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Carbon Reductions in New Non-Domestic Buildings
A report by the UK-GBC Task Group
Executive Summary
INTRODUCTION

The publication of the Code for Sustainable Homes set out targets to achieve radical emissions reductions from new homes. This project was commissioned by the Department for Communities and Local Government to add to the understanding of whether similar targets in the non-domestic sector can be set and achieved and on what timescale.

The Task Group endeavoured to answer the following questions:

1. What is total energy use in non-domestic buildings?

2. Is it feasible to reduce the carbon emissions resulting from this energy use down to zero?

3. What would be the estimated cost of these carbon emissions reductions?

4. Over what timescale could zero carbon new non-domestic buildings be achieved?

QUESTION 1: WHAT IS TOTAL ENERGY USE IN BUILDINGS?

After collecting considerable amounts of existing energy-use data in non-domestic buildings from across the membership of the UK-GBC, and modelling a number of building types, estimates of total energy use could be calculated. However, energy-use data for non domestic buildings was found to be inconsistent, ad hoc and by no means complete. A greater understanding of energy use in buildings is essential not only to understand the feasibility and cost of zero carbon new non-domestic buildings, but also to the successful implementation of policy measures to achieve it.

Therefore the first recommendation of this report is the implementation of Energy Performance in Buildings Directive (EPBD) as soon as possible, which must include Display Energy Certificates (DEC) for all new and existing non-domestic buildings. If implemented in conjunction with a consistent data gathering and reporting mechanism, this will allow accurate data to be gathered around the actual use of energy. With this data it will be possible to design and model future buildings with confidence that energy consumption estimates are accurate. Therefore the second recommendation is the construction of a national database to collate and store this data and make it available to the whole industry.

In addition, although not necessarily related to new-buildings, accurate building energy displays could contribute to the development of zero carbon energy solutions which encompass both new and existing buildings.

QUESTION 2: IS IT FEASIBLE TO REDUCE THE CARBON EMISSIONS RESULTING FROM THIS ENERGY USE DOWN TO ZERO?

It is difficult to generalise across all non-domestic building forms and uses, but energy use, and in particular the electricity to heat ratio, is significantly higher for non domestic buildings than it is for domestic property. This means that for most building forms and uses, the implementation of on-site renewable energy solutions is much more challenging. Indeed, the report shows that on-site renewable energy solutions that are capable of meeting all building energy demand are unlikely in most instances, without significant heat dumping or connection to a local heat network.

This leads to recommendation three: the implementation of an effective hierarchy for carbon emissions reductions including energy efficiency in design and the use of on-site, near-site and off-site renewable energy generation solutions. It is relatively well understood, but always worth stating, that there should be a clear hierarchy for achieving emissions reductions, starting with demand reduction, through passive design measures and high-performance specification. Even sources of “renewable energy” can have a finite capacity, and therefore as much, if not more, effort should be put in to designing out energy demand as is put in to designing in energy generation and supply.

Once high levels of passive performance have been achieved the issue of energy supply can be addressed. Ideally the generation capacity should be located as close to the development as possible in order to avoid unnecessary distribution losses, increase local awareness of energy supply issues, and ensure that
all available renewable energy capacity is exploited.

All solutions would need to ensure additional renewable energy generation to avoid double counting of carbon reductions. It is also recognised that the considerable renewable resources of the UK, although very large (one of the largest in Europe) are nonetheless limited and therefore the use of local resources should be prioritised before the use of national offsite sources. Testing of when this should be prioritised should form part of the work on a resource estimation tool.

Therefore the fourth recommendation is the construction of a UK-wide renewable resource estimation tool, tied to local planning requirements. This tool would be used at the planning stage of developments to assess their renewable energy potential. This would need to take into account the potential both for renewable energy generation on the site and for decentralised energy networks which should be tested and set by the planning authority.

The fifth recommendation is that certain minimum energy efficiency measures also be incorporated within higher levels of any rating system, much the same as the Code for Sustainable Homes has a minimum heat loss parameter. This should include minimum cooling load parameters for building uses in order to ensure efficient use of resources before drawing upon UK-wide resources.

