Editorial
My apologies for a very delayed publication – the world of energy research is moving fast – we are all struggling to keep up. There are large-scale calls out from the European Commission, the Energy Storage Grand Challenge issued by the EPSRC, and the Electricity Market Reform white paper from DECC to name but a few recent distractions.

Despite the wait, I hope that you will find plenty of interest. I’m particularly grateful to Zoe Barber for an excellent and detailed report on the Advances in Photovoltaics event organised by the IOP Ion and Plasma Surface Interactions Group. The event was co-sponsored by the Vacuum, Energy, Thin Films and Surfaces, and Printing and Graphics Science Groups – a clear demonstration of the multidisciplinary nature of energy research. Plus there are two great articles from Jeff Hardy.

Being Autumn, it is time for the Energy Group’s annual event – this year on the exciting developments from small start-ups exploiting a wide range of physical phenomena for energy transformation. The details are on page 19 with registration via the IOP events website. Autumn also heralds our AGM – details on the next page – please do consider joining the committee and help keep the innovative ideas flowing.

Colin Axon
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This newsletter is also available on the web and in larger print sizes.

The Energy Group website is http://eg.iop.org

The contents of this newsletter do not necessarily represent the views or policies of the Institute of Physics, except where explicitly stated.

The Institute of Physics, 76 Portland Place, W1B 1NT, UK.
Tel: 020 7470 4800  Fax: 020 7470 4848
Energy Group AGM

Monday 14th November, 2011
10:15 – 10:45
Institute of Physics, 76 Portland Place, London W1B 1NT.

We urge you to attend as this will help ensure the vitality of the Group, the committee, and the activities we undertake.

This year nominations are needed for:
- Chair,
- Honorary Secretary,
- Honorary Treasurer, and
- Committee Members.

Informal enquiries can be made to either Simon Roberts (simon.roberts@arup.com) or Colin Axon (colin.axon@brunel.ac.uk)

Completed nomination forms should be sent to the Honorary Secretary, Colin Axon (colin.axon@brunel.ac.uk) before Friday 11th November.

If you unable attend the AGM and have issues you would like to be raised at the meeting, please notify the Honorary Secretary before Friday 11th November.

Attendance at the AGM is free and precedes our event

“Stand Up for Start-ups:
Getting Low Carbon Technologies off the Ground”

Please see p19 for details.
Advances in Photovoltaics

Zoe Barber reports on this Institute of Physics meeting held on the 14th September 2011 at IOP Headquarters, London. Organised through the Ion and Plasma Surface Interactions Group, this meeting was co-sponsored by the IOP Vacuum, Energy, Thin Films and Surfaces, and Printing and Graphics Science Groups.

This was a very well attended, entertaining and informative day, with presentations that provided an up-to-date overview of the field, mixed with reports on some fascinating new technology. The picture that emerged was of a buoyant, optimistic industry with technology performing ahead of predictions on many counts. Whilst there is continued pressure for increased efficiencies and reduced costs, the potential is great. In addition to economies of scale, there are many exciting possibilities for future technologies, and many parameters to tune.

Martin Green (University of New South Wales) set the scene with an overview of current market trends, a summary of the current state of exploitation of PV technology and where it may go. As a part of the low carbon technology market, PV has moved from virtual insignificance to an important share over the last decade. Wind energy has been growing strongly, but PV is catching up and will probably overtake it in the next decade. In Australia, this has been encouraged by perhaps over-generous feed-in tariffs, leading to a large uptake of residential PV modules. For example, a 3 kWp system, giving typically about half of the required domestic power usage. Examples of uptake figures include about 8% of homes in Sydney, but also large arrays in Germany and the United States, are set to compete with wholesale conventional power generation soon. Goals for PV uptake vary greatly from country to country, with an overall figure of about 12% PV power contribution in Europe by 2020 (2 GW in the UK).

