Trends in PV Applications – Growth rates, main markets & drivers

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INTRODUCTION.....

- Finance, investment & PV interact on many levels – industry start-ups & growth, innovation funding, green electricity products, project finance, end-user loans...
- Information from our *Trends* work – based on comprehensive surveys of the 19 IEA PVPS countries
- Presentation - the market, how and why it has been evolving, the associated industry growth...and the ultimate reflection of supply / demand issues ➔ the story of prices and value.

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The fundamentals…..

- Demand
- Supply
- Price

eg IEA PVPS

- *Revenue*
- *Profit*

your judgement!

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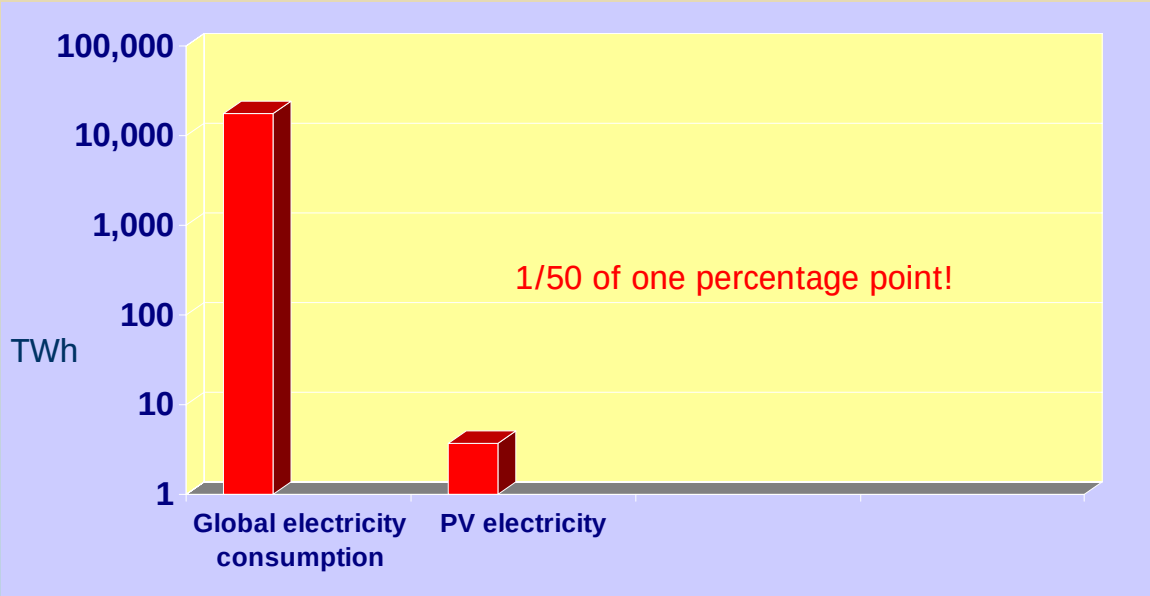
Where does PV electricity currently fit in the larger energy picture?



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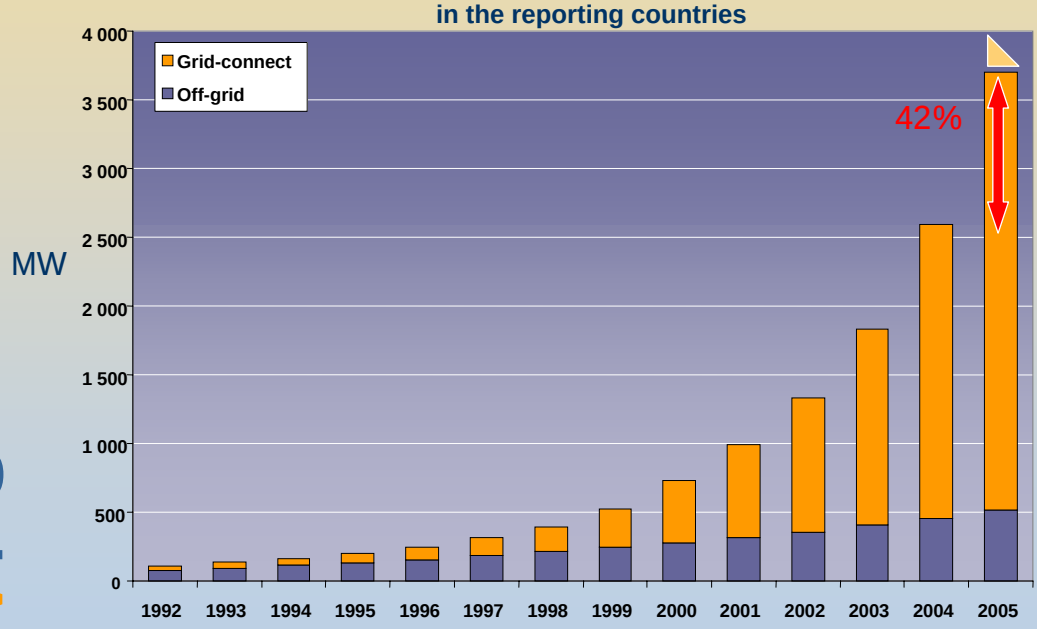
.....but, spectacular market growth!
(market size doubling roughly every 2 years)

