# Indiana Model Solar Ordinance

Beyond the Panel Workshop

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Great Plains Institute

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# Agenda

1. Why solar zoning?
2. Principles of solar-ready zoning
3. Small-scale and Accessory Uses
4. Large-scale and Principal uses
5. Incentives and intersections with other regulations
6. Discussion – Indiana draft Model Ordinance

# Why? Cost…

1. Solar energy electric generation is already competitive with natural gas generation.
2. With on-going cost decreases, solar energy is expected to be the cheapest form of wholesale electric energy generation, of any type, within the next few years.
3. The cost projections do not include any subsidy.

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# Why? Markets ….

1. Large energy consumers are demanding inexpensive, clean, energy, and are taking steps to acquire it.
2. Electric utilities are transitioning to lower cost renewable energy because new solar and wind are cheaper than the existing coal plants on their system.

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## Corporate Investment In Solar Energy Surges

**Ariel Cohen** Contributor ⓘ
Energy
*I cover energy, security, Europe, Russia/Eurasia & the Middle East*

Target retail store with installed rooftop solar array SEIA 2018

America's top corporations are pouring investments into solar energy – led by Apple and Amazon— according to a newly released report by the Solar Energy Industries Association (SEIA).

# Why? Resources…

1. Solar resources that can be economically developed can be found in every county in Indiana.
2. Every county and city will have property owners who will want to develop the valuable economic resources on their property.

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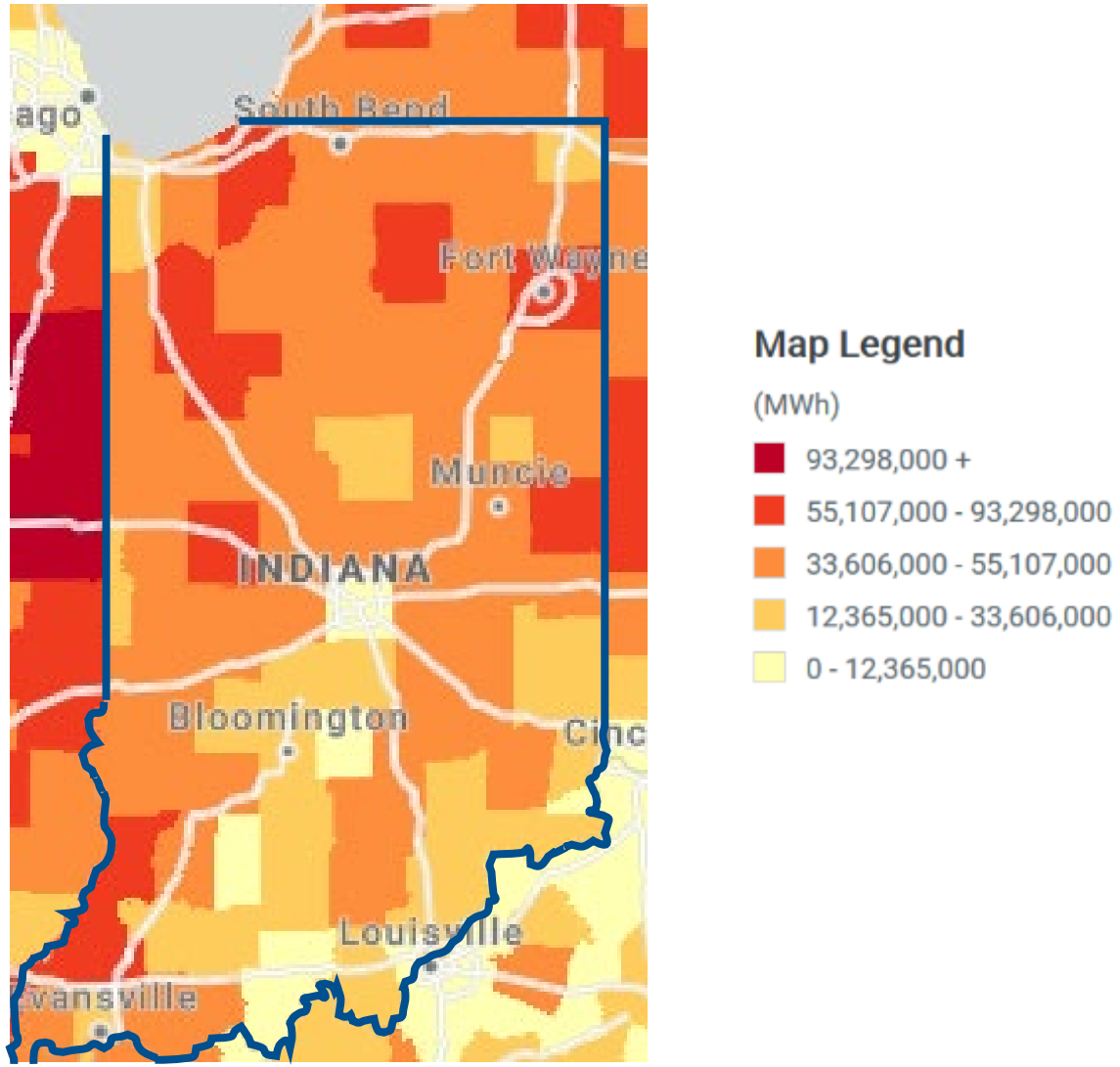
# Indiana Utility Scale Solar Technical Potential

