MAKING COMMUNITIES "SOLAR READY"

THE GROW SOLAR PARTNERSHIP
MIDWEST RENEWABLE ENERGY FAIR 2016

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GREAT PLAINS INSTITUTE
Better Energy. Better World.

Our Mission . . .

Transforming the way we produce, distribute and consume energy to be both economically and environmentally sustainable.

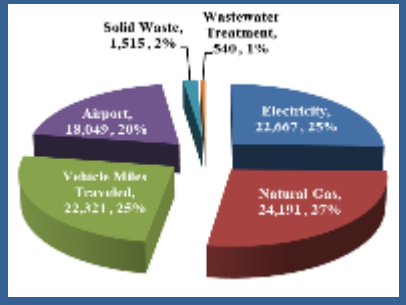
Achieving our Mission by:

1. Developing better energy policy via consensus decision-making.
2. Working with communities to identify and implement local and regional sustainability priorities.
3. Providing local, state, and federal policy-makers with reliable analysis & decision tools.

Sustainable Communities

Transforming the world through community action

1. Grow Solar Partnership
2. GreenStep Cities
3. Metro Clean Energy Resource Team (CERT)
4. Sustainability Planning and Technical Assistance



Conclusions

1. **Solar energy development is local development.** Local government policies and regulations determine how, and whether, local solar resources are used

Photo credit: U.S. DOE SunShot

Photo credit: CR Planning

Conclusions

1. **Local governments are a key partner to creating and sustaining a clean energy future.**

Photo credit: Meet Minneapolis

What are Energy “Reserves”?

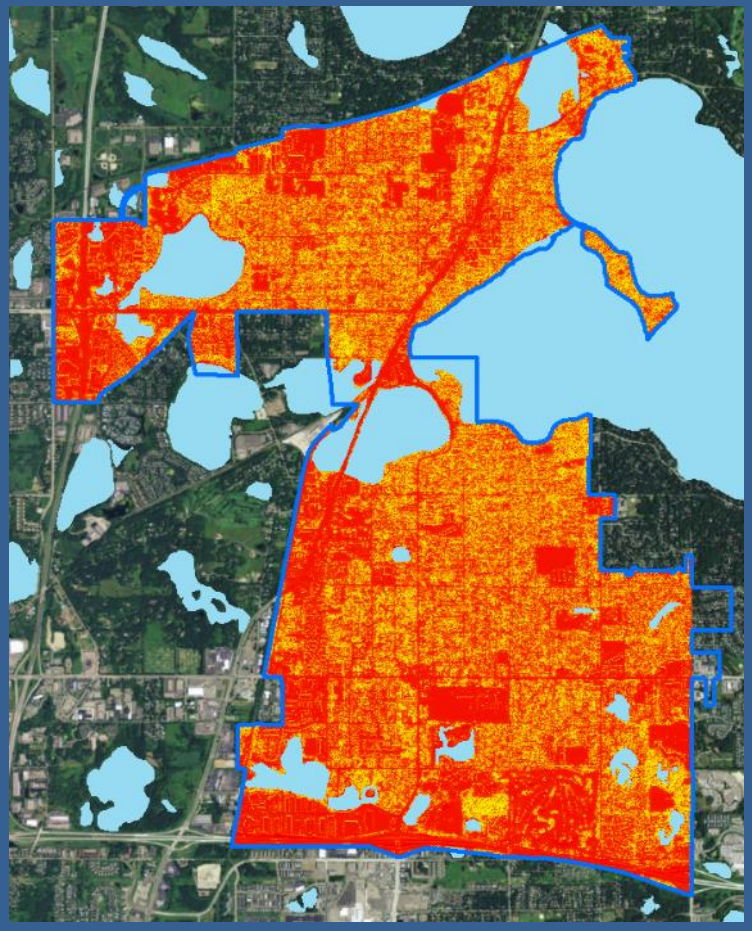
- **Proved oil and gas reserves -** those quantities of oil and gas, which, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be economically producible–from a given date forward, from known reservoirs, and under existing economic conditions, operating methods, and government regulations.

  (SEC definition of proved reserves)

What are Energy “Reserves”?

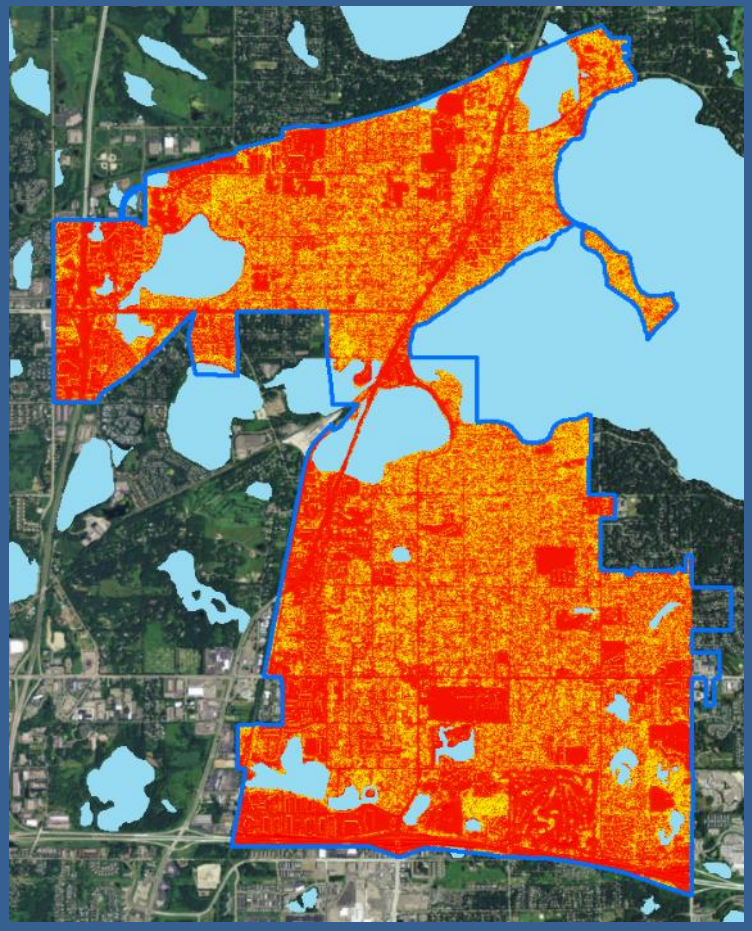
- ✓ **Proved solar reserves -** those quantities of solar energy, which, by analysis of atmospheric and land cover data, can be estimated with reasonable certainty to be economically producible–from a given date forward, from known access to direct sunlight, and under existing economic conditions, operating methods, and government regulations.

City of White Bear Lake



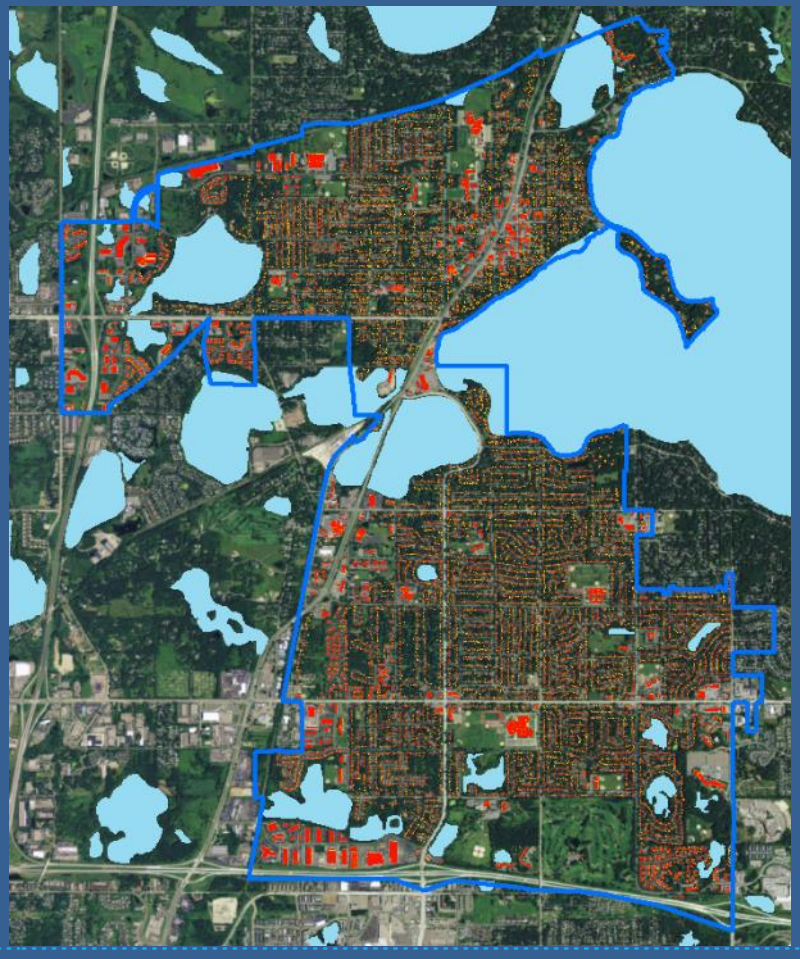
Gross “reserves” sum up the total watt hours of sunlight hitting the land surface, and converts that total into a hypothetical electric production using current technologies.

