

Thin Film Photovoltaics
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Boom or Bubble

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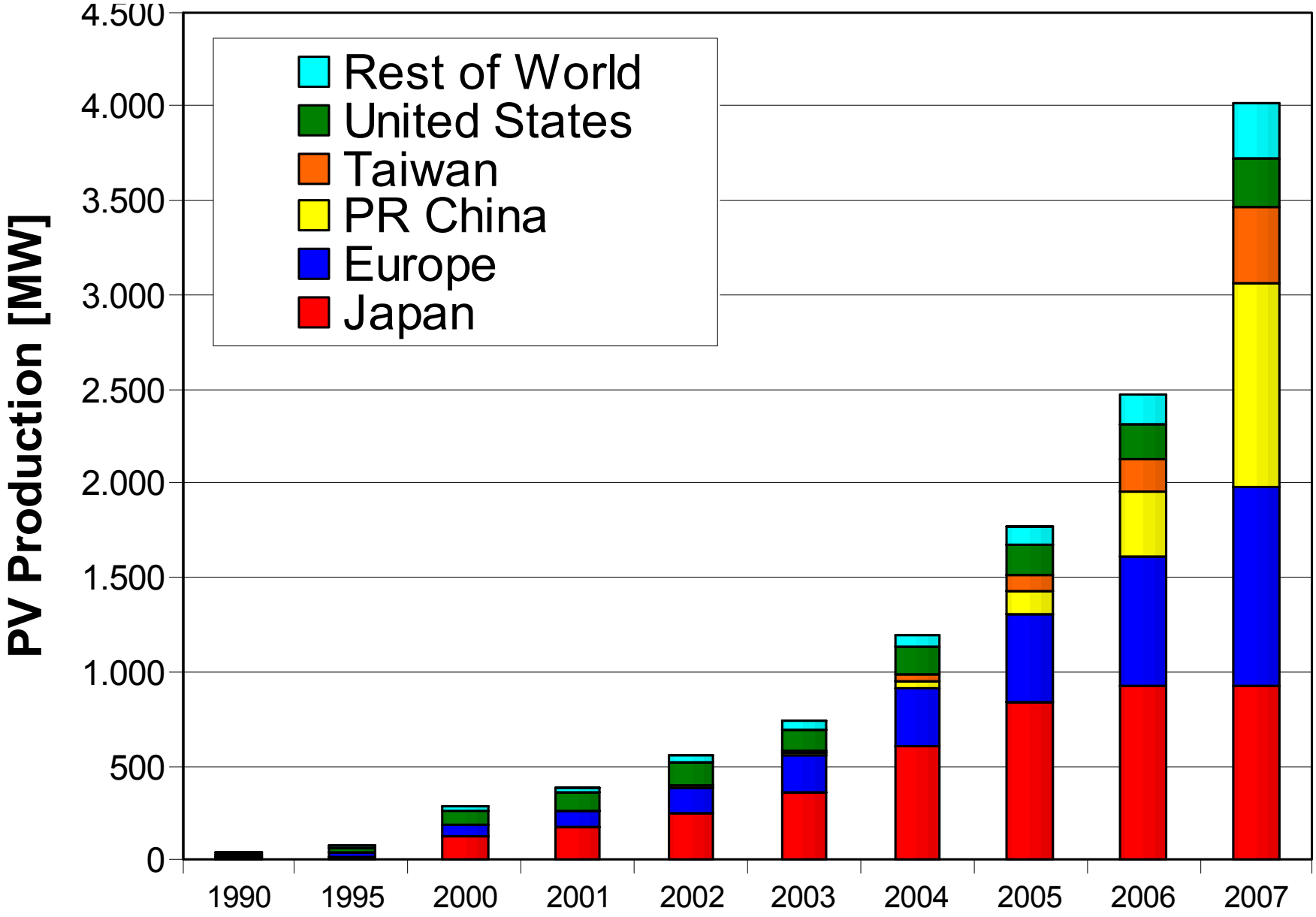
Disclaimer

- The capacity numbers were collected from Press Announcements of 165 different companies with a cut-off date mid of February 2008.
- The capacity figures have a high uncertainty due to the different methods of determining them. Nevertheless I used them to show what is discussed in the public.
- On slide 15 and 16 the 4.5 and 2€/Wp are possible system prices – not project costs - for the customer. Therefore, possible costs for the acquisition or lease of land is not included.
  - The actual BOS/installation costs as well as the cost category distribution might vary from project to project.
  - The figures for the modules represent the possible selling price of the module.
- The use of the material is permitted as long as the sources are acknowledged.
- Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use, which might be made of the following information.



