



CIBSE's response to the government's consultation document
Meeting the Low Carbon Skills Challenge
June 2010

The Chartered Institution of Building Services Engineering exists to promote the art, science and practice of building services engineering for the benefit of all, and the advancement of education and research in building services engineering. CIBSE is dedicated to the development of better buildings by maintaining an active role in contributing to governmental regulations and legislation.

It a leading professional body and a Licensed Member of The Engineering Council. There are around 20k professional building services engineers in membership. This response was compiled with input from CIBSE members and Patrons, and the Technical and Education and Membership departments.

The Institution is committed to tackling climate change and requires its members to 'have due regard to environmental issues in carrying out their professional duties' under its Code of Conduct. CIBSE seeks to improve the construction industry and the existing built environment through support of legislation and collaboration with relevant other bodies. The Institution has worked with government departments and other bodies to this end and provided publications and tools for CIBSE Members, the industry and the public.

Our membership guidance defines the scope of building services engineering as *mechanical and electrical systems for heating, lighting, refrigeration, acoustics, ventilation, air conditioning, water, plumbing, electrical power systems, vertical transport, control systems, fire and security, alarm systems, façade engineering, public health, integrated systems and intelligent buildings, including environmental and sustainability aspects.*

The skills of our members are therefore fundamental to achieving a low carbon economy.

We have some overarching comments relating to the document as a whole. Thereafter our comments are numbered to correspond with your questions.

The document appears to confuse *education* and *training*. In our view the timescales, processes and people involved are different for both of these. Generally, we see non-vocational education in STEM topics as providing underpinning knowledge and

understanding. Skills relate to practical implementation. It seems to us that a strategy for steering greater numbers of young people into STEM education is fundamentally different from a strategy for identifying and delivering training in specific skills such as retrofitting the existing housing stock with low carbon heating technologies.

The document does not articulate a coherent strategy. Indeed, para 42 asks whether, if only we could co-ordinate all the collaborative and competing skills initiatives in every sector, this would add up to a strategy. We feel this is the wrong approach.

Paragraph 8 of the Executive Summary suggests that the only skills requirements for decarbonising the existing housing stock and building zero carbon homes will be “at graduate level, to develop, manufacture and implement new technologies”. It suggests that we merely need to “enhance existing practical construction skills for installing new adaptation and mitigation strategies”.

We believe that this view is fundamentally wrong. In our response to the Heating and Energy Saving Strategy (HESS) Consultation we answered a question about skills levels as follows:

“Should the Government work with industry to develop accreditation standards for advice about, and installation of, energy efficiency technologies? What would be the best model for such a scheme, and why?”

As noted above, delivering the improvements envisaged in the strategy across the millions of existing buildings in the UK will require a significant level of skills. It is essential that low carbon refurbishment of homes in particular, which will be a consumer purchase, does not suffer reputational damage due to the activity of a rogue element. With apologies to reputable window companies, low carbon refurbishment cannot be allowed to become the new double glazing. And there have already been concerns about this in relation to certain trading practices in the solar thermal systems market. There needs to be a careful balance between accreditation and competition in this market.

Government must work with industry to set out the criteria for the design and the installation of energy efficiency technologies and then allow industry to come back with practical ways of meeting those criteria. The criteria should address the link between design of systems and their installation to ensure that the refurbishment integrates those technologies already installed with new installations of low carbon or renewable systems.”

There is another related issue, on which the consultation is silent, but which most appropriately fits into the discussion under the heading of installation of energy efficient technologies. The issue is about skills. What is proposed, which CIBSE agrees is necessary, to deliver at least an 80% reduction in emissions from existing buildings, requires a radical change in the way that we build and refurbish. It requires a new skill set, in design and in construction and installation. And it requires that skill set to be delivered to an industry of hundreds of thousands. It is noted that the pathway to 2050 starts with insulation of walls and lofts to 2015, and then envisages moving to implement more technically advanced measures. As is acknowledged, this cannot occur overnight – a cavity wall insulator will not turn into a ground source heat pump installer over a weekend in late December 2015!!

