Solar Planning and Zoning

SolSmart Training at NCTCOG
10/11/2017

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Meister Consultants Group, A Cadmus Company

Agenda

- Regulatory and approval process
- Why address solar?
- How to address solar
- Actual language applied by cities and towns
- Best practice case studies
- Additional resources

Regulatory & Approval Process

The Public Sector as Regulator

Governments provide the legal framework for land ownership, support development by providing infrastructure, provide standards for development, and regulate the character and location of development.

Development Regulation Mechanisms

- Land Use Plans
- Growth management
- Zoning ordinances and permits
- Subdivision processes
- Site Plan Review
- Building Permits

Regulatory Challenges

- Greenfield
  - Zoning
  - Subdivision
  - Growth management
  - Utility access
  - Storm water management
  - Wetlands, water rights
  - Endangered species
- Redevelopment
  - Zoning
  - Rehab building codes, ADA
  - Parking, traffic concerns
  - Utility access improvements
  - Historic preservation
  - Multiple uses
  - Storm water management
  - Ground contamination

Comprehensive Land Use Plans

- Describes the desirable ways in which a community should develop over 10 – 20 year period
- A set of written development goals and policies, supplemented by maps.
- May be advisory or legally binding depending on state enabling statues.
- Small or focus area plans (for special sectors, districts, or issues).

What is zoning code?

- Zoning is a regulatory tool that municipalities and counties use to dictate certain land uses, heights, set backs and other requirements in particular “zones” within a community.
- Zoning is usually developed to be in line with a community's comprehensive plan or other planning documents.

Who determines the zoning code?

- City Council or Town Selectman (final decision maker)
  - Planning Board
  - Zoning Board of Appeals
- Community planning staff (uphold the code and may make recommendations to change the code)

What happens when a zoning permit is filed?

- Zoning enforcement entity determines if it matches zoning

- If yes, then development plans are reviewed to see if they adhere to development standards
  - Development standards address measurable constraints such as density, building heights, setbacks, landscaping, etc
  - Zoning permit is often the first step, followed by other permits

- If no, applicant has recourses: Re-zoning, variances & appeals

Zoning Changes

- Changes in local legislation to re-zone a parcel
- Property owner presents the case for their plan
- Zoning changes require greater review than permits and typically must be approved by the city or county council.
- Must be weighed against the city's planning goals (comprehensive land use plan), neighborhood preferences and the political disposition of the city/county.

Variances

- Case-by-case modifications to development standards, sometimes waiving the requirements of the zoning ordinance
- Normally handled by zoning board of appeals

Conditional use permits

- Allow an otherwise non-permitted use of the property
- Often evaluated at public hearings – to determine whether the new use of the property would be in the public interest

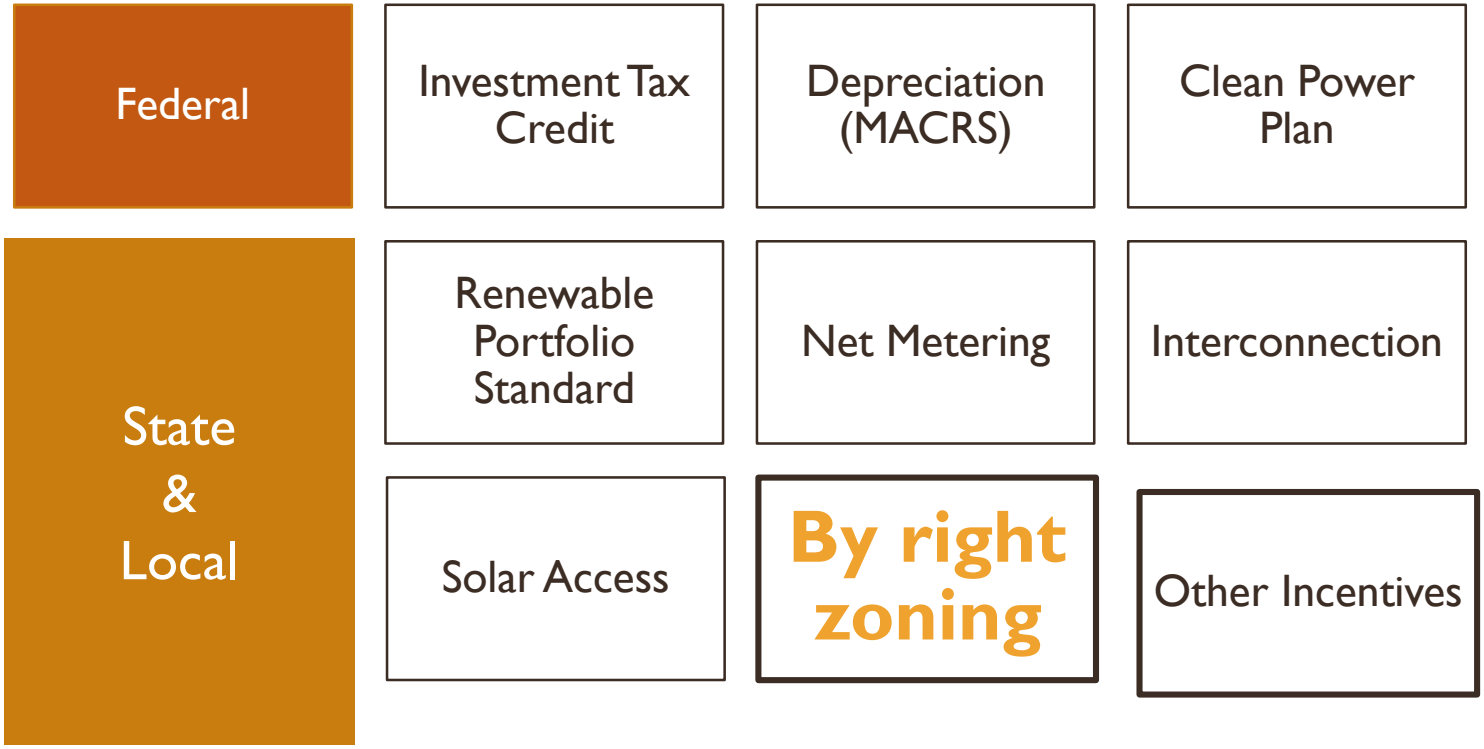
Why address solar through zoning?

Why address solar?

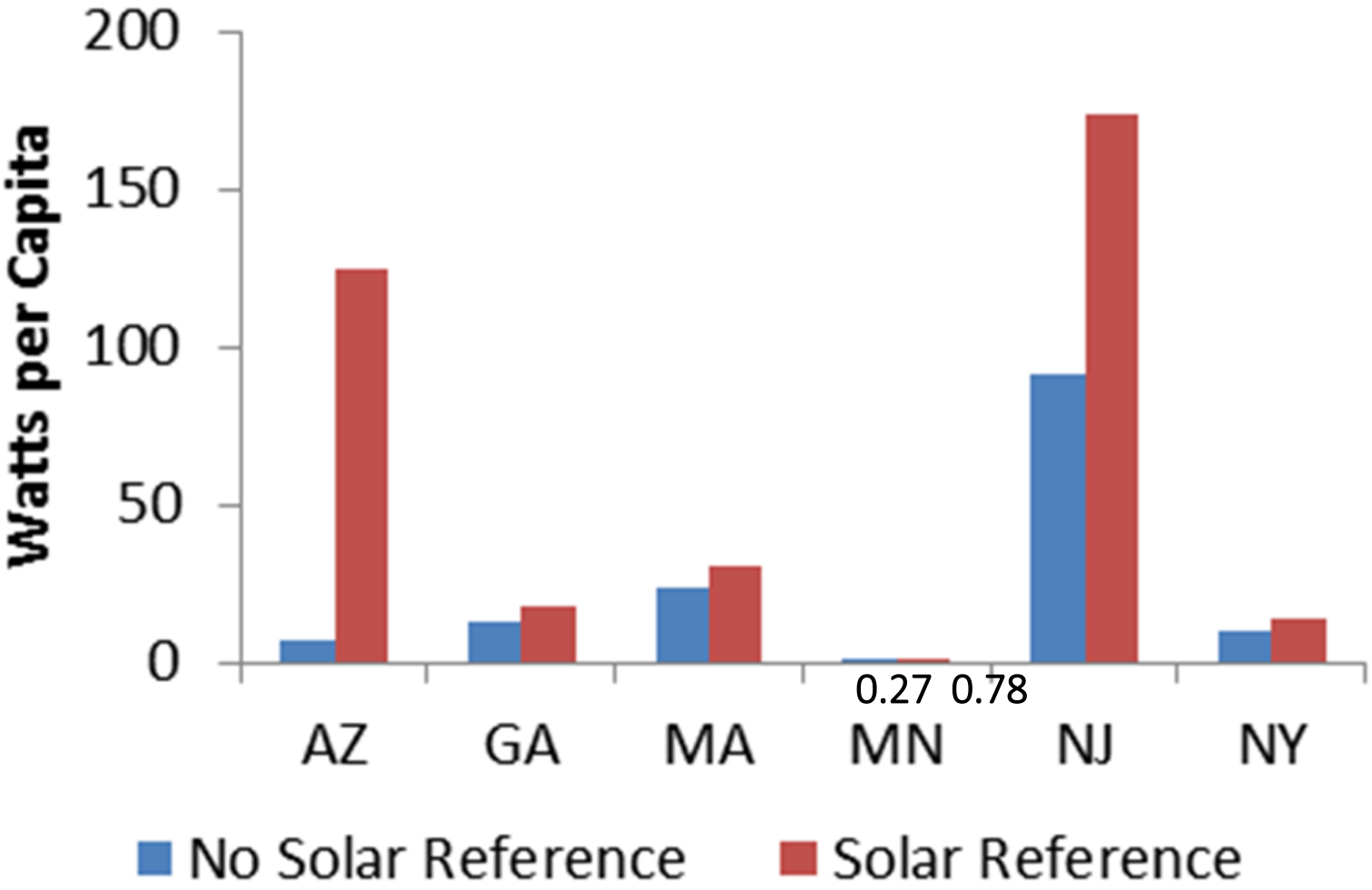
A conspicuous silence on the part of local policies, plans, and regulations on the topic of solar energy use constitutes a significant barrier to adoption and implementation of these technologies.

