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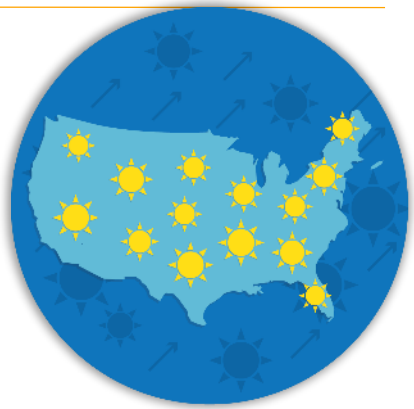
Planning for Solar Development

Brian Ross, AICP, LEED GA
Great Plains Institute
Minneapolis, MN

SolSmart®

- To make it **faster**, **easier**, and more **affordable** for more Americans to choose solar energy, SolSmart will **recognize at least 300 U.S. local governments** with a nationally prestigious solar designation.



Designation

- Earn Bronze, Silver, or Gold designation based on solar-related actions.
- Demonstrate that the community is "**open for solar business**," making it more attractive to solar industries.

Technical Assistance

- Communities can receive no-cost technical assistance on:
  - Siting
  - Permitting
  - Inspection
  - **Planning and Zoning**


TRANSFORMING THE ENERGY SYSTEM TO BENEFIT THE ECONOMY AND ENVIRONMENT.
• INCREASE ENERGY EFFICIENCY AND PRODUCTIVITY
• DECARBONIZE ELECTRICITY PRODUCTION
• ELECTRIFY THE ECONOMY AND ADOPT ZERO- AND LOW-CARBON FUELS
• CAPTURE CARBON FOR BENEFICIAL USE AND PERMANENT STORAGE
GREAT PLAINS INSTITUTE
Better Energy. Better World.

