

Aluminium in Solar

An enabler and consumer
of European solar energy

Position paper

September 2022



EUROPEAN ALUMINIUM

Aluminium, anything but basic!

Delivering on the EU's Solar Strategy with a robust and resilient aluminium sector in Europe

This briefing note highlights the policy initiatives relevant to the solar and aluminium sectors, and how both industries could work together to bolster the broad roll-out of solar photovoltaic (PV) production in Europe based on a resilient and robust European supply of sustainable raw materials.

Background & Introduction

RePowerEU as presented by the European Commission on 18 May 2022 sets out an ambitious plan to accelerate the phase-out of Russian fossil fuels and accelerate the uptake of renewable energy sources (RES) in Europe. With the associated Solar Strategy – and the Solar Industry Alliance helping to bring the EU's plan for solar to life – the EU has clearly put solar energy at the core of its resilience and decarbonisation agenda. Already today, solar energy is the fastest growing source of energy in Europe. The International Energy Agency (IEA) even estimates that solar panels will provide a third of the world's total electricity demand by 2050.

With the green energy transition, the demand for metals will significantly increase, above all for aluminium. A report published by the European Commission in 2020 confirms the role of metals for the implementation of the European Green Deal objectives: the deployment of battery, solar and wind technologies will lead to a substantial increase of raw materials demand. The report adds that the EU's transition to green technology could be "endangered" by weaknesses in the future security of supply of key raw materials, however.

For the European solar and aluminium sectors, the Solar Strategy represents a key opportunity to secure a strong solar manufacturing value chain in Europe, to actively contribute to the objectives of the European Green Deal, while at the same time enabling a faster greening of the European electricity infrastructure. The latter is crucial for the decarbonisation roadmap of the European aluminium industry.

A highly electro-intensive process, the production of primary aluminium requires a constant supply of baseload energy: one single, energy-efficient primary aluminium smelter, consuming 15 MWh per tonne of aluminium produced and producing 200,000 tonnes of primary aluminium per year, has an annual electricity consumption of about 3 TWh, with a share of baseload energy capacity of more than 340 MW. Considering the entire EU27 aluminium production of around 2 million tonnes, annual electricity consumption amounts to 30 TWh per year, requiring at least 3.5 GW of installed baseload capacity.

Against this background, access to both affordable and constant energy is the lifeblood of a viable primary aluminium production sector. To level the intermittent nature of renewable energy sources, solar energy and other decarbonised technologies must therefore form a stable energy mix to fulfil their enormous decarbonisation potential for the European electricity grid, while at the same time ensuring constant and stable supply of decarbonised energy.

Aluminium: An enabler of solar PV

On average, manufacturing 1 MW of photovoltaic capacity necessitates 21 tonnes of aluminium. IRENA's Remap scenario estimates that the increased solar capacity will lead to an extra global demand of 160 million tonnes of aluminium by 2050.

Considering the high metals intensity of the energy transition and the strategic role of aluminium across RES technologies, from solar PV and wind power to CSP, batteries and hydrogen production¹, it is crucial that the EU's legislative framework ensures a resilient raw materials value chain in Europe.

Today's import reliance on solar technology and raw materials jeopardises the successful implementation of the Green Deal, both in economic and environmental terms². In the past twenty years, the European aluminium industry lost more than 30% of its primary production capacity. Since September 2021, another 50% of European production was curtailed due to the skyrocketing energy prices in Europe. In turn, China has built up a 60% market share in primary aluminium production since.

Increasing solar PV capacity from today's 136 GW to 320 GW by 2025 and 600 GW by 2030, as proposed by the EU Solar Strategy, will require an additional 4 and 10 million tonnes of aluminium respectively.

A recent report³ by the IEA confirms that China also dominates global solar PV supply chains: China's share across all stages of solar panel manufacturing (such as polysilicon, ingots, wafers, cells and panels) exceeds 80% - this is more than double of China's share of global PV demand.

The delocalisation of the European solar industry has cost the continent thousands of jobs and its erstwhile leadership role. The International Energy Agency (IEA) estimates that the solar PV industry could create 1,300 manufacturing jobs for each gigawatt of production capacity. To create long-term incentives for solar companies to operate and invest in Europe and not relocate to third countries, Europe must secure the whole value chain.

All in all, industry and policy makers must work together to create a level-playing field between domestic and international actors if we are to reverse the trend of carbon and investment leakage in Europe and ensure import dependencies do not undermine the EU's decarbonisation efforts.

One of the available solutions is more solar panels and aluminium produced in Europe: both have a strong European manufacturing history and play a strategic role in the green transition. Re-shoring solar production to Europe, including the materials value chain, manufacturing sites and work force, will require long-term regulatory support, however.

