

# Coûts des composants photovoltaïques : évolution et perspectives

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**BECQUEREL  
INSTITUTE**

# Becquerel Institute at a glance



- Est. 2014 in **Brussels, Belgium**
- Est. 2022 in **France**
- Focused on **solar PV and its related ecosystems** (storage, electro mobility, buildings)



Strategy Consulting



Applied Research



Support to international organizations

## Project Developers



## Manufacturers



## Associations



## Research projects



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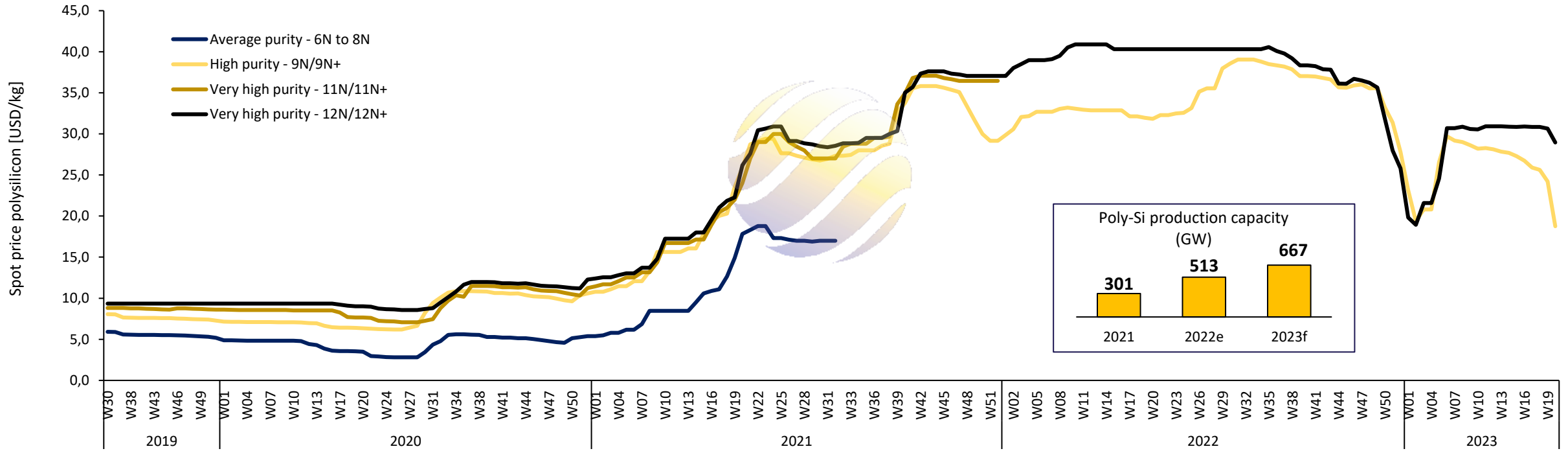
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# 1 | Key trends across the PV value chain

## Polysilicon global spot prices reached record levels in 2022 with more than 40US\$ per kg, but are back on a decreasing path, as production capacities come online

Weekly evolution of PV polysilicon average spot prices on the global market



Combination of factors:

- COVID-19
- Container shortages
- Factory fire/floods
- Logistic issues

- Increase is also the result of **panic buying** by wafer, cell, and module manufacturers

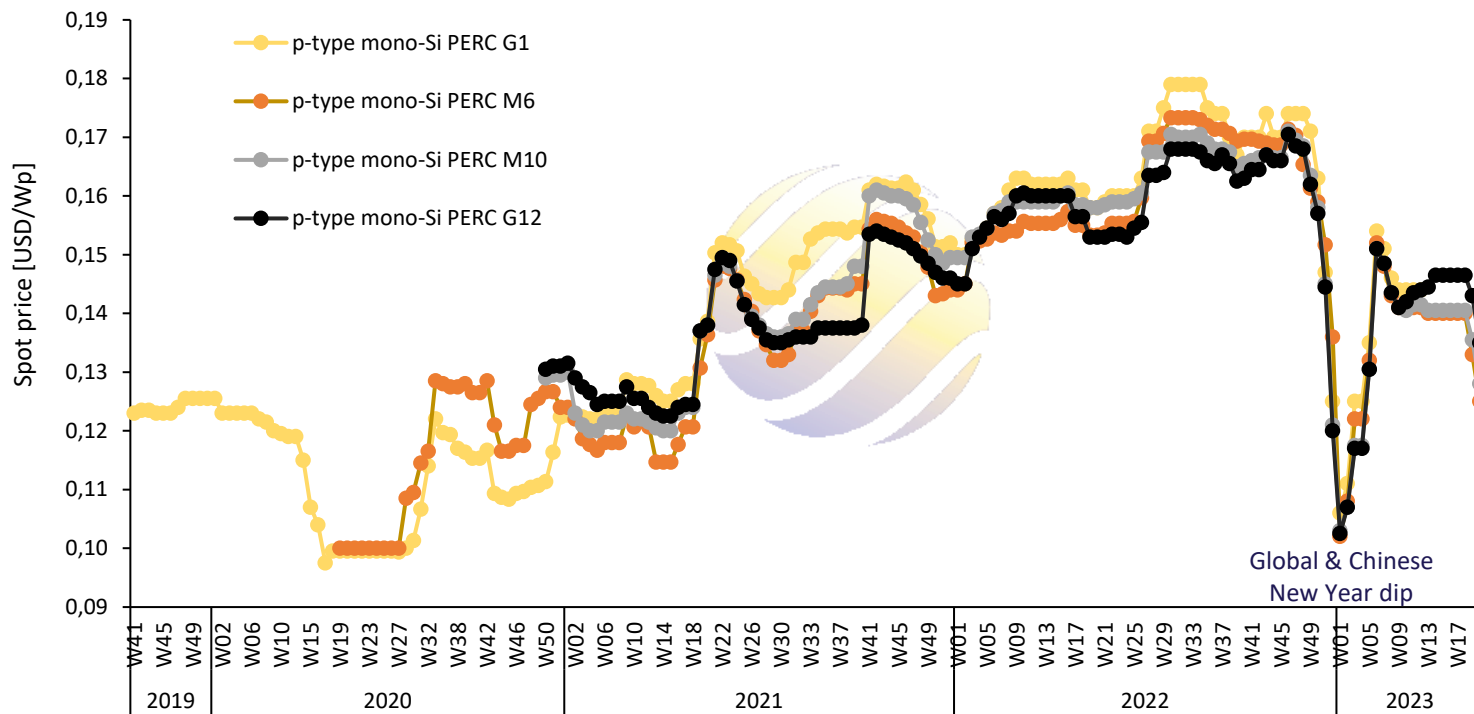
- Shortage of polysilicon supply
- Producers of polysilicon are attempting to expand their capacity
- But setting up new production lines and factories takes time

- Dip due to end of year and Chinese New year
- Transport prices' decrease reinforcing an already strong demand
- Increasing production capacities leading to **oversupply**

# 1 | Key trends across the PV value chain

## PV cells' global spot prices followed the same trend as polysilicon, and prices remain high even if they should soon be back on levels comparable to 2020/2021

