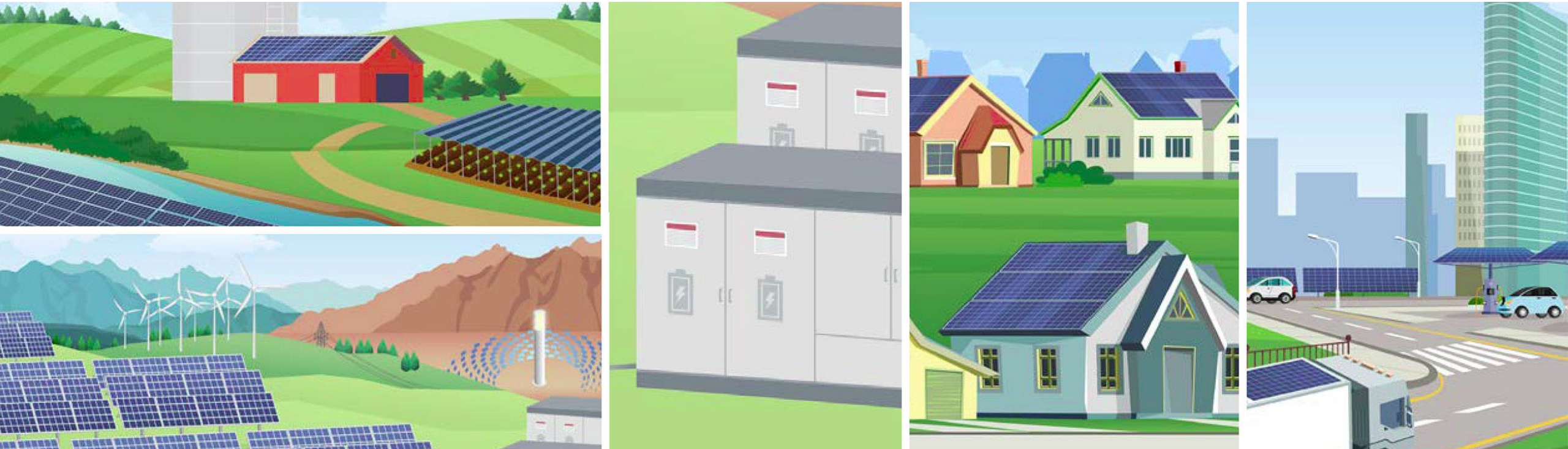
U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Stakeholder Webinar: Solar Energy Progress and Building for the Future

August 27, 2024

Dr. Becca Jones-Albertus and Dr. Krysta Dummit



Welcome and Logistics

- Slides, recording, and transcript will be available on energy.gov/seto-events
- For technical difficulties, chat or email Mianka Wilkins (mianka.wilkins@ee.doe.gov)
- This presentation contains discussion of tax credits. The Department of Treasury is responsible for tax policy and has regulatory authority for the clean energy tax incentives. Questions on those topics should be directed to the Department of Treasury and the Internal Revenue Service.

Agenda

- SETO Introduction
- 2023: a Record-Breaking Year for Solar
- Progress in Solar Two Years After the Inflation Reduction Act (IRA)
- What's Ahead for SETO

Solar Energy Technologies Office Overview

MISSION

We accelerate the **advancement** and **deployment of solar technology** in support of an **equitable** transition to a **decarbonized economy no later than 2050**, starting with a decarbonized power sector by 2035.

WHAT WE DO

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

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

Support **job growth**, **manufacturing**, and the **circular economy**

SETO Subprograms

PHOTOVOLTAICS (PV)

CONCENTRATING SOLAR-THERMAL POWER (CSP)

MANUFACTURING AND COMPETITIVENESS

SYSTEMS INTEGRATION

STRATEGIC ANALYSIS AND INSTITUTIONAL SUPPORT *

WORKFORCE AND EQUITABLE ACCESS *

*Funded from the Soft Costs Budget Line

Recent Announcements and Achievements

DOE's Interconnection Innovation e-Xchange (i2X) team and the Joint Office of Energy and Transportation launched the Innovative Queue Management Solutions (iQMS) for Clean Energy Interconnection and Energization program. This program will award more than $11M to distribution utilities to pilot innovative solutions for managing renewable energy interconnection and electric vehicle charging equipment energization queues. Register for the August 29 informational webinar to learn more.

DOE announced two more finalists in the American-Made Solar Desalination Prize, a $1M competition designed to accelerate the development of low-cost desalination systems that use solar-thermal power to produce clean water from salt water. GreenBlu's technology will recover valuable minerals from seawater. Solar Desalt's project seeks to reduce the amount of wastewater rejected from wineries. As finalists, each team receives $850,000 and will construct their systems to demonstrate operation and validate key performance metrics.

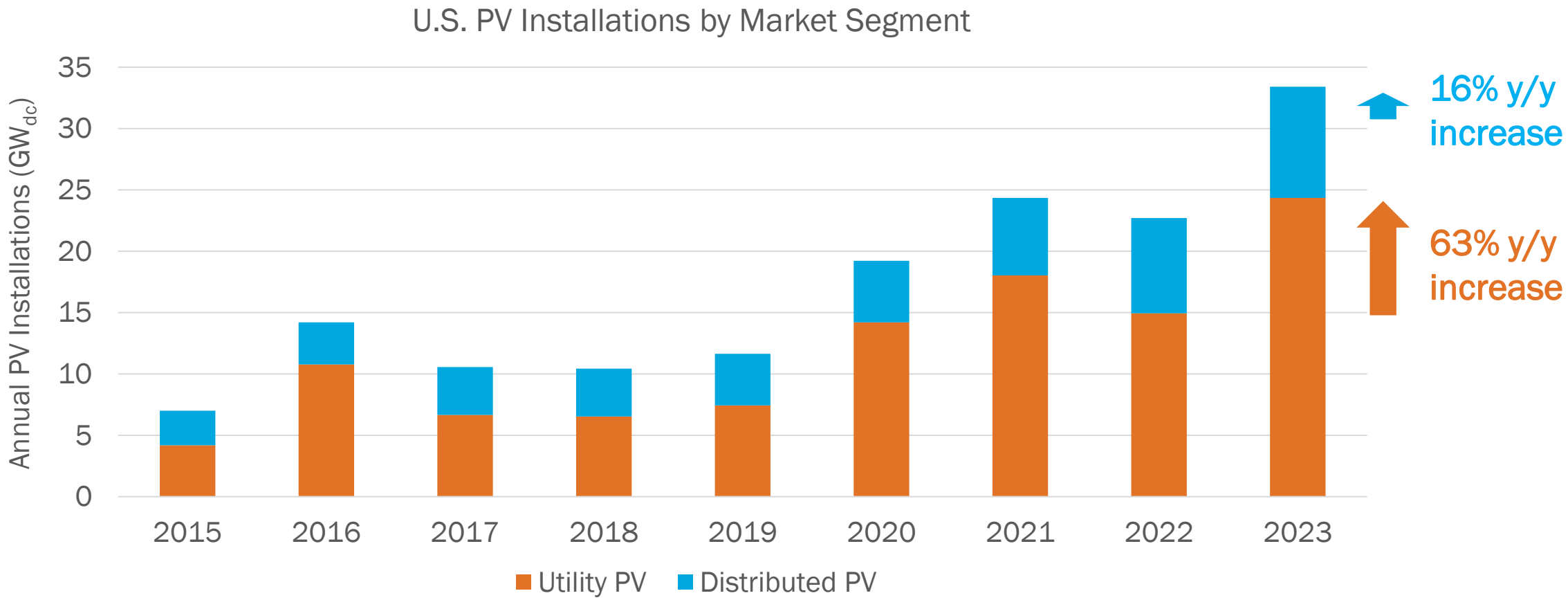
The Biden-Harris Administration announced more than $70 million to seed new technologies across the solar supply chain. The 18 selected projects are addressing gaps in the domestic solar manufacturing supply chain, including equipment, ingots and wafers, and silicon and thin-film solar cell manufacturing, and opening new markets for solar technologies like integrated-photovoltaics and agrivoltaics.

