

FLEXIS

SMART ENERGY FOR OUR FUTURE
YNNI CALL AR GYFER EIN DYFODOL

November 2019
Advisory Board Report



UNDAE EWRWRODEGOL
EUROPEAN UNION



Llywodraeth Cymru
Welsh Government

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Rhanbarthol Ewrop
European Regional
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Swansea University
Prifysgol Abertawe

**University of
South Wales**
Prifysgol
De Cymru

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Foreword



Our last Advisory Board meeting took place in May and, as I'm sure you will recall, the event was followed by the official launch of the FLEXIS Demonstration Area. It is very pleasing to be able to reflect on

the fact that the launch went very well and work on the Demonstration Area is now very clearly taking shape. The focus of this Advisory Board meeting is that subject and a number of presentations and discussions are planned.

In that context, it is a pleasure to welcome our Demonstration Area Project Manager, Rhys Bowley. As I mentioned in my last foreword, Rhys is a Cardiff University graduate, who having spent the past seven years at National Instruments has relocated from Austin, Texas, to Wales. Rhys joined us in June, so it's a pleasure to welcome him to his first FAB meeting.

The current FLEXIS contract is due to finish in mid 2021. However, recent discussions with our funders WEFO have indicated that they are happy to consider a request for a 2-year extension to mid 2023.

I'm delighted to be able to report that FLEXISApp has now been approved for funding by WEFO. FLEXISApp is the Energy System (FLEXIS) Commercialisation Demonstrator that will develop and test individual, innovative energy technology in-situ in a whole multi-vector energy systems environment, within the Demonstration Area. The timing for the start of this contract is excellent, enabling further focus on work in the Demonstration Area.

Another important development relates to the decarbonisation of the South Wales Industrial Cluster.

Working closely with Tata colleagues Phil Clements and Chris Williams, we are currently developing a specification and governance structure for the new cluster. We then plan to take forward this task via the award of a contract to the successful bidder. On completion of the work and subject to the adoption of the recommendations, the approach being developed will, we hope, formalise the creation of the Cluster.

We have had the pleasure of hosting a visit by Sir David Lidington (then Deputy Prime Minister) in July and a visit by the Chair of Ofgem just a few weeks ago. We adopted a similar format for both visits: an initial informal round table discussion in the Baglan Bay Innovation Centre, followed by a visit to the Hydrogen Centre. Huge thanks to Advisory Board members who attended those visits. I feel that we can quite fairly claim that the visits were a success and the FLEXIS message was carried clearly to our visitors.

We extend our warmest congratulations to Prof Richard Dinsdale on the award of the highly prestigious Royal Academy of Engineering Chair in Emerging Technologies. Many congratulations also to our colleagues Liana Cipcigan and Richard Marsh on promotions to Chairs at Cardiff University. Also, it is very pleasing to be able to report the award of an Honorary Professorship at Cardiff University to Advisory Board member Francis Griffiths.

Finally, we send our best wishes and thanks to Sali Button who served us so well as our Communications Officer. Sali took up a post at Cardiff University in the summer and we are now fully into the process of seeking a replacement.

Prof Hywel Thomas

Who's Who

FLEXIS is made up of approximately 100 academics, researchers and administrative staff from three of Wales' leading universities – Cardiff, Swansea and the University of South Wales.

Prof Hywel Thomas

Lead Principal Investigator and PI of Sustainable Earth Energy

Dr Aleksandra Koj

Project Manager

Principal Investigators

Prof Nick Jenkins

Network & grid integration of renewables;
low carbon energy infrastructure in Wales
Cardiff University

Prof Alan Guwy

CymruH2Wales2 – hydrogen and fuel cells
University of South Wales

Prof Phil Bowen

SMART-POWER: enabling integrated energy systems
Cardiff University

Prof Andrew Barron

Energy safety research
Swansea University

Prof Manu Haddad

Alternative environmentally-friendly gas for electrical networks insulation
Cardiff University

Profs Nick Pidgeon & Karen Henwood

Public response to energy systems technologies
Cardiff University

Dr Petar Igic

Power electronics
Swansea University
(Coventry)

Partners



Advisory Board

John Scott (Chair)

Chair of the FLEXIS Advisory Board
and Independent Consultant

Prof Paul Beasley

Head of R & D UK at Siemens

Ben Burggraaf

Energy Operations Manager at
Dwr Cymru Welsh Water

Martin Brunnock

Research, Development and Technical
Director for Tata Steel UK

Dr Mike Colechin

Director of Cultivate Innovation Ltd

Prof Bill David

Professor of Chemistry at
the University of Oxford

Ceri Davies

Executive Director – Knowledge
Strategy and Planning at
Cyfoeth Naturiol Cymru /
National Resources Wales

Steven Edwards

Director of Regulation & Commercial
at Wales & West Utilities

Robert Harper

Gallium Nitride Programme Manager,
Compound Semiconductor Centre

Roger Hey

Future Networks Manager at
Western Power Distribution

Prof Ron Loveland

Energy Advisor to the
Welsh Government

Dr John Newton

Managing Director at ITM Motive

Dr Iliana Portugues

Head of Innovation for National Grid
Electricity Transmission Owner

Stephen Phillips

Chief Executive at Neath Port
Talbot County Borough Council

Dave A Roberts

Director of Smart Interventions,
EA Technology

Prof David Slater

Honorary Professor, School of
Engineering, Cardiff University

Nick Smailes

Head of Business Development
at Energy Systems Catapult

Mahesh Sooriyabandara

Associate Managing Director
at Toshiba Telecommunications
Research Laboratory, Toshiba
Research Europe Ltd

