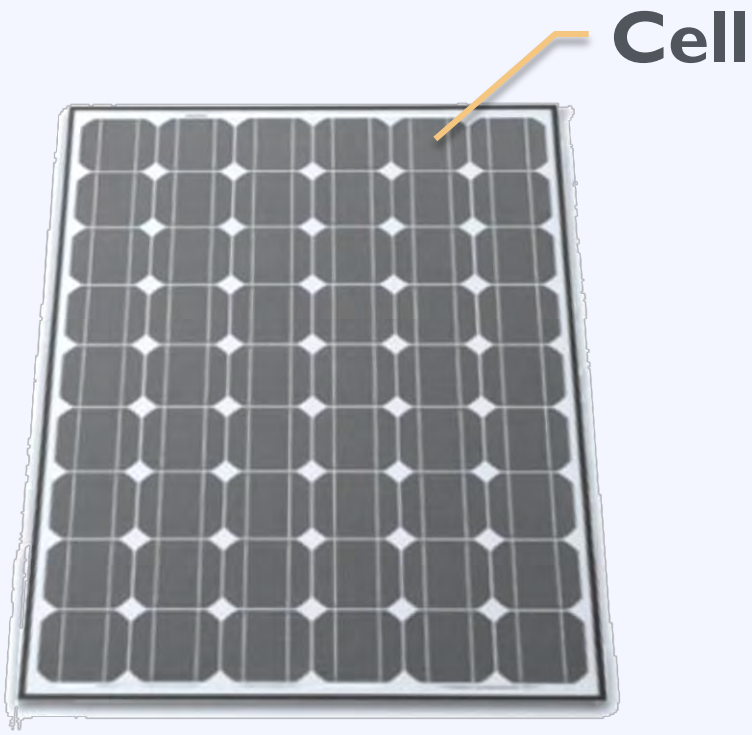
Solar Photovoltaic (PV)

Solar Hot Water



Concentrated Solar Power

Some Basic Terminology



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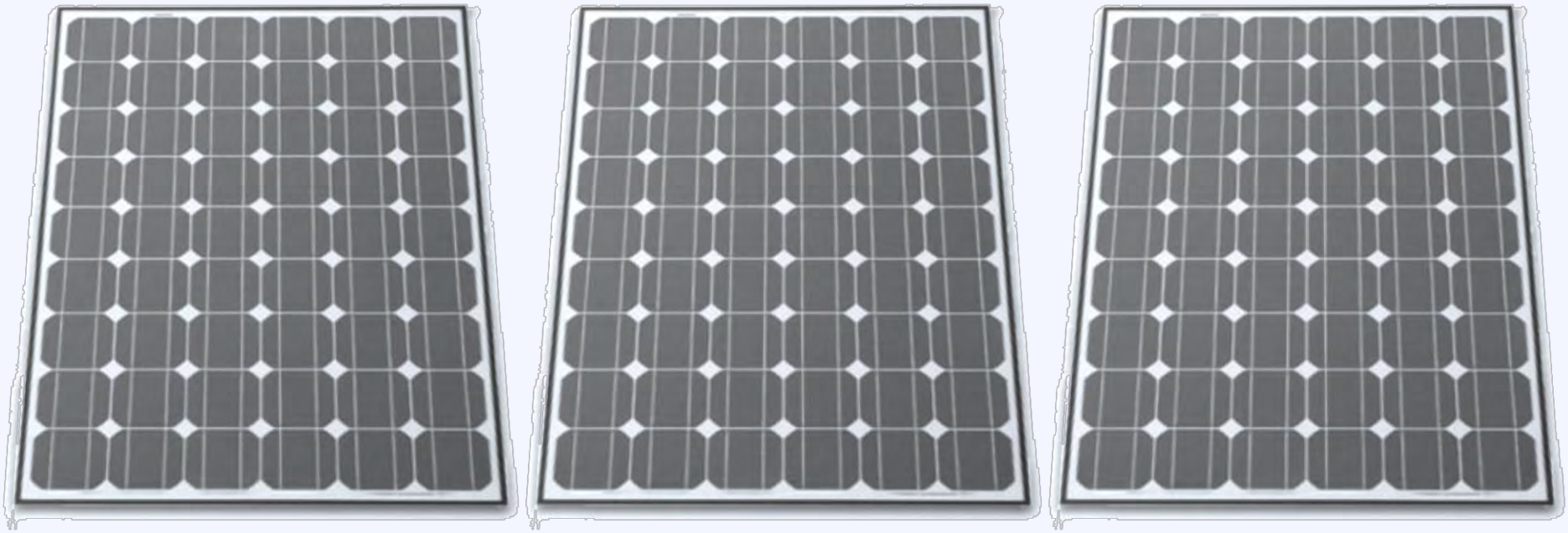
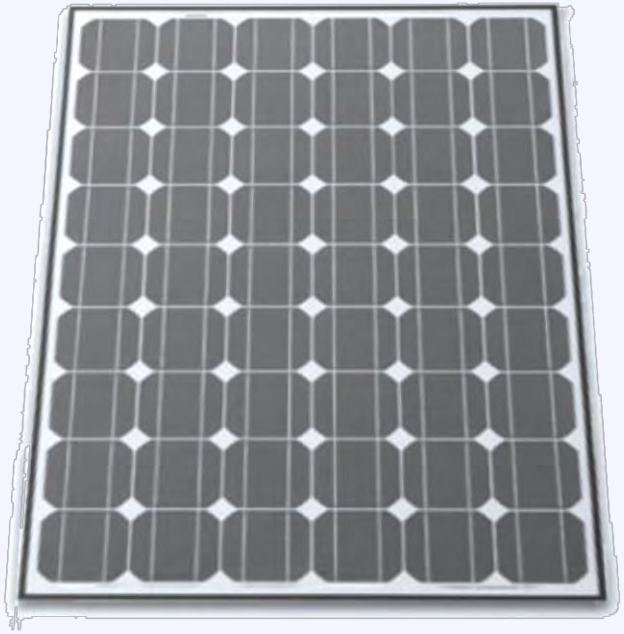


Array

Some Basic Terminology



Capacity / Power

kilowatt (kW)

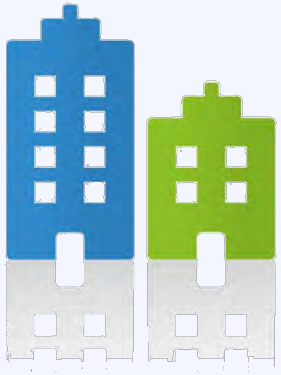
Production

Kilowatt-hour (kWh)

Some Basic Terminology

Residence
5 kW

Factory
1 MW+



Office
50 – 500 kW

Utility
2 MW+

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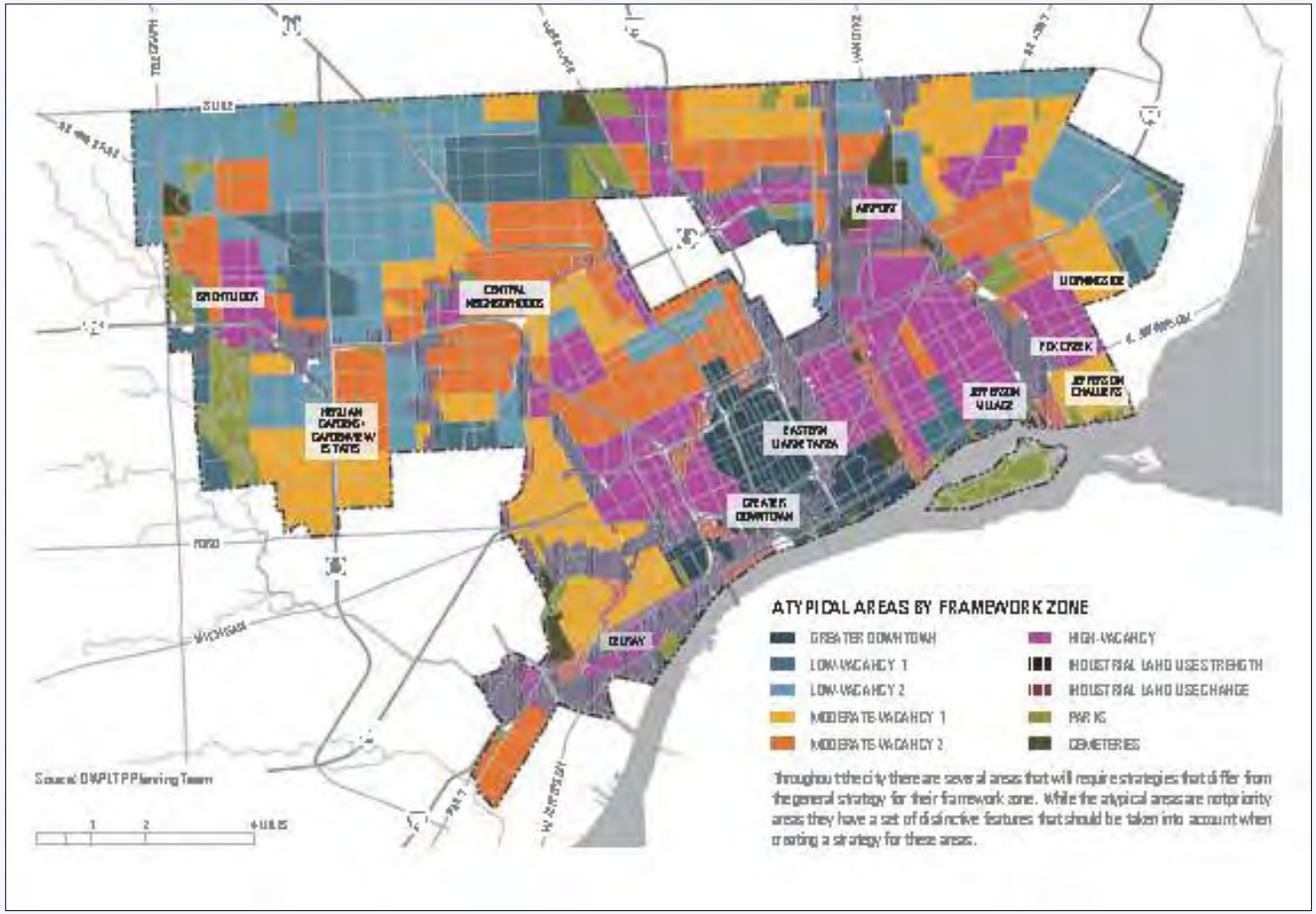
Planning for Solar on Vacant Land



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A Typology of Vacant Property

Unencumbered

REO Properties

Redfields

Grayfields

Brownfields

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The Role of Market Strength

Belmar in Lakewood, CO

vs.

Dixie Square Mall in Harvey, IL

Vacant Land Management in Strong Markets

High demand for conventional development

- Housing
- Offices
- Retail
- Factories

Vacant Land Management in Weak Markets

Clean and Green

Community Gardens

Phytoremediation

Rain Garden

Urban Orchard

Solar Farm

The Case for Solar Redevelopment

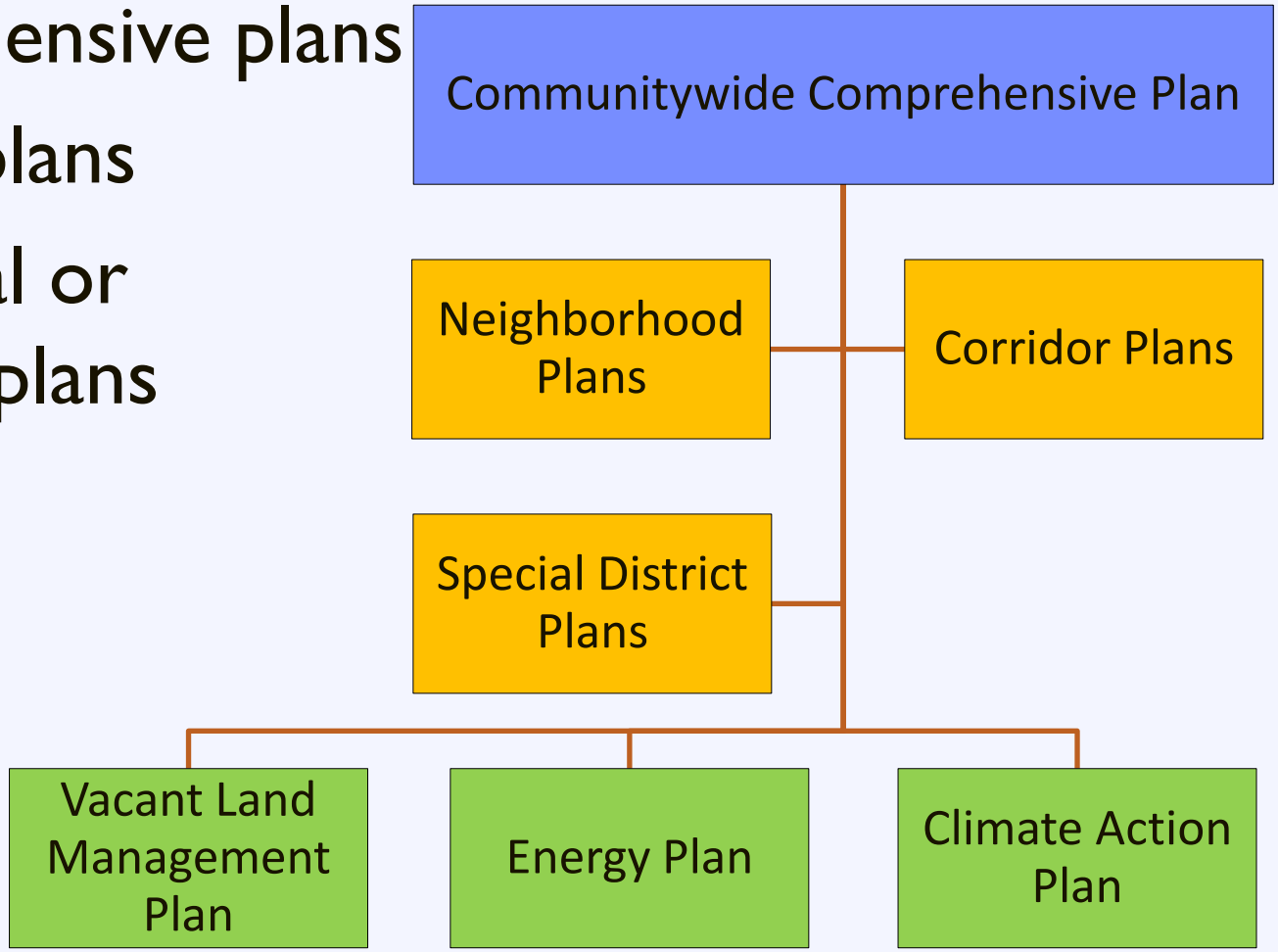
- Doesn't preclude other uses
- Provides an economi return
- Easily scalable
- Relatively uncontroversial

Community Visioning and Goal Setting

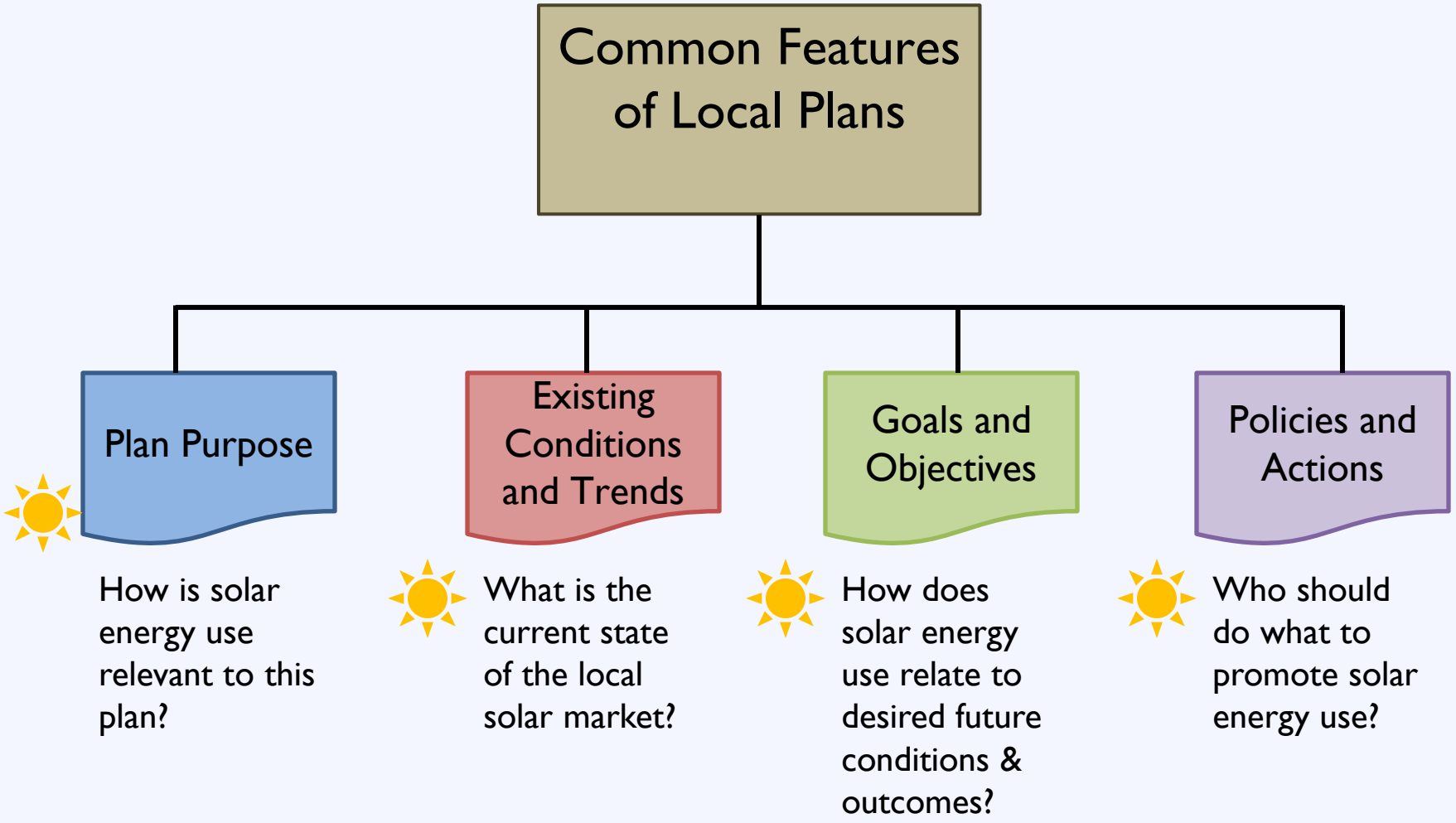
- Establishing community priorities for vacant land management
- Building consensus around goals related to solar energy use

The Role of Local Plans

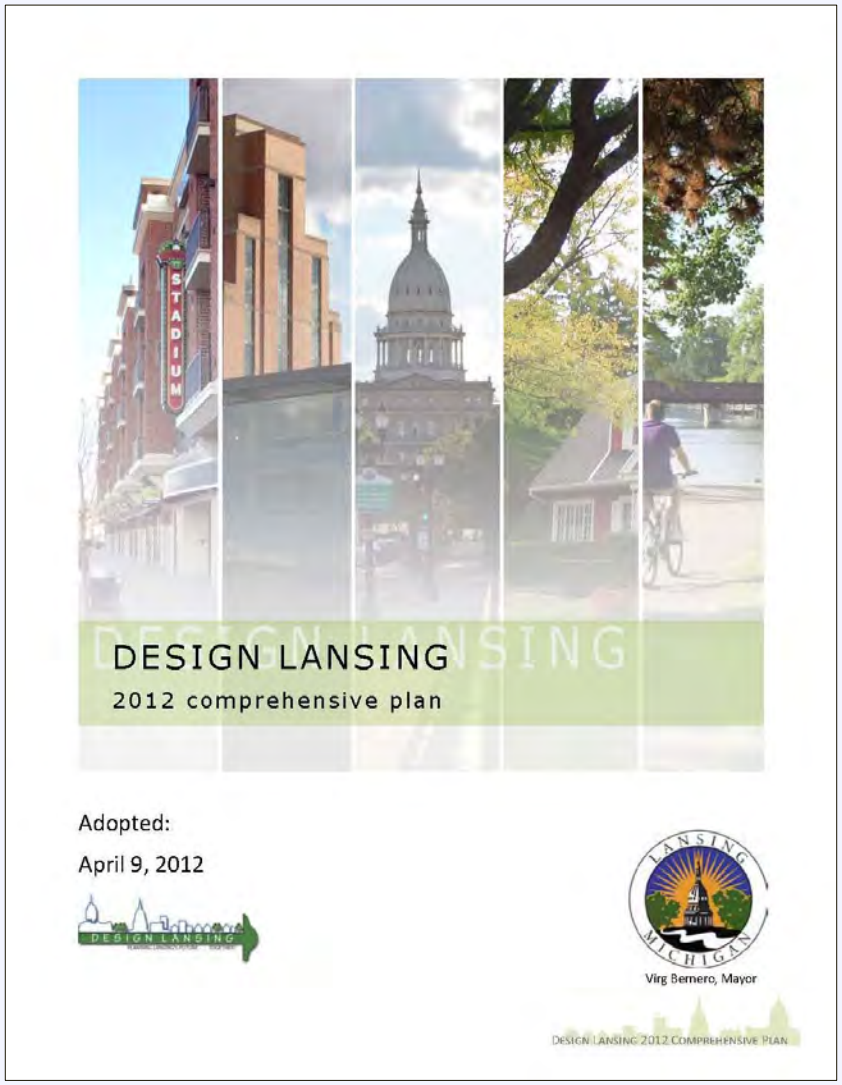
- Comprehensive plans
- Subarea plans
- Functional or strategic plans



