SEREN UPDATE – 27th Sept 2012

GSHPA CONFERENCE

Dr R.W. Francis

Geoenvironmental Research Centre, Cardiff School of Engineering, Cardiff University

ERDF
Llywodraeth Cymru
Welsh Government
Ewrop & Chymru: Buddsoddi yn eich dyfodol
Cronfa Datblygu Rhanbarthol Ewrop
Europe & Wales: Investing in your future
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Sustainable Earth Energy

GRC
Geoenvironmental Research Centre
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Cost
£8.35m

Start Date
Mar 2010

End Date
Jun 2015

THE SEREN PROJECT

- WP1 Delivery
- WP2 Ground Source Heat
- WP3 Underground Coal Gasification
- WP4 Carbon Storage & Sequestration
- WP5 Geoinformatics Toolkit

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Project Delivery

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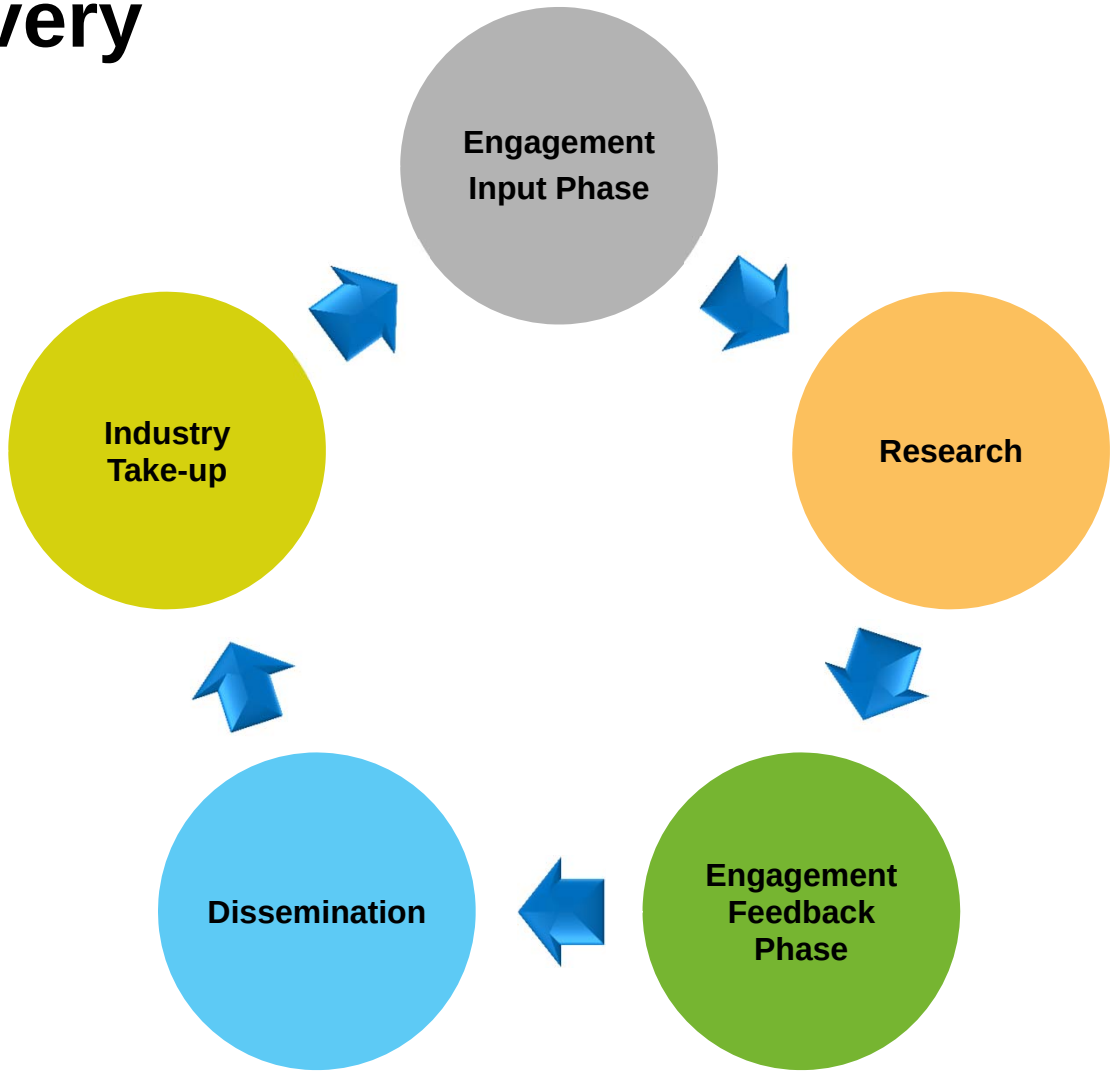


