U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

SOLAR ENERGY TECHNOLOGIES OFFICE

Solar Energy Technologies Office
Quarterly Stakeholder Webinar

Dr. Becca Jones-Albertus, Director
Solar Energy Technologies Office

December 17, 2020

energy.gov/solar-office

Solar Energy Technologies Office (SETO)

WHAT WE DO

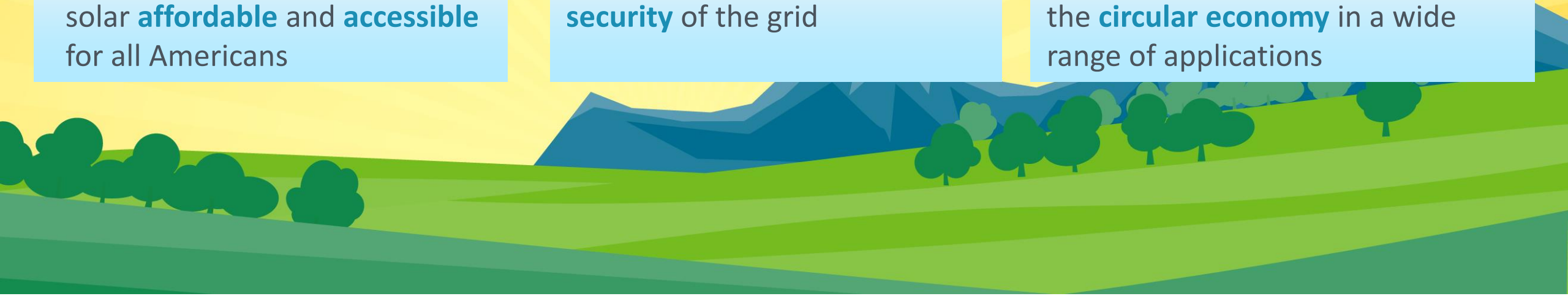
We funds early-stage research and development in three technology areas: **photovoltaics** (PV), **concentrating solar-thermal power** (CSP), and **systems integration**. We also **provide relevant and objective technical information** on solar energy to stakeholders and decision-makers.

OUR PRIORITIES

Drive innovation in technology and soft cost reduction to make solar **affordable** and **accessible** for all Americans

Enable solar to support the **reliability**, **resilience**, and **security** of the grid

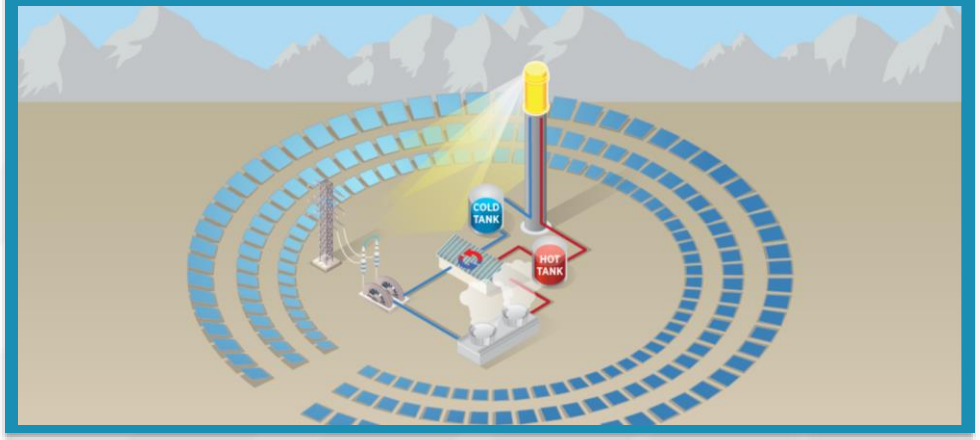
Create a sustainable industry that **supports jobs**, **manufacturing**, and the **circular economy** in a wide range of applications



SETO Teams

PHOTOVOLTAICS

CONCENTRATING SOLAR-THERMAL POWER



STRATEGIC ANALYSIS AND INSTITUTIONAL SUPPORT

SYSTEMS INTEGRATION

MANUFACTURING AND COMPETITIVENESS

Today's Speakers

Dr. Becca Jones-Albertus
SETO Director

Victor Kane
Acting Manufacturing and Competitiveness Program Manager

Bill Nussey
Co-Founder and CEO, Solar Inventions

Catlin Mattheis
Co-Founder, Fracsun

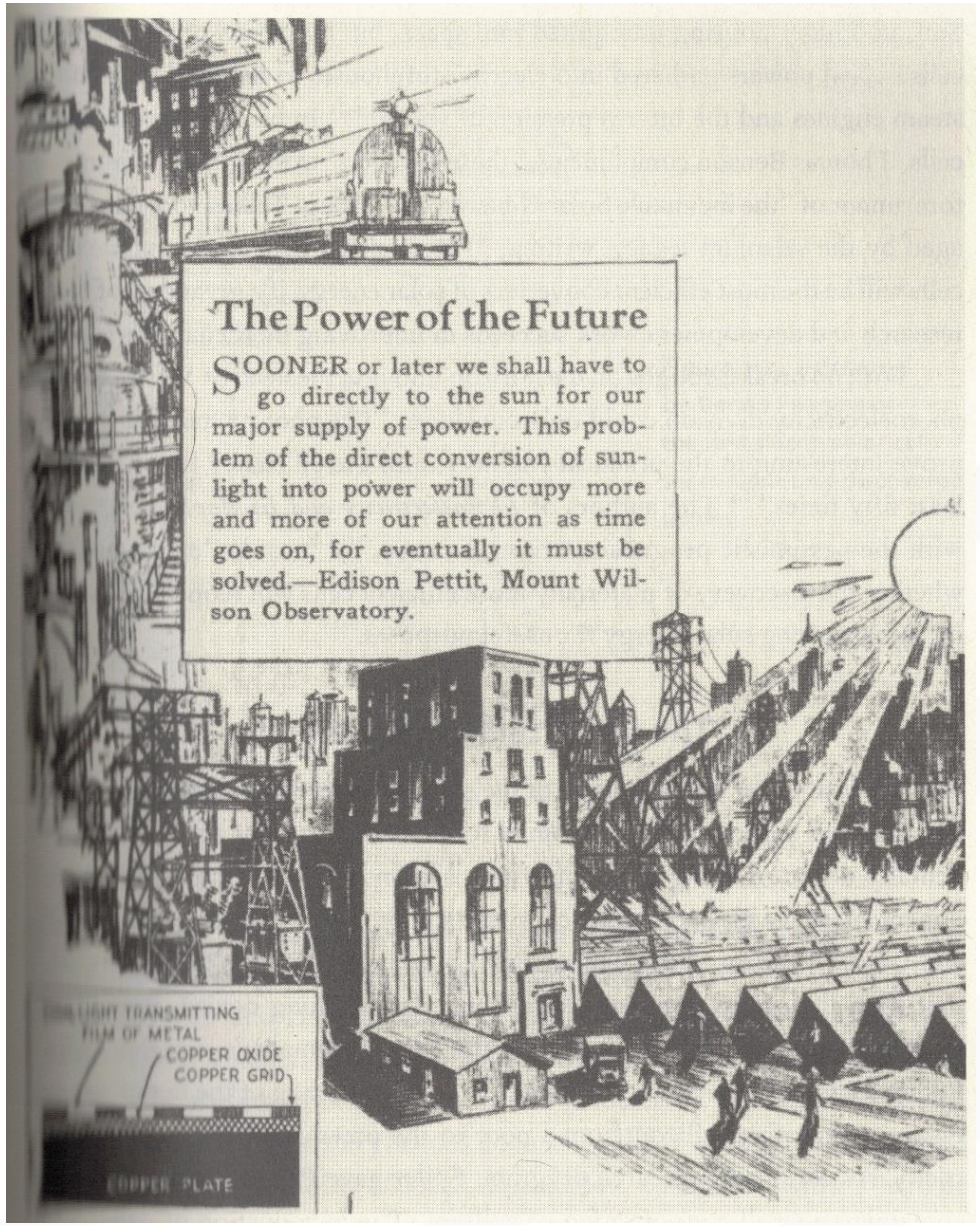
Leila Madrone
Founder and CTO, Sunfolding

Today's Webinar

- SETO Updates
- SETO Manufacturing and Competitiveness Overview
- Featured Awardee Speakers

