30/30 foresight

How will the European PV value chain up production x 30 to meet 30 GW by 2025?

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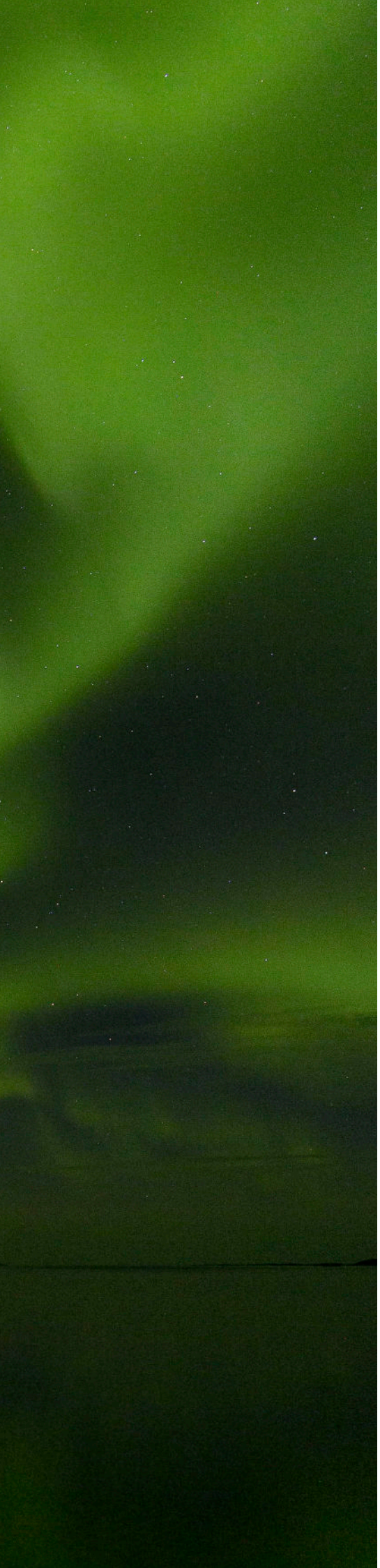

While the European demand for Solar PV soars, why hasn't the Solar PV industry raced forward to scale up? The conundrum is that European companies and investors face a high business risk in establishing a sustainable solar upstream manufacturing value chain.

Over the past two years, Norwegian Crystals has been providing thought leadership around the rebuilding of the European Solar Value Chain. In this article, we discuss the PV industry's mismatch to build at speed and scale, or what we have dubbed the 'capacity synchronicity challenge', and look at why European made PV-products need to demand a market premium, which then raises the issue of end users' willingness to pay. Finally, we ask, what market mechanisms could be used to stimulate investment and reduce risk across the entire value chain?

The European PV Value Chain created with speed and scale

Last year, EU solar GW installations increased by 47% from 2021. At the same time, we saw the EU solar trade deficit reach an average of €10 billion to €12 billion.[1]

Paradoxically, European demand for Solar PV is not a problem. However, as demand grows exponentially and outstrips optimistic forecasts, it exacerbates Europe's dependency, currently 100%, on China to provide the necessary systems[2] for solar power.

Rebuilding, or rebooting, the European PV-industry potentially provides enormous rewards at a geopolitical and macro / micro-economic level, including reducing energy vulnerability whilst increased energy autonomy, stability and resilience and control over strategic, critical materials for energy transition. It will also improve transparency of a fully compliant ESG PV supply chain and reduce emissions in the manufacturing and transportation of PV components. In addition, it can create a profitable, sustainable European Solar PV industry, which leads to increased European jobs, taxes and energy competences.

To achieve the EU ambitions, a complete value chain of 30 GW by 2025, the European PV value chain must build from its low base at speed and scale. Figure 1, which shows the gap between 2022 production and the 2025 target, highlights the massive challenge and enormous opportunity to manage this expansion properly and execute at speed.

1 https://www.pv-magazine.com/2022/12/29/european-solar-manufacturers-need-state-aid-exemptions-now/

