U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Building Out U.S. Solar Manufacturing

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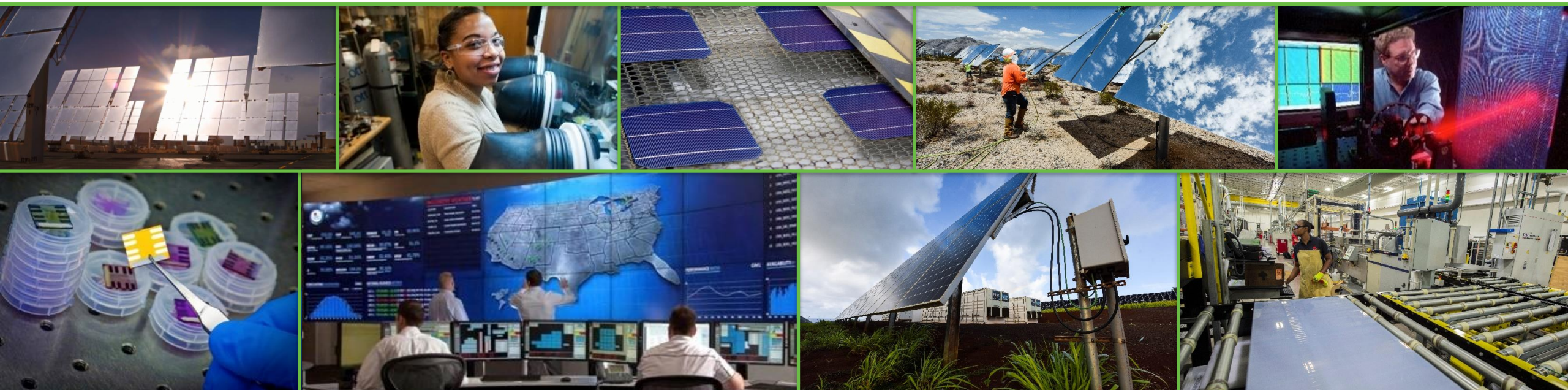
October 12, 2023



Solar Energy Technologies Office (SETO) 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

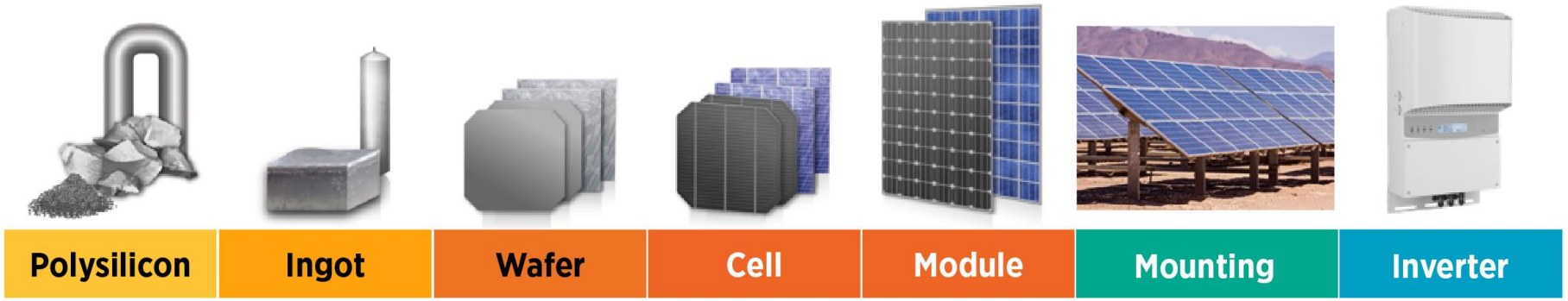
Enable solar to support the **reliability**, **resilience**, and **security** of the grid

Support **job growth**, **manufacturing**, and the **circular economy** in a wide range of applications