Agenda

- SETO Introduction
- 2023: a Record-Breaking Year for Solar
- Progress in Solar Two Years After the Inflation Reduction Act (IRA)
- What's Ahead for SETO

2023 Was a Record-Breaking Year

- Nearly 34 GW_{dc} of annual installations



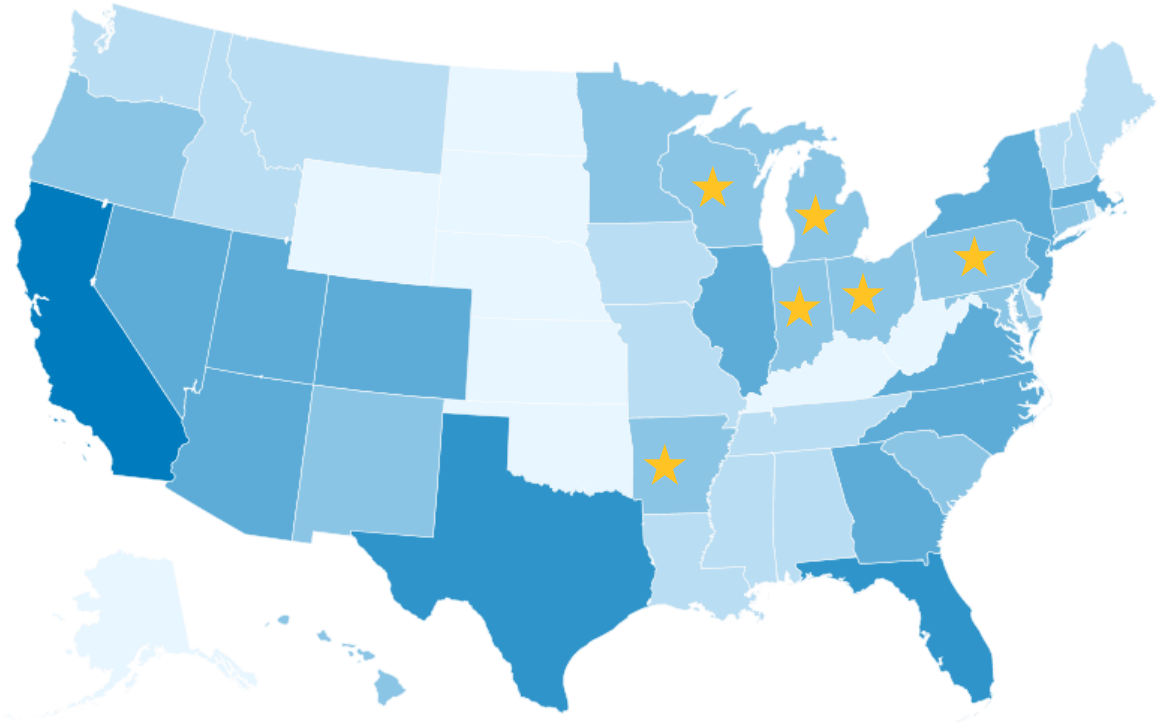
Sources: U.S. Energy Information Administration (EIA), Electric Power Monthly

2023 Was a Record-Breaking Year

- 40 GW_{dc} of annual installations

- **More than half of states with more than 1 GW_{ac} installed cumulatively**

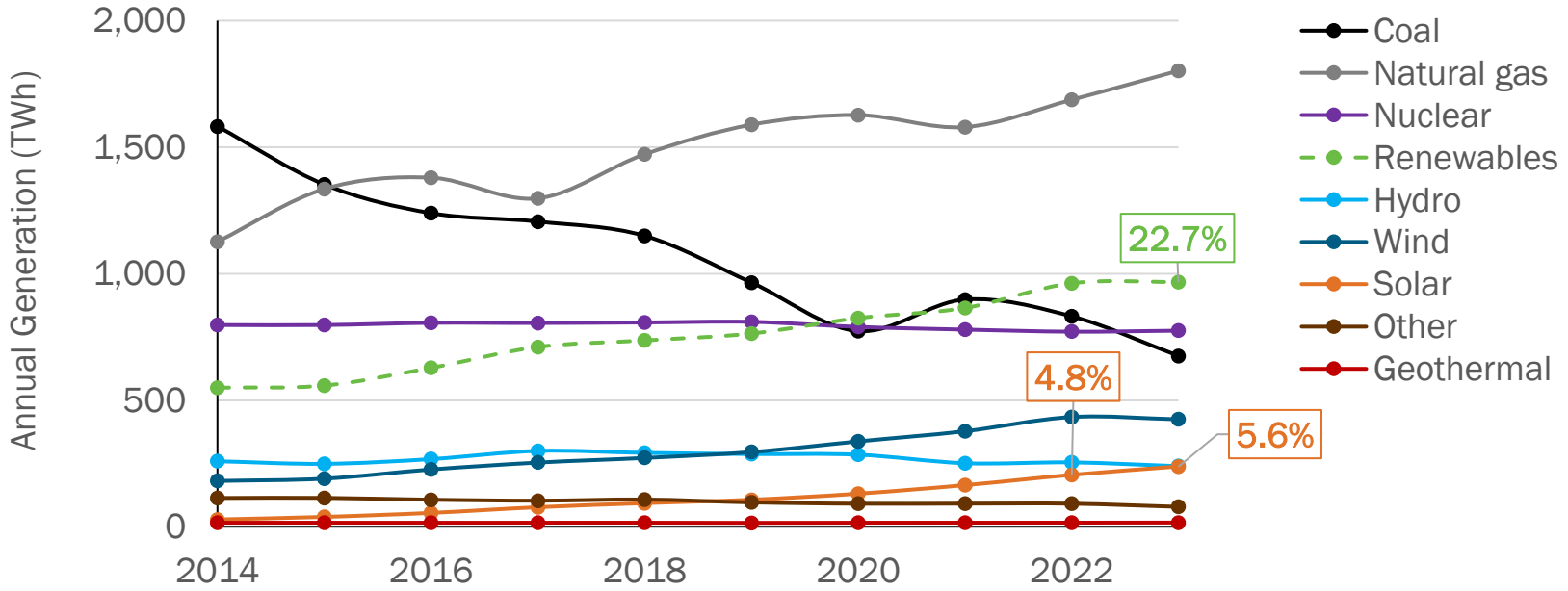
★ Indiana,
★ Michigan,
★ Ohio,
★ Wisconsin,
★ Arkansas, and
★ Pennsylvania achieved this milestone in 2023



Sources: U.S. Energy Information Administration (EIA), Electric Power Monthly, forms EIA-023, EIA-826, and EIA-861 (February 2024, February 2023).

2023 Was a Record-Breaking Year

- 40 GW_{dc} of annual installations
- More than half of states with more than 1 GW_{ac} installed
- **5.6% of electricity in the United States was generated from solar.**



Sources: U.S. Energy Information Administration (EIA), Electricity Data Browser. Accessed March 10, 2024.

2023 Was a Record-Breaking Year

JUNE 12, 2023 | 4 MIN READ

In a First, Wind and Solar Generated More Power Than Coal in U.S.

Wind and solar produced more U.S. power than coal during the first five months of this year, as several coal plants closed and gas prices dropped

BY BENJAMIN STORROW & E&E NEWS

Xcel Energy seeks 650 MW of solar + storage to replace retiring coal plant

By Kelsey Misbrener | August 10, 2023

Replacing US Coal Plants With Solar and Wind Is Cheaper Than Running Them

It now 'unequivocally' costs less to build new renewable energy projects than to operate existing coal plants, according to a new analysis.

Work begins on 200-MW solar array replacing New Mexico coal plant

By Kelsey Misbrener | August 30, 2023

Sources: U.S. Energy Information Administration (EIA), Electricity Data Browser. Accessed March 10, 2024.

2023 Was a Record-Breaking Year

Solar

Heliene boosts U.S. solar supply chain with expansion of Minnesota facility

ACCESSWIRE

SPI's Solar 4 America Begins Manufacturing and Delivering First US-Made M10 Solar Modules from its New State-of-the-Art Fully Automated Production Line in Sacramento

Qcells North America Completes Dalton Factory Expansion

- More than 15 GW_{dc} nameplate domestic module manufacturing capacity!

