PV MANUFACTURING IN EUROPE

Statements

Andreas W. Bett

Fraunhofer Institute for Solar Energy Systems ISE

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Status Quo

Current European c-Si PV Manufacturing Landscape

- Feedstock Si in Iceland, Norway and Germany
- Silicon/wafer production in Scandinavia/France
- Distribution of small module production plants
  < 500 MW/a capacity
- Almost no cell production capacity

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The 10 GW GreenFab

Take the Challenge and Make Business

- 10 GW_p fully integrated production in Europe is competitive
- **Cost advantages >10 %** due to reduced logistic costs
- Production with **less CO_2 emission**
- Strong growing European PV market

For more see: https://www.ise.fraunhofer.de/en/renewable-energy-data.html

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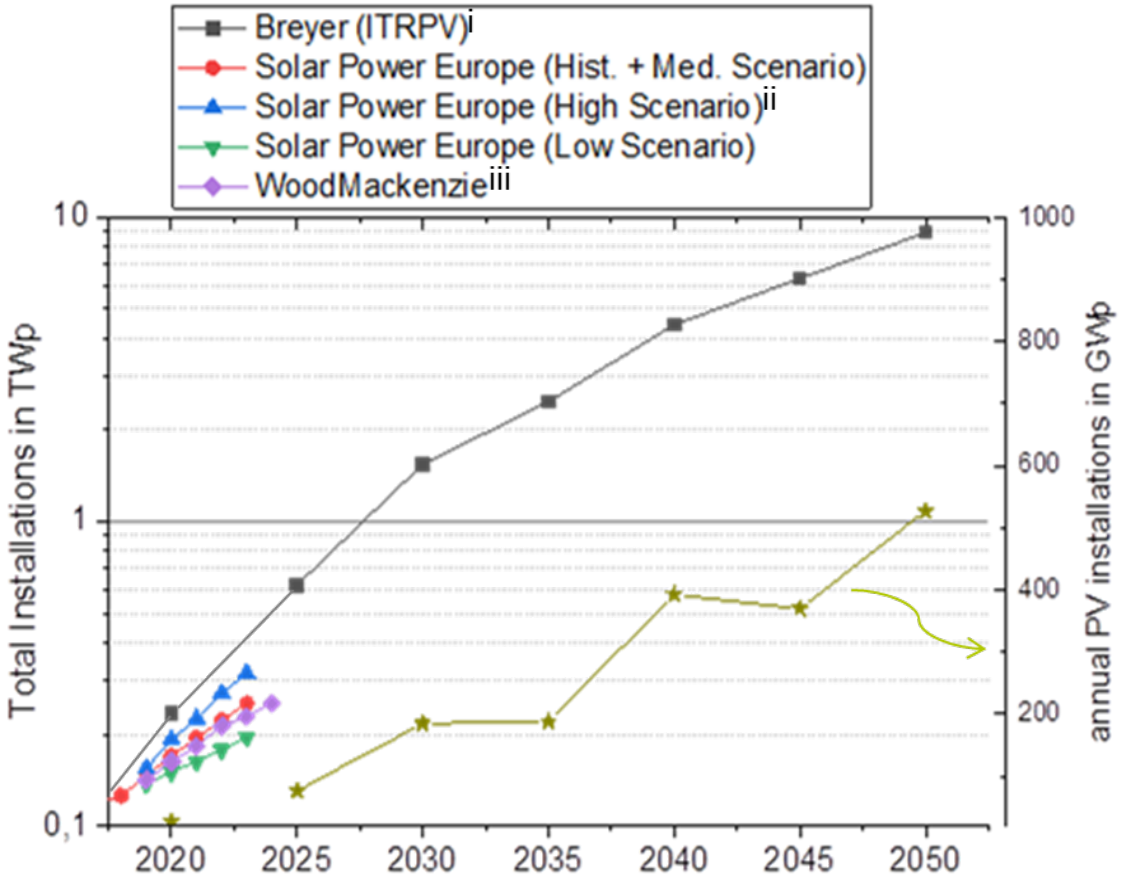
More: tomorrow, Tuesday 11:00, Solar Industry Foum

Growth of the European Photovoltaic Market Expected!



