LCRI LOW CARBON RESEARCH INSTITUTE

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LCRI Convergence Energy Programme News

The LCRI — Cutting Carbon, Boosting Growth

The LCRI was set up in 2008 with an initial investment of £5.17 million by HEFCW, to encourage universities in Wales to work together, uniting low carbon energy research interests across academia, industry and government, and providing a solid research base for existing Welsh industries.

In December 2009 LCRI secured European structural funding of £14.7 million to provide a research base for the Welsh energy and low carbon industry sector.

The LCRI team at their annual conference

This government funding has built low carbon research capacity in Wales and helped to secure a current programme of £82.1 million, including £20.4 million from UK research councils, £20.2 million from EU framework and other sources, with a further £18.7 million support from industry and the partner universities.

The LCRI team currently includes over 130 researchers based in Welsh universities at Cardiff, Swansea, South Wales (formally Glamorgan) Glyndwr, and Bangor. Our research agenda includes renewable and clean energy supply, low to zero carbon energy supply systems, energy efficiency, smart living, reduced energy demand, knowledge and skills transfer, and dissemination and industry partnerships.

The LCRI's Convergence study themes promote research, development and economic growth across the energy sector, including, marine, solar PV, power electronics, low carbon buildings, large scale power generation, hydrogen and fuel cells.

In addition, the LCRI has a number of affiliated Research Centres. The Solar Photovoltaic Academic Research Consortium (SPARC) based at OpTIC in St Asaph, is developing new types of PV panels that will radically reduce the energy used in production.

The Sustainable Building Envelope Centre (SBEC) at Shotton was established with a £1.5 million investment by Tata (plus £500,000 from the Welsh Government) to develop new products associated with energy generating building envelopes.

The Gas Turbine Research Centre (GTRC) at Margam is carrying out research on fuel variability and its effect on the operation of gas turbine generators. The Hydrogen Research Centre located at Baglan Energy Park provides a platform for electrolytic hydrogen and fuel cell R&D.

The LCRI links closely with other energy research activities in Wales. IBERS at Aberystwyth University has developed the first high density genetic map of the energy crop Miscanthus ('elephant grass'). (Continued on page 2)

IN THIS EDITION

ERDF
Llywodraeth Cymru
Welsh Government
Ewrop & Chymru: Buddsoddi yn eich dyfodol
Cronfa Datblygu Rhanbarthol Ewrop
Europe & Wales: Investing in your future
European Regional Development Fund

(continued from page 1)

LCRI also has strong links with the Tata Swansea University research centre SPECIFIC, where research is carried out on innovative uses for metal cladding. LCRI is working with SPECIFIC on the building integrated aspects of new technologies, which then are taken into applied research and demonstration at LCRI's SBEC in Shotton.

LCRI also has links with the Anglesey Energy Island programme in partnership with Bangor University.

As well as working towards increasing and improving low carbon energy research and developing a low Carbon Economy in Wales, we have identified the growing need to approach low carbon technologies in a cross disciplinary way.

This approach is now being developed through the new Smart Operation for a Low Carbon Energy Region (SOLCER) project, which joined the LCRI Convergence programme in September 2012.

SOLCER focuses on combining technologies in energy supply, energy demand reduction and energy storage, with all university and industry partners adopting a systems approach to develop new low carbon products for the market.

LCRI recognises that it is also crucial to be able to support new low carbon technologies through an appropriately skilled workforce, and we are developing skills and training alongside its research activities.

Its Wales Energy Sector (WEST) training project is a partnership of the research universities plus representatives from colleges across Wales, aimed at developing post graduate educational modules focussed on the outcomes from the LCRI research projects.

The LCRI is an excellent example of how government funding can be used to build research capacity and create jobs in Wales.

On a visit to Wales in 2010, the European Commission President, J M Barroso, said the LCRI was one of "the best examples in Europe of Research, Innovation and Sustainable Development"

MARINE CHECKS THE NOISE AT RAMSEY SOUND

Marine team out and about on Welsh waters

LCRI Marine is working to enable, support and help build a sustainable Welsh marine energy sector, through collaborative work with all the leading academic marine institutions in Wales.

Part of this includes working with SME companies in the convergence area, to assist with the assessment, design and optimisation of emerging marine renewable energy recovery technologies with the aim of developing products and introducing them into the market. One of the companies that LCRI Marine has worked with over the last 2 years was Tidal Energy Ltd, an innovative tidal stream technology company preparing to install and test at sea a full-scale prototype tidal stream generating device known as DeltaStream off the Pembrokeshire Coast.

