International Markets, Domestic Effects

What can we learn from the international PV market and how does it affect the UK?

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Rushlight Solar Investor Briefing
28th September 2010

Photovoltaics International

www.pv-tech.org
www.solarpowerportal.co.uk
www.design-buildsolar.com

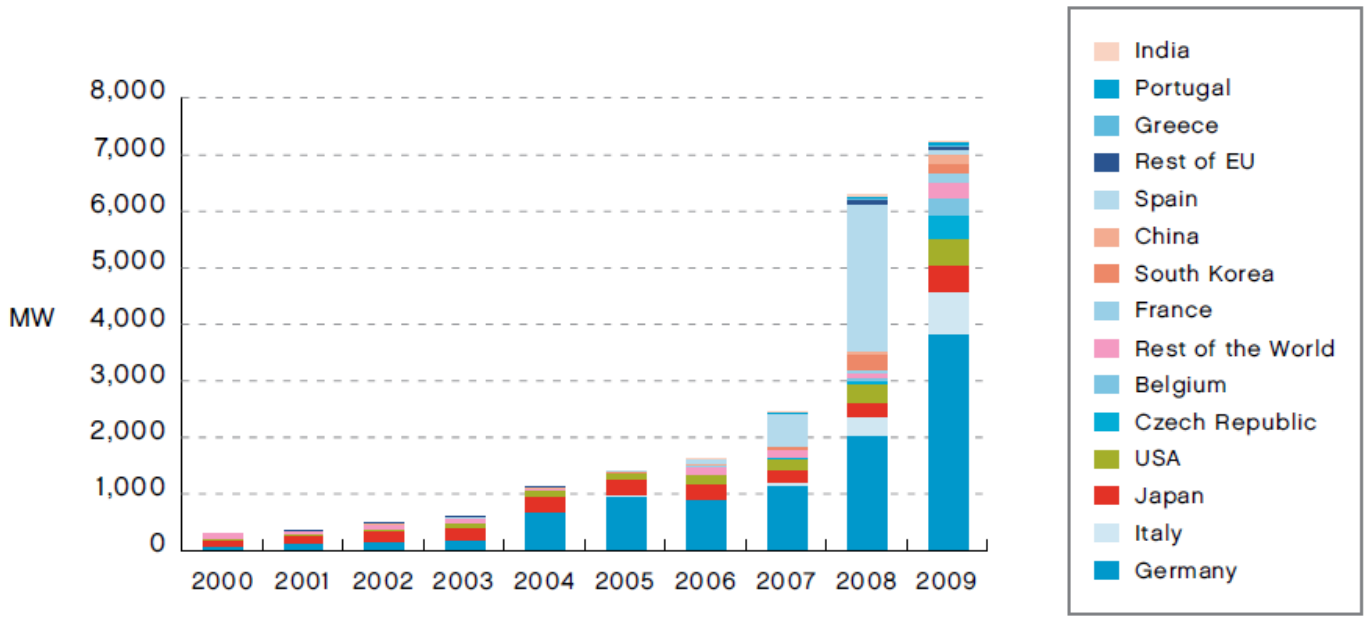
Who is Solar Media?

- Media provider focussing on the business to business supply chain for the global solar industry
- Coverage – Complete value chain-polysilicon to large scale power generation
- Established 4 years – 16 years in microelectronics
- PV-Tech.org is the No 1 website WW specifically for global solar industry. 160,000 visits per month
- Solar Power Portal, Design Build Solar websites unique focus
- 14 print publications per year

Annual PV market

Graph courtesy EPIA, "Global Market outlook to 2014"