Cumulative installed grid-connected and off-grid PV power in the reporting countries



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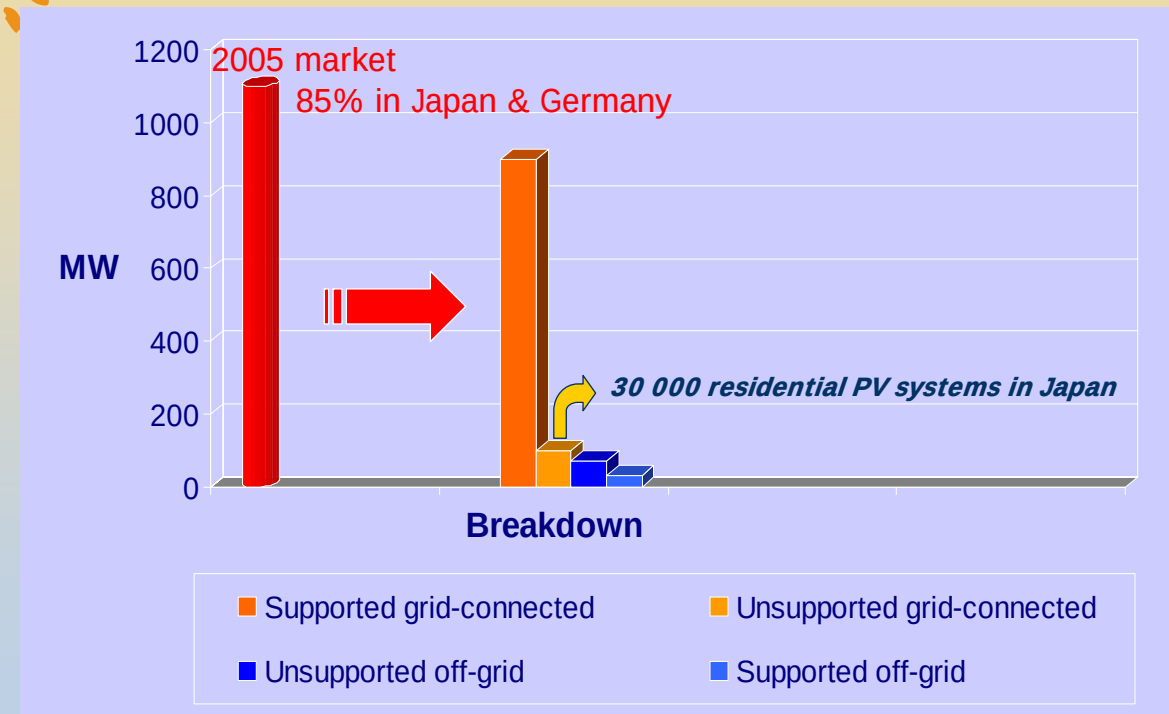
IEA International Energy Agency

A 'real' market...?



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A Wealth of Investment Opportunities Under the Sun November 2006

Public spending on PV: a billion dollar plus enterprise!

- R,D&D and market support;
- Over a decade, public spending on PV has doubled, with relatively steady increases from year to year;
- Initially this spending was largely focused on RD&D; 1994 – 4:1
- The amount spent on market support increased at the expense of RD&D (in both absolute and relative terms) until 2001; '01 – 3:7
- 2004 saw the previously steadily increasing budgets for market support decrease for the first time in a decade;
- From 2001 RD&D expenditure has been both increasing, and increasing its share of the total PV public expenditure. '04 – 1:1

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PV market support frameworks

1. **Enhanced feed-in tariffs**
2. **Direct capital subsidies**
3. **Green electricity schemes**
4. **Renewable portfolio standards**

plus emerging mechanisms...

- **Preferential home mortgage terms**
- **Green loans from commercial banks**
- **Share offerings in private PV investment funds**
- **Tax credits**

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In an ideal world…

- Various measures can be combined to function more effectively
- Funding issues are given due consideration
- The support framework is stable over time, separate from political interference, transparent and clearly targeted

In the real world….