In terms of cost reduction, there’s been a pretty consistent 20% ‘learning rate’ since the late 1970s, meaning that a doubling in production has given about 20% drop in cost, and this is expected to continue. Although cost is very close to retail grid parity currently in some parts of the world, it is some way off wholesale prices. Consideration of power demand cycles are relevant: a plot of daily (German) power demand illustrated the potential contribution from different technologies. PV could flatten out the (midday) peaks and is having significant impact already. In Japan there has been significant investment in hydro-storage technology to make use of the nuclear output (which has to be continuous), and this could usefully be
applied to PV input to the grid, flattening out the daily PV input cycle. The German Advisory Council on Global Change predicts that PV will take over as the principal sustainable energy supply by the middle of the century, with nuclear uptake falling and being replaced by wind and PV. Of note, is the fact that the current trend in PV contribution is ahead of the predictions, and looking set to continue that way.

The focus then moved to the technology, and the competition between 1\textsuperscript{st} generation (Si-wafer-based) and 2\textsuperscript{nd} generation (thin-film) technologies. Many have written off Si-wafer-based devices for economic reasons, but this ignores the huge potential for cost reduction in wafer fabrication. Much of this development has, until now, been in Asia, and may have been missed. As the market has become more competitive, Si-wafer manufacturers have developed new, cheaper products based upon ‘quasi-monocrystalline’ Si ingots, which are being produced in larger and larger sizes. A spin-off of size increase is the ability to produce a higher proportion of high quality, oriented grain growth in the centre of the ingot, using a centrally placed seed crystal combined with directional solidification. There is scope for continued advance and a strong driver to do it, since the silicon wafer is about a half of the total cell cost.

It was also interesting to see the advance in achievable efficiencies and cost reduction based upon the same basic Si p/n junction ‘black cell’ which first emerged in 1974. Past improvements have been on passivation, rear contacts, and surface texture developments, and immediate future goals include finding alternatives for the role of silver, to reduce costs further. Light trapping technology came up several times during the day – here we learnt that optical thickness can be increased to about 40 or 50 times the geometric thickness of the cell, through optimised rear surface scattering. It’s expected that 25% efficiency is achievable here without resorting to any new technologies.

Advantages of moving to thin film technology include not only less material usage and large manufacturing capabilities with integrated module fabrication, but also aesthetics and ruggedness. Chalcogenides, and further ahead, dye-sensitised and organic cells offer great potential as well as capabilities for flexible devices. A plot of efficiency versus cost per unit area showed the improvement on cost for thin film technology, balanced by some drop in efficiency – but it is still early days. There are many possible technologies for 3\textsuperscript{rd} generation cells, and it is not clear which is the frontrunner. One example is stacked cells, with different band gaps, in order to access the whole spectrum. Predictions are for 49% efficiency in 3-cell stacks, going up to 58% in a 6-cell stack. Current work at UNSW includes stacked Si-based technology with band gap manipulation using quantum
confinement (~2 – 5 nm Si dots), as well as optimisation of epitaxial Ge on Si substrates for stacked junction growth. Another approach is the development of hot carrier cells, in which slower thermal relaxation at the band edge is controlled by manipulation of the lattice’s phononic properties, again using quantum dots.

**Cigang Xu** (Oxford Instruments) talked about the trend for reducing the quantity of Si in devices by simply thinning wafers (e.g. to 100 or 150 microns) whilst maintaining thermal and UV stability, and passivation properties. He reported on a European-funded project on the development of Al₂O₃ deposition for the rear side of cells, using Plasma Enhanced Chemical Vapour Deposition – a technique which offers clear routes to industrial scale-up. This process has great potential for precise growth control: precursor supply (TMA + N₂O), RF power, pressure, flow rates, and temperature are all available parameters that can be used for optimisation, whilst monitoring plasma conditions. Ultimately it is necessary to find an appropriate balance between growth rates, precursor usage, uniformity, and film properties.