–American Planning Association Solar Briefing Papers

Solar is a Policy Driven Market



Municipal PV Deployment Correlation with Solar References in Code

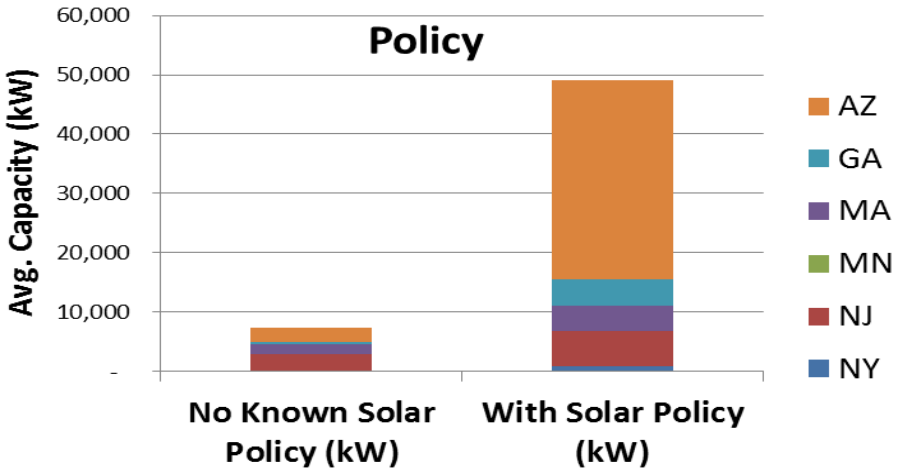


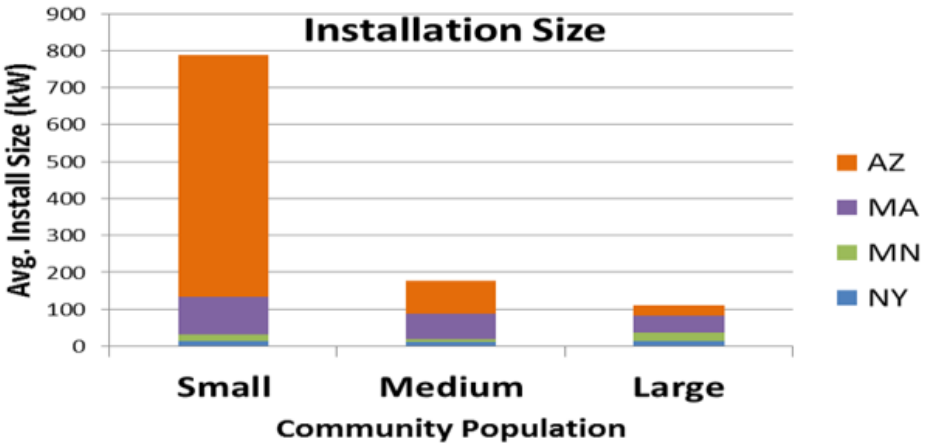
Cook et al. 2016. *Clean Energy in City Codes: A Baseline Analysis of Municipal Codification across the U.S.* NREL-66120. National Renewable Energy Laboratory (NREL), Golden, CO (US). http://www.nrel.gov/docs/fy17osti/66120.pdf

City-Level PV Capacity and Policy Analysis

Findings include:

- Adopting solar planning policies and codes is correlated with more solar
- Smaller communities tend to have fewer, larger systems
- Less populous communities tend to have more solar installed per capita





Powered by SunShot U.S. Department of Energy

Day, Megan H. "Local Solar: What do leading solar communities have in common?" *Planning* 81, no. 11 (2015): 28-33. http://www.nrel.gov/docs/fy16osti/64883.pdf

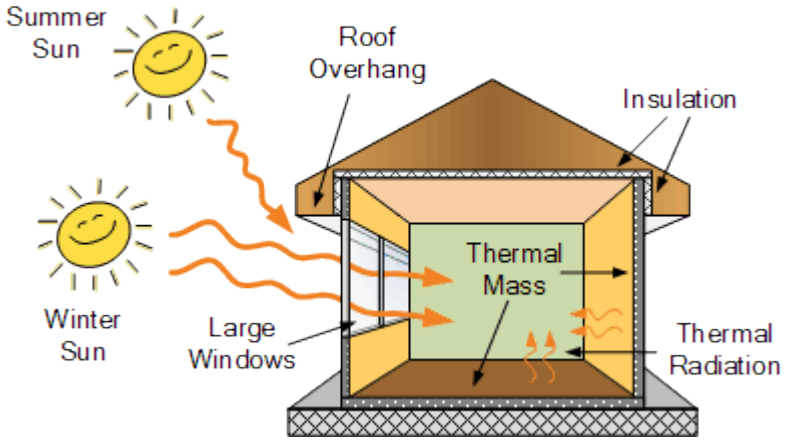
How to address solar in zoning ordinances

Solar Technologies

Solar Photovoltaic (PV)