Common Plan Features

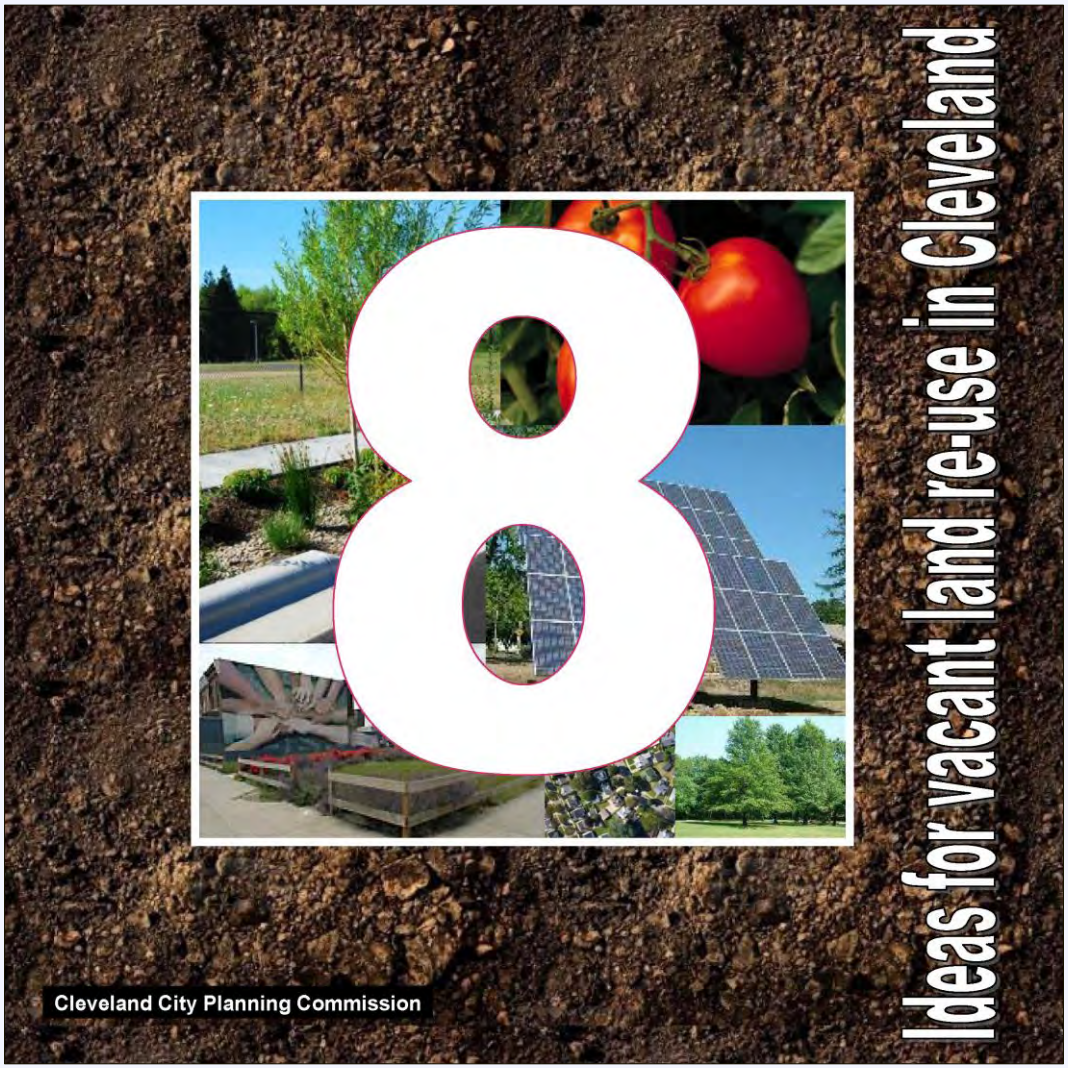


Comprehensive Plan: Lansing, MI



Subarea Plan: Old Brooklyn/Brooklyn Centre in Cleveland, OH

Strategic Plan: 8 Ideas for Vacant Land Reuse in Cleveland



The Role of Development Regulations

- Defining solar energy uses
  - Defining primary-use solar energy systems
  - Defining community solar projects
- Clarifying use permissions
  - Where will these uses be allowed?
  - Any use-specific limitations?

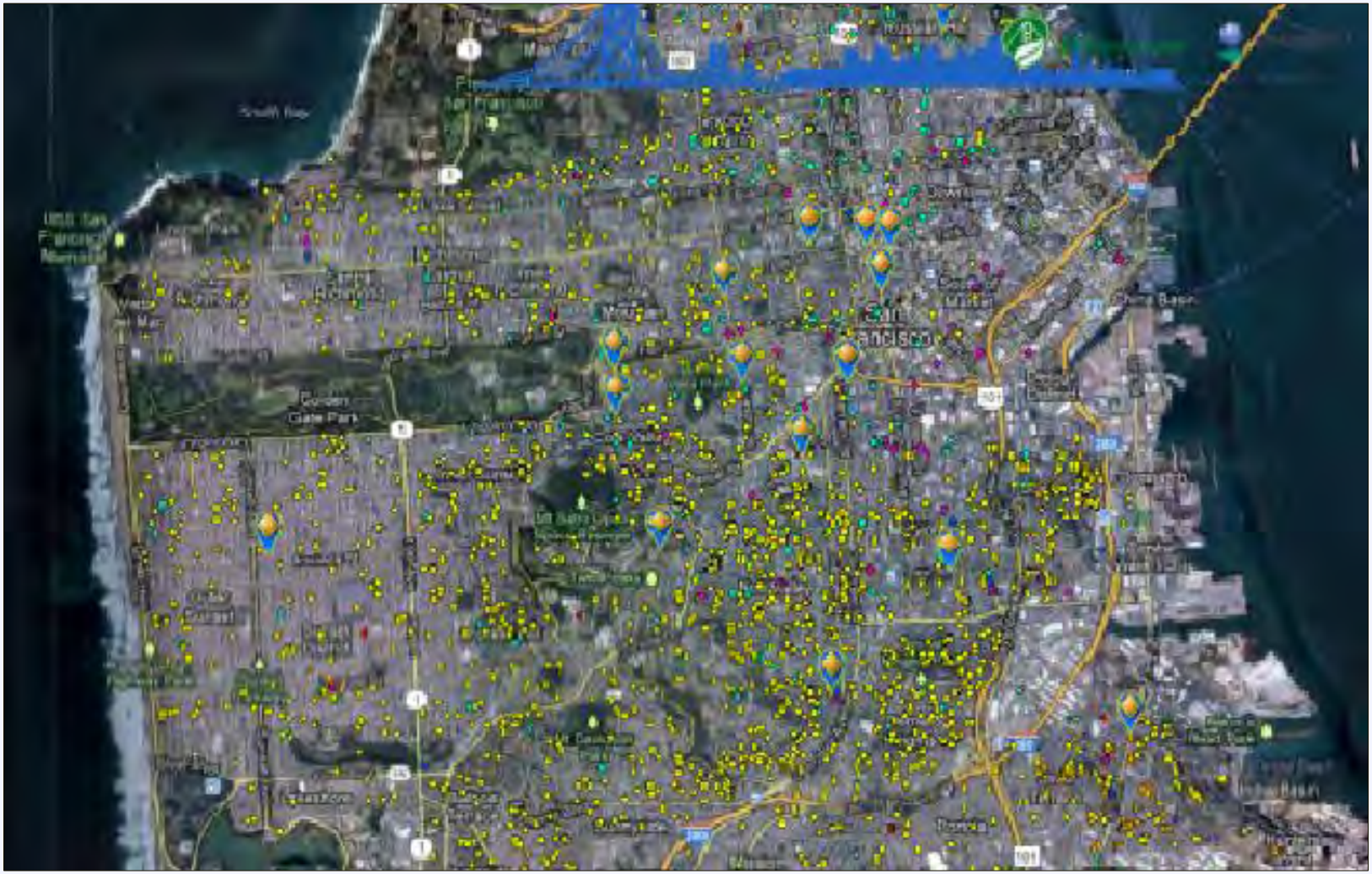
Enabling Urban Solar Farms: Milwaukee, WI

- Defines *solar farm* as "an array of multiple solar collectors on ground-mounted racks or poles that transmit solar energy and is the primary land use for the parcel on which it is located."
- Permits solar farms by right in all districts.

Sanctioning Community Solar: Baltimore, MD

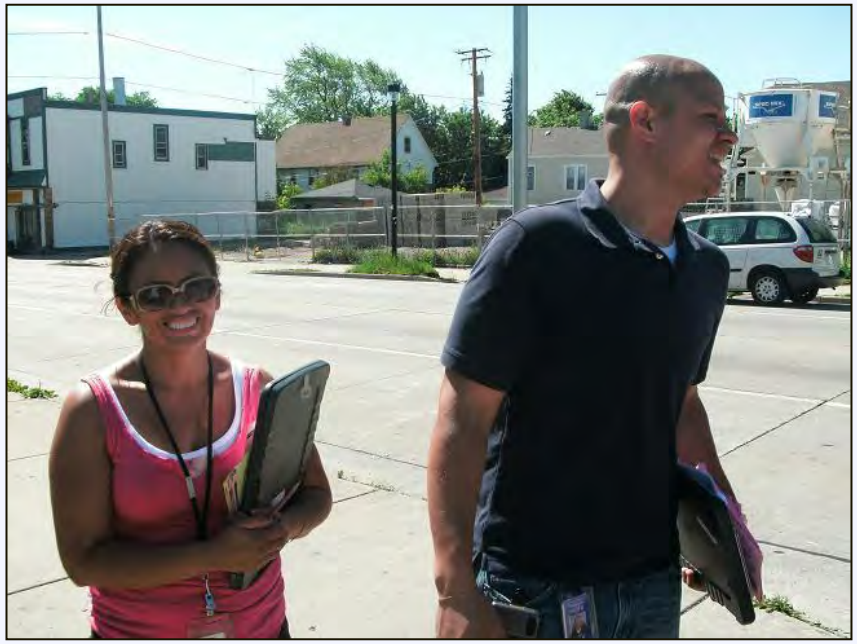
- Defines *community-based alternative energy systems* as "an alternative energy system that primarily produces energy for consumption on site by a property owner or for supply to an electric grid; and is supported by community members who purchase energy from the system and who might benefit financially from the system."
- Permits community solar by right in all districts, subject to setback, height, and screening requirements.

Identifying Opportunities



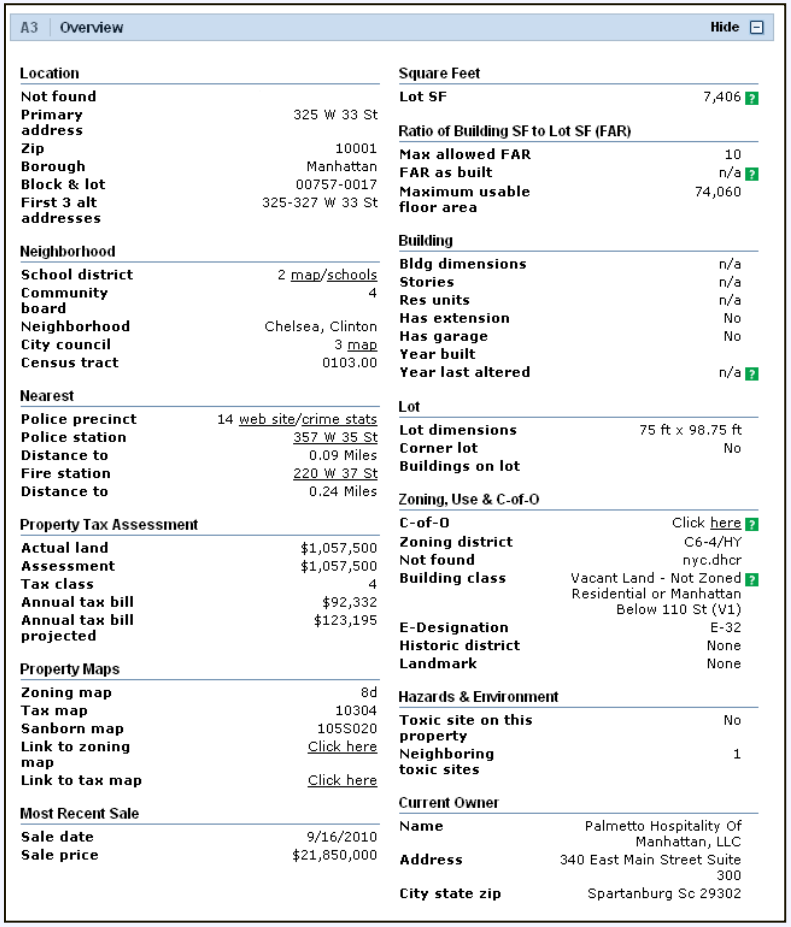
Inventorying Vacant Properties

- Federal brownfield lists
- State brownfield lists
- Local inventories



Real Property Databases

- Zoning
- Ownership
- Code violations
- Indicators of financial distress
- Prior use
- Environmental conditions



A3 Overview — Hide

Location

Not found	
Primary address	325 W 33 St
Zip	10001
Borough	Manhattan
Block & lot	00757-0017
First 3 alt addresses	325-327 W 33 St

Neighborhood

School district	2 map/schools
Community board	4
Neighborhood	Chelsea, Clinton
City council	3 map
Census tract	0103.00

Nearest

Police precinct	14 web site/crime stats
Police station	357 W 35 St
Distance to	0.09 Miles
Fire station	220 W 37 St
Distance to	0.24 Miles

Property Tax Assessment

Actual land	$1,057,500
Assessment	$1,057,500
Tax class	4
Annual tax bill	$92,332
Annual tax bill projected	$123,195

Property Maps

Zoning map	8d
Tax map	10304
Sanborn map	105S020
Link to zoning map	Click here
Link to tax map	Click here

Most Recent Sale

Sale date	9/16/2010
Sale price	$21,850,000

Square Feet

Lot SF	7,406

Ratio of Building SF to Lot SF (FAR)

Max allowed FAR	10
FAR as built	n/a
Maximum usable floor area	74,060

Building

Bldg dimensions	n/a
Stories	n/a
Res units	n/a
Has extension	No
Has garage	No
Year built	
Year last altered	n/a

Lot

Lot dimensions	75 ft x 98.75 ft
Corner lot	No
Buildings on lot	

Zoning, Use & C-of-O

C-of-O	Click here
Zoning district	C6-4/HY
Not found	nyc.dhcr
Building class	Vacant Land - Not Zoned Residential or Manhattan Below 110 St (V1)
E-Designation	E-32
Historic district	None
Landmark	None

Hazards & Environment

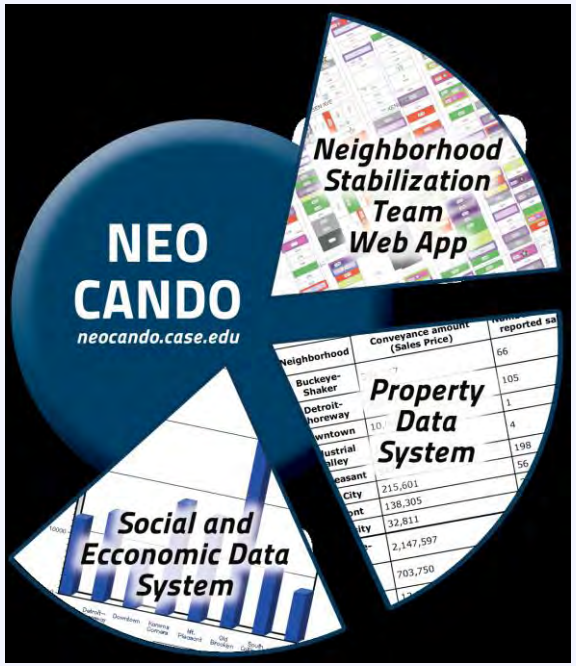
Toxic site on this property	No
Neighboring toxic sites	1

Current Owner

Name	Palmetto Hospitality Of Manhattan, LLC
Address	340 East Main Street Suite 300
City state zip	Spartanburg Sc 29302

Real Property Database: NEO CANDO

- Northeast Ohio Community and Neighborhood Data for Organizing
- Data includes
  - Census
  - Crime data from the Cleveland Police Department
  - Vital statistics from the Ohio Department of Health
  - Property characteristics and sales information from the Cuyahoga County Auditor and Recorder
  - Public assistance data from Cuyahoga County Employment and Family Services
  - Juvenile delinquency data from the Cuyahoga County Juvenile Court
  - Child maltreatment data from the Cuyahoga County Department of Children and Family Services
  - Mortgage lending data (HMDA) from the FFIEC
  - Enrollment and attendance from the Cleveland Municipal School District



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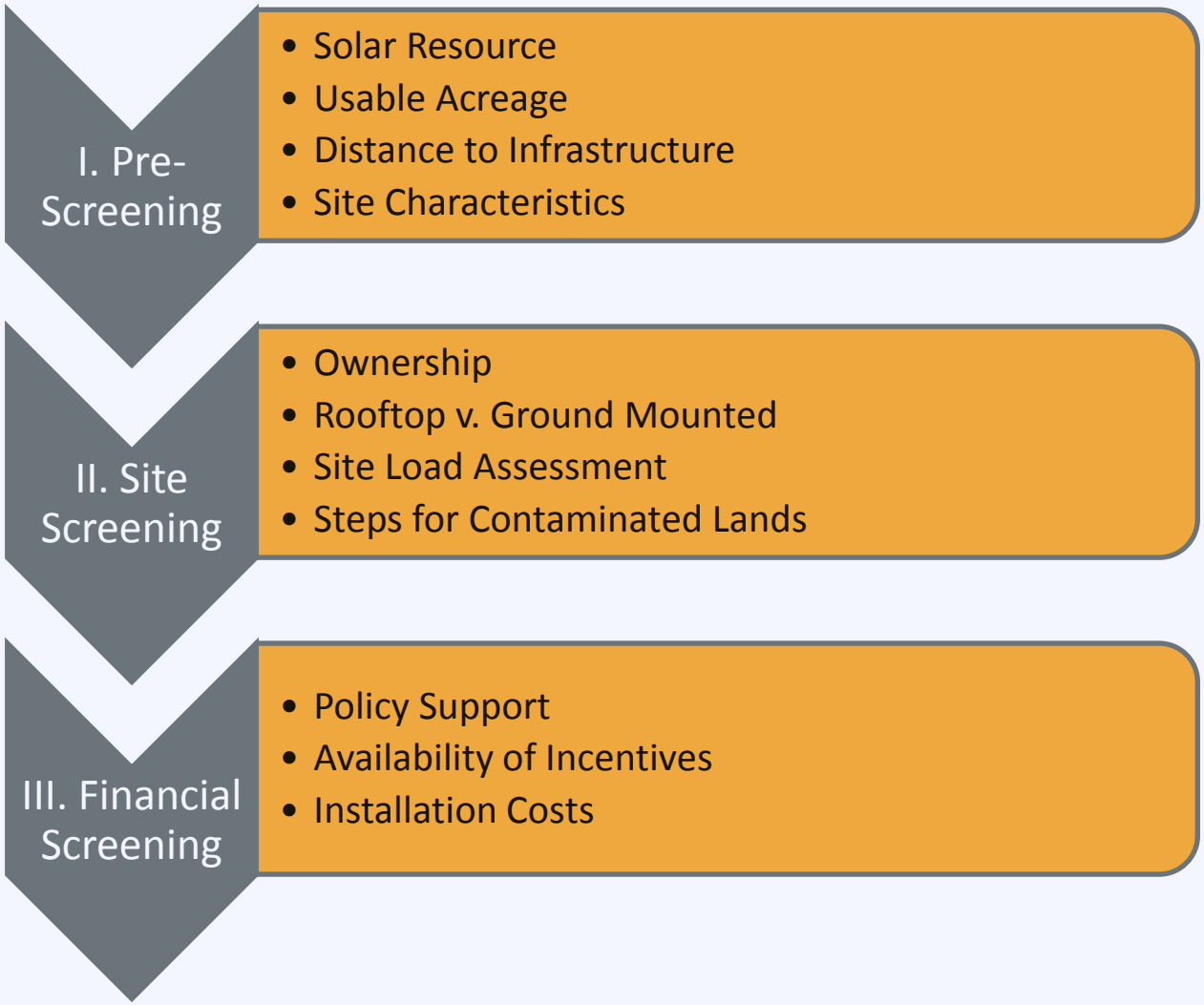
RE-Powering America's Land: Solar Decision Tree



www.epa.gov/oswercpa/docs/solar_decision_tree.pdf

I. Pre-Screening

Solar Resource

> 3.5 kWh/m^2/day

Acreage

Prioritize Sites:

