Topic:	Solar Energy; Zoning
Resource Type:	Guidance Materials & Scholarly Articles
State:	Minnesota
Jurisdiction Type:	N/A
Municipality:	N/A
Year:	Unknown
Community Type – applicable to:	Rural
Title:	Grow Solar Local Government Solar Toolkit for Minnesota: Planning, Zoning, and Permitting
Document Last Updated in Database:	June 20, 2018

Abstract

The model addresses concerns that are primarily in counties, townships, and rural areas rather than cities and urban areas. The incentive portion of the urban model ordinance can be applied in rural areas, as are provisions addressing solar access and aesthetic considerations in those rural areas with development patterns at an urban scale (typically lots smaller than 1 acre). This ordinance addresses solar energy as both a principal use and as an accessory use to the primary residential or commercial use. The model outlines height restrictions on ground-mounted, roof-mounted, and building integrated solar collector units. The model also outlines setback requirements for ground-mounted and roof-mounted solar collector units.

Resource

See separate PDF attached.

Grow Solar

Local Government Solar Toolkit

PLANNING, ZONING, AND PERMITTING

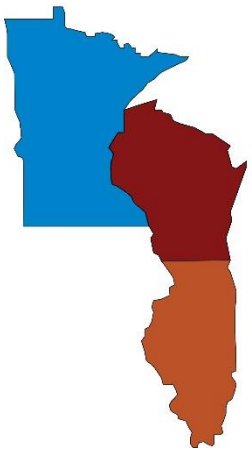
Minnesota

Grow Solar

Rooftop 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.

Grow Solar

State Solar Policy Summary

Minnesota

Minnesota has seen interest in solar grow through changes in policy, the decline in costs, and the availability of various incentives. Because solar is rapidly growing in the state, local governments are increasingly seeing developments come to their communities. 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 20 MW of installed solar capacity. Under the solar standard, that number is expected to grow to at least 450 MW in the next 5 years. With the community solar gardens program, the early indication is that these gardens will be very popular and that installed solar will exceed the 1.5% solar standard.

Barriers to Penetration

As solar gets ramped up in Minnesota, there has already been conflict between solar development and local governments. This is particularly true for large solar farms or gardens that are proposed to be installed on large plots of land. Many local governments have not addressed solar development in existing policies and are finding it difficult to regulate.

Grow Solar

Statutory Context – Local Authority

Enabling Statutes for addressing solar resources

1. **Metropolitan Land Planning Act**
    a. Minnesota Statute 473.859 Subd.2 Land Use Plan. (b) A land use plan shall contain a protection element, as appropriate, for historic sites, the matters listed in the water management plan required by section 103B.23, and an element of protection and development of access to direct sunlight for solar energy systems.
2. **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.
3. **Allowance for Solar Variance**
    a. Minnesota Statute 394.25 Subd. 7 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 […].
4. **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.
5. **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 who seeks a site or route permit for one of the projects identified in this section 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 […]
    c. Subdivision 2. Applicable Projects. Applicants may seek approval from local unities of government to construct the following projects:
        i. Large electric power generating plants with a capacity of less than 80 MW
6. Minnesota Statute 272.02 Subd. 24. Exempt Property. Solar Energy Generating Systems. Personal property consisting of solar energy generating systems […] is exempt.
    a. Principal uses (solar farms or gardens) – the land on which the system is located shall be classified as class 3a property.
    b. Accessory uses – the solar energy system is disregarded for the purposes of classification.
7. Minnesota Statute 272.0295. Solar Energy Production Tax. Applies only to solar energy generating 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, with 80 percent of the revenue distributed to the county and the remaining 20 percent to cities and townships.

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 statutes 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.**

GREAT PLAINS INSTITUTE Better Energy. Better World.

Powered by SunShot U.S. Department of Energy

Solar Resource

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

Solar Benefits

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

Ground Mount System, CERTs

Land Use Conflicts

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

Solar Farm, CERTs

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.

Existing Conditions

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.

Community Rooftop Solar Resource. Rochester, MN

Goals

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.

Policies and Actions

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:

Planning for Solar Energy, American Planning Association
https://www.planning.org/store/product/?ProductCode=BOOK_P575

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

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

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

Metropolitan Council Local Planning Handbook

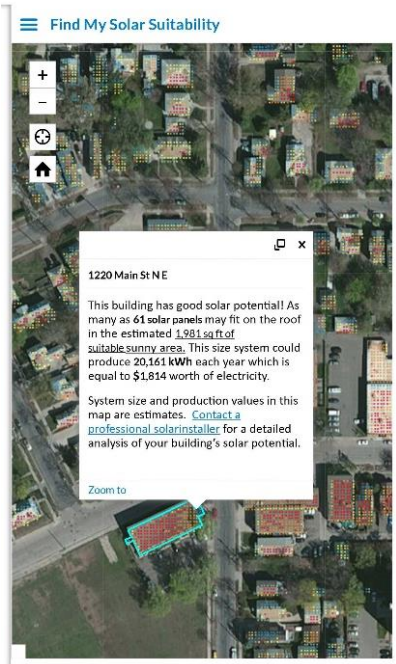
Illinois Planning Authority for Protection Solar Resources ((65 ILCS 5/11-12-5) (from Ch. 24, par. 11-12-5)
http://www.ilga.gov/legislation/ilcs/fulltext.asp?DocName=006500050K11-12-5

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

Grow Solar

Model Solar Zoning for Minnesota Municipalities

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



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?