The Solar PV Supply Chain

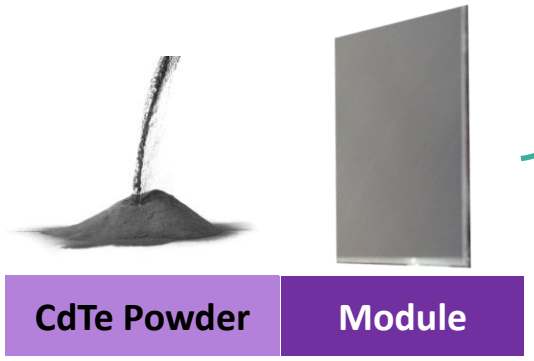
The United States is the second largest national PV market, representing about 12% of global PV demand in 2022. There are two leading types of solar modules used in the United States:

- crystalline silicon (c-Si), representing 83% of installed U.S. capacity through 2022, and
- cadmium telluride (CdTe), representing 17% of installed U.S. capacity through 2022.



There are also several input materials to these various steps including glass, resin, aluminum, and metallurgical grade silicon (MGS).

The CdTe thin-film supply chain differs from the c-Si supply chain in a few crucial ways.

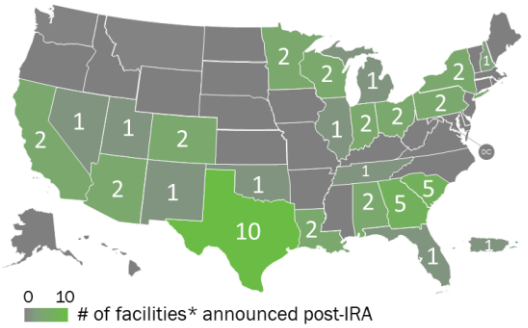


Mounting and connection to an inverter is otherwise identical for CdTe and c-Si modules.

Source: U.S. Department of Energy Solar Photovoltaics Supply Chain Deep Dive Assessment and U.S. Energy Information Administration data.

Elements of Reliable Solar Module Supply Chains

1. Geographic Diversity
2. Corporate Diversity and Financial Health
3. Technological Diversity
4. Sufficient Scale
5. Diversified, Consistent, and Coordinated Support