¹ KU Leuven [Study](#) "Metals for Clean Energy", April 2022

² The carbon intensity of the primary aluminium production in Europe (EU, EFTA, UK) is approximately 6.8kg of CO₂ per kg of aluminium produced compared to a global average of 16.1kg of CO₂ and a Chinese average of 20kg of CO₂, the carbon footprint of recycled aluminium in Europe is below 0.5 t of CO₂ per t of aluminium

³ See IEA Special [Report](#) "Solar PV Global Supply Chains", July 2022

Policy Recommendations

The upcoming Solar Alliance must:

- **Foresee a comprehensive mapping of the volumes of materials and components needed for the increased manufacturing of solar panels in Europe**, assess the vulnerability of those strategic value chains and outline possible remedy actions. This should include a mapping of funding opportunities, platforms for interconnected demand-supply management, as well as investment opportunities.
- **Enhance structured cooperation with job platforms and universities, funding for training, apprenticeships for solar PV** and targeted cooperation with third countries.

The upcoming revision of the **NECPs in 2024 should map out raw materials needs**, identify security of supply issues, investment needs and encompass targets for an efficient collection, sorting and recycling of end-of-life solar panels to enable recovery of valuable raw materials used in solar panels and enable an as closed as possible recycling loop.

For more detail, see Annex I [here](#)

Ensuring efficient carbon leakage measures & cost-effective consumption of solar energy

Primary aluminium production is electricity-intensive. As energy represents about 40% of our primary aluminium production costs, it is in the sector's best interest to facilitate and uniform access to affordable and decarbonised electricity in Europe. For this reason, the uptake of solar energy in Europe should be accompanied by an adaptation of the legislative and regulatory framework for RES project permitting and investments in RES Power Purchase Agreements (PPAs). Especially the role of industrial energy consumers, such as the European aluminium sector, must be better recognised in European RES legislation.

Given our energy intensity, the aluminium sector generally supports all initiatives aimed to decarbonise the EU energy grid and support the consumption of renewable energy at affordable and competitive prices. What's more, aluminium producers can support the decarbonisation of the grid by providing flexibility services that would allow to integrate a higher portion of variable solar energy. In turn, electricity producers can help by offering electricity pricing incentives to aluminium producers using demand management systems. It is therefore paramount that real incentives accompany the energy transition, starting from the production of RES technologies to the development of new RES capacity, including grid infrastructure and permits, and RES energy consumption.

We are convinced that to achieve the recently increased renewable energy objectives, it is important to re-establish the European solar manufacturing base and step up efforts to develop the battery and green hydrogen value chain in Europe. However, especially the aluminium and solar PV sector are heavily exposed to carbon leakage. If European actors are not effectively protected against this risk, carbon leakage could undermine EU climate policy efforts and generate market distortions, which would slow down the development of a strong domestic solar value chain.

Also, carbon leakage negatively affects the competitiveness of generated solar power compared to power from fossil fuels: it reduces demand for ETS allowances, thus lowering prices of fossil fuels-based electricity. In this context, it is important that the proposed Regulation on a Carbon Border Adjustment Mechanism (CBAM) is progressively phased in whilst being tested and does not replace existing carbon leakage measures before its efficiency is ensured.

Policy Recommendations

Develop efficient carbon leakage measures (CBAM, ETS) and ensure fair trade while promoting security of supply for a more sustainable EU value chain:

- Compensation of the indirect costs of the EU ETS must be granted to aluminium producers in Europe: Due to marginal pricing in European electricity markets, a consumer who signs a PPA for renewables will still face carbon costs until the electricity grid is fully decarbonised.
- **In addition, aluminium structures and solar panels should be included in the product scope of the CBAM proposal.** As is, third country manufacturers of finished solar panels (CN CODE 8541) or aluminium structures needed to build solar panels (CN CODE 7610) will not pay a CBAM cost when exporting to Europe. Only solar panel aluminium components (CN CODE 7604) would carry the CBAM levy. European producers of solar panels will therefore pay higher carbon costs because raw material costs for aluminium will increase (and carbon leakage measures are progressively phased out), while third country solar panel producers will avoid the CBAM and continue to export finished solar panels to Europe¹.

Address disproportionate shaping/firming costs for energy-intensive consumers of renewable energy via the so called 'Green Pool' concept:

- Electricity produced by RES units would be 'pooled' together by an aggregator. The aggregator would undertake all shaping risks and supply the consumer with baseload power. As a result of production and consumption aggregation and a competitive tendering process for the assignment of the aggregator, shaping costs would be reduced considerably, whereas partial state support for these costs will allow the rapid growth of this market.

Simplification of EU state aid rules to invest in new solar capacity and regulatory relief for energy-intensive industries from any electricity surcharges to finance new capacity.

Incentivising long-term cross-border PPAs:

- Revise cross-border transmission rights, modernise grid connection practices and freeze current grid connection costs between the years 2022 and 2024 to accelerate the deployment of solar RES projects.
- Develop an EU-level roadmap on grid modernisation and flexibility development, including at distributed level.

