Grow Solar

Local Government Solar Toolkit

PLANNING, ZONING, AND PERMITTING

Minnesota

Grow Solar

Local Government Solar Toolkit

The Grow Solar Local Government Toolkit is a 3-state collaborative project funded by the U.S. Department of Energy.

Acknowledgment: The information, data, or work presented herein was funded in part by the Office of Energy Efficiency and Renewable Energy (EERE), U.S. Department of Energy, under Award Number DE-0006544.

Contact Information

If you have any questions regarding planning, zoning, and permitting for solar energy please contact:

Brian Ross, AICP, LEED Green Associate
Great Plains Institute
betterenergy.org
Office: 612-767-7296
Mobile: 612-501-1531
bross@gpisd.net

Abby Finis, Senior Energy Planner
Great Plains Institute
betterenergy.org
W:612-767-7295
C: 612-245-4070
afinis@gpisd.net

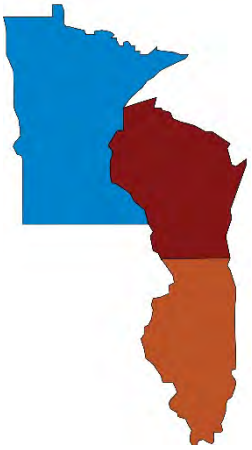
GREAT PLAINS INSTITUTE
Better Energy. Better World.

Grow Solar

Solar Toolkit Summary

Planning, Zoning, and Permitting

As part of the Grow Solar Partnership, toolkits have been assembled to equip local governments in Minnesota, Wisconsin, and Illinois with information regarding solar development as it relates to planning, zoning, and permitting. The purpose of these toolkits is to provide resources that will assist communities in addressing barriers to solar energy installations in a manner tailored to each community's needs. The following is a summary of materials that can be found in each of the toolkits.



Solar Overview

State Solar Policy Summary

Solar policy plays an important role in the development of solar energy. This document includes highlights from each state in both the regulatory arena as well as financial incentives that are available to support solar. Additionally, the State Solar Policy Summary includes statutes that enable local governments to regulate solar in planning, zoning, and permitting. This document can be used as reference guide specific to each state.

Three State Regional Analysis

The Three State Regional Analysis looks at the 3-state region of Minnesota, Wisconsin, and Illinois to identify similarities and differences in state law and typical practices in permitting, planning, and zoning for solar energy development. This document serves as the foundation for the toolkits that were developed for each state. Using this analysis, national best practices were modified so that they could be integrated into each state's regulatory framework insofar as it relates to solar development.

Planning

Comprehensive Plan Guide

The Comprehensive Plan Guide is a tool communities can use when they update their land use plans. This document outlines considerations that communities should make and identifies elements that allow for clear priorities around solar energy objectives. Model language is included to help local governments see the types of goals and policies they could include in their plans.

Zoning

Model Ordinances

All local governments with the authority to regulate zoning should include solar development in their zoning code to recognize the value of solar and alleviate any local concerns. These model ordinances offer language to address a variety of solar land uses, tailored to local conditions and priorities.

Permitting

Local Government Permitting Checklist

Providing a clear and predictable permitting process saves time and money for both contractors and municipalities. Using national best practices, a template has been created that can be adapted locally, with notes on where municipalities might choose to modify standards based on varying circumstances.

Powered by SunShot U.S. Department of Energy

GREAT PLAINS INSTITUTE Better Energy. Better World.

Grow Solar

State Solar Policy Summary

Minnesota

Minnesota has seen interest in solar grow through changes in policy, decline in costs, and the availability of various incentives. Because solar development is rapidly increasing in the state, local governments are seeing requests for Plan and zoning text amendments, permits, and site reviews. The following summarizes state policy that that is driving the market and enabling local government authority.

Solar Policy

In 2013, the State Legislature passed a suite of laws that helped forecast an optimistic outlook for solar in Minnesota. These statutes are provided here:

1. Minnesota Statute 216B.1691, subd. 2f. Requires Minnesota's public utilities to generate or procure 1.5 percent of the utility's retail electricity sales from solar energy.
2. Minnesota Statute 116C.7792. Xcel Energy must provide $5 million in financial incentives each year for 5 years for systems 20 kW or less.
3. Minnesota Statute 216B.1641 establishes the Xcel Energy Community Solar Garden Program.
4. Minnesota Statute 216C.411 is the Made in Minnesota incentive that that provides rebate funding for PV systems under 40 kW that are made in the state.

Prior to the above legislation, the State passed 216B.1691 Renewable Energy Objectives, which requires 25% of total retail electricity sales to be generated from renewable energy sources by 2025. This standard alone did not spur solar development, but helped open the door to a broader mix of renewable energy.

Solar Market

Minnesota has a number of incentives to help spur and finance solar development to reach state goals and mandates. Available incentives are listed here:

- PACE (216C.436) financing for commercial applications
- Made in Minnesota for systems under 40kw are eligible for the Made in Minnesota rebate
- Xcel Energy's Solar Rewards systems under 20 kW may be eligible for
- Additionally, the federal tax credit of up to 30% is available through the end of 2016

Currently, Minnesota has approximately 445 MW of installed solar capacity. That number is expected to grow to at least 1,000 MW in the next 5 years exceeding the 1.5% solar standard.

Barriers to Solar Deployment

There has already been conflict between solar development and other land uses and community resources. This is particularly true for large solar farms or gardens. Many local governments have not addressed solar development in existing policies.

Statutory Context – Local Authority

Enabling statutes for addressing solar resources at the local level are summarized on the following page.

1. **Solar Zoning**
   a. Minnesota Statute 462.357 Subd.1, (cities) 394.25 Subd.2 (counties) . . . a municipality may by ordinance regulate on the earth's surface, in the air space above the surface, and in subsurface areas, . . . access to direct sunlight for solar energy systems . . .
2. **Metropolitan Land Planning Act**
   a. Minnesota Statute 473.859 Subd.2 Land Use Plan. (b) A land use plan shall contain . . . an element for protection and development of access to direct sunlight for solar energy systems.
3. **Enabling Solar Easements**
   a. Minnesota Statute. 500.30 Subd. 3. Solar and Wind Easements. Allows the purchase and holding of easements protecting access to solar and wind energy.
4. **Allowance for Solar Variance**
   a. Minnesota Statute 394.25 Subd. 7, 462.357 Subd.6(2) Variances; Practical Difficulties. Variances shall only be permitted when they are in harmony with the general purposes and intent of the official control and when the variances are consistent with the comprehensive plan […] Practical difficulties include, but are not limited to, inadequate access to direct sunlight for solar energy systems […].
5. **Enabling solar access in subdivision regulation**
   a. Minnesota Statute 462.358 Subd. 2a. Official Controls: Subdivision Regulation; Dedication. The regulations may prohibit, restrict or control development for the purpose of protecting and assuring access to direct sunlight for solar energy systems.
6. **Power Plant Siting**
   a. Minnesota Statute 216E.021. Solar Energy System Size Determination. The alternating current nameplate capacity of one solar energy generating system must be combined with the alternating current nameplate capacity of any other system that:
      i. Is constructed within the same 12-month period […]
      ii. Exhibits characteristics of being a single development […]
   b. Minnesota Statute 216E.05 Subdivision 1. Local Review. (a) […] an applicant . . . shall have the option of applying to those local units of government that have jurisdiction over the site or route for approval to build the project […]
7. **Property Taxes**
   a. Minnesota Statute 272.02 Subd. 24. Exempt Property. Solar Energy Generating Systems. Personal property consisting of solar energy generating systems […] is exempt.
      i. Principal uses (solar farms or gardens) – the land on which the system is located shall be classified as class 3a property.
      ii. Accessory uses – the solar energy system is disregarded.
   b. Minnesota Statute 272.0295. Solar Energy Production Tax. Applies only to systems with a capacity greater than 1MW and establishes a tax rate of $1.20 per megawatt hour. The production tax is paid to the county in which the system is located.
8. **Beneficial Habitat Standard for Solar Farms**
   a. Minnesota Statute 216B.1642 encourages solar site design and management practices that provide native pollinator habitat and reduce stormwater runoff. Creates a technical standard for beneficial habitat, administered by the Board of Soil and Water Resources.

