



Hannover-Bristol Green Energy Summit – Friday 10th June

Summary Report

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WORKSHOP 1: ENERGY EFFICIENCY IN NEW BUILDINGS AND LOW CARBON RETRO-FIT

Facilitated by Sven Andres, Kompetenzzentrum für Energieeffizienz and Celia Beeson, Bristol City Council.

Reported by Mark Taylor, Low Carbon South West and Reading University.

Attendees:

- Torsten Schwarz, Passivhauskonzepte GmbH
- Stephan Wluka-Rentz, RW-Energie UG
- Hanna Porter, Bristol City Council
- Mike Tierney, Bristol University
- Fionnuala Costello, Technology Strategy Board
- Nick Lloyd, Urbane Building Company
- Ian Hutchcroft, Energy Saving Trust
- Simon Blonde
- David Matthews, Hoare Lee
- Ben Ross, Forum for the Future
- Paul Collins, Telepure
- Bill Box, Carnego Systems
- Nick Harris, Power Perfector
- Robin McDowell, Bristol City Council
- Ken Aylmer, Footprint Building
- Craig White, White Design.

The workshop consisted of six presentations given by Torsten Schwarz, David Matthews, Nick Harris, Craig White, Bill Box and Stephan Wluka-Rentz.

The first presentation by **Torsten Schwarz** from **Passivhauskonzepte GmbH**, was on Retrofitting a historic building in Germany using Passivehaus principles to reduce the energy consumption below that of the current regulation requirement, where a 60 % energy reduction was achieved. The technical challenges were seen to be ensuring the fabric breathability of the refurbishment. The achievement of this goal has led to an internal level of thermal comfort that is widely appreciated by the occupants of the building that is not found elsewhere, making it a desirable building to occupy.

David Matthews from **Hoare Lee** gave a presentation on 'Horizon House', a new building for the Environment Agency and explained how a ground source heat pump, solar thermal, PV and innovative ventilation including an occupant lighting indicator, has led to a very efficient and environmentally conscious building design. The building achieved an 85% BREEAM rating. The improvement in user density along with working atmosphere has allowed the Environment Agency to change its business as usual approach to new building procurement.

Nick Harris from **Power Perfector** explained how an average saving of 13% can be made by installing a voltage optimization unit onto the electricity supply of a building. Justifying the voltage optimization device, Mr. Harris said, "the National Grid cannot micro manage voltage." It was envisaged that a model similar to Japan may be possible in the UK where a large scale roll out of these devices could achieve a significant electricity load reduction.

Craig White from **White Design** highlighted his company's philosophy to ecological development and refurbishment. The 'reHAB' approach (thinking of energy use as a drug to be weaned off) is adopted within White Design to bring the emphasis away from a purely

technical material and engineering solution, to include the behavioral issues of the occupant of the building as well. Since 1999, White Design has been using 'Mod/Warm Cell' insulation to current code level standards and reminded the conference that energy reduction reduces the risk of fuel security ('GasPutine' turning off the gas tap in 2008). A method of carbon capture by using natural materials to lock CO₂ into the fabric of new buildings was highlighted as possibly a more effective way of storing carbon than the current CCS strategies. Locally sourced and constructed, natural material, pre-fabricated panels are used to insure a fast build time whilst minimizing the transport costs and maximizing the benefits to the local economy.

Bill Box from **Carnego Systems** aims to "turn data into meaningful information." The emphasis of Mr. Box's presentation was to enable the occupant of a building to understand their use of energy and be informed of the options available to them not only in terms of energy but also in terms of local transport. A new development in Swindon is to have a hybrid energy monitor installed that displays this transport and energy information on a real time basis together with a method of comparison and communication with similar properties. It is hoped that this will lead to a decrease in expensive pre-payment meter usage and an increase in the use of public transport options. It was suggested that when considering how to change user environmental aspirations, "change the culture of the group to change performance."

