



Clean Technology Manufacturing in the U.S: Reflections and Next Steps




Why is Clean Technology Manufacturing Important?

1. Ensures U.S. workers capture the economic gains of innovative industries;
2. Redresses the economic impacts resulting from the decline of manufacturing jobs;
3. Builds reliable and affordable supply chains;
4. Counters the pollution and worker exploitation that plague some overseas clean technology supply chains; and
5. Provides U.S. leadership for the technologies of the future.



Growth of Clean Technology Manufacturing

- Increased manufacturing announcements
 - \$388B of investment for batteries, electric vehicles, solar, wind, and semiconductors
- Manufacturing construction growth
 - \$237B spent in December 2024, up from \$128B in July 2022, and \$80B in October 2019.
- Business and consumer investment in manufacturing and deploying clean technologies is rising
 - \$493B for 2023-2024
 - 71% increase from the previous two-year period
- Job creation is expanding in the clean technology sector
 - Study finds anticipated 336,000 manufacturing jobs per year

FRED  — Total Construction Spending: Manufacturing in the United States

Source: U.S. Census Bureau via FRED®

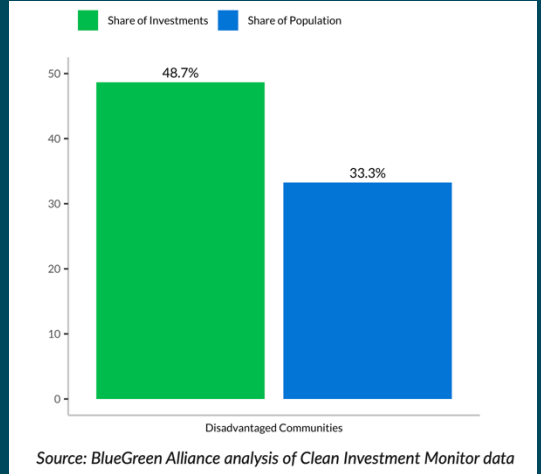
Shaded areas indicate U.S. recessions.


fred.stlouisfed.org

Fullscreen 

Clean Tech Manufacturing & Job Growth

- Two-thirds of job creation is expected to occur in manufacturing and construction
- This contrasts with the sectors of the economy where growth has trended
- Electrical, electronic, and electromechanical assemblers are the manufacturing occupations most impacted



FRED  — All Employees, Manufacturing


Source: U.S. Bureau of Labor Statistics via FRED®

Shaded areas indicate U.S. recessions.

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Supply Chain Mapping

Professional District
Expand
 Click to Search & Filter

Facility Status
 Operating

Industry Subsector

Fuel Technology

Transitioned to EVs since 2019

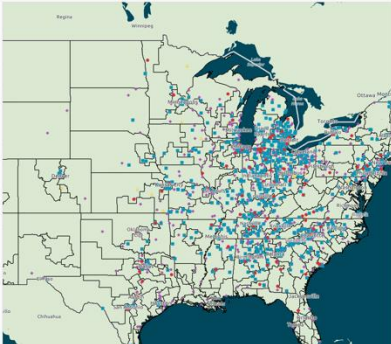
Benefits from 30D

Tier

Unionization

Hard-Hit Communities

Included in S2 Report



Auto Manufacturing Facilities

- Tier 1: Assembly
- Tier 2: Population, Electronics, Body, & Interior
- Tier 3: Parts & Materials
- Tier 4: Infrastructure & Aftermarket

Coal Communities

Deindustrialized Communities

2,050 facilities meet filters

Q Search...

- American Emergency Vehicles, Jefferson NC
- Anderson Manufacturing, Camilla GA
- ARBOC Specialty Vehicles, Middlebury IN
- Autocar Company, Hagerstown IN
- Autocar Company, Birmingham AL
- Autovision, Elton MI
- Battle Motors, New Philadelphia OH
- Bay Bridge Manufacturing, Bristol IN
- Big Rig Manufacturing, Las Vegas NV
- Blue Bird, Fort Valley GA

Find address or place

Map interface showing a zoomed-in view of the Northeast United States, including cities like Vancouver, San Francisco, Los Angeles, Toronto, Chicago, New York, Mexico City, Bogotá, and Lima.