Recording, slides, and links will be available at energy.gov/seto-webinars

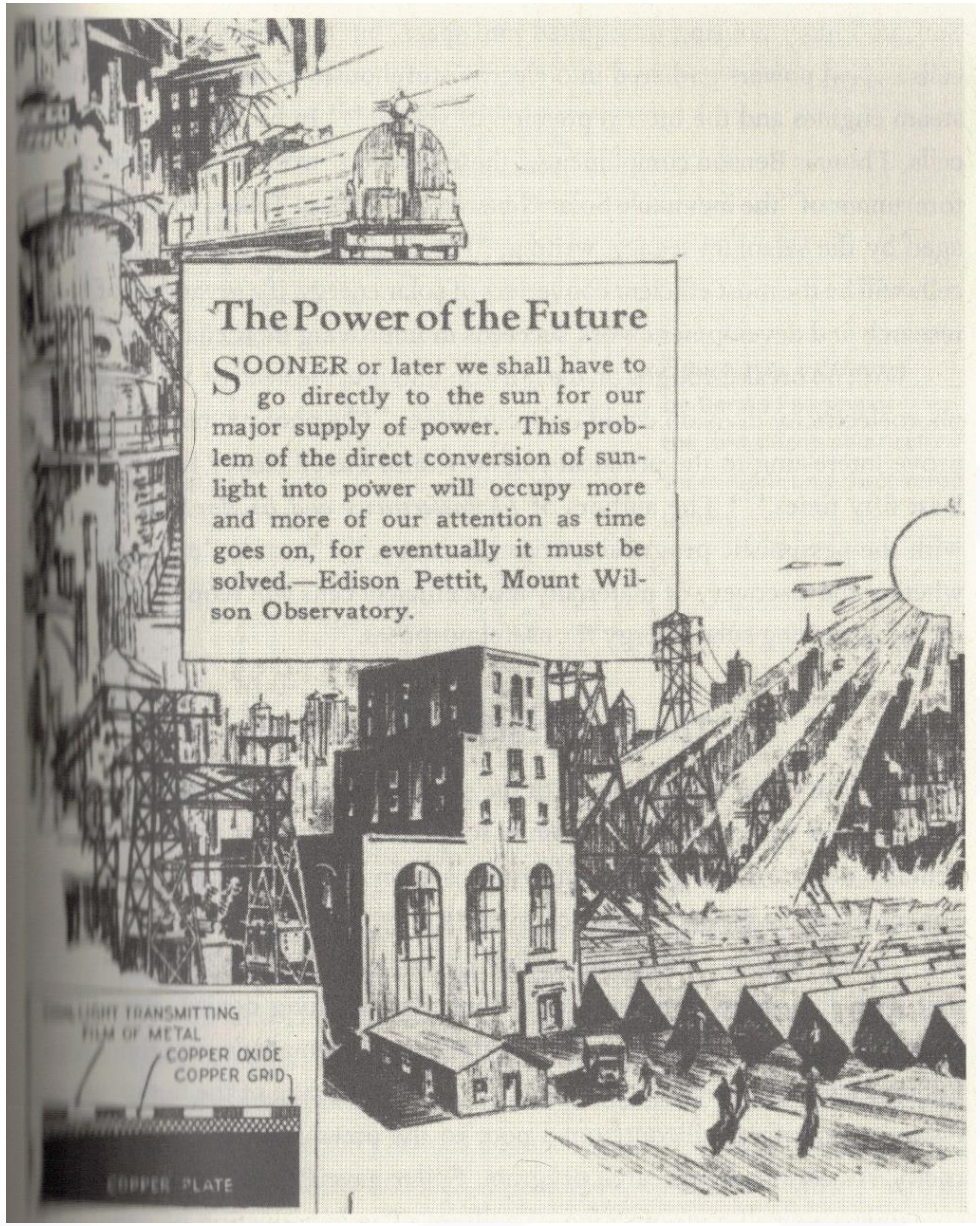
When was this feature on solar energy published in *Popular Mechanics?*



- 1930s
- 1940s
- 1950s
- 1960s

Enter your answer in the chat box!

When was this feature on solar energy published in *Popular Mechanics?*



- 1930s
- 1940s
- 1950s
- 1960s

This featured article focused on selenium, a solar cell material that generated interest before the rise of silicon in the 1950s.

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SOLAR ENERGY TECHNOLOGIES OFFICE

SETO Updates

energy.gov/solar-office

SETO 2020: Year in Review

Announced $200M in funding and selected 67 new projects

700+ attendees at quarterly stakeholder webinars

- **Three** R&D 100 Awards
- **2.5 GW** of PV system data with an average system life of **5 years** collected through PV Fleets Initiative
- Supported revision of IEEE 1547.1-2020 **smart inverter** testing standard

Held first virtual peer review with 800 attendees at opening plenary

- Initiated development of **Power Electronic Testbed** as part of Advanced Research on Integrated Energy Systems
- Selected project to demonstrate a full CSP system with an **sCO_2 cycle**
- Launched **North American Energy Resilience Model** with the DOE electricity, wind, and water offices

SETO 2020: Year in Review

National Community Solar Partnership

353 members from **230** partner organizations

30+ partners receiving technical assistance

20 partners in collaborative working groups

Solar District Cup

Class of **2020**: engaged **525+** students from **52** collegiate institutions

Class of **2021**: **59** teams from **56** institutions; **21%** at minority-serving institutions

SolSmart

Designated **380+** communities

American-Made Solar Prize

Completed **Rounds 2 and 3**

Launched **Round 4**

Funded **80** teams with **$11M** in cash and **$3.4M** in vouchers

Solar Desalination Prize

Launched and selected **19** competitors

SETO Fiscal Year 2020 Funding Opportunity Announcement (FOA) Project Selections

- **$130 million** in new projects to advance solar technologies
- **67** research projects across 30 states
- Goals:
  - Reduce the cost of solar energy
  - Increase U.S. manufacturing competitiveness
  - Improve the reliability of the nation's electric grid.

FY 2021 FOA: Systems Integration and Hardware Incubator

Hardware Incubator Topics

- Product Development
  - $6 million, 6–12 awards
- Product Development & Demonstration
  - $8 million, 1–4 awards

Systems Integration Topics

- Grid-Forming Technologies Research Institute
  - $25 million, 1 award
- Integrating Behind-the-Meter Solar Resources into Utility Data Systems
  - $6 million, 2–3 awards

Webinar: January 6, 2021, 1 p.m. ET

Mandatory Letter of Intent Deadline: January 11, 2021, 5 p.m. ET

Additional Announcements:

- CSP Research and Development Virtual Workshop Series
- GSA Proving Ground Request for Information (RFI) on energy efficient building technology
- Small Business Innovation Research (SBIR) Phase 1 Funding Opportunity
- Connected Communities Funding Opportunity

SETO Fellowship Opportunity

Design and implement national R&D strategies for:

- Photovoltaic Technology
- Concentrating Solar Power Technology
- Solar Integration with the Grid
- Solar Energy Analysis and Institutional Support
- Manufacturing and Technology Commercialization

Eligibility:

- Scientists and engineers with bachelor's, master's, or Ph.D. degrees of all quantitative backgrounds and/or relevant post-degree experience

Application Deadline: **January 15**

VISIT: www.zintellect.com/Posting/Details/3603 • **EMAIL:** DOE-RPP@orau.org

How many solar cells are used to power the International Space Station?

- 80,220
- 130,900
- 262,400
- 456,000

Enter your answer in the chat box!

How many solar cells are used to power the International Space Station?

