



Stepping up on savings

Stephen Finnegan and **Thomas Dowd** discuss the future impact of embodied carbon on meeting emissions targets

The UK government remains committed to the Climate Change Act 2008, which mandates an 80% reduction in CO₂ from 1990 levels by 2050. As part of the strategy of achieving this reduction, all new homes from 2016 will be required to be zero carbon. The 2008 definition required all CO₂ emissions to be reduced to zero through on-site means, covering both regulated emissions from heating, cooling, ventilation and lighting and unregulated emissions from household appliances. Embodied carbon from the construction of the building was excluded.

In 2009 the concept of Allowable Solutions was introduced, which permits developers to pay for carbon saving achieved elsewhere. For example a developer may offset CO₂ emissions against an approved 'on, near or offsite' scheme, such as a local energy storage solution or an investment into low carbon electricity generation. In 2011, a further major change removed unregulated emissions from the definition.

Under the government's current definition, zero carbon involves:

- good fabric energy efficiency (the fabric first approach)
- use of low and zero carbon technologies
- use of Allowable Solutions to compensate for carbon emissions reductions that are difficult to achieve on site.

The exclusion of small sites, anticipated to be developments of fewer than 50 homes, and unregulated emissions have led to accusations of a watering down of the strategy. Pressures have come from large housebuilders, which argue that constructing zero carbon measures will stifle housing development and lead to additional costs. A typical four-bedroom zero carbon home costs on average an additional £9,500. However, we contend that the regulations are already watered down by not including embodied energy emissions.

It is likely that when the debate is over, the focus will inevitably have to shift back to the need to consider the unregulated



▶ and embodied energy of every building. Only then can the UK construct truly sustainable zero carbon buildings.

This will add to the complexity of the decision-making process for the client and the design team, bearing in mind that considering embodied carbon from the concept and design phases through to the material choices can lead to dramatically different outcomes in terms of carbon output. Clearly, in future the choices will be determined by a growing number of factors such as cost, site variables, project team experience and client requirements.

The effect

Five key areas of quantity surveying and project management professional life will be affected once the requirements for consideration of embodied carbon in buildings become mandatory:

- ① **Measurement:** Who will take responsibility and ownership of the measurement and reporting of carbon? Surely the quantity surveyor is best placed to take on board this role. Could measurement rules be either incorporated into the RICS' NRM1, 2 and 3, or is there a requirement for a new standalone NRM4 suite specifically dealing with carbon?
- ② **Optioneering:** Throughout the design process there will be a requirement for the client and the design team, led by the project manager, to develop an optimum solution to the zero carbon conundrum, ensuring value for money. Once the carbon has been measured could the QS take up the opportunity of offering added value? Using the analogy of a carbon rubrics cube, the QS, along with the design team, works through a number of different permutations, beginning with the building fabric, low/zero carbon technologies, Allowable Solutions and embedded carbon, until a combination that best meets the client requirements is met. For example, a building envelope may end up emitting more carbon through the manufacture of additional membranes and materials than is saved in operational terms over the life cycle.
- ③ **Tender appraisal:** What will be placed on operational and embodied carbon in relation to costs during the tender appraisal stage? Would a submission offering reduced carbon take priority over a cheaper construction cost submission?
- ④ **Upskilling:** For the PM and QS to be at the forefront of the

carbon debate, the disciplines will need to take account of the new terminology and technologies to ensure they are able to participate in or lead the design process in terms of material, low carbon technology selection. This includes:

- low carbon technologies, biomass and biogas heating systems, deep geothermal energy systems, micro-hydro, advanced building fabric systems, combined heat and power, district heating
- modern methods of construction, structural insulated panel system
- Fabric Energy Efficiency Standard
- building information modelling
- collaboration and integration of the supply team, the 'flat supply chain'.

⑤ **Design v as-built:** There will be more emphasis on testing a building's performance against how it is supposed to perform. Ad hoc testing could be introduced, with fines for underperformance. This will ultimately put more pressure on the on-site operatives and quality supervisors to ensure that the basics, such as junction detailing and service cut out sealing, are robust enough to ensure there is no gap between aspiration/design and reality on site. There could also be a more concerted effort to move toward offsite manufacture to ensure closer control of these details.

Legal requirements

With the changing role of the QS and PM identified under these five key areas, there will then be a requirement to consider what is compulsory and voluntary. There are three key areas to focus on:

- **construction techniques/methods/specifications:** how will the Climate Change Act and further legislative drivers force the QS and PM to consider carbon? There may be more than the areas identified above that will need to be considered.
- **collaboration and integration of the supply team (contractor/subcontractor):** where does legal responsibility for carbon start and stop, how will it affect supply chains?
- **competitive tendering and framework agreements:** will there be a compulsory legal requirement to consider carbon as part of all future framework agreements, and should it be on a level playing field to other factors in a competitive tendering process?

The landscape is changing and so too is the role of the QS and PM in considering the impact of embodied carbon. ●

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