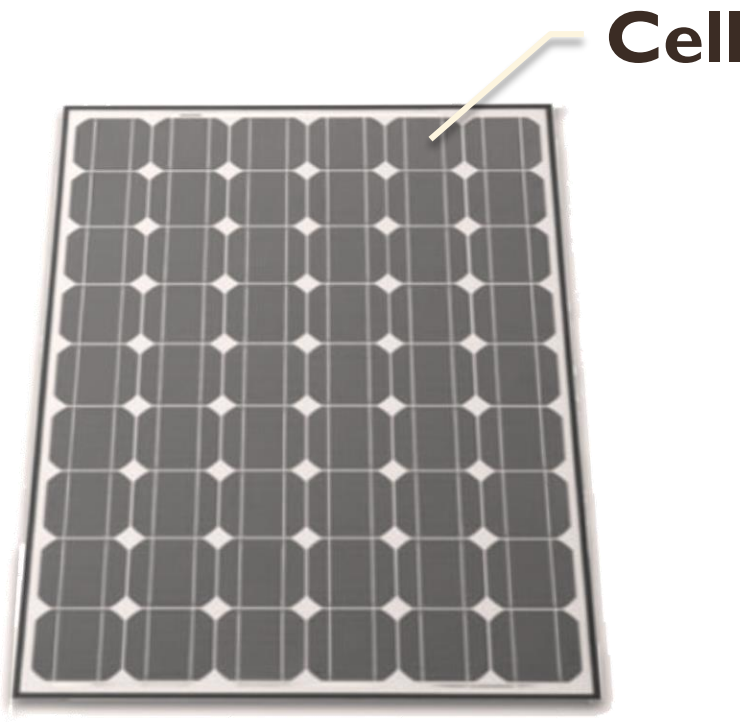
Solar Hot Water

Concentrated Solar Power



Passive Solar

Some Basic Terminology



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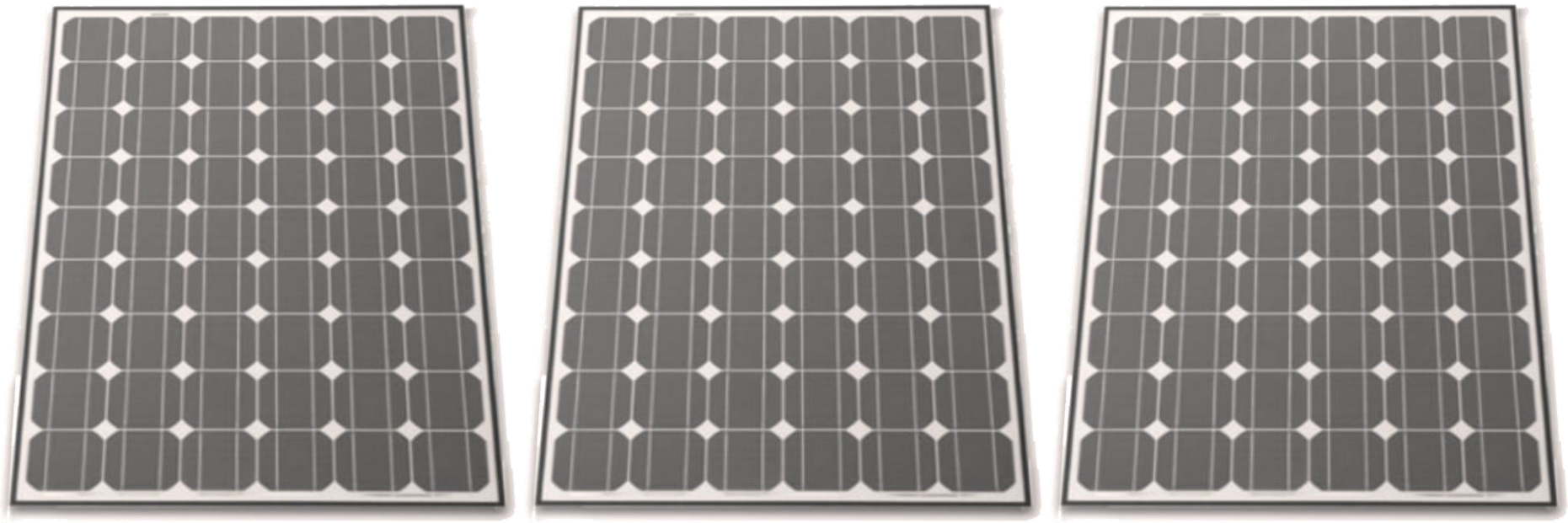
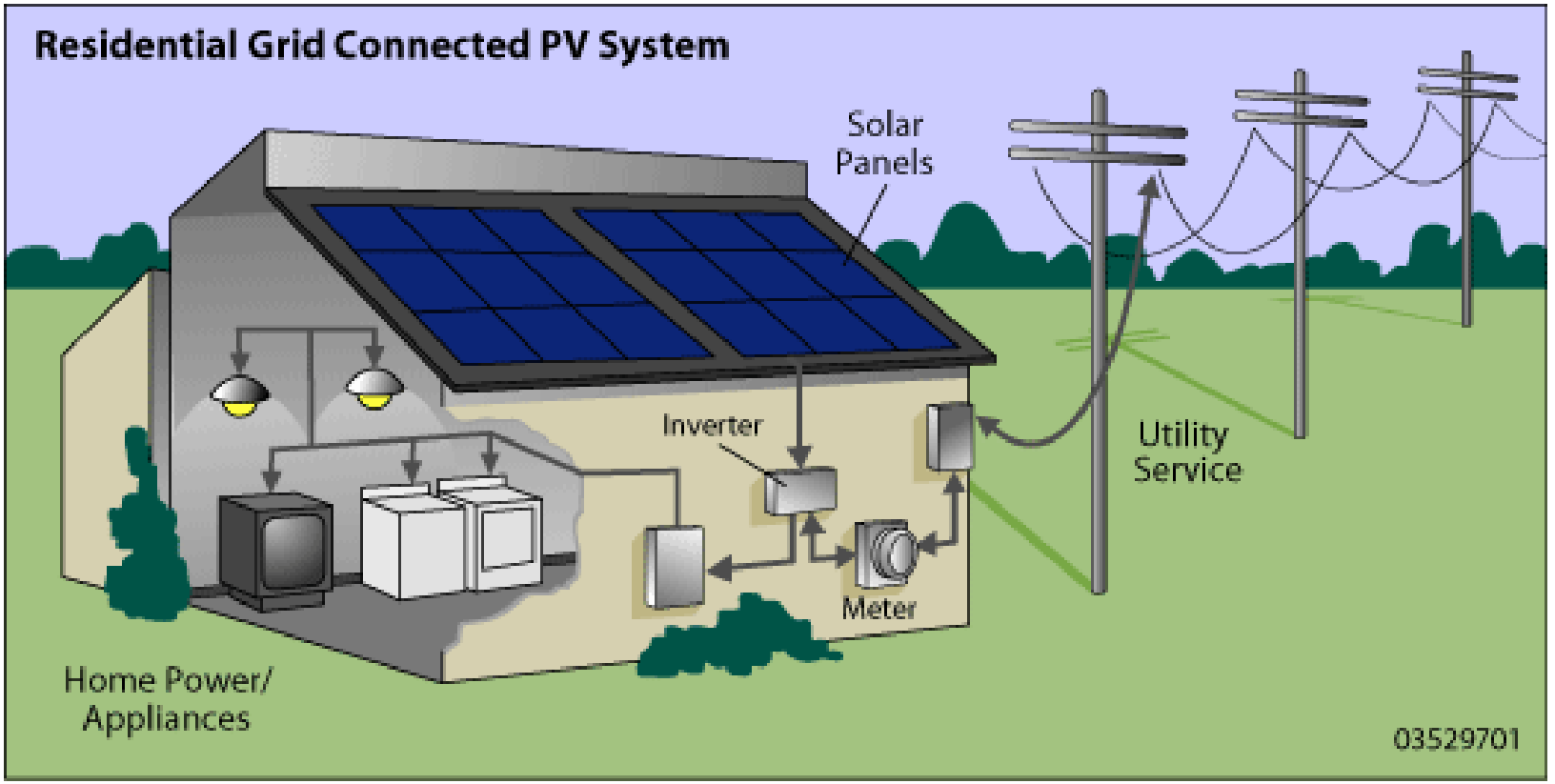


Array

System Components



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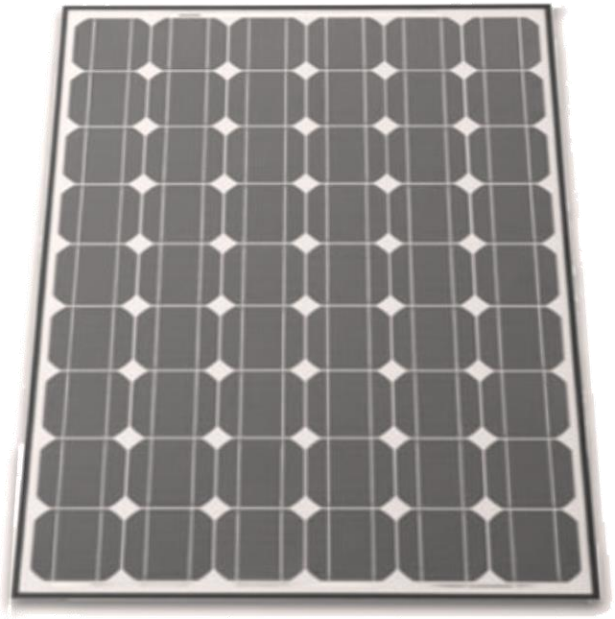


Capacity / Power

kilowatt (kW)

Production

Kilowatt-hour (kWh)

Solar PV Scales

Residence
5 kW

Factory
1 MW+

Office
50 – 500 kW

Utility
2 MW+

Visioning: Scales & Contexts

Every community is different!

Is solar on residential rooftops appropriate for your community?

Visioning: Scales & Contexts

Every community is different!

Is solar on commercial rooftops appropriate for your community?

Visioning: Scales & Contexts

Every community is different!

Is solar on historic structures appropriate for your community?

Visioning: Scales & Contexts

Every community is different!

Is solar on brownfields appropriate for your community?

Visioning: Scales & Contexts

Every community is different!

Is solar on greenfields appropriate for your community?

Visioning: Scales & Contexts

Every community is different!

Is solar on parking lots appropriate for your community?

Visioning: Scales & Contexts

Every community is different!

Is building-integrated solar appropriate for your community?

Zoning best practices for solar: general principles

- **Develop a solar ordinance** – a designated section of the code that addresses all questions related to solar can provide clarity and certainty for property owners

- **Cover both roof AND ground mount**
  - *Allow for accessory use rooftop installations by right*
  - *Allow for primary use, ground mount installations as conditional use*

- **Regulate based on impact rather than:**
  - Capacity (kW): efficiencies improve over time
  - Location of energy usage (e.g. requiring that any accessory use solar generation be consumed exclusively on-site).
    - *Could accidentally preclude community shared solar*

Zoning best practices for solar

Section	Topics to Address
Definitions	**Define "solar" broadly** and provide add'l definitions for specific types of solar
Use tables/ allowed uses	Allow small rooftop and ground mount solar **by right** in all major zoning districts
Dimensional Standards	Exempt small solar from a range of requirements, where possible:
	• Height • Size (ft2) • Setbacks (roof) • Lot coverage & setbacks
Design Standards	• Aesthetics • Glare • Screening/fencing • Exception: historic districts

Language applied by cities and towns

The good and the bad

Definitions

Cupertino, CA

a. A "Solar Energy System" means either of the following:

i. Any solar collector or other solar energy device whose primary purpose is to provide for the collection, storage, and distribution of solar energy for space heating, space cooling, electric generation, or water heating.

ii. Any structural design feature of a building, whose primary purpose is to provide for the collection, storage, and distribution of solar energy for electricity generation, space heating or cooling, or for water heating.

Denver, CO

Definitions

Solar Panel, Flush Mounted: A solar energy collection device mounted to the roof of a structure in such a manner that the device is not more than one foot above the roof surface to which it is attached, and mounted so that the device plane is in a plane which is parallel to the surface of the roof to which it is attached.