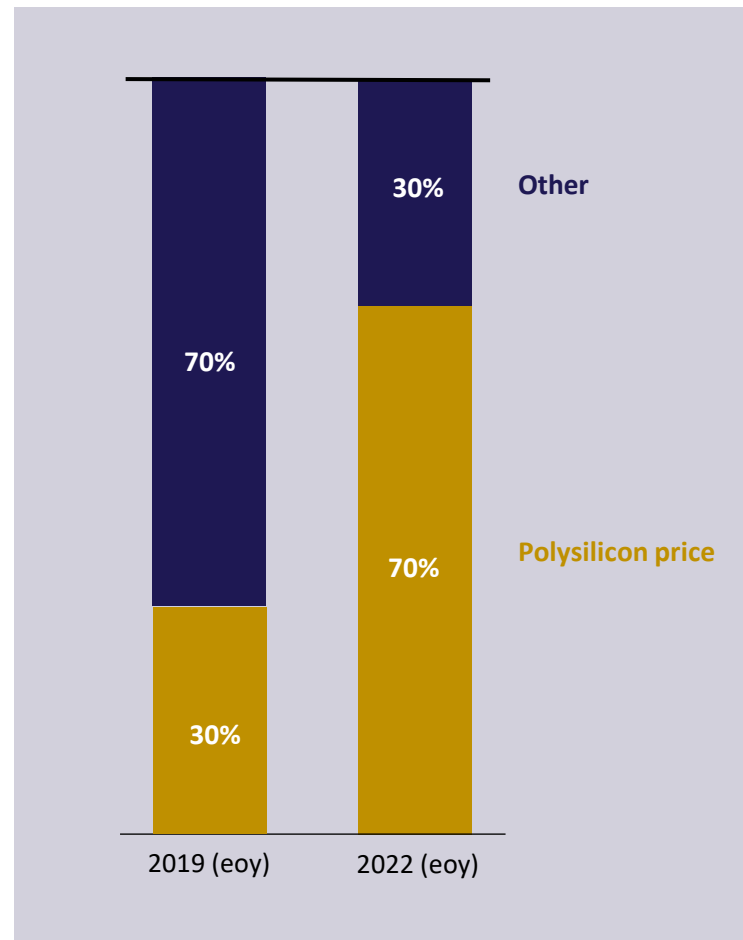
Weekly evolution of PV cells average spot prices (in USD/Wp) on the global market



Since the gradual resumption of post-pandemic activity, prices have risen slightly to over **0,16 US\$/Wp**

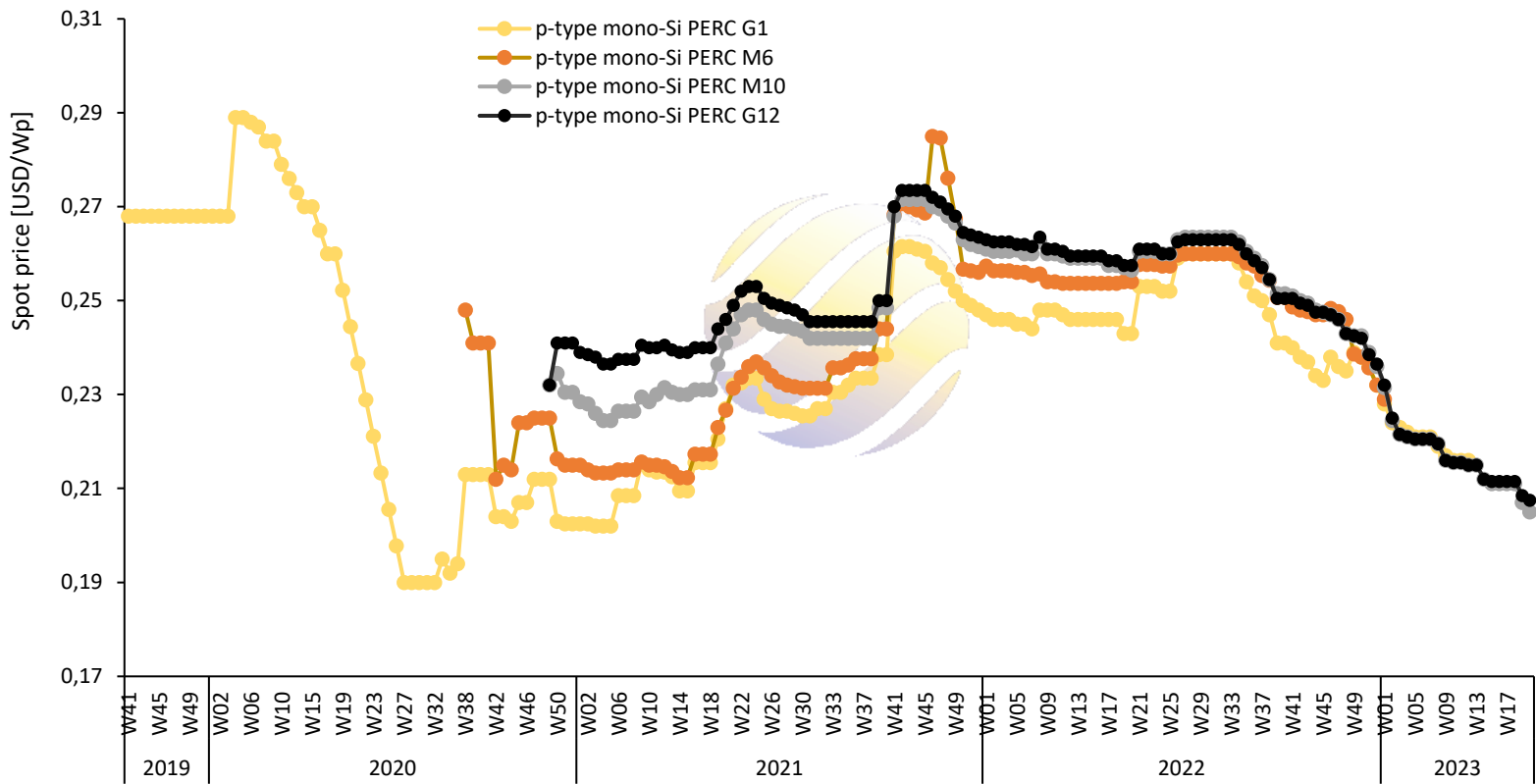
Downward trend ( $\approx$  **0,13 US\$/Wp**), to be confirmed in the coming weeks. Demand remains very strong, and the supply has not yet caught up

Poly-Si represents over two thirds of cells' spot prices



# Global modules' spot prices have been more stable and decreasing since Q3 2022, a trend that has been accelerating since early 2023, pushed by upstream movements

Weekly evolution of PV modules average spot prices (in USD/Wp) on the global market

