LASSO Prize Technical Assistance

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January 8, 2025

Photo by Dennis Schroeder , NREL 53022

Agenda

1. LASSO Overview
2. LASSO Resources
3. Example Cattle Agrivoltaics Systems
4. Key Design and O&M Considerations
5. Technical Assistance Preview
6. Q&A

Housekeeping

- This webinar is being recorded and will be made publicly available (on HeroX) following today's webinar, along with a PDF of the slide deck.
- We will have time for Q&A at the end of today's webinar.
  - Please submit your questions via the Q&A Tool and not via chat.
  - We may not be able to get to all questions today; however, we will post written responses to all questions (whether answered live or not) to the HeroX FAQ following today's presentation.

The InSPIRE Project

Innovative **S**olar **P**ractices **I**ntegrated with **R**ural Economies and **E**cosystems

- InSPIRE is DOE's first and longest-running investment in agrivoltaics, started in 2016
- InSPIRE has conducted field research at 24 sites across the United States
- **Analytical research:**
  - Cost-benefit tradeoffs of different agrivoltaic configurations
  - Assessing research gaps and priorities
  - Tracking agrivoltaic projects across the U.S.
- **Field-based research:**
  - Novel agrivoltaic and traditional utility-scale PV designs integrated with multiple activities
  - Assessing agricultural yields and irrigation requirements in arid environments
  - Grazing standards and best practices
  - Pollinator habitat and ecological services

https://openei.org/wiki/InSPIRE

InSPIRE Team

- Plant science
- Social science
- Soil science
- Entomology
- Hydrology
- Energy systems modeling
- PV technology expertise
- Economic analysis
- Industry experience
- Agricultural fieldwork
- International development

InSPIRE

LASSO Overview

Photo by Joe DelNero, NREL 72447

Large Animal and Solar System Operations (LASSO) Prize

Incentivize pilot cattle agrivoltaics projects across the U.S., share designs and results, and provide information and best practices

- $8+ million in prize awards
- Two tracks – for new and existing projects
- Two bonus prizes:
  - Largest new agrivoltaics project over 5 MW-dc
  - Most valuable data that goes above and beyond the minimum requirements

Two Tracks: Standard and Operating Projects

Track 1: Standard Track

For teams who are developing new cattle agrivoltaics PV projects

Track 2: Operating Projects Track

For teams who have existing cattle agrivoltaics PV Projects

Projects may only be submitted to a single track, either to the Standard Track or to the Operating Projects Track.

LASSO Prize Tracks and Phases

Standard Track

Phase 1: Teaming
6 months

Phase 2: Plans and Construction
Up to 2.5 years

Phase 3: Data Collection
2 years

Operating Projects Track

Phase 1: Summary Information
6 months

Phase 2: Data Collection
2 years

Bonus Prizes

Largest PV System >5MW
Only for Standard Track teams

LASSO Data Bounty
Open to all teams, based on submitting valuable data beyond requirements

LASSO Resources

Photo by Josh Bauer, NREL 94719

Read the Rules

Official Rules
American-Made Large Animal and Solar System Operations (LASSO) Prize

Standard Track Phase 1 and Phase 2A

Operating Projects Track Phase 1

September 2024

Official Rules of the American-Made LASSO Prize are available online on HeroX:
https://www.herox.com/LASSO/resource/1987

Key Rule Reminders:

- Project systems must be at least 250 kW, larger systems are desirable
- The cattle must be integrated/co-located with the system
- Only the capacity of the PV system that the cattle actually graze will be counted toward system size
- Projects must be grid-interconnected

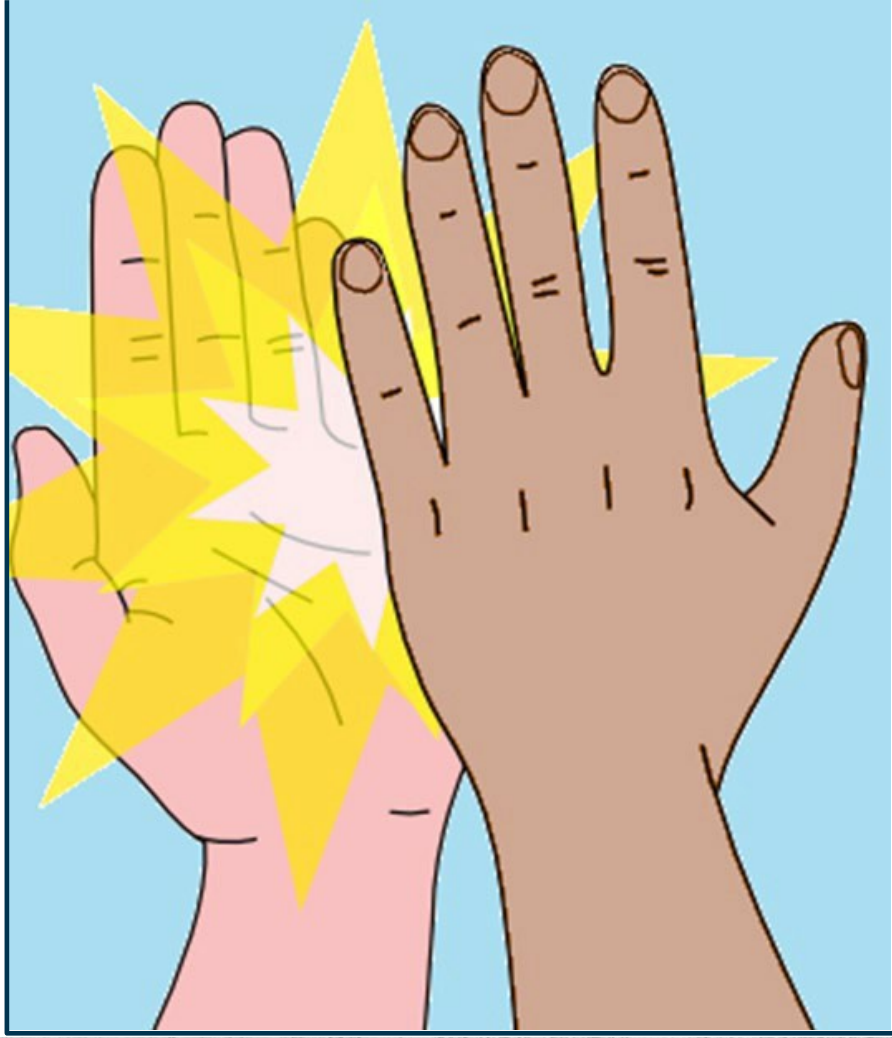
Forming Teams is Essential For LASSO Prize Success