Furniture factory in Gardner, Massachusetts, Photo: Bill Eager
NREL Image Library 00566

Solar by-right

By defining solar energy systems and establishing clear development standards, small-scale solar energy systems may then be allowed as an accessory use, without special zoning review, in all major districts.

Example: Maricopa County, Arizona Zoning Ordinance Section 1206 –

"Renewable energy systems, other than utility-scale electrical generating stations, are allowed as an accessory use within any zoning district, subject to the provisions of Article 1206.3 [which list development standards for such systems]."

"Maricopa County Zoning Ordinance," *Maricopa County Planning and Development Department*, May 2017, Chapter 12, page 30, https://www.maricopa.gov/DocumentCenter/View/272.

Allow small rooftop and ground mount solar in all major zoning districts

Height

Adams County, CO allows for reasonable height exemption

4-03-03-02-10 *SOLAR ENERGY SYSTEM*

2. *Maximum Height of Attached Panels:* Solar panels attached to a roof shall not exceed the maximum permitted height of the structure type by more than five (5) feet.

3. *Maximum Height of Detached Solar Panels:* Fifteen (15) feet.

Lafayette, CO has a reasonable rooftop height allowance for solar

Sec. 26-14-8. - *Height* provisions.

(c) Maximum height for appurtenances. Except as may be permitted by sections 26-14-21 and 26-22.5-7 of this chapter, the maximum permitted height of stacks, vents, antennae, cooling towers, elevator bulkheads, ***solar* panels**, tanks, monuments, cupolas, domes, towers, spires and similar mechanical and nonhabitable structural appurtenances shall be no more than ten (10) feet above the highest point of the principal building on the property in question or ten (10) feet above the maximum permitted height in the zone district, whichever is less

Aesthetics

Maplewood, MN

AN ORDINANCE TO THE MAPLEWOOD MUNICIPAL CODE REGARDING RENEWABLE ENERGY SYSTEMS (Wind, Solar, Geothermal)

Section 4.c.4. Visibility

Solar energy systems (SES) shall be designed to blend into the architecture of the building or be screened from routine view from public right-of-ways other than alleys.

The color of the solar collector is not required to be consistent with other roofing materials.

Northeast Denver Houseing Center's Whittier Affordable Housing Project
Source: NREL/DOE Image 19188

Solar in Historic and Special-Use Districts

Goal: prevent loss of “character-defining” elements of a historic property. Solar can be installed in ways that minimizes disruption.

Breckenridge, CO

Within the Conservation District: Solar panels and solar devices are encouraged to be installed on a non-historic building or building addition and integrated into the building design.

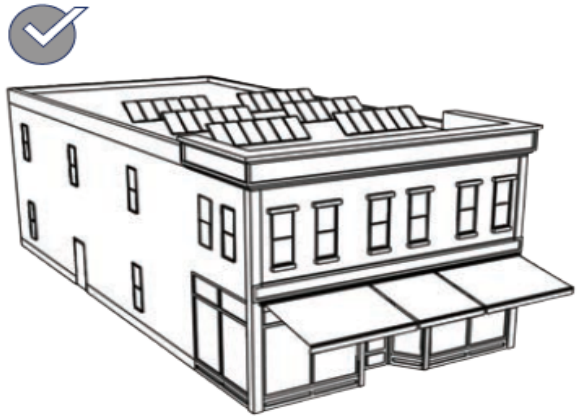
Provide clear guidance for solar in historic districts

Special use and historic districts

Solar Collectors

3.70 Minimize adverse effects from solar collectors on the character of a historic building.

- Place collectors to avoid obscuring significant features or adversely affecting the perception of the overall character of the property.
- Size collector arrays to remain subordinate to the historic structure.
- Minimize visual impacts by locating collectors back from the front facade.
- Consider installing collectors on an addition or secondary structure where applicable.



Place collectors to avoid obscuring significant features or adversely affecting the perception of the overall character of the property.

Source: Plano, TX Downtown Heritage Resource District Design Standards

Roof Coverage

Lafayette, CO
Section 611 is added to the International Fire Code to read as follows:

611 *Solar* Photovoltaic Installations.

611.1. Roof Clearances for Installation:

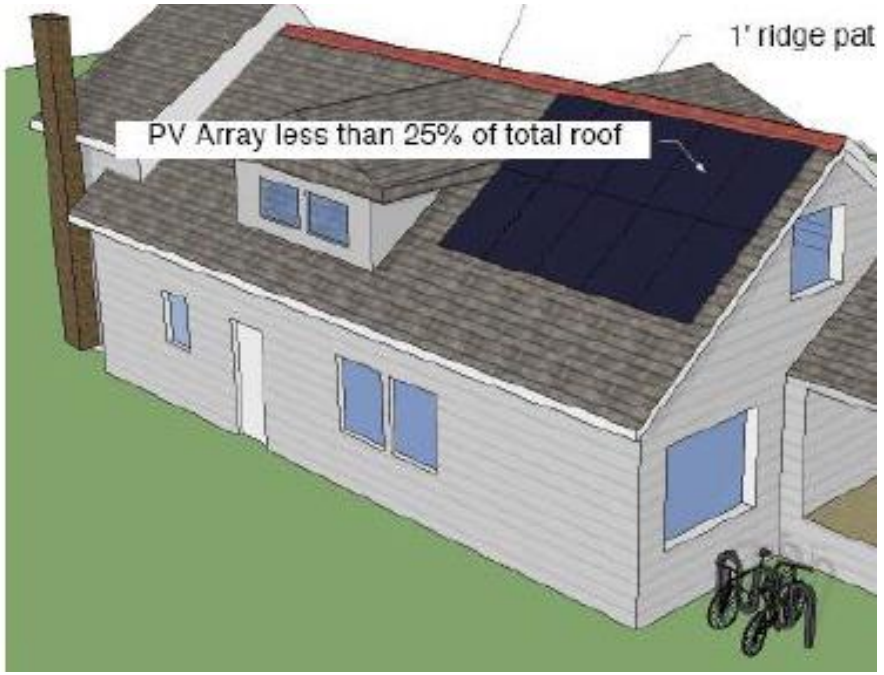
a) *Panels shall not be placed closer than 2'0" to the ridge of any roof.*
b) *Panels shall be placed no closer than 2'0" to the head wall at the top of any roof slope.*
c) *Panels shall be placed no closer than 18" from any roof valley.*
d) *Additional roof access may be required based on unique site conditions as determined by the Fire Department.*

Ensure fire safety with roof setbacks, not a limit on the percentage of roof covered by solar

Roof percent coverage limit does not guarantee safety

Large array that leaves egress pathway: good

Small array that DOES NOT leave egress pathway: problem



Source: 2010 Oregon Solar Installation Specialty Code and Commentary
https://www.oregon.gov/bcd/codes-stand/Documents/2010_OSISC_commentary.pdf

Glare

Most solar farms use PV modules to generate electricity. PV modules use non-reflective glass and are designed to absorb rather than reflect the light that hits the panels in order to convert solar energy into electricity.

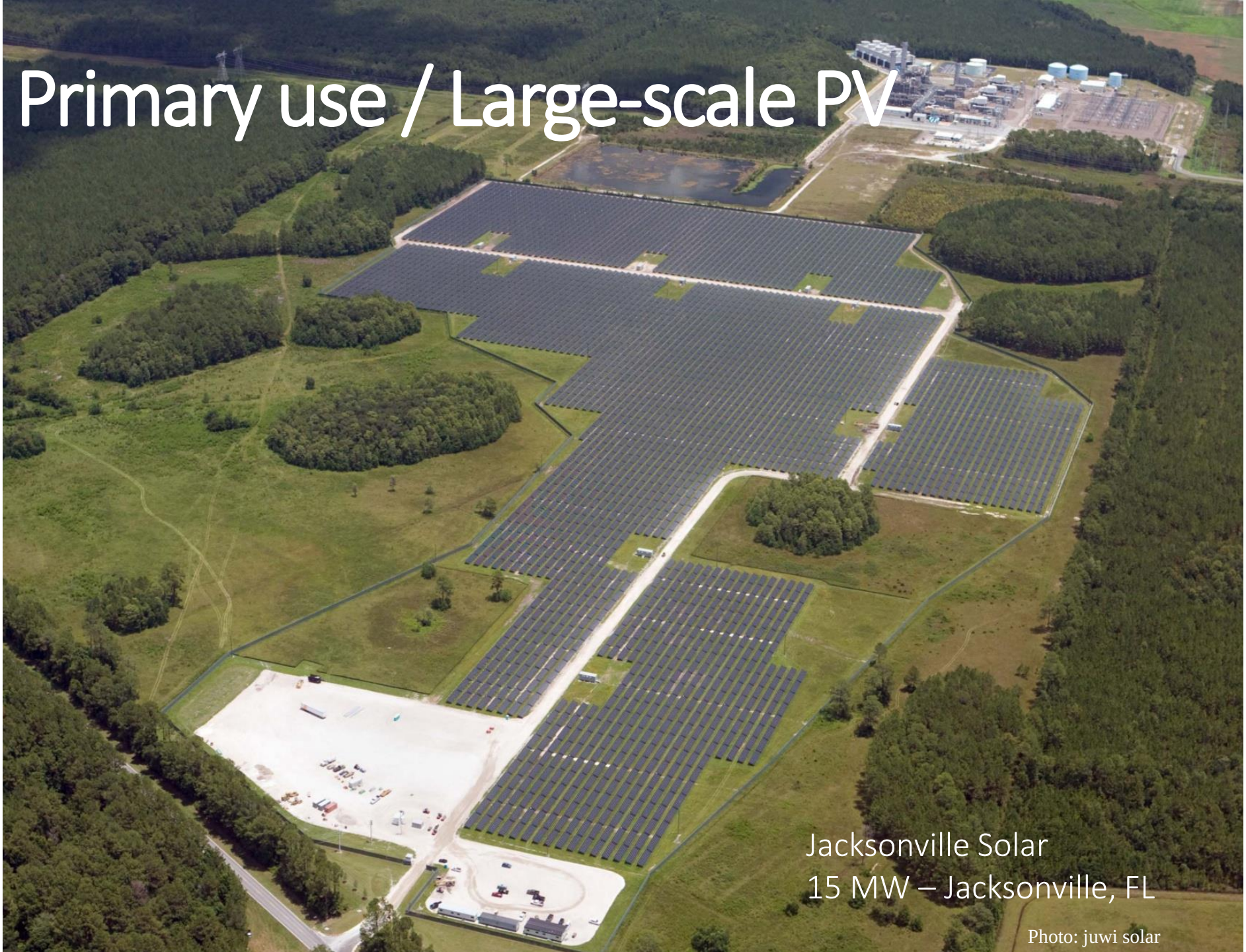
PV modules are generally less reflective than windows and are installed at numerous airports.