Stephan Wulka-Rentz from **RW-Energie** commented on the mindset of the UK house buyer compared to a German house buyer. In Germany it is normal to only buy one house in a lifetime, whereas in the UK people may be prone to moving house every 3 – 5 years. The justification for costly and disruptive refurbishment is therefore far more difficult in the UK. A system of achieving 99% energy efficiency through the 'Energy Tower' was promoted. This new CHP unit is TUF certified and small enough to fit within domestic properties, generating all of the properties' heating requirements and supplying electricity at the same time. Mr. Wulka-Rentz explained how the high levels of performance can be achieved through complete condensation.

The attendees were asked to give feedback from the morning and afternoon sessions and the following points were highlighted as areas for further thought:

- Economics and cultural change
- Technology is mostly in existence, change in user and designer behavior
- Compared to 5 years ago, the technology mostly exists now to solve the technical challenges, challenges now are people and politics
- The UK housing stock may not be able to deliver 80% energy reduction if viewed in isolation, district heating needs better understanding especially implementation into housing estates
- There is a gap between the theoretical and used energy in buildings
- Collaboration and knowledge sharing, the ability to ask people who have done similar projects, used similar products before
- New questions were started to be thought of to be asked of key people leading to a combination of different approaches
- Culture vs. Technology, reflections on energy efficiency, struggling with public engagement, Craig White and Bill Box could collaborate to initiate a new project
- Can client cost issues justify the efficiency measures
- District heating needs an additional session
- User influence on automation, support for the products installed – skills gap on maintenance
- Technologies have been trialed, need now is for training
- A wish that everyone would 'wake up and do it'

- Germans have been described as 'Energy Efficiency Junkies'
- Existing efficient technologies need to replace items due for renewal
- The right mix of solutions is needed
- An analysis at the right level is needed to specify fit for purpose
- There is a different financial control in Germany
- How are the financial costs justified, where is the support from local and national government

In summary the days' discussion led to focusing on:

- The occupant behavior and philosophy of design.
- The cost of refurbishing existing stock and the need for political support for this sector.
- Education and training of new skills was seen as an important next step rather than further product development.
- A means of communicating workable approaches across the industry would be beneficial.

WORKSHOP 2: SOLAR PHOTO VOLTAIC CELLS

Facilitated by Kieran Highman, Bristol City Council
Reported by Claire Croker, Low Carbon South West

Attendees:

- Gudrun Huper, AS Solar (Hannover)
- Spencer Clark, AS Solar (Bristol)
- David Saunders, Bristol Power Co-op
- Gernot Hagemann, hannoverimpuls GmbH
- Jamie O'Nians, Your Power
- Prof Judy Rorison, University of Bristol
- Dr Neil Fox, University of Bristol
- Jas Singh, Auriga Energy
- John Whiten, Ethical Solar
- Tom Beale, Bristol Energy Co-op
- Beth Aspinall, Southern Solar
- Abdul Raaj, Suka Group
- Stephen Barrett, Solar Sense
- Martin Alder, Optimum Energy

PRESENTATIONS:

AS Solar – Spencer Clark

Global company (including Bristol office) based in Germany focussing on a wide range of high quality PV and solar thermal products and other renewables and an ethical manner of working with clients to create solar solutions appropriate to site. Recently refurbished HQ in Hannover is a local renewables landmark. Live feedback on AS Solar installations is available on the AS Solar website.

Ethical Solar - John Whiten

Ethical Solar works to make installations – materials and process – as low carbon as possible. Use Norwegian manufacturers that use low energy processes, also recycle products eg mounting systems and cables. Ethical stance also includes employment issues – ES makes effort to employ people who have been long-term unemployed. ES have emphasis on community base for energy production.

Bristol Energy Co-op – David Saunders

Bristol needs to encourage power generation locally, because money flows out of the region when power is bought in from elsewhere. Bristol Power Co-op has already secured funding for test installation. Under its community scheme, profits will be divided between a dividend to members and reinvestment in solar new build. A dividend would also be paid to community centres which help organise the project. The Coop is investigating complementing solar with micro CHP (gas fuel cells).

Dr Neil Fox – School of Physics, University of Bristol

Carrying out research sponsored by E.ON, working on diamond thermionics – nanotechnology approach using diamond powder for solar generation of electricity. Test unit in Cheltenham goes live in the summer. Offers potential to be much more efficient than PV, using smaller units.