City of White Bear Lake



Gross “reserves” total over 1,182 GWh of electricity, equaling about 910 MW of generating capacity. This is about six times the amount of electricity used in White Bear Lake annually.

Rooftop Solar Reserve



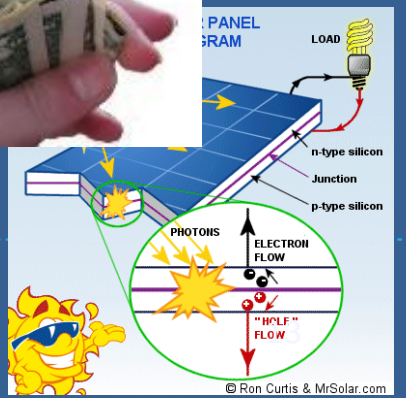
The rooftop “reserves” look at the solar resource that falls on building roofs, a location that generally does not have land use conflicts.

Rooftop Solar Reserve

White Bear Lake's rooftop "reserves" total over 147 GWh of electricity, equaling about 113 MW of generating capacity. This is about 76% of the amount of electricity used in White Bear Lake annually.

Five Principles for Solar Ready Communities…

1. **Comprehensive Plans** that describe solar resources and encourage development
2. **Development Regulations** that explicitly address solar development in its varied forms
3. **Permitting Processes** that are predictable, transparent, and documented
4. **Public Sector Investment** in the community's solar resources
5. **Local Programs** to limit market barriers and enable private sector solar development



Solar Ready Communities

A. Comprehensive Plans that:

- ✓ Identify and define solar resources,
- ✓ acknowledge solar development benefits, co-benefits, and development opportunities and conflicts in the community.

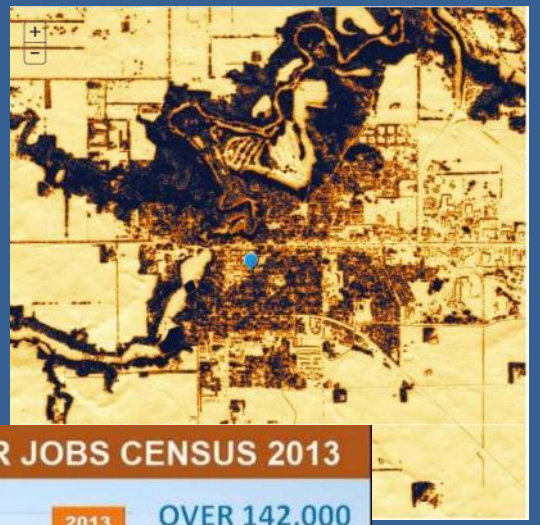
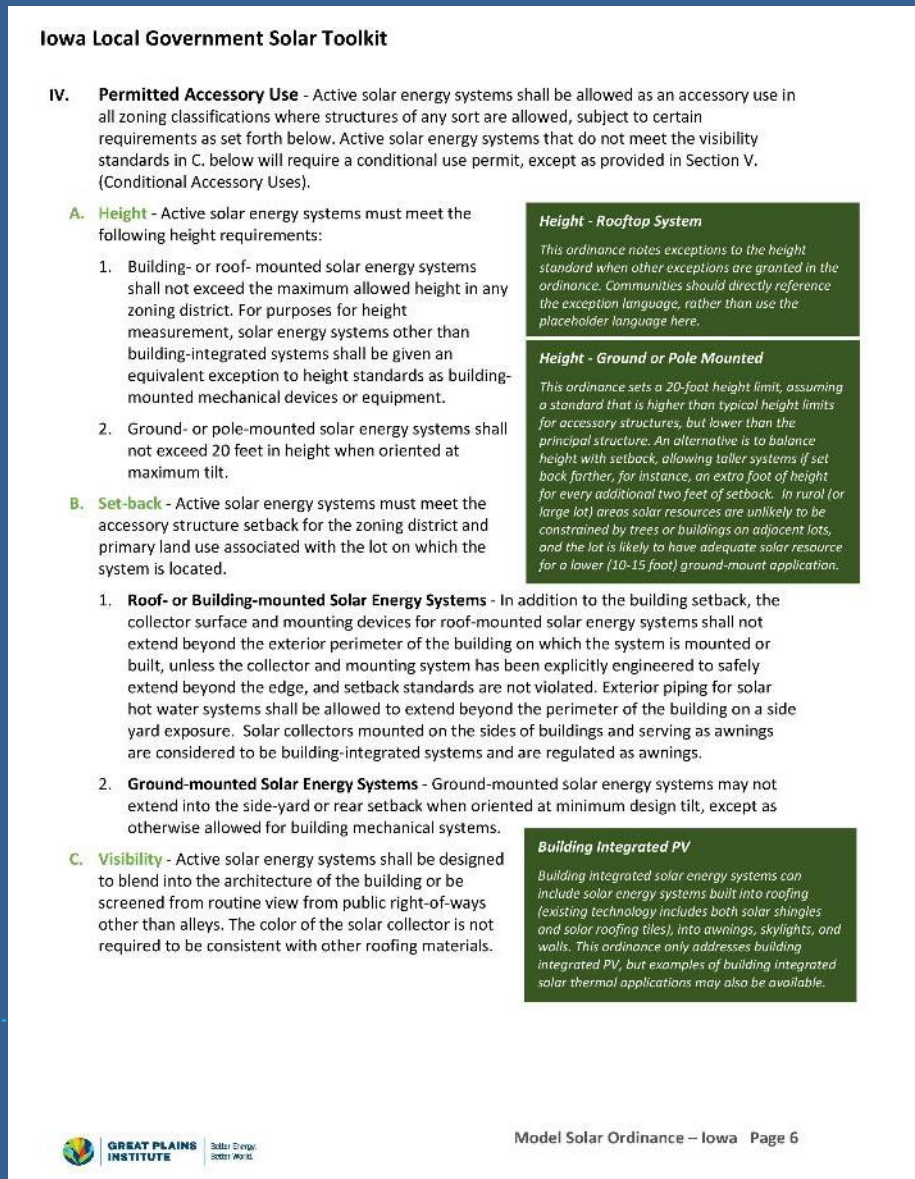


Photo credit: Fresh Energy/Giving Tree

Solar Ready Communities

B. Development Regulations that:

- ✓ explicitly address solar development in its varied forms,
- ✓ creates as-of-right installation opportunities, and
- ✓ set clear and predictable standards for balancing solar resources with other resources and capturing co-benefits.



Iowa Local Government Solar Toolkit

IV. **Permitted Accessory Use** - Active solar energy systems shall be allowed as an accessory use in all zoning classifications where structures of any sort are allowed, subject to certain requirements as set forth below. Active solar energy systems that do not meet the visibility standards in C. below will require a conditional use permit, except as provided in Section V. (Conditional Accessory Uses).

A. Height - Active solar energy systems must meet the following height requirements:

1. Building- or roof- mounted solar energy systems shall not exceed the maximum allowed height in any zoning district. For purposes for height measurement, solar energy systems other than building-integrated systems shall be given an equivalent exception to height standards as building-mounted mechanical devices or equipment.
2. Ground- or pole-mounted solar energy systems shall not exceed 20 feet in height when oriented at maximum tilt.

Height - Rooftop System

This ordinance notes exceptions to the height standard when other exceptions are granted in the ordinance. Communities should directly reference the exception language, rather than use the placeholder language here.

Height - Ground or Pole Mounted

This ordinance sets a 20-foot height limit, assuming a standard that is higher than typical height limits for accessory structures, but lower than the principal structure. An alternative is to balance height with setback, allowing taller systems if set back farther, for instance, an extra foot of height for every additional two feet of setback. In rural (or large lot) areas solar resources are unlikely to be constrained by trees or buildings on adjacent lots, and the lot is likely to have adequate solar resource for a lower (10-15 foot) ground-mount application.

B. Set-back - Active solar energy systems must meet the accessory structure setback for the zoning district and primary land use associated with the lot on which the system is located.

1. **Roof- or Building-mounted Solar Energy Systems** - In addition to the building setback, the collector surface and mounting devices for roof-mounted solar energy systems shall not extend beyond the exterior perimeter of the building on which the system is mounted or built, unless the collector and mounting system has been explicitly engineered to safely extend beyond the edge, and setback standards are not violated. Exterior piping for solar hot water systems shall be allowed to extend beyond the perimeter of the building on a side yard exposure. Solar collectors mounted on the sides of buildings and serving as awnings are considered to be building-integrated systems and are regulated as awnings.
2. **Ground-mounted Solar Energy Systems** - Ground-mounted solar energy systems may not extend into the side-yard or rear setback when oriented at minimum design tilt, except as otherwise allowed for building mechanical systems.

