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SOLAR

MODEL ORDINANCES

PREPARED BY GREAT PLAINS INSTITUTE WITH SUPPORT FROM SUNSHOT AND THE ENERGY FOUNDATION

These model ordinances were created in 2020 for the states of Illinois, Indiana, Iowa, Minnesota, and Wisconsin.

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Iowa Solar Model Ordinance

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Prepared by Great Plains Institute with support from Sunshot and the Energy Foundation

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Model Solar Ordinance – Iowa

Introduction

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

Model Solar Energy Standards

This ordinance is based on the model solar energy ordinance originally created for Solar Minnesota, under a Million Solar Roofs grant from the U. S. Department of Energy and updated for the three-state Grow Solar initiative, funded by Rooftop Solar Challenge Phase 2. It has been substantially updated several times to address additional issues and opportunities for Iowa communities and the evolving solar industry, last updated May 2020

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

Solar Energy Issues

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

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

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

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

Components of a Solar Standards Ordinance

Solar energy standards should:

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

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

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

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

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

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

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

Different Community Types and Settings

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

Solar development is not one thing

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

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

Model Ordinance

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

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

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

1. **Goal** – Encourage the use of local renewable energy resources, including appropriate applications for wind, solar, and biomass energy.
2. **Goal** – Promote sustainable building design and management practices to serve current and future generations.
3. **Goal** – Assist local businesses to lower financial and regulatory risks and improve their economic, community, and environmental sustainability.
4. **Goal** – Efficiently invest in and manage public infrastructure systems to support development and growth.

Comprehensive Plan Goals

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

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

The Comprehensive Plan may not include goals that are enhanced by solar development, (such as climate protection or local resource economic goals). The community should consider creating a local energy plan or similar policy document to provide a policy foundation for solar development regulation.

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 its conversion to electricity or heat reduces dependence on nonrenewable energy resources and decreases the air and water pollution that results from the use of conventional energy sources.

C. Iowa Smart Planning – Iowa Smart Planning principles must be considered when local governments make planning, zoning, development, and resource management decisions. Model Community has adopted Principle 3 – Clean, Renewable, and Efficient Energy – to encourage the promotion of clean energy use through increased access to renewable energy resources.

D. 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.

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

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

III. Definitions

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

Building-integrated Solar Energy Systems – A solar energy system that is an integral part of a principal or accessory building, rather than a separate mechanical device, replacing or substituting for an architectural or structural component of the building. Building-integrated systems include but are not limited to photovoltaic or hot water solar energy systems that are contained within roofing materials, windows, skylights, and awnings.

Solar Definitions

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

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

Community Solar Garden – A solar energy system that provides retail electric power (or a financial proxy for retail power) to multiple community members or businesses residing or located off-site from the location of the solar energy system. Also referred to as shared solar.

Differentiating Solar Uses by Size

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

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

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

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

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

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

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

Renewable Energy Easement, Solar Energy Easement — An easement that limits the height or location, or both, of permissible development on the burdened land in terms of a structure or vegetation, or both, for the purpose of providing access for the benefited land to wind or sunlight passing over the burdened land.

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

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

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

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

Solar Collector — 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. The collector does not include frames, supports, or mounting hardware.

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

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

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

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

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

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

Solar Resource — The design and construction of a building that facilitates and makes feasible the installation of rooftop solar.

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

Solar Resource

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

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

A. Height – Solar energy systems must meet the following height requirements:

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

2. Ground- or pole-mounted solar energy systems shall not exceed 15 feet in height when oriented at maximum tilt.

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

Height - Rooftop System

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

Height - Ground or Pole Mounted System

This ordinance sets a 15-foot height limit, which is typical for residential accessory uses. Some communities allow solar to be higher than other accessory uses in order to enable capture of the lot's solar resource when lots and buildings are closer together. An alternative is to balance height with setback, allowing taller systems if set back farther– for instance, an extra foot of height for every extra two feet of setback. In rural (or large lot) areas, solar resources are unlikely to be constrained by trees or buildings on adjacent lots and the lot is likely to have adequate solar resource for a lower (10-15 foot) ground-mount application.

B. Setback — Solar energy systems must meet the accessory structure setback for the zoning district and principal land use associated with the lot on which the system is located, except as allowed below.

1. **Roof- or Building-mounted Solar Energy Systems** - The collector surface and mounting devices for roof-mounted solar energy systems shall not extend beyond the exterior perimeter of the building on which the system is mounted or built, unless the collector and mounting system has been explicitly engineered to safely extend beyond the edge, and setback standards are not violated. Exterior piping for solar hot water systems shall be allowed to extend beyond the perimeter of the building on a side-yard exposure. Solar collectors mounted on the sides of buildings and serving as awnings are considered to be building-integrated systems and are regulated as awnings.

2. **Ground-mounted Solar Energy Systems** — Ground-mounted solar energy systems may not extend into the side-yard or rear setback when oriented at minimum design tilt, except as otherwise allowed for building mechanical systems.

Visibility and Aesthetics

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

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

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

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

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

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

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

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

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

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

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

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

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

   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-mounted system, including the property lines.

Building Integrated PV

Building integrated solar energy systems can include solar energy systems built into roofing (existing technology includes both solar shingles and solar roofing tiles), into awnings, skylights, and walls.

Roof-Mounted Solar Energy Systems

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

Reflectors

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

Impervious Surface Coverage

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

Roof Coverage

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

Plan Approval

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

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

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

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

I. Compliance with State Electric Code — All photovoltaic systems shall comply with the Iowa State Electric Code.

J. Compliance with State Plumbing Code — Solar thermal systems shall comply with applicable Iowa State Plumbing Code requirements.

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

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

A. Principal Use General Standards

1. **Site Design**

a. **Setbacks** – Community- and large-scale solar arrays must meet the following setbacks;

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

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

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

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

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

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

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

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

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

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

Community-Scale Solar or Solar Gardens

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

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

Appropriate Setbacks

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

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

Screening

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

c. **Ground cover and buffer areas** – the following provisions shall apply to the clearing of existing vegetation and establishment of vegetated ground cover. Additional site-specific conditions may apply as required by Model Community.

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

2. The applicant shall submit a vegetative management plan prepared by a qualified professional or reviewed and approved by a natural resource agency or authority, such as the Natural Resources Conservation Service of the United States Department of Agriculture, the XXXXX County Soil and Water Conservation District, the XXXXX County Conservation Board, Iowa State University Extension and Outreach, the Iowa Department of Natural Resources, and the Iowa Department of Agriculture and Land Stewardship. The plan shall identify:

a. The natural resource professionals consulted or responsible for the plan

b. The conservation, habitat, eco-system, or agricultural goals, which may include: providing habitat for pollinators such as bees and monarch butterflies, providing habitat for wildlife such as upland nesting birds and other wildlife, establishing vegetation for livestock grazing, reducing on-site soil erosion, and improving or protecting surface or ground water quality.

c. the intended mix of vegetation upon establishment

d. the management methods and schedules for how the vegetation will be managed on an annual basis, with particular attention given to the establishment period of approximately three years.

3. Soils shall be planted and maintained in perennial vegetation for the full operational life of the project, to prevent erosion, manage run off and build soil.

4. Vegetative cover should include a mix of perennial grasses and wildflowers that will preferably result in a short stature prairie with a diversity of forbs or flowering plants that bloom throughout the growing season. Blooming shrubs may be used in buffer areas as appropriate for visual screening. Perennial vegetation (grasses and forbs) are preferably native to Iowa, but where appropriate to the vegetative management plan goals, may also include other naturalized and non-invasive species which provide habitat for pollinators and wildlife and/or other ecosystem services (i.e. clovers).

5. Plant material must not have been treated with systemic insecticides, particularly neonicontinoids.

Stormwater and Water Quality Standards

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

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

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

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

f. **Fencing** — Perimeter fencing for the site shall not include barbed wire or chain link wire designs, and shall preferably use wildlife-friendly fencing standards that include clearance at the bottom. Alternative fencing can be used if the site is incorporating agrivoltaics.

2. **Stormwater and NPDES** — Solar farms are subject to Model Community's stormwater management and erosion and sediment control provisions and NPDES permit requirements. Solar collectors shall not be considered impervious surfaces if the project complies with ground cover standards, as described in A.1.c. of this ordinance.

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

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

Site Plan

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

5. **Aviation Protection** — For solar farms located within 500 feet of an airport or within approach zones of an airport, the applicant must complete and provide the results of a glare analysis through a qualitative analysis of potential impact, field test demonstration, or geometric analysis of ocular impact in consultation with the Federal Aviation Administration (FAA) Office of Airports, consistent with the Interim Policy, FAA Review of Solar Energy Projects on Federally Obligated Airports, or most recent version adopted by the FAA.