Total Indiana 2020 Estimated Electricity Consumption

- 104,515,415 MWhs

Total technical potential for utility-scale solar generation

- 3,452,134,081 MWhs




Data and map from NREL State and Local Planning for Energy (SLOPE)
https://gds.nrel.gov/slope


# Principles of Solar-Ready Zoning

1. Enable solar installations by-right for property-owners.
2. Create a clear pathway for principal solar uses.
3. Limit regulatory barriers to developing solar resources.
4. Define appropriate aesthetic standards.
5. Address cross-property solar access issues.
6. Promote “solar-ready” design.
7. Include solar in regulatory incentives.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# Ordinance Purpose

**Basic zoning functions**

1. Use standards
2. Density/intensity standards
3. Dimensional standards

**Advanced zoning functions**

1. Design and character
2. Interaction of land uses
3. Co-benefits
4. Incentives and flexible zoning standards


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# Solar Land Uses

## Consider the land use

- Roof-mounted
- Ground-mounted
- Community-scale systems
- Large-scale systems

## Consider the context

- Accessory use
- Principal use

# Small-scale and Accessory Use Solar

# Zoning best practices for small-scale solar

| | |
|---|---|
| **Define terms** | Include storage and solar hot water heating installations in the definition of “solar,” differentiate by systems by area and rooftop versus ground-mounted |
| **By-right accessory use** | Allow small rooftop and ground-mounted PV in all major zoning districts |
| **Height** | Allow rooftop solar an exemption from or allowance above building height restrictions |
| **Accessory uses** | Exempt solar from counting toward accessory uses maximum |
| **Aesthetic requirements** | • Exempt solar from rooftop equipment screening requirements<br>• Allow PV installations to be seen from public roadways<br>• Limit screening or aesthetic requirements to historic districts |
| **Ground -mounted** | • Include small ground-mounted systems as accessory structures<br>• Require conditional use permit for principal use, ground-mounted systems |
| **Lot coverage** | Exempt ground-mounted solar from lot coverage restrictions that apply to buildings |
| **Setbacks** | Avoid applying principal building setbacks |
| **Roof coverage** | Address fire code setback requirements in coordination with fire officials |
| **Glare** | Glare studies not needed unless solar is on or adjacent to airport, in which case it will be regulated by FAA, not the local jurisdiction |
| **Regulate based on impact/area** | • Not capacity (kW) as efficiencies and technologies change over time<br>• Not where energy is used (e.g. on-site) as it has no bearing on the impact |


# Indiana Enabling Statutes

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

Sec 2. A unit may plan for and regulate the use, improvement, and maintenance of real property and the location, condition, and maintenance of structures and other improvements. A unit may also regulate the platting and subdividing of real property and number the structures abutting public ways. **In planning for and regulating the use of land or in regulating the platting or subdividing of real property, a unit may also regulate access to incident solar energy for all categories of land use**.


