



RETS
Renewable Energies Transfer System



Study Visit report

“Renewable Energy, Sustainable Development and Climate Change; policy, innovation and implementation”

Date(s):	July 14th and July 15th 2010
Location(s):	West Wales <ul style="list-style-type: none">• Pembroke Dock (Pembrokeshire)– Quiet Revolution Wind Turbines• Pembroke Dock (Pembrokeshire) – Pembrokeshire Technium• St. David’s (Pembrokeshire) – Oriel y Parc, National Park Visitor Centre• Cardigan (Ceredigion) – Small World Theatre
Organised by:	West Wales ECO Centre



RETS
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Index of contents

1. INTRODUCTION	3
1.1 CONTEXT	3
1.2. OBJECTIVES OF THE STUDY VISIT	3
2. PARTICIPATING PROJECT PARTNERS	4
3. DAY 1: 14TH JULY 2010, PEMBROKE DOCK, PEMBROKESHIRE	5
3.1. PROGRAMME	5
3.2. CONTENTS	5
4. DAY 2: 15TH JULY 2010 - ST. DAVID'S IN PEMBROKESHIRE, AND CARDIGAN IN CEREDIGION	11
4.1. PROGRAMME	11
4.2. CONTENTS	12
5. EVALUATION OF VISITS	22
6. CONCLUSION	26
7. ANNEXES	27



1. Introduction

1.1 Context

The main objective of RETS is to improve the knowledge and competencies of local and regional policymakers (for example, decision makers and civil servants) in renewable energies, so as to facilitate the deployment of coherent and value added strategic renewable energies policies. This will be realised through the creation of a European community for local authorities on renewable energies, comprised of two key elements: physical tools for meeting and exchanging viewpoints and a virtual platform for collaborative exchange and transfer of good practice through an innovative online approach.

The RETS partnership counts 12 partners from 9 EU Member States: France, Germany, Hungary, Italy, Portugal, UK, the Netherlands, Romania, and Slovenia. It has been developed with the idea of obtaining partners with different types and levels of experiences in the deployment of renewable energies and sustainable management. The panel contains local authorities, universities, energy agencies and associations, more or less advanced in their policy and experiences.

1.2. Objectives of the study visit

The overall aim of the study visits is to collect and share good practice and lessons learned in implementation of Renewable Energy Systems policies and projects.

This Study Visit was designed to introduce new and innovative concepts to RETS partners.

For example; rather than visit a wind farm, which are quite common across Europe; RETS partners visited the only UK manufacturer of turbines designed to operate in an urban environment. Introducing this innovative technology and hearing from the factory manager, it is hoped that some of the municipalities consider the use of these turbines at municipal buildings and sites.

Although not universally applicable, marine renewable energy is a growth area in West Wales. It was considered appropriate for RETS partners to hear about two main developments off the Pembrokeshire Coast, and specifically, the challenges in making progress.

It was also deemed appropriate to present a seminar on some of the non-governmental work being undertaken that looks at adjusting to a new future where the country is not reliant on fossil fuels. Zero Carbon Britain is a radical report produced by CAT.

In addition to hearing about innovations, it was a crucial part of this study visit that all of the venues were good examples of low impact developments. Two of the locations are certified the highest level in the UK, BREEAM Excellent, and the third is a sustainably and as naturally built as possible for its purpose.



2. Participating project partners

- ADEC (FR), Catherine Ledig, Alision Garnier-Rivers, Emmanuel Jacquet
- Serta Municipality (PT), José Farinha Nunes, Paulo Farinha Luís, Ana Paula Geraledes, António José Simoes
- Pinhel Municipality (PT), António Luís Monteiro Ruas, Sandra Manuela Fernandes Pacheco
- Staffordshire University (UK), Jon Fairburn
- West Wales ECO Centre (UK), Jake Hollyfield
- IHK Zetis GmbH (DE), Michael Lill, Markus Bauer
- Municipality Sittard-Geelen (NL), Han Hoogma, Rogier Dieteren, Roswitha Muijres
- ENERGAP Energy Agency (SI), Branka Mirt, Marko Rojs
- ICEMENERG (RO), Maria Rugina
- Provincia Varese (IT), Alberto Boraso, Cesare Bottelli, Susanna Capogna
- Municipality Vecsés (HU), István Loránd Szakáli, Péter Práczki





3. Day 1: 14th July 2010, Pembroke Dock, Pembrokeshire

3.1. Programme

Visit to Quiet Revolution Manufacturing

UK factory for the production of VERTICAL AXIS Wind Turbines for use in an urban environment.

Visit to Pembrokeshire Technium

Seminar on policy and implementation of renewable energy strategies within the statutory authorities. In Pembrokeshire there are two planning authorities, the County Council and the National Park.

Reception in County Hall

with the Chairman and Vice Chairman of Pembrokeshire County Council

3.2. Contents

Quiet Revolution www.quietrevolution.co.uk

Traditional wind turbines have horizontal axis blades. They work at their most efficient in certain conditions only. This is primarily in open spaces with no obstructions or buildings that will cause buffeting and an inconsistency in wind speed and direction.

