

US Solar Supply Chain Vulnerabilities in an Era of Policy Flux

PV Cell Tech Conference USA

October 8th, 2025

kiwa

Kiwa PI Berlin

Trusted Solar and Storage Advisors

1,000+

Factory Audits Conducted

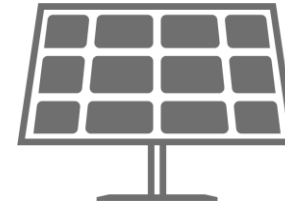
175+ GW

PV Module Production Overseen

3 PV Labs in Key Markets

Berlin, Suzhou, California (PVEL)

PV MODULES



c-Si, CdTe,
TOPCon, HJT

BATTERIES



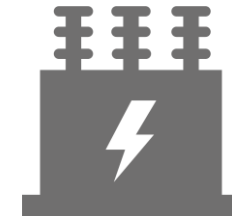
LFP (Li-Ion),
NMC/NCA, Redox
Flow, NIB

INVERTERS



Central, String,
DC-DC Converters

TRANSFORMERS

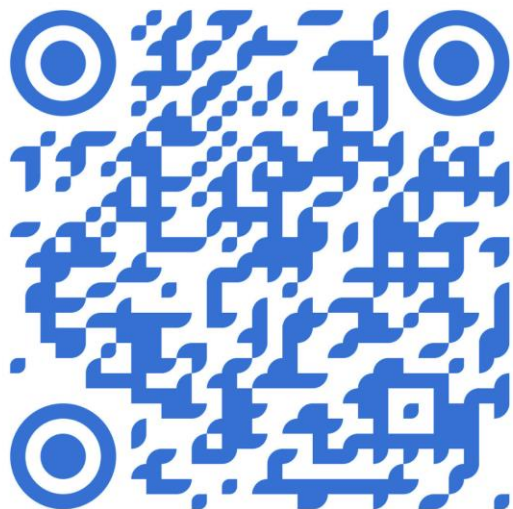


Medium voltage, high
voltage GSU transformers
(substation components)

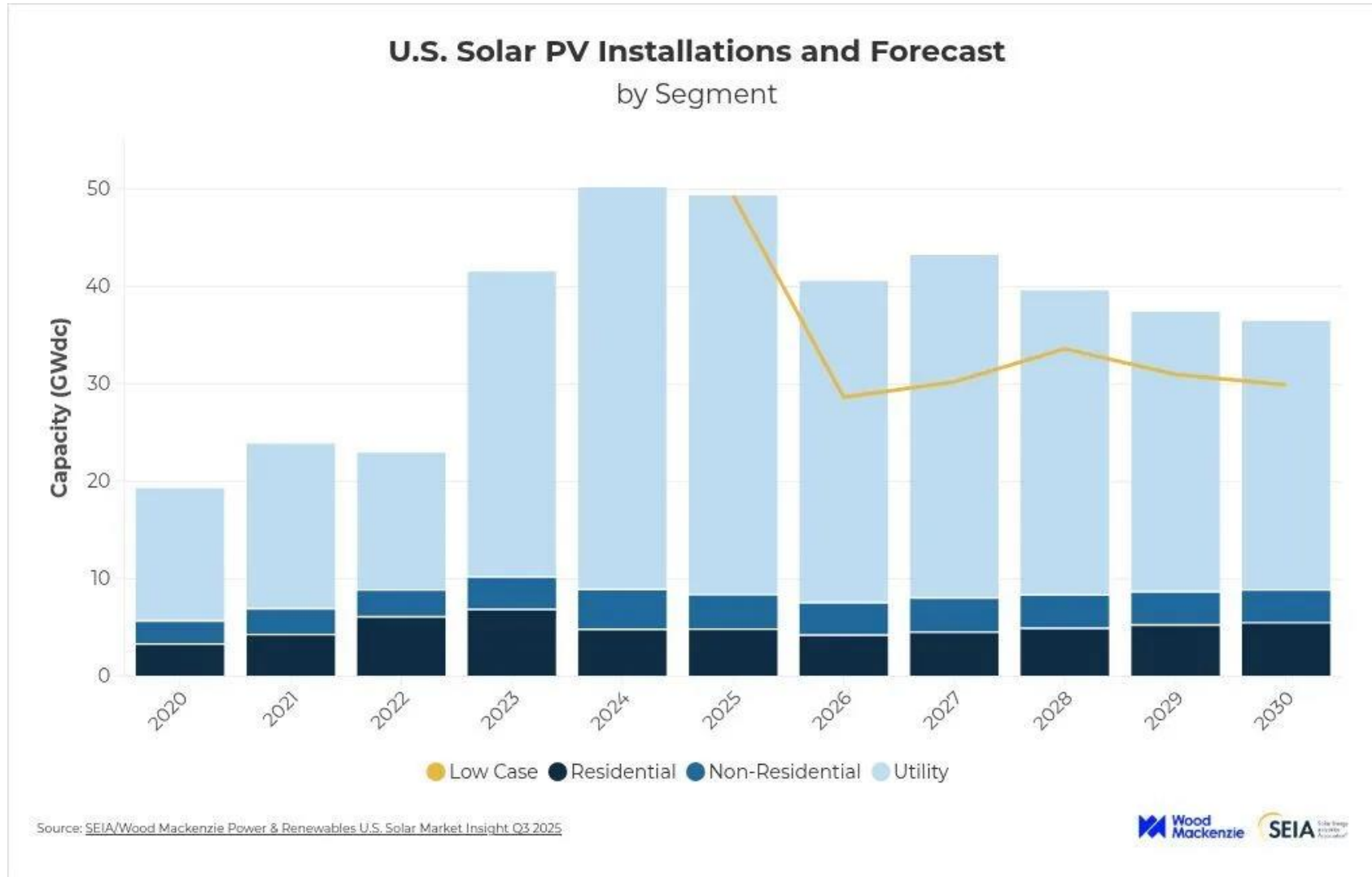
Report Available Now:

- Kiwa PI Berlin & Kiwa PVEL
- Report now available:

kiwa.com/pvcellreport



US Installation Forecast



Job Growth in US Solar Supply Chain

Over 120,000 jobs

Party	Projects	Investments	Jobs
Republican	249	\$107,667,629,000	88,295.00
Democratic	131	\$22,456,300,000	30,133.00
Undefined	22	\$3,187,150,000	4,524.00

PV Magazine October 2, 2025

Economic Multiplier Effects

Each direct manufacturing job creates an estimated 2.5 additional jobs in supporting industries, including logistics, equipment maintenance, raw material supply, and professional services. Communities hosting major solar manufacturing facilities report significant increases in local tax revenue, housing demand, and business activity.

US Manufacturing Tax Support

The IRA's advanced manufacturing tax credit 5x provides incentives for domestic clean energy manufacturing.

Solar manufacturers receive:

- \$0.07 per watt for solar modules
- \$0.04 per watt for solar cells
- \$0.12 per square meter for wafers
- \$3 per kilogram for polysilicon

Domestic content and FEOC guidelines determine eligibility throughout the life of these subsidies

The CHIPS and Science Act also provides 25% investment tax credits for solar ingot and wafer manufacturing facilities, addressing the most significant supply chain gaps.

US Solar Supply Chain Cost of Capital

Capital Investments

- Range of data collected by NREL from interviews of multiple equipment vendors and manufacturers at each stage.
- Balance-of-plant or factory includes building, facilitation and office space
- CapEx estimates do not include investments for new capacity for supporting materials including glass, encapsulants and back sheets, specialty chemical suppliers, etc..