Dr Mark Winskel

Chancellor's Research Fellow
on Energy Innovation, Science
Technology and Innovation Studies,
University of Edinburgh

James Yu

Future Networks Manager
at SP Energy Networks

Dr Martyn Kenny

Sustainability Director for Tarmac

Chris Harris

Head of Regulation and
Compliance at npower

Francis Griffiths

Founder and CEO of Maiple, Chairman
of RTL Ltd, Non- Executive Director
at Green Running, serves on Cardiff
University Strategic Oversight Board

New Members

FLEXIS extends a warm welcome to the following new members of the advisory board:



Dr Martyn Kenny

Martyn is Sustainability Director for Tarmac, a CRH company. Tarmac is the UK's leading producer of aggregates, recycled aggregates, asphalt, concrete, cement, lime and building products like mortars, screeds and blocks. Tarmac also operates a major road contracting business.

As Sustainability Director, Martyn is responsible for developing and implementing a transformational sustainability and product innovation strategy. The approach covers the whole life performance of Tarmac's products and solutions, with particular focus on sustainable construction.

Martyn represents company and sector interests on sustainability legislation and climate policy in the UK, Europe and globally. He chairs several key industry groups and with over 20 years in the industry, Martyn has held a number of senior positions within the organisation



Chris Harris

Currently Head of Regulation and Compliance, Chris has worked at npower for over 21 years. Previously, Chris was npower's Head of Regulation, a role which he held for 11 years.

With a track record in finance and energy, Chris' skills comprise of business process, markets, gas, electricity, energy policy and efficiency, and his key interests are in the areas of regulation and economics.

Chris holds a PhD in Metallurgy, Fracture Mechanics from the University of Cambridge, a PhD in Regulatory Economics from the University of Bath and is an Executive Fellow in Decision Science at London Business School. Formerly a visiting professor on sustainable power distribution at the University of Bath, Chris has published four books on economics as applied to electricity.



Francis Griffiths

Francis is the founder and CEO of Maiple which provides AI powered solutions for manufacturing, healthcare, energy and autonomous systems.

Francis is a business leader and entrepreneur with over 30 years of experience in the Test and Measurement and Industrial Automation Industries. He was Senior Vice President at National Instruments leading the \$1.2B Global Sales and Marketing Organisation.

He also serves as Chairman of RTL Ltd, Non- Executive Director at Green Running, makers of VERV Home Energy assistant, and on the Cardiff University Strategic Oversight Board.

Francis holds a BEng (Hons) degree in Electronics from Cardiff University and was awarded a Fellowship by the IET in 2018. He was recently awarded an Honorary Professorship at Cardiff University.



2019 at a Glance

16th May
FLEXIS Advisory Board Meeting



20th May
DR Renato Zagorscak appointed International Fellow of the Croatian Academy of Engineering

Congratulations to FLEXIS colleague Dr Renato Zagorscak for his appointment as an International Fellow of the Croatian Academy of Engineering at the award ceremony on May 20th.

21st May
FLEXIS has a stand at edie Live

FLEXIS was excited to participate in the UK's biggest energy and sustainability event.

19th June
FLEXIS supports leading 'green' council

Chart-topping Neath Port Talbot Council is the best 'green energy' local authority in Wales. Latest Welsh Government figures show the council has the highest total renewable energy capacity and the greatest renewable energy generation across the country.

FLEXIS is supporting the authority's Decarbonisation and Renewable Energy Strategy by applying its research to a physical site in the county - the FLEXIS demonstration area.



30th August
FLEXIS colleague Prof Liana Cipcigan promoted to Personal Chair



26th September 2019
South West Wales: Renewable Energy Region event

Co-hosted by FLEXIS and 4thRegion, in partnership with Low Carbon Swansea Bay. FLEXIS representatives facilitated round table discussions, with input from projects and initiatives from across the region.



16th October
Ofgem Chairman, Martin Cave, visit FLEXIS Demonstration Area

23rd-27th September 2019
FLEXIS attends European Research and Innovation Days in Brussels

European Research and Innovation Days is the first annual policy event of the European Commission, bringing together stakeholders to debate and shape the future research and innovation landscape.

16th May
FLEXIS Demonstration Area launch event

FLEXIS and Neath Port Talbot Council unveiled a number of green energy projects which will support Port Talbot's move towards a smart, low carbon future.

The event was opened by Prof Mark Taylor, Deputy Director Energy Innovation at the Department for Business, Energy and Industrial Strategy (BEIS). Prof Taylor said: "FLEXIS has great potential for technologies which address climate change, particularly in the areas of industrial heat recovery and hydrogen".

Since the launch event, demonstration area projects have been awarded £1.8million total funding proposals have been submitted for a further £3million.



1st June
FLEXIS gains new Demonstration Area Manager

Rhys Bowley starts his position as the new Demonstration Area Manager for FLEXIS



1st July
Minister for the Cabinet Office David Lidington visits FLEXIS demonstration area

FLEXIS welcomed Minister for the Cabinet Office Sir David Lidington to our demonstration area, followed by a tour of University of South Wales's Hydrogen Centre. The visit was part of a day in Wales celebrating 20 years of devolution.

David Lidington commented "FLEXIS is a great example of universities, scientists, business and local government working together on ways to meet the Net Zero strategy."

24th June
FLEXIS hosts a Go Wales placement

Eli joined FLEXIS on a work taster to help review our sustainability strategy.

19th September
FLEXIS presents during poster sessions at Environment Platform Wales event

The event was chaired by Prof Louise Miskell, and organised by Environment Platform Wales in association with Welsh Government and Natural Resources Wales.

