

Solar Electricity – how can the UK best meet this opportunity?

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ESP KTN

Green Photonics Conference

Millennium Centre, Cardiff

Tuesday, 19 October 2010

Knowledge Transfer Networks

- Introduction to the KTN
- The role of the KTN in technology like PV

Knowledge
Transfer
Network

Electronics, Sensors
Photonics

ESP KTN ... Joining Up the Thinking

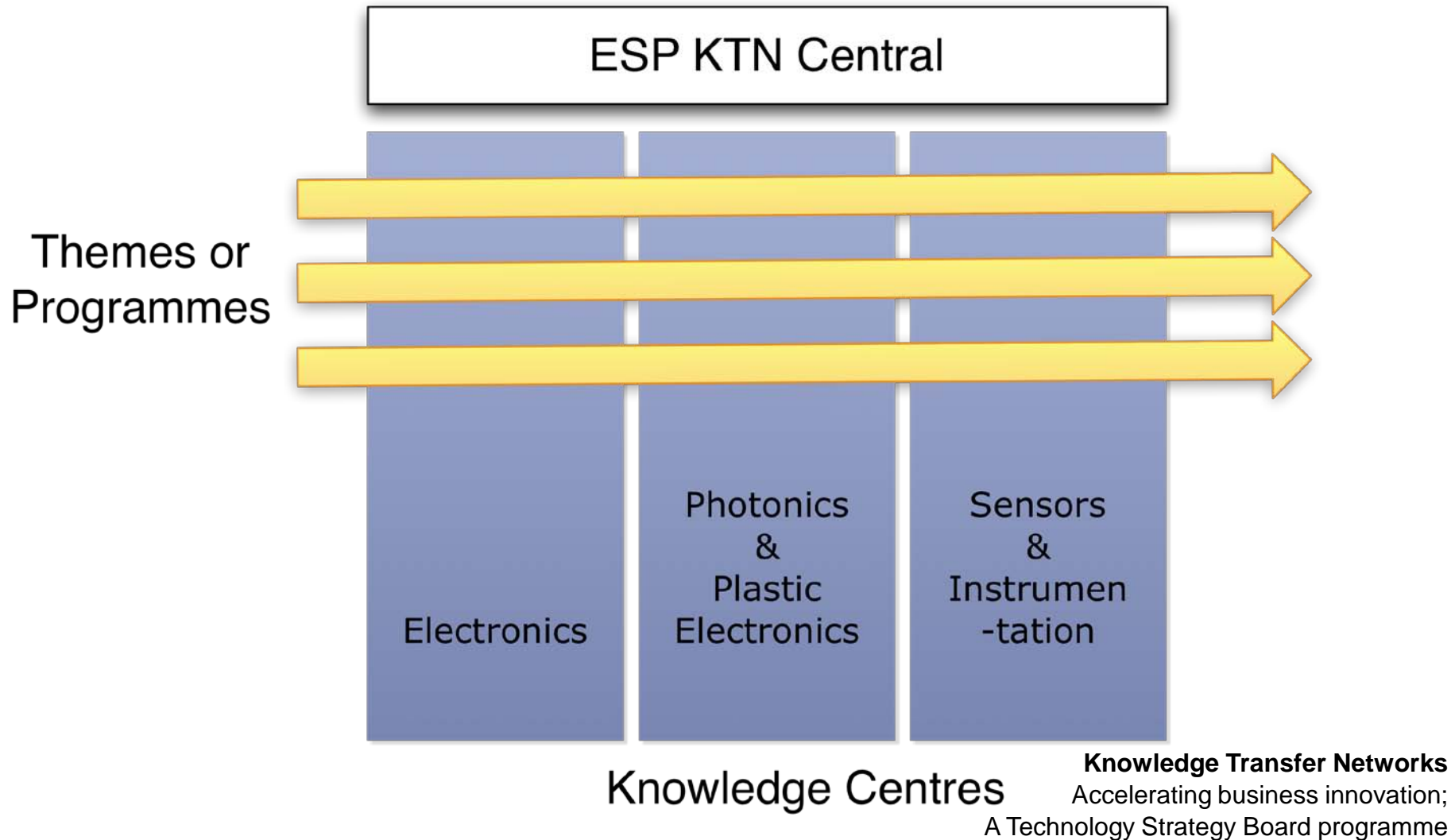
Knowledge Transfer Networks

- National networks in a field of technology or business application, with international perspective
- Bringing together business, research bodies and the finance community ...
- ... to **stimulate innovation** through exchange of knowledge and expertise.
- KTN staff have experience in technology transfer, industry, consultancy, academia
- *Total KTN members: over 57,000*

