



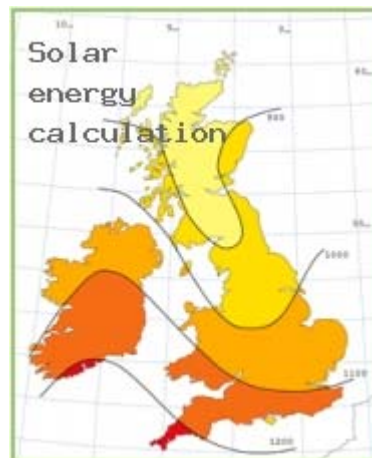
The business case for PV solar energy

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Case for photovoltaic (PV) solar energy

- PV solar energy is the only electricity generation compatible with the urban environment – generating electricity at the point of use.
- The global PV market has sustained growth in excess of 40% per annum over past 10 years.
- Feed-in tariffs to be introduced 2010 in UK will follow European example.
- UK manufacturing is well placed to take advantage of growth in PV market.
- Longer term potential for >20% of our electricity to come from solar.
- Additional 0.5 million jobs to be created by 2040.

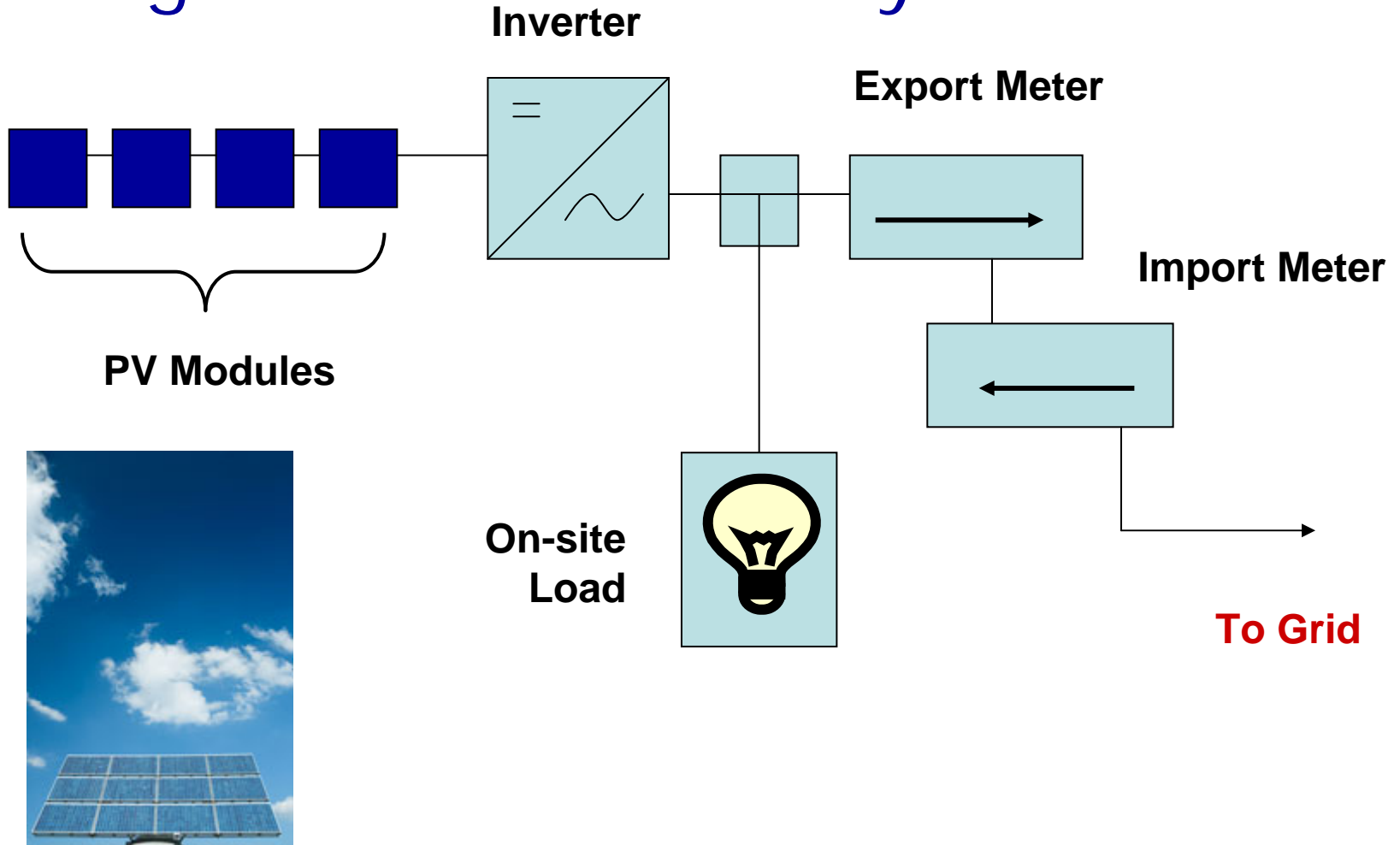


“The solar resource in Wales is more than adequate to support a 2.4 TWh/yr aspiration, since the annual irradiance varies from 2.67 TWh/yr/km² (North Wales) to 2.8 TWh/yr/km² (South Wales)”. *WOF PV Road Map*





What are the components of a grid-connected PV system?