For more detail, see Annex II [here](#)

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ANNEX 1: Detailed policy recommendations for boosting European aluminium supply in solar

Challenge	Opportunity	Policy Recommendation
Need to develop research and innovation	EU large-scale skills partnerships	<ul style="list-style-type: none"> Structured cooperation with job platforms and universities, funding for training, apprenticeships for solar PV, targeted cooperation with third countries.
Need to develop a strong solar manufacturing base in EU, understand raw materials needs to strengthen the EU value chain and encourage investments	EU Solar PV Industry Alliance	<ul style="list-style-type: none"> Coordinate the development of a comprehensive mapping of the volumes of materials and components needed for the increased manufacturing of solar panels, assess the vulnerability of those strategic value chains and propose possible remedy actions. Map funding opportunities and put in contact demand and offers for investment opportunities.
NECPs should provide a coherent and comprehensive framework for the development of a strong RES manufacturing value chain in Europe	Update of the NECPs in 2024 - Commission to publish guidance on how Member States should review their national plans	<ul style="list-style-type: none"> NECPs should map out raw materials needs. NECPs should identify security of supply issues, and encompass targets for recycling of raw materials used in the manufacturing of solar panels. NECPs should identify investment needs in those sectors.

ANNEX 2: Detailed policy recommendations for boosting solar energy consumption across the Aluminium value chain

Challenge	Opportunity	Policy Recommendation
RES permitting process tends to be too long in Europe, leading to lagging procedures and abandonment of some projects	Introduction of a maximum 3-month duration for the permitting process for solar rooftops	<ul style="list-style-type: none"> Enforce RED provisions on facilitating RES permitting Introduce a one-stop-shop provision, simplify notification procedures Introduce an obligation to keep permitting processes uninterrupted Accelerate existing projects already in the pipeline

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		<ul style="list-style-type: none"> When several authorisations or permits are needed for the same project, the administrative process should go in parallel
Risks that some industrial projects are disguised as energy communities	Obligation to set up renewables-based energy communities in every municipalities of a population higher than 10,000 by 2025.	<ul style="list-style-type: none"> Introduce provisions to ensure that energy communities projects are not industrial projects.
Foreign overcapacity of key raw materials in the manufacturing of solar PV Difficulties in Europe to access funding opportunities	Develop European solar PV manufacturing value chain	<ul style="list-style-type: none"> Develop efficient carbon leakage measures (CBAM, ETS) Eliminate EU trade barriers to facilitate access to components and raw materials Ensure open trade environment while promoting security of supply for more sustainable EU value chain
Address disproportionate shaping/firming costs	Increase the overall renewable energy targets from the current 32% to 45% by 2030	<ul style="list-style-type: none"> The '<u>Green Pool</u>' concept: electricity produced by RES units would be 'pooled' together by an aggregator. The aggregator would undertake all shaping risks and supply the consumer with baseload power. As a result of production and consumption aggregation and a competitive tendering process for the assignment of the aggregator, shaping costs would be reduced considerably, whereas partial state support for these costs will allow the rapid growth of this market.
Need to facilitate investments in new solar capacity		<ul style="list-style-type: none"> Full compensation of the indirect costs of the EU ETS: Due to marginal pricing in European electricity markets, a consumer who signs a PPA for renewables will still face carbon costs. Ease or suspend state aid approval procedures by issuing temporary simplified and / or simple notification procedures, similar to the State Aid Temporary Framework, to allow Member States to develop ambitious and fast public support mechanisms.
TSOs and DSOs do not grant long-term cross-border transmission rights	Reform of the electricity forward market design	<ul style="list-style-type: none"> To make long-term cross-border PPAs available in these areas, cross-border transmission rights, physical and financial, need to be made available.

High grid connection costs Over-competition for grid connection points		<ul style="list-style-type: none"> • Freeze current grid connection costs between the years 2022 and 2024 to accelerate the deployment of RES projects. • Modernisation of grid connection practices to adapt them to an exponential number of grid connection requests for distributed solar PV assets. • Develop an EU-level roadmap on grid modernisation and flexibility development, including at distributed level.
The Renovation Wave should consider benefits of solar PV and storage	Objective for EU buildings to use at least 49% of renewable energy by 2030	<ul style="list-style-type: none"> • Ease state aid approval procedures to allow Member States to grant short-term and ambitious public support for renovation. • Develop a massive awareness-raising campaign on renovation and rooftop PV development. • Develop an adequate regulatory framework, through the revision and the subsequent implementation of the EPBD and the REDII.
Lack of harmonisation of planning documents	Obligation to map “go to areas”	<ul style="list-style-type: none"> • “Solar ready” buildings should be clearly mapped out in planning documents.
Lack of prioritisation in permit granting	Guidance on RES permitting and RES PPAs	<ul style="list-style-type: none"> • Dialogue between the different parties involved should be promoted. Buyers and generators should be able to contract directly.

Sources

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