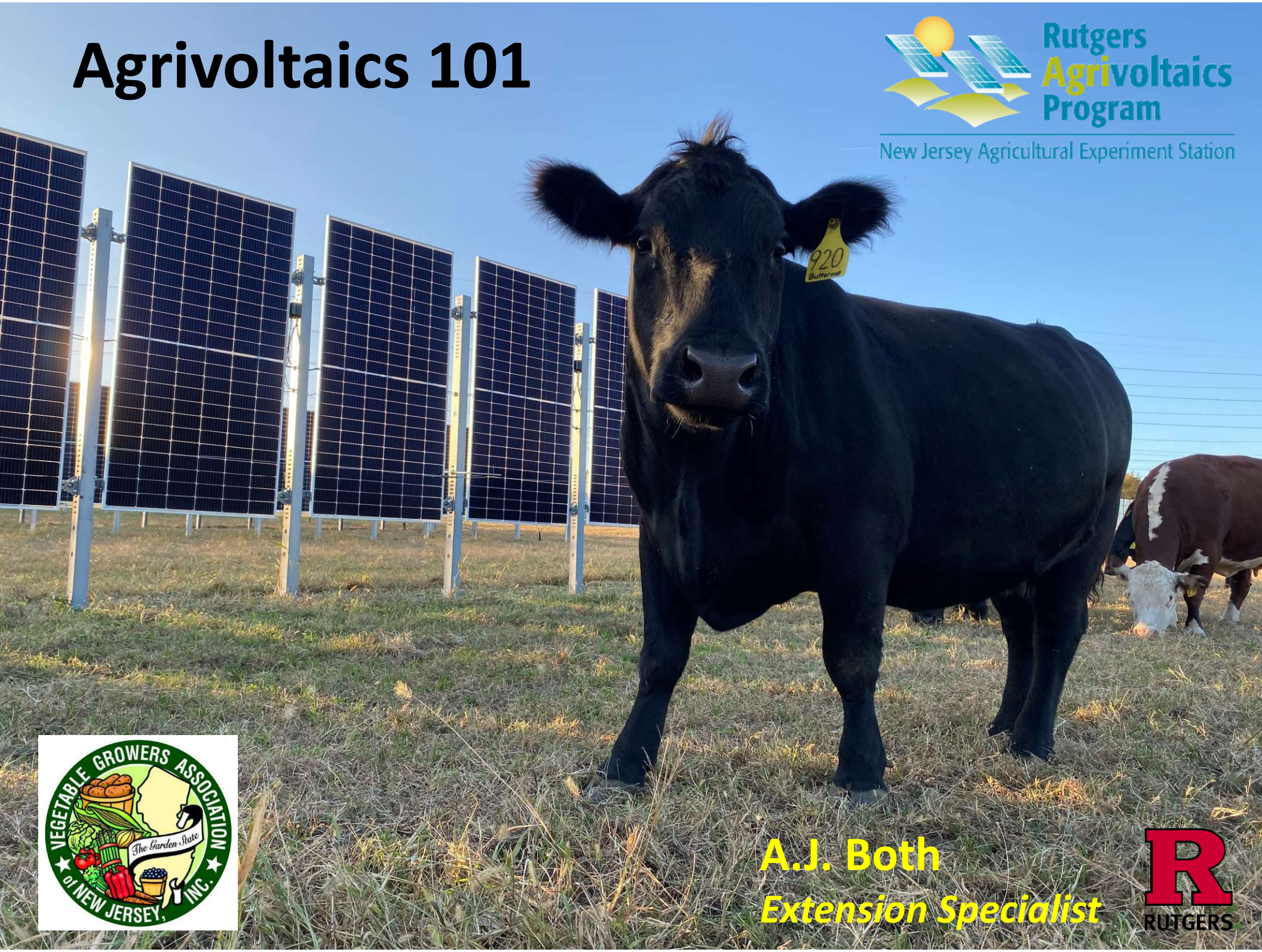
Agrivoltaics 101



Rutgers Agrivoltaics Program

New Jersey Agricultural Experiment Station

Vegetable Growers Association of New Jersey, Inc.
The Garden State

A.J. Both

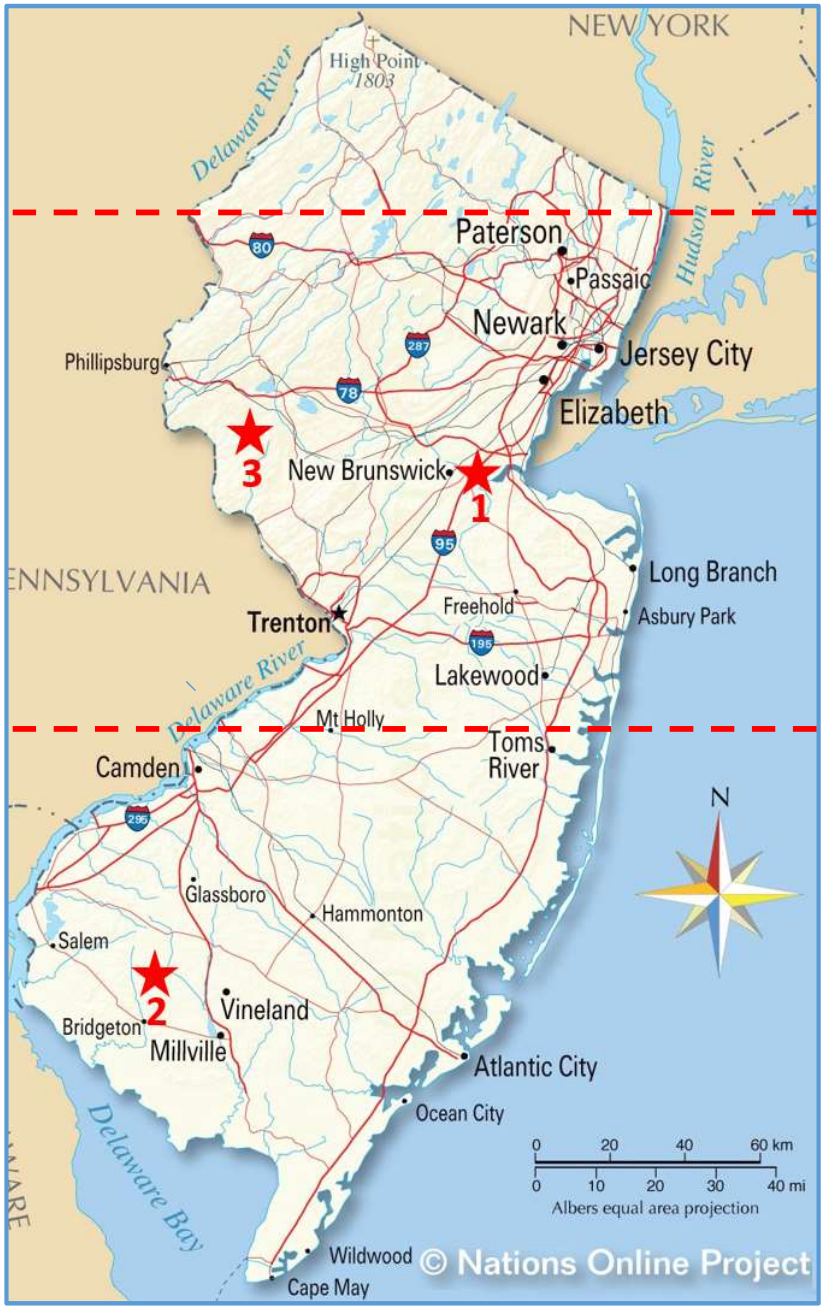
Extension Specialist

RUTGERS

Rutgers Agrivoltaics Program

- Inaugurated in 2021
- Funding received from:
  - NJAES ($100K start-up)
  - State appropriation ($2.9M)
  - DoE FARMS grant ($1.6M)
  - NJBPU ($2.8M contract)
- Constructed three installations
  1. Animal Farm (170 kW_{DC})
  2. RAREC (255 kW_{DC})
  3. Snyder Farm (94.5 kW_{DC})
- Our systems are (remote) net-metered
- Developer: Advanced Solar Products