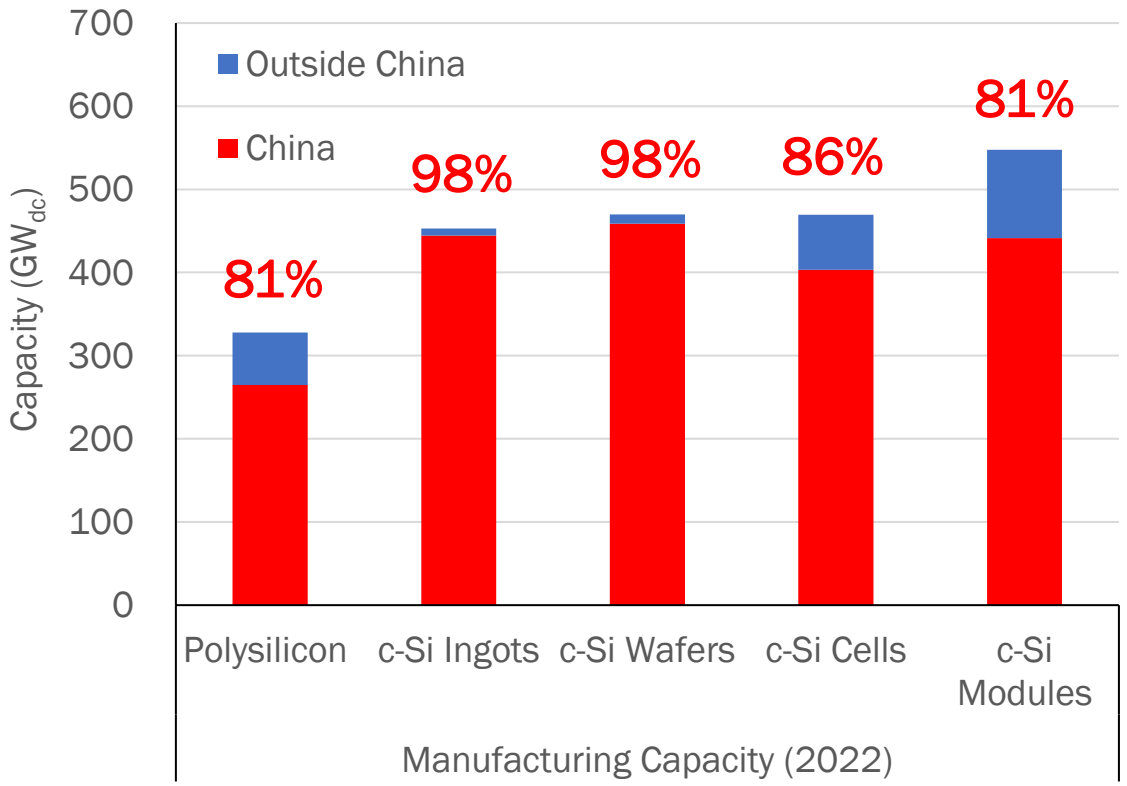
Module

Source: U.S. Department of Energy white paper Building a Bridge to a More Robust and Secure Solar Energy Supply Chain.

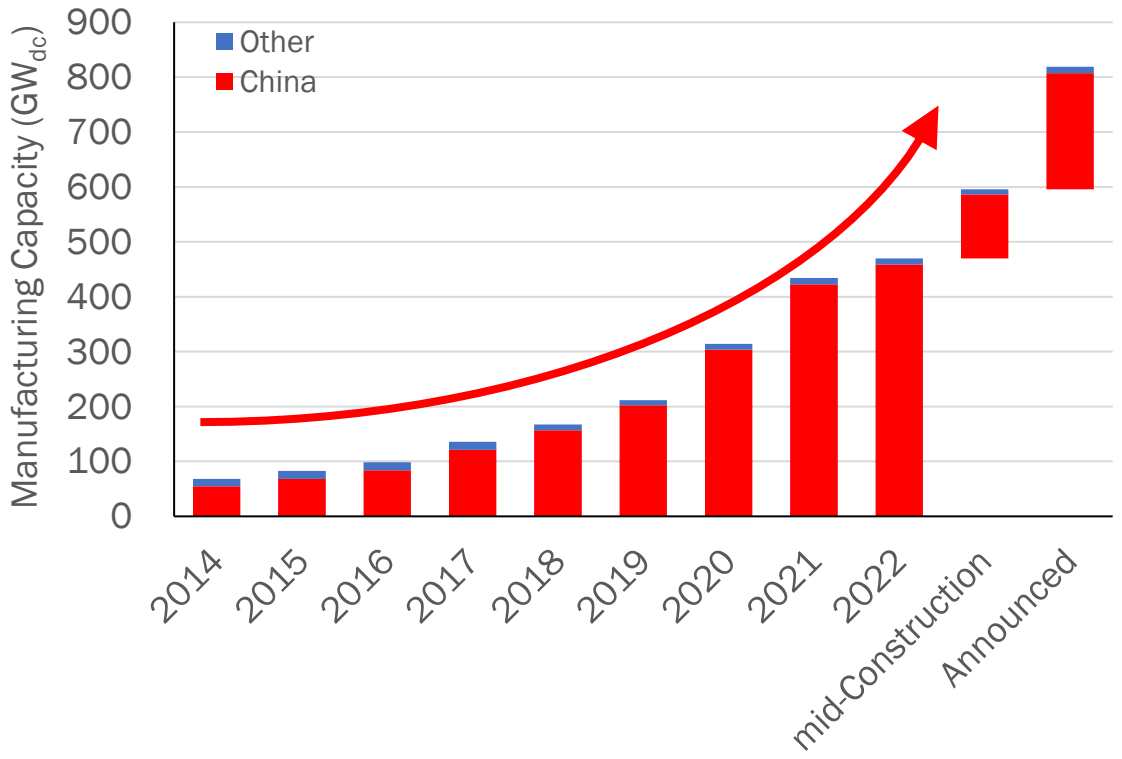
The Global Solar PV Ecosystem is Dominated by China

Between 2000 and 2010, China invested an estimated $50B in solar manufacturing production and continues to announce massive expansions in capacity.

