

MAKING “SOLAR READY” COMMUNITIES

MIDWEST RENEWABLE ENERGY ASSOCIATION
2015 ENERGY FAIR



Brian Ross, AICP, LEED GA
Senior Program Director



**GREAT PLAINS
INSTITUTE**

Better Energy.
Better World.

Great Plains Institute

Non-partisan, non-profit organization:

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.



**GREAT PLAINS
INSTITUTE**

Better Energy.
Better World.

Sustainable Communities


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

Grow Solar



**GREAT PLAINS
INSTITUTE**

Better Energy.
Better World.

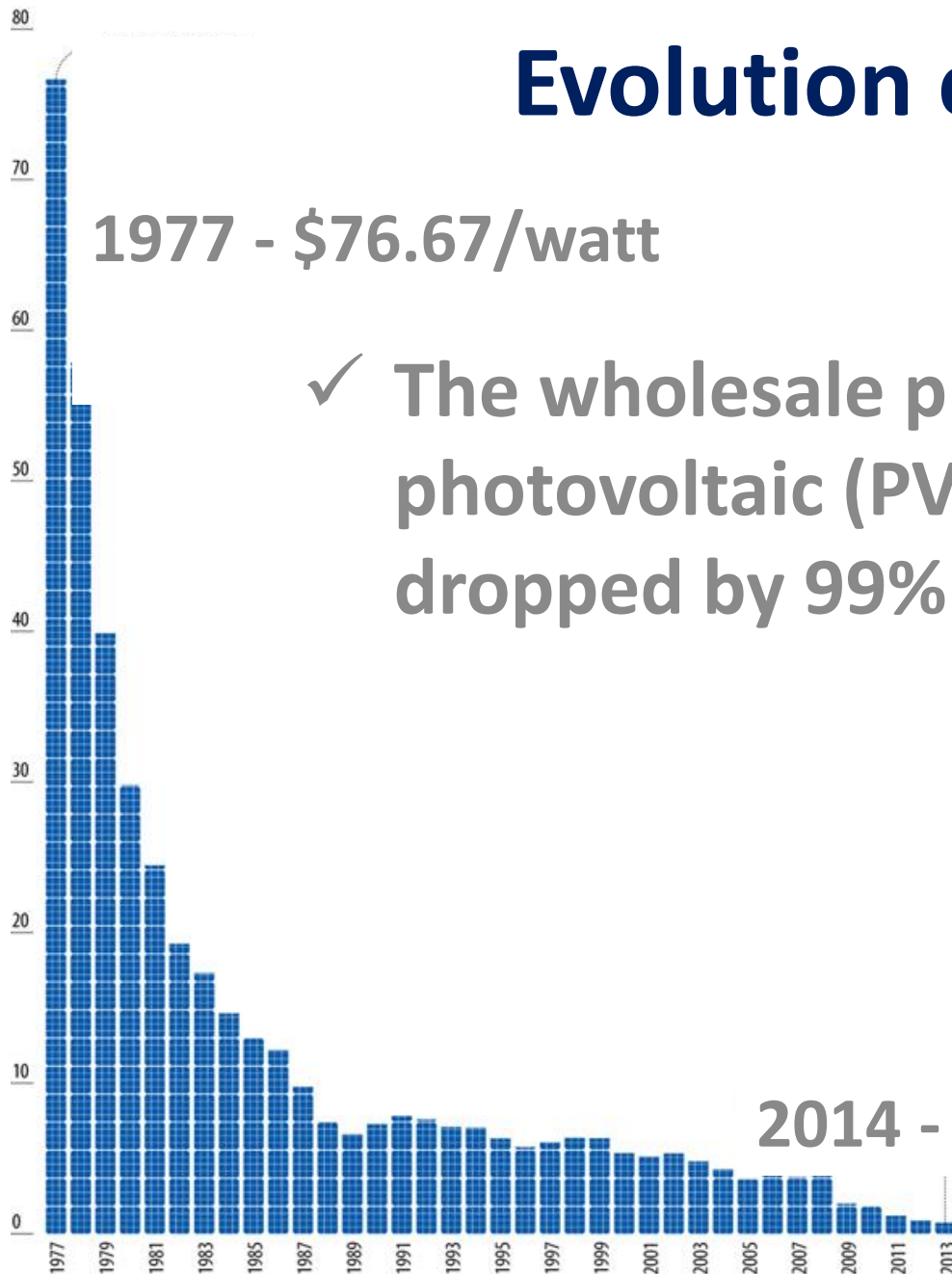


Why Does Local Government Matter?

Evolution of Solar Energy . . .

1977 - \$76.67/watt

- ✓ The wholesale price of solar photovoltaic (PV) panels (\$/watt) has dropped by 99% since 1977.

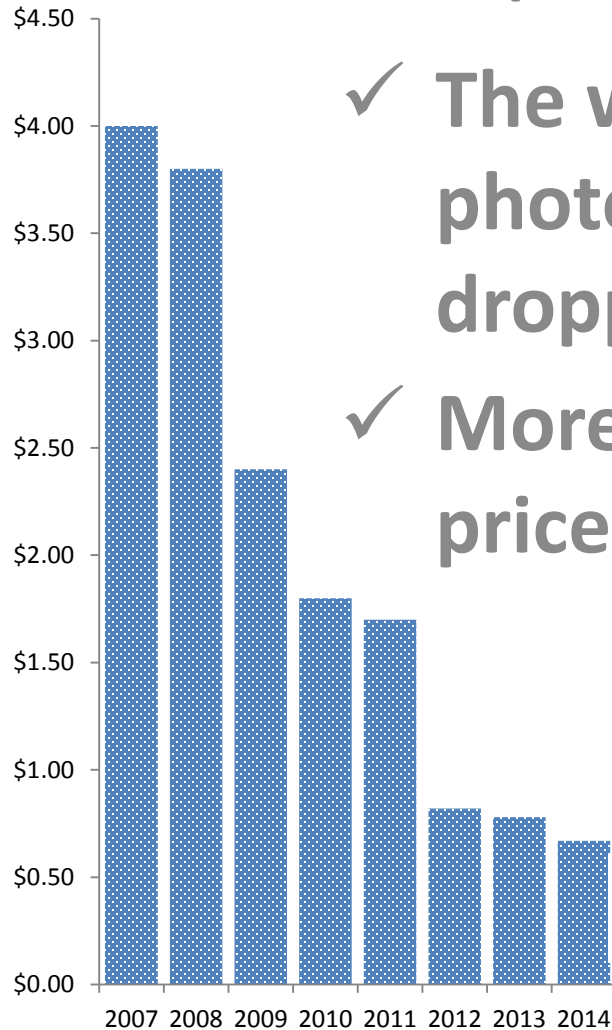


2014 - \$0.67/watt

Evolution of Solar Energy . . .