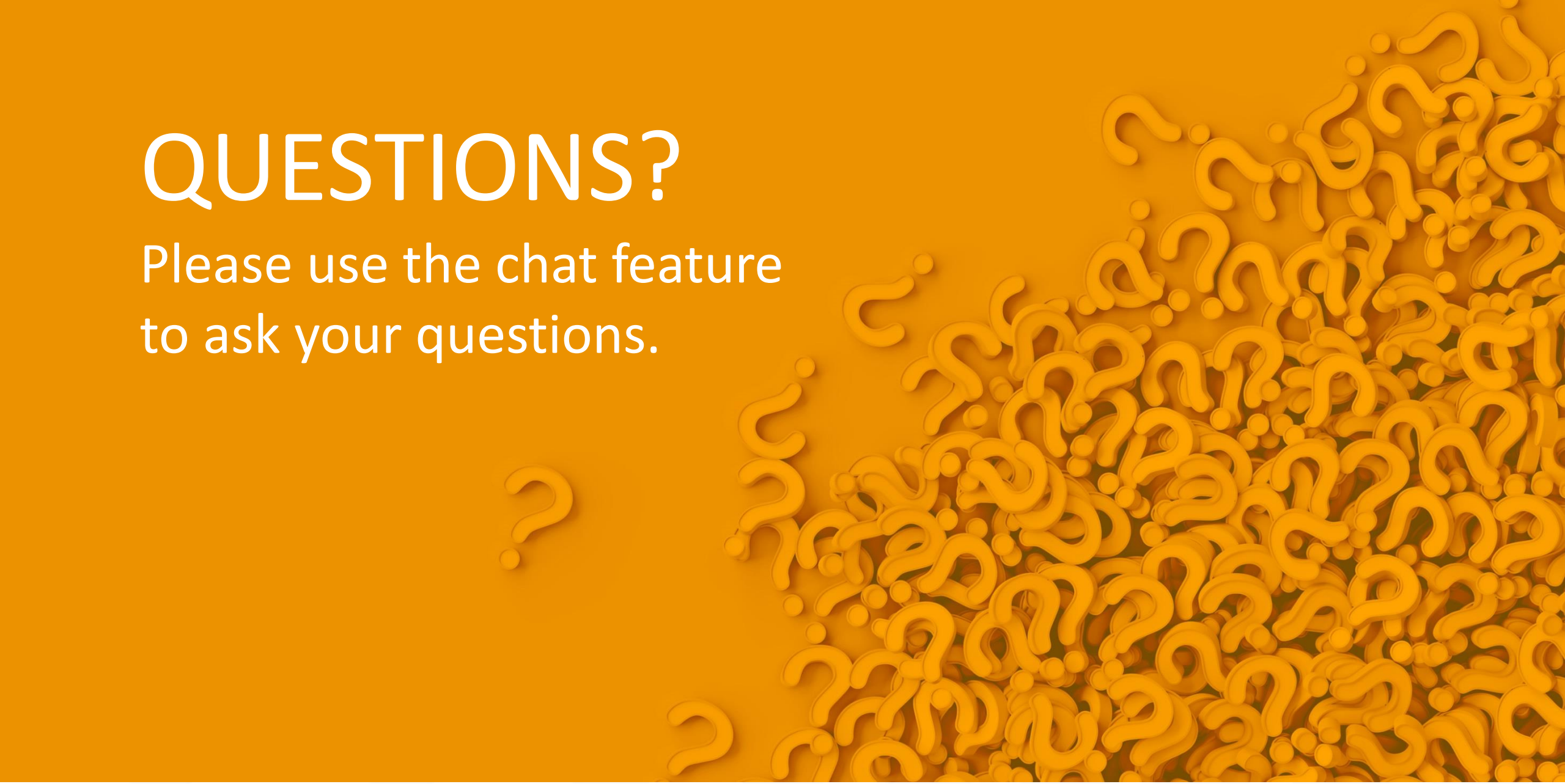
- 80,220
- 130,900
- 262,400
- 456,000

The bifacial silicon solar cells are placed on 240 foot wings (longer than a Boeing 777).

The wings cover an area of more than 27,000 square feet (more than half the area of a football field).

QUESTIONS?

Please use the chat feature to ask your questions.



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Manufacturing and Competitiveness

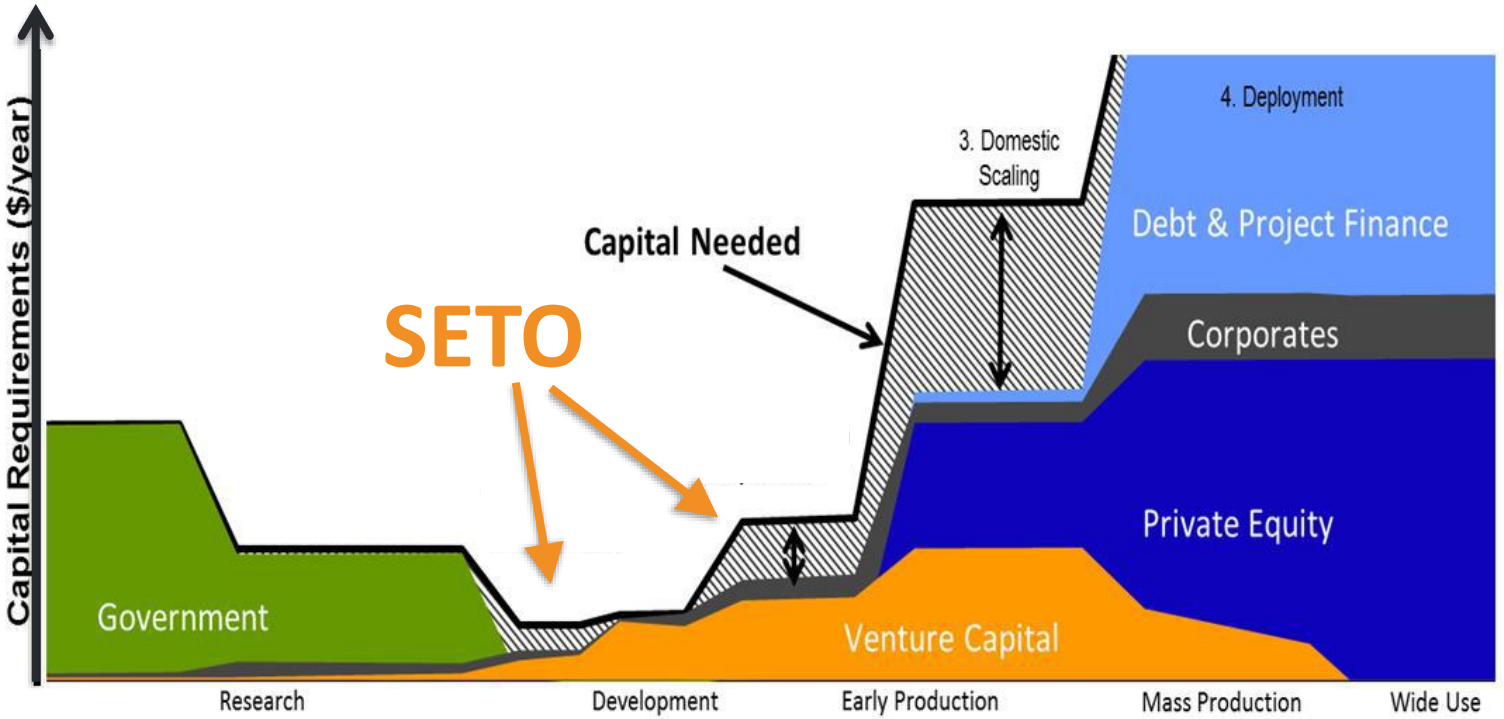
Victor Kane

Acting Program Manager

Manufacturing and Competitiveness Challenges

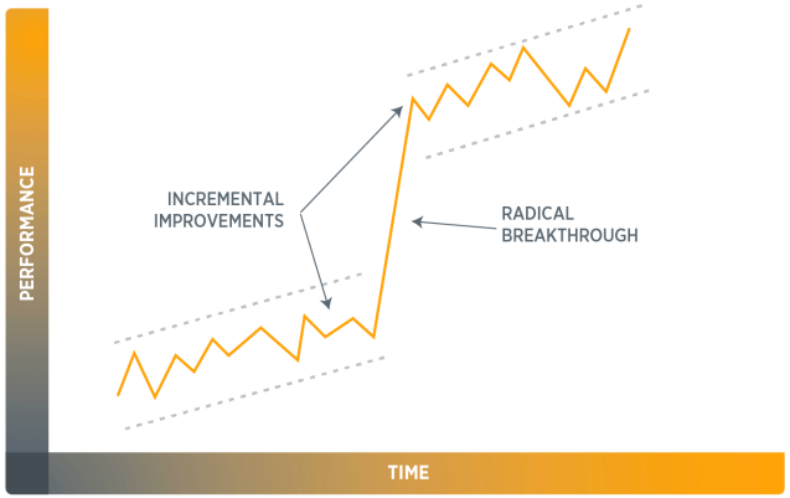
Engages in public-private partnerships to:

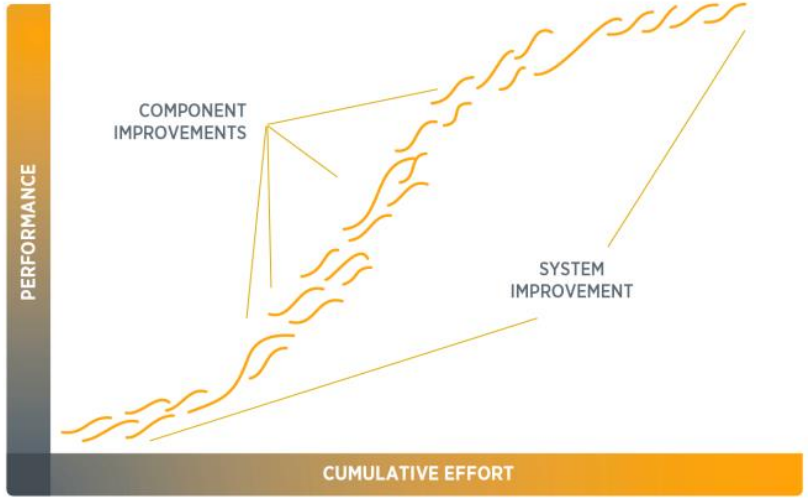
- Bring products out of the lab and closer to market
- Increase domestic manufacturing competitiveness
- Generate domestic value across the solar value chain
- Develop tools to lower costs and increase deployment



What is the goal?

- If the research we fund doesn't reach the market then it has little to no impact.
- If we fund things that would have reached the market on the same timeline without our funding we are also having little to no impact





Failure is:

- Creating a product to spec, on time and on budget that no one wants
- Finding a market need people want solved but not delivering product to spec
- Funding projects the private sector would otherwise support.

SOLAR ENERGY TECHNOLOGIES OFFICE

Technology to Market Funding Programs

Are you an...	With an...		You should apply for...
 INDIVIDUAL	Idea		American-Made Solar Prize
	Prototype	STOP Need to be an incorporated business	
 SMALL BUSINESS	Idea	$$$ Funding up to $800K over 1 year Ease of entry: easy No cost share	American-Made Solar Prize
		$$$ Funding up to $1.3M* over 3 years Ease of entry: medium No cost share	SBIR/STTR
	Prototype	$$$ Funding up to $2M over 2 years Ease of entry: hard Must provide cost share	Incubator**
 LARGE BUSINESS	Idea		American-Made Solar Prize
	Prototype		Incubator**

*SBIR/STTR funding level is based on participation in two phases of the SBIR/STTR funding program.

**Incubator can include Incubator funding opportunity announcements (FOAs) or Incubator topics in SETO-issued FOAs.

American-Made Challenges

SOLAR PRIZE

American-Made SOLAR PRIZE

A $3 million competition designed to energize innovation in U.S. solar manufacturing.

Make a Plan
READY!
Up to 20 Ready Winners ($50,000 each)

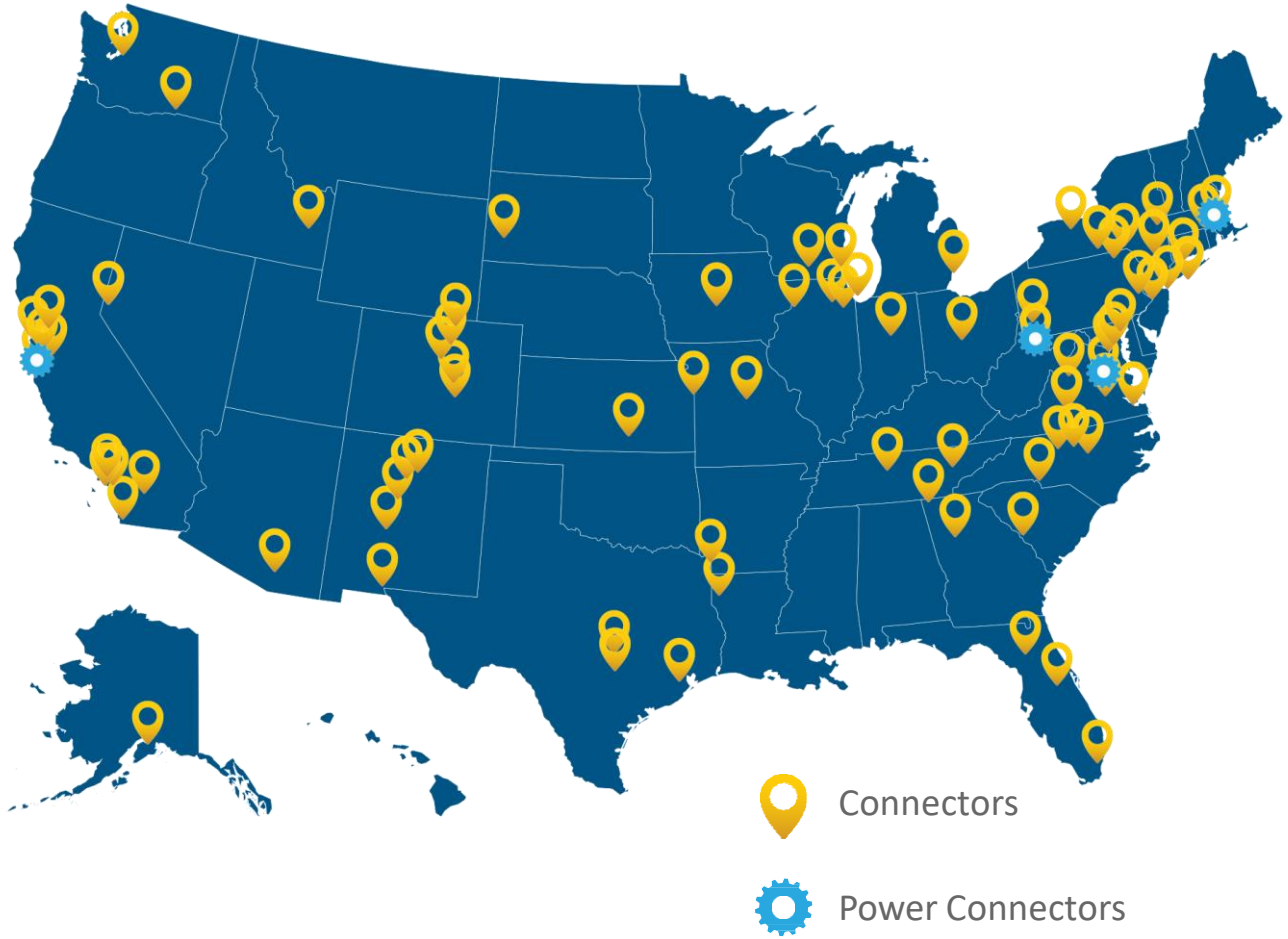
Design a Proof of Concept
SET!
Up to 10 Set Winners
($100,000 each + $75,000 voucher)

Develop Prototype and Identify Pilot Partner
GO!
2 Go! Winners
($500,000 each + $75,000 voucher)