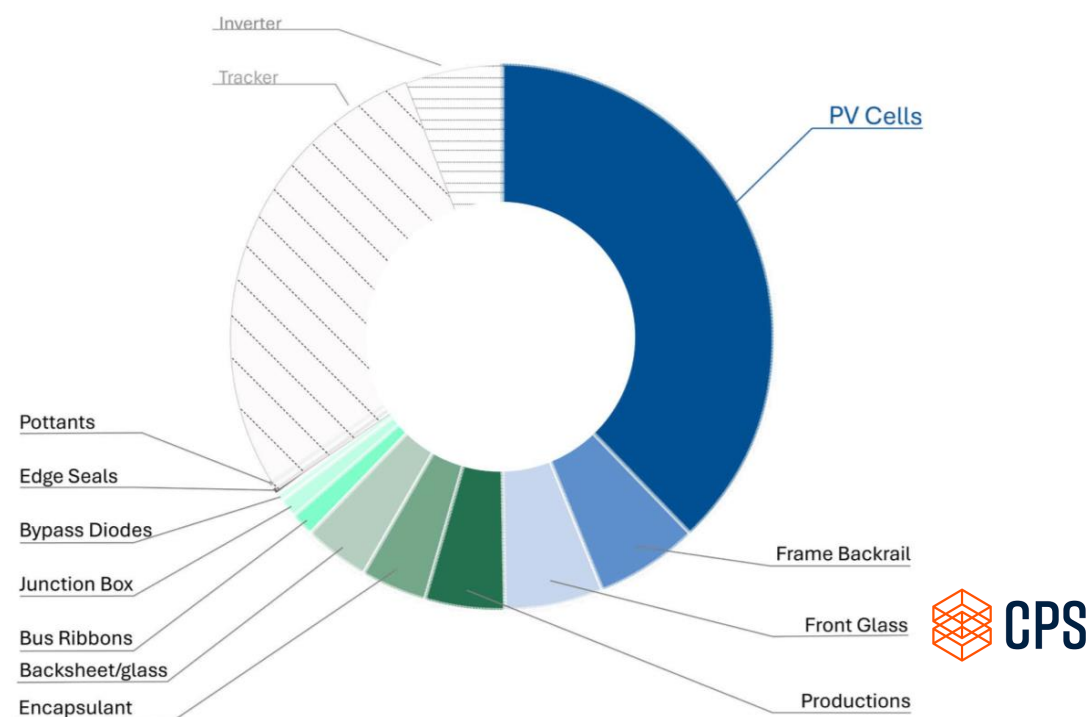
Fixed Cost Drivers	c-Si Supply Chain			
	Polysilicon	Ingots and Wafer	Cell Conversion	Module Assembly
Initial Capital Expenditure (\$USD per Watt of annual capacity)	\$0.11-0.14/W (\$40—50/kg, 2.8 g/W)	\$0.08-0.10/W (\$0.54/wafer, 6.0 W for M6)	\$0.05-0.13/W (PERC to Advanced technology)	\$0.05-0.08/W (Standard to Busbarless)
for equipment:	\$0.06—0.08/W	\$0.06—0.07/W	\$0.03—0.10/W	\$0.03—0.05/W
for balance-of-plant or factory	\$0.04—0.06/W	\$0.02—0.03/W	\$0.02—0.03/W	\$0.02—0.03/W
1 GW_{dc} Investment	\$110—140M	\$80—100M	\$50—130M	\$50—80M
for equipment:	\$65—80 M	\$60—70 M	\$30—100M	\$30—50M
for balance-of-plant or factory	\$45—60 M	\$20—30 M	\$20—30M	\$20—30M
Time to Build (Engineering to production)	3—4 years (All-new, not retrofit)	1—3 years	1—3 years	1—3 years

Data source for figure: NREL.

Available online: <https://www.energy.gov/policy/securing-americas-clean-energy-supply-chain>

38

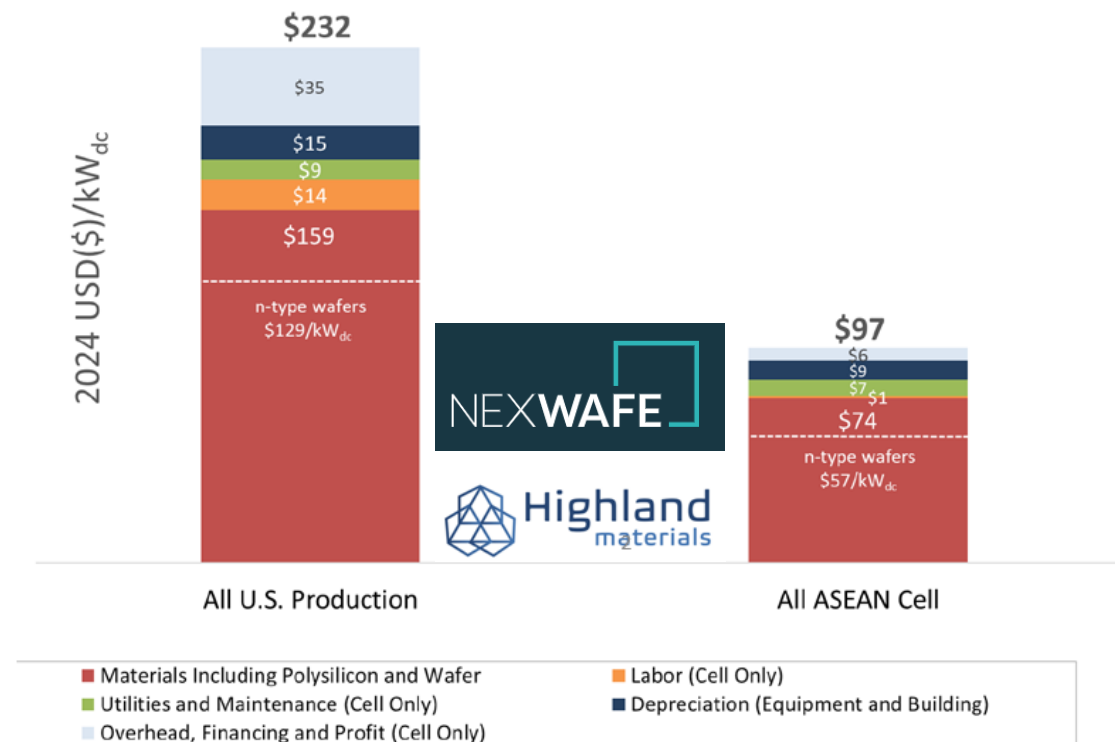
Costs of Components of US Solar Supply Chain