Local Government Solar Toolkits

Grow Solar Partnership

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

Five Solar-Ready Community Principles

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

Grow Solar

Model Solar Zoning for Illinois Municipalities

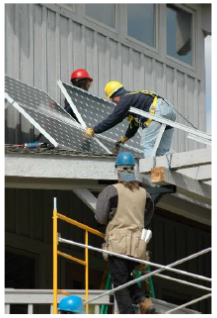


Photo Credit: Midwest Renewable Energy Association

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

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

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

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

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

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

Photo credit: Great Plains Institute

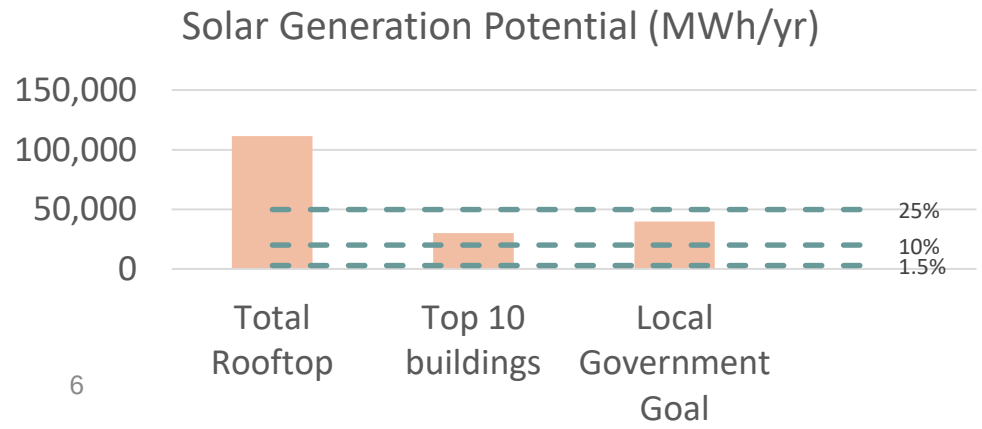
8.50 x 11.00 in

Powered by SunShot U.S. Department of Energy

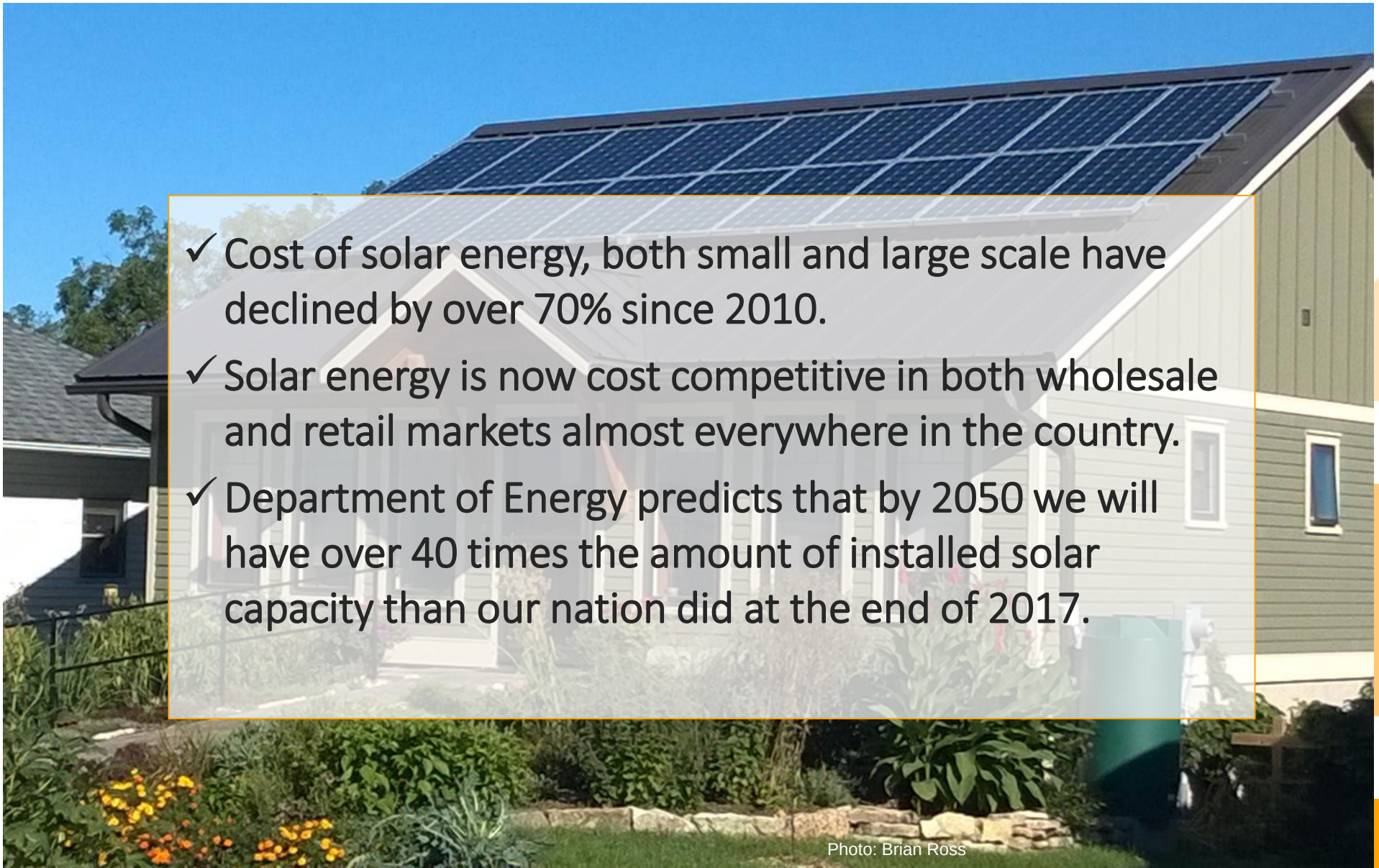
Solar-Ready Comprehensive Plans

Comprehensive Plans that:

1. Identify and define solar resources,
2. Acknowledge solar development benefits and desired co-benefits,
3. Identify solar development opportunities and conflicts in the community,
4. Set solar development targets or goals.



Why Plan for Solar Development?



- ✓ Cost of solar energy, both small and large scale have declined by over 70% since 2010.
- ✓ Solar energy is now cost competitive in both wholesale and retail markets almost everywhere in the country.
- ✓ Department of Energy predicts that by 2050 we will have over 40 times the amount of installed solar capacity than our nation did at the end of 2017.

Photo: Brian Ross

Why Plan for Solar Development?

- ✓ The 2017 Illinois Future Energy Jobs Act created broad market transformation incentives for solar energy.
- ✓ Illinois solar deployment is forecast to grow from approximately 100 MW of solar in 2018 to over 3,000 MW by 2030.
- ✓ Much of the growth will happen in the next five years.
- ✓ **All of it will be located in communities . . .**

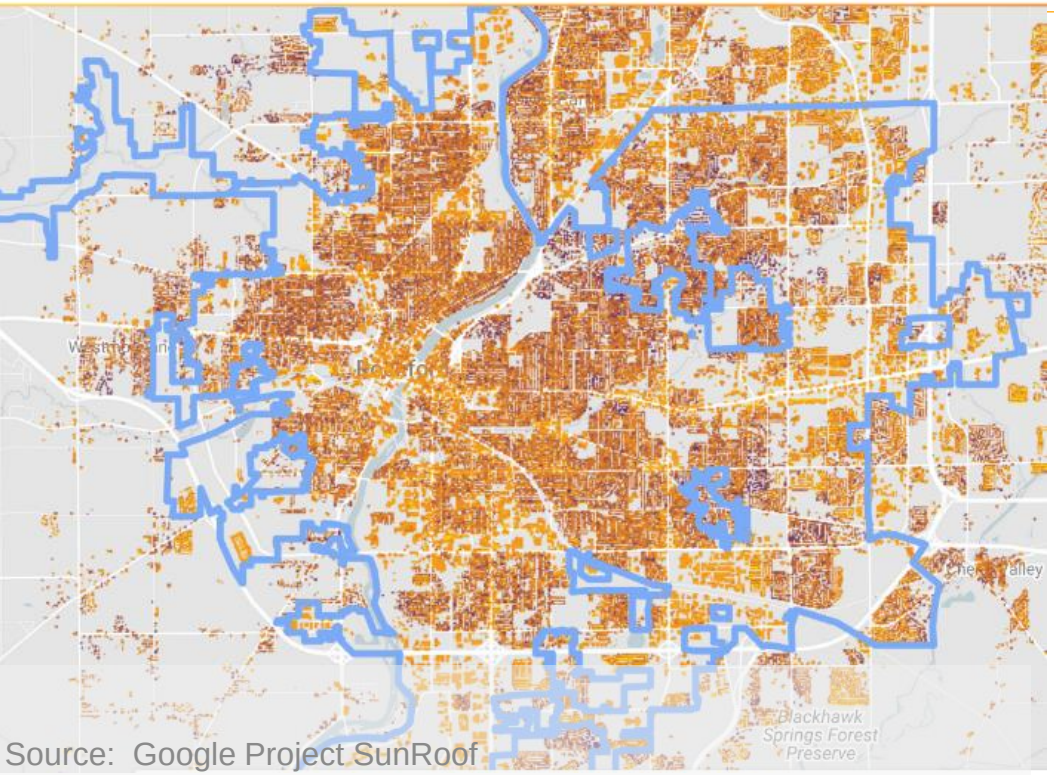
Photo: Flickr NREL Minnesota Pollinator Friendly Solar

Why Plan for Solar Development?


Photo credit: Brian Ross

- ✓ Leading to cheers about clean energy and decarbonizing our electric system.

