Solar Powering Your Community
Workshop: North Charleston, SC
May 15, 2015

- Casey Logan, SCANA
- Eddie Plowden, Berkeley Co. Electric Cooperative
- Brian Burdly, Santee Cooper
- David Morley, American Planning Association, Solar Outreach Partnership
- Sky Stanfield and Erica McConnell, Keyes, Fox & Weidman, Solar Outreach Partnership
- Shawn Stickle, SC Fire Marshall
- Ray Reckelhoff, SC Fire Academy

http://solaroutreach.org
Here Comes the Sunshine.

Solar Workshop for Municipal Employees
May 14, 2015
SCANA Headquarters - Cayce, SC
What is renewable energy?

- Energy resources that are naturally replenishing and virtually inexhaustible.
- Many sources are intermittent (non-dispatchable).
- Includes solar, wind, biomass, hydro, geothermal, recycling resources, hydrogen, tidal and wave resources, and combined heat and power (CHP) from renewables.
Renewable Energy at SCE&G

- **Biomass**
  55 MW (Kapstone)

- **Solar**
  4 MW existing (~300 customers).

- **Hydro**
  221 MW (Saluda, Neal Shoals, Parr, Stevens Creek)

- **Wind**
  SCE&G Innovation Center - Wind Turbine Drive Train Testing facility at Clemson University Research Institute
SCE&G Solar Customer Locations

Legend

Solar Customers

Sources: Esri, HERE, DeLorme, TomTom, Intermap, iDempiere P Corp., GEBCO, USGS, FAO, NPS, NRCAN, geoloqi, IGN, Mapbox NL, Ordnance Survey, Esri Japan, METI, Esri China

Mapbox and Mapbox logo are trademarks of Mapbox Inc. © OpenStreetMap contributors and the OSM User Community
Why Focus On Solar?

• Increasing customer interest.

• Cost of solar has decreased by more than 60%+ since 2008.

• Solar is scalable.
Select Solar Sizing and Costs

- **Residential**
  - $3.50/watt, or approx. $14,000 for a 4 kW system

- **Small Commercial**
  - $2.75/watt, or $55,000 for a 20 kW system

- **Utility-Scale (Solar Farm)**
  - $2.00/watt, or $2 million per MW

*Note: Costs are subject to market changes, potential financing expenses and specifications for each installation such as existing roofs or new construction.*
VALUE of the GRID
SCE&G System Load and 4kW Solar Max Output

Summer Day

SCE&G provides power
Customer generation but grid support still needed
SCE&G provides power

Rooftop solar customers use the grid...

24/7

Note: The peak for solar generation and the peak for usage on our system do not coincide.
S.C. Distributed Energy Resource Program Act 236

Directs Investor Owned Utilities by 12/31/2020:

• To develop customer incentives to promote the establishment of renewables
• Meet goals of 42 MW utility-scale farms, and 42 MW customer-scale installations
Cumulative Solar Participants

- Utility-Scale (1 MW - 10 MW)
- Customer-Scale (<1 MW)
- Existing Solar

Year 2015: 560 (300 + 260)
Year 2016: 1850 (1500 + 350)
Year 2017: 2735 (2400 + 335)
Year 2018: 3570 (3000 + 570)
Year 2019: 4330 (3000 + 1330)
Year 2020: 4965 (3000 + 1965)
Cumulative Solar MW

- **Utility-Scale (1 MW - 10 MW)**
- **Customer-Scale (< 1MW)**
- **Existing Solar**

<table>
<thead>
<tr>
<th>Year</th>
<th>Utility-Scale</th>
<th>Customer-Scale</th>
<th>Existing Solar</th>
<th>Total MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>4.3</td>
<td>5.9</td>
<td>4</td>
<td>14.2</td>
</tr>
<tr>
<td>2016</td>
<td>19.5</td>
<td>4</td>
<td>4</td>
<td>33.9</td>
</tr>
<tr>
<td>2017</td>
<td>36.3</td>
<td>4</td>
<td>4</td>
<td>76.6</td>
</tr>
<tr>
<td>2018</td>
<td>40.3</td>
<td>4</td>
<td>4</td>
<td>84.3</td>
</tr>
<tr>
<td>2019</td>
<td>44.3</td>
<td>4</td>
<td>4</td>
<td>88.3</td>
</tr>
<tr>
<td>2020</td>
<td>48.3</td>
<td>4</td>
<td>4</td>
<td>96.3</td>
</tr>
</tbody>
</table>

SCE&G
Leading in Solar Energy
sceg.com/solar
Thank You

Casey Logan
Renewable Products/Services and Energy Demand Management
cjlogan@scana.com
Solar 101

Powered by SunShot
U.S. Department of Energy
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 United States.

http://solaroutreach.org
Complimentary Services

- Technical Resources
- Regional Workshops
- One to One Assistance
- Strategy Session

http://solaroutreach.org
Focus Areas

- Streamlining and standardizing permitting and interconnection processes
- Improving planning and zoning codes/regulations for solar electric technologies
- Increasing access to solar financing options

http://solaroutreach.org
There Are Multiple Solar Technologies

Passive Solar Design

Solar Photovoltaic (PV) Systems

Solar Thermal Systems

Concentrating Solar Power
Some Basic Terminology

Panel / Module

Cell
Some Basic Terminology

Array
Some Basic Terminology

Building-Mounted (Rooftop) Systems
Some Basic Terminology

Ground-Mounted (Freestanding) Systems
Some Basic Terminology

Building-Integrated Systems
Some Basic Terminology

- **Capacity / Power**: kilowatt (kW)
- **Irradiance**: Kilowatt-hours/square meter (kWh/m²)
- **Production**: Kilowatt-hour (kWh)
Some Basic Terminology

