



Security And Sustainability Forum

Convening Global Experts to Guide Decision Making



Beneficial Electrification: The Future of Farming

Thursday, November 4, 2021

Webinar Registration: 600



Kevin Dooley,
Moderator

Chief Research Scientist
The Sustainability Consortium Global Institute of Sustainability & Innovation, ASU



Keith Dennis

Vice President
National Rural Electric Cooperative Association (NRECA).
Board Co-Chair, Beneficial Electrification League



Doug Hutchings

Co-Founder & Chairman
Delta Solar



Jim Whitaker

Managing Partner
Trinity Farms



Tony Heiser

Business Development Manager - Electric Vehicle Applications
KEB America, Inc.



Drew Slattery

Human Dimensions of Change Lead
The Farm Journal's Trust in Food



Edward Saltzberg

Executive Director
[Security & Sustainability Forum](#)

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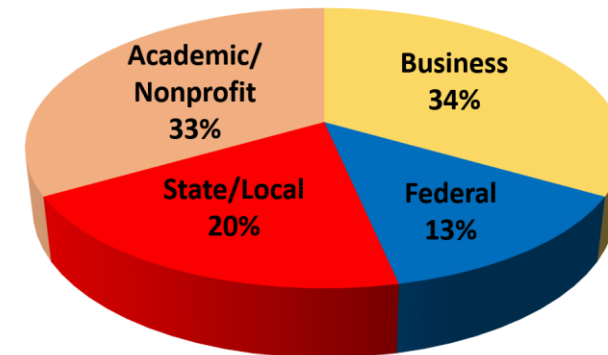
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1. **Welcome:** Ed Saltzberg, *Executive Director, SSF*
2. **Context: Kevin Dooley, Moderator,** *Chief Research Scientist, The Sustainability Consortium Global Institute of Sustainability & Innovation, ASU*
 - **Keith Dennis,** *Vice President, National Rural Electric Cooperative Association (NRECA). Board Co-Chair, Beneficial Electrification League*
 - **Doug Hutchings,** *Co-Founder & Chairman, Delta Solar*
 - **Jim Whitaker,** *Managing Partner, Trinity Farms*
 - **Tony Heiser,** *Business Development Manager - Electric Vehicle Applications, KEB America, Inc.*
 - **Drew Slattery,** *Human Dimensions of Change Lead, The Farm Journal's Trust in Food*
1. **Panel Discussion with Audience Q + A:** *Use the box in the Go To Webinar window*
2. **Panel Summary**
3. **Closing**

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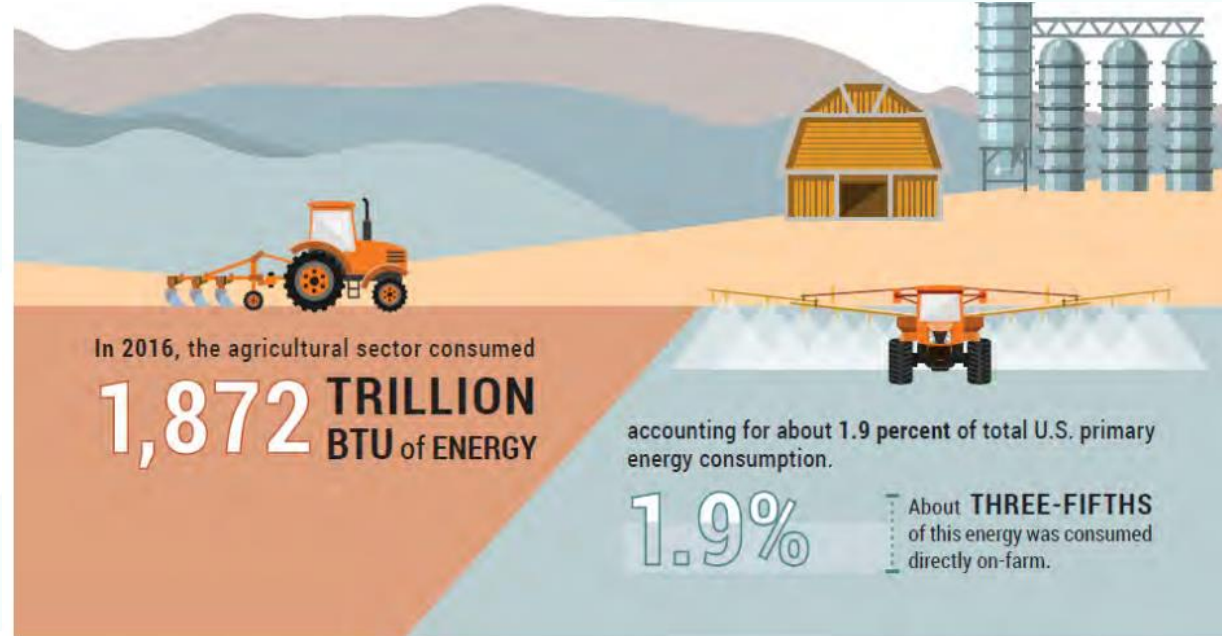