Why Plan for Solar Development?



Source: Google Project SunRoof

Rockford, IL

- ✓ Rooftop Solar Reserves equaling 1,100 MW of generating capacity.
- ✓ Enough to supply an most of the community's annual electric needs.

- ✓ Leading to cheers about clean energy and decarbonizing our electric system.
- ✓ Leading to new value for property owners and new economic development opportunities large land owners and agricultural producers.

Why Plan for Solar Development?

MARKETS & POLICY (/ARTICLES/CATEGORY/MARKETS-AND-POLICY)

Inside the 'Chaos' Enveloping Illinois' Distributed Solar Market

At work on a fix, the state faces threats of "not only market confusion, but potentially market failure."

EMMA FOEHRINGER MERCHANT | OCTOBER 16, 2018

Illinois is going through its first solar growing pains.

Looking back on the evolution of state solar markets, Will Kenworthy — now Vote Solar's Midwest regulatory director — remembers companies camping out overnight to turn in applications for incentives in New Jersey.

He recalls Xcel Energy representatives in a 2014 meeting hoping for 25 megawatts of applications in the first part of the utility's community solar program. And he also remembers Xcel raking in applications (http://www.greenmark.us.com/insight/xcel-gets-427-solar-garden-applications-minnesota-less-one-week) for more than 400 megawatts in the program's first week.

- ✓ Leading to cheers about clean energy and decarbonizing our electric system.
- ✓ Leading to new value for property owners and new economic development opportunities large land owners and agricultural producers.
- ✓ Leading to predictions of being overwhelmed by the solar chaos…
- ✓ All within our communities.

Source Greentechmedia.com Oct 16, 2018

Solar Development is Development

Potential conflicts with other resources or development goals:

- Urban forests
- Historic resources
- Development, redevelopment, density
- Natural areas and habitat
- Aesthetics/character/viewsheds
- Agricultural practices
  - ✓ Loss of prime agricultural soils
  - ✓ Loss of local productive capacity
  - ✓ Fragmentation of land

Striving for Low-Impact Solar Development

With appropriate development guidance, both small and large-scale solar development can provide new opportunities while minimizing nuisances or cross-property impacts.

Large-Scale Development

- **Agricultural opportunities** – Diversified income stream for agricultural operators, co-located ag production, pollinator benefits for nearby crops
- **Water quality protection** – Perennial ground cover that reduces runoff, soil conservation, vegetated wetland and waterway buffers
- **Habitat value** – Pollinators, small mammals, birds, reptiles

Photo credit: Prairie Restorations

Striving for Low-Impact Solar Development

With appropriate development guidance, both small and large-scale solar development can provide new opportunities while minimizing nuisances or cross-property impacts.

Small-Scale Development

- **Green Building Standards** – LEED or other certification, Net Zero Energy
- **Co-location** – Parking lots (solar+EV), industrial buffer areas, commercial/industrial flat roofs
- **Property values** – enhancing residential value, architectural integration, property-based energy cost reductions, housing reinvestment

Photo credit: Innovative Power Systems

Land Use Plans for Solar Development

Good plans enable good development

- Solar energy is an economically valuable local resource
- Valuable resources should benefit the owner and the community
- Local plans lay the policy foundation for development regulation and programs that enable capture of benefits, while minimizing risks

Photo credit: Fresh Energy/Giving Tree

Table 15: Median Installer Wages

	INSTALLATION	PROJECT DEVELOPMENT	INSTALLATION AND PROJECT DEVELOPMENT
Entry-Level Wage	$15.00	$16.22	$15.00
Mid-Level Wage	$20.00	$25.00	$21.00
Senior/Supervisor Wage	$30.00	$38.00	$30.00

Source: 2017 Solar Jobs Census, Solar Foundation

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Land Use Planning for Large-Scale Solar

Megan Day, AICP
National Renewable Energy Laboratory

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The data, results, conclusions, and interpretations presented in this document have not been reviewed by technical experts outside NREL or the Solar Energy Technologies Office.