C. Visibility - Active solar energy systems 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.

Building Integrated PV

Building integrated solar energy systems can include solar energy systems built into roofing (existing technology includes both solar shingles and solar roofing tiles), into awnings, skylights, and walls. This ordinance only addresses building integrated PV, but examples of building integrated solar thermal applications may also be available.

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C. Permitting practices that:

- ✓Reduce time spent on acquiring permits and conducting inspections
- ✓Make the permit process transparent and predictable to both staff and applicants
- ✓Ensure the permit process reflects industry best practices
- ✓Establish a permit fee that appropriately covers local government review and inspection costs

Solar Ready Communities

D. Public Sector Investment in the community's solar resources to demonstrate viability, community commitment, technological elements.

Photo credit: Bruce Schnaak Photography, City of Saint Paul, City of Minneapolis

Solar Ready Communities

E. **Local Programs** to remove or limit market barriers (lack of information, financing, workforce) that prevent capture of the economic, environmental, and social value of the community's solar resources.

Grow Solar Partnership

Regional Sustainable Development Partnerships

University of Minnesota Extension

Clean Energy Resource Teams

Great Plains Institute

Better Energy. Better World.

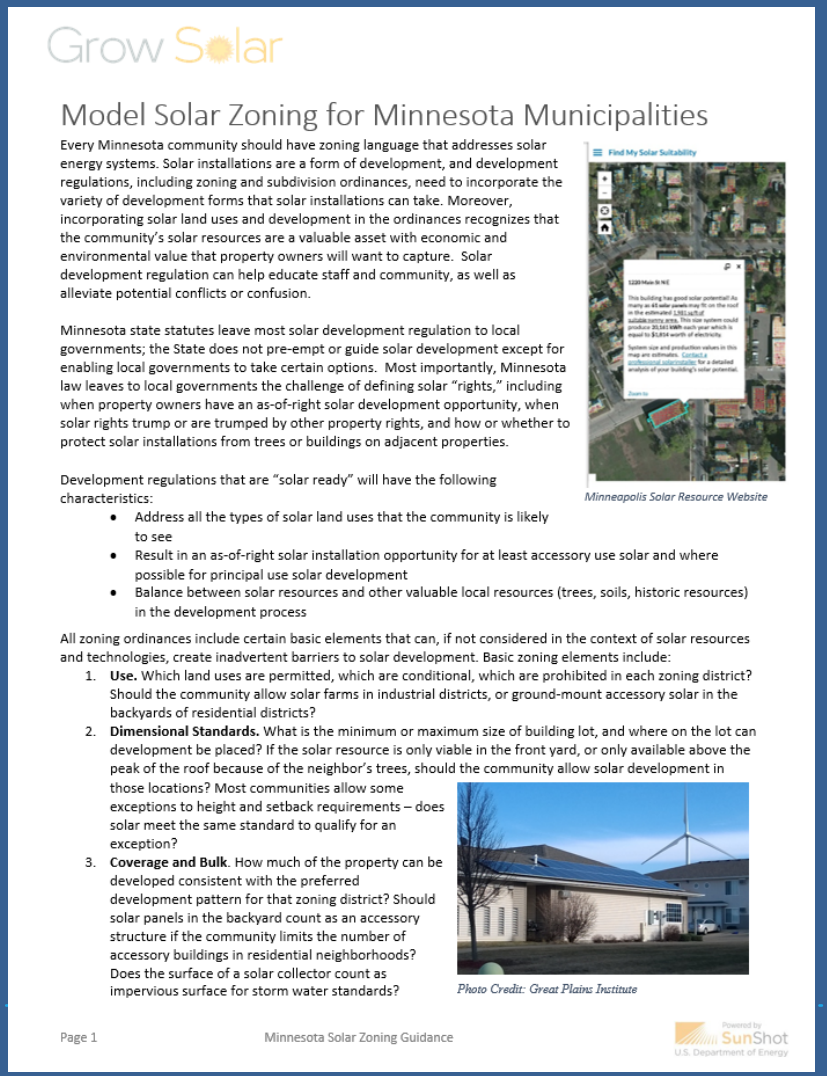
Local Government Solar Toolkits

Planning, Zoning, Permitting

http://www.growsolar.org/toolbox/toolkits/

Grow Solar Toolkit

1. **Summary of Statutes** that guide or enable local government actions regarding solar development
2. **Comprehensive Plan guidance** and local policy best practices
3. **Land use regulation guidance** and best practices to enable solar development
4. **Model zoning ordinance**
5. **Permitting guidance** and best practices to reduce soft costs
6. **Model solar building permit**



Grow Solar

Model Solar Zoning for Minnesota Municipalities

Every Minnesota community should have zoning language that addresses solar energy systems. Solar installations are a form of development, and development regulations, including zoning and subdivision ordinances, need to incorporate the variety of development forms that solar installations can take. Moreover, incorporating solar land uses and development in the ordinances recognizes that the community's solar resources are a valuable asset with economic and environmental value that property owners will want to capture. Solar development regulation can help educate staff and community, as well as alleviate potential conflicts or confusion.

Minnesota state statutes leave most solar development regulation to local governments; the State does not pre-empt or guide solar development except for enabling local governments to take certain options. Most importantly, Minnesota law leaves to local governments the challenge of defining solar "rights," including when property owners have an as-of-right solar development opportunity, when solar rights trump or are trumped by other property rights, and how or whether to protect solar installations from trees or buildings on adjacent properties.

Development regulations that are "solar ready" will have the following characteristics:

- Address all the types of solar land uses that the community is likely to see
- Result in an as-of-right solar installation opportunity for at least accessory use solar and where possible for principal use solar development
- Balance between solar resources and other valuable local resources (trees, soils, historic resources) in the development process

Find My Solar Suitability

Minneapolis Solar Resource Website

All zoning ordinances include certain basic elements that can, if not considered in the context of solar resources and technologies, create inadvertent barriers to solar development. Basic zoning elements include:

1. **Use.** Which land uses are permitted, which are conditional, which are prohibited in each zoning district? Should the community allow solar farms in industrial districts, or ground-mount accessory solar in the backyards of residential districts?
2. **Dimensional Standards.** What is the minimum or maximum size of building lot, and where on the lot can development be placed? If the solar resource is only viable in the front yard, or only available above the peak of the roof because of the neighbor's trees, should the community allow solar development in those locations? Most communities allow some exceptions to height and setback requirements – does solar meet the same standard to qualify for an exception?
3. **Coverage and Bulk**. How much of the property can be developed consistent with the preferred development pattern for that zoning district? Should solar panels in the backyard count as an accessory structure if the community limits the number of accessory buildings in residential neighborhoods? Does the surface of a solar collector count as impervious surface for storm water standards?