- Residence: 5 kW
- Office: 50 – 500 kW
- Factory: 1 MW+
- Utility: 2 MW+
Some Basic Terminology

**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.
Some Basic Terminology

**Interconnection** refers to the process of tying a PV system into the local utility’s grid.
Planning and Zoning for Solar Energy
Overview

- Planning for Solar Energy Use
  - Establishing a community vision
  - Prioritizing locations
  - Adding vision and priorities to local plans

- Zoning for Solar Energy Use
  - Defining solar uses
  - Establishing clear use permissions
  - Adopting appropriate standards
  - Adopting complimentary development regulations
Key APA Resources

- Planning for Solar Energy (PAS 575):

- Solar Planning and Zoning Data Search:
  [www.planning.org/solar/data/](http://www.planning.org/solar/data/)
Planning for Solar Energy Use: Establishing a Community Vision
Consider How Solar Energy Use Relates to a Long-Term Vision for Growth or Change
A Planning Perspective on Solar Energy Use

Solar Irradiance Is a Local Resource.

- It can be used to produce heat or electricity.
- But using it may affect the use or conservation of other resources.
Communities Pursue Many Goals

- Livability
- Harmony with Nature
- Economic Resilience
- Social Equity
- Healthy Community
- Regional Cooperation
- Authentic Participation

A Sustainable Community
Solar Energy Use Relates to Multiple Goals

- Healthy Community
- Harmony with Nature
- Economic Resilience
Solar Energy Use Is a Strategy

Goal: Harmony with Nature

Objective 1: Reduce Fossil Fuel Consumption

Policy 1: Support Energy Conservation
- Strategies:
  - Energy-Efficient Construction
  - Green Infrastructure

Policy 2: Support Renewable Energy Production
- Strategies:
  - Solar Energy Use
  - Wind Energy Use
  - Geothermal Energy Use
Planning for Solar Energy Use: Prioritizing Locations
Considerations

- Photovoltaic (PV) systems need unobstructed access to sunlight.
  - Freestanding systems increase siting options.
  - But, they are more vulnerable to future obstructions.

![Diagram showing shading over time]

Year 0 = No shading
Year 20 = Major shading
Considerations

- PV systems are modular.
  - Solar installations can take up a fraction of a single residential rooftop or hundreds of acres.
  - But, there are economies of scale.

PSE&G Trenton Solar Farm, 1.3 MW on about 5.5 acres
Considerations

- Potentially competing priorities

Historic Preservation

Tree Preservation

Urban Redevelopment
Considerations

- Local land-market supply and demand.
  - Some cities and counties have abundant space.
    - Low-density, primarily residential communities
    - Legacy cities with weak market demand for surplus vacant properties
    - Rural townships and counties
  - Others have fewer suitable locations.
    - Built-out cities with high demand for new housing and office space
Planning for Solar Energy Use: Incorporating Vision and Priorities into Local Plans
Why Are Plans Important?

- They put specific initiatives and actions into a larger context.
Why Are Plans Important?

They guide decision making:

- Provide rationale for zoning and other development regulations
- Link programmatic and capital investments to community goals and objectives
- Send signals to the private market about preferred types of development projects
Types of Local Plans

Communitywide Comprehensive Plan

Subarea Plans
- Neighborhood Plans
- Corridor Plans
- District Plans

Functional Plans
- Green Infrastructure Plan
- Energy Plan
- Climate Action Plan
What Do Your Local Plans Say?

- About where you want solar development to happen?
  - Rural areas
  - Residential neighborhoods
  - Commercial or industrial districts
  - Public land and facilities
  - Greenfield sites
  - Brownfield sites
What Do Your Local Plans Say?

- About what the local government intends to do to facilitate solar development?
  - Update development regulations
  - Install solar systems on public property
  - Explore utility partnerships
  - Create incentive programs
Goal IV.4: Promote pollution prevention practices to achieve sustainable use of natural resources, and to protect the environment and human health.

- Objective IV.4.3: Increase the use of solar energy.
  - Strategy IV.4.3.1: Provide the public and City officials with current data and research regarding how to apply solar power.
  - Strategy IV.4.3.2: Explore the use of solar energy on every project built by the City.
  - Strategy IV.4.3.3: Explore providing incentives to encourage citizens to use solar energy.
  - Strategy IV.4.3.4: Work with surrounding communities to ensure an ongoing “solar friendly” relationship with local energy providers.
  - Strategy IV.4.3.5: Explore the use of solar energy on all City equipment and machinery.
  - Strategy IV.4.3.6: As public and private development occurs, be vigilant in seeking and maintaining opportunities for solar fields.
  - Strategy IV.4.3.7: Require all developments over two acres in size to provide evidence of having explored solar energy options as part of the approval process.
Goal #4: Manage our community facilities, infrastructure, and public resources in a manner that ensures both the existing population and future generations may enjoy the benefits and economic opportunities that make Oconee County an attractive and affordable place to live.

Objective 3: Upgrade solid waste facilities to improve services and allow for needed upgrades and expansion to provide for anticipated growth.

- Strategy 6: Seek and establish appropriate uses for closed landfill areas, which may include, but will not be limited to, the establishment of solar power generation facilities and appropriate recreation facilities.
Zoning for Solar Energy Use: Defining Solar Uses
Why Are Zoning Definitions Important?

