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**EUROPEAN SOLAR PV INDUSTRY ALLIANCE
RECOMMENDATIONS PAPER SERIES I**

**Recommendations on financial mechanisms to fill the
cost gap and restore the PV industry in Europe**

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1. EXECUTIVE SUMMARY

With the target of installing more than **320 GW of PV solar panel capacity by 2025**, and almost **600 GW by 2030**¹, Europe must rely on a resilient and strong supply chain.

The urgency to mitigate the current dependence on a single country is recognised by large economies all over the world which are developing support schemes to boost **PV industry reshoring**. Companies and investors are reacting quickly, and this is the very last useful moment to retain capital in Europe to redevelop a strong domestic PV industry. Overcoming the existing price gap with market leaders requires the **EU and Member States government's support**, which must be **clear, predictable, durable, and properly sized**.

This paper presents analysis from the European Solar PV Industry Alliance (ESIA) Finance Working Group and its recommendations to bridge the financial gap between EU producers and other world regions, notably China, and make European PV manufacturing competitive.

2. THE TIME TO ACT IS NOW

China is holding a close to monopolistic position in the global PV manufacturing value chain. The concentration of PV products and components supplied from China varies from 98% to 75% depending on the component². This dominant position threatens Europe's **security of supply**, a vulnerability that the Net-Zero Industry Act proposal aims to tackle by ensuring that EU manufacturing capacity covers 40% of the EU's annual demand. Current EU production in the different PV segments is insignificantly low, however, our continent (still) shows a wide presence of **relevant players** active across the entire value chain in almost all of the EU and EEA Member States. This ecosystem, brought together by ESIA, can support the reshoring of the PV industry as long as the right measures are put in place over the next few months.

Important steps have been made by the EU since the launch of ESIA, notably the new Temporary Crisis and Transition Framework (TCTF), adopted by the European Commission in March, and the proposal of the Net Zero Industry Act, also proposed in March. But uncertainties still remain with regards to the applicability of financial support measures in Europe. In the meantime, other regions are implementing mechanisms that provide **clarity on vision, strategy and supporting tools**, attracting financial resources, and mobilizing investors. Capital and knowledge, as a consequence, are **shifting away from Europe**.

European players are ready to play their part, but a sufficient support scheme is needed to enable local industry to be **competitive in the global market**, and it must be able to attract **investor funding** over the ones available in other regions, such as the PRCs "Made in China" strategy, the US' IRA, or India's PLI.

Crucially, during 2023 and in particular as of July 2023, the pricing gap of manufacturing in Europe comparing with international prices keeps widening due to pricing of modules coming from China and Asian markets, as a consequence of non-European market being closed for them, and an

¹ REPower EU

² 2021 reference, according to IEA report 2022

overcapacity built to satisfy those markets. Consequently, the European PV manufacturing companies have limited chances of selling their production. The new situation in the EU market needs to be factored in when providing financial support to investments in manufacturing facilities and their operating activities in Europe.

3. THE FUNDING GAP

China has focused on the development of its solar industry with a dedicated industrial policy (Made in China 2025) for over **15 years**. Chinese central and local governments have provided **strong financial support** on the operating costs (OPEX) and initial capital investment (CAPEX), which have been present for many years and helped Chinese companies to reduce their manufacturing costs (energy, labour, materials, depreciation...) and to achieve today's dominant position in the PV industrial sector.

The ESIA Finance Working Group quantified these differences by compiling information from each industrial player involved in the Alliance, together with companies' proprietary pricing models. **OPEX and CAPEX comparisons** between European and Chinese projects are summarized in Figures 1 and 2 below.

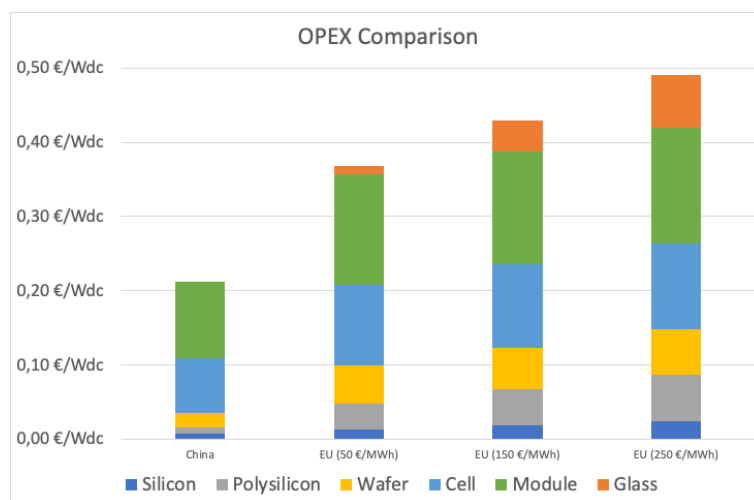


Figure 1: OPEX gap within European and Chinese production, at three different energy prices, expressed in € per Watt produced.