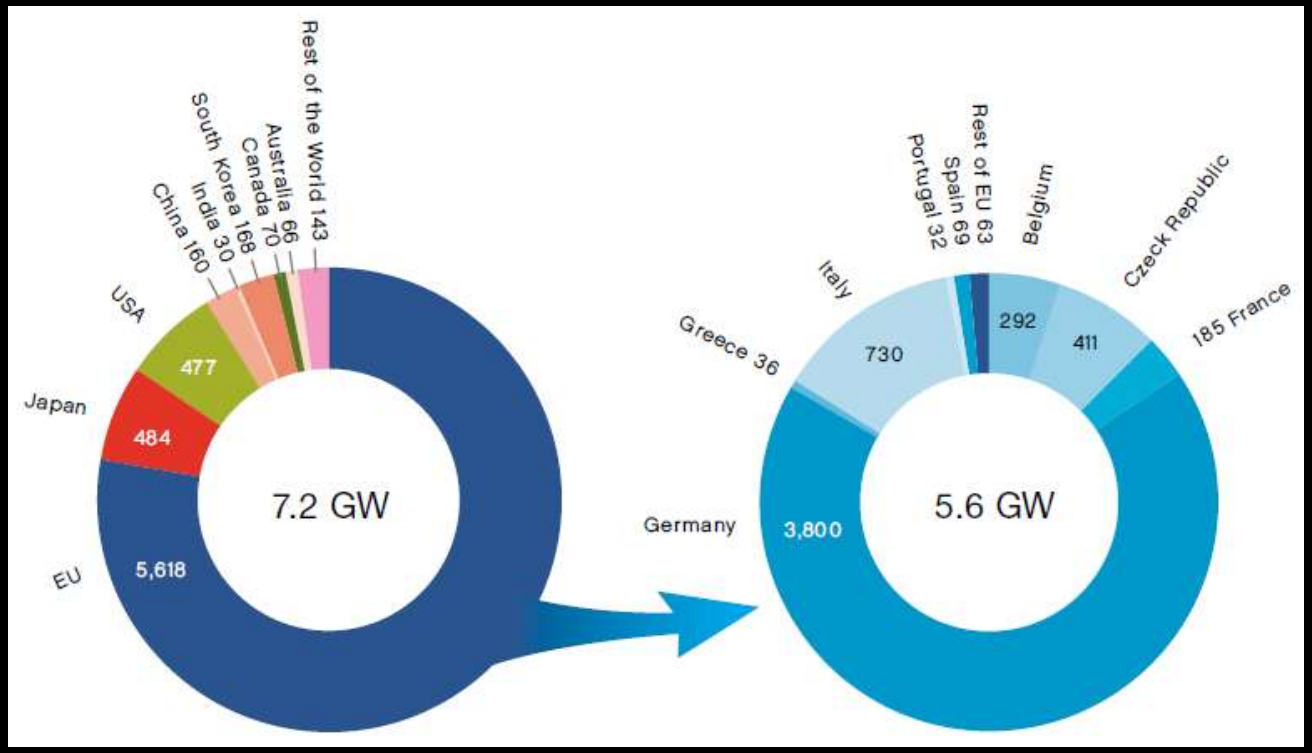
Figure 2 - Evolution of the World annual PV market 2000-2009



Less than 1GW in 2003 to 7.2GW in 2009

Regional Markets 2009

Graph courtesy EPIA, "Global Market outlook to 2014"



The UK in 2009 10MW

UK Market

Compared to Germany

- Similar irradiation
- Higher % home ownership
- Similar levels of disposable income per household
- Mature and stable economy