- They simplify the text by replacing complex ideas with short terms.
- They establish the precise meaning of words or phrases as used in the text.
Define these:
- Solar collector
- Solar energy system
- Building-mounted solar energy system
- Ground-mounted (or freestanding) solar energy system
- Building-integrated solar energy system

Consider defining these:
- Small ground-mounted solar energy system
- Medium ground-mounted solar energy system
- Large ground-mounted solar energy system
Sample Definitions

- **Solar collector:**
  Any device that transforms solar radiation into thermal or electrical energy.

- **Solar energy system:**
  A complete assembly consisting of one or more solar collectors and associated mounting hardware or equipment.
Sample Definitions

- **Building-mounted solar energy system:**
  A solar energy system affixed to either a principal or accessory structure on a lot. (Minneapolis, MN)

- **Ground-mounted solar energy system:**
  A solar energy system with a supporting framework that is placed on, or anchored in, the ground and that is structurally independent from any building…(Fort Collins, CO)

- **Building-integrated solar energy system:**
  A solar energy system that is an integral part of a principal or accessory building, rather than a separate mechanical device, replacing or substituting for an architectural or structural component of the building…(Minneapolis, MN)
Sample Definitions

- **Small ground-mounted solar energy system:** A ground-mounted solar energy system occupying no more than one-half acre of land.

- **Medium ground-mounted solar energy system:** A ground-mounted solar energy system occupying between one-half acre and 10 acres of land.

- **Large ground-mounted solar energy system:** A ground-mounted solar energy system occupying more than 10 acres of land.

(Adapted from Casco Township, MI)
Zoning for Solar Energy Use: Establishing Use Permissions
Three Alternative Approaches

- Regulatory silence
- Permissions that distinguish between accessory and primary solar energy systems
- Permissions that distinguish among different types of solar energy systems
Regulatory Silence

Pros
- You don’t have to do anything.

Cons
- Property owners and developers may not be mind readers.
- Relies on ad-hoc use interpretations and “tradition” for small solar energy systems.
- Relies on time-consuming (and costly) discretionary review processes for larger solar energy systems.

Wait a minute! You’re telling me the word “solar” doesn’t appear once in our code?
Accessory vs. Primary Distinctions

### TABLE OF PERMITTED USES

<table>
<thead>
<tr>
<th>Use</th>
<th>Residential Districts</th>
<th>Mixed-Use Districts</th>
<th>Commercial Districts</th>
<th>Industrial Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>solar energy system</td>
<td>C</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

*P = Permitted; C=Conditional Use; A=Accessory Use Only*

**Pros**

- Consistent with how many communities add new uses to their codes.

**Cons**

- “Accessory” isn’t always easy to define.
- Has no inherent connection to land-use characteristics.
- All nuance must be handled through use-specific standards.
# System Type Distinctions

## TABLE OF PERMITTED USES

<table>
<thead>
<tr>
<th>Use</th>
<th>Open Space Districts</th>
<th>Residential Districts</th>
<th>Mixed-Use Districts</th>
<th>Commercial Districts</th>
<th>Industrial Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OS</td>
<td>AG</td>
<td>R-1</td>
<td>R-2</td>
<td>MX-1</td>
</tr>
<tr>
<td>building-integrated solar energy system</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>building-mounted solar energy system</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>small ground-mounted solar energy system</td>
<td>C</td>
<td>P</td>
<td>P</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>medium ground-mounted solar energy system</td>
<td>X</td>
<td>P</td>
<td>C</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>large ground-mounted solar energy system</td>
<td>X</td>
<td>C</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

P = Permitted; C=Conditional Use; X=Prohibited
System Type Distinctions

Pros
- Has inherent connection to land-use characteristics.
- Both clear and nuanced.

Cons
- Distinctions among small, medium, and large may feel arbitrary.

I told you that focusing on system types would make our job easier.
Zoning for Solar Energy Use: Adopting Appropriate Standards
Standards for Building-Mounted Systems

- Limited exemptions from district height limits
- Placement restrictions in historic districts
- Decommissioning requirements
- Aviation notification and glare analysis for systems over a certain size (e.g., ½ acre)

Altair Energy (NREL 08880); Walmart Corporate; City of Seattle (NREL 18074)
Standards for Ground-Mounted Systems

- Height limits and required setbacks
- Minimum lot size or maximum lot coverage
- Screening requirements
- Transmission infrastructure placement requirements
- Signage and lighting limits
- Decommissioning requirements
- Aviation notification and glare analysis for systems over a certain size (e.g., ½ acre)
Zoning for Solar Energy Use: Adopting Complimentary Development Regulations
Complimentary Regulations

- Solar access protections
- Solar site-design standards
- Solar-ready home standards
- Incentives for projects that incorporate solar energy systems
Solar Access Protections

- Three basic species of solar access protections:
  - Solar access easements
  - Solar access permits
  - Solar “fences”
Over 30 states have statutorily enabled solar access easements (but not SC).