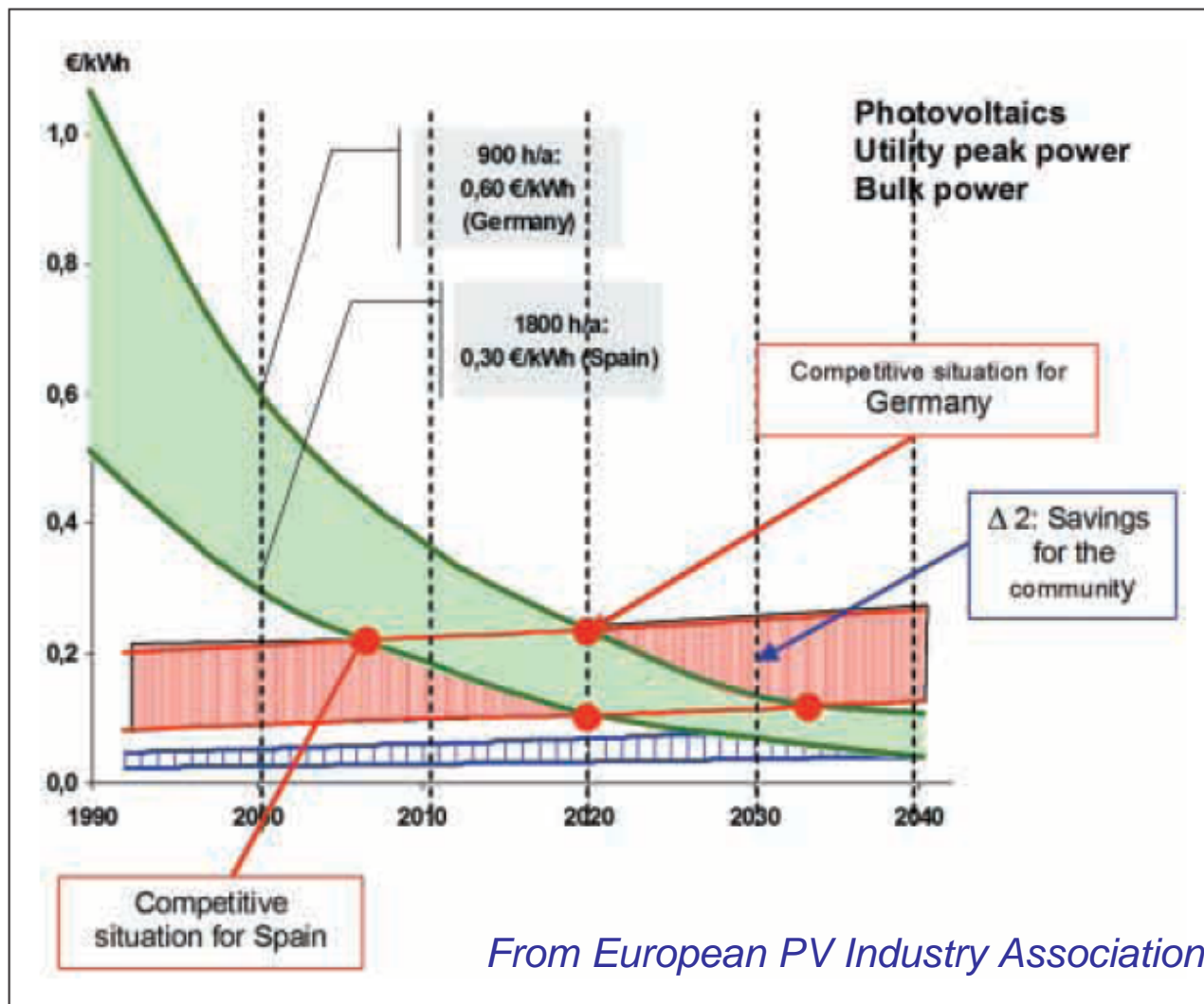


Current strengths and weaknesses of solar PV

- All system components are available now for BIPV installations.
- No moving parts, 25 year guarantee on modules, low maintenance.
- Energy generated over year is very predictable.
- A range of PV products now available for excellent aesthetics on roofs and facades.
- Solar PV is silent and no CO₂ emissions.
- Energy payback can be as little as one year.
