

European Aluminium and SolarPower Europe joint paper – aluminium and solar: synergies and opportunities

This paper highlights policy recommendations to boost solar photovoltaic (PV) production rollout in Europe based on a robust and sustainable European supply of raw materials like aluminium. It also examines how the EU solar industry can best provide sustainable energy to the European aluminium value chain to reduce its carbon footprint.

Boosting synergies between European aluminium & solar value chains

The EU is actively setting targets and policies to foster a robust domestic solar value chain, driven by solar's remarkable 100% annual growth in the last two years and continued projects increase towards 2030 on track to reach and overachieve the RePower EU targets for solar. Aluminium is essential to secure this ongoing growth. Studies show [approximately 21 tonnes of aluminium is required to produce 1 MW of solar capacity](#), as it plays a crucial role in various aspects of solar panel production.¹ Increasing solar PV capacity from today's 136 GW to 320 GW by 2025 and 600 GW by 2030, projected to be overachieved, as proposed by the [EU Solar Energy Strategy](#), will require an additional 4 and 10 million tonnes of aluminium. Aluminium is used in module production (+10% of the final cost), mounting structures (particularly on rooftops) and inverters. Looking ahead, as the use of solar panels continues to rise, efficient recycling becomes essential. The International Energy Agency (IEA) estimates that recycled materials such as aluminium could meet 21% of the solar PV demand by 2040. This recycling reduces waste and contributes to a sustainable supply chain for both industries. Against this background, the upcoming revision of the WEEE Directive should support an improved end-of-life performance in the PV sector by setting up tailored provisions for end-of-life solar products and encouraging the recovery of the most valuable materials.

Conversely, for the European aluminium primary industry, electricity represents up [to 40% of production costs](#)², with smelters consuming up to 3,690,000 MWh annually. It is in the sector's best interest to facilitate uniform access to affordable and decarbonised electricity in Europe.

Smelters need massive amounts of green electricity to reduce their carbon footprint further, and the solar PV sector is essential in delivering a clean, affordable and reliable electricity supply to the aluminium industry also across the other different segments of its value chain. **Together, these industries are critical to building a green and resilient European economy.**

How can the solar industry best supply the aluminium value chain?

European solar power purchase agreements (PPAs) are breaking records every year, with more than 4GW already signed this year. In 2022, the two biggest PPAs signed were coming from the Aluminium industry, picturing the huge potential of long-term agreements to support hard-to-decarbonize sectors in their transition journey. Still a few issues are preventing European aluminium producers from relying on solar energy (and other renewable energy sources). The main one being the derived shaping and

¹ European Commission, [EU Solar Energy Strategy](#), 2022

² CEPS, [Composition and Drivers of Energy Prices and Costs](#) (2019)

firming costs generated **to match plants' consumption profile**. Primary Aluminium is a baseload consumer. Stopping a potline usually means production will not be able to start again, and when the sun doesn't shine, the aluminium plant with its cast housed and remelting furnaces still needs to be supplied in energy. Solar developers are adapting their offer to match with any profile of renewable electricity consumption. We are seeing the emergence of shaped and 24/7 PPAs, formats that will require important investments in flexibility assets to thrive. That is why 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 renewable Power Purchase Agreements. Especially the role of industrial energy consumers like the aluminium sector must be better recognised in European legislation.

Aluminium producers can support the decarbonisation of the grid by providing flexibility services that would allow them 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. Therefore, real incentives must accompany the energy transition, starting with producing RES technologies and developing new RES capacity, including grid infrastructure and permits and RES energy consumption. To achieve the recently increased renewable energy targets, it is essential to re-establish the European solar manufacturing base and step up efforts to support industrial consumption of onsite and off-site solar, together with more storage and flexible energy solutions.