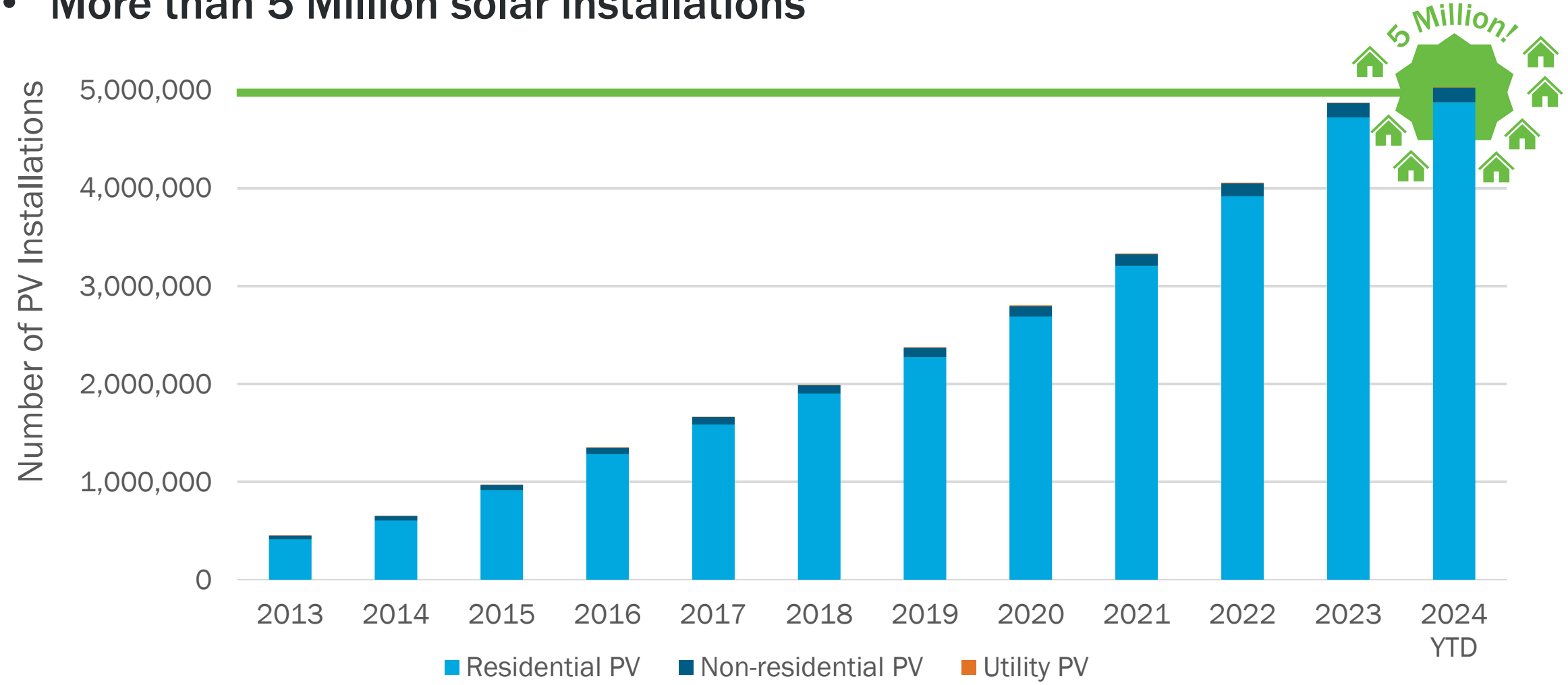
https://www.renewableenergymagazine.com › pv_solar › first-solar-to-invest-up-to-1-20230728

First Solar to invest up to $1.1 billion in fifth US manufacturing facility

Jul 28, 2023 · First Solar, the largest fully vertically integrated solar manufacturer in the Western Hemisphere with 6.3 GW of operational capacity in the US, also previously announced an investment of up to $370 million for a dedicated R&D innovation center in Perrysburg, Ohio, which is expected to be

2024 Has Continued Setting Records

- More than 5 Million solar installations

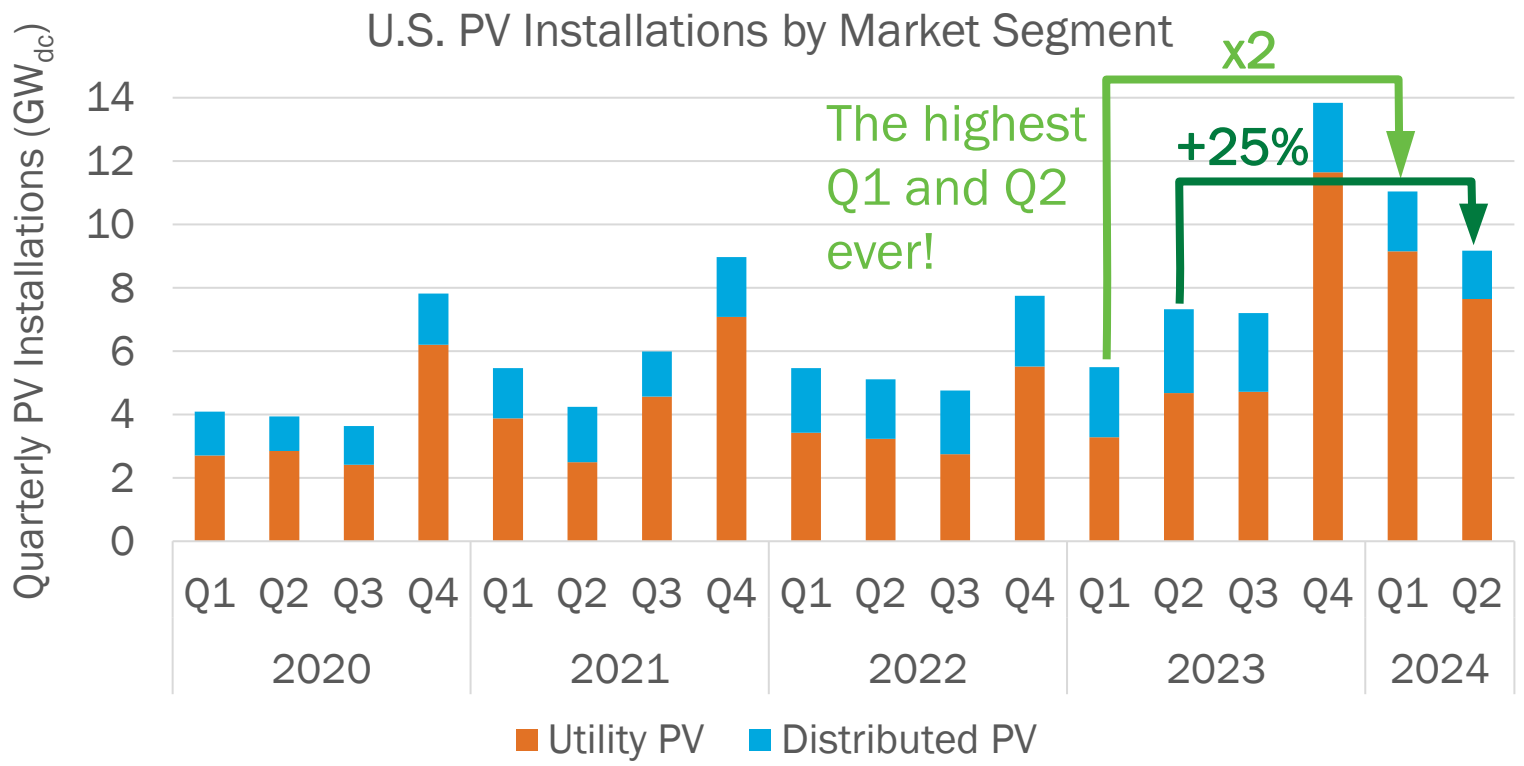


Sources: Wood Mackenzie/SEIA: US Solar Market Insight Full Report Q2 2024, June 2024.

2024 Has Continued Setting Records

- More than 5 Million solar installations

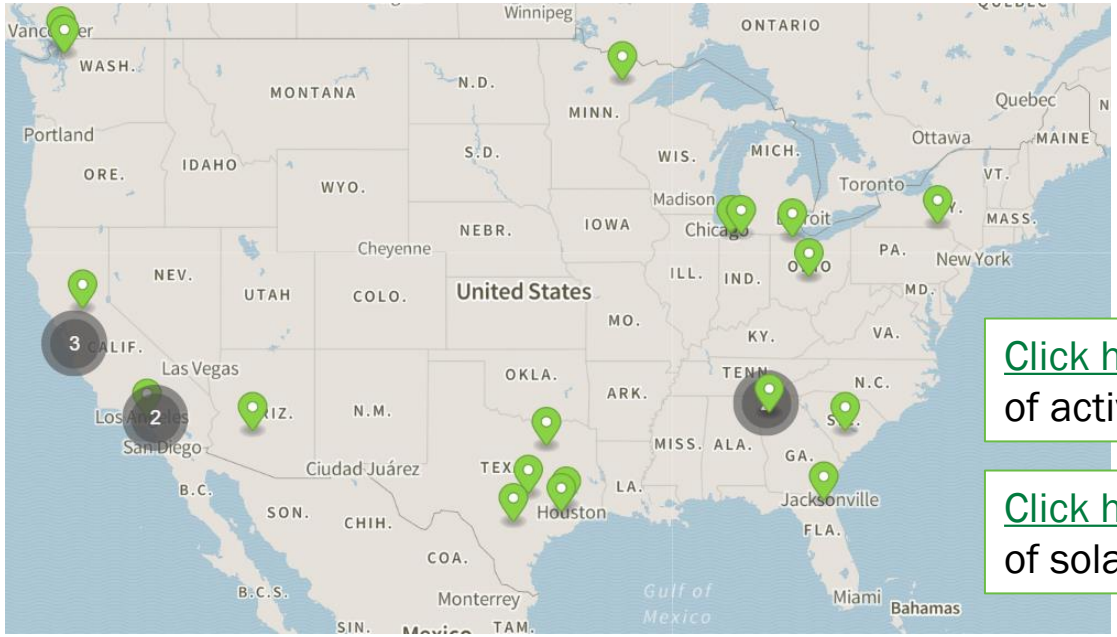
- **10 GW_{dc} of installations in Q1 2024 alone**



Sources: U.S. Energy Information Administration (EIA), Electric Power Monthly

2024 Has Continued Setting Records

- More than 5 Million solar installations
- 10 GW_{dc} of installations in Q1 2024 alone
- **More than 40 GW_{dc} domestic module manufacturing capacity (and climbing)!**



Click here to interactively view a map of active solar manufacturers.