Prof Judy Rorison – University of Bristol

Specialist in optical communications, based in Department of Electrical and Electronic Engineering. Working on improving laser technology applications for solar generation of electricity. Would have advantages of huge efficiency improvements over PV, and size –

much smaller unit needed. Major part of cost of PV is the mounting structure itself. Manufacturing process for laser units very high tech and expensive, but mass production would bring costs down. Units using lasers already being manufactured, though Prof Rorison's work on intermediate band solar cells is currently theoretical.

Institut für Solarenergieforschung – (Research institute of Solar Energy) - Gernot Hagemann – (hannoverimpuls)

The Institute is a privately run establishment of 150 staff affiliated to the University of Hannover. It researches PV and Solar Thermal issues, and is a certified test centre as well as working on innovations in the field. Examples of current research projects are: the storage of solar thermal energy produced in the summer in the ground, to warm the ground for better heat exchange for ground source heat pumps in the winter; how excess heat produced by PV could be used in a similar way for air heat pumps; glazing PV units with a microstructured light-redirecting foil to allow heat and light through in the winter, and keep heat out in the summer.

GENERAL DISCUSSION

Key conclusion - a 'Bristol Solar' Steering Group to be formed

- Members – local solar companies (including those not present), co-ops, consumers, installers, academics, Bristol City Council, Bristol Green Capital
- Issues for the Group to tackle:
 - Best practice/standards, self-regulation
 - State of the market
 - FIT changes/the comprehensive review (including collection of evidence-based material for submission)
 - Emerging technologies
 - Enabling co-ops
 - Training
- Initial focus Bristol – then spread out to CUBA/SW
- First Meeting – W/c Monday 11 July
- Jamie O'Nians to draw up detailed proposals for the group
- Kieran Highman to liaise with Darren from Green Capital
- Gernot Hagemann invited members to continue discussion at Hannover Trade Fair in April 2012

Other issues discussed:

Economy

- Easier to get investors to invest once a scheme is proven – cf Triodos.
- Good to use local manufacturers/installers – keep money and jobs in local economy - though need to keep balance with quality issues
- There is currently concern about large scale PV projects because of FIT changes. However, money which might have gone to larger schemes may now be available for smaller ones. In addition, large scale projects may become economically viable once costs come down.
- Possible future location of Green Investment Bank not certain yet – might be Bristol. However, what it can invest in not clear at present
- German banks invested in solar early on because of the German FIT scheme. British banks have previously been reluctant to loan for solar projects.
- Need to have better training than MCS in UK – cf Germany
- Munich's economy has boomed because of early investment in renewables – Bristol needs to follow this example.
- Planning in Germany has supported renewables also – hence equipment and investment goes to Germany. Bristol needs to address planning issues.

- People in Hannover work together on carbon reduction – great transport system, positive attitude to renewables, compared with public belief in UK that they are expensive.
- Hannover Government is setting up PV competitions between communities to stimulate uptake – those with the most successful installations win a reward for the community such as a kindergarten

Community ownership

- Hannover remunicipalisation of supply contrasts with UK demunicipalisation. There needs to be stability and accountability of supply. Accessibility and democratisation are important – those without roof space or with unusable roof space, together with those without ready money for current system of installations are denied subsidy. This issue is also being discussed in Germany.
- ‘Solar allotments’ – community schemes – might be an answer to access issues.
- Current FIT support doesn’t distinguish between applications from wealthy individuals and community schemes.
- Diamond/optical developments show that PV farms aren’t the answer – better to focus on community/personal installations
- Bristol residents likely to raise money for roof-top schemes through co-ops etc

Grid

- Bristol’s roof top survey indicates significant installations of PV possible – the challenge here is the connections to the grid.
- Need to share infrastructure implications – at the moment, if your proposed installation is the one to tip the sub-station over the limit, you get landed with the fee for alteration.
- AS Solar testing 5kw battery to store solar-generated energy until later in the day. Battery could be useful to avoid having to expand grid to cope with peak supply in day, and to integrate with demand for charging of electric cars. UK legislation getting in the way of the battery idea - KH to investigate this issue once SC has forwarded more info.
- Supply/demand issues in grid are a key issue in Germany where high density of installed systems means significant local impact on grid depending on cloud cover.