- The cost is mostly purchase and installation – need finance.
- Without subsidy the economic payback period can be long.
- False perception that UK climate is not suitable for solar PV.
- Lack of creative marketing of PV in UK.
- Lack of consumer confidence regarding product lifetime.
- Lack of consistency in government grants and incentive schemes.



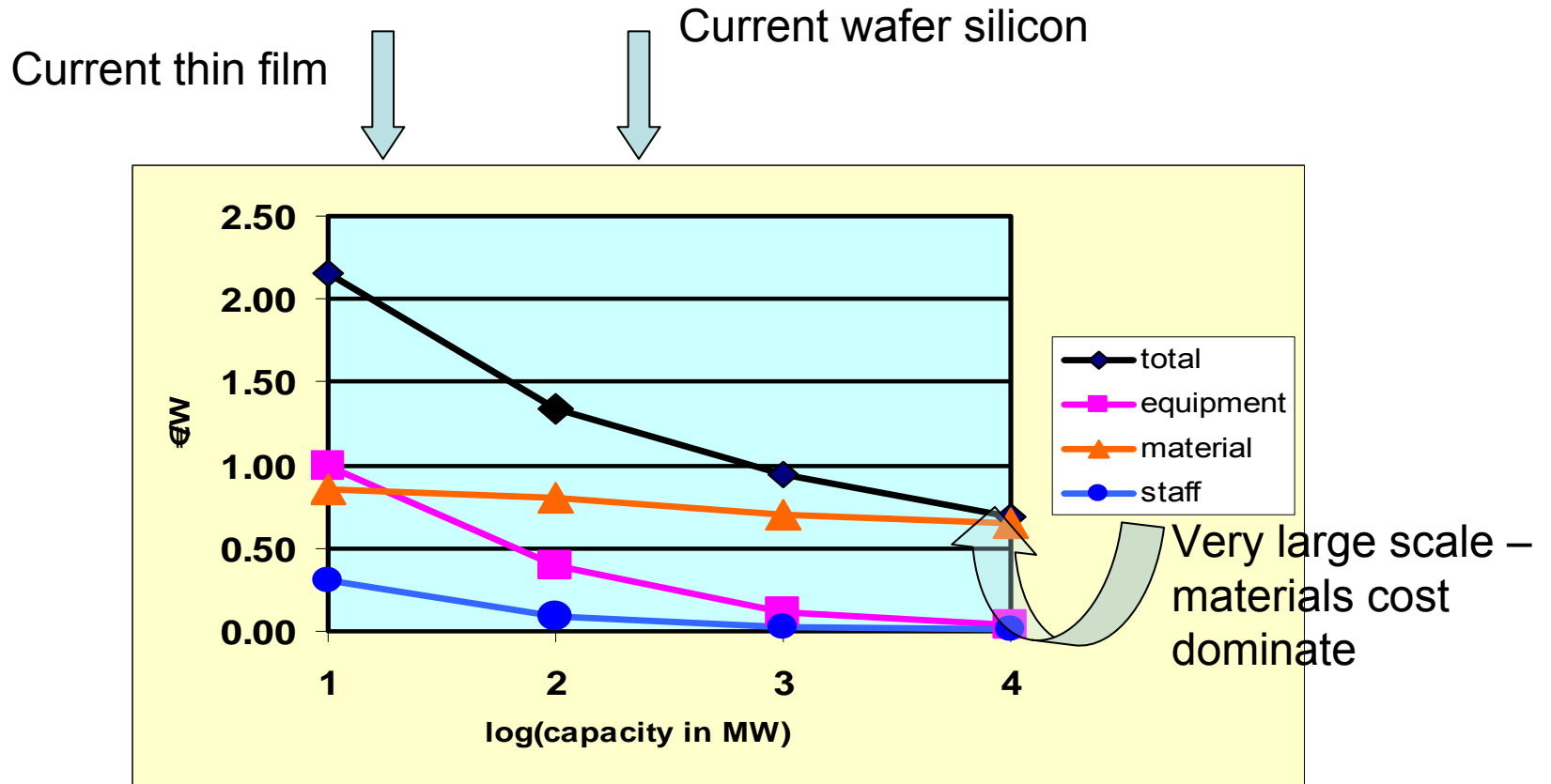
Cost reduction and grid parity target dates