Click here to interactively view a map of solar manufacturing announcements.

2024 Has Continued Setting Records

- More than 5 Million solar installations
- 10 GW_{dc} of installations in Q1 2024
- More than 40 GW_{dc} dc
- **Solar+storage, agrivoltaics, and community solar projects are growing in size and popularity.**

pv magazine

Largest US solar goes online

A new 875 MW solar project in Ca solar panels and offers more thar

JANUARY 22, 2024 RYAN KENNEDY

MARKETS | UTILITY SCALE PV | UTILITY SCALE STO

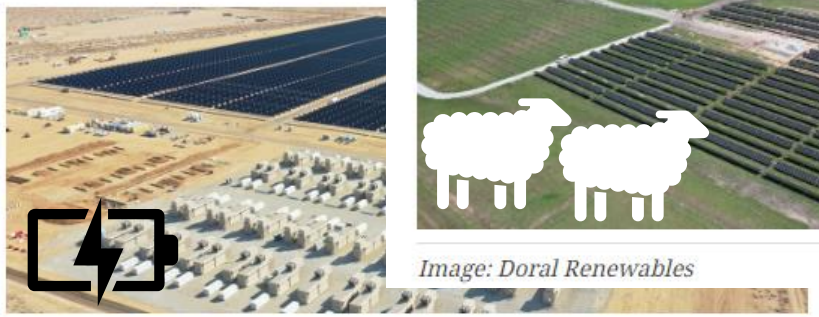


Image: Mortenson

pv magazine

Indiana's largest plant about to co

Mammoth North Solar is a 400 MW a that is the first phase of Doral Renew complex.

JULY 10, 2024 ANNE FISCHER

INSTALLATIONS | UTILITY SCALE PV | INDIANA

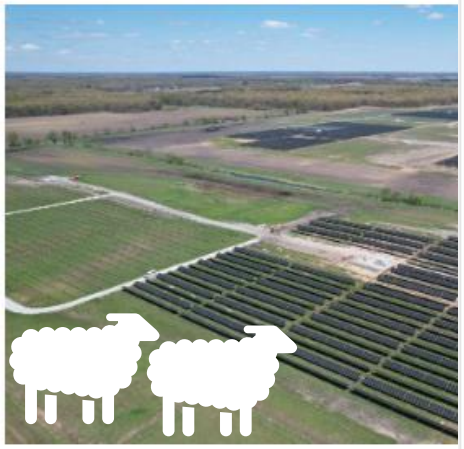


Image: Doral Renewables

pv magazine

Major U.S. corporations embracing community solar

The Coalition for Community Solar Access (CCSA) noted that household names such as Microsoft, Google, Walmart, Starbucks, Rivian, Wendy's, and T-Mobile are just a few of the Fortune 500 companies that have signed agreements with community solar developers.

AUGUST 26, 2024 ANNE FISCHER

MARKETS | MARKETS & POLICY | ILLINOIS | UNITED STATES

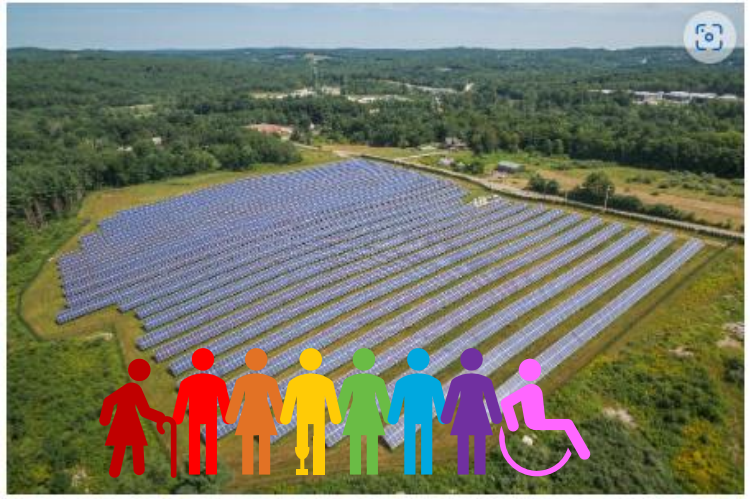


Image: Nexamp

Agenda

- SETO Introduction
- **2023: a Record-Breaking Year for Solar**
- Progress in Solar Two Years After the Inflation Reduction Act (IRA)
- What's Ahead for SETO

Links to Resources – *These Slides Will be Posted to our Website*

SETO has published several resources providing overviews of the federal solar tax credits within the Inflation Reduction Act. They do not constitute professional tax advice or other professional financial guidance and may change based on additional guidance from Treasury.

- Homeowner's Guide to the Federal Tax Credit for Solar Photovoltaics | Department of Energy
  - An overview of the tax credits available to homeowners for installing or purchasing a residential solar system.
- Federal Solar Tax Credits for Businesses | Department of Energy
  - An overview of the tax credits available to businesses and non-profits for installing or purchasing a solar system.
- Federal Tax Credits for Solar Manufacturers | Department of Energy
  - An overview of the tax credits available to solar manufacturers for establishing domestic operations.
- Tribal Guide to Solar Energy | Department of Energy
  - An overview of the considerations for Tribes installing solar, including how Tribes can claim federal tax credits.
- Summaries within several of NREL's recent Quarterly Solar Industry Update | Department of Energy

Links to Resources – *These Slides Will be Posted to our Website*

The Internal Revenue Service has set up a website documenting all new guidance, updates, and news on the Inflation Reduction Act of 2022 | Internal Revenue Service (irs.gov).

CleanEnergy.gov has helpful links maintained by the White House on the Inflation Reduction Act, including:

- The Inflation Reduction Act Guidebook
- A Summary of the Clean Energy Tax Provisions in the Inflation Reduction Act
- Information on Direct Pay | Clean Energy | The White House

Photo Credit: Hit Me With Your SunShot Photo Contest
Agriculture and Solar, Solar in Nature, Solar and Wildlife Category
First Place Winner Chad Akire.

What was in the Inflation Reduction Act (IRA)?

On August 16, 2022, President Biden signed the Inflation Reduction Act into law, marking the most significant action Congress has taken on clean energy and climate change in the nation's history.

The bill contained an estimated **$370 Billion in clean energy investments**. The law also advanced the President's Justice40 Initiative, which committed to delivering 40% of the overall benefits of climate, clean energy, and related federal investments to communities that have been marginalized, overburdened by pollution, and underserved by infrastructure and other basic services.

The bulk of the funding for clean energy in IRA comes in the form of tax credits.

- Advanced Manufacturing Production Credit (MPTC or 45X)

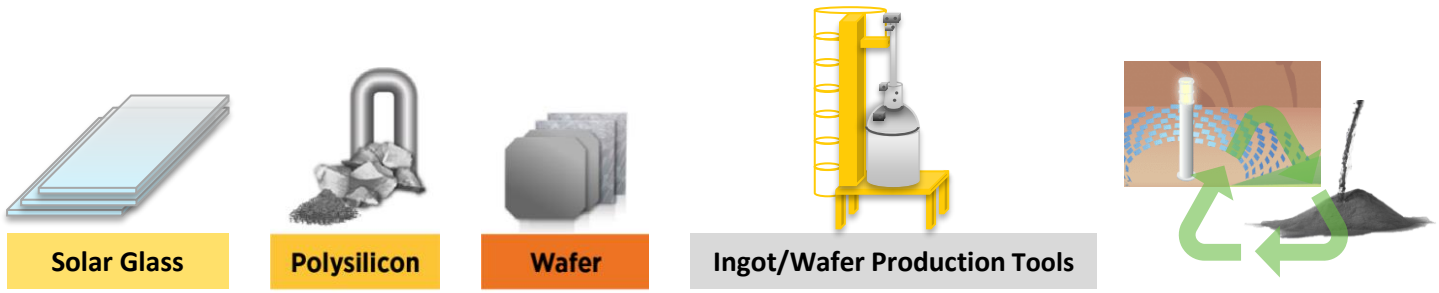
What was in the Inflation Reduction Act (IRA)?

On August 16, 2022, President Biden signed the Inflation Reduction Act into law, marking the most significant action Congress has taken on clean energy and climate change in the nation's history.