Clean Industrial Facilities

- Efficient Buildings
- Batteries & Energy Storage
- Solar Photovoltaics
- EV Assembly
- Onshore Wind
- Rail
- EV Charging
- Electric Grid
- Offshore Wind
- Hydrogen

Supply Chain Gaps

Framework:

- Evaluate domestic manufacturing capacity
- Analyze degree that domestic production meets domestic demand
- Spotlight most notable gaps

Gaps:

1. PV wafers and cells
2. Offshore wind
3. Transformers

1	Supply Chain	Component	Description of Component	State of U.S. Supply Chain	Description of U.S. Supply Chain	45X & 48C Eligibility	Description of 45X Coverage
	Solar	Metallurgical-Grade Silicon (MGS)	Metallurgical-grade silicon (MGS) is the primary input material for polysilicon (it is also called silicon metal).	Significant	There are currently 6 plants producing MGS in the	48C only	While 45X covers polysilicon refining, the language does not mention that primary inputs for polysilicon
49	Solar	Solar-grade polysilicon	Polysilicon is the high-purity product obtained by refining MGS. PV is the primary consumer of	Moderate	Four operating polysilicon facilities are listed in the	45X & 48C eligible	This is one of the solar energy components eligible for 45X
50	Solar	PV wafer	A thin slice, sheet, or layer of semiconductor material of at least 240 square centimeters that comprises the	None	The DOE Solar Deep Dive report notes that the United	45X & 48C eligible	This is one of the solar energy components eligible for 45X
51	Solar	PV cell (crystalline or thin-film)	The PV cell is the smallest semiconductor element of a solar module. It performs the immediate conversion of	None	No operational facilities producing PV cells are listed	45X & 48C eligible	This is one of the solar energy components eligible for 45X
52	Solar	Polymeric backsheet (laminators)	A sheet on the back of a solar module that serves as an electric insulator and protects the components of	Significant	Backsheets for solar modules are typically made	45X & 48C eligible	This is one of the solar energy components eligible for 45X
53	Solar	Backsheet materials (film extrusion)	Nearly all backsheets use polyester (PET), often in combination with polyvinyl fluoride (PVF).	Limited	The DOE notes that PVDF-based backsheets dominate	48C only	While 45X covers polymeric backsheets, the language does not mention coverage of subcomponents or
54	Solar	Backsheet materials (PVF resins)	Nearly all backsheets use polyester (PET), typically in some combination with polyvinyl fluoride (PVF).	Limited	PVF resin is manufactured at two U.S. facilities, located	48C only	While 45X covers polymeric backsheets, the language does not mention coverage of subcomponents or
55	Solar	Encapsulant film	Encapsulant film forms a protective barrier around the PV cells, essentially laminating the cells. The main	Moderate	While the United States has significant capability to	48C only	45x does not mention the encapsulant film component for PV modules. 48C covers investments in facilities that
56	Solar	PV Module	Connected and laminated PV cells within a protected final assembly, ready for installation. Module	Significant	U.S. module assembly (with imported cells) scaled up	45X & 48C eligible	This is one of the solar energy components eligible for 45X
57	Solar	Inverter - general	Inverters convert direct current (dc) electricity from the modules into alternating current (ac) for connection to	Significant	There are 16 domestic inverter facilities listed	45X & 48C eligible	This is one of the solar energy components eligible for 45X
58	Solar	Torque tube	A structural steel support element that is part of a solar tracker. Torque tubes are rotated by a drive	See trackers and steel tubes		45X & 48C eligible	This is one of the solar energy components eligible for 45X
59	Solar	Steel tubes	A structural steel support element.	Significant	There are at least 14 U.S. facilities that produce	45X & 48C eligible (for torque tubes only)	Torque tubes are covered under 45X but not other types of steel tubes used in solar installations
60	Solar	Structural fasteners	A component used to connect the mechanical and drive system components of a solar tracker to the	Moderate	Generally solar fasteners are standard parts that are	45X & 48C eligible	This is one of the solar energy components eligible for 45X
61	Solar	Inverter - subcomponents: optimizer	Components are generally manufactured in separate locations from where they are eventually assembled	Moderate	Only one domestic optimizer producer was	48C only	45x covers five types of inverters (central, utility, commercial, residential, and micro), but doesn't specify
62	Solar	c-Si ingot	Polysilicon is melted to grow monocrystalline silicon ingots. The monocrystalline silicon ingot then gets	None	The United States has not active c-Si ingot, wafer, or	Possibly 45X & 48C eligible	It is unclear whether this is covered under 45X. 45X covers solar grade polysilicon, as well as the wafers
63	Solar	Trackers - general	PV trackers are used to orient modules more directly toward the sunlight to increase energy production per	Significant	In total, there are about 26 U.S. facilities that produce	48C only	45x covers torque tubes and structural fasteners for tracking, but does not mention other components of the
64							

Policy Considerations:

1. Due to policy developments the U.S. lost manufacturing capacity.
2. Manufacturing is capital intensive and requires long time horizons for investment decisions.
3. Manufacturing productivity in the U.S. has undergone a slowdown.
4. Demand for new manufacturing workers means several occupations could face labor shortages
5. Capacity to produce supply chain research and support investment strategies





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