**Kurt Barth** (Abound Solar) described the transfer of a ~15 year Colorado State University project through to the production line. The product consists of rugged CdTe PV modules, now being fabricated on a commercial scale, with an impressive 19 month schedule from 1st generation tool (in 2009) to the first modules coming off the production line in 2010. At all stages of development, manufacturability has been a key driver. The product is robust, using a unique encapsulation design with an edge seal enclosing internal desiccators, resulting in impressive long term performance (test devices maintained high performance at 85°C and 85% humidity well in excess of the 1000 hours required for certification). It takes about 2.5 hours from start to finish for complete, automated cell manufacture: glass loading, laser scribing grooves, growth of semiconductor (using a proprietary method based on thermal sublimation) and sputtered metal back contacts, and encapsulation. They will be producing 70K modules per month in a year’s time. The yield is >80%, and total area efficiency up to 10% – with improvements expected through the fine tuning of thickness and processing. Large area arrays are being set up and a German 5.4 MW fixed tilt facility is performing ahead of predictions. Further expansion, funded by US DOE loans, is taking place, based on 65 MW production line units, with a 2nd production line at the original site, and a 3rd planned (giving about 170 MW by 2012). A new facility will have up to 10 lines running. Manufacturing costs are dropping as annual production increases to 1500 MW (2014). This is a great example of a really fast ramp from concept to production line, with potential for continued improvements.
Stuart Irvine (Optic Technium / Glyndwr University) also discussed the commercial drivers of cost reduction and improved capabilities. Although thin-film technology actually offers only slight reduction on the costs of Si-technology at this stage, there’s great potential for further cost reductions in the future. Thin-film technology is now growing in maturity, with high volume manufacture leading to economies of scale. It is still a close race, with the prediction that thin-film technology will represent about 25% of the PV market by 2013. Materials challenges for thin-film PV include the need for energy conversion efficiency improvement, reduction in quantity of costly semiconductor material, use of lower cost materials, and cheaper and lower energy processing methods, with high throughput. There are also issues of durability and product lifetime.

Models of the costing breakdown, from the UK PV Supergen consortium, have illustrated that the relatively small materials component of total production costs doesn’t justify switching to ultrathin films right now, but there’s uncertainty about future materials prices (and Te prices are critical), so this viewpoint may change. When costing it is important to remember that full materials utilisation must be considered (not just the quantity of material in the final device), and to introduce the impact of improved cell efficiency. The bottom line is that efficiency must improve, but not at the expense of increased materials costs.

Irvine also discussed the deposition of CdS on windows using a Zn addition to increase transmission by atmospheric pressure MOCVD (at growth temperatures of ~200 – 450°C). Efficiency is monitored as a function of thickness: how thin can the films be whilst maintaining properties? It is not simply absorption that must be considered: there are other effects to take into account in cells that are just a few microns across. And what goes wrong in the thinnest layers? Micro-Light Beam Induced Current mapping nicely illustrates some of the issues of uniformity and pin-holes, with different wavelengths (blue versus infra-red) showing up different issues. Current work includes enhancing absorption with light capture through scattering, optimisation of back reflectors, and the addition of super-absorber material to replace CdTe. Here iron pyrite is being trialled: nominally FeS₂, but with notoriously difficult to control stoichiometry. Future work will also look at combining organics and inorganics in hybrid devices to extend the wavelength range.

Matthias Kauer gave an overview of PV research at Sharp Laboratories. PV is a key technology for the company, representing a growing fraction of product sales (since 1959), with solar cell products and PV sales particularly important in Europe. These products are based on both Si and thin-film technologies with an emphasis on local production for
local consumption. The Sharp plant in Wrexham (UK) produces 500 MW per annum (crystalline Si), and Si thin-film cell manufacture is being set up in Italy. In Sakai, Japan, thin-film solar cell fabrication is going on alongside a major LCD facility where there are economies of scale and overlap in the use of glass supplies. Kauer referred to the plot of power demand versus PV generation which had been shown earlier. Cost reduction rates suggest grid parity in ~ 5–10 years, which will be followed by continued expansion into new markets, e.g. electric vehicles, and ‘town’ power generation. Significant efficiency improvements will come with the application of novel nanomaterials. Sharp’s R&D site in Oxford has a range of areas and products. An example is proof-of-concept of a novel nanostructured thin-film Si solar cell, using a very high aspect ratio light trapping ‘moth-eye’ surface as a substrate for subsequent film growth (~1.5 micron pillars, with ~0.5 micron spacing). Modeling and simulations of IV characteristics generally tie in with experimental results: discrepancies are put down to shadowing and incomplete filling, leaving some uncoated regions. These devices will be further optimised and potential manufacturing routes assessed. Another interest is in multi-junction solar cells, based on a stack of lattice matched III-V materials, currently being fabricated by MBE. There’s a ‘missing’ bandgap (~1 eV) material (X) to fit into the stack: Ge/X/GaAs/GaInP, and InGaAsN may be the solution.