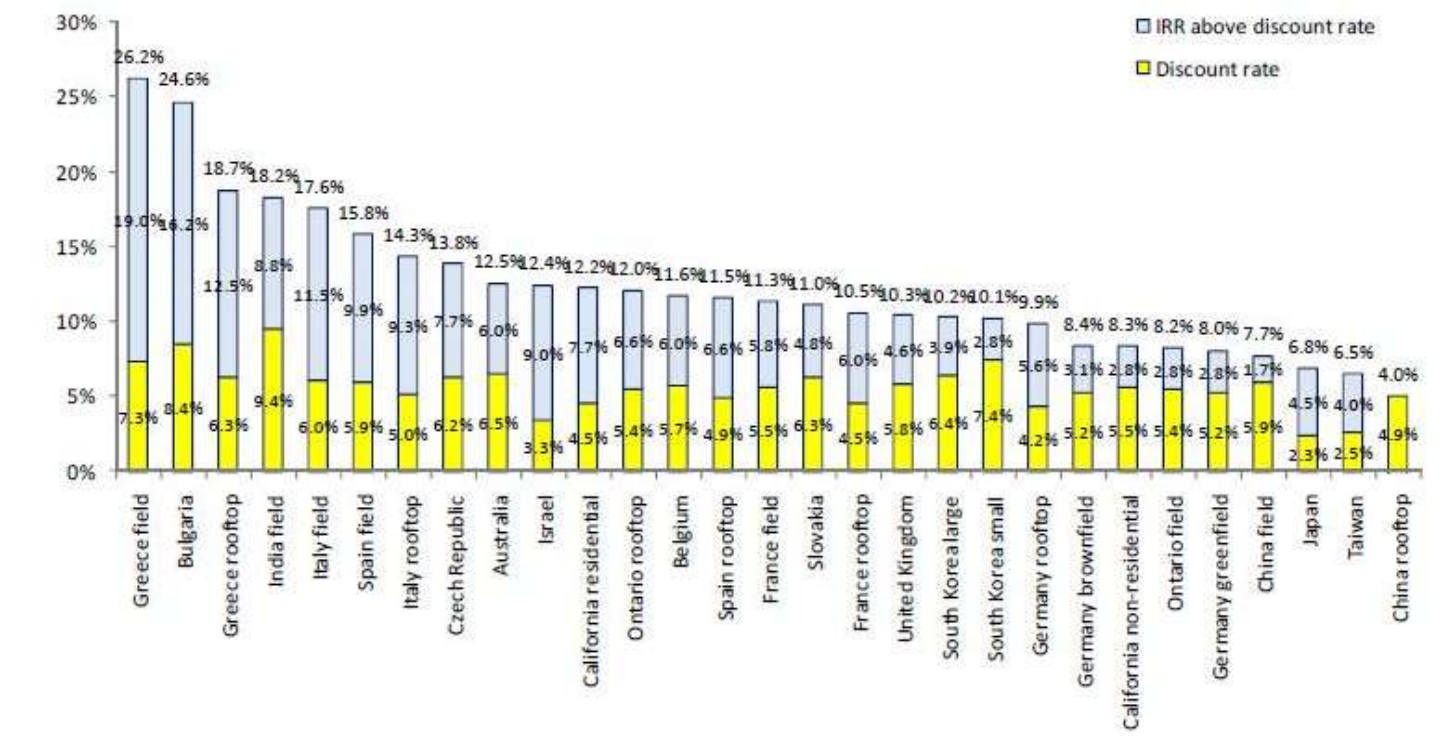
UK Market Forecast	*2010*	*2011*
EPIA	60MW	250MW
IMS Research	60MW	250MW
iSuppli Corp	100MW	250MW

OFGEM UK Figures (Since April 2010)

- 10,000 PV Installations (April-Sept 24 =9,957)
- 24.8MW installed (41 Commercial)
- Pipeline of utility-scale projects 800MW - 1GW. 400MW known to be targeted at Cornwall.