23rd September 2019
EU funds to support FLEXISApp

Nearly £3million EU funds is to be invested in a new Cardiff University project to help scientific researchers, the public sector, SMEs and industrial specialists develop fully scalable technology for low carbon energy systems.

The FLEXISApp project will focus on collaborative research into components suitable for use in sustainable energy systems at commercial scale, working with companies based in or moving into Wales.

[Source: gov.wales press release, 23rd September 2019]

4th Oct 2019
Professor Richard Dinsdale named Chair in Emerging Technologies

FLEXIS colleague Professor Richard Dinsdale is one of 8 world-leading engineers to be named a Chair in Emerging Technologies by the Royal Academy of Engineering. The £2.8M grant will allow Prof Dinsdale to develop and commercialise microbial bioelectrochemical systems for waste treatment and resource recovery.



May - September 2019
'Energy Futures' workshops

The FLEXIS Social Science team facilitated 'Energy Futures' workshops with the Port Talbot community to explore how everyday life may change with a decarbonised energy system. Their findings will help FLEXIS demonstrator projects avoid risks and enhance the value to project stakeholders including the wider community.

Spotlight on Success

Professor Richard Dinsdale Wins Prestigious Royal Academy of Engineering Award



FLEXIS colleague Prof Richard Dinsdale has been awarded a Chair in Emerging Technologies for his work in bio-electrochemical systems, including 10 years of research funding and support.

Prof Richard Dinsdale is one of eight pioneering

researchers to be awarded a prestigious Chair in Emerging Technologies. These ground-breaking research projects have been recognised by the Royal Academy of Engineering for their potential to considerably benefit the UK economy and society. They reflect the UK's technological priorities, with many of the projects aligned to the government's Industrial Strategy and designed to tackle some of the biggest industrial and societal challenges of our time. They have been allocated a total of £22million of research funding, supported through the UK government's Investment in Research Talent initiative.

Academy president Prof Sir Jim McDonald said in a press release: "The quality and vision of those receiving the awards are testament to the outstanding research talent in the UK.

It is essential that we support both the innovations and the pioneering individuals who will transform their ideas into fully commercialised technologies with important and widespread applications."

Prof Dinsdale added:

“This activity has been supported within [University of South Wales] USW and FLEXIS over the years and this award is not only a reflection on the quality of work colleagues and I have been doing but also reflection on the positive collaborations we have had with the FLEXIS team.”

Prof Richard Dinsdale is Chair of Sustainable Environmental Systems in the Sustainable Environment Research Centre at the University of South Wales. He aims to develop and commercialise microbial bio-electrochemical systems for waste treatment and resource recovery, an innovative area of biotechnology which manipulates the electrochemical properties of microbial cells to make industrial processes more efficient. This could enhance wastewater treatment, improve metal recovery and help convert carbon dioxide into renewable green platform chemicals.

His research activities are directed at optimizing microbial cultures for the production of energy either as hydrogen, methane or directly as electrons from low grade biomass resources including wastes or other products such as volatile fatty acids and bioplastics. He has received funding as principal investigator and co-investigator of over £6 million from the EPSRC, BBSRC, and NERC, the European Framework programs, European regional development funding or industry. He has been funded in 5 EPSRC SUPERGEN projects and was the scientist in charge of a FP6 Marie Curie project.

Professor Liana Cipcigan Promoted to Personal Chair



Prof Liana Cipcigan is Leader of the Sustainable Travel cross-cutting theme in the Cardiff School of Engineering and a leading member of Transport Futures Research Network. She also sits on the Strategic Board of Sustainable Places Research Institute

and is the founding director of Cardiff University's Electric Vehicle Centre of Excellence. She is a valued contributor to the FLEXIS Electric Vehicle charging project, working closely with Neath Port Talbot Council and Smarter Grid Solutions.

Since joining Cardiff University, Prof. Cipcigan has undertaken internationally recognised research in two fields of global importance: Smart Grids and Electric Vehicle (EV) integration into electricity and transport systems. Electricity networks and transport are increasingly interacting in an unprecedented manner, giving rise to a new merged industry perfectly aligned with her expertise.

She is currently leading a £1million EPSRC Network+ project 'Decarbonising Transport through Electrification, a whole system approach (DTE)' with academic partners Cranfield University, University of Bristol, University of Birmingham, and University of Southampton. The network aims to transform current practices and research in the decarbonisation of transport, looking at the electricity networks, electric vehicle charging infrastructure, electric and hybrid aircraft and the electrification of the rail network.

Her expertise has been widely recognised: She was called upon to serve as an expert for the House of Lords in the 'Shaping the Future of EVs, debating the EV Bill' roundtable, 2018; serves as an expert in the Low Carbon Vehicles Steering Group for the Welsh Government; gave evidence to Economy, Infrastructure and Skills Committee 'EV charging in Wales' at the National Assembly for Wales, 2018; and gave evidence for The Committee on Climate Change.

Among her many achievements, Prof Cipcigan shows a sustained and impactful collaboration with industry, as highlighted by her flagship secondment at National Grid under the prestigious Royal Academy of Engineering Industrial Fellowship.

During this secondment she developed new areas of research, with two follow-up projects funded by National Grid: 'Electric Road System for Dynamic Charging of Electric Vehicles' and 'Feasibility study to unlocking flexibility from within industrial and commercial users', a collaborative project with TATA Steel Port Talbot.

