



Operation Stepchange the ZEDstandard

So what's it going to be like in the UK towards the middle of this century – when severe rationing of fossil fuels seems inevitable? How are we going to keep our computers and trains running on the limited stocks of renewable energy available within our national boundaries? Will we have enough green electricity to power all the heat pumps and air conditioning needed to make a lightweight building in a London summer of 2080 seem bearable? **Bill Dunster**, **Chris Twinn** and **Craig Simmons** discuss.

Whatever the improvements in technical efficiency in the renewable energy sector – the answer is a firm 'no'. The first luxuries to go will be mass air travel, followed by a steady reduction in foodmiles, and more people choosing to live within walking or cycling distance from their jobs. However, with half current UK carbon emissions coming from buildings, and the other from our collective lifestyle and workstyles, it is essential that we plan the renovation and replacement of our urban fabric to stay within the limited stocks of renewable electricity and biomass available within our national boundaries. If we wish to create a politically stable society that does not need to spend vast resources competing abroad to secure more than its fair share of the dwindling international supplies of fossil fuel – we need to set benchmarks limiting the consumption of our scarce resources as soon as possible.

It is not enough to sponsor a turbine in Wales with the pretense of powering offices in London unless the offices have already adopted all sensible load reduction measures. Similarly it is not sensible to make claims that a new residential community in the Thames Gateway,

powered by the waste of an entire London Borough, is zero carbon, as one day that borough will need its own local 'waste to energy' scheme to maintain public services. It is far better to generate renewable energy on site to minimise the drain on limited national stocks.

There is much debate about how green to go in the construction industry, and how fast. Debra Brownhill, of the 'BRE Ecohomes' scheme admits that the highest standard of 'Excellent' only produces a 35% carbon saving over the building regulations legal minimum. The volume housebuilders have been slow to adopt even the lowest ecohomes standards, making it difficult for the BRE, as a private sector company funded by the industry, to introduce higher standards. Even the World Wildlife Fund with its million sustainable homes campaign finds itself supporting these low environmental performance standards in an effort to maximise take up of its campaign. If millions of new homes really were built to ecohomes very good standards – national carbon emissions will rise steadily.

Unfortunately this very British advocacy of gradual incremental change isn't going

to keep the lights on in thirty to fifty years time without resorting to the abominable nuclear energy scenario – and the inevitable security headaches that come with the threat of melt downs, terrorism, and radioactive waste disposal over millennia.

Probably the best idea is to limit national demand by encouraging a stepchange reduction in our built fabrics demand for heat, power and cooling. Step change zero fossil energy developments are only expensive because hardly anybody is building them – each small scale project is a prototype. The government sustainable community programme plans to build an additional 180,000 homes a year for the foreseeable future to reduce property values in the south east – many of them on land already owned by the government agency English Partnerships. ZEDfactory research has shown that it only takes somewhere between 2000 and 5000 new homes and workspace a year built to ZEDstandards for the economies of scale to cut in, creating no additional premium for achieving ZED infrastructure capable of making a national renewable energy scenario viable. This is a

critical moment in the evolution of the UK construction industry, and decisions taken now will dramatically effect the quality of life for most ordinary people in the UK. If we could somehow agree to adopt the Stepchange initiatives proposed by ZEDstandards, and replicated in Germany by the Passivhaus movement – a ZEDproducts buyers club could be formed enabling even the smallest projects all over the UK to take advantage of centrally negotiated volume discounts. As these economies of scale ramp up, there will be no additional cost premium for a ZED step change specification, and the reactionary industry lobby against change will have no further grounds to complain about cost – all achieved avoiding difficult government mandatory legislation. Coupled to a public promotion of the health and quality of life benefits of the environmental approach, it will be possible to create considerable demand for this new industry specification. ZEDfactory already has an unsolicited database of over 1000 people wanting a ZEDhome, and with only a handful of units being built a year – it is easy to demonstrate that demand exceeds supply by a healthy margin.

With the latest government white paper indicating that North Sea oil and gas are likely to be exhausted within ten years, complacency over these issues will become an issue of national security. If we want our children to stay at home when other nations fight for oil, and avoid leukaemia clusters around nuclear plants – this sort of industry wide initiative may be a constructive way forward.

Building now for the day after tomorrow

The Government's Energy White Paper clearly sets out the challenge. The UK's carbon dioxide emissions must be reduced by 60% before 2050 to mitigate the worst effects of climate change. If one takes a more precautionary approach to atmospheric CO₂ concentrations, and accepts the principle of allowing poorer countries to produce, then so-called contraction and convergence models indicate we will need to reduce UK emis-

sions still further and more rapidly, to about 30% of current levels by 2030.

Not only must greenhouse gas emissions be managed, but also the demand for energy which, in the UK, has



increased by 13% in last 30 years. The renewable resources we will increasingly rely upon are not unlimited. According to RCEP energy scenarios, and assuming energy demand optimistically remains at current levels, only about one-quarter of UK supply could be met by renewables in 2050. The 'dash for gas' we have witnessed in the last few years must rapidly give way to a 'negawatt revolution'. Renewables and energy efficiency are the way forward. Despite the long life span of buildings, there is still time for the construction industry and those responsible for planning our towns and cities to make a significant contribution. According to the Government's Performance and

Innovation Unit, about half the buildings that will be in use in 2050 have yet to be built.

The energy used in constructing, occupying and operating buildings represents approximately 50% of greenhouse gas emissions in the UK. If CO₂ reductions of the magnitude required are to be realised then extremely strict emission standards for new developments are required. Given that there are already many examples of zero carbon emission buildings it is reasonable to argue that this design philosophy could and should be mainstreamed.

