



Rutgers Agrivoltaics Program Update and Lessons Learned November 15, 2022

Project partners:



What is Agrivoltaics?

- Combines agriculture with solar power generation (\neq solar farming)
- Keeps agriculture as the main focus for land use
- Can be combined with both animal and plant production
- Any yield losses are offset by income from electricity generation
- Can contribute to the viability and resiliency of farming
- Contributes to renewable energy goals (NJ: net-zero by 2050)



<https://www.next2sun.de/>



<https://www.jackssolargarden.com/>

Farm Locations

1. Rutgers Animal Farm, New Brunswick, NJ
2. Rutgers Agricultural Research and Extension Center, Bridgeton, NJ
3. Clifford E. & Melda C. Snyder Research and Extension Farm, Pittstown, NJ



Proposed design for the Rutgers Animal Farm

Vertical bifacial panels

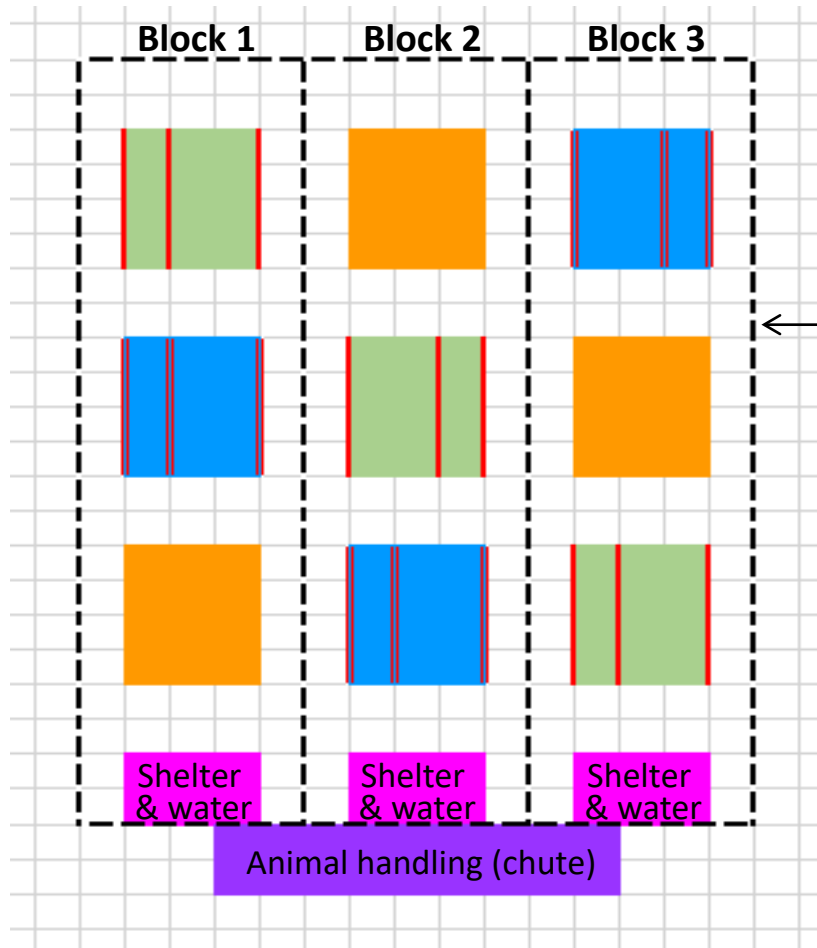


1. Animal Farm Location

Total fenced area:
300 by 544 ft
378 panels
170 kW_{DC}
Row spacing: 20/40 ft

Vertical Bifacial Installation
System size 170 kW_{DC}

• Design details Animal Farm



Each gray grid square measures 20 by 24.7 ft (E-W by N-S)