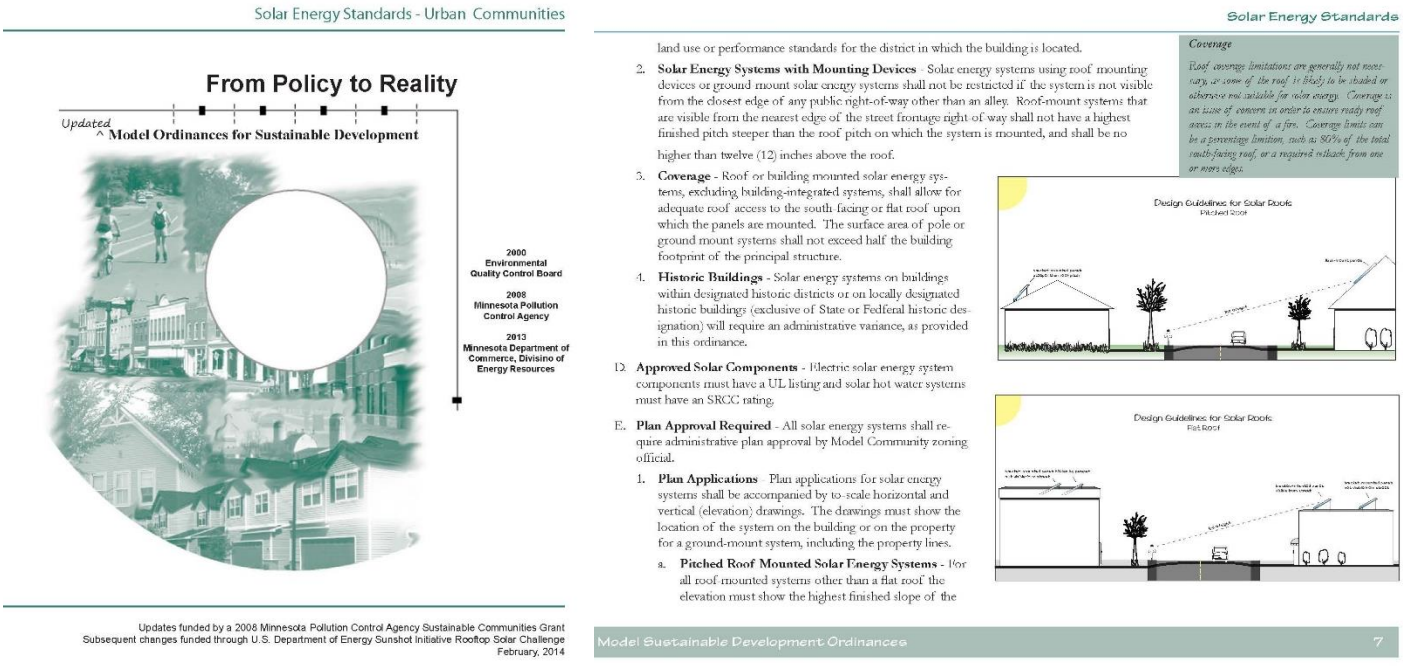
Powered by SunShot U.S. Department of Energy

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?

A number of cities and counties in Minnesota have adopted solar development regulations based on the State of Minnesota's two 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 and the Minnesota Solar Challenge. The two ordinances address two distinct types of communities;

1. urban communities where the primary form of solar development is accessory uses on rooftops and in yards, and
2. rural areas, where solar development is more likely to be ground mount accessory and large solar farms or gardens as a principal use.



Minnesota's model solar ordinances, provided below, offer sample ordinance language that 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 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."

From Policy to Reality

Updated

^ Model Ordinances for Sustainable Development

2000
Environmental Quality Control Board

2008
Minnesota Pollution Control Agency

2013
Minnesota Department of Commerce, Divisino of Energy Resources

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

Prepared for the Minnesota Division of Energy Resources by:

Brian Ross

501 Main Street SE #711
Minneapolis, MN 55414
612-588-4904
bross@crplanning.com

INTRODUCTION

In spite of its cold and dark reputation, Minnesota has good solar potential, as good as Houston, Texas and many parts of Florida. As solar energy system components have become more efficient and less costly an increasing number of solar energy installations have been installed in Minnesota. Since 2005, the interest in solar energy has rapidly increased such that many communities have had to address solar installations as a land use issue. Solar energy components continue to improve in efficiency and decline in price; the U.S. Department of Energy forecasts that solar energy will start to reach widespread cost parity with retail electric costs by 2016.

But solar energy is much more than an alternative (or supplement) to utility power. Solar energy has become a symbol of energy self-sufficiency and environmental sustainability. The growth in solar installations is attributable more to the non-economic benefits than as an economic substitute for the electric utility. Households and businesses wanting to reduce their carbon footprint see solar energy as a strong complement to energy efficiency. Volatility in natural gas prices makes free solar fuel look attractive as a price hedge.

Solar energy issues

Local governments will need to address solar energy installations in their development regulation in the near future. Three primary issues tie solar energy to development regulations:

1) *Nuisance and safety considerations*. Solar energy systems have few nuisances, but visual impacts and safety concerns by neighbors sometimes create opposition to solar installations. Good design and attention to aesthetics can answer most concerns. But the misperception that solar energy systems are ugly and unsafe, rooted in poorly designed 1970s solar installations, have sometimes resulted in unnecessary regulation or outright prohibitions.
2) *Protecting access to solar resources.* Development regulations can limit a property owner's ability to access their solar resource. Moreover, solar access can be limited by buildings or vegetation on adjacent lots, and should be a consideration in zoning districts that allow tall buildings or in developing communities where subdivisions should enhance or protect homeowner's access direct sunlight.
3) *Climate protection goals*. Local governments that have committed to meeting climate protection goals can meet some of their commitment by removing regulatory barriers to solar energy and incorporating low or no-cost incentives in development regulations to spur solar investment.

Model Solar Energy Standards

This ordinance is based primarily on the model solar energy ordinance created for Solar Minnesota, under a Million Solar Roofs grant from the U.S. Department of Energy. It has been updated several times to reflect different needs of Minnsota communities and the evolving solar industry, last updated February, 2014

Statutory Solar Access Requirement

Local governments within the seven-county metropolitan region are required under state law to address solar access in their comprehensive plans, and thus indirectly in their development regulation that implements the comprehensive plan (Minn. Stat. 473.859, Subd. 2[b]). Refer to the Metropolitan Council Land Planning Handbook for more information.

Components of a solar standards ordinance

Solar energy standards should consider the following elements:

- Remove regulatory barriers and create a clear regulatory path (an as-of-right installation) to solar development for both accessory and (if appropriate) principal uses such as solar farms and ground-mount community shared solar installations.
- Address solar access issues within the subject property to ensure reasonable access not unduly limited by height, setback, or coverage limitation, recognizing the distinct design and function of solar technologies.
- Define aesthetic standards that retain an as-of-right installation while balancing design concerns in urban neighborhoods, historic districts, and new subdivisions.
- Address solar access issues across property lines in subdivisions and zoning districts that allow taller buildings on smaller (urban density) lots.
- Encourage solar-ready subdivision and building design.
- Incorporate regulatory incentives that can spur private-sector solar investment.

Urban and rural communities

The model ordinance language addresses concerns that are primarily in cities rather than counties or townships. Issues of solar access and nuisances associated with solar energy systems are of less consequence outside urban density areas, where lot sizes are almost always greater than one acre. Aesthetic issues or solar access issues might come into play in lakeshore areas or conservation development areas, where homes are closer together or protected trees might limit solar access. The incentive potion of the model ordinance can also be applied in rural areas. Some provisions of this model are applicable to low-density or rural areas, but more appropriate language is provided in the model County ordinance provided in a separate document.