The inventors of the Quiet Revolution turbine have designed a Vertical Axis Turbine that is not adversely affected by rapidly varying wind direction. The Helix design of the blades means that at any one time the turbine is being turned around by the wind. This allows it be positioned in a built up area, including on top of buildings. There are a number of examples on the QR website:

<http://www.quietrevolution.co.uk/projects.htm>

RETS partners received a tour of the factory, with every part of the manufacturing process explained by the factory manager Vaughan Griffiths. He explained the rationale behind certain decisions and the progress of improvements and efficiencies in the design of the turbine.

Development the turbine continues with emphasis on light weight carbon fibre/plastic materials and 'off the shelf' components to limit the costs.

They are controlled by an on board computer that monitors the wind speed and the turbine. It anticipates the wind speed and turns the turbine on, by releasing the brake. It spins it up to match the wind speed.

The default state of the turbine is 'braked' with power need to release the brake. A significant proportion of the electricity generated by the turbine is required for the on-board electronics and computer monitoring equipment.

The turbines are 'soak tested' at the Pembroke Dock site with computerised monitoring equipment measuring every aspect of the stress and strain on the turbine.

Quiet Revolution has a number of international distributors, but are looking for more. The Turbine costs about £45,000.



Figure 1 Quiet Revolution Factory



Figure 2 Vaughan Griffiths with turbine blades



Figure 3 Carbon Fibre base unit for blades



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Figure 4 fitting the spindle together



Figure 5 Soak testing the completed turbine



European Union
European Regional Development Fund





Day 1 continued: Pembrokeshire Technium

The Pembrokeshire Energy Technium is one of series of buildings in Wales dedicated to the incubation and development of new business. Each Technium has a speciality and the Pembrokeshire one is an Energy Technium.

It was developed as a response to deteriorating economic circumstances in the county with high unemployment, low skill levels and low average wages. Pembrokeshire County Council wanted to

- Diversify the economy
- Create new jobs
- Skill up the workforce
- Create an emphasis on Quality Jobs (Knowledge Economy)
- Increase average wage levels

Its objective – To get Pembrokeshire’s unemployment down, and average wage up, to the Welsh average.

After a number of considerations, and research into Science and Technology parks elsewhere, the Technium model was chosen because of the emphasis on a single sector. In this case Energy.

It was designed and built to BREEAM Excellent standards – www.breeam.org and has the following renewable energy and energy efficiency measures installed:

- Biomass Boiler
- Rainwater harvesting to flush toilets
- Cooling lake linked to fresh air ventilation
- Borehole
- Reactive lighting

It currently has:

- 17 “Incubation” offices
- 2 Board Rooms and 3 Meeting Rooms
- Multi-purpose Atrium
- Power Electronics Laboratory
- Climate Change Research Centre (IBM)
- CATIA Suite
- 13 Growth units
- Sites for further developments
- Comprehensive Business Support Package

The Technium hosts Swansea University’s Climate Change Research Centre, housing an IBM supercomputer and visualisation suite. It has five tenant companies and it also hosts regular meetings of:

- Energy Workforce Skills Group
- Pembrokeshire Marine Energy Group
- Various Private Sector Energy Companies



Figure 6 rear of Technium



Figure 7 side and front of Technium



Figure 8 main entrance



Figure 9 Atrium



Policy and Strategy Implementation – two presentations from the two statutory authorities in Pembrokeshire

Presentations by Pete Sedgwick - Local Development Plans Officer
Steve Keating – Sustainability and Energy Manager

RETS partners heard first from Pete Sedgwick from the [Pembrokeshire Coast National Park](#). It is the UK's only coastal national park. He set the context:

- UK Climate change Act 2008 requires a cut in emissions to 80% of 1990 levels by 2050
- Sustainable Development Commission to advise Government how to do it.
- Wales Spatial Plan – To see Pembrokeshire as an energy hub and low carbon region by 2050

He explained the 'layers' of statutory (public) authority and what they are responsible for:

- UK government – power stations and wind farms over 50mW.
- Welsh Assembly Government – Wales Spatial Plan and policy advice to local planning authorities
- Local Planning Authorities – Most development other than domestic renewable energy

The Park has carried out a review of the potential for renewable energy within the Park. It recognises that it has a responsibility to support sustainable energy developments, but can not go against the objects of the Park to protect and enhance the landscape. It has produced a [document that highlights](#) all the areas and types of renewable energy technology that can be used.

He also summarised the challenges to this process, summarised as:

- Protected landscape
- Public scepticism
- Cost of technology
- Competing priorities

He concluded by summing up the opportunities that now exist:

- FITS, RHI and Code for Sustainable Homes set to change the market
- Welsh government devolved powers on building regulations
- New Coalition Government to roll out smart grid and meters
- Anaerobic digestion of waste pushed by UK and Welsh Government
- Green Investment Bank to be set up
- Marine energy to be encouraged

Steve Keating of [Pembrokeshire County Council](#) led a presentation on what the council had achieved in terms of installing renewable energy technologies into public buildings.