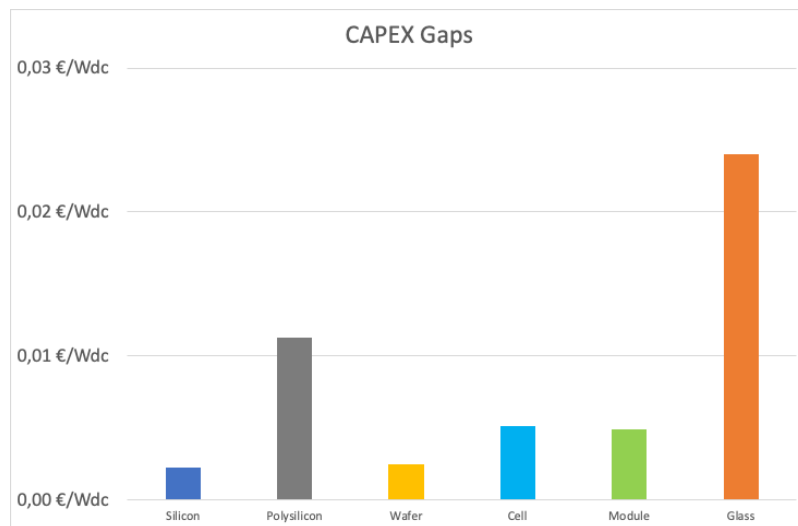


Figure 2: CAPEX gap within European and Chinese production, expressed in € per Watt produced.

The complete upstream PV value chain includes metallurgical silicon, polysilicon, wafers, ingots, cells, modules, solar glass, inverters, semiconductors, production tools, equipment, components (such as crucible and silver paste) and much more. It is important to note that Europe has access to all the raw materials standing at the base of this chain. Despite the importance of each step mentioned, and due to constraints in data availability, the Finance WG focused on polysilicon, wafers, cells, and modules, considering these steps as potential enablers of the entire value chain to be restored. The Working Group also assumed that the current commercial conditions (no import bans or restrictions) will remain unchanged in the next years.

The gap analysis revealed that the main causes that lead to a higher European CAPEX and OPEX are:

- Higher labour costs in Europe and the fact that in some parts of the value chain, the Chinese include no-cost forced labour.
- Limited availability of CAPEX and OPEX funding due to the lack of an equivalent public support framework.
- Uncompetitive energy prices and lack of visibility around competitive electricity long-term contracts vs the investments required, especially for energy-intensive sectors such as metallurgical silicon, polysilicon and wafers.
- Lack of possible economies of scale to leverage equally across the value chain.
- Higher raw material prices, due to energy prices and/or duties on imported raw material.
- Higher costs for equipment, land, permitting, building and infrastructure.
- Lack of a local/regional ecosystem of sub-suppliers.

Those conditions create a large cost gap across the value chain. Finance WG estimated this by comparing **public indexes** with **companies' costs and available prices**

in the market. The Finance WG considered three different **energy cost scenarios**³ (50, 150, 250 €/MWh), one unique **EBIT target** (10%), and assumed projects developed in a **greenfield environment**.

Production cost gaps between European and Chinese manufacturing are summarized in the table below. The figures show that **€4.7 billion to €6.4 billion annual support, depending on the energy cost scenario** (considering that OPEX is included in CAPEX as amortisation) is needed to bridge the gap and build a competitive 30 GW PV value chain that meets the targets set out by the Alliance and outlined in the EU Green Deal Industrial Plan’s Net Zero Industry Act. This support will need to last for a minimum of **8-10 years** in order to build a solid, independent and sustainable European PV industry.