2 At the time of writing this article, China is considering restricting exports of key solar manufacturing equipment

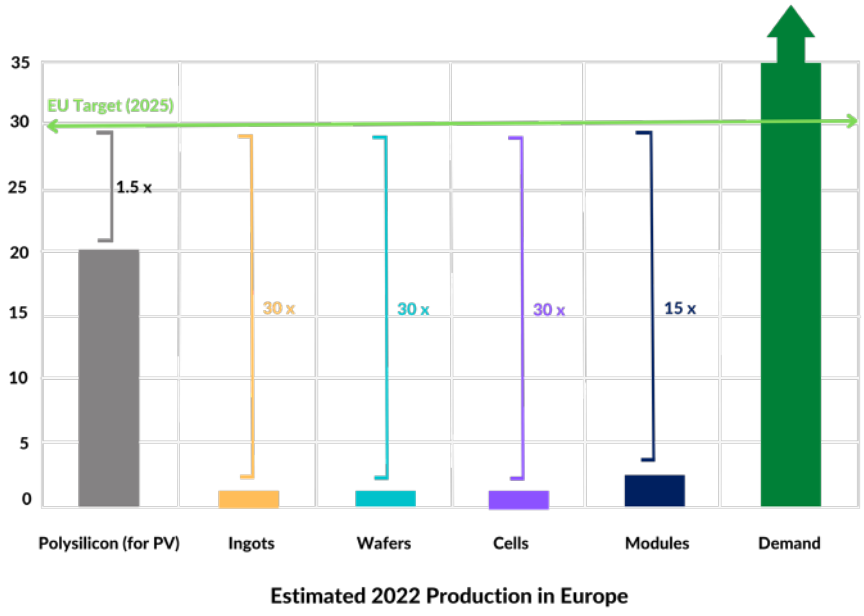

Figure 1: European production v target v demand. To achieve the EU ambitions of a complete European value chain of 30 GW by 2025 requires a CAPEX of EUR 10~15 billion, similar to the 2022 PV-trade deficit

The capacity synchronicity challenge

As each part of the European Solar PV value chain races to scale production to facilitate efficiencies, higher offtake is required. Significant risk and uncertainty in offtake along the value chain leads to inefficiencies, as manufacturers seek large advance payments to secure customers' offtake obligations and bolster their capital expenditures. It becomes very difficult to synchronize and integrate capacities along the value chain while growing from 'nothing' to 'significant' over a short time span.

For example, European upstream products may be sold to Asia rather than within Europe because of mistrust in the European PV industries ability to secure their offtake. Also, we see European companies not returning to PV-equipment manufacturing due to uncertainties of economics and timing.

Innovating alongside building with speed and scale

The core technology of PV is relatively mature, but there are opportunities to innovate, including technical efficiency improvements, embedding circularity design and lowering the industry's environmental footprint.

Drawing from the lessons of the European PV industries' past failings, the focus of the PV value chain in the short term will be building at speed and scale a modern, competitive industrial platform. To realize its potential requires a full-scale, integrated industrial platform. Inserting new innovations into the platform during this period could potentially exacerbate the capacity synchronicity challenge.

European Government's focus, and placement of grants, on European PV innovation is not likely to help scale at speed, as industry needs to utilize existing technologies and then adapt.

Do European made PV-products need to demand a market premium?

For the European PV value chain to 'walk the talk' and meet the expectations of government and the public, the highest standards of ESG across the PV value chain are required. This includes compliance to environmental standards and human rights including no forced labour, low CO_2 manufacturing and embedding circular economy and circular manufacturing principles. These requirements do increase costs along the supply chain.

Compared with Chinese and USA power prices, the European PV industry operates on a playing field that is simply not level. The result: European PV companies have little available access to competitively priced electrical power resulting in higher operations costs and less competitively priced solar modules.

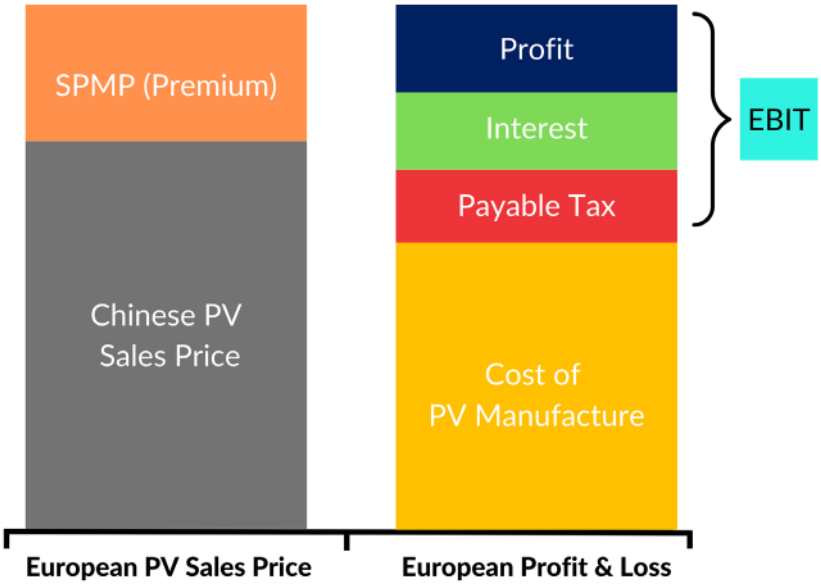

Figure 2: A solar PV market premium (SPMP): creating a level playing field

To create a sustainable, vibrant European Solar PV industry and achieve the rewards detailed above, it is essential to generate an appropriate profit. Figure 2 highlights that for the industry to achieve this, it requires a Solar PV market premium (SPMP).