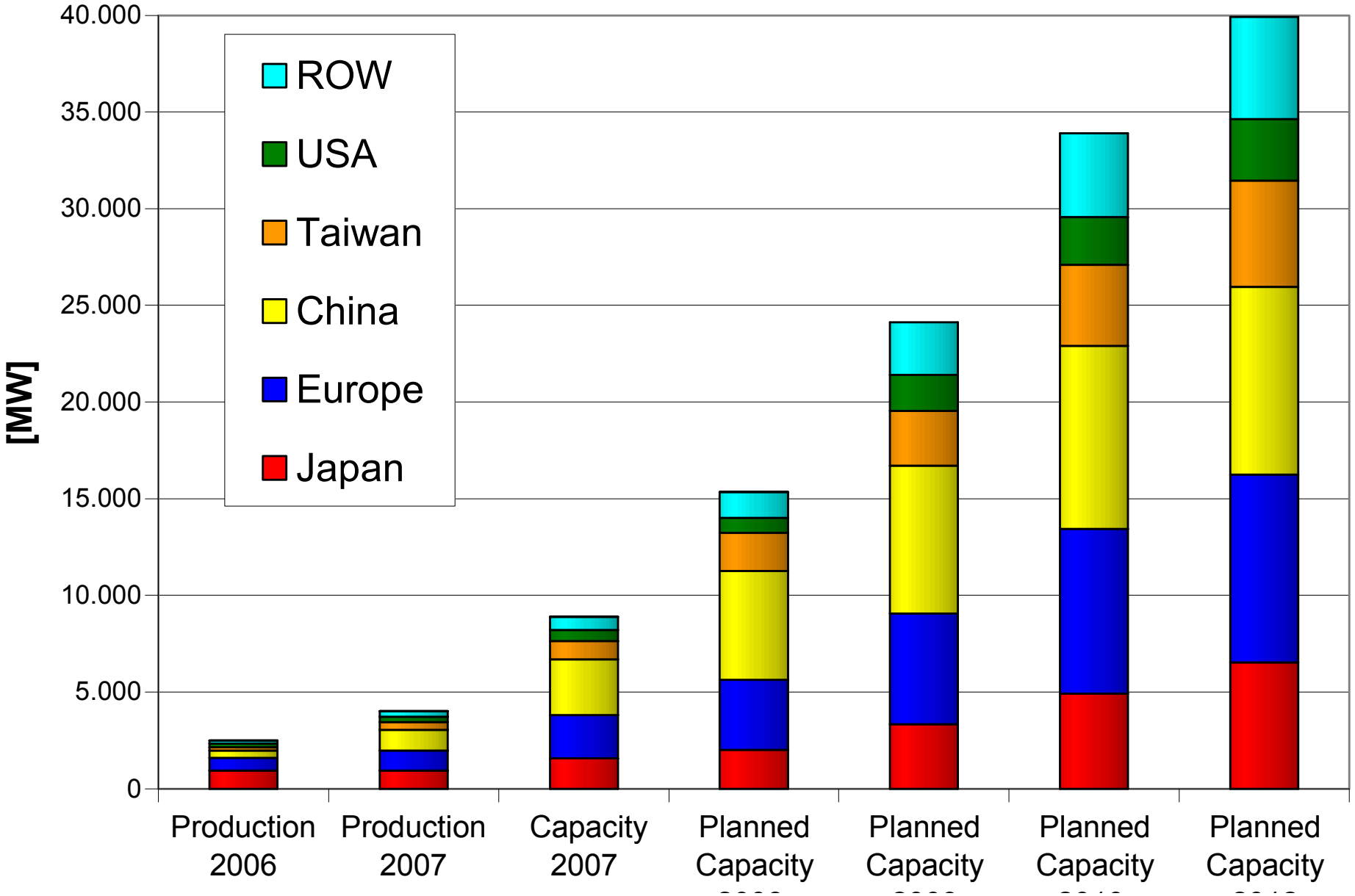
- Photovoltaics Overview
- Industry
- Cost Reduction and Learning Curves
- Markets
- Conclusions