Drew Slattery
*Human
Dimensions of
Change Lead
The Farm Journal's
Trust in Food*

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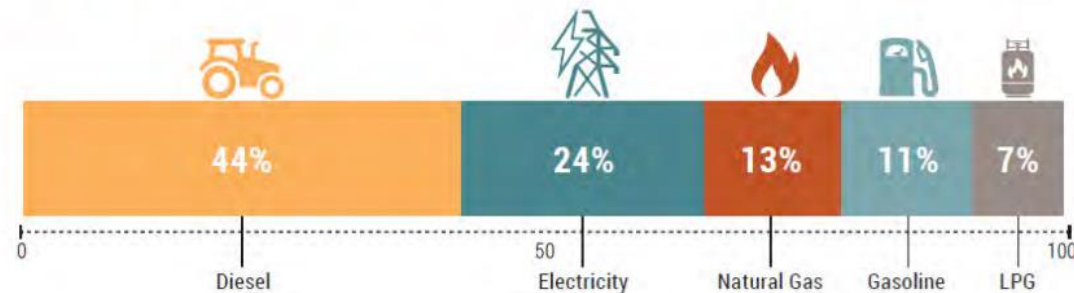
Energy Use in Agriculture

Keith Dennis



This graphic updates data found in the USDA-ERS report, *Trends in U.S. Agriculture's Consumption and Production of Energy: Renewable Power, Shale Energy, and Cellulosic Biomass* (<http://www.ers.usda.gov/publications/pub-details?pubid=74661>), released August 2016.

Fertilizer and pesticides made up about **TWO-FIFTHS** total energy consumed indirectly in agriculture in 2016.



What is “Beneficial Electrification?”

Beneficial Electrification (BE) includes the application of electricity to end-uses where doing so satisfies at least one of the following conditions, without adversely affecting the others:

- Saves consumers money over time;
- Benefits the environment and reduces greenhouse gas emissions;
- Improves product quality or consumer quality of life;
- Fosters a more robust and resilient grid



Beneficial Electrification programs are a valuable opportunity to engage both electric utilities and environmental groups in the effort to identify solutions that work well for the end-use consumer, local communities and the environment.

NOT an “Electrify Everything” Concept



Follow The Beneficial Electrification League on LinkedIn

Interests are Beyond Just EVs and Emissions



BEL Strategy – Applied RDD&D



North Carolina Electric Cooperatives and White Rock Farms – Waste lagoon pumping system



Hoosier Energy (Indiana) – Poultry barn heat recovery

Central Electric Cooperative (South Dakota) - eUTVs



Great River Energy and Runestone Energy (MN) – Ammonia Production that can be used in fertilizer

Solar and Agriculture – Enhancing Financial and Environmental Sustainability

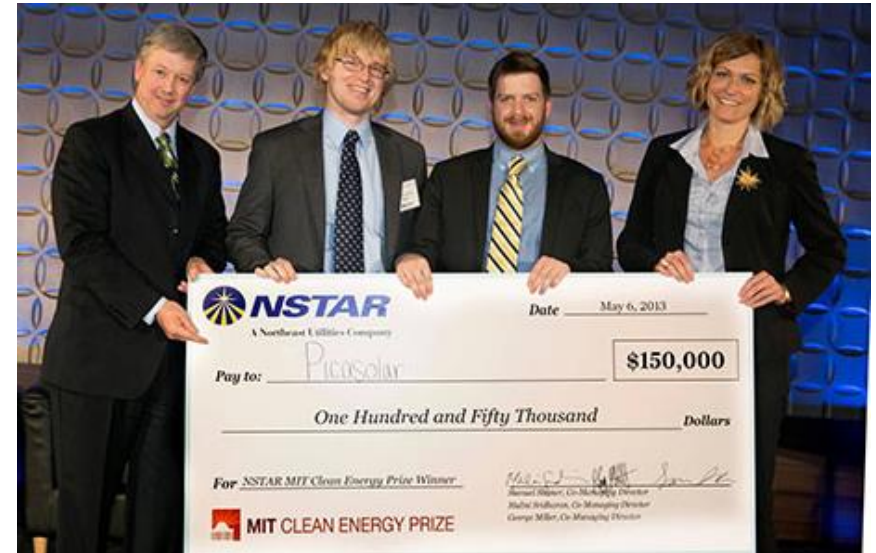
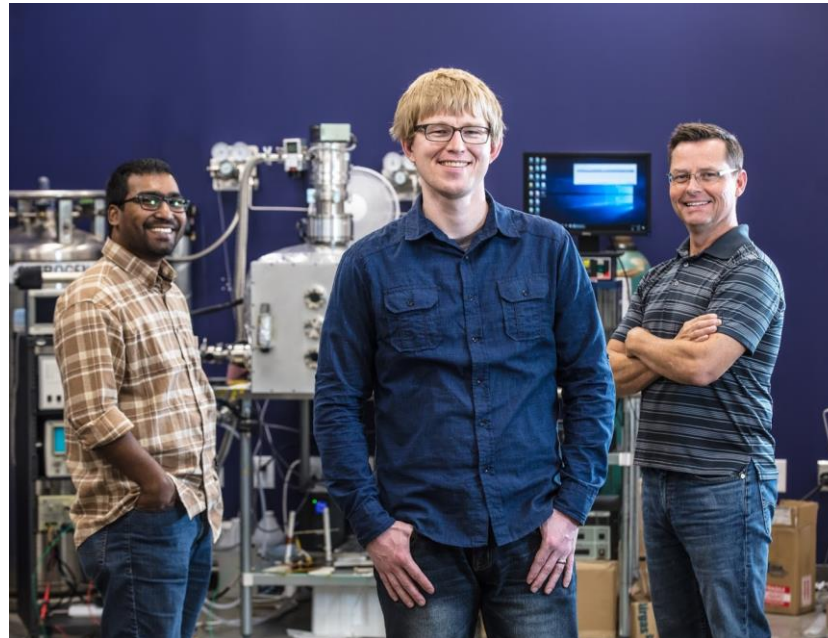
Douglas Hutchings, PhD
CEO Delta Solar
doug@deltasolar.com



