



ENERGY-RENEWABLE ECOSYSTEM: SOLAR ENERGY TECHNOLOGY

DEFINITION

The solar energy industry encompasses all activities related to the development, production, and deployment of solar energy technologies. This includes the manufacturing of solar panels (photovoltaic or PV panels), the development of solar thermal systems, the installation of solar systems on residential, commercial, and industrial properties, and the generation and distribution of solar power.

The EU defines solar energy as a critical component of its renewable energy strategy, playing a significant role in meeting its energy and climate goals.

SME SIGNIFICANCE



NUMBER OF SMEs IN THE EU27 VALUE CHAIN

ca. **80** in manufacturing only. The number of SMEs active in services, project development and especially deployment is unknown.



EMPLOYMENT BY SMEs

ca. **6,000** in manufacturing only.

SHARE OF SMEs OVER TOTAL

50%

ADDED VALUE OF SMEs OVER TOTAL

20%

SOLAR ENERGY EU VALUE CHAIN

PHASE 1

RAW AND PROCESSED MATERIALS

- Quartz crucibles, which is critical to produce ingots, are currently mainly sourced from China.
- China is also the largest producer and supplier of silicon, as well as polysilicon, the high-purity form of silicon used as the raw material for solar cells.
- For other materials such as glass or aluminium, there are dependencies as well, but the suppliers are more diversified.

PHASE 2

COMPONENT MANUFACTURING

- Ingot and wafer manufacturing is the most vulnerable segment in the solar PV value chain in terms of cost of re-shoring. One of the key components for the ingot producing process are Cz-pullers. It is also the most expensive part of equipment in the ingot-wafer segment at almost half of production equipment investment costs. Chinese suppliers dominate the market, providing the most advanced technology, the best quality and the lowest prices.

PHASE 3

SYSTEM INTEGRATION

- The market dominance of China for finished photovoltaic cells and solar panels stands at around 80%. The global market share of EU companies has been in decline for a long period

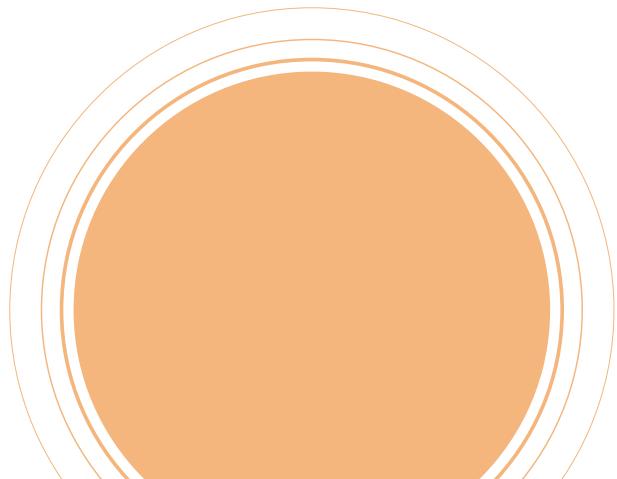
STRENGTHS AND VULNERABILITIES

EU STRENGTHS

- There is some **startup activity** in the EU.
- The installation and maintenance of solar panels provides ample job opportunities in SMEs, even if these are manufactured abroad.
- **Inverter production** continues to dominate as the largest segment of solar manufacturing in Europe, boasting a production capacity exceeding 82 GW, marking a 14% increase from 2022's capacity of 72 GW. Presently, inverter manufacturers remain the cornerstone of solar employment within the EU.
- Solar manufacturers in Europe have access to **specialised photovoltaic research institutes** across several countries.
- EU firms can find opportunities in **decommissioning and recycling panels** at the end of their life cycle. This is a growth market, that can reduce the dependence on imported materials and where SMEs in the EU are well placed given the large volume of installed panels. In 2022, decommissioning and recycling solar panels accounted for just 1% of all employment in the EU, a number is likely to rise sharply as more and more existing panels will reach the end of their life cycle.

EU VULNERABILITIES

- While the deployment of solar panels is on a sharp upward trajectory in the EU, the **manufacturing of solar panels is in a long-term decline**. This was mainly due to the strong competition from low-cost Asian manufacturing companies. In 2007, Europe had more than 40% of production capacity, a percentage that has dwindled since to around 1% in 2023.
- In several components and intermediate products, the **Chinese dominance** is near-complete.
- Chinese companies and other actors such as research centres, technical universities and technology infrastructures became increasingly dominant in R&D and innovation. The EU has witnessed a **substantial loss in research and innovation** as well as in the capacity to manufacture the specialised tools necessary.
- There is **global overcapacity**, which leads to Chinese-made products being offered at very competitive and possibly even below-market prices.