Aviation Standards, Glare

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

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

Agricultural Protection

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

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

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

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

d. Locating the project in a wellhead protection area for the purpose or removing agricultural uses from high risk recharge areas.

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

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

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

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

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

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

1. **Rooftop gardens permitted** – Rooftop community systems are permitted in all districts where buildings are permitted.
2. **Community-scale uses** – Ground-mounted community solar energy systems must cover no more than ten acres (project boundaries), and are a permitted use in industrial and agricultural districts, and permitted with standards or conditional in all other non-residential districts. Ground-mounted solar developments covering more than ten acres shall be considered large-scale solar.
3. **Dimensional standards** – All structures must comply with setback and height, standards for the district in which the system is located.
4. **Other standards** – Ground-mounted systems must comply with all required standards for structures in the district in which the system is located.

Defining Community-Scale Solar

The acreage size for community-scale solar garden written here (10 acres) is the high end of project size for a one megawatt system, but community-scale could be defined as high as 10 megawatts (100 acre project size). Community-scale solar is the size that can fit in to the landscape.

Drinking Water Protection

In identifying preferred areas or districts for solar principal uses, the community should consider co-benefits of solar energy development. One such potential co-benefit is protection of drinking water supplies. Solar energy development may be intentionally sited within vulnerable portions of public water supply systems as a best management practice to restore and protect perennial groundcover that reduces nitrate contamination of ground water supplies.

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

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

Large-Scale Solar Conditional Uses

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

Example Use Table

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

P = Permitted

PS = Permitted Special (additional separate permit or review)

C = Conditional

Blank Cell = Prohibited

Solar as a Land Use

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

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

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

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

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

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

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

VII. Solar Access — Model Community encourages protection of solar access in all new subdivisions and allows for solar resources to be protected consistent with Iowa Statutes.

Homeowner Installation Rights Protected

"City councils and county boards of supervisors may include in ordinances relating to subdivisions a provision prohibiting deeds for property located in new subdivisions from containing restrictive covenants that include unreasonable restrictions on the use of solar collectors."

Source: Iowa Statutes, 564A.8

A. Solar Easements Allowed — Model Community allows solar easements to be filed, consistent with Iowa State Code 564A7. Any property owner can purchase an easement across neighboring properties to protect access to sunlight. The easement can apply to buildings, trees, or other structures that would diminish solar access. In situations where the easements are not voluntarily agreed to, the solar access regulatory board may determine whether or not granting an easement is appropriate, consistent with Iowa Statutes 564A.3.

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

Covenants and HOA Design Standards

One of the most common barriers to solar energy in developing areas are restrictive covenants in new subdivisions. The covenants are intended to maintain 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 limit the developer or homeowner's association from creating unwarranted restrictions on a sustainable source of energy. Iowa law (noted above) allows communities to protect individual home owners' solar development rights from restrictive covenants in new subdivisions. Some language is provided here, but the language should be included in the subdivision ordinance, consistent with state law. Communities should, for clarity, ensure that covenants requiring design review of improvements (even though the design review covenant does not mention solar) must make reasonable provisions for allowing solar development by homeowners.

Iowa Statutes 564A.7 SOLAR ACCESS EASEMENTS.

1. Persons, including public bodies, may voluntarily agree to create a solar access easement. A solar access easement whether obtained voluntarily or pursuant to the order of a solar access regulatory board is subject to the same recording and conveyance requirements as other easements.

2. A solar access easement shall be created in writing and shall include the following:

a. The legal description of the dominant and servient estates.

b. A legal description of the space which must remain unobstructed expressed in terms of the degrees of the vertical and horizontal angles through which the solar access easement extends over the burdened property and the points from which these angles are measured.

3. In addition to the items required in subsection 2 the solar access easement may include, but the contents are not limited to, the following:

a. Any limitations on the growth of existing and future vegetation or the height of buildings or other potential obstructions of the solar collector.

b. Terms or conditions under which the solar access easement may be abandoned or terminated.

c. Provisions for compensating the owner of the property benefiting from the solar access easement in the event of interference with the enjoyment of the solar access easement, or for compensating the owner of the property subject to the solar access easement for maintaining that easement.

VIII. Renewable Energy Condition for Certain Permits

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

1. Impacts on the performance of the electric distribution system,
2. Increased local emissions of greenhouse gases associated with the proposal,
3. Need for electric vehicle charging infrastructure to offset transportation-related emissions for trips generated by the new development,
4. Other impacts of the proposed development that are inconsistent with the Model Community Comprehensive Plan.

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

Renewable Energy Conditions, Incentives

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

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

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

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

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

Solar Roof Incentives

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

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

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

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

1. **Solar Access Lots Identified** — At least __% of the lots, or a minimum of __ lots, are identified as solar development lots.
2. **Covenant Assigned** — Solar access lots are assigned a covenant that homes built upon these lots must include a solar energy system. Photovoltaic systems must be at least three (3) KW in capacity.
3. **Additional Fees Waived** — Model Community will waive any additional fees for filing of the covenant.

Solar Ready Buildings

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

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

Solar Access Subdivision Design

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

Illinois Solar Model Ordinance

Photo by Katharine Chute

Prepared by Great Plains Institute with support from Sunshot and the Energy Foundation

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Model Solar Ordinance – Illinois

Introduction

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

Model Solar Energy Standards

This ordinance is based on the model solar energy ordinance originally created for the Department of Energy's Phase I Rooftop Solar Challenge program in Minnesota, and updated for the three-state Grow Solar initiative, funded by Rooftop Solar Challenge Phase 2. This version was last updated June 2020.

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

Solar Energy Issues

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

1. *Land use conflicts and synergies*. Solar energy systems have few nuisances. But solar development can compete for land with other development options, and visual impacts and perceived safety concerns sometimes create opposition to solar installations. Good design and attention to aesthetics can address most concerns for rooftop or accessory use systems. Good siting and site design standards for large- and community-scale solar can similarly resolve conflicts and create co-benefits from solar development such as restoring habitat, diversifying agricultural businesses, and improving surface and ground waters.
2. *Protecting access to solar resources*. Solar resources are a valuable component of property ownership. Development regulations can inadvertently limit a property owner's ability to access their solar resource. Communities should consider how to protect and develop solar resources in zoning, subdivision, and other development regulations or standards.
3. *Encouraging appropriate solar development*. Local government can go beyond simply removing regulatory barriers and encourage solar development that provides economic development, climate protection, and natural resources co-benefits. Local governments have a variety of tools to encourage appropriately sited and designed solar development to meet local goals.

Components of a Solar Standards Ordinance

Solar energy standards should:

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

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

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

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

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

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

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

Different Community Types and Settings

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

Solar development is not one thing

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

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

Model Ordinance

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

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

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

1. Goal – Encourage the use of local renewable energy resources, including appropriate applications for wind, solar, and biomass energy.
2. Goal – Promote sustainable building design and management practices to serve current and future generations.
3. Goal – Assist local businesses to lower financial and regulatory risks and improve their economic, community, and environmental sustainability.
4. Goal – Efficiently invest in and manage public infrastructure systems to support development and growth.

Comprehensive Plan Goals

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

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

The Comprehensive Plan may not include goals that are enhanced by solar development, (such as climate protection or local resource economic goals). The community should consider creating a local energy plan or similar policy document to provide a policy foundation for solar development regulation.

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

Climate Protection Strategies

Local governments that are participating in the Cities for Climate Protection program, Mayor's Climate Protection signatories, the Cool Cities/Cool Counties program, or have adopted climate protection or energy independence policies or plans can use private solar investment to meet those goals.

C. Consistency with Regional Plans – Model Community is part of a regional planning process that has developed recommendations for greenhouse gas reductions, a purpose served by encouraging local solar development.

D. 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.

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

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

III. Definitions

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

Building-integrated Solar Energy Systems – A solar energy system that is an integral part of a principal or accessory building, rather than a separate mechanical device, replacing or substituting for an architectural or structural component of the building. Building-integrated systems include, but are not limited to, photovoltaic or hot water solar energy systems that are contained within roofing materials, windows, skylights, and awnings.

Solar Definitions

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

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

Community Solar Garden – A solar energy system that provides retail electric power (or a financial proxy for retail power) to multiple community members or businesses residing or located off-site from the location of the solar energy system. Also referred to as shared solar.

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

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

Differentiating Solar Uses by Size

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

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

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

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

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

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

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

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

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

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

Solar Collector – 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. The collector does not include frames, supports, or mounting hardware.

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

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

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

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

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

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

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

Solar Resource

Understanding what defines a "solar resource" is foundational to how land use regulation affects solar development. Solar energy resources are not simply where sunlight falls. A solar resource has minimum spatial and temporal characteristics, and needs to be considered not only today but also into the future. Solar energy equipment cannot 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.