- Software
- Know How
- Products
- Processes

- Computational
- Experimental
- Demonstration

- Evening Lectures
- Day Seminars
- Conferences
- Web Site
- Case Studies

- Mail Shots
- Email shots
- Advertisements
- Phone calls

WORK PACKAGE WP1 – DELIVERY

Engagement

- **Companies**

- **Stakeholders**
  - *Carbon Trust*
  - *Environment Agency*
  - *Coal Authority*
  - *GSHP.*

- **Local authorities and Business Clubs**

WORK PACKAGE WP1 – DELIVERY

Transnational

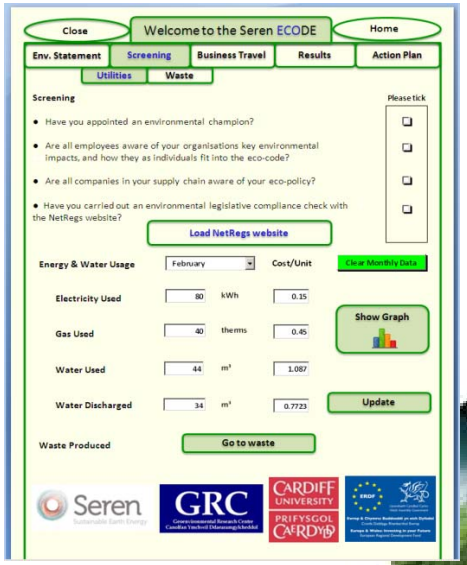
- **Global community: UNIDO, UNESCO, EIT KIC InnoEnergy and Climate Change KIC**
- Developing Research Centres in Ghana and Nigeria – UNIDO backed.
- Joint Projects with Central Mining Institute, Katowice, Poland
- Collaboration with IIT Roorkee, India

SEREN PROJECT TARGETS

Output	Target
Enterprises Assisted	80
Collaborative Projects	25
Companies Created	8
Jobs created	153
Enterprises Adopting or improving equality strategies and monitoring systems	30
Enterprises Adopting and implementing Environmental Action Plans	30
New or improved products, processes or Serviced launched	25
Investment Induced (£million)	10

WORK PACKAGE WP1 – DELIVERY

Cross Cutting Themes



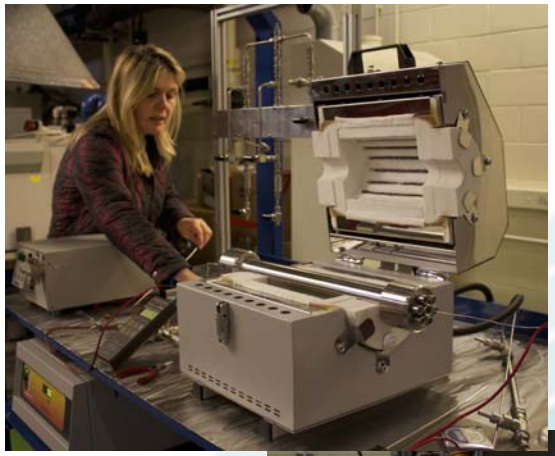
EcoCode Software

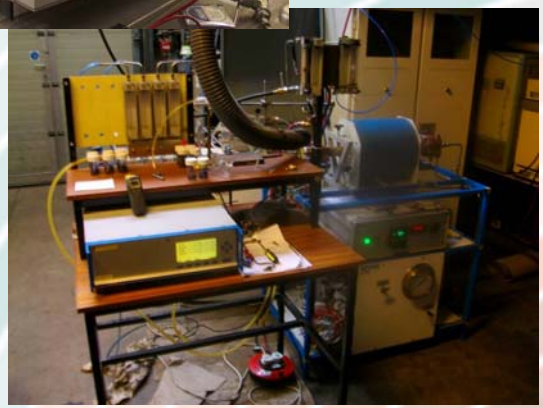
E&D Software

WORK PACKAGE WP3 – UCG

High Pressure Rig

- High pressure high temperature rig
- Can produce data
  - product *gas composition,*
  - *product gas ultimate yield, etc.*
- Environmental issues being addressed
- Tools being developed include:
  - *Coal resource assessment tool*
  - .Cgemical model
  - Energy model