Technology

- Inverters are the weak link in the PV installations. The costs for upgrading these during the life of the array needs to be built in at the beginning.
- Hybrid panels using heat from PV arrays for air heat pump already on market in Germany.
- Suka Group (part of AS Solar) is working on integrating gas controls with solar generation

Data collection

- Experience in Germany shows data on installations should be collected from the beginning (now having to hunt for it).
- In the future Bristol City Council could sponsor chips making broadband connections between units for data exchange and collection.
- Data on installations could feature on the Bristol Solar mapping project.
- Coops will need data on each part of their installations.
- Money to fund data collection might be available from UK Technology Strategy Board

WORKSHOP 3: DISTRICT HEATING AND BIOMASS

Facilitated by: Josh Thumim Centre for Sustainable Energy

Reported by: Jodie McGregor , Low Carbon South West

Attendees:

- Tony Norton, Centre for Energy & Environment, Exeter University
- Dirk Goeman, Emission Partner
- Michael Strecker, Ares Technology
- David Strecker, Ares Technology
- Mareike Schmidt, Bristol City Council
- Sam Whatmore, Forever Fuels
- Andrew Baker, C&C Green Energy
- James Ford, Hoare Lea
- Dr Laurence Ketteringham, University of Bristol
- Paul Isbell, Bristol City Council
- Prof Martin Bigg, SW Environmental iNet
- George Ferguson, Ferguson Mann Architects
- Alan Bailey, Low Carbon South West
- Christian Peters, hannoverimpuls GmbH

The workshop consisted of a 'warm up' introduction session followed by four presentations given by Tony Norton, Michael Strecker, Dirk Goeman and Sam Whatmore.

The first presentation by **Tony Norton** from the **Centre for Energy and the Environment** was on District heating & CHP in Cranbrook and Exeter. Tony explained the plans for a district heating project for a new development of over 2900 new homes in a new community, East of Exeter. The project, largely driven by private sector, is a collaboration between the public and private sector and includes:

- £28m public sector infrastructure funding package
- £4.1m HCA low carbon infrastructure grant
- Private sector ESCo proposition
- Renewable Heat Incentive (RHI)
- Skypark commercial development included in scheme

The benefits of the scheme are:

- Reduce developers exposure to tightening CO₂ standards at little extra cost
- Demonstration of a private sector ESCo model
- Biomass CHP using recycled wood
- ~£45m low carbon investment

Michael Strecker from **Ares Technology** gave a presentation about a rumen-based process for the sustainable production of biogas. He explained that their new double-stage fermenter system, containing an artificial rumen (decomposition of cellulose and creation of SCFA) and a fermenter for SCFA-degradation (creation of CH₄ and CO₂) would mean an increase in the performance of fermentation through a higher daily decomposition rate of between 10-25%. The type of waste that can be used to process high-quality multipurpose biogas can include agriculture waste;_ hay, straw, maize, rape, grass and sunflower trade / industry waste paper /cardboard, draff, bran, beet and from landscape conservation / disposal ; nettle / pest plants and foliage. The reduction in the size of the plant to a tenth of the size means that the process is much more achievable in a wider range of places and can work on a much more competitive level.

The third presentation given by **Dirk Goeman** of **Emission Partner** looked at the Emission Control for Energy from Biogas, using catalysts. The advantages of using catalyst technology includes ; No Biogas DeSulfation needed to reduce the emissions ; reduced formation of SO₃ , high likelihood of long durability due to sulfur resistance and the reduced overall cost to meet regulatory standards. With energy from Biogas due to increase in the UK, regulatory standards for Biogas Power Plants will mean there is a potential need for catalysts. Sulfur resistant catalysts are the most efficient and cheapest way to meet regulatory standards!