All teams must include, at a minimum, a solar developer and a rancher or farmer, but should also consider including other multidisciplinary members such as local governments, academic researchers, extension programs, etc.

Competitors are responsible for forming their own teams, but LASSO is providing resources to help, such as:

- HeroX Teaming Resource
- Power Connector Support (ADL Ventures)

Start forming your team now for your Phase 1 submission!



Standard Track Key Dates

Phase 1 (September 2024–May 2025)	
September 10, 2024	Open for Phase 1 Submissions
March 6, 2025, 5 p.m. ET	Phase 1 Submission Deadline
May 2025	Phase 1 Winner Announcement (Anticipated)
Phase 2 (May 2025–March 2028)	
May 2025*	Phase 2A Open for Submissions
November 27, 2025, 5 p.m. ET May 28, 2026, 5 p.m. ET November 26, 2026, 5 p.m. ET	Phase 2A Submission Deadlines
Rolling Announcement; February 2026 - February 2027	Final Phase 2A Winners Announced
Rolling Opening Date: February 2026 - February 2027*	Phase 2B Open for Submissions
February 9, 2028, 5 p.m.	Phase 2B Submission Deadline
March 2028*	Final Phase 2B Winners Announced

Phase 3 (April 2028–May 2030)	
April–September 2028*	Phase 3A Data Collection Period
October 19, 2028, 5 p.m. ET	Phase 3A Submission Deadline
October 2028–March 2029*	Phase 3B Data Collection Period
April 19, 2029, 5 p.m. ET	Phase 3B Submission Deadline
April 2029–September 2029*	Phase 3C Data Collection Period
October 18, 2029, 5 p.m. ET	Phase 3C Submission Deadline
October 2029–March 2030*	Phase 3D Data Collection Period
April 18, 2030, 5 p.m. ET	Phase 3D Submission Deadline and Final Report Deadline Data Bounty Prize Submission Deadline
May 2030*	Data Bounty Prize Winner Announced

Winners for Phases 3A–3D will be announced, and awards will be paid, approximately 30–60 days following each submission deadline.

