



Fresh Energy

1



2



Solar array, Georgia


3

Solar array, Ohio



Photo: Janelle Patterson, *Marietta Times*

4



FOCUS: HEAVEN FOR THE WALL STREET JOURNAL

Energy from more than 1,200 solar panels powers Benjamin Freund's 650-acre dairy farm and home in East Canaan, Conn.

# Solar Projects Sow Tension

**As panels supplant crops on more farms, states weigh limits on big renewable fields**

By JOSEPH DE AVILA

The boom in solar energy is forcing states and farming communities to grapple with where large renewable-energy projects should be built.

In Connecticut, a state senator has proposed a bill that would discourage the use of farmland for solar projects. Counties in North Carolina and Washington have already imposed temporary restrictions on solar projects, citing

tion of Counties.

The pressure in rural areas stems, in part, from simple economics. Some farmers are installing solar panels on a patch of their land to help offset energy costs. Other farmers are renting out entire fields to solar companies that can afford to pay premium prices for access to clear fields that don't require much work or money to prepare for a solar project.

"Of course, there can be local tension in terms of what people are used to on the farmland, what people like to see in a rural environment," said Amit Ronen, director of the George Washington University Solar Institute. "But I don't see it as a long-term

whelming opposition," said Mr. Scanlon. The county denied the application.

Benjamin Freund, who has a dairy farm in East Canaan, Conn., in recent years installed more than 1,200 solar panels on a patch of his land and on top of his dairy barn. The generated power offsets his entire \$6,000 monthly energy bill.

He said he doesn't like competing with solar companies when he needs access to other farmland, but he also doesn't like being told what he can build on his property.

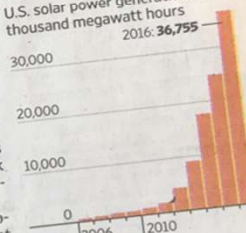
"From a property rights standpoint, this is a heavy-handed way to say that my property no longer has this development potential simply because of the fact that it's arable land," Mr. Freund said.

Robin Chesmer, managing member of a dairy farm in

### On the Bright Side

U.S. solar power generation in thousand megawatt hours

2016: 36,755



Source: Department of Energy THE WALL STREET JOURNAL.

North Carolina Clean Energy Technology Center.

But large solar installations don't always sit well with local communities.

5



# Fresh Energy

6



7



8



Connexus Energy  
Prairie Restorations

9



Minnesota Power: 2 projects  
Camp Ripley solar

10



Green Lantern Solar  
Bee the Change

11



North Star Solar, DE Shaw  
Minnesota Native Landscapes  
Monarch caterpillar  
Photo: Jake Janske

12



Aurora Solar  
Enel Green Power  
Photo: Jake Janske

13



Aurora Solar  
Enel Green Power

14

# September 2016



Engie Solar  
Prairie Restorations

15

# September 2017



Engie Solar  
Prairie Restorations

16





17



18



Denison University,  
Photo by Susan Studer King

19



University of Dayton  
Before Seeding

20



21

## Pollinator-friendly... landfill cap vegetation??

H1060990-012207

A review of the impacts and risks for use of native grass, forb, shrub and tree species plantings when used to stabilize and close domestic solid waste landfill caps.

prepared for

The Albany, New York Landfill

by

Steven I. Apfelbaum, William Young, James P. Ludwig and Bradley M.

TABLE OF CONTENTS TOC to "1-3"

INTRODUCTION	2
OVERVIEW OF SITE CLOSURE PLAN	2
ASSUMPTIONS	4
CONCLUSIONS	22
BIBLIOGRAPHY AND REFERENCES CITED	25-46
TABLE 1:	17
Table 1A: Compatibility with the Design Intent	
Table 1B: Criteria and Scoring used in Table 2	
TABLE 2:	

**INTRODUCTION**

This is a technical review of the scientific literature to address the following questions and purposes:

- Can native prairie grasses, wildflowers, forbs and trees be used safely for the final revegetation and stabilization of the Albany landfill cap?
- Will native species grow on geotextile protected clay caps?
- Will these plant species contribute, cause, or exacerbate failure of the geotextile clay cap? If so, by what proven mechanisms?
- Are native plant species equal or superior to stabilize and reduce the risks of failure of geotextile clay caps?
- What are the growth and survival characteristics of native prairie grasses, flowers, shrubs and trees that confirm native species are compatible with landfill cap closure?
- What characteristics of soil and landfill cap management will augment or detract from native species use for landfill cap closures?