Electronics, Sensors, Photonics KTN

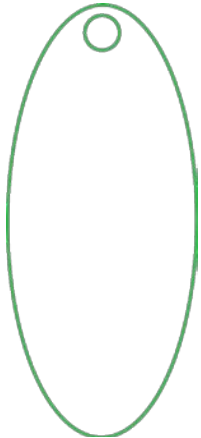
- Electronics, Sensors and Photonics & Plastic Electronics KTN's are the new Knowledge Centres which merged into ESP KTN on 1st July 2010
- A single outward looking face for, and point of access to, the Electronics, Sensors and Photonics community of industries, academia and entrepreneurs
- A strong, recognised and influential voice of the community into central & regional Government, Technology Strategy Board and Research Councils.
- Nationally driven, regionally supported, globally aware & connected

What is the ESP KTN?

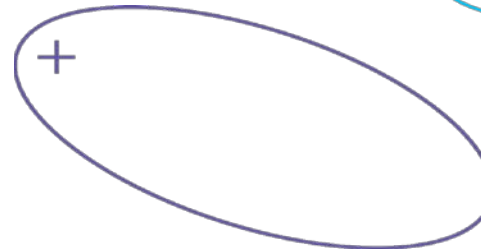


ESP KTN Future Challenges & Solutions

Quality of Life Technologies



Smart Moves

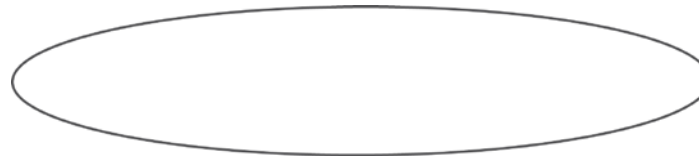


Connected World



Electricity For the Future

Knowledge Base Support



Secure World



Electricity for the Future

- To meet UK renewables targets the UK will have to generate more electricity from cleaner sources
 - Renewables
 - Nuclear
 - Fossil fuel plants with carbon capture
- Will need an electricity grid with larger capacity able to manage greater fluctuations
 - Smart grids
 - Smart metering
 - Domestic feed in
- Will electricity generation remain centralised in near future?