Principal and accessory uses

This ordinance addresses solar energy as an accessory use to the primary residential or commercial use in an urban area. Solar energy systems are also sometimes the primary use as on "solar farms" that are large arrays of hundreds or thousands of ground or pole-mounted panels, or in the case of solar thermal power plants, such as seen in the desert southwest. These land uses have different issues and need to be addressed in a substantially different manner than discussed in this model. Sample language addressing these principal solar land uses is provided in the county model solar 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's citizens by promote the safe, effective and efficient use of active solar energy systems installed to reduce the on-site consumption of fossil fuels or utility-supplied electric energy. The following 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 in residential, commercial, and industrial buildings to serve the needs of 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 –** Efficiently invest in and manage public infrastructure systems to support development and growth.

B. **Climate Change Goals** - As a signatory of the Cool Cities program, Model Community has committed to reducing carbon and other greenhouse gas emissions. Solar energy is an abundant, renewable, and nonpolluting energy resource and that its conversion to electricity or heat will reduce our dependence on nonrenewable energy resources and decrease 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 under used local energy resource and encouraging the use of solar energy will diversify the community's energy supply portfolio and exposure to fiscal risks associated with fossil fuels.

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.

Comprehensive Plan Goals

Tying the solar energy ordinance to Comprehensive Plan goals is particularly important when the solar standards include regulatory incentives or solar requirements as described in the last section of this ordinance. If the Comprehensive Plan does not include goals that could address solar energy, and the community does not have some of policy foundation for encouraging private investment in solar energy (such as climate protection goals) the community should consider creating a local energy plan.

Climate Protection Strategies

Solar energy should be part of every community's portfolio for addressing climate change or energy transitions (also known as "peak oil") considerations. Local governments that are participating in the Cities for Climate Protection program, Mayor's Climate Protection signatories, or the Cool Cities/Cool Counties program can use private solar investment as a vehicle for meeting goals. Additional community benefits that improve sustainability are also spelled out in the findings section.

III. Definitions

Active Solar Energy System - A solar energy system whose primary purpose is to harvest energy by transforming solar energy into another form of energy or transferring heat from a collector to another medium using mechanical, electrical, or chemical means.

Building-integrated Solar Energy Systems - An active 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.

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

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 - An active 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.

Renewable Energy System - A solar energy or wind energy system. Renewable energy systems do not include passive systems that serve a dual function, such as a greenhouse or window.

Roof Pitch - The final exterior slope of a building 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 the solar resource (see definition below) on a lot or building, including access across adjacent parcel air rights, for the purpose of capturing direct sunlight to operate a solar energy system.

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 design 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.

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 any day of the year.

Solar Collector - A device, structure or a part of a device or structure for which the primary purpose is to transform solar radiant energy into thermal, mechanical, chemical, or electrical energy.

Solar Collector Surface - Any part of a solar collector that absorbs solar energy for use in the collector's energy transformation process. Collector surface does not include frames, supports and mounting hardware.

Solar Daylighting - A device specifically designed to capture and redirect the visible portion of the solar spectrum, while controlling the infrared portion, for use in illuminating interior building spaces in lieu of artificial lighting.

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 Device - A system or series of mechanisms designed primarily to provide heating, cooling, electrical power, mechanical power, solar daylighting or to provide any combination of the foregoing by means of collecting and transferring solar generated energy into such uses either by active or passive means. Such systems may also have the capability of storing such energy for future utilization. Passive solar energy systems shall clearly be designed as a solar energy device such as a trombe wall and not merely a part of a normal structure such as a window.

Solar Energy System - A device or structural design feature, a substantial purpose of which is to provide daylight for interior lighting or provide for the collection, storage and distribution of solar energy for space heating or cooling, electricity generating, or water heating.

Solar Heat Exchanger - A component of a solar energy device that is used to transfer heat from one substance to another, either liquid or gas.

Solar Hot Air System - (also referred to as Solar Air Heat or Solar Furnace) – An active 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 typically uses a vertically mounted collector on a south-facing wall.

Solar Hot Water System (also referred to as Solar Thermal**)** - 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 Resource

Understanding what defines a "solar resource" is foundational to understanding 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 equipment can not function as designed if installed in partial shade, with too few hours of daily or annual direct sunlight, or without southern or near-southern exposure. Many provisions of the model ordinance are predicated on the concept that a solar resource has definable characteristics that are affected by local land use decisions and regulation.

Height - Rooftop System

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

Height - Ground or Pole Mounted

This ordinance sets a 20-foot height limit, assuming a standard that is higher than typical height limits for accessory structures, but lower than the principal structure. Communities may want to consider balancing height with setback, allowing taller systems if set back farther, for instance, an extra foot of height for every additional two feet of setback.

Building Integrated PV

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

Roof-Mounted Solar Energy Systems

This ordinance sets a threshold for solar panels 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 sometimes create additional considerations in regard to the wind and drift load on structural roof components. Safety risks can be mitigated through structural review or roof structure modification if the aesthetic impacts are not a concern to the community.

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

Solar Storage Unit - A component of a solar energy device that is used to store solar generated electricity or heat for later use.

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

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

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

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

1. **Roof-mounted Solar energy systems** - In addition to the building setback, the collector surface and mounting devices for roof-mounted solar energy systems shall not extend beyond the exterior perimeter of the building on which the system is mounted or built, unless the collector and mounting system has been explicitly engineered to safely extend beyond the edge, and setback standards are not violated. Exterior piping for solar hot water systems shall be allowed to extend beyond the perimeter of the building on a side yard exposure.
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.

C. **Visibility** - Active solar energy systems shall be designed to blend into the architecture of the building or be screened from routine view from public right-of-ways other than alleys. The color of the solar collector is not required to be consistent with other roofing materials.

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

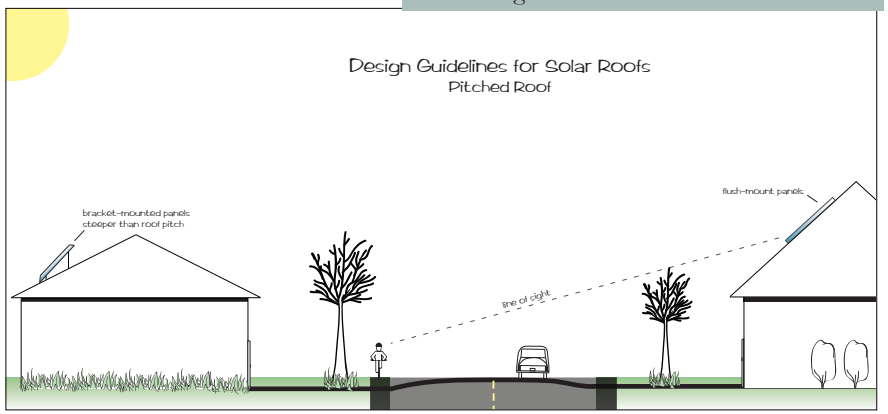
D. **Approved Solar Components** - Electric solar energy system components must have a UL listing and solar hot water systems must have an SRCC rating.