Area needed: 5 – 8 acres/MW_{DC}
(excluding headlands)



Agrivoltaics (a.k.a. dual-use solar) simultaneously combines agriculture/horticulture with solar energy generation on the same piece of land

- Keeps the land in agricultural production
- Contributes to the state's renewable energy mandate

Different types of agrivoltaic systems

- Fixed-tilt (low to the ground, South facing)
- Seasonally adjustable tilt (manual, on posts, South facing)
- Single-axis trackers (North-South rows, various post heights)
- Dual-axis trackers (always pointed perpendicular to the Sun)
- Vertical bifacial (no moving parts, bifaciality factor)
- Elevated fixed-tilt or trackers on support structures

Fixed-tilt, South facing

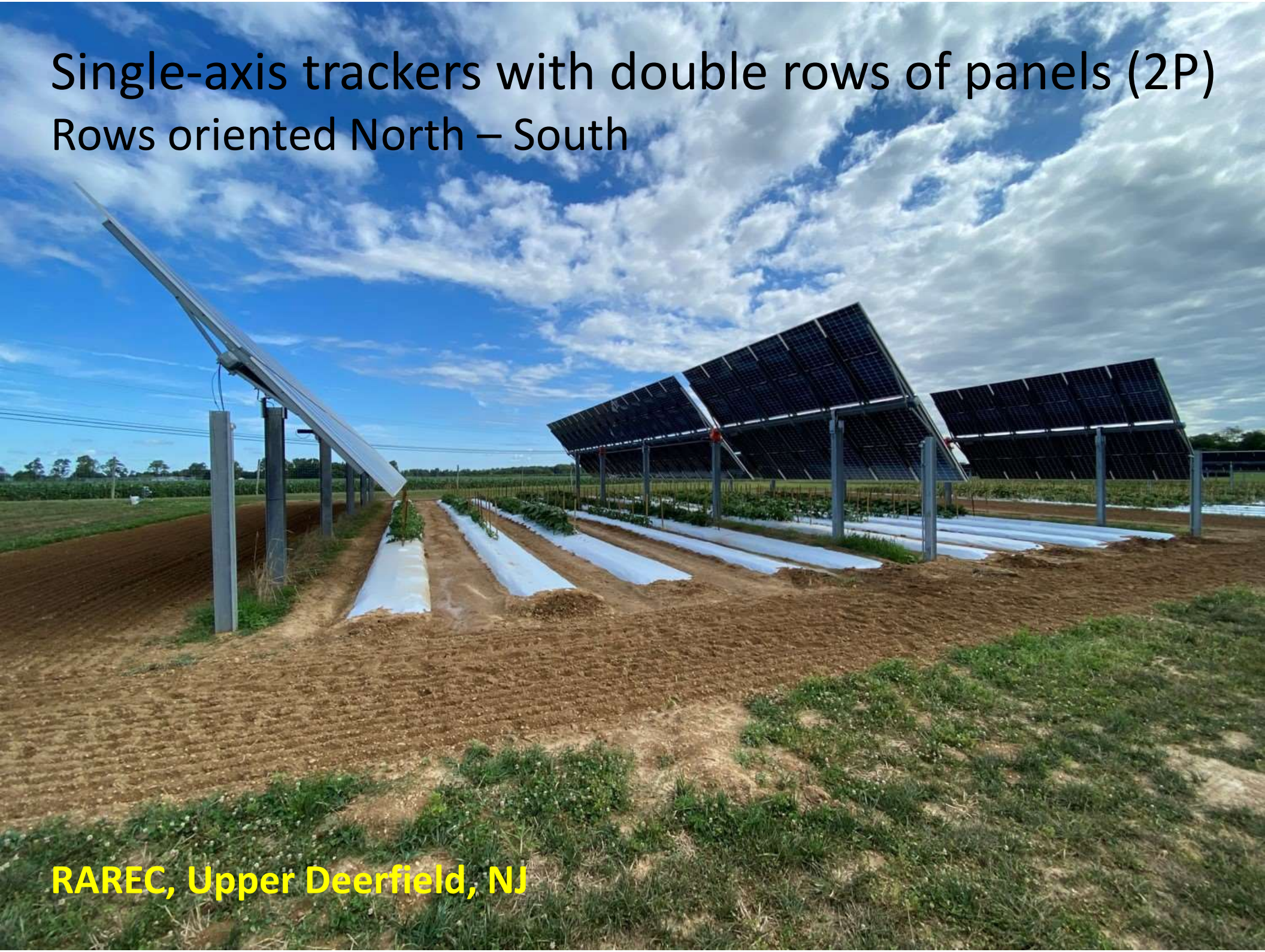
Seasonally adjustable tilt, South facing