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

A. Height– Solar energy systems must meet the following height requirements:

1. Building or roof-mounted solar energy systems shall not exceed the maximum allowed height in any zoning district. For purposes of height measurement, solar energy systems other than building-integrated systems shall be given an equivalent exception to height standards as building-mounted mechanical devices or equipment.

2. Ground or pole-mounted solar energy systems shall not exceed 15 feet in height when oriented at maximum tilt.

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

Height - Rooftop System

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

Height - Ground or Pole Mounted System

This ordinance sets a 15-foot height limit, which is typical for residential accessory uses. Some communities allow solar to be higher than other accessory uses in order to enable capture of the lot's solar resource when lots and buildings are closer together. An alternative is to balance height with setback, allowing taller systems if set back farther– for instance, an extra foot of height for every extra two feet of setback. In rural (or large lot) areas, solar resources are unlikely to be constrained by trees or buildings on adjacent lots and the lot is likely to have adequate solar resource for a lower (10-15 foot) ground-mount application.

B. Setback– 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, as allowed below.

1. **Roof or Building-mounted Solar Energy Systems** – The collector surface and mounting devices for roof-mounted solar energy systems shall not extend beyond the exterior perimeter of the building on which the system is mounted or built, unless the collector and mounting system has been explicitly engineered to safely extend beyond the edge, and setback standards are not violated. Exterior piping for solar hot water systems shall be allowed to extend beyond the perimeter of the building on a side yard exposure. Solar collectors mounted on the sides of buildings and serving as awnings are considered to be building-integrated systems and are regulated as awnings.

2. **Ground-mounted Solar Energy Systems**– Ground-mounted solar energy systems may not extend into the side-yard or rear setback when oriented at minimum design tilt, except as otherwise allowed for building mechanical systems.

Visibility and Aesthetics

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

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

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

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

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

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

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

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

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

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

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

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

Building Integrated PV

Building integrated solar energy systems can include solar energy systems built into roofing (existing technology includes both solar shingles and solar roofing tiles), into awnings, skylights, and walls.

Roof-Mounted Solar Energy Systems

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

Reflectors

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

Impervious Surface Coverage

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

Roof Coverage

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

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

1. Plan Applications. Plan applications for solar energy systems shall be accompanied by to-scale horizontal and vertical (elevation) drawings. The drawings must show the location of the system on the building or on the property for a ground-mount system, including the property lines.

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

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

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

I. Compliance with State Electric Code — All photovoltaic systems shall comply with the Illinois State Electric Code.

J. Compliance with State Plumbing Code — Solar thermal systems shall comply with applicable Illinois State Plumbing Code requirements.

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

Plan Approval

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

Glare (Accessory Uses)

This ordinance does not include glare standards for accessory use solar installations. Solar collectors (the panels) have glass surfaces and thus will reflect light. However, the glare risk associated with accessory use solar is generally lower and less intrusive to nearby land uses than glare from glass windows, which are ubiquitous in developed areas. The surface area of a residential solar array may actually be less than the window surface area of a typical single family home. The horizontal orientation of a window is much more likely to reflect sunlight into the neighbor's home or onto a nearby street than is a solar array (which is tilted toward the sky). In most cases, a solar panel reflects less than a window.

For the most part, concerns about glare from residential systems are misplaced: local governments do not regulate reflected light from window glass or other glass building components. That is not to say that there is not occasionally glare from a solar panel - if the angle of the sun and the panel and the viewer are positioned just right. But, like windows, the reflection is intermittent and of short duration.

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

A. Principal Use General Standards

1. Site Design

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

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

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

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

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

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

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

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

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

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

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

Community-Scale Solar or Solar Gardens

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

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

Appropriate Setbacks

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

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

Screening

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

c. Ground cover and buffer areas – The following provisions shall apply to the clearing of existing vegetation and establishment of vegetated ground cover. Additional site-specific conditions may apply as required by Model Community.

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

2. The project design shall include the installation and establishment of ground cover meeting the beneficial habitat standard consistent with 525 ILCS 55/1 "Pollinator-Friendly Solar Site Act" or successor statutes and guidance as set by the Illinois Department of Natural Resources.

3. The applicant shall submit a vegetation management plan adhering to guidance set forth by the pollinator-friendly scorecard published by the Illinois Department of Natural Resources.

4. Beneficial habitat standards shall be maintained on the site for the duration of operation, until the site is decommissioned.

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

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

7. Plant material must not have been treated with systemic insecticides, particularly neonicontinoids.

Stormwater and Water Quality Standards

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

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

Drinking Water Protection

In identifying preferred areas or districts for solar principal uses the community should consider co-benefits of solar energy development. One such potential co-benefit is protection of drinking water supplies. Solar energy development may be intentionally sited within vulnerable portions of public water supply systems as a best management practice to restore and protect perennial groundcover that reduces nitrate contamination of ground water supplies.

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

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

2. Stormwater and NPDES — Solar farms are subject to Model Community's stormwater management and erosion and sediment control provisions and NPDES permit requirements. Solar collectors shall not be considered impervious surfaces if the project complies with ground cover standards, as described in A.1.c of this ordinance.

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

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

Site Plan

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

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

Aviation Standards, Glare

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

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

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

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

Agricultural Protection

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

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

   d. Locating the project in wellhead protection area for the purpose of removing agricultural uses from high risk recharge areas.

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

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

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

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

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

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

Defining Community-Scale Solar

The acreage size for community-scale solar garden written here (10 acres) is the high end of project size for a one megawatt system, but community-scale could be defined as high as 10 megawatts (100 acre project size). Community-scale solar is the size that can fit in to the landscape.

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

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

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

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

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

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

Large-Scale Solar Conditional Uses

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

Example Use Table

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

P = Permitted

PS = Permitted Special (additional separate permit or review)

C = Conditional

Blank Cell = Prohibited

Solar as a Land Use

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

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

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

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

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

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

VI. Restrictions on Solar Energy Systems Limited – Consistent with 765 ILCS 165, no homeowners' agreement, covenant, common interest community, or other contract between multiple property owners within a subdivision of Model Community shall prohibit or restrict homeowners from installing solar energy systems. No energy policy statement enacted by a common interest community shall be more restrictive than Model Community's solar energy standards.

Homeowner Installation Rights Protected

No deed restrictions, covenants, or similar binding agreements running with the land shall prohibit or have the effect of prohibiting a solar energy system from being installed on a building erected on a lot or parcel covered by the deed restrictions […]

Source: Illinois Statutes, 765 ILCS 165/20

VII. Renewable Energy Condition for Certain Permits

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

1. Impacts on the performance of the electric distribution system,
2. Increased local emissions of greenhouse gases associated with the proposal,
3. Need for electric vehicle charging infrastructure to offset transportation-related emissions for trips generated by the new development,
4. Other impacts of the proposed development that are inconsistent with the Model Community Comprehensive Plan.

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

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

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

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

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

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

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

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

Solar Roof Incentives

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

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

Solar Ready Buildings

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

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

Solar Access Subdivision Design

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

Model Solar Ordinance

for Indiana local governments

Photo credit: Great Plains Institute

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Model Solar Ordinance – Indiana

Introduction

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

Model Solar Energy Standards

This ordinance is based on the model solar energy ordinance originally created for the Department of Energy's Phase I Rooftop Solar Challenge program in Minnesota, and updated for the three- state Grow Solar initiative, funded by Rooftop Solar Challenge Phase 2.

However, solar energy is much more than just low-cost energy generation. Households and businesses seeking to reduce their carbon footprint see solar energy as a strong complement to energy efficiency. Agricultural producers see solar energy as an economic hedge against price volatility in commodity crops. Utilities see solar's declining cost, high reliability, and free fuel as a means to put downward pressure on electric rates. Corporate, institutional, and municipal buyers are actively acquiring carbon-free solar generation to meet climate and clean energy goals. And innovative solar site designs are creating and capturing habitat and water quality co-benefits by using solar with habitat-friendly ground cover to restore ecosystem functions. Innovative solar site designs can also create and capture biodiversity and water quality benefit with vegetation plans that include perennial ground cover to enhance ecosystem functions that have been lost over the decades.

Solar Energy Issues

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

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

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

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

Components of a Solar Standards Ordinance

Solar energy standards should:

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

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

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

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

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

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

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

Different Community Types and Settings

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

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

Solar development is not one thing

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

How to Use this Model Ordinance

This Model Ordinance is based on research and best practices identified through working with over 100 Midwestern communities over the last ten years as solar energy markets evolved and expanded. The standards included in this model reflect the real-world controversies and opportunities the communities faced as the solar energy market grew. The portfolio of standards included in the model is intended to provide a reference for how communities can address those controversies and opportunities to make solar development more predictable, solar land use regulation more transparent, and regulatory standards more consistent across jurisdictions within the same solar market.