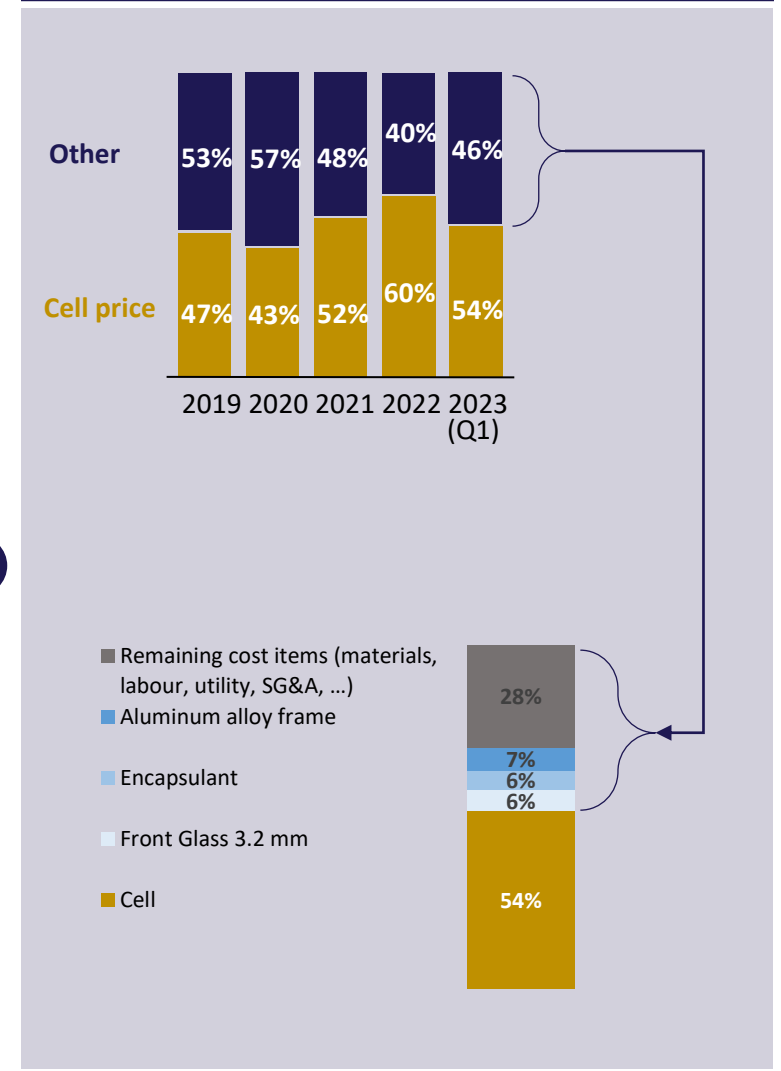


Module spot prices have tended to homogenize for the different cell sizes

Prices have been fairly stable between Q4 2021 and Q3 2022, at around 0,25 US\$/Wp

Downward trend (around 0,21 US\$/Wp) should continue, possibly slowing down.

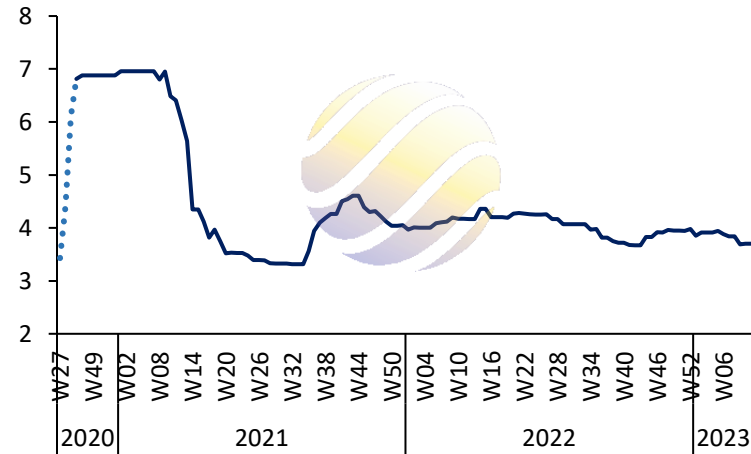
Key drivers and influencing factors for cells' spot prices



## 2 | Focus on PV modules

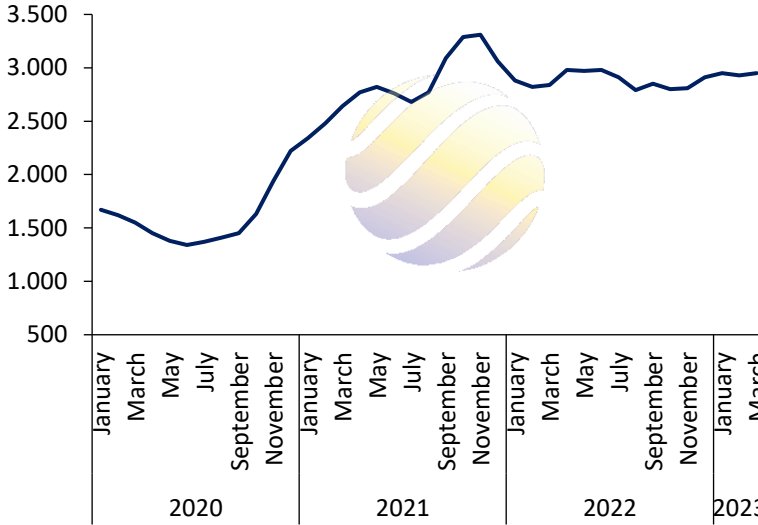
# Solar glass and EVA prices, two crucial components to manufacture PV modules, remain high and are not likely to decrease any time soon

Weekly evolution of PV glass (3.2mm), in USD/m<sup>2</sup> average spot prices on the global market



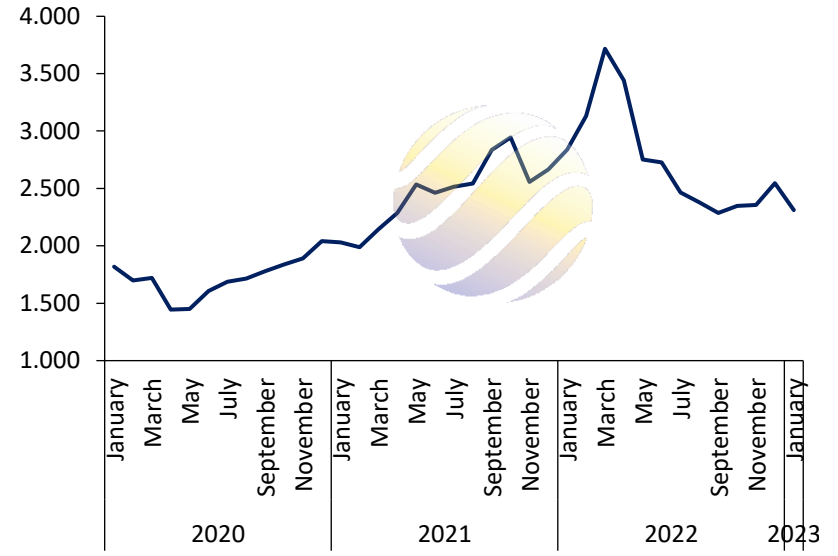
- China alleviated the quota on glass production around December 2020
- PV glass spot prices have been decreasing and are now back to their 2019-level.
- However, the increasing demand for larger PV modules and for bifacial modules will continue to **put the pressure on suppliers, who struggle to follow up.**

Weekly evolution of EVA, in USD/Mt average spot prices on the global market



- End of 2021, bump in EVA spot prices was due to raw materials prices increase.
- Prices have now stabilized prices, although at a high level.
- **Supply/demand imbalance** is looming, as new production capacities are not coming online fast enough

Weekly evolution of aluminum, in USD/Mt average spot prices on the global market



- End of 2021, bump in aluminum spot prices was due to raw materials prices increase.
- After a peak in early 2022, prices have now stabilized prices, although at a high level.