The Energy White Paper itself accepts that low energy, zero carbon emission buildings will be important in delivering CO₂ reductions.

However, a low carbon economy requires action across sectors and buildings can positively contribute in other ways to create more autonomous sustainable communities. The Energy Efficiency Best Practice Programme (EEBPP) report 'Building a Sustainable Future' considered a range of planning issues and reviewed several case studies of sustainable homes and went as far as devising some draft 'zero CO₂' standards. This was developed further in a later EEBPP leaflet as an advanced energy efficiency standard.

More recently, the Sustainable Buildings Task Group (SBTG) Report recommended that a Code for Sustainable Building (CSB) be developed which included certain minimum standards across a range of impacts – not just energy.

Despite the good work being done there is no agreed definition of what constitutes a 'zero emission development' (or ZED). How autonomous must a development be to qualify? Must all energy be generated onsite? Should water treatment be included? Must facilities for low carbon vehicles be incorporated? What about food supply chains and waste management? The answers are both philosophical and technical.

Current regulations provide limited guidance. The latest Building Regulations,

though aimed at improving energy efficiency, are incremental in their approach. Their scope is also limited to the fabric of the building. The various BREEAM rating schemes, such as Ecohomes, are better. They take a broader approach to defining what makes a development sustainable, acknowledging the ways in which building design and location can influence the lifestyle of the occupiers. But, as the comprehensive critique by Michael Priaulx (March edition of BFF) clearly demonstrated – and the Sustainable Buildings Task Group concluded – this scheme is not without its own flaws and limitations. When compared to the aspirations set out in the White Paper, the Ecohomes performance targets appear quite modest. For example, it is theoretically possible to be awarded the top Ecohomes rating of ‘Excellent’ (a score of over 70 credits) without even exceeding current Building Regulations. In contrast, a development which adopted the environmental principles pioneered in the zero fossil-fuel BedZED development could rate more than 90 credits. This would still attract only an ‘Excellent’ rating despite going some way further towards meeting the Government’s CO₂ reduction targets.

Defining the ZEDstandard

Although examples of ‘super insulated’ and ‘zero heating’ buildings have been around for more than 30 years there has, to date, been only limited attempts to consolidate this at the community level-

opment level. The following are a few examples of such ‘joined up’ thinking:

- * buildings can help to reduce transport emissions by careful location
- * integrating live/work units and providing solar charging points for electric vehicles.
- * the impacts associated with food production, transport and distribution could be reduced by providing some on-site allotments and greenhouses with associated low energy retail outlets.

Given that almost half the UK’s CO₂ emissions are not attributable to buildings, then it is apparent that to deliver a low carbon economy we need new developments that not only require no fossil fuel-derived energy themselves but which are also designed to reduce non-buildings related carbon emissions. The ZEDstandard proposed here is one that reaches beyond the confines of the building envelope to address broader lifestyle choices.

A useful and popular concept for measuring and monitoring personal environmental impacts is the ecological footprint. This holistic approach can be used to measure both the demands placed on the environment (termed the ‘footprint’) and the capacity of natural systems to sustainably meet these demands (termed the ‘biocapacity’). In this way it can be used to determine how sustainable a particular community is. An analysis of the average UK citizen’s energy

and materials use indicates that if everyone in the world adopted current lifestyles we would need about three planets to sustainably support global consumption. If we want a world where everyone can enjoy a fair share of the planet’s bounty, and where other species can flourish, then we need to adopt a ‘one planet’ lifestyle as defined by the ecological footprint (Chambers *et al* 2000). This benchmark

forms the philosophical basis of the ZED Standard. The aim is to secure a high quality of life without exceeding global carrying capacity.

A ZED checklist

The ecological footprint typically considers end-user consumption as meeting one of the three basic, personal needs:

- Nourishment
- Shelter
- Mobility

An additional category – named ‘Goods & Services’ – covers all other direct and indirect consumption. Included in this are a wide range of products, private and public services.

This framework is used to express the ZEDstandard with the addition of ‘quality of life’ and ‘biodiversity’ components to encompass a range of other factors.

In a future issue we will bring you a simplified ‘checklist’. Though not the full proposed ZEDstandard, the checklist is designed to provide a quick initial assessment of a development to see whether basic ZED criteria are met. Unlike the BRE’s EcoHomes scheme, all criteria must be met to gain the Standard.

We welcome feedback on some of these ideas as soon as possible. The draft ZED standards can be viewed on www.zedstandards.com

Illustrations previous page: mixed use development at Jubilee Wharf, Penryn, Cornwall – client Andrew Marsden; building physics Chris Twinn; architects Bill Dunster Architects / ZEDfactory Ltd; structural engineer Mark Lovell; QS James Nisbet and partners.

‘How we can save the planet’ Mayer Hillman and Tina Fawcett Pub: Penguin 2004. For more on contraction and convergence check out the Global Commons Institute www.gci.org.uk

Biomass production is one example of the limitations on renewable energy sources. The RCEP suggest that a challenging, but feasible, goal for 2050 is to produce 140TWh/yr (12% of total current UK energy consumption) from a combination of energy crops and other biomass wastes with a land take of 7 million hectares. This is just under over one-quarter of the total UK land area and would have a significant impact on agriculture.

The Energy Review: A Performance and Innovation Unit Report 2002 <http://www.number-10.gov.uk/su/energy/TheEnergyReview.PDF>

http://www.dti.gov.uk/construction/sustain/EA_Sustainable_Report_41564_2.pdf