Value Chain	EU Gaps		
	@ 50 €/MWh	@ 150 €/MWh	@ 250 €/MWh
Silicon	0,54 c€/W _{dc}	1,09 c€/W _{dc}	1,64 c€/W _{dc}
Polysilicon	2,96 c€/W _{dc}	4,52 c€/W _{dc}	6,08 c€/W _{dc}
Wafer	3,12 c€/W _{dc}	3,64 c€/W _{dc}	4,16 c€/W _{dc}
Cell	3,98 c€/W _{dc}	4,37 c€/W _{dc}	4,76 c€/W _{dc}
Module	5,55 c€/W _{dc}	5,97 c€/W _{dc}	6,39 c€/W _{dc}
Glass	1,12 c€/W _{dc}	4,12 c€/W _{dc}	7,12 c€/W _{dc}

Figure 2: Price gap within European and Chinese production, at different energy prices, expressed in € per Watt produced

4. WHAT IS NEEDED TO BRIDGE THE FUNDING GAP

The WG Finance has developed an analysis of the most relevant funding mechanisms currently available, their description, recommendations for short-term improvements that would help the reshoring of the PV manufacturing across the entire value chain and some expectations for the upcoming MFF, 2027 onwards (see ANNEX A).

Results from the analysis show that up to date, there are no sufficient instruments, that can allow not only the acceleration but also the growth of investments in the short term. To be effective, the support schemes should be modified as follows:

- Ensuring support for the **entire value chain**, from raw and processed materials to end products.
- Subsidizing **OPEX** (i.e., € per Watt produced), and not only **CAPEX**, for a **minimum duration of 10 years**, to allow companies to reach the required scale.

³ Energy price scenarios selected on the basis of current power prices for different European countries as per 2022 real costs for operating companies within the ESIA membership.

- Reducing the **administrative hurdles in the TCTF** (cohesion requirements, subsidy caps, etc.).
- Extending funds not only to innovative solutions but also to **the best available technology**, allowing manufacturing facilities to grow fast in terms of capacity produced.
- Allocating incentives to every resilient project under the scope, independent of **size** (universal approach vs. competitive process) and **location** (such as less-developed areas).
- Shortening **implementation timeframes and simplifying procedures**: supporting schemes designed within the EU, both at member states and European Union levels, need to be unique, clear, and deterministic.
- Reducing the uncertainty of allocation of public funding by ensuring allocation if key criteria are met.
- Covering the **real funding gap** as described above, without limiting coverage to 30%.
- Supporting European-made product demand (domestic content or resilience rules for each value chain step) to provide market pull.
- Ensuring that PV products imported from outside Europe meet specific environmental and social criteria aligned with European objectives.
- Encouraging competitiveness within the **global market**, in terms of scale, simplicity, certainty and speed, by considering other funding tools developed in other countries.

These instruments and the support schemes should be implemented without delay by the market announcement in September 2023 and legislative frameworks by the end of 2023 at the latest. ESIA also supports clear and harmonised non-price criteria that reward best-performing solar systems based on sustainability and resilience criteria as a key tool for financing solar PV production in Europe.

A review on national schemes of two of the most active member states in the reshoring of PV manufacturing in Europe (France and Germany) has been developed, together with a comparison with the US Inflation Reduction Act (IRA) which appears to be an effective and fast-track mechanism for scaling up industrial photovoltaic projects in the country and is attracting investment and interest from across the industry globally, positioning the United States as a competitive country in the sector (See ANNEX B).

5. ESIA RECOMMENDATION

Europe must act now to establish a level playing field and ensure that the objectives of the Solar Strategy and the Net-Zero Industry Act are met. The current and potentially growing dependency on one country, China, threatens the security of supply and therefore puts the EU's energy independence and 2030 climate targets at risk. ESIA members recognise the US' IRA as a best practice (since it is clear, predictable, adequate in terms of duration and magnitude and distributed along the entire value chain) and recommend some key improvements in the current EU financial toolbox for PV manufacturing:

- Use State aid and the new Innovation Fund competitive bidding mechanism to subsidise OPEX (€ per Watt produced) for a minimum duration of 10 years.
- Prolong TCTF beyond 2025, at least until the end of 2027, with more adapted requirements for PV manufacturing projects in Articles 85 and 86 (relax the geographical requirements, constraints on aid based on company size, proof of counterfactual scenario, etc.).
- Ensure that enough funding from the Innovation Fund is channelled to the PV value chain by e.g., earmarking a portion of the funds for PV manufacturing until 2030, and prioritising key segments of the value chain like ingots and wafers.
- Improve the use of InvestEU to support the achievement of the targets of the Solar Strategy and Net-Zero Industry Act, in particular making use of the new window proposed with STEP.
- Limit EU financial support e.g., from the Innovation Fund, InvestEU, etc. and State aid to projects with equal or majority ownership and/or controlled mainly by European-based companies.