Sam Whatmore from **Forever Fuels** presented about the innovation in woodfuel products, systems, and supply chains in South West England. They are suppliers of premium grade wood fuel; Wood chip and wood pellet. With 10 years industry experience they originally started in the South West England and are spreading nationally. Forever Fuels have a low carbon footprint with local depots – local woodlands – local people. The company has 150 customers including 2 NHS hospitals. Their main source of material used to make the wood chip and wood pellets come from Small Diameter Roundwood, Sawmill Residues, Reclaimed material , Forestry Residues, and Arboricultural Arisings. Forest Fuels have different delivery mechanisms; Tipped, Scissor lift, Hook bin, Blown....and each site needs a bespoke solution and this will be an issue for the next 25 years! A connection was made between Forever Fuels and Ares Technology Company. The forest residues that Forever Fuels deal with are exactly the type of fuel that can be used in the fermenting processes, if the Ares Technology company set up plants in the UK.

The attendees of the workshop were asked to consider the presentations given throughout the day and share ideas about potential or collaborative projects that Hannover and Bristol could pursue. The workshop was made up of people from different sectors in the environmental field including policy, project management, developers and research /funding. Three small subgroups, containing a mixture of the sectors were formed and some good ideas were presented at the afternoon plenary.

In the plenary, **sub group A** expanded on the idea from Forever Fuels and Ares Technology looking at combining the two. Using waste material from the parks that Bristol City Council manages, this can potentially feed in as an energy source to a combined heat and power system or biomass system used by a developer. The group expressed the idea of a demonstrator project in Bristol and a duplicate project in Hannover.

Sub group B expressed several ideas:

- A collaborative research project between Bristol and Hannover looking into the idea of electrical storage systems, where energy has come from renewable energy sources and stored for later use.
- The need for a more 'joined up approach ' and 'area based approach ' during planning procedures . For example at the master planning stages, energy efficiency initiatives should be taken into account and ideas are linked up. The UK planning system can learn a lot from the German planning system.
- Marketing energy efficiency initiatives – Bristol can learn from Hannover and the way they promote initiatives on a larger scale. Bristol has started to do this through 'Green Doors' but could do more to encourage awareness and uptake.

Sub group C looked into an integrated system approach to energy and got creative, presenting the Summit with a flip chart diagram of their idea and two slides explaining this.

Their idea was titled **Reducing CO₂ footprint in Bristol Industrial Area**
Overviewing a complete local industrial area -

- Recording the heat and power needs of the companies in this area by amount and time.
- Clustering those needs and finding synergies between excess heat in one company and heat needs in a neighbourhood company.
- Developing a heat grid where heat is sold into and taken out.
- Understanding the electricity needs in this neighbourhood and adding combined heat and power plant to generate the electricity and perhaps the heat can be used as well. Supplying biomethane to these combined heat and power plants which comes from a nearby biogas plant
- Biogas plant produces electricity and has its own heat sink with the production of the biomethane. Heat is completely used. Biomethane is sent to the combined heat and power plant in the local industrial area.
- Search for new companies in this industrial area which fit into the electricity and heat needs of their neighbours.

NB: A technical feasibility study is currently underway for a large-scale Thermal Energy Grid in the Avonmouth and Severnside area, which would serve the various organisations in that area. Low Carbon South West are driving this project and working with a number of technical and financial contributors.

WORKSHOP 4: WIND ENERGY – EMERGING TECHNOLOGIES

Facilitated by Johnny Gowdy, Regen SW.

Reported by Lindsay Sutherland, Low Carbon South West.

Attendees:

- Colin Morgan, GL Garrad Hassan
- Christian Keindorf, SKI Ingenieurgesellschaft GmbH
- Dr Paul Harper, University of Bristol
- Chris Williams, Goodridge Environmental
- David McSherry, Cormarent
- Andrew Fraser, UKTI
- Julian Garnsey, RWE Energy
- Gernot Hagemann, hannoverimpuls GmbH

Johnny Gowdy introduced the workshop by giving an overview of wind energy in the South West and **Regen SW**'s work in this field. A key area of opportunity for Bristol and the South West is the manufacturing and supply chain, with two offshore sites around the South West coast - the Atlantic Array, in the Bristol Channel and another one off the Dorset coast. There is also the possibility of a 'South West Marine Energy Park' which would attract further investment and support commercialisation.

