




SolarPower
Europe

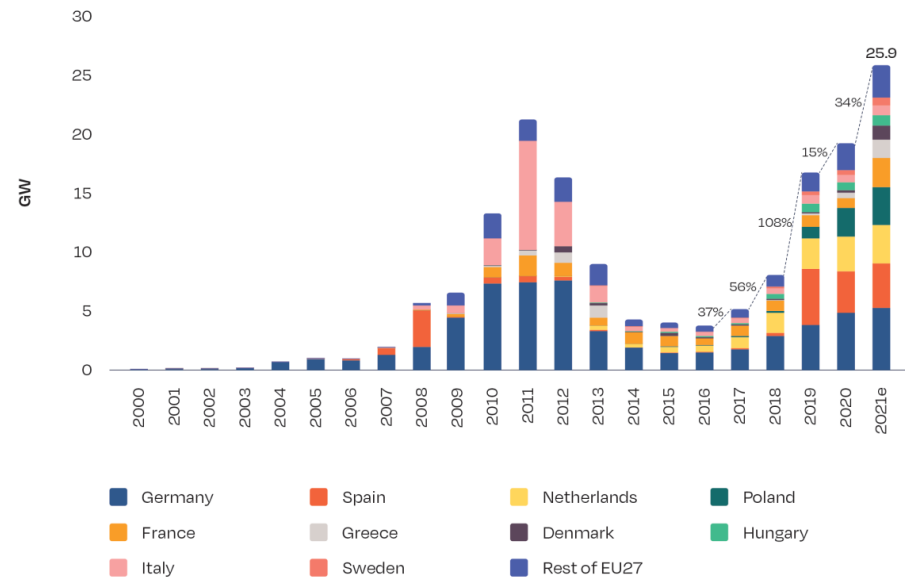
 Ref. Ares(2022)2661182 - 07/04/2022

Solar PV manufacturing industry

Brussels

Record installations in 2021

EU27 ANNUAL SOLAR PV INSTALLED CAPACITY 2000-2021

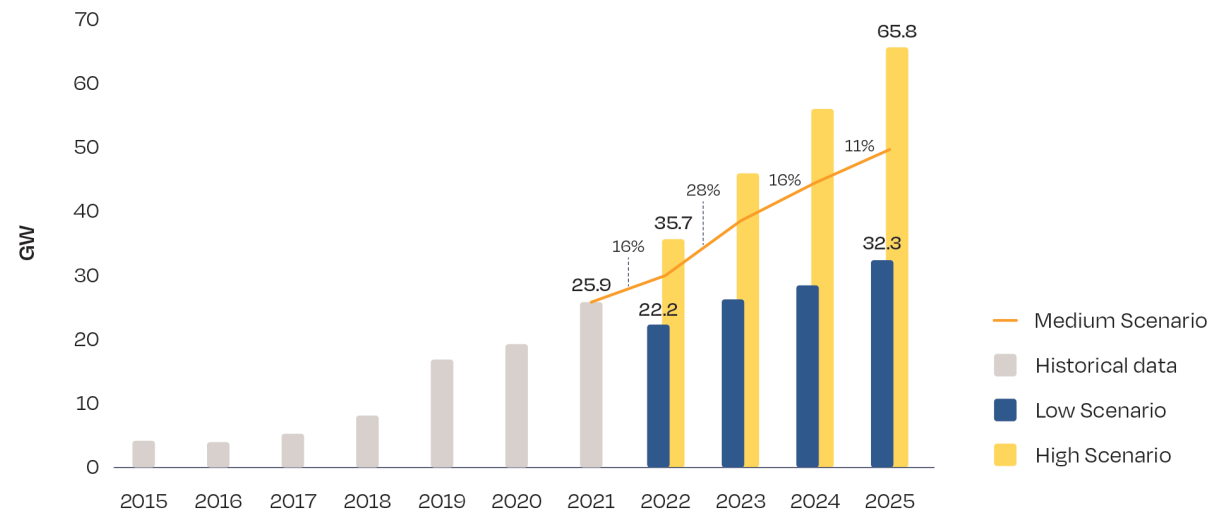


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With around 25.9 GW installed in the EU (+34%), 2021 marks the best year in history just a decade after the former record of 21.4 GW in 2011.

Further strong growth expected

EU27 ANNUAL SOLAR PV MARKET SCENARIOS 2022-2025

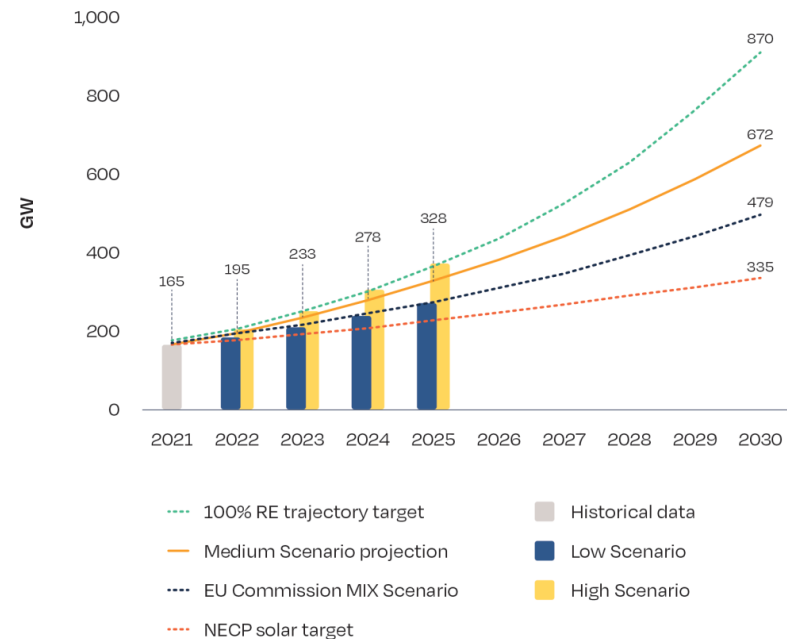


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The coming 4 years until 2025 will be characterised by further strong growth, with a 30 GW market already in 2022 and reaching 50 GW annually installed in 2025.