- Example: Scenario by Solar Power Europe
  - Strong market growth already in 2019
  - Future growth to more than 30 GW/a in 2023 and 200 GW/a in 2030
- Drivers
  - Binding national targets for renewables in many EU-28 countries
  - Strong price decrease due to the restructuring of the Chinese market
  - Activities of utilities, corporates, and big funds in Europe who invest in PV as both the lowest cost and most versatile energy generation source

i: Energy Transition in Europe, LTU and EnergyWatch group, 2019, ii: SolarPower Europe Global Market Outlook 2019, iii: Wood MacKenzie, Europe solar PV outlook, 2019

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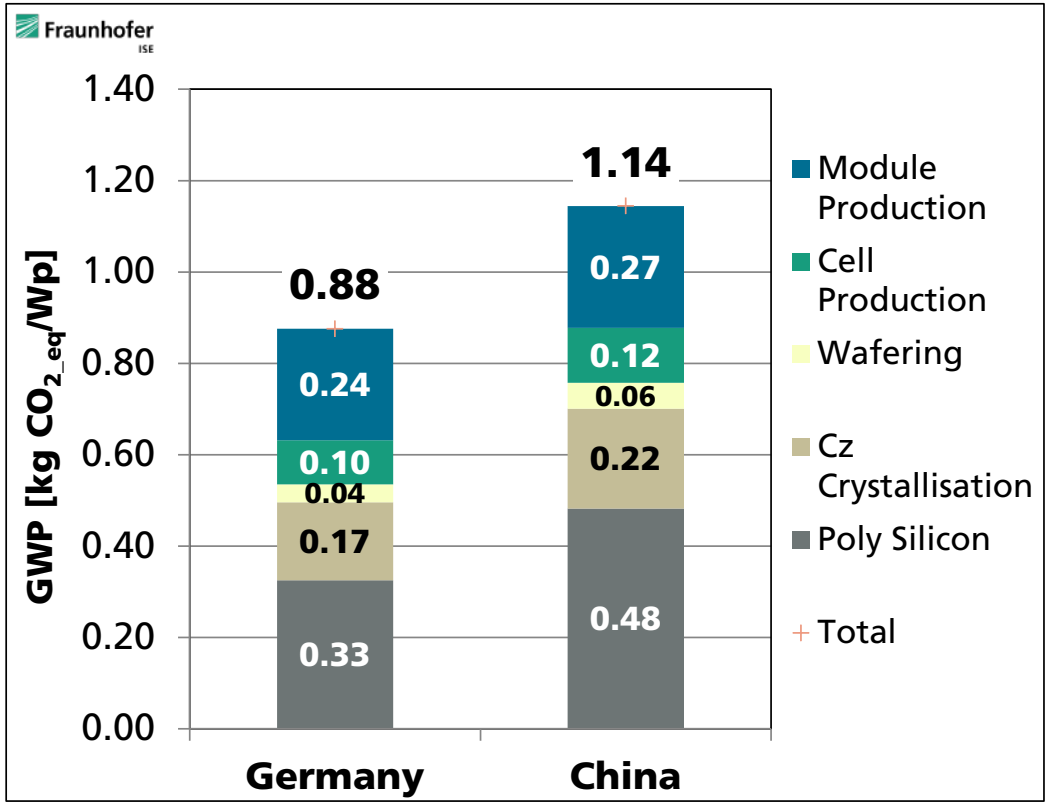
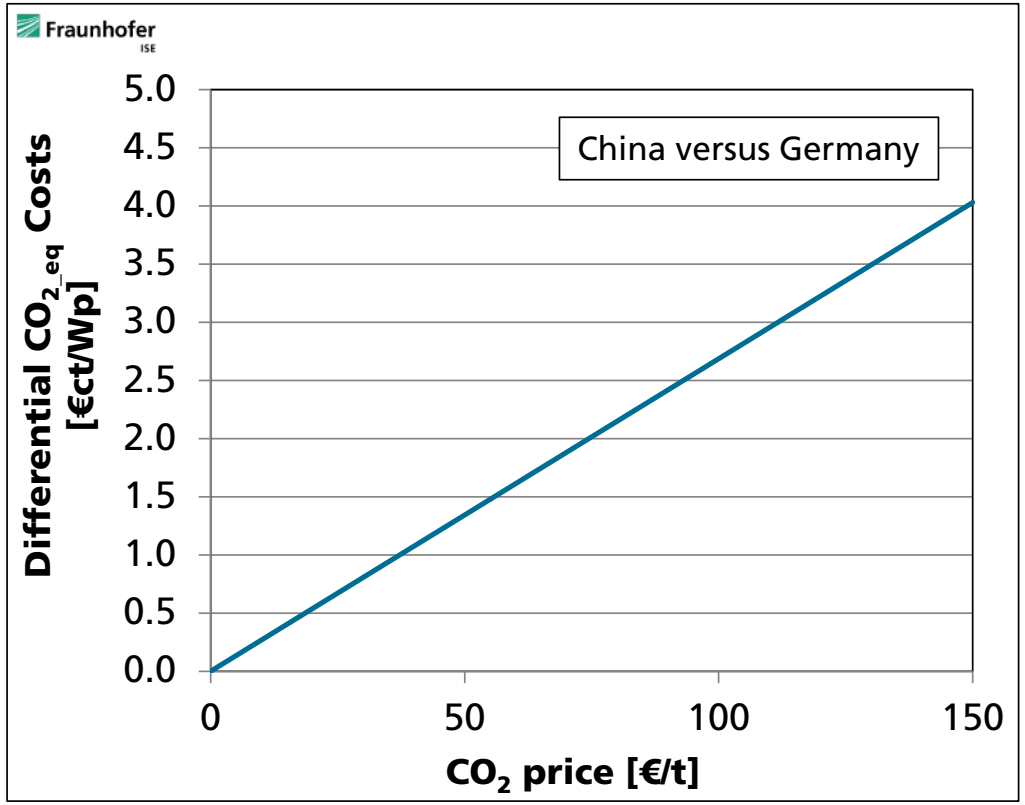
Carbon Emissions of PV Production and Effects of a Carbon Pricing

