Solar power supply chain by country

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Global solar PV manufacturing capacity has increasingly moved from Europe, Japan and the United States to China over the last decade. China has invested over USD 50 billion in new PV supply capacity - ten times more than Europe - and created more than 300 000 manufacturing jobs across the solar PV value chain since 2011.

This special report examines solar PV supply chains from raw materials all the way to the finished product, spanning the five main segments of the manufacturing process: polysilicon, ingots, wafers, cells and modules.

The Solar Photovoltaics Supply Chain Review explores the global solar photovoltaics (PV) supply chain and opportunities for developing U.S. manufacturing capacity. The assessment concludes that, with significant financial support and incentives from the U.S. government as well as strategic actions focused on workforce, manufacturing, human ...

SNAPSHOT OF THE GLOBAL PV MARKET IN 2022. IEA PVPS has distinguished itself throughout the years by producing unbiased reports on the development of PV all over the world, based on information from official government bodies and reliable industry sources.

This special report examines solar PV supply chains from raw materials all the way to the finished product, spanning the five main segments of the manufacturing process: polysilicon, ingots, wafers, cells and modules. The analysis covers supply, demand, production, energy consumption, emissions, employment, production costs, investment, trade ...

Solar PV is a crucial pillar of clean energy transitions worldwide, underpinning efforts to reach international energy and climate goals. Over the last decade, the amount of solar PV deployed around the world has increased massively while its costs have declined drastically. Putting the world on a path to reaching net zero emissions requires solar PV to expand globally on an even greater scale, raising concerns about security of manufacturing supply for achieving such rapid growth rates - but also offering new opportunities for diversification.

To achieve the Biden Administration"s goal of 100% clean electricity by 2035, solar energy would need to grow from 4% of electricity supply today to 40%, dramatically increasing demand for solar modules and components. This rapid expansion of solar energy has the potential to yield broad benefits in the form of economic activity, improved public health, and workforce development.

The supply chain for solar PV has two branches in the United States: crystalline silicon (c-Si) PV, which made up 84% of the U.S. market in 2020, and cadmium telluride (CdTe) thin film PV, which made up the remaining 16%.

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The supply chain for c-Si PV starts with the refining of high-purity polysilicon. Polysilicon is melted to grow monocrystalline silicon ingots, which are sliced into thin silicon wafers. Silicon wafers are processed to make solar cells, which are connected, sandwiched between glass and plastic sheets, and framed with aluminum to make PV modules. Then, they are mounted on racking or tracking structures and connected to the grid using a power electronics device called an inverter.

The supply chain for CdTe PV starts with refining cadmium and tellurium to high-purity powders, which are then deposited directly onto a glass sheet. Another piece of glass and plastic sealant are applied to finish the module, which then can be mounted and connected to the grid in an identical fashion to c-Si modules.

The primary inputs to the global solar supply chain include: metallurgical-grade silicon (MGS), glass, resins to make plastic sheets (encapsulant and backsheet), and aluminum. MGS is produced from high-grade quartz. Quartz is a compound of silicon and oxygen, the two most abundant elements in the earth"s crust.

While the country has considerable polysilicon production capacity, as of 2021, it was not being used for solar applications. There was also no active ingot, wafer, or silicon cell manufacturing capacity. Using imported cells, about 2 GW of c-Si modules were made domestically in 2020. An additional 25 GW of c-Si modules were imported, 75% of them from Chinese companies operating in Southeast Asia.