What is needed is a programme of managed investment in new capacity, new technology, and above all new skills for the construction workforce. In CIBSE’s response to the consultation on the definition of zero-carbon buildings, we stressed the enormous challenge that we face to build genuinely low or zero-carbon buildings.

The following anecdote from a CIBSE Board member, currently engaged in a home building project, illustrates the point. The design for this low carbon home requires a fully functioning air barrier between the thermal mass of the main envelope and the insulation. Insulation has to be cut to size and shape in-situ. This has to be done so as not to damage the air barrier, and in such a way that the insulation fits accurately within the supporting structure. Yet even after six weeks and several explanations of the importance of the air barrier, it was still being damaged by careless handling by the operatives.

Arguably the greatest challenge facing us is not cutting emissions by 80% in existing buildings, but training the construction workforce to build and install in such a way that our designs can deliver the reduced emissions that the designers intended and the regulators demanded! Yet this is a fundamental requirement that we have to start to address now, not at some indeterminate point in the future.”

Extract from CIBSE response to the HESS Consultation, 8th May 2009

These comments are reproduced at length here because they demonstrate the scale of the skills challenge, in the view of a significant number of members of the Institution.

With specific reference to Construction and the Built Environment (CBE) the document presumes that there is a clear understanding of the **current situation regarding energy performance of buildings** (and hence carbon emissions). This is not the case. Reliable data is not available, largely because *the ...nature of UK construction [business] inhibits the dissemination of building performance information¹*. The recent interim report by the Chief Construction Advisor also notes the urgent need for a funded programme of post occupancy evaluation, both to generate usable data and to create a culture of learning from experience. We first of all need to understand why our non-low carbon practices are so poor and then improve them almost immeasurably. This would seem to present an almost impossible skills challenge.

A better approach to this consultation would have been a quantitative analysis of what needs to be done to move towards a low carbon economy. In the buildings area we know

- What the current building stock (domestic and other) consists of
- What we are currently building
- Targets for emissions and when they need to be achieved (eg. in the UK Low Carbon Transition Plan)

We can therefore calculate what needs to be done to the existing stock by way of retrofit, assuming the new builds perform as expected. Eg. for the 2020 target, we would know how many buildings per week need to be retrofitted and what the options are in terms of measures. This would lead to an estimate of people and skills needed, and we can then define our short terms skills gap and take action to bridge it. For the medium and long term more assumptions would need to be built in but at least the process is clear and it would be possible to test the sensitivity of the outcomes to the assumptions made to see where the risks are. This sort of analysis should have been done to underpin the UKLC Transition Plan or for HEM (paras 67 and 68 p 37) . It may be that the Zero Carbon Hub is doing such an analysis for their route map (para 65 p 36)

¹ Royal Academy of Engineering Report *Engineering a low carbon built environment* January 2010

We are concerned that CIBSE was not among the organisations (Annex 3) **consulted** in preparing the document. Please ensure that our Technical Director Dr. Hywel Davies hdavies@cibse.org is on your mailing list for similar consultations in future.

The following numbering corresponds to your questions 1 – 24:

1 **take-up of STEM subjects**

- The current initiatives in this area such as STEMNET, Tomorrows Engineers etc should continue to be funded and expanded if possible. The STEM Ambassadors scheme, (within which our **Building Services Engineering Ambassadors** scheme operates) is especially effective in raising interest and motivation in schools.
- Actions to incentivise recruitment and retention of well qualified and motivated **teachers** of STEM subjects should be enhanced and class sizes reduced. Teacher CPD requires immediate investment to enable them to update and engage with the careers and technologies associated with the low carbon economy.
- **STEM subjects at A level** are perceived as being harder and therefore bright students aiming to maximise their UCAS points may avoid them. The Department of Education should revisit the research on this reported in *Engineering UK 2008*² with a view to making A level grading fairer.
- The development of **University Technical Colleges** should be accelerated and well resourced. Vocationally related 14-19 Diplomas relevant to low carbon careers, specifically Engineering and CBE, should continue to be supported. Investment in careers information, advice and guidance is an urgent priority.
- At its National Conference in April 2010 CIBSE members supported a proposal to make ‘education for building energy efficiency and sustainability’ a compulsory topic for children at both primary and secondary schools (possibly for inclusion in the National Curriculum). This would raise awareness of the issues surrounding energy, buildings and a sustainable built environment at an early age.