90 Days

90 Days

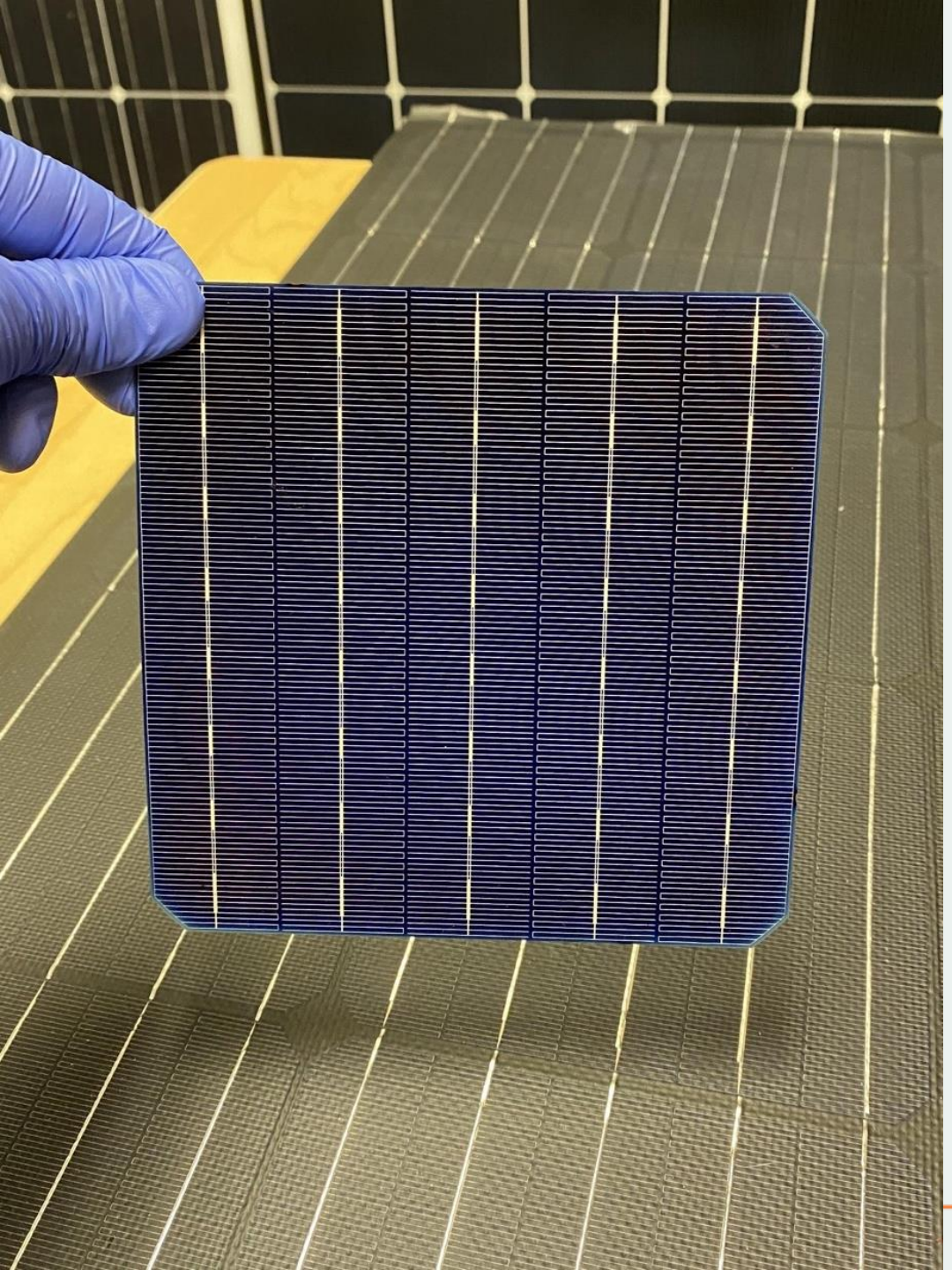
90 Days



Bill Nussey, Co-Founder and CEO, Solar Inventions

Solar Inventions History

- Apr 2018 — Company creation and first lab prototypes
- Mar 2019 — Ready! phase winner of the American-Made Solar Prize
- Jun 2019 — Winner of Set! phase in American-Made Solar Prize
- Jun-Oct 2019 — Manufactured 50,000 C3 cells on large scale PV lines
- Sep 2019 — First place winner of the first American-Made Solar Prize
- Q1 2020 — Produced 200+ panels with 3 different U.S. manufacturers
- Q3 2020 — Published C3 white paper and commercial launch of first product



Our First Commercial Technology: C3

Solar Inventions has created a Configurable Current Cell (C3), transforming a traditional single-circuit solar cell into a cell with multiple circuits, all without physically altering the underlying silicon wafer.

Our Results

Result	Status	Benefit (US$)
Reduced metal (silver)	**Demonstrated** 3% reduction in silver with no cell performance hit (n-Type and HJT savings will be much higher)	**@$700/kg = $1M/1GW**
Increased cell efficiency	**Demonstrated** Multiple cell production runs across 50,000 cells	**1GW -> +4.5MW** **@$0.25/W = $1.1M**
Increased CTM	**PERC demonstration successful** Results from pilot run at commercial production facility confirmed CTM benefit	**+$1.1M in CTM reduction**

Total Benefit = $3.2M per GW

No changes to factory line
Cells remain whole; no need to break cells

Thoughts for future Solar Prize submitters

SBIR·STTR
America's Seed Fund

SUPPORTING small business SOLAR INNOVATIONS

Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR)

Small businesses

2 Phase structure

9 months (Phase I) + 2 years (Phase II)

No Cost Share

$200k (Phase I) + $1.1M (Phase II)

- Phase I is meant to conduct a feasibility study
- Phase II is meant to develop a prototype / proof of concept
- STTR encourages collaboration with research institutions
- Vehicle to support technology transfer - provide funding to companies developing and commercializing a patented technology developed by a research institution

SBIR·STTR
America's Seed Fund

Catlin Mattheis, Co-Founder, Fracsun

PV Soiling Loss Management Solution

Catlin Mattheis
Co Founder

December 2020

Company Overview

- Founded in 2011

- Focus: *Build a device and associated algorithm to both empirically measure soiling rate and determine the most economic point in time to schedule cleaning events*
- Awards: *Phase I – 2017 Phase II – 2018 to 2020*
- Traction: *1.12 GW of solar assets monitored under the ARES soiling solution platform. Partnerships with 6 of the top solar asset owners in the U.S.*
- IP: *U.S. Patent for device and data delivery granted in Feb 2015. PCT patent filed July 2020 for all major solar markets, will enable global protection for the device.*

Phase I – Prototype Pilot

ARES Device

Fast 30 minute installation

Internet-of-things cellular uplink

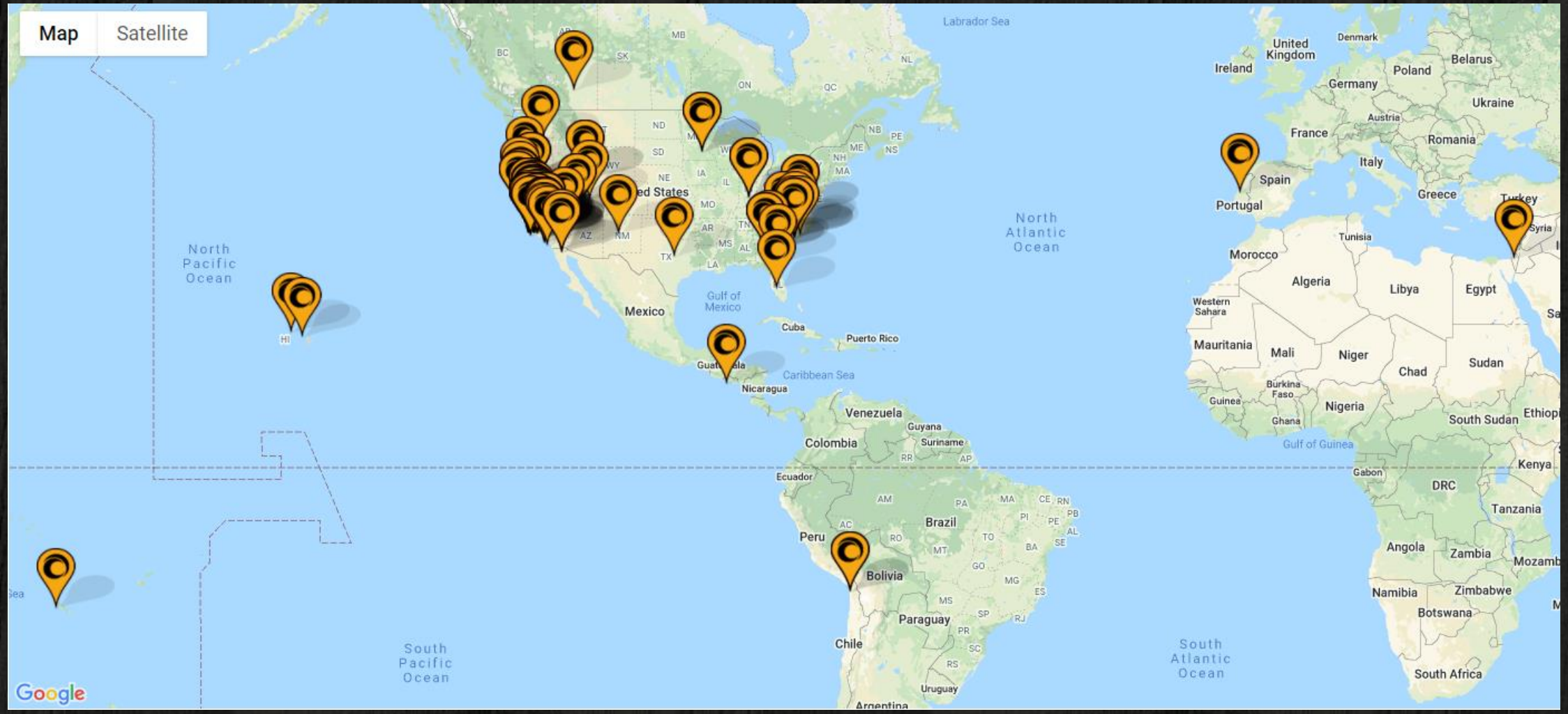
Web Portal displays device and plant metrics