Global PV Manufacturing Capacity



Global Annual Wafer Manufacturing Capacity

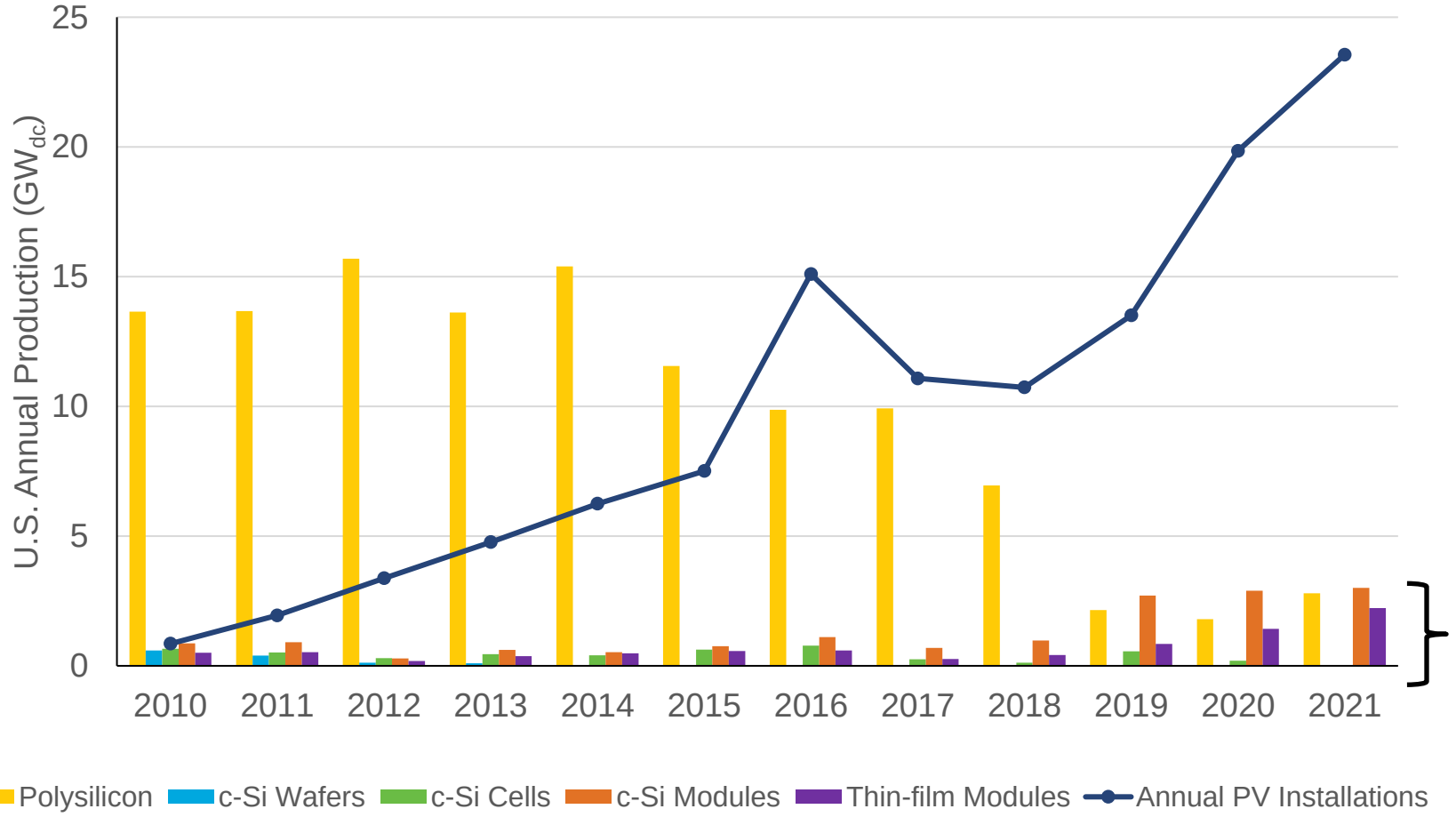


Many of the other pieces of the PV module supply chain, such as the production-facility equipment (e.g., ingot-pullers) and input materials (e.g., aluminum frames, glass, plastic sheets, metal for mounting structures) come mainly from China.