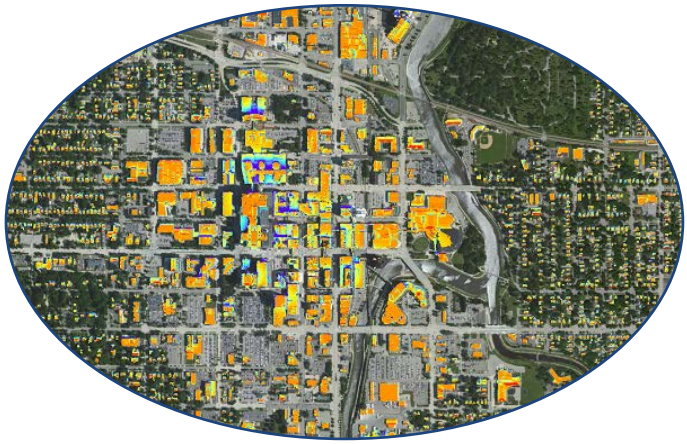
Grow Solar

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 values. Communities are acknowledging this valuable resource and incorporating support and guidance for solar 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 Minnesota, The Metropolitan Land Planning Act (Minnesota Statute 473.859 Subd.2) requires communities in the metro area to include solar access protection in comprehensive plans. The statute states:

> **A land use plan shall contain a protection element, as appropriate, […], and an element of protection and development of access to direct sunlight for solar energy systems.**

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. Minnesota has geographic solar resource data available at 1-meter resolution across virtually the entire state. GIS data will be available for downloading soon.

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, CERTs

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

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

Some conflicts to consider include:

- Agricultural practices
- Urban forests
- Historic resources
- Airport control towers
- Natural areas
- Future housing or commercial development

Each community is different and may see conflicts arise that are not listed here. Identifying and addressing those conflicts in comprehensive planning will need to happen at the community level.

Elements

Common features of a comprehensive plan include a discussion of existing conditions, a presentation of desired outcomes in the form of a vision and goals, and an inventory of policies and actions that support those goals. The following model language are examples of what could be incorporated into a comprehensive plan.

Understanding the potential importance of a community's solar resource requires some knowledge of both the availability of the local solar resource and the community's existing energy use. Using a solar map, like the one described above, is a useful way to demonstrate the solar potential across the area. Identifying the areas with the greatest potential can help the community plan and prepare for the best sites to locate solar investment and to achieve the goals outlined in the plan. Understanding the nature of the community's energy use – data that can be obtained from the community's utility providers – can put the solar resource within the appropriate economic and use intensity context. For instance, most communities have sufficient solar resources to theoretically meet a substantial portion of their electric energy consumption, even if only the best resources are used. Minnesota's Local Government Project

Community Rooftop Solar Resource. Rochester, MN

for Energy Planning (LoGoPEP) is currently working to make the process of integrating solar into community energy plans easier. LoGoPEP, a US Department of Energy funded project that began in 2016, is working to provide communities with the tools they need to integrate various clean energy and efficiency strategies together. Using these tools, cities will be able to measure the role that solar could play in reducing CO2 emissions while optimizing city resources.

Among communities that have added renewable energy goals and objectives to their plans, common themes include encouraging solar site design for new subdivisions, improving the energy performance of municipal facilities, removing barriers and creating incentives for small-scale or "distributed" installations, and capturing economic development opportunities associated with renewable energy investment.

Examples of goals may be:

> **Goal 1:** Encourage local production of solar energy on new residential and commercial construction.
>
> **Goal 2:** Maximize the production of solar photovoltaic energy to the extent feasible, while minimizing potential biological, agricultural, visual, and other environmental impacts.

In Comprehensive Plans, policies are statements of intent with enough clarity to guide decision-making. Policy statements should be tied to the desired goals and set a clear path to action. Examples of policies are:

> **Policy 1:** Establish clear guidelines for solar ready development in all zoning districts where solar is a permitted use.
>
> **Policy 2:** The City supports the State's effort to achieve the Renewable Portfolio Standard (RPS), which requires utilities to generate 25% of electricity from renewable energy sources, and the State's solar energy goal of having sufficient solar generation to meet 10% of electric use by 2030.

Actions are more specific statements that direct programs, regulations, operational procedures, or public investments. Action statements are intended to guide the implementation of the stated policies. Examples of action statements follow:

> **Action 1:** Provide incentives for developers who build solar-ready residential and commercial structures.
>
> **Action 2:** The City should complete a study to identify opportunities for investment in solar energy resources on public buildings and lands.

Additional Resources:

Model RFP Language to incorporate energy into comprehensive plans: http://www.regionalindicatorsmn.com/customer_media/EnergyRFP2.pdf

Local Government Planning for Energy Project (LoGoPEP): http://www.regionalindicatorsmn.com/energy-planning

Google's Project Sunroof solar mapping tool https://www.google.com/get/sunroof/data-explorer/

Illinois Planning Authority for Protection Solar Resources ((65 ILCS 5/11-12-5) (from Ch. 24, par. 11-12-5) http://www.ilga.gov/legislation/ilcs/fulltext.asp?DocName=006500050K11-12-5

Iowa Smart Planning Principles, Statute, Guidance document on-line. https://rio.urban.uiowa.edu/sites/rio/files/Iowa_Smart_Planning_Overview_0.pdf

Metropolitan Council Local Planning Handbook

Metropolitan Council Solar Planning Requirement Factsheet https://metrocouncil.org/Handbook/Files/Resources/Fact-Sheet/RESILIENCE/Planning-for-Solar.aspx

Minnesota Solar Planning Requirement – Metropolitan Land Planning Act 473.859. Subd.2b

Planning Advisory Service Essential Info Packets, Planning and Zoning for Solar Energy https://www.planning.org/pas/infopackets/eip30.htm

Planning for Solar Energy, American Planning Association https://www.planning.org/publications/report/9117592/

University of Minnesota solar mapping tool http://solar.maps.umn.edu/

All photos are courtesy of the **Clean Energy Resources Teams**

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.

Minneapolis Solar Resource Website

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

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:

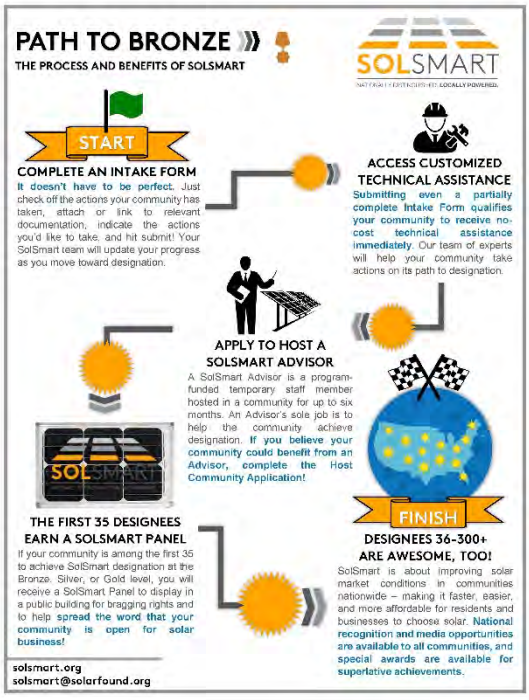
1. **Use.** Which land uses are permitted, which are conditional, which are prohibited in each zoning district? Should the community allow solar farms in industrial districts, or ground-mount accessory solar in the backyards of residential districts?
2. **Dimensional Standards.** What is the minimum 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

Some communities' zoning ordinances have more advanced elements that should also be addressed to remove barriers and to take advantage of incentives. Examples include:

- **Design standards** - Are community aesthetic or character standards part of local regulations? How can solar development fit into areas where the community has set design goals?
- **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? Is there a public purpose in protecting solar access across property lines?
- **Home Owners Associations.** Does the community have an interest in ensuring solar development rights in common interest communities?
- **Integrating with Other Processes.** How does solar development conflict or support agricultural protection, historic preservation, urban forests, urban expansion areas, municipal utility goals?