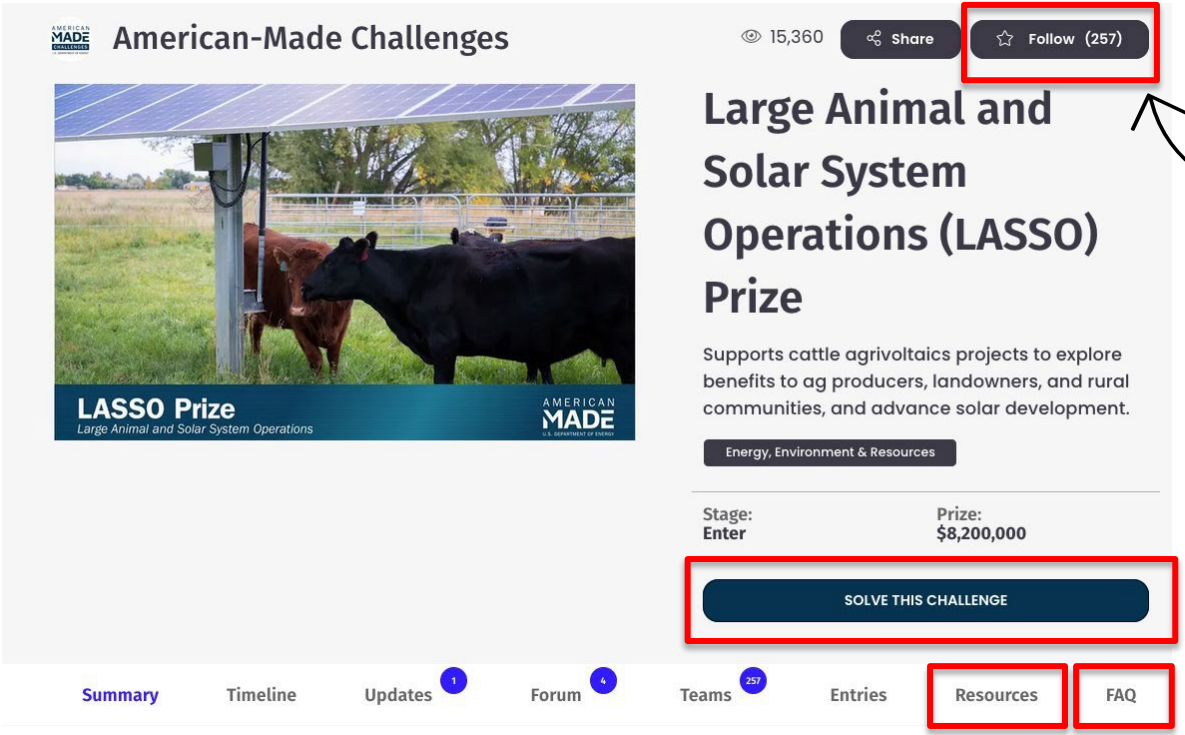
Operating Projects Track Key Dates

Phase 1 (September 2024–May 2025)	
September 10, 2024	Open for Phase 1 Submissions
March 6, 2025, 5 p.m. ET	Phase 1 Submission Deadline
May 2025	Phase 1 Winner Announcement (Anticipated)
Phase 2 (June 2025–May 2027)	
June–November 2025*	Phase 2A Data Collection Period
December 18, 2025, 5 p.m. ET	Phase 2A Submission Deadline
December 2025–May 2026*	Phase 2B Data Collection Period
June 18, 2026, 5 p.m. ET	Phase 2B Submission Deadline
June–November 2026*	Phase 2C Data Collection Period
December 17, 2026, 5 p.m. ET	Phase 2C Submission Deadline
December 2026–May 2027*	Phase 2D Data Collection Period
June 17, 2027, 5 p.m. ET	Phase 2D Submission Deadline and Final Report Deadline Data Bounty Prize Submission Deadline
May 2030*	Data Bounty Prize Winner Announced (date aligned with Standard Track)

Winners for Phases 2A–2D will be announced and awards will be paid approximately 30–60 days following each submission deadline.

LASSO HeroX

Follow the prize on HeroX!
HeroX.com/LASSO



Follow the Prize

Submission Form

Answers to your Questions

Rules and Teaming Resource

Example Cattle Agrivoltaics Systems

Photo by Joe DelNero, NREL 72447

Fixed-Tilt Systems

Source: https://agupdate.com/agriview/news/dairy/solar-plus-cows-green-dairy/article_9d60cc04-a0e6-11ee-989c-fffceed9b5ca.html (University of Minnesota)

Source: https://pv-magazine-usa.com/2023/06/30/beef-cattle-agrivoltaics-on-an-oregon-family-ranch/ (Kathy Voth, OnPasture)

Vertical Bifacial Systems

Source: https://vrijstadenergie.nl/zonneprojectdenheuvel/ (Vrijstad Energie)

Source: https://rcei.rutgers.edu/cows-and-solar-panels-in-a-new-jersey-first-project-melds-farming-with-electricity-generation/ (Lori Nardoza)

Single-Axis Tracking Systems

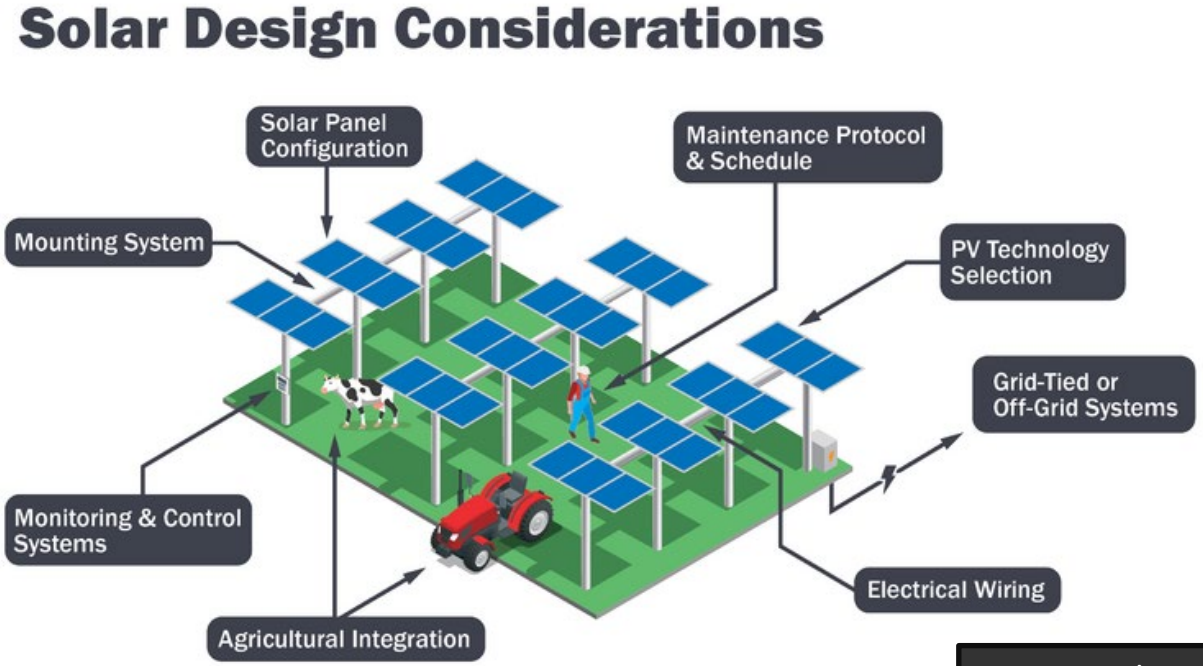
Source: https://www.ombrea.fr/en/agri-energies-elevage/ (Ombrea)

Source: https://bigpivots.com/agrivoltaics-becoming-part-of-weld-county-proposals/ (Jack's Solar Garden)

