LCRI LOW CARBON RESEARCH INSTITUTE

Volume 2: July 2013

LCRI Convergence Energy Programme News

Minister for Finance Attends SBED Launch

(Left to right) David Rees (AM - Aberavon), Mark Collinson (Tata Steel), Phil Jones (SBED), Finance Minister Jane Hutt, Kevin Bygate (CEO SPECIFIC)

Last month saw the official launch of Cardiff University's Sustainable Building Envelope Demonstration (SBED) project, at the SPECIFIC Innovation Centre in Baglan, during the EU Sustainable Energy Week.

The SBED project follows on from the work of LCRI's Low Carbon Built Environment's Work Package 1 team, at the Sustainable Building Envelope Centre, in Tata Steel's Shotton site in North Wales.

The SBEC Centre's focus is on accelerating the development of low and zero carbon solutions for the built environment using steel in combination with other materials.

SBEC operates out of a specially refurbished building designed to act as a test rig and proving ground for new technologies, demonstrating them in use. The building has provisionally been awarded a BREEAM Excellent rating.

The SBED project aims to take this one step further. The team will design, model, test, prototype and monitor low carbon building systems incorporating transpired solar collectors (TSC) in eight 'buildings in use' in Convergence Areas of Wales. Building types may include residential, commercial (offices or retail), industrial and institutional (schools, hospitals, care homes).

Backed with £1.8m from the European Regional Development Fund through the Welsh Government, as well as funding from Tata Steel and HEFCW, the SBED project will involve demonstrating prototype building integrated solar energy technologies, tested on a range of building types.

The launch was opened by the Welsh Finance Minister, Jane Hutt, as well as key note speakers from Tata Steel, and the Welsh Government. The Minister was given a tour of the SPECIFIC facilities, which included a demonstration of the TSC technology that will be used on the SBED sites.

The Minister said "It is vital that we invest EU funds to help us meet the goals of the EU as well as our own ambitions - putting sustainable development at the heart of

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government. Projects like SBED support growth in the low carbon economy and encourage innovation, which, in turn, help create jobs and build a strong economy."

SBED will monitor the construction, implementation and performance of these, sharing lessons learnt with the wider industry. The SBED team will closely monitor the construction, implementation and real-life performance of the demonstration systems, disseminating best practice.

Information gathered during the project will enable the economic viability and cost effectiveness of the technologies to be assessed for the different building types.

Phil Jones, SBED Project Director, Cardiff University, said "Renewable energy technologies for generating both thermal and electrical energy can be fully integrated as part of the external construction, of a building, providing a more cost effective and aesthetically pleasing solution, compared to the usual 'bolt on' approach.

This project aims to 'kick-start' Welsh industry to manufacture, install and maintain energy generating building envelopes, by demonstrating their application to a range of building types throughout Wales, for a cost effective innovative contribution to achieving low carbon buildings."

Debbie Taylor, Project Manager, said “This project is a good example of the significance and importance of Industrial Research funding and we are very proud to see the results of our work progressing out of the University and onto buildings in Wales.”

Clockwise from top left: Phil Jones introducing SBED Project, Jane Hutt with SPECIFIC staff, delegates at the launch event, Phil Jones demonstrating the SBED technology

Alternative Fuels and All Energy for Hydrogen

Top left and below: The Hydrogen and Alternative Fuel Vehicles Workshop. Top right: A Mazda RX8 Hydrogen Fuelled Vehicle

In April, LCRI's Hydrogen team held a Hydrogen and Alternative Fuel Vehicles Workshop at the Park Inn, Cardiff.

The workshop was delivered by the University of South Wales in conjunction with IMI Awards Wales (Institute of Motor Industry), and aimed to give practical insights into the issues associated with repairing and maintaining upcoming types of vehicles using alternative fuels, such as electric, natural gas and hydrogen. It also aimed to outline support from IMI and the LCRI available to businesses to further develop training in these areas and improve their environmental systems.