LCRI Marine's Merin Broudic from Swansea University worked in collaboration with Tidal Energy Ltd to undertake a project to monitor and analyse underwater background noise at the proposed deployment site for Tidal Energy Ltd's marine renewable energy device.

As part of an important LCRI Marine underwater acoustic research project, Merin is actively working with the marine renewable energy industry to understand the potential acoustic interaction between marine wildlife and offshore construction, operation and decommissioning.

Merin said "In addition to finding new techniques of monitoring underwater noise, working with Tidal Energy Ltd has made me appreciate the challenging environment in which technologies are going to be deployed."

Merin took recordings using the LCRI's hydrophone equipment, which was deployed from a local survey vessel in the Ramsey Sound area of Pembrokeshire.

Data results have been analysed and provided to Tidal Energy Ltd for their Environmental Impact Assessment, and have also been used to form part of the on-going LCRI research project.

Dr Miles Willis, the project manager said "LCRI Marine is working with developers of marine energy technology to understand the possible effects of noise on marine mammals. The work being done by Merin in Pembrokeshire will help reduce environmental risks for the entire marine energy sector."

BRIGHT SPARCs AT SWANSEA STADIUM

The LCRI SPARC team hosted a "PV in Wales Post Feed in Tariff Reduction" seminar at the Liberty Stadium, Swansea, on March 11th. The LCRI SPARC project aims to enable grid parity for PV solar energy in Wales by 2015, to enhance the adoption of PV solar electricity.

The SPARC team are working to accelerate research in photovoltaic materials for solar energy conversion, to make Wales a world leader in the production of new aspects of low cost thin film photovoltaics. This seminar was targeted at raising awareness of the significant potential for Solar PV despite reductions in the Feed In Tariff (FIT), and to bring together people from across the PV supply chain who can share their experiences and expectations for the future of the PV industry in Wales.

This seminar was also used as a platform to identify potential steps that installers can take to capitalise on the current PV market and diversify into emerging markets such as post-installation maintenance and servicing. Discussion included investigations into Government schemes, and third party services and products which PV installers may use to improve their customer service.

There were also presentations on PV monitoring solutions, large scale PV and energy storage, the need for specialist PV cleaning companies, the BRE National Solar Centre, the Green Deal and SMEs, and how to choose PV partners. Professor Stuart Irvine, and Richard Lewis members of the SPARC team opened the conference and discussed SPARC and the collaborative R&D opportunities with the LCRI.

Industry speakers included James Rankin from Green Energy Options, Steve Williams from Solar Panel Cleaners, Nick Tune from BRE National Solar Centre, Robert Goss from Conergy, Ben Robinson from Dulas MHH, and Andrew Pad more from Egnida Green Energy. LCRI SPARC's Stuart Irvine said "This event was a chance to showcase some of the excellent research being carried out by the LCRI SPARC team.

It enabled us to engage with companies in the Welsh PV industry, and demonstrate the ways in which we can collaborate with them to maintain a competitive edge in this rapidly changing market. "

SPARC's Post Feed-In-Tariff Reduction Seminar at the Liberty Stadium

First Six Months of SOLCER in the LCRI

In September 2012, the LCRI welcomed SOLCER, (Smart Operation for a Low Carbon Energy Region) as the latest project to join the Convergence Energy Programme. The aim of SOLCER is to implement and combine existing and emerging low carbon technologies through a systems based approach.

This will allow energy users to evaluate appropriate solutions incorporating energy supply, storage and demand at different scales.

This will range from individual buildings, community projects and industrial sites, up to local authority and regional scale. SOLCER's collaborative approach will help the LCRI bring together research from across different industry sectors, providing another step towards reducing carbon emissions, whilst developing a stronger low carbon industry in Wales.

Through a series of case studies, the SOLCER team will identify drivers and barriers that are preventing large scale roll out of technologies, so that they can advise on ways to increase flexibility and adaptability within the various systems, and maximise the use of low carbon technologies.

Phil Jones, Chair of the LCRI said "If we are to reduce carbon emissions in the built environment we can no longer use a bolt on, component based approach, we have to adopt more holistic systems. We have to optimise at a systems level rather than components, integrating across supply, storage and demand side management – 'linking smart grids to smart living'".