2007 - \$4.00/watt

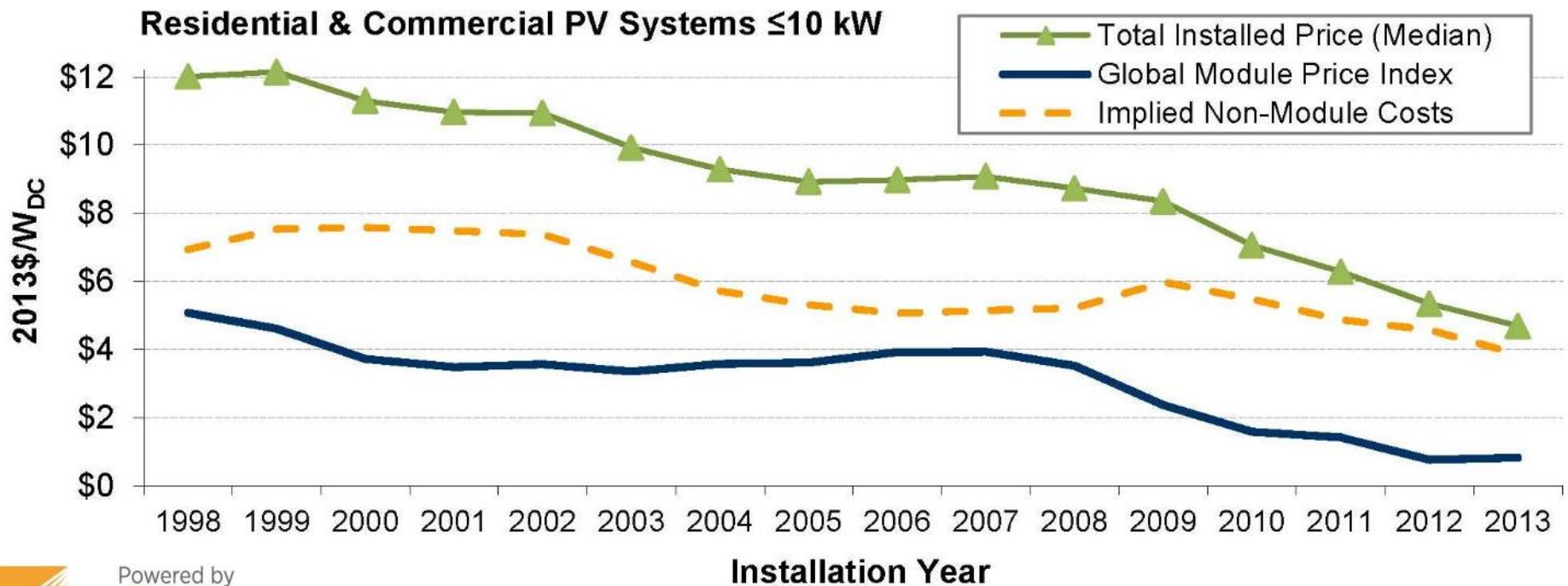
- ✓ The wholesale price of solar photovoltaic (PV) panels (\$/watt) has dropped by 99% since 1977.
- ✓ More significantly, since 2007, the price has declined by 83% . . .



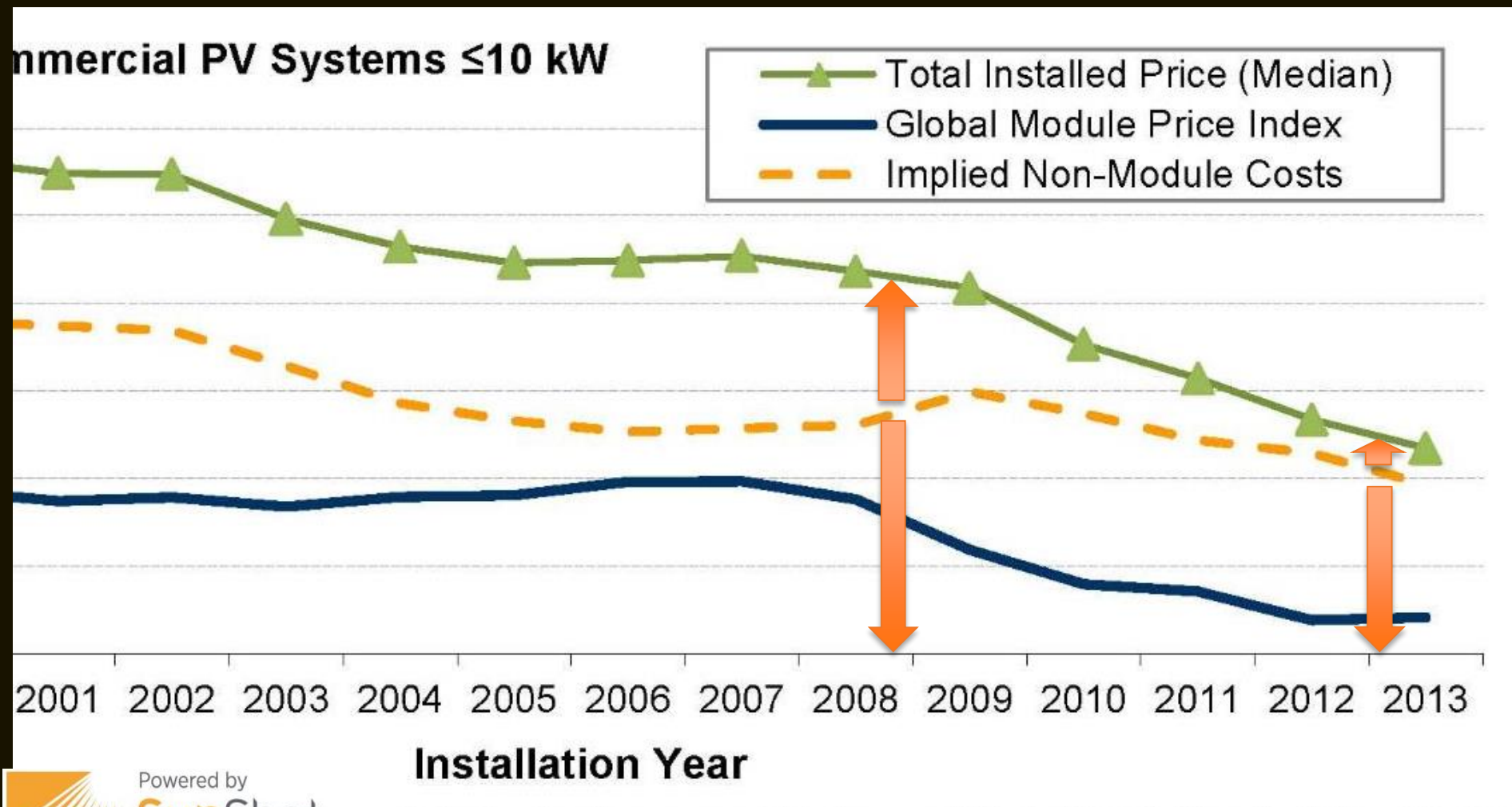
2014 - \$0.67/watt

Evolution of Solar Energy ...

- ✓ DOE (SunShot) estimates that installed costs need to be well below \$2/watt (rooftop) to sustain the market.
- ✓ However, the “soft cost” component for rooftop systems in particular remains difficult to address



Evolution of Solar Energy ...



If you remember one thing . . .

- ✓ **Local governments are a critical partner in the task of creating a self-sustaining solar energy market**



Photo credit: Meet Minneapolis

If you remember two things . . .