Single-axis trackers with single rows of panels (1P)

Rows oriented North – South

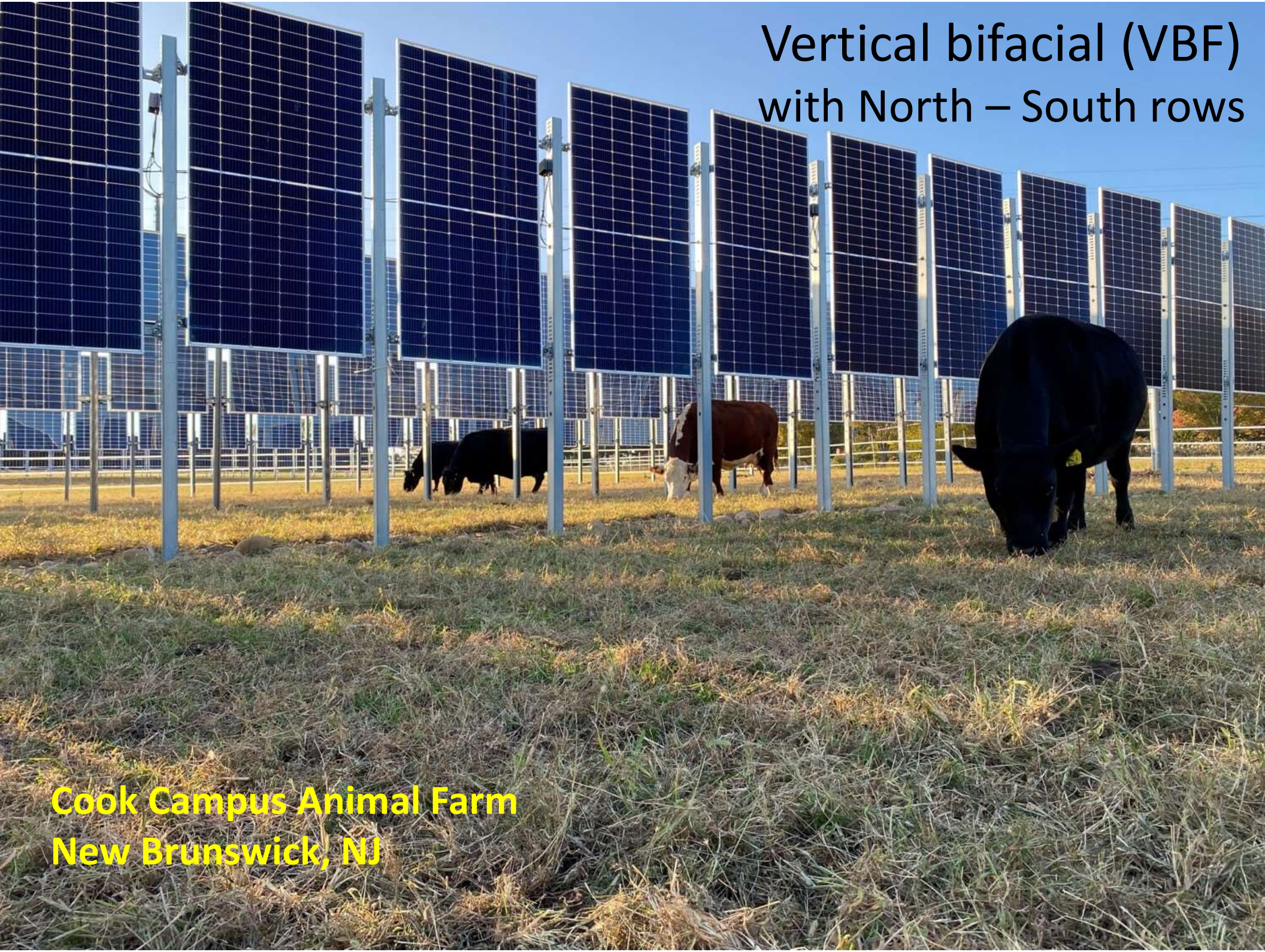
Single-axis trackers with double rows of panels (2P)