Photo Credit: Great Plains Institute

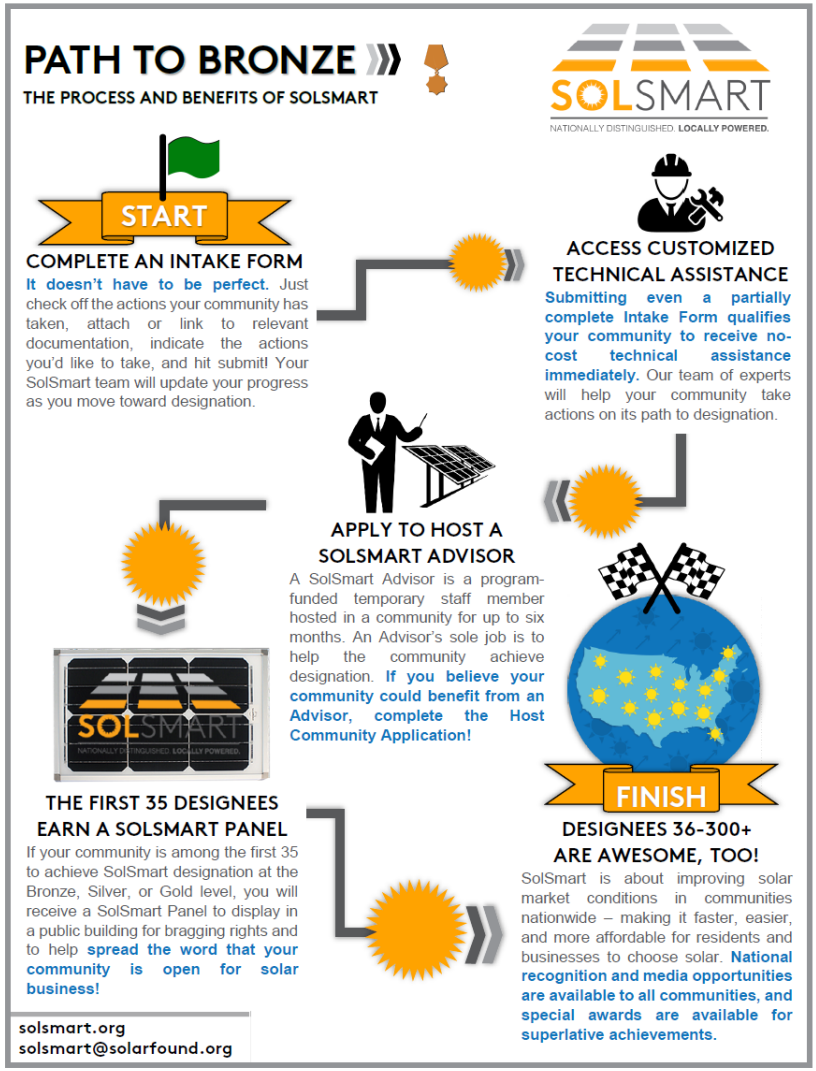
Page 1 Minnesota Solar Zoning Guidance

Powered by SunShot U.S. Department of Energy

SolSmart

Certifying Solar Ready Communities

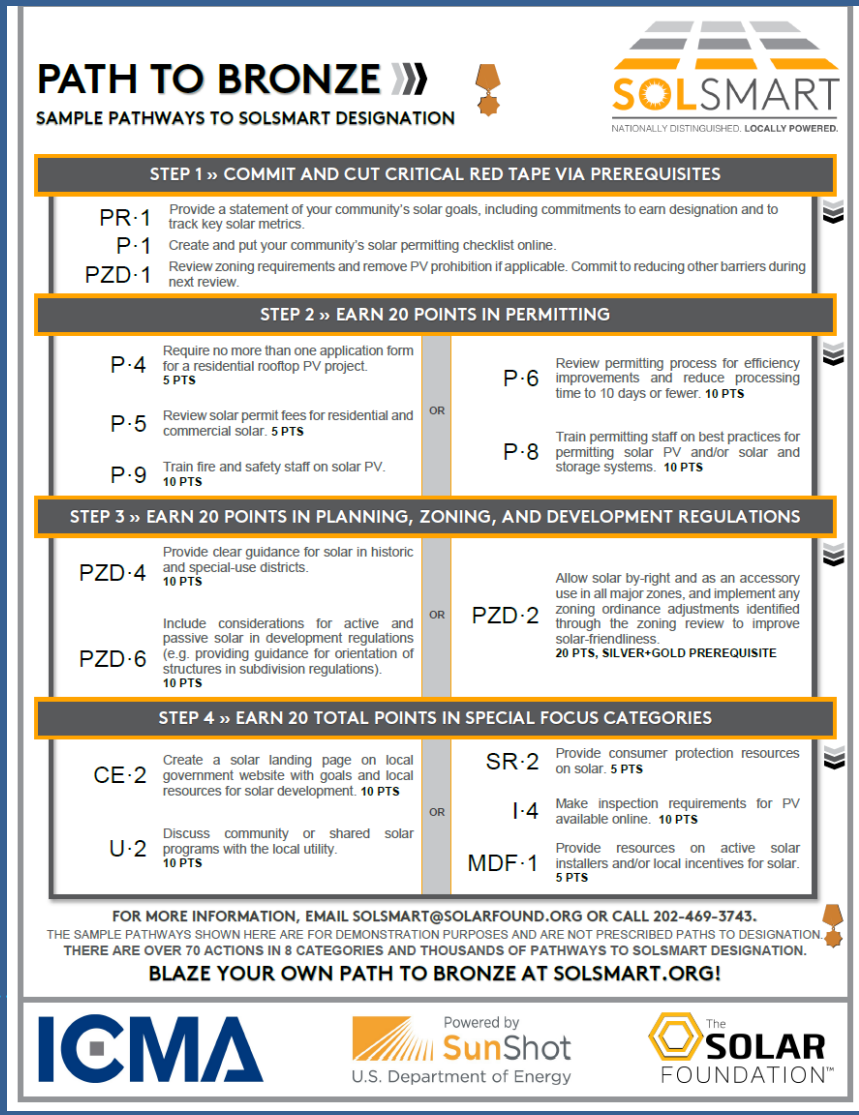
- ✓ National Department of Energy (DOE) Certification program for “solar ready” cities and counties.
- ✓ Technical assistance available from the Solar Foundation for entering the program.
- ✓ Opportunity to apply for a full time solar “advisor” staff person for your community or organization for up to six months.



SolSmart

Certifying Solar Ready Communities

- ✓ Three levels of certification: Gold, Silver and Bronze
- ✓ Looking to certify 300 communities across the nation over the next 3 years
- ✓ Best practices follow the Grow Solar program and the Local Government Solar Toolkit.
- ✓ Search for “SolSmart” . . .



Local Planning for Solar Resources

Grow Solar Toolkit

- ✓ Existing conditions,
- ✓ Desired conditions,
- ✓ Strategies for getting there

Grow Sola

Local Government Solar Toolkit

PLANNING, ZONING, AND PERMITTING

Wisconsin

Grow Solar

Solar in Comprehensive Planning

Purpose

Comprehensive plans are the foundational policy document reflecting a community's priorities and values regarding development and local resources. Solar energy resources are an increasingly valu local resource — solar development can bring environmental and economic benefits to a communi through clean energy production, creation of local jobs and revenue, and improved property value Communities are acknowledging this valuable resource and incorporating support and guidance fo energy development into comprehensive plans, sending a strong message of commitment for sust growth in the solar energy sector.

Communities are not, however, always familiar with the characteristics of solar resources and solar land uses. This document outlines considerations that communities should make and identifies elements that allow for clear priorities around solar energy objectives. Identifying how solar development can benefit the community will help decision-makers determine how solar resources and investments are integrated into the community in a way that balances and protects competing development or resources.

Downtown Solar Resource Map, Rochester, MN

Considerations

When addressing solar development in a comprehensive plan, it is important to acknowledge what makes solar work for a community as well as the inherent conflicts that may arise. Any comprehen plan that includes a solar component should:

1. Address the solar resource and the different land use forms that solar development can tal
2. Acknowledge the multiple benefits of solar development
3. Guide decision-makers on optimizing opportunities when solar development might conflict other resources or land use forms

Each of these components can help a community identify how they wish to include solar as a resou and to be able to reasonably justify why and where solar development is supported.

Additionally, in Wisconsin, Statute 66.1001 Comprehensive Planning, outlines the elements that m included in a comprehensive plan. Elements where solar goals and policies may be added include: ..... *and Opportunities; Utilities and community facilities; Agricultural, natural, cultural resources; economic development; and land use.*

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Solar Resource

The local landscape (e.g., topography, on-site obstructions, obstructions on adjacent land, potential future obstructions) defines whether or not a given site has a good solar resource. An adequate solar resource is a site that is unshaded for at least 6 hours a day, both now and into the future. Communities can map their solar resource using LiDAR data that is frequently available in urban areas, and in some states even in rural areas. Such a map can allow the community to measure the size of their "solar reserves" identify areas with good and poor resources for prioritizing development in a manner consistent with other land uses, and even distinguish between opportunities for rooftop and ground-mount solar development opportunities.

In addition to measuring and recognizing the solar resource, communities should recognize that a variety of methods exist to capture the energy and provide economic value. There are several different types of solar installations a community will want to consider: rooftop, accessory ground-mount, and principal ground-mount. A community can use the comprehensive plan to determine which of these technologies to support and/or promote.

Rooftop Solar, MREA

Solar Benefits

Communities can realize a number of benefits through solar development, including environmental, energy production, and economic development. Environmental benefits include helping meet local air quality or climate protection goals. Communities with renewable energy or energy independence goals can better achieve these through explicit support of solar energy development. Economically, solar development creates construction jobs for a variety of trades, financially benefits those who install systems on their properties with lower energy bills, and increases the property value of buildings within the local housing market.

Ground Mount System, CERTs

Land Use Conflicts

Like any development, solar may come into conflict with other land uses, and solar resources are often co-located with other important local resources. Recognizing these issues in the comprehensive plan can help to mitigate future problems.