Key Design Considerations

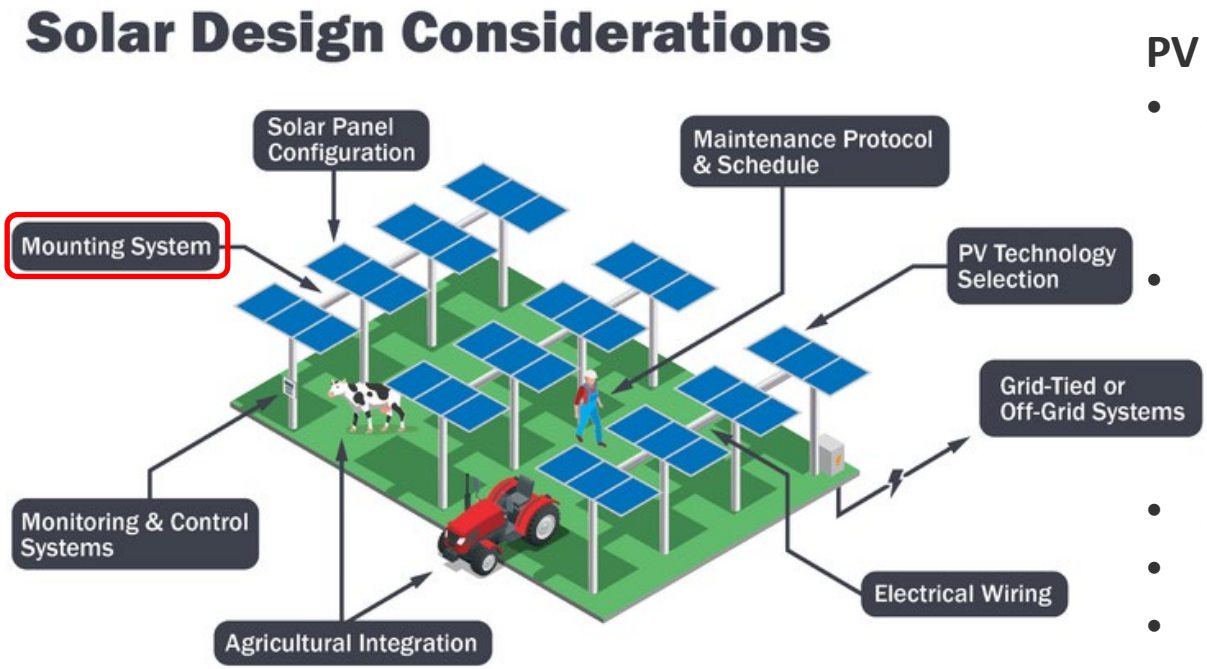
Photo by Joe DelNero, NREL 72447

Key Agrivoltaic Design Considerations



For more detailed information, see the InSPIRE "Getting Started" resources here: https://openei.org/wiki/InSPIRE/Getting_Started

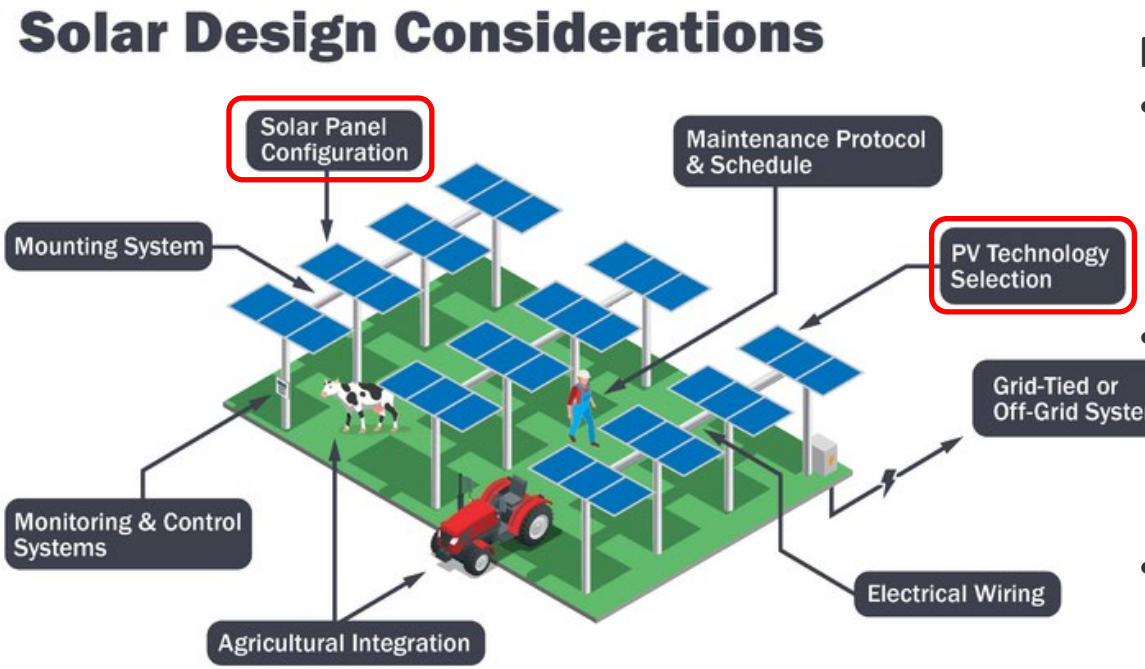
Key Agrivoltaic Design Considerations



PV Mounting and Racking Systems

- Standard Designs
  - Fixed-tilt
  - Single-axis tracking
- Emerging Designs
  - Vertical bifacial
  - Canopy
  - Cable systems
- System height
- Groundcover ratio (GCR)
- Installed capital costs
- Generation tradeoffs
- Maintenance tradeoffs