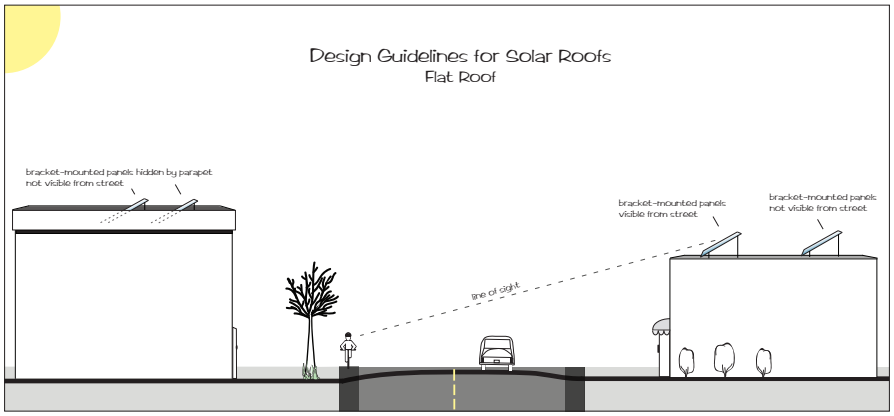
E. **Plan Approval Required** - All solar energy systems shall require administrative plan approval by Model Community zoning official.

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.
   a. **Pitched Roof Mounted Solar Energy Systems** - For all roof-mounted systems other than a flat roof the elevation must show the highest finished slope of the

Coverage

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





solar collector and the slope of the finished roof surface on which it is mounted.

b. **Flat Roof Mounted Solar Energy Systems** - For flat roof applications a drawing shall be submitted showing the distance to the roof edge and any parapets on the building and shall identify the height of the building on the street frontage side, the shortest distance of the system from the street frontage edge of the building, and the highest finished height of the solar collector above the finished surface of the roof.

2. **Plan Approvals** - Applications that meet the design requirements of this ordinance, and do not require an administrative variance, 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.

F. **Compliance with Building Code** - All active 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.

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

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

I. **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.

Administrative Variance

This model language uses an administrative variance process to balance between aesthetic design considerations and the building owner's choice to use the property for generating renewable energy. Administrative variances allow staff to departures from the design standards when such departures are necessary in order to allow for efficient harvest of solar energy, without having to get Planning Commission approval or pay additional fees. The administrative variance standards spell out the conditions that staff would use to judge if the system genuinely could not be designed consistently with Section IV. (such as a lack of solar access except on the front of the building), and the metrics by which staff would judge screening or visual integration with the building. Some communities will have other means to allow this, or will have a conditional use permit process that does not create burdensome additional regulation.

V. Administrative Variance (or conditional use) - Model Community encourages the installation of productive solar energy systems and recognizes that a balance must be achieved between character and aesthetic considerations and the reasonable desire of building owners to harvest their renewable energy resources. Where the standards in Section IV. A., B., or C. cannot be met without diminishing, as defined below, the minimum reasonable performance of the solar energy system, an administrative variance (or CUP) may be sought from the zoning official. An administrative variance (or CUP) shall be granted if the standards are met.

A. **Minimum Performance Design Standards** - The following design thresholds are necessary for efficient operation of a solar energy system:

1. **Fixed-Mount Active Solar Energy Systems** - Solar energy systems must be mounted to face within 45 degrees of south (180 degrees azimuth).

Restrictions on Solar Energy Systems

One of the most common barriers to solar energy in developing areas are restrictive covenants in new subdivisions. The covenants are intended to maintain an the appearance of homes, property values, and saleability. If, however, the local government provides solar design standards that protect against poor design of solar accessory uses, it is reasonable to prevent the developer or homeowner's association from creating unwarranted restrictions on a sustainable source of energy.

2. **Solar Electric (photovoltaic) Systems** - Solar collectors must have a pitch of between 20 and 65 degrees.
3. **Solar Hot Water Systems** - Solar collectors need to be mounted at a pitch between 40 and 60 degrees.
4. **System Location** - The system is located where the lot or building has a solar resource.

B. **Standards for an Administrative Variance** (CUP) - A variance shall be granted by the zoning official if the applicant meets the following safety, performance and aesthetic conditions:

1. **Aesthetic Conditions** - The solar energy system must be designed to blend into the architecture of the building or be screened from routine view from public right-of-ways other than alleys to the maximum extent possible while still allowing the system to be mounted for efficient performance.
2. **Safety Conditions** - All applicable health and safety standards are met.
3. **Non-Tracking Ground-Mounted Systems** - Pole-mounted or ground-mounted active solar energy systems must be set back from the property line by one foot.

VI. Restrictions on Solar Energy Systems Limited - No homeowners' agreement, covenant, common interest community, or other contract between multiple property owners within a subdivision of Model Community shall restrict or limit solar energy systems to a greater extent than Model Community' solar energy standards.

VII. Solar Access - Model Community encourages solar access to be protected in all new subdivisions and allows for existing solar to be protected consistent with Minnesota Statutes.

A. **Solar Easements Allowed** - Model Community has elected to allow solar easements to be filed, consistent with Minnesota Stat. Chapter 500 Section 30. Any building owner can purchase an easement across neighboring properties to protect access to sunlight. The easement is purchased from or granted by owners of neighboring properties and can apply to buildings, trees, or other structures that would diminish solar access.

B. **Easements within Subdivision Process** - Model Community may require 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;
(c) A description of the vertical and horizontal angles, expressed in degrees, and distances from the site of the wind power system in which an obstruction to the winds is prohibited or limited;
(d) Any terms or conditions under which the easement is granted or may be terminated;
(e) Any provisions for compensation of the owner of the real property benefiting from the easement in the event of interference with the enjoyment of the easement, or compensation of the owner of the real property subject to the easement for maintaining the easement;
(f) Any other provisions necessary or desirable to execute the instrument.

Source: Minnesota Stat. 500.30 Subd. 3.

Renewable Energy Conditions (previous page)

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. This model ordinance notes these opportunities for consideration by local governments. In most cases, additional ordinance language would need to be inserted into the community's ordinances. For instance, a provision that PUDs incorporate solar energy would need to be included in the community's PUD ordinance, or if a condition of a CUP was to make the building solar-ready, this would need to be included in the conditional use permit section of the ordinance.

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 make requirements or use incentives to ensure that certain public amenities are included in development. These same tools and incentives can be used to encourage private investment in solar energy. Communities will not want to use all these incentives, but should select which ones make the most sense in their community (or create some other incentive that encourages solar energy). As with any incentive, an important element of creating the incentive is to engage planning or economic development staff in the creation of the incentive, so that staff can assist the developer in taking advantage of the provisions.

VIII. Renewable Energy Condition for Certain Permits

A. **Condition for Rezoning or Conditional Use Permit** - Model Community may, in an area where the local electric distribution system was installed more than twenty years ago, or where the local electric utility has documented a near-term need for additional distribution substation or conductor capacity, require on-site renewable energy systems as a condition for a rezoning or a conditional use permit.