≥ 5 acres

≥ 2 but < 5 acres

Estimate 5 acres per MW

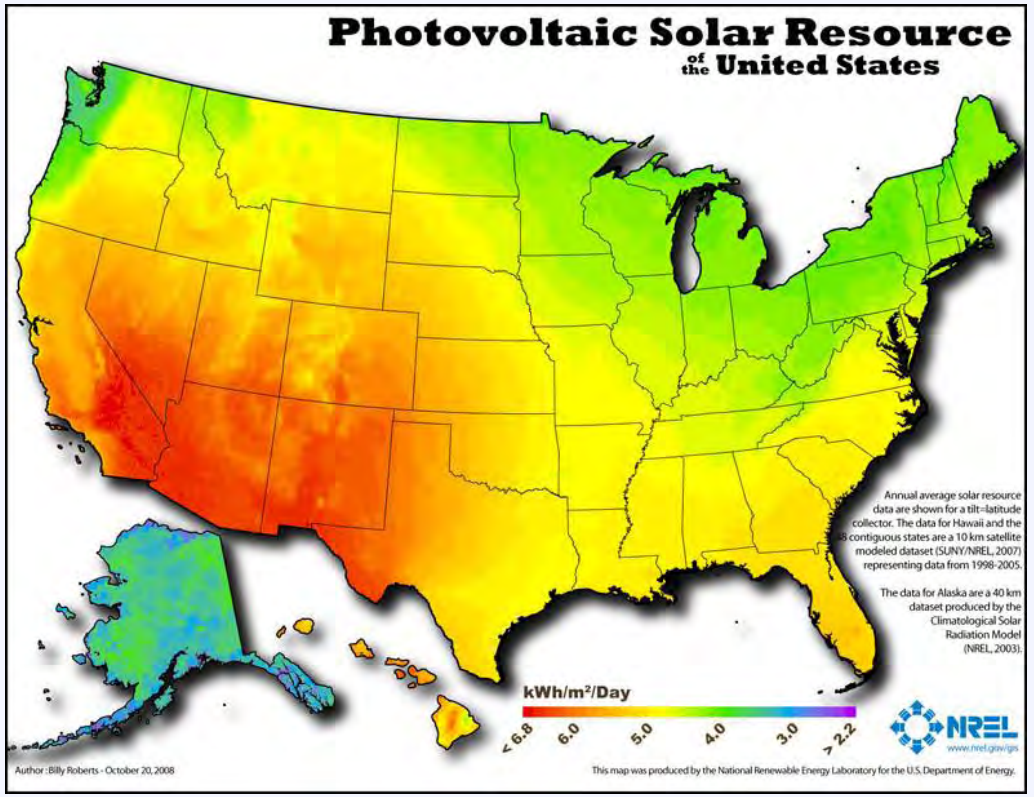


Image source: www.nrel.gov/gis/images/map_pv_national_lo-res.jpg

I. Pre-Screening

Distance to Grid Infrastructure

< ½ mile to transmission or distribution lines

Distance to Graded Road

<1 mile to road access

Site Slope

Less than 6 degrees (~10% grade)

Site Shading

6 hours of sunlight; 1:1 setback; 2 acres unshaded

II. Site Screening

Ownership

Does municipality own the land? If private owner, must gauge interest in selling/developing for solar

Rooftop vs. Ground Mounted

Rooftop requires sound existing structure not slated for demolition for 25+ years

Site Load Assessment

Average Retail Price of Electricity > $0.08/kWh

On-site load = Net Metering

Off-site load = *Virtual* Net Metering or off-taker

II. Site Screening

Considerations for Landfills

Site feasibility is influenced by a number of unique factors:

- Landfill Closure Status
- Landfill Cap and Liner
- Redevelopment Restrictions

  Covenants or Easements

  Restrictive Closure Permits

  Local Zoning or Building Codes

- Certain Ground Conditions

  No uniform soil settling

  Insufficient weight bearing capacity

  Installation violates erosion controls

  Incompatible gas or leachate management practices

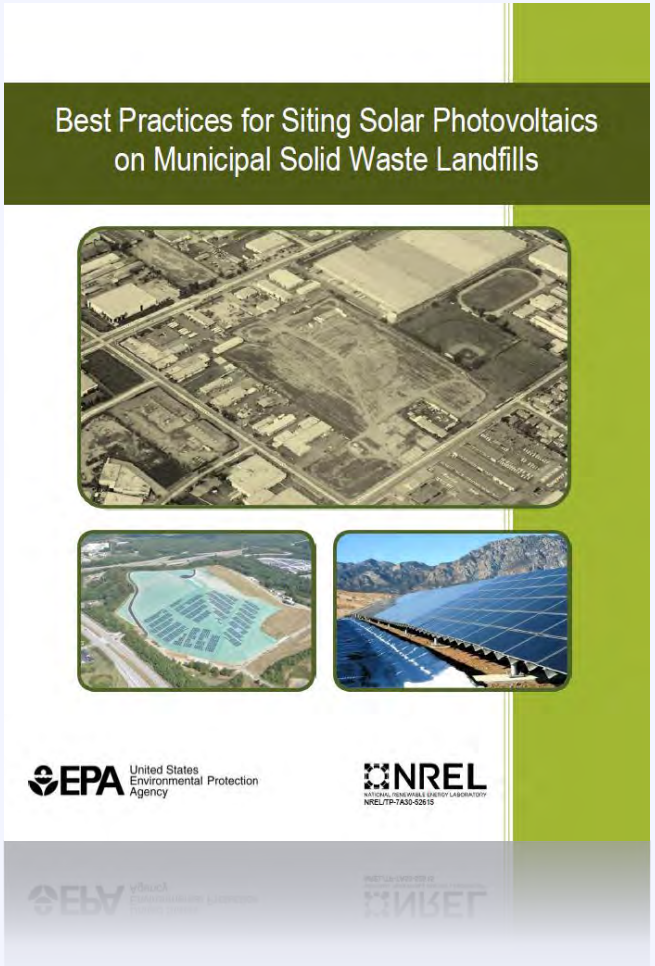
II. Site Screening

Resource

Best Practices for Siting Solar Photovoltaics on Municipal Solid Waste Landfills

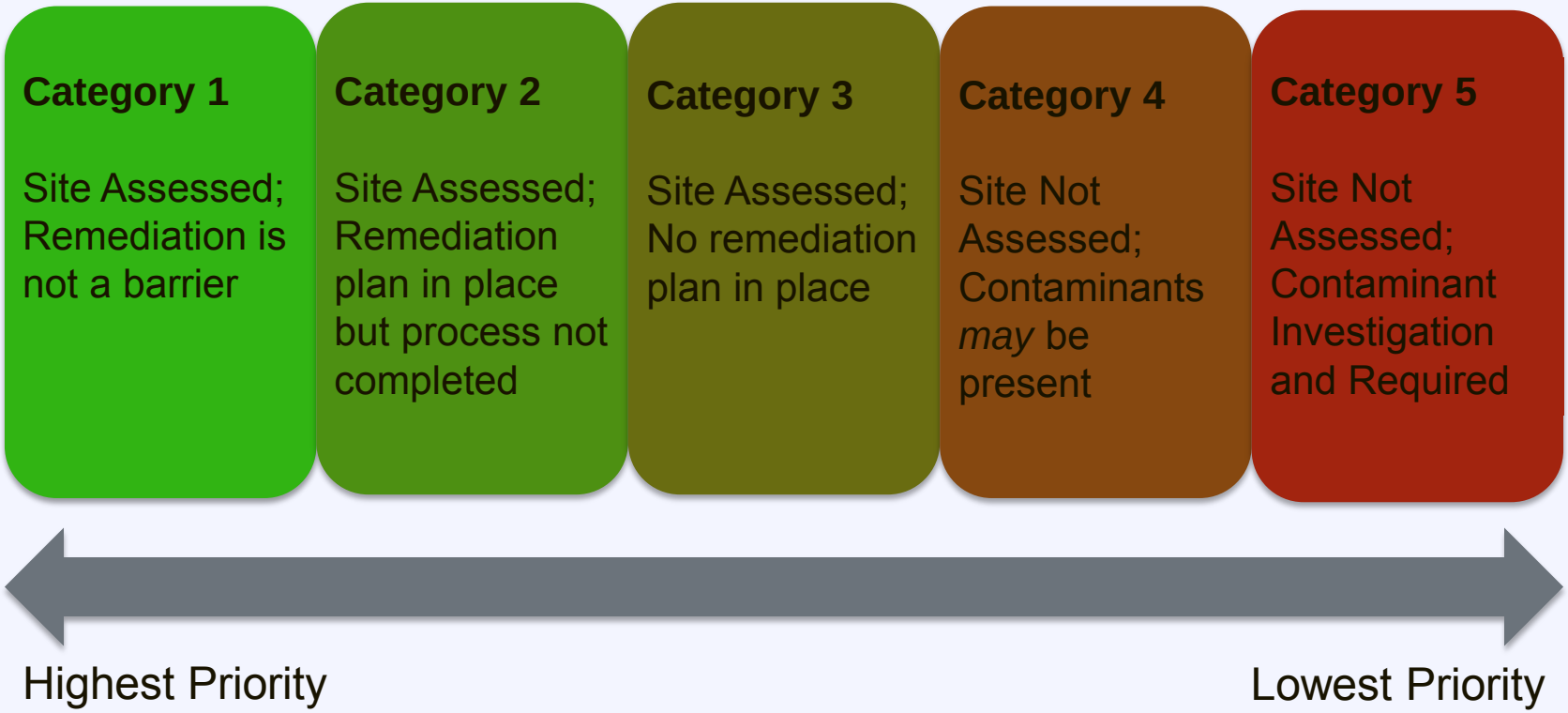
A comprehensive guide covering PV technology, unique site feasibility criteria, and system design considerations.

www.epa.gov/renewableenergyland/docs/best_practices_siting_solar_photovoltaic_final.pdf



II. Site Screening

Potentially Contaminated Sites



III. Financial Screening

Incentives

- Federal ITC/ MACRS
- QECBs
- State RPS/ SRECs
- Rebates
- Tax Credits
- Feed-in Tariffs

Policy Support

- Third Party Ownership
- PACE
- (Virtual) Net Metering

Installed Costs

- Large Commercial
- (> 100kW)
- $2.25 - $2.75/W

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The Solar Equation

Cost

+ Installed Cost

+ Maintenance

- Direct Incentive

Benefit

+ Avoided Energy Cost

+ Excess Generation

+ Performance Incentive

The Solar Equation

Cost

+ Installed Cost

+ Maintenance

- Direct Incentive

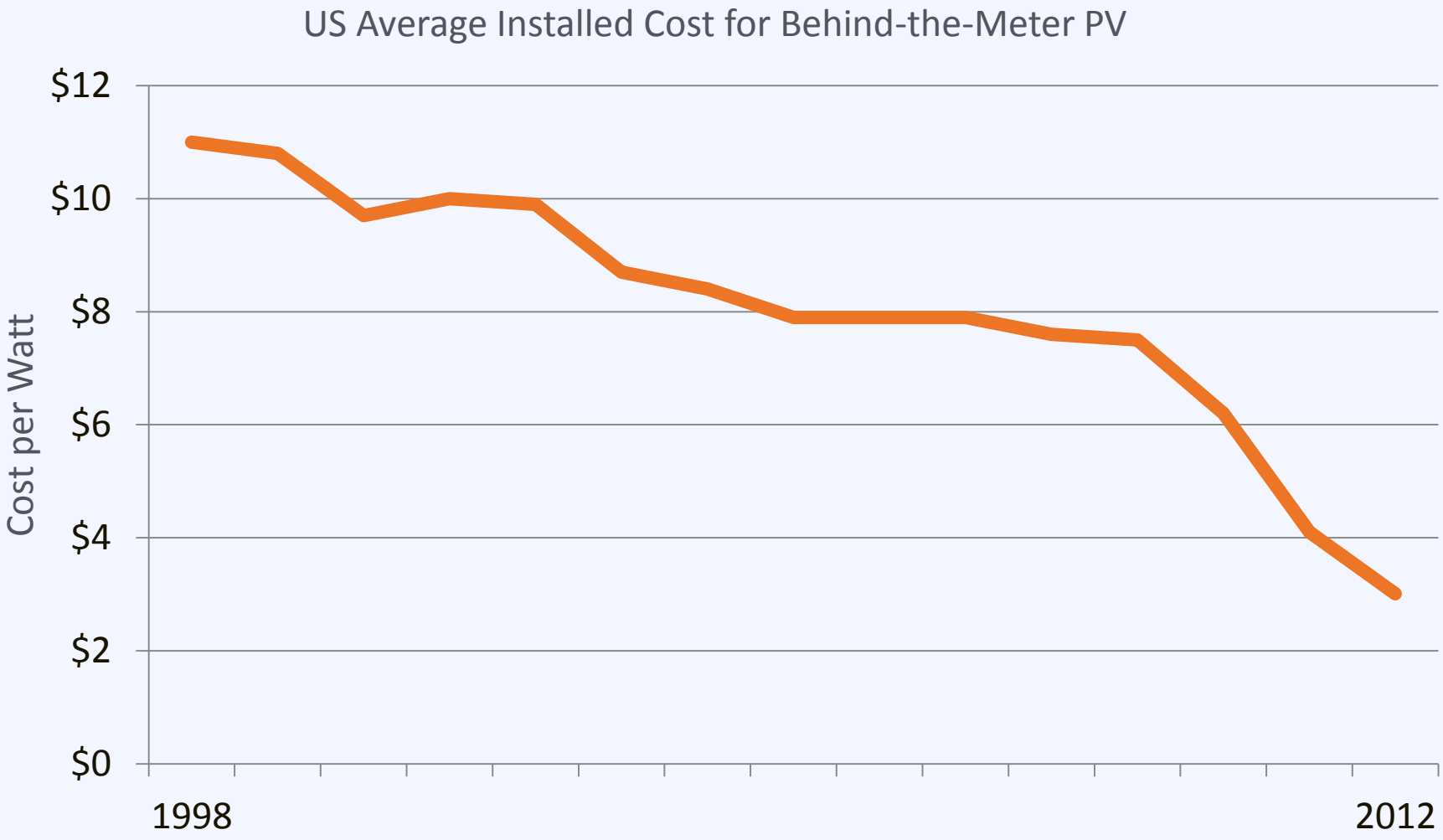
Benefit

+ Avoided Energy Cost

+ Excess Generation

+ Performance Incentive

The Cost of Solar



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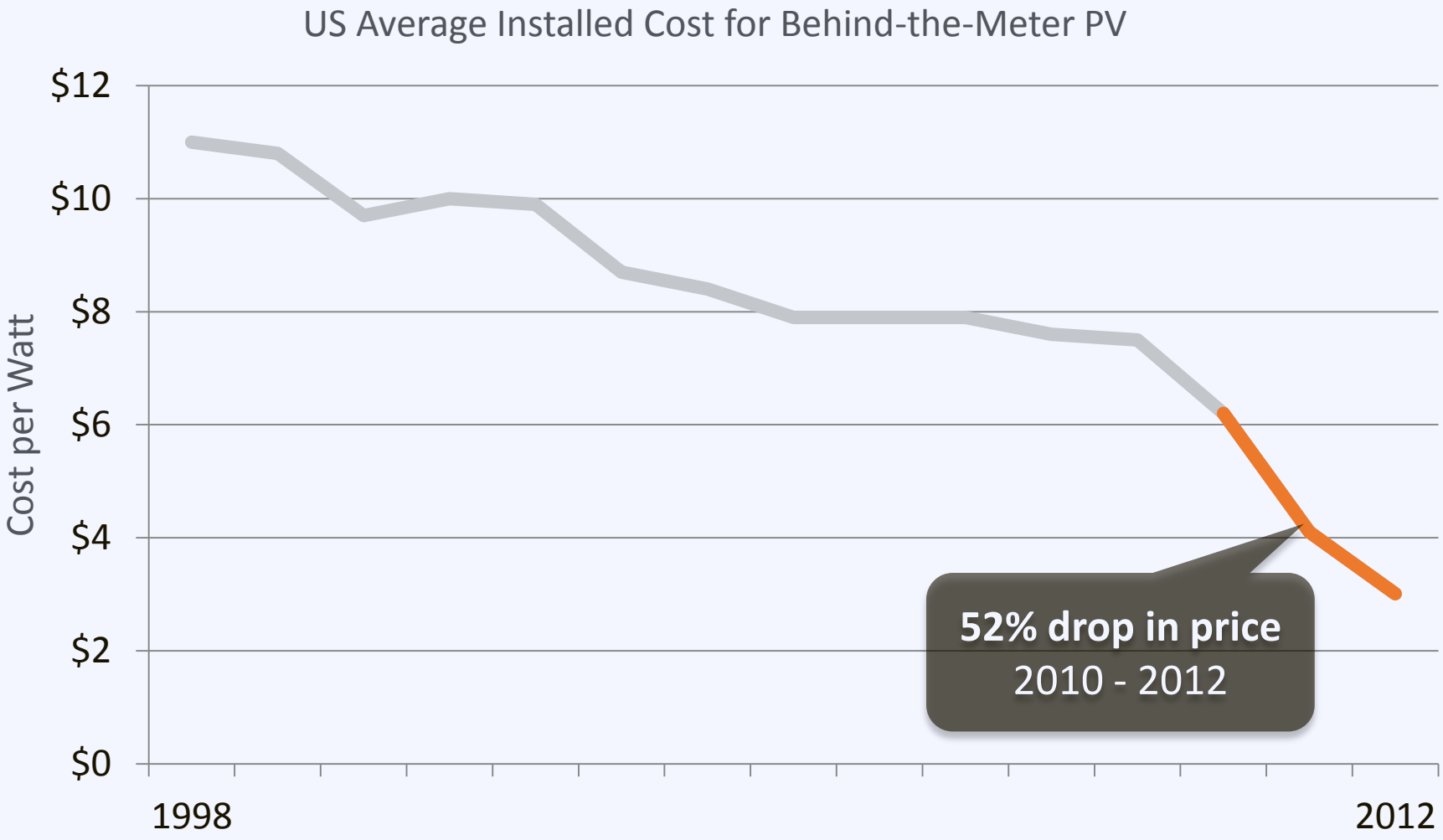
The Cost of Solar



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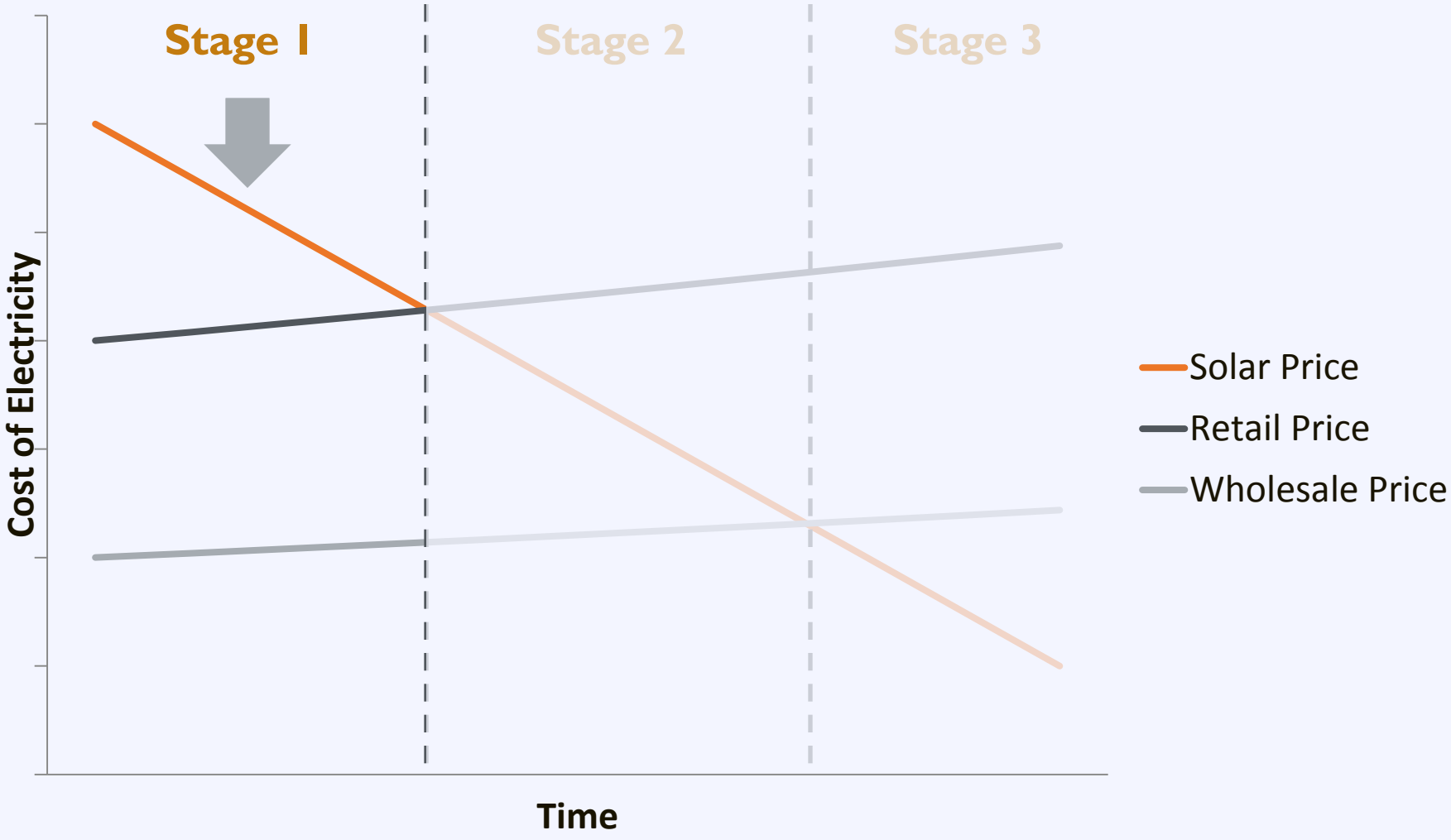
Solar Market Stages