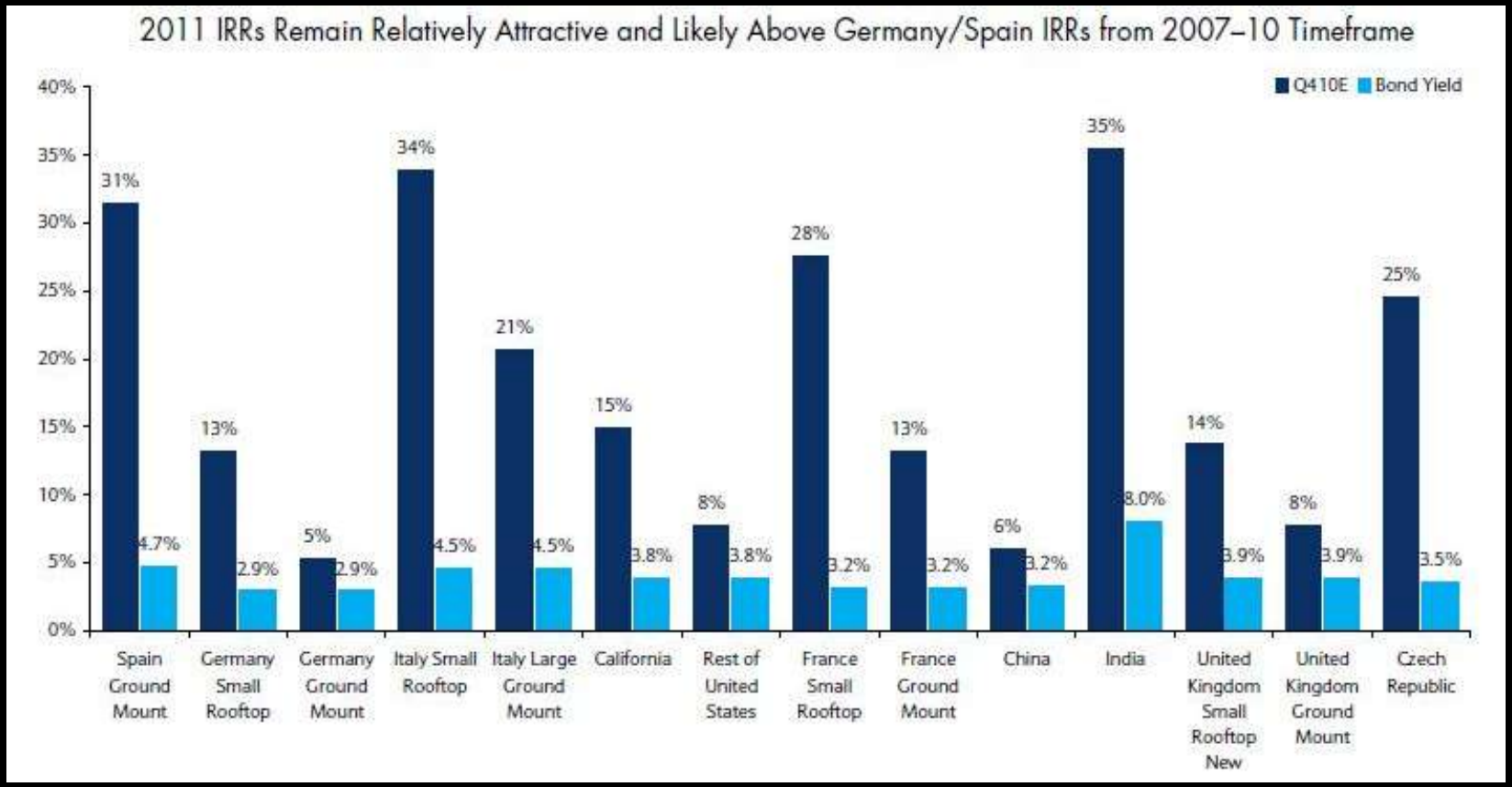
Unlevered IRR vs. Discount Rate %-2010

Source: PHOTON Consulting, LLC. Note: All data are rough estimates.



PV system IRR's > discount rates continue to drive strong installation growth across many markets… but will PV grow "responsibly"?

Barclays Capital IIR Model



UK Market Dynamics

- Demand driven by government FiT. 10.3% IRR
- Supply – 2010 very tight for quality products
- Faster price declines as artificially high

Product	*UK vs. Germany - Cost*	
Modules (c-Si)	50% higher	Limited supply / choice
Inverter	50-70% higher	Severe limited supply / severe limited choice
Installation	50-60% higher	Lack of experience & competition

Barclays Capital 2011 Forecast

- Lower Subsidy Declines = Higher Downstream Profitability = Higher Capital Investments = Higher Demand
- As shipments to higher-subsidy markets such as Italy and France increase in 2011, blended subsidies (on per watt basis) could likely decrease at a slower rate compared to module
- ASPs in 2011 declining 15%.
- Expect downstream profitability to increase in 2011. Result in higher returns to drive higher investments in the sector and hence higher demand.

Global Market Outlook 2010

- iSuppli Corp. Germany will install 6.6GW in 2010, 71% increase over 2009. Some predict 8GW.
- Global installations are likely to reach between 15GW and 17GW+ in 2010. Many revised forecasts in last few months. Up from 13GW avg.
- Module ASP's fell 55% in 2009, will fall another 10% on average in 2010.
- Average price per watt for inverters worldwide will decline by 13.5%. More competition from Asia.
- Polysilicon price down to US$50/kg. 2008 was $240/kg and equates to 1/3 price of module.

Global Market Outlook 2011

- PHOTON Consulting Forecast
- 25GW installed
- Germany Flat (7GW)
- Key markets: U.S.A, Italy, France, Belgium, Ontario
- Asia new impact. China, Malaysia, Australia

Concerns

Global liquidity, Interest rate rises, abrupt PV capping, mid-year FiT regressions in Germany.

Technology Race: Crystalline

- Polysilicon price trend down to sub-US$30/kg. Incumbent suppliers heavy capacity expansions. New entrants large industrial firms and ‘integrated’ PV manufacturers using advanced poly production techniques with large-scale.
- Higher purity poly from larger number of suppliers = higher cell efficiencies at lower cost
- Leading cell efficiencies in volume production from low-cost leaders 18% + Target 20% efficiencies in production 2012.
- Record cell efficiencies from SunPower, Sanyo pushing 21% + in production
- Increasing number of 1GW capacity/shipment companies create economies of scale never seen before.
- R&D roadmaps go past 25% cell efficiencies.
- Innovation at new high tempo.
- New Asian entrants are major industrial manufacturers. Samsung, LG, Hyundai, UMC.