World-wide PV Cell/Module Production

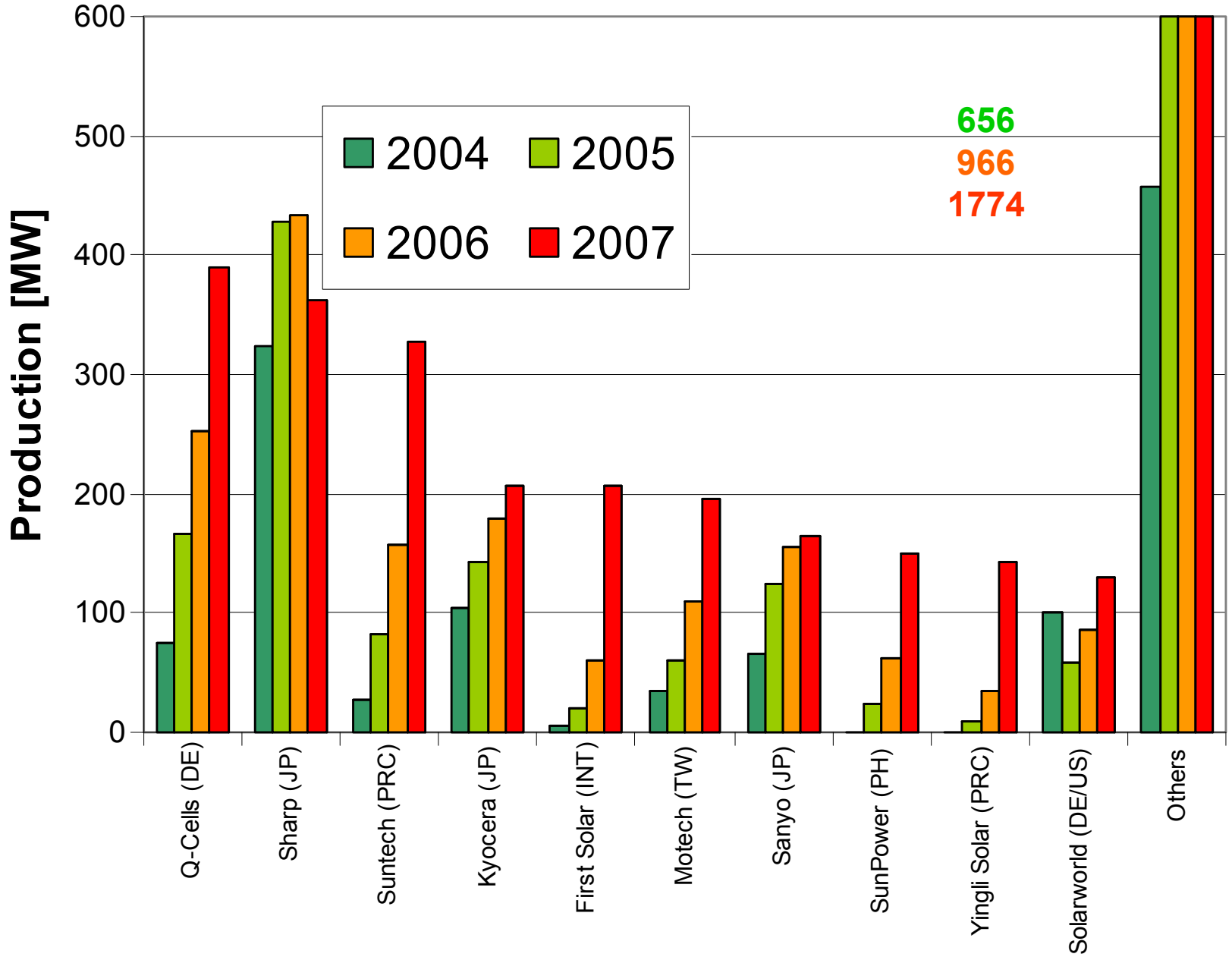


Data source: PV News, Photon International and own analysis

World-wide PV Production and Announced Capacity Increases

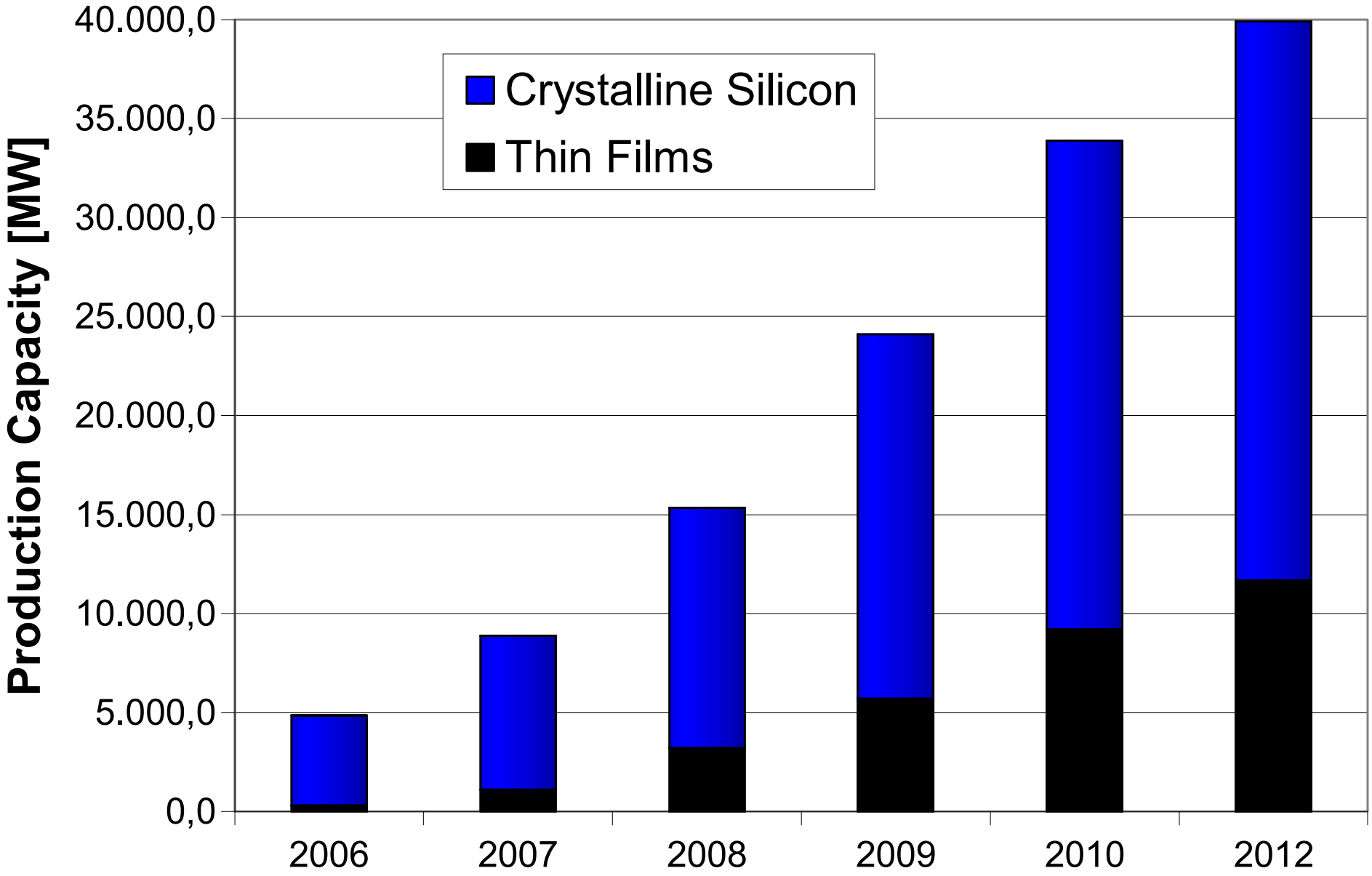


Top Ten PV Cell/Module Producers 2007



Data source: PV News

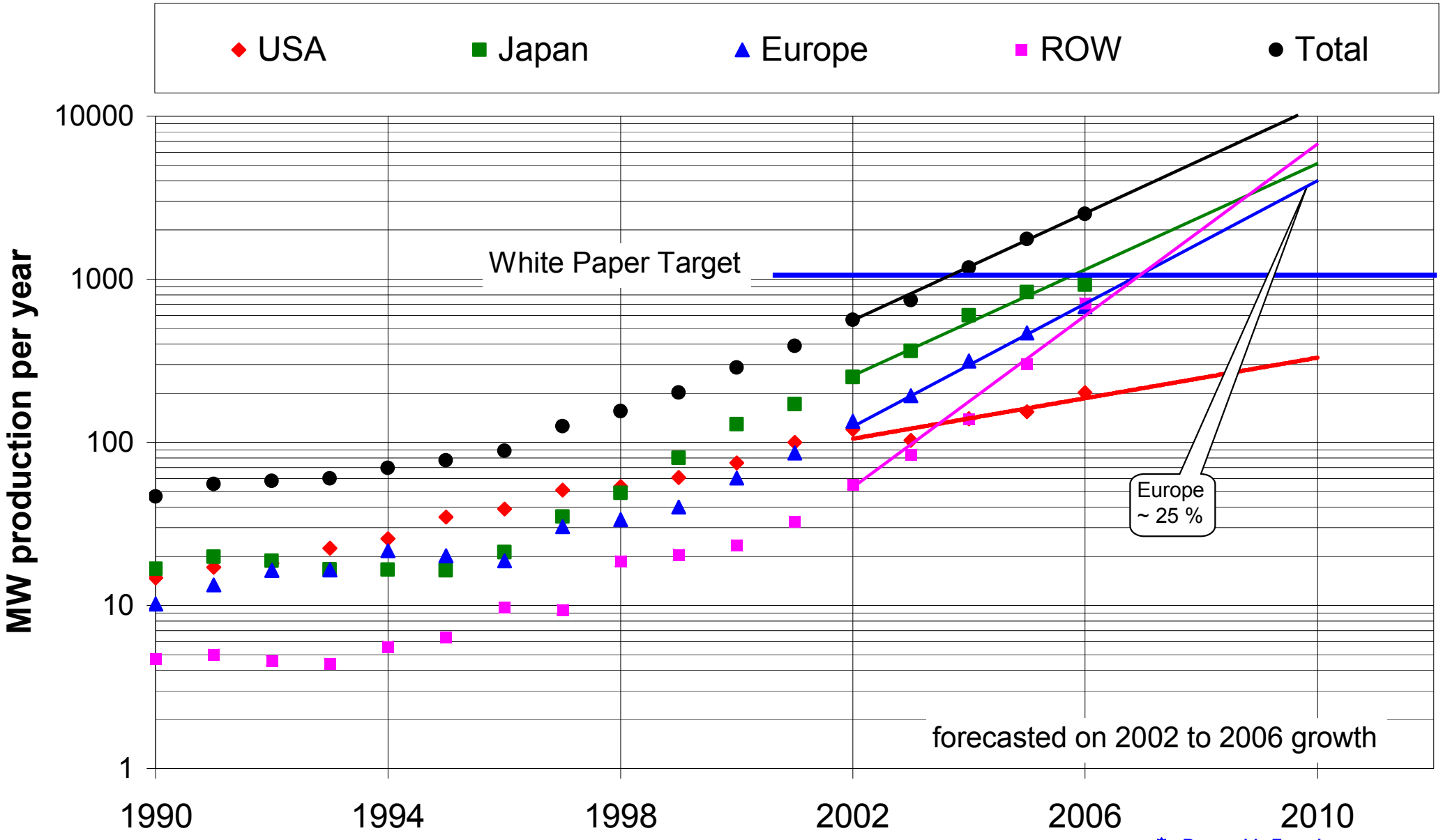
Announced Capacity Increases



Market Estimates

PV News (Production)	Europe + Japan + USA 35% Growth	45% Growth
2006: 2,500 MW	1,680 MW	1,680 MW
2007: 3,750 MW	2,268 MW	2,436 MW