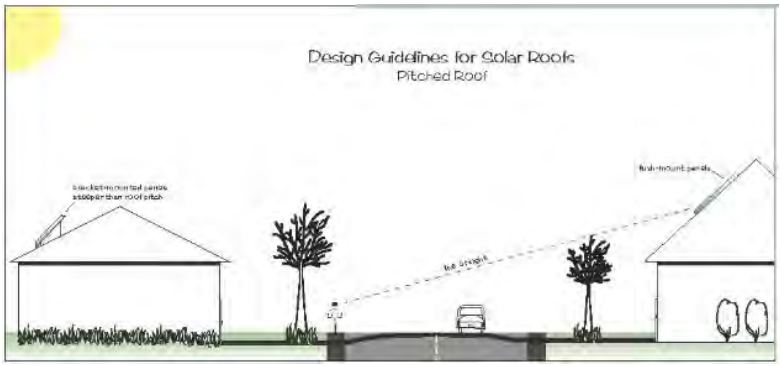
Many cities and counties in Minnesota have adopted solar development regulations based on the State of Minnesota's model solar ordinances. The ordinances were originally developed as part of the State's package of model ordinances for sustainable development *(From Policy to Reality: Model Ordinances for Sustainable Development*), and subsequently evolved with the development of Minnesota's solar markets through the Minneapolis Saint Paul Solar Cities program, the Minnesota Solar Challenge, and the Grow Solar Partnership. The most recent version incorporates recent changes in Minnesota statutes, the rapid development of the community solar garden market, and the development of the national SolSmart recognition program for "solar-ready" communities. The model ordinance provides language that meets SolSmart standards for solar-ready zoning and enables certification.



Minnesota's model solar ordinance, provided below, offers sample ordinance language to address a variety of solar land uses and local circumstances. The models also provide explanatory text and suggestions for altering the language to tailor the ordinances to local conditions and priorities.

The seven principles for solar-ready zoning include:

1. Create an as-of-right solar installation path for property-owners.
2. Limit regulatory barriers to developing solar resources.
3. Define appropriate aesthetic standards.
4. Address cross-property solar access issues.
5. Address principal solar uses.
6. Consider "solar-ready" design.
7. Consider regulatory solar development incentives.



The Resources and Reference Material section at the end of the document provides additional national and state examples and materials to guide local decision-making on making development regulation "solar ready."

Resources and Reference Material:

- Minneapolis Solar Zoning Ordinance: http://www.minneapolismn.gov/www/groups/public/@cped/documents/webcontent/convert_285502.pdf
- Saint Paul Accessory Solar Ordinance, Section 65.921 Saint Paul Municipal Ordinance
- Stearns County Solar Standards, Section 6.51 County Zoning Ordinance https://co.stearns.mn.us/Portals/0/docs/Ordinances/ord439.pdf
- SolSmart Program (national best practices and sola-ready recognition), http://www.gosparc.org/
- National American Planning Association, *Planning for Solar Energy,* https://www.planning.org/publications/report/9117592/
- National American Planning Association, Planners Advisory Service Essential information packet, https://www.planning.org/pas/infopackets/eip30.htm
- National Renewable Energy Lab, Best Practices in Solar Zoning, State and Local Governments Blog, www.nrel.gov/tech_deployment/state_local_governments/blog/best-practices-in-zoning-for-solar
- University of North Carolina, *Planning and Zoning for Solar Energy*, http://sogpubs.unc.edu/electronicversions/pdfs/pandzsolar2014.pdf
- Solar ABCS, *A Comprehensive Review of Solar Access Law in the United States,* http://www.solarabcs.org/about/publications/reports/solar-access/pdfs/Solaraccess-full.pdf
- The Solar Foundation, *A Beautiful Day in the Neighborhood: Encouraging Solar Development through Community Association Policies and Procedures,* http://www.thesolarfoundation.org/a-beautiful-day-in-the-neighborhood-encouraging-solar-development-through-community-association-policies-and-processes/
- National Alliance of Preservation Commissions, *Sample Guidelines for Solar Systems in Historic Districts*, http://www.preservationnation.org/information-center/sustainable-communities/buildings/solar-panels/additional-resources/NAPC-Solar-Panel-Guidelines.pdf
- National Trust for Historic Preservation, Installing Solar Panels on Historic Buildings, https://nccleantech.ncsu.edu/wp-content/uploads/Installing-Solar-Panels-on-Historic-Buildings_FINAL_2012.pdf

Model Solar Ordinance – Minnesota

Introduction

Minnesota's solar energy resources are high quality and cost effective—as good as many states to our south and consistently available across the entire state. As solar energy system components have become more efficient and less costly, an increasing number of solar energy systems have been installed in Minnesota. Market opportunities for solar development have dramatically increased in Minnesota over the last five years, such that communities must now address solar installations as land use and development issues. Solar energy components continue to improve in efficiency and decline in price; large-scale solar energy is expected to become the least expensive form of electric energy generation within a few years, surpassing wind energy and natural gas in levelized cost of energy.

Model Solar Energy Standards

This ordinance is based on the model solar energy ordinance originally created for Solar Minnesota, under a Million Solar Roofs grant from the U.S. Department of Energy. It has been substantially updated several times to reflect address additional issues and opportunities for Minnesota communities and the evolving solar industry, last updated May 2020

But solar energy is much more than just low-cost energy generation. Households and businesses seeking to reduce their carbon footprint see solar energy as a strong complement to energy efficiency. Agricultural producers see their solar energy as an economic hedge against price volatility in commodity crops. Utilities see solar's declining cost, high reliability, and free fuel as a means to put downward pressure on electric rates. Corporate, institutional, and municipal buyers are actively acquiring carbon-free solar generation to meet climate and clean energy goals. And innovative solar site designs are capturing habitat and water quality co-benefits by using solar with habitat-friendly ground cover to restore eco-system functions.

Solar Energy Issues

Local governments in Minnesota are seeing increasing interest by property owners in solar energy installations and are having to address a variety of solar land uses in their development regulation. Given the continuing cost reductions and growing value of clean energy, solar development will increasingly be a local development opportunity, from the rooftop to the large-scale solar farm. Three primary issues tie solar energy to development regulations:

1. *Land use conflicts and synergies.* Solar energy systems have few nuisances. But solar development can compete for land with other development options, and visual impacts and perceived safety concerns sometimes create opposition to solar installations. Good design and attention to aesthetics can address most concerns for rooftop or accessory use systems. Good siting and site design standards for large- and community-scale solar can similarly resolve conflicts and create co-benefits from solar development, such as restoring habitat, diversifying agricultural businesses, and improving surface and ground waters.

2. *Protecting access to solar resources.* Solar resources are a valuable component of property ownership. Development regulations can inadvertently limit a property owner's ability to access their solar resource. Communities should consider how to protect and develop solar resources in zoning, subdivision, and other development regulations or standards.

3. *Encouraging appropriate solar development.* Local government can go beyond simply removing regulatory barriers and encourage solar development that provides economic development, climate protection, and natural resources co-benefits. Local governments have a variety of tools to encourage appropriately sited and designed solar development to meet local goals.

Components of a Solar Standards Ordinance

Solar energy standards should:

1. *Create an as-of-right solar installation path for property-owners.* Create a clear regulatory path (an as-of-right installation) to solar development for accessory uses and - if appropriate - for principal uses such as large-scale solar and ground-mount community shared solar installations.

2. *Enable principal solar uses.* Define where community- and large-solar energy land uses are appropriate as a principal or primary use, set development standards and procedures to guide development, and capture co-benefit opportunities for water quality, habitat, agriculture.

3. *Limit regulatory barriers to developing solar resources.* Ensure that access to solar resources is not unduly limited by height, setback, or coverage standards, recognizing the distinct design and function of solar technologies and land uses for both accessory and principal uses.

4. *Define appropriate aesthetic standards.* Retain an as-of-right installation pathway for accessory uses while balancing design concerns in urban neighborhoods and historic districts. Set reasonable aesthetic standards for solar principal uses that are consistent with other principal uses that have visual impacts.

5. *Address cross-property solar access issues.* Consider options for protecting access across property lines in the subdivision process and in zoning districts that allow taller buildings on smaller (urban density) lots.