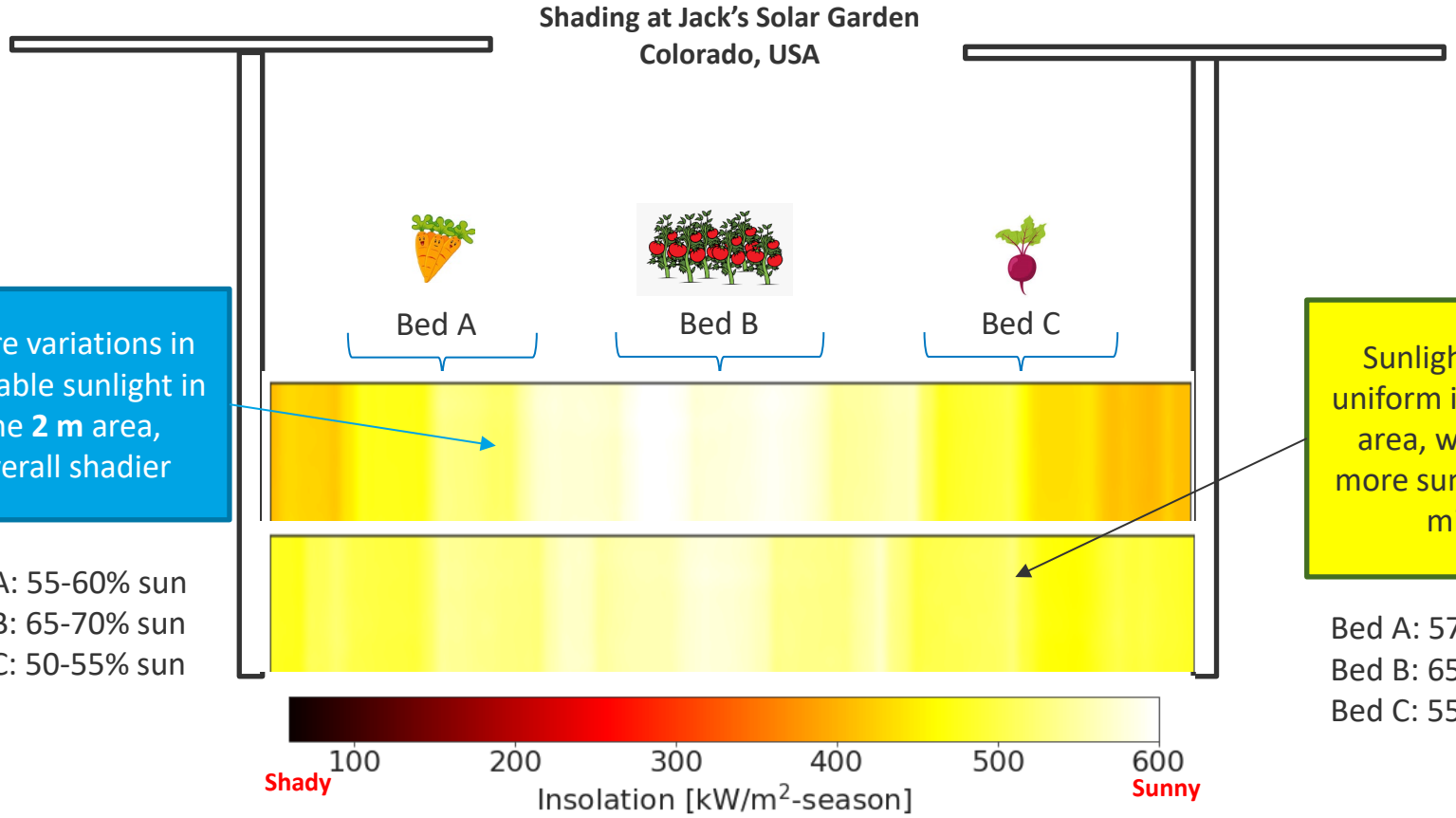
Key Agrivoltaic Design Considerations



PV Technology and Configurations

- PV technology selection
  - Monofacial/bifacial PV
  - CdTe
  - Organic PV/Other
- PV panel configuration
  - Inter-panel spacing
  - Row spacing
  - System height
- Shading patterns

Agrivoltaic Microclimate – Sunlight at Different Heights



More variations in available sunlight in the **2 m** area, overall shadier

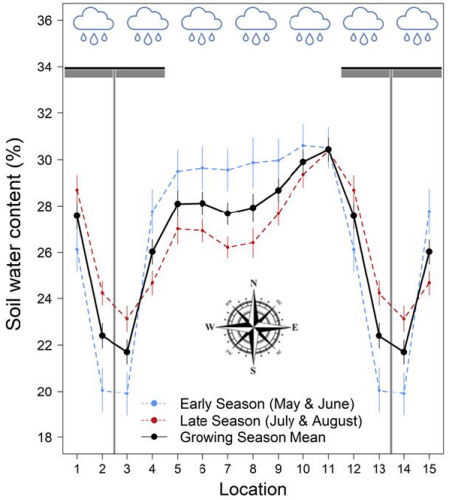
Bed A: 55-60% sun
Bed B: 65-70% sun
Bed C: 50-55% sun

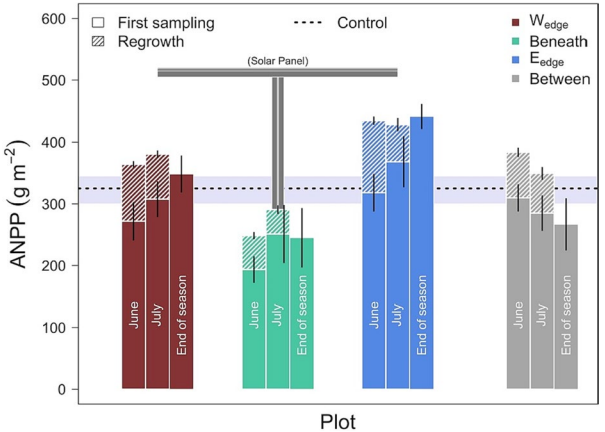
Sunlight is more uniform in the **2.5 m** area, with a little more sunlight in the middle