BAU scenario still below 1.5 Paris ambition

EU27 TOTAL SOLAR PV MARKET SCENARIOS 2021 – 2030 AND 100% RE TRAJECTORY TARGET

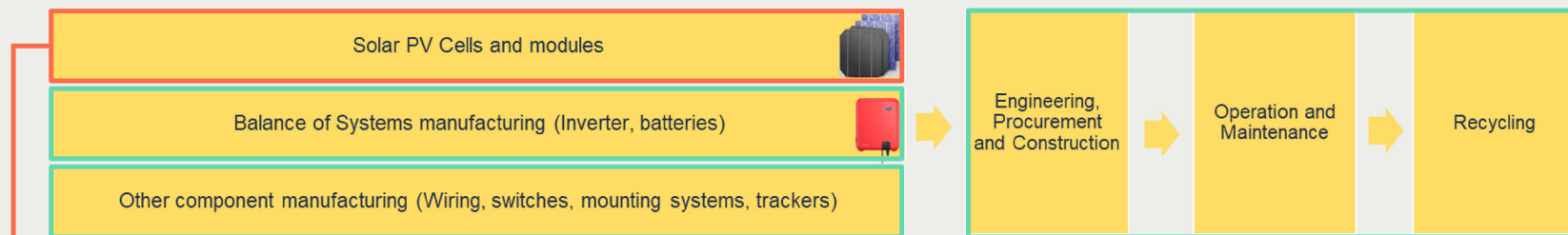


NOTE: Values for EU Commission MIX Scenario are based on a 1.25 DC/AC conversion ratio assumption, as suggested in Jaeger-Waldau et al. (2021): The Role of Photovoltaics in the Response of the European Member States to the European Green Deal.

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Total solar fleet in the EU is expected to increase from 165 GW installed today to 328 GW in 2025, and 672 GW in 2030. This is much above the aggregate capacity goal from NECPs (335 GW) and EU Commission scenario (479 GW), but far below the capacity needed to remain aligned with a 1.5°C Paris scenario.

This represents jobs and growth for the EU industry, but Europe does not have a strong module manufacturing industry

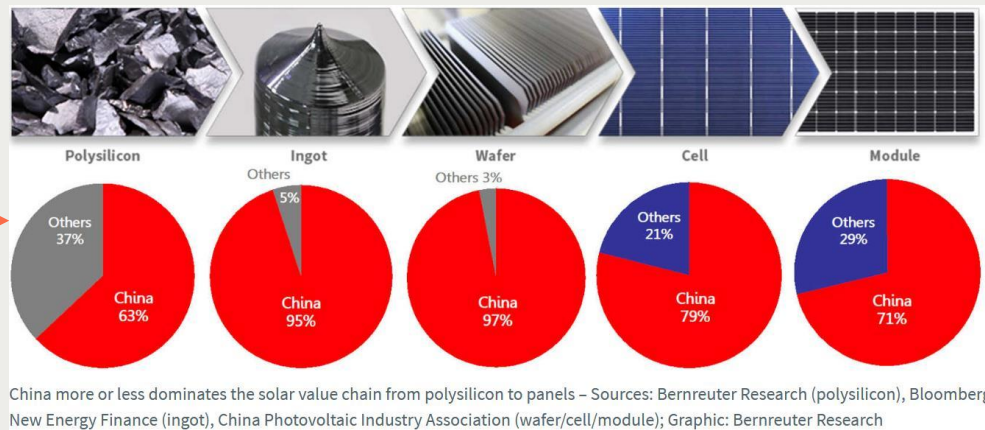


Upstream / manufacturing industry

Strong EU inverter manufacturers (SMA, Fronius, Ingeteam, Fimer), strong tracker manufacturers (Soltec)

Downstream / service industry

+Half a million jobs by 2025, 4 mio in 2050



Reaching this objective will require a true strategy on the solar supply chain.



Increase the resilience of the solar downstream industry to supply chain shocks (recent module price increase, higher transport costs) and increase their independence



Maintain the EU leadership in R&D technologies



Create economic added value and jobs in the EU (+€45b of taxes (income taxes alone), + corporate taxes on the €90b of net cash flows for the industry for a 20 GW objective)

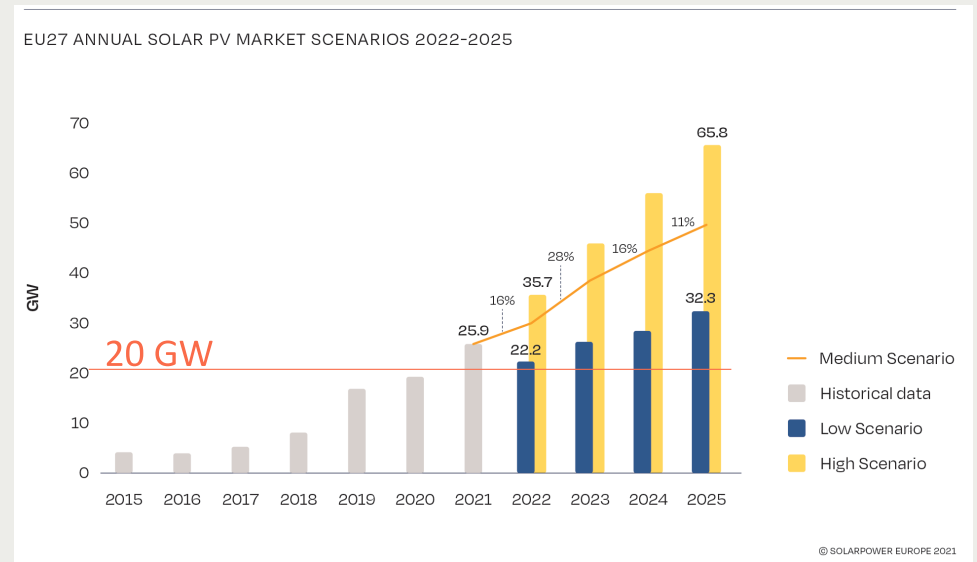


Increase the sustainability of solar products

The European Solar Initiative sets a vision for the solar industry: 20-GW worth of manufacturing capacity, from polysilicon to module by 2025



How does it compare to the demand?