Optimal wash period reporting

Deployed over 100 devices across 1.12 GW of solar assets (Nov 2020)

Phase II – Large-Scale Pilot

Device Location Map



Funding Opportunity: SBIR/STTR FY 2021 Phase 1 Release 2

RESEARCH TOPICS

- Floating Solar-Powered Aeration Systems
- Solar Systems Resilient to Weather-Related or Cyber Threats
- Innovation in Solar Aesthetics for Residential Photovoltaic Systems
- Commercial and Industrial Solar Systems
- Agricultural Solar Systems
- Components for Generation 3 Concentrating Solar-Thermal Power (Gen3 CSP) Thermal Transport Systems
- Affordability, Reliability, and Performance of Solar Technologies
- Electrical Connections for Photovoltaic Modules and Systems

TECHNOLOGY TRANSFER OPPORTUNITIES

- **National Renewable Energy Laboratory:** Method for Mechanical Load Testing of Photovoltaic (PV) Modules with Concurrently Applied Stressors and Diagnostic Methods
- **Sandia National Laboratories:** Nanocomposite Barrier Films for PV Applications

KEY DATES

TOPICS ISSUE DATE

- November 9, 2020

FUNDING OPPORTUNITY ANNOUNCEMENT

- December 14, 2020

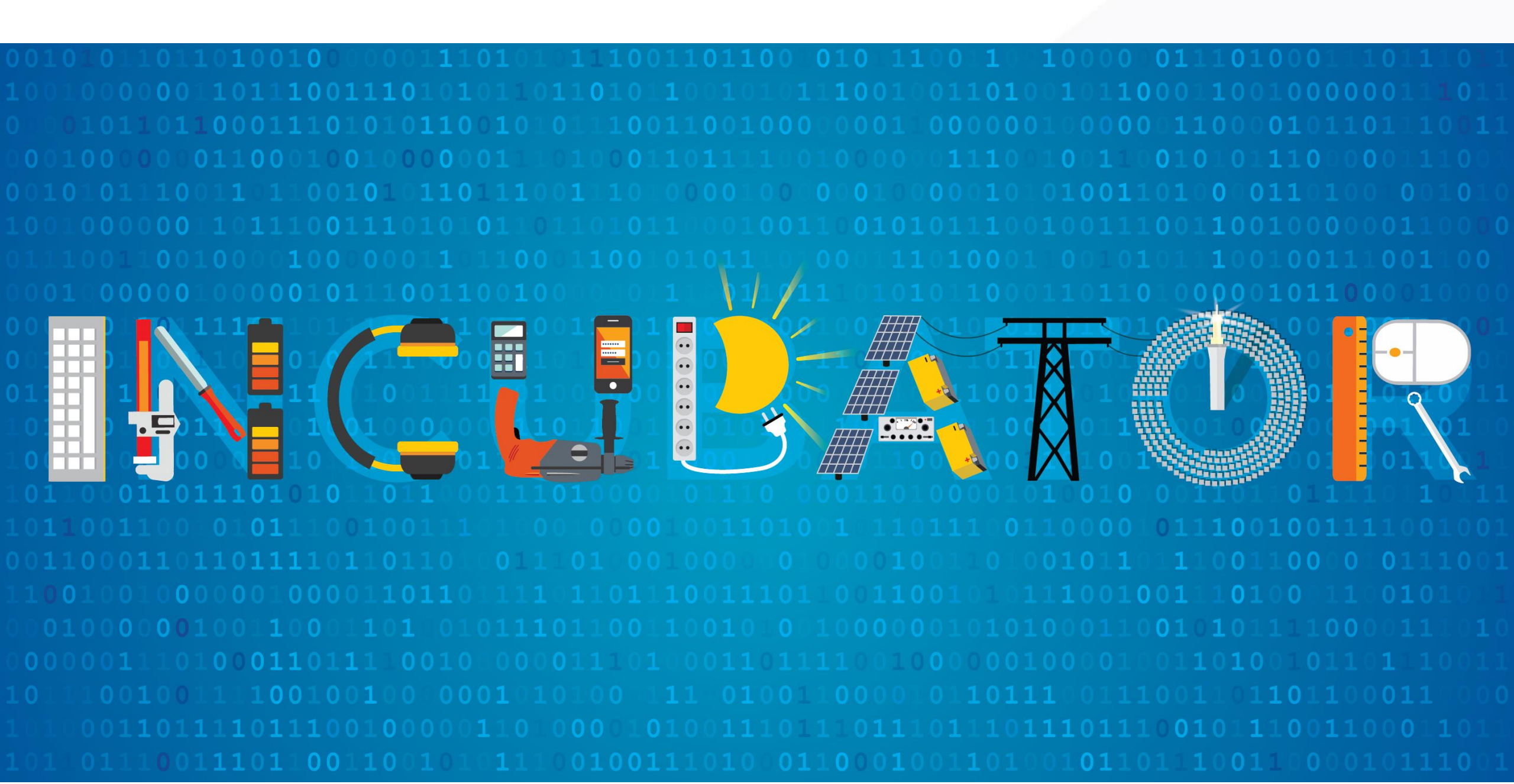
MANDATORY LETTER OF INTENT

- January 4, 2021

FULL APPLICATIONS

- February 22, 2021

energy.gov/solar-office/sbir


INNOVATION

Innovations in Manufacturing: Hardware Incubator

For-Profit Team Lead

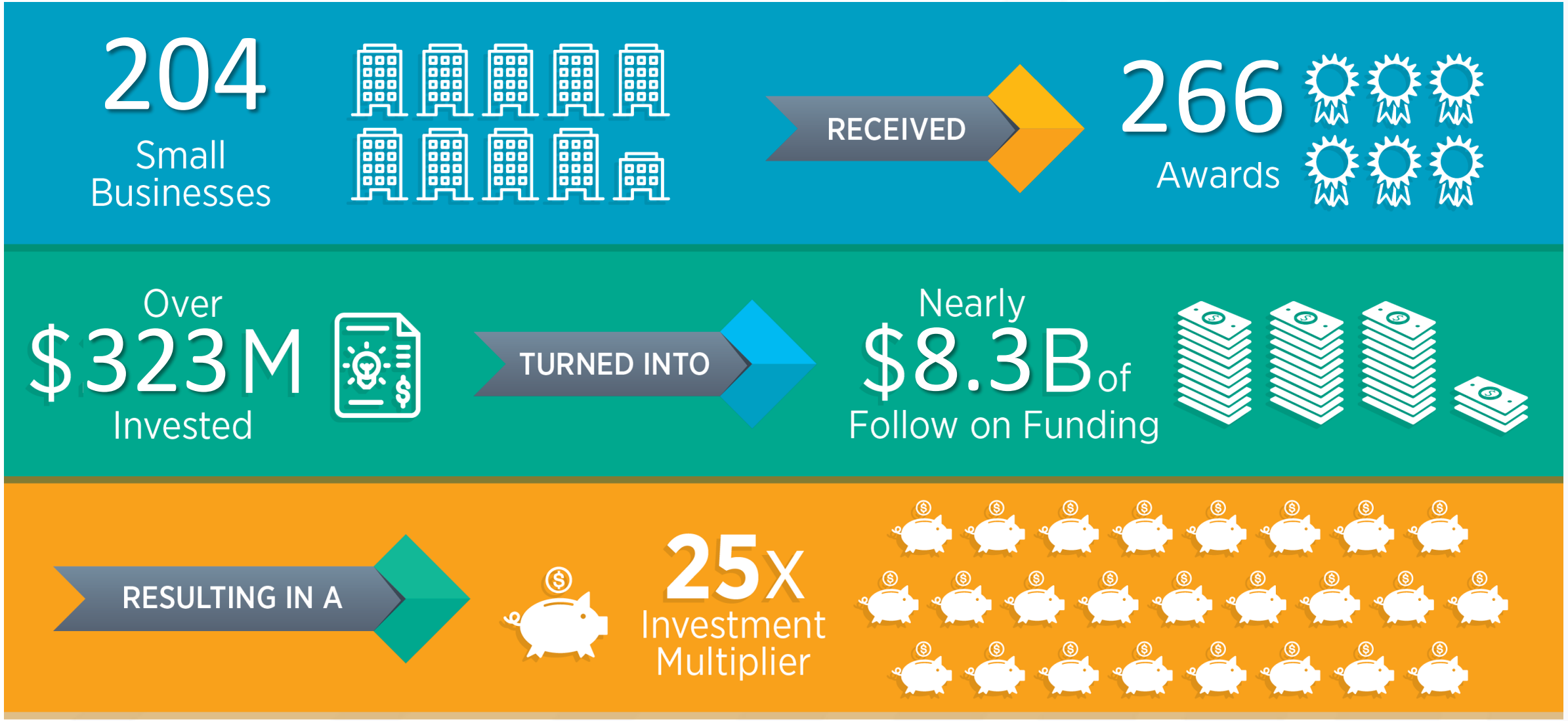
Periods of performance 1 – 3 years

20 - 50% Cost Share

Awards Up to $3M