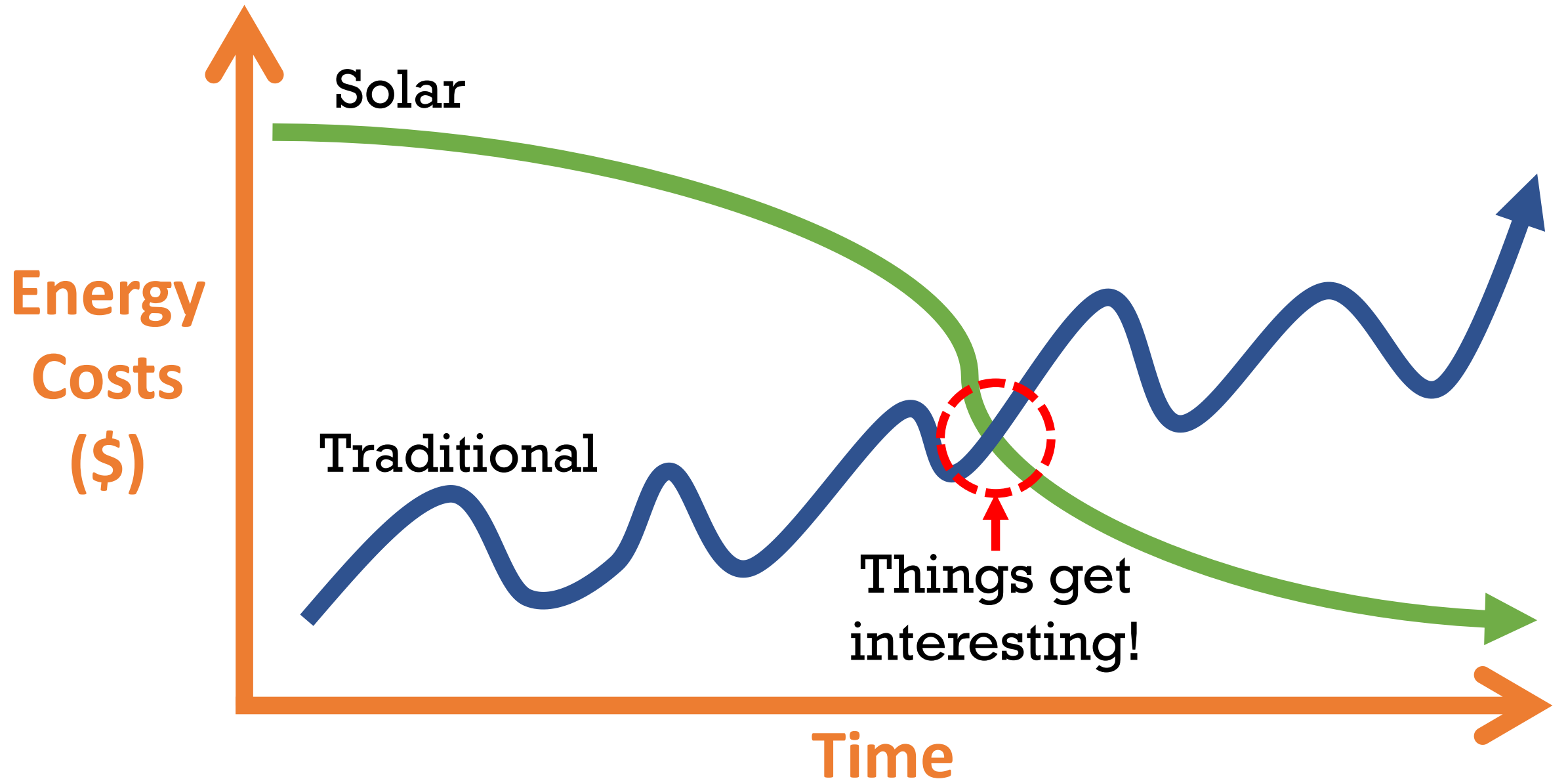
My Background

- **Grew up in Mena Arkansas.**
- **Worked on a horse ranch and in chicken houses.**
- **Attended the Arkansas School for Math and Science (and the Arts).**
- **Double major in Math & Physics at Hendrix College (2005).**
- **Masters and Ph.D. at UA Fayetteville (2008 / 2010).**
- **Co-founded several companies focused on solar technology.**