Our strength: the cell technologies of the future are being developed in Europe, in the top 3 leaders in R&I (with Japan and S-Korea)

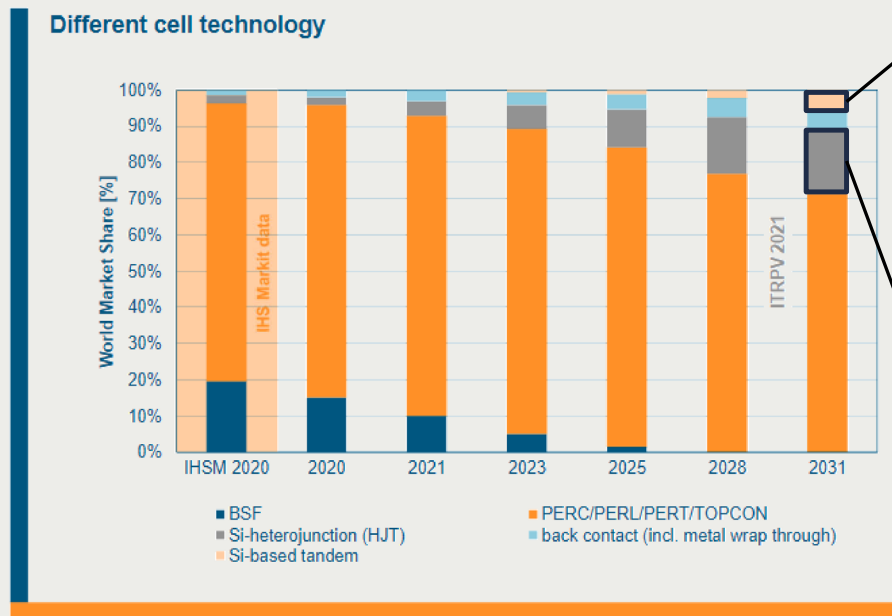


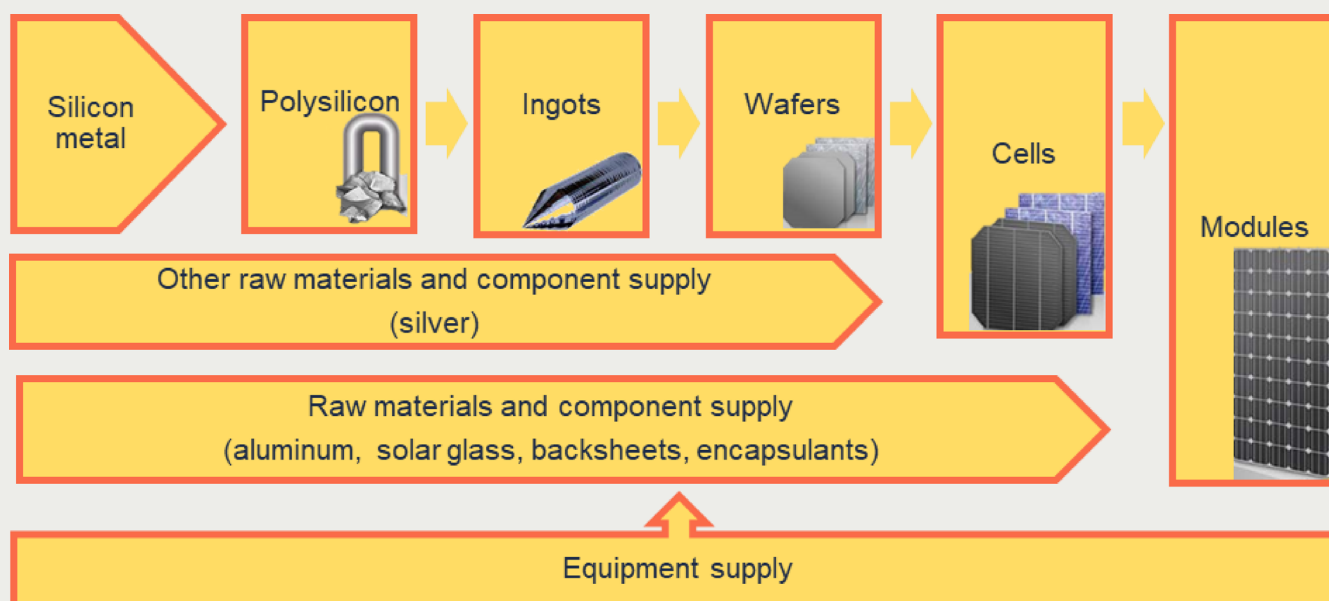
Fig. 32: Market shares for different cell technologies. IHS Markit data for 2020 are indicated as reference [16].

Perovskite technologies:

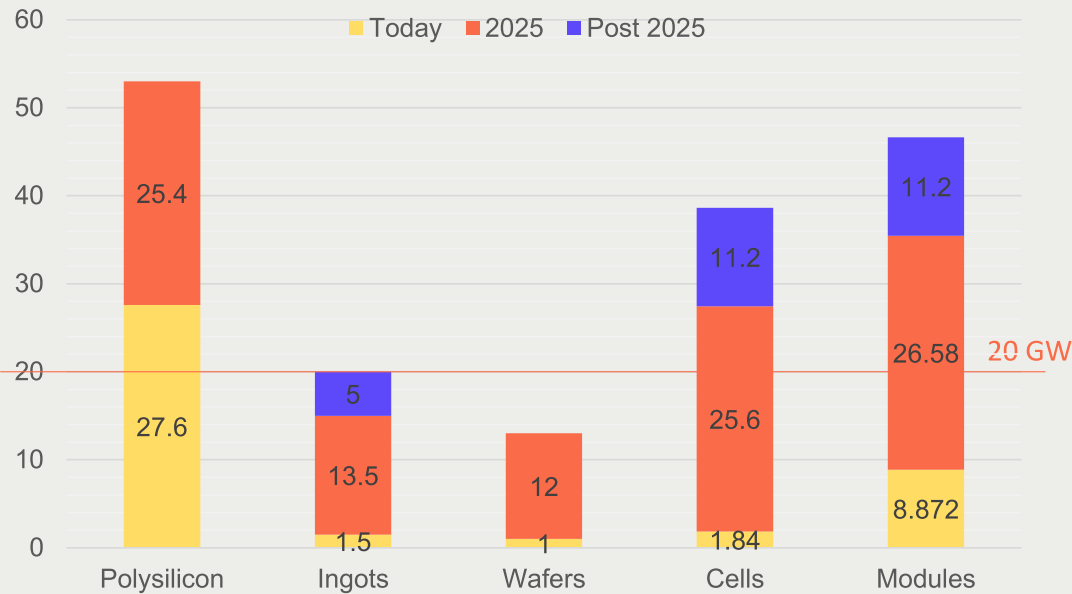
- (UK / DE) Oxford PV: a certified **29.52% conversion efficiency** with their perovskite-silicon solar cell
- (BE/NL/DE) Solliance consortium: **29.2% efficiency** with their lab perovskite / silicon solar cell.
- (FR) research institute IPVF: realised a mini module (25cm²) of **16% efficiency**, with a potential of 30%+ efficiency when combined with advanced silicon technologies.