These easements are private agreements that protect solar access on a particular property through limits on

- building height
- trees and other vegetation

Typically voluntary but may be tied to permit process
Solar Access Permits

- Owner documents solar energy system to receive protection of solar access
- Limitations of shading on solar energy systems through limits on
  - Building height and massing
  - Tree and landscaping placement

Source: New York Times
Solar “Fence” Standards

- Unobstructed access to sunlight required for “box” on lot
- Limitations of shading on solar energy systems through limits on
  - Building height and massing
  - Tree and landscaping placement

Source: www.bouldercolorado.gov
Solar Site Design Standards

- Minimum number of lots must be “Solar-Oriented Lots”
- Streets designed to maximize solar access
- Buildings oriented for maximum solar gain
- Typically applied to low-density residential zones

Source: www.clackamas.us
Solar-Ready Home Standards

- May be mandatory or voluntary
- Prewiring for solar PV systems
- Pre-plumbing for solar hot water systems
Development Incentives

- Density bonus for projects that incorporate solar energy systems
  - Bonus tied specifically to solar power
  - Bonus tied to a menu of potential features
# Model Solar Development Regulations

<table>
<thead>
<tr>
<th>Source</th>
<th>Model Ordinances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Massachusetts Executive Office of Energy and Environmental Affairs</td>
<td>Model Zoning for the Regulation of Solar Energy Systems; Model As-of-Right Zoning Bylaw: Allowing Use of Large-Scale Ground-Mounted Solar Photovoltaic Installations</td>
</tr>
<tr>
<td>Minnesota Department of Commerce</td>
<td>Solar Energy Standards - Urban Communities; Solar Energy Standards - Counties</td>
</tr>
<tr>
<td>North Carolina Clean Energy Technology Center</td>
<td>Template Ordinance for Solar Energy Development in North Carolina</td>
</tr>
<tr>
<td>Utah Clean Energy</td>
<td>Model Ordinance for Residential and Non-Residential Distributed Solar Energy Systems</td>
</tr>
</tbody>
</table>
David Morley, AICP
Senior Research Associate
American Planning Association

dmorley@planning.org
312.786.6392

Solar Outreach Partnership: solaroutreach.org
APA’s SolarOPs resources: www.planning.org/research/solar/
Efficient Solar Permitting for Your Jurisdiction: South Carolina

Powered by SunShot
U.S. Department of Energy
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

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
For 30 years the Interstate Renewable Energy Council, Inc. (IREC) has been known for connecting people, ideas and technology to produce measurable results in the renewable energy field.

IREC’s programs and policies lead to:

- easier, more affordable connection to the utility grid;
- fair credit for renewable energy produced;
- best practices for states, municipalities, utilities, and industry; and
- quality assessment and credentialing for trainers of our growing clean energy workforce.
Permitting Umbrella

Pre-Application Materials
Application Submittal
Application Review
Inspection

http://www.irecusa.org/regulatory-reform/permitting
### Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:30 – 11:45</td>
<td>Identifying Goals: Why permitting reform?</td>
</tr>
<tr>
<td>11:45 – 12:45</td>
<td>Identifying Successful Approaches Part I: Pre-application and application submittal</td>
</tr>
<tr>
<td>12:45 – 1:15</td>
<td>Lunch</td>
</tr>
<tr>
<td>1:15 – 2:15</td>
<td>Identifying Successful Approaches Part II: Application review and inspections</td>
</tr>
<tr>
<td>2:15 – 2:45</td>
<td>Regional Coordination: Examples &amp; Discussion</td>
</tr>
<tr>
<td>2:45 – 3:00</td>
<td>Wrap-up</td>
</tr>
</tbody>
</table>
Identifying Goals: Why Permitting Reform?
EIA forecasts for medium and low cases, available at: http://www.eia.gov/forecasts/aeo/er/index.cfm
Identifying Challenges

Solar Developer Perspective:

• Unclear or inconsistent requirements
• Lengthy application review process, even for small projects
• High or inconsistent fees
• Multiple inspections and long time windows
• Lack of familiarity with solar

Added together, these cost a lot of money!

Identifying Challenges

Local Government Perspective:

• Solar permitting is just a piece of everything else local governments do.
• Many local governments are resource-constrained.
• Inexperienced installers submit incomplete applications.
• Installations do not match design drawings.
• Importance of balancing government’s needs and demands with encouraging solar energy and economic development.
Residential Solar “Soft Costs”

U.S. Average Total Soft Costs, by System Size and Type

- Weighted avg. for res. PV (<10 kW) = $5.04/Watt

Small Commercial Solar “Soft Costs”

U.S. Average Total Soft Costs, by System Size and Type

**U.S. Total Costs (2012)**
Weighted avg. for comm. PV (>100 kW) = $4.27/Watt

Permitting Costs Matter

- Local permitting and inspection add an average of about $0.50 per watt, or $2,516 per residential install
- Inefficient processes can overwhelm local departments and consume resources that could be used elsewhere
- An efficient process can promote economic development and energy savings in the community

Activity: Getting to know you

1. Name

2. Municipality or Jurisdiction & position

3. What is the interest level of solar development in your jurisdiction and how does it impact you or your department?
Implementing Improvements: Key Principles

• **Responsibility** for change should be shared between permitting authorities and the solar industry.

• Changes to permitting policies should **benefit** municipal governments as well as solar installers and their customers.
Goals for Permitting Reform

1. Post requirements online
2. Implement an expedited permit process
3. Enable online permit processing
4. Require a fast turn-around time
5. Implement reasonable permitting fees
Goals for Permitting Reform

6. Do not require community-specific licenses
7. Offer a narrow inspection appointment window
8. Eliminate excessive inspections
9. Train permitting staff in solar

PLUS regional consistency
Identifying Successful Approaches
Overview of the Permitting Process

**Pre-Application** – access to information on solar permit requirements and procedures

**Application Submittal and Review** – application forms, fees and review

**Inspections** – scheduling inspections and inspector training
Pre-Application Materials: How they can help

- Reduce number of individualized questions staff has to field
- Increase amount of applications submitted correctly and completely the first time
- Put everyone on the same page with respect to requirements—reducing conflict
- Can help manage expectations
- Facilitate solar expansion in your community
Poll

Does your jurisdiction provide any pre-application materials?