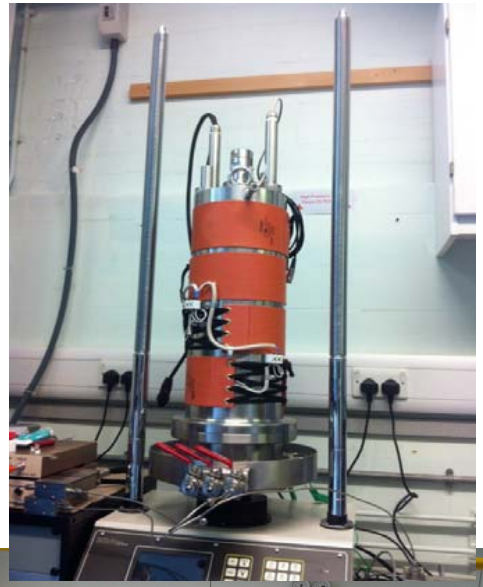




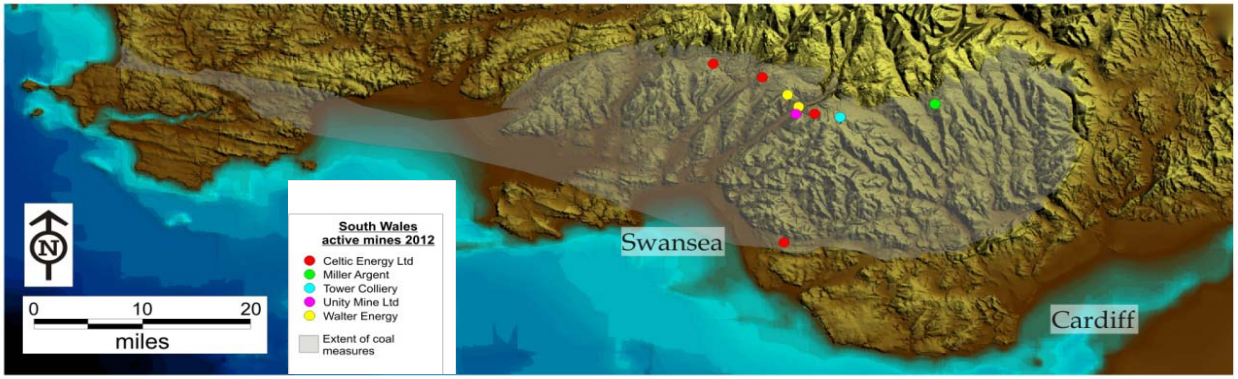
WORK PACKAGE WP4 – CSS

Experimental Work

- **Apparatus development.**
  - Adsorption/desorption unit.
  - Permeability/gas flooding unit.



- **Coal sampling.**



- **Resource Assessment.**

- **Site Selection.**

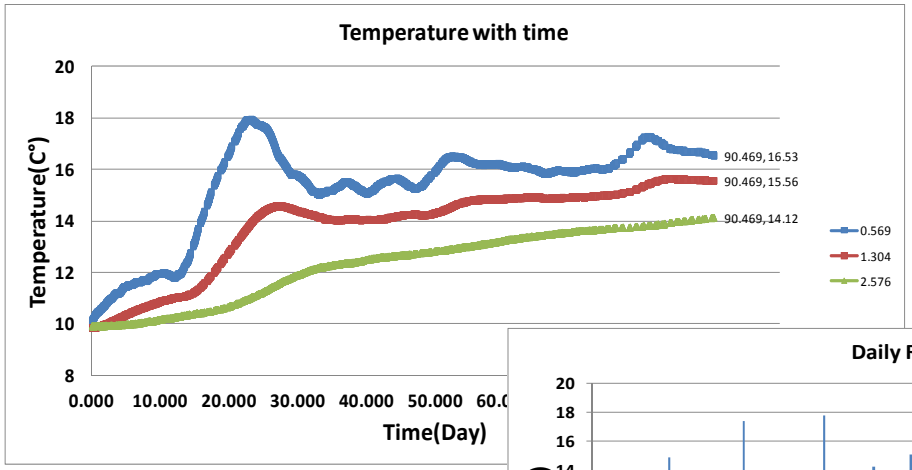
WORK PACKAGE WP5 – Geoinformatics Toolkit