Sun Edison PV array at the NWTC. *Photo by Dennis Schroeder, NREL 11249490*

Best Practice

Do not require a glare study. Leave this to the FAA.

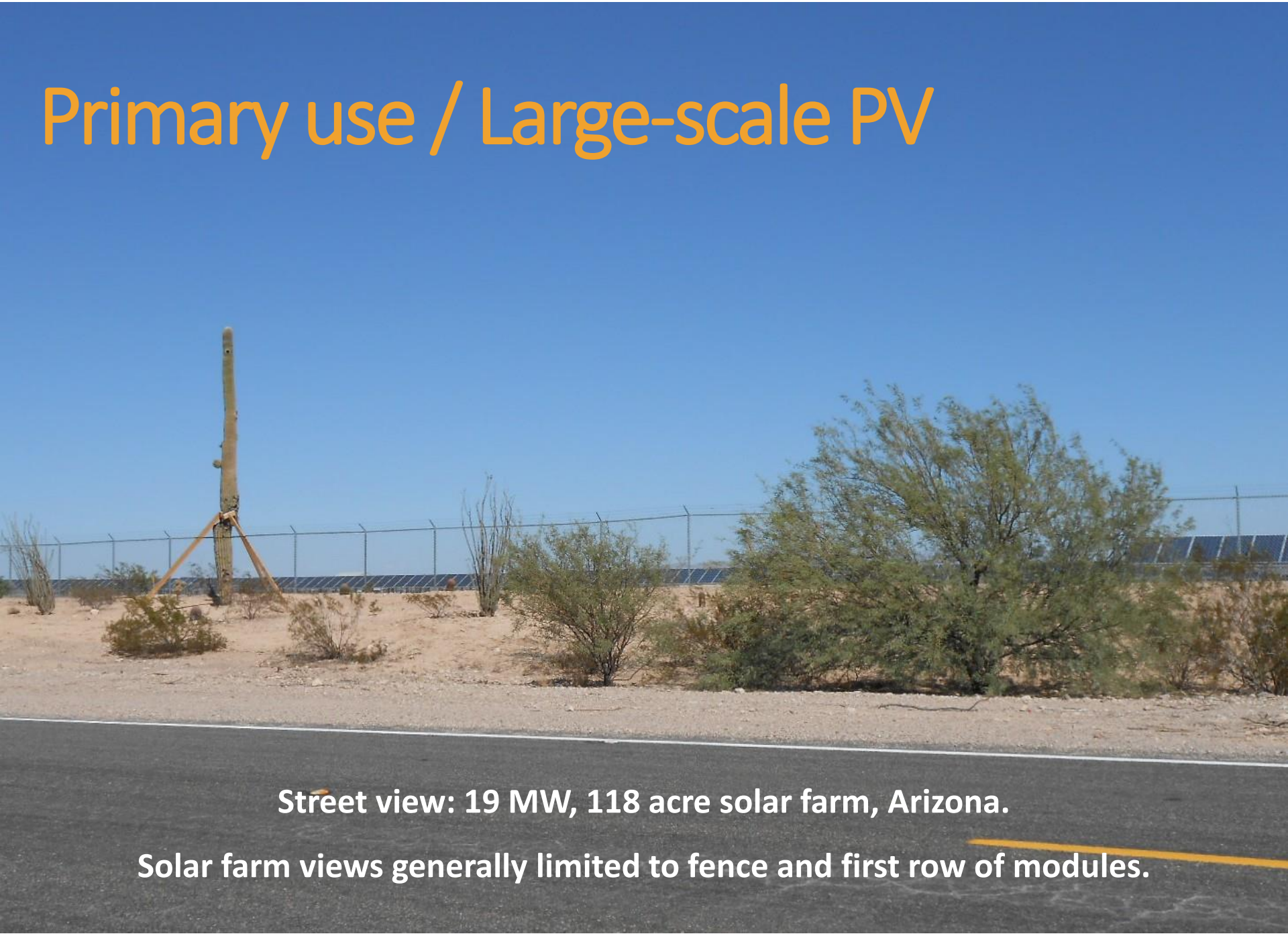
Primary use / Large-scale PV



Jacksonville Solar
15 MW – Jacksonville, FL

Photo: juwi solar

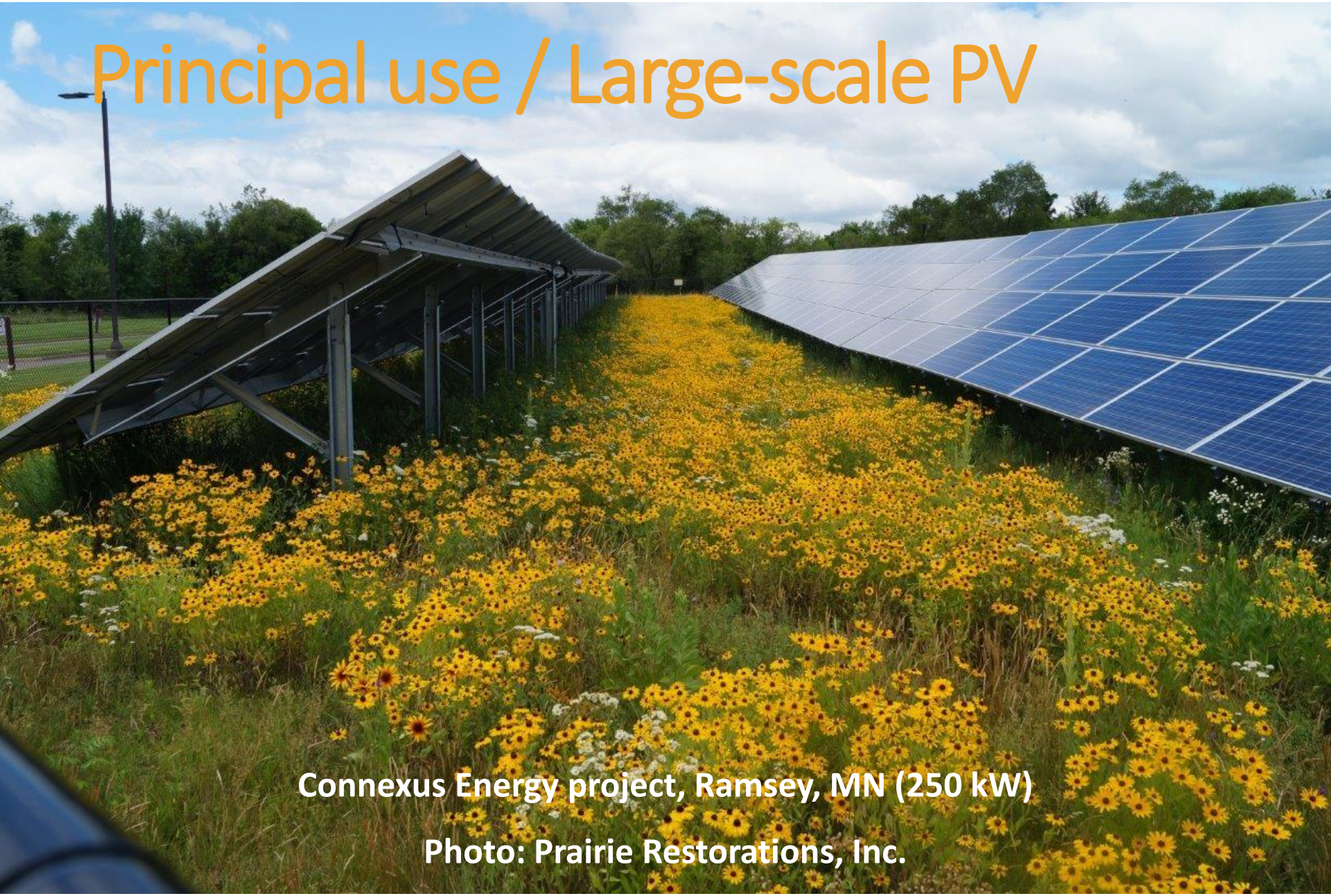
Primary use / Large-scale PV



Street view: 19 MW, 118 acre solar farm, Arizona.