1. The renewable energy condition may only be exercised for new construction or major reconstruction projects.
2. The renewable energy condition may only be exercised for sites that have 90% unimpeded solar or wind energy access, and for which the renewable energy system can reasonably meet all performance standards and building code requirements.

B. **Condition for Planned Unit Development (PUD) Approval** - Model Community may require on-site renewable energy systems as a condition for approval of a PUD permit, in order to mitigate for:

1. Risk to the performance of the local electric distribution system,
2. Increased emissions of greenhouse gases,
3. Other risks or effects inconsistent with Model Community's Comprehensive Plan.

IX. Solar Roof Incentives - Model Community has identified the following incentives for development applications or subdivisions that will include buildings using active solar energy systems.

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 each one kilowatt of PV or 64 square feet of solar hot water collector installed for each new residence.

B. **Vacant Lot Preference** - When Model Community disposes of vacant parcels of land that are under City ownership through auction, Model Community shall award a 10% bid preference up to $5,000 for every kilowatt of solar capacity that is to be incorporated into the fully-built out parcel, when awarding the bid. The bidder must also meet all land use and dimensional requirements, and must post a bond for the amount of the bid preference granted.

C. **Solar-Ready Buildings –** Model Community encourages builders to use solar-ready design in buildings. Buildings that submit a completed U.S. EPA's Renewable Energy Ready Home Solar Photovoltaic Checklist and associated documentation will be certified as a Model Community solar ready

home, a designation that will be included in the permit home's permit history.

D. **Solar Access Variance** - On a site where the solar access standards of the subdivision ordinance are difficult to meet due to topography or road connectivity, the zoning administrator shall grant an administrative exception from the solar access standards provided the applicant meets the following conditions:

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 an active solar energy system. Photovoltaic systems must be at least one (1) KW in capacity and solar thermal systems must have at least 64 square feet of collector area.
3. **Additional Fees Waived** - Model Community will waive any additional fees for filing of the covenant.

E. **Affordable Housing Offset** - On a site where 90% of the potential solar access is unimpeded, and the local electrical distribution system was installed more than twenty years ago, Model Community may substitute a requirement for grid-intertie photovoltaic systems or active solar thermal systems for up to 50% of the affordable housing requirement. For each unit of affordable housing for which a solar energy substitution is made:

1. The photovoltaic system must have at least 2 kilowatts (KW) of capacity with 90% unobstructed solar access.
2. The active solar thermal system must be sized and have sufficient solar access to generate 75% of the estimated domestic hot water load for a family of four.

F. **Commercial Parking Requirement Offset** - On a site where 90% of the potential solar access is unimpeded, and which has access to mass transit within a block of the development site or which has an approved Travel Demand Management (TDM) plan, or which has entered into a shared parking arrangement with another commercial business that has distinct peak parking profiles, Model Community may substitute a requirement for grid-intertie photovoltaic systems or an active solar thermal systems for up to 50% of the parking requirement, up to a maximum of 5 spaces. For each parking space for which a solar energy substitution is made:

1. The photovoltaic system must have at least one (1) kilowatt (KW) of capacity with 90% unobstructed solar access; or
2. An active solar thermal system must have at least 64 square feet of solar collector, and must have sufficient summer load to utilize collector output.

From Policy to Reality

Updated
^ Model Ordinances for Sustainable Development

2013
Minnesota Department of Commerce, Division of Energy Resources, Minnesota Solar Challenge

Minnesota Solar Challenge

Funded through U.S. Department of Energy Sunshot Initiative Rooftop Solar Challenge
Revised February, 2014

Prepared for the Minnesota Department of Commerce by:

Brian Ross

501 Main Street SE #711
Minneapolis, MN 55414
612-588-4904
bross@crplanning.com

INTRODUCTION

In spite of its cold and dark reputation, Minnesota has good solar potential, as good as Houston, Texas and many parts of Florida. As solar energy system components have become more efficient and less costly an increasing number of solar energy installations have been installed in Minnesota. Since 2005, the interest in solar energy has rapidly increased such that many communities have had to address solar installations as a land use issue. Moreover, starting in 2014 many utilities will be making new investments in large-scale solar "farms," and Minnesota has started to see new "community-shared" solar projects. Solar energy components continue to improve in efficiency and decline in price; the U.S. Department of Energy forecasts that solar energy will start to reach widespread cost parity with retail electric costs by 2016; solar is already a cost-competitive option in some locations.

Model Solar Energy Standards

This ordinance was developed for the Minnesota Solar Challenge program, co-funded by the U.S. DOE Rooftop Solar Challenge. It was developed as a county/rural community version of the Minnesota model Urban Solar Energy Standards, and was last updated February, 2014

Solar energy offers retail customers an alternative (or supplement) to utility power. Solar energy has become a symbol of energy self-sufficiency and environmental sustainability. The growth in solar installations is attributable more to the non-economic benefits than as an economic substitute to the utility. Households and businesses wanting to reduce their carbon footprint see solar energy as a strong complement to energy efficiency. Volatility in natural gas or propane prices makes free solar fuel look attractive as a price hedge.

Solar energy issues

Local governments will need to address solar energy installations in their development regulation in the near future. Three primary issues tie solar energy to development regulations:

1) *Protecting access to solar resources.* Development regulations can limit a property owner's ability to access their solar resource. Moreover, solar access can be limited by buildings or vegetation on adjacent lots, and should be a consideration in zoning districts that allow tall buildings or in developing communities where subdivisions should enhance or protect homeowner's access direct sunlight.
2) *Nuisance and safety considerations.* Solar energy systems have few nuisances, but visual impacts and safety concerns by neighbors sometimes create opposition to solar installations. Good design and attention to aesthetics can answer most concerns. But the misperception that solar energy systems are ugly and unsafe, rooted in poorly designed 1970s solar installations, have sometimes resulted in unnecessary regulation or outright prohibitions.
3) *Climate protection goals.* Local governments that have committed to meeting climate protection goals can meet some of their commitment by removing regulatory barriers to solar energy and incorporating low or no-cost incentives in development regulations to spur solar investment.

Statutory Solar Access Requirement

Local governments within the seven-county metropolitan region are required under state law to address solar access in their comprehensive plans, and thus indirectly in their development regulation that implements the comprehensive plan (Minn. Stat. 473.859, Subd. 2[b]). Refer to the Metropolitan Council Land Planning Handbook for more information.