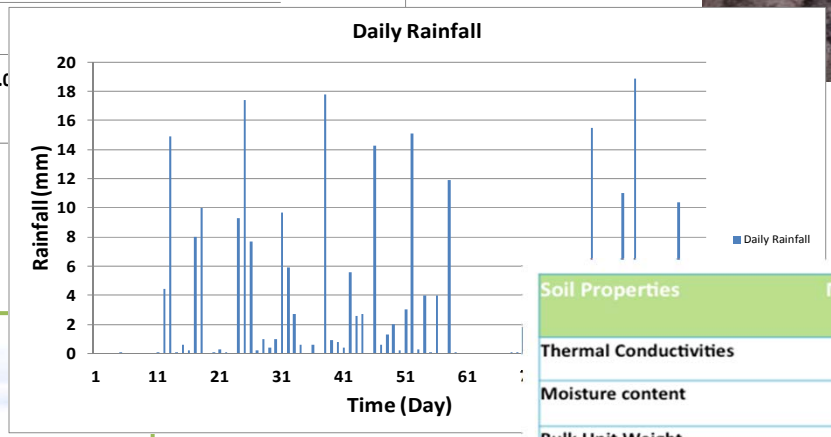
Google Based Geoportal

WORK PACKAGE WP2

GROUND SOURCE HEAT

Site Monitoring – Lower Pentre

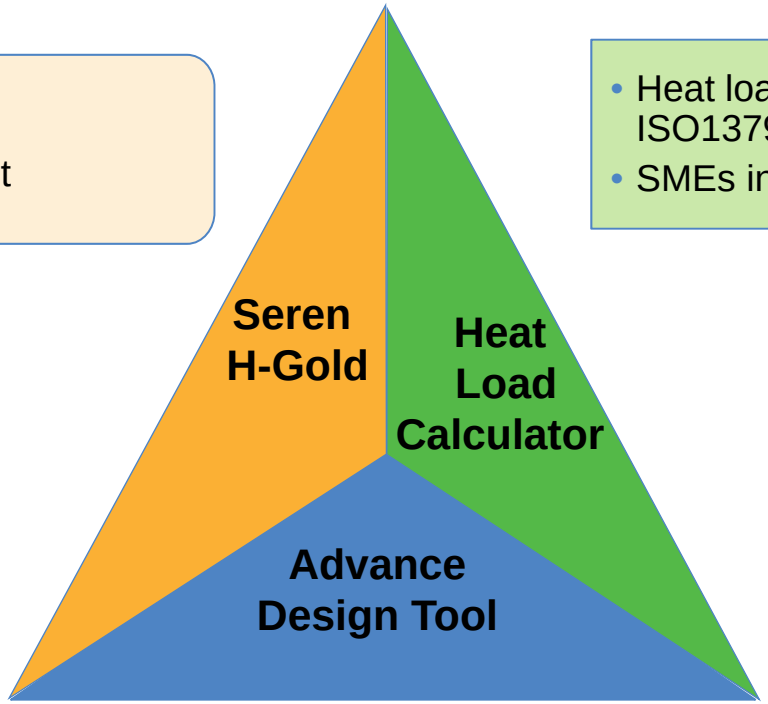




Soil Properties	Min.	Max.	Avg.	Test Type
Thermal Conductivities	2.06	2.87	2.44	In-site
Moisture content	8	15	12	Lab
Bulk Unit Weight	13	19	16	Lab
Mineral Content	Quartz			Lab
Soil classification				Lab
Sample 1:	Fine Grained soil (Inorganic silt, ML) >70% passing 75 µm			
Sample 2:	Coarse Grained soil (Gravel) <36% passing 4.5 mm			

Producing Software to Aid Design

- Pre-feasibility Study
- SMEs new to the GSHP market



- Heat load calculation as per BS EN ISO13790
- SMEs involved in energy market

- Long term behaviour
- Companies in Consultancy, Designing and installation

Seren H-GoLD

- Software as a tool for Welsh companies new to GSHP Market
- Software adequately provides the assessment for pre-feasibility of GSHP system

Type

- Developed for Horizontal ground loop size estimation
- Satisfies the MIS 3005 standards for in-house software design tool

Reviews

- Can be improved as WP2 uncover parameters

Significant features

- Building energy demand
- Local ground temperature,
- Soil and pipe thermal conductivity
- Pipe parameters

Delivery

- Software is stand-alone and includes an 'installer' to launch from CD

SEREN HLC

- Software as a tool for companies in Energy Market
- Software adequately provides the energy demand for space heating & cooling of the buildings.

