

Zero carbon homes: Perceptions from the UK construction industry



Emma Heffernan^{a,*}, Wei Pan^b, Xi Liang^c, Pieter de Wilde^a

^a School of Architecture Design and Environment, Plymouth University, Drake Circus, Plymouth PL4 8AA, UK

^b Department of Civil Engineering, University of Hong Kong, Hong Kong, China

^c Centre for Business and Climate Change, Business School, University of Edinburgh, Edinburgh, UK

HIGHLIGHTS

- The strongest drivers were perceived to be in the legislative and economic themes.
- More barriers were identified than drivers or potential support mechanisms.
- Economic and skills and knowledge barriers were perceived as the most significant.
- Uncertainty in zero carbon homes policy is a barrier to zero carbon homebuilding.
- Proposed support mechanisms include zero carbon champions and self-build homes.

ARTICLE INFO

Article history:

Received 20 August 2014

Received in revised form

3 January 2015

Accepted 5 January 2015

Keywords:

Zero carbon homes

Drivers

Barriers

Support mechanisms

Construction industry

Perceptions

ABSTRACT

The take-up of the many voluntary energy efficiency standards which exist in the UK and internationally has been limited. As a result, governments have recognised the need to introduce mandatory schemes through legislation, e.g. from 2016 all new build homes in the UK will be required to achieve zero carbon in regulated energy consumption. However, as 2016 approaches, very few zero carbon homes are being delivered. This paper explores the drivers and barriers for zero carbon homebuilding. The perceptions of the wider construction industry were gathered through a series of semi-structured interviews with professionals involved in commissioning, designing, constructing and regulating housing. The results show that, whilst drivers for zero carbon homebuilding exist, the barriers are currently perceived to be greater than the drivers. The barriers are categorised into five groups: economic, skills and knowledge, industry, legislative and cultural. Mechanisms for policy and industry support for the delivery of zero carbon homes are identified to address these barriers. The research findings highlight the need for a clear and robust policy framework for the forthcoming standard. The Government and industry must prioritise raising public awareness of the need for and benefits of zero carbon homes to help develop market demand.

© 2015 Elsevier Ltd. All rights reserved.

1. Introduction

Globally, buildings represent around 40% of primary energy consumption (IEA, 2014). The building sector has been identified as the sector with the greatest potential to reduce consumption (IPCC, 2007; GhaffarianHoseini et al., 2013). The UK Government has committed to a legally binding target of reducing carbon dioxide (CO₂) emissions by 80% of 1990 levels by 2050 (HM Government, 2008). In 2012, the domestic sector accounted for approximately 29% of final energy consumption in the UK (DECC,

2013a), 82% of this energy was used for space heating and domestic hot water (DECC, 2013b). Therefore, new build housing has the potential to be a leader in meeting the CO₂ emission reduction target. In 2007, the UK Government formally announced their intention to move towards the requirement for all new homes to be zero carbon from 2016 (DCLG, 2007) ahead of the Europe-wide requirement for all new buildings to be 'nearly zero-energy' by 2020 (European Union, 2010). When it was announced, zero carbon was defined as 'over a year, the net carbon emissions from all energy used in the home would be zero' (DCLG, 2007 p. 5). As a means of encouraging the housebuilding sector to voluntarily improve the energy efficiency of new homes, the Code for Sustainable Homes (the Code) was introduced in 2007 (DCLG, 2013a). Since its inception, very few homes have been built to the higher levels of the Code (DCLG, 2013b) and of those that have, the vast

* Corresponding author.

E-mail addresses: emma.heffernan@plymouth.ac.uk (E. Heffernan), wpan@hku.hk (W. Pan), Xi.Liang@ed.ac.uk (X. Liang), pieter.dewilde@plymouth.ac.uk (P. de Wilde).

majority have been public sector housing. The statistics are suggestive of a reticence from the private housebuilding sector to act voluntarily; a view supported by the literature (Peterman et al., 2012; Goodchild and Walshaw, 2011). Therefore, housebuilders are failing to deliver *zero carbon homes* in preparation for the 2016 Regulations. Previous research into why the private sector is failing to respond to the non-mandatory stimulus has been limited. The research that has been undertaken has focused solely on the views of the large volume housebuilders (Osmani and O'Reilly, 2009). This previous study is primarily quantitative in nature and predates the ongoing global financial crisis which has had a significant impact on housebuilding activity in the UK (Sharman, 2014).

The aim of this paper is therefore to explore the barriers to the mass development of zero carbon new build homes in the UK through an investigation of perceptions around zero carbon homebuilding from professionals involved in the commissioning, design, construction and regulation of housing. The objectives of the paper are to

- Establish the state-of-the-art in zero carbon homebuilding through a critical review of the literature.
- Evaluate the drivers for zero carbon homebuilding.
- Explore the barriers and challenges in delivering *zero carbon homes*; and
- Formulate mechanisms, for both policy and practice, to support the delivery of *zero carbon homes*.