His presentation showed how the council had reduced its Carbon emissions by 13% since 2004. It highlighted the measures that led to one of its awards from the UK Carbon Trust.

He listed range of measures that have recently gone into new buildings. These include:

- Low energy lighting/LED's
- Lighting daylight/motion sensors
- Biomass wood pellet heating





- Solar hot water panels
- Photovoltaic panels
- Wind turbines
- Natural ventilation
- Rainwater harvesting
- Pipe/valve insulation
- Push/spray/infrared control taps
- Water flow restriction
- Urinal flush controls
- Water Boreholes
- Superior levels of insulation
- Sustainable materials e.g. hemp
- Combined Heating and Power
- Services Controls / BMS
- Fully condensing boilers
- Lake cooling

From January 2003 to March 2009 these ideas were incorporated into 91 schemes in schools and public buildings

4. Day 2: 15th July 2010 - St. David's in Pembrokeshire, and Cardigan in Ceredigion

4.1. Programme

Marine Energy off the coast of Pembrokeshire – Oriell y Parc Landscape Gallery St. David's

A tour of the National Park's flagship building, a BREEAM Excellent gallery, visitor centre and conference centre.

Two presentations from two different companies developing different marine renewable energy projects.

- Tidal Energy
- Wave Energy

Zero Carbon Britain 2030 – Small World Theatre, Cardigan

Welcome and tour of the Small World Theatre a radical new sustainable and green building.

A seminar with Peter Harper of the Centre for Alternative Technology on their groundbreaking report on how the UK can meet the challenge of a low carbon future.



4.2. Contents

Oriel y Parc – Landscape Gallery St. David’s Pembrokeshire

Oriel y Parc is an amazing and innovative building which sits discreetly in the landscape. Beneath its elegant façade, state of the art green technologies work hard to provide a comfortable and sustainable environment. This building is a living, breathing entity which contributes to the landscape in a positive way both aesthetically and functionally.



The new development incorporates the existing National Park Visitor Centre, built in 1999, and provides a much larger complex containing two new landscape galleries. A tremendous amount of groundwork was required to prepare the new site, with the positioning of the underground galleries and the complex stone feature work requiring particularly close attention. During construction, every effort was made to reduce the amount of waste created on site. The earth removed from the site to make room for the galleries was, for example, stored at a nearby farm and used later to cover the gallery roof. The £3 million crescent-shaped building was designed by Smith Roberts Associates and is built of local building materials where possible. It has a curved roof supported by dramatic columns at the front of the building and a large spine wall to the rear. If you were to look from above at the surrounding walls, you would see that they have been designed to echo the gentle ripples made by a pebble as it is dropped into a pond. The biggest challenge facing the design team was how to incorporate green technologies into what was expected to be a very energy hungry building. As a result both the design of the building and the energy supply have been engineered to the highest standards and include features which will conserve maximum energy use and loss.

One of the principal materials in this structure is wood. From the wooden supporting timbers to the gallery steps, all of this wood has been sourced with sustainability in mind.

The floor, stairs and outside seats are all made of Welsh Oak, much of which was sourced through the Coed Cymru initiative, a partnership dedicated to the sustainable management of woodlands. This ‘Green Oak’ is untreated and relies on the large overhanging eaves to keep it dry. As the wood matures, it will contract and harden resulting in a stronger structure. The structural beams that support the zinc roof are made from a substance known as glulam, a material composed of sections of softwood glued together, making it both incredibly strong and very sustainable.



The columns supporting Oriel y Parc's roof and the blocks which cap the surrounding walls, are all made from stone dust. It is made by grinding waste stone into tiny pieces which are then mixed with cement and moulded into shaped locks for building. This means that whilst it is as tough as stone, it is easier and cheaper to mould into shape. The stones used in the construction of the tower and the new building extension have also been sourced locally from reclaimed derelict buildings.

Wool is a natural fibre derived from a renewable resource and is much more energy efficient to manufacture as insulation than synthetic materials. Massive amounts of insulation have been built into the foundations and walls at Oriel y Parc to conserve energy. Wool also helps to regulate the moisture levels in the building, helping to keep it cool in the summer and warm in the winter. This warmth may not be noticeable, but it prevents condensation in the building cavities and in warm conditions, releases moisture which causes a cooling effect.

Renewable Energy:

Ground Source Heat Pump

The Ground source heat pump consists of 12 100m lengths of pipe buried in bore holes deep beneath the ground. A few metres beneath the surface of the ground, the temperature is uniformly cool (around 12°C) throughout the year. By repeatedly pumping a mixture of water and antifreeze through the pipes beneath the ground, heat is absorbed, compressed and transferred to the building via underfloor heating.

Photovoltaic cells

Photovoltaic cells convert daylight into electricity. At Oriel y Parc there are 3 banks of photovoltaic cells mounted on the roof of the gallery. Each module consists of a number of cells made from a semi-conducting material, usually silicon. When light shines on the cells it creates an electric field across the layers causing electricity to flow. The more intense the light, the greater the flow of electricity. Photovoltaics only require daylight, and not sunlight, to function, which means that they still generate some power even on a cloudy day.