**QUESTION 3: WHAT IS THE ESTIMATED COST OF THESE CARBON EMISSIONS REDUCTIONS?**

The estimated cost of delivering all new non-domestic buildings to zero carbon standards varies widely with both the form and the use of the building.

Very few true zero carbon non-domestic buildings have been constructed in the UK; as a result there is little empirical evidence as to what a cost premium might be. Furthermore, due to performance and quality drivers, there is a wide range of costs associated with functionally similar non-residential buildings. Due to the absence of an established knowledge resource and the high variability in baseline costs, the reporting of the extra cost of zero carbon on the basis of a percentage addition runs the risk of significant error, and misrepresenting the factors that drive the cost premium in the first place.

Information was taken from completed projects, which are likely to have relatively low occupation-related loads. The associated modelling, which is based on scenarios that more closely reflect the current commercial marketplace, suggests that the premium could range from over 30 per cent down to as low as 5 or 10 per cent of current baseline costs given sufficient time for the market to develop, and detailed specifications to be costed. In some extreme cases, the premium could well be higher than this. It is important to note that considerable work in building a knowledge base which matches cost premiums with building type and building performance will be required to enable a confident and contextually accurate assessment to be made.

Significant carbon reductions are required to mitigate the onset of climate change, but the economic drivers for this are not yet sufficiently in place to respond to the recommendations of the Stern Review.

Therefore recommendation six is that policy intervention is required and should cut across many policy areas: planning, Building Regulations and energy as a minimum.

This report highlights the fact that energy-demand reductions for building occupiers are not financially incentivised at current energy prices. Therefore, occupiers must be engaged in demand reduction. To do this, and to ensure additionality for the whole lifetime of the building, the seventh recommendation is that consideration should be given to requiring the occupier to pay for the actual amount of carbon emitted (as shown on the DEC) over and above that predicted to be used by the building by the Energy Performance Certificate (EPC).

**QUESTION 4: OVER WHAT TIMESCALE COULD ZERO CARBON NEW NON-DOMESTIC BUILDINGS BE ACHIEVED?**

With commercial property valuations at very high levels, there is little prospect for further upward growth. As a result, an increase in cost related to low-carbon construction
is likely to affect either levels of rent, developer profitability or the price paid for land in the first instance. That said, the market is already gearing up to achieve the challenging targets of the Code for Sustainable Homes and this has been achieved by setting a clear road map for the whole industry to work towards.

A challenging yet achievable timeframe for achieving zero carbon new non-domestic buildings along the lines set for housing is needed to allow the market to innovate, adapt and deliver in a way which ensures both the achievement of carbon reduction goals and the stability of the property sector.

A similar regulatory escalator to that in place for housing is required for non-domestic buildings. Therefore recommendation eight is that the timeline should begin with the next revision of the Building Regulations with step changes at each revision of the Building Regulations, concluding with a zero carbon standard but adding in an extra level of zero ‘regulated’ energy use.

The above cost estimates suggest a very wide range of timelines to achieving zero carbon. However, if a zero carbon new non-domestic buildings target is to be set, this research suggests that with a trajectory in place similar to that adopted for the Code for Sustainable Homes, and the above “zero ‘regulated energy’” step added, a deadline of 2020 could be adopted. This trajectory needs to be clear and fixed to give the industry firm direction to plan and achieve this target. Further work is needed to understand the cost of such a trajectory and to set these costs in the context of the Stern Review. This work has suggested that collaboration between UK-GBC, as the co-ordinating voice of the industry, and Government, can define the most direct road map by bringing together all sectors of the building industry and related organisations in search of common goals. The project would need to be continuous and ongoing. The different organizations participating in the UK-GBC provide effective checks and balances through debate and industry consultation at the very highest level. The release of the Calcutt Review and the subsequent announcement of an investigation into the feasibility of a delivery body to coordinate the delivery of zero carbon homes by 2016 is very relevant. Given the findings and recommendations in this report, attention should be given to how the delivery of all zero carbon buildings can be co-ordinated and delivered.

The full report is available at www.ukgbc.org

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