Solar energy development is local development

- ✓ **Local government development oversight determines how, and whether, local solar resources are used**



Photo credit: U.S. DOE SunShot



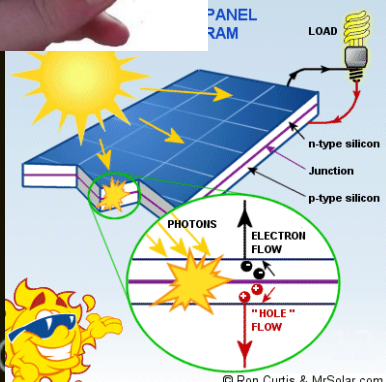
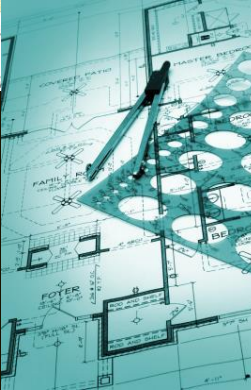
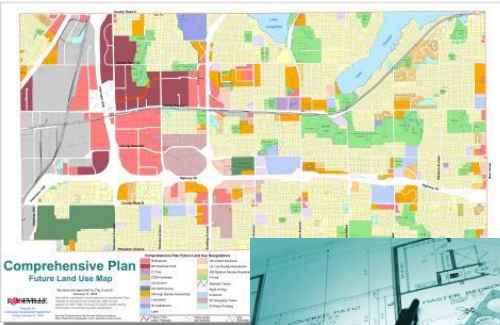
Photo credit: CR Planning

An aerial photograph of a large-scale solar farm. The image shows numerous rows of solar panels, each with a grid of thin lines, stretching across a flat landscape. The panels are tilted at an angle, and the perspective is from a high angle, looking down and across the rows. The sky is clear and blue. In the background, there are some trees and a fence line.

Role of Local Government ...

Five Principles for Solar Ready Communities...

- 1. **Comprehensive Plans** that acknowledge and address solar resources and 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 Development is Development

Solar energy development is local development

- ✓ Is investment adding value to homes and businesses
- ✓ Creates economic opportunity
- ✓ Uses local resources
- ✓ Poses potential conflicts



Photo credit: U.S. DOE SunShot



Solar Development is Development

Typical Local Government Roles in Development Activities

- ✓ **Regulator** – policy, zoning, permitting
- ✓ **Educator** – providing information to help people make informed decisions
- ✓ **Financier or Assembler** – EDA type role, providing financing tools, development preparation, assembly of resources for private sector investment
- ✓ **Developer** - HRA or public housing authority type role, owning and managing development for private sector use
- ✓ **Consumer** – developing solar for public sector use



Grow Solar Toolkit

Planning, Zoning, Permitting

The image displays three overlapping book covers for the 'Grow Solar Local Government Solar Toolkit'. Each cover features the 'Grow Solar' logo at the top, followed by the title 'Local Government Solar Toolkit' and the subtitle 'PLANNING, ZONING, AND PERMITTING'. The covers are color-coded by state: Minnesota (blue), Illinois (orange), and Wisconsin (red). The covers are arranged in a staggered, overlapping fashion, with the Wisconsin cover at the bottom center, the Minnesota cover on the left, and the Illinois cover on the right.

Grow Solar
Local Government
Solar Toolkit
PLANNING, ZONING, AND PERMITTING
Minnesota

Grow Solar
Local Government
Solar Toolkit
PLANNING, ZONING, AND PERMITTING
Illinois

Grow Solar
Local Government
Solar Toolkit
PLANNING, ZONING, AND PERMITTING
Wisconsin

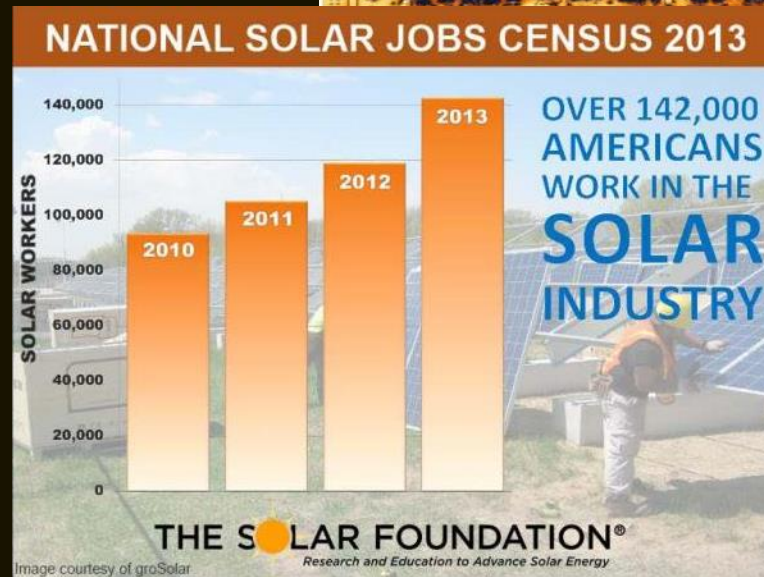
An aerial photograph of a large-scale solar farm. The image shows numerous rows of solar panels, each with a silver metal frame and a blue-tinted glass surface. The panels are arranged in a grid pattern, with rows extending into the distance. The perspective is from a high angle, looking down at the panels. The sky is a clear, pale blue. In the background, there are some trees and a road. The overall scene is a vast, organized array of solar energy collectors.

Local Solar Policy

Solar Ready Communities

Comprehensive Plans that

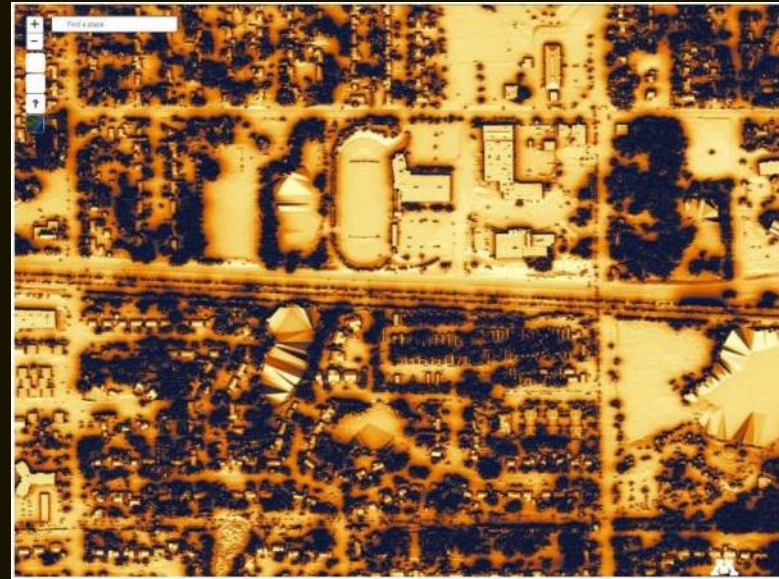
- ✓ address solar resources
- ✓ acknowledge solar development benefits and opportunities in the community.
 - Property value
 - Job creation
 - Import substitution