Solar Thermal

As well as the photovoltaics, solar thermal panels mounted on the roof generate hot water by harnessing the power of the sun. Radiation from the sun heats water in a panel on the roof which in turn supplies the heat as hot water.



MARINE RENEWABLE ENERGY

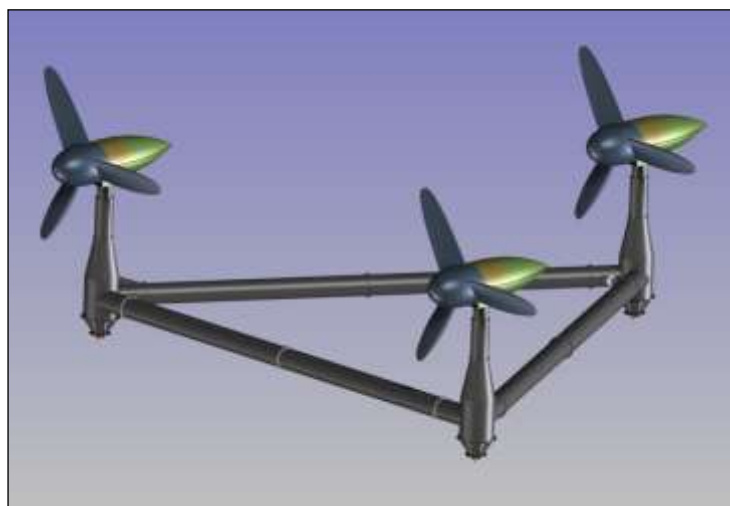
Tidal Energy Ltd:

In the first presentation, RETS partners heard about DeltaStream; a proposal to demonstrate a tidal stream energy converter in Wales By Richard Ayre, Founder & Director, Tidal Energy Ltd.



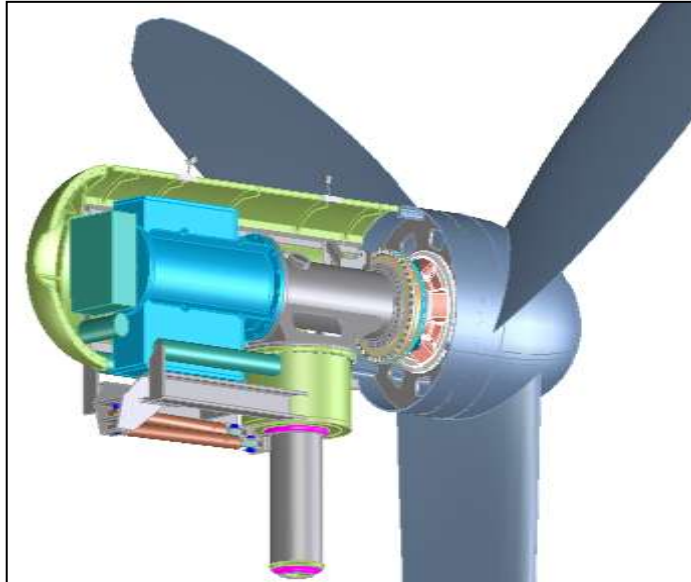
Tidal Energy Ltd was set up by Richard Ayre, a local Marine Engineer. Welsh Assembly Government sponsored trials Cleddau Estuary, 2002. The results of these trials were fed into subsequent designs. This was followed by investment by Eco2 and Carbon Connections Ltd (University of East Anglia) in January 2008.

Current Design Development of DeltaStream Device





Each unit has an overall rating of 1.2 mW, with each turbine rated at 400W, and there being 3 turbines per unit. The turbines use a Nacelle Design.



Each DeltaStream of a nominal maximum 1.2MW at 6 knots produces an average 5.5 million kWh to 7.7 million kWh over 20 years when there is a Tidal Factor between 0,42 (Orkney) and 0,3 (General UK good coastal position).

The test site is in Ramsey Sound which lies of the coast of St. David’s on the northern part of the Pembrokeshire peninsula. The developers are in the process of establishing a 12 month prototype demonstration





The Prototype Test Programme includes all of the following steps, some of which have been completed:

- Technical design (Complete)
- Site Surveys (Complete)
- Environmental surveys (continuous)
- Public exhibitions (Mar and Nov 2009)
- Crown Estate Lease and Onshore Works Planning Approval (September 2009)
- Consent applications (October 2009)
 - Consultation complete
- Determination July 2010?
- Installation August 2011
- Removal September 2012

For more information:

http://www.tidalenergy ltd.com/deltastream_spec_sheet.pdf

<http://www.carbon-connections.org/downloads/DeltaStream%20case%20study.pdf>

Wave Dragon

Iain Russell presented to RETS partners about an innovative wave power technology.



The Wave Dragon is the result of:

- A Danish-based company developing a technology to convert wave energy into electricity
- A Concept over 20 years old
- One of the world's market leaders
- A Prototype machine in Danish waters, operational May 2003 to September 2007 (over 22,000 grid connected Hours of operation)
- About to develop and deploy first full scale unit in Wales (Constructing at Pembroke Dock)

Why wave power?