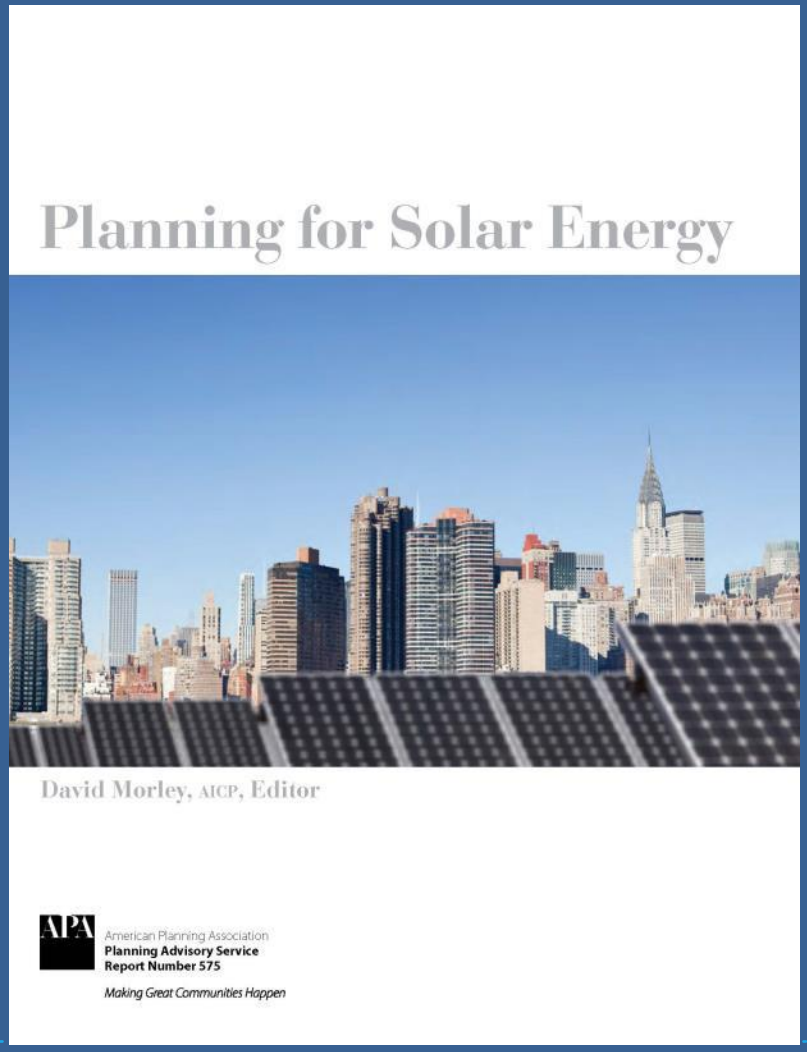
Solar Farm, CERTs

Planning Best Practice

Chapter 4: Plan Making

David Morley, AICP, and Erin Musiol, AICP

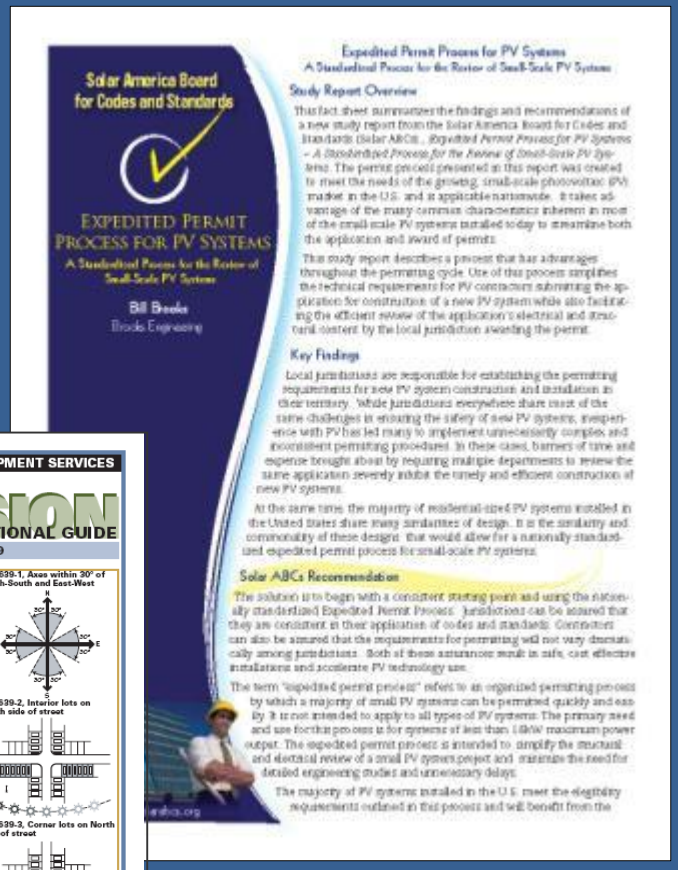
- ✓ Common Features of Local Plans
- ✓ Solar in the Comprehensive Plan
- ✓ Solar in Subarea Plans
- ✓ Solar in Functional Plans
- ✓ Summary

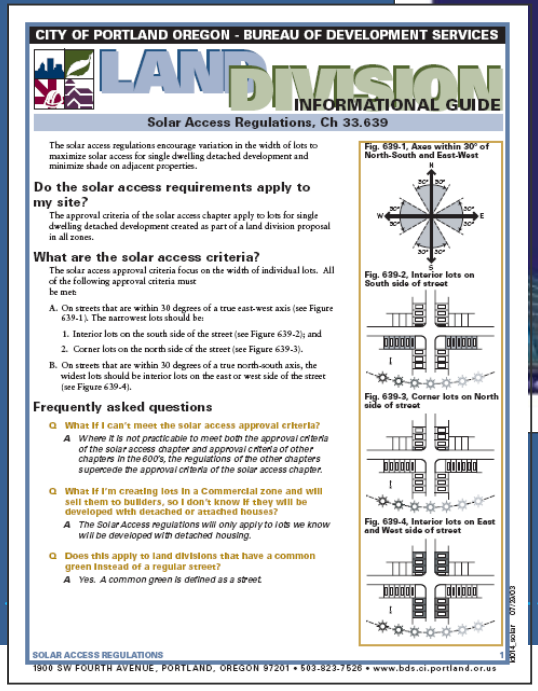


Solar Permitting Processes and Best Practices

Solar Ready Communities

Permitting Processes with predictable and clear submittal requirements, review timeframes, and permit fees.





Solar Ready Communities

Permitting best practice goals

A. Reduce time spent on acquiring permits and conducting inspections

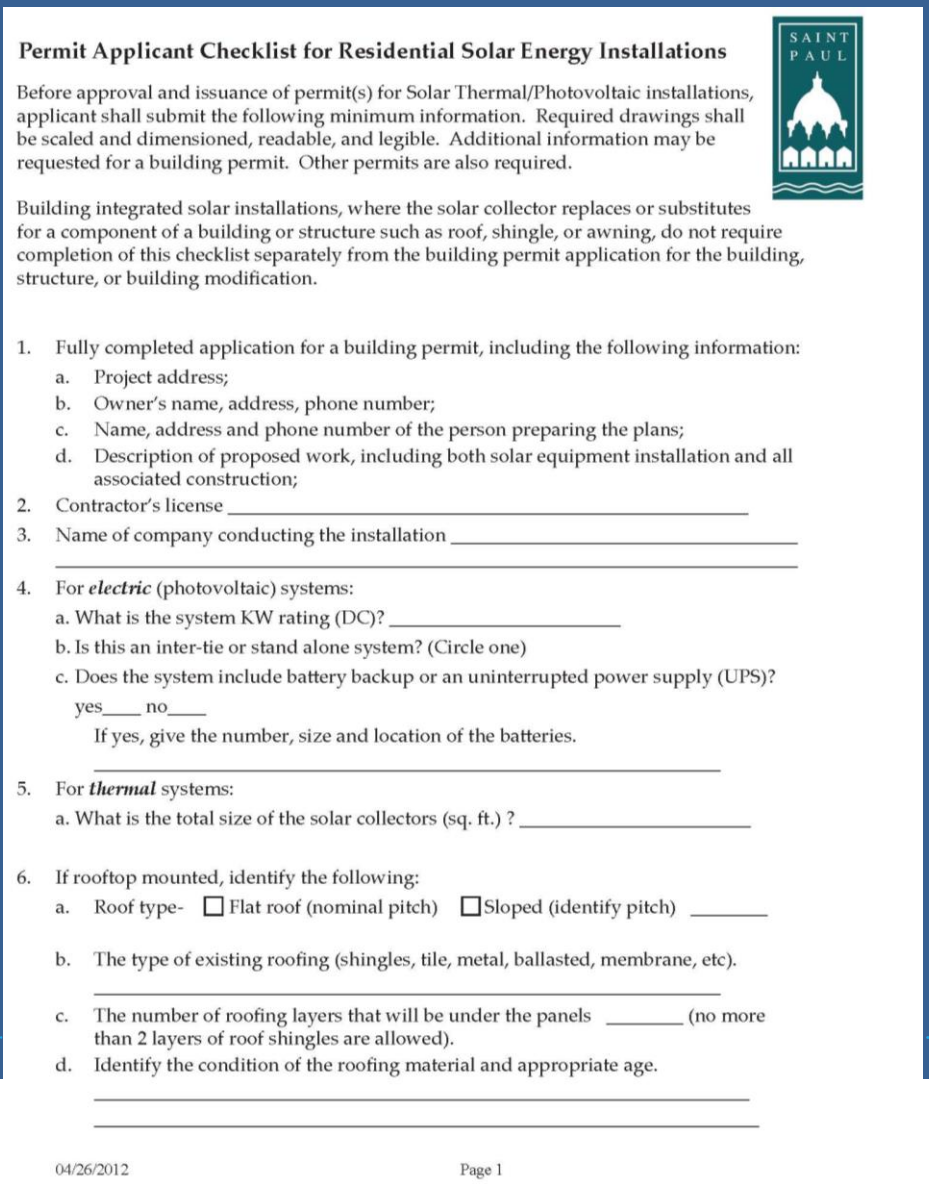
B. Make the permit process transparent and predictable to both staff and applicants

C. Ensure the permit process reflects industry best practices

D. Establish a permit fee that appropriately covers local government review and inspection costs

Permitting Best Practices

Solar Permit Checklist – Minneapolis/St. Paul



Permit Applicant Checklist for Residential Solar Energy Installations

Before approval and issuance of permit(s) for Solar Thermal/Photovoltaic installations, applicant shall submit the following minimum information. Required drawings shall be scaled and dimensioned, readable, and legible. Additional information may be requested for a building permit. Other permits are also required.