Bed A: 57-62% sun
Bed B: 65-70% sun
Bed C: 55-60% sun

Agrivoltaic Microclimate – Water and Vegetation Growth

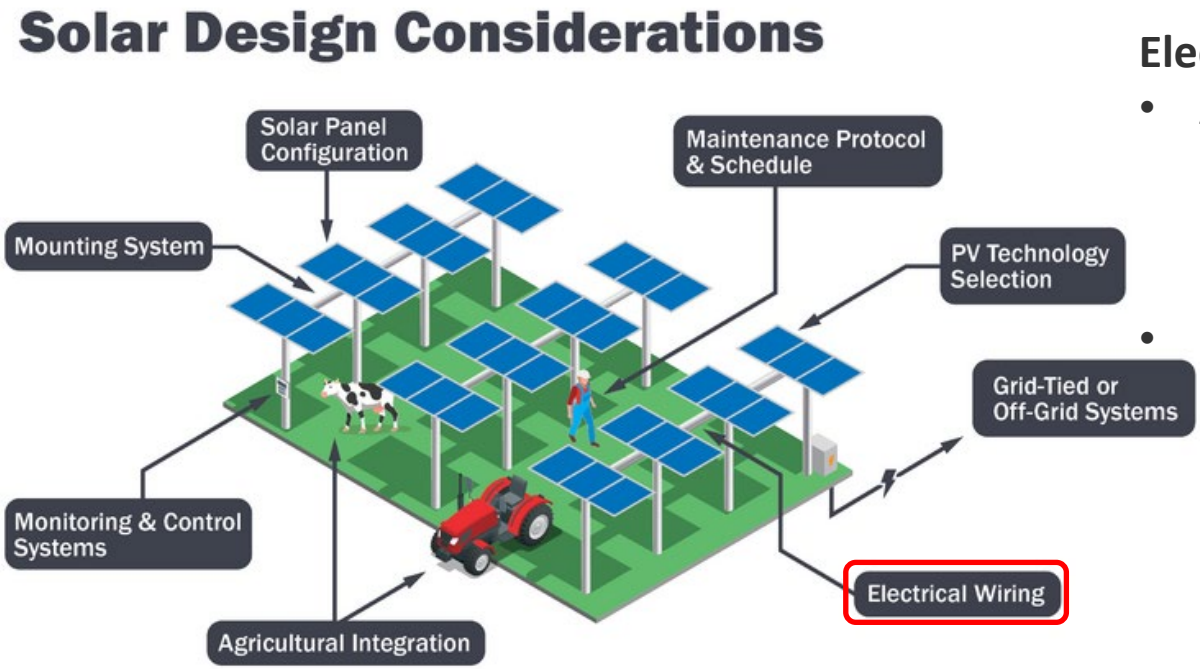
- Agrivoltaic site in Colorado (Jack's Solar Garden)
- Seasonal soil moisture patterns under and between panels
- Panel configuration and tracking operations can affect runoff and dew
- Interplay of adjusted soil moisture, available sunlight, and temperature can affect vegetation performance





Sturchio et al., 2022
Sturchio et al., 2024

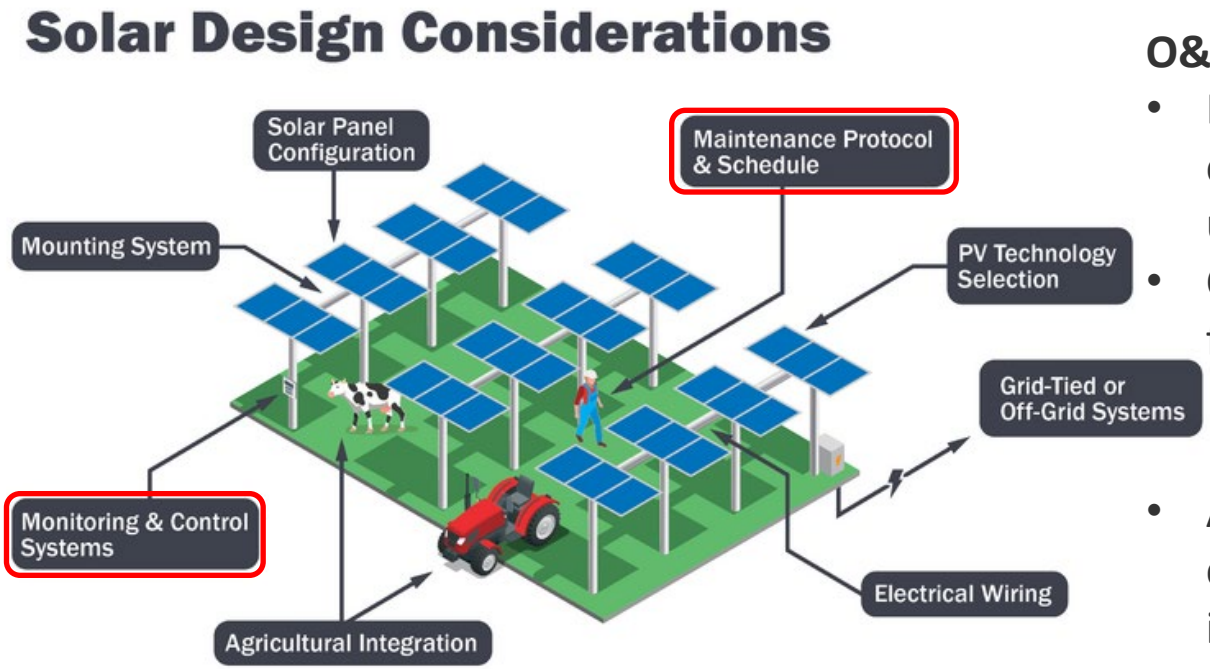
Key Agrivoltaic Design Considerations



Electrical Wiring

- Above-ground wiring protection
  - Conduit
  - Minimizing interaction risks (no dangling loops)
- Below-ground wiring protection
  - Sufficient depth based on soil, animal behavior, and equipment utilized
  - Consideration of all potential activities on-site