During the Innovate UK project 'Ebbs and Flows Energy Systems', Prof Cipcigan led the development of a Cloud-based Virtual Power Plant (C-VPP). The project used electricity storage assets to flatten the peak demand profile of buildings, to manage buildings' demand during triad peaks, and to enable buildings manager participation in the grid balancing services market. The C-VPP software platform was successfully tested on commercial and domestic pilots. It was the first Vehicle-to-Grid unit installed in a UK domestic property.

She has actively contributed to the public understanding of EVs contribution to emissions reduction and the challenges related to the charging infrastructure, establishing links with wider communities. Some of her activities in this area include: Guest speaker at Edinburgh International Science Festival and serving as a member of the Steering Group for the Re-Energising Wales Project.

The UK government identified EVs at the heart of their Industrial Strategy. 'Clean Growth' and 'Future of Mobility' are identified as "society-changing opportunities and industries of the future." Prof Cipcigan has been at the forefront of this shift to electrified transport for over a decade, delivering international research leadership and excellence, collaborating widely with industry, and being recognised as an expert in EVs and Smart Grids with national and international esteem.

Case Studies

Redesigning Low Carbon Energy Futures in Port Talbot

The FLEXIS Social Science team, led by Professors Karen Henwood and Nick Pidgeon, have been exploring the societal impacts of future energy scenarios through a series of interactive workshops with the Port Talbot community. Their research will help FLEXIS anticipate public perceptions about the introduction of decentralised systems for low-carbon energy production and consumption in Port Talbot.

The research is one of three workstreams being undertaken by the FLEXIS social science team and is structured around two main phases of data collection. The first involved interviews with community participants, and the second consisted of five community workshops hosted in Port Talbot between May and September 2019. The workshops focused on four potential energy scenarios for the future and involved a series of activities designed to provoke discussion about the effects of increasingly renewables-based energy systems in the region.

Phase 1

During the first phase of research, community members were interviewed about their lives in Port Talbot and their relationships with energy and the local environment. Participants were selected to represent diverse relationships to the local area, these included: steelworkers, young workers, residents whose families had lived in Port Talbot for at least three generations, river users and gardeners/allotmenters.

Interviewees were asked to provide photographs representing parts of Port Talbot which matter to them. They were also presented with a simplified map of the town and invited to identify emotionally significant locations, as well as those which were in need of improvement. The interviews, photographs and maps were used to inform the development of socially and emotionally relevant stimulus material for use in later workshops.

According to the Social Science team:

“The visual and non-linear character of maps have been used as a means of eliciting discussion of the material, social and cultural experiences and relationships subjects have with their environments. They provide an anchor point from which multiple identifications and affective narratives can emerge. By opening these documents up to discussion, modification and adaptations we aim to provide space for more affective and vernacular representations to surface.”

Phase 2

The second phase of research comprised a series of workshops centred around four proposed energy scenarios for Port Talbot. These scenarios reflect how the energy system in Port Talbot may change in the future, based on previous FLEXIS research. According to the Social Science team, the four Flexis scenarios bring together ‘a wide range of existing and upstream technologies, infrastructures and social practices, linked together for the purposes of economic development and decarbonisation, which are deeply embedded in expert and policy discourse at local and national levels’

During the workshops, a series of activities were used to elicit discussion and evaluate the desirability of the proposed energy scenarios. Throughout these activities, materials illustrating each of the scenarios were displayed on four pinboards mounted on six-foot tall easels. Through the use of interviews, focus groups, and maps, the research team provided a variety of resources and prompts for exploring the potential human, social and environmental impacts of changing energy systems.

Emerging Themes

Initial points for analysis were the ways in which participants relate to Port Talbot, the cultural discourses invoked in discussing life in the town, and the way such relationships change as participants explore the four FLEXIS scenarios. Early analysis shows three emerging themes, namely:

1. Ambivalence about industry and the town's relationship with it
2. Trust/distrust in competence and reliability of local actors
3. Decline narrative vs untapped local potential

The results of this research will be instrumental in helping FLEXIS demonstration projects avoid risks, whilst simultaneously enhancing value to project stakeholders including the wider community.

Decarbonising Heat

Cardiff University researchers led by FLEXIS Principal Investigator, Professor Nick Jenkins, take a spatially integrated approach to assessing options for regional heat supply.

In 2019, the UK amended its previous greenhouse gas emissions targets for 2050 and is now aiming at becoming net zero. According to the Committee on Climate Change, this would require 90% of buildings to have low carbon heating by 2050, as well as substantial infrastructure changes by 2030. As an intermediate target, a carbon intensity of heat of 180 gCO₂/kWh by 2030 has been suggested.

With this goal in mind, Cardiff University researchers have proposed a methodology for assessing options for local heat supply in the UK, using Neath Port Talbot (NPT) as a case study.

In contrast to the electrical grid, which is decarbonising rapidly, the heat sector has remained largely unchanged for the past three decades. In 2018, the final energy demand for space heating and hot water in the UK domestic sector was close to 400 TWh; A figure which has changed little since 1990. This demand is mainly met by natural gas, reflecting a slow uptake of low carbon technologies.

There are several technological options for decarbonising heat, such as heat pumps, district heating networks and hydrogen boilers. The optimal heat supply mix not only depends on costs and performance of technologies, but also is significantly affected by spatial resolution chosen and the local circumstances such as building stock, waste heat and available electricity network capacity.

The team of researchers designed a methodology for estimating the annual heat demand by fuel type for small areas (LSOA's) in the UK. They then formulated a spatially resolved optimisation model to assess the options for heat supply in local areas. This model compares the viability of installing individual heating systems and district heating schemes by using a range of national, local and technological data.