The model has been tailored to reflect Indiana-specific enabling statutes, ordinance practices, and community priorities currently seen in the state, with input from local planning, solar industry, and other experts. Because Indiana communities' ordinances, comprehensive plans and other local planning documents naturally vary, not all provisions included in the Model Ordinance will be suitable for each individual community. Moreover, as this is a "best practices" document, communities may decide not to include one or more suggested provisions. A community may also be aware of elements not included in this Model Ordinance that they wish to include. These sorts of adjustments are to be expected.

Appendix A includes links to solar ordinances already adopted by Indiana communities. The authors have not reviewed these existing ordinances against the language provided in this Model Ordinance, but provide them for users' convenience.

Model Ordinance

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

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

A. Comprehensive Plan Goals – Model Community has goals in its Comprehensive Plan, including preserving the health, safety, and welfare of the community by promoting the safe, effective, and efficient use of solar energy systems. The solar energy standards specifically implement the following goals from the Comprehensive Plan:

1. **Goal** – Encourage the use of local renewable energy resources, including appropriate applications for wind, solar, and biomass energy and energy storage.
2. **Goal** – Promote sustainable building design and management practices to serve current and future generations.
3. **Goal** – Assist local businesses to lower financial and regulatory risks and improve their economic, community, and environmental sustainability.
4. **Goal** – Efficiently invest in and manage public infrastructure systems to support development and growth.

B. 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.

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

D. Consistency with Greenhouse Gas Reduction Plans – Model Community has developed recommendations for greenhouse gas reductions, a purpose served by encouraging local solar development.

E. Improve Competitive Markets – Solar energy systems offer additional energy choices to consumers and will improve competition in the electricity and natural gas supply markets.

Comprehensive Plan Goals

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

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

The Comprehensive Plan may not include goals that specifically address or would be enhanced by solar development (such as climate protection or local resource economic goals). While lack of a policy goal should not delay adoption of a solar ordinance, the community may wish to consider creating a local energy plan or similar policy document that provides guidance regarding solar development.

Climate Protection Strategies

Some local governments in Indiana have adopted climate resolutions, committed to national climate goals, or have otherwise identified greenhouse gas reduction or energy independence targets. Introductory language in solar ordinances can list those commitments. An increasing number of Hoosier local governments are using and promoting solar installations to meet their energy and greenhouse gas reduction goals, but there are many reasons other than climate-related goals for a community to prepare for solar developments.

III. Definitions

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

Building-integrated Solar Energy Systems – A solar energy system that is an integral part of a principal or accessory building, rather than a separate mechanical device, replacing or substituting for an architectural or structural component of the building. Building-integrated systems include, but are not limited to, photovoltaic or hot water solar energy systems that are contained within roofing materials, windows, skylights, and awnings.

Community-Scale Solar Energy System – A commercial solar energy system that converts sunlight into electricity for the primary purpose of serving electric demands off-site from the facility, either retail or wholesale. Community-scale systems are principal uses and projects typically cover less than 10 acres.

Community Shared Solar – A solar energy system that provides retail electric power (or a financial proxy for retail power) to multiple community members or businesses residing or located off-site from the location of the solar energy system.

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

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

Large-Scale Solar Energy System – A commercial solar energy system that converts sunlight into electricity for the primary purpose of wholesale sales of generated electricity. A large-scale solar energy system will have a project size greater than 10 acres and is the principal land use for the parcel(s) on which it is located. It can include collection and feeder lines, substations, ancillary buildings, solar monitoring stations and accessory equipment or structures thereto, that capture and convert solar energy into electrical energy, primarily for use in locations other than where it is generated.

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.

Pollinator-Friendly Solar Energy – A community- or large-scale solar energy system that meets the requirements of the 2020 Indiana

Solar Definitions

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

Differentiating Solar Uses by Size

Community-scale and large-scale systems are defined here as occupying less than 10 acres and greater than 10 acres, respectively. Some communities use a lower number (five acres) and some a higher number (up to 50 acres). An ex-urban city would likely use a lower number and a rural county could use a higher number. Community-scale is generally a size that can fit into the land use fabric of the community without assembly of separate parcels. Some communities have chosen not to distinguish between community- and large-scale, and instead use a single large-scale designation.

Pollinator Friendly Standards

As pollinator-friendly landscaping becomes more common for solar energy systems, organizations are publishing standards, checklists, and scorecards to help developers and local governments so they will not have to independently research the kinds of plants that are appropriate and so that landscaping described as "pollinator-friendly" can be assured to meet an independently established standard. In Indiana, examples include Purdue University's 2020 Indiana Solar Site Pollinator Habitat Planning Scorecard and the Michiana Area Council of Governments' (MACOG) Technical Guide: Establishment and Maintenance of Pollinator-Friendly Solar Projects. Porter County, Indiana has adopted pollinator-friendly language in its solar ordinance that also provides a useful guide. Using a standard establishes a common foundation for what constitutes a pollinator-friendly installation and saves the local government the dilemma of devising and policing a habitat standard.

Solar Site Pollinator Habitat Planning Scorecard developed by Purdue University or another pollinator-friendly checklist developed by a third-party as a solar-pollinator standard designed for Midwestern eco-systems, soils, and habitat.

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.

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

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

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

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

Solar Collector – 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. The collector does not include frames, supports, or mounting hardware.

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

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

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

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

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

Solar-Ready Design – The design and construction of a building that facilitates and makes feasible the installation of rooftop solar.

Solar Resource

Understanding what defines a "solar resource" is foundational to how land use regulation affects solar development. Solar energy resources are not simply where sunlight falls. A solar resource has minimum spatial and temporal characteristics, and needs to be considered not only today but also into the future. Solar energy equipment cannot 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.

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

A. Height – Solar energy systems must meet the following height requirements:

1. Building or roof-mounted solar energy systems shall not exceed the maximum allowed height in any zoning district. For purposes of height measurement, solar energy systems other than building-integrated systems shall be given an equivalent exception to height standards as building-mounted mechanical devices or equipment.

2. Ground or pole-mounted solar energy systems shall not exceed 15 feet in height when oriented at maximum tilt.

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

B. Setback – Solar energy systems must meet the accessory structure setback for the zoning district and principal land use associated with the lot on which the system is located, as allowed below.

1. **Roof or Building-mounted Solar Energy Systems** – The collector surface and mounting devices for roof-mounted solar energy systems shall not extend beyond the exterior perimeter of the building on which the system is mounted or built, unless the collector and mounting system has been explicitly engineered to safely extend beyond the edge, and setback standards are not violated. Exterior piping for solar hot water systems shall be allowed to extend beyond the perimeter of the building on a side yard exposure. Solar collectors mounted on the sides of buildings and serving as awnings are considered to be building-integrated systems and are regulated as awnings.

2. **Ground-mounted Solar Energy Systems** – Ground-mounted solar energy systems may not extend into the side-yard or rear setback when oriented at minimum design tilt, except as otherwise allowed for building mechanical systems.

C. Visibility – Solar energy systems in residential districts shall be designed to minimize visual impacts from the public right-of-way, as described in C.1-3, to the extent that doing so does not affect the cost or efficacy of the system, consistent with Indiana Code 36-7-2-8. Visibility standards do not apply to systems in non-residential districts, except for historic building or district review as described in E. below.

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.

Indiana Code Title 36. Local Government § 36-7-2-1

Sec. 8 . . . (b) A unit may not adopt any ordinance which has the effect of prohibiting or of unreasonably restricting the use of solar energy systems other than for the preservation or protection of the public health and safety.

(c) This section does not apply to ordinances which impose reasonable restrictions on solar energy systems. However, it is the policy of this state to promote and encourage the use of solar energy systems and to remove obstacles to their use. Reasonable restrictions on solar energy systems are those restrictions which:

(1) do not significantly increase the cost of the system or significantly decrease its efficiency; or (2) allow for an alternative system of comparable cost and efficiency.

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 System

This ordinance sets a 15-foot height limit, which is typical for residential accessory uses. Some communities allow solar to be higher than other accessory uses in order to enable capture of the lot's solar resource when lots and buildings are closer together. An alternative is to balance height with setback, allowing taller systems if set back farther – for instance, an extra foot of height for every extra two feet of setback. In rural (or large lot) areas, solar resources are unlikely to be constrained by trees or buildings on adjacent lots and the lot is likely to have adequate solar resource for a lower (10-15 foot) ground- mounted application.

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

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

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

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

D. Lot Coverage – Ground-mounted systems shall meet the existing lot coverage restrictions for the zoning district except as defined below.

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

2. Ground-mounted systems shall not count toward the maximum number of accessory structures permitted.

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

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

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

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-mounted system, including the property lines.

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

Visibility and Aesthetics

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

Building-integrated PV

Building-integrated solar energy systems can include solar energy systems built into roofing (existing technology includes both solar shingles and solar roofing tiles), into awnings, skylights, and walls.