Source: Solar Electric Power Association

The Solar Equation

Cost

+ Installed Cost

+ Maintenance

- Direct Incentive

Benefit

+ Avoided Energy Cost

+ Excess Generation

+ Performance Incentive

Incentives: Solar

Federal	Investment Tax Credit	Qualified Energy Conservation Bonds	Accelerated Depreciation	
State	Tax Credits	Tax Exemptions	Property Assessed Clean Energy	
Utility	Renewable Energy Credits	Net Metering	Rebates	Feed-in Tariff

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Investment Tax Credit

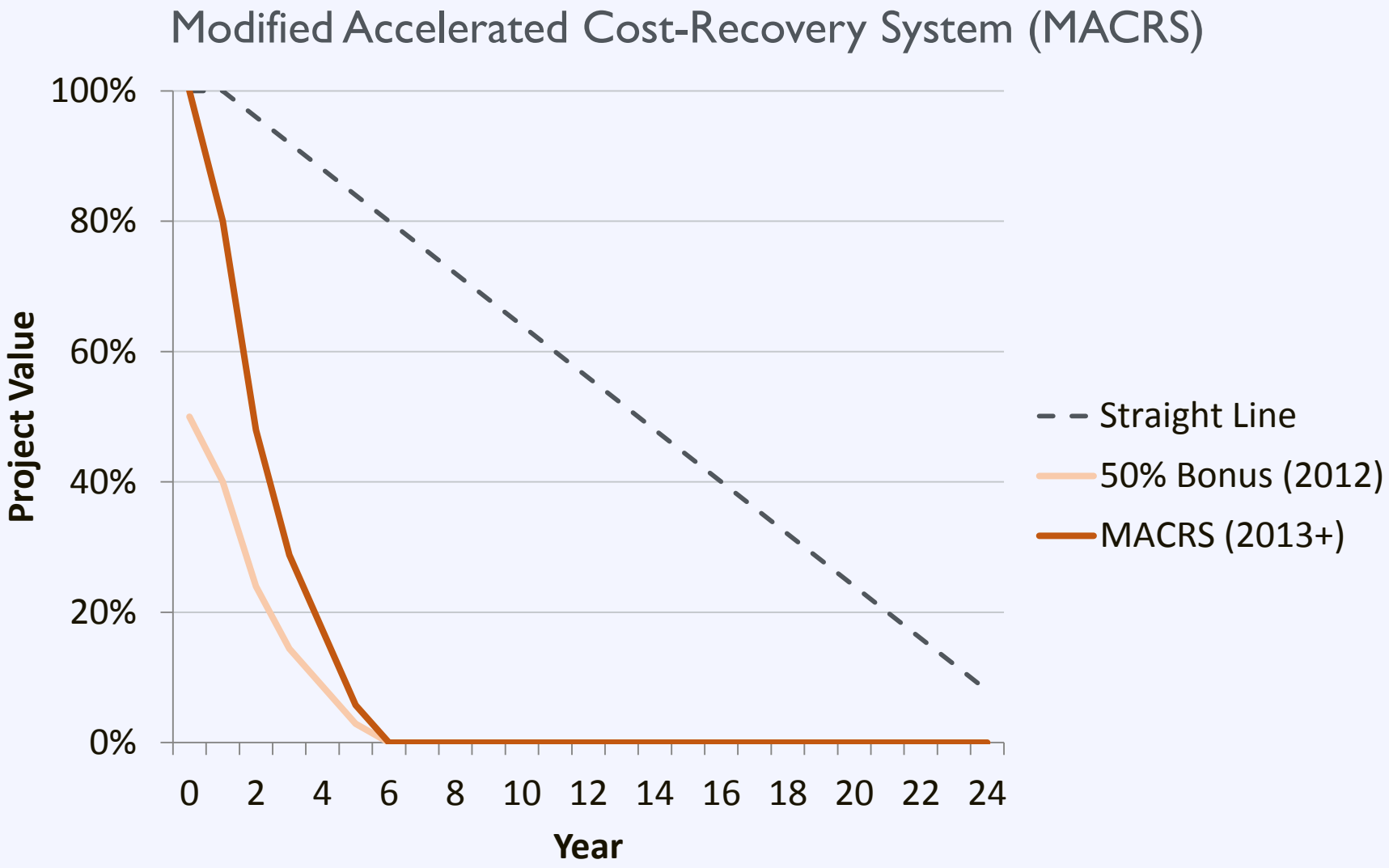
Type: Tax Credit

Eligibility: For-Profit Organization

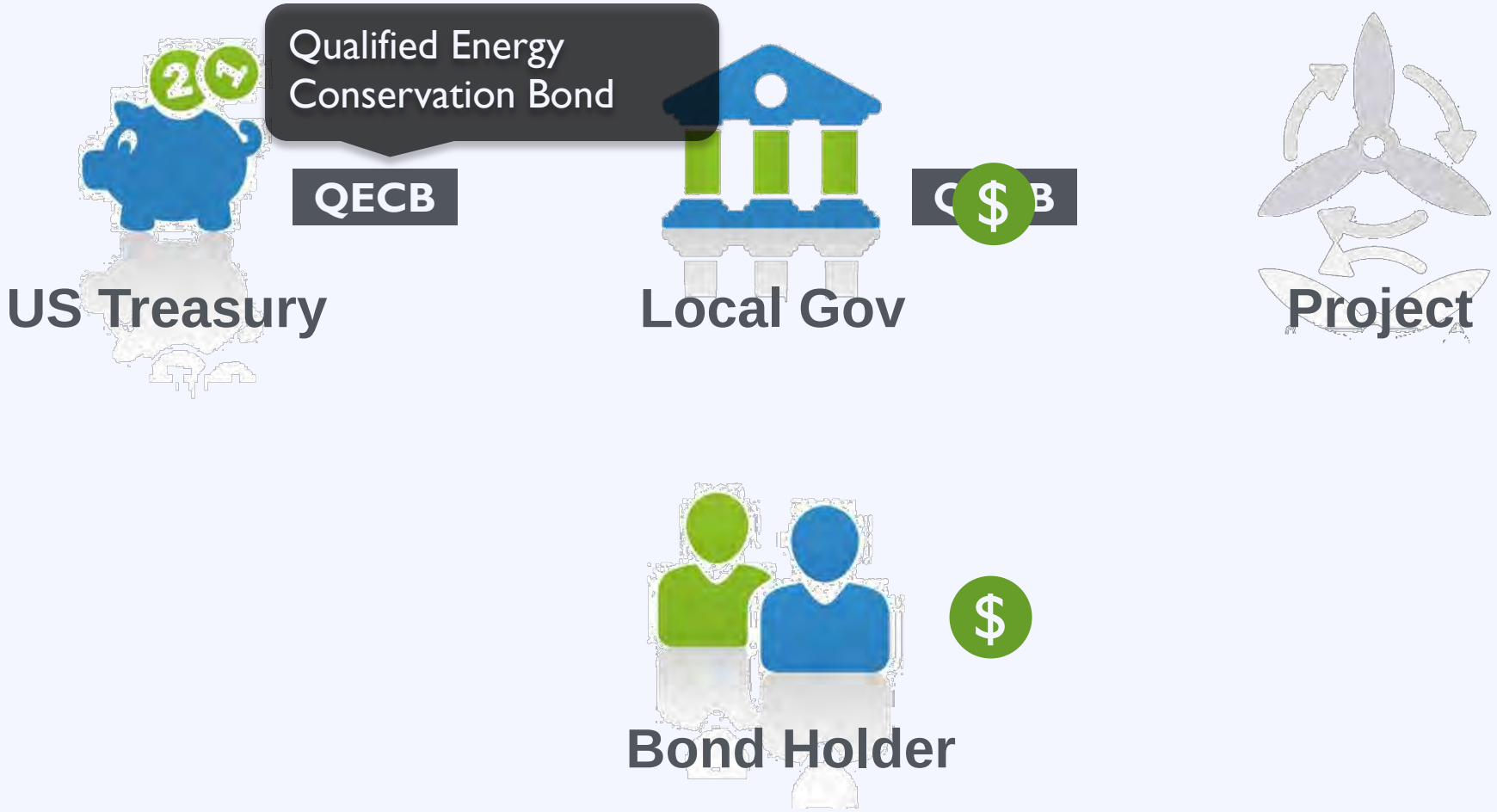
Value: 30% of the installation cost

Availability: Through 2016

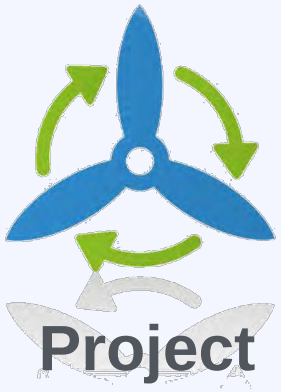
Accelerated Depreciation



Qualified Energy Conservation Bond



Qualified Energy Conservation Bond



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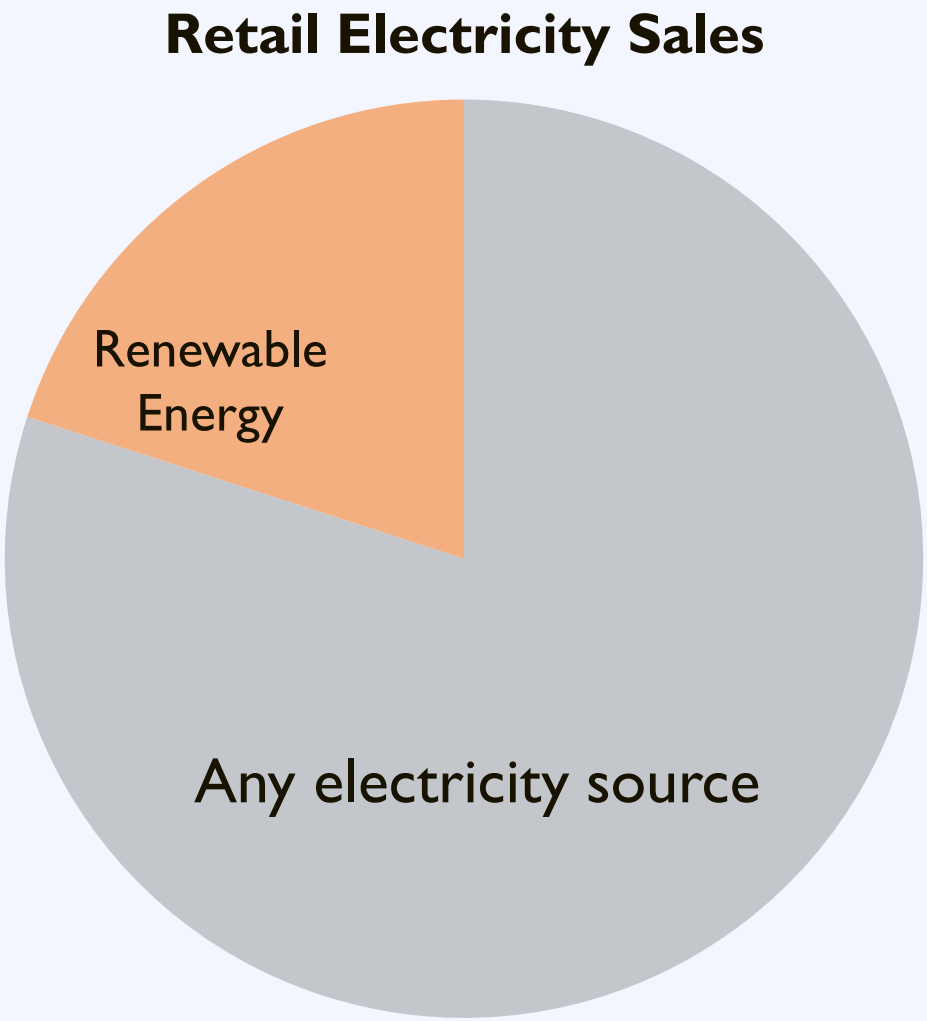
Renewable Portfolio Standard



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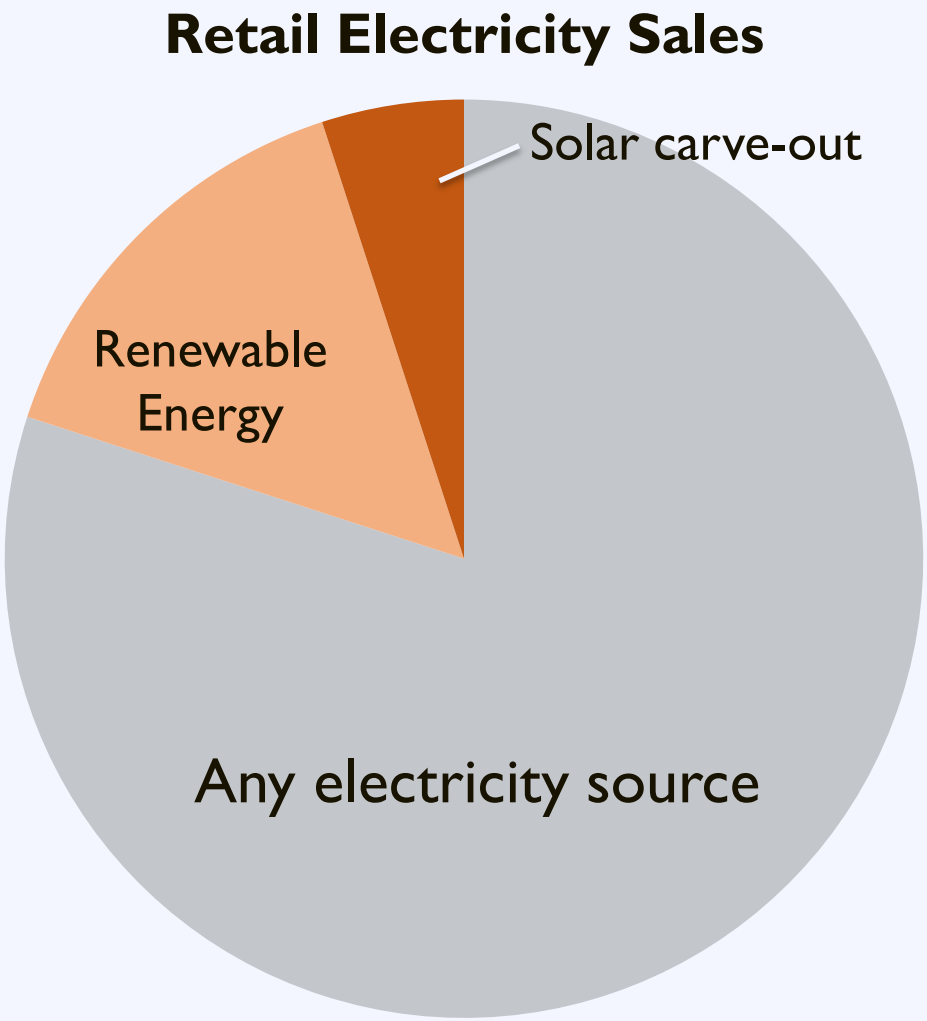

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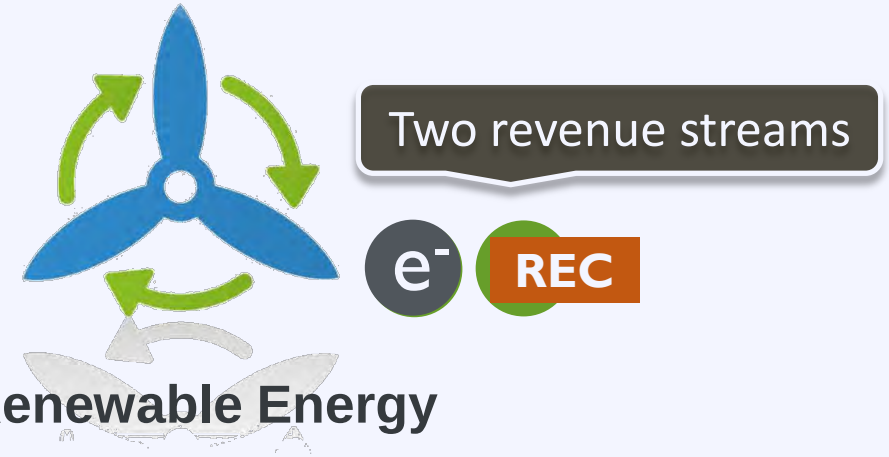
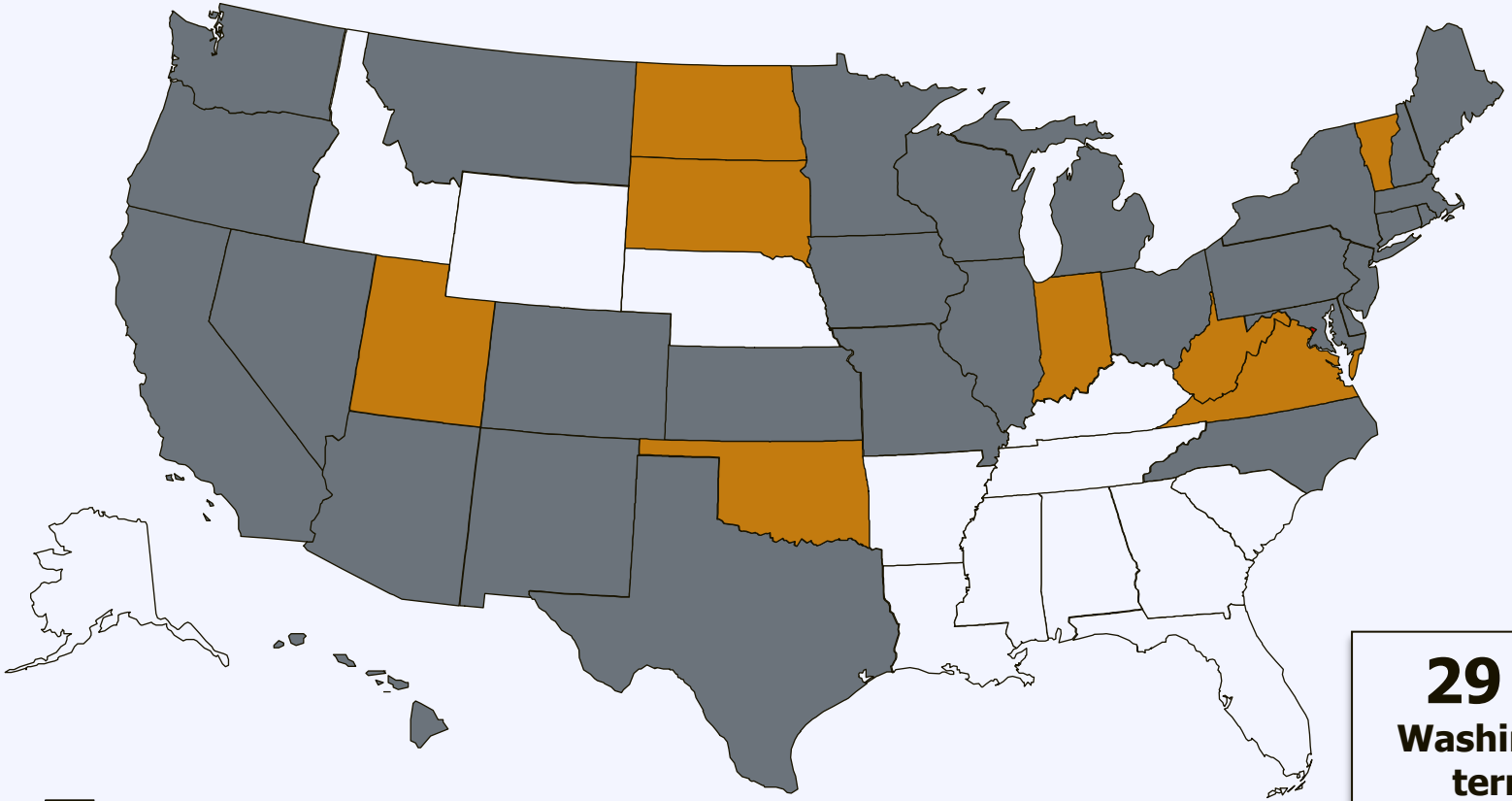


Renewable Portfolio Standard

www.dsireusa.org / March 2013



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

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U.S. Department of Energy

Net Metering

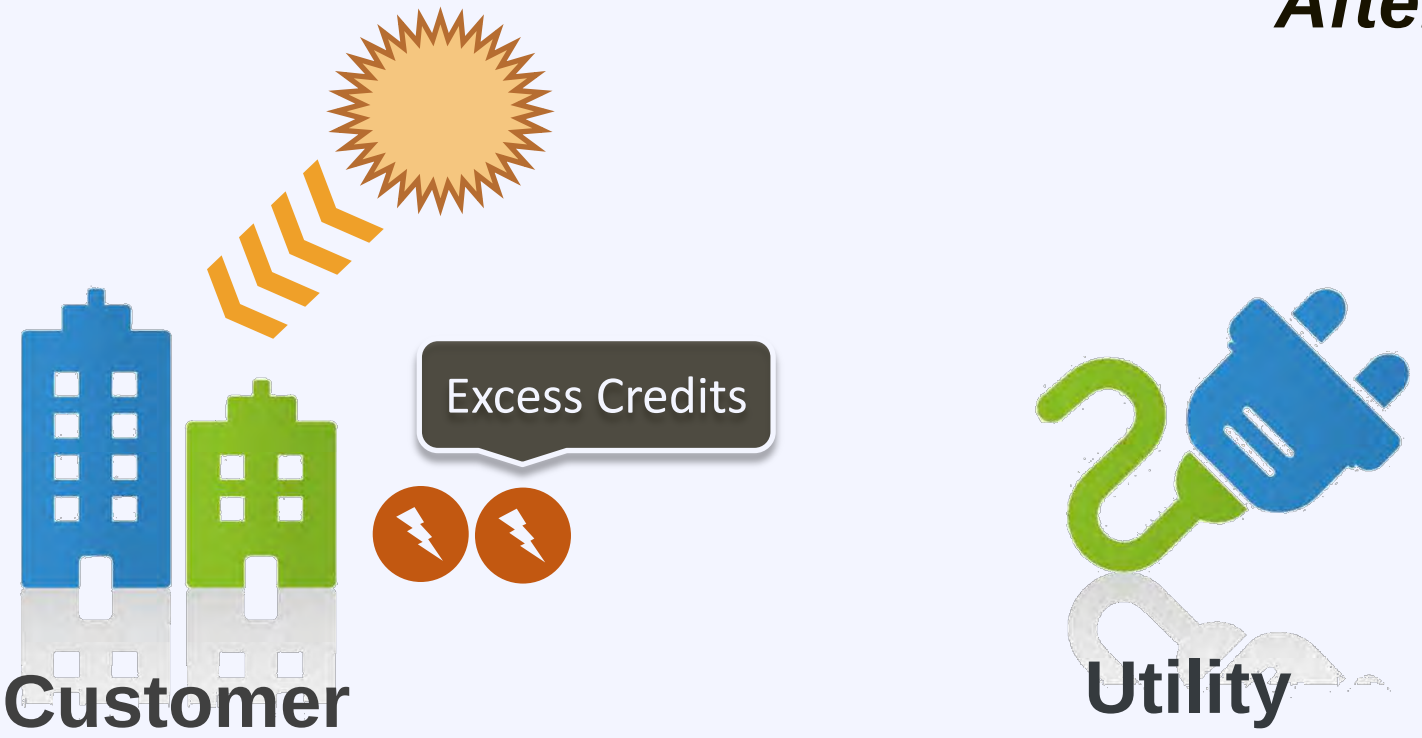
Net metering allows customers to export power to the grid during times of excess generation, and receive credits that can be applied to later electricity usage

Net Metering: Overview

Morning

Net Metering: Overview

Afternoon



Net Metering: Overview

Night

Customer

Utility

Solar covers 100% of the customer's load, even at night!