The bill contained an estimated **$370 Billion in clean energy investments**. The law also advanced the President's Justice40 Initiative, which committed to delivering 40% of the overall benefits of climate, clean energy, and related federal investments to communities that have been marginalized, overburdened by pollution, and underserved by infrastructure and other basic services.

The bulk of the funding for clean energy in IRA comes in the form of tax credits.

- Advanced Energy Project Credit (48C)



What was in the Inflation Reduction Act (IRA)?

On August 16, 2022, President Biden signed the Inflation Reduction Act into law, marking the most significant action Congress has taken on clean energy and climate change in the nation's history.

The bill contained an estimated **$370 Billion in clean energy investments**. The law also advanced the President's Justice40 Initiative, which committed to delivering 40% of the overall benefits of climate, clean energy, and related federal investments to communities that have been marginalized, overburdened by pollution, and underserved by infrastructure and other basic services.

The bulk of the funding for clean energy in IRA comes in the form of tax credits.

Images courtesy of the National Renewable Energy Lab

- Production Tax Credit (PTC, 45)
- Investment Tax Credit (ITC, 48)
  - Domestic content bonus
  - Energy community bonus
  - Low-income communities bonus
  - Eligible for direct pay or transfer

What was in the Inflation Reduction Act (IRA)?

On August 16, 2022, President Biden signed the Inflation Reduction Act into law, marking the most significant action Congress has taken on clean energy and climate change in the nation's history.

The bill contained an estimated **$370 Billion in clean energy investments**. The law also advanced the President's Justice40 Initiative, which committed to delivering 40% of the overall benefits of climate, clean energy, and related federal investments to communities that have been marginalized, overburdened by pollution, and underserved by infrastructure and other basic services.

The bulk of the funding for clean energy in IRA comes in the form of tax credits.

Image courtesy of the National Renewable Energy Lab

- Residential Clean Energy Credit (25D)

What was in the Inflation Reduction Act (IRA)?

On August 16, 2022, President Biden signed the Inflation Reduction Act into law, marking the most significant action Congress has taken on clean energy and climate change in the nation's history.

The bill contained an estimated **$370 Billion in clean energy investments**. The law also advanced the President's Justice40 Initiative, which committed to delivering 40% of the overall benefits of climate, clean energy, and related federal investments to communities that have been marginalized, overburdened by pollution, and underserved by infrastructure and other basic services.

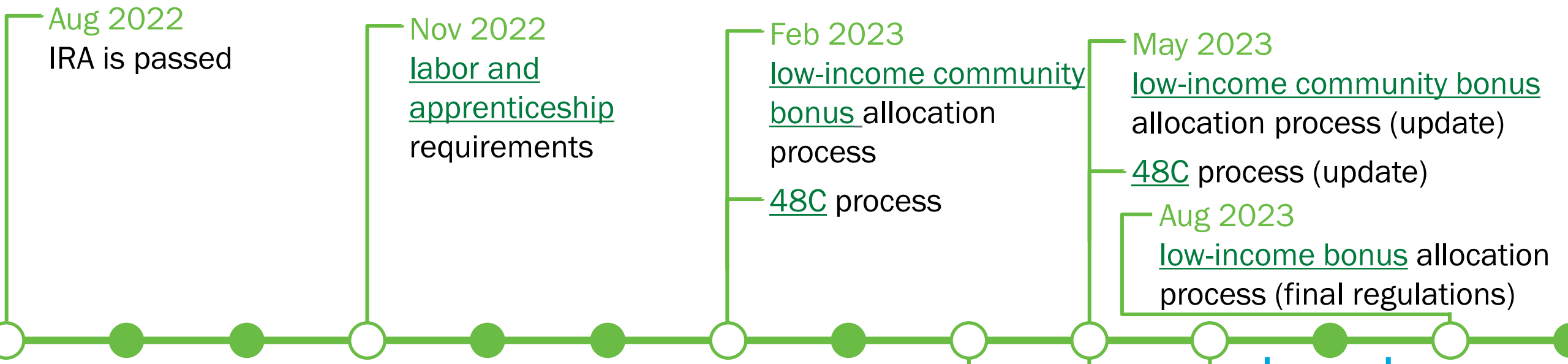
The bulk of the funding for clean energy in IRA comes in the form of tax credits.

- Advanced Manufacturing Production Credit (MPTC or 45X)
- Advanced Energy Project Credit (48C)
- Production Tax Credit (PTC)
- Investment Tax Credit (ITC)
- Residential Clean Energy Credit (25D)

There is also funding made available in IRA that will impact solar deployment.

- Grants such as the Solar for All, Rural Energy for America, and EPA's Environmental Justice programs.
- Loans through the DOE Loan Program Office, Tribal Energy Loan Guarantee Program, and others.

IRA Timeline – Treasury Guidance for Solar Tax Credits (Year 1)



Aug 2022
IRA is passed

Nov 2022
labor and apprenticeship requirements

Feb 2023
low-income community bonus allocation process

48C process

May 2023
low-income community bonus allocation process (update)

48C process (update)

Aug 2023
low-income bonus allocation process (final regulations)

Apr 2023
energy community bonus guidance

May 2023
domestic content bonus guidance

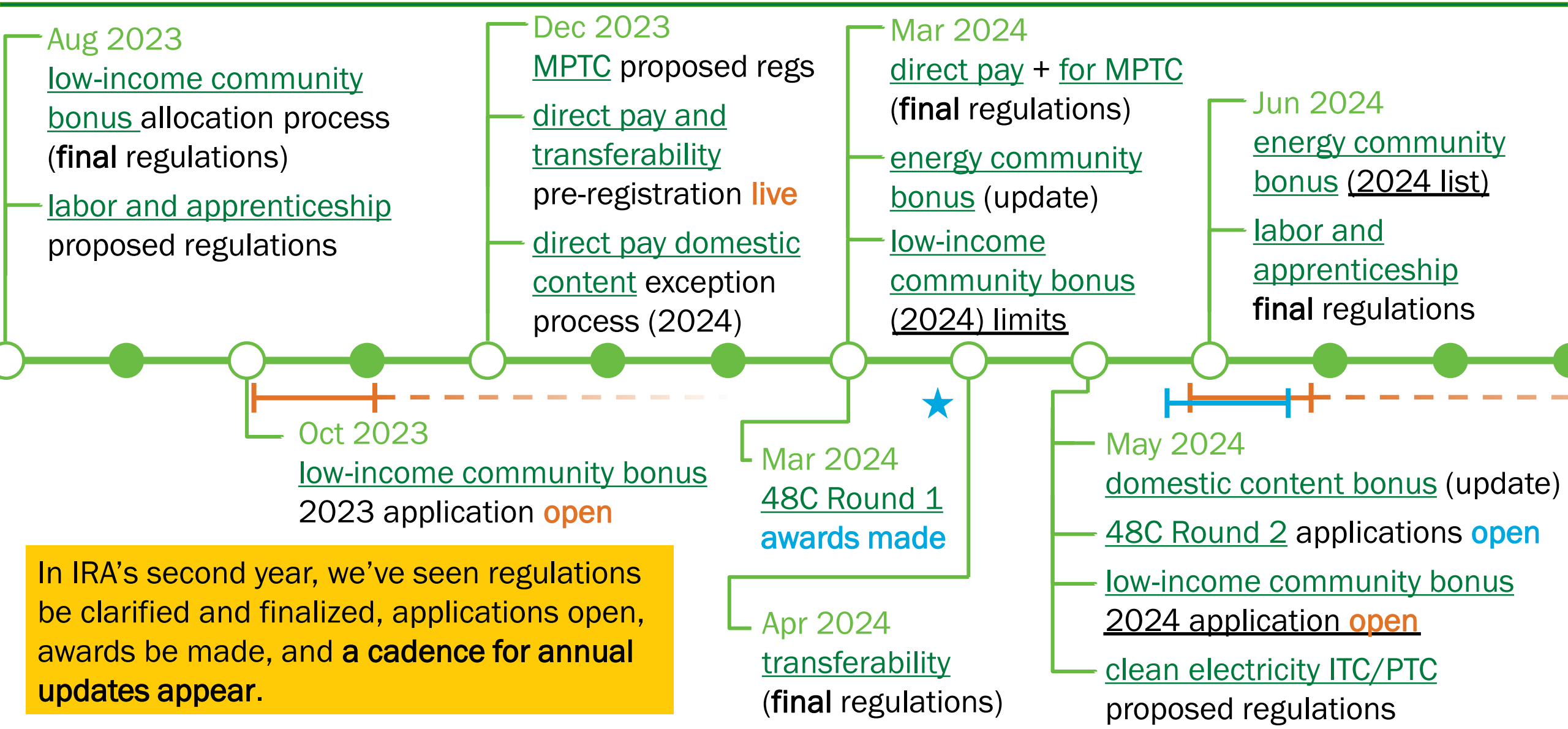
Jun 2023
direct pay and transferability process

energy community bonus update

48C Round 1 applications **open**

IRA's first year saw a flurry of work as the Department of Treasury and the Internal Revenue Service drafted and proposed hundreds of pages of guidance on all the new tax credits.