Policy recommendations

- Given aluminium's energy intensity, the aluminium sector generally supports all initiatives to decarbonise the EU energy grid and spur renewable energy consumption at affordable and competitive prices. The sector is exposed to international competition, and access to affordable renewable energy is crucial to maintaining a level playing field.
- **Encouraging RES PPAs** and developing instruments to accelerate their uptake **and tackle shaping costs**. Aluminium smelters require massive amounts of baseload electricity to function. Aluminium producers need solutions to tackle those moments where RES cannot satisfy their demand. This is also the main reason preventing energy intensives from signing PPAs.
- Address the mismatch between the urgent need for solutions to accelerate the rollout of RES and PPAs and the **length of approval processes at the EU level**. Energy-intensive industries have tried to put forward solutions to tackle shaping costs. As an example, the Green Pool proposal put forward by the Greek government would propose to pool together the demand for energy-intensive consumers in RES. Then, an aggregator, chosen via public auctions, would tackle shaping and firming costs, basically taking care of flowing RES to the grid. In exchange, energy-intensive consumers would invest in new renewable capacity to be added to the grid. This proposal is waiting for the EU's approval.
- Provide an adequate **timeline for administrative processes and regulatory certainty**. The electricity price crisis has highlighted the need for a clear and fixed regulatory framework. The inframarginal revenue cap imposed on electricity producers has clearly impaired the capacity of energy-intensive industries to sign PPAs, these caps are illegal and have to be removed in all Members States. The EU needs enabling conditions to help industrial off-takers **plan ahead**.

How can the aluminium industry best supply the solar industry?

Considering the strategic role of aluminium in solar PV production, it is crucial that the EU's legislative framework ensures a resilient raw materials value chain in Europe and values sustainability for the procurement of solar PV components.

Today's import reliance on solar technology and raw materials requires resilience and diversification, including by reshoring at least 30GW of solar PV production across the value chain by 2030.. The European aluminium industry lost more than 30% of its primary production capacity in the past twenty years. Since September 2021, another 50% of European production has been curtailed due to the skyrocketing energy prices in Europe. Meanwhile, China has built up a 60% market share in primary aluminium production since.

A [2022 report](#) by the IEA confirms that China also dominates global solar PV supply chains across all stages of solar panel manufacturing (such as polysilicon, ingots, wafers, cells and panels).

Policy recommendations

- Make sure **stable and resilient supply chains are valorised at the EU scale**.. Sustainability initiatives are paramount to ensure green, sustainable aluminium is prioritised in solar PV manufacturing. The [Aluminium Stewardship Initiative](#) (ASI) and the [Solar Stewardship Initiative](#) (SSI) are key tools to foster sustainable value chains, and their value should be adequately recognised at the EU scale.
- Ensure a competitive advantage to **ESG-compliant products and increase resilience**. Public procurement initiatives such as non-price criteria in the Net Zero Industry Act are important to ensure green aluminium and use of related aluminium components for manufacturing solar PVs is rewarded. The European Solar PV Industry Alliance calls for applying non-price criteria to a small but growing segment of public auction and procurement commensurate to the scaling domestic solar production of at least 30GW by 2030.
- **Encourage innovation and experience**. The aluminium and solar value chain has the potential to decarbonise further but to reach this objective, it needs research and innovation support. EU-made aluminium already has the lowest carbon footprint globally, but to bridge the gap towards net zero, it needs adequate support. On the other side, the solar PV value chain needs adequate support to increase its efficiency.
- **Encourage appropriate recycling frameworks** – prevent increasing share of theft in the recycling process, retain scraps in Europe. Compared to primary production, recycling aluminium saves 95% of the electricity consumed. To reduce the carbon footprint of European aluminium, we need to ensure recycling is valorised in the EU. The IEA considers that aluminium recycling could provide up to 21% of the needs in aluminium for the solar PV value chain. It is paramount recycling is adequately valorised at the EU scale. In order to do so, the revision of the WEEE framework should target the solar sector in a specific category and create incentives to the recycling of high-value and strategic materials.