6. *Promote "solar-ready" design.* Every building that has a solar resource should be built to seamlessly use it. Encourage builders to use solar-ready subdivision and building design.

7. *Include solar in regulatory incentives.* Encourage desired solar development by including it in regulatory incentives: density bonuses, parking standards, flexible zoning standards, financing/grant programs, promotional efforts.

Different Community Types and Settings

The model ordinance language addresses land use concerns for both urban and rural areas, and thus not all the provisions may be appropriate for every community. Issues of solar access and nuisances associated with small or accessory use solar energy systems are of less consequence in rural areas, where lot sizes are almost always greater than one acre. Large-scale and community- scale solar (principal solar land uses) are much more likely to be proposed in rural areas rather than developed cities. However, urban areas should consider where community- or large-scale solar can add value to the community and enable economic development of a valuable local resource. Rural communities should address rooftop and accessory ground-mount development, although the standards used in this model are designed more for the urban circumstances.

Solar development is not one thing

Communities would not apply the same development and land use standards to an industrial facility and a single family home, merely because both are buildings. Community and large-scale solar development is a completely different land use than rooftop or backyard solar. Standards that are appropriate for large-scale solar may well be wholly inappropriate for rooftop solar and may unnecessarily restrict or stymie solar development opportunities of homes and business owners.

This ordinance includes language addressing solar energy as an accessory use to the primary residential or commercial use in an urban area and language for principal solar uses more typically seen in rural communities. Communities should address both types of solar development.

Model Ordinance

I. Scope - This article applies to all solar energy installations in Model Community.

II. Purpose - Model Community has adopted this regulation for the following purposes:

A. Comprehensive Plan Goals - To meet the goals of the Comprehensive Plan and preserve the health, safety and welfare of the community by promoting the safe, effective and efficient use of solar energy systems. The solar energy standards specifically implement the following goals from the Comprehensive Plan:

1. **Goal** – Encourage the use of local renewable energy resources, including appropriate applications for wind, solar, and biomass energy.

2. **Goal** – Promote sustainable building design and management practices to serve current and future generations.

3. **Goal** – Assist local businesses to lower financial and regulatory risks and improve their economic, community, and environmental sustainability.

4. **Goal** – Implement the solar resource protection element required under the Metropolitan Land Planning Act.

Comprehensive Plan Goals

Tying the solar energy ordinance to Comprehensive Plan goals is particularly important for helping users (both Planning Commission and community members) understand why the community is developing and administering regulation.

The language here provides examples of different types of Comprehensive Plan goals, and other policy goals that the community may have that are served by enabling and encouraging solar development. The community should substitute its policy goals for these examples.

If the Comprehensive Plan does not include goals supporting local solar development), the community should consider creating a local energy plan or similar policy document to provide a policy foundation for solar development regulation (as noted in II.B) .

B. Climate Change Goals - Model Community has committed to reducing carbon and other greenhouse gas emissions. Solar energy is an abundant, renewable, and nonpolluting energy resource and its conversion to electricity or heat reduces dependence on nonrenewable energy resources and decreases the air and water pollution that results from the use of conventional energy sources.

C. Infrastructure - Distributed solar photovoltaic systems will enhance the reliability and power quality of the power grid and make more efficient use of Model Community's electric distribution infrastructure.

D. Local Resource - Solar energy is an underused local energy resource and encouraging the use of solar energy will diversify the community's energy supply portfolio and reduce exposure to fiscal risks associated with fossil fuels.

Metropolitan Land Planning Act

Minnesota local governments subject to the Metropolitan Land Planning Act are required in their comprehensive plans to plan for the protection and development of solar resources. Communities must then incorporate Plan goals in their local controls. This ordinance implements that required Comprehensive Plan element.

E. Improve Competitive Markets - Solar energy systems offer additional energy choice to consumers and will improve competition in the electricity and natural gas supply market.

III. Definitions

Agrivoltaics – A solar energy system co-located on the same parcel of land as agricultural production, including crop production, grazing, apiaries, or other agricultural products or services.

Building-integrated Solar Energy Systems – 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. Building-integrated systems include, but are not limited to, photovoltaic or hot water solar energy systems that are contained within roofing materials, windows, skylights, and awnings.

Solar Definitions

Not all these terms are used in this model ordinance, nor is this a complete list of solar definitions. As a community develops its own development standards for solar technology, many of the concepts defined here may be helpful in meeting local goals. For instance, solar daylighting devices may change the exterior appearance of the building, and the community may choose to distinguish between these devices and other architectural changes.

Community-Scale Solar Energy System – A commercial solar energy system that converts sunlight into electricity for the primary purpose of serving electric demands off-site from the facility, either retail or wholesale. Community-scale systems are principal uses and projects typically cover less than 20 acres.

Community Solar Garden – A solar energy system that provides retail electric power (or a financial proxy for retail power) to multiple community members or businesses residing or located off-site from the location of the solar energy system, consistent with Minn. Statutes 216B.1641 or successor statute. A community solar garden may be either an accessory or a principal use.

Differentiating Solar Uses by Size

Community-scale and Large-scale systems are defined here as occupying less than 20 acres and greater than 20 acres respectively. Some communities will use a lower number (ten acres) and some a higher number (up to 50 acres). An ex-urban city would use a lower number and a rural county could use a higher number. Community-scale is generally a size that can fit into the land use fabric of the community without assembly of separate parcels. Some communities have chosen not to distinguish between community- and large-scale, but use a single large-scale designation.

Grid-intertie Solar Energy System – A photovoltaic solar energy system that is connected to an electric circuit served by an electric utility company.

Ground-mount – A solar energy system mounted on a rack or pole that rests or is attached to the ground. Ground-mount systems can be either accessory or principal uses.

Large-Scale Solar Energy System – A commercial solar energy system that converts sunlight into electricity for the primary purpose of wholesale sales of generated electricity. A large-scale solar energy system will have a project size greater than 20 acres and is the principal land use for the parcel(s) on which it is located.

Off-grid Solar Energy System – A photovoltaic solar energy system in which the circuits energized by the solar energy system are not electrically connected in any way to electric circuits that are served by an electric utility company.

Passive Solar Energy System – A solar energy system that captures solar light or heat without transforming it to another form of energy or transferring the energy via a heat exchanger.

Photovoltaic System – A solar energy system that converts solar energy directly into electricity.

Renewable Energy Easement, Solar Energy Easement – An easement that limits the height or location, or both, of permissible development on the burdened land in terms of a structure or vegetation, or both, for the purpose of providing access for the benefited land to wind or sunlight passing over the burdened land, as defined in Minn. Stat. 500.30 Subd. 3 or successor statute.

Roof-mount – A solar energy system mounted on a rack that is fastened to or ballasted on a structure roof. Roof-mount systems are accessory to the principal use.

Roof Pitch – The final exterior slope of a roof calculated by the rise over the run, typically but not exclusively expressed in twelfths such as 3/12, 9/12, 12/12.

Solar Access – Unobstructed access to direct sunlight on a lot or building through the entire year, including access across adjacent parcel air rights, for the purpose of capturing direct sunlight to operate a solar energy system.

Solar Carport – A solar energy system of any size that is installed on a carport structure that is accessory to a parking area, and which may include electric vehicle supply equipment or energy storage facilities.

Solar Collector – The panel or device in a solar energy system that collects solar radiant energy and transforms it into thermal, mechanical, chemical, or electrical energy. The collector does not include frames, supports, or mounting hardware.

Solar Daylighting – Capturing and directing the visible light spectrum for use in illuminating interior building spaces in lieu of artificial lighting, usually by adding a device or design element to the building envelope.

Solar Energy – Radiant energy received from the sun that can be collected in the form of heat or light by a solar collector.

Solar Energy System – A device, array of devices, or structural design feature, the purpose of which is to provide for generation or storage of electricity from sunlight, or the collection, storage and distribution of solar energy for space heating or cooling, daylight for interior lighting, or water heating.