Public document  
City of Albany

22

# Pollinator-friendly... landfill cap vegetation??

## Literature says "Yes!"

H06090-012207

A review of the impacts and risks for use of native grass, forb, shrub and tree species plantings when used to stabilize and close domestic solid waste landfill caps.

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23

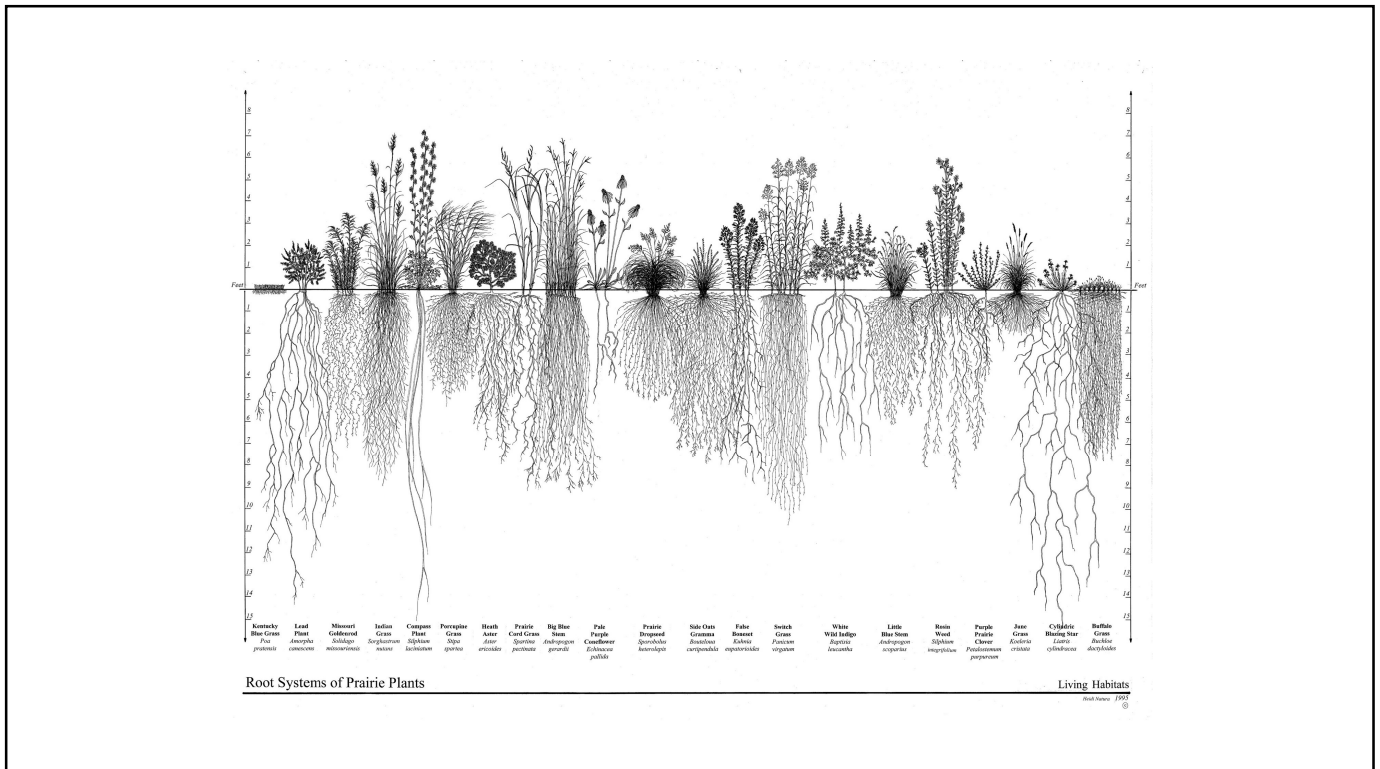


Rehoboth Delaware, 2.4 MW  
Photo by Lucas Faria

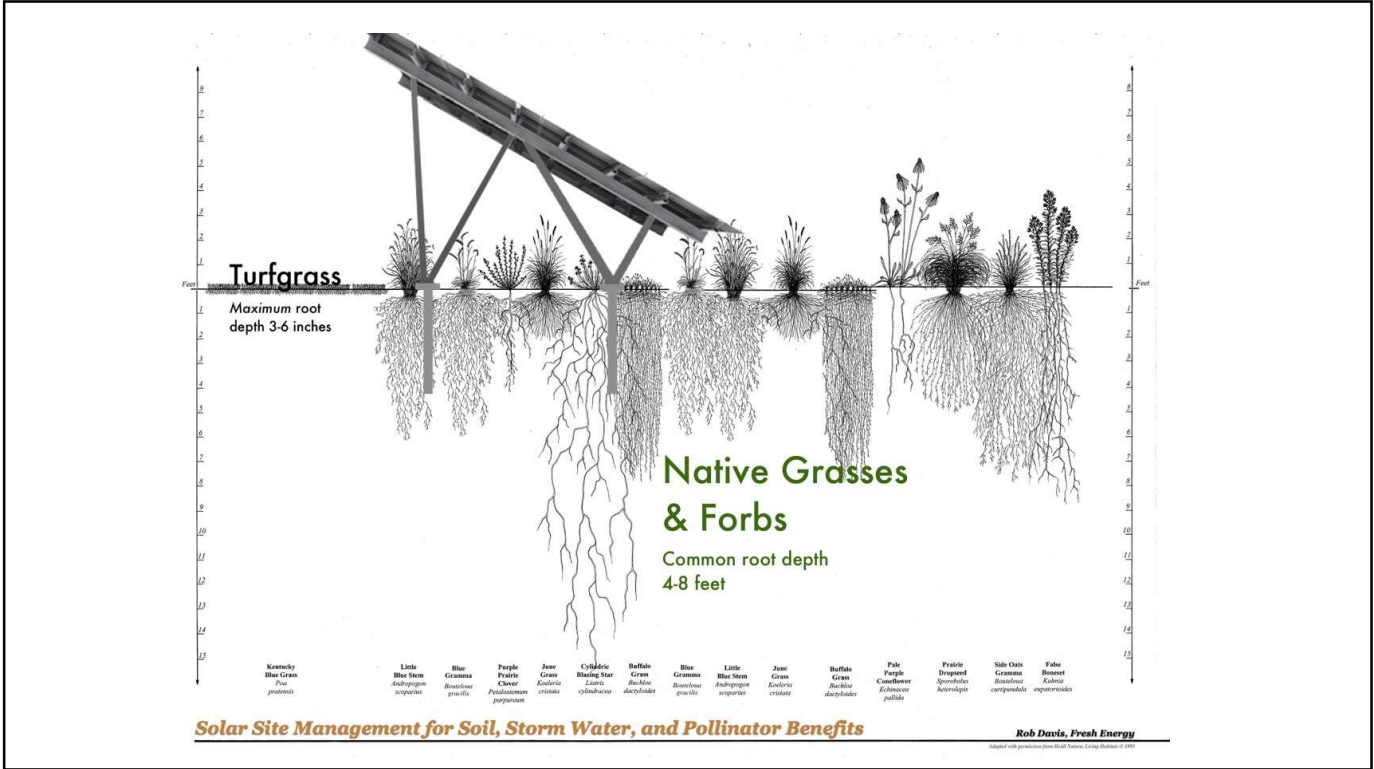
24



25



26



27

**Meeting SunShot Cost and Deployment Targets through Innovative Site Preparation and Impact Reductions on the Environment (InSPIRE)**