Source: BloombergNEF 2022.

The U.S. Solar PV Ecosystem

U.S. Domestic Solar PV Production and Installations (GW_{dc} equivalent)

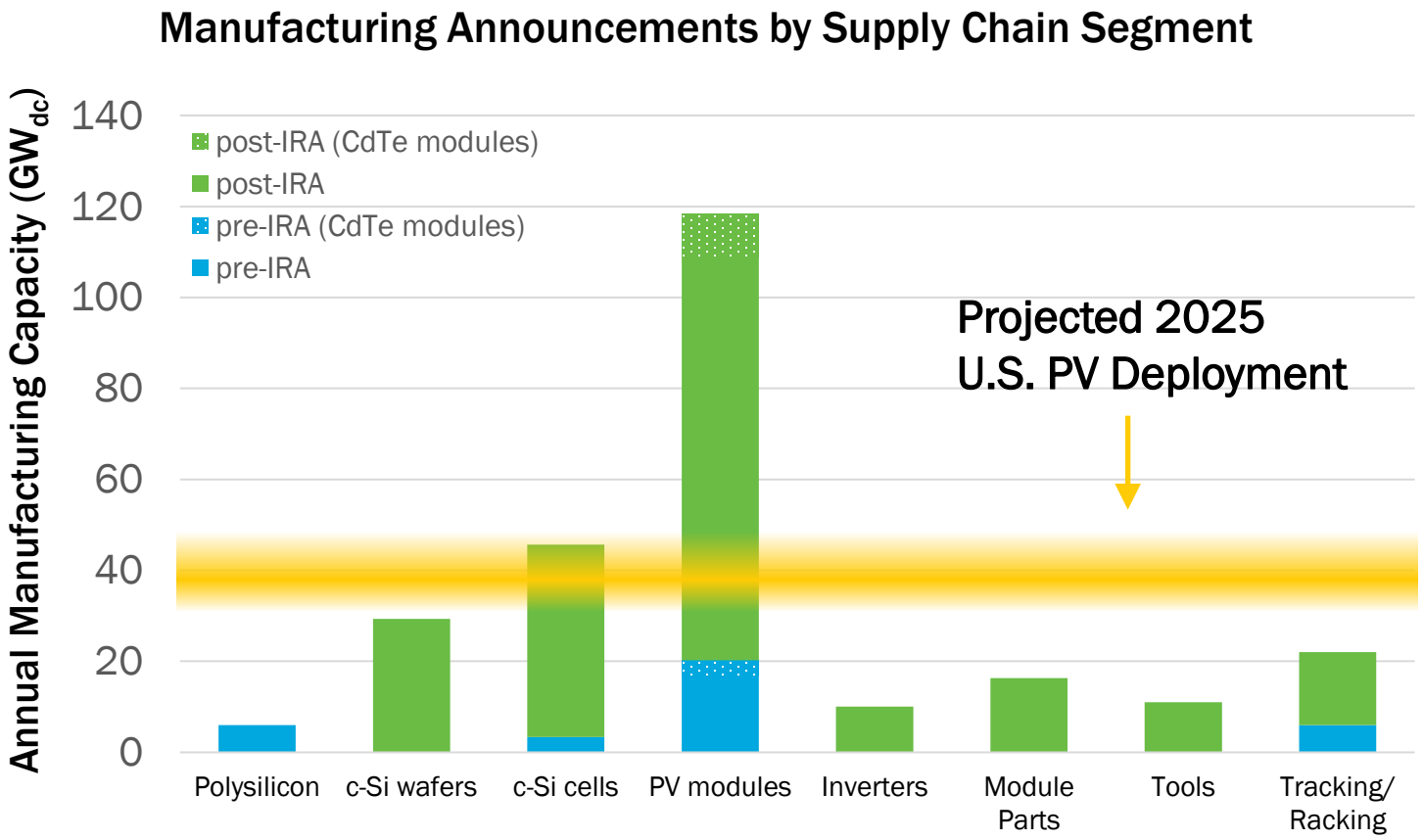


In 2021, U.S. manufacturing of c-Si and CdTe modules together represented 17% of U.S. PV supply.