ESP KTN Networking

The key to it all

Quality of Life Technologies

Connected World

Translating
the
Challenges
into
Opportunities

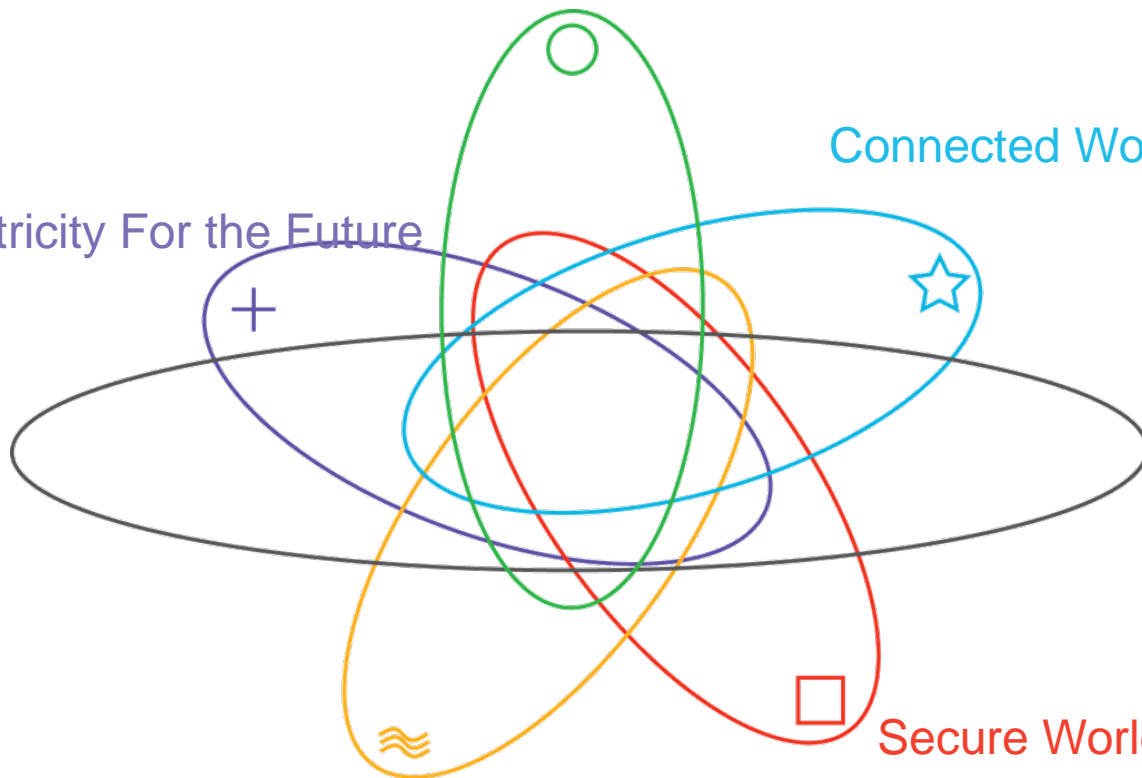
Electricity For the Future

Knowledge Base Support

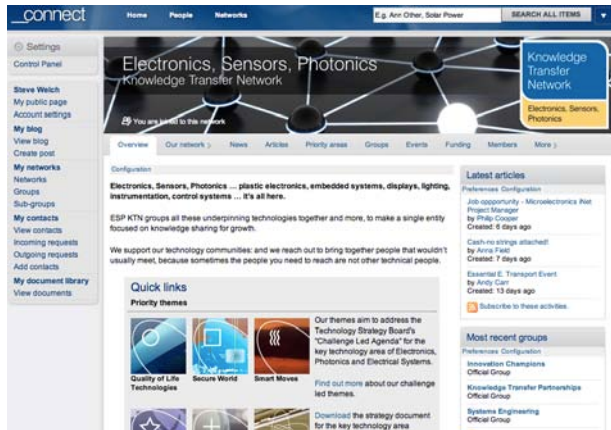
Secure World

Smart Moves

Knowledge Transfer Networks
Accelerating business innovation;
A Technology Strategy Board programme



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- Complete your individual profile
 - The more information on your organisation you add, the better your networking connections

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Knowledge Transfer Networks
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Knowledge Transfer Networks

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- The role of the KTN in technology like PV

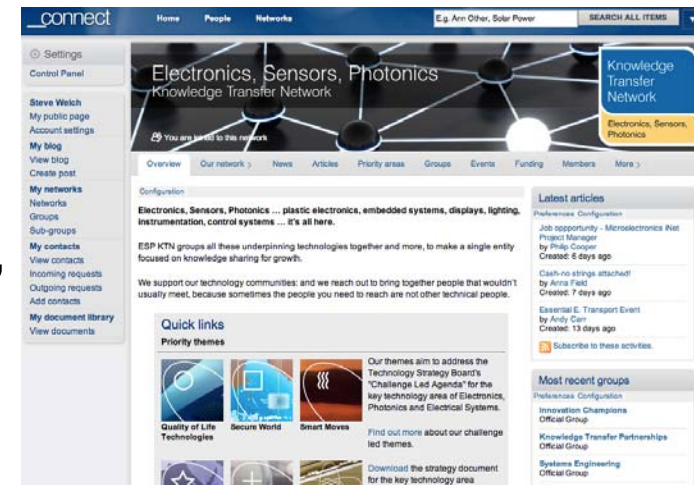
Knowledge
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ESP KTN ... Joining Up the Thinking

UK PV/SE strategy workshop

- Last month, the ESP KTN organised a residential workshop to consider the question: “Do photovoltaics have a future in the UK?”
- The invited participants were drawn from industry, installers, researchers, investors, and Government.
- This slide set is a short summary of the workshop, and draft outputs. The full report, with recommendations for action, will be available on the ESP KTN web site ([_connect](#)) shortly.
- One recommendation is to use the term “Solar Electricity”, hence the abbreviation SE in this presentation.