Solar farm views generally limited to fence and first row of modules.

Principal use / Large-scale PV



Connexus Energy project, Ramsey, MN (250 kW)

Photo: Prairie Restorations, Inc.

Primary use / Large-Scale PV

No glare	• Less reflective than water and windows and compatible with nearby residential, office, or aviation uses
Very low noise	• 45 decibels at 10 meters from the inverters, which is slightly less noise than a refrigerator makes
Safe	• Photovoltaic modules are enclosed in glass, carry a 25 year warranty, meet all applicable electrical and safety standards
Low voltage	• Far lower voltage than transmission lines – No EMF impacts

Lot Coverage, Impervious Surface

Zoning codes and development regulations can limit **lot coverage** on large lots to as little as 10%.

Impervious surface calculations – Ensure ground mount modules are not considered impervious as long as there is pervious surface beneath them (e.g. grass)

Exempt principal use solar from lot coverage requirements.


Walton EMC Cooperative Solar

Special Development Sites (e.g. brownfields)

- Offer expedited review as long as project meets certain standards
- Provide exemptions from lot coverage/impervious surface requirements

PZD-8 Encourage or incentivize solar PV development on parking lots, vacant lots, landfills, buffer lands, brownfields, airport safety zones, and non-building structures (20 points)

Shaffer Landfill, Billerica, MA, Urban Green Technologies
https://www.high-profile.com/wp-content/uploads/2015/04/Shaffer-Landfill_PV-aerial.jpg

Pitfall: regulating based on location of energy consumption

Adams County, Colorado

4-03-03-02-10 *SOLAR ENERGY SYSTEM*

1. *Property Served:* The solar energy system shall be designed to only provide energy for the property upon which it is located. However, excess energy may be sold as permitted by state and federal law.

Prevents shared or community solar installations and any primary use solar energy installation.

Regulate impacts, not use

Zoning based development incentives

- Reward solar-ready construction or construction that includes solar
  - *Streamline permitting*
  - *Bonus FAR up to a certain cap (e.g. .20) above base density in a district for integration of a solar energy system*

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

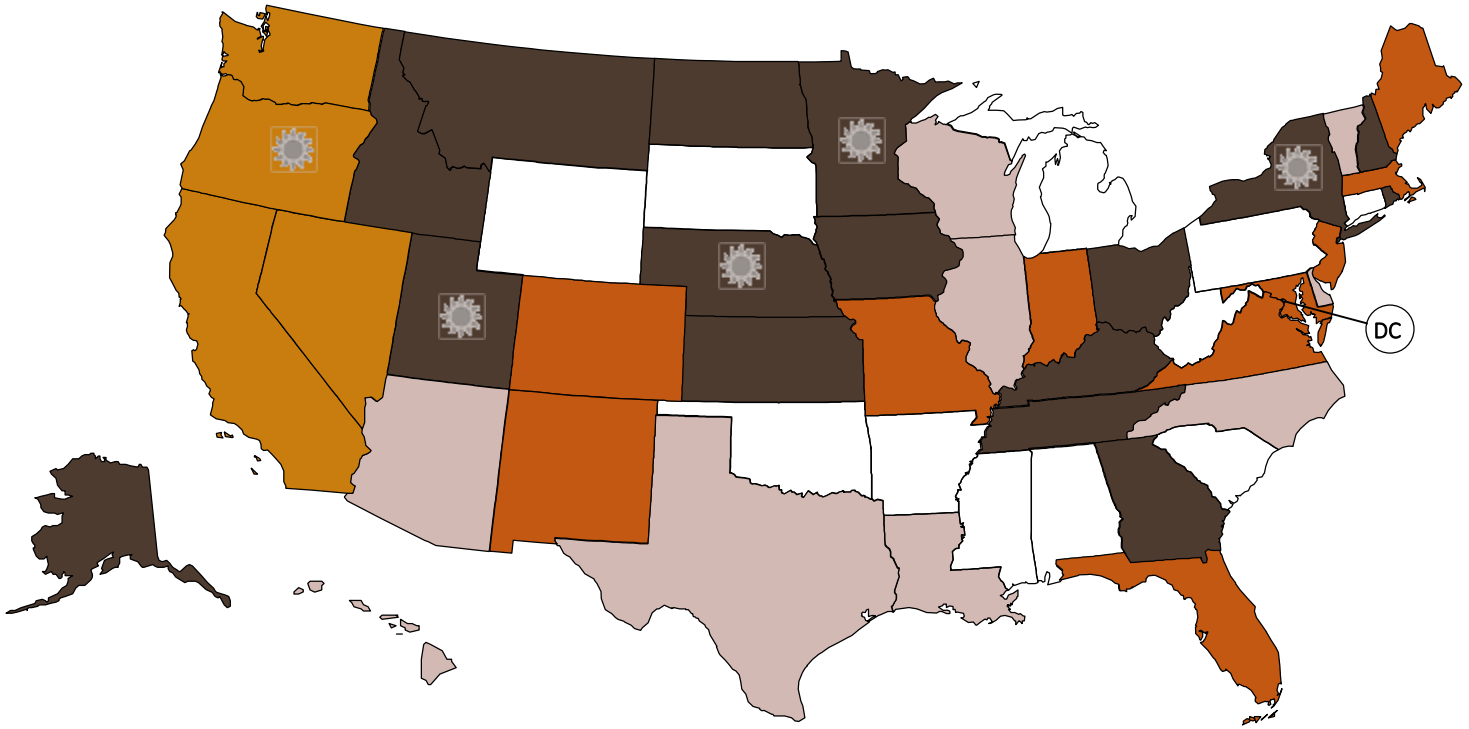
Solar Access

A landowner does not have any legal right to the free flow of light and air across the adjoining land of his neighbor

Powered by SunShot
U.S. Department of Energy

Source: Google Earth

Solar Access



Solar Easements Provision

Solar Rights Provision

Solar Easements and Solar Rights Provisions

U.S. Virgin Islands

Local option to create solar rights provision

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Source: Database of State Incentives for Renewables & Efficiency (www.dsireusa.org)

Solar Access

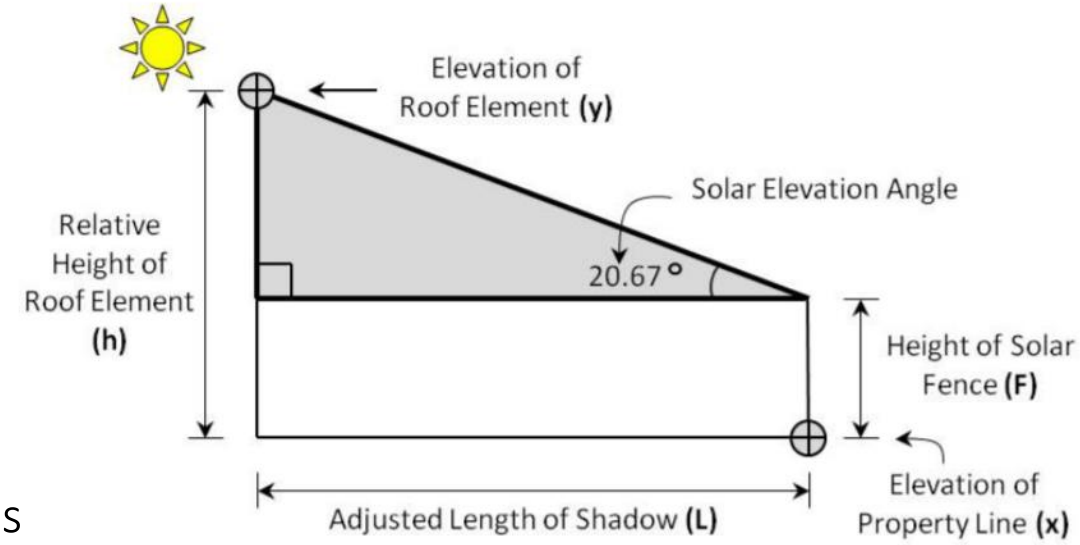


Figure 1: Section Along Shadow Length at 10 a.m. and 2 p.m.