Roof-Mounted Solar Energy Systems

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

Roof Coverage and Fire Code

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. The new 2018 IRC adopted by Indiana provides guidance for consistency with fire code and roof access. The permitting best practice is to allow for fire marshal variances where appropriate on access pathways.

G. Approved Solar Components – Electric solar energy system components must have an Underwriters Laboratory (UL) or equivalent listing and solar hot water systems must have an Solar Rating & Certification Corporation (SRCC) or equivalent rating.

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

I. Compliance with State Electric Code – All photovoltaic systems shall comply with the Indiana State Electric Code.

J. Compliance with State Plumbing Code – Solar thermal systems shall comply with applicable Indiana State Plumbing Code requirements.

K. Utility Notification – It is recommended that the interconnection application be submitted to the utility prior to applying for required permits. Grid-tied solar energy systems shall comply with interconnection requirements of the electric utility. Off-grid systems are exempt from this requirement.

V. Principal Uses. Model Community encourages the development of commercial or utility scale solar energy systems where such systems present few land use conflicts with current and future development patterns. Community and large-scale systems are either conditional or permitted with site plan review, and are excluded elsewhere.

A. **Principal Use General Standards**

1. Site Design

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

1. Property line setback from a non-participating landowner's property line must meet the established setback for buildings or structures in the district in which the system is located, except as otherwise determined in 1.a.6 below.

2. Property line setbacks between separate parcels both of which are participating in the project may be waived upon agreement of the landowner(s).

3. Roadway setback of 50 feet from the ROW of State highways and County and State Aid Highways (CSAHs), and 40 feet for other roads, except as otherwise determined in 1.a.6 below.

4. Housing unit setback of 150 feet from any existing dwelling unit of a non-participating landowner, except as otherwise determined in 1.a.6 below. Participating landowner housing must meet building setbacks or required yards for the district in which the project is located.

Impervious Surface Coverage

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

Historic Buildings

The standards set forth by the local historic preservation commission should be consistent with the standards for solar energy systems on historically designated buildings published by the U.S. Department of the Interior. If the local historic preservation commission does not have standards, local commissions should refer to the U.S. Department of Interior Standards and guidelines outlined at https://www.nps.gov/tps/sustainability/new-technology/solar-on-historic.htm

Plan Approval

This process is generally part of the process for obtaining a building permit. The standard that the model community typically uses for submittal requirements should be included here. If the community does not issue building permits, it can be tied to a land use permit instead. For rural areas or cities without zoning or building code standards, the plan approval section may be eliminated.

Use Standards

Most communities require a conditional use permit for large-scale solar development. The large size of such developments usually means that site-specific standards and design issues need to be considered. However, some communities have decided that sufficient oversight is provided by the Planning Commission in review of standards, and have chosen to list the use as permitted in appropriate districts. This is a decision to be made by each community in light of its oversight and review standards. To encourage large-scale solar development, list it as a permitted use.

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

6. All setbacks can be reduced by 50%, except that unwaived setbacks cannot be less than 30 feet, if the array has a landscape buffer that screens the array at the setback point of measurement.

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

1. A landscape plan shall be submitted that identifies the type and extent of proposed buffer and screening. Vegetation or another type of buffer can be proposed.

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

3. Screening shall not be required along highways or roadways, except as provided in 4. below, or along property lines within the same zoning district, except where the adjoining lot has an existing residential use.

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

c. Height – Large- and community-scale solar energy systems shall not exceed 20 feet.

Appropriate Setbacks

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

The setback distances provided here are general examples that should be modified to be consistent with other setbacks already in the ordinance. Property line setbacks are typically not in excess of 50 feet, special setbacks for housing or existing sensitive land uses may be larger. Excessive setbacks that are unique to solar land uses, or that are designed for land uses with health and safety or significant nuisance risks such as industrial uses or animal agriculture, are unjustified given the low level of risk or nuisance posed by the solar array. It is common for a participating landowner to agree to a setback shorter than stated in the established ordinance. In that case, a waiver of the setback should be allowed.

Screening

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

d. Ground cover and buffer areas (alternative A) – Community- or large-scale ground-mounted solar energy systems are required to adhere to the following standards. Additional site-specific conditions may apply as required by Model Community.

1. Ground around and under solar panels and in project site buffer areas shall be planted, established, and maintained for the life of the solar project in perennial vegetated ground cover meeting the definition of Pollinator-Friendly Solar Energy in Section III above.

a) All applicants shall submit a completed pollinator-friendly solar scorecard such as the 2020 Indiana Solar Site Pollinator Habitat Planning Scorecard developed by Purdue University, or a similar third-party solar pollinator standard designed for Midwest eco-systems and conditions.

b) When the scorecard results demonstrate the project does not qualify as pollinator-friendly, the applicant shall submit a landscaping plan detailing site conditions that prevent the site from being qualified and alternative means of meeting the water quality and habitat goals of the pollinator-friendly standard.

2. The site shall be planted and maintained to be free of invasive or noxious species, as listed by the Indiana Invasive Species Council. No insecticide use is permitted on the site. This provision does not apply to insecticide use in on-site buildings, in and around electrical boxes, spot control of noxious weeds, or as otherwise may be deemed necessary to protect public health and safety.

3. Projects maintained as pollinator-friendly compliant are exempt from landscaping requirements and post-construction stormwater management controls (as stated in Section V. A.2. below) that may be otherwise required under Model Community's development regulations, unless required due to special conditions by the plan commission or the Board of Zoning Appeals.

Importance of Ground Cover

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

If appropriately established, these ground cover standards also likely reduce maintenance costs and limit the need for chemical weed management, which also improves water quality outcomes.

Options for Ground Cover Standards

Two options are offered for ground cover standards. Alternative A requires perennial vegetation consistent with local eco-systems that meets the definition of "pollinator-friendly habitat," demonstrated through completion of the Purdue University pollinator scorecard or a similar third-party Midwest relevant checklist. Pollinator-friendly or habitat-friendly ground cover is a solar best practice encouraged or required by communities and some states for solar development throughout the Midwest. The inherent visual and water quality benefits of pollinator habitat can provide a basis to exempt the project from other landscaping and water quality requirements.

Alternative B requires regionally appropriate perennial ground cover. If the developer elects to use pollinator-friendly ground cover and wants to label it as such, the Purdue (or other) scorecard must be used, and other landscaping and water quality requirements are waived.

Other alternatives are also available and can be considered. Some communities may choose to apply a pollinator standard only under certain conditions, such as for mitigating taking farmland out of production. Another alternative is to encourage compliance with a habitat standard but make requirement decisions on a case by case basis in the permit review process.

e. Ground cover and buffer areas (alternative B) – Community- or large-scale ground-mounted solar energy systems are required to adhere to the following standards. Additional site-specific conditions may apply as required by Model Community.

1. Ground around and under solar panels and in project site buffer areas shall be planted, established, and maintained for the life of the solar project in perennial vegetated ground cover.

2. To the maximum extent feasible for site conditions, perennial vegetation ground cover shall be based on a diverse seed mix of native species consistent with guidance specific to the local area provided by

the Soil and Water Conservation District office or the Indiana Native Plant Society.

3. The owner/operator shall demonstrate site maintenance that is intended to remove invasive or noxious species, as listed by the Indiana Invasive Species Council, without harming perennial vegetation.

4. No insecticide use is permitted on the site. This provision does not apply to insecticide use in on-site buildings, in and around electrical boxes, spot control of noxious weeds, or as otherwise may be deemed necessary to protect public health and safety.

5. Plant material must not have been treated with systemic insecticides, particularly neonicontinoids.

6. Community- or large-scale ground-mounted solar energy systems that propose to install, establish, and maintain pollinator-friendly vegetative cover are to demonstrate the quality of their habitat by using guides such as Purdue University 2020 Indiana Solar Site Pollinator Habitat Planning Scorecard, or other third party solar-pollinator scorecards designed for Midwestern eco-systems, soils, and habitat.

7. Projects certified and maintained as pollinator-friendly compliant are exempt from landscaping requirements and post-construction stormwater management controls (as stated in Section V. A.2. below) that may be otherwise required under Model Community's development regulations, unless required due to special conditions by the plan commission or the Board of Zoning Appeals.

f. Foundations – A qualified engineer shall certify, prior to application for building permits, that the foundation and design of the solar panel racking and support is within accepted professional standards, given local soil and climate conditions.

g. Power and communication lines –

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

2. Power and communication lines between the project and the point of interconnection with the transmission system can be overhead.

h. Fencing – Perimeter fencing for the site shall not include barbed wire or woven wire designs and shall preferably use wildlife-friendly fencing standards that include clearance at the bottom. Alternative fencing can be used if the site is incorporating agrivoltaics.