A. Yes
B. No

[Graph showing 0% for Yes and 0% for No]
Application Checklists

Just the Basics
Solar Permitting Checklists

Checklists are an integral part of the permitting process. They provide a simple list of required information for either the permit application or the inspection that follows. As such, they can serve as guides for solar installers as well as permit review staff and inspectors. Checklists can save staff time for the jurisdiction by reducing the number of inquiries received from installers, and can also save time and money for the solar installer by streamlining requirements clear and transparent. They can also help to ensure that application and inspection requirements are applied consistently across the board to all installers. In some cases, jurisdictions require applicants to turn in the completed checklist as part of the application to help to verify that the application is complete. Some jurisdictions choose to provide even more information in other guidance documents, as discussed on the reverse side of this sheet.

Tips for Application Checklists
✓ List required forms, such as building permit application form, and where they can be located
✓ List and describe required diagrams or plans, including the number of copies needed
✓ List any other required documentation, signatures or approvals
✓ Describe the fee structure and options for payment
✓ Provide online or in-person application submittal instructions
✓ Provide information about office locations, hours, and appropriate staff contacts
✓ Include citations to relevant code or other resources as much as possible for the applicant to reference

Tips for Inspection Checklists
✓ List the information required in advance of the inspection
✓ List what the inspector will look at on-site and what requirements are expected to be met
✓ Consider dividing checklist into appropriate sections, such as utility service, AC power source, inverter, arrays/modules, and grounding/bonding
✓ Explain who needs to be there and what applicant can expect during the inspection
✓ Provide information about office locations, hours, and appropriate staff contacts
✓ Include citations to relevant code or other resources as much as possible for the applicant to reference

Examples to check out

These jurisdictions have published checklists for solar permitting:
- Boulder County, Colorado
- Miami-Dade County, Florida
- Tucson, Arizona
- San Jose, California
- Berkeley, California
- Maui County, Hawaii


- List required forms, diagrams or plans and where they can be found
- List any other documentation, signatures or approvals
- Describe the fee structure and options for payment
- Provide submittal instructions
- Provide office locations, hours and appropriate staff contacts
- Include citations to relevant code or other references for technical requirements
A broader look at the solar permitting process

- Installation process overview
- Licensing and code requirements
- Interconnection process
- Electrical permit requirements
- Building permit requirements
- System inspection process
- Information on incentives
- Definitions of uncommon terms and acronyms

Solar Permit Guidebooks

Going Above and Beyond Solar Permitting Guidance Documents

Checklists provide the essential information on the permit application and inspection process, and are a great place to start. But sometimes it can be even better to provide more detailed information to solar permitting applicants in more comprehensive guidance documents. In addition to information on permit application and processing, these documents may provide background on solar technologies, available incentives, information on finding installers, roles for different departments and entities in facilitating a solar installation, and more. At a minimum, guidance documents should include information about your jurisdiction’s processes, including any unique or unusual requirements. All of the information for checklists described on the reverse side of this sheet would be appropriate for guidance documents, as well. Beyond that, there are a variety of topics jurisdictions have included in guidance documents.

Tips for Writing
- Work with nearby communities to streamline procedures and forms and to share the task of creating them.
- Try to coordinate with other relevant agencies, departments and entities, such as the local utility, to offer guidance that is as comprehensive as possible.
- Approach the document from an outsider’s perspective: what information would a complete novice need to successfully complete the process?
- Review existing guidance documents from other jurisdictions. The following cities provide good examples: Portland, OR; Philadelphia, PA; San Diego, CA; San Jose, CA; Boston, MA and Scottsdale, AZ.
- Solicit feedback from a wide audience, including developers, homeowners and fellow staff.

Topics for Consideration
1. Solar Installation Process Overview
2. Licensing and Code Requirements
3. Interconnection Process
4. Electrical Permit Requirements
5. Building Permit Requirements
6. System Inspection Process
7. Information on Incentives
8. Definitions of Uncommon Terms and Acronyms

Gold Star for Good Work
Solar Permitting Guidance in Boston, MA

The City of Boston offers one of the most thorough solar permitting guides in the United States. Its “Solar Boston Permitting Guide” was developed as part of the City’s involvement in the U.S. DOE’s Solar America Cities program. The Guide serves as a resource for Boston residents, businesses and solar installers to help them navigate the solar development process.

Boston also provides an interactive GIS map to help assess locations for solar on the same website. Even for jurisdictions not interested in going as far as Boston, its permitting guidance materials offer a great model to start from. The guide is available at www.cityofboston.gov/climate/solar.aspx.
Poll

Does your jurisdiction have a website?

A. Yes
B. No
Poll

Does it have a page for your department?

A. Yes
B. No
Poll

Does it have a solar-specific page?

A. Yes
B. No
Website and Electronic Resources

- Permitting requirements applicable to solar
- Application form and any checklists
- Detail on how the application will be processed
- Links to other regulatory or private entities involved in solar permitting
- Links to additional information and resources

Clear identification of the precise information needed to process a permit for a solar installation

Consistent to the extent possible across jurisdictions in a region or state

Model: Solar ABCs Expedited Permit Process for PV Systems

Solar ABCs, Expedited Permit Process: [www.solarabcs.org/about/publications/reports/expedited-permit](http://www.solarabcs.org/about/publications/reports/expedited-permit)
Poll

Does your jurisdiction determine the residential permit fee for solar based on:

A. Valuation
B. Flat Fee
C. Other?
Solar Permit Fees

Fees should be based upon staff time it takes to process solar permit application

- The Vote Solar Initiative, Project: Permit—community-led fee-reduction campaign
  www.projectpermit.org

- Fee Calculator
  http://lomaprieta.sierraclub.org/climate-action/solar_permit_fees

- State fee statutes
  – Examples: California, Colorado, Arizona

- Fee waivers—City and County of Honolulu
LUNCH
Poll

Do you offer in-person submittal with later review for all applications?