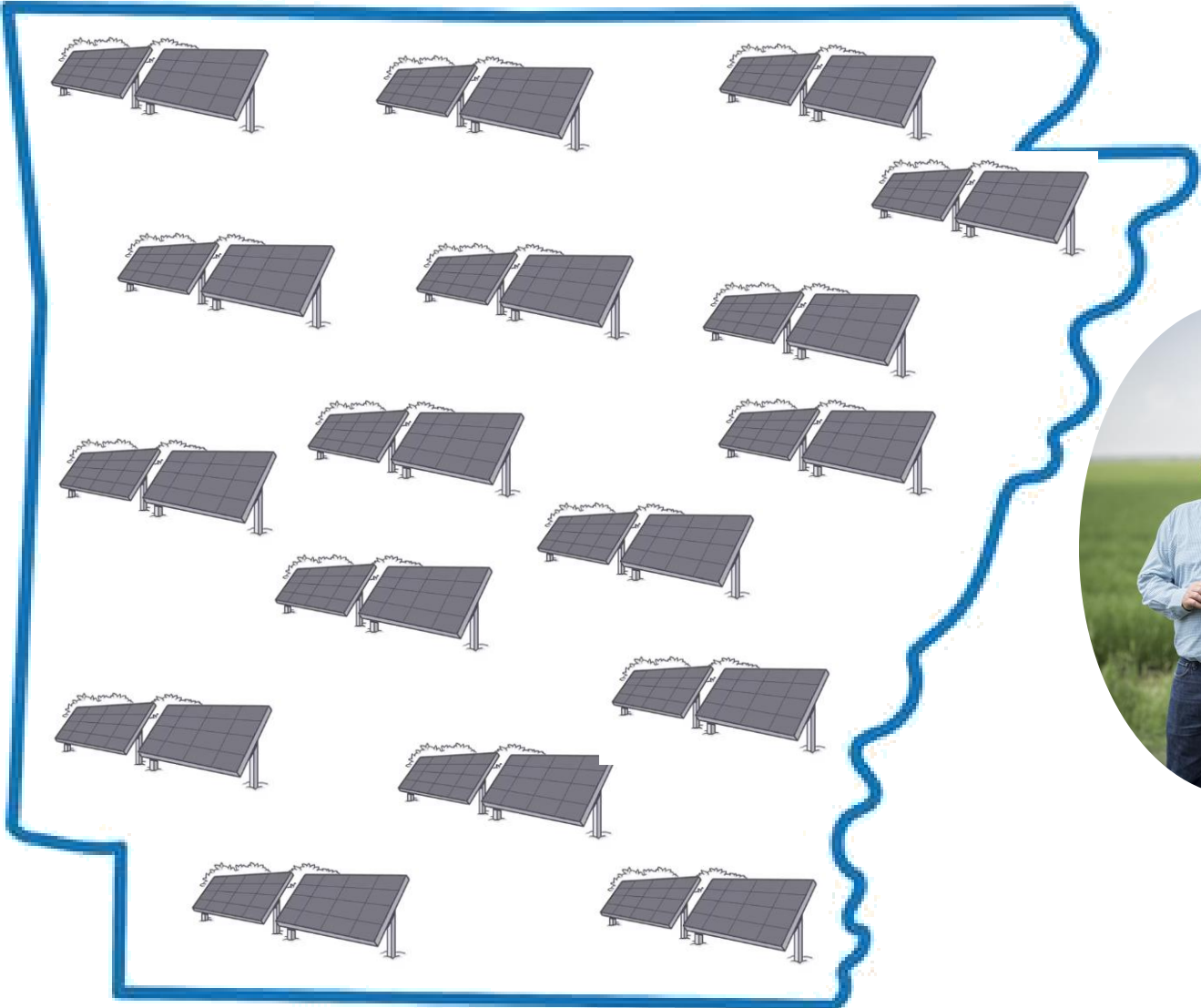
My Background



The Motivation



Arkansas Solar



**Distributed and
individually owned by
customers**



Net Metering



280kW fixed-tilt ground mount solar array leveraging net metering



Dermott Arkansas

Meter Aggregation



310kW fixed-tilt ground mount providing credits for over 30 different meters with meter aggregation