Sam Stranks (Oxford University) described the development of a PV composite ‘blend’ based on single-walled carbon nanotubes (~1 nm diameter, 1 micron long) wrapped in a single layer of polymer (P3HT), and dispersed in a matrix. Although efficiencies are currently low, there are plenty of possibilities for optimisation of the blend, to give long-lived charge separation e.g. the density, spacing, size, and directionality of the nanotubes. Time-resolved photoluminescence studies are being used to characterise the structures.

We heard about work on cost and efficiency gains through fabrication studies at Loughborough, including optimisation of groove shape for buried contacts by laser ablation (for concentrator PV devices). This is achieved by tuning laser power, stage speed, energy, pulse rate and duration. Coherence Correlation Interferometry is a fast, large area method that is used for characterisation. The requirement for a fast, cheap, in-line method for surface scattering studies was illustrated by work at the Laboratoire de Physique des Interfaces et Couches Minces, Palaiseau. They are using Mueller Polarimetry for monitoring surface texture optimisation to control light management in devices.

Finally, Ralph Gottschalg (Loughborough University) gave an entertaining and extremely informative talk on the problems of testing cells
and modules to be able to make true comparisons and give trustworthy data. A couple of talks earlier in the day had referred to the need for robust testing regimes and effective comparators, and here we learnt that the situation is a minefield! Although people may assume that testing by placing two cells alongside each other will give a true comparison, this is not the case, for all sorts of reasons (including ground reflection, wind speed, and pigeons!). And there are serious issues with reverting to ‘laboratory conditions’ simply because they don’t represent the conditions in the field. Round-robin results performed in a series of high quality European laboratories gave frighteningly large variations in results (+/-3%), and agreements were worse with varying irradiance. The description of the current attempts to develop international standards, requiring standard conditions, standardised data for module behaviour, agreed methods for modeling energy yield, and standardised reporting, raised many smiles.

As if all this information were not enough for this one-day meeting, there was a lively and varied poster show to take in as well! A total of 17 presentations illustrated fabrication, structure, characterisation, and modeling of PV cells and devices, as well as some novel applications.

Dr Zoe Barber is Reader in the Department of Materials Science and Metallurgy at the University of Cambridge. Her research interests are based around thin-film deposition using a range of techniques: magnetron sputtering, ionized sputter deposition, pulsed-laser ablation and sol-gel fabrication. The Device Materials Group are developing and optimising the growth of many different thin-film device materials. Zoe has recently been Chair of the Ion and Plasma Surface Interactions Group of the IOP.
Transforming the SUPERGEN Family
By Jeff Hardy

Recently I’ve been looking at the transition from SUPERGEN consortia to SUPERGEN ‘hubs’. SUPERGEN stands for Sustainable Power Generation and Supply and the programme has been with us since 2003. It’s a key part of the Research Councils UK Energy programme and when it was first created it represented a departure from typical funding models. SUPERGENs are multidisciplinary partnerships working in major programmes of work, rather than individual research groups working in isolation; they also involve industrial collaborations to encourage the take up of research. To date there have been 14 SUPERGEN consortia created and funded:

- Bioenergy
- Sustainable Hydrogen Energy
- Marine Energy Research
- FLEXNET
- PV Materials
- Plant Life Extension
- Fuel Cells
- Highly Distributed Energy Future
- Excitonic Solar Cell
- Energy Storage
- Biological Fuel Cells
- Asset Management and Performance of Energy Systems
- Wind Energy Technologies
- Delivery of Sustainable Hydrogen