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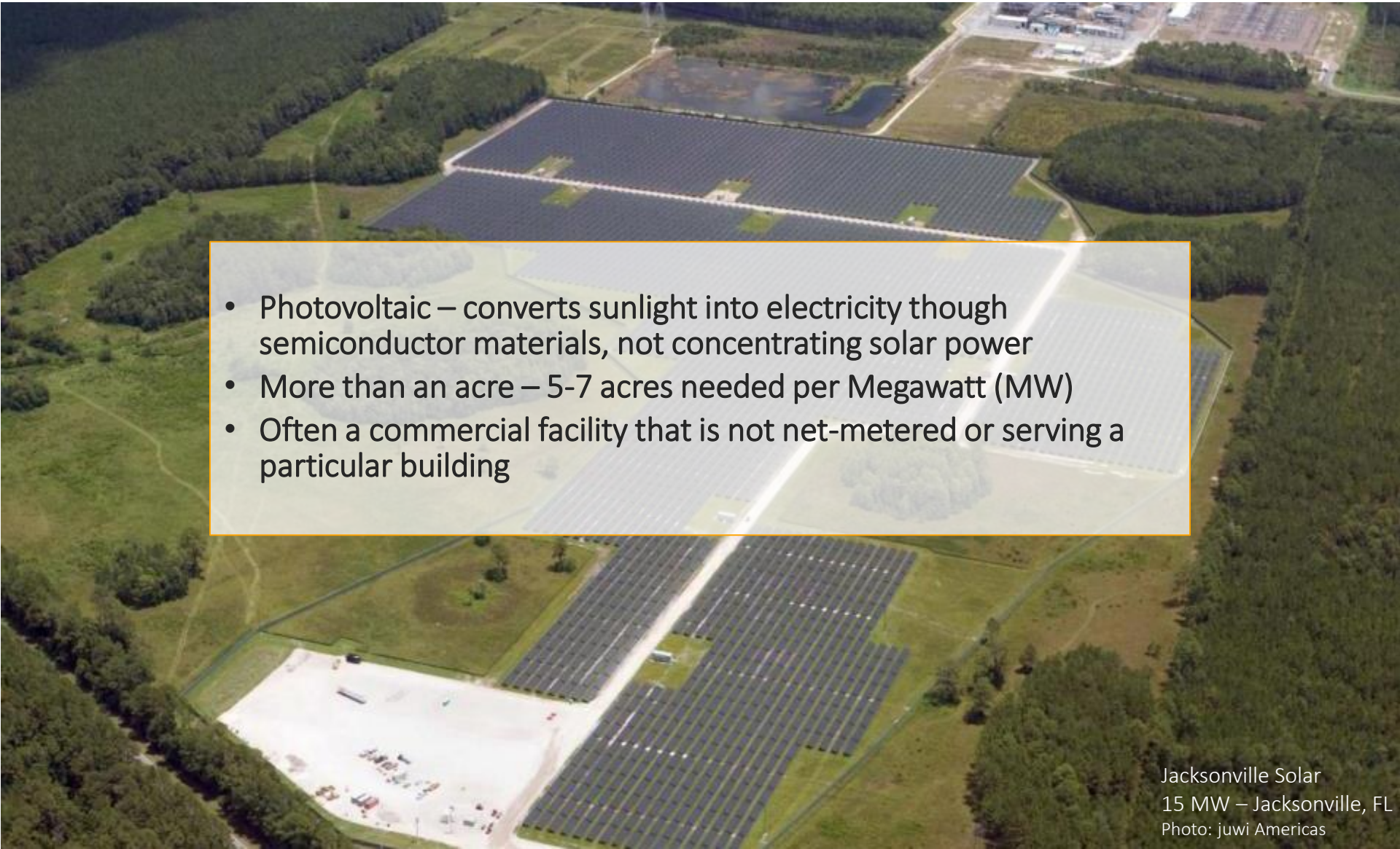
What is Large-Scale PV?

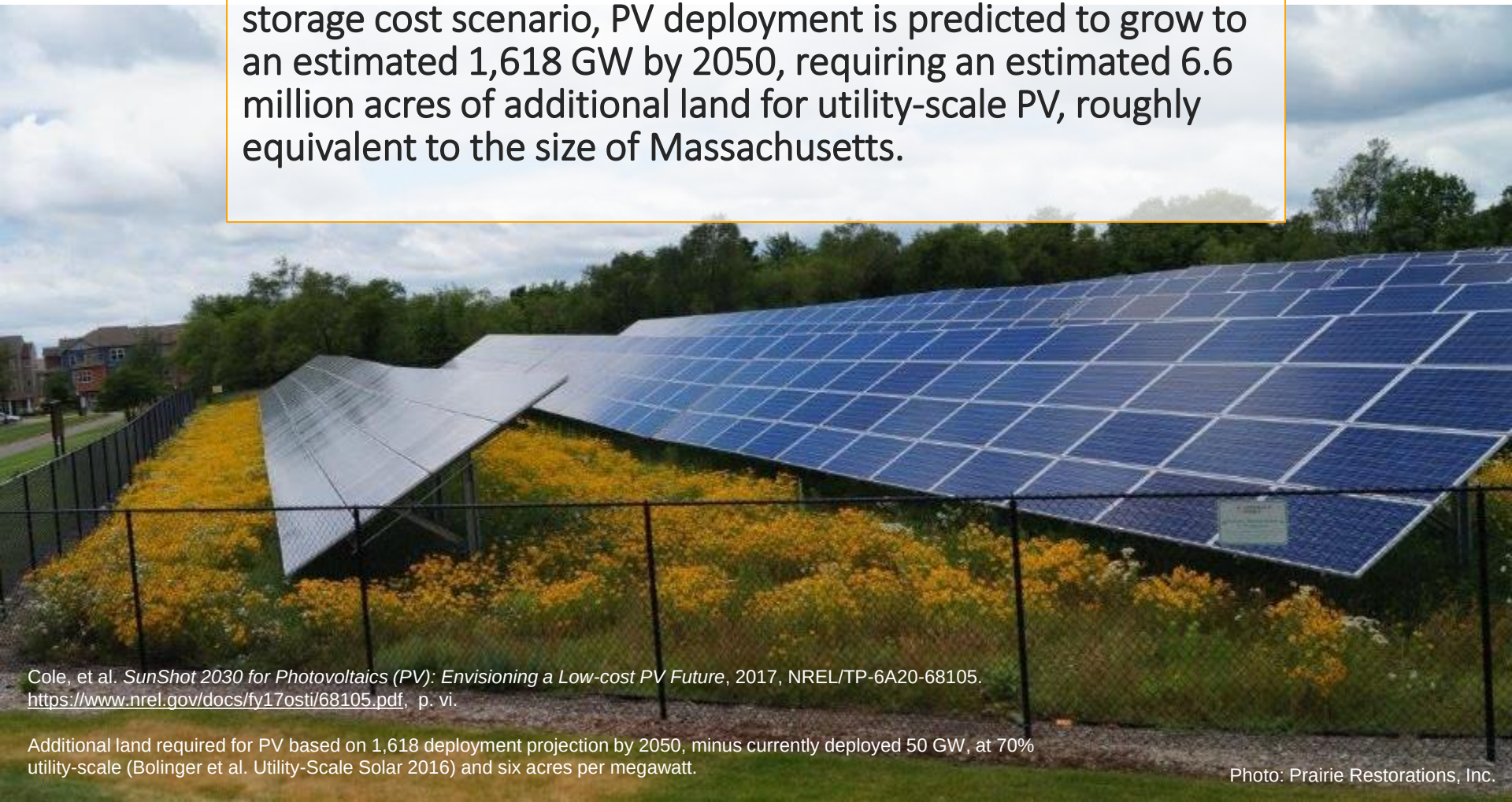


- Photovoltaic – converts sunlight into electricity though semiconductor materials, not concentrating solar power
- More than an acre – 5-7 acres needed per Megawatt (MW)
- Often a commercial facility that is not net-metered or serving a particular building

Jacksonville Solar
15 MW – Jacksonville, FL
Photo: juwi Americas

Why Plan for Large-Scale PV?