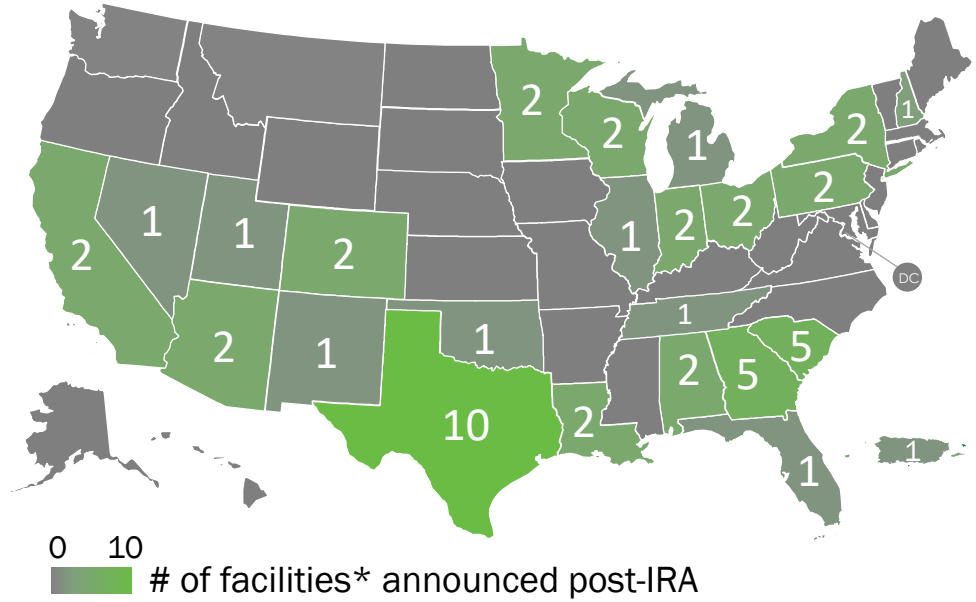
Source: U.S. Department of Energy Solar Photovoltaics Supply Chain Deep Dive Assessment and U.S. Census Bureau data.

Inflation Reduction Act Impacts on U.S. Solar PV Manufacturing

Since IRA's passage, over 210 GW of manufacturing capacity has been announced across the solar supply chain, representing nearly 21,000 potential jobs and nearly $12 billion in announced investments across 66 new facilities or expansions.*



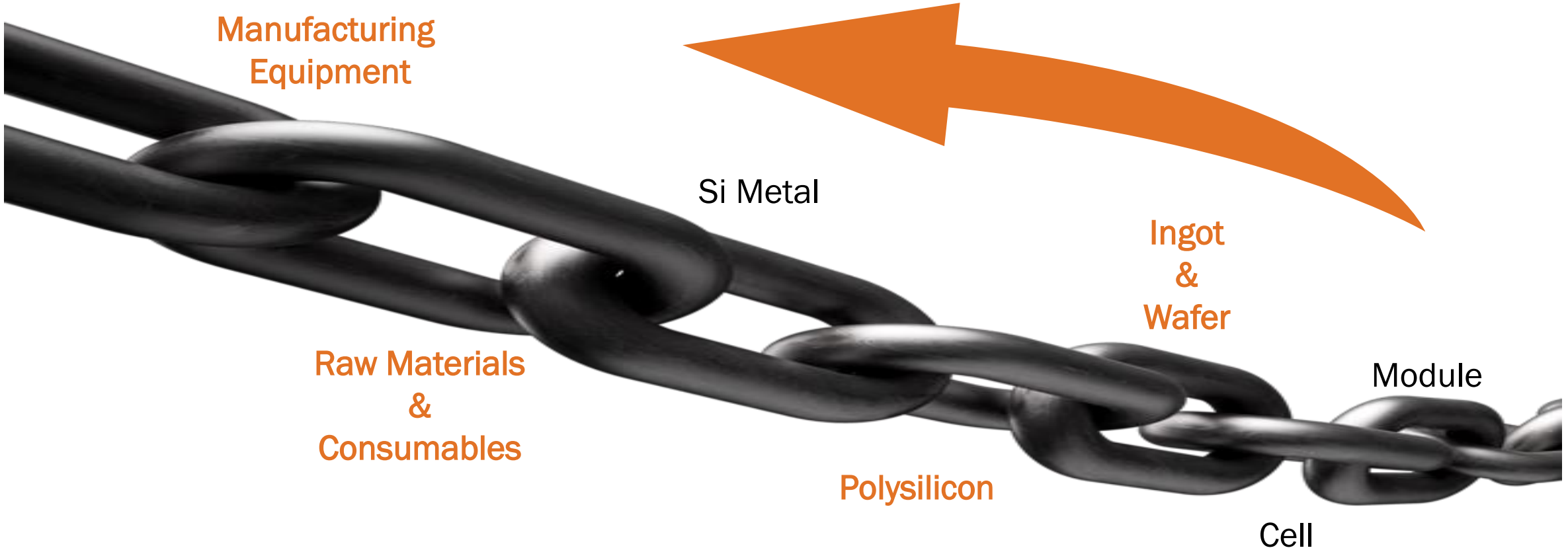
These announcements post-IRA represent potential investment in 23 states and Puerto Rico, with the majority slated to begin operation within the next two years.