2010: 7,140 MW	5,200 MW	7,700 MW
2011: 9,300 MW	7,000 MW	11,165 MW
2012: 12,100 MW	9,450 MW	16,200 MW

Market Projection



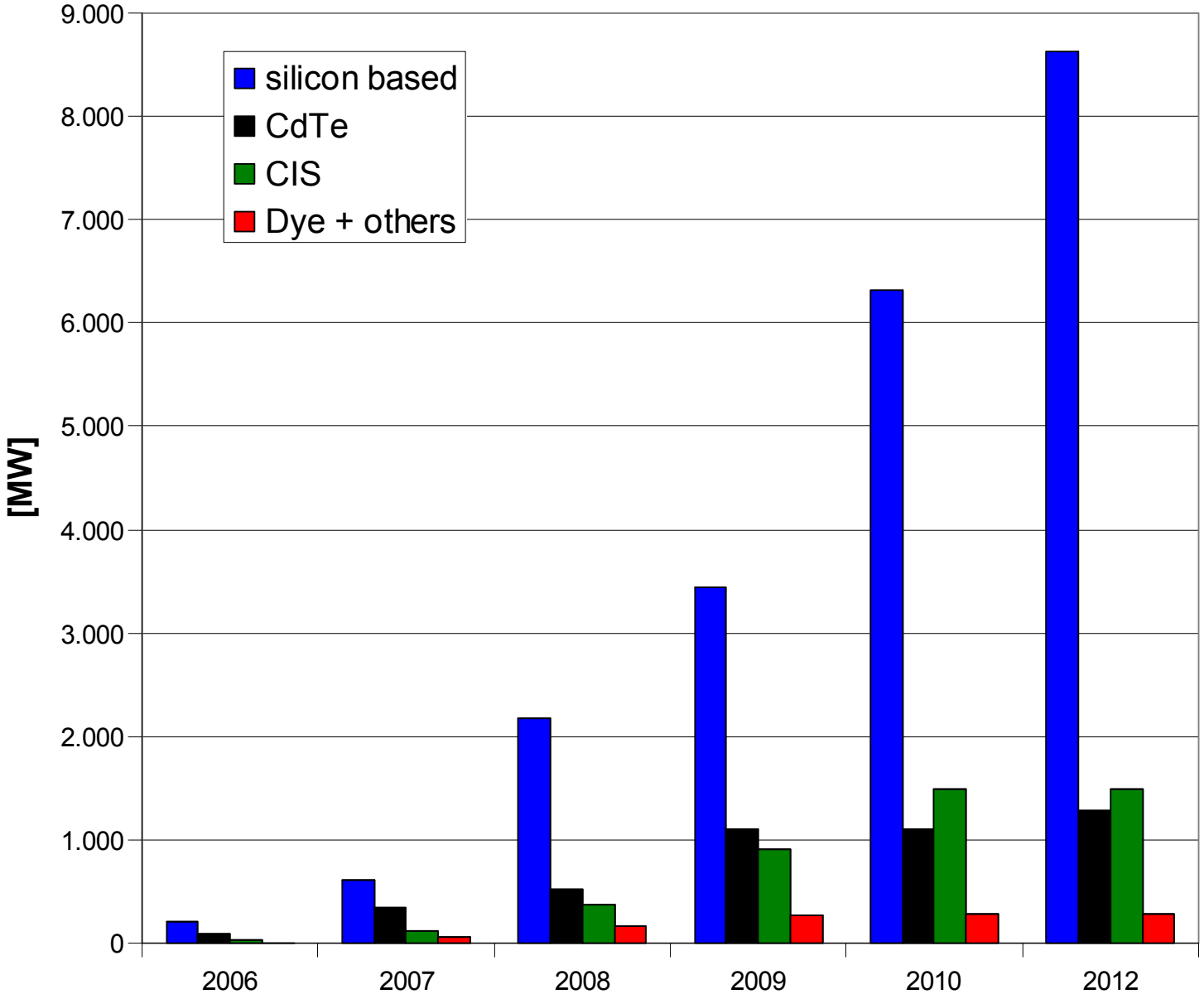
Thin Film Industry

- more than 130 companies world wide (range : research to production)
- 21 companies have produced thin film PV in 2006 (more than 1 MW available on the free market)
- In 2007 at least 5 companies started their ramp up face and delivered first modules
- In August 2007 I found 7 companies to offer “turn-key” systems
- Now: 12 to 13 companies offer “turn-key” systems