2. **Stormwater and NPDES** – Large- and community-scale solar projects are subject to Model Community's stormwater management and erosion and sediment control provisions and Nonpoint Pollution Discharge Elimination System (NPDES) permit requirements. Solar collectors shall not be considered impervious surfaces if the project complies with ground cover standards, as described in A.1.d and e of this ordinance.

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

Site Plan

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

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

5. **Aviation Protection** – For large- and community-scale solar projects located within 500 feet of an airport or within approach zones of an airport, the applicant must complete and provide the results of a glare analysis through a qualitative analysis of potential impact, field test demonstration, or geometric analysis of ocular impact in consultation with the Federal Aviation Administration (FAA) Office of Airports, consistent with the Interim Policy, FAA Review of Solar Energy Projects on Federally Obligated Airports, or most recent version adopted by the FAA.

6. **Agricultural Protection** – Large- and community-scale solar projects must comply with model community's site assessment standards for identifying agricultural soils. Model Community may require mitigation for use of prime soils for solar array placement, including the following:

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

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

   c. Locating the project in a wellhead protection area for the purpose of removing agricultural uses from high risk recharge areas.

   d. Using pollinator-friendly ground cover, as defined in Section III.

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

   a. Decommissioning of the system must occur in the event the project does not produce power for 12 consecutive months. An owner may petition for an extension of this period upon showing of reasonable circumstances that have caused the delay in the start of decommissioning.

   b. The plan shall include provisions for removal of all structures and foundations to a depth of 48", restoration of soil and vegetation and assurances that financial resources will be available to fully decommission the site.

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

   d. Model Community may require the posting of a bond, letter of credit, a parent guarantee, or other financial surety to ensure proper decommissioning.

   e. The value of the decommission bond or letter of credit should consider the salvage value of the solar equipment.

Aviation Standards, Glare

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

Agricultural Protection

The agricultural protection section applies only to those communities that have adopted agricultural protection standards in their development regulations that apply to multiple types of development. In those instances, this provision applies those same standards to solar development. The ordinance language is written for a community that requires assessment of soils, but not necessarily protection of those soils. Communities should carefully evaluate to what degree solar development should be subject to the community's agricultural protection standards.

Solar and Prime Soils

Solar farms do not pose the same level or type of risk to agricultural practices or prime farm soil, as does housing or commercial development.

• State stormwater standards require, in most cases, establishment of perennial vegetation over the solar project site by the end of construction. The groundcover at solar farms will protect agricultural soil, build nutrients, prevent erosion, and improve topsoil quality at the site.

• Some forms of agriculture can be co-located with solar development, including grazing, small crop production, and apiaries.

• Solar farms can be easily turned back to agriculture at the end of the solar farm's life (now being estimated to be 35 years).

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

1. **Rooftop shared solar systems permitted** – Rooftop systems are permitted in all districts where buildings are permitted.

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

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

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

Drinking Water Protection

In identifying preferred areas or districts for solar principal uses, the community should consider co-benefits of solar energy development. One such potential co-benefit is protection of drinking water supplies. Solar energy development may be intentionally sited within vulnerable portions of public water supply systems as a best management practice to restore and protect perennial groundcover that reduces nitrate contamination of ground water supplies.

Defining Community-Scale Solar

The acreage size for community-scale solar garden written here (10 acres) is the high end of project size for a one-megawatt system, but community-scale could be defined as high as 10 megawatts (100-acre project size). Community-scale solar is the size that can fit in to the landscape.

Community-Scale Solar or Solar Gardens

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

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

C. Large-Scale Solar – Ground-mounted solar energy arrays that are the principal use on the lot are permitted under the following standards:

1. **Conditional use permit** – Large- and community-scale solar projects are conditional uses in agricultural districts, industrial districts, shoreland and floodplain overlay districts, airport safety zones subject to V.A.5. of this ordinance, and in the landfill/brownfield overlay district for sites that have completed remediation.

Large-Scale Solar Conditional Uses

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

Example Use Table

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

P = Permitted

PS = Permitted Special (additional separate permit or review)

C = Conditional

X = Prohibited

Solar as a Land Use

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

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

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

• Community-scale solar principal uses are either conditional uses or permitted uses, depending on the community decisions. Permitted uses are where a 10-acre development can be integrated into the landscape, and require special consideration in shoreland and floodplain overlay districts.

• Large-scale solar is prohibited in higher density districts and conditional or permitted with separate permit review in all other districts.

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

VI. Renewable Energy Condition for Certain Permits

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

1. Impacts on the performance of the electric distribution system,
2. Increased local emissions of greenhouse gases associated with the proposal,
3. Need for electric vehicle charging infrastructure to offset transportation-related emissions for trips generated by the new development, and
4. Other impacts of the proposed development that are inconsistent with the Model Community Comprehensive Plan.

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

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

A. Density Bonus - Any application for subdivision of land in the Districts that will allow the development of at least four (4) new lots of record shall be allowed to increase the maximum number of lots by 10% or one lot, whichever is greater, provided all building and wastewater setbacks can be met with the increased density, if the applicant enters into a development agreement guaranteeing at least three (3) kilowatts of PV for each new residence that has a solar resource.

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

Renewable Energy Conditions, Incentives

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

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

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

Solar Roof Incentives

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

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

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

1. **Solar Access Lots Identified** - At least 20% of the lots, or a minimum number of lots to be determined by Model Community.
2. **Covenant Assigned** - Solar access lots are assigned a covenant that homes built upon these lots must include a solar energy system. Photovoltaic systems must be at least three (3) KW in capacity.
3. **Additional Fees Waived** - Model Community may waive any additional fees for filing of the covenant.

Solar-Ready Buildings

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

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

Solar Access Subdivision Design

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

Appendix A

The following list contains solar ordinances proposed and adopted in Indiana. This list has not been vetted by the authors of Indiana's Model Solar Ordinance; instead, this list is intended to provide examples of what has already been adopted.

List of Solar Ordinances Adopted by Local Governments in Indiana *Last Updated October 2020*		
Local Government	**Adoption Date**	**Ordinance Link**
City of Goshen	2012; Amended in 2017	Goshen Zoning Ordinance > Solar Energy System Regulations
City of Plymouth	2017; Amended in 2019	City of Plymouth Zoning Ordinance Solar Energy Standards
City of South Bend	2019	South Bend Zoning Ordinance > Solar
Elkhart County	Dec 2014, Effective Feb 2015; Amended Jan 2020	Elkhart County Zoning Ordinance > Solar Panel Array
Fulton County	Unknown	Fulton County Zoning Ordinance > Solar Energy Systems Standard
Henry County	(proposed)	Draft Ordinance as of Oct 2020
Lake County	Sep 2020	Lake County Zoning Ordinance
Marshall County	2017; Amended Jan 2020*	Marshall County Zoning Ordinance > Solar Energy Systems
Porter County	Apr 2020	Porter County Unified Development Ordinance Amendment > Solar Ordinance Chaps. 2, 5 and 10
Posey County	Mar 2020	Posey County Zoning Ordinance > Renewable Energy Generation Systems for Cynthiana, Poseyville, and Mount Vernon
Posey County	Mar 2020	Posey County Zoning Ordinance > Renewable Energy Generation Systems for Unincorporated Areas
Pulaski County	Dec 2019, Effective Jan 2020	Pulaski County Unified Development Ordinance > Wind Energy Convergence and Solar Energy Systems
Randolph County	Jul 2020	Randolph County Solar Energy Systems Siting Regulations
Shelby County	Jul 2018	Shelby County Unified Development Ordinance > Commercial Solar Energy Systems Standards
St. Joseph County	Feb 2020	St. Joseph County Zoning Ordinance > Special Regulations for Renewable Energy Systems
Starke County	Jun 2019	Starke County Solar Energy Ordinance
White County	Jan 2019	White County Zoning Ordinance > Solar Farms and Solar Energy Systems

*under moratorium until 2021 to address decommissioning in the ordinance

Minnesota Solar Model Ordinance

Photo by Katharine Chute

Prepared by Great Plains Institute with support from Sunshot and the Energy Foundation

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Last Updated August 2020

Model Solar Ordinance – Minnesota

Introduction

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

Model Solar Energy Standards

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

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

Solar Energy Issues

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

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

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

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

Components of a Solar Standards Ordinance

Solar energy standards should:

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

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

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

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

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

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

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

Different Community Types and Settings

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

Solar development is not one thing

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

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

Model Ordinance

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

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

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

1. **Goal** – Encourage the use of local renewable energy resources, including appropriate applications for wind, solar, and biomass energy.
2. **Goal** – Promote sustainable building design and management practices to serve current and future generations.
3. **Goal** – Assist local businesses to lower financial and regulatory risks and improve their economic, community, and environmental sustainability.
4. **Goal** – Implement the solar resource protection element required under the Metropolitan Land Planning Act.