UK SE/PV strategy workshop

The purpose of the workshop

- Under the (deliberately provocative) title of “Do photovoltaics have a future in the UK?”, we gathered many of the stakeholders in the diverse UK PV sector so that we could discuss the strengths, weaknesses and threats to the UK PV sector.
- By addressing these issues in a structured manner, we were able to identify opportunities and produce a series of recommendations and actions for the UK.
- This workshop was by invitation only, and involved decision makers from the industrial, academic, research, installation, and regulation communities. Each of these different perspectives ensured a lively and informed debate leading to a coherent and co-ordinated plan for the future which is summarised in these slides.
- Introductory presentations were made by various experts at the start of the workshop.

UK SE/PV strategy workshop

List of participants

First name	Surname	Organisation
Will	Barton	TSB
Peter	Batchelor	BIS
Roger	Bentley	Whitfield Solar
Alex	Cole	NaREc
John	Costyn	DECC
Trevor	Cross	E2V & ESP KTN
Jonathan	Halls	Solar Press
Antony	Hurden	ESP KTN
Stuart	Irvine	Centre for Solar Energy Research, Glyndwr University PV NET co-ordinator
Matthias	Kauer	Sharp Laboratories of Europe
James	Kingsley	Ossila Ltd
Keith	Lewis	EMRS DTC & ESP KTN
Nigel	Mason	PV Consulting
Humayun	Mughal	Silicon CPV plc
Steve	Phelps	IQE (Europe) Ltd
Michael	Priestnall	CENEX & Independent consultant
Keith	Rollins	Du Pont-Teijin Films (substrates for OPV) & chair of the Plastic Electronics Leadership group,
Rachael	Rowlands-Jones	Dyesol - now at Liverpool University
Paul	Rowley	Loughborough University
Garry	Staunton	Carbon Trust
Ian	Vance	Amazing Communications Ltd
Nicholas	Walker	Microsharp Corporation Limited
Mike	Walls	CREST (University of Loughborough)
Hamish	Watson	Polysolar
Matthew	White	Whitespace Innovation
Maarten	Wijdekop	Corus
Ian	Williams	BIS
Alastair	Wilson	ESP KTN
Philip	Wolfe	Ownergy

NOTE: Not all sectors of the PV industry were represented (particularly in the balance-of-systems [BOS] and installation area) due in part to availability of invited participants.

Knowledge Transfer Networks
Accelerating business innovation;
A Technology Strategy Board programme

UK SE/PV strategy workshop

- The workshop used break-out groups to consider Strengths and Weaknesses in the UK SE/PV sector, taking account of the different/competing technologies, the situation in the supply chain in UK, export markets, and also what Threats exist.
 - The announcement of the SEII in May provided another reminder of the timeliness of the workshop.
- Some of the issues in SE/PV development were addressed in two different areas which included:
 - Developments for the Active layer
 - These tend to focus on improving efficiency and reducing cost
 - Developments around Peripheral elements which include:
 - Building integration of SE/PV.
 - System cost reduction and reliability.

UK photovoltaics (Solar Electricity) workshop

The following slides represent a draft of the preliminary workshop outputs

Draft preliminary outputs

DRAFT

- UK SE/PV SWOT analysis and potential threats
- Raise profile of SE across the UK
- Actions for 'Trade Association'
- Actions for the KTN to initiate
- Actions to benefit UK SE sector
 - Build up knowledge base
 - Identify metrology resources

KTN commissioned report*

SWOT analysis of UK PV Value Chain Data

Strengths

- Access to a world class, innovative and collaborative solar specific R&D community, specialists in material science
- A Full thin film solar production facility in the UK : EPOD Solar Wales
- Skills related to the production of PV cells and units in the semiconductor and electronics industries
- A market leader in refining silicon ingots for wafer production
- A production facility of the worlds PV market leader
- An international reputation for modern architectural design and in the construction of buildings which integrate environmentally friendly technologies such as PV
- No UK Legacy of c-Si base manufacturing facilities that have to be justified – can be agile and move into new Thin Film market

Opportunities

- Introduction of breakthrough technology (e.g. CdTe, III-V multi-junction devices, DSSC and organic cells) and increased demand could reduce PV unit costs significantly
- Limited number of players in the CdTe, III-V and DSSC market
- Leverage of the UK's capability in semiconductors production
- Low Carbon Building and other initiatives could increase PV integration in buildings
- Increasing Government support for micro-generation technologies
- UK and European market expansion could support PV wafer and cell manufacture and increased module assembly
- Growing and relatively unexploited UK market for PV