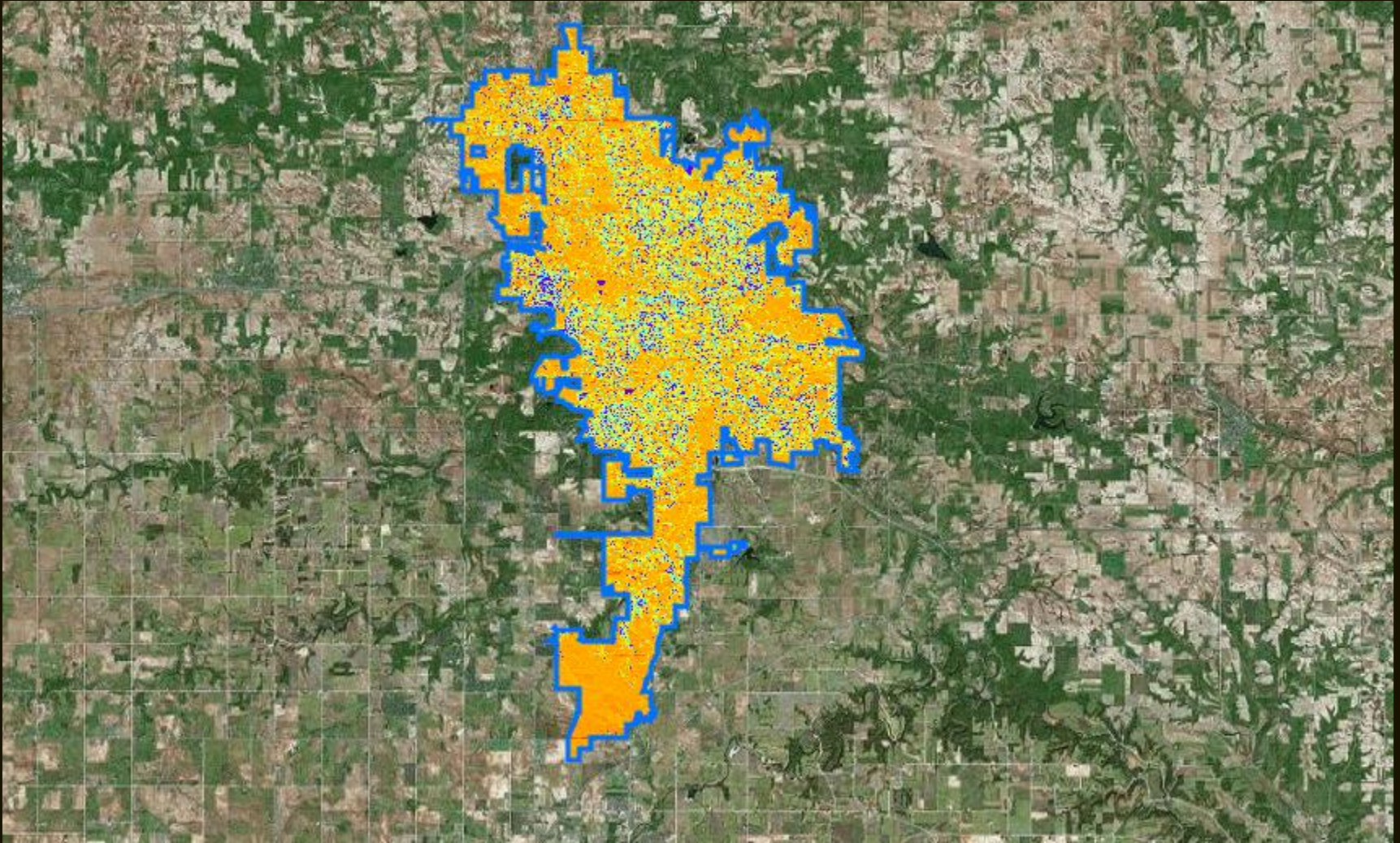
Solar Ready Communities

Comprehensive Plans that

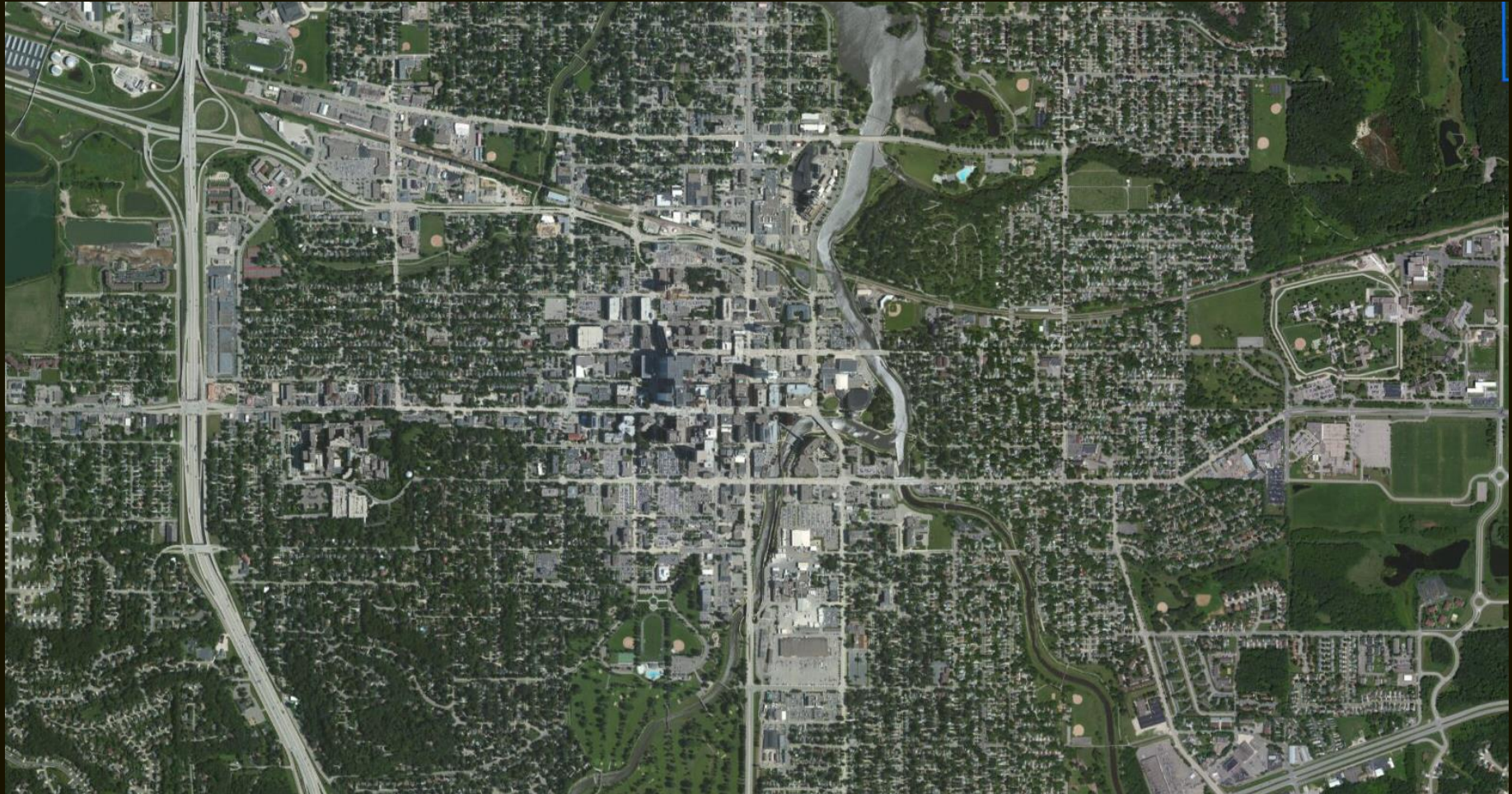
- ✓ acknowledge perceived nuisances or potential conflicts between solar development and other resources;
 - Agricultural practices
 - Urban forests
 - Historic resources
 - Airports
 - Natural areas



Thinking about your Solar “Reserve”