Under the Department of Energy's SunShot, low battery storage cost scenario, PV deployment is predicted to grow to an estimated 1,618 GW by 2050, requiring an estimated 6.6 million acres of additional land for utility-scale PV, roughly equivalent to the size of Massachusetts.



Cole, et al. *SunShot 2030 for Photovoltaics (PV): Envisioning a Low-cost PV Future*, 2017, NREL/TP-6A20-68105. https://www.nrel.gov/docs/fy17osti/68105.pdf, p. vi.

Additional land required for PV based on 1,618 deployment projection by 2050, minus currently deployed 50 GW, at 70% utility-scale (Bolinger et al. Utility-Scale Solar 2016) and six acres per megawatt.

Photo: Prairie Restorations, Inc.

Large-Scale PV Potential Benefits

- Economic development (jobs & spending)
- Increased local property tax income without additional services
- Improves energy security – no fuel needs
- Local power generation – no shipping or purchasing of fuels
- Reduces environmental risk of fossil fuels – mining, coal ash, greenhouse gases, mercury, etc.

PV array at the National Wind Technology Center *Photo by Dennis Schroeder, NREL 11249490*

Large-Scale Solar in Zoning Codes

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

Solar Energy System, Large-Scale: Active Solar Energy System that occupies more than 40,000 square feet of surface area.

Solar Energy System, Medium-Scale: Active Solar Energy System that occupies more than 1,750 but less than 40,000 square feet of surface area.

Solar Energy System, Small-Scale: An Active Solar Energy System that occupies 1,750 square feet of surface area or less.

Further distinguish between rooftop and ground-mounted.

Photo credit: https://www.sunraisedfarms.com/

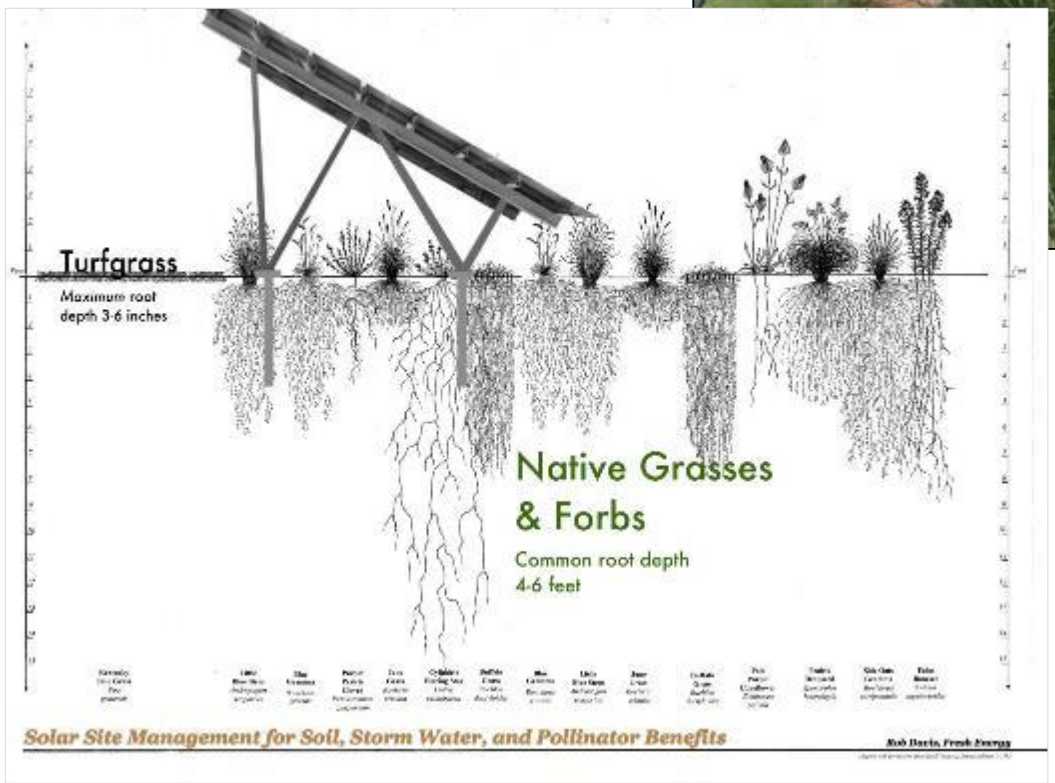
Addressing Large-Scale PV Myths

No glare	• Less reflective than water and windows and compatible with nearby residential, office, or aviation uses
Very low noise	• 45 decibels at 10 meters from the inverters, which is slightly less noise than a refrigerator makes
Safe	• Photovoltaic modules are enclosed in glass, carry a 25 year warranty, meet all applicable electrical and safety standards
Low voltage	• Far lower voltage than transmission lines – No electro magnetic field (EMF) impacts

https://www.nrel.gov/tech_deployment/state_local_governments/blog/top-five-large-scale-solar-myths
https://www.nrel.gov/technical-assistance/blog/posts/research-and-analysis-demonstrate-the-lack-of-impacts-of-glare-from-photovoltaic-modules.html

Low-Impact Solar Development

- Minimizing grading
- Minimizing soil compaction
- Planting native vegetation



NREL's National Wind Technology Center's solar installation where native grasses and revegetation techniques were tested.

https://www.nrel.gov/docs/fy17osti/66218.pdf

Pollinator Friendly/Ag Preservation Policies

State Policy

Minnesota standards for pollinator-friendly solar legislation – Statute 216B.1642

Maryland Department of Natural Resources – Solar Generation Facilities – Pollinator–Friendly Designation

South Carolina – Solar Habitat Act – Voluntary solar best-management practices to establish native vegetation and pollinator habitat

Oregon Land Conservation and Development regulations aim to limit large-scale solar development on high-value farmland and arable land and address soil compaction, erosion, and noxious weeds.