England Arkansas

New policy enabled leasing of solar arrays –went into effect in July 2019

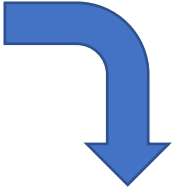


Strong Economics

**Federal Corporate
Tax Rate of 21%**

Project Cost

**Individual Federal
Tax Rate of 30%**



44% in Tax Benefits

52% in Tax Benefits



Annual Electric
Offset

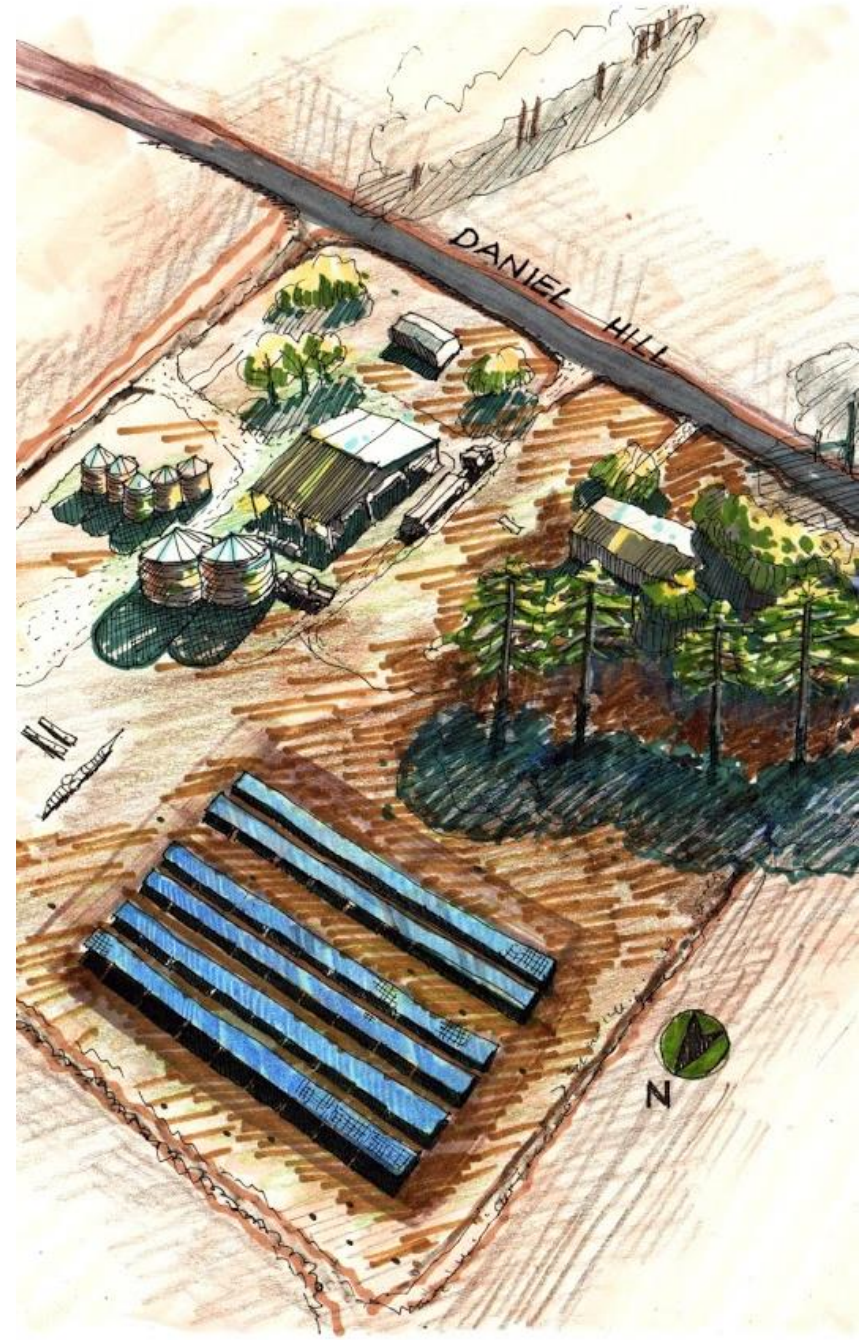
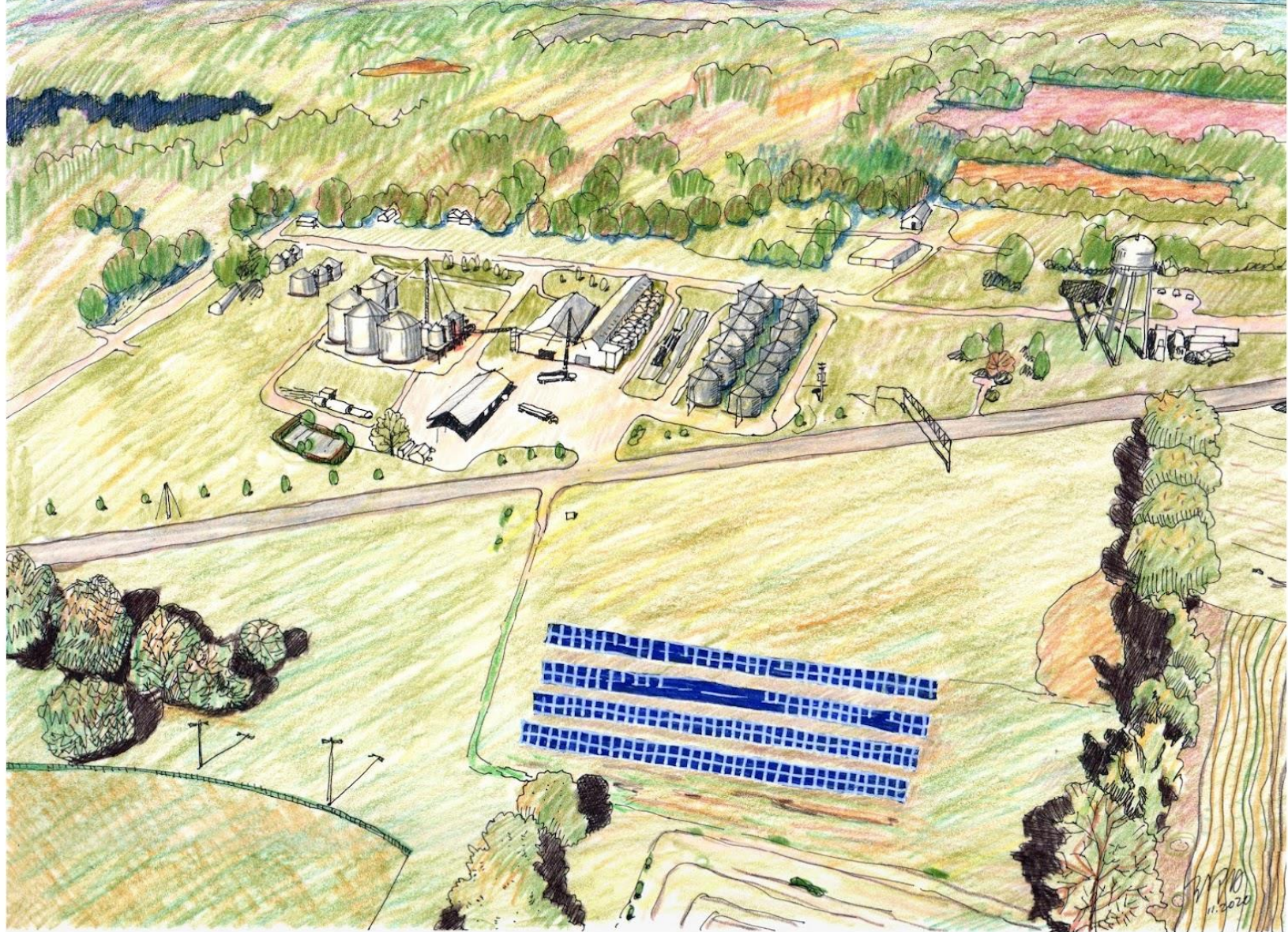