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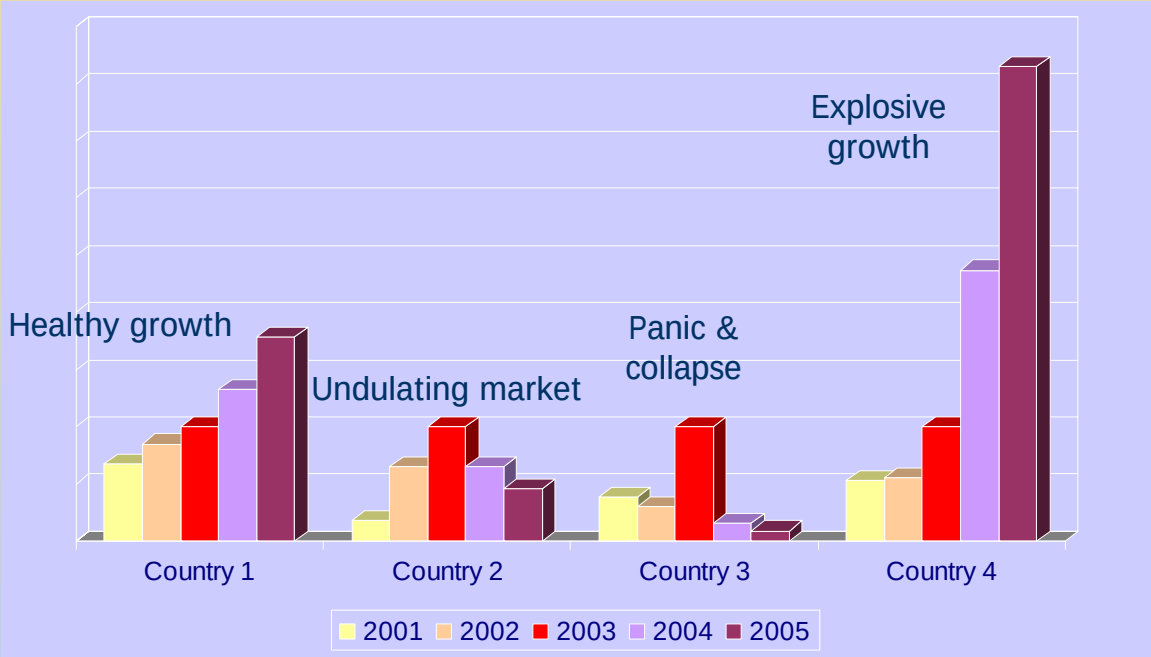
Patterns of annual installed capacity
(values for 2003 set equal)



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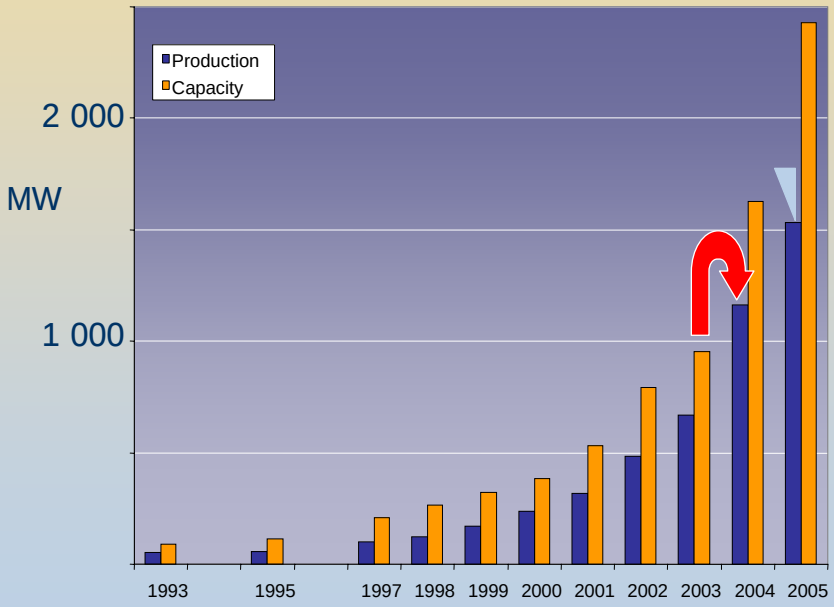
Some PV support mechanisms, problems… and solutions

Feed-in tariffs (PV customers with business cash flow needs)	Inherently unpredictable where specific results are sought. Could lead to overheated markets or negligible impacts. Setting caps can introduce start/stop effects.	Clearly target on specific, limited market segments.
Capital subsidies (PV customers with limited access to capital)	Often too simplistic & do not encourage broader consideration of customer energy management, or willingness to pay for PV. Can inflate system prices & subsidize more affluent customers.	Explore willingness to pay and social equity issues. Clearly reduce subsidy rate over a period of time
Green electricity & RPS (electricity customers and businesses)	General schemes unlikely to have positive impact, may have unforseen negative implications for PV.	Create PV specific products and requirements