- UK has a large wave resource
- Resource is related to water depth, and the sea off the Pembrokeshire coast is deep.



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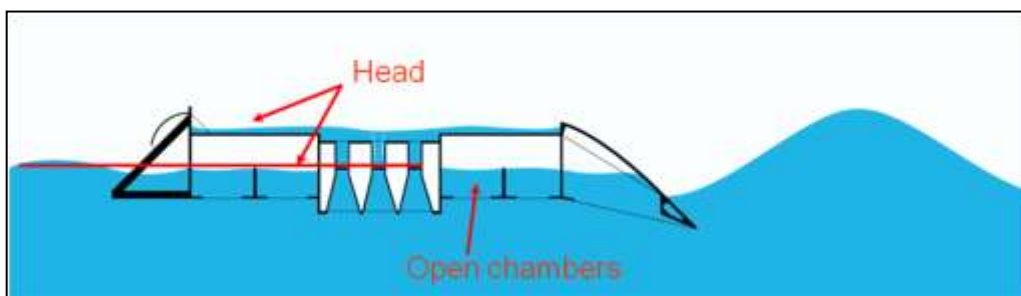


In the UK, Wave Dragon is implementing a Demonstration Device:

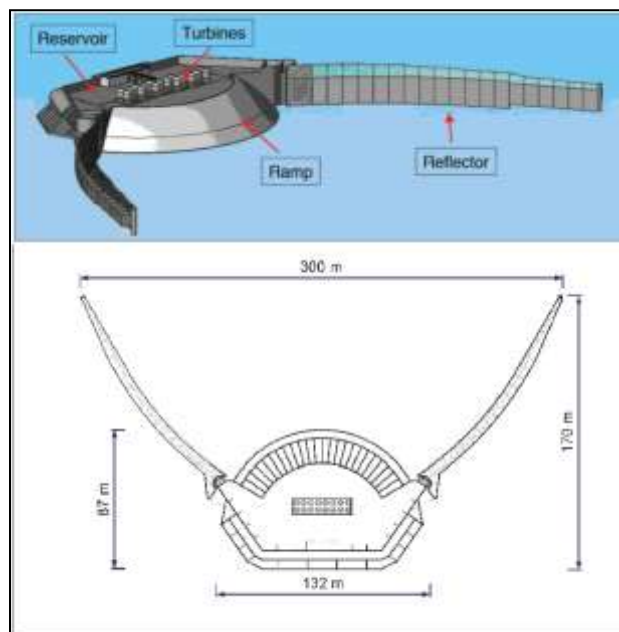
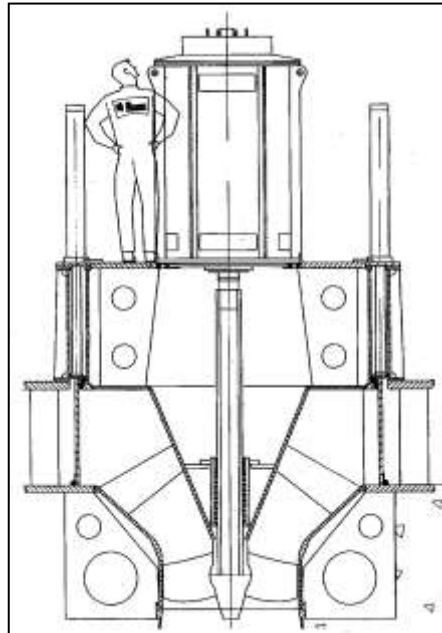
- The device can generate up to 7MW - export capacity is grid limited
- The proposed site is off Pembrokeshire Coast
- It is being funded by the Welsh Assembly Government under EU Objective 1
- The device will be in-situ for max 3-5 years only (could be one season)
- After that, device towed to deeper water site, either off Wales or elsewhere
- And the demonstrator site is decommissioned

How does it work?

Out in open water, waves crash over the ramp and pass down a turbine.



The turbine then works in the normal way. Electricity is generated on board and transmitted to shore via a sea bed cable.



Power Plant – if deployed in bigger numbers:

- 11 units in a 6.25 km line resulting in a power plant, size: 77 MW
- Electricity for 60,000 homes from:
- A size of 5.5 km², which is 75% of the space needed for offshore wind farms at the same power
- At deep water (more than 25 meter) almost without visual impact

As with other marine energy developments, the biggest barrier between development and implementation is obtaining the consents. This is subject to a number of impact assessments and



consultations, all of which invariably take longer than expected.

Small World Theatre: www.smallworld.org



The final venue for the study visit was the innovative Small World Theatre in Cardigan. This building has been built using as much local and sustainable material as possible, given its purpose. It is primarily used as a theatre workshop for the construction of very large props and models. But also acts as a venue and conference centre, dance workshop and rehearsal room.





It was an appropriate location to hear from Peter Harper of the Centre for Alternative Technology www.cat.org.uk about their pioneering report on decarbonising Britain by 2030. The whole report can be downloaded at www.zerocarbonbritain.com.