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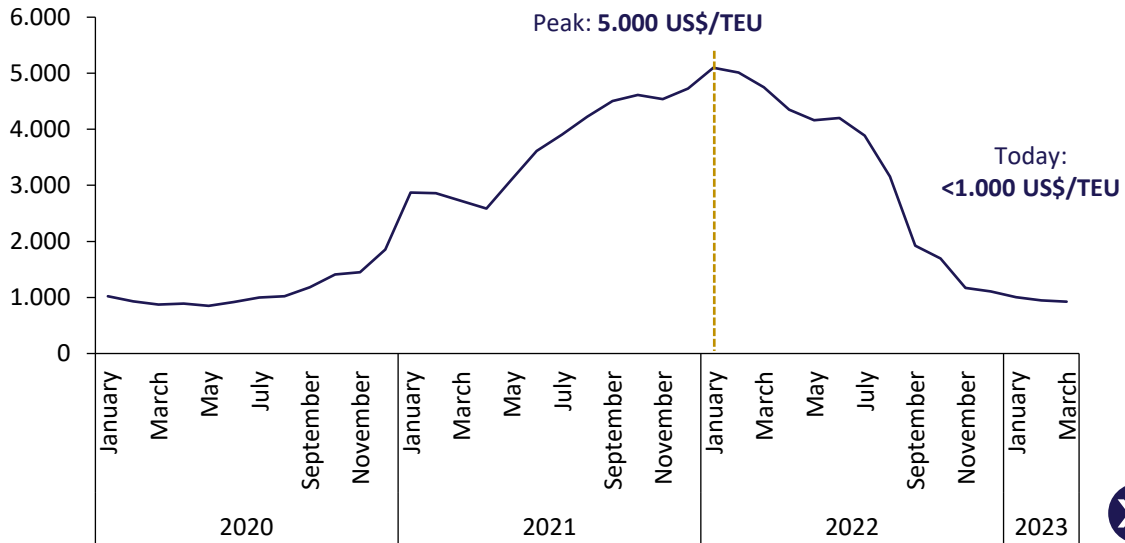
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## 2 | Focus on PV modules

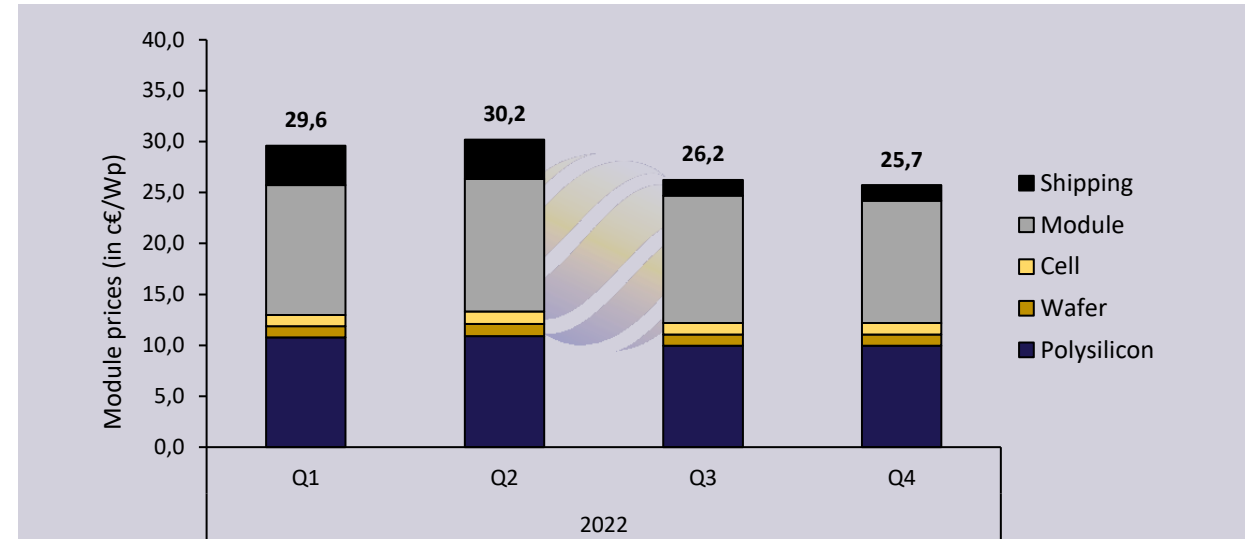
Module prices in Europe are decreasing as shipping costs and polysilicon prices have been decreasing, but the pace is slower than at global level

### Evolution of the Shanghai Export Containerized Freight Index (SCFI) (in US\$/TEU\*)

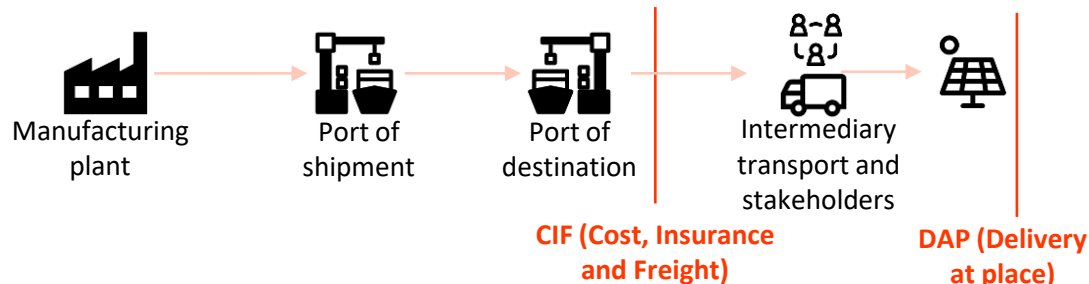
\*TEU: Twenty-foot equivalent unit



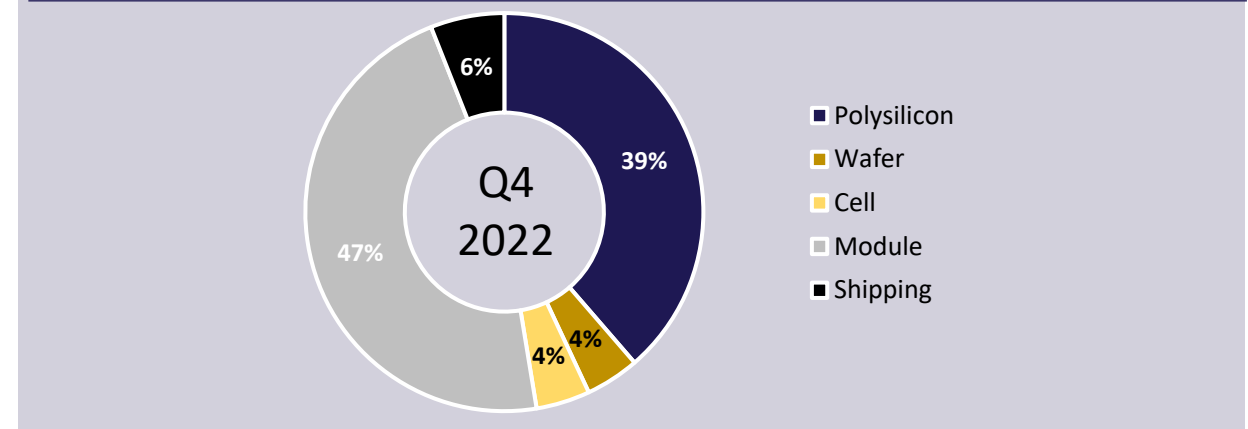
### Recent evolution of CIF prices for mainstream PV modules in Europe (utility-scale)