Total fenced area: 300 by 544 ft

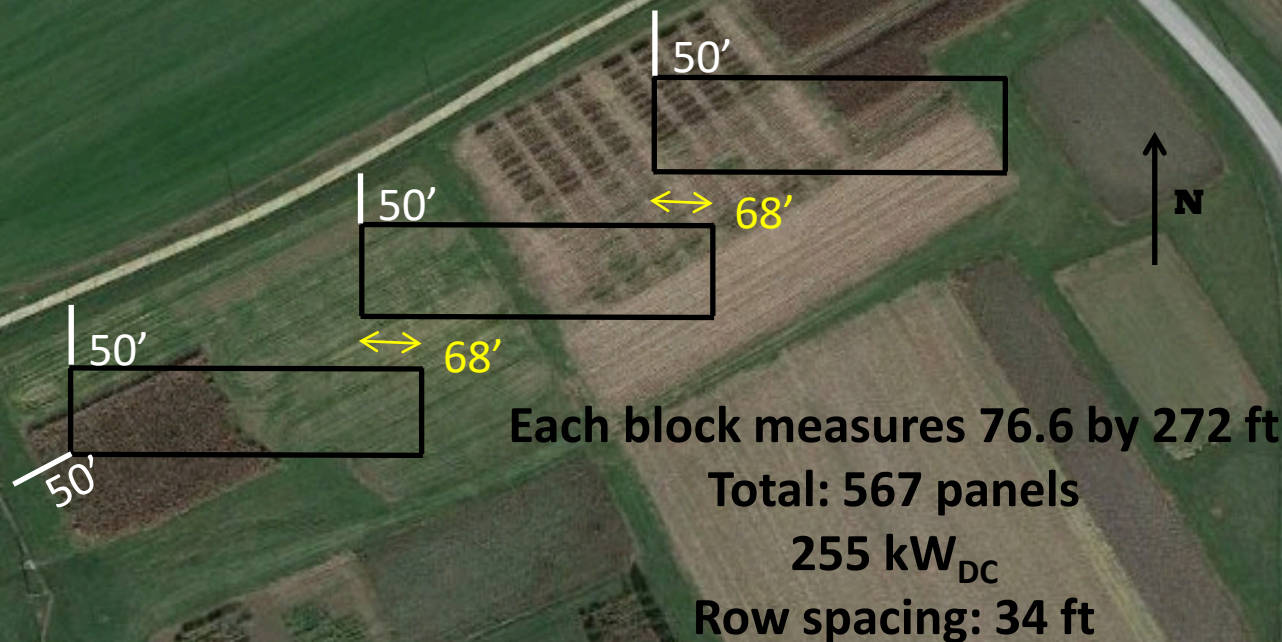
- Green = Three rows of single panels
- Blue = Three rows of double panels
- Orange = control treatment (no panels)
- Total number of panels (all three blocks): 378 (170 kW_{DC})
- Panels: ZnShine (450 W; bifaciality: 70%)
- Racking: Next2Sun or ASP



Single-axis tracking systems (Rotate E-W)

- Single or double rows of solar panels
- Panels in portrait orientation

2. RAREC Location



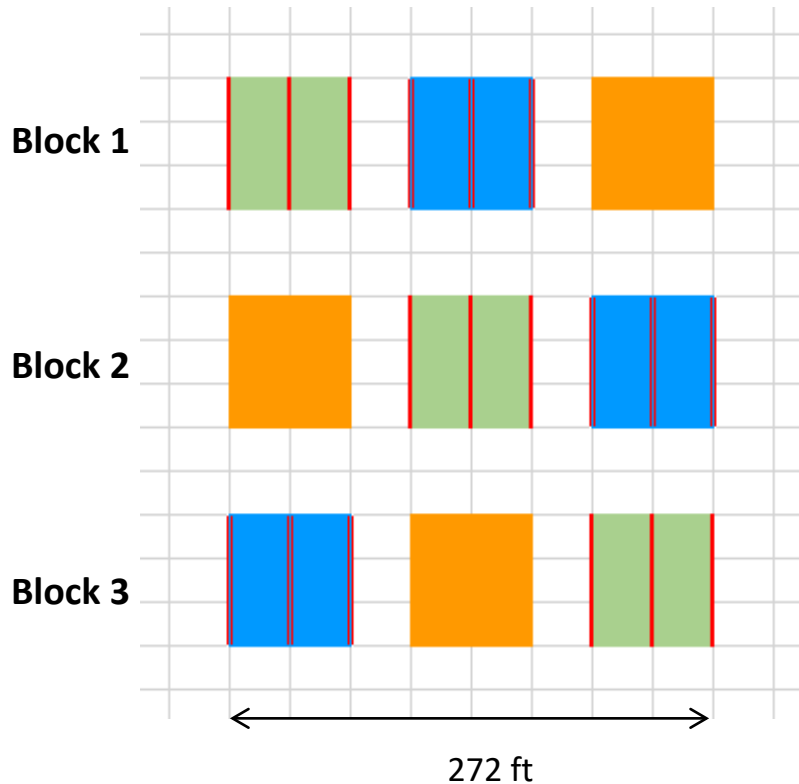
Single Axis Tracking System

Size depends on interconnect feasibility study (by ACE):