Scenarios: Germany and China



Carbon footprint of a Cz PERC glass-backsheet module production*



CO_2 cost difference of a Cz PERC module production located in Germany compared to China.

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Costs for Logistics Becomes Notable!

More than 10% of Full Delivery Costs!

Up to 3 €ct/W transport cost & CO_2 emission

Production cost 2022: ~ 20 €ct/W

https://de.wikipedia.org/wiki/Containerschiff#/media/Datei:NYK_Virgo_(8154929586).jpg

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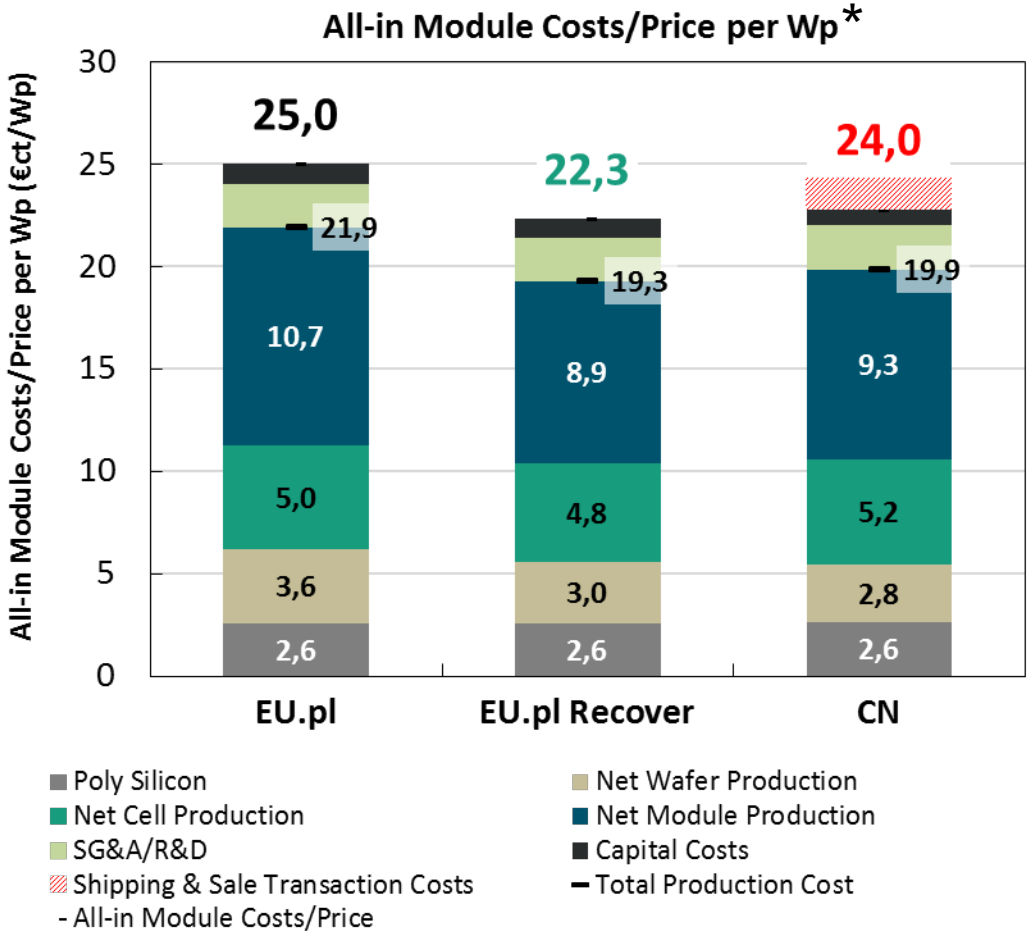
Cost Comparison of Module Manufacturing Europe versus China
Calculation of Full Manufacturing Module Costs