IRA Timeline – Treasury Guidance for Solar Tax Credits (Year 2)



In IRA's second year, we've seen regulations be clarified and finalized, applications open, awards be made, and **a cadence for annual updates appear**.

U.S. Solar PV Manufacturing is Growing Nationwide

The solar supply chain has been growing across the country, with over 50 new facilities coming online post-IRA, the result of an estimated $3B in investment and ultimately creating an estimated 12,000 family-sustaining jobs!*

Manufacturing or recycling facility that has come online or expanded post-IRA

Click here to interactively view a map of active solar manufacturers.

The last two years have been momentous for solar manufacturing.

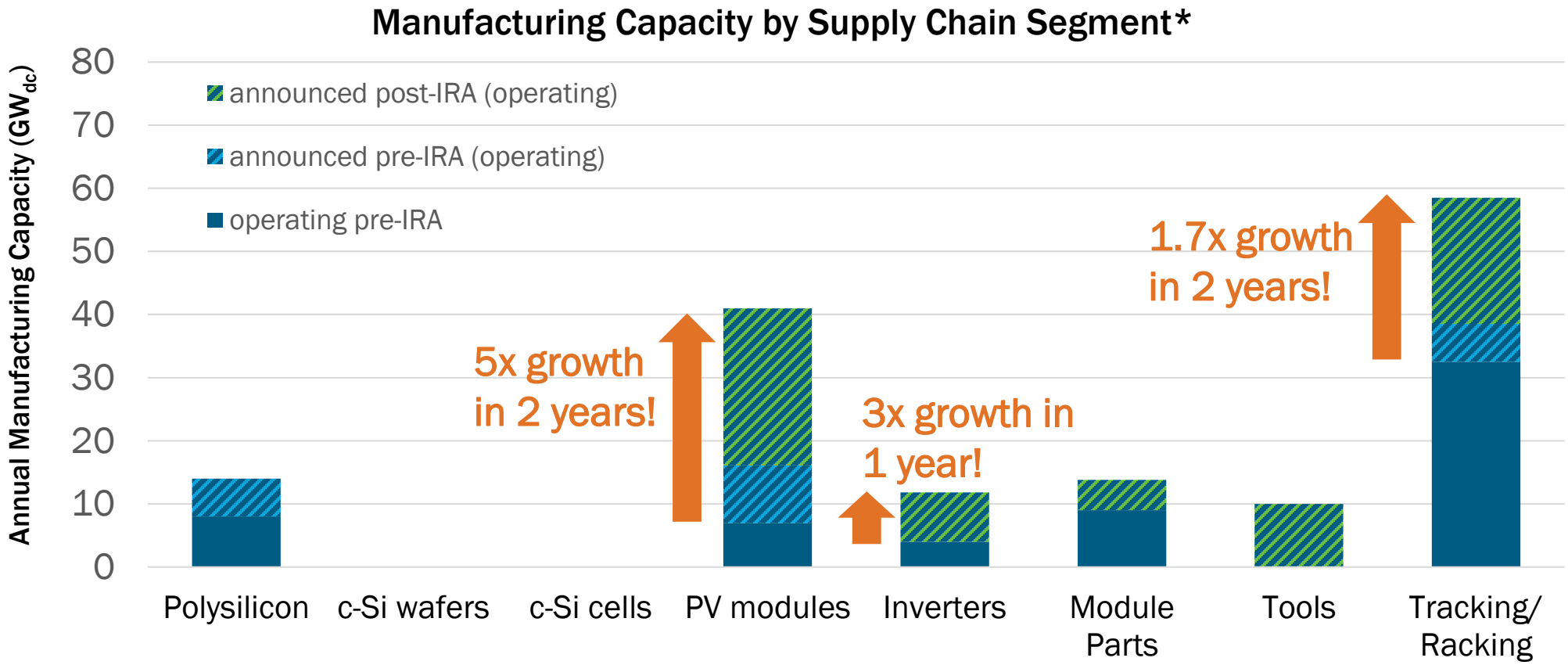
- **First Solar**, **GAF Energy**, **Heliene**, **Jinko Solar**, **Mission Solar**, and **Qcells** all completed module manufacturing facility expansions.
- **Canadian Solar**, **Hounen, Illuminate USA**, **Imperial Star Solar, Meyer Burger**, **SEG Solar**, and **Sirius PV** all opened new module manufacturing facilities
- **REC Silicon** restarted polysilicon production
- **Nextracker**, **Array Technologies**, and **GameChange Solar** all greatly expanded domestic production of tracker parts.
- **Enphase**, **EPC Power**, and **SolarEdge** opened new inverter manufacturing facilities.
- And a host of other new or expanded facilities from junction boxes to encapsulants to recycling came online.

Sources: Internal DOE tracking of public announcements.

*Not all announcements include facility locations, job, operating capacity, or investment numbers.

U.S. Solar PV Manufacturing is Growing Across the Supply Chain

Since IRA's passage, manufacturing capacity has been added across the solar supply chain from facilities announced pre- and post-IRA.



There is also a lot of capacity still planned for this year (and the next several), including **cells**, **wafers**, **inverters**, **recycling** and, of course, even more **modules**!

Click here to interactively view a map of solar manufacturing announcements.

Sources: Internal DOE tracking of public announcements.

*Not all announcements include facility locations, job, operating capacity, or investment numbers.

IRA is Increasing Access to Residential Solar Energy

The Residential Clean Energy Credit (25D)

Treasury estimates in 2023 that more than 750,000 taxpayers took advantage of the tax credit for installing rooftop solar power on their homes and more than 48,000 for installing batteries.

- This is significantly higher than pre-IRA!

Families in all 50 states, the District of Columbia, and Puerto Rico claimed 25D or the Energy Efficient Home Improvement Credit. Nearly half of the families who claimed one or both credits had incomes in 2023 of less than $100,000.

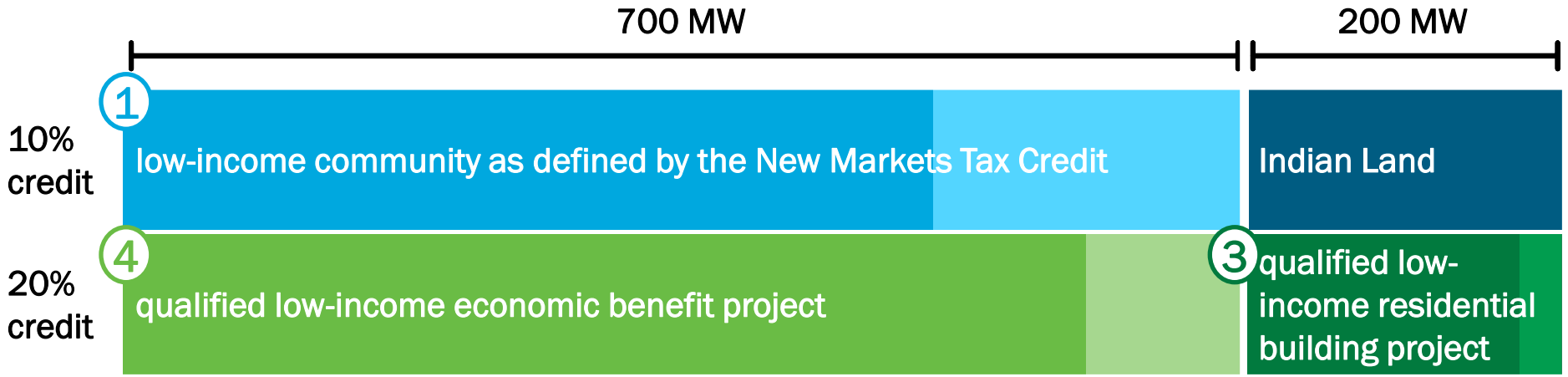
Photo Credit: Hit Me With Your SunShot Photo Contest Residential Solar Category First Place Winner Quincy Biddle.

According to research from Lawrence Berkeley National Labs, rooftop solar continues to both broaden by expanding into states with generally lower income levels and deepen by reaching less-affluent households and disadvantaged communities.

IRA is Increasing Access to Solar Energy for LMI Households

Low-Income Communities Bonus to the Investment Tax Credit (a.k.a., 48(e))

Administered by DOE's Office of Energy Justice and Equity, this program will increase adoption of and access to renewable energy in low-income communities while providing social and economic benefits. 2023 was the program's first year and it allocated 82% of its credits.