Many of these SUPERGENs have finished, or are close to finishing, their programmes. Although a process of renewal is on-going, the way in which the new SUPERGENs will operate is going to change radically. In 2009 the Research Councils consulted the energy community on how the SUPERGENs had performed and how they might operate in the future. The findings indicated that SUPERGENs had been successful in delivering technological progress, interacting with industry, interdisciplinary working and that the SUPERGEN brand was strong politically and internationally. However, the picture was not entirely rosy – the consortia were criticised for poor exploitation of technologies, being somewhat of a ‘closed shop’ and failing to engage and network the wider energy community outside of the SUPERGEN family. Furthermore, the UK research landscape changed,
Centres for Doctoral Training were introduced, the European Energy Research Alliance emerged and the Research Councils began their transition from funders to sponsors of research.

It was decided that a new model for SUPERGEN was required – step forward the ‘hub’. The aim of the new SUPERGEN programme is to create relatively small ‘Hubs’ run by a theme champion. In this context, small means something like 4-6 core partners. The grant (typically around the £4 million mark) consists of three key activities:

1. A network, open to relevant academics and industry to join (around 20% of grant). The network should coordinate the community, advise the hub on emerging research priorities and provide access to additional academic and industry capability.
2. A clearly defined research programme (40% of grant).
3. A flexible research fund that could be deployed quickly (40% of grant).

Two of these new breed Hubs have been announced: Power Networks (called ‘Hubnet’) and Marine Challenge. Hubnet brings together the three electricity network consortia. Three more are in the process of creation currently: Bioenergy, Hydrogen and Fuel Cells, and Solar Energy.

A key priority of the SUPERGEN hubs is to develop a clear strategy of how to take their area of research forward. This strategy will be inherent in the core research efforts proposed. The strategy should also be used to inform a growth strategy for the hub or to put that another way, how the hub acquires funding and expertise for the activities that are needed to fulfil a UK strategy that can’t be funded by the core SUPERGEN grant. Interestingly, the Research Councils are relaxed about where the sources for the additional activities come from. Figure 1 shows how additional work might be funded as a series of additional projects, managed by the hub. The strategy should also explain how the hub will protect and exploit intellectual property and outline an industrial engagement strategy. In the SUPERGEN call for proposals it has been noted that the “network” element may be run in conjunction with the Energy Generation and Supply KTN if the proposer sees this as an advantage. In fact, UKERC (acting through the EG&S KTN) were named in the successful Power Networks proposal. UKERC are also mentioned in the call for the Solar and Bioenergy calls, and our KTN colleagues are mentioned in the Marine and Fuel Cell and Hydrogen calls. Working with the KTN gives the SUPERGENs access to a broad community (business, finance, etc) of people who may be able to take the developments onto the next stage. Additionally, there is the benefit of a KTN manager who knows their community well, and in the case of UKERC,
experience in running energy community networks. The good news is that we have been approached by a number of consortia and have had some great discussions.

I'm personally quite excited by the new SUPERGEN model. I'm a big fan of the move towards strategic and flexible energy research hubs, I feel that it's a flexible mechanism that allows the hubs to build up the right consortia and momentum to get stuff done. As long as the hubs are able to pull in the resources and people to deliver the desired outcomes then I'm hopeful of some significant progress towards exploiting UK energy research excellence over the coming five years.

Dr Jeff Hardy is Knowledge Exchange Manager at the UK Energy Research Centre and Future and Emerging Opportunities Manager at the Energy Generation and Supply Knowledge Transfer Network. He runs the National Energy Research Network which has >1000 members from academia, industry and Government. He is chair of the UK Carbon Capture and Storage Community Advisory Committee, a member of the Management Board for the UK Carbon Capture and Storage Centre and chair of the Board of Trustees of the Green Chemistry Network. In the past he has been Environment and Energy Policy Manager at the Royal Society of Chemistry, an academic working on Green Chemistry, a water analyst and a research chemist in a nuclear laboratory.
Playing CCS Catch-up
By Jeff Hardy

There is a perception that the UK is falling behind the leading nations in the development of carbon capture and storage (CCS). Our timeline for the UK demonstration programme has slipped; the Government has scrapped the Longannet demonstrator and there is no certainty on the other projects in the programme. On top of this, there is no clear commercialisation pathway beyond the demonstration programme. Coupled to this, there are a number of new players entering the race, although most have taken a hit with the recession.