Heterojunction technologies: several world-records established by French research institute CEA INES since 2012

What does the solar PV value chain look like?



What's the scale of the effort?



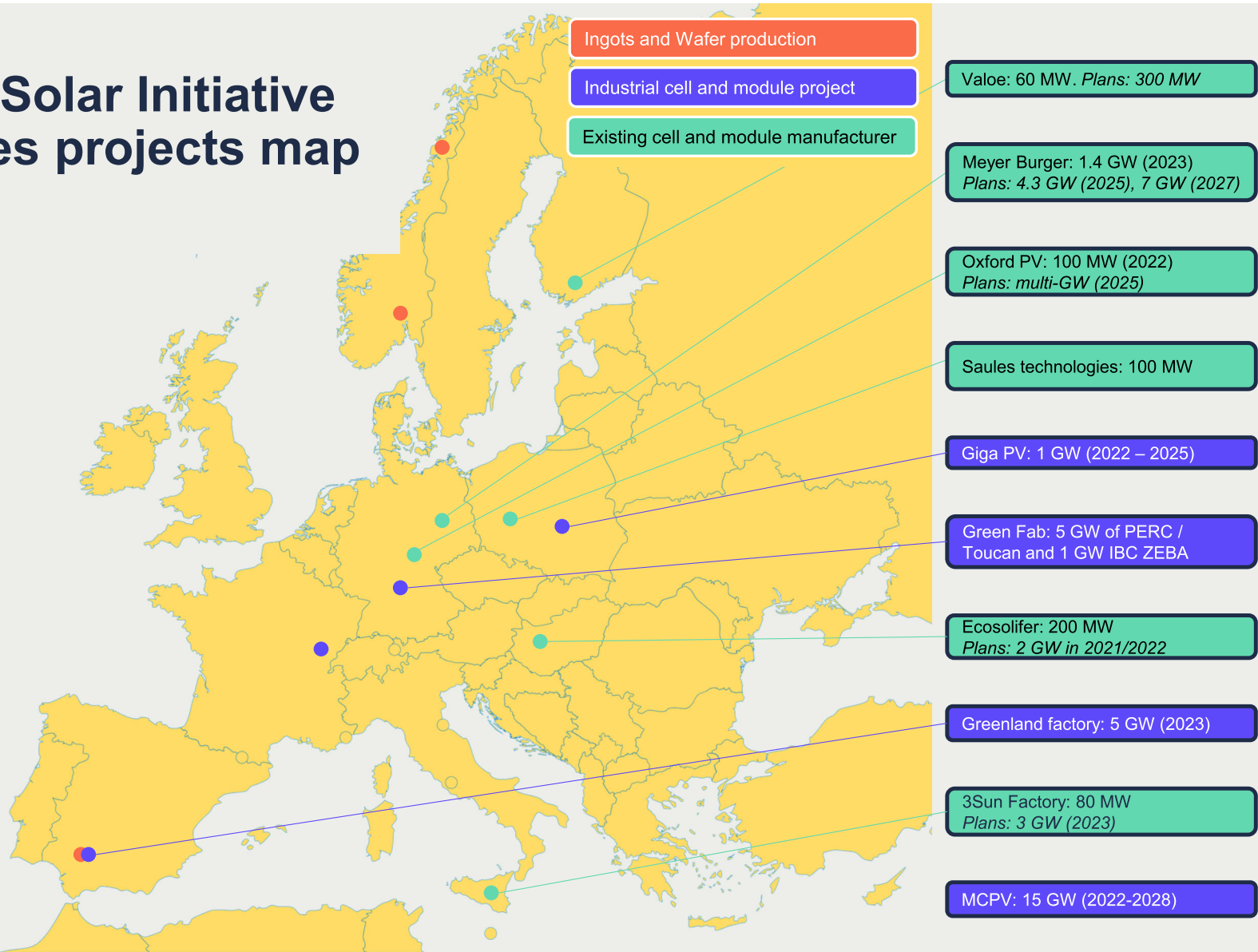
Estimated total investment needs (public support needed as a share or a guarantee of the volumes below)

PV component	€/GW	Total needs for 20 GW
Polysilicon	100 120 Mn€	2.4 Bn€
Ingots & Bricks		~1 Bn €
Wafers	50 to 60Mn€	1.2 Bn€
Cells & Modules	160-175 Mn€	3.5 Bn€
Total		8.1 Bn€

The European Solar Initiative

Cells & modules projects map

Jan. 2022



How do we get there?