Type

•Developed tool provides annual and monthly energy

Satisfies the **BS EN ISO: 13790**

Reviews

- Can be improved as Collaborative company proposes

Significant features

Consider the effects from

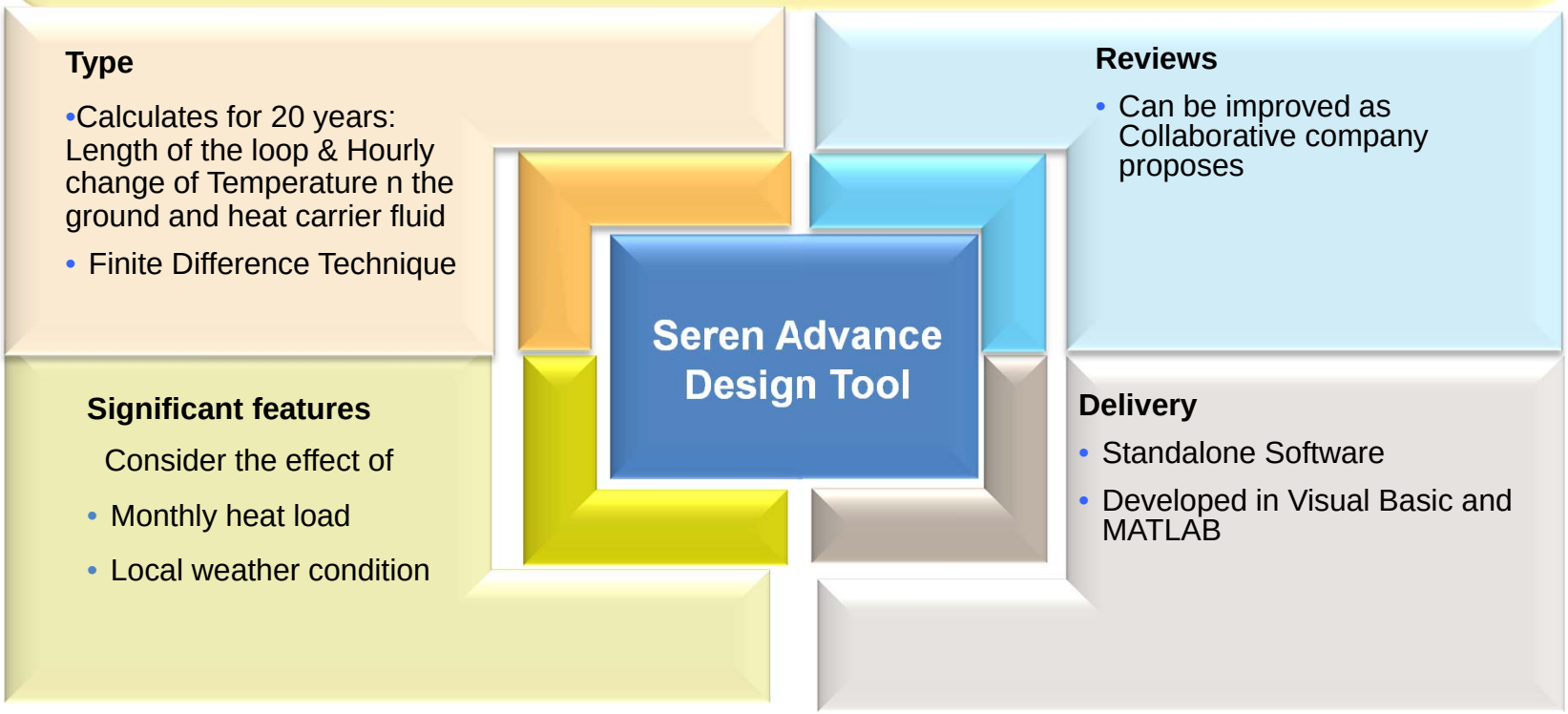
- **Transmission,**
- **Ventilation,**
- **Internal heat gains,**
- **Solar heat**

Delivery

- Developed in Excel Environment

Seren Advance Design Tool

- Software as a tool for companies in Consultancy, Designing and Installations
- Software will adequately provide long term behaviour for GSHP System



Numerical Models & Simulation

Ground Loop Boundary

•Range of simulations were undertaken considering both horizontal and vertical systems.