- European Industry reviewing target for 12% of total electricity supply from PV by 2020
- Germany may achieve grid parity by 2015 due to production scale.



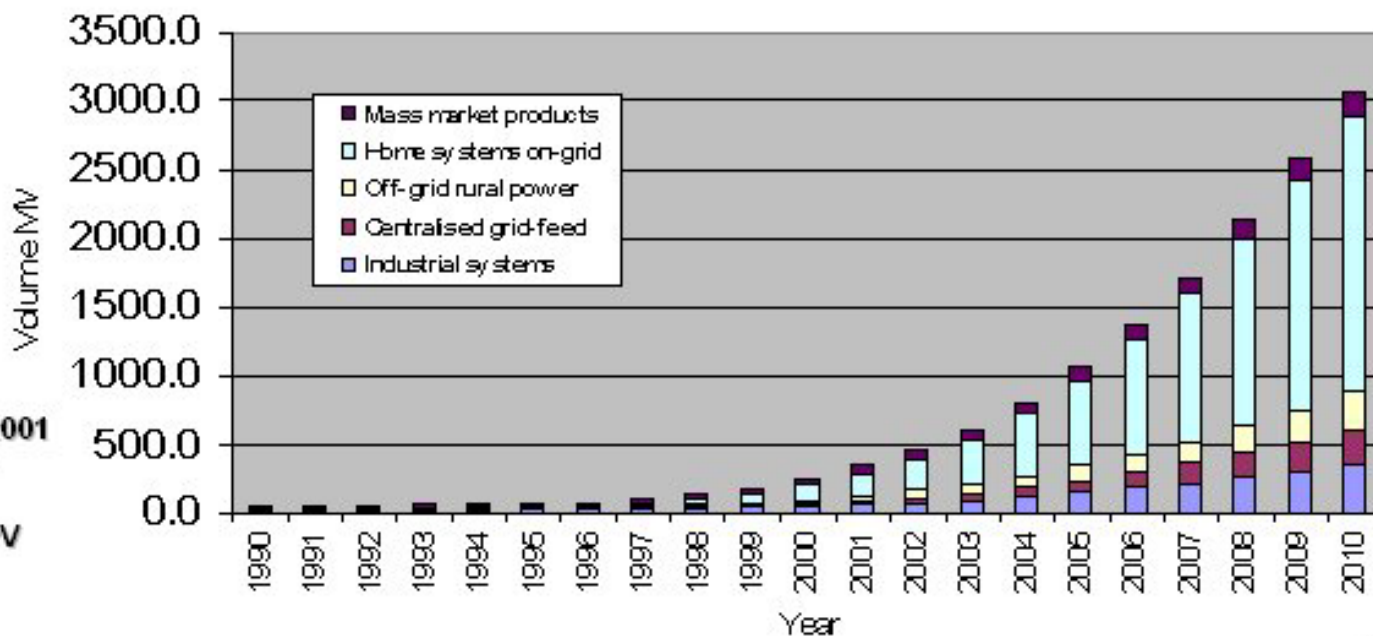
Reduction in module cost with production scale