Components of a solar standards ordinance

Solar energy standards should consider the following elements:

- Remove regulatory barriers and create a clear regulatory path (an as-of-right installation) to solar development for both accessory and (if appropriate) principal uses such as solar farms and ground-mount community shared solar installations.
- Address solar access issues within the subject property to ensure reasonable access not unduly limited by height, setback, or coverage limitation, recognizing the distinct design and function of solar technologies.
- If there are urban density developments, define aesthetic standards that retain an as-of-right installation while balancing design concerns.
- Encourage solar-ready subdivision and building design.
- Incorporate regulatory incentives that can spur private-sector solar investment.

Urban and rural communities

The model ordinance language addresses concerns that are primarily in counties, townships, and rural areas rather than cities and urban areas. The incentive potion of the urban model ordinance can be applied in rural areas, as are provisions addressing solar access and aesthetic considerations in those rural areas with development patterns at an urban scale (typically lots smaller than 1 acre).

Principal and accessory uses

This ordinance addresses solar energy as both a principal use and as an accessory use to the primary residential or commercial use. Counties and rural areas are much more likely to see "solar farms" or ground-mounted "community solar" installations. These solar installations are large arrays of hundreds or thousands of ground or pole-mounted panels covering anywhere from a few acres to over 100 acres. These land uses have different issues and need to be addressed in a substantially different manner than discussed in the urban model ordinance standards.

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

II. Purpose - Consistent with the County Comprehensive Plan, the intent of this Section is to allow reasonable capture and use, by households, businesses, and property owners, of their solar energy resource, and encourage the development of renewable energy businesses, consistent with community development standards. Model County has adopted this ordinance 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 County's citizens by promote the safe, effective and efficient use of active solar energy systems installed to reduce the on-site consumption of fossil fuels or utility-supplied electric energy. The following 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 in residential, commercial, and industrial buildings to serve the needs of current and future generations.
3. **Goal** – Assist local businesses to lower financial and regulatory risks and improve their economic, County, and environmental sustainability.
4. **Goal** – Efficiently invest in and manage public infrastructure systems to support development and growth.

B. **GHG Reduction Goals** - Model County has committed to reducing carbon and other greenhouse gas emissions in its GHG Reduction Plan. Solar energy is an abundant, renewable, and nonpolluting energy resource and its conversion to electricity or heat will reduce our dependence on nonrenewable energy resources and decrease the GHG emissions and other air and water pollution that results from the use of conventional energy sources.

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

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

Comprehensive Plan Goals

Tying the solar energy ordinance to Comprehensive Plan goals is particularly important when the solar standards include regulatory incentives or solar requirements as described in the last section of this ordinance. If the Comprehensive Plan does not include goals that could address solar energy, and the community does not have some of policy foundation for encouraging private investment in solar energy (such as climate protection goals) the community should consider creating a local energy plan.

Climate Protection Strategies

Solar energy should be part of every community's portfolio for addressing climate change or energy independence considerations. Local governments that are participating in climate protection programs or the Cool Cities/Cool Counties program can use private solar investment as a vehicle for meeting goals. Additional community benefits that improve sustainability are also spelled out in the findings section.

III. Definitions

Building-integrated Solar Energy Systems - An active 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.

Community Solar - A solar-electric (photovoltaic) array 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 system may be either an accessory or a principal use.

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 design 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.

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

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 most recent version.

Renewable Energy System - A solar energy or wind energy system. Renewable energy systems do not include passive systems that serve a dual function, such as a greenhouse or window.

Roof Pitch - The final exterior slope of a building 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 the solar resource (see definition below) on a lot or building, including access across adjacent parcel air rights, for the purpose of capturing direct sunlight to operate a solar energy system.

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 any day of the year.

Solar Collector - A device, structure or a part of a device or structure for which the primary purpose is to transform solar radiant energy into thermal, mechanical, chemical, or electrical energy.

Solar Collector Surface - Any part of a solar collector that absorbs solar energy for use in the collector's energy transformation process. Collector surface does not include frames, supports and mounting hardware.

Solar Daylighting - A device specifically designed to capture and redirect the visible portion of the solar spectrum, while controlling the infrared portion, for use in illuminating interior building spaces in lieu of artificial lighting.

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 Device - A system or series of mechanisms designed primarily to provide heating, cooling, electrical power, mechanical power, solar daylighting or to provide any combination of the foregoing by means of collecting and transferring solar generated energy into such uses either by active or passive means. Such systems may also have the capability of storing such energy for future utilization. Passive solar energy systems are designed as a solar energy device, such as a trombe wall, and not merely a part of a normal structure such as a window.

Solar Energy System - A device or structural design feature, a substantial purpose of which is to provide for the collection, storage and distribution of sunlight for space heating or cooling, generation of electricity, water heating, or providing daylight for interior lighting.

Solar Farm - A commercial facility that converts sunlight into electricity, whether by photovoltaics (PV), concentrating solar thermal devices (CST), or other conversion technology, for the primary purpose of wholesale sales of generated electricity. A solar farm is the principal land use for the parcel on which it is located.

Solar Heat Exchanger - A component of a solar energy device that is used to transfer heat from one substance to another, either liquid or gas.

Solar Hot Air System - An active 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 typically uses a vertically mounted collector on a south-facing wall.

Solar Resource

Understanding what defines a "solar resource" is foundational to understanding 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 equipment can not function as designed if installed in partial shade, with too few hours of daily or annual direct sunlight, or without southern or near-southern exposure. Many provisions of the model ordinance are predicated on the concept that a solar resource has definable characteristics that are affected by local land use decisions and regulation.

Solar Hot Water System (also referred to as Solar Thermal**)** - 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 Storage Unit - A component of a solar energy device that is used to store solar generated electricity or heat for later use.

Interconnection

Nearly all solar electric system are "grid-connected," meaning that the system is connected to into the electric system of a building that is connected to the grid, or the solar installation is connected directly to the grid (such as a solar farm). In all cases, grid-connected systems need to have an interconnection agreement with the electric utility.

Glare

Solar collectors (the panels) have glass surfaces and thus can create glare. However, the glare is no different than glare from a glass window, and as panels are pitched toward the sun reflections are almost always upward. Moreover, solar panels are specifically designed to be anti-glare, as reflected light lowers the panel efficacy.

Reflectors

Unlike the solar collector, systems that use a reflector do create a potential glare situation that may be greater than building windows. Reflectors are designed to reflect, not absorb, light. However, the glare risk is intermittent and seasonal (usually only in the summer, early morning or late evening, and only for a limited amount of time). Counties may want to include provisions regarding reflector glare in the event that a glare nuisance situation arises in order to provide guidance for addressing the nuisance.

IV. General standards - All solar energy systems shall comply with the following standards.

A. Interconnection agreement - All electric solar energy systems that are connected to the electric distribution or transmission system through the existing service of the primary use on the site shall obtain an interconnection agreement with the electric utility in whose service territory the system is located. Solar energy systems connected directly to the distribution or transmission system must obtain an interconnection agreement with the interconnecting electric utility. Off-grid systems are exempt from this requirement.