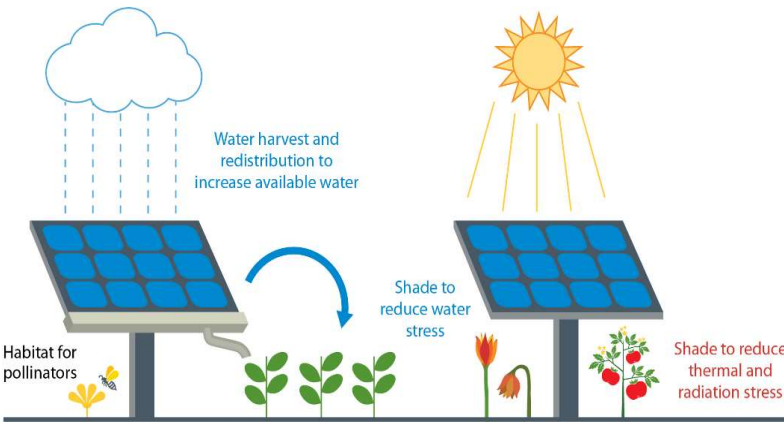
Jordan Macknick, Co-Principal Investigator, InSPIRE; ASTRO Working Group Co-Chair, NREL

Heidi Hartmann, Co-Principal Investigator, InSPIRE, Argonne National Lab

Rob Davis, ASTRO Working Group Co-Chair, Fresh Energy

28

# InSPIRE Project Overview



InSPIRE Project Sites



Select from the options below to display all sites using that technology.

- Beekeeping
- Co-location of Solar and Agriculture
- Native Vegetation
- Solar-Integrated Greenhouse
- Beneficial Predators
- Dryland Agriculture Co-location
- Pollinator Habitat

**Field-based research topics:**

- (1) Economic viability of solar-agriculture co-location configurations
- (2) Increasing agricultural yields in arid environments
- (3) Energy, water, and food security in remote, off-grid areas
- (4) Pollinator habitat and ecological services

**Analytical research topics:**

- (1) Satellite imagery analysis of current land groundcover practices
- (2) Cost-benefit analysis of O&M ground cover practices
- (3) Quantification of ecological services of groundcover options

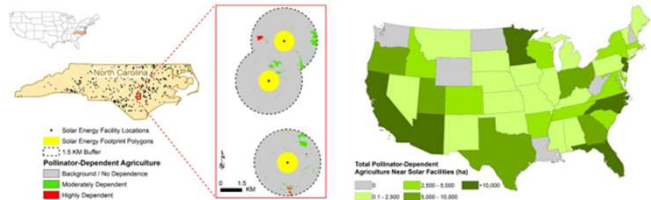


29



## Key Highlight: Pollinator-Friendly Solar

Over 860,000 acres of agricultural land would benefit if existing solar facilities had pollinator-friendly vegetation



30



31

## The Objective

Photovoltaic Stormwater Management Research and Testing (PV-SMaRT)

Megan Day  
303-275-3261  
Megan.day@nrel.gov



"PV-SMaRT" seeks to reduce balance of system soft costs associated with stormwater infrastructure requirements and improve water quality by developing and disseminating research-based, solar-specific resources for estimating stormwater runoff and best practices for stormwater management and water quality at ground-mounted PV facilities.

32



What constitutes “pollinator-friendly”  
in the context of a solar array?

33



34

# Pollinator-Friendly Solar

## Incremental <> Meaningful

*Solar site vegetation that helps bees and beneficial insects*

35

## Flexible Standard, Vetted by Expert Entomologists

- Percent wildflowers
- Percent native species
- Diversity of species
- # seasons flowering
- Nearby assets
- Signage?
- Management plan?
- Insecticide risk

**Solar Site Pollinator Habitat Assessment Form for Project Planning**  
For solar companies and local governments to meet pollinator/wildlife habitat certification.