To reach the intermediate target of 180 gCO₂/kWh by 2030, their model shows that the path to decarbonising heat is reliant on a steep increase in gas prices. This would create the economic environment for an uptake of district heating schemes using large scale heat-pumps and individual air source heat pumps (ASHPs) in disfavour of gas boilers. The study also shows the utilisation of waste heat increases the viability of district heating schemes by providing a source of heat at low cost.

To get closer to a carbon intensity of zero for heat, the results show that a majority of dwellings will need to be connected to district heating schemes or use individual ASHPs, and all gas boilers will be phased out. In that scenario, most of the heat sector will be electrified, which means that decarbonisation in the electricity sector will be a prerequisite to reach the full decarbonisation of the heat sector.

Researcher Alexandre Canet said: “From an implementation point of view, the model shows that an increase in gas price is a major trigger for the decarbonisation of the heat sector. However, based on price projections from [the Department for Business, Energy & Industrial Strategy] BEIS, the increase in gas price over the next few years won't be sufficient to create these changes.” He suggests external regulations, such as incentives or binding policies, as a possible solution.

FLEXIS Collaboration with National Grid

Work is underway on a new collaboration funded by National Grid. The research has two broad aims: to improve predictions of heat dissipation around buried electrical lines and to develop new materials for use in burying cables. Both streams fit within National Grid's "undergrounding" agenda - that is, replacing overhead electrical transmission infrastructure with buried assets. The team's research will work towards maximising the capacity of the transmission network and provide the science base needed to justify de-rating.

Temporary Flowable Backfills

The first stream of work focused on developing new materials for use in undergrounding cables. The backfill surrounding a buried cable (or other transmission line) fulfils a vital role in ensuring the heat that is generated from inside the cable is adequately dissipated to the environment. This prevents the cable from overheating, which can contribute to the mechanical breakdown of the insulation. Normally, a particular grade of sand is combined with some cement to form the backfill. This traditional backfill medium is well characterised and performs reliably, but temporary flowable backfills present a more elegant solution: they have the potential for easier and cheaper installation with lower carbon cost.

Temporary flowable backfills involve the reuse of native soil available at the site, combined with a small quantity of a fluidising agent and cement, to create a backfill that can flow as a liquid until it sets around the cable or other transmission line. The research carried out at Cardiff University involved testing the mechanical and thermal properties of various potential mixes and comparing their performance against the conventional backflow medium. Results of the investigation indicate that, for certain native soil types, temporary flowable backfills are likely to be a viable option. However, caution must be taken over its universal application, as certain soil types seem problematic.



the overarching aim is to develop the scientific basis to justify short term ratings adjustments of cables by increasing confidence in the prediction of heat dissipation.

Improving Predictions of Heat Dissipation

The second stream of work considered the problem of improving the integrity of future predictions of heat dissipation from buried electrical transmission lines. A combined numerical and experimental testing programme was carried out to investigate the extent to which monitoring the temperature and moisture movement in the backfill could be used to adjust the ratings of cables. More specifically, by monitoring the temperature and moisture in the backfill, the thermal properties of the backfill could be appropriately tuned to match the experimental data and therefore allow for future predictions of higher fidelity.

According to Dr Richard Sandford:

"The focus is foremost on reducing conservatism; the overarching aim is to develop the scientific basis to justify short term ratings adjustments of cables by increasing confidence in the prediction of heat dissipation... A supplementary benefit of our approach concerns early fault detection; if the heat dissipation behaviour begins to deviate considerably from the previously established norm, then this can be taken to be indicative of a developing fault condition"



Future Opportunities

FLEXISApp: On the Road to Commercialisation

Nearly £3m EU funds will back a new Cardiff University project to help scientific researchers, public sector, SMEs and industrial specialists develop fully scalable technology for low carbon energy systems.

FLEXISApp will focus on collaborative research into sustainable energy systems at commercial scale, working with companies based in or moving into Wales.

This project builds on the success of the ongoing five-year FLEXIS research programme, which is supported by £15m of EU funds. FLEXISApp aims to exploit the existing research pipeline to commercialise resilient, affordable and secure energy systems across Wales, with the potential for global application.

The FLEXIS demonstration area in Neath Port Talbot will feature as a hub to test and showcase new innovations and business models for the energy industry. Demonstrating new ideas as commercially viable is crucial to encourage uptake from local and international investors working in the sustainable energy industry.

The project will help to develop secure, affordable and proven low carbon energy solutions at commercial scale, which will contribute towards a net-zero carbon future. The growth of the low-carbon economy will help to tackle poverty and social exclusion. More efficient and cost-effective supply solutions will help alleviate fuel-poverty while new technology can turn individuals and local communities into energy producers who can directly reap the financial benefits of their own generation.

Counsel General, Jeremy Miles, who oversees EU funding in Wales, said: "Wales is now firmly established as a leading scientific centre for research into flexible energy systems. It's vital that we continue to develop creative solutions to global energy efficiency challenges, and help to lead the transition towards a greener, low-carbon economy."

"This project will help progress new products and technologies to market, bringing much closer the availability of sustainable energy systems at a fully functional commercial level. It will promote greener products and improved air quality, as well as driving economic growth and creating new jobs in Wales, ultimately promoting a more equal, more prosperous, and greener Wales."

"By promoting collaboration and encouraging a joined up approach to climate change issues, EU funding continues to drive progress in R&D, science, infrastructure and skills in Wales, and plays a vital part in modernising our economy, increasing productivity and developing employment and business opportunities."