The event was opened by Alan MacKrill from IMI Awards, and speakers included Paul Fraser from Gateshead College, Trevor Fletcher from Hardstaff, Colin Williams from IMI, Matthew Jones, the LCRI's Environmental Sustainability Officer, as well as the LCRI's Jon Maddy, from the University of South Wales.

As well as describing the features of the various vehicle types, topics also included funding assistance and environmental and equal opportunities support.

The workshop included exhibitions by the speaker organisations, including the LCRI and University of South Wales, as well as several FE colleges.

LCRI's Jon Maddy said "The event was a huge success, attracting over 100 delegates, from first year apprentices to senior management representatives. It was a fantastic opportunity to showcase the research into hydrogen and alternative fuels for vehicles, as well as the overall work being done by the LCRI. The event gave the audience a practical insight into the vehicle types that they will be encountering in the immediate future."

In May, Hydrogen's Alan Guwy attended the All Energy Conference in Aberdeen. The conference is one of the UK's largest renewable energy and combines all elements of the renewables and sustainable energy industries, and took place in conjunction with the H2FC Supergen Conference.

Alan gave a presentation entitled Integrated Biological Hydrogen Production, which discussed Dark Bio Hydrogen fermentation, and the method of integrating fermentative hydrogen production with bio-methane systems.

Alan said "This was the first H2FC Supergen Annual Conference held in conjunction with the UK's largest renewable energy event All Energy.

It was an excellent opportunity to showcase the activities and results of the LCRI H2Wales project, and to promote the work of the LCRI as a whole."

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WEST at Wylfa and Launch of Combustion Course

The WEST team with other exhibitors at Adult Learner's Week

In May, the Welsh Energy Sector Training Project (WEST) attended the Adult Learner's Week at Trawsfynydd and Wylfa nuclear power stations.

The Trawsfynydd station is currently undergoing decommissioning and the Wylfa site will shortly follow suit, which will mean nearly 1200 people facing redundancy. Adult Learning week was an opportunity for the staff to get a better understanding of how CPD training with organisations projects such as WEST can help them to develop their skills and experience, as well as explore new career options in other energy sectors.

Vicki Stevenson, WEST project Manager said "It was wonderful to know that WEST can offer help to people who are looking for new career directions."

The first of WEST's pilot modules was also launched in May. The 3 day LSPG Combustion Course was delivered at Cardiff University's Gas Turbine Research Centre (GTRC), one of Cardiff University School of Engineering's research facilities.

The module consists of core and chosen topics covering a variety of themes, including alternative fuels utilisation, combustion emissions, risks and hazards, and energy conversion technologies. It is accredited by Cardiff University's Centre for Lifelong Learning, and is worth 10 credits level 4 on the Credit and Qualifications Framework Wales.

All 5 attendees were from Northwood and WEPA Limited, a paper mill company based in Bridgend, which utilises a range of energy technologies including a gas turbine. The course enabled the staff to get a better understanding of how combustion performance and emissions can be monitored and improved, and it gave them an appreciation of the impact of fuel variability on efficient combustion.

The feedback was very positive, with one participant saying that the course had allowed them to "identify burner inefficiencies and be able to make an informed decision".

Sally Hewlett, WEST LSPG Research Assistant said "LSPG is very encouraged by the positive and enthusiastic way in which the course was received. We are eager to expand our course selection to include online options. In this way, materials can be made accessible to individuals throughout Wales, who want to up-skill in this field."

Demonstration during WEST's LSPG Combustion Course

SPARC Case Study: Hydro Industries

Paul Holland and Richard Lewis from SPARC with the team from Hydro Industries

SPARC's Swansea team have been working with Hydro Industries, a company specialising in electro-chemical water treatment, to revolutionise the way they power their equipment.

Hydro Industries is based in one of the biggest solar energy parks in the UK, just outside of Llanelli, and was formed in 1993. It specialises in the design, manufacture and operation of electro-chemical based water treatment systems. By utilising an electro-chemical approach it is possible to treat water with a highly clean and renewable friendly technology without the need for adding chemical or biological agents.