Boulder, CO Solar Access Guide:
https://bouldercolorado.gov/plan-develop/solar-access-guide

Options:

1. Encourage private easements
2. Facilitate or trigger easements at solar building permit
3. Require review for potential shading of existing solar energy systems for adjacent building permits
4. Implement “solar fence” concept to regulate solar access for parcels – applies to vegetation and structures

Best practice case studies

Zoning Standards: Hobart, IN

Definition

Technology types

Broad and inclusive

SOLAR ENERGY SYSTEM. A set of devices whose primary purpose is to collect solar energy and convert and store it for useful purposes including heating and cooling buildings or other energy-using processes, or to produce generated power by means of any combination of collecting, transferring, or converting solar generated energy.

SUBSTATIONS. Any electrical facility designed to convert electricity produced by wind turbines to a voltage for interconnection with transmission lines.

TOTAL HEIGHT. The highest point, above ground level, reached by a rotor tip or any other part of the WECS.

TOTAL NAME PLATE CAPACITY. The total of the maximum rated output of the electrical power production equipment for a WECS project.

TOWER. Towers include vertical structures that support the electrical generator, rotor blades, or meteorological equipment.

TOWER HEIGHT. The total height of the WECS exclusive of the rotor blades.

TRACKING SOLAR ARRAY. A solar array that follows the path of the sun during the day to maximize the solar radiation it receives.

WECS - WIND ENERGY CONVERSION SYSTEM. A device such as a wind charger, windmill, or wind turbine and associated facilities that converts wind energy to electric energy, including, but not limited to: power lines, transformers, substations, and meteorological towers. The energy may be used on-site or distributed into the electrical grid.

Zoning Standards: Hobart, IN

§154.436 PERMITTED AND CONDITIONAL USES FOR SOLAR ENERGY SYSTEMS

Solar Farms will be permitted, conditionally permitted or not permitted based on the generating capacity and land use district as established in the table below; (P=Permitted, CU=Conditional Use, NP=Not Permitted):

	Large Solar Energy System	Accessory Solar Energy System
(1) A-1	CU	P
(2) R-1/2/3/4	CU	P
(3) OS-1 & B-1/2	CU	P
(4) B-3 & PBP	CU	P
(5) M-1/2	P	P

(A) *Standards for Solar Energy Systems, Accessory*

Solar energy systems are a permitted accessory use in all zoning districts, subject to the following standards:

Zoning Standards: Hobart, IN

Dimensional Standards

- Large Solar Systems/ Solar Farms
  - Land Use and Conditional Use permits
  - Stormwater compliance
  - Underground power and communication lines
  - Engineering Approval
  - Code compliant
  - Pre-construction meeting
- Small Accessory Systems
  - Exempt from accessory buildings requirements
  - Setback requirements
  - No height exemption
  - Roof setback
  - Lot coverage restrictions
  - Electric code compliance
  - Utility notification
  - Minimize glare

San Antonio

- SolSmart Silver and a Solar America City
- Goal of creating a solar energy economy
- Aggressive utility scale investments and goals
- Small scale solar by-right

CITY OF SAN ANTONIO
SOLAR DEVELOPMENT PLAN

SOLAR AMERICA COMMUNITIES
SOLAR SAN ANTONIO
BUILD SAN ANTONIO GREEN
cps ENERGY
mission verde alliance
SAN ANTONIO CLEAN TECHNOLOGY FORUM
AACOG Alamo Area Council Of Governments
Good Company

Kennedale

- Permits solar by right as an accessory use
- Recent zoning code changes
- Clear communication about solar permitting – solar landing page and permit checklist (in development)

Table 3.2 Schedule of Uses: Agricultural and Residential Districts								
Use	**AG**	**R-1**	**R-2**	**R-3**	**D**	**MF**	**MH**	**Other**
Accessory Uses								
Accessory buildings	P	P	P	P	P	P	P	*11.2*
Garage sales	P	P	P	P	P	P	P	*11.10*
Holiday tree and firewood sales	S							*11.17*
Home occupation	P	P	P	P	P	P	P	*11.18*
Outdoor display, accessory retail sales								*11.23*
Outdoor display, temporary accessory retail sales								*11.24*
Outdoor storage, commercial and industrial								*11.25*
Residential sales	P	P	P	P	P	P	P	*11.30*
Solar energy equipment	P	P	P	P	P	P	P	*11.37*
Accommodations, Hospitality, Entertainment								
Banquet hall								
Bed and breakfast	S	S	S	S	S	P		
Hotel/motel								

Additional resources

Local solar resources

Google Project Sunroof for cities
https://www.google.com/get/sunroof/data-explorer/

ESTIMATED SOLAR INSTALLATION POTENTIAL

Overall

Total estimated size and solar electricity production of viable roofs for Denver, CO

Roofs	Roofs
63%	111K

Roof space	Capacity	Electricity
151M	2.1K	3M
sq ft	MW DC	MWh AC per yr

apps1.eere.energy.gov/sled/#/

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

State & Local Energy Data

Toolbox: Learn about community energy actions

Explore how communities have implemented energy policies. Find resources to take action today.

Browse Energy Actions

Small Building Rooftop PV Potential, Denver CO

Suitable Small Buildings
108,500 buildings

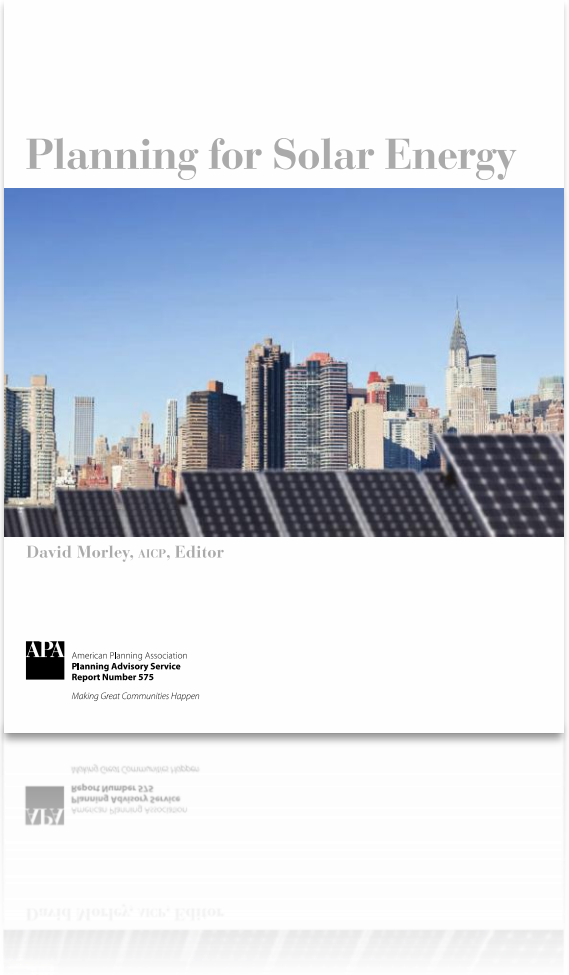
Unsuitable Small Buildings
64,000 buildings

Suitable area	5,000,000 m2
Capacity potential	700,000 kW
Energy generation potential	1,000,000 MWh

Technical Resources

Resource **Planning for Solar Energy**

A guide for planners on determining and implementing local solar goals, objectives, policies, and actions



www.planning.org

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U.S. Department of Energy

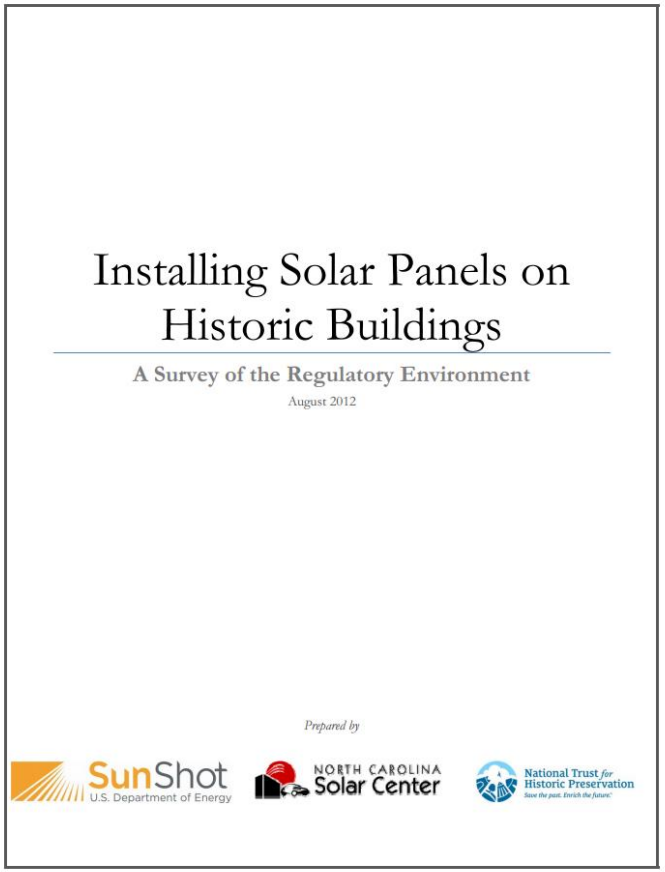
Zoning Standards: Historic

Resource

North Carolina Clean Energy Technology Center

Provides sample design principles and example regulations incorporating historic preservation into sustainability and energy projects.