Comprehensive Plan Goals

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

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

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

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

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

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

Metropolitan Land Planning Act

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

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

III. Definitions

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

Beneficial Habitat Solar Energy – A community- or large-scale solar energy system that meets the requirements of the Minnesota Beneficial Habitat Standard consistent with consistent with Minnesota Statutes, section 216B.1642

Solar Definitions

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

Building-integrated Solar Energy Systems – A solar energy system that is an integral part of a principal or accessory building, rather than a separate mechanical device, replacing or substituting for an architectural or structural component of the building. Building-integrated systems include, but are not limited to, photovoltaic or hot water solar energy systems that are contained within roofing materials, windows, skylights, and awnings.

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

Differentiating Solar Uses by Size

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Solar Ready Design –The design and construction of a building that facilitates and makes feasible the installation of rooftop solar.

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

Solar Resource

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

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

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

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

2. Ground- or pole-mounted solar energy systems shall not exceed 15 feet in height when oriented at maximum tilt.

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

Height - Rooftop System

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

Height - Ground or Pole Mounted System

This ordinance sets a 15-foot height limit, which is typical for residential accessory uses. Some communities allow solar to be higher than other accessory uses in order to enable capture of the lot's solar resource when lots and buildings are closer together. An alternative is to balance height with setback, allowing taller systems if set back farther– for instance, an extra foot of height for every extra two feet of setback. In rural (or large lot) areas, solar resources are unlikely to be constrained by trees or buildings on adjacent lots and the lot is likely to have adequate solar resource for a lower (10-15 foot) ground-mount application.

B. Setback - Solar energy systems must meet the accessory structure setback for the zoning district and principal land use associated with the lot on which the system is located, except as allowed below.

1. **Roof- or Building-mounted Solar Energy Systems** – The collector surface and mounting devices for roof-mounted solar energy systems shall not extend beyond the exterior perimeter of the building on which the system is mounted or built, unless the collector and mounting system has been explicitly engineered to safely extend beyond the edge, and setback standards are not violated. Exterior piping for solar hot water systems shall be allowed to extend beyond the perimeter of the building on a side-yard exposure. Solar collectors mounted on the sides of buildings and serving as awnings are considered to be building-integrated systems and are regulated as awnings.

2. **Ground-mounted Solar Energy Systems** - Ground-mounted solar energy systems may not extend into the side-yard or rear setback when oriented at minimum design tilt, except as otherwise allowed for building mechanical systems.

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

Visibility and Aesthetics

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

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

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

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

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

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

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

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

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

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

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

F. Plan Approval Required - All solar energy systems requiring a

Building Integrated PV

Building integrated solar energy systems can include solar energy systems built into roofing (existing technology includes both solar shingles and solar roofing tiles), into awnings, skylights, and walls.

Roof-Mounted Solar Energy Systems

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

Reflectors

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

Impervious Surface Coverage

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

Roof Coverage

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

Plan Approval

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

building permit or other permit from Model Community shall provide a site plan for review.

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-mounted system, including the property lines.

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

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

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

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

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

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

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

A. Principal Use General Standards

1. Site Design

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

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

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

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

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

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

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

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

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

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

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

Community-Scale Solar or Solar Gardens

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

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

Appropriate Setbacks

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

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

Screening

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

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

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

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

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

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

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

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

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

Ground Cover Standards

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

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

Site Design in Conditional Use Permit

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

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

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

• maintenance standards limit or prevent pesticide use.

Financial Surety

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

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

f. **Fencing** Perimeter fencing forthe site shall not include barbed wire or woven wire designs, andshall preferably usewildlife-friendly fencing standards that include clearance at the bottom. Alternative fencing can be used if the site is incorporating agrivoltaics.

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

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

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

5. **Aviation Protection** - For solar farms located within 500 feet of an airport or within approach zones of an airport, the applicant must complete and provide the results of a glare analysis through a qualitative analysis of potential impact, field test demonstration, or geometric analysis of ocular impact in consultation with the Federal Aviation Administration (FAA) Office of Airports, consistent with the Interim Policy, FAA Review of Solar Energy Projects on Federally Obligated Airports, or most recent version adopted by the FAA.

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

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

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

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

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

Stormwater and Water Quality Standards

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

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

Site Plan

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

Aviation Standards, Glare

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

Agricultural Protection

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

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

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

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

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

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

Prime Farmland and Agrivoltaics

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

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

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

1. **Rooftop gardens permitted** - Rooftop community systems are permitted in all districts where buildings are permitted.
2. **Community-scale uses -** Ground-mounted community solar energy systems must cover no more than ten acres (project boundaries), and are a permitted use in industrial and agricultural districts, and permitted with standards or conditional in all other non-residential districts. Ground-mounted solar developments covering more than ten acres shall be considered large-scale solar.
3. **Dimensional standards** - All structures must comply with setback, height, and coverage limitations for the district in which the system is located.
4. **Other standards** - Ground-mounted systems must comply with all required standards for structures in the district in which the system is located.

Defining Community-Scale Solar

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

Drinking Water Protection

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

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

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

Large-Scale Solar Conditional Uses

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

Example Use Table

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

P = Permitted

PS = Permitted Special (additional separate permit or review)

C = Conditional

Blank Cell = Prohibited

Solar as a Land Use

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

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

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

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

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

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

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

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

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

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

Solar Easements

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

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

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

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

(more provisions, see Statute)

Source: Minnesota Stat. 500.30 Subd. 3.

VIII. Renewable Energy Condition for Certain Permits

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

1. Impacts on the performance of the electric distribution system,
2. Increased local emissions of greenhouse gases associated with the proposal,
3. Need for electric vehicle charging infrastructure to offset transportation-related emissions for trips generated by the new development,
4. Other impacts of the proposed development that are inconsistent with the Model Community Comprehensive Plan.

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

Renewable Energy Conditions, Incentives

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

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

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

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

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

Solar Roof Incentives

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

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

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

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

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

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

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

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

Solar Ready Buildings

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

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

Solar Access Subdivision Design

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

Wisconsin Solar Model Ordinance

Photo by Katharine Chute

Prepared by Great Plains Institute with support from Sunshot and the Energy Foundation

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Model Solar Ordinance – Wisconsin

Introduction

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

Model Solar Energy Standards

This ordinance is based on the model solar energy ordinance originally created for Solar Minnesota, under a Million Solar Roofs grant from the U. S. Department of Energy and updated for the three-state Grow Solar initiative, funded by Rooftop Solar Challenge Phase 2. It has been substantially updated several times to address additional issues and opportunities for Wisconsin communities and the evolving solar industry, last updated May 2020

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

Solar Energy Issues

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

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

2. *Protecting access to solar resources*. Solar resources are a valuable component of property ownership. Development regulations can inadvertently limit a property owner's ability to access their solar resource. Communities should consider how to protect and develop solar resources in zoning and subdivision processes, consistent with state law (Wisconsin Statute §66.0401).

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

Components of a Solar Standards Ordinance

Solar energy standards should:

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

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

3. *Limit regulatory barriers to developing solar resources.* Ensure that access to solar resources is not unduly limited by height, setback, or coverage standards, unless the restriction satisfies the conditions of Wisconsin Statute §66.0401 (1m) a-c.

4. *Define appropriate aesthetic standards.* Retain an as-of-right installation pathway for accessory uses while balancing design concerns in urban neighborhoods and historic districts. Per state law, design or aesthetic standards may not restrict the installation or use of solar energy systems, unless the restriction satisfies the conditions of Wisconsin Statute §66.0401 (1m) a-c.

5. *Address cross-property solar access issues.* Ensure solar installations have protected access across property lines in the subdivision process and in all zoning districts, per state law (Wisconsin Statute §700.41.

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

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

Different Community Types and Settings

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

Solar development is not one thing

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

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

Model Ordinance

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

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

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

1. **Goal** – Encourage the use of local renewable energy resources, including appropriate applications for wind, solar, and biomass energy.
2. **Goal** – Promote sustainable building design and management practices to serve current and future generations.
3. **Goal** – Assist local businesses to lower financial and regulatory risks and improve their economic, community, and environmental sustainability.
4. **Goal** – Efficiently invest in and manage public infrastructure systems to support development and growth.

Comprehensive Plan Goals

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

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

The Comprehensive Plan may not include goals that are enhanced by solar development, (such as climate protection or local resource economic goals). The community should consider creating a local energy plan or similar policy document to provide a policy foundation for solar development regulation.

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

C. Wisconsin Smart Planning – Wisconsin Smart Planning principles must be considered when local governments make planning, zoning, development, and resource management decisions. Model Community has adopted Principle 3 – Clean, Renewable, and Efficient Energy – to encourage the promotion of clean energy use through increased access to renewable energy resources.