Every year Europe has a trade deficit of +20 B€⁴. If these PV products were manufactured end to end in Europe, the taxes collected from workers' income tax and companies' corporate tax would be +2 B€⁵ annually, which offsets largely all the subsidies requested for the ramp-up included in this paper.

ESIA also supports clear and harmonised non-price criteria that reward best-performing solar systems based on sustainability and resilience criteria. In addition, ESIA calls for the implementation of carbon footprint requirements, Ecodesign and other sustainability requirements, including references to human rights and labour standards, to enter the EU market. Finally, a tax credit scheme to incentivise PV projects built with EU-made PV components, including residential installations, should be designed to support demand and provide a higher and more secure return for investors.

In addition to restoring manufacturing capabilities, hence delivering key EU industrial policy objectives, such measures would **support renewables development**, create **green jobs**, **reduce import dependency**, and thereby **retain significant economic value** within the EU and EEA.

⁴ Extrapolated from data published by Infolink reporting 51.9 GW imports from China in the period January to May 2023 at average price of 0.20 US cents per watt.

⁵ Extrapolated from expected annual market figures and 40.000 new jobs created all across the value chain (including suppliers and other service providers) to re-establish 30 GW of manufacturing capacity.

ANNEX A – EXISTING SUPPORTING TOOLS ANALYSIS

			<u>Status quo available instruments</u>				
Instrument			budget / year earmarked for PV manufacturing	summary	CAPEX / OPEX	assessment	Target beneficiary project (Objective)
	EU managed	Horizon Europe	~280 MEUR (21-24 Work Programmes)	R&I focused, call based (competitive) with consortium approach. Heavy administrative burden	CAPEX	Heavily funded but lack of commercial/industrial benefits. At this stage, not fit for purpose for industrial scaling-up.	
		Innovation Fund	Not earmarked	CO2 emissions reduction and innovation driven. Change in the ETS Directive and implementing regulation could allow for better approaches. Competitive bidding mechanism planned for in 2024 for climate tech manufacturing is positive.	CAPEX, OPEX	5 PV manufacturing projects supported in the past 3 large-scale calls but only 1 in the ingots & wafers segment (weakest link of the value-chain). Highly competitive and high application costs. Long time to money (more than 18 months from call to money).	
Grant	EU, under MS management	RRF / REPOWEREU	Not Earmarked	Possibility for Member States to support PV manufacturing projects using RRF funding e.g. 3Sun in Italy.	CAPEX	Status of national plans and schemes uncertain	
		Just Transition Fund	Not Earmarked		CAPEX	Status of national plans and schemes uncertain	
		ESF+	Not earmarked			Status of national plans and schemes uncertain	
	MS	State Aid		State Aid rules allow support in form of investment aid (subsidy or other measures) under conditions. Cover CAPEX, rather than OPEX (although exceptional opening to OPEX in case of matching aid under the new TCTF). Can also cover energy price support, skills, R&I ...)	CAPEX, OPEX	Conditions to deploy State Aid for solar PV manufacturing have improved with revision of GBER and TCTF (notably section 2.8 : Schemes - oara 85 or matching aid - para 86). Status of implementation in MS still unclear. No figure	
		IPCEI	Not earmarked	A specific option to deploy State aid. R&I focus.	CAPEX	An option, with constraints (time, administrative burden, Innovation focus, coordinated approach across MS). Lead taken by Spain and some supportive Member States but no information on progress made.	
Debt	EU	EIB Venture Debt	Not earmarked	Venture debt, guaranteed by Invest EU. Technology innovation driven. Fit for purpose for the early stage of new manufacturing projects but limited budget (ca 100MEUR per year, 7-10 deals per year).	CAPEX	No VD deployed on solar PV manufacturing recently. Fit for purpose to finance innovation or innovation centers/pilot lines of future industrial capacities. Will not meet the industry needs but could allow EIB to reclaim competence in the solar PV value chain ahead of project finance.	
		EIB ACTIF (Action for Climate Thematic Impact Finance**)	not earmarked		CAPEX		
	MS	EIB Project Finance	not earmarked	Fit for purpose for industrial scaling up across the value chain. Catalyst and signal for private investors. Large financing capacity.		EIB not recently active on solar PV manufacturing. Risk appetite to be demonstrated. Cost of capital not a competitive advantage.	