Source: Internal DOE tracking of public announcements. *Not all announcements include facility locations, job, or investment numbers.

Ensuring a Secure Solar Supply Chain

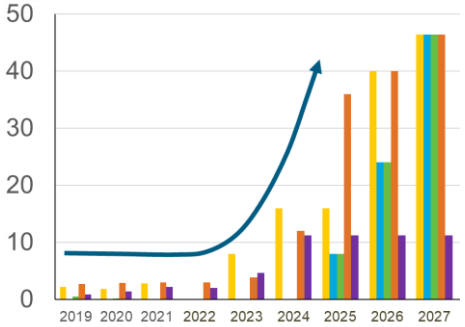
It is not enough to simply move constraint further up the supply chain.



All parts of the supply chain must be resilient.

Opportunities

- Leverage a 30-50GW$_{dc}$/y minimum PV manufacturing market to reduce cost, enabling capacity expansions and innovation



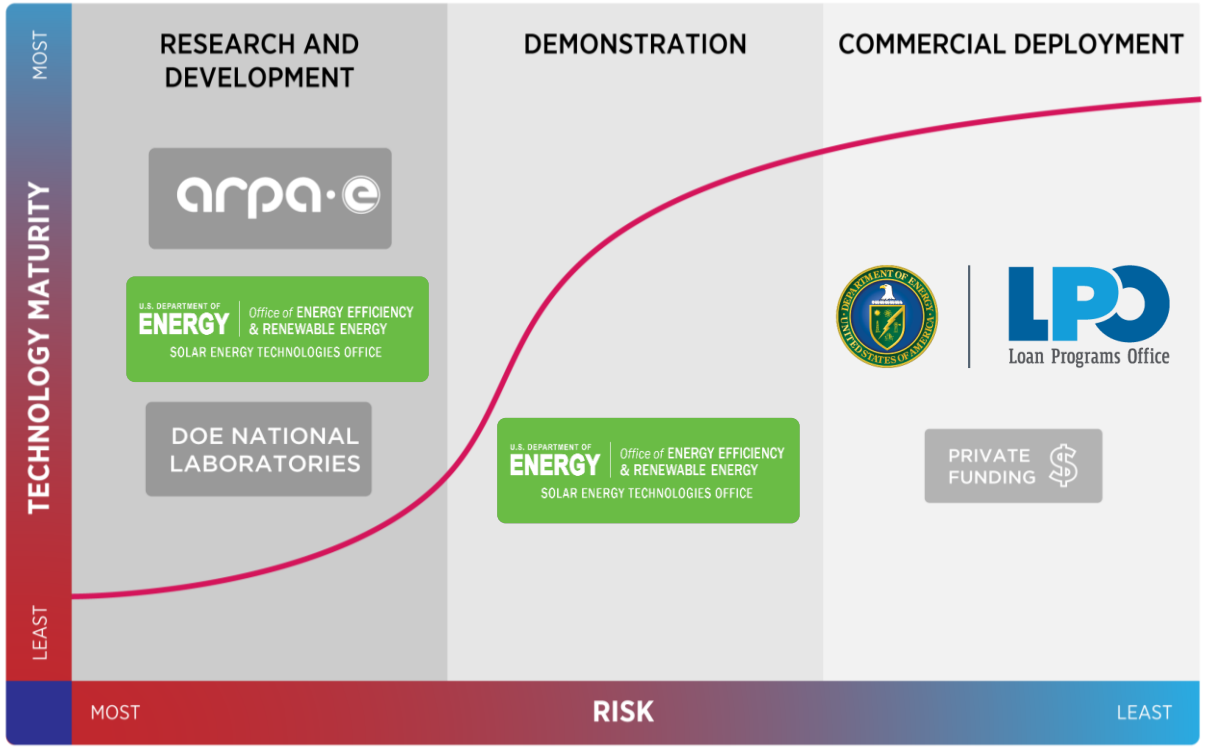
- Leverage expertise from proven tier 1 equipment manufacturers including workforce training and ramp-up support