- Open to all hardware solutions relevant to the solar industry
- Projects with potential to support a strong U.S. solar manufacturing sector and supply chain
- Focus on products with a clear pathway to reduce solar electricity costs that are too risky for private investment but have the potential for rapid commercialization
- Ideal applicant advances an existing early-stage prototype to a manufacturable, commercially relevant prototype

Private Sector Taking Innovation to Market (2007-2020)



Leila Madrone, Founder and CTO, Sunfolding

sunfolding

SETO 2020

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Everyone else:

- Motors
- Gearboxes
- Grease
- Bearings
- Dampers
- Torque
- Tubes
- Drive Shafts
- Linkages

sunfolding

AirDrive™

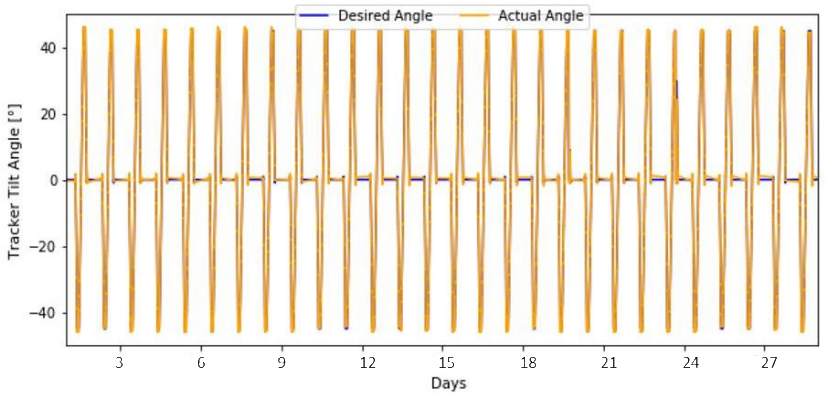
Sunfolding: Next Generation Solar Infrastructure

LAND USAGE
More capacity, higher efficiency

CONSTRUCTION
Installs faster, less grading

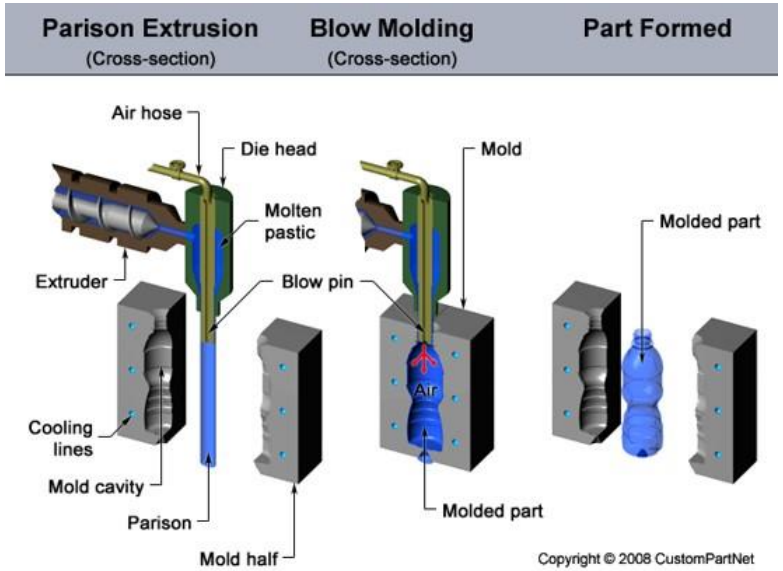
MAINTENANCE
Centralized, less O&M locations

2012 ARPA-E: Technology R&D



sunfolding

2016 Sunshot: Manufacturing R&D



Leverage the cost and scaling of high-volume polymer manufacturing

with the power of industrial air.

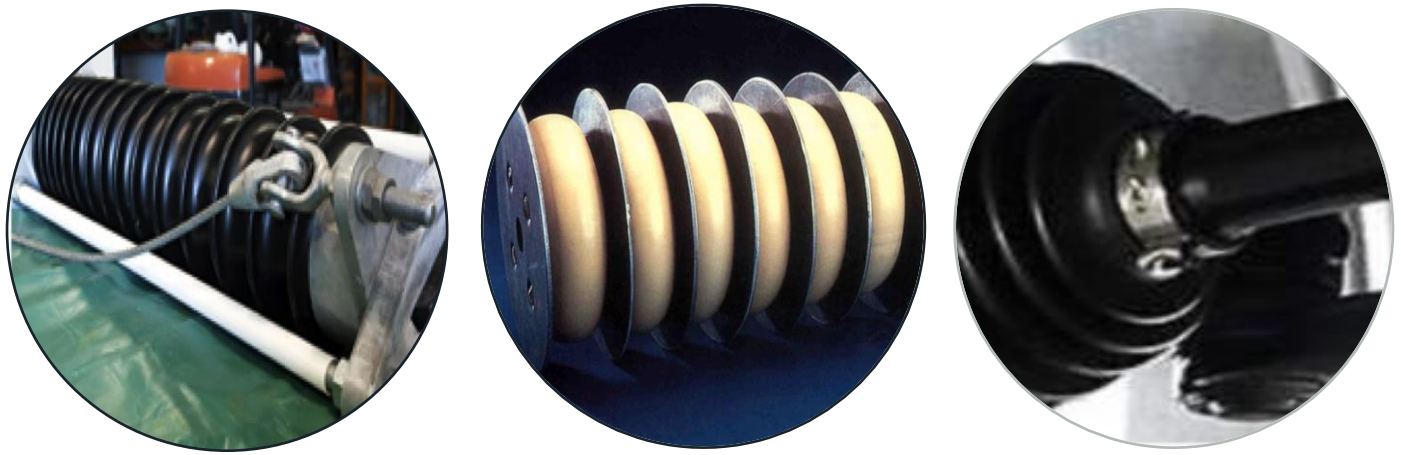
Industrial Heavy Lifting

Industrial Tilting

Train, Truck, and Heavy Equipment
Suspension Systems

Materials

Dupont - strategic collaborator on materials and manufacturing



Leveraging materials and processes from industries designed to last decades.