A. Yes
B. No
Poll

Do you have an expedited process for certain permits?

A. Yes
B. No
Poll

Do you offer online permitting?

A. Yes
B. No
How long would you expect it to take to process a residential solar permit application?

A. Same day
B. Less than 3 days
C. More than 3 days
D. A week or more
Application Submittal and Review

- Most common process = in-person submittal with later review

**Potential Improvement:** Expedited review for pre-qualified projects, plans or installers

- Simple project pre-qualification
  - Solar ABCs model

- Plan templates or pre-approvals
  - Honolulu, HI (pre-approved templates)
  - San Diego, CA (pre-approved plan)

- Installer pre-qualification
  - Long Island Unified Solar Permitting Initiative (NY)

Common Project Requirements for Expedited Review

- Rooftop installations on residential structures
- Size limited (often to 10 kW or below)
- A maximum weight per sq. ft., e.g., 5 lbs/sq. ft.
- Minimum clearance range around the equipment
- Maximum height above the roof surface
- Panels and inverters installed per manufacturers’ specifications

Potential Improvement: Over-the-counter submittal and review for qualified systems

- Goal = one trip, short wait time
- Often more efficient for city and applicant
- Can be limited to “simple systems” that meet pre-identified goals
- Goal = one trip, short wait time
- Example: Scottsdale, AZ—for all residential plan review, including solar

Potential Improvement: Online or electronic submittal and review

- Potential to be significantly more efficient for city and applicant
- Online applications can present education opportunity and increase completeness
- Can improve communication opportunities
- However, can present high upfront costs
- Can be rolled out slowly in small steps
Application Submittal and Review

http://portal.cityofsacramento.org/Community-Development/Building/Building%20Programs/Sacramento%20Streamline
Poll

Do you require a rough-in and final inspection for residential solar?

A. Yes
B. No
Poll

Do you require different inspections for electrical, building and/or fire?

A. Yes
B. No
Inspection Timing and Scheduling

Frequency and timing of inspections = critical cost component of solar installation

Potential improvements:

- Easier inspection scheduling
- Reasonably narrow time window
- One inspection (building, electrical, fire, etc.)

Example: Miami-Dade County, Florida
To inform and educate inspectors and installers—increase efficiency, minimize disputes.
IREC Model Inspection Checklist

- Prepared in conjunction with Don Hughes, Senior Electrical Inspector in Santa Clara County, CA
- Contains key building, electric and fire code requirements with references to national code sections
- Includes a table of signage requirements
- Can easily be modified to include any unique state or local requirements.
Using an Inspection Checklist

- Educational tool for inspectors and installers
- Improve consistency of inspections – ensuring same features are checked for each system
- Reduce conflicts between inspectors and installers
- Method of notifying installers of unique or new requirements
- Can require it be submitted along with the application form
Inspector Training

Regional Training Providers

Photovoltaic Online Training Platform (PVOT)

- No-cost online training for code officials, architects, installers, etc.
- Three goals:
  1. Instruct code officials in reliable field inspection practices for PV installations
  2. Substantially increase reach and scale of training for code officials in the U.S.
  3. Quickly and cost-effectively reach more code officials than with onsite workshops and seminars
- Six basic learning modules covering the major topics of concern for expedited permitting and field inspection
- Seventh module is immersive activity imbedded in an open-source, game-based framework with its own assessment

www.irecusa.org/workforce-education/solar-instructor-training-network/trainer-resources/pv-online-training
Installer Licenses

- Best Practice is to avoid community specific licenses.
- State contractors license
- Local business license or permit
- If license is required, use NABCEP or engage at the state level to develop a state-wide license
Regional Coordination: Examples & Discussion
Consistency Is Important

- Standardization across a geographical region
  - Easier for installers working regionally or statewide
  - Easier for jurisdictions because installers make fewer mistakes
- Leveraging experience and successes of others
- Encouraging regional economic development

Simplifying the Solar Permitting Process
The Importance of Consistency

Many municipalities and other authorities having jurisdiction (AHJs) are facing dramatic increases in rooftop solar permit applications. With this trend expected to continue and spread, streamlining building and electrical permitting processes will become increasingly important to more AHJs. To facilitate such streamlining, the Interstate Renewable Energy Council (IREC) and Vote Solar have identified nine Best Practices in Residential Solar Permitting which should result in benefits to both AHJs and solar installers.

Underlying these best practices is the goal of increased consistency of solar permitting processes across jurisdictions. When technical and procedural requirements are relatively consistent—regionally, statewide, or even nationally—it can offer significant efficiency benefits for both AHJs and the solar industry.

Why Is Consistency Important?

Like many other contractors, solar installers typically work in more than one jurisdiction. Their businesses may be countrywide or statewide, or even span multiple states. On the other hand, control over the permitting process is typically a local function. AHJs have varying degrees of discretion over what the process looks like, but they are almost always the entities responsible for solar permitting. As a result, solar installers can often face different permitting requirements jurisdiction by jurisdiction. When permitting requirements vary in this way, understanding and complying with them can be time-intensive and costly for solar installers. It can also mean that installers make more mistakes in the process—for example, providing inadequate information on their applications—which in turn can be time-intensive and costly for AHJ staff as well.