#1 Ensure the development of projects through our industrial alliance the



In coordination with our sponsors
Commissioner for Industry Th Breton
Commissioner for Energy K Simson

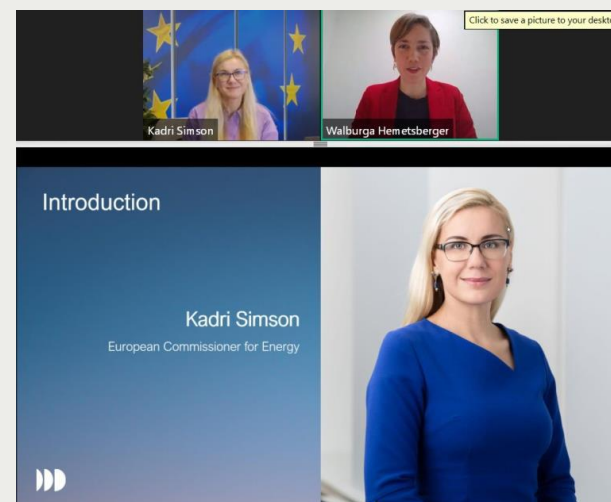
The Solar Manufacturing Accelerator

Objective: structure the industry, facilitate the development of new industrial projects



The Solar Business Investment Platform

Objective: select high potential industrial projects, and de-risk, accelerate and finance them



We know the levers we need to use to redevelop manufacturing in Europe.

A new **de-risking fund** managed by the EIB for solar manufacturers with InvestEU
Launch a **top-runner research and industrial programme** on an innovative technology (IPCEI)

Unlock **investments** into labs and fabs to keep the technological leadership and reach scale

Create a globally competitive **business environment**

Easier access to state aid support on **electricity cost**
Remove barriers on access to **material supply** (silicon, aluminum, solar glass)

Encourage member states to include **CO2 standard criteria** in their tenders
Increase **consumer information**

Set high **sustainability standards** for PV system components

Maintain a strong **demand pipeline**

Clear ambition for an ambitious deployment of renewables
Develop a true strategy for **solar prosumers**
Mobilise **public procurements** to buy European

US and India are reinvesting and strongly supporting cutting-edge manufacturing.

USA –Back Better Act and the Solar Energy Manufacturing for America Act, adopted on 19th November 2021 by the House of Representatives and now on the table of the Senate

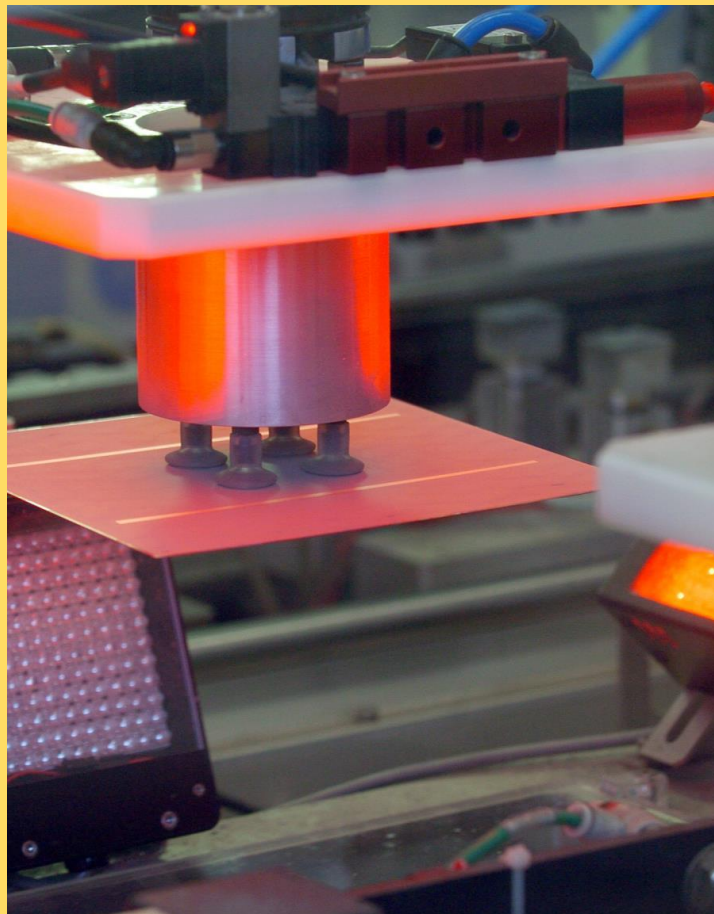
- USD 110 billion budget for RES supply chain investments, through a 30% tax credits for investments into advanced solar energy manufacturing or a USD 0.07/Wp production tax credit for sales of solar cells and modules.
- Market boost measures: solar investment tax credit at 30%, including a +10% bonus for products made in the US.

India – New Production Linked Incentive

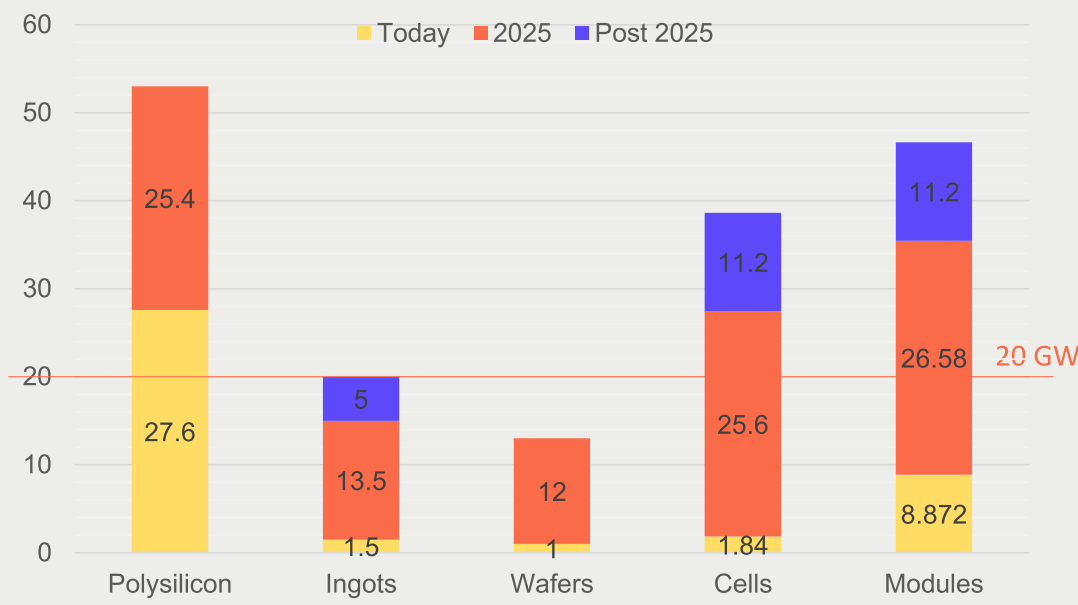
scheme (total budget USD 610 mio), aiming at reaching 10 GW of domestic manufacturing capacity along the fully value chain

- Tender for a subsidy (Rs/Wp) on the sale cost of the module, granted automatically during five years.
- Subsidy level depends on the performance of the module (module efficiency and module's temperature coefficient of Pmax) - between 2.25 and 3.75 Rps/Wp.
- First tender results (summer 2021): 19 companies selected for a total of 19 GW of production.