Ideal Case: 249 kW_{AC}

Worst Case: 50 kW_{AC}

• Design details RAREC



Each gray grid square measures 34 by 24.4 ft (E-W by N-S)

- Green = 3 rows of single panels
- Blue = 3 rows of double panels
- Orange = control (no panels)
- Total number of panels (all three blocks): 567 ($255.2 \text{ kW}_{\text{DC}}$)
- Panels: ZnShine (450 W; bifaciality: 70%)
- Racking system: Arctech Solar

3. Snyder Farm Location

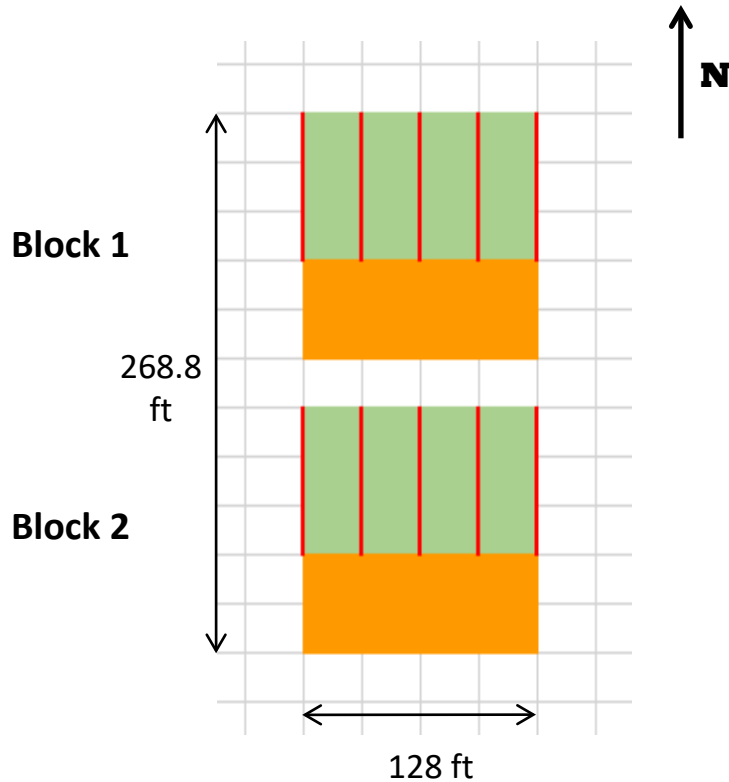


Total area:
128 by 269 ft
210 panels
94.5 kW_{DC}
Row spacing: 32 ft

Single Axis Tracking System
Size limited by transformer
& remote net metering rules
to 82.4 kW_{DC}

Locust Grove Rd

• Design details Snyder Farm



Each gray grid square measures 32 by 24.4 ft (E-W by N-S)

- Green = 5 rows of single panels
- Orange = control (no panels)
- Total number of panels: 210 ($94.5 \text{ kW}_{\text{DC}}$)
- Maximum interconnect capacity: $82.4 \text{ kW}_{\text{DC}}$
- Panels: ZnShine (450 W; bifaciality: 70%)
- Racking system: Arctech Solar

Lessons Learned to Date

- Location, location, location! Branch lines on power grids in rural areas are not always designed to accommodate additional generating capacity, especially when considering larger systems (> 1 MW)
- Getting interconnect approvals from local utilities varies greatly from one provider to another and may incur engineering fees
- Most solar developers have limited knowledge of farming practices and how to properly design agrivoltaic systems
- Some key agrivoltaic equipment is manufactured outside the US, causing longer delivery times and additional costs
- Large-scale (grid-scale) projects have a long wait time, over two years, to get regional interconnect approvals (PJM in our case)

- Capacity of local utility grids

Atlantic City Electric (ACE) map:

- <https://pepco.maps.arcgis.com/apps/dashboards/940e65bf6294b589f5832ab1521c93f>

PSEG map:

- <https://nj.pseg.com/saveenergyandmoney/solarandrenewableenergy/solarpowersustainability>

(You have to use the +/- button on the map to zoom in)

JCP&L map:

- <https://firstenergycorp.maps.arcgis.com/apps/webappviewer/index.html?id=d43cf2482a344e469eae6ca569403c24>

(again, you have to zoom in to see stuff)

There are other electric suppliers in NJ but they may not have the online mapping available



Atlantic City Electric Proposal to Advance Clean Energy & Boost Resiliency

80 targeted projects to help improve service reliability for local homeowners and businesses and increase opportunities for additional solar in South Jersey

NOV 3, 2022

Atlantic City Electric has proposed “Powering the Future,” a portfolio of projects to expand on the company’s support of New Jersey’s clean energy and climate goals while furthering its commitment to delivering safe and reliable service for its customers and communities.