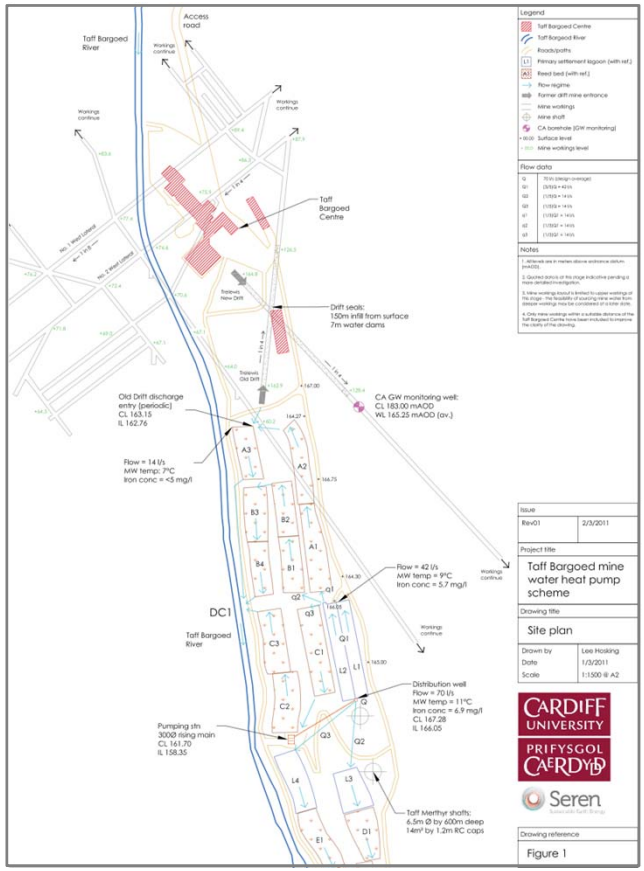
•A subsequent investigation showed that both horizontal and vertical ground loop boundaries could be successfully represented with **relatively simple boundary conditions** (e.g. an average W/m length)

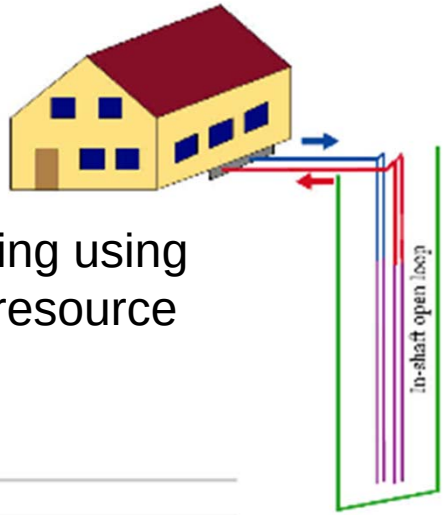
•This was especially the case for **horizontal systems** due to the relatively low heat fluxes induced and the dominance of the surface boundary.

Surface Boundary

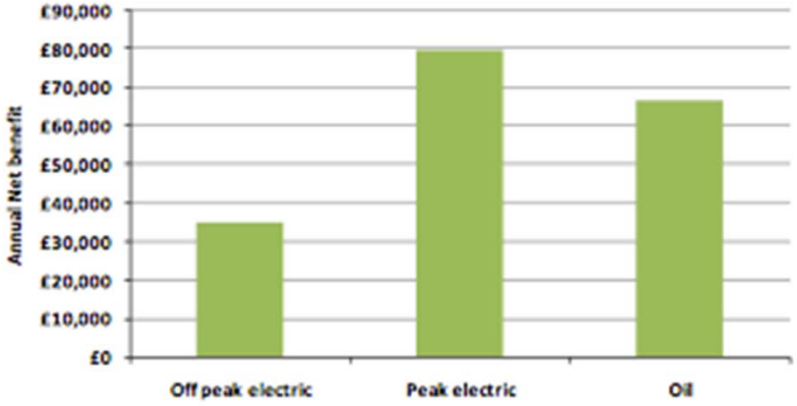
- A boundary has been developed within **COMPASS** which is capable of representing the ground surface.
- The boundary breaks down the surface components to the shortwave, longwave, sensible and latent heat fluxes.

Taff Bargoed Minewater Project





Open loop system using using mine shaft as a heat resource



Net benefit of mine water heat pump system over other heating systems

TARGETS – UP TO AUGUST 2012

Output	Target	Achieved
Enterprises Assisted	25	25
Collaborative Projects	8	8
Companies Created	1	2
Jobs created	13	10
Enterprises Adopting or improving equality strategies and monitoring systems	4	7
Enterprises Adopting and implementing Environmental Action Plans	4	20
New or improved products, processes or Serviced launched	4	23
Investment Induced (£million)	0.5	0*

DIOLCH YN FAWR AM WRANDO
THANK YOU FOR LISTENING

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