Net Metering: Market Share

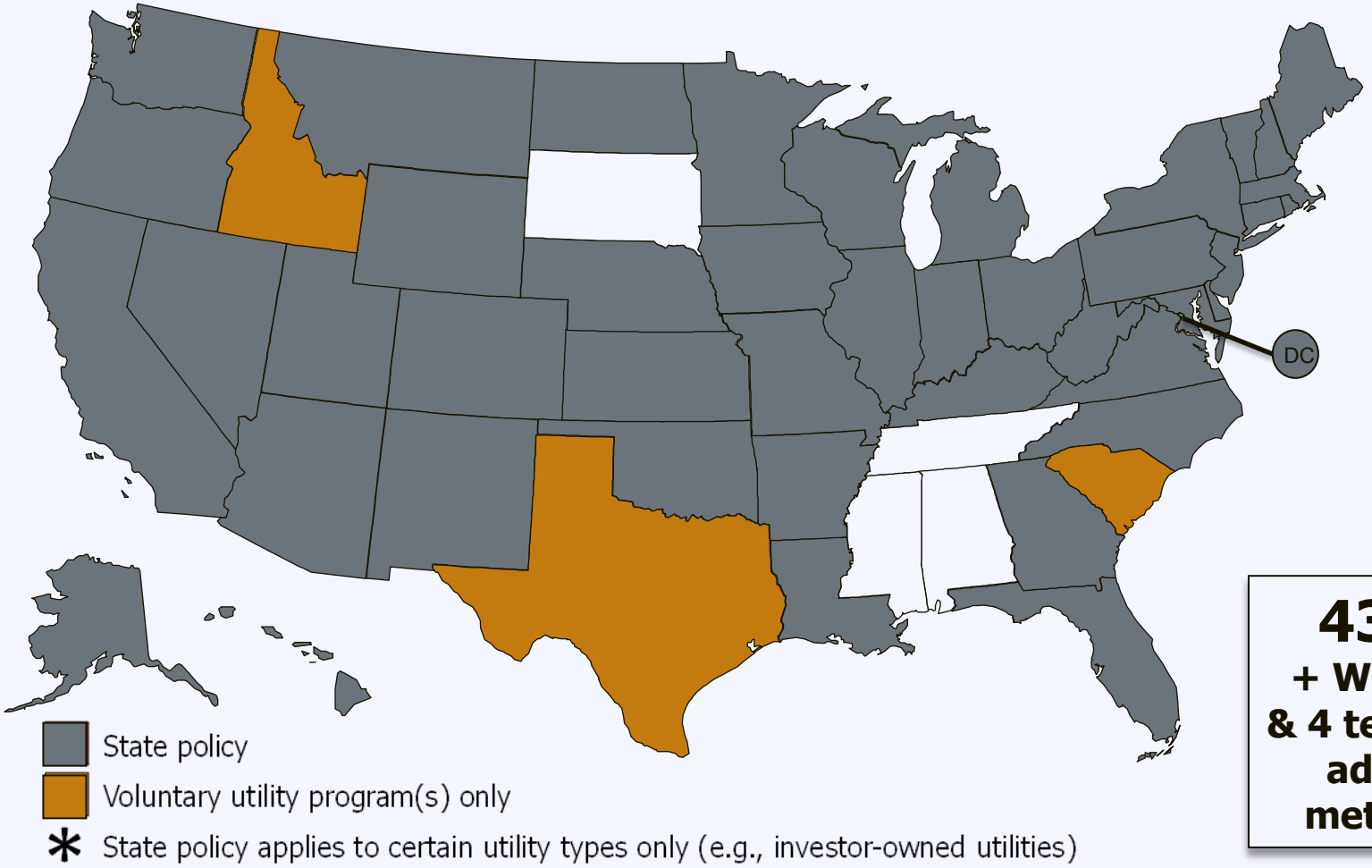
More than **93%** of distributed PV Installations are net-metered

Powered by SunShot U.S. Department of Energy

Source: IREC (http://www.irecusa.org/wp-content/uploads/IRECSolarMarketTrends-2012-web.pdf)

Net Metering: State Policies

www.dsireusa.org / August 2012



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

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

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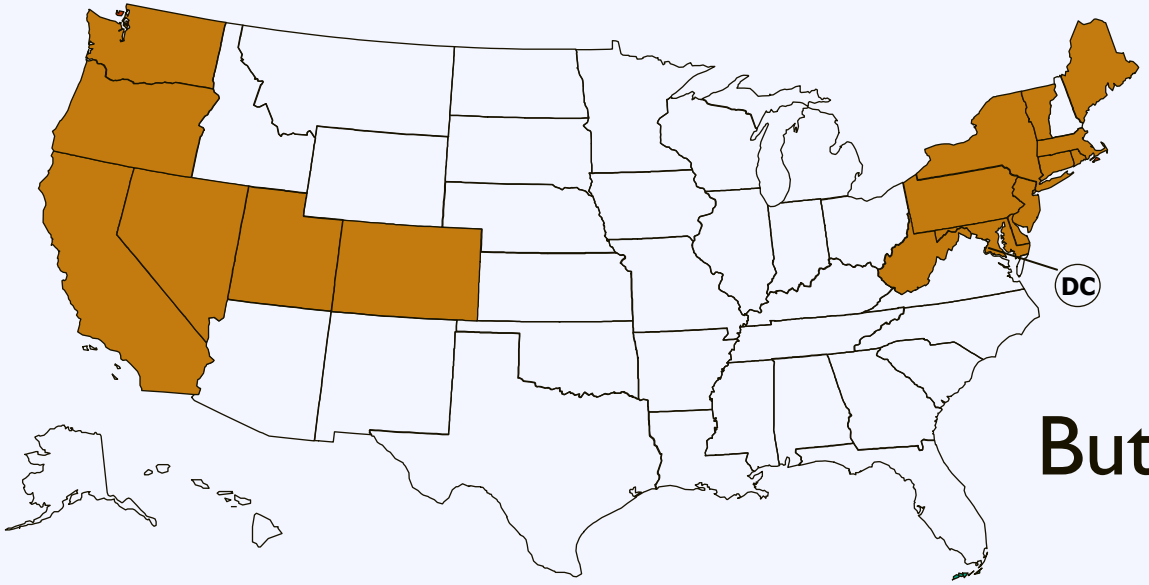
U.S. Department of Energy

Net Metering: Virtual

Net Metering: Meter Aggregation



But…It's complicated

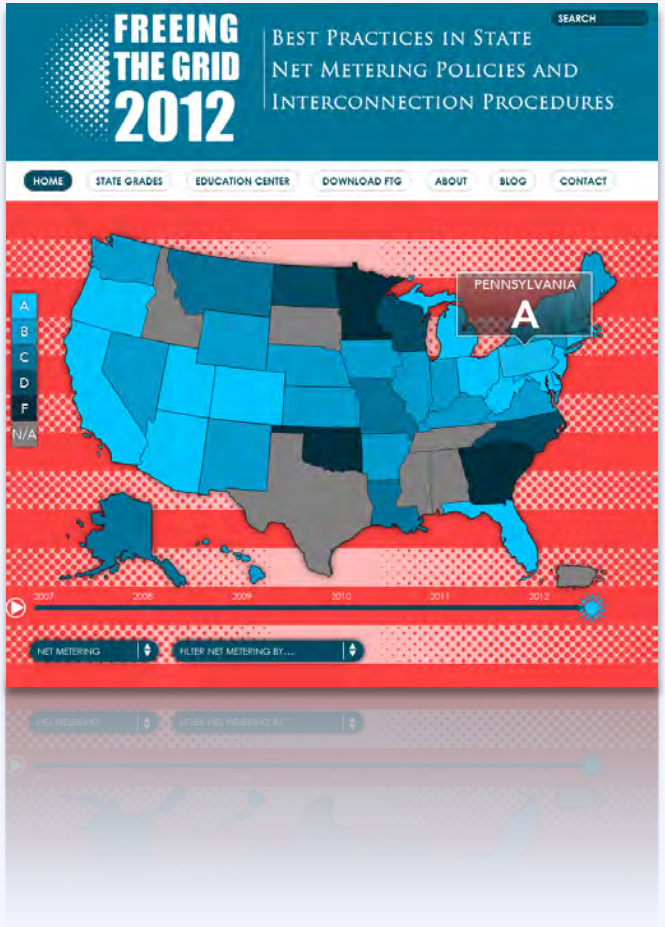
- Ownership requirements
- Contiguous vs. non-contiguous properties
- Multiple customers
- Multiple generators
- Modified system/aggregate system size limits
- Rollover rates
- Distance limitations
- Number of accounts
- How to address accounts on different tariffs

Net Metering: Resources

Resource **Freeing the Grid**

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

http://freeingthegrid.org/



Incentives: Brownfields

Federal	Environmental Protection Agency	Housing and Urban Development	Economic Development Administration
State	Gap Financing	Voluntary Cleanup	Technical Assistance
Local	Revolving Loans	Tax Abatements	Tax Increment Financing

Incentives: Brownfields

Federal	Environmental Protection Agency	Housing and Urban Development	Economic Development Administration
	Areawide Planning Grants	Community Development Block Grants	Public Works
	Assessment Grants	Section 108 Loan Guarantees	ED Planning Assistance
	Cleanup Grants	Brownfields EDI	Global Climate Change Mitigation Incentive Fund
	Revolving Loans		

Ownership Options

Direct Ownership

Third-Party Ownership

Direct Ownership

- Balance Sheet
- Debt (Bonds)

Direct Ownership

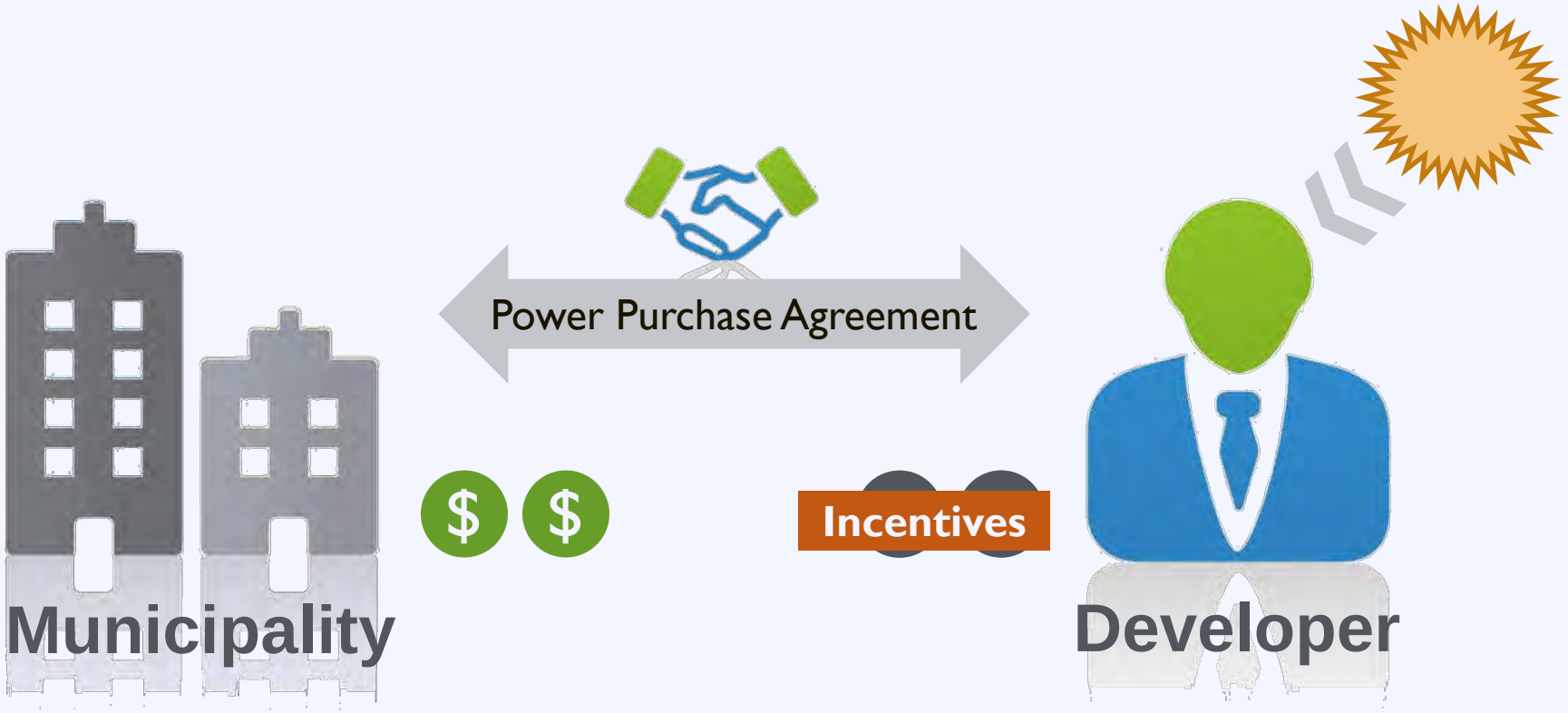
Pros

- Low – cost electricity
- REC revenue
- Utilize cheap bond money

Cons

- Large upfront cost
- Long term management
- Can't take tax benefits
- Development risk
- Performance risk

Third Party Ownership



Third Party Ownership

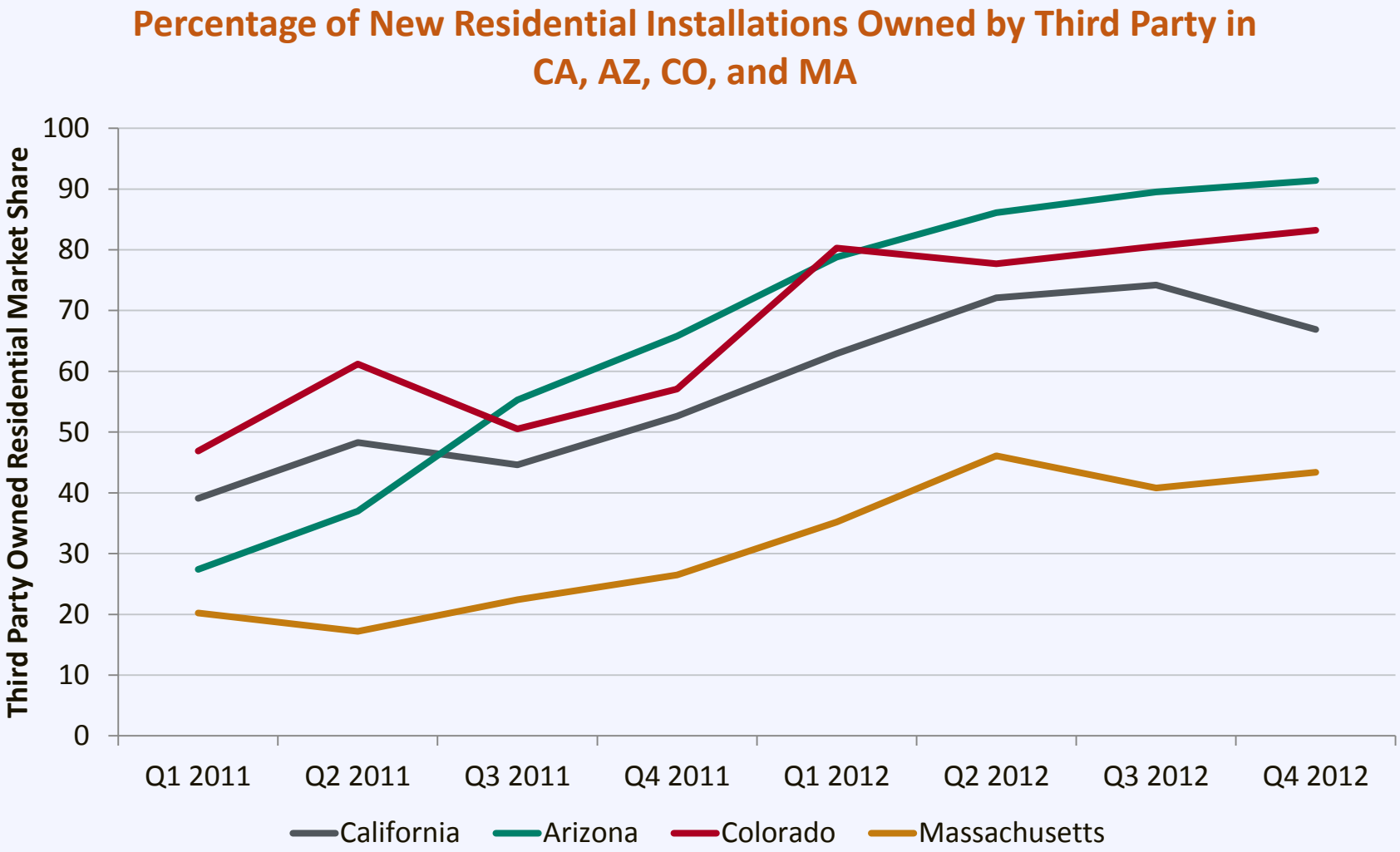
Pros

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

Cons

- Don't keep RECs
- Can't use bonds

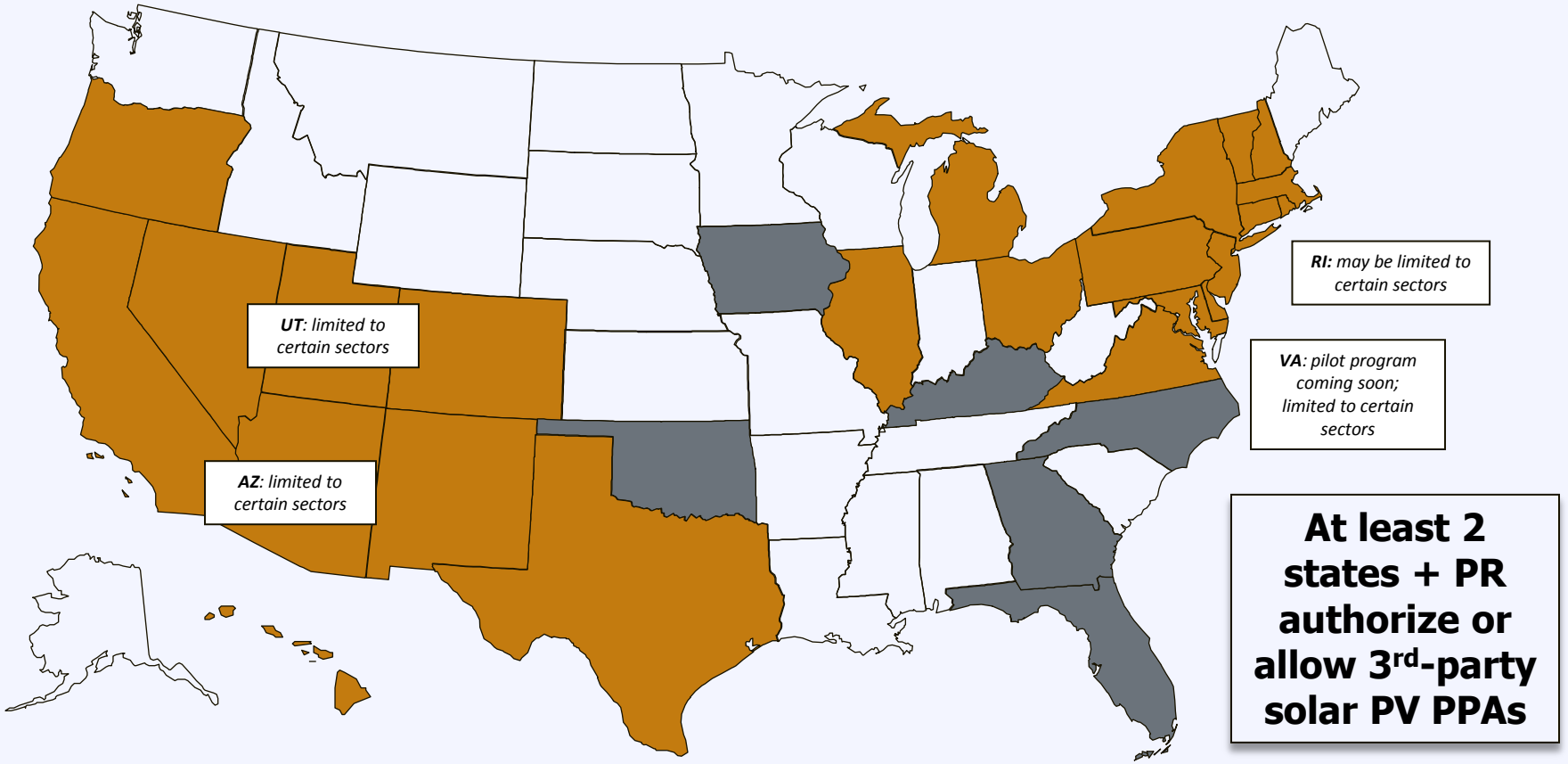
Benefits of PPAs



Source: GTM Research/ Solar Energy Industries Association, *U.S. Solar Market Insight 2012 Year-in-Review*

Third Party Ownership: State Policy

www.dsireusa.org / February 2013



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.