**1. PERCENT OF PROPOSED SITE VEGETATION COVER TO BE DOMINATED BY WILDFLOWERS**

31-45% +5 points  
 46-60% +10 points  
 61+% +15 points

Total points: [ ]

**2. PLANNED % OF SITE DOMINATED BY NATIVE SPECIES COVER**

15-50% +5 points  
 51-75% +10 points  
 76-100% +15 points

Total points: [ ]

**3. PLANNED COVER DIVERSITY (if all species in seed mixes are native from upland and wetland mixes can be combined)**

10-19 species +5 points  
 20-25 species +10 points  
 26 or more species +15 points

Total points: [ ]

**4. PLANNED SEASONS WITH AT LEAST 3 BLOOMING SPECIES PRESENT (check/all that apply)**

Spring (April-May) +5 points  
 Summer (June-August) +5 points  
 Fall (September-October) +5 points

Total points: [ ]

**5. AVAILABLE HABITAT COMPONENTS WITHIN .25 MILES (check/all that apply)**

Native bunch grasses for nesting +2 points  
 Native trees/shrubs for nesting +2 points  
 Clean, perennial water sources +2 points  
 Created nesting habitats (bee blocks, etc.) +2 points

Total points: [ ]

**6. SITE PLANNING AND MANAGEMENT**

Detailed environment and management plan developed (see attached plan) with binding/contract to implement +15 points  
 Signage legible at forty or more feet stating pollinator-friendly solar habitat (at least 1 every 200') +5 points

Total points: [ ]

**7. SEED MIXES**

Mixes are composed of at least 40 seeds per square foot +5 points  
 All seed genetic origin within 175 miles of site (per 2.0 of Guidelines) +5 points  
 At least 25% milkweed cover to be established from seed/plants +10 points

Total points: [ ]

**8. INSECTICIDE RISK**

Planned on-site insecticide use or pre-planting seed/plant treatment (including building/electrical boxes, etc.) +10 points  
 Communication/registration with local chemical applicators about need to prevent drift from adjacent areas +10 points

Total points: [ ]

Grand Total: [ ]

Provides Exceptional habitat >85  
 Meets Pollinator Standards 70-84

Project Name: \_\_\_\_\_  
 Vegetation Consultant: \_\_\_\_\_  
 Project County: \_\_\_\_\_  
 Project Size: \_\_\_\_\_  
 Projected Seeding Date: \_\_\_\_\_

Send completed forms, project plans, seed mixes and any communication with pesticide applicators to: alan.shaw@state.ms.us

Note: Measurements of percent "cover" should be based on "biobase cover" defined as the amount of the ground surface that is covered by a vertical projection of foliage as viewed from above. To measure cover accurately it is recommended to use plots, and/or transects in addition to monitor spectrophotometry measurements. Wildflowers in question 1 refer to "forbs" which are flowering plants that are not woody, and are not grasses (grasses, sedges, etc.) and can include introduced clovers and other non-native species beneficial to pollinators.

36

# Public Policy: State & County

- Pollinator-Friendly Solar standards MN, MD, VA, NC, SC, VT, NY, SC, IL, IN, MI, MO, OH
- Pollinator-friendly=conditional approval rather than blanket denial
- Michigan opened 3 million acres of agricultural reserve land only to pollinator-friendly solar projects
- Massachusetts SMART program adder (\$) for pollinator-friendly sites

37

## pv magazine

### Solar-powered pollinators for less than a penny a watt

Ernst Pollinator and Prairie Restorations offer the services, as required by various state scorecards for solar siting, to bring your solar site up to the "pollinator standard", while also saving money on operations and maintenance over the long term.

APRIL 5, 2019 JOHN WEAVER

BUSINESS MARKETS POLICY PRODUCTS UNITED STATES



Prairie Restorations - SoCore

38

## Potential Benefit: slow PV loss/degradation in a warming world

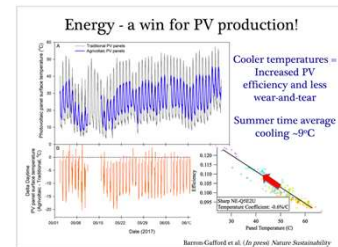
PV efficiency degrades by an average of 0.6% for every 1°C increase in temperature above 25°C (77 F).