Weaknesses

- Investment barriers for new entry into the PV cell production market are high
- Manufacturing processes for PV cells are expensive (labour and capital intensive) –[If so - how does Germany and USA do it ??]
- Relatively low (local) market demand suppresses industry growth
- Expensive PV installations (per watt of installed capacity) require significant financial support – UK not a good track record of risk taking

Threats

- Strong competition in PV cell manufacture from companies in Japan, Germany and the US in particular
- Production cost reductions for PV systems not realised fully
- Transfer of PV cell manufacture to low cost, developing economies the same applies to potential new production facilities
- Inadequate UK support measures as compared with those offered elsewhere

SWOT revision from one break-out group

Knowledge

Strengths

- Architectural design
- UK research base
- Materials expertise
- Equipment & instrumentation suppliers
- Range of large & small suppliers
- Volume manufacturer of modules (Sharp)
- Glass & TCO manufacturer (Pilkington)
- Roll to roll capability
- Power electronics/control engineering capability

Weaknesses

- UK profile
- No single industry voice (UK TA)
- Lack Technology Innovation Centre (Clerk Maxwell)
- No big UK PV manufacturer
- Understanding of UK capability and gaps
- No TUV equivalent (i.e. no UK test centre) link to building centre?
- Lack of academic commercial knowledge transfer
- Lack of measurement of existing installations
- No integrated equipment suppliers

Opportunities

- Building regulations for BIPV (inc Merton rule 10% renewables)
- Develop UK high skills PV base in developing industry
- Supply chain for modules (to Sharp)
- Inward investment (like G24i)
- Regional opportunities
- Expanding UK market
- Input to energy efficient buildings and others like FOF (Factory of the Future)
- Influencing future TSB funding
- Design & integration of modules for holistic energy management
- Cluster of new companies in the CPV area looking to grow exports
- Leading university research groups in the emerging OPV area

Threats

- Understanding of world capability
- UK fails to consolidate and develop large activities
- Late entry to market
- Weak UK supply chain

DRAFT

Threat to UK SE supply chain

DRAFT

- Drawing on EU experience, big companies arrive with an existing supply chain.
- There might appear to be no mechanism for favouring UK suppliers within a sustainable supply chain (not necessarily so true in Wales).
- The supply side may be a barrier to growth in the UK market.
- Opportunities:
 - Local suppliers of components – low transport costs (e.g. fabrication next door to Pilkington).
 - Integrators – framing, systems, BIPV structures/components.
 - Unique products (BOS*, smart inverters, etc.).
 - Trained & skilled installers (highest proportion of employment in this sector).
 - EPIA & Greenpeace report, “PV offers important social benefits in terms of job creation. Significantly, much of the employment creation is at the point of installation (installers, retailers and service engineers), giving a boost to local economies”

* A PV array is usually part of a system that may also include energy storage devices (e.g. batteries), support frames, and electronic inverters and controllers; these are collectively referred to as the balance-of-system or BOS.

Things to be done for the UK Solar Electricity sector

DRAFT

- Raising of public awareness
 - Use term ‘Solar Electricity’ rather than PV.
 - One voice for the UK – flag waving.
 - What is the ‘elevator pitch’ for UK SE?
 - Basis for a press release.
 - Creates Jobs; Generates Wealth; Reduces Carbon Dioxide Emissions; Prevents fuel poverty; Access to export market with 40% CAGR
 - What are the benefits that comes from FiTs as a Government investment?
 - What is the story to tell about the UK SE technology?
 - Include the cost-benefit argument
 - Include a ‘Solar Energy Index’ in weather forecasting.

Table 5.1: Worldwide employment in PV-related jobs under Solar Generation Scenarios

year	Installation	Production	Wholesaler	Research	Supply	Total
Advanced Scenario						
2007	77,688	22,968	6,890	2,986	8,613	119,145
2010	220,162	62,546	18,764	8,131	23,455	333,058
2015	559,282	147,373	44,212	19,159	55,265	825,292
2020	1,632,586	393,530	118,069	51,159	147,574	2,342,907
2025	3,877,742	839,338	251,801	109,114	314,752	5,392,747
2030	7,428,118	1,406,841	422,052	182,889	527,565	9,967,468
Moderate Scenario						
2007	77,688	22,968	6,890	2,986	8,613	119,145
2010	166,518	47,306	14,192	6,150	17,740	251,906
2015	486,219	128,121	38,436	16,656	48,045	717,478
2020	1,018,552	245,519	73,656	31,917	92,070	1,461,713
2025	1,806,321	390,978	117,294	50,827	146,617	2,512,037
2030	2,770,569	524,729	157,419	68,215	196,773	3,717,705

*For 2006 EPA data is used. For later years the figures are based on extrapolation of EPA data.