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?

Agenda

8:40 – 8:45	Solar 101
8:45 – 9:05	Planning for Solar on Vacant Land
9:05 – 9:20	Screening Potential Sites
9:20 – 9:30	Exercise Part 1
9:30 – 9:50	Financing Solar Projects on Brownfield Sites
9:50 – 10:00	Exercise Part 2
10:00 – 10:15	The Procurement Process
10:15 – 10:30	Exercise Review and Wrap Up

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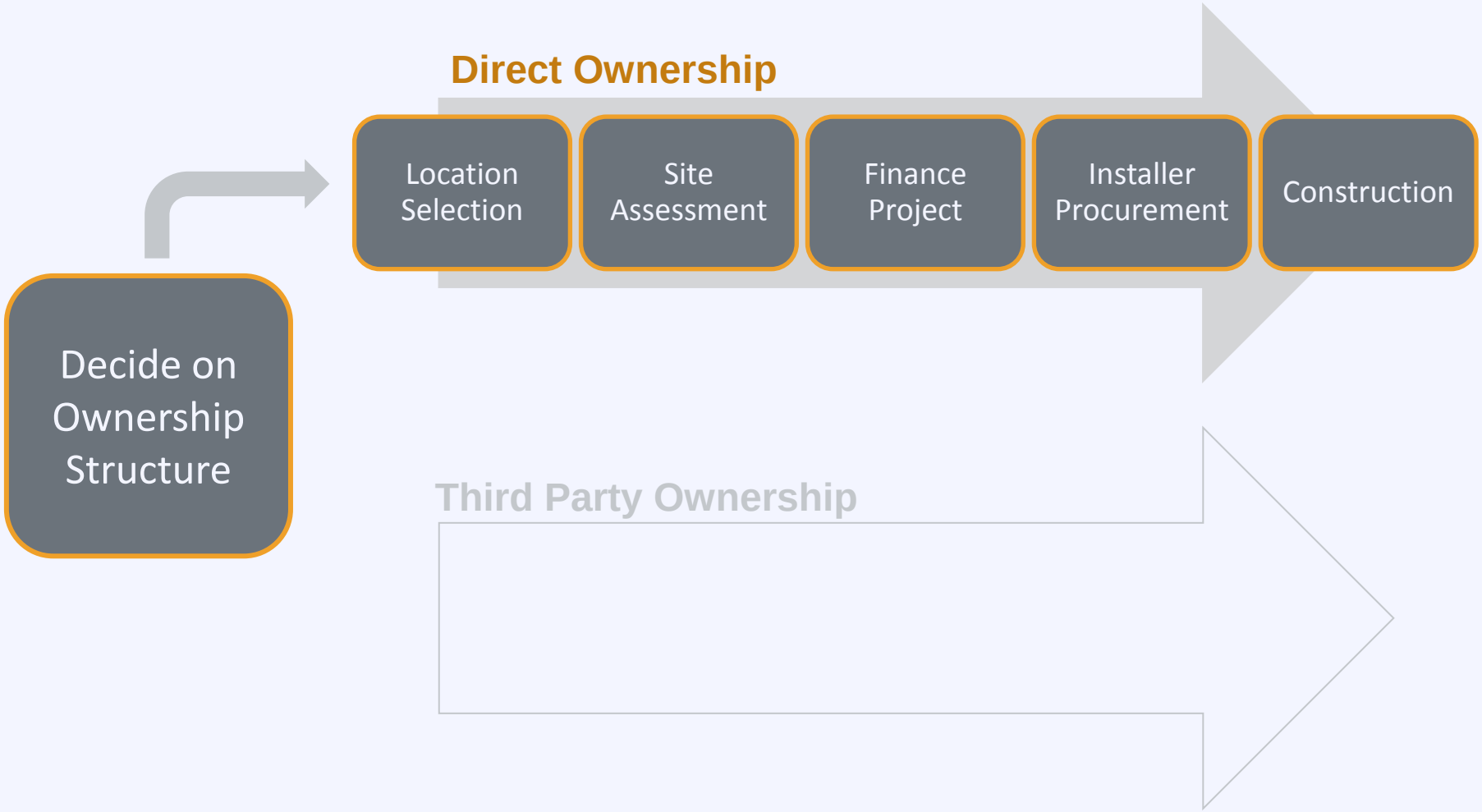
Process

Decide on Ownership Structure

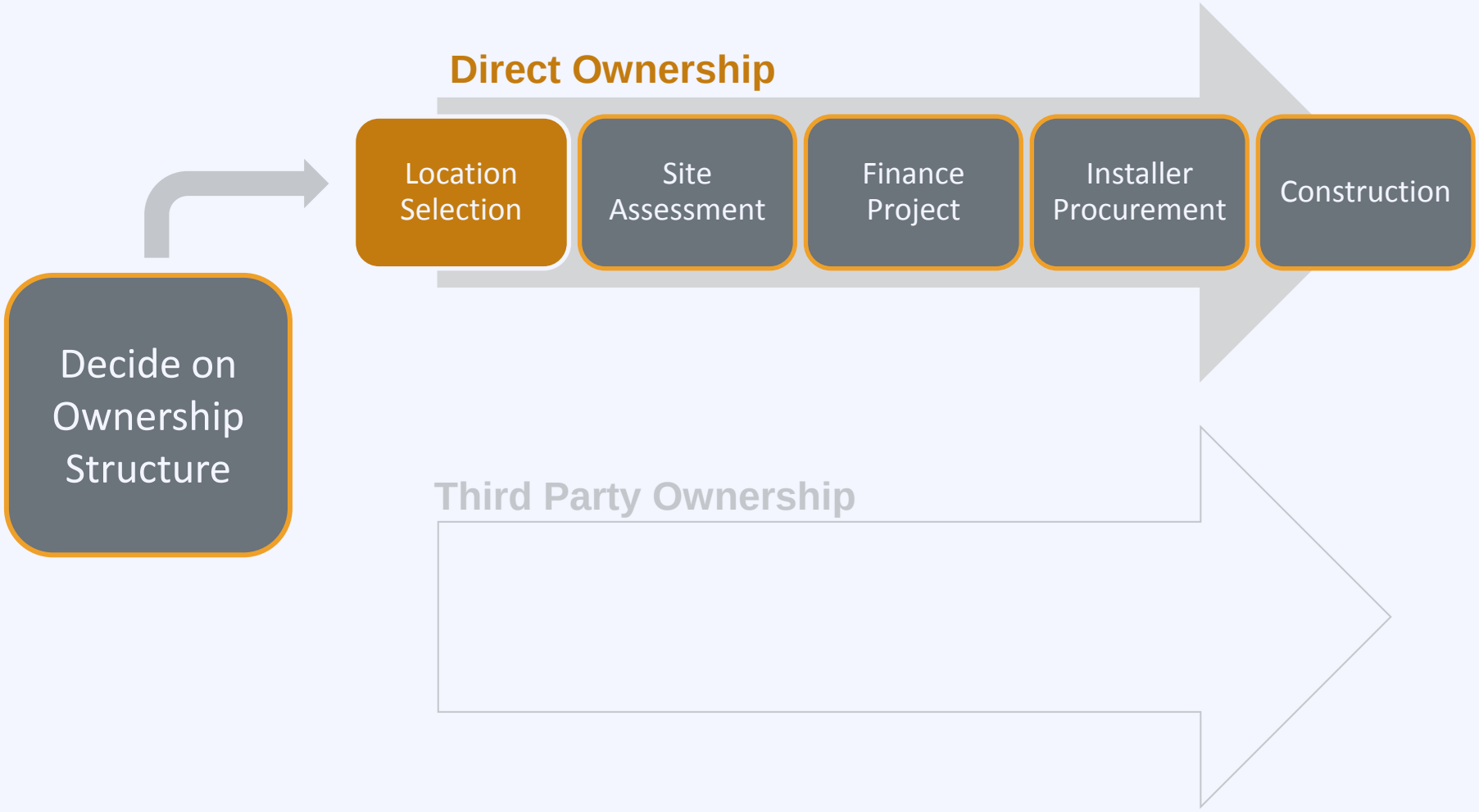
Option 1: Direct Ownership

Option 2: Third Party Ownership

Process


Direct Ownership
Location Selection
Site Assessment
Finance Project
Installer Procurement
Construction
Decide on Ownership Structure
Third Party Ownership

Process


Direct Ownership
Location Selection
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Finance Project
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Construction
Decide on Ownership Structure
Third Party Ownership

Step 1: Location Selection

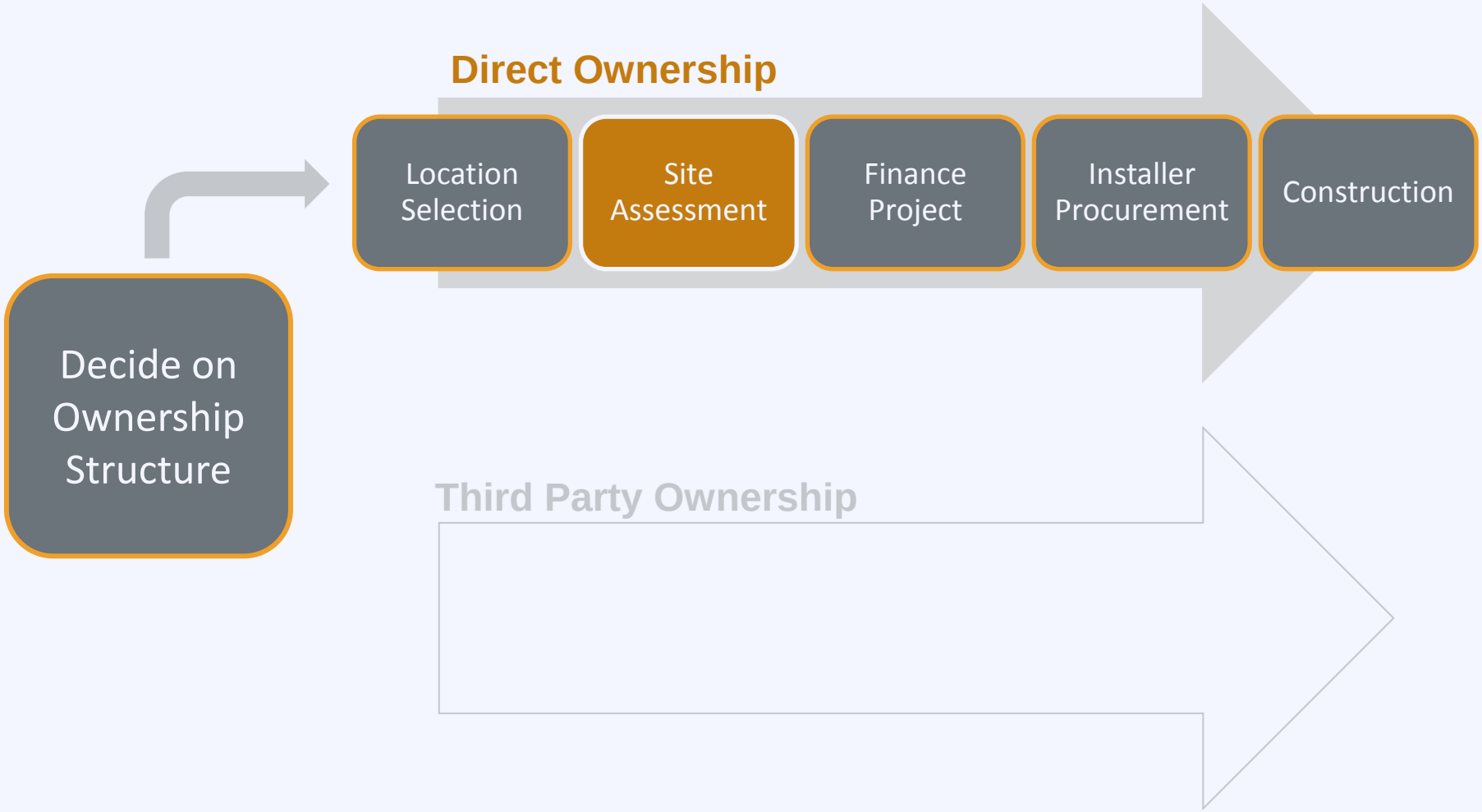
- Who is using the energy?
- Where is the energy being used?
- What is the user's energy load?
- What is the user's energy cost?

Step 1: Location Selection

Rooftop

Ground

Process


Direct Ownership
Location Selection
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Construction
Decide on Ownership Structure
Third Party Ownership

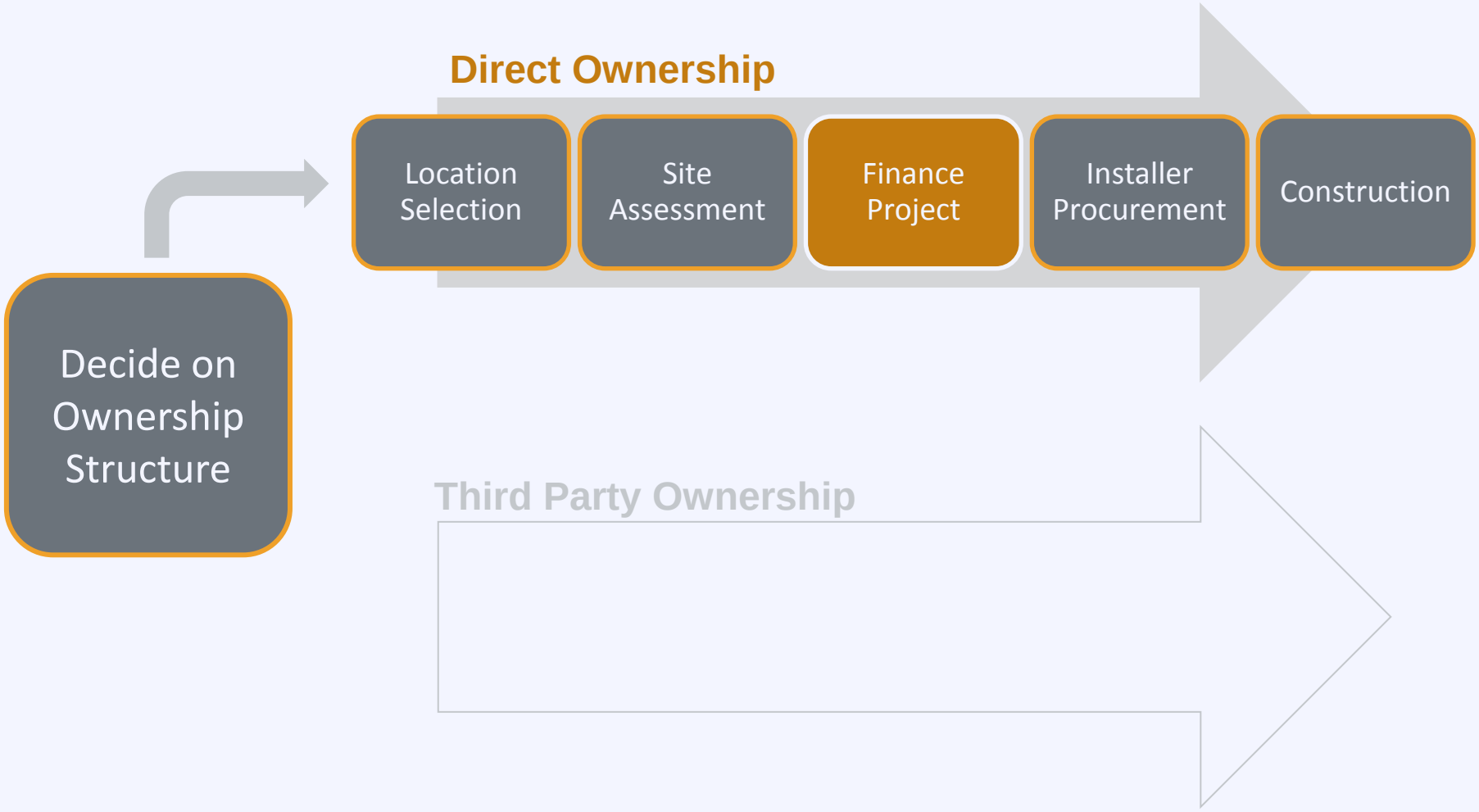
Step 2: Site Assessment

- 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
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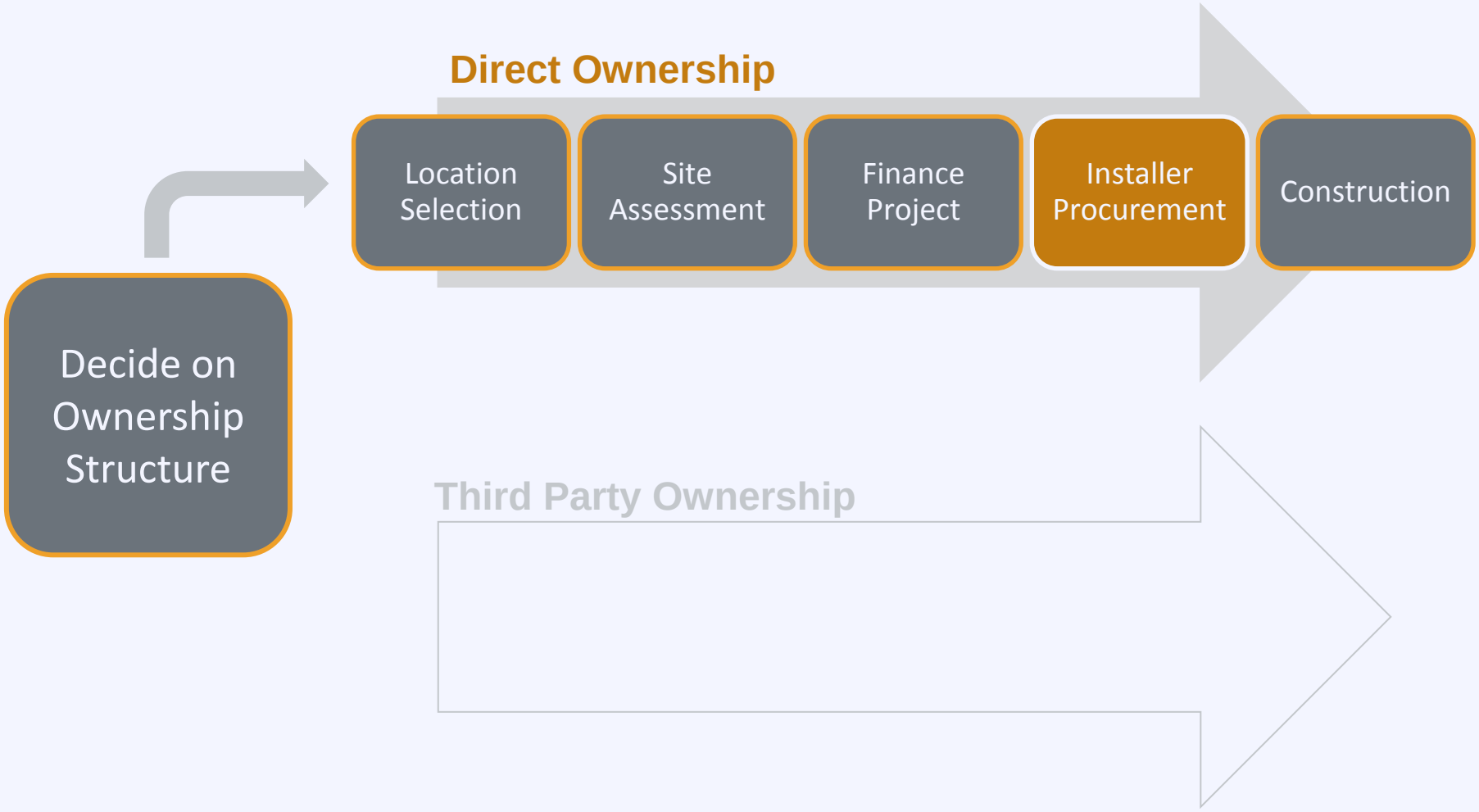
Construction
Decide on Ownership Structure
Third Party Ownership