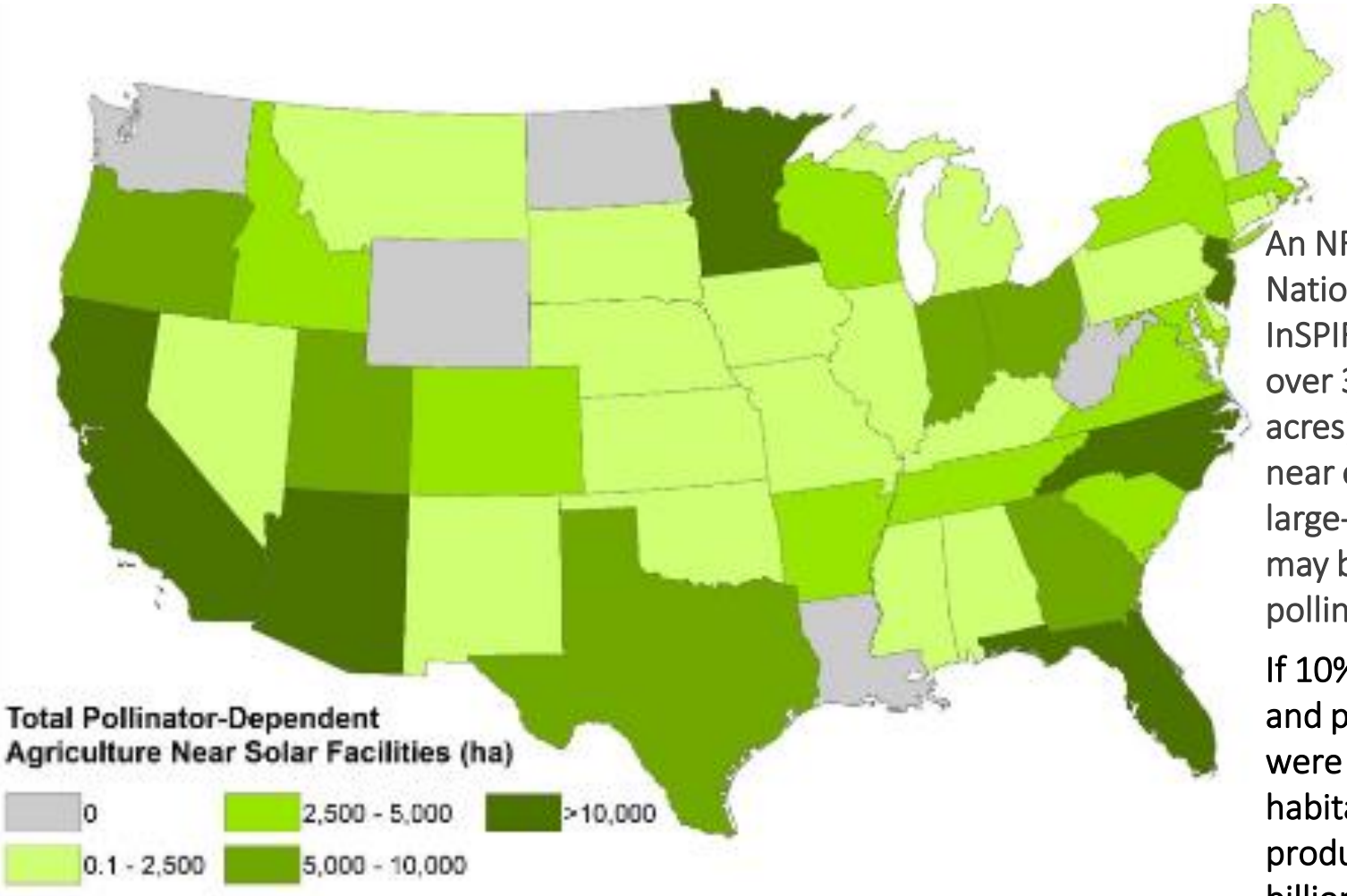
County Policy

Linn County, IA – Amended the Development Code to require solar farms be planted with native grasses and wildflowers and prohibits application of insecticides.

Stearns County, MN – Land Use and Zoning Ordinance requires solar farm ground cover meet above state statute.

Photo: Prairie Restorations, Inc.

Potential Ag Benefits of PV Pollinator Habitat



An NREL and Argonne National Laboratory InSPIRE study identified over 3,500 km^2 (800,000 acres) of agricultural land near existing and planned large-scale PV facilities that may benefit from insect pollinators.

If 10% to 50% of existing and planned solar facilities were used for pollinator habitat, they would produce $1.9 to $5.7 billion in pollination benefit annually.