The recent report on the state of (CCS) in the UK jointly authored by the Advanced Power Generation Technology Forum\(^1\) (APGTF) and the Energy Generation and Supply KTN\(^2\) (EG&S KTN) “Cleaner Fossil Power Generation in the 21st Century – Maintaining a Leading Role”, makes for interesting reading. The APGTF and the EG&S KTN published a strategy two years ago; this report is a rallying cry to get the UK back on track. The strategy maintains the UK vision from the 2009 document:

1. Adoption of a target for the successful deployment of carbon abatement technologies and in particular CCS, in the UK, with a target of up to 10% of UK power generation (approximately 40TWh) being from fossil-fuel plant fitted with CCS by 2020.
2. A capability is created in the UK so that CCS can make a major contribution to the targets of 80% greenhouse gas emissions reduction by 2020.
3. The UK is positioned for success in global markets and influence in the EU and global policy dialogue.

In addition to the rallying call, the report gives a sneak preview of the RDD&D priorities that are expected in the DECC CCS roadmap which will be most likely be released in November. Starting with capture technologies, a number of the short term priorities revolve around getting the technologies, particularly post-combustion capture, proved at scale and across a range of fuels (coal, gas and biomass). This includes understanding the environmental impacts and monitoring requirements of the first generation of technologies. Specific to post-combustion capture is the whether the plants can be operated flexibly and also how the spent amine (the CO\(_2\) absorbent) will be treated. For pre-combustion technologies,

\(^1\) www.apgtf-uk.com/
\(^2\) www.innovateuk.org/energyktn
there is interest in how the plants could be operated in polygeneration mode, which is where you have the option to separate the hydrogen from the syn gas and to do something with it other than burning it in the power station (e.g. fuelling vehicles or the chemical industry). For oxyfuel combustion there is a whole list of things that need to be done to prove the technology – a key one is to investigate materials to be used in the plants.

Industrial CCS is still on the agenda and the immediate challenge is to understand which technologies will be most appropriate for the big process such as steel, cement and oil refining. A key point here is that it’s only going to be worth installing CCS on an industrial plant that you can guarantee will still be around in 30 years’ time, otherwise it makes little financial sense. For the transport of CO₂ it is important to understand the hazards to inform decisions on where pipelines might be routed. Additionally, metering the quantity of CO₂ and impurities in pipes and monitoring of pipes for leaks or defects are priorities. There is also work needed on ship-based transport of CO₂.

Storage of CO₂ has by far the most high priorities for RDD&D. There are many priorities, but to crudely summarise, we need to know much more about: storage capacity, particularly in saline aquifers; what happens to CO₂ in reservoirs; how we monitor it and check for leaks; and what do we do in the unfortunate circumstance when there is a leak.

This all needs to be brought together in an operational process. On top of this is the need to integrate this whole complicated CCS process, so that pipe A connects to pipe B etc. So how much would it cost to put the UK back into the leading pack? Here’s a breakdown of the rough costs:

- Basic R&D - £10m per annum
- Applied R&D - £20m per annum
- 4 large-scale CCS demonstrators - £4-8bn total
- Major saline formation appraisal programme - £200m total
- Development of an onshore transport network - £1-2bn.

Dr Jeff Hardy is Knowledge Exchange Manager at the UK Energy Research Centre and Future and Emerging Opportunities Manager at the Energy Generation and Supply Knowledge Transfer Network. He runs the National Energy Research Network which has >1000 members from academia, industry and Government. He is chair of the UK Carbon Capture and Storage Community Advisory Committee, a member of the Management Board for the UK Carbon Capture and Storage Centre and chair of the Board of Trustees of the Green Chemistry Network. In the past he has been Environment and Energy Policy Manager at the Royal Society of Chemistry, an academic working on Green Chemistry, a water analyst and a research chemist in a nuclear laboratory.
Chair’s Notes
A major task for the past year has been to ensure a smooth transition to a new set of officers – I will have served my maximum allowable term and thus be stepping down at the 2011 AGM. Our Treasurer, Dan Blood, will also have served three years. The tasks involved are not onerous and I will be delighted to discuss with anyone interested in stepping forward to help take this vibrant group to the next stage of its development. Jeff Hardy has also stepped down. We very much valued his advice and input on the committee, both from a chemist’s perspective and having worked as a policy office at the Royal Society of Chemistry, but especially from his current role at UKERC, the UK Energy Research Centre. During the last three years I am very pleased to have collaborated with the Materials and Characterization, Ion and Plasma Surface Interactions, Thin Films and Surfaces, and the Engineering Physics Groups of the IOP in various events.