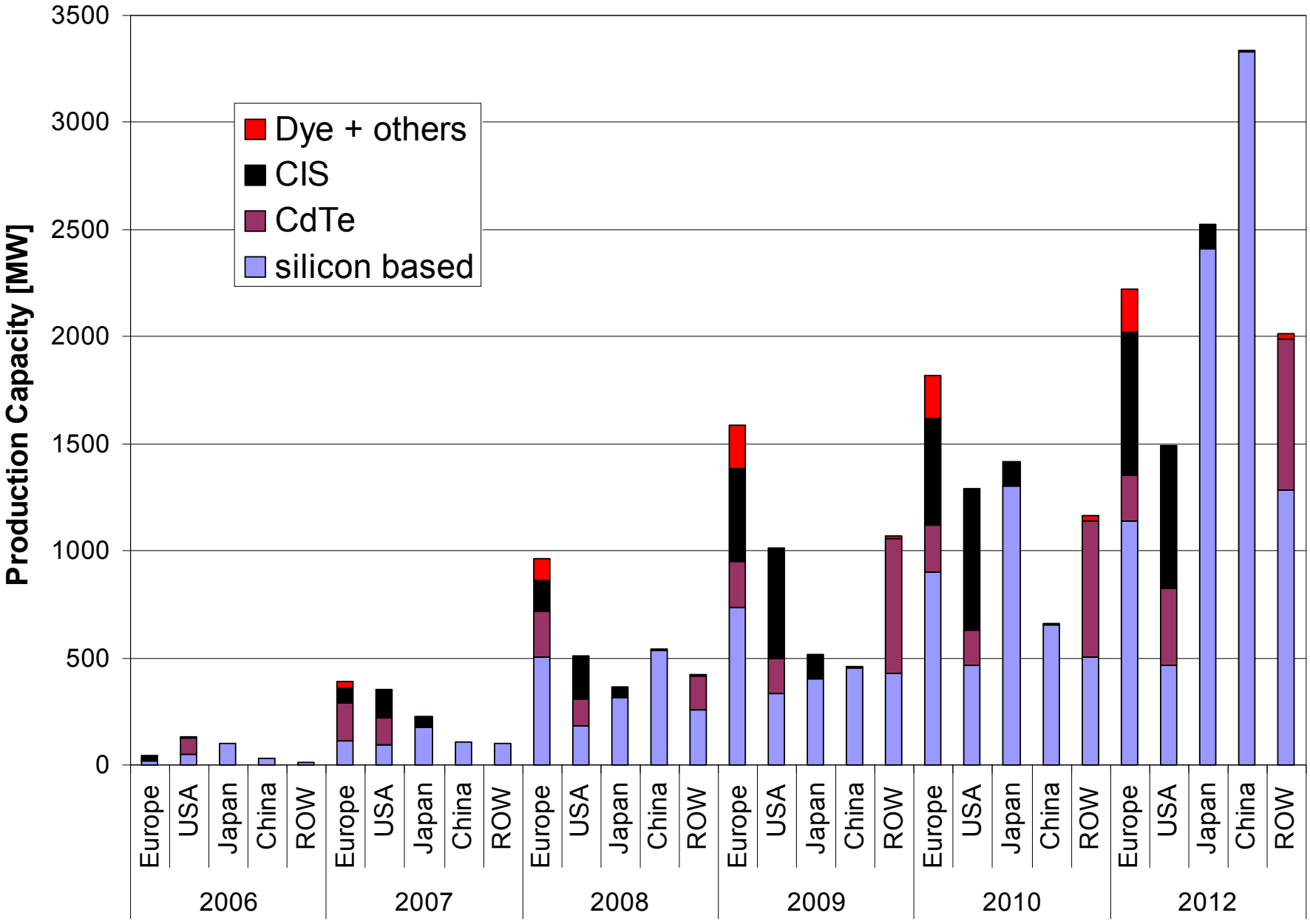
Thin Film Industry

- 82 companies have announced time frames and capacities for build up or increase of production capacities (August 2007)
- 100 companies have announced time frames and capacities for build up or increase of production capacities (April 2008)
- 36 in Europe, 22 China, 10 Taiwan, 19 USA, 8 Japan, 8 ROW
- 68 silicon based
- 21 Cu(In,Ga)2(Se,S)2
- 6 CdTe
- 5 Dye & others

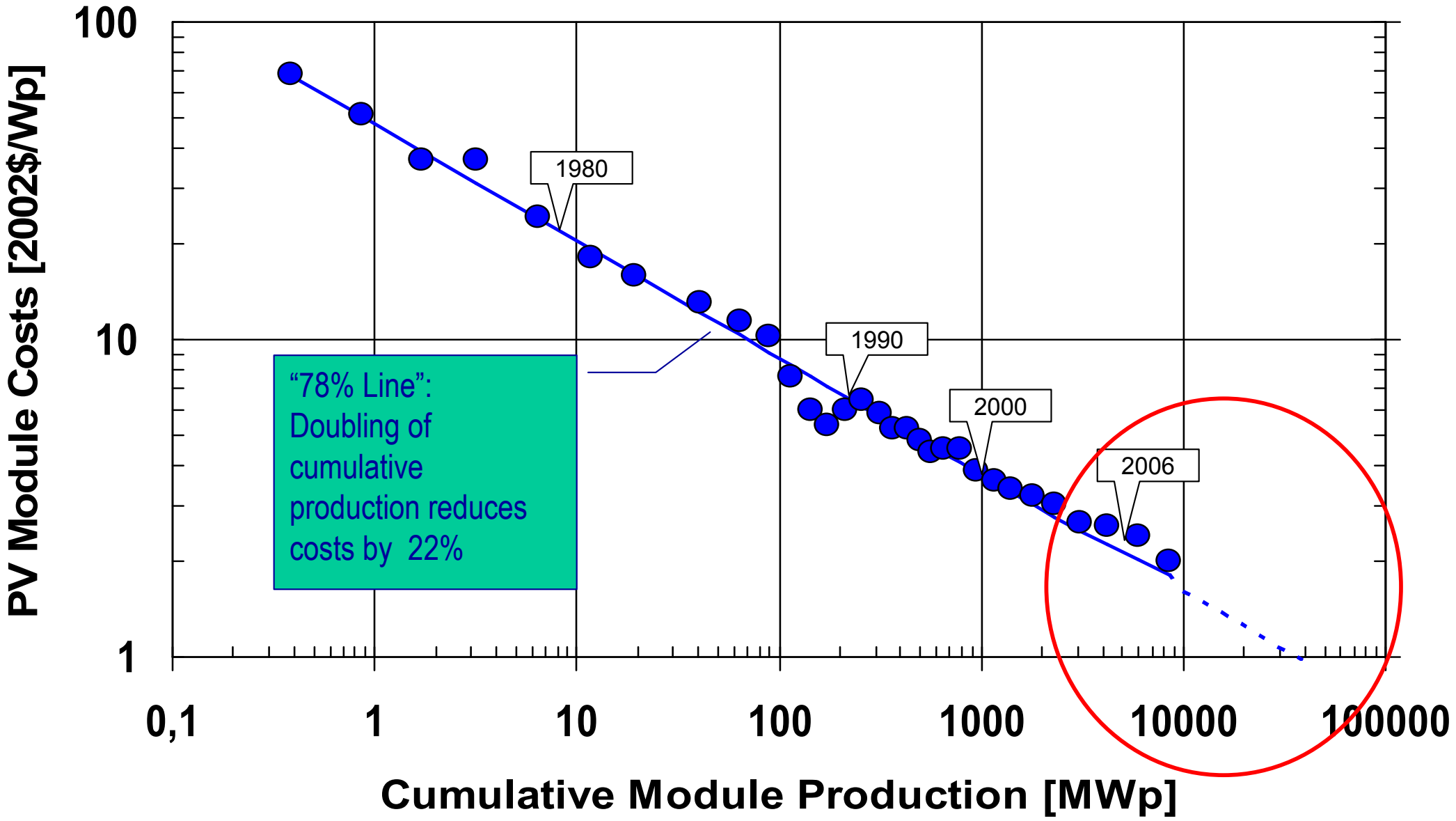
Announced Production Capacities by Technology