2 **universities and businesses**

- The consultation paper (footnote 47) refers to the RAEng report *Engineering a low carbon built environment: the discipline of building engineering physics*. In its section on *Education* (pp 16 – 18) this report explains that ‘*the skills that will be essential to delivering this scale of [carbon] reduction are simply not taught at present in the majority of universities*’. This is because

² Section 1c page 21

technological innovation, regulation and targets are running ahead of HE : *'university courses take time to design, approve and implement and rely on there being sufficient authoritative reference materials on a subject'*. This seems an intractable problem.

- It would be helpful to launch a large scale programme of **staff exchanges** and placements between university teaching staff and employees of firms and organisations already active in the low carbon economy. Some models and case studies are given in the RAEng's February 2010 report *Engineering Graduates for industry*³. The engineering institutions, who draw their membership from across the spectrum of practitioners and academics, might be able to broker such schemes, if properly resourced to do so.
- Your document highlights the need for **cross cutting and integrative skills** to be developed in STEM professionals. We agree. This is expressed in *Engineering a low carbon built environment* (ibid), and related to the adoption of a *'systems engineering'* approach to planning the energy performance of buildings. Universities should be incentivised, through the funding regime, to develop such programmes.
- The funding regime for university engineering courses generally should be urgently reviewed, with HEFCE providing greater support for programmes of study directly relevant to jobs in the low carbon economy; even if this means reducing funding, or raising tuition fees, for less vocationally relevant programmes in non-engineering disciplines. Currently *funding of engineering degree programmes already falls short of what is needed by [around] 15% [which] represents a significant challenge to financial stability for university engineering departments*⁴. We support Sir William Wakeham's conclusions in his report that the necessary funds for the development of **experience-led engineering degrees** should be ring fenced.

3 colleges and universities responding to specialist skills needs

- The Department of Education's work initiated by E4E⁵ to improve the **data** on takeup and output of engineering programmes in FE should be accelerated. Rationalisation of qualifications is needed and transparency of qualification names and types must be improved to help employers understand what they mean.
- In our sector, there is a view that 3 or 4 year degrees in engineering have taken precedence in national education policy over more practical routes, and that this has had a damaging effect. It is felt that potentially competent and talented engineers have been lost to the profession because of an over-emphasis on theory. There is strong support for a more practically oriented development

³ Downloadable from www.raeng.org.uk

⁴ page 4 *Engineering graduates for industry* RAEng report February 2010

⁵ Education for Engineering

route that blends skills with academic learning and can be taken part time. The Foundation Degree appears to fit this model, though we are not yet convinced that it delivers what it promises.

- More needs to be done to support apprenticeships: in our sector demand from qualified and motivated candidates far outstrips supply.

4 is our overall analysis correct?

- We do not agree that *the required skills will be mainly at Graduate level* (executive summary para 8). Of course high level skills are needed. But many of the technologies that are key to the achievement of the targets already exist, for example solar water heating, photovoltaics, CHP and microgeneration. There is an urgent need for **technicians** to install, repair and maintain these systems, given that retrofitting to existing buildings forms such a major part of the agenda. And these technicians really need to be multiskilled to undertake plumbing, electrical and roofing work to the high standards of safety to deliver adequate life time performance from these systems.
- The document fails to take account of the distrust of the (skills and) qualifications landscape which our members, speaking as employers, regularly express. There has been innovation overload, with new qualifications appearing, established and trusted ones threatened, unclarity and ambiguities in nomenclature and questions around quality assurance in both FE and HE. To achieve the skills to deliver the low carbon economy a period of stability, consolidation, and rationalisation is required in the tertiary education landscape. Your paras 10 and 11 of the main document refer.
- We agree with the five key challenges

5 how to replicate good practice

Assuming that we know what good practice looks like, then we believe this is simply a matter of funding. See the comment on the need for post occupancy data, which, amongst other things, helps to generate better knowledge of what is good practice in practice. There is ample capability and willingness to work together between professional bodies, universities, colleges, SSCs and trade associations in building services engineering and more widely across CBE to develop low carbon skills. There is great willingness to learn from examples of good practice and keen commitment to meeting the targets. CIBSE maintains particularly strong links and mutual support with Summitskills on all matters relating to skills and careers. We suggest that joined up thinking between the professional body and the SSC in our sector is one example of good practice which could be replicated elsewhere. We welcome and strongly support the creation of the **National Skills Academy for Environmental Technologies**.