In summary, the research and the report describe the energy situation in the UK over the next 20 years and what is required in order to be able to live within our limits and what effect this will have.

The background to the project can be looked at in two ways –

Background Logic 1:

- The “Brundtland” definition of sustainability (1989) is widely accepted
 - “Development that meets the needs of the present without compromising the needs of the future”
- The UNFCCC was signed by most nations in 1992
 - “Prevention of dangerous climate change”
- ZCB2030 is a straightforward logical response to the implications of these principles, using the knowledge available in 2010.

Background Logic 2:

- There is a logical and ethical requirement to avoid climatic “tipping points”



- But we don't know if or when
- Need a series of emergency "Plan B's"
- Low or zero-carbon destinations and back-cast routes
- Need for social and political dialogues NOW
- International coordination
- Vigorous proactive research programmes

The seminar illustrated the main points of the report in an engaging way with illustrations and discussions. As can be seen from the presentation slides.

Some of the main features of the report are:

- High 'effective' carbon prices (between £200-£1000/tonne)
- 'Incentivisation' for many things now uneconomic
- Balanced combination of 'power down', 'power up' and net-negative processes
- No nuclear power or Carbon Capture and Storage
 - The sums add up OK without them
 - But they could be included in the model

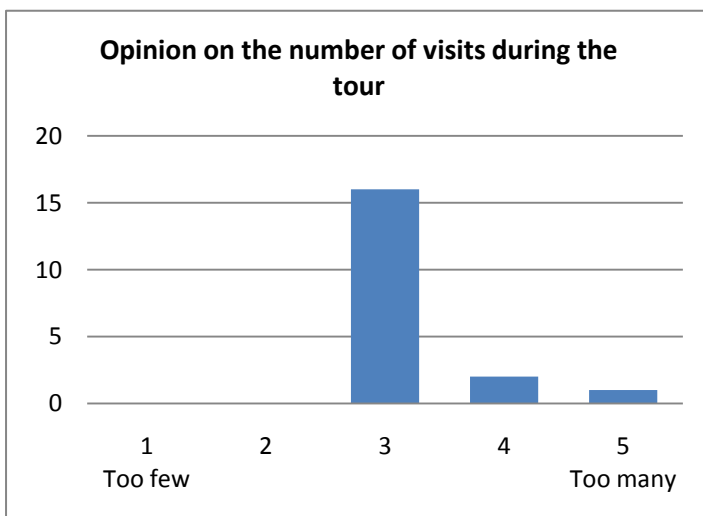
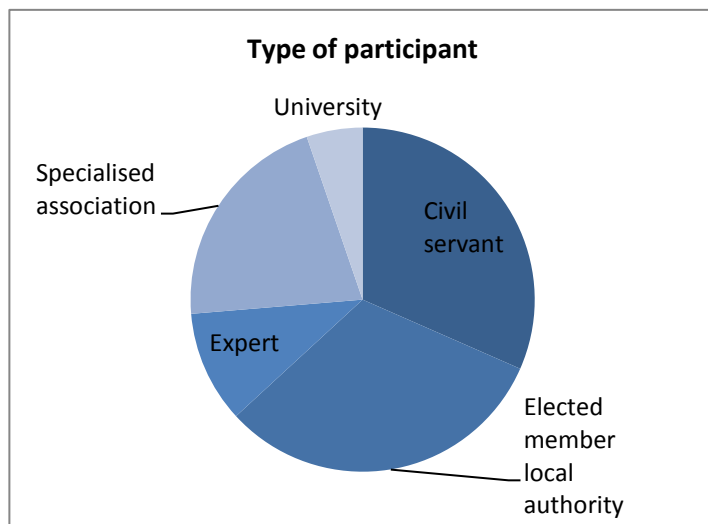
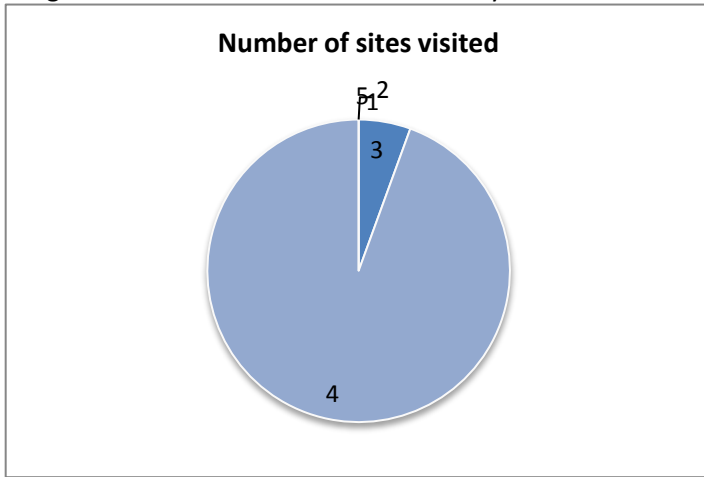
The session concluded with some of the benefits we could expect:

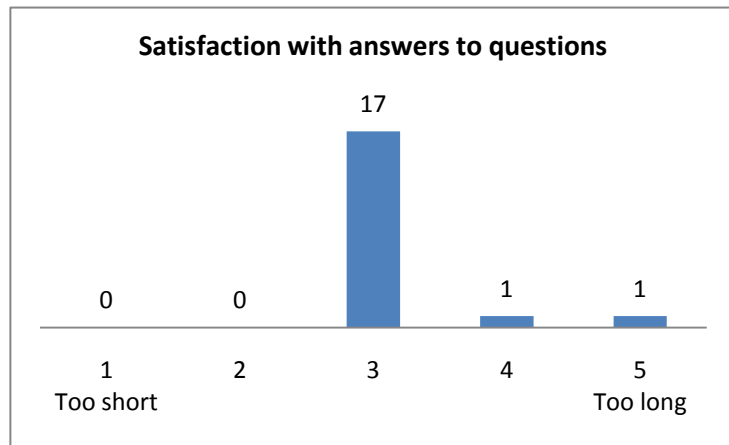
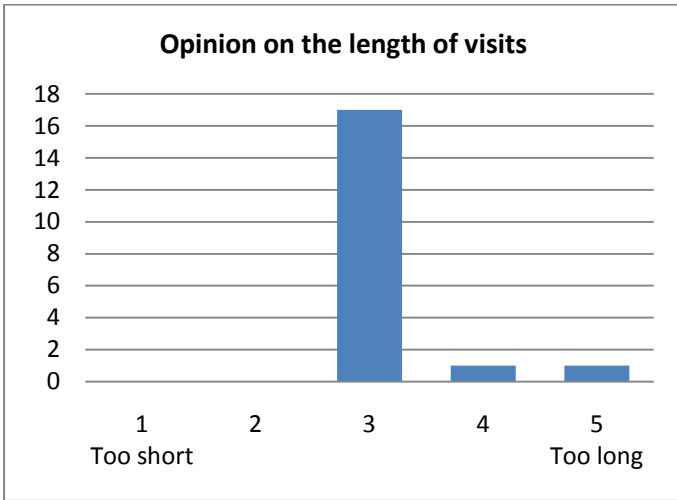
- Greater energy security
- Positive balance of payments
- High employment
- Greater food security
- Improved diet
- Possible increase in biodiversity

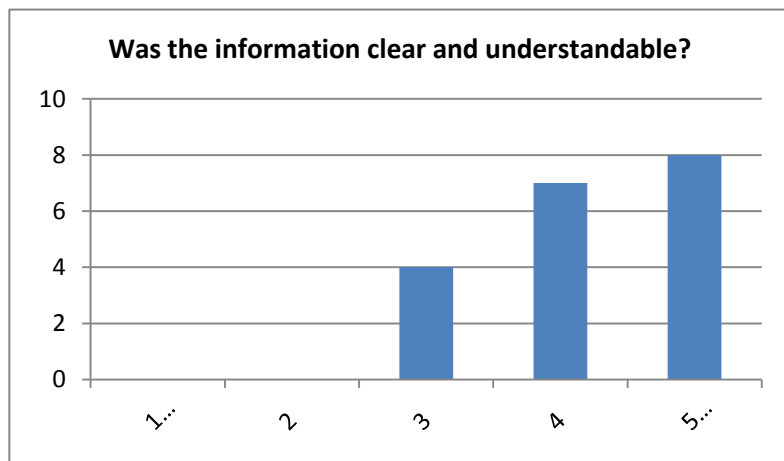
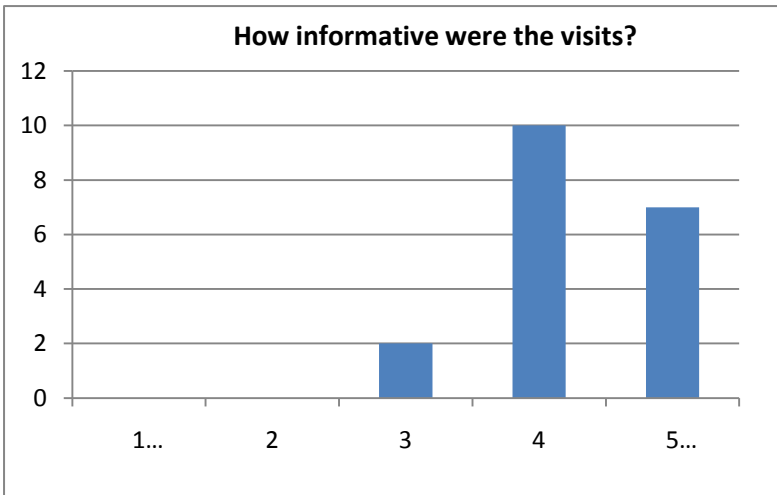
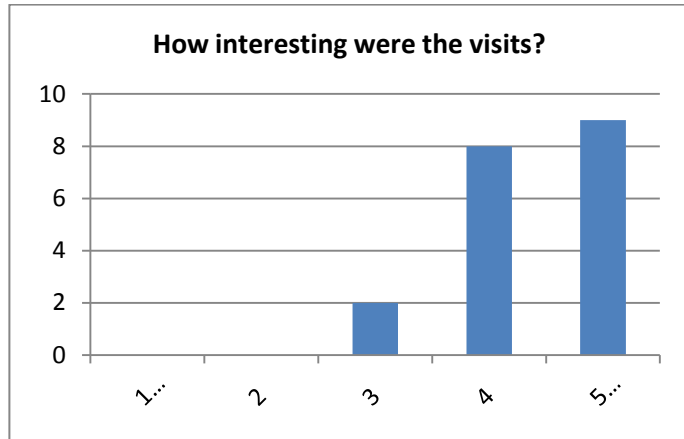