Cost model of Dieter Bonnet for thin film CdTe solar modules PV21



Global Context of expanding PV Market

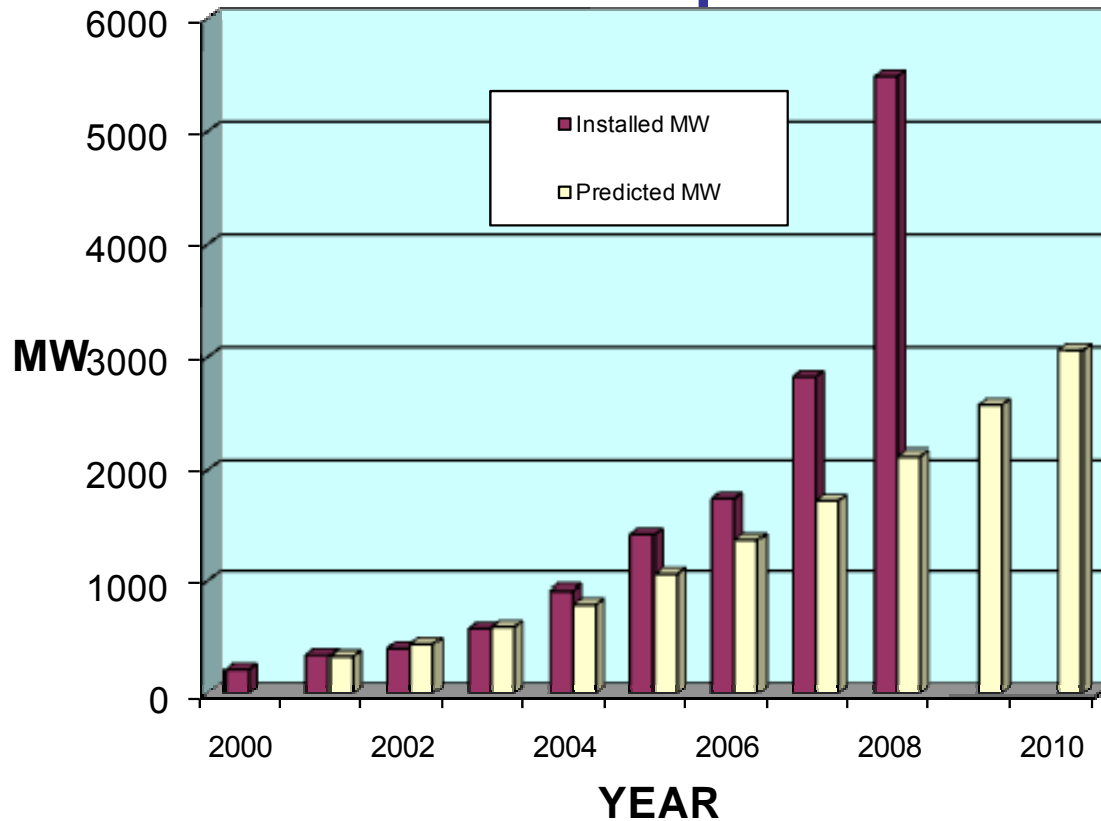


Strategies unlimited 2001
date Checked against
Actual IEA – PVPS
Report 2004 and EU PV
status Report 2003

Predicted Market Growth (2001) – adjusted 2003/2004



The reality has exceeded expectations

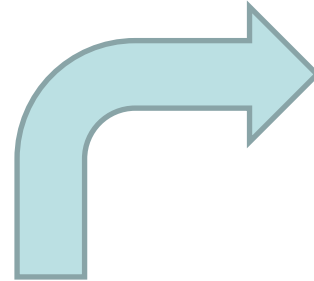


90% current PV production is crystalline Si, thin film is set to take a larger share