Building integrated solar installations, where the solar collector replaces or substitutes for a component of a building or structure such as roof, shingle, or awning, do not require completion of this checklist separately from the building permit application for the building, structure, or building modification.

1. Fully completed application for a building permit, including the following information:
   a. Project address;
   b. Owner's name, address, phone number;
   c. Name, address and phone number of the person preparing the plans;
   d. Description of proposed work, including both solar equipment installation and all associated construction;
2. Contractor's license _____
3. Name of company conducting the installation _____
   _____
4. For ***electric*** (photovoltaic) systems:
   a. What is the system KW rating (DC)? _____
   b. Is this an inter-tie or stand alone system? (Circle one)
   c. Does the system include battery backup or an uninterrupted power supply (UPS)?
      yes____ no____
      If yes, give the number, size and location of the batteries.
      _____
5. For ***thermal*** systems:
   a. What is the total size of the solar collectors (sq. ft.) ? _____
6. If rooftop mounted, identify the following:
   a. Roof type- ☐ Flat roof (nominal pitch) ☐ Sloped (identify pitch) _____
   b. The type of existing roofing (shingles, tile, metal, ballasted, membrane, etc).
      _____
   c. The number of roofing layers that will be under the panels _____ (no more than 2 layers of roof shingles are allowed).
   d. Identify the condition of the roofing material and appropriate age.
      _____
      _____

04/26/2012 Page 1

1. Identifies when the checklist is applicable
2. Collects basic information about the installation
3. Identifies required drawings and technical information to acquire a permit
4. Identifies when structural engineering review is necessary
5. Identifies criteria for other permit or process requirements

Permitting Best Practices

Solar Permit Checklist – Minneapolis/St. Paul

Permit Applicant Checklist for Residential Solar Energy Installations

Required Drawings and Plans

7. Provide construction drawings that include a building section detail and complete notation of method of fastening equipment to the roof of the subject property, including the following details:

   a. Cross section that identifies rafter size, spacing and span dimension and approximate roof slope.

   b. Identify style, diameter, length of embedment of bolts (i.e., 5/16" lags with minimum 3" embedment into framing, blocking, or bracing).

   _____

   _____

   _____

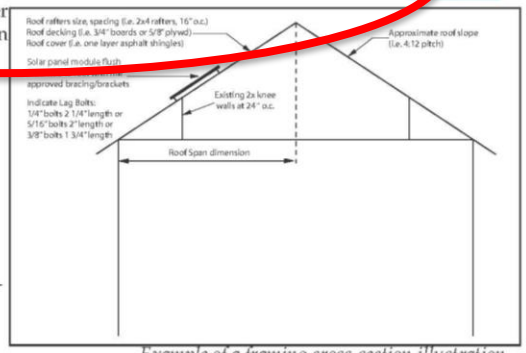
   c. Is system to be mounted according to panel and rack manufacturers' instructions?

   yes____ no____

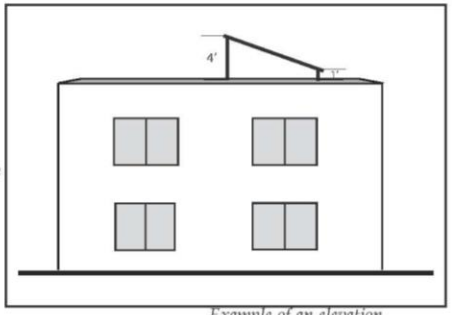
   If no, please explain. Attach explanation if more space is needed.

   _____

   _____



Example of a framing cross-section illustration



Example of an elevation

8. Provide an elevation of the structure indicating the appearance of the proposed solar installation (see example to the right). Note the finished height of the system above the roof or, if ground -mounted, above the ground.

9. Provide a site plan indicating the buildings and features of the property (see example on following page). The site plan shall show property line locations, approximate location of all structures, the location(s) of the panel installations, setback from property lines, the main service location, and, if applicable, the solar easement across adjoining properties. For roof-mounted systems identify the setback dimension from the peak and from all edges of the roof.

Rooftop Solar Installations

10. Is the equipment to be ***flush-mounted*** to the roof (mounted such that the collector surface is parallel to the roof)?

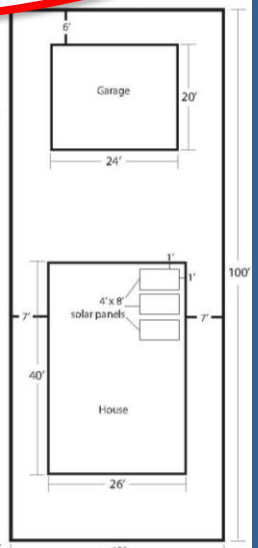
    yes____ no____ (If no, go to question 12)

Permitting Best Practices

Solar Permit Checklist – Minneapolis/St. Paul

Permit Applicant Checklist for Residential Solar Energy Installations

11. The minimum structural threshold for installing a ***flush-mounted*** PV system is a roof structure with at least 2 x 4 rafters no more than 24" on-center spacing.
    a. Does the roof structure use 2x4 or larger rafters, spaced no wider than 24 inches on center?
       yes____ no____
    b. If a ***solar thermal*** installation, is the collector/racking system fastened to each rafter passing under the collector?
       yes____ no____
12. ***Non-flush-mounted installations*** have different potential structural considerations. If the answer to question 10 (is the system flush-mounted?) is no, please provide the following additional information.
    a. Is the finished pitch of the collector at or less than a 12/12 pitch?
       yes____ no____
    b. Is the collector or racking fastened to the roof within one foot of the roof peak?
       yes____ no____
    c. Is the collector/racking system fastened to each rafter passing under the collector?
       yes____ no____
    d. Is the horizontal span (roof span dimension) of the rafter less than 7.75 feet for 2x4 rafters or 11.5 feet for 2x6 rafters?
       yes____ no____
13. Roof decking and structural supports should all be in good condition without visible roof sag/deflection. Is the roof structure in good condition, having no visible sag, cracking or splintering of rafters, or other potential structural defect? If roof structure is accessible, please provide a photo showing the condition of the roof. If roof structure is not accessible, provide an exterior photo, side view, of the roof.
       yes____ no____
14. If the answer is no to question 11, 12 a. - d., or 13 please provide a study or statement regarding the proposed solar installation and all proposed structural modifications stamped by a Minnesota licensed/certified structural engineer. Approval can come in the following forms:
    a. Construction plans denoting the roof structure and any modifications to the structure if required, as well as the method of installation of solar collector on the subject property.
    b. Letter from engineer accomplishing the same as above if the engineer feels that letter format will provide the necessary information.



Example of a site plan

Permitting Best Practices

Solar Permit Checklist – Minneapolis/St. Paul

Permit Applicant Checklist for Residential Solar Energy Installations

Ground Solar Installations

13. For *ground-mounted* solar energy systems, the installation must meet property line setback standards for accessory structures, as identified in the Saint Paul Zoning Code (Section 65.921, 65.501). Verification of the property line and appropriate setback is required, either through identification of property pins or completing a survey. Identify the method used to verify property lines and setbacks.

☐ Located property pins ☐ Completed survey (attach) ☐ Other (attach explanation)

Electrical Information

15. Specify the locations of all equipment and disconnects (on a separate page, if necessary) (e.g., AC disconnect located on exterior face of ____ wall of house, invertor and DC disconnect located in the interior within _____ room).

_____

_____

16. Provide a single line drawing of the electrical installation which includes the following information: PV panel layout, PV power source short circuit current rating, conductor size, type, locations and lengths of runs, wiring methods, grounding points, inverter location, disconnect locations, battery locations (if applicable), point of connection to the existing electrical system. Note the existing service size and number of meters. An example of a single line drawing is attached to this checklist.

17. Provide manufacturer's specification sheets on all components including but not limited to inverters and panels, which include the make, model, listing, size, weight, etc.

Heritage Preservation

18. Legislative Code § 73.06 provides that exterior work, including installation of solar energy systems, within city designated heritage preservation sites and districts is subject to review and approval by the Heritage Preservation Commission (HPC) prior to the issuance of city permits. For a city map showing individual sites and district boundaries go to http://www.stpaul.gov/index.aspx?NID=4080. You may also search by a specific address by using "property look-up" at: https://www.stpaulonestop.com/AMANDA5/eNtraprise/StPaul/m3list/a_PickProperty.jsp?id=ReadOnlyStpaul.