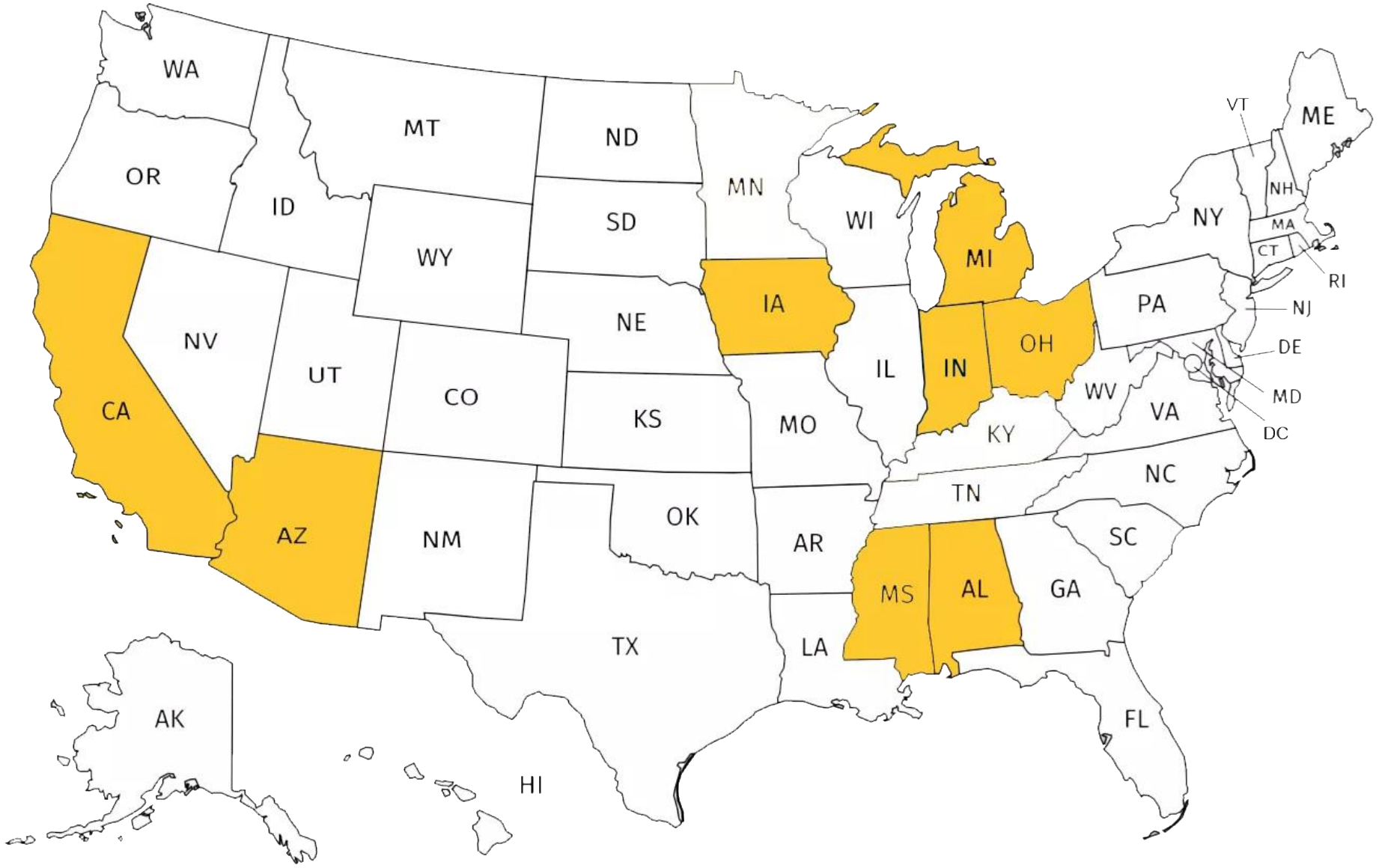
AirDrive System

Tier 1 Automotive manufacturers

sunfolding

sunfolding

U.S. Manufacturing Partners Locations



Next Generation Solar Infrastructure Built with US Manufacturing

Funding Opportunity: FY 2021 Hardware Incubator

TOPIC 3A: PRODUCT DEVELOPMENT

- De-risk new technologies and manufacturing processes and bring them to a commercially relevant prototype stage
- Develop and validate a realistic pathway to commercial success

TOPIC 3B: PRODUCT DEVELOPMENT & DEMONSTRATION

- Conduct pilot-scale testing and demonstration of products or solutions. This includes:
  - High-volume or high-throughput manufacturing processes for solar hardware
  - Production of a large enough number of devices for statistically robust field testing and validation
  - Demonstration of a system focused on pilot-testing new hardware

KEY DATES

ANNOUNCEMENT
- December 16, 2020

INFORMATIONAL WEBINAR
- January 6, 2021, 1:00 p.m. ET

MANDATORY LETTER OF INTENT
- January 11, 2021

CONCEPT PAPERS
- January 25, 2021

FULL APPLICATIONS
- March 29, 2021

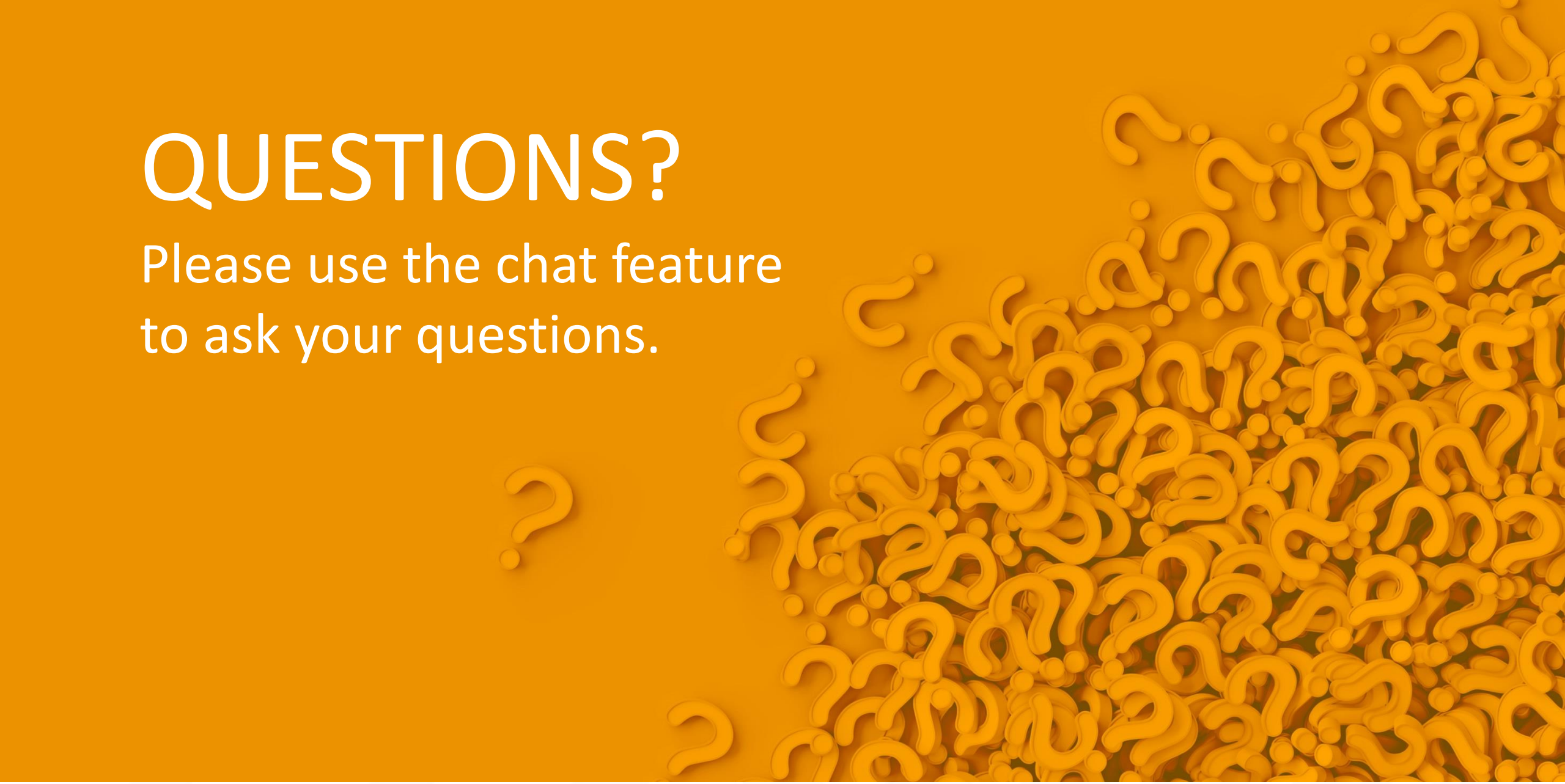
bit.ly/SETO-FY21-Hardware

Apply for SETO Funding Opportunities!

- Learn how to apply for a funding opportunity
- Check out current funding opportunities
- View all SETO funding programs
- Attend SETO events and webinars to stay in the loop
- Subscribe to our newsletter to be notified of new funding opportunities
- Email solar@ee.doe.gov with questions

QUESTIONS?

Please use the chat feature to ask your questions.



Thank You and Exit Survey

- We'd love to learn about you – what brought you here today and what we can do to better engage with you
- We will start a webex poll momentarily that you can complete as you are exiting

SIGN UP NOW:
energy.gov/solar-newsletter