Direct link



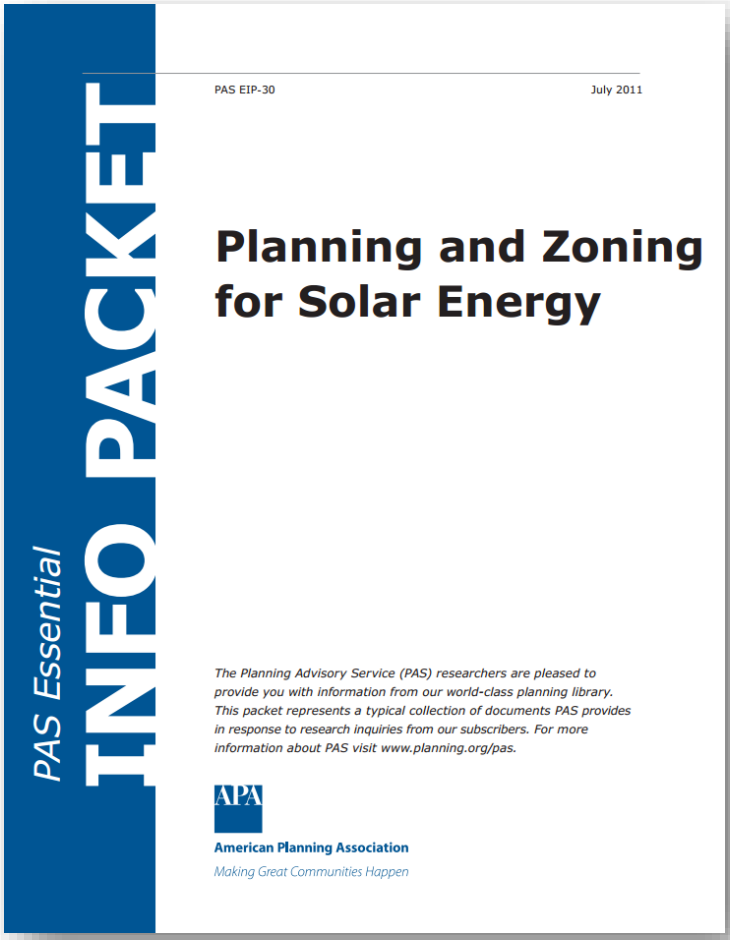
Zoning Standards: Model Ordinances

Resource

American Planning Association

This Essential Info Packet provides example development regulations for solar.

Direct link



https://www.planning.org/media/document/9026655/

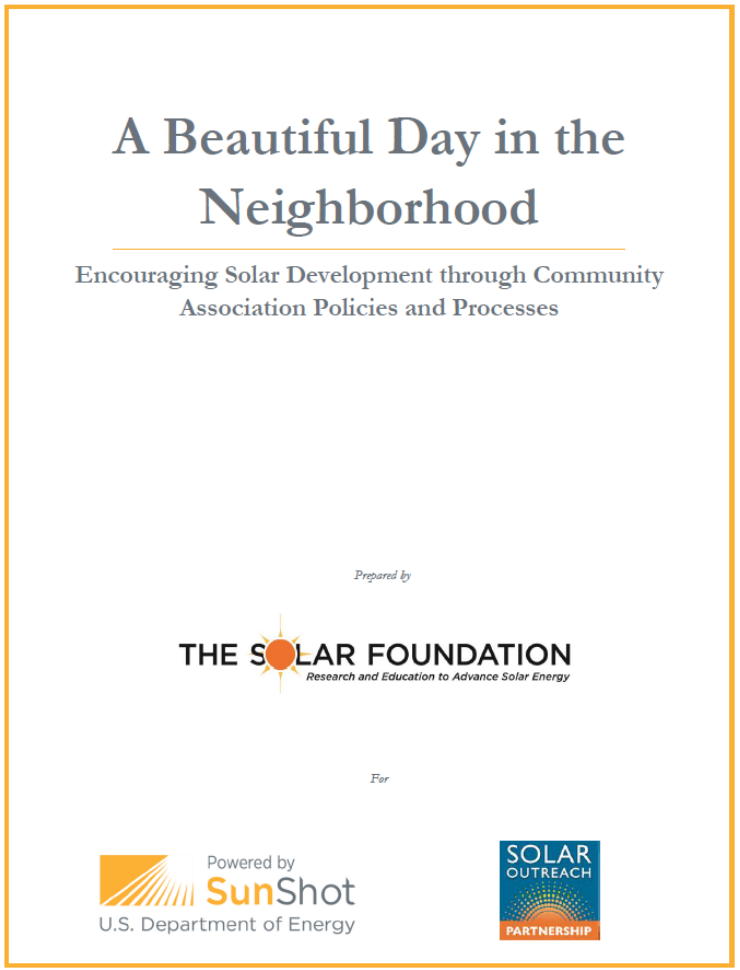
Private Rules on Residential Solar

Resource

The Solar Foundation

Guide for HOAs on solar access law and simple recommendations for reducing barriers to solar in association-governed communities.

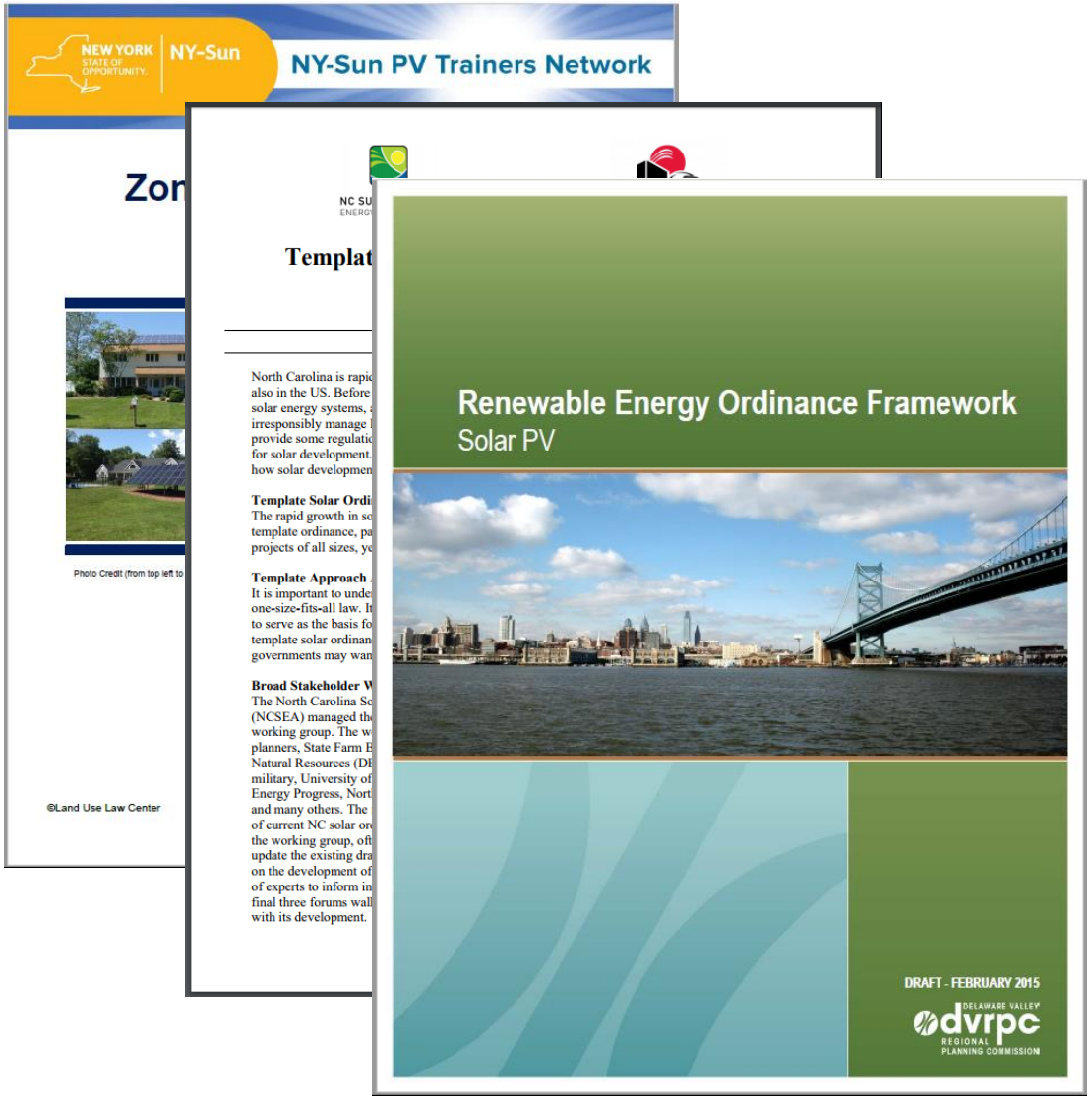
Direct link



Model ordinances with language and rationales

Resource

- North Carolina
- Delaware Valley Regional Planning Council
- Massachusetts
- New York



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Thank you!

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