Project Pipeline



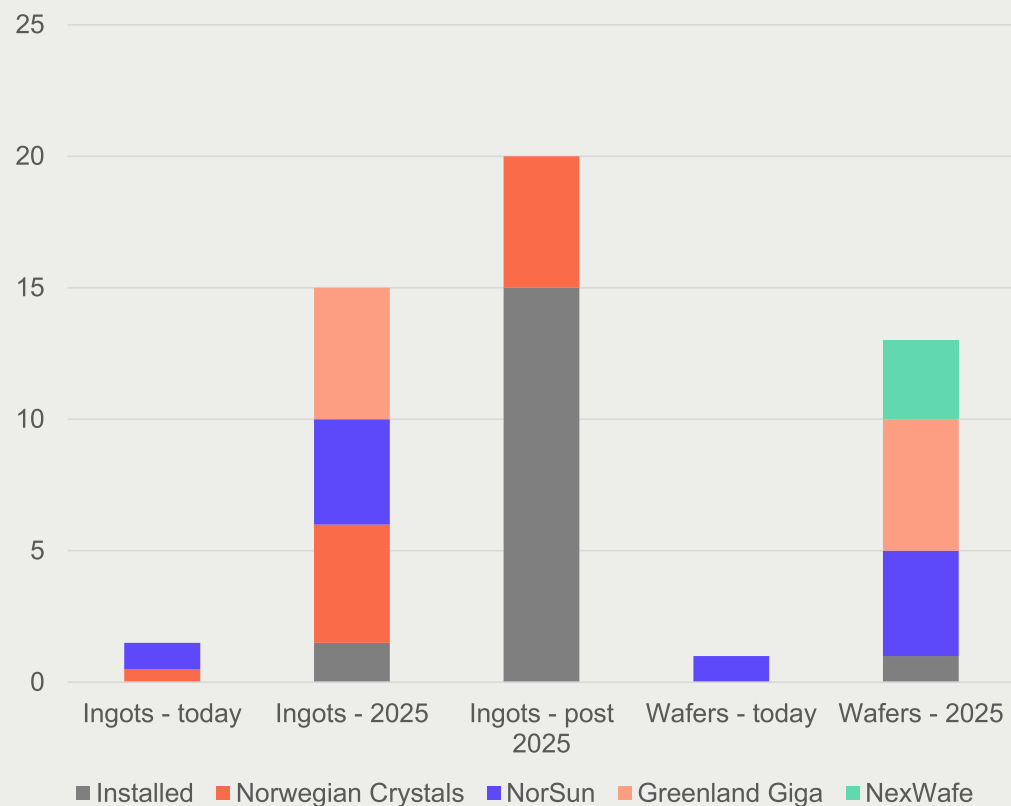
What's the scale of the effort?



Estimated investment needs

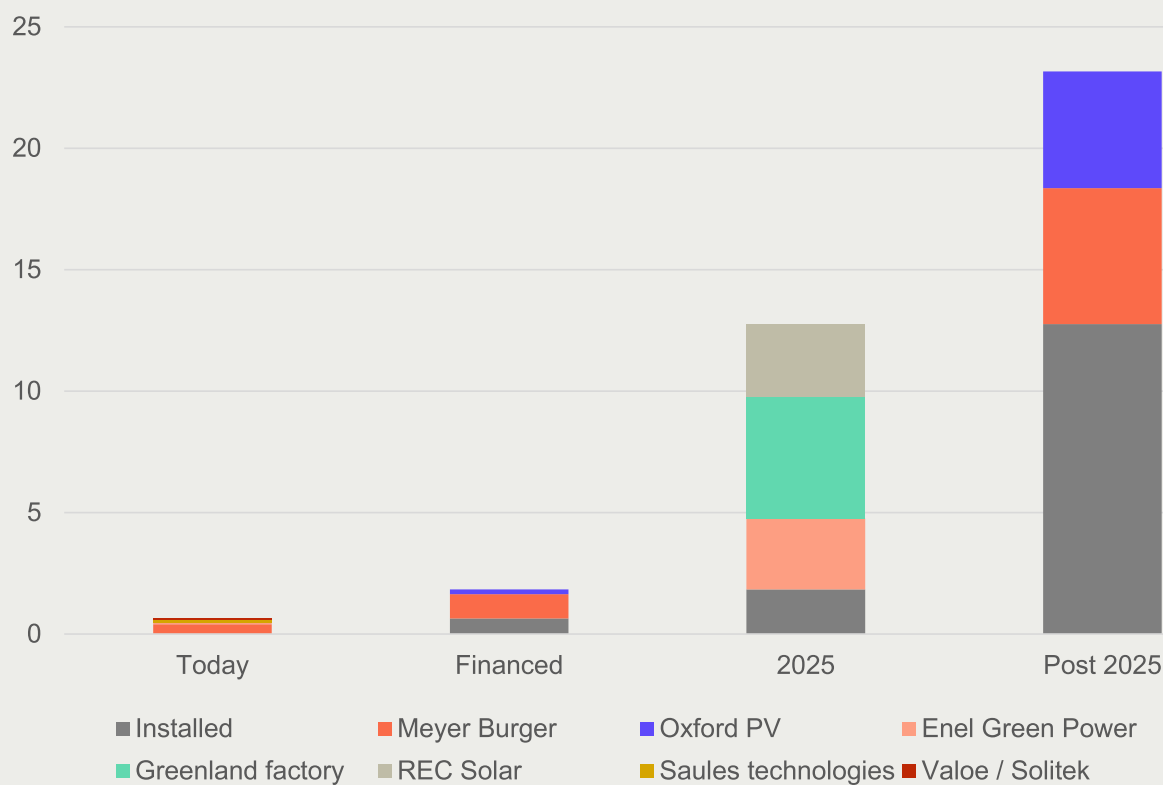
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Ingots & Wafers possible scenario