As Holger Giebel from **TimberTowers** could not attend, **Gernot Hagemann** gave his presentation on his behalf. TimberTowers was founded in 2008 to produce specially made timber-panelled towers for multi-megawatt wind energy plants, using cross-laminated timber and surface material components. The main advantages are that these towers are: a carbon-neutral, easily recyclable natural product; very cost effective, producing savings of up to 20% per project; and more easily transported to almost any location worldwide.

Colin Morgan gave an overview of **GL Garrad Hassan**'s work in the wind energy sector. As Colin explained, it is a critical time for offshore wind, with the need for huge investment and the current hesitation amongst investors.

Christian Keindorf from SKI Ingenieurgesellschaft GmbH gave a detailed presentation on their technical research into grouted connections on offshore wind turbines. This is an important topic for offshore wind as grouted connections often become damaged. Christian explained how the introduction of 'shear keys' into the structure can minimise such damage, thus avoiding the need to spend time and money on repair work.

Chris Williams from **Goodridge Environmental** gave a brief presentation on their work providing small scale vertical axis wind turbines.

Summary of discussion points and conclusions:

- **Better academic collaboration**

The universities in the Bristol and Hannover regions have similar aims and would benefit from closer collaboration and knowledge sharing. For example, Hannover University have recently introduced a new MSc course in Wind Energy and there is huge potential to set up better links or an exchange scheme with universities in the Bristol region. Low Carbon South West could coordinate this with its contacts at the various universities and link to the wider skills agenda. There are some good existing internship/apprenticeship schemes but these need to be marketed more widely to increase awareness and participation from industry.

- **Opportunities for Bristol**

Bristol is in a good position to get involved in the R&D, manufacturing and supply chain for offshore development projects, with its excellent technological knowledge base and existing infrastructure. Vestas already have a base in the region and many large companies in the aerospace industry have transferable skills and technologies.

- **SME collaboration**

The South West is home to many SMEs in the renewable energy industry and many of these will find it difficult to take advantage of these opportunities alone. There are many organisations trying to help SMEs but many SMEs are confused about which organisation to turn to. The Global Wind Alliance was set up to bring together manufacturers, engineers and other skills needed for wind development projects into a single, reliable point of access. A similar alliance could be useful to bring together relevant organisations in the South West and incorporating relevant expertise from Hannover at the same time. SMEs could work together on bids or joint ventures. Such collaboration could also make it easier for academia to reach more SMEs and cultivate better links.

- **Regional champions**

In addition to the work of SMEs, there is a real need for some of the big companies in the region, such as Rolls Royce or Vestas, to win some big manufacturing contracts and act as champions for offshore wind and wave energy in the South West.

CONCLUSIONS

In the final session of the day, each workshop facilitator gave a brief summary of their workshop discussions to the whole Summit, reporting their main conclusions. The following discussion and action points brought the Summit to a close:

- The practicalities of setting up a District Heat Grid were discussed. The proposed Thermal Energy Grid at Avonmouth will provide an excellent learning opportunity. Other collaborative projects such as Low Carbon South West's 'Low Carbon Queen Square' and 'Low Carbon Manufacturing Park, and the 'Climate Alliance' in Germany offer further examples of a joined-up approach.
- George Ferguson suggested that the Bristol-Hannover partnership work on a new, physical project, something practical and manageable. He suggested that the new Local Enterprise Zone, based in Temple Meads, might provide an ideal opportunity – an example project might be installing CHP in a small part of the new zone. All agreed that this was a good idea.
- Paul Harper reminded the Summit of the opportunities for more academic collaboration and student exchanges. Following the success of the recent Low Carbon South West Student Research Competition, the next competition could invite applications from universities in the Hannover region. It was suggested that 'Leonardo' funding could be applicable in this area.
- Robin McDowell proposed setting up a teleconference between Bristol and Hannover before the summer holiday season to build on the momentum built up over the Summit.