Rows oriented North – South



RAREC, Upper Deerfield, NJ

Dual-axis trackers, always pointed to the Sun


Vertical bifacial (VBF)
with North – South rows
Cook Campus Animal Farm
New Brunswick, NJ

Elevated agrivoltaics with single-axis trackers

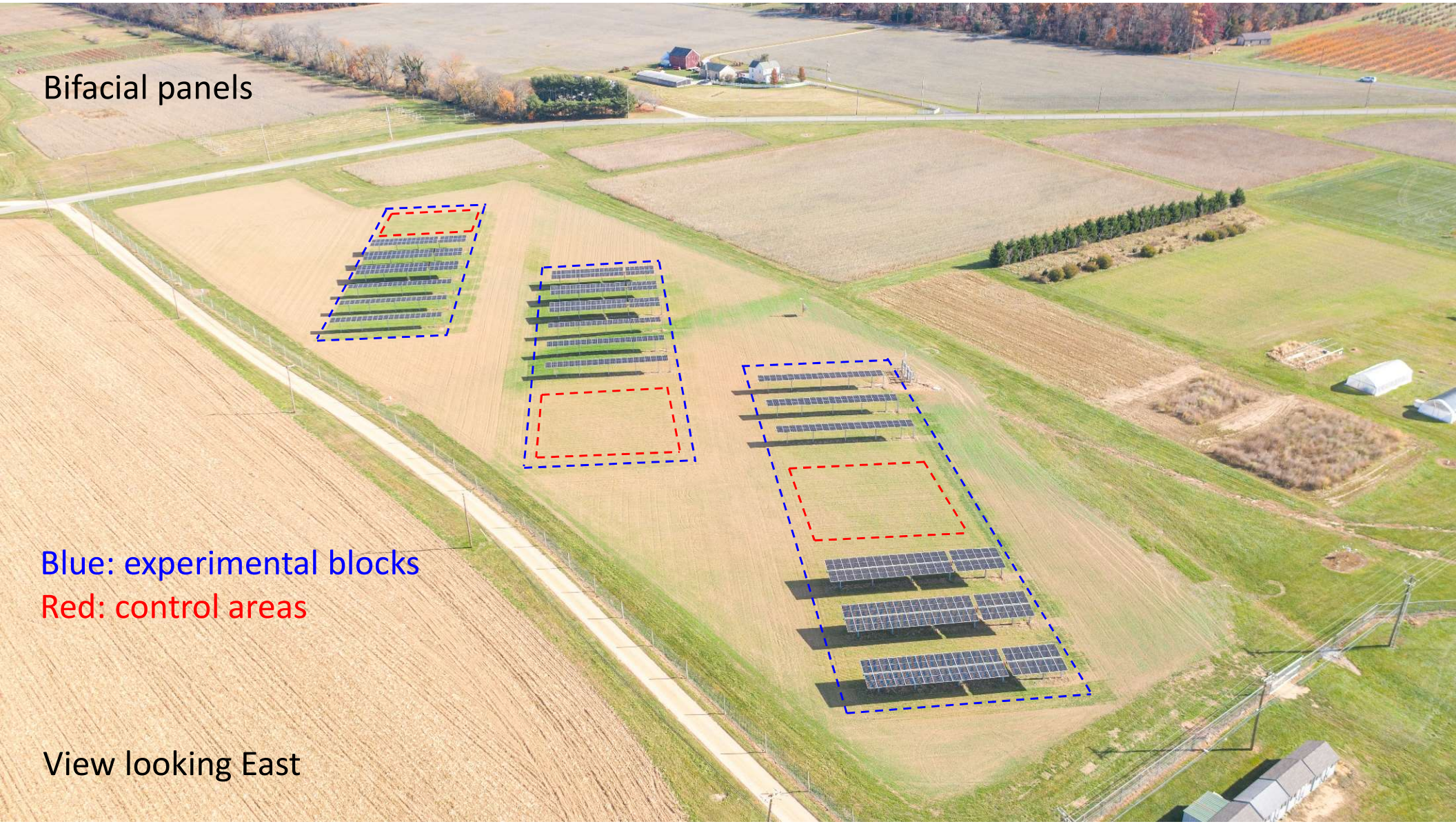
Snyder Farm, Pittstown, NJ

Jersey Central Power & Light
A FirstEnergy Company

95 kW_{DC} installed, 82.4 kW_{DC} grid-connected, single-axis trackers with a pivot point 2.4 m (8 feet) above ground level): hay production. Two treatment blocks, each with a control area and five rows with single rows of panels. Row spacing: 9.8 m (32 feet).