The first stage of project involves the team conducting a research review into low carbon technologies within the LCRI Convergence Energy programme that are available immediately for implementation into systems and investigating locations for the implementation of these.

They are also looking at low carbon technologies external to the LCRI project, to see if they can be combined with LCRI R&D.

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WEST Partners Complete Energy Sector Education Audit

The Welsh Energy Sector Training (WEST) project has recently completed 12 months of research with Swansea Metropolitan University, and Glyndwr University, to audit the current Low Carbon Further Education level education provision in Wales.

The aim of this research was to identify the education being offered to organisations, and individuals entering or currently working within the Low Carbon sector. This included electricians, plumbers, engineers, and companies which supply and fit renewable energy technologies.

The results identified the fact that the current training and education are included within traditional courses, with emphasis on the domestic installation market.

The research showed high levels of commitment and enthusiasm from Further Education staff in North and South Wales, who are clearly working hard towards enabling the emerging Welsh Low Carbon Economy.

Another discovery revealed that current political pressure has reduced the ratio of staff student contact hours in FE institutions. This was found to have a significant negative effect on the delivery of Low Carbon technology programmes, despite interest from the student community.

The gaps in training provision appear to be broadly similar across North and South Wales, with a need to improve the general understanding of a Low Carbon economy, emphasise the importance of Energy Security for UK, and replace existing generation capacity.

There was some expectation that employers within the Low Carbon sector have the potential to lead the drive to meet the Welsh Government's Strategy on Low Carbon.

However, the report also demonstrated that, at present, employers consider current strategies such as the Green Deal are unlikely to lead to future benefits to employment. WEST concluded that South Wales was offering courses to a wider range of Low Carbon employees than North Wales, by including the trades, designers and architects. However, student numbers on courses were found to be lower in South Wales, likely as a result of higher density of FE Institutions, and a wider range of courses.

Across the board, companies did not feel that they could rely on renewable installations for their income.

They are also not convinced that the Green Deal will drive the industry forward, many blaming the reduction in the Feed-In-Tariffs for the low uptake of these technologies.

WEST Director, Julie Gwilliam said "The research undertaken to date, supports existing knowledge about weaknesses in existing policy and issues within the training delivery in this sector, and outlines some clear recommendations for us to drive the WEST project forward."

WEST will use this information to create and develop a series of post graduate Energy Sector training courses that will be launched this September.

Environmental Audit for Vintage Joinery

The LCRI Convergence Energy Programme offers free support to companies within the Convergence areas of Wales, 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.

Vintage Joinery is an example of one of the businesses who have recently received support from the LCRI. They are based in South Wales and produce bespoke & purpose made joinery.

Their services are used by customers throughout the UK and include a range of high quality wood products for new build, period dwellings, listed buildings and retrofit, both commercially and domestically.

After undergoing an environmental audit and implementing new systems, Vintage Joinery are working towards Level 2 of the Green Dragon Environmental Standard. Following advice about legislation Vintage Joinery has also applied for an exemption from the Environment Agency that will allow them to re-use the sawdust waste they produce.

This will allow them to divert about 1.4 tonnes of waste per annum from landfill, and will save the company about £1500 every year. The Green Dragon Standard is a certified badge of approval for environmental management and a useful marketing tool.

Many Welsh public sector organisations (including most Local Authorities, NHS Trusts and Welsh Government themselves) operate a Green Dragon system.

Many environmentally-aware organisations now ask for environmental credentials as part of their tendering process and having Green Dragon in place will help companies to improve their green image and win more contracts.

Matthew Jones, the LCRI's Environmental Sustainability Officer said "Vintage Joinery have made significant efforts to ensure their impact on the environment has been minimised wherever possible.

They've done this whilst maintaining working practices focussed on the highest quality product for their customers.

I think it's important those customers, and prospective others, are can have these environmental credentials confirmed by a third-party standard like Green Dragon."

The Vintage Joinery team, with Matthew Jones, LCRI's Environmental Sustainability Officer

SBEC Turns Two In March

SBEC at Tata Steel's Shotton Works site in Flintshire

LCBE's Sustainable Building Envelope Centre (SBEC) celebrated its second anniversary in March 2013. The SBEC centre, based in Tata Steel's Shotton works in North Wales, was unveiled in 2011.

It was constructed with funding from the Welsh Government and Tata Steel to accelerate the development of low and zero carbon solutions for the built environment using steel in combination with other materials. SBEC was designed to be a showcase for sustainable products and used to test and monitor new integrated heating, energy and ventilation systems on the fabric of the building.