In 2001 46% was on grid domestic. Predicted to become 66% in 2010



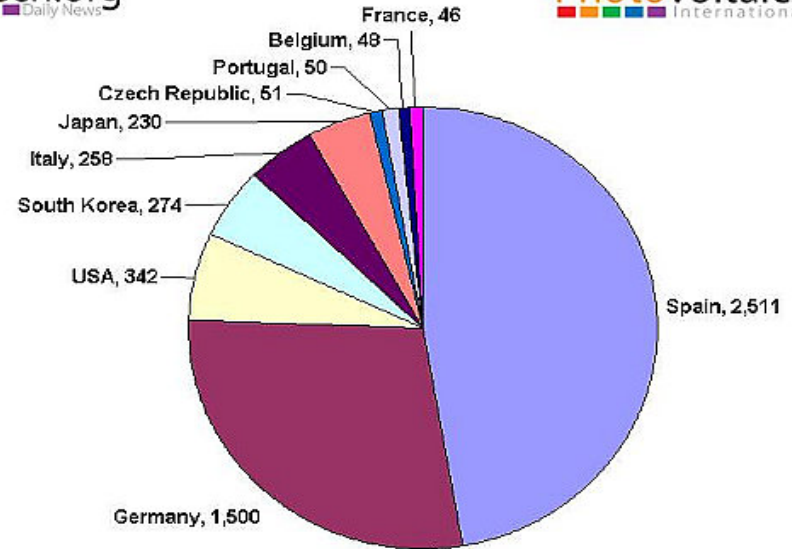
Proven market stimulus of feed-in tariff



2008:

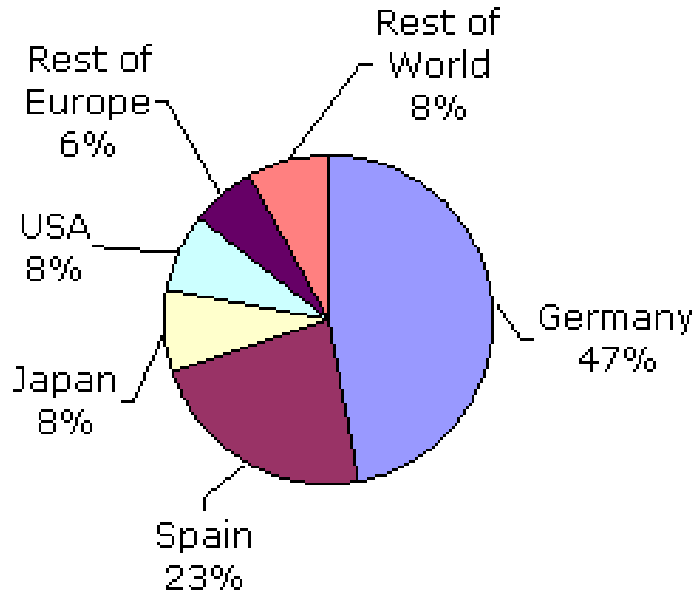
PV-tech.org
Daily News

Photovoltaics
International



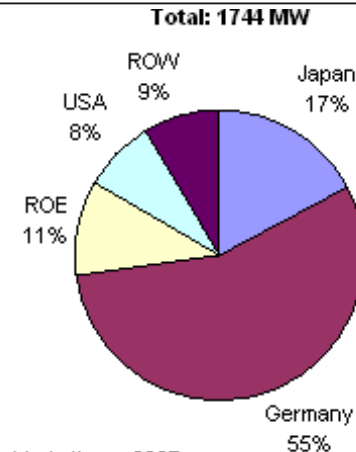
EPIA: Top 10 PV Markets in 2008 (MW)

World Photovoltaic Market in 2007
2826 Megawatts



Copyright: Solarbuzz LLC

2006:



Source: Marketbuzz 2007



Total: 1744 MW



MATS UK SRA challenges - Crystalline silicon

- low-cost solar grade silicon feedstock
- high-quality, low-cost crystallization
- high yield cutting of very thin wafers
- thin-film wafer equivalents