The Swansea SPARC team, who specialise in the research and development of Power Electronics Systems for renewable energy sources , have been working with Hydro Industries to incorporate Solar PV generation technology into their product portfolio. By incorporating a sustainable power source into their product systems, they will open up new markets in developing countries where a reliable mains electricity network is not often available and domestic home application eliminates chemical or biological approaches.

The technology was first developed in 2004, and demonstrated on a much smaller scale than the models being used today. Although scaling up is not a problem for the electro-chemical process, it presents a challenge in terms of the power electronics systems that underpin the technology.

Richard Lewis from SPARC's Swansea team said "The issue we are facing is a matter of controlling the DC current, and ensuring that we maintain maximum treatment levels, with minimum energy usage."

Dr Paul Holland, LCRI Research Fellow and Senior Lecturer from Swansea University's College of Engineering said "It has been a real pleasure working with the team at Hydro Industries.

We hope to continue to work together across a range of technologies and applications where we can make real impact with Hydro and its suppliers to benefit the local economy and provide jobs for our graduates".

The roof of the Hydro Industries solar park

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SOLCER First Stage Under Way

SOLCER test equipment in action

LCRI's cross cutting SOLCER project is looking at combining low carbon energy supply, storage and demand technologies. SOLCER is bringing together research and products being developed by LCRI and other low carbon research projects, so they work in harmony in one system.

SOLCER's first stage involves putting test rigs at various sites – at the Welsh School of Architecture's base in the Bute Building in Cardiff University, at SPARC's CSER headquarters in St Asaph in North Wales, and at the LCRI Hydrogen Centre in Baglan. At the WSA, the team are installing a wind turbine and PV solar panels linked to a battery storage system and low energy appliances and lighting all based on a DC energy circuit.

SOLCER's project manager, Jo Patterson said: "These test rigs will investigate the issues associated with the implementation of low carbon systems comprising of supply, storage and demand technologies. Once underway we will utilise the information generated on both a technical and broader level, to implement further systems in houses across South Wales. These will test the systems further and present us with material for modelling for larger scale roll out."

Monitoring will identify where energy losses are occurring and when energy supply, storage and demand can be matched. Broader issues such as supply chains and costs of components will be explored, which are very important for implementation of these technologies in the real world. SOLCER will look into the potential risks of combining the technologies and will be identifying opportunities to work alongside larger scale projects to investigate potential modelling opportunities and transfer of knowledge and expertise.

LED There Be Light

LED Lights

LCBE's Work Package 2 is researching LED technology, and working towards developing high efficiency lighting solutions. Lighting accounts for some 20% of world energy usage, however current lighting efficiencies are generally still low. LED technology is already four times better than incandescent lighting.

The potential for energy saving, incorporated with increasing the efficiency of power supplies, and integrating smart controls, make LEDs a highly desirable, eco-friendly lighting source. As LED efficiencies continue to improve, this technology is very much an integral part of future building design for a low carbon built environment.

LCBE's Work Package 2, led by Professor Ken Board, has been working on lighting designs in the build environment. Part of their role involves working with convergence based companies, to offer a free lighting audit. This includes looking at the current lighting

systems within a company, in terms of efficiency, cost and usage. Ken's team can then identifying ways in which they can be adapted to save money, as well as become more environmentally friendly.

So far they have looked at a number of workshops, warehouses and office spaces. One example was a warehouse which had a very poor lighting design. The space included 150 lights, in a poorly arranged pattern. They were on 24 hours day, and the lighting levels were almost three times brighter than the space required.