Solar Hot Air System (also referred to as Solar Air Heat or Solar Furnace) – A solar energy system that includes a solar collector to provide direct supplemental space heating by heating and re-circulating conditioned building air. The most efficient performance includes a solar collector to preheat air or supplement building space heating, typically using a vertically-mounted collector on a south-facing wall.

Solar Hot Water System – A system that includes a solar collector and a heat exchanger that heats or preheats water for building heating systems or other hot water needs, including residential domestic hot water and hot water for commercial processes.

Solar Mounting Devices – Racking, frames, or other devices that allow the mounting of a solar collector onto a roof surface or the ground.

Solar Resource – A view of the sun from a specific point on a lot or building that is not obscured by any vegetation, building, or object for a minimum of four hours between the hours of 9:00 AM and 3:00 PM Standard time on all days of the year, and can be measured in annual watts per square meter.

Solar Resource

Understanding what defines a "solar resource" is foundational to how land use regulation affects solar development. Solar energy resources are not simply where sunlight falls. A solar resource has minimum spatial and temporal characteristics, and needs to be considered not only today but also into the future. Solar energy systems are economic only if the annual solar resource (measured in annual watts per square meter) are sufficiently high to justify the cost of installation. The resource is affected by the amount of annual shading, orientation of the panel, and typical atmospheric conditions. Solar resources on a particular site can be mapped and quantified, similar to quantifying other site resources that enhance property value; mineral resources, prime soils for agriculture, water, timber, habitat.

IV. Permitted Accessory Use - Solar energy systems are a permitted accessory use in all zoning districts where structures of any sort are allowed, subject to certain requirements as set forth below. Solar carports and associated electric vehicle charging equipment are a permitted accessory use on surface parking lots in all districts regardless of the existence of another building. Solar energy systems that do not meet the following design standards will require a conditional use permit.

A. Height - 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 15 feet in height when oriented at maximum tilt.

3. Solar carports in non-residential districts shall not exceed 20 feet in height.

Height - Rooftop System

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

Height - Ground or Pole Mounted System

This ordinance sets a 15-foot height limit, which is typical for residential accessory uses. Some communities allow solar to be higher than other accessory uses in order to enable capture of the lot's solar resource when lots and buildings are closer together. An alternative is to balance height with setback, allowing taller systems if set back farther– for instance, an extra foot of height for every extra 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 - 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, except as allowed below.

1. **Roof- or Building-mounted Solar Energy Systems** – 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 - Solar energy systems in residential districts shall be designed to minimize visual impacts from the public right-of-way, as described in C.1-3, to the extent that doing so does not affect the cost or efficacy of the system. Visibility standards do not apply to systems in non-residential districts, except for historic building or district review as described in E. below.

Visibility and Aesthetics

Aesthetic regulation should be tied to design principles rather than targeted at a specific land use. If the community already regulates aesthetics in residential districts, this model language provides guidance for balancing between interests of property owners who want to use their on-site solar resources and neighbors concerned with neighborhood character. Substantial evidence demonstrates that solar installations have no effect on property values of adjacent properties. But where aesthetic regulation is used to protect community character, these standards provide balance between competing goals.

1. **Building Integrated Photovoltaic Systems** - Building integrated photovoltaic solar energy systems shall be allowed regardless of whether the system is visible from the public right-of-way, provided the building component in which the system is integrated meets all required setback, land use, or performance standards for the district in which the building is located.

2. **Aesthetic restrictions** – Roof-mount or ground-mount solar energy systems shall not be restricted for aesthetic reasons if the system is not visible from the closest edge of any public right-of-way other than an alley, or if the system meets the following standards.

   a. Roof-mounted systems on pitched roofs that are visible from the nearest edge of the front right-of-way shall have the same finished pitch as the roof and be no more than ten inches above the roof.

   b. Roof-mount systems on flat roofs that are visible from the nearest edge of the front right-of-way shall not be more than five feet above the finished roof and are exempt from any rooftop equipment or mechanical system screening.

3. **Reflectors** - All solar energy systems using a reflector to enhance solar production shall minimize glare from the reflector affecting adjacent or nearby properties.

D. Lot Coverage - Ground-mount systems total collector area shall not exceed half the building footprint of the principal structure.

1. Ground-mount systems shall be exempt from lot coverage or impervious surface standards if the soil under the collector is maintained in vegetation and not compacted.

2. Ground-mounted systems shall not count toward accessory structure limitations.

3. Solar carports in non-residential districts ar exempt from lot coverage limitations.

E. Historic Buildings - Solar energy systems on buildings within designated historic districts or on locally designated historic buildings (exclusive of State or Federal historic designation) must receive approval of the community Heritage Preservation Commission, consistent with the standards for solar energy systems on historically designated buildings published by the U.S. Department of Interior.

F. Plan Approval Required - All solar energy systems requiring a building permit or other permit from Model Community shall provide a site plan for review.

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.

Roof-Mounted Solar Energy Systems

This ordinance sets a threshold for pitched roof installations that they not be steeper than the finished roof pitch. Mounted systems steeper than the finished roof pitch change the appearance of the roof, and create additional considerations in regard to the wind and drift load on structural roof components. If the aesthetic impacts are not a concern to the community, the structural issues can be addressed in the building permit, as described in this Toolkit.

Reflectors

Unlike a solar collector, reflector systems do create a potential glare nuisance. While reflector systems are unusual, communities may want to include this reference as a precaution.

Impervious Surface Coverage

Rather than consider the solar panel for a ground-mount system as a roof, this provision recognizes that the ground under the panel can mitigate stormwater risks if it is kept in vegetation so that rain water can infiltrate. Any effects are deminimus for a small array if the lot is otherwise within coverage ratios.

Roof Coverage

National Fire Code standards recommend keeping solar arrays well away from roof edges and peak in order to enable some fire fighting access. Different fire departments have addressed this in different ways. Recommendations for solar friendly permitting that accommodate Fire Code recommendations can be found in the Solar America Board of Codes and Standards.

Plan Approval

This process is generally part of the process for obtaining a building permit. If the community does not issue building permits, it can be tied to a land use permit instead. For rural areas or cities without standards for rooftop systems, the plan approval section may be eliminated.

1. **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.

2. **Plan Approvals** - Applications that meet the design requirements of this ordinance shall be granted administrative approval by the zoning official and shall not require Planning Commission review. Plan approval does not indicate compliance with Building Code or Electric Code.

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

H. Compliance with Building Code - All solar energy systems shall meet approval of local building code officials, consistent with the State of Minnesota Building Code, and solar thermal systems shall comply with HVAC-related requirements of the Energy Code.

I. Compliance with State Electric Code - All photovoltaic systems shall comply with the Minnesota State Electric Code.

J. Compliance with State Plumbing Code - Solar thermal systems shall comply with applicable Minnesota State Plumbing Code requirements.

K. Utility Notification - All grid-intertie solar energy systems shall comply with the interconnection requirements of the electric utility. Off-grid systems are exempt from this requirement.

V. Principal Uses – Model Community encourages the development of commercial or utility scale solar energy systems where such systems present few land use conflicts with current and future development patterns. Ground-mounted solar energy systems that are the principal use on the development lot or lots are conditional uses in selected districts.

A. Principal Use General Standards

1. Site Design

a. **Set-backs** – Community- and large-scale solar arrays must meet the following setbacks:

1. Property line setback for buildings or structures in the district in which the system is located, except as other determined in 1.a.5 below.

2. Roadway setback of 150 feet from the ROW centerline of State highways and CSAHs, 100 feet for other roads, except as other determined in 1.a.5 below.

3. Housing unit setback of 150 feet from any existing dwelling unit, except as other determined in 1.a.5 below.

4. Setback distance should be measured from the edge of the solar energy system array, excluding security fencing, screening, or berm.

5. All setbacks can be reduced by 50% if the array is fully screened from the setback point of measurement.

b. **Screening** – Community- and large-scale solar shall be screened from existing residential dwellings.

1. A screening plan shall be submitted that identifies the type and extent of screening.

2. Screening shall be consistent with Model Community's screening ordinance or standards typically applied for other land uses requiring screening.

3. Screening shall not be required along property lines within the same zoning district, except where the adjoining lot has an existing residential use.