When requirements are consistent, installers become familiar with them and learn efficient ways to comply with them. Installers benefit because they spend less time learning the particularities of each jurisdiction’s requirements and can instead focus on designing safe and effective systems that can be installed at a low cost. AHJs benefit because the overall quality of the applications and the installations increases. As a result, AHJ staff has to spend less time educating installers and ensuring compliance with relevant standards. Adoption of a consistent set of requirements also allows AHJs to take advantage of other jurisdictions’ knowledge and experience, rather than developing new standards.

In the end, the core goal of any permitting process is to allow the AHJ to ensure public health and safety, as well as compliance with any design standards. Streamlining permitting processes in a consistent way does not change those goals. Instead, it helps to meet them in a more efficient manner for both AHJs and solar installers, as well as other contractors that obtain permits through the same processes.

IREC Importance of Consistency  
How to Work Toward Consistency

- **Local**—Adopt model forms and guidelines
- **Statewide**—Conform with state legislation and guidance
- **Regional**—Collaborate with neighboring jurisdictions

... Or do all three!
Model Forms and Guidelines

- IREC: Permitting [www.irecusa.org/regulatory-reform/permitting](http://www.irecusa.org/regulatory-reform/permitting)
  
  ★ Model Inspection Checklist for Rooftop PV Systems—can be tailored to meet local needs
  
  – Plus examples from other (nearby) jurisdictions included in:
    
    - *Sharing Success: Emerging Approaches to Efficient Rooftop Solar PV Permitting*
    - Residential Solar Permitting Best Practices Explained
    - Guide to Preparing Solar Permitting Checklists

★ Solar ABCs Expedited Permit Process [www.solarabcs.org/permitting](http://www.solarabcs.org/permitting)
State Guidance and Legislation

- **State-level guidance**
  - Information on ways to streamline the process
  - Model forms and documents applicable statewide
  - Example: California Solar Permitting Guidebook

- **State legislative efforts**
  - Mandatory changes to make local processes more fair, efficient and uniform
  - Examples:
    - Permit fee statutes in CA, CO and AZ
    - More comprehensive statutes in CA and WA
Regional Approaches to Reform

- **Benefits**
  - Cost-efficient—administrative economies of scale and sharing expertise
  - Can reflect unique local/regional needs
  - Can leverage existing partnerships
  - Voluntary process—potentially more collaborative and consensus-based

- **However**—since voluntary and not mandatory, means some work to ensure meaningful regional buy-in
Do you stay in touch with other jurisdictions regarding permitting?

A. Often
B. Occasionally
C. Never
Regional Approaches to Reform

Solar One Stop (AZ)
http://solaronestopaz.org

- Collaborative web site housing wealth of solar-related information
- Explains coordinated regional permitting process in City of Tucson, Pima County and other area jurisdictions
  - Standardized process to simplify structural and electrical review of residential PV systems
  - 10-day standard turn-around time
Regional Approaches to Reform

East Bay Green Corridor Rapid PV Permit (CA)

- 9 Bay area cities with a **regional, standardized permitting process** for most PV systems (up to 10 kW) on single-family homes
- Based on **housing stock common to the area**

www.ebgreencorridor.org/rapid_pv_permit_introduction.php

![Map of East Bay region showing green corridor and cities like Richmond, El Cerrito, Berkeley, UC Berkeley, Emeryville, Peralta CCD, Oakland, Alameda, San Leandro, Hayward, and CSUEB.]
New streamlined permitting process allows for a central website that houses jurisdictional permitting information and application materials.
What else does this collaboration offer?

- Rapid over-the-counter permitting in 6 cities
- 3 to 7 day turnaround in 3 cities
- Cost-recovery permit fees or lower in all cities

East Bay Green Corridor Rapid PV Permit (CA)
www.ebgreencorridor.org/rapid_pv_permit_introduction.php
Regional Approaches to Reform

NY State Unified Solar Permit Initiative
www.cuny.edu/about/resources/sustainability/nyssolar/NYSolarSmartPermitWorkshops.html

- Statewide, collaborative effort—NYSERDA, NYPA, municipalities, CUNY
- Based on Long Island Unified Solar Permit Initiative (LIUSPI)—which was modeled on Solar ABCs expedited permit process
- Municipal incentives available for permit adoption ($2,500-$5,000 depending on population)
- Regional workshops to encourage adoption
Do you think it would be useful to develop some or all of the pre-application materials?

A. Yes
B. No
C. Unsure
Poll

Checklist?

A. Yes
B. No
Poll

Guidebooks?

A. Yes
B. No
Poll

Website?

A. Yes
B. No
Poll

Do you think an expedited solar permitting process could be helpful in your jurisdiction?

A. Yes
B. No
Poll

What is the most likely barrier to adopting an expedited permitting process?

A. Needs elected official approval
B. Insufficient resources
C. Perception of favoritism
D. Concerns about safety/quality
E. No concerns
F. Others
Poll

What would be your primary concern about doing only one inspection for residential solar?