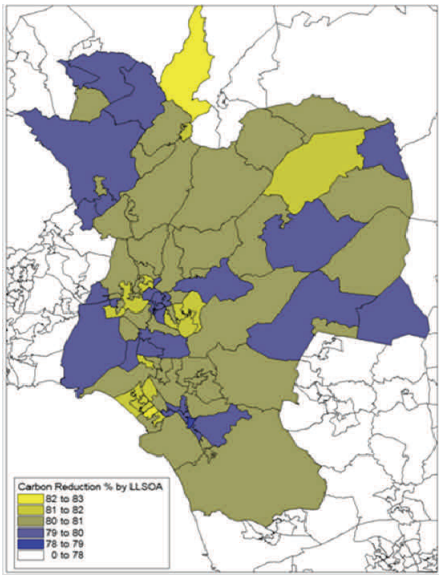
By following the team's advice to rearrange the lights, the company was able to meet the lighting requirements for the warehouse, as well as save £2500.

Health and safety is also an important factor when lighting an area, as it is essential that lighting meets the special requirements, but is not too bright. The team found two examples in this area, one being a poorly lit welding bay, and the other being an inspection area which was nearly twice as bright as it needed to be.

So far, Work Package 2 have collaborated with the DVLA (Swansea), Wales National Pool Swansea, Amcanu Ltd (Bury Port), Glamorgan Glass (Port Talbot) industry partners. They are currently working on a number of designs for workshops based in Pontyclun area (ACS and AL-Met) and offices in the Swansea area.

Professor Board said "As a result of the assessments undertaken it is clear that the scope for energy saving in the context of lighting within buildings is enormous with payback times such as to make it attractive for many organisations to consider".

Urban Scale Retrofit with Scenario Modelling



Modelling image of Neath Port Talbot County Borough Council

A collaborative paper with contributions by the Scenario Modelling team will be presented at the 13th International Conference of the International Building Performance Simulation Association, in Chambery, France, in August.

The paper entitled *Modelling urban Scale retrofit, pathways to 2050 low carbon residential building stock* brings together work by the LCRI Scenario Modelling for Low Carbon Wales, the EPSRC funded Retrofit2050 project, and the JISC-funded STEEV project.

The UK government has set an ambitious target of 80% reduction of carbon emissions by the year 2050. As part of this target, it is predicted that the emissions related to buildings in 2050 will need to be close to zero.

Local authorities in Wales share the responsibility of improving and maintaining building stock condition to certain levels of sustainability and promoting the deployment of renewable energy schemes in their area.

The Welsh residential sector has a larger share of hard-to-treat properties compared to the rest of the UK. There is currently no representative residential stock model for Wales, and studies quoted in literature model the region based on data from other parts of the UK. This bottom-up approach goes one step further to demonstrate the possibility of providing policy makers and stakeholders at the local level with valuable information on the potential for retrofit based on area specific data.

The results are visualised in a web application, to allow stakeholders to engage with the modelling process.

The research measures the impact of housing retrofit renewable technologies, occupant behaviour, and grid decarbonisation at a local authority scale, using the Neath Port Talbot County Borough Council area as a case study.

Dr Aliki Georgakaki from the LCRI's Scenario Modelling team, said "We were really pleased to work on this collaboration, and the paper had very good reviews from the conference."

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LCRI Case Study: TYF Goes Green in St David's

The team at TYF in St David's

LCRI's Environmental Sustainability Officer, Matthew Jones, works with companies within the Wales Convergence areas, to help develop Environmental Management Systems (EMS) and Equality and Diversity (E&D) strategies. This allows businesses to improve their corporate image, make financial savings, and improve their compliance with legislation, all whilst reducing their environmental impacts

TYF is a company that Matthew has worked with this year. Established in 1985, TYF is a multi -faceted organisation offering outdoor adventures, innovation and sustainability support for business, government and schools, and an ethical, organic outdoor clothing shop. The focus of the company has always been sustainability and remaining as green and eco-friendly as possible. Their working method reflects the products and services they provide.

When Matthew first began working with TYF they had already maintained a Green Dragon Environmental Standard system to Level 3 for three years. The Green Dragon Standard is a certified badge of approval for environmental management and a useful marketing tool.