4. Model Community may require screening where it determines there is a clear community interest in maintaining a viewshed.

Community-Scale Solar or Solar Gardens

Community solar systems differ from rooftop or solar farm installations primarily in regards to system ownership and disposition of the electricity generated, rather than land use considerations. There is, however, a somewhat greater community interest in community solar, and thus communities should consider creating a separate land use category.

This language limits the size of the garden to ten acres, which is an installation of no more than one MW of solar capacity. Communities should tailor this size limit to community standards, which may be smaller or larger.

Appropriate Setbacks

The community should consider balancing set-back requirements and screening requirements for principal use solar. Since the primary impact to neighbors of large-scale solar is visual, screening becomes less useful, as the setbacks get larger (and vice versa).

The setback distances provided here are general examples that should be modified to be consistent with other setbacks already in the ordinance. Excessive setbacks that are unique to solar land uses, or that are similar to high nuisance land uses such as industrial uses or animal agriculture, are unjustified given the low level of risk or nuisance posed by the system.

Screening

The community should consider limiting screening of community- or large-scale solar to where there is a visual impact from an existing use, such as adjacent residential districts or uses. Solar energy systems may not need to be screened from adjacent lots if those lots are in agricultural use, are non-residential, or have low-intensity commercial use.

c. **Ground cover and buffer areas** - The following provisions shall be met related to the clearing of existing vegetation and establishment of vegetated ground cover. Additional requirements may apply as required by Model Community.

1. Large-scale removal of mature trees on the site is discouraged. Model Community may set additional restrictions on tree clearing or require mitigation for cleared trees.

2. The project site design shall include the installation and establishment of ground cover meeting the beneficial habitat standard consistent with Minnesota Statutes, section 216B.1642, or successor statutes and guidance as set by the Minnesota Board of Water and Soil Resources (BWSR).

3. The applicant shall submit a planting plan accompanied by a completed "Project Planning Assessment Form" provided by BWSR for review by BWSR or the County SWCD.

4. Beneficial habitat standards shall be maintained on the site for the duration of operation, until the site is decommissioned. The owner of the solar array shall complete BWSR's "Established Project Assessment Form" at year 4 and every 3 years after that, and allow the County SWCD to conduct a site visit to verify compliance.

5. Model Community may require submittal of inspection fee at the time of the initial permit application to support ongoing inspection of the beneficial habitat ground cover.

6. The applicant shall submit a financial guarantee in the form of a letter of credit, cash deposit or bond in favor of the Community equal to one hundred twenty-five (125) percent of the costs to meet the beneficial habitat standard. The financial guarantee shall remain in effect until vegetation is sufficiently established.

d. Foundations - A qualified engineer shall certify that the foundation and design of the solar panel racking and support is within accepted professional standards, given local soil and climate conditions.

e. Power and communication lines - Power and communication lines running between banks of solar panels and to nearby electric substations or interconnections with buildings shall be buried underground. Exemptions may be granted by Model Community in instances where shallow bedrock, water courses, or other elements of the natural landscape interfere with the ability to bury lines, or distance makes undergrounding infeasible, at the discretion of the zoning administrator.

Ground Cover Standards

Minnesota has created a "beneficial habitat" certification, administered by the Board of Soil and Water Resources (BWSR) to enable local governments and solar developers to certify principal use solar as having achieved the co-benefits of using the site as pollinator habitat.

Establishing and maintaining native ground cover creates important co-benefits to the community or the property owner. Native grasses can be harvested for forage and wildflowers and blooming plants can create pollinator and bird habitat, and maintaining the site in native vegetation will build soils that can be turned back into agriculture at the end of the solar farm's life.

Site Design in Conditional Use Permit

Certain site design elements may be included in a community's conditional use permit for community- and large-scale solar. Best practices for habitat-friendly solar site design include, for instance, that:

• panels be at least 36 inches off the ground to allow mowing and other maintenance,

• panels be spaced to allow vegetation to be self-sustaining,

• maintenance standards limit or prevent pesticide use.

Financial Surety

Communities frequently require bonds or similar financial guarantees when infrastructure improvements are required for a development project. The beneficial habitat installation can be considered in a similar light. Establishing a self-sustaining pollinator or native habitat ground cover requires maintenance over the first 2-3 years, and some maintenance over the life of the project.

2. **Stormwater and NPDES** - Solar farms are subject to Model Community's stormwater management and erosion and sediment control provisions and NPDES permit requirements. Solar collectors shall not be considered impervious surfaces if the project is certified as beneficial habitat solar, as described in A.1.c.2. of this ordinance.

3. **Other standards and codes** - All solar farms shall be in compliance with all applicable local, state and federal regulatory codes, including the State of Minnesota Uniform Building Code, as amended; and the National Electric Code, as amended.

4. **Site Plan Required** - A detailed site plan for both existing and proposed conditions must be submitted, showing location of all solar arrays, other structures, property lines, rights-of-way, service roads, floodplains, wetlands and other protected natural resources, topography, electric equipment, and all other characteristics requested by Model Community. The site plan should show all zoning districts and overlay districts.

5. **Aviation Protection** - For solar farms located within 500 feet of an airport or within approach zones of an airport, the applicant must complete and provide the results of the Solar Glare Hazard Analysis Tool (SGHAT) for the Airport Traffic Control Tower cab and final approach paths, consistent with the Interim Policy, FAA Review of Solar Energy Projects on Federally Obligated Airports, or most recent version adopted by the FAA.

6. **Agricultural Protection** - Solar farms must comply with site assessment or soil identification standards that are intended to identify agricultural soils. Model Community may require mitigation for use of prime soils for solar array placement, including the following:

   a. Demonstrating co-location of agricultural uses (agrivoltaics) on the project site.

   b. Using an interim use or time-limited CUP that allows the site to be returned to agriculture at the end of life of the solar installation.

   c. Placing agricultural conservation easements on an equivalent number of prime soil acres adjacent to or surrounding the project site.

   d. Locating the project in a Drinking Water Supply Management Area or wellhead protection area.

Stormwater and Water Quality Standards

Perennial grasses and wildflowers planted under the panels, between arrays, and in setback or buffer areas will substantially mitigate the stormwater risks associated with solar arrays, and result in less runoff than typically seen from many types of agriculture. The ground cover standards in Section A.3. will mitigate many stormwater risks, although soil type and slope can still affect the need for additional stormwater mitigation.

Solar with native perennial ground cover can provide multiple water quality benefits when converting from most agricultural crop uses. Both groundwater (limiting nitrate contamination) and surface waters (reducing phosphorus and sediment loading) can benefit if the system is appropriately designed.

Site Plan

Solar farm developers should provide a site plan similar to that required by the community for any other development. Refer to your existing ordinance to guide site plan submittal requirements.

Aviation Standards, Glare

This standard was developed for the FAA for solar installations on airport grounds. It can also be used for solar farm and garden development in areas adjacent to airports. This standard is not appropriate for areas where reflected light is not a safety concern.

Agricultural Protection

If the community has ordinances that protect agricultural soils, this provision applies those same standards to solar development. Communities should understand, however, that solar farms do not pose the same level or type of risk to agricultural practices as does housing or commercial development. Solar farms can be considered an interim use that can be easily turned back to agriculture at the end of the solar farm's life (usually 25 years.)

7. **Decommissioning** - A decommissioning plan shall be required to ensure that facilities are properly removed after their useful life.

   a. Decommissioning of the system must occur in the event the project is not in use for 12 consecutive months.

   b. The plan shall include provisions for removal of all structures and foundations, restoration of soil and vegetation and assurances that financial resources will be available to fully decommission the site.

   c. Disposal of structures and/or foundations shall meet the provisions of the Model Community Solid Waste Ordinance.

   d. Model Community may require the posting of a bond, letter of credit or the establishment of an escrow account to ensure proper decommissioning.

Prime Farmland and Agrivoltaics

Minnesota Admin. 7850.4400 Subd. 4 has provisions for the protection of prime farmland when large electric power generating plants are located on lands designated as prime farmland.

There are a number of mitigation opportunities for solar sited on prime farmland, such as co-locating agricultural uses within solar arrays (also called agrivoltaics). Groundcover that includes pollinator-friendly plantings may enhance surrounding agricultural opportunities, or in the case of protecting drinking water or wellhead protection areas as described below.