December 17, 2024
NREL
Transforming ENERGY

Scenarios for TOPCon Cell Conversion for the U.S. PV Market

"Materials" Includes the Modeled Prices (MP) for Polysilicon and Ingot and Wafer





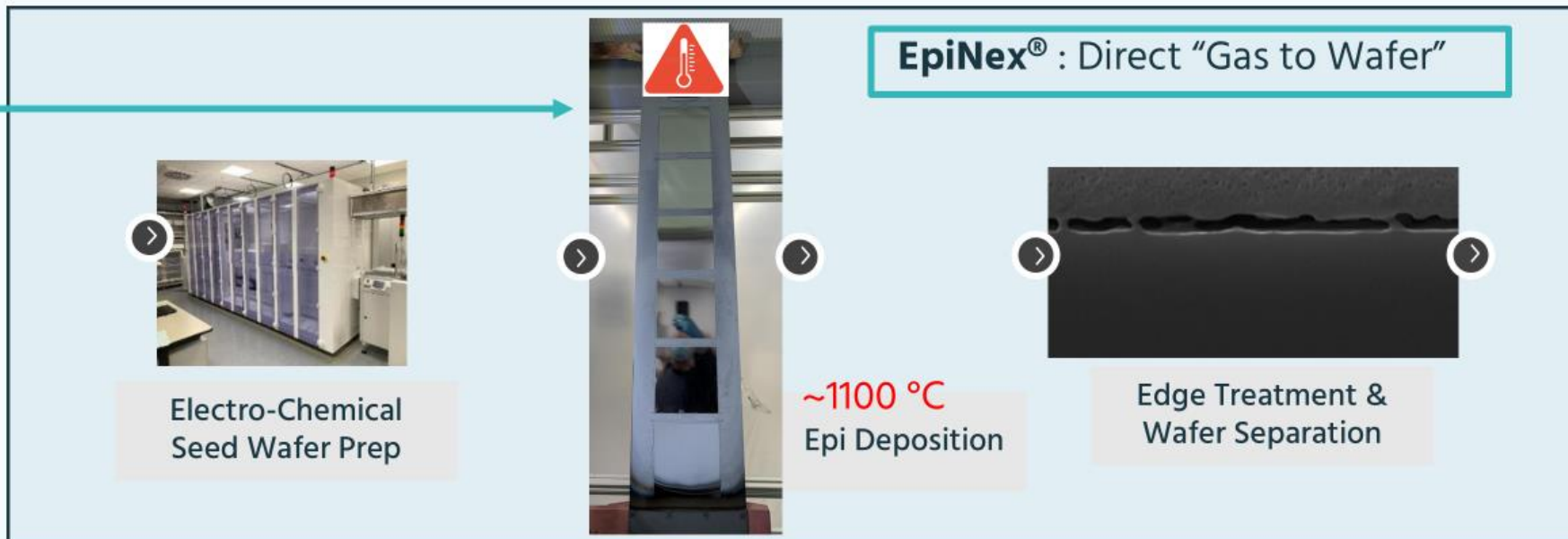
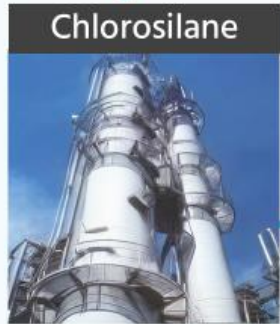
Highland Materials Overview

Highland's U.S. based polysilicon purification process provides a cost-effective, environmentally friendly alternative to incumbent processes.

The Highland process offers the opportunity for U.S. polysilicon production that meets the landed cost of Chinese polysilicon with no requirement for ongoing production credits or other incentives.

*Highland is the only solar silicon manufacturing process that can **recycle saw kerf** and depleted solar panels **back into polysilicon** – further reducing cost of goods in manufacturing.*

NexWafe — Direct Gas-to-Wafer | Bitterfeld 2027



CZ + wire-saw turns only ~40% of first-pass silicon into wafers (kerf is not recycled)
EpiNex is kerf-free and ~90% Silicon to wafers → **Approx 2× wafers per kg of Polysilicon**



CPS Glass (Canadian Premium Sand Inc.)

Publicly traded on the Toronto Venture Exchange (TSXV) Ticker: CPS



CPS owns a unique low-iron solar grade sand deposit in Manitoba (central Canada) with sufficient resource to supply >20GW of solar glass manufacturing for 30 years

Projects in Development:

- Fully permitted, shovel-ready greenfield solar glass manufacturing site in Manitoba (6GW supply)
- Brownfield solar glass manufacturing site in southern US (4GW supply)