Sharp module factory near Wrexham producing 220 MW/year



MATS UK SRA challenges - Thin film PV: a-Si, CdTe, CIGS

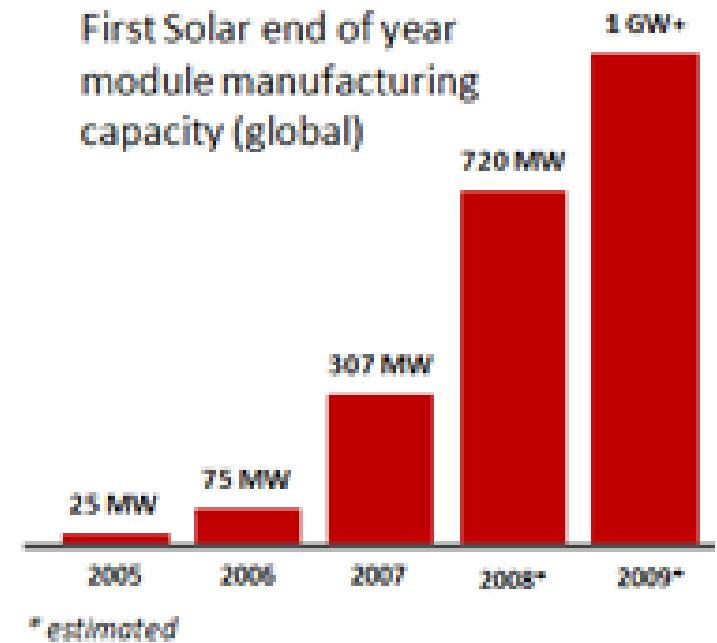
- Improving efficiency of thin film PV modules.
- Improve production throughput and yield.
- Implementation of in situ monitoring and process control.
- Increase production scale.
- Better understanding of module lifetime issues.
- Increase materials utilisation.
- Incorporation of innovative materials.
- Improved characterisation techniques, in particular for thin film polycrystalline materials.



First solar is leading the way with high volume thin film PV manufacture



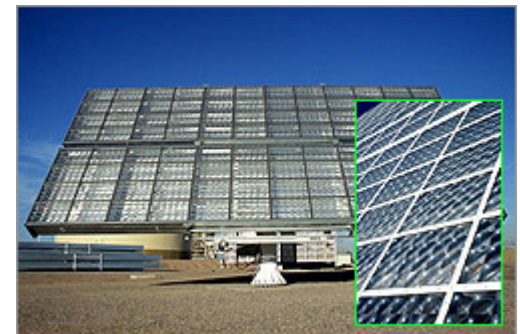
Commissioned: February 2006; December 2005
Region: Gescher, Germany
Project Size: 1.4 MW
Project Developer: COLEXON Energy AG





MATS UK SRA challenges - Concentrator PV

- Optical design of lenses from cheap materials such as plastics.
- The development of efficient photo luminescent concentrators and light guiding to the PV collectors.
- Development of improved methods for characterising optical conversion materials for concentrators.
- Materials integration.



20kW concentrator STAR centre Arizona

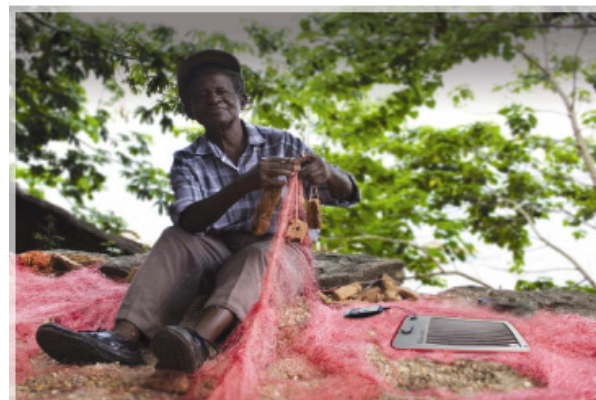


MATS UK SRA challenges - Excitonic PV

- Understanding the charge conduction (excitonic) conduction mechanisms.
- Replacing liquid redox couple with suitable polymer (development of new p-type polymers).
- Effective utilisation of the solar spectrum.
- Development and evaluation of new materials.



G24i DSC solar cells for mobile phones





UK Opportunities

- UK PV manufacturing capacity has potential to grow with global demand.
- Strong supply chain from materials (e.g. Crystalox) through to bespoke architectural modules (e.g. Romag).
- Strong potential for job creation (0.5 M by 2040)
- High value innovation from UK R&D base.

UK Threats

- Failure to implement an effective feed-in tariff.
- Failure to realise link between growth in manufacturing base with UK adoption of PV.
- Lack of investment for UK manufacturing to keep pace with global growth.
- Talking down the potential of solar energy in UK could become a self fulfilling prophesy!



CSER lab from basic thin film materials deposition to measurement of PV cells