Professor Hywel Thomas, FLEXIS lead Principal Investigator added: "We are delighted to receive further EU support to develop the Demonstration Area covering Port Talbot, which will model energy and CO2 flows, alternative energy generation and distribution processes as well as improving the efficiency of existing business and the potential for new businesses in the area. The award is testament to the commitment of the partners at the heart of this project: Neath Port Talbot Council, Tata Steel and the FLEXIS Research Group."

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This project will help progress new products and technologies to market, bringing much closer the availability of sustainable energy systems at a fully functional commercial level.



Future Opportunities

FLEXIS Traction Project to Benefit from £1.8M Welsh Government Funding

Neath Port Talbot Council has welcomed funding of £1.8m to develop the Cefn Coed Colliery Museum into a 'discovery gateway' for the Welsh Government's Valleys Park Initiative. The money is in addition to £1.5m which has already been committed by the Welsh Government to the specialist treatment and repair of the historic pithead frames at Cefn Coed.

Cefn Coed Colliery Museum is home to one of the FLEXIS traction projects developed in collaboration with Neath Port Talbot County Council. The site has high potential for renewable technologies and offers exciting opportunities for mine water heat recovery. As a relatively isolated rural location, the colliery provides an interesting place to model the benefits of off-grid storage, or experiment with topics of energy-islanding and grid resilience. The visitors centre will provide a platform for community outreach, where members of the public can interact with ideas about energy systems and the future of decarbonisation.

The Leader of Neath Port Talbot Council, Councillor Rob Jones, welcomed the funding saying: "We are delighted to be working in conjunction with the Welsh Government and the Valleys Task Force on this extremely important project which is aimed at boosting local economies and creating new jobs."

Councillor Annette Wingrave, Neath Port Talbot Council's Cabinet Member for Regeneration and Sustainable Development added: "Our vision for this site is to create an iconic attraction which assists in growing the visitor economy in the area by promoting the important heritage and unique landscape of our valleys areas while putting the local community at the forefront of the attraction."

The proposed development will create visitor facilities, a café offering locally sourced produce, retail offerings including local arts, and play provision to attract families. The Cefn Coed Gateway will become a central base to explore the western valleys and other nearby attractions and activities.

Investment in a series of Discovery Gateways in the Valleys is seen as crucial to the Valleys Park initiative, the gateways providing safe and welcoming spaces for local communities and visitors. The Valleys Park will promote tourism, create jobs and maximise social, economic and environmental advantages by developing a highly visible network of gateways set in uplands, woodlands, nature reserves and country parks, across the South Wales Valleys.



FLEXIS Traction Project: Electric Vehicle Charging Strategy

The decarbonisation of transportation as a driver of societal well-being is considered widely important across Welsh and UK policy. Ministers believe that pollution from transportation poses the largest environmental risk to public health in the UK, costing up to £2.7bn in lost productivity each year. The 'Road to Zero,' is setting the landscape to achieve decarbonisation of the transport sector and electric vehicles (EV) are seen as "a key part of our future smart and flexible energy system, supporting the use of storage in homes and potentially providing power back to the grid". The UK government recently identified EVs at the heart of the industrial strategy with challenges including 'Clean Growth: maximising the advantages for UK industry from the global shift to clean growth', and, 'Future of Mobility: becoming a world leader in shaping the future of mobility'.

Because of this pressing need for EV charging infrastructure within Wales, and the significant research and economic opportunity EV presents, we are very excited to announce Professor Cipcigan is bringing her world leading expertise to one of the FLEXIS traction projects. This traction project is centred around defining a strategy for the deployment of EV charging infrastructure within the FLEXIS Demonstration Area.

The project will consist of three main phases, beginning in the first phase by consulting with leading academics and industry partners to produce an effective, impactful and future-proof electric vehicle charging strategy.

The second phase will focus on the physical implementation of a co-ordinated low emission vehicles/electrical charging strategy programme. This plan will be synchronised with the other Authorities within the Swansea Bay City Deal, and other neighbouring Authorities.

The third phase will use information gathered from the implemented smart charging stations to build a detailed dataset of electric vehicle charging behaviours within the borough to fuel research into topics including vehicle-to-grid transfer for flexible energy systems, virtual power plants, and future economic/business models for electric vehicle charging stations.



Upcoming Events

As part of the ESRC 2019 Festival of Social Science, the FLEXIS Social Science team will be holding a public engagement event at the St Paul's Centre in Port Talbot on the evening of 7th November, free and open to the public.

Redesigning Low Carbon Energy Futures in Port Talbot

St Paul's Centre, Port Talbot
Thursday 7th November
7.00pm - 9.00 pm

Summary:

Qualitative data from our Port Talbot workshops in the form of energy scenarios (constructed through expert interviews with FLEXIS engineering colleagues and stakeholders), completed community maps and focus group/personas task data will be presented as the basis for discussion of two energy system scenarios.

Description:

The event will build on social science research done as part of the multidisciplinary FLEXIS project involving Cardiff, Swansea and South Wales universities. FLEXIS is focused on decarbonising energy systems, centred around the Demonstration Area in Neath Port Talbot. We will present results from five community workshops conducted during 2019 in Port Talbot which focused on four scenarios for potential energy futures developed by the FLEXIS social science team.