B. UL listing - Electric solar system components that are connected to a building electric system must have an Underwriters Laboratory (UL) listing.

C. Electric code - All solar installations must comply with the Minnesota and National Electric Code.

D. Building code - All rooftop solar systems shall comply with the Minnesota Building Code.

E. Plumbing Code - Solar thermal hot water systems shall comply with applicable Minnesota State Plumbing Code requirements.

F. Reflectors - All solar energy systems using a reflector to enhance solar production shall minimize glare from the reflector affecting adjacent or nearby properties. Measures to minimize glare include selective placement of the system, screening on the north side of the solar array, modifying the orientation of the system, reducing use of the reflector system, or other remedies that limit glare.

G. Height limit - Building- or roof- mounted solar systems shall not exceed the maximum allowed height in any zoning district. For purposes of height measurement, solar systems other than building-integrated systems shall be considered to be mechanical devices and are restricted consistent with other building-mounted mechanical devices for the zoning district in which the system is being

installed, except that solar energy systems shall not be required to be screened.

H. Visibility, commercial installations - Commercial rooftop systems shall be placed on the roof to limit visibility from the public right-of-way or to blend into the roof design, provided that minimizing visibility still allows the property owner to reasonably capture solar energy.

V. Standards for specific solar uses. The following standards apply to specific types of solar uses:

A. Rooftop solar energy systems - accessory to the primary land use, designed to supply energy for the primary use.

(1) These systems are permitted accessory uses in all districts in which buildings are permitted.

(2) No land use permit is required.

B. Ground-mount solar energy systems - accessory to the primary land use, designed to supply energy for the primary use.

(1) Ground-mount systems are permitted accessory uses in all districts where buildings are permitted.

(2) Ground-mount systems require a land use permit and are subject to the accessory use standards for the district in which it is located, including setback, height, and coverage limits.

(3) The collector surface of a ground-mount system and any foundation, compacted soil, or other component of the solar installation that rests on the ground is considered impervious surface. Vegetated ground under the collector surface can be used to mitigate stormwater runoff.

C. **Community solar energy systems** - Roof or ground-mount solar energy systems, may be either accessory or primary use, designed to supply energy for off-site uses on the distribution grid, consistent with Minn. Statutes 216B.1641 or successor statute.

(1) Rooftop community systems are permitted in all districts where buildings are permitted.

(2) Ground-mount community solar energy systems are conditional uses in all districts.

(3) An interconnection agreement must be completed with the electric utility in whose service territory the system is located.

(4) All structures must comply with setback, height, and coverage limitations for the district in which the system is located.

(5) Ground-mount systems must comply with all required standards for structures in the district in which the system is located.

Height Standards

In rural areas the height standards that apply to the principal and accessory uses are unlikely to constrain solar development. Solar resources are unlikely to be constrained by trees or buildings on adjacent lots, and is likely to have adequate an solar resource for a ground-mount application even if the roof is shaded.

Visibility and Aesthetic Considerations

Not all counties use design or aesthetic standards for commercial buildings. This standard is provided as an example for counties that do regulate commercial building design or the aesthetics of rooftop equipment. Solar arrays should be treated similar to other rooftop equipment, while accommodating the functioning of the system (screening requirements render the system useless).

Impervious Surface and Stormwater

The county should consider an important distinction between a ground-mount solar array and the roof of an accessory building; the uncompacted and vegetated ground under the array can be used to infiltrate stormwater. Having the infiltration area does not eliminate all the impacts of the collector surface, but should be considered as a significant mitigating factor.

Community 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 counties should consider creating a separate category.

Stormwater and NPDES Standards

As noted with ground-mount accessory use installations, the county needs to understand the distinction between a ground-mount solar array and the roof of an accessory building as regards impervious surfaces. The collector surface is impervious, but the uncompacted and vegetated ground under the array can be used to infiltrate stormwater. A solar farm will almost always require an NPDES permit. However, greater attention should be given, in developing the SWPPP, to how the applicant manages the ground under the panels than to the panels themselves. Perennial grasses planted under the panels and between arrays will substantially mitigate the effect of the panels on rainwater.

Site Plan

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

Aviation Standards

This standard was developed for the FAA for solar installations on airport grounds. It can also be used for surrounding areas, particularly for solar farm installations.

Agricultural Protection

If the county has ordinances that protect agricultural soils, this provision applies those same standards to solar development. Counties should understand, howver, that solar farms do not pose the same level or type of risk to agricultural practices as does housing or commercial development.

D. Solar farms - 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.

(1) **Conditional use permit** - Solar farms require a conditional use permit.

(2) **Stormwater and NPDES -** Solar farms are subject to the County's stormwater management and erosion and sediment control provisions and NPDES permit requirements.

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

(4) **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.

(5) **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 the County 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.

(6) **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 the County. The site plan should also show all zoning districts, and overlay districts.

(7) **Aviation Protection** - For solar farms located within 500 feet of an airport or within the A or B safety 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.

(7) **Agricultural Protection** - Solar farms must comply with site assessment or soil identification standards that are intended to protect agricultural soils.

(8) **Decommissioning** - A decommissioning plan shall be required to ensure that facilities are properly removed after their useful life. Decommissioning of solar panels must occur in the event they are not in use for 12 consecutive months. The plan shall include provisions for removal of all structures and foundations, restoration of soil and vegetation and a plan ensuring financial resources will be available to fully decommission the site. Disposal of structures and/or founda-

tions shall meet the provisions of the County Solid Waste Ordinance. The County may require the posting of a bond, letter of credit or the establishment of an escrow account to ensure proper decommissioning.

V. Non-Conforming Accessory Installations - Model County encourages the installation of productive solar energy systems and recognizes that dimensional standards, height standards, and other standards to retain desired character and aesthetic must be balanced with the reasonable desire of building owners to harvest their renewable energy resources. Where the standards in Section IV. G., or H., cannot be met without diminishing the minimum reasonable performance of the solar energy system as defined in Section V. A., a non-conforming installation can be, if the County so chooses, permitted under a conditional use permit (CUP).

A. **Minimum Performance Design Standards** - The following design thresholds are necessary for efficient operation of a solar energy system:

1. **Fixed-Mount Solar Energy Systems** - Solar energy systems must be mounted to face within 45 degrees of south (180 degrees azimuth).
2. **Solar Electric (photovoltaic) Systems** - Solar collectors must have a pitch of between 20 and 65 degrees.
3. **Solar Hot Water Systems** - Solar collectors must have a pitch between 40 and 60 degrees.
4. **System Location**- The system is located where the lot or building has a solar resource, as defined in this ordinance.