Equity	EU	EIC	Not earmarked	CAPEX	Investment mandate not adapted to industrial greenfield projects (eg Holosolis, Carbon), therefore not fit for purpose for scaling
		EIF	Not earmarked		
	MS				

Innovation/technology driven. Small tickets relevant for start ups. Investment mandate not adapted to industrial greenfield projects (eg Holosolis, Carbon), therefore not fit for purpose for scaling

Indirect equity participation through the funding of funds.

Appropriate in theory although track record, approach on solar manufacturing to be clarified.

European Tech Champions Initiative (ETCI) launched in February 2023. will back high-tech companies in their late-stage growth phase. The new Fund of Funds has secured initial commitments of €3.75 billion from EIB Group, Spain, Germany, France, Italy and Belgium. Clarify, specify mandate for PV

ANNEX B – NATIONAL MECHANISMS AND COMPARISON TO THE US IRA

FRENCH PROPOSAL

The French “Green Industry” legislative proposal, submitted to the Parliament in May 2023 and pending adoption, aims at removing barriers to investment in and accelerating green industrial projects. It includes in particular measures to facilitate access to land, simplify and accelerate permitting, and include sustainability criteria in public procurement as of mid-2024. In addition, the Government should propose a new tax credit for green industry investments (including PV manufacturing) starting in 2024.

GERMAN PROPOSAL

The German proposal published by the BMWK in June ‘23 is built on the base of Point 86 of the TCTF. In principle, it lacks the same deficiencies as the ones described above. With these schemes/restrictions regarding how and where to produce, companies exposed to global competition can hardly work and build a competitive capacity. Usually, capacity expansion happens within the already existing sites due to the availability of infrastructure, land and synergies with the actual production, which can benefit from circular processes. The German proposal does also not address globally competitive electricity prices, which is a major prerequisite, beyond significant CAPEX support. Some of the criteria in the German EOI are dubious or unclear and need to be clarified and/or adjusted to allow for a balanced value chain development.

US IRA

In August 2022, the United States launched the **Inflation Reduction Act (IRA)** which provides temporary support via (transferable) tax credits – for 10 years - creating safe investment conditions without a permanent subsidy. The IRA has been very well received by all the stakeholders of the solar energy sector and over **90 new clean energy projects** in small towns and bigger cities nationwide have been announced, totalling \$89.5 billion in new investments⁶.

IRA provides a simple and transparent mechanism for non-refundable OPEX support on a per DC-rated capacity product produced and sold basis, applied to each part of the PV value chain, including its upstream critical and strategic raw materials.

It lasts from 2023 to 2032, when the incentive **amount** covers the cost gap for several products, and gradually reduces over the last 3 years by 25%, relying on capacity development and improvement.

Not only the duration and magnitude of the incentive are attractive, but also the boost given to the entire value chain. Together with the clear and accessible procedure, this creates confidence among investors, encouraging private investments and allowing for the very important parallel scaling along the value chain.

⁶ *Clean Energy Boom, Climate Power. Updated 31/01/2023*

A 30 GW European value chain under such as scheme, would require approximately \$5 billion per annum in support and not to forget that the electricity prices in the US for industrial companies are already at around 4 \$cent/kWh.

Last but not least, the US IRA incentive system is one of many parts of a wider support system that the USA have implemented to support the US renewable industry. A major key component of the US support mechanism is the ITC Investment Tax Credit, which provides significant credits to companies that choose to invest a share of their yearly profit into solar, thereby reducing their taxes over many years and creating demand for PV systems. All of this, considering that renewable energy, and particularly solar energy, provides lower prices of electricity to final consumers and industry, reducing the energy and fossil fuels dependency, and uncertainty on prices while increasing the resiliency of power systems.

The IRA also contains a 30% tax credit for solar farms, with a bonus worth an additional 10% of the project cost for using domestic content. Those 10% bonus represents the incentive for market uptake from the demand side.

To qualify for the bonus, the US IRA specifies certain rules in relation to the manufacturing activities that need to be produced locally (e.g., iron or steel products) and that 40% of the cost of the manufactured products (e.g., modules, trackers, and inverters, ...) must be made in the United States. The rules mean that certain components used to manufacture solar panels can be made overseas so long as the domestic content cost threshold is met by other components in a facility's manufactured products.

In addition to the **US**, countries like **Canada, Australia and India** are now actively revamping their solar industry and implementing similar incentives and protective measures.