EXAMPLES OF POLICY MEASURES INTRODUCED TO ENHANCE OPEN STRATEGIC AUTONOMY

EU

- The European Commission launched the **European Solar Photovoltaic Industry Alliance** in 2022. This aims at scaling up manufacturing technologies of innovative solar photovoltaic products and components in the EU, in order to diversify production and establish a “Made in Europe” solar value chain. It will do so by promoting investments in large-scale factories.
- The **Solar Energy Strategy** is the key policy instrument for solar PV. It aims at installing 600 GW new capacity by 2030. It contains the Solar Rooftop Initiative, a revision of the Renewable Energy Directive to make obtaining permissions simpler and faster, the skills partnership and the EU Solar PV Industry Alliance covering triple helix stakeholders.
- The **European Solar Charter**, recently signed by leaders from 23 EU member states and the European Commission, aims to bolster the European PV manufacturing sector.

MEMBERS STATES

- **Germany**: The Renewable Energy Sources Act (EEG) guarantees a fixed feed-in tariff for solar electricity, which means that solar power producers are paid a certain amount for each kilowatt-hour of electricity they generate. The Federal Ministry for Economic Affairs and Energy also offers a number of grants for solar energy projects and other support measures. The KfW state-bank has improved financing conditions for photovoltaic industry projects, offering expanded state credit options. Germany has shelved plans to subsidise its domestic solar manufacturing industry by rewarding consumers for buying European-made panels.
- The **French** government has committed to a comprehensive incentive program backed by EUR 30 billion, intended to expand solar, wind, and hydroelectric capacities through 2026. This initiative includes competitive bidding processes to determine premium payment rates for renewable energy producers, aimed at stimulating the market and ensuring fair pricing mechanisms. France has also introduced new feed-in tariffs for PV systems up to 500 kW, encouraging smaller scale solar projects by offering a guaranteed price for the electricity they generate. The country is also streamlining administrative processes to speed up the approval and installation of solar projects, reducing the time from planning to operation and plans to offer financial and operational support for local SMEs that participate in small-scale solar projects.

EXTRA-EU

- **China** has become the undisputed global leader partly thanks to substantial government support, which can be classified as followed:
 - Financial incentives to bolster the solar industry, including feed-in tariffs to encourage investments into renewable energy.
 - Significant public support to R&D for solar technology.
 - Ambitious capacity targets for solar energy, which were frequently updated to reflect the growing emphasis on renewable energy within national energy strategies. These targets have been instrumental in guiding the industry's expansion and the installation of substantial solar power capacities across the country.
 - Export credits and reducing barriers to international trade for solar products.
 - Supply chain optimization to facilitate access to necessary raw materials and ensuring that manufacturers have the components required to produce solar panels efficiently and at scale.

POLICY RECOMMENDATIONS TO MAXIMISE SME OPPORTUNITIES AND REDUCE RISKS IN OPEN STRATEGIC AUTONOMY

Help startups and SMEs to reach their minimum production scale, through for instance financial support via COSME or via the SME-specific instruments used in the Member States.

Disseminate information and co-training to deal with the complexities and technicalities of **Green Public Procurement** to the benefit of SMEs in Europe. The Big Buyers Working Together project and Community of Practice for sustainable solar panels are promising.

Provide eco-system support so that SME producers in Europe can gain a competitive edge. The role of **intermediaries** such as university tech transfer offices, SME-supporting government agencies and specialised cluster organisations is important in this respect.

Develop the nascent activities of the **Trade and Technology Council** to realise a global level playing field. It can also be an important platform to increase access to critical raw materials and components and align

Local content requirements can stimulate domestic industries, and may be appropriate tools to reverse the long-term decline of EU manufacturers in solar energy.

The European Solar Manufacturing Council asked the EU to launch **emergency measures** including a scheme to buy up excess inventories of EU solar modules to ease the oversupply, and change state aid rules to boost government support for local solar producers.

Data sources:

- https://api.solarpowereurope.org/uploads/1823_SPE_Jobs_report_09_0953d35b2a.pdf?updated_at=2023-09-26T11:44:34.465Z
- <https://www.ise.fraunhofer.de/content/dam/ise/de/documents/publications/studies/Photovoltaics-Report.pdf>