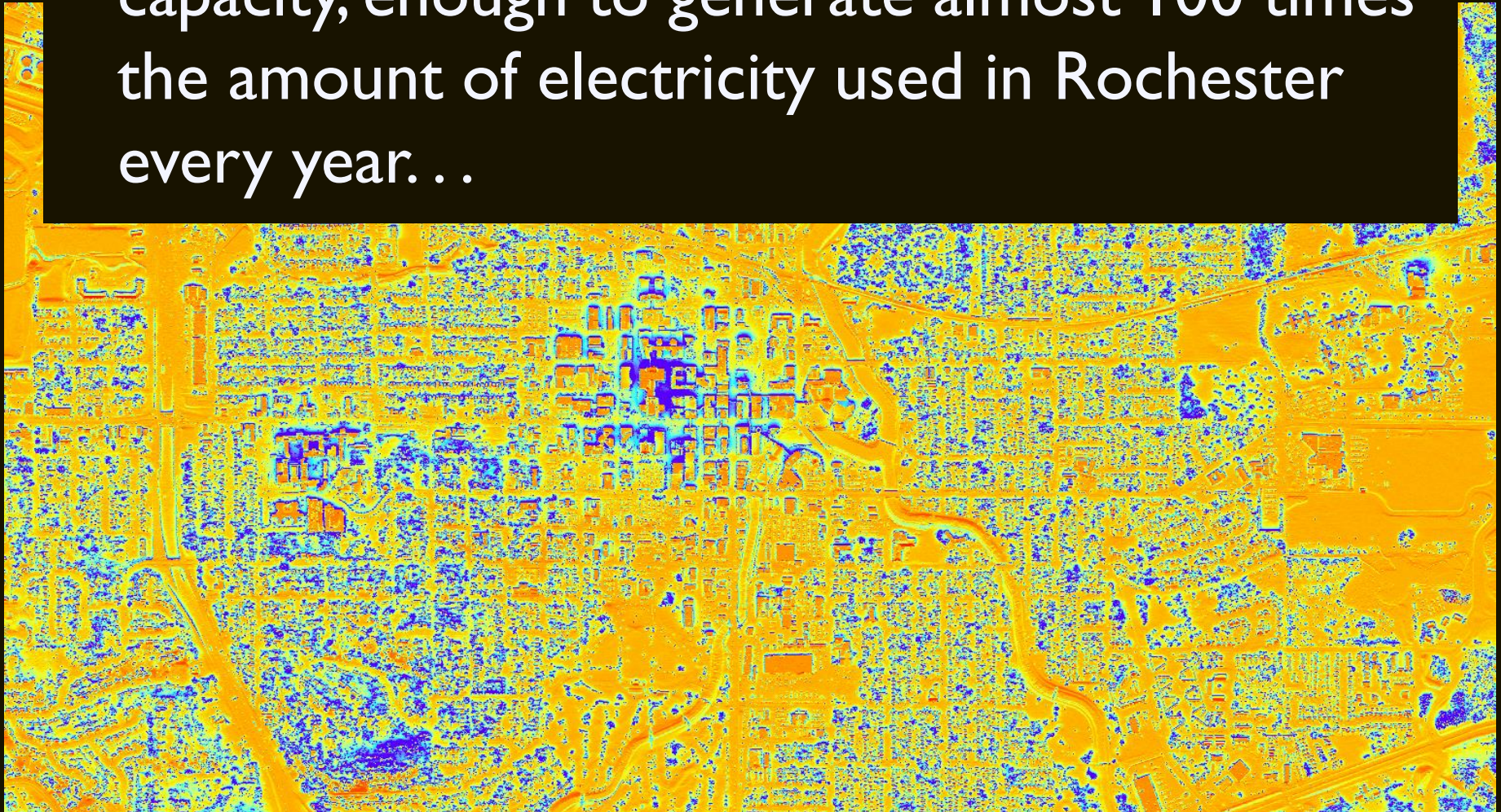


Rochester's Solar "Reserve"

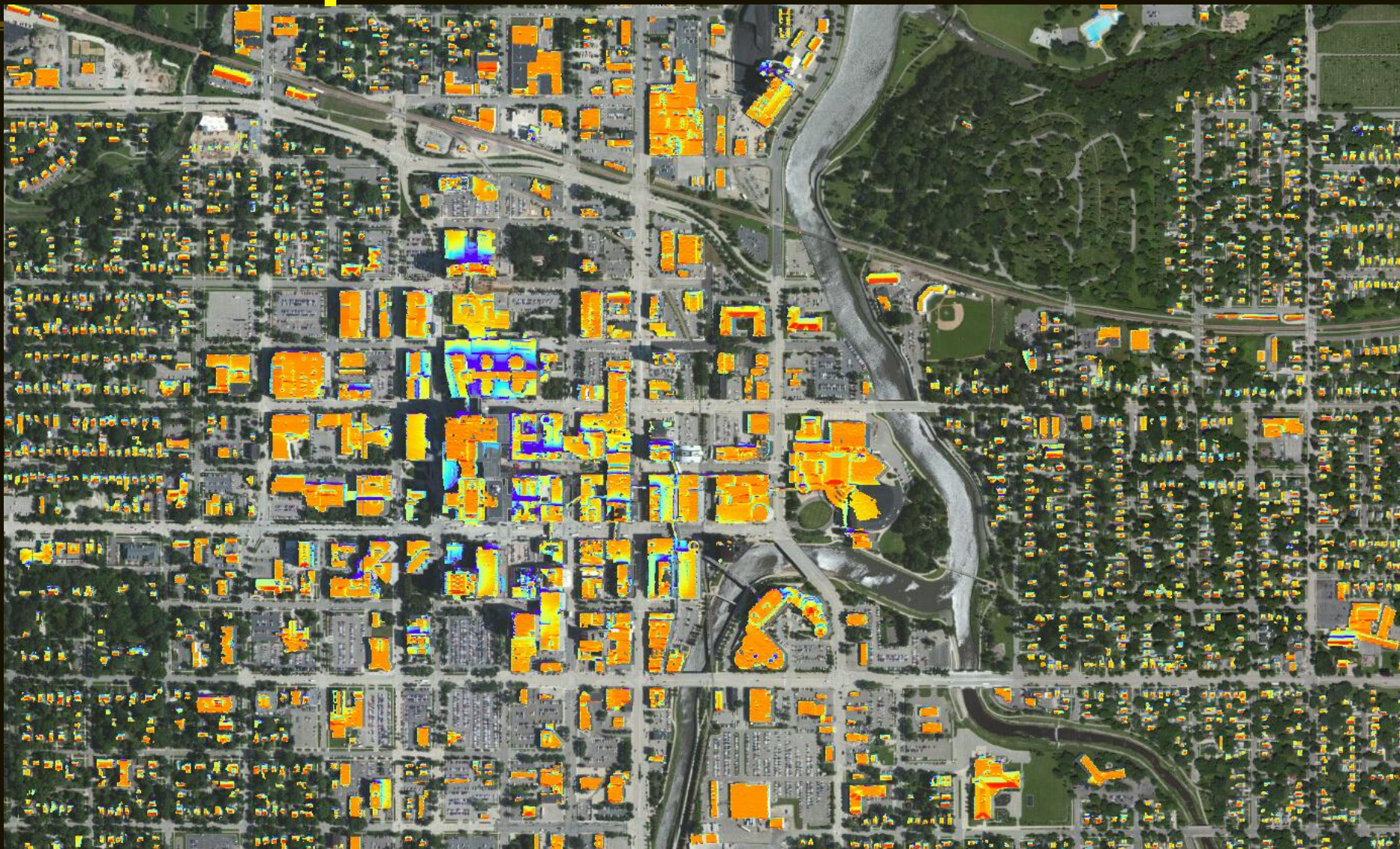


Rochester's Solar "Reserve"

- Gross solar reserve – Over 7,000 MW of capacity, enough to generate almost 100 times the amount of electricity used in Rochester every year...