### How to understand price perimeters



### Breakdown of CIF price in Q4 2022



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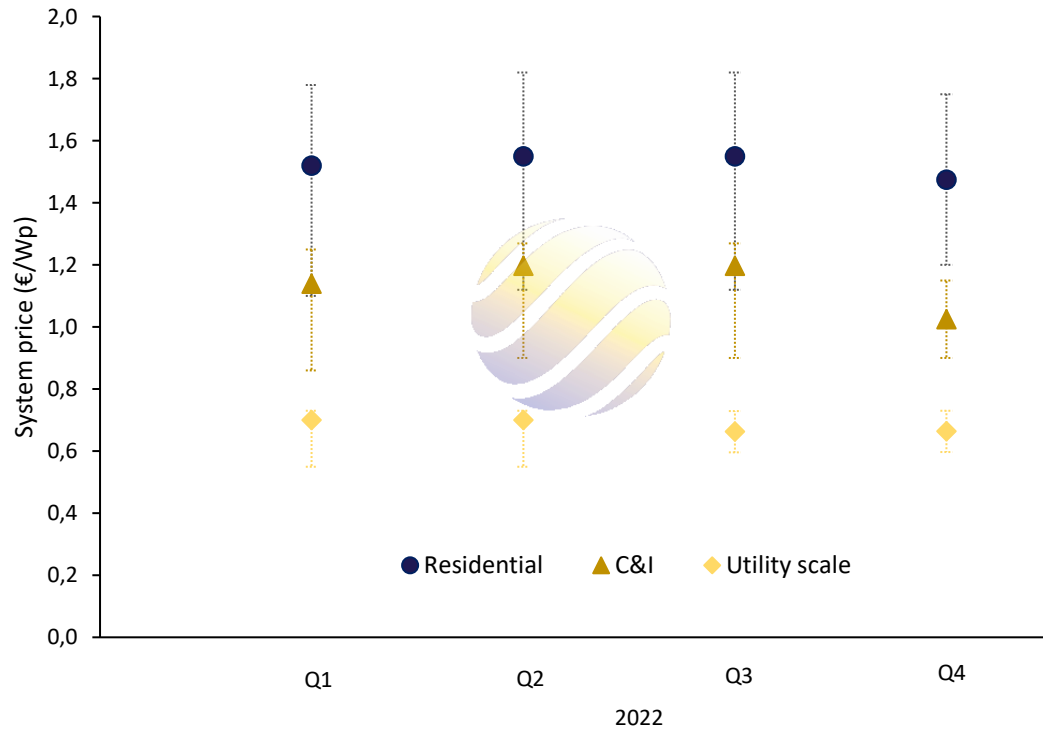
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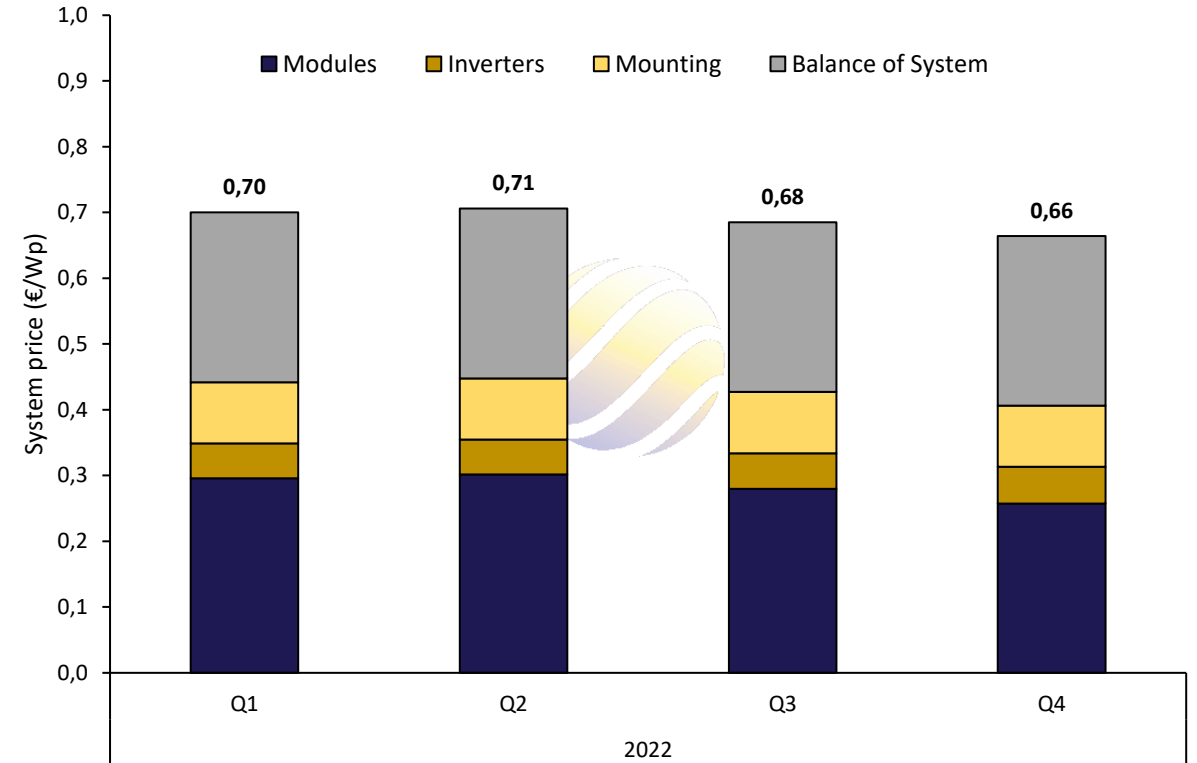
### 3 | A look at PV Systems

System end-user prices show large variations across Europe and bumped in early 2022, especially in the distributed segment, but have been decreasing since then

Evolution of average end-user price per segment in Europe (with ranges)



Evolution of average end-user system price in Europe (utility-scale)