Step 3: Finance Project

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

Process


Direct Ownership
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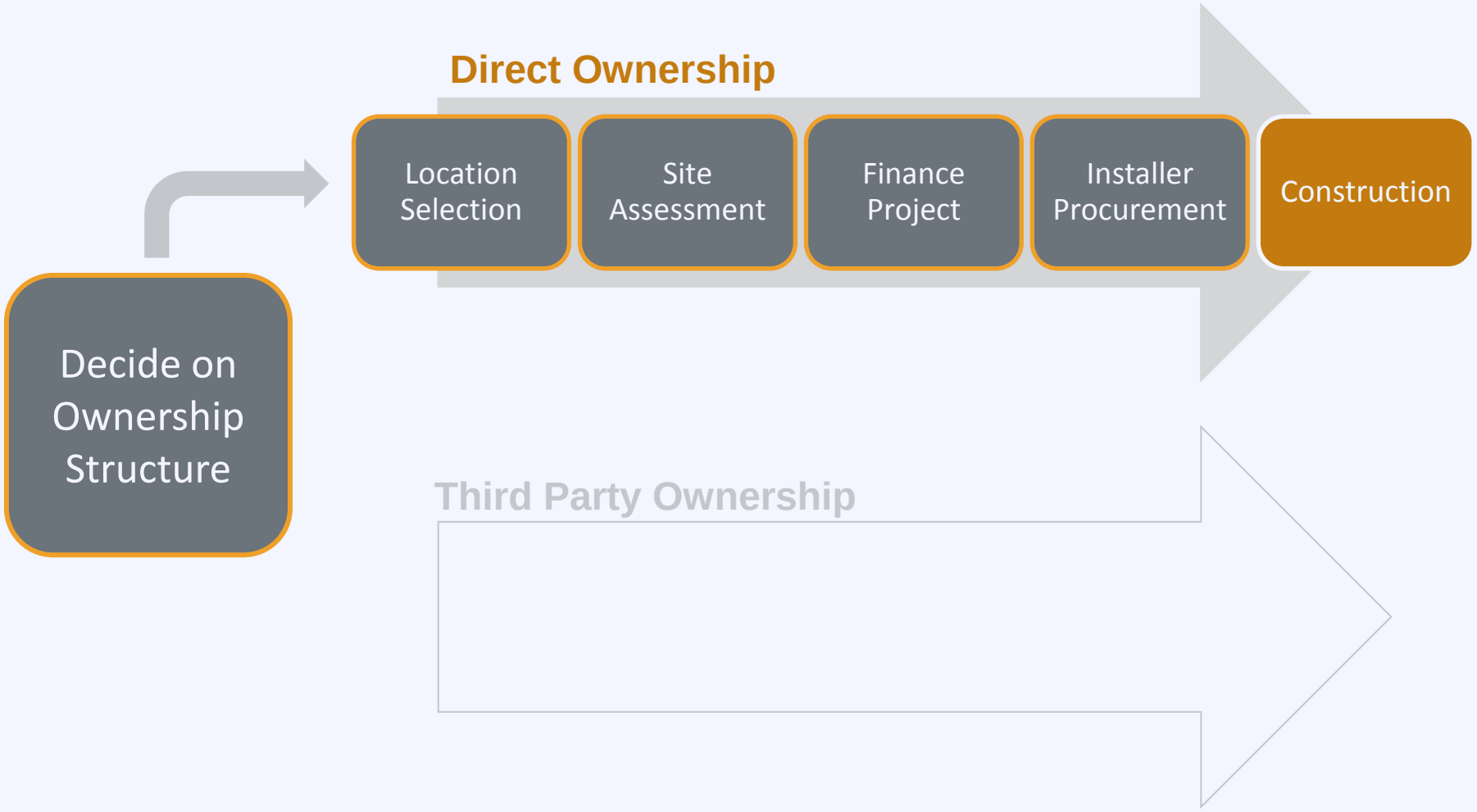
Finance Project
Installer Procurement
Construction
Decide on Ownership Structure
Third Party Ownership

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
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Installer Procurement
Construction
Decide on Ownership Structure
Third Party Ownership

Direct Ownership

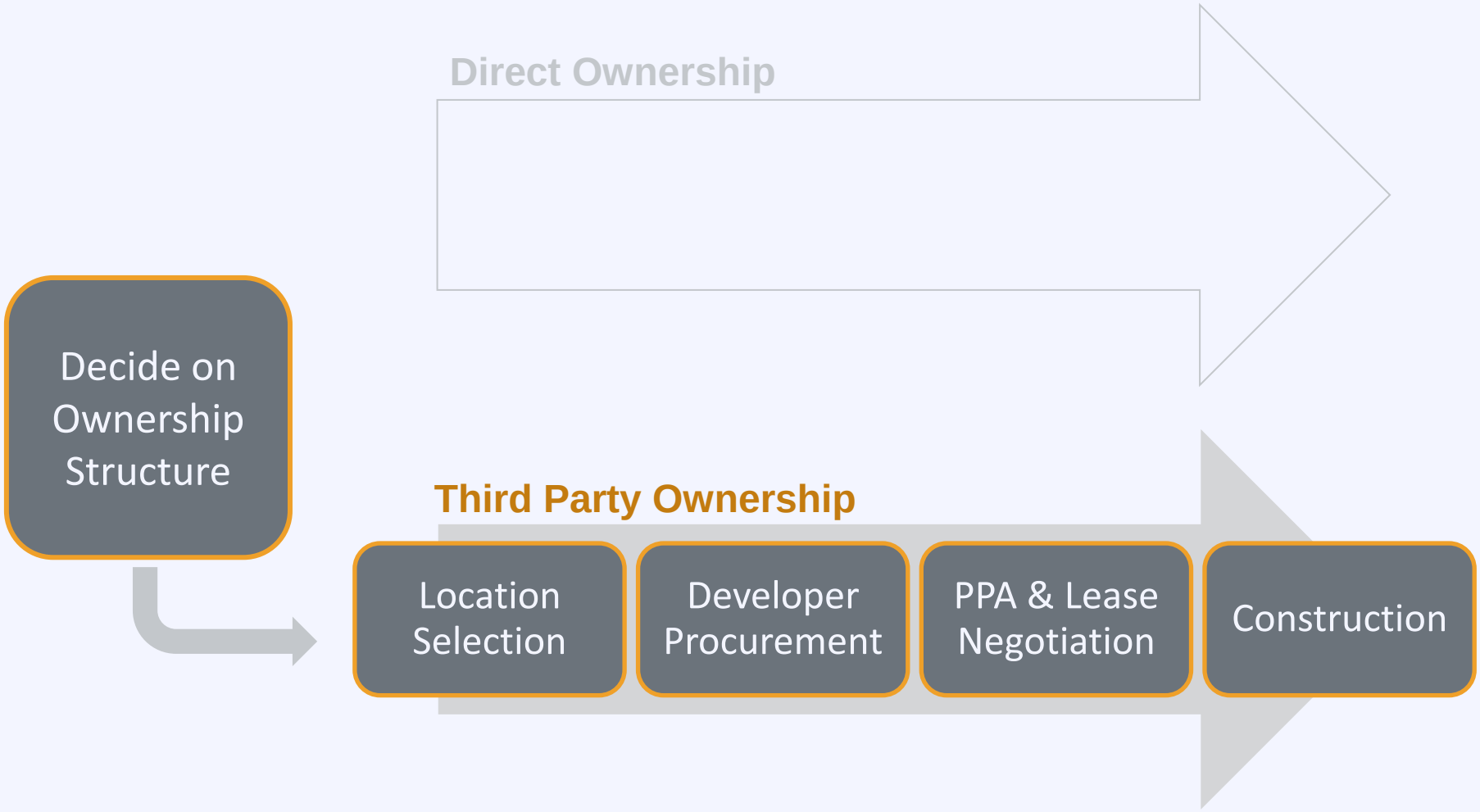
Pros

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

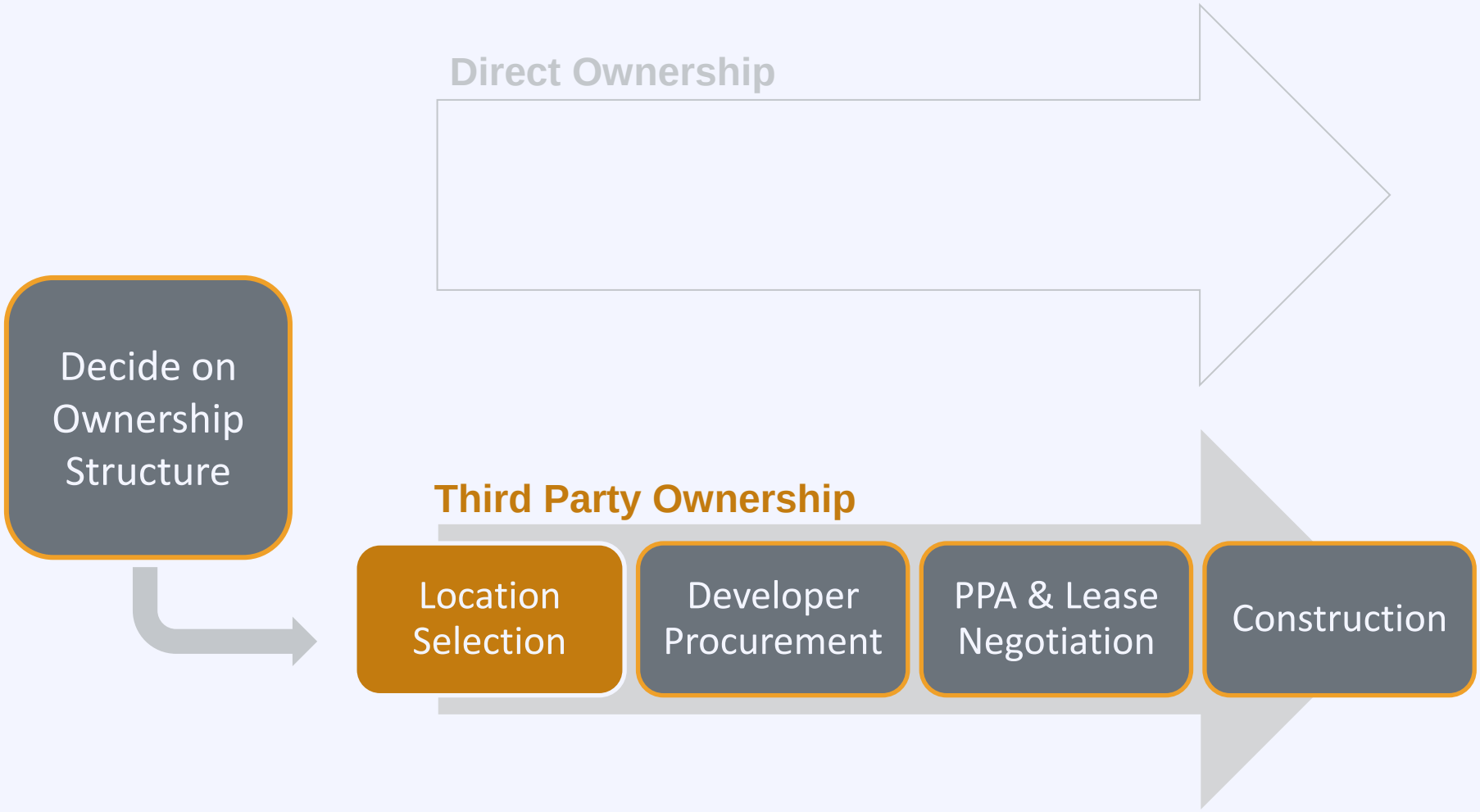
Cons

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

Process


Direct Ownership
Decide on Ownership Structure
Third Party Ownership
Location Selection
Developer Procurement
PPA & Lease Negotiation
Construction

Process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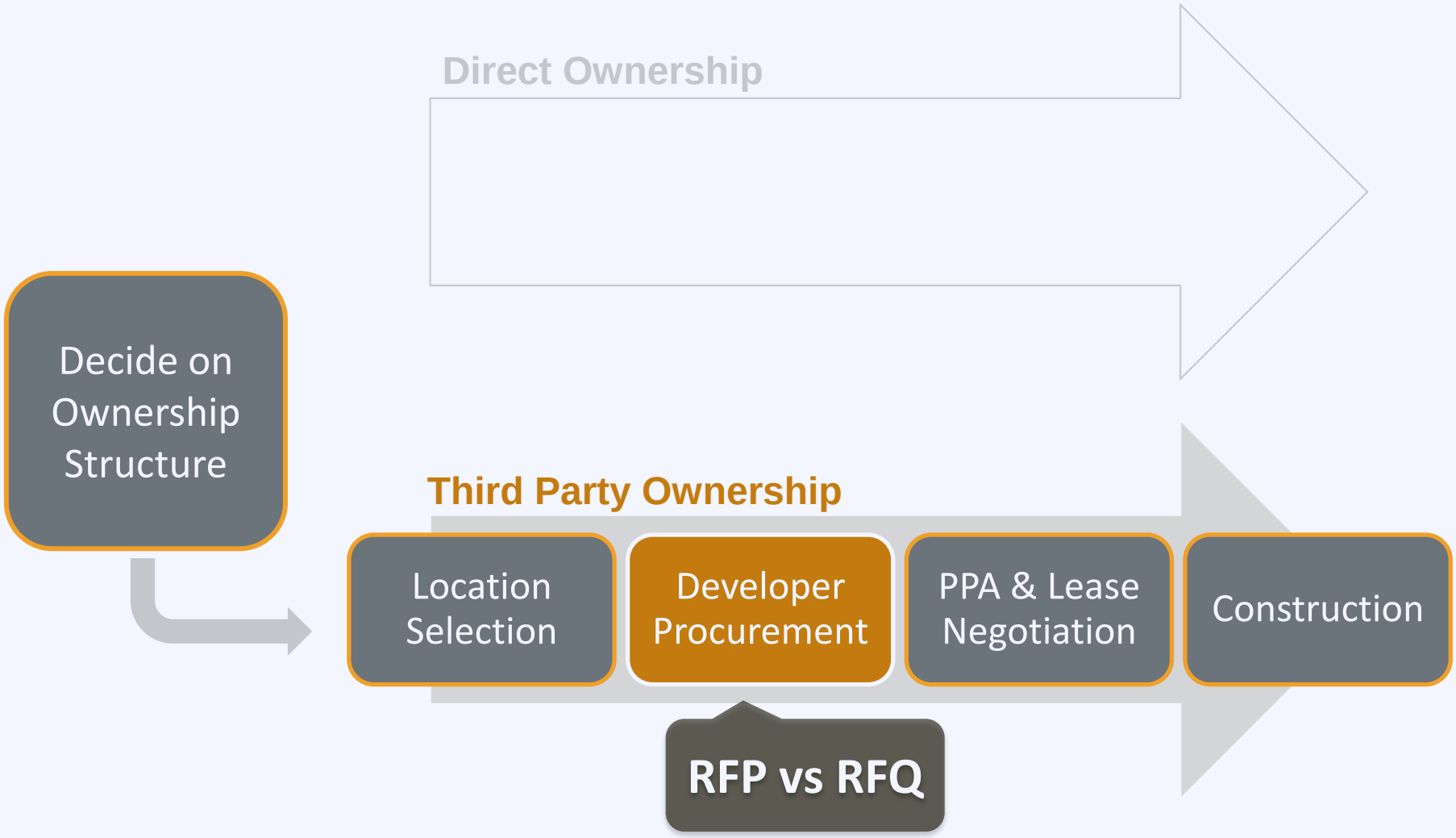
Direct Ownership
Decide on Ownership Structure
Third Party Ownership
Location Selection
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PPA & Lease Negotiation
Construction
RFP vs RFQ

Step 2: Developer Procurement

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

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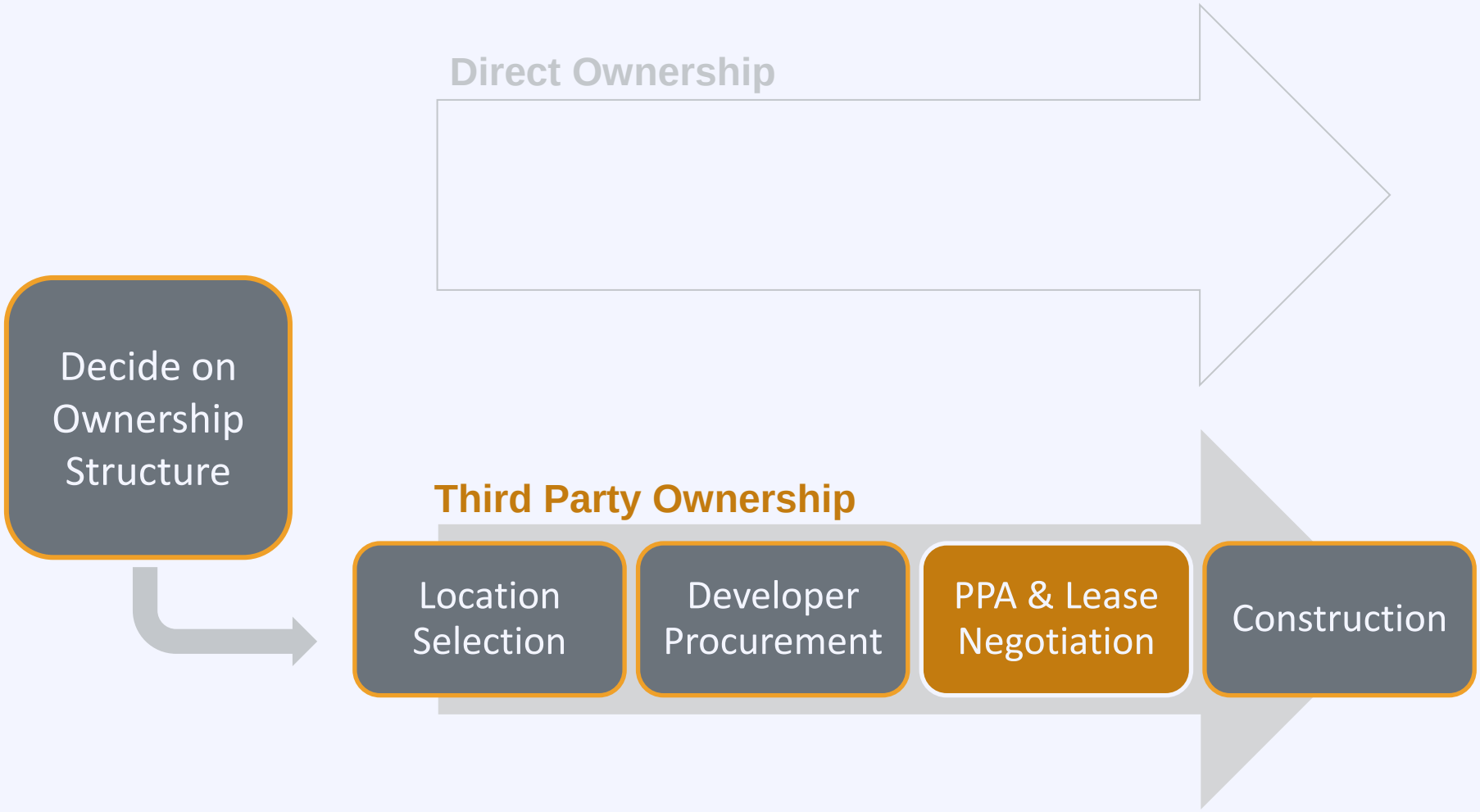
U.S. Department of Energy

Source: NREL Webinar "Procuring and Implementing Solar Projects on Public Buildings: How to Avoid Common Pitfalls" December 8, 2010