Rooftop Solar Reserves



Rooftop Solar Reserves



Rooftop Solar Reserves

- Rooftop solar reserve – 470 MW of capacity, enough to generate approximately 50% of the amount of electricity used in Rochester every year. . .



Grow Solar Toolkit

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

Grow Solar

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 valuable local resource — solar development can bring environmental and economic benefits to a community 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 for energy development into comprehensive plans, sending a strong message of commitment for sustained 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 comprehensive plan that includes a solar component should:

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

Each of these components can help a community identify how they wish to include solar as a resource 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 must be 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.*

Grow Solar

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.

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.

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.



Rooftop Solar, MRCA



Ground Mount System, CERTs



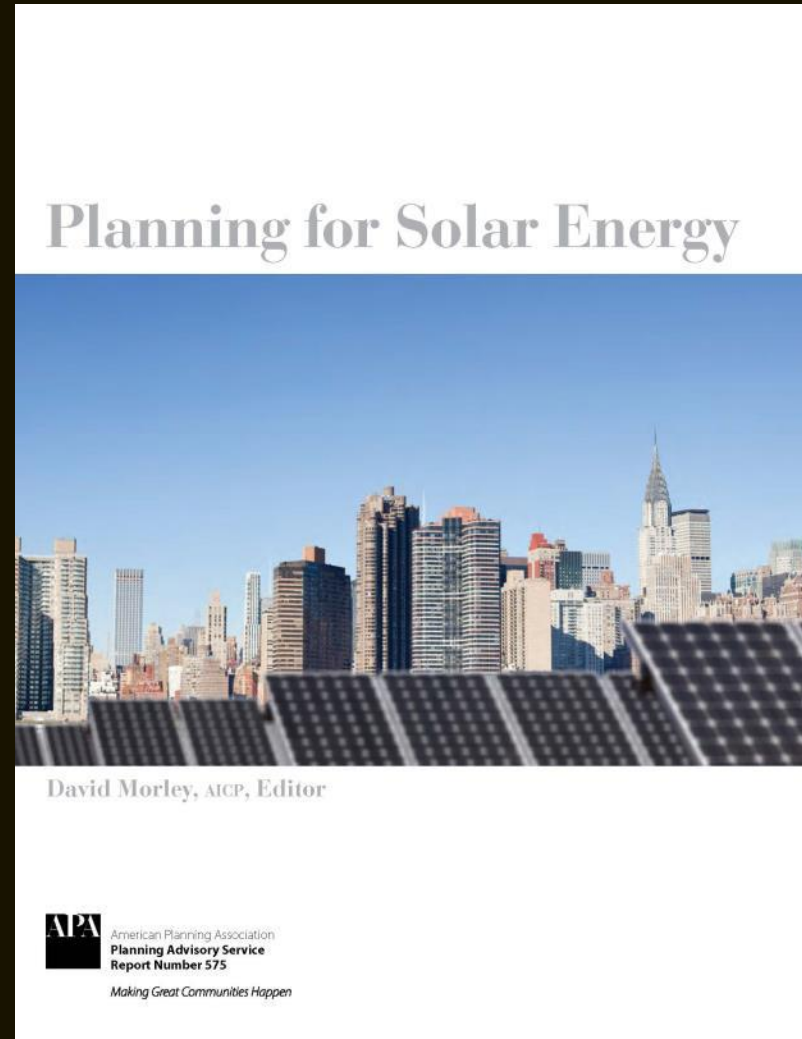
Solar Farm, CERTs

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



An aerial photograph of a large-scale solar farm. The image shows numerous rows of solar panels, each with a grid of thin silver lines. The panels are tilted at an angle, and the rows recede into the distance, creating a strong sense of perspective. The sky is a clear, pale blue. A semi-transparent blue horizontal bar is overlaid across the middle of the image, containing the text.

Regulation of Solar Development

Solar Ready Communities

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

Solar America Board for Codes and Standards

EXPEDITED PERMIT PROCESS FOR PV SYSTEMS
A Standardized Process for the Review of Small-Scale PV Systems

Bill Brooks
Brooks Engineering

Expedited Permit Process for PV Systems
A Standardized Process for the Review of Small-Scale PV Systems

Study Report Overview

This fact sheet summarizes the findings and recommendations of a new study report from the Solar America Board for Codes and Standards (Solar ABCs), *Expedited Permit Process for PV Systems – A Standardized Process for the Review of Small-Scale PV Systems*. The permit process presented in this report was created to meet the needs of the growing, small-scale photovoltaic (PV) market in the U.S. and is applicable nationwide. It takes advantage of the many common characteristics inherent in most of the small-scale PV systems installed today to streamline both the application and award of permits.

This study report describes a process that has advantages throughout the permitting cycle. Use of this process simplifies the technical requirements for PV contractors submitting the application for construction of a new PV system while also facilitating the efficient review of the application's electrical and structural content by the local jurisdiction assisting the permit.

Key Findings

Local jurisdictions are responsible for establishing the permitting requirements for new PV system construction and installation in their territory. While jurisdictions everywhere share most of the same challenges in ensuring the safety of new PV systems, experience with PV has led many to implement unnecessarily complex and inconsistent permitting procedures. In these cases, barriers of time and expense brought about by requiring multiple departments to review the same application severely inhibit the timely and efficient construction of new PV systems.

At the same time, the majority of residential-sized PV systems installed in the United States share many similarities of design. It is the similarity and commonality of these designs that would allow for a nationally standardized expedited permit process for small-scale PV systems.

Solar ABCs Recommendation

The solution is to begin with a consistent starting point and using the nationally standardized Expedited Permit Process. Jurisdictions can be assured that they are consistent in their application of codes and standards. Contractors can also be assured that the requirements for permitting will not vary dramatically among jurisdictions. Both of these assurances result in safe, cost-effective installations and accelerate PV technology use.

The term "expedited permit process" refers to an organized permitting process by which a majority of small PV systems can be permitted quickly and easily. It is not intended to apply to all types of PV systems. The primary need and use for this process is for systems of less than 10kW maximum power output. The expedited permit process is intended to simplify the structural and electrical review of a small PV system project and streamline the need for detailed engineering studies and unnecessary delays.

The majority of PV systems installed in the U.S. meet the eligibility requirements outlined in this process and will benefit from the

CITY OF PORTLAND OREGON - BUREAU OF DEVELOPMENT SERVICES

LAND DIVISION INFORMATIONAL GUIDE
Solar Access Regulations, Ch 33.639

The solar access regulations encourage variation in the width of lots to maximize solar access for single dwelling detached development and minimize shade on adjacent properties.

Do the solar access requirements apply to my site?

The approval criteria of the solar access chapter apply to lots for single dwelling detached development created as part of a land division proposal in all zones.

What are the solar access criteria?

The solar access approval criteria focus on the width of individual lots. All of the following approval criteria must be met:

- On streets that are within 30 degrees of a true east-west axis (see Figure 639-1). The narrowest lots should be:
 - Interior lots on the south side of the street (see Figure 639-2); and
 - Corner lots on the north side of the street (see Figure 639-3).
- On streets that are within 30 degrees of a true north-south axis, the widest lots should be interior lots on the east or west side of the street (see Figure 639-4).

