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
  o Zoning
  o Subdivision
  o Growth management
  o Utility access
  o Storm water management
  o Wetlands, water rights
  o Endangered species

❖ Redevelopment
  o Zoning
  o Rehab building codes, ADA
  o Parking, traffic concerns
  o Utility access improvements
  o Historic preservation
  o Multiple uses
  o Storm water management
  o 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
  o Development standards address measurable constraints such as density, building heights, setbacks, landscaping, etc
  o 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

<table>
<thead>
<tr>
<th>Federal</th>
<th>State &amp; Local</th>
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<tbody>
<tr>
<td>Investment Tax Credit</td>
<td>Renewable Portfolio Standard</td>
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<tr>
<td>Depreciation (MACRS)</td>
<td>Net Metering</td>
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<tr>
<td>Clean Power Plan</td>
<td>Interconnection</td>
</tr>
<tr>
<td>Solar Access</td>
<td>Other Incentives</td>
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</tbody>
</table>

By right zoning
Municipal PV Deployment Correlation with Solar References in Code

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

How to address solar in zoning ordinances
Solar Technologies

Solar Photovoltaic (PV)

Solar Hot Water

Concentrated Solar Power

Passive Solar
Some Basic Terminology

Panel / Module

Cell
Some Basic Terminology

Array
System Components

Residential Grid Connected PV System

- Solar Panels
- Inverter
- Meter
- Home Power/Appliances
- Utility Service
Some Basic Terminology

Capacity / Power
kilowatt (kW)

Production
Kilowatt-hour (kWh)
Solar PV Scales

**Residence**
5 kW

**Office**
50 – 500 kW

**Factory**
1 MW+

**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:
  o Capacity (kW): efficiencies improve over time
  o Location of energy usage (e.g. requiring that any accessory use solar generation be consumed exclusively on-site).
    o Could accidentally preclude community shared solar
# Zoning best practices for solar

<table>
<thead>
<tr>
<th>Section</th>
<th>Topics to Address</th>
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<tbody>
<tr>
<td><strong>Definitions</strong></td>
<td>Define “solar” broadly and provide add’l definitions for specific types of solar</td>
</tr>
<tr>
<td><strong>Use tables/allowed uses</strong></td>
<td>Allow small rooftop and ground mount solar by right in all major zoning districts</td>
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<tr>
<td><strong>Dimensional Standards</strong></td>
<td>Exempt small solar from a range of requirements, where possible:</td>
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<td>• Height</td>
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<td>• Size (ft2)</td>
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<td>• Setbacks (roof)</td>
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<td>• Lot coverage &amp; setbacks</td>
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<td><strong>Design Standards</strong></td>
<td>• Aesthetics</td>
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<td>• Glare</td>
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<td>• Screening/fencing</td>
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<td></td>
<td>• Exception: historic districts</td>
</tr>
</tbody>
</table>
Language applied by cities and towns

The good and the bad
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.

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.
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].”


Best Practice

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.


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 Housing 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.

*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.

Best Practice
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
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

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

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

**Best Practice**

Exempt principal use solar from lot coverage requirements.
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
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.

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

Source: Google Earth
Solar Access

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

Solar Easements Provision
Solar Rights Provision

Local option to create solar rights provision

U.S. Virgin Islands

Powered by SunShot
U.S. Department of Energy

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

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.
§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):

<table>
<thead>
<tr>
<th></th>
<th>Large Solar Energy System</th>
<th>Accessory Solar Energy System</th>
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<tbody>
<tr>
<td>(1)</td>
<td>A-1</td>
<td>CU</td>
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<tr>
<td>(2)</td>
<td>R-1/2/3/4</td>
<td>CU</td>
</tr>
<tr>
<td>(3)</td>
<td>OS-1 &amp; B-1/2</td>
<td>CU</td>
</tr>
<tr>
<td>(4)</td>
<td>B-3 &amp; PBP</td>
<td>CU</td>
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<tr>
<td>(5)</td>
<td>M-1/2</td>
<td>P</td>
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</tbody>
</table>

(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
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

<table>
<thead>
<tr>
<th>Use</th>
<th>AG</th>
<th>R-1</th>
<th>R-2</th>
<th>R-3</th>
<th>D</th>
<th>MF</th>
<th>MH</th>
<th>Other</th>
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<tbody>
<tr>
<td>Accessory Uses</td>
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<tr>
<td>Accessory buildings</td>
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<tr>
<td>Garage sales</td>
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<td>Holiday tree and firewood sales</td>
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<td>Home occupation</td>
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<tr>
<td>Outdoor display, accessory retail sales</td>
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<tr>
<td>Outdoor display, temporary accessory retail sales</td>
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<tr>
<td>Outdoor storage, commercial and industrial</td>
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<td>Residential sales</td>
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<tr>
<td>Solar energy equipment</td>
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<tr>
<td>Accommodations, Hospitality, Entertainment</td>
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<td>Banquet hall</td>
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<td>Bed and breakfast</td>
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<td>S</td>
<td>S</td>
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<td>Hotel/motel</td>
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<tr>
<td>Micro brewery</td>
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Values: P = Permitted, S = Suspending, Other: see ordinance for details.
Additional resources
Local solar resources

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

ESTIMATED SOLAR INSTALLATION POTENTIAL

State & Local Energy Data

Toolbox: Learn about community energy actions
Explore how communities have implemented energy policies. Find resources to take action today.

Small Building Rooftop PV Potential, Denver CO

<table>
<thead>
<tr>
<th></th>
<th>Suitable Small Buildings 196,500 buildings</th>
<th>Unsuitable Small Buildings 64,000 buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable area</td>
<td>5,000,000 m²</td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>700,000 kW</td>
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</tr>
<tr>
<td>Energy generation potential</td>
<td>1,000,000 MWh</td>
<td></td>
</tr>
</tbody>
</table>

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

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

63% 111K

Roofs  Roofs
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
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
www.solaroutreach.org
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

www.solaroutreach.org
Model ordinances with language and rationales

Resource

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

www.solaroutreach.org
Thank you!  
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