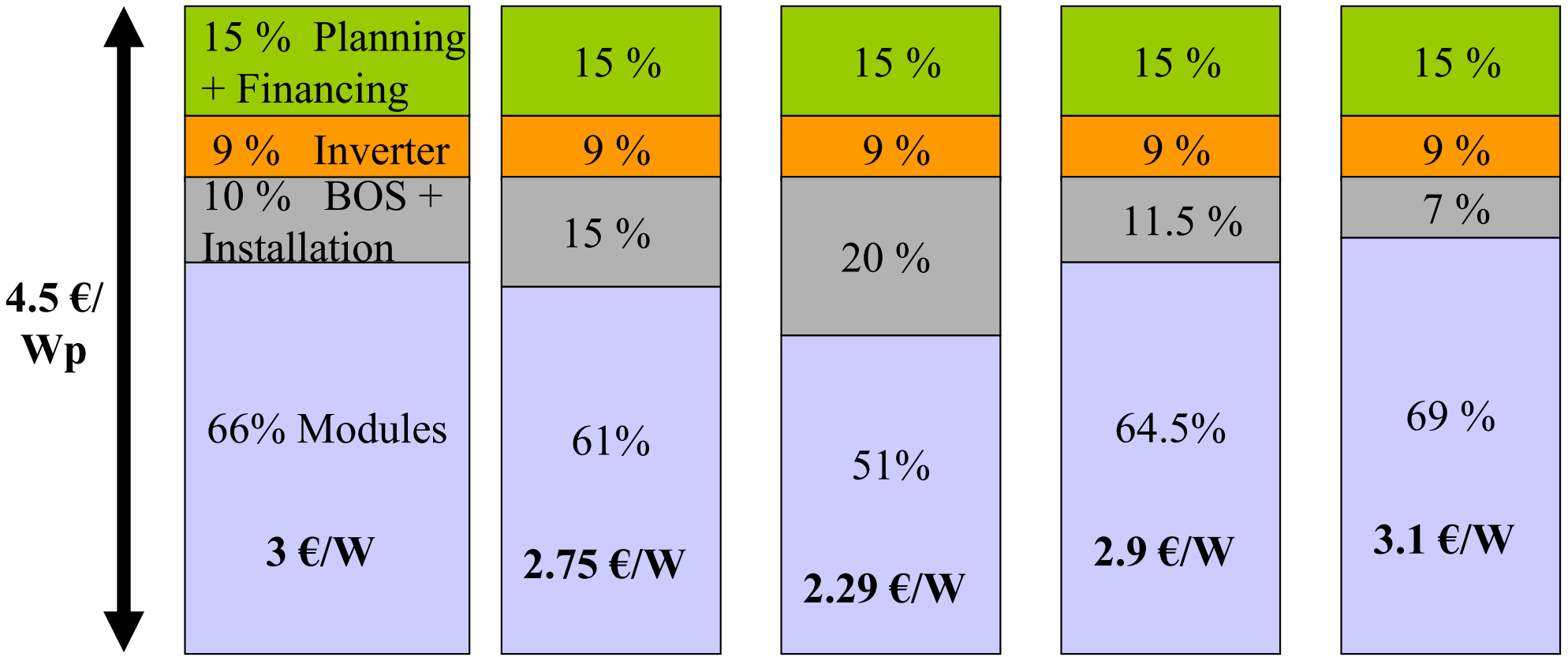
Announced Capacity Increases: Regional Differentiation by Technologies