**10-15% IRR* on
After-Tax Investment**

**12-18%* IRR on
After-Tax Investment**

*Includes all anticipated operations and maintenance costs

Whitaker Grain



Solar and Agriculture – Enhancing Financial and Environmental Sustainability

Douglas Hutchings, PhD
CEO Delta Solar
doug@deltasolar.com



KEB Overview...Product Portfolio

Tony Heiser



KEB's vertically integrated portfolio of control and automation products ranging from touchscreen to motor shaft

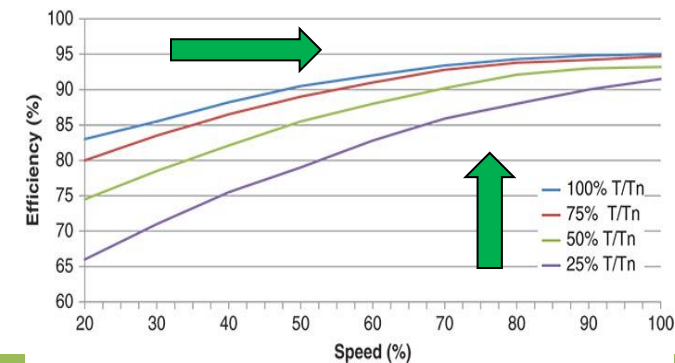
Primary product groups include:

- Embedded controllers
- Inverters for AC motor control
- AC motors (induction and servo)
- Gearing
- Electromechanical clutches and brakes
- ...as well as specialized industry-specific products...
 - ...such as for eMobility



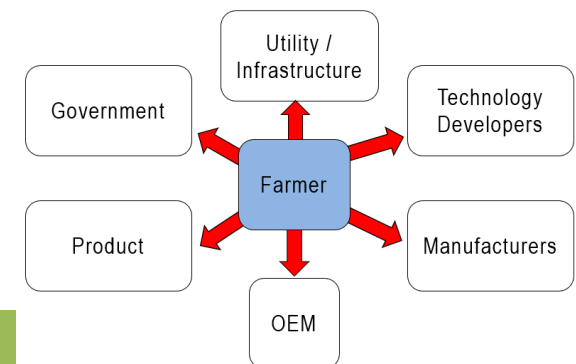
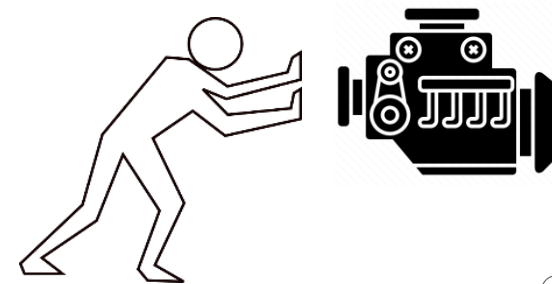
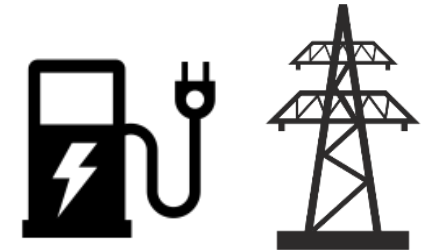
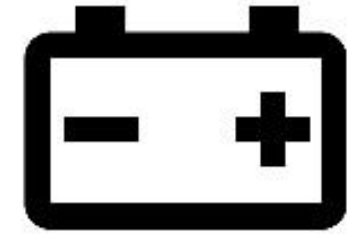
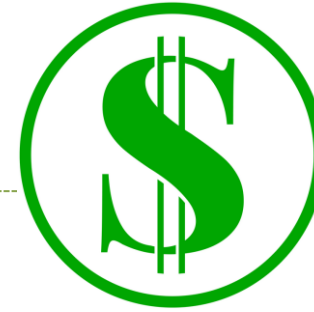
Why electrification?

- Reduced emissions
- Eliminate hazardous chemicals – “Hydraulic Replacement”
- Better performance
 - Precision control (operation independent of engine speed)
 - Increased productivity (faster cycle rates)
- Increased efficiency
 - Power On-Demand = Operation when need (no idle)
 - Operation at most efficient operating points
 - Eliminate parasitic loads
 - Reduced engine size (hybrid)
 - Reduced fuel consumption
- Reduced operating and maintenance costs