The teams aimed to create a construction process which would enable the façade of buildings - both roof and walls - to be transformed from a passive energy conservation role to an active energy generation, storage, dissipation and management function.

Since its construction, the LCBE and Tata steel teams, headed by SBEC Director Daniel Pillai of Tata Steel, have developed and commercially launched two products at the SBEC centre: an active solar air heating device (based on Transpired Solar collector technology), and a frameless, lightweight PV module, bonded directly to the pre finished metal roof.

The teams have also completed the development of design software, design and best practise guide, including the web based feasibility tool to assess energy delivered, CO2 saved and financial payback. This will enable future architects to design and specify buildings using this technology, to help deliver low to zero carbon buildings.

Daniel said "Over the last 2 years, we have worked hard to develop these technologies, and also to bring on the supply chain capable of executing the projects.

This has included not only manufacturing companies producing the collectors but also installers. We have built a number of pilot projects to prove these technologies in operation and in the process further enhanced their performance.

"The unique position of SBEC and its industrial partnership with the supply chain enables this end to end capability necessary to accelerate the uptake of new technologies, particularly in a conservative construction industry."

Looking forward, Daniel was very optimistic of the low temperature thermal storage devices, both diurnal and inter-seasonal being worked on, and their ability to meet most if not all the space heating requirements.

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LSPG Had The Power in Margam Park

LSPG's Low Carbon Power Generation Seminar in Margam Park

The LSPG team hosted the "Low Carbon Power Generation Seminar and Expo: 2013" at The Castle, Margam Park in March.

The LSPG team is researching the suitability of utilising alternative and renewable gaseous fuels for power generation.

This research is being driven by the increasing costs and security associated with using natural gas and the potential to offset these costs with a net reduction in CO2 emissions through efficiency improvement and use of biomass.

This seminar was a platform to provide information to companies in Wales about the costs and trends of current power generation, and the future of energy diversity.

It was an opportunity for businesses to engage with academics and Low Carbon industry professionals, and to learn about new funding and support being offered to companies who want to enter the Low Carbon energy market.

The event included exhibitions and contributions stands from GTRC, Refgas, GEM, Ynni Glan, Innovation Network, and Cardiff University's Business GatewayGEM, MayPhil, as well as the LCRI WEST, Hydrogen and central teams, as well as demonstrations from the GTRC of thermal imaging, high speed imaging techniques, and the GTRC High Pressure Combustion Rig 3D visualisation model.

There were presentations from industry, and LSPG industry partners, including Chris Williams from TATA Steel, who described the Waste Heat Recovery measures being taken at their Port Talbot plant, and Mark Johnson from Rolls-Royce, who discussed trends and future aspects of Gas Turbine Emissions.

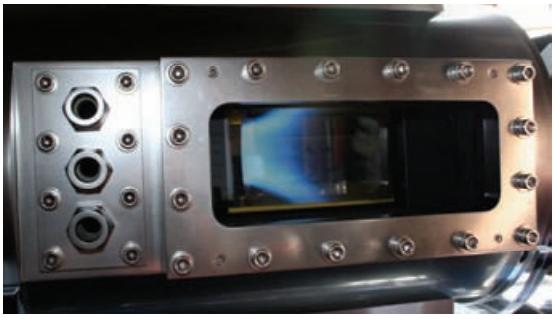
Yura Sevcenco, LSPG Project Engineer said "We are very grateful to our event partners and staff who worked tirelessly to setup this event, were the success could be measured by the packed-out crowds for the seminars and the buzz of discussion in the expo."

LCRI speakers included Sally Hewlett from the Welsh Energy Sector Training project, Jon Maddy from the LCRI Hydrogen team, and Professor Phil Bowen, Director of Cardiff University's School of Engineering, and Project Lead for the LSPG team.

Steve Morris, Project Manager for the LSPG team said "The event was a huge success for us as it was well attended and brought together individuals and companies from many industrial sectors all with the aim of low carbon power generation ".

The event finished with a tour of the Gas Turbine Research Centre in Margam, and the Baglan Park Hydrogen Centre, to show the LSPG and Hydrogen teams in action.

Professor Phil Bowen said "I was delighted to see so much interest shown by the Welsh private sector in the LSPG offering, and enjoyed the excellent industrial presentations and debate."