Is the installation address within a heritage preservation district, or on a landmark property or building?

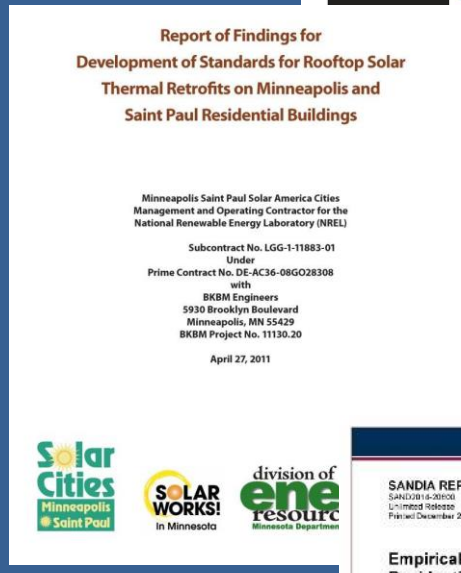
yes____ no____

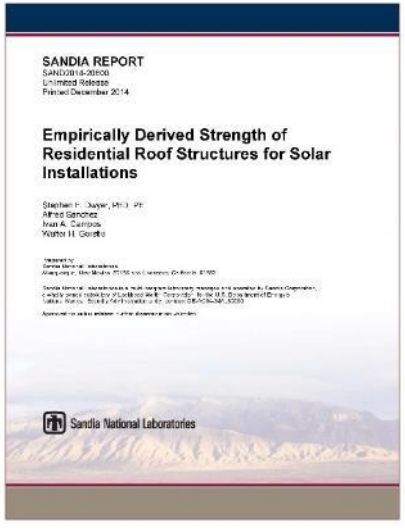
Solar installations on properties with heritage preservation considerations will require additional review, either administrative review by staff or review by the Heritage Preservation Commission.

Standardizing Permitting

Structural engineering studies on residential rooftop solar installations.

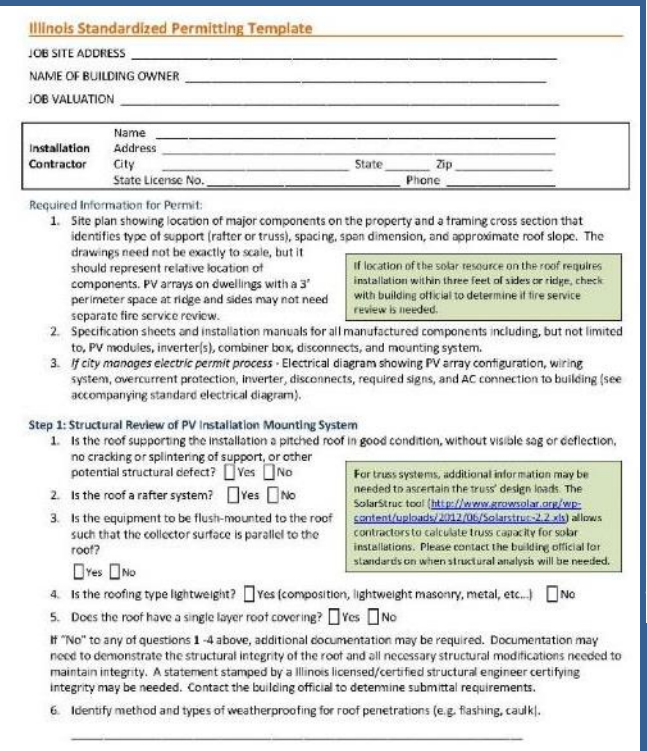
- ✓ Minneapolis Saint Paul Solar Cities Structural Study
- ✓ Minnesota Standardized Load Tables for residential solar installations
- ✓ Sandia National Lab study on roof strength for solar installations.
- ✓ Solar America Board of Codes and Standards





Grow Solar Toolkit

- ✓ Submittal requirements
- ✓ Structural guidance
- ✓ Standard electrical diagram
- ✓ Permit fees



Illinois Standardized Permitting Template

JOB SITE ADDRESS _____

NAME OF BUILDING OWNER _____

JOB VALUATION _____

Installation Contractor	Name	
	Address	
	City	State ____ Zip ____
	State License No.	Phone ____

Required Information for Permit:

1. Site plan showing location of major components on the property and a framing cross section that identifies type of support (rafter or truss), spacing, span dimension, and approximate roof slope. The drawings need not be exactly to scale, but it should represent relative location of components. PV arrays on dwellings with a 3' perimeter space at ridge and sides may not need separate fire service review.

   If location of the solar resource on the roof requires installation within three feet of sides or ridge, check with building official to determine if fire service review is needed.
2. Specification sheets and installation manuals for all manufactured components including, but not limited to, PV modules, inverter(s), combiner box, disconnects, and mounting system.
3. *If city manages electric permit process* - Electrical diagram showing PV array configuration, wiring system, overcurrent protection, inverter, disconnects, required signs, and AC connection to building (see accompanying standard electrical diagram).

Step 1: Structural Review of PV Installation Mounting System

1. Is the roof supporting the installation a pitched roof in good condition, without visible sag or deflection, no cracking or splintering of support, or other potential structural defect? ☐Yes ☐No
2. Is the roof a rafter system? ☐Yes ☐No
3. Is the equipment to be flush-mounted to the roof such that the collector surface is parallel to the roof? ☐Yes ☐No

   For truss systems, additional information may be needed to ascertain the truss' design loads. The SolarStruc tool (http://www.growsolar.org/wp-content/uploads/2012/06/Solarstruc-2.2.xls) allows contractors to calculate truss capacity for solar installations. Please contact the building official for standards on when structural analysis will be needed.
4. Is the roofing type lightweight? ☐Yes (composition, lightweight masonry, metal, etc..) ☐No
5. Does the roof have a single layer roof covering? ☐Yes ☐No

If "No" to any of questions **1**-4 above, additional documentation may be required. Documentation may need to demonstrate the structural integrity of the roof and all necessary structural modifications needed to maintain integrity. A statement stamped by a Illinois licensed/certified structural engineer certifying integrity may be needed. Contact the building official to determine submittal requirements.

6. Identify method and types of weatherproofing for roof penetrations (e.g. flashing, caulk).

   _____

Mounting System Information:

7. Is the mounting structure an engineered product designed to mount PV modules with no more than an 18" gap beneath the module frames? ☐Yes ☐No

   If No, provide details of structural attachment certified by a design professional. Manufacturer's engineering specifications are sufficient to meet this requirement.
8. For manufactured mounting systems, fill information on the mounting system below:
   a. Mounting System Manufacturer _____
   b. Product Name and Model #_____
   c. Total Weight of PV Modules and Rails _____ lbs
   d. Total Number of Attachment Points_____ (attachment points must be equally distributed across the array)

      Attaching the rail to each rafter or truss that passes under the array, or to blocking installed between each support, may serve to mitigate for any structural uncertainties on older roofs or wind loading concerns. This approach is used by other Midwestern cities based upon engineering studies conducted with their building stock. Contact the building official to determine requirements.
   e. Weight per Attachment Point _____ lbs
   f. Maximum Spacing between Attachment Points on a Rail _____inches (see product manual for maximum spacing allowed based on maximum design wind speed).
   g. Total Surface Area of PV Modules (square feet)_____ ft2
   h. Distributed Weight of PV Module on Roof (c+f)_____ lbs/ft2

      If distributed weight of the PV system is greater than 5 lbs/ft2, a study or statement demonstrating the structural integrity of the installation, or a statement stamped by an Illinois licensed/certified structural engineer, may be required. Contact the building official to determine requirements.

Step 2: Electrical Review of PV System

Please document the following information to be issued an electric permit. If the installation does not meet the following thresholds, additional information may be needed, as requested by the permit official.

1. PV modules, utility-interactive inverters, and combiner boxes are identified for use in PV systems.
2. The PV array is composed of 4 series strings or less per inverter.
3. The total inverter capacity has a continuous AC power output 13,440 watts or less
4. The AC interconnection point is on the load side of service disconnecting means (NEC 2011 705.12(D), NEC 2008 690.64(B)).
5. A standard electrical diagram should be used to accurately represent the PV system. Acceptable diagrams, in interactive PDF format, are available at www.solarabcs.org/permitting.

Fill out the standard electrical diagram completely. A guide to the electrical diagram is provided at www.solarabcs.org/permitting to help the applicant understand each blank to fill in. If the electrical system is more complex than the standard electrical diagram can effectively communicate, provide an alternative diagram with appropriate detail.

Step 3: Permit fee for residential installations

____ Fees $100

____ Additional inspection ..... $ 50.00
(Per inspection, when needed)

TOTAL FEE = $_____

RECEIPT NO. _____

DATE _____

Recommended fee for residential or small commercial solar installations is a fixed fee between $50 - 200, consistent with cost for services (permit processing, inspection) incurred by the government unit. Alternatively, the fee can be valuation based, but for a building permit should exclude the value of the solar collectors and electronics.