Examining the Potential for Agricultural Benefits from Pollinator Habitat at Solar Facilities in the United States
Leroy J. Walston, Shruti K. Mishra, Heidi M. Hartmann, Ihor Hlohowskyj, James McCall, and Jordan Macknick
Environmental Science & Technology, https://pubs.acs.org/action/showCitFormats?doi=10.1021%2Facs.est.8b00020

Quantifying the Economic Value of Pollination to Improve Adoption of Solar Facilities in U.S. Agricultural Environments, NREL and Argonne National Laboratory, 2018, publication pending

Putting the ‘farm’ back in solar farms: Study to test ag potential at PV sites

WRITTEN BY

Frank Jossi
January 22, 2018

PHOTO BY

Matthew Gorrie / Bolton Bees

Minnesota will be included in a study to help federal researchers test the potential of pollinator-friendly habitat and fruit and vegetable crops around solar arrays.

The National Renewable Energy Laboratory (NREL) will plant vegetation this year at three Minnesota solar installations owned by Enel Green Power. The sites are among 15 around the country that will be part of the research project.

Midwest Energy News: http://midwestenergynews.com/2018/01/22/putting-the-farm-back-in-solar-farms-study-to-test-crop-potential-at-pv-sites/

Solar Farms and Apiaries

Solar farms provide opportunities for honey production.

Solar Farms and Agriculture

Sheep grazing is an increasingly common vegetation management practice.

Webinar on NREL's InSPIRE project: Co-locating Agriculture and Solar https://fresh-energy.org/nrelwebinar/

Planning for Large-Scale PV -- Summary

Comprehensive plan

- Recognize your solar resource
- Establish solar goals and objectives

Zoning for large-scale PV

- Differentiate between rooftop and ground mounted
- Differentiate between small- and large-scale PV
- Establish development standards that achieve solar goals and objectives

Options for attracting beneficial solar development

- Offer expedited permitting review if projects meet established development standards
- Base permitting fees on plan review time and expense rather than a percentage of construction costs
- Offer property tax or sales tax exemptions or reductions
- Provide clarity from County Assessor on how development will be taxed
- Consider ground cover standards and PV and agriculture co-benefits

PV array at the National Wind Technology Center *Photo by Dennis Schroeder, NREL 11249490*

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Best Practices for Small-Scale Solar

James Schroll
The Solar Foundation

Solar and the Zoning Code

A conspicuous silence on the part of local policies, plans, and regulations on the topic of solar energy use constitutes a significant barrier to adoption and implementation of these technologies.

–American Planning Association Solar Briefing Papers

Definitions

Best practice: Define solar energy systems broadly to incorporate the collection, storage, and distribution of energy for heating, cooling, electricity, and water heating. Include systems "balance of system" equipment. Consider developing multiple definitions based on system size (by square foot), not system capacity.

Why it matters: Defining solar broadly will encompass solar PV, solar water heaters, etc. Including racking, inverters, and storage. Developing different definitions for small-, medium, and large-scale solar will allow a community to consider impact and regulate these larger systems differently.

Accessory use

Best practice: Allow solar as a by-right accessory use in the zoning ordinance for all major zones. Solar energy systems can be permitted subject to certain standards outlined in the ordinance.

Why it matters: Conditional or special use permits can increase the time needed for review and add additional costs to solar installations. Conditional and special use permits should only be considered for larger installations (e.g. solar farms) and possibly medium-scale systems in residential zones, and not for small-scale accessory use systems.

Height

Best practice: Exempt roof-mounted solar energy systems on flat roofs from height calculations or allow systems to exceed the maximum height by 5 to 10 feet.

Why it matters: Installations on flat roofs must be at a tilt to be most efficient. Buildings that are at or near the maximum building height limit may be unable to install solar energy systems, or may not be able to do so efficiently.

Furniture factory in Gardner, Massachusetts, Photo: Bill Eager
NREL Image Library 00566

Setbacks

Best practice: Permit ground-mounted solar energy systems a modest encroachment into the setback.

Why it matters: Allows more flexibility for the placement of ground-mounted solar energy systems to ensure its economically viable, while still maintaining a setback from the lot line.

Lot coverage

Best practice: Exempt ground-mounted systems from lot coverage/impervious surface calculations as long as the ground beneath the system is pervious (e.g. grass).

Why it matters: Counting ground-mounted systems toward lot coverage/impervious surface calculations could limit implementation where lots are at or near the maximum lot coverage allowed.

Aesthetics

Best Practice: Don't regulate aesthetics or limit visibility from public rights-of-way. Exempt from screening requirements.

Why it matters: Design review can be subjective and implemented inconsistently. Visibility limitations could prevent solar from being installed efficiently. Screening can add cost and possibly shade systems.

Northeast Denver Housing Center's Whittier Affordable Housing Project
Source: NREL/DOE Image 19188

Historic and Special-use Districts

Best practice: Provide guidance about how systems can be installed.

Why it matters: Guidance can allow for additional opportunities for installing solar, while preserving historic character.

Solar Collectors

3.70 Minimize adverse effects from solar collectors on the character of a historic building.

- Place collectors to avoid obscuring significant features or adversely affecting the perception of the overall character of the property.
- Size collector arrays to remain subordinate to the historic structure.
- Minimize visual impacts by locating collectors back from the front facade.
- Consider installing collectors on an addition or secondary structure where applicable.
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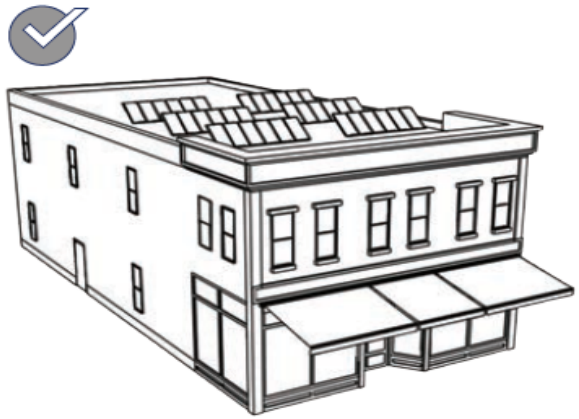
- Consider installing collectors on an addition or secondary structure where applicable.
- Exposed hardware, frames and piping should have a matte finish, and be consistent with the color scheme of the primary structure.