We are in the process of organising our annual one-day meeting – ‘Stand Up for Start-ups: Getting Low Carbon Technologies off the Ground’, co-sponsored by the Engineering Physics Group. The initial idea was by Roger Welch and all the committee contributed to identifying companies and making the initial approaches to invite speakers. I’m very grateful to Roger then taking the lead on this and bringing his expertise in technology transfer and university spin-out development to put together what looks to being an exciting day (p19). A novel feature will be scoring by the audience for each start-up in terms of which they would invest a virtual £4m.

Looking back on my time on the Energy Group committee, this has covered a period of tremendous change of energy in the UK; from the doldrums of the term “energy” not appearing in the title of any UK Government department to formation in 2008 of DECC, the Department of Energy and Climate Change. Emissions reduction, energy security, pricing by the big six companies, saving energy and all “doing our bit” are all in the news, but there is still a huge challenge ahead. Though the carbon emissions reduction of 80% by 2050 is oft quoted, this still seems more an aspiration in isolation from the reality of the economy. With the top concern of getting out of recession back onto economic growth, will there ever be a right time for serious investment in energy alternatives? The resource issue known as “peak oil” divides opinion but I suggest should be confronted as a high risk and planned for.

So I thank my Energy Group colleagues for stimulating discussions and wish the new committee all the best.

Simon Roberts
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Energy News
Robin Morris presents a round-up of recent energy and energy-related news which may not always have caught the eye of the mainstream media.

Possible Ireland-UK Electrical Interconnector
Ireland’s west coast could see a major construction programme of wind farms sponsored by the UK, which will involve more grid interconnections.

Power Engineering International
25/6/11

Preferred Reactor Design within 2011
Horizon Nuclear Power, the joint venture between E.ON and RWE to build nuclear power plants in the UK, has said it will choose its preferred reactor design by the end of 2011.

Power Engineering International
25/6/11

Exploiting Heat from Data Centres
In a publication ‘The Data Furnace: Heating up with Cloud Computing’, Microsoft and the University of Virginia suggest that cloud computing should be made more distributed, with waste heat being used to warm buildings. The report indicates that IT equipment in the United States accounted for 61bn kWh – or around 3% of the national consumption in 2006.

eWeek Europe
27/7/11

European Association for Storage of Energy Founded
EASE will promote and support analysis and evaluation of the benefits of using energy storage in the broader energy grid. The Association will work on technology and application related aspects of energy storage such as assessment of storage applications and development of storage technology roadmaps as well as addressing financial, economic and regulatory issues. It plans also to work with all relevant groups on the optimal integration of all components into validation projects and business models for a successful transition to a low carbon, safe and sustainable energy infrastructure, and to help establish a coherent master plan for the introduction of energy storage worldwide.

Metering.com
30/9/11
Book Reviews

Energy 2050: Making the Transition to a Secure Low-Carbon Energy System
Edited by Jim Skea, Paul Ekins, and Mark Winskel


This book emerged from the work which characterised the first phase of the UK Energy Research Centre – in that sense, it is the ‘book of the project’. The ‘Energy 2050’ project¹ developed a collection of scenarios set-up to examine how the UK might move towards a resilient low-carbon energy system by the year 2050. Each of the scenarios emphasises one of the major system driving forces i.e. economics, environment, or security. The project used various tools including life cycle assessment, least-cost optimisation modelling, the modelling of linked physical energy systems, and learning curve analysis to explore the consequences of different rates of technological change. As the UK Research Councils funded the work, analysis is restricted to the UK only. In addition, the work includes the social and economic background against which the main aims would have to be function. Developing, testing, and understanding the scenarios in all their dimensions involved several dozen researchers with different expertise across many UK universities. The project almost defined what is meant by multidisciplinary ‘whole systems analysis’. This book reflects not only the wide variety of knowledge and expertise input into the scenario analysis, but more importantly the structure and process of the project as a whole; this makes the Energy 2050 a truly unique text.