I HEREBY CERTIFY that I have completed and examined this application and certify that the information contained therein is correct. If a permit is issued, I agree all work will be done in conformance with all applicable ordinances and codes of this City and laws of the State of Illinois.

_____
CONTRACTOR OR AUTHORIZED AGENT/HOMEOWNER

Resources and Reference Material

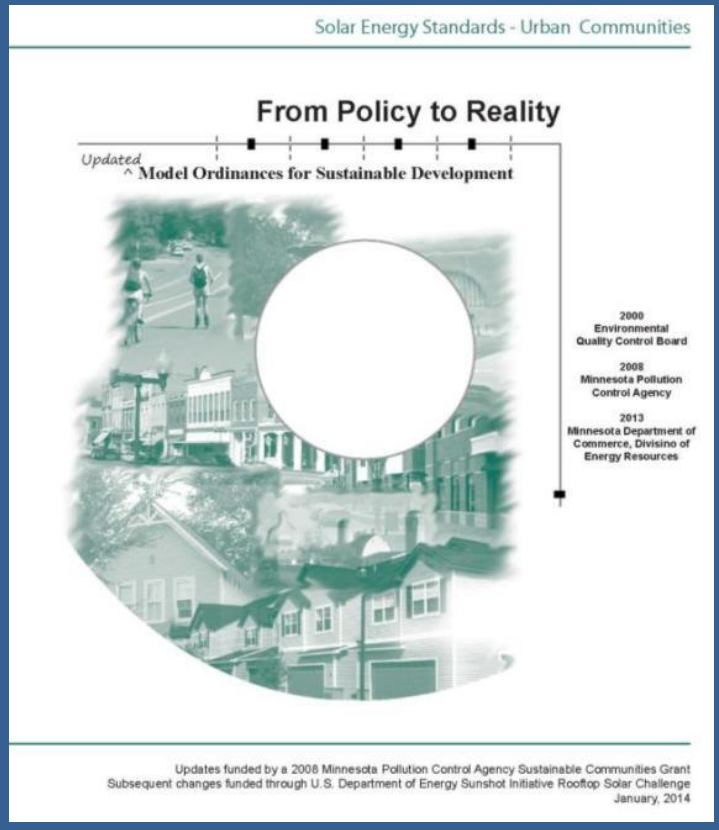
- Chicago Solar Express, http://www.cityofchicago.org/city/en/progs/env/solar_in_chicago.html
- Milwaukee Solar Permit, http://city.milwaukee.gov/MilwaukeeShines/Solar-Professionals/Permitting.htm#.VUD8_JNi9ps
- Saint Paul Solar Permit Checklist, http://www.stpaul.gov/DocumentCenter/View/76171
- National Renewable Energy Lab: *Permitting Best Practices* http://www.nrel.gov/docs/fy13osti/57104.pdf
- Interstate Renewable Energy Council: *Solar Permitting Best Practices*: http://www.irecusa.org/solar-permitting-best-practices/
- Solar America Board for Code and Standards (Solar ABCs): *Expedited Permit Process*, with sample line drawings for all installation types: http://www.solarabcs.org/
- Sandia National Laboratories, *Empirically Derived Strength of Residential Roof Structures for Solar Installations*, http://prod.sandia.gov/techlib/access-control.cgi/2014/1420600.pdf
- SolarStruc Tool, http://www.growsolar.org/wp-content/uploads/2012/06/Solarstruc-2.2.xls
- Minneapolis Saint Paul Solar Cities Program, *Standards for Rooftop Solar Thermal Retrofits*,
- Minnesota Division of Energy Resources/Department of Labor and Industry, *Standardized Load Tables Characterizing Residential Solar Thermal and Solar Electric installations for Residential Structures*, http://mn.gov/commerce/energy/images/FINAL-Standardized-Load-Table-Report.pdf
- Grow Solar Inspection trainings, http://www.growsolar.org/technical-assistance/training-program-development/

Regulation of Solar Development

Solar Ready Communities

Development Regulations that:

- ✓ explicitly address solar development in its varied forms,
- ✓ create as-of-right installation opportunities, and
- ✓ set clear and predictable standards for balancing solar resources with other resources.



Basic Solar Energy Zoning – Accessory Uses

Do your basic zoning tools - uses, setbacks, heights, coverage – create barriers for home and business owners to capture solar resources?

Define an "as-of-right" installation fo

Basic Solar Energy Zoning – Principal Uses

Do your basic zoning tools set clear standards for solar farm or garden development?

Advanced Solar Zoning

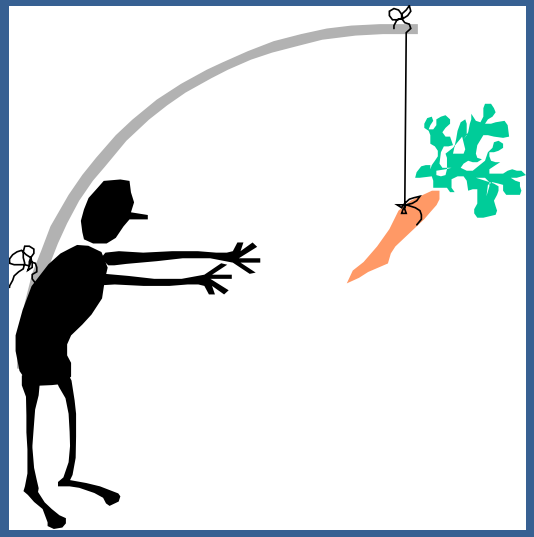
Using advanced regulatory concepts to encourage solar development

- ✓ **Design standards** - Are community aesthetic or character standards part of local regulations?
- ✓ **Solar easements or cross-property protection** - Does local regulation protect the solar resource when someone makes a long-term investment in solar infrastructure?
- ✓ **Home Owners Associations**– Does the community have an interest in ensuring solar development rights in common interest communities?
- ✓ **Integrating with other processes** – agricultural protection, municipal utility, historic preservation, etc.

Incentives and Requirements

Does development regulation use incentives?

- ✓ **Density bonus** for solar development
- ✓ **Protect solar resources** when subdividing
- ✓ **Identify** preferred areas for solar farms
- ✓ **Financial incentives** in fee structure
- ✓ **Planned Unit Development** conditions
- ✓ **"Solar ready" construction**



Grow Solar Toolkit

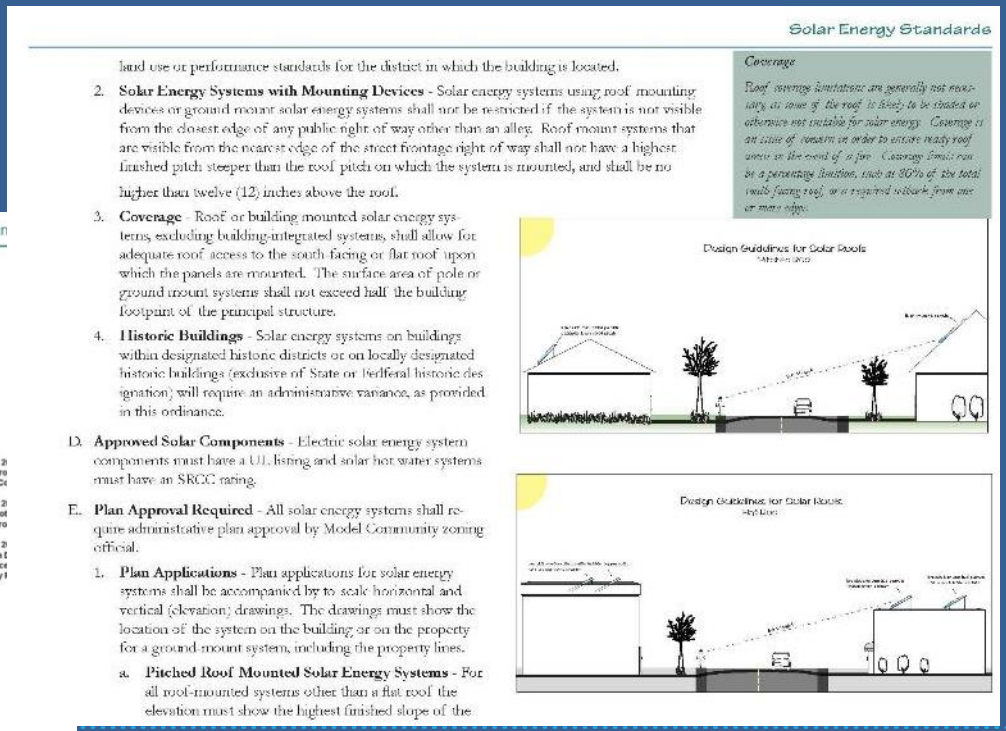
- ✓ Solar accessory uses, by type
- ✓ Solar principal uses
- ✓ Regulatory incentives

Grow Solar

Local Government Solar Toolkit

PLANNING, ZONING, AND PERMITTING

Minnesota



THANK YOU!

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Better Energy. Better World.