Known:  
Bare ground/gravel  
→ Heat island



??  
*NREL is studying*



Known:  
Tomatoes under panels  
→ 9°C cooling

39

## Benefits / Questions / Issues

### Benefits

- Community support
- Soil benefits
- Permit approval
- Reduced mower/solar contact
- Reduced grading/stormwater
- Resilient landscaping
- Brand / enhanced reputation
- Reduced litigation risk
- Solar energy performance
- Reduced frost heave risk
- Benefit adjacent crops

### Questions

- Burn/fire risk
- OSHA (bee stings, etc)
- Endangered species act
- Seed supply
- Unfamiliarity / training

40

Procurement  
influences solar  
farm design

41

**Benefit:**  
**Corporations want**  
**pollinator-friendly solar**

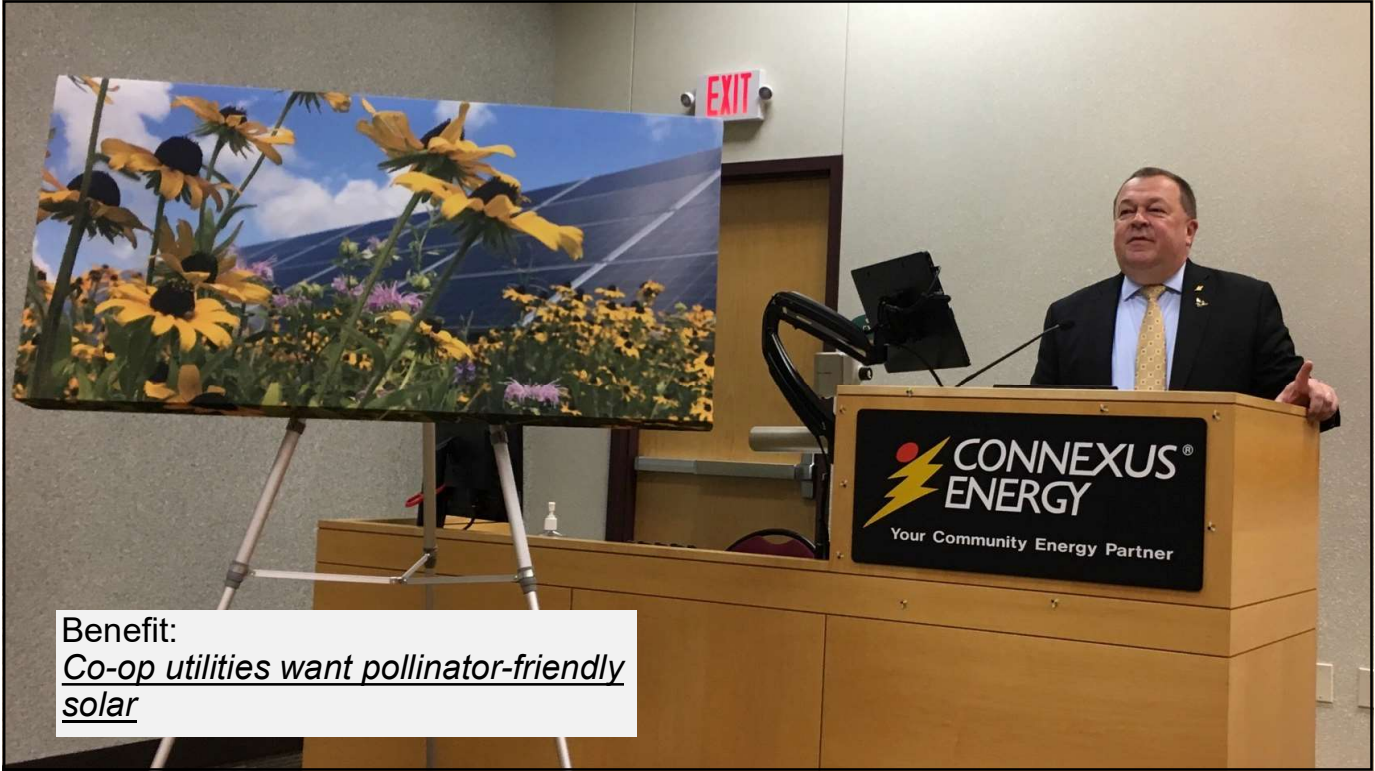


Organic Valley launches  
community solar partnership to  
be 100 percent renewably  
powered by 2019



Farmer-owned cooperative will become the largest food company in the world to source all its electricity from renewable resources within the decade.