Place collectors to avoid obscuring significant features or adversely affecting the perception of the overall character of the property.

Source: Plano, TX Downtown Heritage Resource District Design Standards

Glare

- **Best practice:** Do not require glare study or analysis, unless at or near an airport.
- FAA requires glare study/analysis for installations at or near an airport.
- **Myth:** Solar PV causes glare.
- **Reality:** Solar PV creates less glare than windows and water.
- For more info: https://www.nrel.gov/state-local-tribal/blog/posts/research-and-analysis-demonstrate-the-lack-of-impacts-of-glare-from-photovoltaic-modules.html

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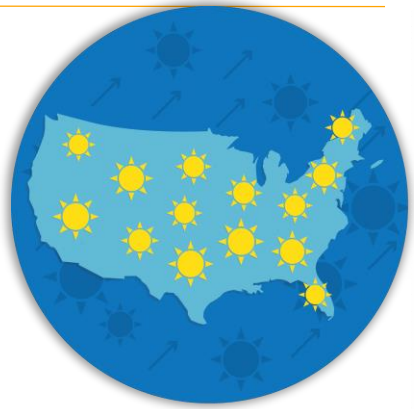


Designation

- Earn Bronze, Silver, or Gold designation based on solar-related actions.
- Demonstrate that the community is "**open for solar business**," making it more attractive to solar industries.

Technical Assistance

- Communities can receive no-cost technical assistance on:
  - Siting
  - Permitting
  - Inspection
  - **Planning and Zoning**

SolSmart in a Small Town

South Barrington, IL

SolSmart in a Small Town
South Barrington, IL

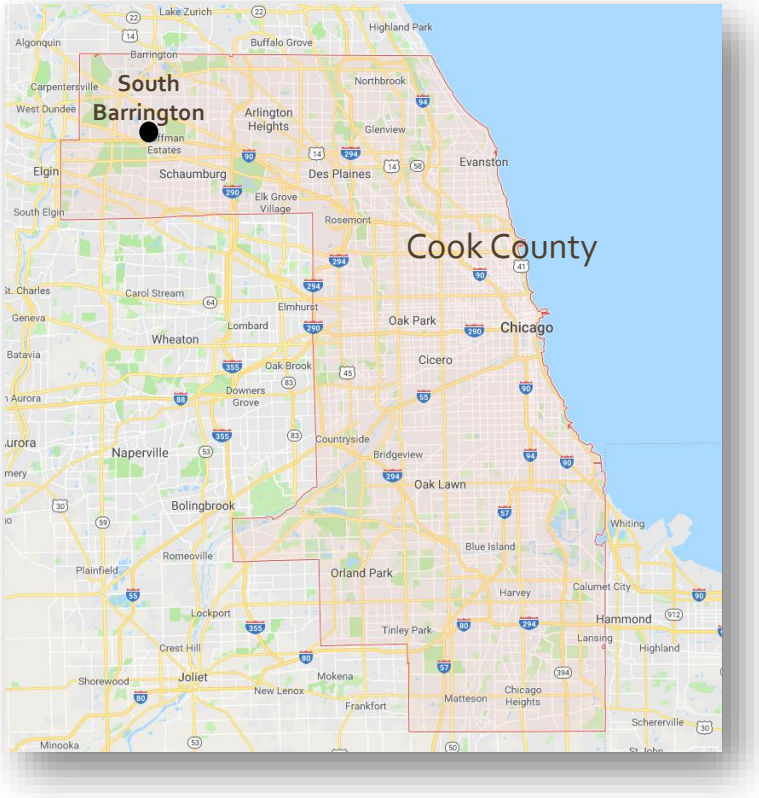
Bob Palmer
Village Administrator
AICP, ICMA-CM
LEED, AP-HOMES

Est. Population: 4,981 (2017)

Size: 7.68 square miles

Location: Northwest Cook County

Features:
- Arboretum Shopping Center
- South Barrington Conservancy
- Goebberts Farm & Garden Center
- Stillman Nature Center
- Willow Creek Church



Staff and Contracted Services

Administration

6.5

Police

19 Full-Time

5 Part-Time

3 Administration Clerks

Contracted Services

Cuba Township (Public Works)

QuadCom (Dispatch)

West Dundee (IT)

Sheafer & Roland

Barrington Countryside F.P.D

Metropolitan Mayors Caucus

Greenest Region Compact 2 (GRC2)

SolSmart

Village of South Barrington

SolSmart Goal:

Help local government reduce barriers to solar energy growth and make it easier for homes and business to go solar.

SolSmart: Reducing "Solar Soft Costs"

Process:

1. Letter of Commitment
2. Technical Assistance
3. **Bronze**
   - Permitting (200 pts)
   - Planning, Zoning, and Development (200 pts)
   - Special Focus (200 pts)
4. **Silver**
   - The above, plus two (2) additional actions
   - In planning, zoning and development and inspection categories (100 pts)
5. **Gold**
   - The above, plus required action in permitting (200 pts)

BEFORE SolSmart

- Provision in Municipal Code
  - Alternative Energy Systems
    - Scope
    - Solar Energy Collection Panels and Solar Water Heating Systems (Solar Panels)

AFTER SolSmart

Solar Landing Page on Website → Village Initiatives → Greenest Region Compact 2 (GRC2)

↓

Information Resources → Grow Solar Local Government Solar Toolkit → Homeowners' Solar Right Act

↓

Consumer Protection Resources → Going Solar in America → Solar Potential

Find an Installer

End Results

- **Gold Status**
  - 1 of 8 in Illinois

- **Special Recognition Award**
  - 1 of 3 in Illinois

Thank you

Village of South Barrington