UK 'SE/PV Trade Association'

A coherent voice for UK SE/PV

DRAFT

- Form UK SE/PV organisation ('Trade Association') to represent all stakeholders
 - This was identified as necessary two days before the BPVA held its inaugural meeting
 - KTN has requested a meeting soon
 - Ensure involvement with the Solar Energy Society
- Such an organisation needs to:
 - Engage with Europe (currently weak)
 - Particularly with EPIA (120 members, 6 UK, no UK board member)
 - SEII (SOLAR EUROPE INDUSTRY INITIATIVE)
 - Nicola Pearsall and Stuart Irvine already involved
 - Official representation via DECC (Steve Martin) but not a specialist
 - KTN to meet Nicola Pearsall and Steve Martin to ensure coherent activity
 - FP7
 - How does UK engage effectively? No cohesive lobbying voice.
 - Present single coherent and cohesive voice for the UK
 - Neither DECC nor BIS recognise where to get a sense of the UK SE sector
 - Raise the profile of Solar Electricity and the capability of the UK
 - KTN role to support this work



UK 'SE/PV Trade Association'

Some policy issues

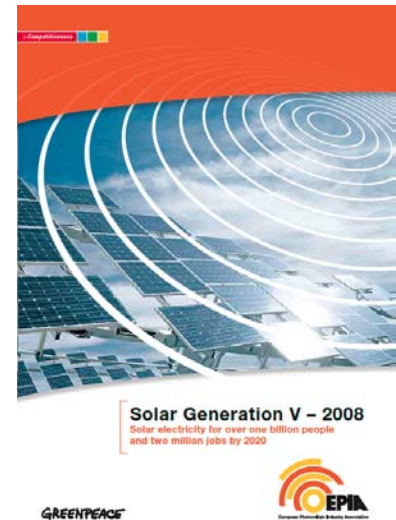
DRAFT

- Engage with DECC on FiTs – should include system level performance.
- Differential FiTs rate for building-integrated systems (as in France).
- Lobby government to retain FITS.
- Should certification be at the system level (consider energy yield).
- Installers should be certified for system design, optimisation, configuration.
 - Not just for 'HSE issues' (as current Microgeneration Certification Scheme, MCS)

Things to be done for the UK Solar Electricity sector

DRAFT

- Raising of public awareness
 - Ensuring that SE/PV meets all appropriate building standards and objectives. Make the buying decision easy for construction industry.
 - c.f. lighting with new lighting technology
 - Highlight societal benefits from SE use in social housing (human interaction is low as opposed to feeding meter)
- Education
 - Construction sector – including architects – should be encouraged to adopt BIPV (BISE).
 - Installers – educate to provide design training to select optimum system for each installation.
 - Government.
 - Jobs – mainly in installation (see EPIA/Greenpeace report).
 - Public – demonstrate viability and pay-back for domestic installations. Also social housing benefits.
 - Investors – present a case to enable businesses to benefit from SE



Actions for the KTN to initiate

DRAFT

- Shift the fixation from PV **technology** onto **system** performance for Solar Electricity.
- Engage with:
 - Electronics (& Sensors) KTN to explore intelligent SE systems;
 - Modern Built Environment KTN – BIPV/BISE;
 - Energy Generation & Supply, including
 - Nottingham University on Grid issues
 - Joint events with PKC & EKC ESP KTN, EG&S KTN and MBE KTN;
 - Use other KTN activities to seek opportunities for UK SE sector.
- Inform the TSB & EPSRC.
- Develop good working relationship with BPVA & SES.