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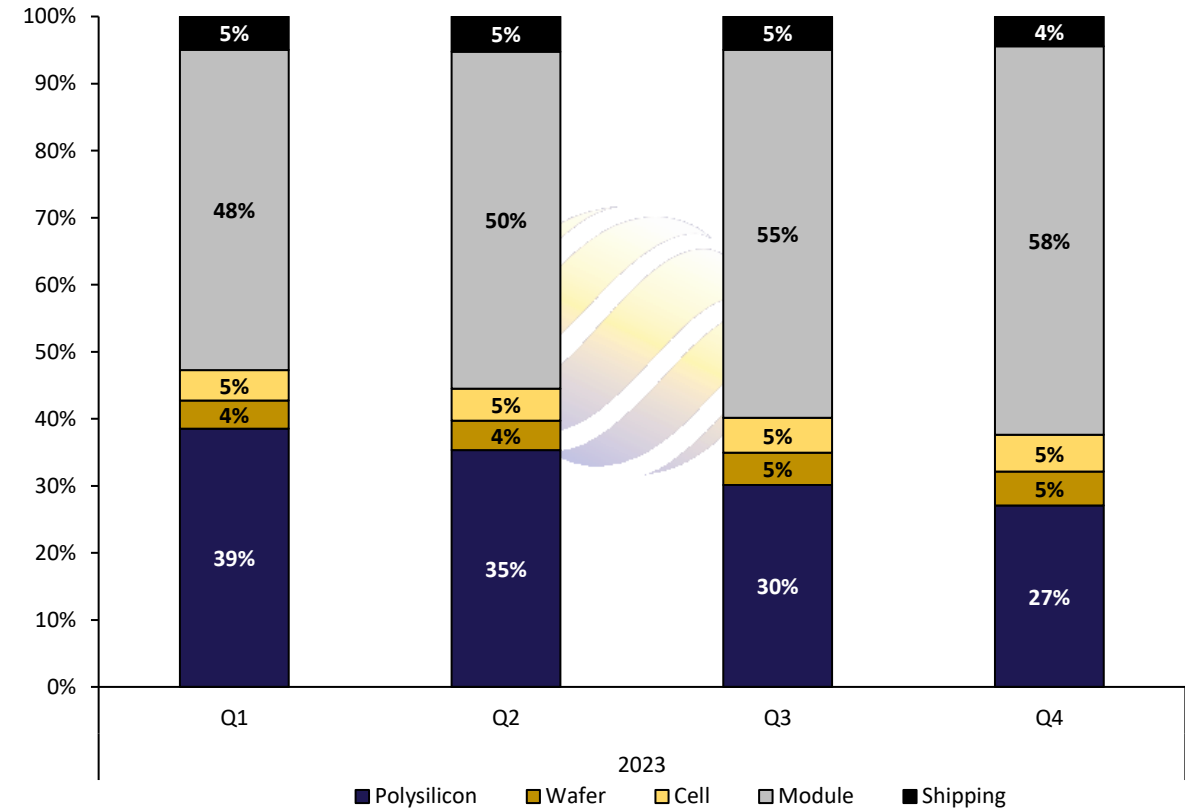
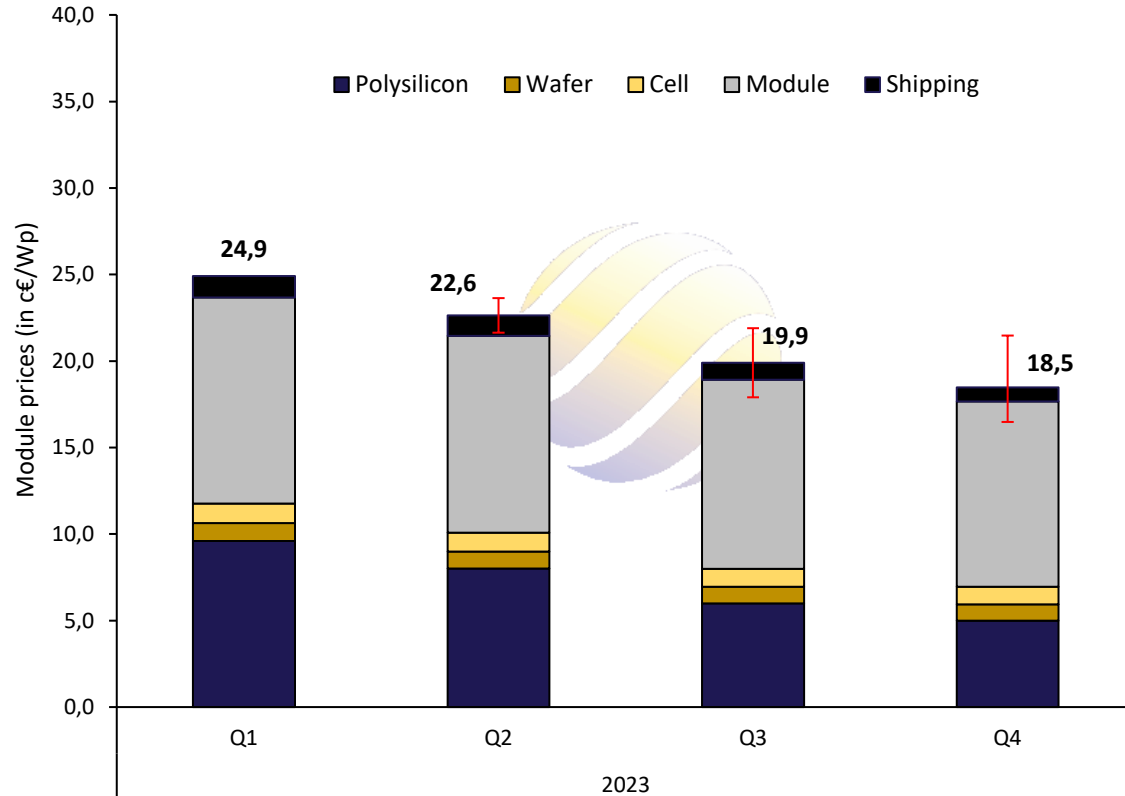
**3** | A look at PV systems in Europe

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## 4 | Outlook

Module prices should keep on decreasing, pushed by the rapidly diminishing prices in of polysilicon, reaching less than 0,20 €/Wp by the end of the year

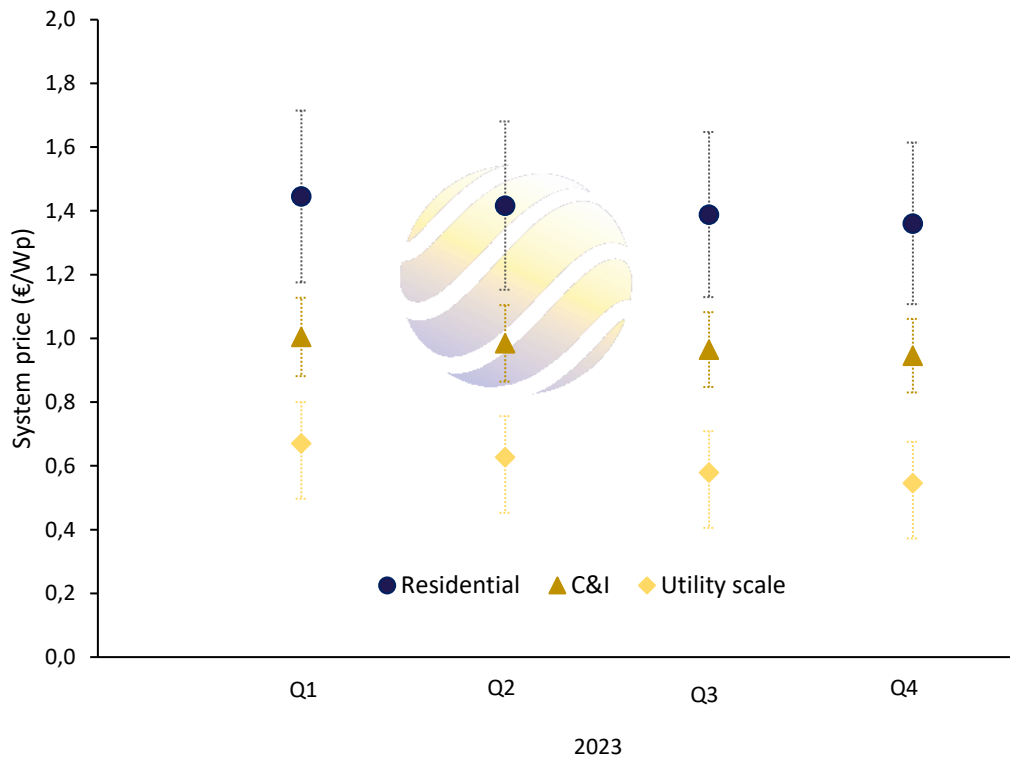
Estimated evolution of mainstream PV modules average CIF prices and price structure in Europe (utility-scale)