# Indiana Enabling Statutes

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

Sec. 8 (a) As used in this section, "solar energy system" means either of the following:

(1) any solar collector or other solar energy device whose primary purpose is to provide for the collection, storage, and distribution of solar energy for space heating or cooling, or for water heating; or

(2) any structural design feature of a building, whose primary purpose is to provide for the collection, storage, and distribution of energy for space heating or cooling, or for water heating.

(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.**

# Use

A. **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.

| 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 |

# Height

**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-mounted application.*

# Lot Coverage

**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.

***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 rain water can infiltrate. Any effects are de minimus for a small array if the lot is otherwise within coverage ratios.*

# Visibility

## Elements of the visibility section

- **Intended to provide guidance to communities that already regulate aesthetics or design.**
- Designed to minimize visual impacts from the public right-of-way to the extent that doing so does not affect cost or efficacy consistent with Indiana Statute 32-7-2-8.
- Can displace design standards or review in subdivisions with homeowner association standards.
- Separate from historic or heritage preservation standards.

***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.*

# Visibility

2. **Aesthetic standards** – **Consistent with Indiana Statutes 32-7-2-8**, 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.

***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.*

# Other Considerations

- Historic buildings
- Plan approval
- Compliance with building, electric, and plumbing code
- Utility notification

# Large-Scale and Principal Use Solar

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# Principles for Managing Large-Scale Development

1. Lay the planning groundwork
2. Recognize large-scale PV as a unique land use
3. Identify a development pathway
4. Focus on impacts (not on electrons)
5. Avoid treating PV like a building (coverage)
6. Address local nuisances and risks
7. Use appropriate decommissioning standards

Derived from “Are You Solar Ready”, M. Day, Planning Magazine, March 2020

# Zoning best practices for large-scale solar

| | |
|---|---|
| **Define Terms** | • Define large-scale solar as a unique land use (not an industrial land use),<br>• Include storage in the definition of large-scale solar<br>• Distinguish between small and large systems by area as needed |
| **Enable Development** | Most large-scale solar will be a conditional or interim use in those districts where allowed, although small or community scale development can be a permitted use |
| **Land Use, not Energy Use** | Performance or design standards should focus on land use impacts and benefits, not on energy use or performance |
| **Recognize land use differences** | • Exempt PV panels from coverage limits<br>• Exempt PV panels from impervious surface standards if ground cover is suitably pervious (see co-benefits below) |
| **Capture Co-Benefits** | • Require habitat-friendly ground cover to be installed, established, and maintained<br>• Enable co-location of agricultural uses (sometimes in place of ground cover)<br>• Consider opportunities for floating solar |
| **Screening requirements** | • Look to existing screening requirements as a guide, consistency across land uses<br>• Limit screening to residential districts or existing uses<br>• Balance screening against larger setbacks, both are not necessary |
| **Setbacks** | • Look to existing setback distances as a guide<br>• Balance setbacks with screening requirements (more screening, less setback)<br>• Measure setbacks from array edge |
| **Glare** | Glare studies only needed if adjacent to an airport. On-airport solar will be appropriately regulated by FAA |
| **Decommissioning** | Require decommissioning to a reasonable standard and financial risk |

# Site Design Elements

- Setbacks
- Screening
- Ground cover and buffer areas
- Power and communication lines
- Fencing (to be added)

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# Setbacks

1. Property line setback for buildings or structures in the district in which the system is located
2. Roadway setback of 150 feet from the ROW centerline of State highways and CSAHs, 100 feet for other roads
3. Housing unit setback of 150 feet from any existing dwelling unit
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 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

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.