RAREC, Upper Deerfield, NJ

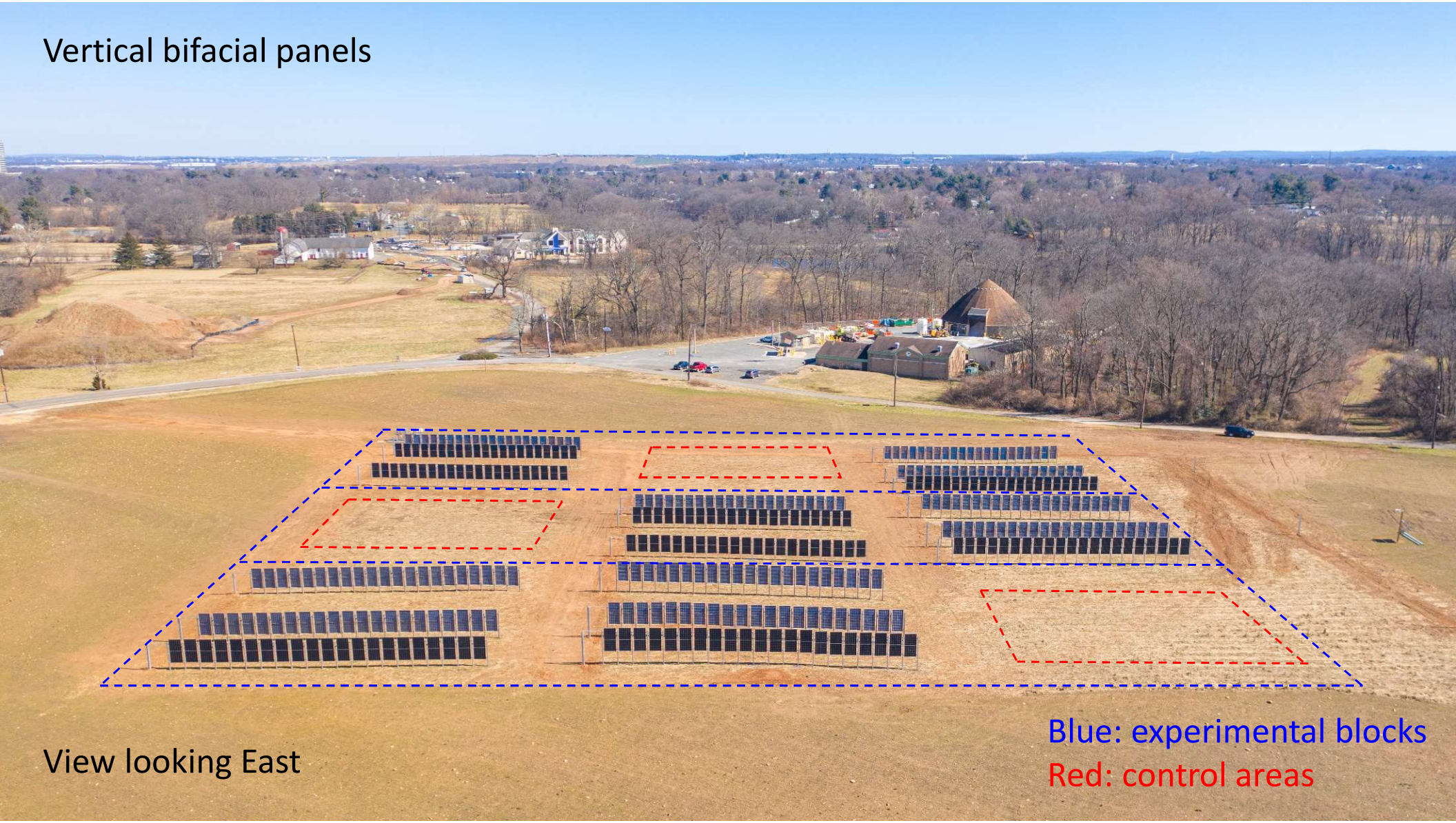
atlantic city electric℠
AN EXELON COMPANY



255 kW_{DC} installed, 48.6 kW_{DC} grid-connected, single-axis trackers with a pivot point 2.4 m (8 feet) above ground level: Staple and vegetable crop production. Three randomized blocks, each with a control area, three rows with single rows of panels, and three rows with double rows of panels. Row spacing: 10.4 m (34 feet).

Animal Farm, New Brunswick, NJ

PSEG



170 kW_{DC}: Grazing large animals and forage production. Three randomized blocks, each with a control area, three rows with 61 cm (2 feet) clearance height, and three rows with 1.22 m (4 feet) clearance height. Row spacing: 6.1 or 12.2 m (20 or 40 feet). Each row has 21 vertical bifacial panels (oriented East or West).

Key lessons learned/challenges encountered

- Every electric utility has its own procedures/timelines
- The local grid capacity may not be large enough
- Grid capacity information is not always easy to obtain
- Grid upgrades are very expensive and time-consuming
- Price per watt for each system (For our VBF > $\$4/W_{DC}$)
- Consider trackers that can rotate ±90° from horizontal
- East or West orientation of VBF panels?
- Need for contingency funds (be aware of rocky fields)
- Design-build projects require good communication and trust between developer and customer
- Operating large agricultural equipment near an agrivoltaic system can be tricky and will likely slow the process down

Operating equipment near agrivoltaic systems

General design and construction challenges

- Few design tools available for agrivoltaics
- Hiring an experienced developer/contractor
- Keeping the developer/contractor focused on agriculture
- Time required to get permits/approvals
- Dealing with delays in the supply chain
- Planning for future replacement/decommissioning
- Projects can be more time consuming than anticipated

Specific construction challenges

Soil compaction

Handling topsoil

Post refusals

Conduit risers

Placement of conduit boxes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Thank you!! Questions?
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