B. Community-Scale Solar – Model Community permits the development of community-scale solar, subject to the following standards and requirements:

1. **Rooftop gardens permitted** - Rooftop community systems are permitted in all districts where buildings are permitted.

2. **Community-scale uses -** Ground-mount community solar energy systems must cover no more than ten acres (project boundaries), and are a permitted use in industrial and agricultural districts, and permitted with standards or conditional in all other non-residential districts. Ground-mount solar developments covering more than ten acres shall be considered large-scale solar.

3. **Dimensional standards** - All structures must comply with setback, height, and coverage limitations for the district in which the system is located.

4. **Other standards** - Ground-mount systems must comply with all required standards for structures in the district in which the system is located.

Defining Community-Scale Solar

The acreage size for community-scale solar garden written here (10 acres) is the high end of project size for a one megawatt system, which is the maximum size of community solar gardens within Xcel Energy's program. But other utilities have other size limitations, and community-scale could be defined as high as 10 megawatts (100 acre project size). Community-scale solar is the size that can fit in to the landscape.

Drinking Water Protection

In identifying preferred sites for solar principal uses the community should consider co-benefits of solar energy development. One such potential co-benefit is protection of drinking water supplies. Solar energy development may be intentionally sited within vulnerable portions of Drinking Water Supply Management Areas (DWSMAs)as a best management practice to restore and protect native perennial groundcover that reduces nitrate contamination of ground water supplies.

C. Large-Scale Solar - Ground-mount solar energy arrays that are the primary use on the lot, designed for providing energy to off-site uses or export to the wholesale market, are permitted under the following standards:

1. **Conditional use permit** – Solar farms are conditional uses in agricultural districts, industrial districts, shoreland and floodplain overlay districts, airport safety zones subject to A.1.5. of this ordinance, and in the landfill/brownfield overlay district for sites that have completed remediation.

Large-Scale Solar Conditional Uses

Large -scale solar should require a conditional use or interim use permit in order for the community to consider the site-specific conditions. The districts listed here are examples. Each community needs to consider where large scale solar is suitable in the context of its zoning districts and priorities.

Example Use Table

Use Type	Residential	Mixed Use	Business	Industrial	Agricultural, Rural, Landfill	Shoreland	Floodplain	Special (Conservation, Historic Districts)
Large-scale solar				C	C	C	C	C
Community-scale solar	C	C	C	P	P	PS	PS	PS
Accessory use ground-mounted solar	P	P	P	P	P	P	C	C
Rooftop solar	P	P	P	P	P	P	P	PS

P = Permitted

PS = Permitted Special (additional separate permit or review)

C = Conditional

Blank Cell = Prohibited

Solar as a Land Use

The above use table shows four types of solar development that are distinct types of land uses (two kinds of accessory uses, two principal uses), and a group of districts or overlays that are commonly used in Minnesota.

• Rooftop system are permitted in all districts where buildings are permitted, with recognition that historic districts will have special standards or permits separate from the zoning permits.

• Accessory use ground-mount are conditional where potentially in conflict with the primary district or overlay goal.

• Community-scale solar principal uses are conditional where land use conflicts or opportunity conflicts are high, permitted where a 10 acre development can be integrated into the landscape, and requiring special consideration in shoreland and floodplain overlay districts.

• Large-scale is prohibited in higher density districts and conditional in all other districts.

Both community- and large-scale solar is allowed in shoreland and floodplain overlay districts, because the site design standards requiring beneficial habitat ground cover not only ensure a low-impact development but in most cases result in a restoration of ecosystem services from the previous (usually agricultural) use.

VI. Restrictions on Solar Energy Systems Limited – As of (adoption date for this ordinance) new homeowners' agreements, covenant, common interest community standards, or other contract between multiple property owners within a subdivision of Model Community shall not restrict or limit solar energy systems to a greater extent than Model Community' solar energy standards.

VII. Solar Access - Model Community encourages protection of solar access in all new subdivisions.

A. Solar Easements Allowed - Model Community allows solar easements to be filed, consistent with Minnesota State Code 500. Any property owner can purchase an easement across neighboring properties to protect access to sunlight. The easement can apply to buildings, trees, or other structures that would diminish solar access.

B. Easements within Subdivision Process - Model Community requires new subdivisions to identify and create solar easements when solar energy systems are implemented as a condition of a PUD, subdivision, conditional use, or other permit, as specified in Section 8 of this ordinance.

Solar Easements

Minnesota allows the purchase and holding of easements protecting access to solar and wind energy. The easement must specify the following information:

Required Contents - Any deed, will, or other instrument that creates a solar or wind easement shall include, but the contents are not limited to:

(a) A description of the real property subject to the easement and a description of the real property benefiting from the solar or wind easement; and

(b) For solar easements, a description of the vertical and horizontal angles, expressed in degrees and measured from the site of the solar energy system, at which the solar easement extends over the real property subject to the easement, or any other description which defines the three dimensional space, or the place and times of day in which an obstruction to direct sunlight is prohibited or limited;

(more provisions, see Statute)

Source: Minnesota Stat. 500.30 Subd. 3.

VIII. Renewable Energy Condition for Certain Permits

A. **Condition for Planned Unit Development (PUD) Approval** - Model Community may require on-site renewable energy systems, zero-net-energy (ZNE) or zero-net-carbon (ZNC) building designs, solar-synchronized electric vehicle charging or other clean energy systems as a condition for approval of a PUD permit to mitigate for:

1. Impacts on the performance of the electric distribution system,

2. Increased local emissions of greenhouse gases associated with the proposal,

3. Need for electric vehicle charging infrastructure to offset transportation-related emissions for trips generated by the new development,

4. Other impacts of the proposed development that are inconsistent with the Model Community Comprehensive Plan.

B. **Condition for Conditional Use Permit** - Model Community may require on-site renewable energy systems or zero net energy construction as a condition for a rezoning or a conditional use permit.

Renewable Energy Conditions, Incentives

The community can use traditional development tools such as conditional use permits, PUDs, or other discretionary permits to encourage private investment in solar energy systems as part of new development or redevelopment. This model ordinance notes these opportunities for consideration by local governments. In most cases, additional ordinance language would need to be tailored to the community's ordinances.

For instance, a provision that PUDs (or other special district or flexible design standard) incorporate solar energy should be incorporated into the community's PUD ordinance rather than being a provision of the solar standards.

Conditional use permits generally include conditions, and those conditions can include renewable energy or zero net energy design, but only if the conditions are clearly given preference in adopted policy or plans. Explicit reference to climate or energy independence goals in the ordinance and explicit preference for such conditions will set a foundation for including such conditions in the permit.

IX. Solar Roof Incentives - Model Community encourages incorporating on-site renewable energy system or zero net energy construction for new construction and redevelopment. Model Community may require on-site renewable energy or zero-net-energy construction when issuing a conditional use permit where the project has access to local energy resources, in order to ensure consistency with Model Community's Climate Action Plan.

A. **Density Bonus** - Any application for subdivision of land in the ___ Districts that will allow the development of at least four new lots of record shall be allowed to increase the maximum number of lots by 10% or one lot, whichever is greater, provided all building and wastewater setbacks can be met with the increased density, if the applicant enters into a development agreement guaranteeing at least three (3) kilowatts of PV for each new residence that has a solar resource.

Solar Roof Incentives

This section of the model ordinance includes a series of incentives that can be incorporated into development regulation. Most cities and many counties use incentives to encourage public amenities or preferred design. These same tools and incentives can be used to encourage private investment in solar energy. Communities should use incentives that are already offered, and simply extend that incentive to appropriate solar development.

Some of the incentives noted here are not zoning incentives, but fit more readily into incentive programs offered by the community (such as financing or incentive-based design standards).

B. **Financial Assistance** – Model Community provides financial assistance to certain types of development and redevelopment. All projects that receive financial assistance of $_____ or greater, and that have a solar resource shall incorporate on-site renewable energy systems.