Frequently asked questions

Q What if I can't meet the solar access approval criteria?
A Where it is not practicable to meet both the approval criteria of the solar access chapter and approval criteria of other chapters in the 6000, the regulations of the other chapters supersede the approval criteria of the solar access chapter.

Q What if I'm creating lots in a Commercial zone and will sell them to builders, so I don't know if they will be developed with detached or attached houses?
A The Solar Access regulations will only apply to lots we know will be developed with detached housing.

Q Does this apply to land divisions that have a common green instead of a regular street?
A Yes. A common green is defined as a street.

SOLAR ACCESS REGULATIONS
1800 SW FOURTH AVENUE, PORTLAND, OREGON 97201 • 503-823-7526 • www.bds.ci.portland.or.us

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.

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

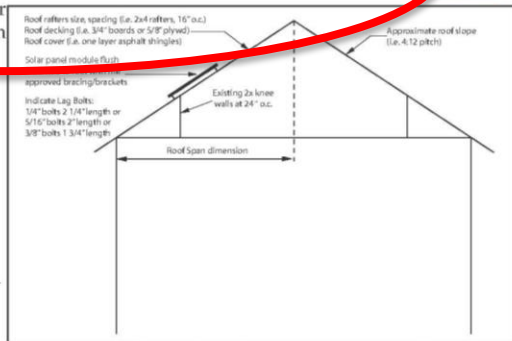
Permit Applicant Checklist for Residential Solar Energy Installations



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:

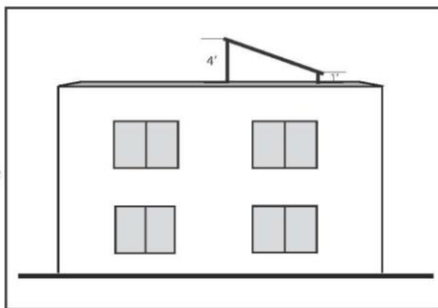
- Cross section that identifies rafter size, spacing and span dimension and approximate roof slope.
- Identify style, diameter, length of embedment of bolts (i.e., 5/16" lags with minimum 3" embedment into framing, blocking, or bracing).



Example of a framing cross-section illustration

- 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 an elevation

- 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.
- 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

- 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 ___

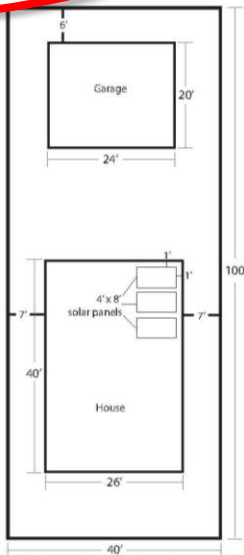
13. Roof decking and structural supports should all be in good condition without visible roof sag/deflection. Is the roof structure in good condition, having no visible sag, cracking or splintering of rafters, or other potential structural defect? If roof structure is accessible, please provide a photo 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.



Permitting Best Practices

Solar Permit Checklist – Minneapolis/St. Paul



Permit Applicant Checklist for Residential Solar Energy Installations

Ground Solar Installations

14. 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, inverter 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/NAVANDA5/eNtraprise/StPaul/m3list/a_PickProperty.jsp?nc=ReadOnmystpaul.

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

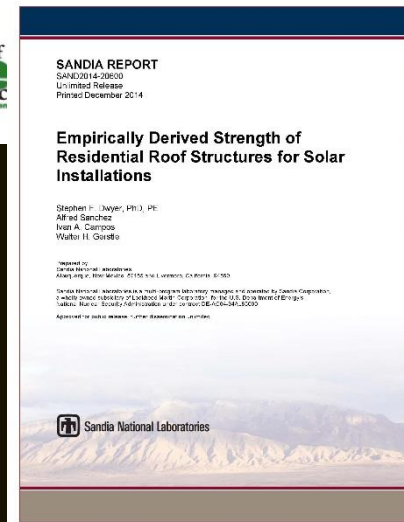
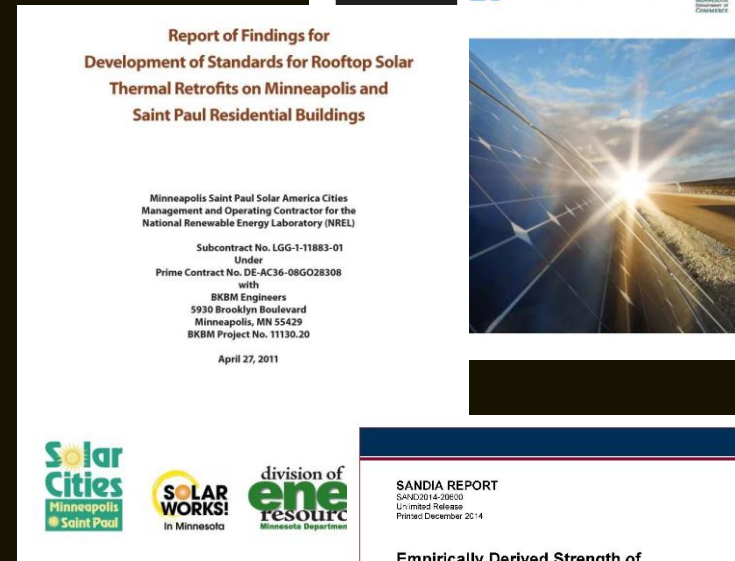
yes ___ no ___

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.

- ✓ <http://mn.gov/commerce/energy/images/SolorRoofsReport.pdf>
- ✓ <http://mn.gov/commerce/energy/images/FINAL-Standardized-Load-Table-Report.pdf>
- ✓ <http://prod.sandia.gov/techlib/access-control.cgi/2014/1420600.pdf>



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:

- 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.
- Specification sheets and installation manuals for all manufactured components including, but not limited to, PV modules, inverter(s), combiner box, disconnects, and mounting system.
- 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).

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.

Step 1: Structural Review of PV Installation Mounting System

- 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
- Is the roof a rafter system? Yes No
- Is the equipment to be flush-mounted to the roof such that the collector surface is parallel to the roof? Yes No
- Is the roofing type lightweight? Yes (composition, lightweight masonry, metal, etc...) No
- Does the roof have a single layer roof covering? 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.

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 an 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:

- Mounting System Manufacturer _____
- Product Name and Model # _____
- Total Weight of PV Modules and Rails _____ lbs
- Total Number of Attachment Points _____
 (attachment points must be equally distributed across the array)
- Weight per Attachment Point _____ lbs
- Maximum Spacing between Attachment Points on a Rail _____ inches (see product manual for maximum spacing allowed based on maximum design wind speed).
- Total Surface Area of PV Modules (square feet) _____ ft²
- Distributed Weight of PV Module on Roof (c+s) _____ lbs/ft²

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.

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.

- PV modules, utility-interactive inverters, and combiner boxes are identified for use in PV systems.
- The PV array is composed of 4 series strings or less per inverter.
- The total inverter capacity has a continuous AC power output 13,440 watts or less
- The AC interconnection point is on the load side of service disconnecting means (NEC 2011 705.12(D), NEC 2008 690.64(B)).
- 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 _____

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

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.