A premium and therefore access to profits will be essential to provide attractive returns on private capital, equity as well as debt, and thus incentivize lenders and private investors to invest into the European PV-chain at an early stage. It is also needed to facilitate and justify initial public support, grants, loans and guarantees, attract talent and to afford to generate employment, competency and skills. It will also help manage the higher cost of running a production based on modern worker welfare in comparison to the 996 working hour system.

There are a number of considerations for the introduction of a SPMP, including how large and for how long should it be in effect? Manufacturers can't fall into the traps of the past and rely on subsidies to underwrite their operations.

Who ultimately is responsible for the SPMP? Whether the government underwrites or the end user pays, the challenge downstream is the European customer has no incentive to buy higher priced PV modules.

Two key areas that appear to be consistent amongst the PV chain manufactures is the need for a strategy that supports the whole PV manufacturing eco system not just module manufacturers or those in the innovation arena and the need to avoid the 'subsidy trap' that impacted the industry 15 years ago.

Stimulating investment and reducing risk in the European PV value chain

ESMC in its report PV Manufacturing Lessons Learned in Europe stresses the 'European PV manufacturing industry has enormous growth potential, but without the operationalization of some support instruments without delay this potential could be irreversibly wasted.'[3]

Whilst there is strong interest from private capital to invest in European Solar PV, it is unlikely to happen without broad EU support to mitigate some of the key risks in achieving speed and scale throughout the value chain.

Numerous solutions are being discussed, including the recently established European Solar PV Industry Alliance which is seeking an extensive support program for the European PV manufacturing industry. More details on their strategic action plan are available at solaralliance.eu

The recent announcement of the Green Deal Industry Plan and the establishment of an 'EU Sovereign Fund' may be able to direct these funds into current renewable investments.

One solution Norwegian Crystals has been deliberating alongside other European manufacturers is the establishment of a hybrid Contract for Difference Market Mechanism. This could operate to calibrate the price premium to ensure competitive European PV manufacturing. Enabling stable production at high-capacity utilization: the key to driving down costs.

There are two aspects to this European PV Market Mechanism (EPvMM) program.

3 esmc.solar/market-intelligence/

Firstly, SPMP addresses how the volume, and hence the cost to the Government, may be controlled by giving the program a budget limit to manage the Solar PV market premium.

This could be structured as a CFD-scheme in that the PV Market Mechanism entity enters into a contract with each PV manufacturer on a negotiated guaranteed price for their off take. The seller negotiates with their customers to agree on a price. If the buying and selling price deviates from the guaranteed price, the seller will receive and pay the difference from or to EPvMM.

Secondly, an Upstream Inventory Buffer. This is a mechanism to provide synchronicity between selling and buying capacity as production comes online. The cost to the Government could be controlled by restricting the volume of inventory or value that the EPvMM may hold at any time. The focus of the EPvMM would be in the upstream value chain polysilicon, ingot and wafer manufacturing as downstream, the European PV-installations/demand outweighs European module manufacturing.

It would make sense to align and scale the budget to facilitate the EU ambitions: 30GW/y production by 2030.

Conclusion

There is strong interest from private capital to invest in Solar PV as the cheapest form of renewable energy available currently and for the foreseeable future. However, it will not happen without broad EU support to mitigate some of the key risks in achieving speed and scale throughout the Solar PV value chain. Any supply disruptions to source PV products will lead to a quasi-immediate stop of deploying solar power in Europe. Europe does not have any resilience against such a sourcing crisis.

Public initiatives in cooperation with European industry can make this happen, but it will require bold, focused, coordinated and consistent action over time. Perhaps an essential ingredient here is to learn from the past and collaborate towards a strong, positive vision.

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European PV Market mechanism (EPvMM)

Upstream polysilicon manufacturers use the EPvMM to justify selling products to European market. When monosilicon ingot/wafer manufacturing increases and consistent polysilicon demand volumes are sufficient the Upstream Inventory Buffer mechanism for polysilicon could be phased out. When demand for ingot/wafer from European cell manufactures reaches 15 GWp the market mechanism could then be phased out at this point.