6 is stimulating innovation the best way?

- Yes. The RAEng report by Professor Doug King (referenced in your para 30 footnote 47) provides concrete examples and proposals for the built environment sector through the development of the discipline of **building engineering physics**. The *Engineering Graduates for Industry* report section 4.5 provides a case study of innovative provision in building services engineering at London South Bank University.
- However innovations in content and delivery in FE and HE and all types of work based learning must be delivered within a stable, transparent and well understood qualifications framework with robust QA. There should be no further innovations in qualification types or level.

9 promoting energy-related careers

Although most building services engineers do not operate in the power generation sector (except in designing, specifying and installing systems for *micro-generation*), ours are nevertheless emphatically **energy-related careers**. In our outreach to schoolchildren, for example at the Big Bang Fair, we created the **Low Carbon Heroes** brand. This highlights the large scale carbon-saving decisions (e.g. specifying low energy lighting or natural ventilation in a vast shopping complex) that building services engineers make every day, and the importance of the work they do. Research confirms that young people, and especially *girls*, are particularly motivated by *ethical, environmental and people issues*⁶

The link between STEM subjects and practical action, both in the classroom and in the workplace, needs to be reinforced

11 Zero Carbon Hub

The published objectives of the Zero Carbon Hub appear to chime exactly with the aims set out in your consultation document. The paper rightly identifies that there are numerous different organisations, agencies and sub sectors involved in delivering low carbon solutions in construction and the built environment. This is exacerbated by the fact that the sector is largely made up of SMEs and microbusinesses, and that *‘working practices within it have been competitive and adversarial’* which *‘inhibits the dissemination of building performance information’*⁷. If the Hub operates as intended, it should facilitate the joined up thinking which will be so necessary for the sector to achieve its targets. The Hub will need to achieve buy in from the universities, employers, professional bodies and trade associations, SSCs and other relevant agencies. Our perception is that it does not currently enjoy a high profile outside the domestic buildings market and this will need to change if it is to deliver benefits more widely. However, the funding of the hub is currently uncertain, and it may therefore not be available as a source of integration and joined up thinking.

⁶ *When STEM? a question of Age* IMechE report May 2010

⁷ *Engineering a low carbon built environment* *ibid*

12 delivering low carbon skills

Our earlier comments on the need for significant levels of training and upskilling to deliver on the scale required to achieve the Climate Change Act targets are worthy of reiteration.

- The National **Apprenticeship** scheme should be strengthened and accelerated, and stronger financial incentives put in place for employers, especially small ones, to take on apprentices in the low carbon industries.
- In FE, **data** collection and analysis urgently needs to be improved so that we have a clear picture of the current situation: what relevant engineering and construction qualifications are already out there, attainment levels on these programmes and where the gaps are.
- The pressure government can bring to bear through its own procurement policies is perhaps overstated in the consultation document, given that public spending cuts will be deeper than was expected when the document was drafted. More **direct government action**, through rewarding carbon friendly business practices and penalising others, may be necessary.
- The government may wish to commission research to identify the extent to which firms spearheading the move to a low carbon economy have been hit by the **recession**, relative to the economy as a whole.
- All these have **funding** implications, but in our view are essential if carbon and skills targets are to be met.

13 retrofitting

Delivering the targets set out in the Low Carbon Transition Plan and set by the Climate Change Act require a step change in the level of retrofit activity in the existing stock. To refurbish over 21 million buildings by 2050 requires one building to be retrofitted every minute of every day of every year from now until 2050. At present we just do not have the capacity in skills or elsewhere to achieve this scale of delivery.