The remainder of this paper is organised as follows: the subsequent section provides a background on the mandatory and voluntary context for the energy efficiency of new build homes in the UK and the wider context and also considers the diffusion of energy efficiency innovation within housebuilding. Section 3 sets out the methodology employed in the research. Section 4 presents the findings of the empirical research and Section 5 evaluates these in the policy context. Finally, conclusions are drawn and implications for policy and practice are identified in Section 6.

2. Towards zero carbon

2.1. Nearly zero-energy buildings

From 2020, there will be a requirement for all new buildings within the member states of the European Union to be 'nearly zero energy' (European Union, 2010):

"nearly zero-energy building" means a building that has a very high energy performance... The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby"

The Energy Performance in Buildings Directive (EPBD) places the responsibility for developing a legislative framework for the

delivery of 'nearly zero-energy buildings' on the individual member states; *zero carbon homes* and *zero carbon buildings* are the UK's response to this Directive. Whilst flexibility is necessary to allow individual countries to develop their legislation with regard to their own contextual conditions, Mlecnik (2012) cites the confusion created by the diversity of definitions internationally as an obstacle to the implementation of the EPBD. Indeed, the fact that no common definition for zero energy buildings exists remains of concern internationally (Marszal et al., 2010; Torcellini et al., 2006). Thus, due to the tightening legislative backdrop, there has been much discussion with regards to definitions around zero energy buildings. A number of papers have considered definitions for zero energy buildings (Hernandez and Kenny, 2010; Marszal et al., 2011; Torcellini et al., 2006) and a broad range of issues in relation to the scope of a definition have been considered, including energy efficiency, renewable energy generation, grid connection and system boundaries *inter alia*. However, whilst there has been debate around definitions for zero energy buildings, there has been little debate about the definition of *zero carbon homes* within the academic literature. The definition of *zero carbon homes* in the UK has been discussed in the context of changes made since the standard was first proposed (McLeod et al., 2012). Heffernan et al. (2013) suggest that the proposed definition for *zero carbon homes* is limited and present energy balance options for consideration in the development of a holistic definition.

2.2. Zero carbon homes

Zero carbon homes is a standard first announced to the UK construction industry in 2007, at which point the UK Government expressed an intention to require all new homes to be *zero carbon* from 2016 (DCLG, 2007). The standard was originally ambitious, requiring not only the emissions from regulated energy (for heating, cooling, hot water, ventilation, auxiliary services and lighting) to be accounted for, but also those from unregulated energy (for cooking and plug-in appliances) (DCLG, 2007). The Zero Carbon Hub is a public/private partnership that has been and continues to be central to the development of the definition of *zero carbon homes* in the UK. Their 2014 proposals suggest the *zero carbon homes* standard will comprise three elements for compliance: a Fabric Energy Efficiency Standard (FEES); on-site energy generation using low or zero carbon technologies (Carbon Compliance) and 'allowable solutions' (Zero Carbon Hub, 2014). Allowable solutions provide for local, near or off-site carbon offsetting, such as a community renewable energy scheme (Zero Carbon Hub, 2011). Between 2007 and 2014, the proposed definition of zero carbon for the standard has been subject to two significant amendments; firstly, the introduction of allowable solutions in 2009 (Parliament UK, 2009) and secondly, the removal of the requirement to account for unregulated energy in the 2011 budget (HM Treasury and BIS, 2011) (Fig. 1).

The Government was initially criticised for the ambitious speed and scale of the zero carbon policy (Lowe and Oreszczyn, 2008) and recommendations were made to limit the targeted reduction

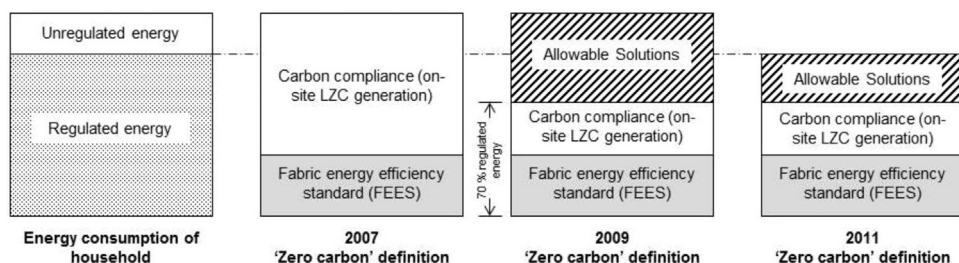


Fig. 1. The Evolution of the official zero carbon definition in the UK (developed from Zero Carbon Hub, 2011).

Download English Version:

<https://daneshyari.com/en/article/7401081>

Download Persian Version:

<https://daneshyari.com/article/7401081>

[Daneshyari.com](https://daneshyari.com)