Many Welsh public sector organisations operate a Green Dragon system, and it is a recognised environmental credential that can improve a company's green image whilst attracting new business. TYF were due for a Green Dragon audit, so Matthew helped them by auditing the existing system, looking at new targets and ways to updating their legal register with the latest legislation. This has ensured that they retained their Green Dragon status.

As well as working with the LCRI, the company have independently developed very strong sustainability practises. As one of the first companies in the UK to sign up to the 1% For The Planet scheme they donate some of their turnover to environmental charities every year.

The company was a founding member of the St David's Eco City project and encourage sustainable travel methods for those taking part in their activity days. They have also taken part in the Cycle to Work scheme; securing small loans for their staff to buy bicycles to commute to work. Recently TYF has installed an electric vehicle charging point, which they use to provide a free charging facility for the Eco City electric car, as well as allowing other owners to charge up.

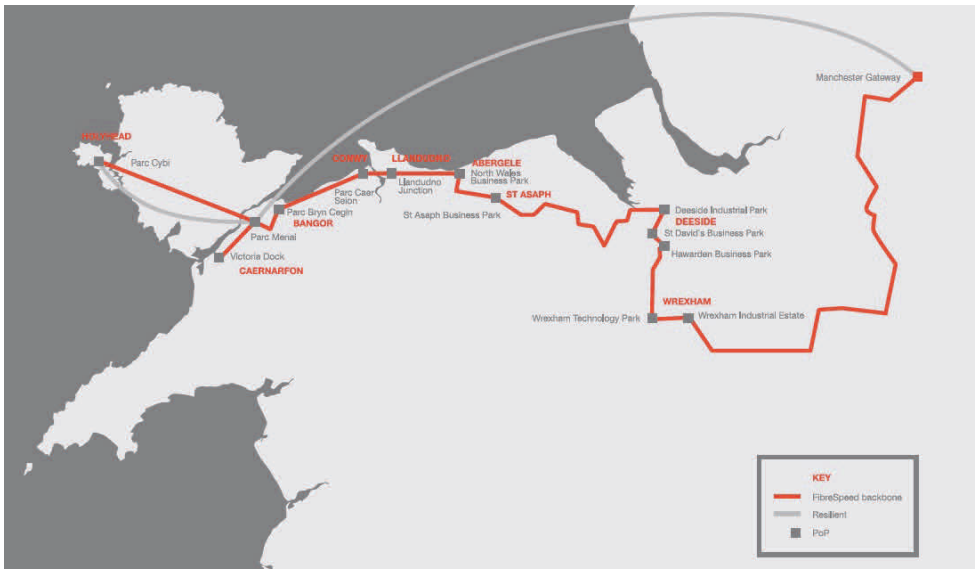
TYF are now looking to install Solar PV panels on their site. They cannot place them on their roof, as they operate from a Grade 2 listed building. Instead, they are hoping to build a new bike shed, and install the Solar PV panels on the shed roof. Further down the line the team are even considering installing a biomass boiler to heat the office and shop.

TYF's founder, Andy Middleton said "Environmental care and stewardship has been part of TYF's DNA since we started business in 1986. We deeply aware of the increasing impact of environmental factors on business and communities, and our entire business is focused on making a positive difference through inspiring and guiding sustainable change.

Knowing that we are doing the right thing operationally is a central part of this, and Green Dragon has helped us navigate this path safely with excellent support."

The electric vehicle charging point, TYF's staff bike rack, and the TYF shop in St David's

LSPG Case Study: Bluefields R&D Project Work



Map of Fibre Optic Highway in North Wales

The LSPG team has recently worked with Bluefield Caernarfon Ltd, to produce a feasibility study regarding a brownfield site in Caernarfon. The site has potential to be developed into a high speed data centre. It is close to a fibre optic highway, and the regeneration potential for the local area makes it an attractive option for blue chip customers.