Resources and Reference Material

- Chicago Solar Express, http://www.cityofchicago.org/city/en/progs/energy/solar_in_chicago.html
- Milwaukee Solar Permit, http://city.milwaukee.gov/MilwaukeeShines/Solar-Professionals/Permitting.htm#VUD8_JN19ps
- Saint Paul Solar Permit Checklist, <http://www.stpaul.gov/DocumentCenter/View/76171>
- National Renewable Energy Lab: Permitting Best Practices <http://www.nrel.gov/docs/fv13osti/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/>

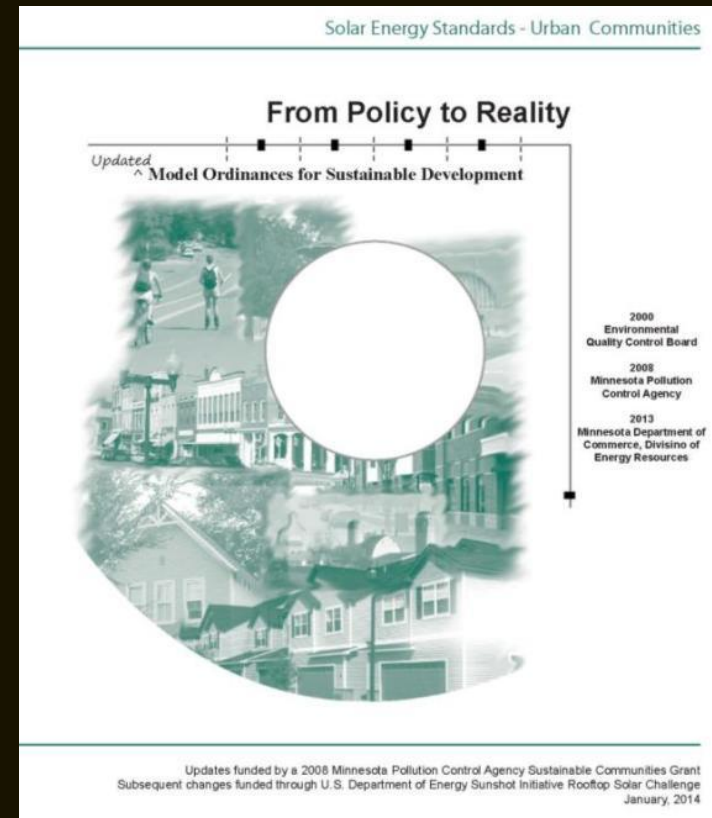
An aerial photograph of a large-scale solar farm. The image shows numerous rows of solar panels, each with a grid of thin lines. The panels are tilted at an angle, and the perspective is from a high angle, looking down and across the rows. The sky is clear and blue. A semi-transparent blue horizontal bar is overlaid across the middle of the image, containing the text.

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?

- ✓ **Uses** - Are accessory solar land uses allowed?
- ✓ **Dimensional standards** - What exceptions does your ordinance allow for height and setback standards?
- ✓ **Coverage** - Is a ground-mount solar energy system the same as a shed or garage?
- ✓ **Does your ordinance define an “as-of-right” installation for accessory uses?**

Basic Solar Energy Zoning – Principal Uses

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

- ✓ **Uses** - Are principal solar land uses allowed? Are clear land use priorities set in districts, overlays?
- ✓ **Submittal requirements** – What information do you need from solar farm developers?
- ✓ **Coverage** – How does your ordinance consider solar collector surfaces in coverage or impervious surface ratios?
- ✓ **Are solar principal uses treated equivalently as other industrial or natural resource based uses?**

Advanced Solar Zoning

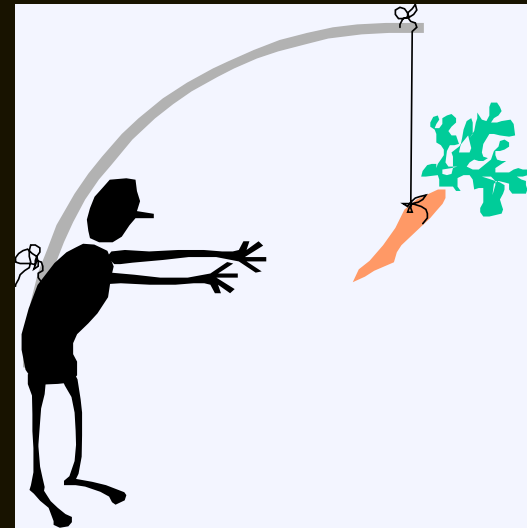
Does your zoning use advanced regulatory concepts that can affect solar development?

- ✓ **Design standards** - Are community aesthetic or character standards part of local regulations?
- ✓ **Solar easements or cross-property protection** - Does local regulation protect the long-term 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 your 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**



The community has an long-term interest in sustainable infrastructure – housing, transportation, energy systems

Grow Solar Toolkit

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



Local Government Solar Toolkit

PLANNING, ZONING, AND PERMITTING

Minnesota



From Policy to Reality

Updated Model Ordinances for Sustainable Development

- 2 Enviro Quality Co
- 2 Minnesot Control
- 2 Minnesota Commerce Energy!

Updates funded by a 2008 Minnesota Pollution Control Agency Sustainable Communities Grant
 Subsequent changes funded through U.S. Department of Energy Sunshot Initiative Rooftop Solar Challenge
 January, 2014

Solar Energy Standards

land use or performance standards for the district in which the building is located.

- Solar Energy Systems with Mounting Devices** - Solar energy systems using roof mounting devices or ground-mount solar energy systems shall not be restricted if the system is not visible from the closest edge of any public right-of-way other than an alley. Roof-mount systems that are visible from the nearest edge of the street frontage right-of-way shall not have a highest finished pitch steeper than the roof pitch on which the system is mounted, and shall be no higher than twelve (12) inches above the roof.
- Coverage** - Roof or building mounted solar energy systems, excluding building-integrated systems, shall allow for adequate roof access to the south-facing or flat roof upon which the panels are mounted. The surface area of pole or ground mount systems shall not exceed half the building footprint of the principal structure.
- Historic Buildings** - Solar energy systems on buildings within designated historic districts or on locally designated historic buildings (exclusive of State or Federal historic designation) will require an administrative variance, as provided in this ordinance.

D. Approved Solar Components - Electric solar energy system components must have a UL listing and solar hot water systems must have an SRCC rating.

E. Plan Approval Required - All solar energy systems shall require administrative plan approval by Model Community zoning official.

- Plan Applications** - Plan applications for solar energy systems shall be accompanied by to-scale horizontal and vertical (elevation) drawings. The drawings must show the location of the system on the building or on the property for a ground-mount system, including the property lines.
 - Pitched Roof Mounted Solar Energy Systems** - For all roof-mounted systems other than a flat roof the elevation must show the highest finished slope of the

Coverage

Roof coverage limitations are generally not necessary, as some of the roof is likely to be shaded or otherwise not suitable for solar energy. Coverage is an issue of concern in order to ensure ready roof access in the event of a fire. Coverage limits can be a percentage limitation, such as 80% of the total south-facing roof, or a required setback from one or more edges.

Design Guidelines for Solar Roofs
Pitched Roof

Design Guidelines for Solar Roofs
Flat Roof

THANK YOU!



Brian Ross, AICP, LEED GA

Senior Program Director

bross@gpisd.net

612-767-7296



**GREAT PLAINS
INSTITUTE**

Better Energy.
Better World.