**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.*

# Ground cover and buffer areas

## Main Points:

- Community- and large-scale ground-mounted solar energy systems are required to adhere to pollinator-friendly management practices.
- Language on ground cover is aligned with guidance from the Purdue University Extension.

**Ground Cover Standards**

*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.*

*Purdue University is developing a pollinator-friendly certification standard for solar development, and the Michiana Area Council of Governments has published a technical guide on establishing and maintaining pollinator-friendly solar projects. These references can provide local governments the foundational information to remove the need for codifying or in some cases reviewing proposed ground cover plans by solar developers. The ordinance language here is from another Indiana reference, the Report on Pollinator-Friendly Solar in Indiana published by EQ Research and the Center for Pollinators in Energy at Fresh Energy.*

# Ground cover and buffer areas

**Details:**

- Ground around and under solar panels and in buffer area shall be planted, established, and maintained for the life of the solar project in perennial ground cover.
- Ground cover shall be based in a diverse seed mix.
- Plantings shall be free of invasive species.
- No insecticide use is permitted on the solar site, except for the on-site buildings, in and around electrical boxes, and spot control.
- Plant material must not have been treated with systemic insecticides, particularly neonicontinoids.

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Photo credit: Katharine Chute

# Stormwater and Water Quality Standards

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.

**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.*

# PV Stormwater Management Research and Testing (PV-SMaRT)

Last 5 digits of project number: **36472**
Principal Investigator (PI): **Megan Day**
PI Email: **megan.day@nrel.gov**

**SOFT COSTS TRACK** (PV *Market and Regulation Topic*)

## BACKGROUND / INDUSTRY IMPACT

- Ground-mounted PV sites are often considered impervious surfaces in local water quality permitting, leading to costly additional infrastructure requirements.
- Current models used by local jurisdictions are unable to estimate stormwater runoff for ground-mounted PV.

## PROJECT OVERVIEW / OBJECTIVES

The objective of this project is to develop and disseminate:

1. Research-based, solar-specific resources for estimating stormwater runoff at ground-mounted PV sites; and
2. Stormwater management and water quality best practices.

## METHODS

- Field research will collect data on stormwater runoff at ground-mounted PV sites.
- A 3-D hydrologic model will be developed to generate PV-specific stormwater runoff coefficients and nomographs to inform stormwater permitting.
- Analysis of current practices and stakeholder engagement will identify best practices in stormwater management and water quality for ground-mounted PV.

## KEY OUTCOMES / MILESTONES

In the first year of the project:

- Establish Water Quality Task Force to provide feedback on field research methods, 3-D model development, and best practices.
- Establish Five ground-mounted PV field research sites in five states, and collect measurements on soil moisture, infiltration, and climatic conditions.
- Calibrate initial 3-D hydrologic model using 2018 data from Minnesota ground-mounted PV site.

## CONCLUSION / REMAINING RISK

- Project initiated in January 2020, with planned completion in December 2022.
- Aggressive timeline to establish site access and install monitoring at five ground-mounted PV sites in five states.

# Develop ***research-based***, PV-specific tools and best practices for ***stormwater management*** and water quality at ***ground-mounted PV*** sites