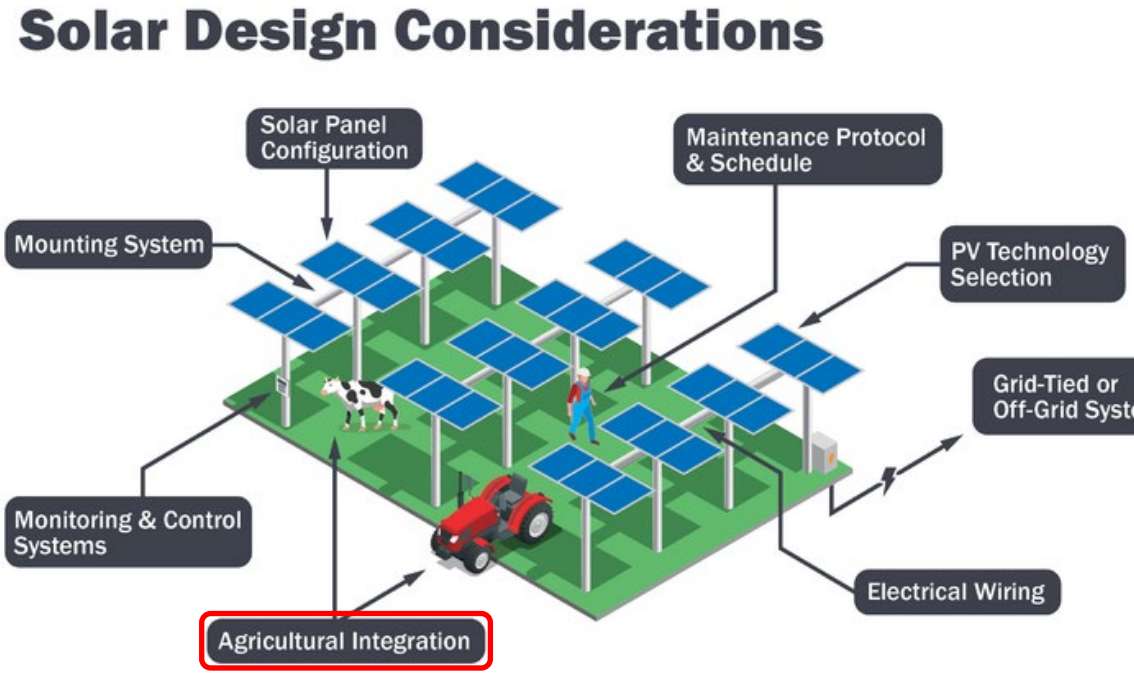
Key Agrivoltaic Design Considerations



O&M and Monitoring

- Design systems to be compatible with scheduled (and unexpected) O&M practices
- Clear roles and responsibilities for each aspect of the system
  - Solar
  - Agricultural
- Advanced monitoring and control systems for real-time information