Technology Race: Thin-Film

- Multiple niche & differentiated products. Solyndra, Unisolar, Konarka et al.
- Three key technologies in production: CdTe, a-Si, CIGS
- First Solar #1 PV company: The CdTe thin-film producer saw manufacturing cost decline 13% year over year, reaching US$0.76/watt in the second quarter, 11% module efficiency 1GW capacity and growing. Roadmap to 20% efficiencies but yet to move to larger substrate size = biggest one-off cost reduction benefit. CIGS in R&D.
- Multinational firms entering TF production. Sharp (1GW) TSMC, Samsung (R&D) Many more expected in next few years.
- Potential of lowest cost-per watt. Requires Large-scale, $$$, module efficiencies to compete with First Solar

Is there a thin-film revolution?

- Multiple niche markets emerging allowing different technologies to build and supply
- Increasing focus on manufacturing cost reductions (Turnkey 2.0 lines by 2012 including new turnkey suppliers, centrotherm, Manz, Roth & Rau)
- Higher efficiencies (Better processing equipment and materials)
- All authentic reports show NO material supply issues for CdTe or CIGS despite large demand.

BUT!

Is there a thin-film revolution?

- High initial capital cost
- Ramp-up times long
- Must run at full capacity all of the time for cost competiveness
- Bankability
- First Solar is currently the benchmark on all parameters with first move advantage.
- 1st Gen business failures and business direction shift (Applied Materials)
- Crystalline will remain highly competitive and ubiquitous (Rooftop, commercial & utility)
- Lower capital cost (cell to module)
- Significantly faster ramp capability and significantly lower idle or low-utilization cost
- Crystalline has potential to retain 70% of TAM

Back to the UK - Module Issues

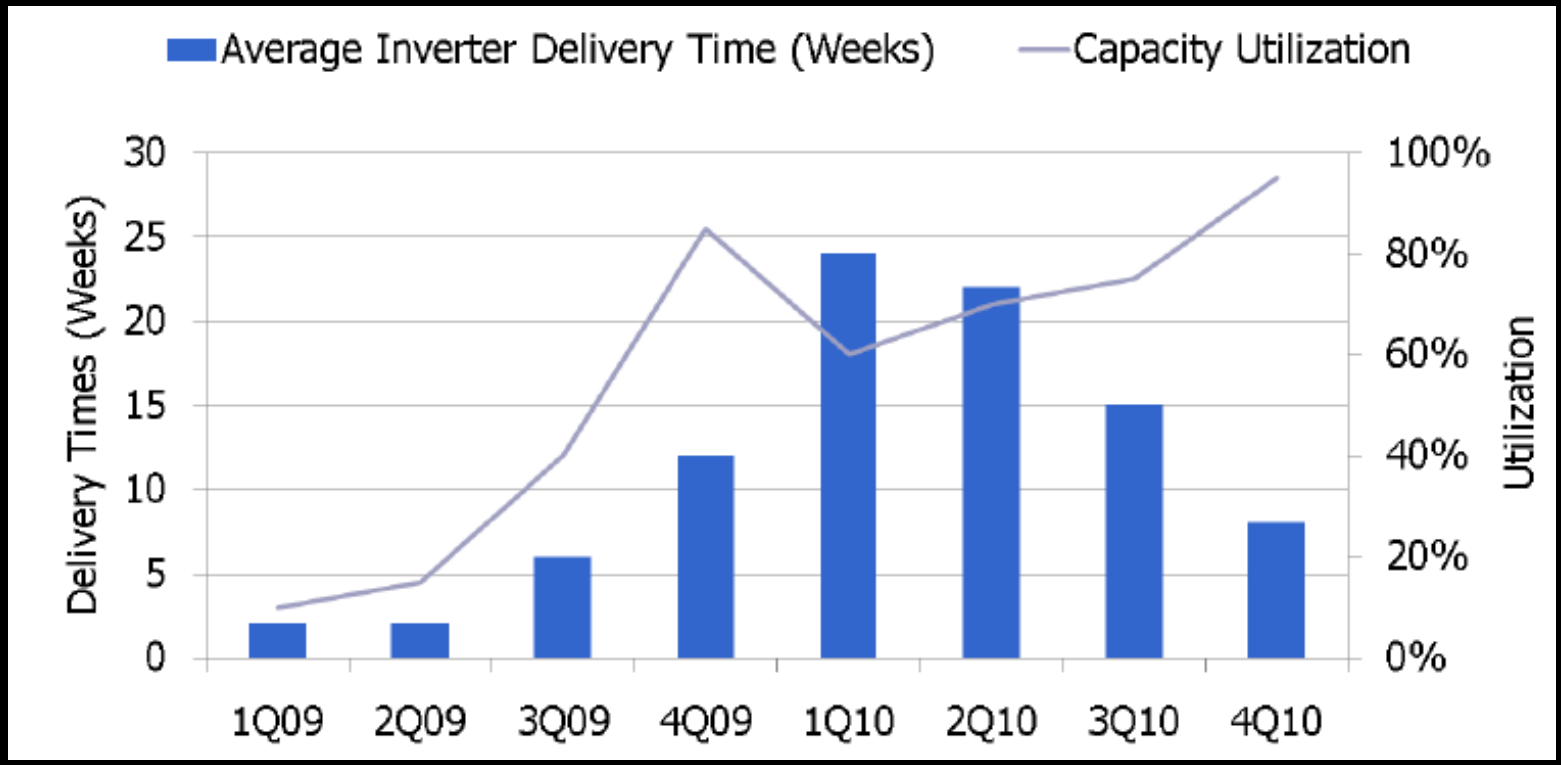
1. Limited supply of high efficiency “Branded” modules available in the UK. SunPower, Q-Cells are ‘sold-out.’ Sanyo, Sharp adding capacity in EU
2. Those high efficiency modules that are available are being sold at an additional premium over the global norm.
3. Module supply constraints will ease as new capacity comes online in China and Taiwan. Still not enough 200watt + modules and probably wont happen until 2011.
4. As only lower efficiency or smaller watt output modules are available the ROI for system owners becomes less attractive.
5. Thin film commercial applications: First Solar CdTe sold out 2010.
6. The faster capacity expansions of some Chinese and Taiwanese. suppliers could create quality issues, efficiency issues. Yet could flood UK market.
7. Tight module supply in 2010. New capacity especially from China/Taiwan should ease supply of low-end modules in 2011.