C. **Solar-Ready Buildings** – Model Community encourages builders to use solar-ready design in buildings. Buildings that submit a completed U.S. EPA Renewable Energy Ready Home Solar Photovoltaic Checklist (or other approved solar-ready standard) and associated documentation will be certified as a Model Community solar ready home, and are eligible for low-cost financing through Model Community's Economic Development Authority. A designation that will be included in the permit home's permit history.

D. **Solar Access Variance** – When a developer requests a variance from Model Community's subdivision solar access standards, the zoning administrator may grant an administrative exception from the solar access standards provided the applicant meets the conditions of 1. and 2. below:

1. **Solar Access Lots Identified** - At least __% of the lots, or a minimum of __ lots, are identified as solar development lots.

2. **Covenant Assigned** - Solar access lots are assigned a covenant that homes built upon these lots must include a solar energy system. Photovoltaic systems must be at least three (3) KW in capacity.

3. **Additional Fees Waived** - Model Community will waive any additional fees for filing of the covenant.

Solar Ready Buildings

New buildings can be built "solar-ready" at very low cost (in some cases the marginal cost is zero). Solar energy installation costs continue to decline in both real and absolute terms, and are already competitive with retail electric costs in many areas. If new buildings have a rooftop solar resource, it is likely that someone will want to put a solar energy system on the building in the future. A solar ready building greatly reduces the installation cost, both in terms of reducing labor costs of retrofits and by "pre-approving" most of the installation relative to building codes.

A community's housing and building stock is a form of infrastructure that, although built by the private sector, remains in the community when the homeowner or business leaves the community. Encouraging solar-ready construction ensures that current and future owners can take economic advantage of their solar resource when doing so makes the most sense for them.

Solar Access Subdivision Design

Some communities will require solar orientation in the subdivision ordinance, such as requiring an east-west street orientation within 20 degrees in order to maximize lot exposure to solar resources. However, many such requirements are difficult to meet due to site constraints or inconsistency with other requirements (such as connectivity with surrounding street networks). Rather than simply grant a variance, the community can add a condition that lots with good solar access actually be developed as solar homes.

Solar Permitting for Minnesota Municipalities

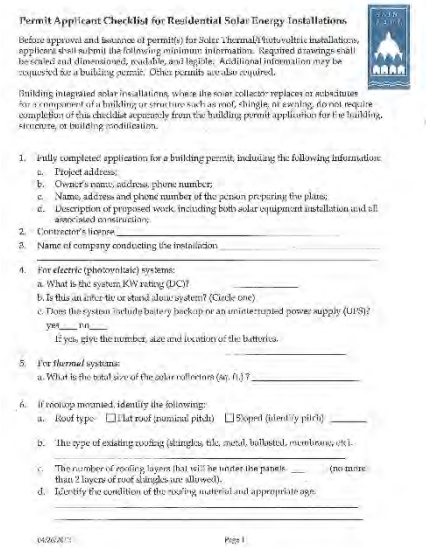
When a home or business owner makes the decision to install solar, the process begins in earnest for the solar installer. A Minnesota municipality can help reduce the cost of solar development for homeowners and for the City by setting clear and predictable standards for the permitting and inspection process. The Solar America Board of Code and Standards (Solar ABCS) developed a model permitting process based on thousands of installations across the nation and years of data collection and research. The model process is the national best practice that local governments across the nation adapt to their community circumstances. The Minnesota Dept. of Labor and Industry has adopted these best practices for electric permits and inspections, and provides a solar permitting guidance page for all electric code officials across the state.

However, permitting in a rural city will look different than the process in the City of Saint Paul. Cities of similar size have distinct characteristics in their building stock that call for different approaches to permitting. However, all municipalities use an identical Minnesota building code standard, and should rely on the same principals and standards to make the permitting process transparent, predictable, and based on the best evidence and research. With a new and evolving technology such as solar energy, local governments should clarify the technical and administrative processes so permit staff have a roadmap for dealing with technology and installation practices for which they might be unfamiliar. Principles for solar-ready permitting include 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 to ensure cross-jurisdictional consistency,
- ✓ Establish a permit fee that appropriately covers local government review and inspection costs.

The following template provides standardized solar permit language for Midwestern cities, but also notes where local municipalities might choose to modify the standards. The cities of Minneapolis and Saint Paul, Minnesota's "beacon" cities that helped define the national best practices, adapted the national permitting best practices to their particular regulatory standards and building stock. These two solar permitting examples (referenced in the Resources section) demonstrate how two cities can collaborate to set a common permitting standard in spite of differences in administrative procedures and staffing. Minnesota's two "beacon" cities also incorporated additional elements into their permitting processes, such as design standards and heritage preservation.

Additional resources on permitting processes, standards, and research are found at the end of the document.

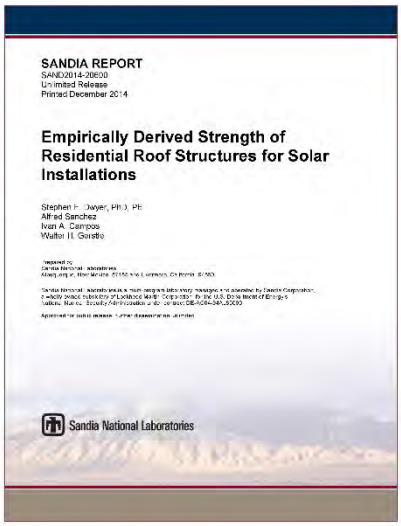

Permit Applicant Checklist for Residential Solar Energy Installations

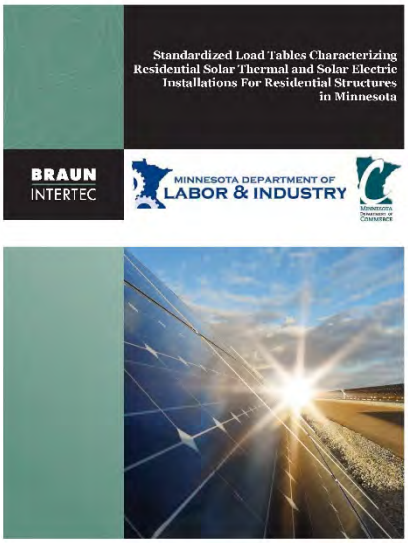
Before approval and issuance of permit(s) for Solar Thermal/Photovoltaic installations, applicant shall submit the following minimum information. Required drawings shall be scaled and dimensioned, readable, and legible. Additional information may be requested for a building permit. Other permits may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

04/26/2013 Page 1





Powered by SunShot U.S. Department of Energy

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 Minnesota 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)

   e. Weight per Attachment Point (c÷d) _____ 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÷g)_____ lbs/ft2

   i.

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 was used by Minneapolis and Saint Paul based upon engineering studies conducted with their building stock. Contact the building official to determine requirements.

If the outcome of e. is greater than 45 lbs or h. is greater than 5 lbs/ft2, a study or statement demonstrating the structural integrity of the installation, or a statement stamped by a Minnesota 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.

This section should be included in the permit only if the local government administers electric permits and inspections. Otherwise the electric permit is administered by the State of Minnesota Department Labor and Industry. In either case, the electric permit application can be a separate document, as in some cases the licensed electrician may be a different contractor. MnDLI provides a solar resources page for electric permitting and inspections for PV systems, including referencing the Solar ABCS.

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 Minnesota.

_____
CONTRACTOR OR AUTHORIZED AGENT/HOMEOWNER

Resources and Reference Material:

- Minneapolis Solar Permit Checklist, http://www.minneapolismn.gov/www/groups/public/@regservices/documents/webcontent/convert_272925.pdf
- Saint Paul Solar Permit Checklist, http://www.stpaul.gov/DocumentCenter/View/76171
- Minnesota Department of Labor and Industry Solar PV Resources page (electric permits) http://www.dli.mn.gov/CCLD/ElectricalSolar.asp
- 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-stat/pdfs/standardized-load-table-report.pdf
- Grow Solar Inspection trainings, http://www.growsolar.org/technical-assistance/training-program-development/

The information, data, or work presented herein was funded in part by the Office of Energy Efficiency and Renewable Energy (EERE), U.S. Department of Energy, under Award Number DE-EE0006544