Longer-term industry trends

PV module production and module production capacity



Industry value chain

Growth: 2004 → 2005

Silicon feedstock (tonnes sold to PV industry)	8 900 → 11 000 24%
(*Ingot & wafer production*)	
PV Cell Production, MW	1 109 → 1 500 35%
PV Module Production, MW	1 160 → 1 532 32%
Cell Production Capacity, MW/yr	*1 295 → 2 152 66%*
Module Production Capacity, MW/yr	*1 629 → 2 527 55%*

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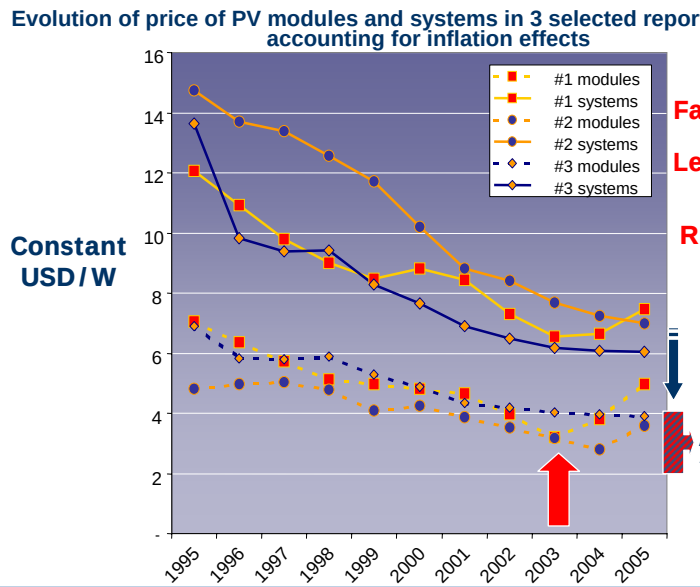
Continuing price falls?

Booming demand and tight feedstock supply



Falls – Canada, Japan, Korea

Level – Australia, Austria, Denmark & UK

Rise – mainly Europe

The PV economists' Holy Grail!

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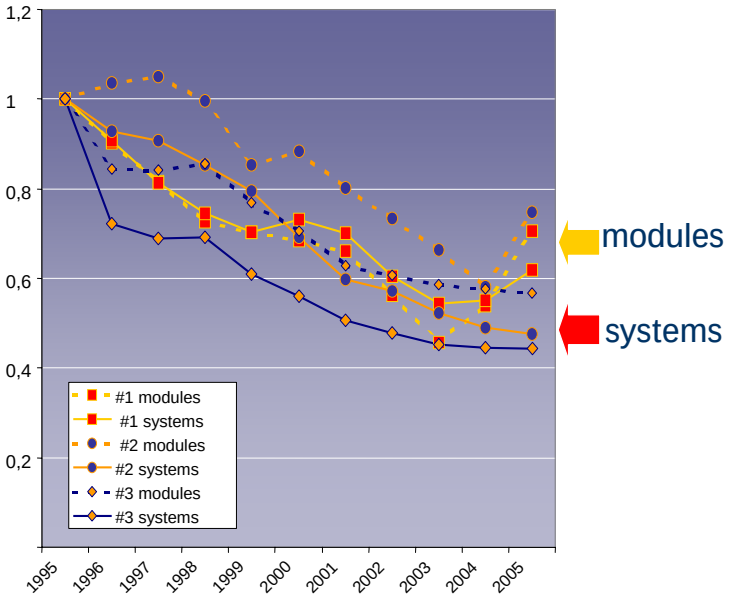
Prices of PV modules and systems relative to 1995



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Some challenges for investors and policy makers…

- How secure is political support for PV if prices do not fall, wealth flows to other countries and local jobs do not materialize?
- Global market, vigorous demand & tight supply – opportunities for small players and innovators OR large players to thrive at the expense of all others?
- To what extent should the market's willingness to pay for PV be explored before public resources are allocated?

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PV's 'additional' values – or how to sell expensive technology!

- **Electrical**
  Peak demand reduction, supply security, reduced line losses, power quality improvement...
- **Environmental**
  Reduced emissions, water use & safety risks from power generation..
- **Architectural**
  Multi-functional, reduced embodied & purchased energy...
- **Socio-economic**
  New industries, products & markets, energy supply diversity, local employment, sustainable development, aid mechanism...

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Discussion points (if needed)...

- Just how unreal is the 'not real' market? Does it matter?
- The emerging 'mechanisms' – where might the smart money go?
- Does market size matter? PV ***could*** provide 5% of global electricity in >15 years, if current growth patterns continue...(but, continued public support ($) & market expansion will need cost & price reductions)
  Or is quality (value) more important?
- Does high price/low volume = low price/high demand for financiers?
- How will the electricity and finance industries interact? Competitors or collaborators?

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