- Build trusted relationships for future improvements with the potential to outcompete competitors

- Mitigate supply chain risks

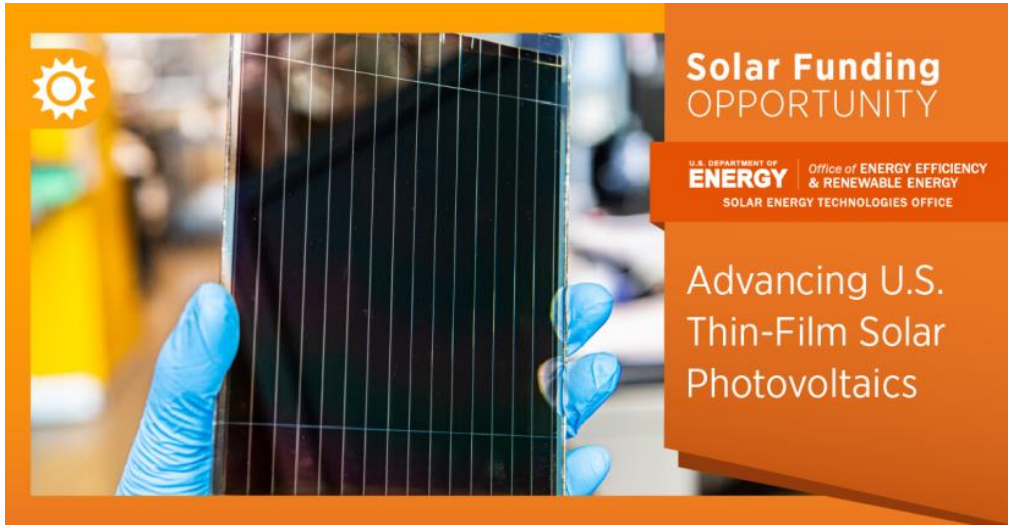
What is SETO Doing to Support IRA Investments?

- **SETO supports manufacturing and innovation in a variety of ways**
  - R&D to advance new technologies and reduce costs
  - Support for entrepreneurs and businesses commercializing new technologies
  - Workforce training partnerships
- **Through this work SETO**
  - Seeds new technologies
  - Develops them through pilot manufacturing
- **Successful technologies would then be eligible to apply to the Loan Programs Office**



Examples of SETO's Manufacturing Investments

$45M Silicon Solar Manufacturing and Dual-use Photovoltaics Incubator FOA



$24M FY22 Solar Manufacturing Incubator funding program

$36M Advancing U.S. Thin-Film Solar Photovoltaics FOA

SETO Newsletter – Stay in Touch

- The SETO newsletter highlights the key activities, events, funding opportunities, and publications that the solar program has funded.

SIGN UP NOW:
energy.gov/solar-newsletter

Links to Tax Credit Resources

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

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
- Federal Solar Tax Credits for Businesses | Department of Energy
- Federal Tax Credits for Solar Manufacturers | Department of Energy
- Summaries within several of NREL's recent Quarterly Solar Industry Update | Department of Energy