LCRI's Hydrogen Lead Heads to Sweden

Delegates from the 2013 Renewable Energy Meeting at Umea University, Sweden

Professor Alan Guwy, project lead of the LCRI Hydrogen team, recently travelled to Sweden to give a talk on Increasing Biogas Production Using Integrated Biohydrogen and Biomethane Systems at the 2013 Renewable Energy Meeting at Umea University, Sweden.

The LCRI Hydrogen team is aiming to create an academic and industrial hydrogen research hub in Wales, and establish links with local companies to begin the development of a Welsh Hydrogen industry. The conference, which attracted international speakers from top ranking Universities, covered a range of topics global energy and climate aspects, artificial and natural photosynthesis, hydrogen production by microorganisms, and bioenergy.

Alan's presentation discussed the benefits of using an integrated biogas prodution system, which includes utilisation of waste material as an energy source, the production of carbon neutral fuel and lower construction and operating costs.

By utilising a two stage process, the findings show a significant increase in the efficiency of the overall process, with 38% increase in energy yields, a greater stability, even at lower retention times, retention times as low as 12 days possible while still obtaining 18% increase in energy yields, and the ability to produce H2 as well as CH4 gas. On-going work involves using grass as the substrate, to see how efficient the production is with a different material.

The next stage of the research will involve looking at the differences in the process with other substrates (waste materials such as sewage sludge).

Professor Guwy said "By using a biohydrogen reactor upfront of a biomethane reactor in this two stage process we can significantly increase the total biogas yield even when using wastes with high lignocellulosic content. This conference was a fantastic opportunity to showcase the work of the Hydrogen team on an international stage, demonstrating the value of the hydrogen research being done in Wales, and promoting the wider work of the LCRI to a global audience."

LCRI Scenario Modelling Team Discuss Methods and Findings with Future Researchers

Dr Aliki Georgakaki and Kruti Gandhi from the LCRI Scenario Modelling team recently gave presentations about their research to Cardiff University Masters students.

The Scenario Modelling team are working to develop an integrated energy scenario and modelling framework for Wales, in order to support the transition to a low carbon economy through innovation and industrial development.

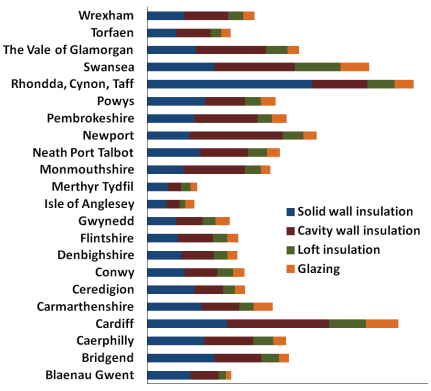
The presentations included an introduction to Scenario Modelling, which is essentially using mathematical representations, statistical and scientific data from various sources to look at a range of possible futures and understand the differences between them.

One example of the use of scenario modelling presented by Aliki and Kruti looked at the potential carbon and economic savings that could be made if low carbon measures were fitted to houses in Wales. They were able to analyse the current housing stock in Wales at a local authority level.

By reviewing various different aspects of the houses from current data, including of the type of wall, the level of insulation, the type of glazing, heating systems and heating fuel, they applied a model that calculated CO2, energy and economic savings that could be made if all houses were fitted with high levels of loft and wall insulation, and best practise glazing products.

It is important to look at Wales and local authorities in particular separately, because there are important regional factors and infrastructure which can alter energy usage results.

For example, Wales has a larger share of hard to treat properties compared to the rest of the UK, and their distribution is not uniform across the local authorities. By taking these factors into account in the modelling work, Aliki and Kruti's findings give a far more area specific result in terms of what can, and needs to be done to increase CO2 efficiency in Wales.



Scenario Modelling findings

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EVENTS COMING UP

WEST

Wylfa Nuclear Power Station on Anglesey are hosting a Learning at Work event on 22/23rd May 2013. This will involve various HE/FE providers coming into showcase the course on offer.

HYDROGEN

Professor Alan Guwy will be presenting at the All Energy Conference in Aberdeen on May 22nd/23rd

MARINE

Gareth Potter will be exhibiting at the All Energy Conference in Aberdeen, May 22/23rd, on the Welsh Government Marine Energy stand

The LCRI

The LCRI Convergence Energy Programme was launched in September 2009, with funding of more than £14.7 million from the Welsh European Funding Office (WEFO) matched with £18.7 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 editorial team:

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