5. Evaluation of visits

Based on the standard questions for RETS partners' feed back, the following graphs illustrate how delegates felt about the West Wales Study Visit





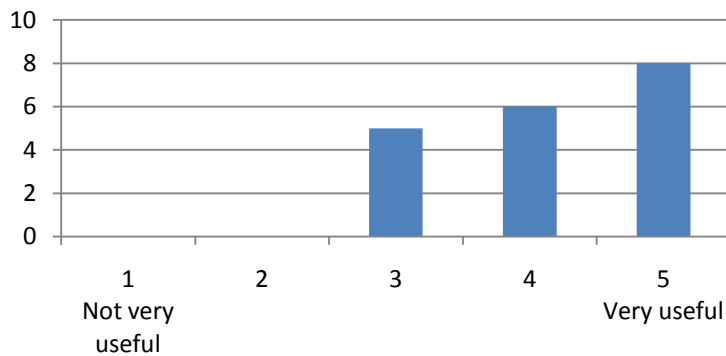




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How useful were the visits?



Final comments from evaluation forms:

13. Can any of the good practices be applied to your region, and if yes, which ones?

- ZERO CARBON BRITAIN
- WE HAVE TO MAKE OUR OWN ZERO CARBON STRATEGY WHICH WILL BE COMPATIBLE WITH ZCB2030
- ECO BUILDINGS
- QUIET REVOLUTION TURBINES
- WIND TURBINES
- WIND TURBINES
- WIND TURBINES
- WINDMILL TECHNOLOGY
- ECO BUILDINGS
- WIND TURBINES
- QUIET REVOLUTION TURBINES
- QUIET REVOLUTION TURBINES
- QUIET REVOLUTION TURBINES
- NOT DIRECTLY BUT WE CAN TRANSFER METHODS AND ELEMENTS OF PHILOSOPHY
- CARBON REDUCTION MEASURES
- QUIET REVOLUTION TURBINES
- QUIET REVOLUTION TURBINES
- TECHNIUM

14. How could the study visits be improved?

- THEY ARE OK
- HAVE MORE TIME BETWEEN PRESENTATIONS
- IT SHOULD BE MORE PRACTICAL
- IT SHOULD BE MORE PRACTICAL
- IT SHOULD BE MORE PRACTICAL



- TO HAVE A DOCUMENT PRESENTING THE GENERAL CONTEXT TO READ BEFORE

6. Conclusion

Overall the visit was a great success. All delegates had plenty of opportunity to participate. Some of the feedback from the Strasbourg visit indicated that RETS partners were less concerned with long lunches than they were with spending time at venues and looking at technologies. Or at least spending time with speakers and practitioners.

As with the Strasbourg visit there is some desire to visit sites and technologies in situ and working, rather than hearing about developments and applications without actually seeing anything. E.g. the marine energy talks could not be followed up with site visits.

But overall this study visit showed off the best of the innovation in energy efficient buildings, renewable energy technologies and thinking that is taking place in West Wales.



7. Annexes

Press releases were sent to:

- Western Telegraph
- Western Mail
- BBC Wales
- County Echo
- Tivyside Advertiser

The following appeared in the Western Telegraph.

County to show off renewable energy

NEWPORT'S ECO Centre is hosting an international meeting and study tour of west Wales as part of its 30th anniversary celebrations.

Pembrokeshire will share its renewable energy and sustainable development experiences with delegates from across Europe, in a INTERREG IV C funded project.

RETS - Renewable Energy Transfer System - is a collaboration between 12 organisations from nine countries across Europe, including the West Wales ECO Centre.

A study tour between July 13th and 15th aims to share local experiences in renewables, while showcasing Pembrokeshire in a European context.

Jake Hollyfield, director and project manager at the ECO Centre, said: "This is a very exciting prospect for us.

"It gives us great pleasure to work with our local partners to show off the best examples of the county's approach to renewable energy systems."

The visit will include tours to the Quiet Revolution wind turbine factory in Pembroke Dock and Pembrokeshire Technium; a seminar on wave and tidal energy at the Oriell-y-Park, St Davids, and a seminar at the Small World Theatre with senior staff from the Centre for Alternative Technology.

All venues have been selected as flagship examples of low energy buildings using sustainable technologies for heat and light and power. The study tour will then be published on the RETS web portal.