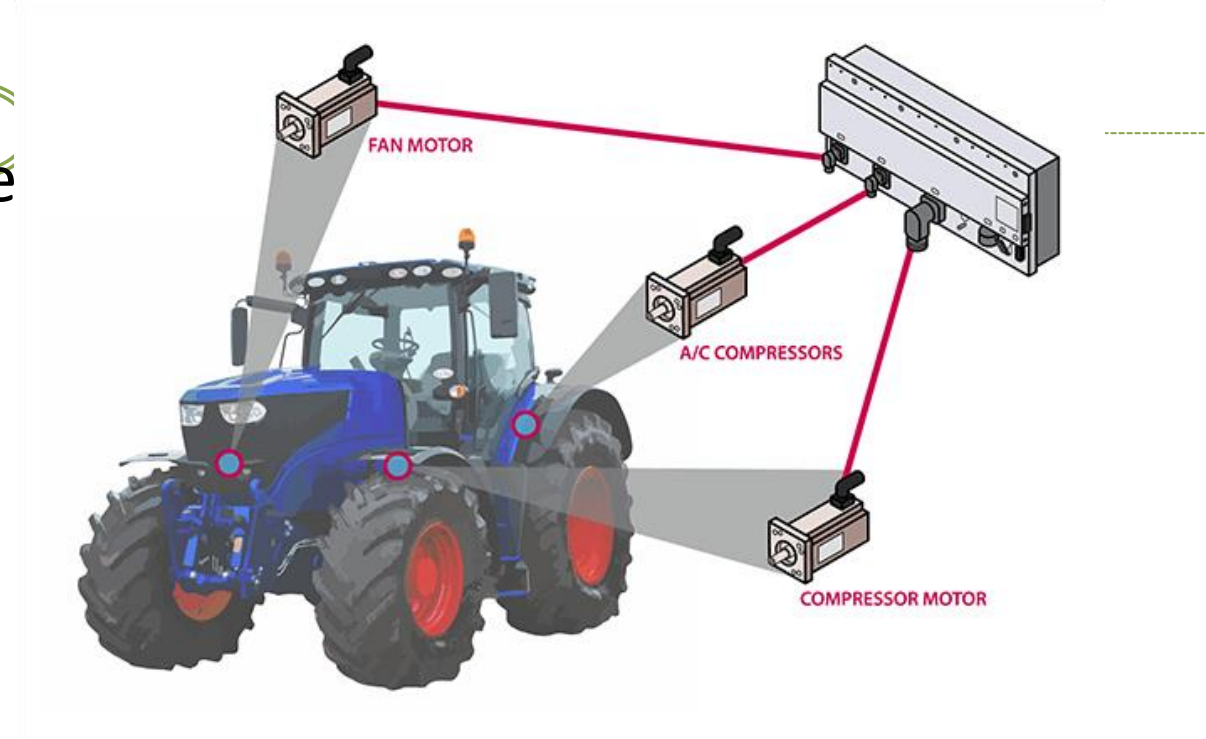
Electrification challenges

- Financial feasibility
 - Total Cost of Ownership (TCO)
 - Incentives / Subsidies
- Technology
 - Battery size
 - „Working machinery“ requires more power!
 - Cybersecurity
- Infrastructure (DC charging)
 - Installation (costs and logistics)
 - Coordinating with utilities
- Overcoming industry inertia (e.g. ICEs)
- Aligning stakeholders
 - Farmers, OEMs, Utilities, Manufacturers, Government, etc....



Trade-offs – Hybrid Solutions

- **Drawback:** Working equipment require large batteries to fully electrify
- **Trade-off:** Hybrid solutions
 - Electrified Auxiliaries
 - Compressors, pumps, fans, etc.
 - Electric PTO for implements
- **Benefits:**
 - Solutions quicker to market
 - Reduced engine size
 - Increased engine operating efficiency
 - Reduced fuel consumption / Emissions



Trade-offs – Total Cost of Ownership



HIGHER upfront costs

LOWER operating and
maintenance costs

? Subsidies / Incentives / Rebates ?



Total Cost of Ownership

Future opportunities...



■ Telemetrics:

- Remote and Autonomous operation
 - Over-the-air realtime diagnostics and software updates
- Cloud computing, AI, data analytics & insights
 - Enhanced precision farming and optimizing efficiency
 - Preventative maintenance

■ Industrial Automation Solutions:

- Adopting *state-or-the-art* industrial technology onto agricultural equipment and systems

■ Automotive Solutions:

- Adopting *mature* electrification solutions from the commercial automotive industry

- “Feldschwarm“ (field swarm): Interconnected autonomous field operations by electrically-driven automation machinery vehicles

Trinity Farms – Jim Whitaker



Irrigation Automation



Drew Slattery
Human Dimensions of Change
Lead

@

Trust In Food –
a Farm Journal Initiative

dslattery@FARMJOURNAL.COM

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Trust In Food

Deploying Farm Journal's
TRUST, DATA, and REACH to
drive farm-level behavior
change related to sustainability

trustinfood.com
farmjournal.com



**farmers
are human**

**to change farming,
we must change humans**

but humans are complex



Photo: Lance Cheung, USDA

Beneficial Farm Electrification

Key Points



The decision-making and implementation processes of change are complex; electrification is no exception

- Electrification must be locally-relevant
- Education is needed
- Trusted Advisors must be engaged

Electrification is no silver bullet

- Reliability, cost, feasibility



*Photo Credit: USDA /
Lance Cheung*

Drew Slattery

*Human Dimensions of Change Lead,
Trust In Food*

dslattery@farmjournal.com

trustinfood.com

farmjournal.com

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Audience Q&A

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Kevin.Dooley@asu.edu



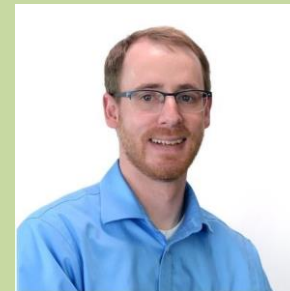
Keith Dennis
keith.dennis@nreca.coop



Doug Hutchings
doug@picasolar.com



Jim Whitaker
jimwhitaker68@gmail.com



Tony Heiser
Tony.Heiser@kebamerica.com



Drew Slattery
dslattery@farmjournal.com



Edward Saltzberg
esaltzberg@ssfworld.org

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