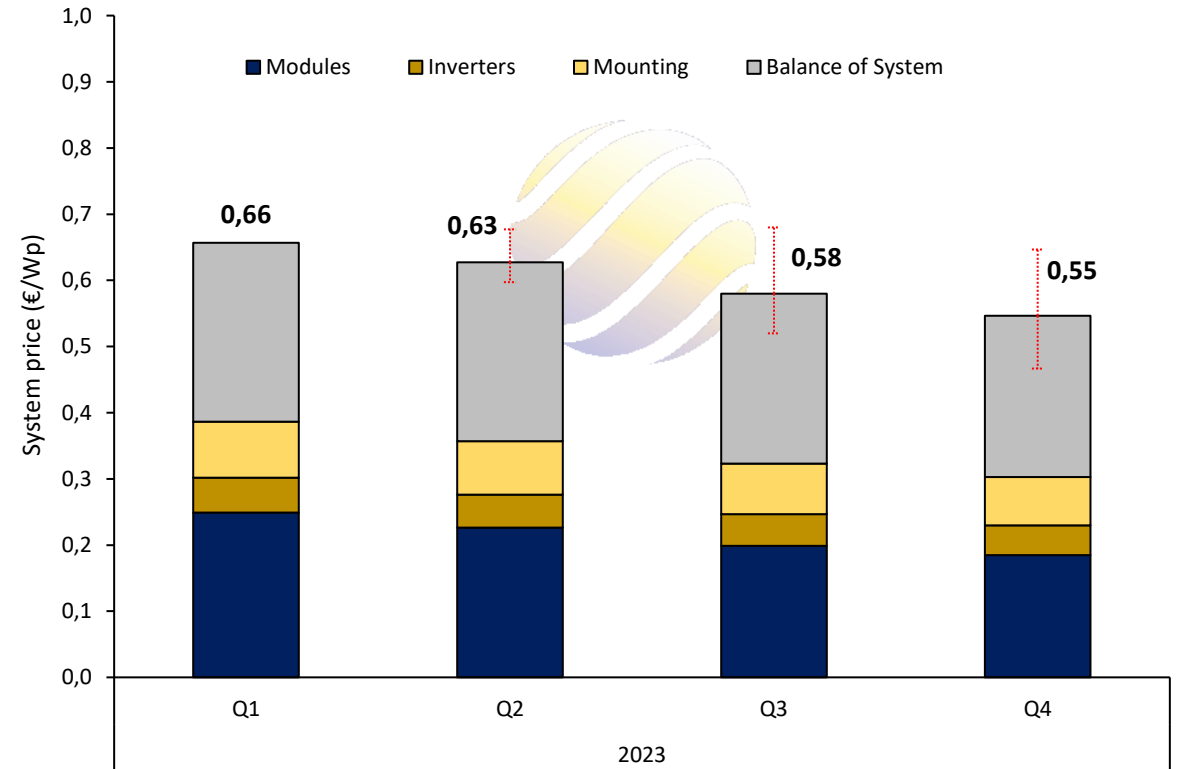
## 4 | Outlook

System end-user prices should follow the decreasing trend initiated by modules, but the pace should be more limited, as other cost items' prices remain high

Evolution of average end-user price per segment in Europe (with ranges)

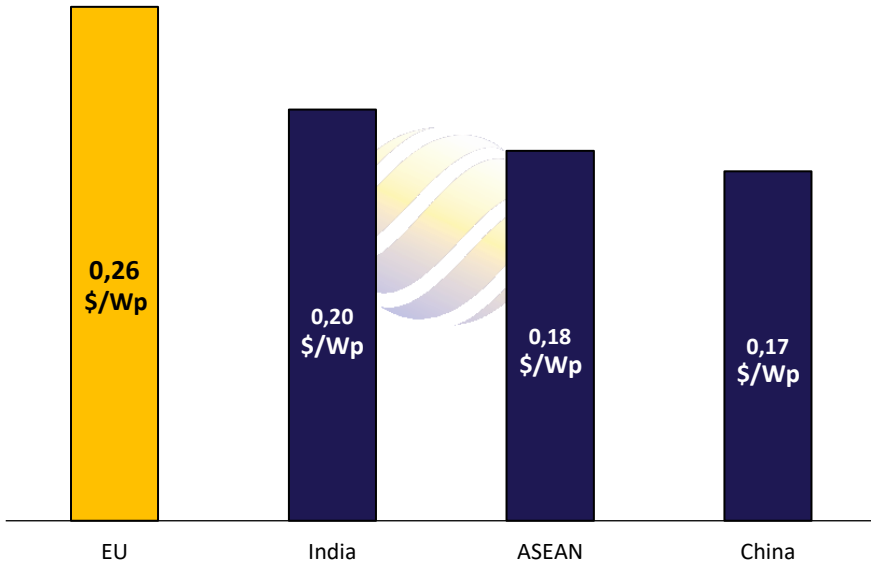


Evolution of average end-user system price in Europe (utility-scale)

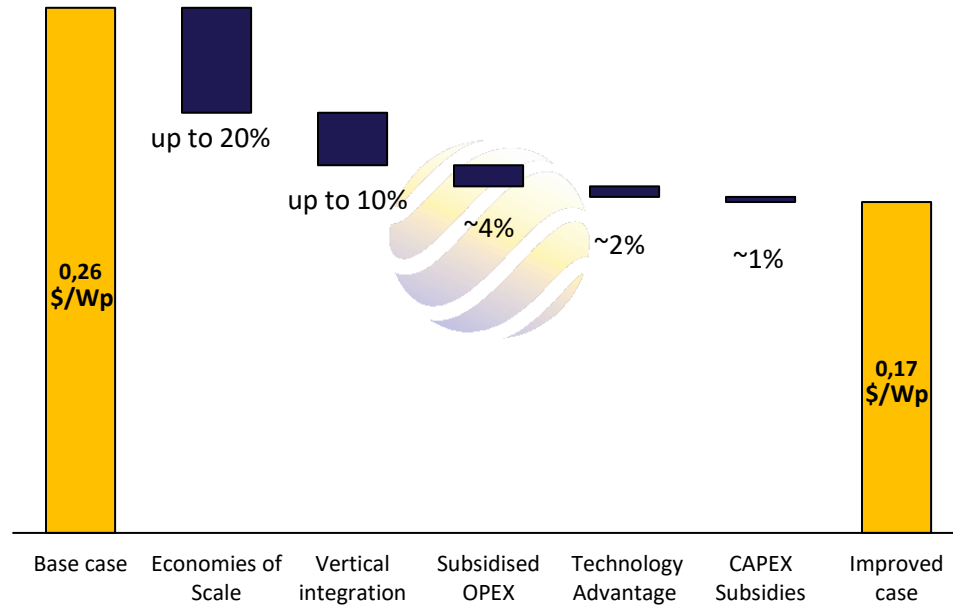


# Future locally produced solar PV components could compete with imported ones, under certain conditions, on a value-based basis rather than a cost-basis

Today's best-in-class production costs of PERC modules



How to reduce the gap?