42



Benefit:  
Co-op utilities want pollinator-friendly solar

43

Electric utilities get pollinator-friendly solar when they ask for it.



BRIEF

**In bid to help bees, Xcel to require vegetation disclosure in solar RFPs**



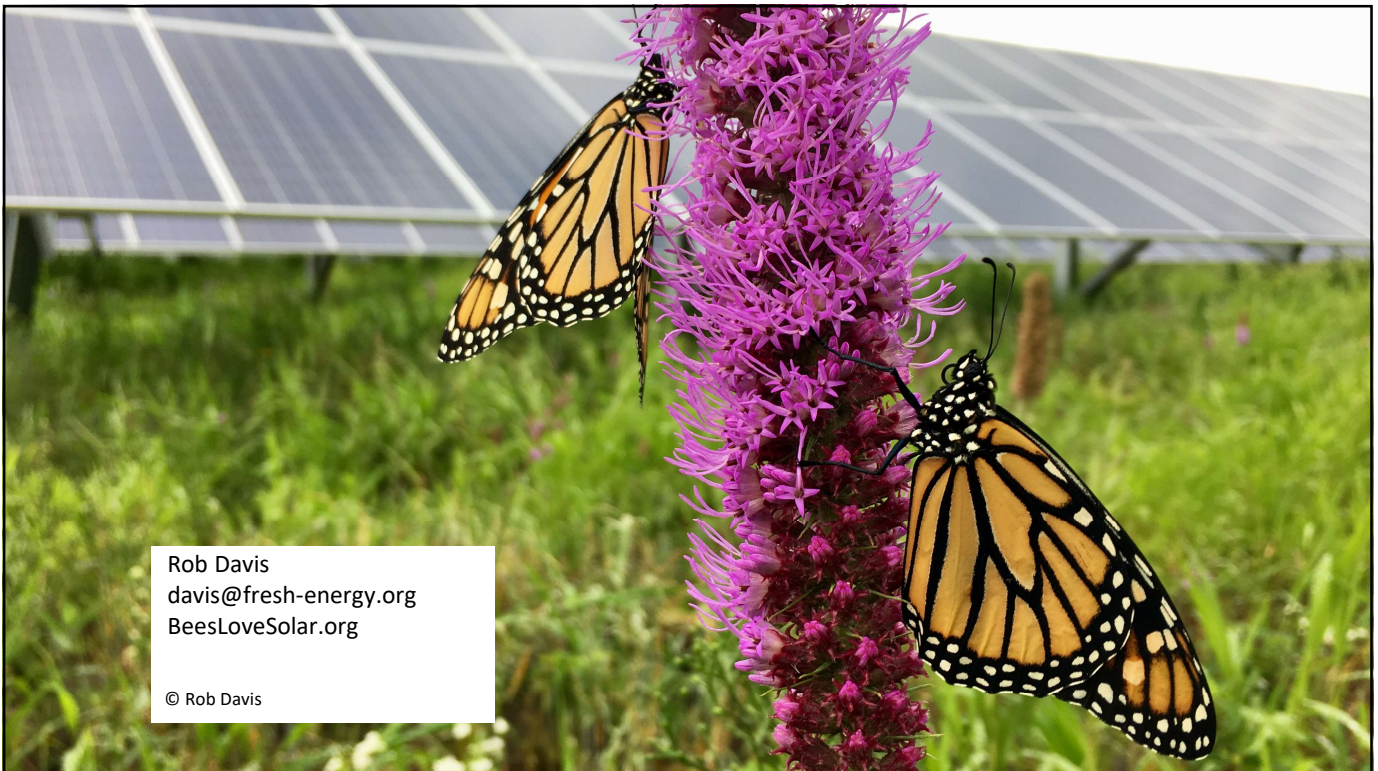
(Credit: Engie Distributed Solar)

44

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# Procurement influences solar farm design

45



Rob Davis  
davis@fresh-energy.org  
BeesLoveSolar.org

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46