Actions for KTN to initiate (2)

DRAFT

- Make contact with all principal investigators on EPSRC projects to ensure they recognise the support that KTN can provide to disseminate and build on their research.
 - **Feel free to contact me directly on this.**
- Presenting at national events (in addition to Green Photonics).
 - Photonex 2010 at Telford (November)
 - SolarFlair10 (December)
 - Possibly 7th Photovoltaic Science Applications and Technology Conference (PVSAT-7) (Heriot Watt University, April 2011)
- A summary report will be prepared, and distributed to all participants, as well as being made available on the KTN web site.

Actions for KTN to initiate (3) The investment community

DRAFT

- Raise awareness of business benefits to investors (including banks).
- Consider options for the funding gap for near-term PV. technology development (TRL 4-6) to address risk reduction, leverage of VC funding.
- Produce compelling elevator pitch (“solar electricity”).
- Discuss with Financial Services KTN.
 - Discussions with the FS KTN recently suggested this type of support is not part of their mission.

Actions to benefit UK SE/PV sector

Build up knowledge base

DRAFT

- Update KTN supply chain report and look for gaps in the UK SE supply chain, including:
 - Identify different needs for each opportunity;
 - Revise supply chain report in collaboration with other KTNs;
 - Include materials development and use other KTNs to identify latent suppliers;
 - Identify existing metrology capability in UK and identify what needs to be done to meet UK needs (see next slide);
 - Where possible, integrate with the UK SE academic atlas (Stuart Irvine)
 - Atlas of UK R&D in PV for UKERC is currently out for consultation

UKERC
Monday, October 11, 2010

Home About Learning Research Activities International

Research Atlas

Atlas | Register | Landscapes | Roadmaps | Energy Data Centre | Classification | FAQ | Contact

Home » Research Atlas » Welcome

Welcome to the Research Atlas.

The UK Energy Research Centre has created four tools to assist policy makers and researchers to review the current status of UK Energy Research and Development, and identify the key research challenges

Actions to benefit UK SE/PV sector

UK SE/PV test house

DRAFT

- Map metrology capability across UK. This might include:
 - If metrology needs emerge, inform NPL with details of scope and scale (opportunity for NPL and other existing UK test facilities).
 - The need reference standards in the UK and commercial test house.
 - The need to by-pass TUV with long waiting list.
 - Define any need for standardisation of measurement (TUV, etc.).
 - Identify scope and scale of Welsh Assembly funding centre in Ebbw Vale (BRE Port Talbot).
 - Confirm need for test facilities for modules rather than just wafers (inc. accelerated life-time and environmental testing – different test conditions for different PV technologies/systems).
 - Identify researchers who understand the science on underlying system reliability.
 - Collect panel life-time data (is 50 years realistic?)
 - Publish module test data to allow installers to be aware of energy yields

Actions to benefit UK SE/PV sector

UK SE/PV test house

DRAFT

- The UK would benefit from monitoring facilities to yield geographic performance data.
 - FiTs installation data is not sufficient – it should include more data about installations and systems. This data should be available for analysis
 - Possible opportunity for development of SE/PV data gathering instruments (similar to weather station data)
- To support this, there needs to be real world data available on the web via monitored demonstrator sites (UK and abroad – where export markets exist)
 - UK is better suited to particular technologies – need data to validate this.
 - Sheffield Solar Farm is an example, as are NaREC and Universities at Hatfield and Loughborough
 - Energy Saving Trust has solar ‘isobars’ on UK map
 - SKA may be opportunity for demonstrator site for CPV



Opportunities at the system level Collaboration with other KTNs

DRAFT

- **Inverters**
 - Advanced inverters/BOS will improve system reliability, efficiency and LCOE
 - Lifetime – should match that of SE/PV modules and other BOS
 - maximum power-point trackers
 - per module inverters
 - Opportunity for UK inverter manufacturer
 - UK rate of change of irradiance places a strain on the inverters. Hence UK role in intelligent inverter design.
 - Introduce FiTs requirement for availability of inverter data
- **Monitoring and control**
 - Service provision of lifetime performance etc.
 - Usage based control / smart use
- **Installation and packaging**
 - Easier / better looking panels (without loss of efficiency and increase in cost)
 - Reduction of on-site time
- **Real life-time issues**
 - Degradation of cabling systems
 - AR coatings – materials/coatings to enhance light capture
 - Cleaning systems
 - Aesthetics
 - Storage
 - DC wiring and connectors
 - Fire safety
 - Grid integration issues re quality of “signal”

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