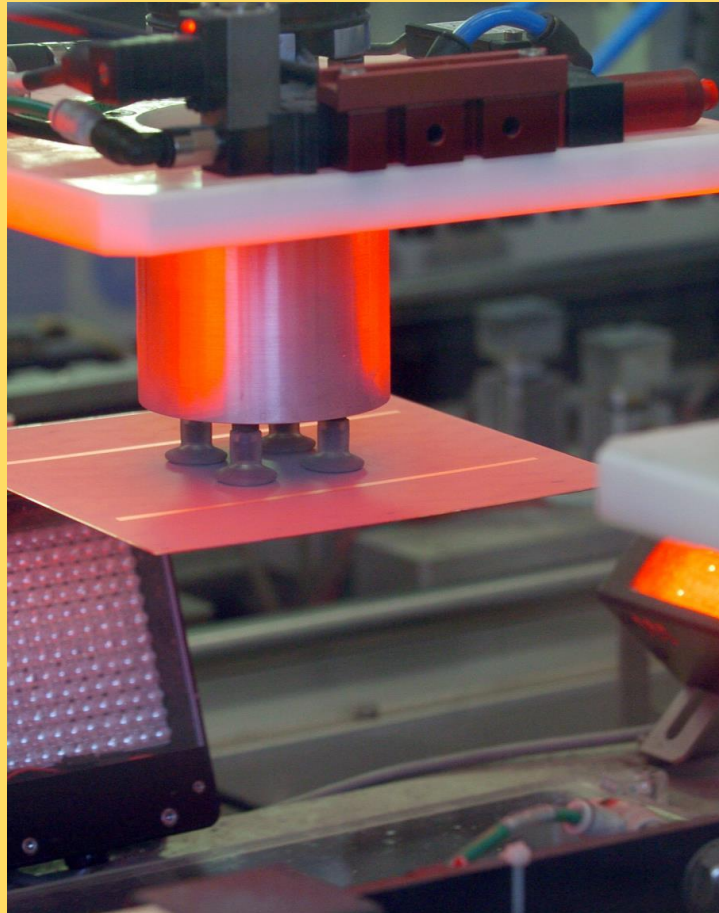
- Norwegian Crystals (ingots): 0.5 GW ingots capacity, ramp up project to 5 GW looking for financing (Norway) and 5 GW production capacity (location undefined).
- Costs: €250 mio CAPEX needs over 4 yrs, funding need €~180 mio (€70 to 100 mio in Q4 2021 / Q1 2022 equity, remainder €80 to 110 mio in commercial debt, public support, equity within 15 months of the initial funding)
- NorSun (ingots and wafers): 1 GW ingots and wafers production capacity, with projects to expand to 5 GW capacity, Norway (NorSun).
- Estimated cost EUR 350 million (40% subsidies, 40% loans backed by guarantees, 20% equity).
- Greenland Giga project (ingots and wafers): project to develop 5 GW ingots and wafer production in 2023 (Sevilla, Spain).
- Estimated cost €370 mio + €430 mio for building etc.
- Nexwafe (wafers) searching for investment in Europe, recently received investment from Indian investor Reliance, new investor to be announced. 200MW line in Europe opening in H2 2022, scale up to 3 GW in 2025.
- Estimated costs: €100 m needed in public / private partnership to commission the pilot fab.

Cells (+module) possible scenario



- Meyer Burger: 1.4 GW production line opening in 2022, plans for 4.2 GW in 2025 and 7 GW opening by 2027. Estimated CAPEX needs: EUR 160-175 mio/GW.
- Oxford PV: 200 MW production line opening in 2022, plans for scale up to multi-GW by 2025. Estimated additional CAPEX to be disclosed bilaterally.
- Enel Green Power: 80 MW production line opened in 2019, plans for scale up to 3 GW by 2023. Estimated additional CAPEX to be disclosed bilaterally.
- Greenland factory: plans to open a 5 GW manufacturing line by 2023. Estimated CAPEX: €190 mio + €430 mio.
- REC Solar project: plans to open a 3 GW manufacturing project in France. Estimated additional CAPEX to be disclosed bilaterally.
- Saules technologies (Poland): 100 MW line (HJT technology) with plans to scale up. Estimated additional CAPEX to be disclosed bilaterally.
- Valoe and Solitek (Finland / Czech Republic): 60 MW with plans to scale up. Estimated additional CAPEX to be disclosed bilaterally.

Strategic Action Plan for Solar PV



1) Unlock investments into labs and fabs

Keep supporting a strong research and innovation programme for cutting edge solar PV technologies

- **Emphasize R&I in solar PV technologies:** *Horizon Europe framework programme.*
- **Launch a top-runner programme on research, demonstration and piloting of solar PV innovative technologies:** *Innovation Fund, European Innovation Council, Important Project of Common European Interest.*

Support investments in first manufacturing projects

- Structure the European industry via the **European Solar Initiative.**
- **De-risk private investments** in strategic solar PV industrial projects, by creating a credit guarantee programme for EU manufacturers managed by the EIB: *InvestEU facility, Recovery and Resilience Funds.*
- Establish a structured and regular dialogue **between the EIB top management, national public investment banks and the solar industry.**
- Use the **EU taxonomy** to orient private investments towards solar PV manufacturing.

2) Set the conditions for a globally competitive European solar PV manufacturing industry

- Chart the course towards **cost-competitive low-carbon electricity** for the power-intensive solar PV manufacturing, including by removing barriers to renewable power purchase agreements and allowing member states to introduce state aid support measures on the electricity price to solar PV manufacturing (*implementation of the Renewable Energy Directive, revision of the Climate, Energy and Environmental protection Aid Guidelines*).
- Facilitate **access to land for new manufacturing sites** at national level, through a proactive dialogue with national authorities and streamlined permitting procedures.
- Ensure the PV industry in Europe has cost effective access to critical **material supplies**, such as solar glass, Si-metal or aluminium, by removing all trade barriers on the import of such products in the short term, until a viable domestic supply chain is in place.
- Ensure the **robust protection of intellectual property** for solar PV companies, including through technical and financial support to pursue future IP disputes.