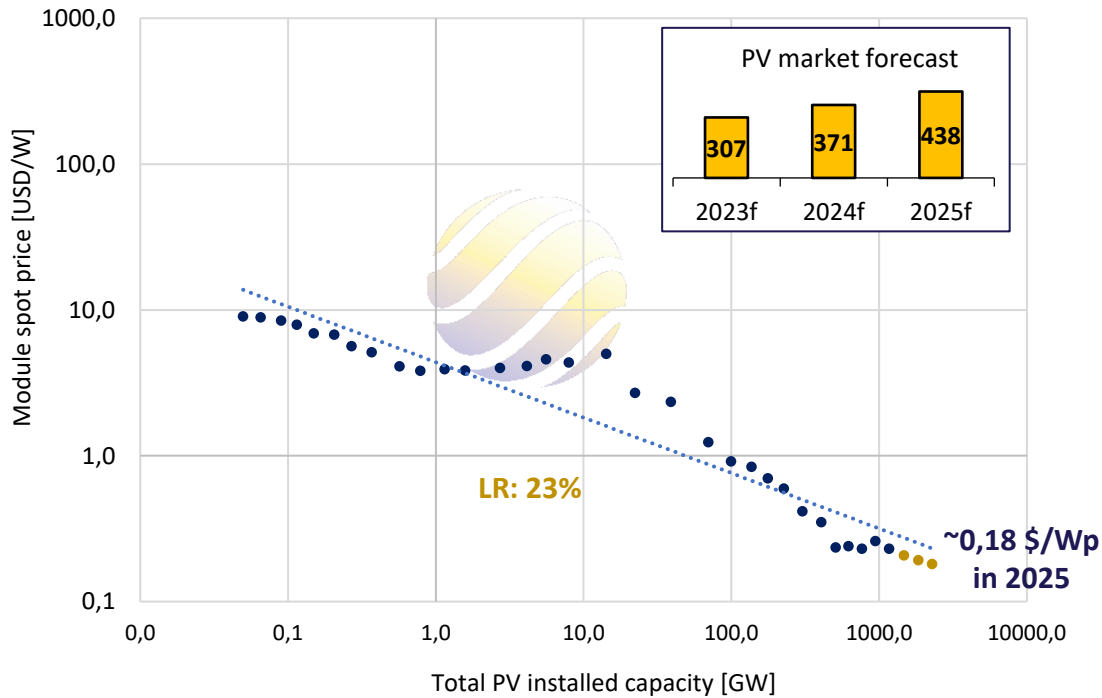
Value-based approach

- Low environmental footprint
- Locally-made
- Improved social standards
- Better traceability
- Higher security of supply

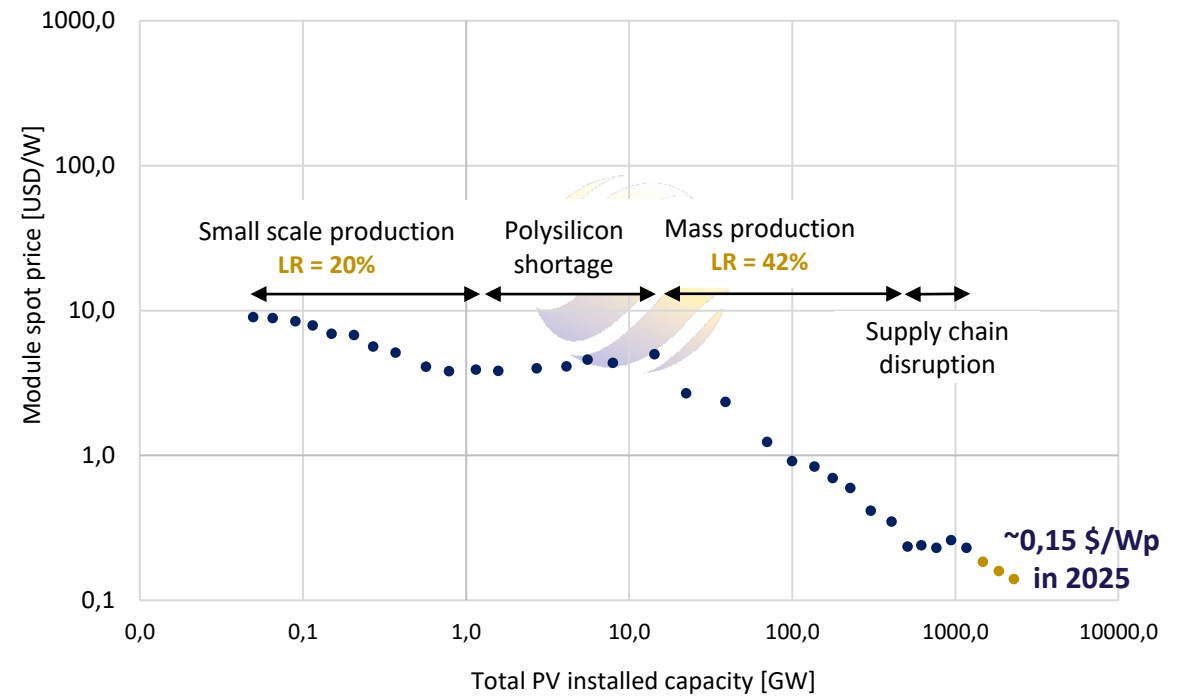
## 4 | Outlook

In the medium term, the average spot prices of PV modules should keep on decreasing, reaching 0,18 US\$/Wp in 2025, possibly even going as low as 0,15 US\$/Wp

Single rate learning curve of PV modules' spot prices (1992-2025)



Multi-rate learning curve of PV modules' spot prices (1992-2025)



# Key takeaways on PV prices

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- 1 The PV sector is back on a **path of decreasing prices**, pushed by massive **expansion of production capacities**, in particular at polysilicon stage
- 2 Module prices are decreasing as well, although the pace of this **diminution is more moderate because of other price components (solar glass, EVA, silver)**
- 3 By the end of 2023, prices of **mainstream modules** (delivered in Europe) should stand **below 0,20 €/Wp for large buyers**
- 4 At **system level**, the cost of BoS remain high and will decrease slowly, as **tensions persist in the supply chain** (e.g., inverters)
- 5 Local PV production could be competitive only **if all levers are activated simultaneously and rapidly...** BUT should rather aim at competing on a **value-based basis rather than cost-basis** with Asian manufacturers

Thanks for your attention

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Q&A



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