LSPG's feasibility study examined the ways in which low carbon technology could be combined to meet the needs of the proposed development.

Low carbon would be an attractive option to blue chip companies, and would ensure that the energy mix for the site would be as efficient and clean as possible.

The site had some restrictions due to nearby conservation areas, which meant that tidal turbines and off shore wind power would not be permitted as part of the energy mix.

After examining various options, the LSPG team concluded that a Combined Heat and Power (CHP) system, known as Cogeneration, would be an excellent energy production solution for the data centre. A CHP utilises waste heat for some heating requirements, and can achieve a 90% efficiency rate. This could be used in combination with biomass, onshore wind turbines or photo-voltaic technology to meet the needs of the site.

The team also concluded that the project might have to consider some form of energy storage solution in the form of batteries, to solve the problem caused by renewable sources being an intermittent supply of energy. This would also provide the required Uninterruptible Power Supply (UPS) as an alternative to utilising backup generators.

These technologies would ensure that as and when power regulations change, the site remains compliant with legislation. As the technologies develop, the team will be able to improve and increase power production efficiency, whilst keeping costs down.

Yura Sevcenco, Project Engineer at the LSPG, said "This was an interesting case study for us to work on, seeing how to implement new efficient low carbon power generation on the same site alongside conventional options, while always maintaining the security of supply for a data centre."

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Marine Exhibit at Royal Society Summer Science Exhibition

Members of Swansea University's Marine Energy Research Group (MERG); part of the LCRI Marine team, were accepted to exhibit 'Generating Power from the Sea' at the prestigious Royal Society's Summer Science Exhibition in Carlton House Terrace, London.

This annual exhibition showcases the most exciting cutting-edge science and technology research. It provides a unique opportunity for members of the public to interact with scientists and ask them questions about their work.

The Marine team was organised by LCRI Marine's Tracy Tunstall and led by Principal Investigator Dr Ian Masters. Staffing was provided by over 10 LCRI Marine and MERG staff, including the College of Engineering's student ambassadors. The exhibit demonstrated how scientists can generate electricity from the sea, by harnessing the energy created by tidal streams – this type of hydropower is a predictable form of renewable energy that can contribute up to 15% of the UK's future energy source.

Generating Power from the Sea comprised a demonstration flume supplied by Gunt Technologies that showcased a model tidal stream turbine created by the MERG team. Visitors to the exhibition were able to see the electricity being generated by the model, and participate in the LCRI Marine's research theme exercises including listening to underwater sounds and learning about environmental studies. The younger audience were invited to make their own paper tidal stream turbine and use simple mathematics to work out the speed of the 'duck in the flume'.

Throughout the week, Dr Michael Togneri gave a presentation at the Café Science event and the Marine team participated in two evening Soirees which were highly attended by distinguished guests and fellows of the Royal Society, including the Duke of Kent who visited the stand and confirmed to Dr Masters that Marine Energy was "a good idea!"

The Royal Society welcomed 12,505 visitors throughout the week with online visitors in excess of 30,000. LCRI Marine's Industrial Liaison Officer, Gareth Potter confirmed "We were thrilled to be invited to exhibit at this exhibition.

The event has been a huge success in raising the profile of Marine Energy and for bringing our world leading research from Wales to Westminster."

From top left: Marine team at evening exhibition, and the team demonstration to the public

LCRI ANNUAL CONFERENCE - COMING SOON

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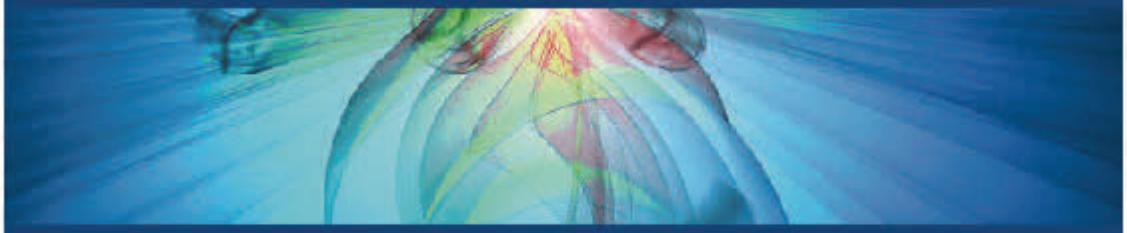
LCRI Annual Conference: Low Carbon Market Transitions