D. 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.

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

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

III. Definitions

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

Building-integrated Solar Energy Systems – A solar energy system that is an integral part of a principal or accessory building, rather than a separate mechanical device, replacing or substituting for an architectural or structural component of the building. Building-integrated systems include but are not limited to photovoltaic or hot water solar energy systems that are contained within roofing materials, windows, skylights, and awnings.

Solar Definitions

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

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

Community Solar Garden – A solar energy system that provides retail electric power (or a financial proxy for retail power) to multiple community members or businesses residing or located off-site from the location of the solar energy system. Also referred to as shared solar.

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

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

Differentiating Solar Uses by Size

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

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

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

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

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

Renewable Energy Easement, Solar Energy Easement — An easement that limits the height or location, or both, of permissible development on the burdened land in terms of a structure or vegetation, or both, for the purpose of providing access for the benefited land to wind or sunlight passing over the burdened land, consistent with Wis Statutes 700.35.

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

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

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

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

Solar Collector — 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. The collector does not include frames, supports, or mounting hardware.

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

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

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

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

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

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

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

Solar Resource

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

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

A. Height – Solar energy systems must meet the following height requirements:

1. Building- or roof- mounted solar energy systems shall not exceed the maximum allowed height in any zoning district. For purposes of height measurement, solar energy systems other than building-integrated systems shall be given an equivalent exception to height standards as building-mounted mechanical devices or equipment.

2. Ground- or pole-mounted solar energy systems shall not exceed 15 feet in height when oriented at maximum tilt.

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

B. Setback — Solar energy systems must meet the accessory structure setback for the zoning district and primary land use associated with the lot on which the system is located, except as allowed below.

1. **Roof- or Building-mounted Solar Energy Systems** — the collector surface and mounting devices for roof-mounted solar energy systems shall not extend beyond the exterior perimeter of the building on which the system is mounted or built, unless the collector and mounting system has been explicitly engineered to safely extend beyond the edge, and setback standards are not violated. Exterior piping for solar hot water systems shall be allowed to extend beyond the perimeter of the building on a side -yard exposure. Solar collectors mounted on the sides of buildings and serving as awnings are considered to be building-integrated systems and are regulated as awnings.

2. **Ground-mounted Solar Energy Systems** — Ground-mounted solar energy systems may not extend into the side-yard or rear setback when oriented at minimum design tilt, except as otherwise allowed for building mechanical systems.

C. Visibility – Solar energy systems in residential districts shall be designed to minimize visual impacts from the public right-of-way, as described in C.1-3, to the extent that doing so does not affect the cost or efficacy of the system, consistent with WI Statute §66.0401.

Limitations on Zoning Restrictions

Under Wisconsin Statute §66.0401, local governments may not place any restriction on the installation or use of solar energy systems unless the restriction:

- *Serves to preserve or protect public **health or** safety*
- *Does not significantly increase the ysystem cost or decrease the efficiency*
- *Allows for an alternative system of comparable cost and efficiency*

Height - Rooftop System

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

Height - Ground or Pole Mounted System

This ordinance sets a 15-foot height limit, which is typical for residential accessory uses. Some communities allow solar to be higher than other accessory uses in order to enable capture of the lot's solar resource when lots and buildings are closer together. An alternative is to balance height with setback, allowing taller systems if set back farther– for instance, an extra foot of height for every extra two feet of setback. In rural (or large lot) areas, solar resources are unlikely to be constrained by trees or buildings on adjacent lots and the lot is likely to have adequate solar resource for a lower (10-15 foot) ground-mount application.

Visibility and Aesthetics

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

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

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

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

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

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

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

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

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

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

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

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

Building Integrated PV

Building integrated solar energy systems can include solar energy systems built into roofing (existing technology includes both solar shingles and solar roofing tiles), into awnings, skylights, and walls.

Roof-Mounted Solar Energy Systems

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

Reflectors

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

Impervious Surface Coverage

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

Roof Coverage

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

Plan Approval

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

1. Plan Applications — Plan applications for solar energy systems shall be accompanied by to-scale horizontal and vertical (elevation) drawings. The drawings must show the location of the system on the building or on the property for a ground-mount system, including the property lines.

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

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

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

I. Compliance with State Electric Code — All photovoltaic systems shall comply with the Wisconsin State Electric Code.

J. Compliance with State Plumbing Code — Solar thermal systems shall comply with applicable Wisconsin State Plumbing Code requirements.

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

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

Community-Scale Solar or Solar Gardens

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

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

A. Principal Use General Standards

1. Site Design

a. Setbacks — Community- and large-scale solar arrays must meet the following setbacks;

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

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

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

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

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

Appropriate Setbacks

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

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

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

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

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

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

Screening

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

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

c. Ground cover and buffer areas — the following provisions shall apply to the clearing of existing vegetation and establishment of vegetated ground cover. Additional site-specific conditions may apply as required by Model Community.

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

2. The applicant shall submit a vegetative management plan prepared by a qualified professional or reviewed and approved by a natural resource agency or authority, such as the Wisconsin Department of Natural Resources, County Soil and Water Conservation District, Land and Water Conservation Department or Natural Resource Conservation Service. The plan shall identify:

a. The natural resource professionals consulted or responsible for the plan

b. The conservation, habitat, eco-system, or agricultural goals, which may include: providing habitat for pollinators such as bees and monarch butterflies, providing habitat for wildlife such as upland nestine birds and other wildlife, establishing vegetation for livestock grazing, reducing on-site soil erosion, and improving or protecting surface or ground-water quality.

c. The intended mix of vegetation upon establishment.

d. The management methods and schedules for how the vegetation will be managed on an annual basis, with particular attention given to the establishment period of approximately three years.

3. Soils shall be planted and maintained in perennial vegetation for the full operational life of the project, to prevent erosion, manage run off and build soil.

4. Vegetative cover should include a mix of perennial grasses and wildflowers that will preferably result in a short stature prairie with a diversity of forbs or flowering plants that bloom throughout the growing season. Blooming shrubs may be used in buffer areas as appropriate for visual screening. Perennial vegetation (grasses and forbs) are preferably native to Wisconsin, but where appropriate to the vegetative management plan goals, may also include other naturalized and non-invasive species which provide habitat for pollinators and wildlife and/or other ecosystem services (i.e. clovers).

5. Plant material must not have been treated with systemic insecticides, particularly neonicontinoids.

Stormwater and Water Quality Standards

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

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

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

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

f. Fencing — Perimeter fencing for the site shall not include barbed wire or woven wire designs, and shall preferably use wildlife-friendly fencing standards that include clearance at the bottom. Alternative fencing can be used if the site is incorporating agrivoltaics.

2. **Stormwater and NPDES** — Solar farms are subject to Model Community's stormwater management and erosion and sediment control provisions and NPDES permit requirements. Solar collectors shall not be considered impervious surfaces if the project complies with ground cover standards, as described in A.1.c. of this ordinance.

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

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

5. **Aviation Protection** — For solar farms located within 500 feet of an airport or within approach zones of an airport, the applicant must complete and provide the results of a glare analysis through a qualitative analysis of potential impact, field test demonstration, or geometric analysis of ocular impact in consultation with the Federal Aviation Administration (FAA) Office of Airports, consistent with the Interim Policy, FAA Review of Solar Energy Projects on Federally Obligated Airports, or most recent version adopted by the FAA.

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

Site Plan

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

Aviation Standards, Glare

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

Agricultural Protection

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

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

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

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

d. Locating the project in a wellhead protection area for the purpose or removing agricultural uses from high risk recharge areas.

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

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

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

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

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

Defining Community-Scale Solar

The acreage size for community-scale solar garden written here (10 acres) is the high end of project size for a one megawatt system, but community-scale could be defined as high as 10 megawatts (100 acre project size). Community-scale solar is the size that can fit in to the landscape.

Drinking Water Protection

In identifying preferred areas or districts for solar principal uses, the community should consider co-benefits of solar energy development. One such potential co-benefit is protection of drinking water supplies. Solar energy development may be intentionally sited within vulnerable portions of public water supply systems as a best management practice to restore and protect perennial groundcover that reduces nitrate contamination of ground water supplies.

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

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

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

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

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

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

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

Large-Scale Solar Conditional Uses

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

Example Use Table

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

P = Permitted

PS = Permitted Special (additional separate permit or review)

C = Conditional

Blank Cell = Prohibited

Solar as a Land Use

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

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

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

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

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

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

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

VII. Renewable Energy Condition for Certain Permits

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

1. Impacts on the performance of the electric distribution system,
2. Increased local emissions of greenhouse gases associated with the proposal,
3. Need for electric vehicle charging infrastructure to offset transportation-related emissions for trips generated by the new development,
4. Other impacts of the proposed development that are inconsistent with the Model Community Comprehensive Plan.

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

Renewable Energy Conditions, Incentives

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

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

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

Solar Roof Incentives

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

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

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

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

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

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

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

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

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

Solar Ready Buildings

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

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

Solar Access Subdivision Design

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