- Comparision costs for module manufacturing assuming a 1 GW_p manufacturing capacity
  - Manufactured in China (as reference scenario)
  - Manufactured in Europe with today´s European material supply chain (EU.pl)
  - Manufactured in Europe with adapted European material supply chain (EU.pl Recover)

→ **local manufacturing opens opportunities**



*Ref: J. Rentsch, et al, *Competitiveness of a European PV manufacturing chain*, Photovolt. Int., Vol. 43, p. 29-35, 2019

More: Friday 2EO1.1, P. Fath et al

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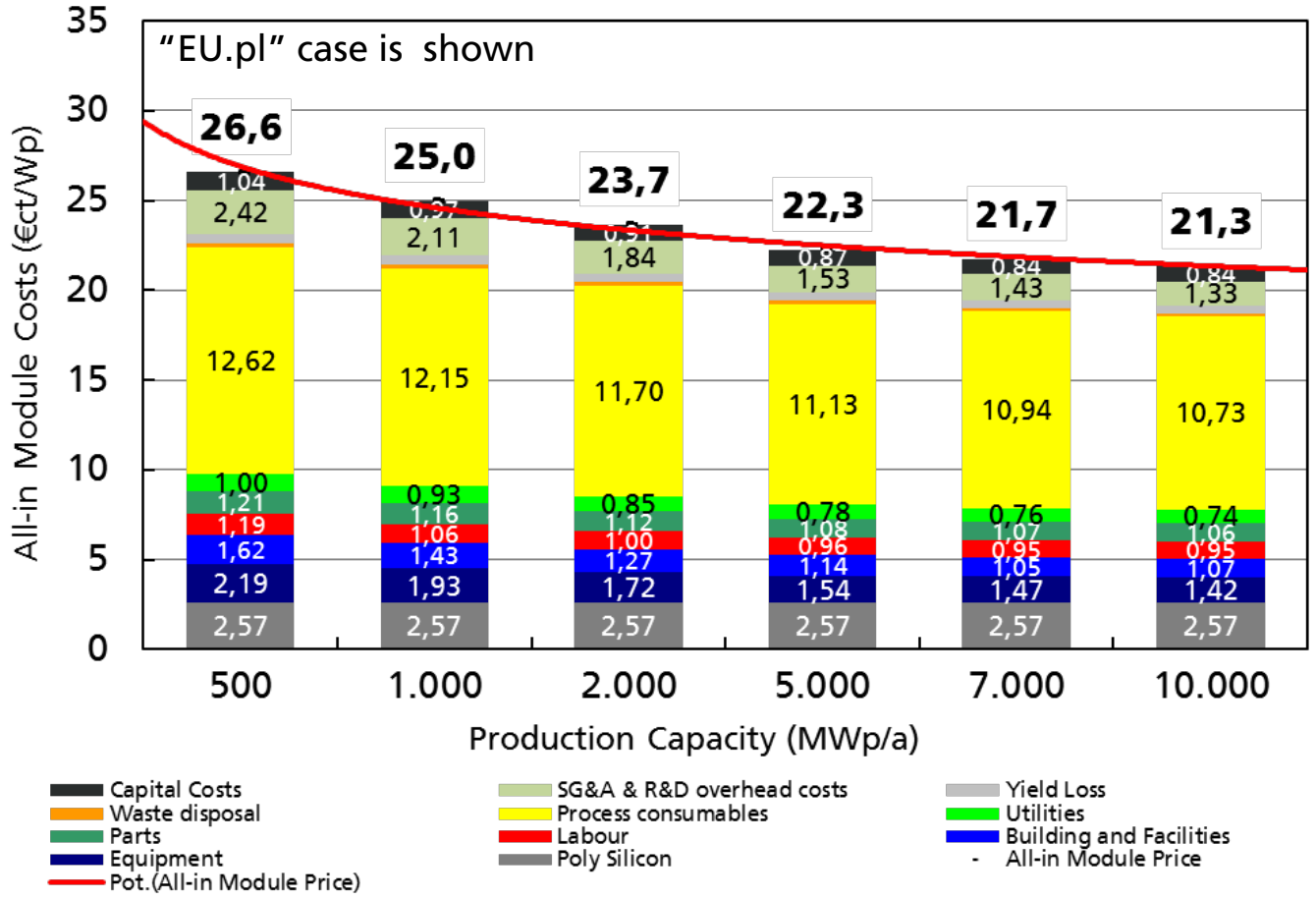
Development of Cost in Dependence of Manufacturing Size