325 MW of capacity rolled over into 2024

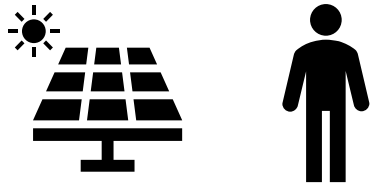
During the initial 30-day application window in 2023, the program received more than 46,000 applications, representing more than 8 GW of generation capacity!

While the initial 30-day application window for 2024 has closed, the program is still accepting applications on a rolling basis.

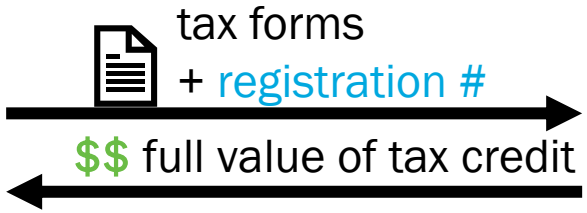
IRA is Increasing Access to Solar Energy for New Entrants

Direct Pay and Transferability

As a result of the direct (or elective) pay option, groups such as school districts, non-profits, Indian tribal governments, rural electric cooperatives, and many others who were previously ineligible for the Investment Tax Credit and the Production Tax Credit can now take full advantage of those tax credits.



Tax burden < full credit
still receives full value



IRS

Other entities have the option to transfer or sell their tax credits to better recoup their value.

As of January 2024, over 1,000 projects had registered with the IRS to be able to transfer tax credits and more than 100 projects were registered to receive direct pay! At the time, projects were location in 40 states and territories in just the first few months of the link being live.

IRA Timeline – Other Programs Funding Solar Projects (Year 1)

Aug 2022
IRA is passed

Dec 2022
USDA solicits FY23 Rural Energy for America Program (REAP) applications

Mar 2023
USDA releases further REAP guidance

Jul 2023
EPA launches the Clean Communities Investment Accelerator and the National Clean Investment Fund (NCIF)

Home Energy Rebate and Contractor Training from SCEP

Jun 2023
EPA launches Solar for All

May 2023
LPO publishes interim rules for loan guarantees for clean energy projects

Apr 2023
LPO announces Sunnova VPP conditional commitment

IRA's first year also saw other departments and offices make significant progress, including the Department of Agriculture (USDA), the Environmental Protection Agency (EPA), and within the DOE, the Loan Programs Office (LPO) and the Office of State and Community Energy Programs (SCEP).

IRA Timeline – Other Programs Funding Solar Projects (Year 2)

Aug 2023
USDA announces a batch of REAP awards

Jan 2024
USDA announces a batch of REAP awards

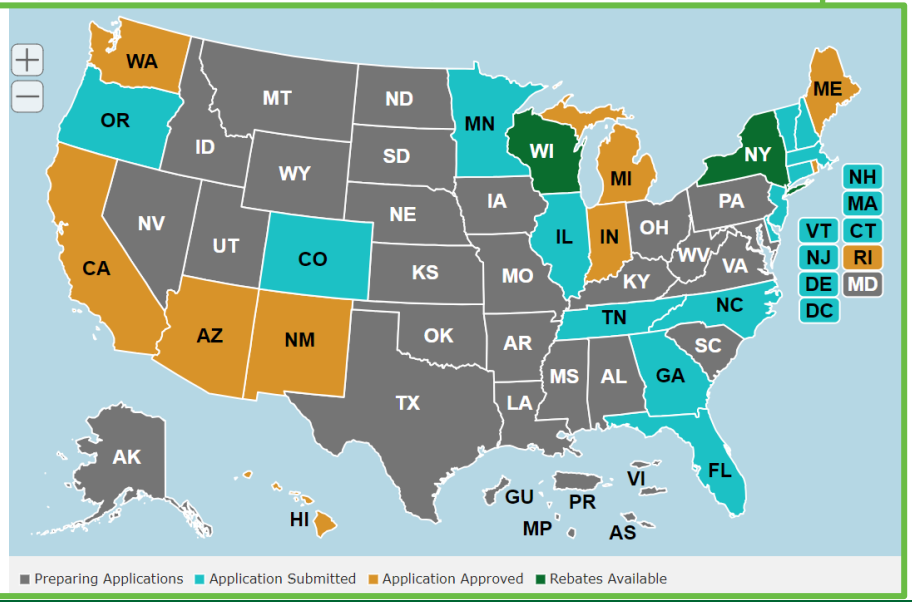
Apr 2024
EPA makes Accelerator, NCIF, and Solar for All selections

Jul 2024
USDA announces a batch of REAP awards

Aug 2024
LPO announces Qcells conditional commitment

In IRA's second year we have seen the USDA, EPA, and others make significant progress, announcing awards, conditional commitments, and milestones nationwide.

Aug 2024
26 states and territories have applied to SCEP for full funding to launch Home Energy Rebates



What's Next?

IRA is Game Changing

Over **300 GW** of solar (+storage!) manufacturing capacity announced and more to come!

Tax credits flowing **for the first time** to communities that have been marginalized, overburdened by pollution, and underserved by infrastructure!

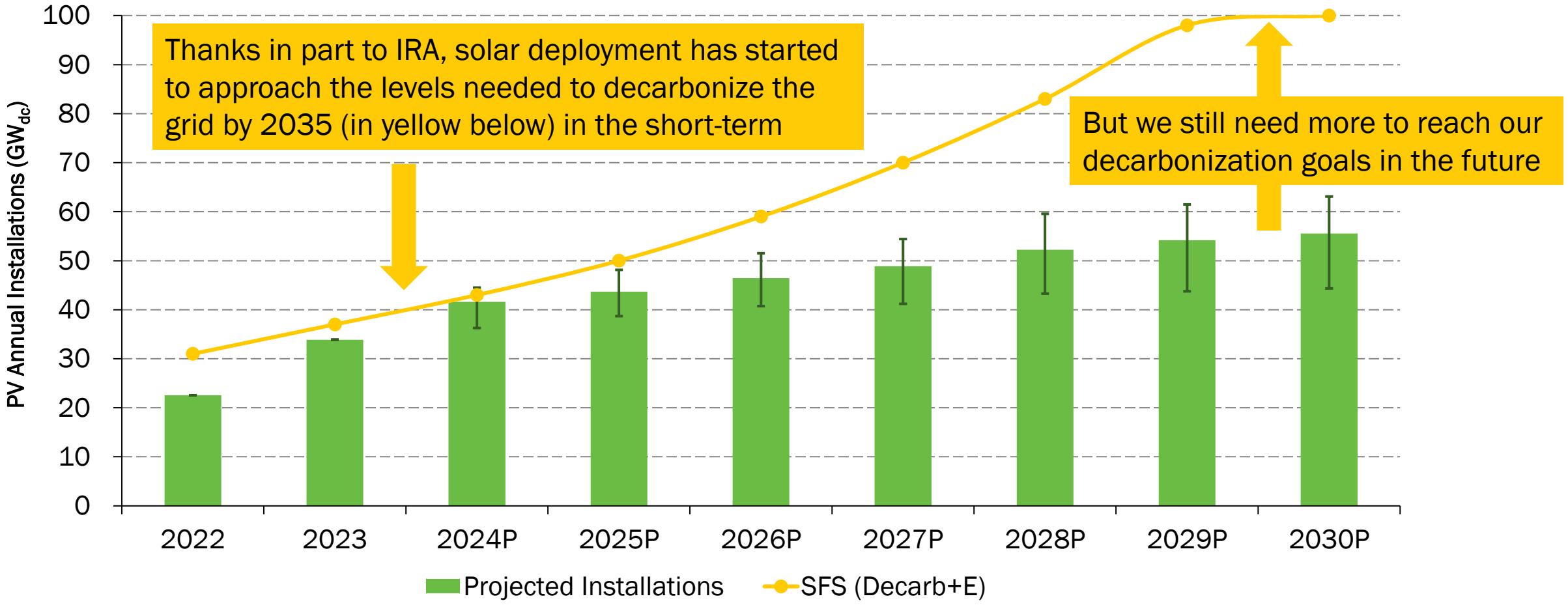
Between **25-70 GW** more solar deployment over the next 5 years!

A truly **nationwide** approach to ensuring all Americans can receive meaningful benefits from solar energy!

Agenda

- SETO Introduction
- 2023: a Record-Breaking Year for Solar
- **Progress in Solar Two Years After the Inflation Reduction Act (IRA)**
- What's Ahead for SETO

Where are We Headed?



Notes: P = projection. Colored bars represent average projections, and error bars represent average high and low projections, line represents a smoothed Decarbonization+ Electrification (Decarb+E) scenario from the Solar Futures Study (SFS).