Back to the UK - Inverter Issues

1. Severe shortages of high efficiency models (I.e. SMA Sunnyboy, 98% eff., 25 week lead times).
2. Global semiconductor component shortage through 2010. IGBT's 15-20 week delays; Capacitors up to 50 weeks.
3. 2nd tier supplier's component sourcing raises quality issues.
4. 2nd tier suppliers lower eff. Models reduce the ROI for systems.
5. 2011 end of Q1 expect better availability as capacity expansions and supply chain regain balance
6. Microinverters and optimzers gaining market share. Greater power harvesting (shaded), simpler install. Lack of UK installer knowledge of microinverters and power harvesting.

Inverter Issues cont…

Graph Courtesy IMS Research



UK - Installation Issues

1. Lack of experience. Poor sales tactics similar to the double glazing industry.
2. Lack of knowledge on; system location, best modules and inverters available to maximise ROI.
3. Installers are mainly small firms that lack purchasing power.
4. Time and cost of install longer than Germany. Reduces system ROI.

UK Other issues

- Consumers lack knowledge and awareness of benefits
- Poor government planning and education
- Lack of transparency and systems for tracking installs and products
- “Free Solar” offers. 3 companies selling in UK. Potential good/bad outcome of consumer awareness.
- High Street: Tesco, M&S, Co-op, British Gas. One product fits all. Non-optimised installs

Recommendations

- Invest in market awareness in conjunction with government programmes, Carbon Trust, Energy Savings Trust etc.
- Build adequate industry information resources for the UK
  - Market data
  - Media
  - Industry networking
  - PV association
- Secure your supply chain
  - Test third party suppliers
  - Negotiate direct with the manufacturer where possible
  - Form buying groups if possible
  - Be wary of deals that sound too good to be true
  - Seek advice if you need it

The Plug

- Go to and recommend www.solarpowerportal.co.uk
- Attend "***Solar Power UK Conference",*** 18th –19th October 2010 in London.
- Speakers (25) include Alan Whitehead MP, RBS, Ray Noble, National Farmers Union, Places for People.
- Send us any and all UK related press releases to editorial@solarpowerportal.co.uk
- Link to us!

Thank you

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