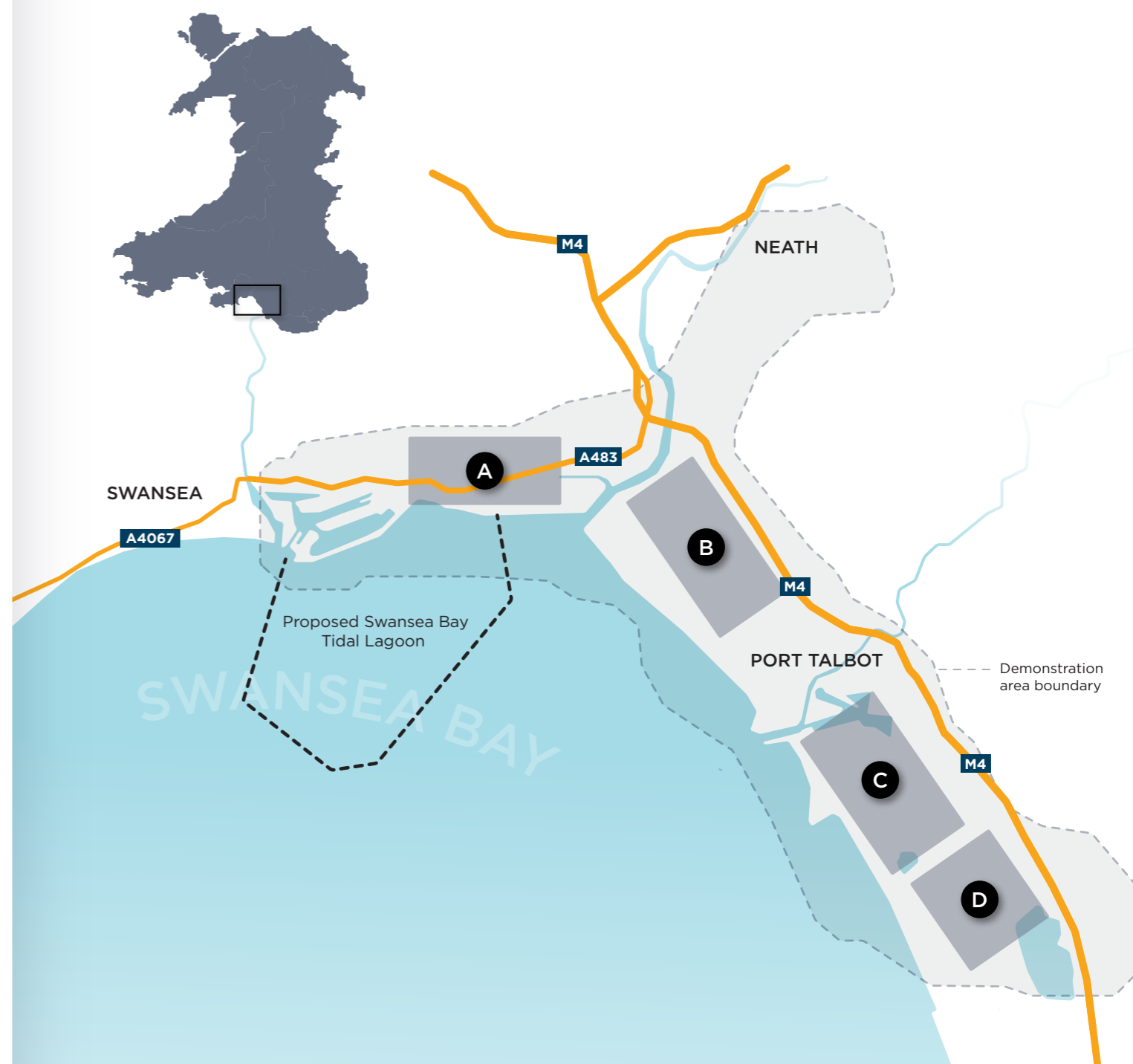
Participants used community maps to identify issues relevant to place, and then evaluated the desirability or otherwise of the scenarios with the aid of focus group discussion and a personas task. They were invited to create imaginary characters and then describe their everyday lives in decarbonised futures.

The event will feature presentation and discussion of the community mapping activity, as well as an opportunity for attendees to explore and evaluate the two scenarios which have previously excited most interest among workshop participants. The focus will be on using discussion of maps and scenarios to link desirability of particular pathways for broad socio-technical change (decarbonisation of power, heat and transport) to the specific social and geographical character of places.

The FLEXIS Social Science team comprises Karen Henwood, Nick Pidgeon, Catherine Cherry, Christopher Groves, Erin Roberts, Fiona Shirani, and Gareth Thomas.

The FLEXIS Demonstration Area

- A** • Swansea University Bay Campus
• Water treatment works
- B** • Hydrogen Centre
• Council offices
• Paper mill
• Energy Park
- C** • Tata Steel Port Talbot
• Cement works
• Water treatment plant with electrical generator
- D** • Gas fired power station
• Schools / Hospital
• Solar technology provider
• SPECIFIC Buildings as Power Stations
- D** • Gas Turbine Research Centre (Cardiff University)
• Biomass power station
• Gas & electricity networks
• Industrial gas & equipment supplier