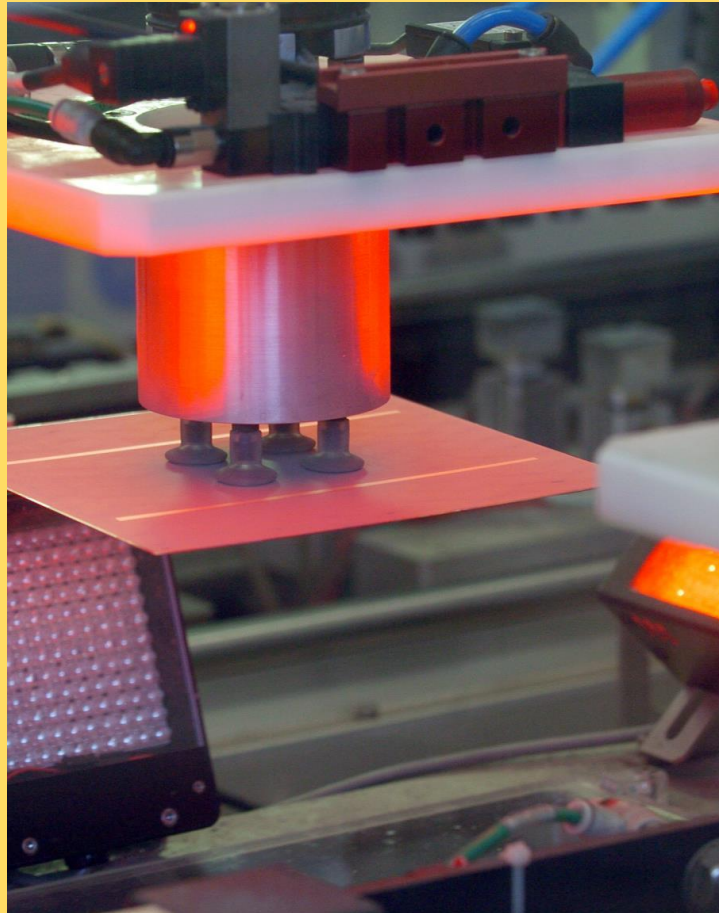
3) Maintaining a strong demand pipeline

- Set a clear trajectory for the deployment of renewables
 - Increase **the EU-level renewable energy target** to 45% (*recast Renewable Energy Directive*) and endorse the objective of 100% renewable energy systems.
 - Prioritise **renewable-based electrification** (*Fit for 55 Package, TEN-E Regulation*).
 - **Remove barriers to the development of solar PV projects**, by facilitating access to land, streamlining permitting procedures and investing into a modern grid infrastructure.
- Develop a **true strategy for solar prosumers**,
 - mandating solar PV or solar PV-readiness on all new and renovated buildings (*Renovation Wave initiative, recast Energy Performance of Buildings Directive*)
 - developing an incentive framework for rooftop PV and exempting it from tenders (*recast Climate, Energy and Environmental protection Aid Guidelines*)
- **Mobilise public procurements** - understood as purchases by public authorities and subjected companies and not as national incentive schemes - for EU products, including by valuing the most sustainable technologies (*upcoming Guidelines on identifying and addressing strategic dependencies through public procurements, implementing Directive 2014/24/EU*)

4) Setting high sustainability standards for products

- Value the **CO2 content of products produced in the EU and entering the European market**.
 - **Disclose the embodied CO2 content of PV components** based on an uniform EU methodology for CO2 content calculation (*new Ecodesign Directive rules*).
 - **Value the CO2 content selection criteria in frontrunner support schemes**. To maintain competition, price should remain the main selection criterion, but sustainability should also be valorised provided this is done in an objective and transparent manner (*revision of the Climate, Energy and Environmental protection Aid Guidelines*).
- Increase **consumer information** on the quality and energy performance of products for the market, by creating an energy label for residential market and disclosure requirement for commercial and industrial market (*Energy Labelling Directive*).
- Increase **supply chain transparency**, through industry action in a first step and new due diligence requirements in a second step (*Sustainable Corporate Governance Initiative, Corporate Sustainability Reporting Directive (CSRD), EU Social Taxonomy*).
- Develop **a true framework for high value PV recycling**, supporting the emergence of a fully-fledged recycling industry and facilitating manufacturers' access to recycled materials (*recast of the WEEE Directive*).

Benchmark of non-EU policies



Annex. Comparison of regulatory industrial incentives in EU, US, India, China

Gvt Measures	EU	US	India	China
Manufacturing Production incentives	Very limited by EU state aid	Ossof bill & US reconciliation bill in Congress: Impressive production incentives at all stages of PV manufacturing	Auction of PV manufacturers to secure aid Incentives for higher efficiency products ^[1]	Driven by access to free capital w/c enables endless capacity increases (national/ regional gvt & regional banks)
Cost of labor incentives	Limited by state aid	Training incentives	Already a competitive advantage for India & significant incentives	Wide spread
Cost of energy incentives	Limited by state aid	?	?	Wide spread: use of cheap coal therefore increasing relocation to Mongolia & XinJiang
Other incentives	R&D but not always eligible for new production capacity (only pilot projects, or if plant had R&D onsite)	Indirectly linked to industrial policy	?	Free infrastructure (roads), R&D incentives....
Tariffs	None since 2019. MIP unsuccessful/ easy to circumvent	201 reconducted	Tariffs enter into place in Feb 2022	Closed market to foreign competition. Subsidized demand at home fuels capacity to sell cheap abroad
PV installation incentives	Indirect via national targets	Extension of US ICT which should dope local PV demand	?	I assume so, not familiar with the mechanics
Market access	Open, no local content requirements allowed	201, XinJiang import ban, Buy American	See Tariffs	See Tariffs
Product policy	EU Ecodesign to enter into force in 2024/25 Streamline product information requirements & cut off market access for least performing modules	N/A US standardization work tends to be industry led. See GEC on PV sustainability standard	tbd	China increasingly leading standardization efforts in international fora



Thank you for your attention.

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