¹ www.ukerc.ac.uk/support/tiki-index.php?page=UKERC2050background
There is good sign-posting between the twelve chapters and generally good linking at the policy and technical levels. After the fact it is always possible to see further or alternative ways to link work together, but it would be wrong to criticise Skea, Ekins, and Winskel as it was a major undertaking. It is clear that the editors took tremendous care to ensure that as much richness of the analysis was brought to light as possible.

If I have any complaints, it is with the lack of colour. Although this is understandable in a book of this length, a number of the more complicated graphs and diagrams really would have been more readable with the use of colour. Whilst this book is not meant to be written from an engineering and physical science point of view, I think it would have been helpful to have had input from some of the power systems engineers who were already part of the UKERC family. For example, chapter eight – ‘A Change of Scale? Prospects for Distributed Energy Resources’ – could have included some discussion on the grid-connection issues of micro-generation which may ultimately determine the deployment of small-scale embedded generation.

The book pivots on chapter five, which briefly introduces the numerical characteristics of the chosen pathways to decarbonisation and then discusses the results of the MARKAL modelling. If the reader specifically wants to know about the core modelling, chapter five is the place to start. Subsequent chapters are written in the light of this work, bringing in other modelling techniques and research to examine various ways and barriers to achieve the scenario pathways. The topics discussed include resilience, uncertainty, lifestyle and consumption, and the role of innovation. In their conclusion, Skea, Ekins, and Winskel are up-beat about the prospects for decarbonisation; there are many pathways which get the UK there, albeit at different rates. On the other hand, one of the key factors required which came out of the UKERC work was demand reduction.

Energy 2050 won’t tell you directly how to conduct and organise scenario building, but it will show you what can be achieved with a team large enough to really get to grips with a significant problem. The introductory chapters characterising the UK energy system and actors give a really good overview and are suitable to stand alone for advanced undergraduates and masters students. The remaining nine chapters are more suitable for researchers. This text should be required reading for all graduate students starting out on whatever aspect of energy research, whether engineering, economics, or socio-technical.

Colin Axon,
Brunel University, London.
Forthcoming Events

Stand Up for Start-ups: Getting Low Carbon Technologies off the Ground

This one-day meeting provides insight into the technology challenges faced by companies in bringing new low-carbon physics-based technology to market. The programme will be designed to enable plenty of time for discussion with the speakers and within the audience. Charges apply (with the usual concessions), lunch and refreshments are included.

Coffee will be available from 10:00, the main event starts at 11:00.

The Energy Group AGM will take place between 10:15 – 10:45.

Date: Monday 14th November, 2011
Time: 10:15 – 17:15
Venue: Institute of Physics, 76 Portland Place, London W1B 1NT.
Registration: www.iop.org/events/scientific/conferences/y/11/carbon/
Organiser: Dr. Roger Welch, roger.welch@isis.ox.ac.uk
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We plan to have a bit of fun by running a ‘fantasy spin out’ format through the day. Delegates will mark up with their investments and at the end of the day we shall see which company has attracted the most ‘investment’.

Garry Staunton (TSB): Introduction
Jon Howes (Isentropic): Heat Pumps
Huw Hampson-Jones (Oxis Energy): Batteries
Rob Morgan (Highview): Liquid Air Energy Storage
Henry Snaith (Oxford PV): Thin-film Photovoltaics
Arnold Harpin (Oxsensis): Sensors
Carl Griffiths (Seren Photonics): LEDs
Chris Wright (Moxia Energy): DC distribution
Energy Group Contacts

We welcome comments and suggestions for events and items for the Newsletter.

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