Scenario: Europe with Today´s Material Supply

- **Production volume**
  - Better line balancing: less equipment, higher utilization, labour decrease
- **Supply chain**
  - Buying power related discounts
- **Additional scaling effects**
  - Less overhead (diluted SG&A cost)
  - Lower interest rate with higher corporate value



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Example Setup

- **Business model:** Crystallization + wafering + cell- + module- production
- **Product:** High efficiency mono Si 21,9% modules (glass-glass, 30 years warranty/>40 years lifetime)
- **CAPEX for 10 GW: ~ 2 billion Euro**
  - **Possible Financing Scheme:**

    25% equity = 0.5 bn €; 25% subsidy = 0.5 bn €;
    30% EIB loan = 0,6 bn €; 20% bank loan = 0,4 bn €
- **Support scheme on European level**
  - IPCEI for Photovoltaics

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PV as an Important Project of Common European Interest (IPCEI)
Setting the Framework for Investments

- PV will play the major role in meeting Europe's 32 % renewables target by 2030, and beyond
- The economic weight of the PV value chain is huge
- Local production in the EU allows for strategic autonomy in the important energy sector as well as for job creation and leadership in innovation

→ **The PV value chain is of strategic importance for Europe**

- Europe has a strong industrial and R&D knowledge base for PV production
- But: Re-establishing the complete PV value chain requires a joint and strategic initiative

→ **An Important Project of Common European Interest (IPCEI) should provide the framework for public and private investments into the PV value chain.**

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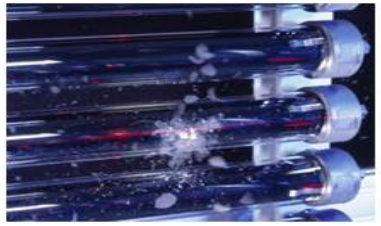
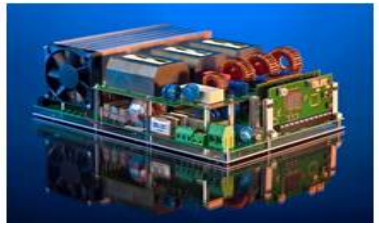
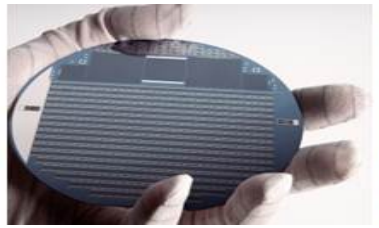
Thank You for Your Attention

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Dr. Andreas Bett

www.ise.fraunhofer.de

andreas.bett@ise.fraunhofer.de

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