Our Stakeholders

Enterprise information	UNIVERSITET (DTU)	GZF	Liverpool John Moores University	RWE nPower	UK Power Networks
3M	Department for Business, Energy & Industrial Strategy (UK Government)	HELMHOLTZ ZENTRUM POTSDAM ORSCHUNGSZENTRUM (GFZ)	Local Partnerships LLP	RWE Npower plc	UK Research and Innovation
ABB Group			Loughborough University	Schneider Electric	UKCCS Research Centre
Airbus	Department for Environment, Food & Rural Affairs (UK Government)	Honeywell	Low Carbon Swansea Bay	SER Cymru II	UniLAB
Akzo Nobel		IGEM (Inst of Gas Engineers and Managers)	Materials Processing Institute	Severn Trent Water	Uniper SE
Amazon	Department for Transport (UK Government)	Imperial College	Minister of State for Climate Change and Industry	Shell	UNIVERSIDADE DO PORTO (UPORTO)
AMT Symbex Ltd			Name of enterprise	Siemens	Universita Ca'Forscari Venezia
Bangor University	DNV GL	IMPERIAL COLLEGE OF SCIENCE TECHNOLOGY AND MEDICINE	National Energy Action	Siemens	Universita Delgi Studi Di Roma La Sapienza
BGS Manju	Dwr Cymru Welsh Water	Indian Institute of Technology Roorkee	National Grid	SINTEF	UNIVERSITAT POLITECNICA DE CATALUNYA (UPC)
Bionica SL	EA Technology	Ineris	National Physical Laboratory (NPL)	SOFTER SPA	University of Bath
Biotrend SA	Ecole Centrale de Lyon	INERIS	Natural Environment Research Council (NERC)	SP Energy networks	University of Bristol
BIS Group	Ecole Polytechnique	Initiative for Managing Policymaker-Academic Cooperation and Transfer (IMPACT), Swansea University	Neath Port Talbot County Borough Council	SP Energy Networks	University of Edinburgh
BP	eCORP International, LLC	Innovate UK	New University of Lisbon	SP Energy Networks	University of Leeds
Bridgend County Borough Council	EERA (European Energy Research Alliance)	INSTITUTE OF CHEMICAL PROCESS FUNDAMENTALS OF THE ASCR (ICPF)	Newcastle University	SPECIFIC (Swansea University)	University of Leeds
Calon Energy Baglan Bay Power Station	EFACEC ENERGIA - MAQUINAS E EQUIPAMENTOS ELECTRICOS SA (EFACEC)	INSTITUTE OF CHEMICAL PROCESS FUNDAMENTALS OF THE ASCR (ICPF)	Northern Gas Networks	SPECIFIC Buildings as Power Stations	University of Manchester
Carbon Conversations	Egnida	INSTITUTE OF CHEMICAL PROCESS FUNDAMENTALS OF THE ASCR (ICPF)	Northern Powergrid	SSE plc	University of Manchester
Cardiff County Borough Council	Electronic Systems Design Centre (ESDC), Swansea University	INSTITUTE OF CHEMICAL PROCESS FUNDAMENTALS OF THE ASCR (ICPF)	NRW (IRFAN)	Stainless Metalcraft Ltd	University of Manchester
Carreg Las	ELIA SYSTEM OPERATOR (ELIA)	Institute of Electrical and Electronics Engineers (IEEE)	Ofgem	Supergen Bioenergy	University of Nottingham
CCS (Carbon Capture & Storage Association)	Energy saving trust	Institute of Welsh Affairs	Ofgem (GB Electricity Distribution Network)	Swansea Bay City Deal	University of Oxford
Celsa Steel UK	Energy Saving Trust	Integral	POLSKA GRUPA GORNICZA	Swansea University	University of Reading
Centre for Radiation, Chemicals and Environmental Hazards (CRCE), Public Health England	Energy Systems Catapult	Intellectual Property Office	Port of Milford Haven	Tampere University of Technology	University of Sheffield
CG HOLDINGS BELGIUM NV (CG)	Energy Technologies Institute (ETI)	International Energy Agency (IEA)	Port Talbot Waterfront Enterprise Zone	Tata Group UK	University of Southampton
CIIIA (Centro de Investigacion e Innovacion en Ingenieria Aeronautica), UANL (Mexico)	Enzen global solutions private Ltd	ITM Power	Power Networks Research Academy (PNRA)	Tata steel	University of Strathclyde
Climate Change, Environment and Rural Affairs Committee, National Assembly for Wales	Future Generations Commissioner for Wales	Jaguar Land Rover	Queen's University Belfast	Tata Steel UK	University of Verona
Compound Semiconductor Centre	General Electric (GE)	KATHOLIEKE UNIVERSITEIT LEUVEN (KU Leuven)	REHAU	Technical University of Denmark	University of Warwick
Consiglio Nazionale Delle Ricerche	Gexcon AS	Katowiki Holding Weglowy SA	Renishaw	Tecnalina	Virgin Atlantic
CONTROL INTEL-LIGENT DE L'ENERGIA SCCL (CINERGIA)	GIG	Keele University	Rhondda Cynon Taf County Borough Council	The Behavioural Insights Team	Wales and West Utilities
Council on Large Electric Systems (CIGRE)	Global Challenges Research Fund (GCRF)	Kensa (manju)	Ricardo plc	The Committee on Climate change	Wales and West Utilities
Cranfield University	GLOWNY INSTYTUT GORNICTWA (GIG)	Khalifa University	RICE	Tianjin University	Wales Council for Voluntary Action (WCVA)
Cyfoeth Naturiol Cymru / Natural Resources Wales	Grid Solutions	Kingsmill Industries (UK) Ltd	Riversimple	Tidal Lagoon Power	WEFO (EU funds in Wales)
DANMARKS TEKNISKE	GW4 Alliance (Bath, Bristol, Cardiff & Exeter Universities)	KU Leuven	Riversimple movement	TNEI	Welsh Government
		Lancaster University	Royal Society	Torfaen County Borough Council	Western Power distribution
		Leeds City Council	RRI Tools	Toshiba	Western Power distribution
		Life Sciences Hub Wales		Toshiba	Western Power Distribution
				UCG Engineering LDT	Westminster Energy, Environment and Transport Forum
				UCL (University College London)	WRAP Cymru
				UK Energy research centre	ZF
				UK Energy Research Centre (UKERC)	