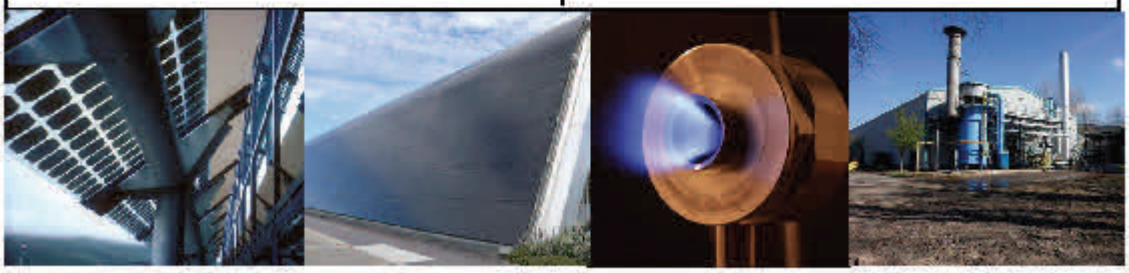
5th & 6th November

Venue Cymru, Llandudno, LL30 1BB



PROGRAMME

DAY 1	DAY 2
09:30 - 10.15 Registration and Breakfast	09:00 - 09:30 Registration and Breakfast
10.15 - 12.30 Plenary Session	09:30 - 11:00 Session 3: Low Carbon Transitions and Scenarios / Bio Energy / WEST
12:30 - 13:30 Lunch	11:00 - 11:30 Coffee
13:30 - 15:00 Session 1: LCBE / Hydrogen / SPARC	11:30 - 12:15 Panel Chairs - Closing Summaries
15:00 - 15:30 Coffee	12:15 - 12:30 Closing Plenary
15:30 - 17:00 Session 2: SOLCER / LSPG / Marine	12:30 - 14:00 Lunch / Networking
17:00 - 18:00 Evening Drinks	
18:00 - 21:00 Evening Dinner	



For more information about the LCRI Annual Conference, and to book exhibition space please contact the LCRI Administrator or the LCRI Publicity Officer on:

Tel: 02920 870003

Email: SterryN1@cardiff.ac.uk Email: DanielJ3@cardiff.ac.uk www.lcri.org.uk

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EVENTS COMING UP

WEST - Launching further pilot modules from September 2013

LCBE - LCBE exhibition featuring work from each of their work package teams. 18th September, The Works, Ebbw Vale

LCBE - Work Package 6 Workshop, at Cardiff Metropolitan University - 2nd September, 9:00am - 4.30pm

LCRI - LCRI Annual Conference: Low Carbon Market Transitions. Venue Cymru, Llandudno, 5 & 6th November

The LCRI

The LCRI Convergence Energy Programme was launched in September 2009, with funding of more than £15 million from the Welsh European Funding Office (WEFO) matched with £19 million from Welsh universities and industry.

The LCRI Convergence Energy Programme is a Research, Development and Innovation (R&D&I) programme, aiming for long-term economic growth and the creation of employment opportunities for Wales.

The LCRI Programme works with enterprises, including the SME sector in particular, to deliver industry-relevant new knowledge and technologies that will provide business opportunities and help Wales deliver on its low carbon agenda.

LCRI Convergence Energy Programme News is a bi-monthly newsletter to promote the work and achievements of the LCRI Convergence projects.

If you have any stories that you'd like us to include, please contact the LCRI Publicity Officer, Jo Daniel.

DanielJ3@cardiff.ac.uk

02920 870003

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