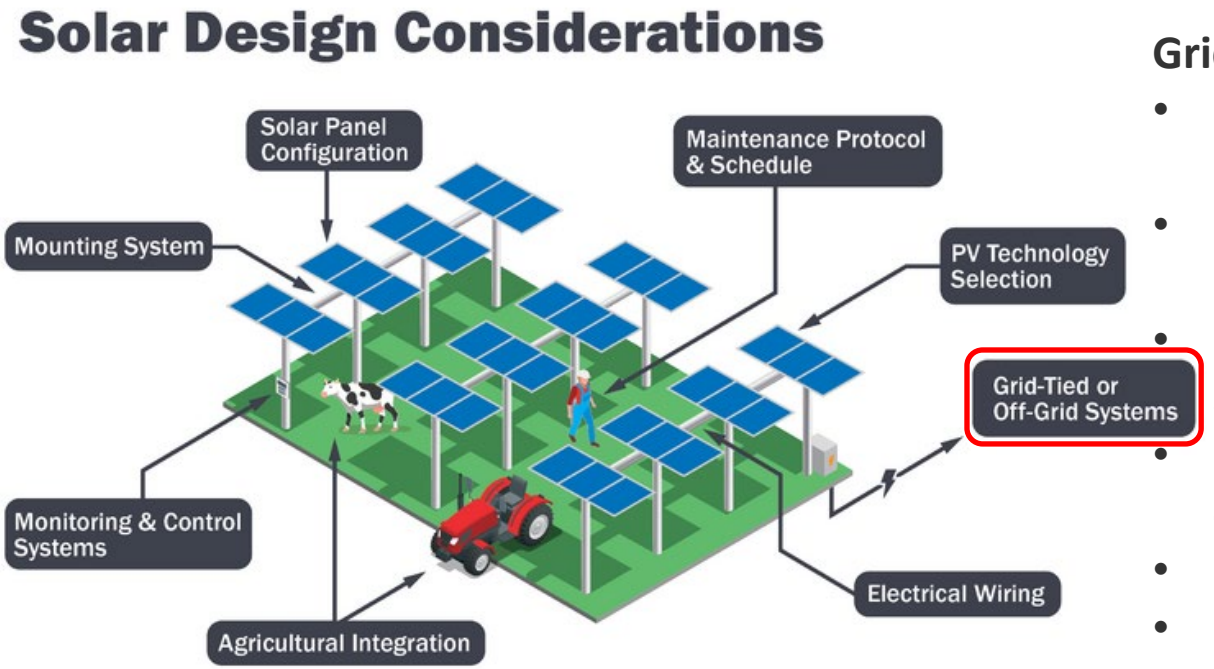
Key Agrivoltaic Design Considerations



Cattle Integration/Compatibility

- All required (permanent and temporary) ag equipment
- All solar infrastructure (beyond only PV panels)
- Seasonal changes in animal activity, behavior, and location
- Animal interactions
- Flexibility based on changing herd sizes, breeds, etc.
- Compatibility with best animal husbandry practices
- Alignment with grazing plans

Key Agrivoltaic Design Considerations

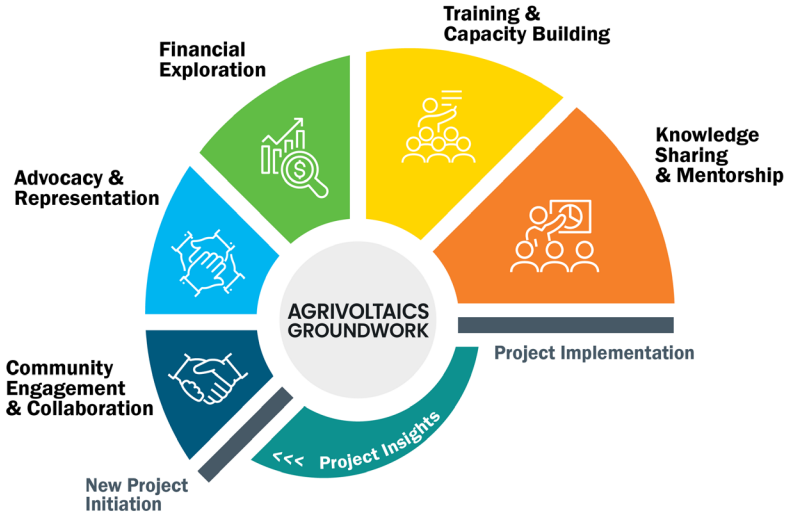


Grid-Tied vs. Off-Grid Systems

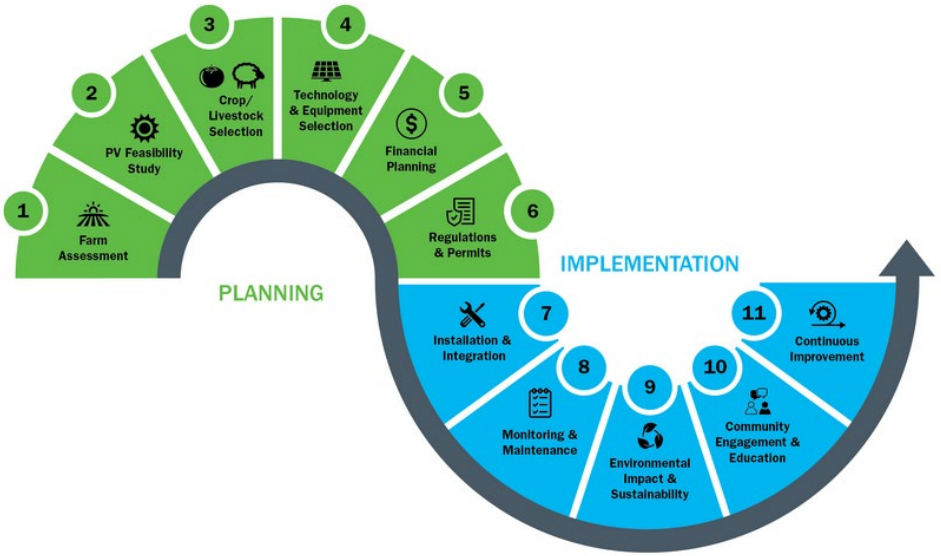
- Identification of local state and utility options based on load
- Economic assessment based on rate ($/kWh) possible
- Consideration of battery costs and performance for off-grid
- Interconnection planning, compliance, and cost estimates
- Impacts on insurance, financing
- Business model
- *LASSO projects must be interconnected*

Agrivoltaics Groundwork and Pathways

Agrivoltaics Groundwork



Agrivoltaics Pathway



For more detailed information, see the InSPIRE "Getting Started" resources here: https://openei.org/wiki/InSPIRE/Getting_Started

Technical Assistance Preview

Photo by Joe DelNero, NREL 72447

Phase 1 Technical Assistance

- NREL agrivoltaics researchers will be providing technical assistance for Phase 1:
  - January 8, 2025 – 11am MT – Webinar #1 (Agrivoltaics Design Basics)
  - January 22, 2025 – 12pm MT – Office Hours #1
  - February 5, 2024 – 11 am MT – Webinar #2 (Data Collection)
  - February 19, 2024 – 11 am MT – Office Hours #2
- Follow the prize on HeroX to be notified when registration goes live for these events!

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Sign Up Today!

Become a LASSO Competitor:

- Follow the Prize on HeroX– Get important updates about the prize
- Read the Rules – Everything you need to know about participating in the prize
- Form a Team– Use the Teaming Resource on HeroX
- Attend ADL's Office Hours – Visit HeroX for links to register
- Submit to Phase 1– Submission Deadline March 6, 2025, at 5 p.m. ET

Questions?: LASSO.Prize@nrel.gov

Q&A

Photo by Josh Bauer, NREL 94719