Process


Direct Ownership
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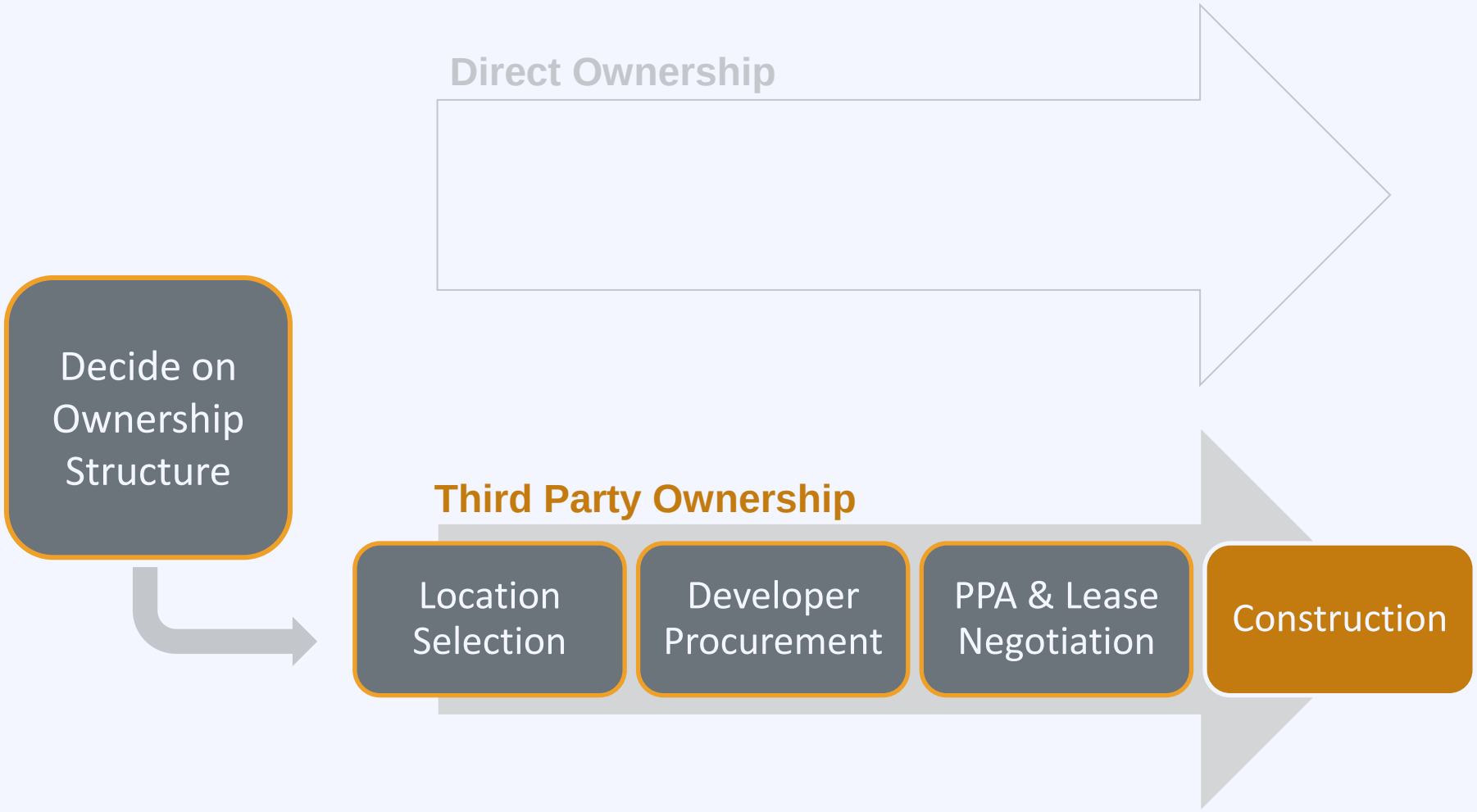
PPA & Lease Negotiation
Construction

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
Decide on Ownership Structure
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Third Party Ownership

Pros

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

Cons

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

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Scituate Case: Site Screening

Site Characteristic	*Description*	*Guideline*	*Decision*
Solar Resource	4.29 kWh/m^2/day	> 3.5 kWh/m^2/day	**Suitable**
Acreage	29 acres total; 6.2 acres for solar	≥ 5 acres; ≥ 2 but < 5 acres	**Suitable**
Distance to Grid	< 0.1 miles	< 0.5 miles	**Suitable**
Distance to Roads	< 0.1 miles	< 1.0 miles	**Suitable**
Site Slope	9% to 11% grade	≤ ~10% grade	**Suitable***
Site Shading	6.2 acres for solar	> 2 acres	**Suitable**
Ownership	Municipality	Purchase if private	**Suitable**
Rooftop v. Ground	Open Ground	--	**Ground**
Load Assessment	Nearby municipal properties	Retail Rates > $0.08/kWh	**Virtual Net Metering**
Landfill Status	Closed & Capped; Landfill gas extraction	Closed; No concerns	**Suitable***

Scituate Case: Financial Screening

Financial Screen

System Ownership Options:	**Third-Party Ownership**	**Direct Ownership***	
Federal Incentives Available:	**30% ITC****	**MACRS****	**QECBs**
Supportive State Policies:	**RPS w/ Solar Carve-Out** **PACE**	**(Virtual) Net Metering**	

Check State Solar Incentives at www.dsireusa.org/solar

* Alternatively, the land could be leased to a developer who would own the project and find an off-taker

** These incentives would only be available if a private developer owned the project (as with TPO or land lease)

Scituate Case: In Development

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Source: Brightfields Development www.solarbrownfields.com/municipal-solar-brownfields-solutions/

Columbus Case: Site Screening

Site Characteristic	*Description*	*Guideline*	*Decision*
Solar Resource	4.94 kWh/m^2/day	> 3.5 kWh/m^2/day	**Suitable**
Acreage	90 acres total; 55 acres for solar	≥ 5 acres; ≥ 2 but < 5 acres	**Suitable**
Distance to Grid	~ 0.3 miles	< 0.5 miles	**Suitable**
Distance to Roads	< 0.1 miles	< 1.0 miles	**Suitable**
Site Slope	"Minimal"	≤ ~10% grade	**Suitable***
Site Shading	55 acres for solar	> 2 acres	**Suitable**
Ownership	Private	Purchase if private	**Suitable***
Rooftop v. Ground	Open Ground	--	**Ground**
Load Assessment	Various nearby properties	Retail Rates > $0.08/kWh	**Find Off-Taker**
Site Status	Closed; Remediation Complete	Site Assessed; Remediation not a barrier	**Suitable**

Columbus Case: Financial Screening

Financial Screen

System Ownership Options:	**Third-Party Ownership**	**Direct Ownership***	
Federal Incentives Available:	**30% ITC****	**MACRS****	**QECBs**
Supportive State Policies:	**RPS w/ Solar Carve-Out** **PACE**	**(Virtual) Net Metering**	

Check State Solar Incentives at www.dsireusa.org/solar

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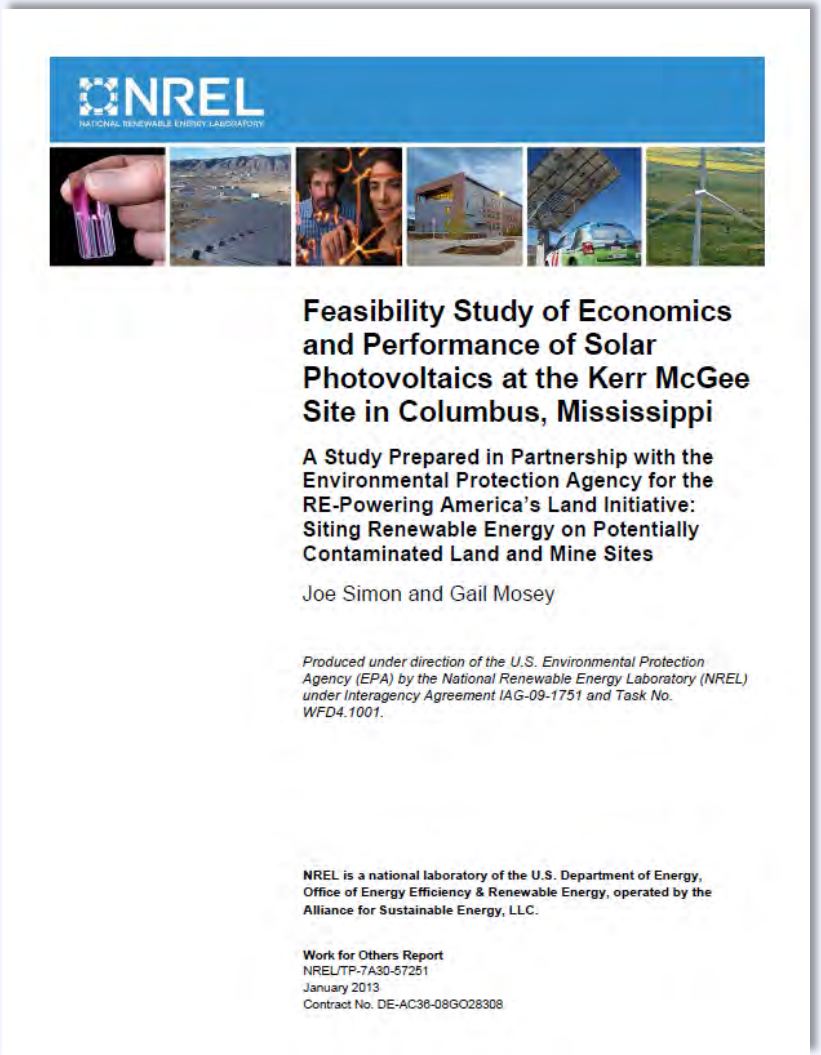
Columbus Case: Currently Assessed


NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Feasibility Study of Economics and Performance of Solar Photovoltaics at the Kerr McGee Site in Columbus, Mississippi

A Study Prepared in Partnership with the Environmental Protection Agency for the RE-Powering America's Land Initiative: Siting Renewable Energy on Potentially Contaminated Land and Mine Sites

Joe Simon and Gail Mosey

Produced under direction of the U.S. Environmental Protection Agency (EPA) by the National Renewable Energy Laboratory (NREL) under Interagency Agreement IAG-09-1751 and Task No. WFD4.1001.

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

Work for Others Report
NREL/TP-7A30-57251
January 2013
Contract No. DE-AC36-08GO28308

Powered by SunShot
U.S. Department of Energy

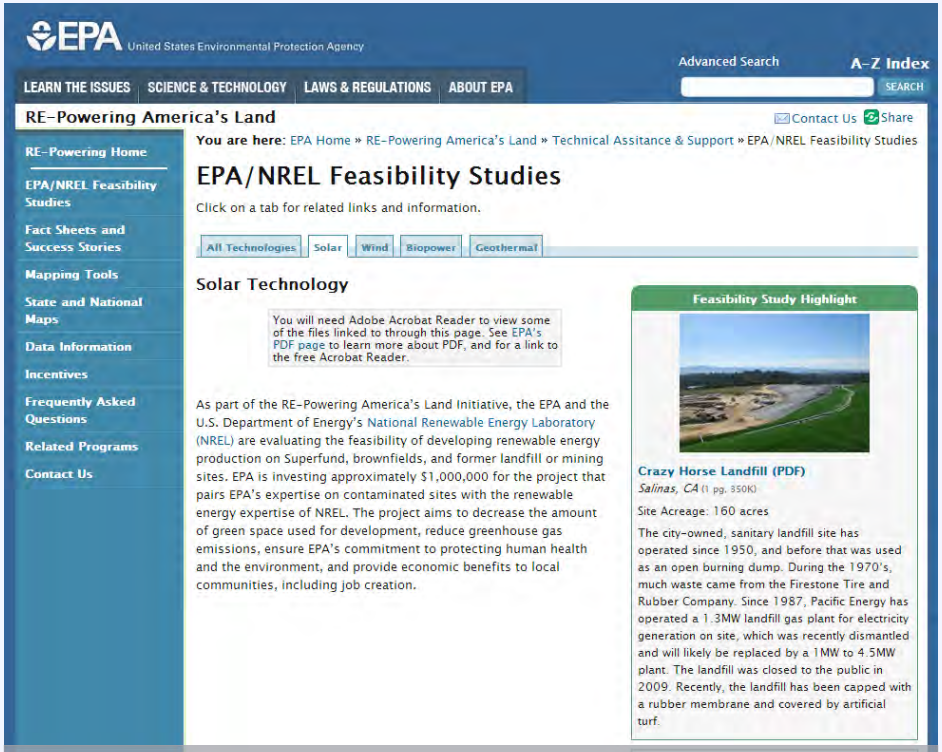
Available at: http://www.nrel.gov/docs/fy13osti/57251.pdf

Additional Studies

Resource **EPA/ NREL Feasibility Studies**

Provides fact sheets and feasibility studies on the suitability of Superfund, brownfield, landfill, and former mining sites for solar energy development.

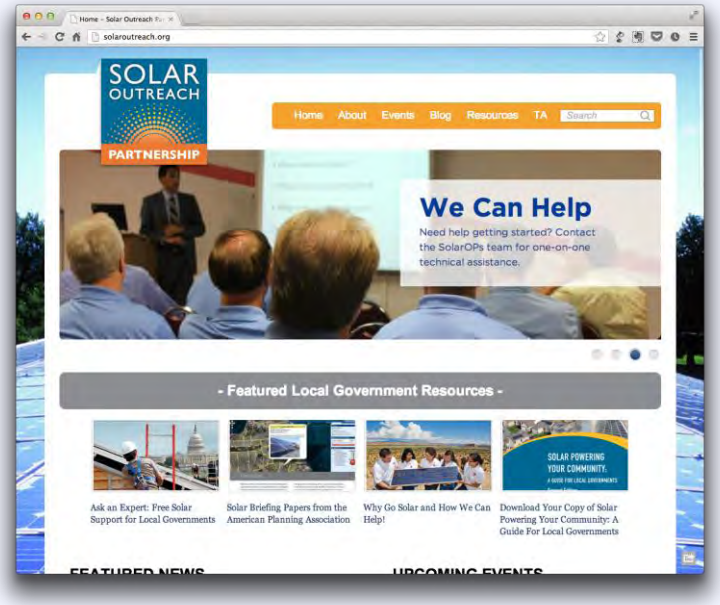
www.epa.gov/oswercpa/rd_studies.htm#solar



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



www.solaroutreach.org

For more information email: solar-usa@iclei.org

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U.S. Department of Energy

Jayson Uppal

Meister Consultants Group

jayson.uppal@mc-group.com
(617) 209-1990

Philip Haddix

The Solar Foundation

phaddix@solarfound.org
(202) 469-3750

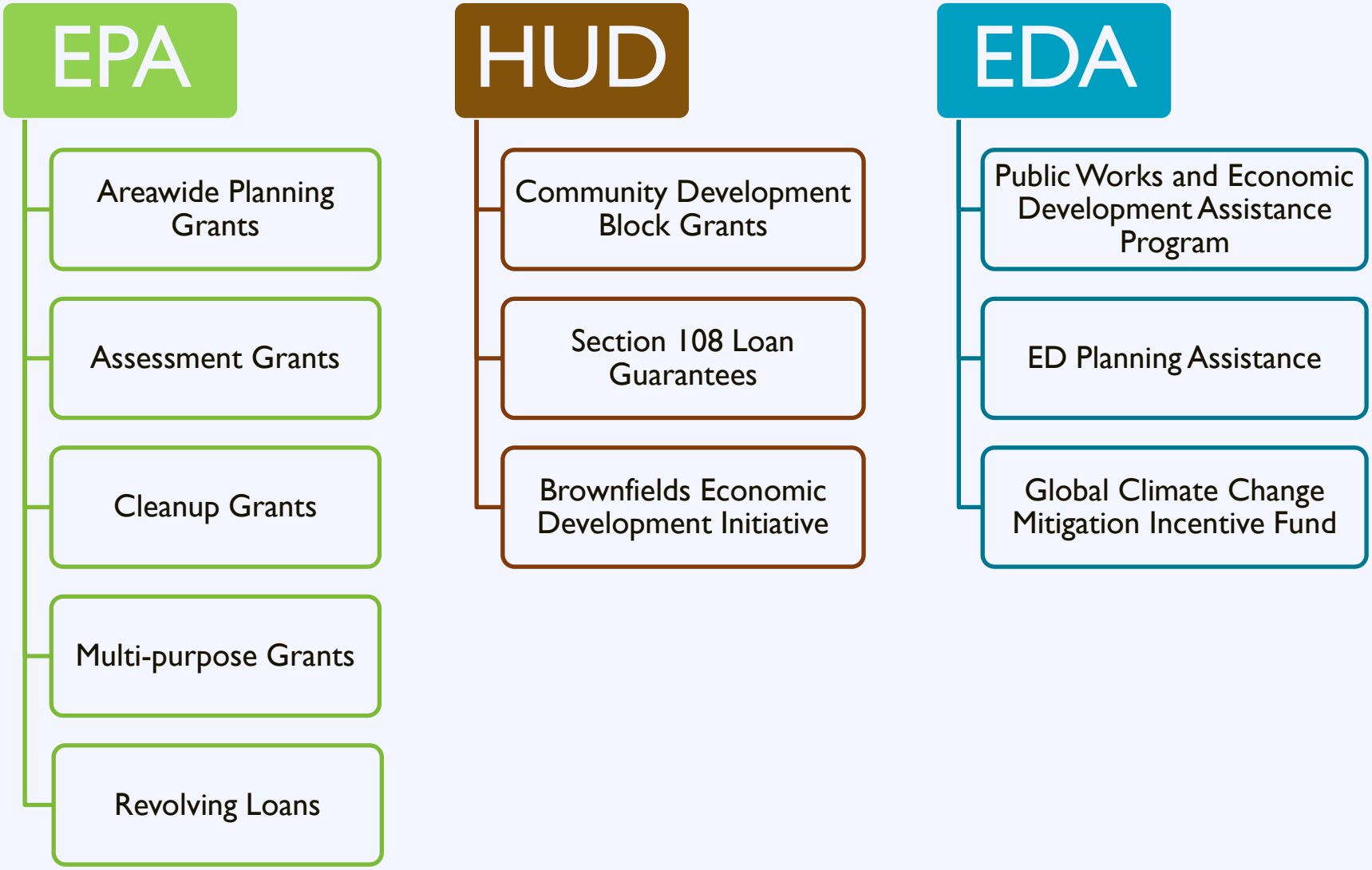
David Morley

American Planning Association

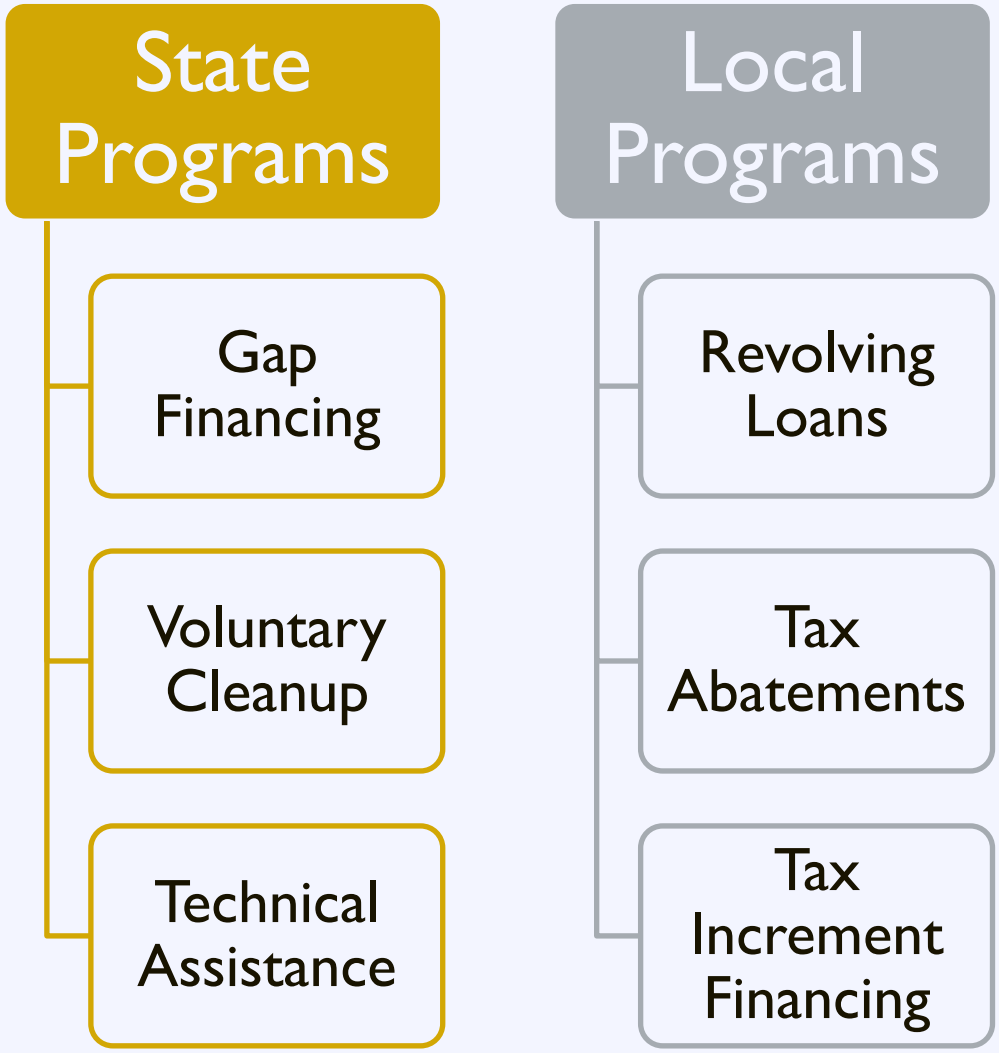
dmorley@planning.org
(312) 786-6392

Appendix

Federal Brownfields Funding



State and Local Brownfields Funding



Incentives: EPA Grants

Assessment Grants: Up to $400,000 for planning, environmental assessments, and community outreach.

Cleanup Grants: Up to $200,000 to carry out cleanup activities at brownfields sites.

Revolving Loan Funds: Up to $1 Million to capitalize a revolving loan fund that provides loans to carry out cleanup activities

Incentives: HUD Grants

The following grants from HUD are eligible for brownfields rehabilitation:

- Community Development Block Grants (CDBG)
- Section 108 Loan Guarantees
- Economic Development Initiative (EDI) grants
- Brownfields Economic Development Initiative (BEDI)