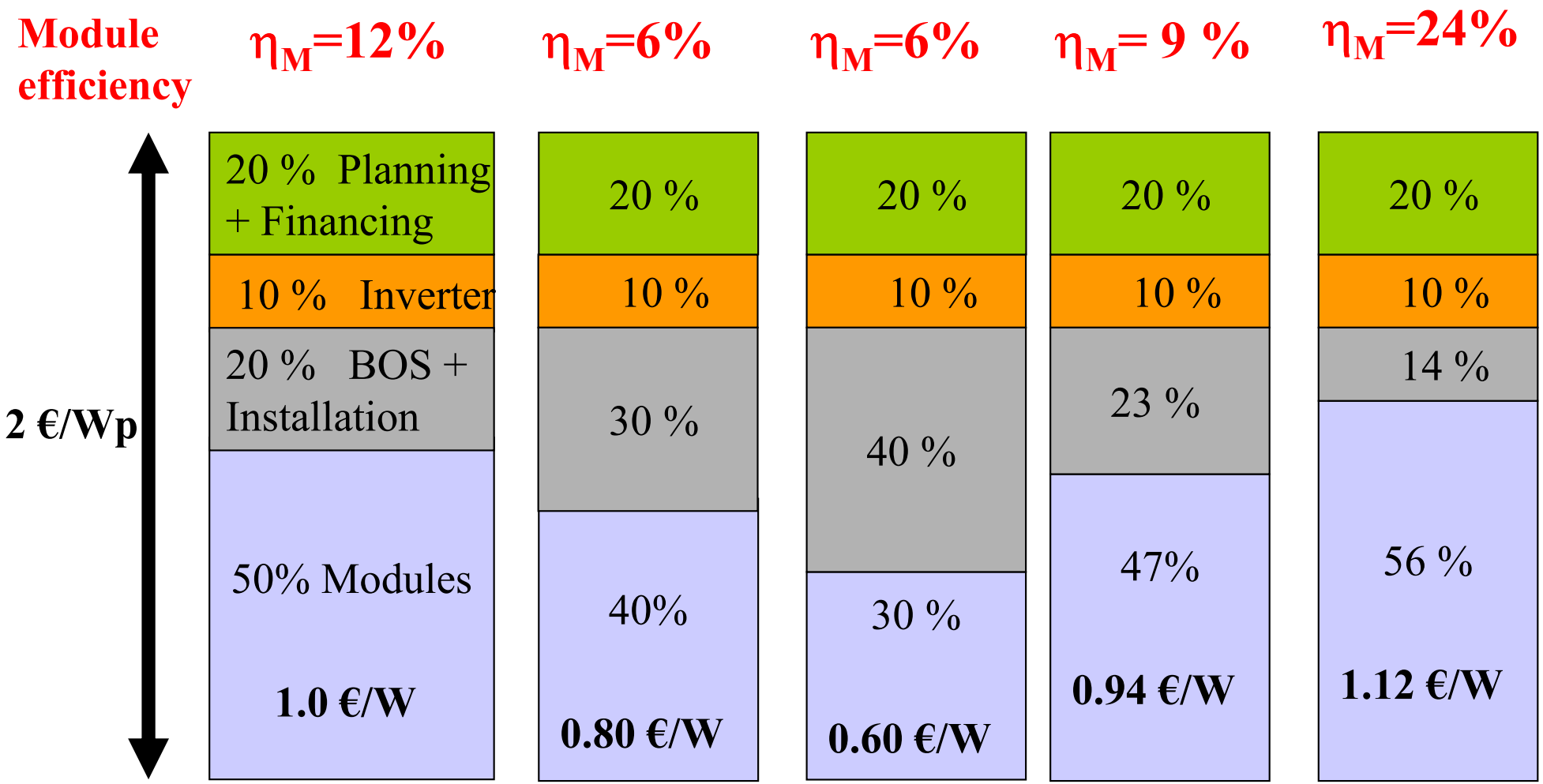
PV Technology Learning Curve since `76



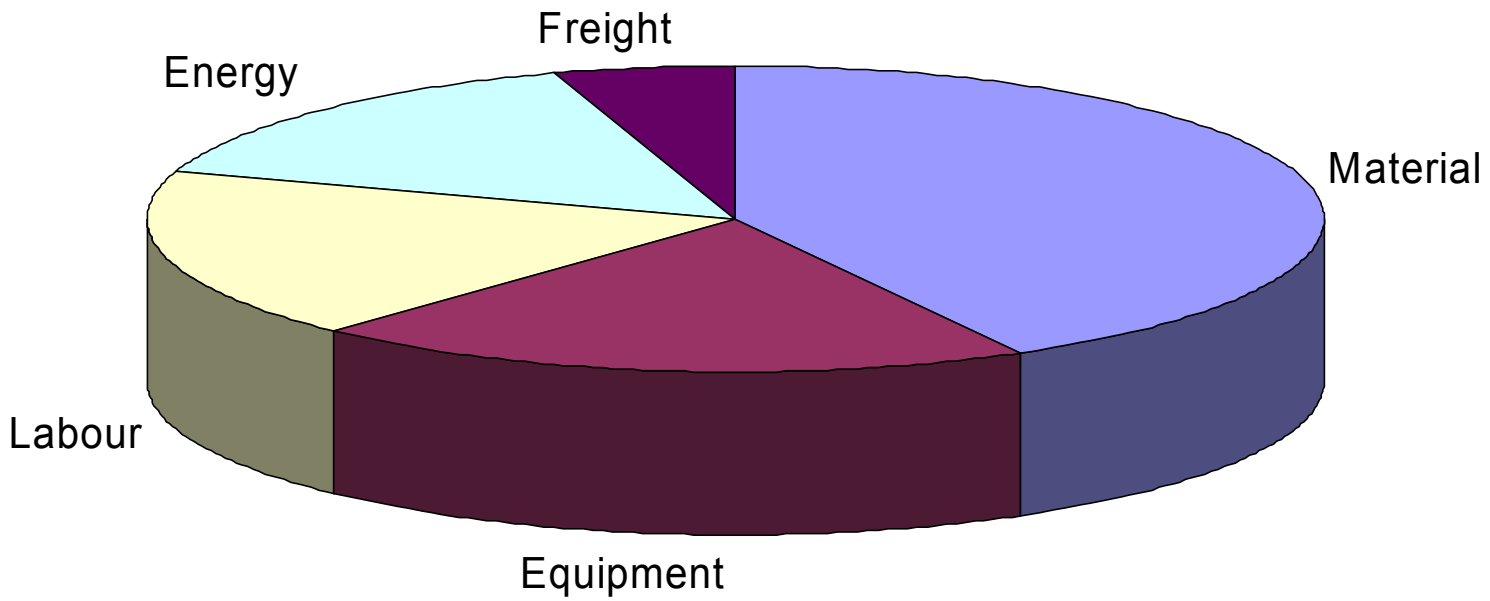
Cost Relevance of Module Efficiency



Cost Relevance of Module Efficiency



Average Thin Film Cost Structure



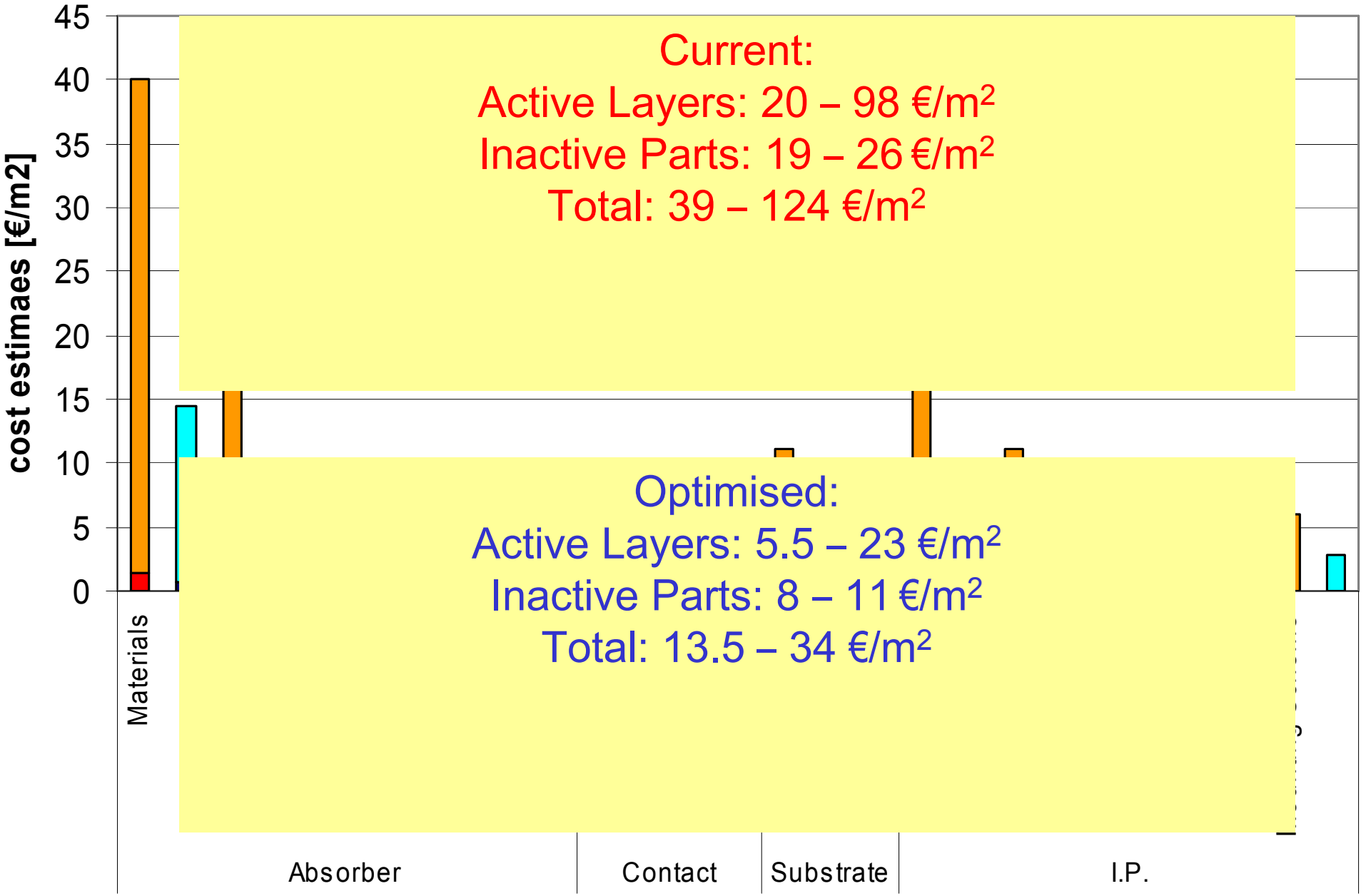
Technology dependent Drivers

Deposition Process: Dominates Energy
Deposition Materials: Dominates Depreciation
Package/Assembly: Dominates Materials

Common Drivers

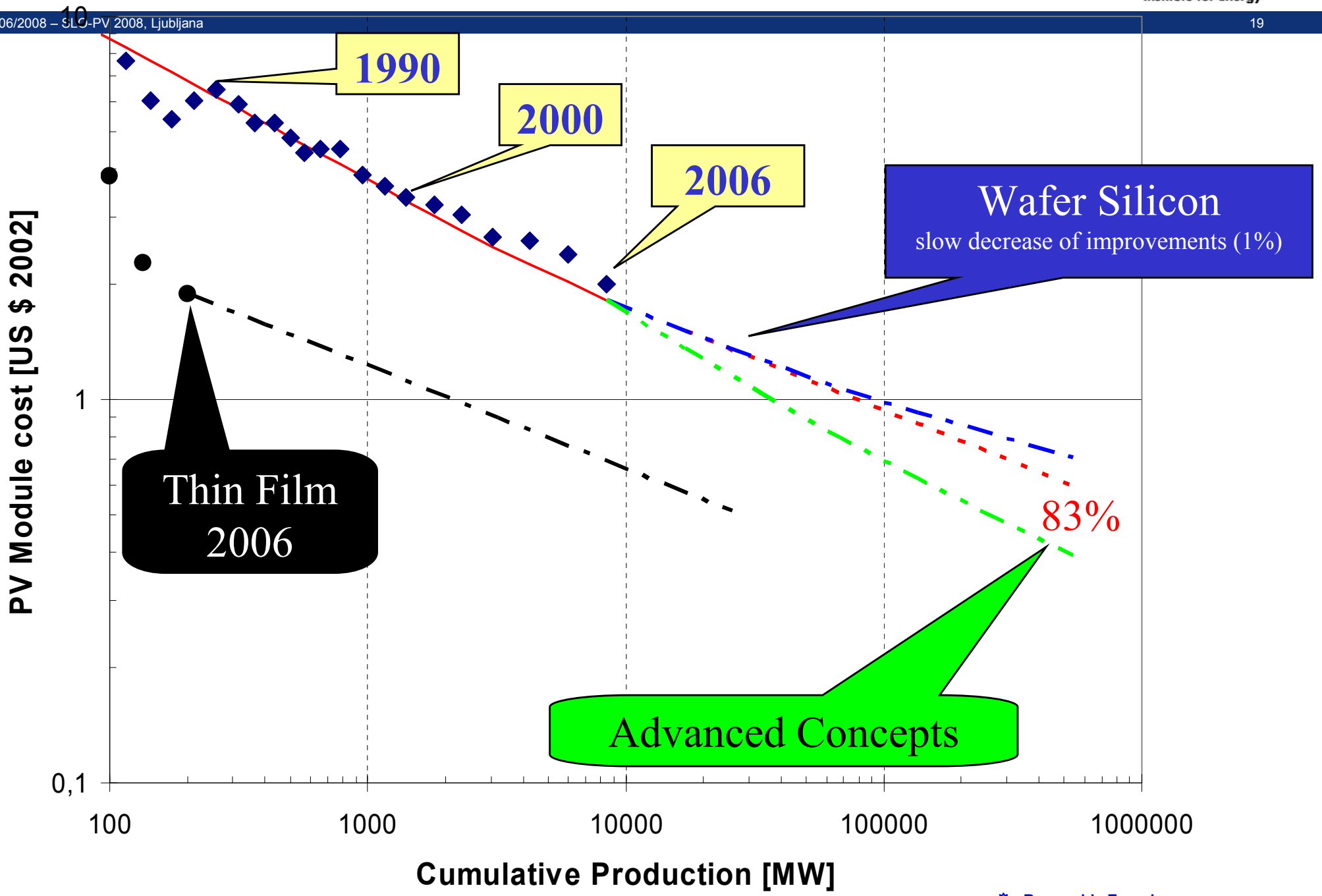
Material Cost: Volume, Efficiency
Depreciation: Throughput, Efficiency
Labour: Throughput, Automation, Efficiency
Energy: Throughput, Efficiency

Thin Film Cost Reduction Potentials



Data: K. Zweibel

Learning Curve Scenarios



Conclusions

☺ **Thin Film PV Production Capacities grow faster than the already high PV growth rates**

☹ **High uncertainty about time schedule of about 50% of the announced capacity increases**

☺ **If production volume is ramped up according to plans, Thin Film PV has the potential to reach the 1 €/Wp cost target at the end of this decade**

😐 **Markets for the next decade will still depend on public support**


Photo by Steve Locke
Thank you for your attention!
PV Status Report 2007
http://re.jrc.ec.europa.eu/refsys/pdf/PV_StatusReport_2007.pdf