Sources: BNEF, 2Q 2024 Global PV Market Outlook, 5/23/24; Wood Mackenzie and SEIA, Q2 2024 US Solar Market Insight, 6/24; Wood Mackenzie and SEIA, 2023 Year in Review US Solar Market Insight, 3/24. Adapted from U.S. Department of Energy, Solar Futures Study, 9/21. U.S. Energy Information Administration (EIA), Electric Power Monthly.

What is SETO Doing to Build for the Future?

- Planning and operating a grid with increasing variable, distributed and digital generation

Solar Technologies' Rapid Integration and Validation for Energy Systems (STRIVES)

$31M to improve power systems simulation software tools and demonstrate new business models for distribution systems operations to integrate and optimize the value of clean energy technologies like solar, wind, storage, building technologies, and electric vehicles.

What is SETO Doing to Build for the Future?

- Planning and operating a grid with increasing variable, distributed and digital generation
- Building a secure, domestic supply chain

Solar Energy Supply Chain Incubator

$39M for projects that de-risk solar hardware, manufacturing processes, and software products across a wide range of solar technology areas.

What is SETO Doing to Build for the Future?

- Planning and operating a grid with increasing variable, distributed and digital generation
- Building a secure, domestic supply chain
- **Improving siting, permitting and interconnection processes**

Renewable Energy Siting through Technical Engagement and Planning (R-STEP)

$12M for round two of the R-STEP program, which funds state-based collaboratives and provides tailored technical assistance to improve renewable energy planning and siting for local communities.

What is SETO Doing to Build for the Future?

- Planning and operating a grid with increasing variable, distributed and digital generation
- Building a secure, domestic supply chain
- Improving siting, permitting and interconnection processes
- Growing an inclusive workforce

$5M American-Made Upskill Prize

Upskill Prize

for the Solar Manufacturing Workforce

AMERICAN MADE
U.S. DEPARTMENT OF ENERGY

Apply by Nov 20!

Help accelerate the expansion of the U.S. solar manufacturing workforce and equip workers with the skills necessary to revitalize the U.S. solar module manufacturing supply chain.

What is SETO Doing to Build for the Future?

- Planning and operating a grid with increasing variable, distributed and digital generation
- Building a secure, domestic supply chain
- Improving siting, permitting and interconnection processes
- Growing an inclusive workforce
- **Ensuring equitable distribution of the benefits of the clean energy transition**

Community Power Accelerator™

Connecting developers, investors, philanthropists, and community-based organizations to create an ecosystem of partners that work together to get more equity-focused community solar projects financed and deployed.

What is SETO Doing to Build for the Future?

- Planning and operating a grid with increasing variable, distributed and digital generation
- Building a secure, domestic supply chain
- Improving siting, permitting and interconnection processes
- Growing an inclusive workforce
- Ensuring equitable distribution of the benefits of the clean energy transition
- **Improving efficiency and reliability, while addressing end-of-life issues**

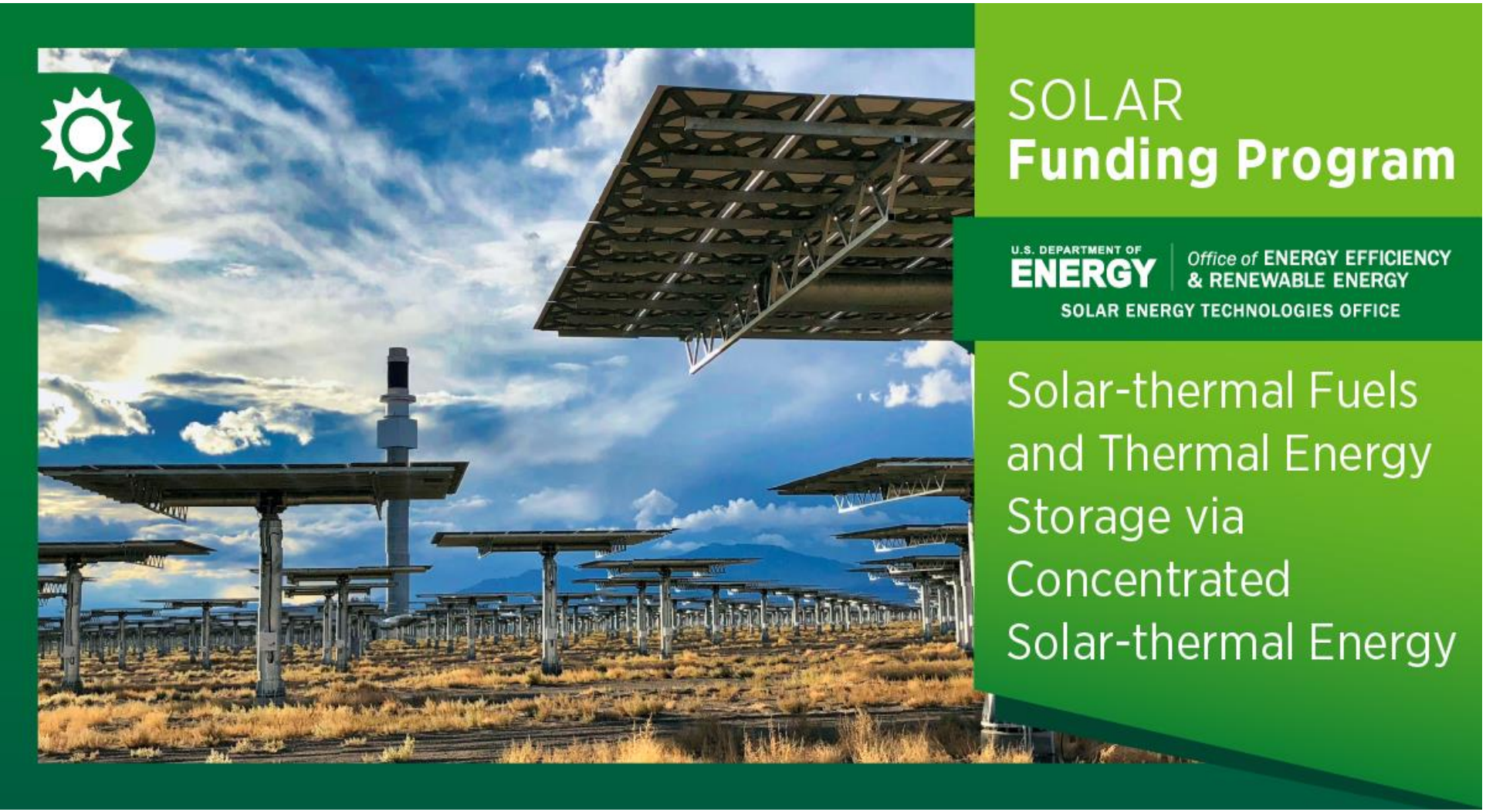
FY24 PV Research & Development

$20M for innovative PV research and development that reduces the cost of modules, reduces carbon and energy intensity of the PV supply chain and manufacturing process, and optimizes PV technology for new, specialized markets.

What is SETO Doing to Build for the Future?

- Planning and operating a grid with increasing variable, distributed and digital generation
- Building a secure, domestic supply chain
- Improving siting, permitting and interconnection processes
- Growing an inclusive workforce
- Ensuring equitable distribution of the benefits of the clean energy transition
- Improving efficiency and reliability, while addressing end-of-life issues
- Opening new markets

Solar-thermal Fuels and Thermal Energy Storage Via Concentrated Solar-thermal Energy



$33M across nine projects to accelerate the development of solar-thermal energy storage via fuels, as well as on site energy storage for industrial applications and power production.

$8M American-Made LASSO Prize

Follow the prize at HeroX.com/LASSO to receive updates and start forming your team today!

Cattle agrivoltaics could help preserve agricultural land, generate additional income for farmers and ranchers, and ease barriers to solar deployment. LASSO brings together agricultural and solar stakeholders in teams to develop innovative co-location plans, build pilot sites, and share best practices, costs, and energy and agricultural outcomes.

Open Prize Competitions

- American-Made Solar Prize Round 8
  Submissions due **Sep. 26, 2024**
- Solar District Cup Class of 2025
  Submissions due **Sep. 26, 2024**
- American-Made Upskill Prize for the Solar Manufacturing Workforce
  Submissions due **Nov. 20, 2024**
- American-Made Challenges: Solar Desalination Prize Round 2
  Design Contest and Test Contest open through **Apr. 2025**

Photo Credit: Hit Me With Your SunShot Photo Contest
Solar Workforce and Installation Category First Place Winner Saman Kouretchian.

SETO at RE+ 2024

Thank You for Attending!

SIGN UP NOW:
energy.gov/solar-newsletter

- View today's recording and slides at bit.ly/seto-stakeholder-webinar
- Find open SETO funding opportunities at bit.ly/seto-funding
- Sign up for funding notices at bit.ly/eere-funding
- Become a reviewer at bit.ly/seto-reviewer
- Browse all SETO events & webinars at energy.gov/seto-events

QUESTIONS