B. **Standards for granting a CUP** - A CUP shall be granted by the zoning official if the applicant meets the following safety, performance and aesthetic conditions:

1. **Aesthetic Conditions** - The solar energy system must be designed to blend into the architecture of the building or be screened from routine view from public right-of-ways to the maximum extent possible while still allowing the system to achieve efficient performance.
2. **Safety Conditions** - All applicable health and safety standards are met.
3. **Non-Tracking Ground-Mounted Systems** - Pole-mounted or ground-mounted active solar energy systems must be set back from the property line by three feet.

VI. Restrictions on Solar Energy Systems Limited - No homeowners' agreement, covenant, common interest community, or other contract between multiple property owners within a subdivision of Model County shall forbid installation of solar energy systems or create design standards that effectively preclude solar energy installations.

Decommissioning Standards

Solar farms should file a decommissioning plan with the county. Requiring financial surety for decommissioning may not be justified for small solar farms, as some farms could be too small to be able to acquire a bond or similar instrument. These standards could also apply to Community Solar installations.

Non-Conforming Accessory Installations

This provision allows property owners (usually in small lot areas) who have a solar resource to apply for a conditional use permit if dimensional standards or height limits restrict installations where the resource is located. On large lots dimensional or height standards are unlikely to limit the solar installation.

Homeowners' Associations

This provision would apply to new subdivisions and HOAs, and provides very general language for protecting solar development rights. Alternatively, the county could set aesthetic standards for solar development and limit the HOA from being more restrictive than the county (see the urban solar design standards for examples).

Solar Easements

Minnesota allows the purchase and holding of easements protecting access to solar and wind energy. Examples of what the easement must specify are noted below, see the statute for a complete list:

***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 . . .

Source: Minnesota Stat. 500.30 Subd. 3.

Renewable Energy Conditions

The community can use traditional development tools such as conditional use permits, PUDs, or other discretionary permits to encourage solar energy development. This model ordinance notes these opportunities for consideration by local governments. In most cases, additional ordinance language would need to be inserted into the community's ordinances. For instance, a provision that PUDs incorporate solar energy or ensure the buildings in the PUD are solar-ready construction, the provision should be included in the community's PUD ordinance.

VII. Solar Access - Model County encourages solar access to be protected in all new subdivisions and allows for existing solar to be protected consistent with Minnesota Statutes.

A. **Easements Allowed** - Model County has elected to allow solar easements to be filed, consistent with Minnesota Stat. Chapter 500 Section 30. Any building owner can purchase an easement across neighboring properties to protect access to sunlight. The easement is purchased from or granted by owners of neighboring properties and can apply to buildings, trees, or other structures that would diminish solar access.

B. **Subdivision Solar Easements** - Model County may require 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.

VIII. Renewable Energy Condition for Certain Permits

A. **Condition for Rezoning or Conditional Use Permit** - Model County may, in an area where the local electric distribution system was installed more than twenty years ago, or where the local electric utility has documented a near-term need for additional distribution substation or conductor capacity, require on-site renewable energy systems as a condition for a rezoning or a conditional use permit.

1. The renewable energy condition may only be exercised for new construction or major reconstruction projects.
2. The renewable energy condition may only be exercised for sites that have 90% unimpeded solar or wind energy access, and for which the renewable energy system can reasonably meet all performance standards and building code requirements.

B. **Condition for Planned Unit Development (PUD) Approval** - Model County may require on-site renewable energy systems as a condition for approval of a PUD permit, in order to mitigate for:

1. Risk to the performance of the local electric distribution system,
2. Increased emissions of greenhouse gases,
3. Other risks or effects inconsistent with Model County's Comprehensive Plan.

IX. Solar Roof Incentives - Model County has identified the following incentives for development applications or subdivisions that will include buildings using active solar energy systems.

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 each two kilowatts of PV or 64 square feet of solar hot water collector installed for each new residence.

B. **Solar-Ready Buildings –** Model County encourages builders to use solar-ready design in buildings. Buildings that submit a completed U.S. EPA's Renewable Energy Ready Home Solar Photovoltaic Checklist and associated documentation will be certified as a Model County solar ready home, a designation that will be included in the permit home's permit history.

C. **Solar Access Conditions** - On a site where the solar access standards of the subdivision ordinance are difficult to meet due to topography or road connectivity, the county shall consider non-conforming development patterns as a conditional use provided the applicant meets the following conditions:

   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 an active solar energy system. Photovoltaic systems must be at least one (1) KW in capacity and solar thermal systems must have at least 64 square feet of collector area.
   3. **Additional Fees Waived** - Model County will waive any additional fees for filing of the covenant.

Solar Roof Incentives

This section of the model ordinance provides examples of incentives that can be incorporated into development regulation. Most cities and many counties use incentives to encourage desired public amenities in new development. These same tools and incentives can be used to encourage private investment in solar energy. Communities will not want to use all these incentives, but should select which ones make the most sense in their community (or create some other incentive that encourages solar energy). As with any incentive, an important element of creating the incentive is to engage planning or economic development staff in the creation of the incentive, so that staff can assist the developer in taking advantage of the provisions.

Solar Access in Subdivisions

Some local governments require solar orientation of new subdivisions (requiring a south-facing building or lot line to accommodate solar design in the buildings). Designing the subdivision around natural features or contours can make these provisions difficult to meet. This language offers an alternative to simply granting a variance to the solar orientation requirement.

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 http://www.co.stearns.mn.us/Portals/0/docs/Document%20Library/ordinances/ord439.pdf
- National American Planning Association, *Planning for Solar Energy,* https://www.planning.org/store/product/?ProductCode=BOOK_P575
- National American Planning Association, Planners Advisory Service Essential information packet, https://www.planning.org/pas/infopackets/open/eip30.htm
- 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/

Grow Solar

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 by setting clear and predictable standards for the permitting and inspection process. Making the permit and inspection process transparent and predictable to contractors saves time for both contractors and municipalities. The Solar America Board of Code and Standards (Solar ABCS) developed a set of permitting principals and standards for permitting solar installations based on thousands of installations across the nation and years of data collection and research. These standards are the national best practices that local governments across the nation adapt to their community circumstances.

However, a one-size-fits-all approach does not work for solar permitting in Minnesota municipalities. Communities of different sizes have different processes. 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.

A template for adapting national permitting best practices to Minnesota cities is provided below. The 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 related to permitting processes, standards, and research are included at the end of the document for reference by municipal staff, elected officials and installers.

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

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 _____ lbs

   f. Maximum Spacing between Attachment Points on a Rail _____inches (see product manual for maximum spacing allowed based on maximum design wind speed).

   g. Total Surface Area of PV Modules (square feet)_____ ft2

   h. Distributed Weight of PV Module on Roof (c÷f)_____ lbs/ft2

> 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 distributed weight of the PV system is greater than 5 lbs/ft2, a study or statement demonstrating the structural integrity of the installation, or a statement stamped by 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).

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