A. Inspector training
B. Code compliance
C. Installer qualifications
D. No concerns
Conclusions and Take-Aways
## Solar Permitting Best Practices

1. Post requirements online
2. Implement an expedited permit process
3. Enable online permit processing
4. Require a fast turn-around time
5. Implement reasonable fees
6. Do not require community-specific licenses
7. Offer a narrow inspection appointment window
8. Eliminate excessive inspections
9. Train permitting staff in solar

### Project Permit: Best Practices in Residential Solar Permitting

1. **Post Requirements Online:** Information on permit fees, application requirements and process should be easily accessible via the city’s website as applicants can review and prepare materials in advance. Municipalities should provide a submitable checklist of all requirements for rooftop solar PV and solar thermal permitting in a single online location. [Click here for an example of a checklist.](#)

2. **Implement an Expedited Permit Process:** The majority of small residential PV systems can be processed quickly if they meet clearly defined review requirements. We recommend adopting an expedited permitting review process for these systems that enables review over-the-counter or via electronic processing within one day. The Solar Access Program provides a good example that can be used as a starting point. (Note: for larger systems, not covered by the Expedited Permit guidelines, municipalities should set and adhere to standard permitting requirements to make the process clear and transparent. The municipality should work to make these standards consistent with neighboring jurisdictions.) [NOT CURRENTLY GRADED IN PROJECT PERMIT](#)

3. **Enable Online Permit Processing:** Moving to a fully online permitting system can significantly reduce travel time for inspects and workload for municipalities. We recommend adopting a system that enables submittal, review and approval of PV permits via email or a website within a short period of time.

4. **Require a Fast Turn Around Time:** Offering a one-day turnaround for permit submissions is a best practice. Travel to and from the building department can be one of the most cost-intensive parts of the permitting process for installers. Obtaining a new PV permit shall require no more than one visit to the building department for properly completed applications. If an over-the-counter option is not feasible, we at least suggest a permit turn around time of less than three days.

5. **Implement Reasonable Permitting Fees:** Using a fee-based method instead of a value-based method to assess permit fees streamlines the process and ensures that larger solar energy systems are not arbitrarily penalized. Fees should fairly reflect the time needed for city staff to review and issue a permit. There should be no fees associated with operating the solar system. A reasonable residential permit fee should be a flat fee of $50 or less if best practices are followed.

6. **Do Not Require Community-Specific Licenses:** We recommend accepting NABCEP PV installer and solar thermal certifications, or already existing trade licensing requirements, in lieu of community specific solar business licenses.

7. **Offer a Narrow Inspection Appointment Window:** Offering an exact appointment time, or keeping the window for inspection appointments at or below two hours greatly reduces the amount of costly worker time spent waiting for inspectors to arrive. Inspectors could also call contractors as appointment times become close to further save time.

8. **Eliminate Excessive Inspections:** We recommend a clearly defined plan review process and only one inspection for standard rooftop systems on existing homes. Inspectors should not be asked to validate the safe and efficient operation of a proposed PV system (i.e. plan checks with aesthetic criteria) unnecessary costs and expenses permit issuance. We support having both qualified inspectors and inspectors proficient in solar to ensure safe and compliant installations.

9. **Train Permitting Staff:** Solar training for building department staff to review permits and perform consistent fire department checks reduces time and cost. cities should make 2 or 3 day workshops available to relevant staff. Training should be available to both building department plan check and review staff as well as for inspectors. [Click here for free online training for code officials, developed by IREC.(NOT CURRENTLY GRADED IN PROJECT PERMIT](#)

For more information on solar permitting best practices visit [www.projectpermit.org](http://www.projectpermit.org) or email [projectpermit@nrgsusa.org](mailto:projectpermit@nrgsusa.org)

---


Further Resources

- IREC: Permitting, [www.irecusa.org/regulatory-reform/permitting](http://www.irecusa.org/regulatory-reform/permitting)
  - Residential Solar Permitting Best Practices Explained
  - Simplifying the Solar Permitting Process: The Importance of Consistency
  - Guide to Preparing Solar Permitting Checklists
  - Model Inspection Checklist for Rooftop PV Systems
- Vote Solar [http://projectpermit.org](http://projectpermit.org)
SolarOPs Technical Assistance

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

www.solaroutreach.org
Follow up and Questions

- Sky Stanfield
  510-314-8204
  sstanfield@kfwlaw.com

- Erica Schroeder McConnell
  510-314-8206
  emcconnell@kfwlaw.com
First Responder Training
Photovoltaic (PV) Fire Marshal Training
May 13–15, 2015

Chief Deputy Stickle
803–834–0944
Shawn.Stickle@llr.sc.gov
Presentation will be available through the South Carolina Fire Academy soon!

Chief Deputy Stickle
803–834–0944
Shawn.Stickle@llr.sc.gov
Duke Energy’s Experience

Fire Protection, Fire Safety at Solar PV Arrays
1.2 megawatt rooftop PV array (5,252 panels each 230 kW)
Incident: PV Solar Fire
When: April 16, 2011
Where: Rooftop of Manufacturing Facility in Mount Holly, NC
What: Fire damaged or destroyed solar panels, combiner box 2F (fire), combiner box 2A (arching), and roofing.

5,252 230-Watt PV modules; Two inverters 500 kW inverters and one 135 kW inverter.
Report of the Results of the Investigation of Failure of the 1.135 MW Photovoltaic (PV) Plant at the National Gypsum Facility in Mount Holly, North Carolina

Prepared for:
Duke Energy
526 South Church St.
Charlotte, NC 28202-1904

Prepared by:
Brooks Engineering
873 Kells Circle
Vacaville, CA 95688
www.brooksolar.com

May 26, 2011

Evidence of scorching on backplane

Evidence of eroded backplane as a result of feeder arcing or multiple string conductor arcing
Contributing Factors include increased solar irradiance after storm, strong winds, some poor installation practices, thermal expansion, certain industry practices.
Fire Protection Elements

Better conduit management on large arrays

Monitor array at lower levels, higher frequency

Notify operator immediately

Automatically Shut-Off when thresholds exceeded
Thank you!