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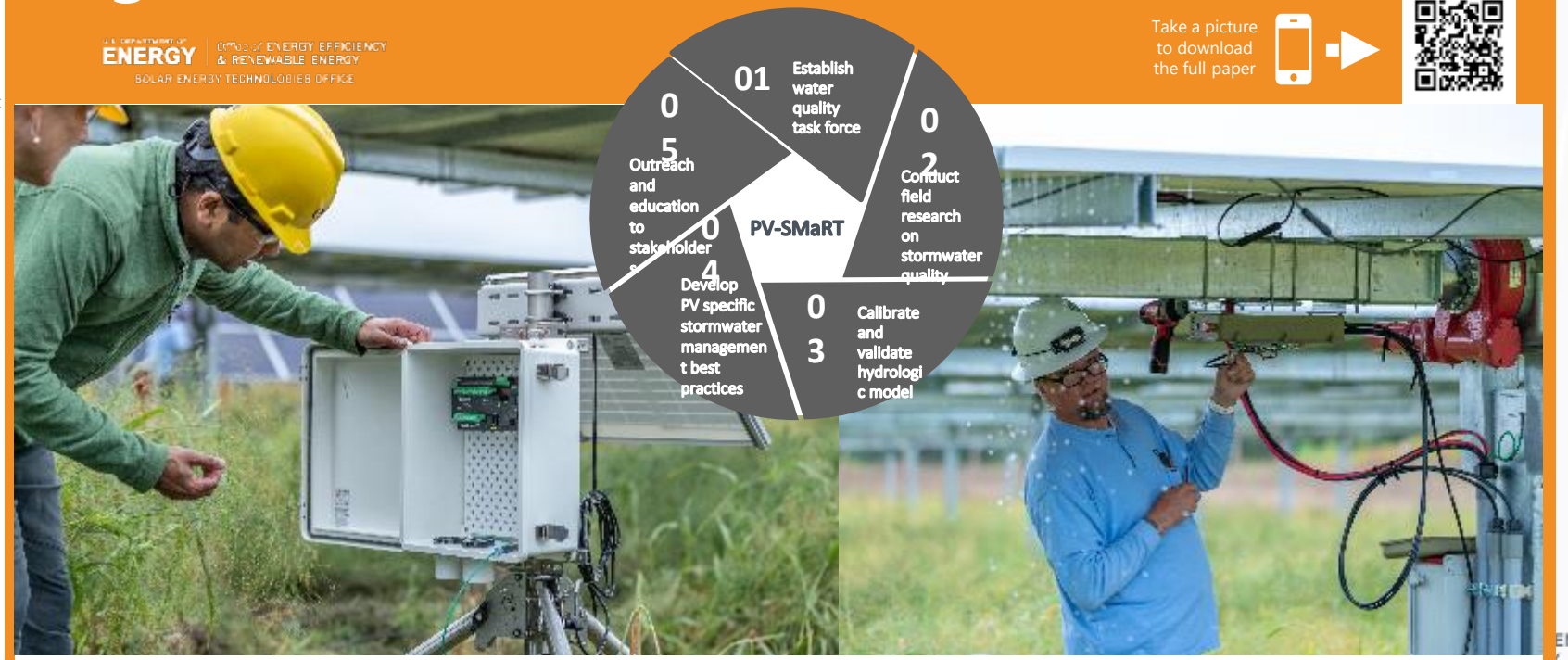


**Additional project contributors:** Fresh Energy, Great Plains Institute, University of Minnesota

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# Other Elements

- Other code compliance
- Site plan required
- Aviation protection
- Agricultural protection
- Decommissioning

# Decommissioning and Recycling

- Rapidly evolving field
- Included in ordinance as part of the decommissioning plan
- Discussion of further inclusion of solar waste and recycling

## New California regulation could jump-start solar panel recycling sector

The state's upcoming classification of photovoltaic panels as universal waste is expected to allow for greater efficiencies in handling a material stream that is projected to grow substantially

# Community-Scale Solar

- May be ground-mounted (far more common) or roof-mounted
- Fewer than ten acres
- Permitted by-right in certain districts and through a conditional use permit in other non-residential districts

# Large-Scale Solar

- Principal use solar over 10 acres
- Permitted through a conditional use permit in select districts

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# Advanced Zoning Tools

- Condition for PUD approval
- Condition for conditional use permit
- Solar roof incentives
- Solar-ready buildings
- Solar access variance