<https://njbmagazine.com/njb-news-now/atlantic-city-electric-proposal-to-advance-clean-energy-boost-resiliency/>

- Update on NJ Board of Public Utilities Solar Energy Programs



Successor Solar Incentive (SuSI) Program

- The NJBPU has established a new **Successor Solar Incentive Program**, known as the “SuSI” Program. Provides incentives to **new solar generation facilities** connected to NJ’s transmission/distribution system
- SREC’s and TREC’s will be phased out
- SREC-II’s will be used in their place
- Administratively Determined Incentive (**ADI**) Program – BPU sets the SREC-II price (net-metered, community solar, dual-use programs)
- Competitive Solar Incentive (**CSI**) Program – Developers bid for an SREC-II price and BPU awards projects with the best value (grid scale projects)

<https://njcleanenergy.com/renewable-energy/home/home>



Successor Solar Incentive (SuSI) Program

Net-Metered Projects

- Program provides set incentives for net-metered residential & non-residential projects of **5 MW or less**
- Best option for reducing on-site electric costs
- Limited to 100 to 110% of your annual usage

<https://njcleanenergy.com/renewable-energy/home/home>



Successor Solar Incentive (SuSI) Program

Grid Supply Projects

- Program will provide incentives for grid supply projects and net-metered non-residential projects **greater than 5 MW.**
- General program rules expected in December 2022, and details for farm program rules in early 2023. Goal of holding the first solicitation by mid 2023
- Some of this program will be allowed on farms: Up to 2.5% of total ADA land possible (non-preserved)

<https://njcleanenergy.com/renewable-energy/home/home>



Community Solar Energy Program

- The Pilot Program has finished, BPU is now in the process of rolling out the full program rules
- Enables customers to virtually connect to a solar energy project in their utility service territory and receive a credit on their utility bills
- **Community solar** will enable access to clean energy generation for customers currently unable to place solar generation directly on their own properties
- This program **discourages placement on farms** by not awarding points for being located on farmland

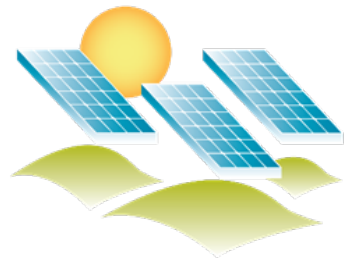
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Dual-Use Solar Pilot Program (Agrivoltaics)

- Rules and regulation to be established by the BPU in consultation with Secretary of Ag (Proposed rules in 2023, anticipated first awards by late 2023)
- **Up to 200 MW (+ 100 MW) of dual-use solar installations** in NJ over 3-5 years (not on preserved farms, Highlands, Pinelands)
- **Maximum of 10 MW per site** (~100 acres @ 50% solar density)
- Land must be **actively devoted to agricultural/horticultural use**
- Competitive applications to BPU, ranking and approval in consultation with the NJ Secretary of Ag
- For projects in an Ag Development Area (**ADA**), it must be in association with a research study undertaken in coordination with a NJ institution of higher education

<https://njcleanenergy.com/renewable-energy/home/home>



Rutgers Agrivoltaics Program

New Jersey Agricultural Experiment Station

In summary

- We anticipate construction of NJAES agrivoltaic systems to be completed by April 2023
- Crop trials to begin immediately afterwards
- Policymakers need to consider limitations of grid interconnection when designing AV/solar programs.
- Multidisciplinary approach is key
- Farmer and community acceptance to be determined
- Push-back anticipated (already encountered)
- Agrivoltaics could be a real boon for agriculture, but sound research is needed

A vibrant rainbow arches across a dark, stormy sky above a green field. In the foreground, there is a wooden structure, possibly a greenhouse or a covered walkway, and a small solar panel on a tripod. The background shows a line of trees and a distant horizon.

Thank You!!!

Photo by Daniel Ward

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<https://ecocomplex.rutgers.edu/agrivoltaics-research.html>