- We welcome the creation of the National Skills Academy for Environmental Technologies under the direction of the Summitskills SSC. Qualifications reflecting the relevant skills are being developed and these need to be well publicised and explained to members of the public and householders who will be employing these contractors.
- Crucially, the skill set which these technicians and tradesmen will need must include communication with the customer and the ability to explain how the new, very different, technologies work. Experience shows that, in commercial and public buildings, the actual performance in practice of properties which were designed to be low carbon is sometimes very poor. This is because building users, facilities managers etc, do not know how to operate the systems (such as BMS) which have been installed. Monitoring, maintenance,

followup and support will be crucial, and should be built into the skills training.

- The achievement of personal professional registered status for learners (EngTech) should be an integral part of the skills programmes. The requirements for achievement of EngTech include communication and interpersonal skills, and a commitment to CPD. We welcome the creation of the new Technician Council based at the Royal Academy of Engineering to highlight the importance of professional membership for this cadre of workers.
- The targets quoted in your para 67 may need to be reviewed against up to date economic data. For example, we believe that domestic insulation business has slowed down in the recession.

14 awareness of regulations

- Recent years have seen unprecedented advances in laws and regulations governing carbon emissions of buildings, and their energy efficiency (Part L). They include rules on EPCs, DEC's and the creation of Low Carbon Consultants and Assessors. CIBSE delivers training and quality assures the certification for these individuals. But we do not see the provisions being enforced, and no penalties are being exacted for non-compliance. It therefore appears that the impetus which should drive carbon friendly innovation in the supply chain is lacking. We recommend that government reviews the way in which **compliance** is organised and policed, as a matter of urgency.
- CIBSE is currently spearheading a campaign called *non-compliance costs*. Details at www.cibse.org. The campaign addresses the issue of low rates of compliance with Air Conditioning Inspections and f-gas legislation. Unless there is proper **enforcement**, carbon targets will not be met.

15 eco-towns

- The creation of eco-towns would offer the opportunity to educate the wider public on environmental issues and, in the long term, raise public interest and motivation in STEM and carbon-friendly technologies and public engagement with the low carbon economy.
- Historically, there is a dearth of accurate evidence about actual performance of new buildings because of reluctance to share commercially sensitive data⁸. The discipline of building physics has therefore been slow to develop. Eco-towns offer an opportunity for transparency, and the planning permissions granted could accelerate a move towards more openness, for example by imposing conditions on those involved to share information for the purposes of R and D in the wider community.

⁸ *Engineering a low carbon built environment* page 6

23 skills in the service and support sectors

- As your para 99 identifies, products (for example controls in building management systems, central heating boilers) which are designed to save energy will not do so unless they are appropriately specified and intelligently operated. The contribution of suppliers and manufacturers to the upskilling agenda should not be ignored. When bringing a new product to market, they will always offer free training to potential buyers/installers. There is potential for this type of training to be recognised and ‘accredited’ .CIBSE already does this to some extent through its Directory of Training Providers , and the majority of CIBSE Patrons are product manufacturers.
- We consider that some key skills challenges here lie with the end user. Individual householders (domestic) and facilities managers (non-domestic) will need support to get the most out of low carbon technologies. Widespread installation of smart meters is therefore one priority, along with good communication and interpersonal skills of installers and maintenance technicians..

24 skills for adapting to climate change

Your para 106 identifies professional bodies as key players in building adaptive capacity across society. Alongside our core business of personal professional registration, we engage in research, publishing, training and development, as well as certification as noted in 14 above. CIBSE certainly sees itself and its work becoming better known as progress towards a low carbon economy accelerates. We believe this can best be done through the school curriculum, in an integrated way, and this again builds on the CIBSE proposals for education on these topics to be incorporated into national educational practice. For building adaptive capacity across society, the key skills are likely to be around ‘systems thinking’ and sufficient understanding of STEM principles to enable an appreciation of complex chains of cause and effect. CIBSE is eager to work with government on this.

Finally, it seems clear that all the recommendations in the consultative paper, and our supplementary comments, carry resource implications, at a time when money is tight. But we believe that creating a sound skills base to deliver the low carbon economy must be prioritised in government spending. Failure to invest now will be far more costly in the long term.