

## Introduction

The Building Regulations were amended on October 1<sup>st</sup> to include more stringent minimum carbon dioxide (CO<sub>2</sub>) emissions for new residential dwellings. A reduction of 25% is required in England and Wales and 30% in Scotland compared to the 2007 standards. This is part of a staged improvement with the aim of achieving net zero carbon for new housing by 2016.

The Regulations encourage the consideration of building design in a holistic way, rather than focusing on specific elements such as insulation or boiler efficiency. This 'whole dwelling' approach lends itself to a significant degree of design flexibility and a range of measures can be considered in order to find the most cost-effective solution. A number of these have been listed below:

### Measures to achieve new CO<sub>2</sub> emission standards:

- passive solar design measures
- thermal mass and insulation improvements
- ventilation and air tightness improvements
- lighting improvements
- enhanced heating and lighting controls
- on-site low carbon and renewable technologies
- district wide Combined Heat and Power systems



## Costs

Research<sup>1</sup> indicates that improved thermal insulation and air tightness is unlikely to achieve the new standards cost-effectively and that the benefits of low carbon / renewable technologies (e.g. photovoltaic (PV) panels, solar water heating, combined heat and power and heat pumps) should be considered. The feasibility and cost of different solutions depends upon the location of the dwelling, the dwelling type and size, as well as availability of fuels. Hence, there is no 'one-size fits all solution' and measures should be evaluated on a site-specific basis.

Initial research indicates that in Scotland on-site communal wind power can, under the right conditions, represent a cost effective solution in rural locations, whilst solar water heating and air source pumps are low capital cost options for both urban and rural locations<sup>1</sup>. It has been estimated that the 30% reduction required in Scotland can be achieved for a minimum additional capital cost<sup>1</sup> ranging between 2.7-5.8%. Other studies indicate the cost of achieving compliance in England could be higher at 2-9%<sup>2</sup>.

For dwellings that use LPG, oil or electricity as their primary fuel source, the impact of the various improvement scenarios differs from those fuelled by mains gas.

<sup>1</sup> <http://www.scotland.gov.uk/Resource/Doc/217736/0091341.pdf>

<sup>2</sup> ACT Building Control Ltd. – Summary of Key Changes to the Building Regulations 2010

### Life cycle costs and payback periods

Where an individual is building their own property it will be important to consider the lifecycle costs of low carbon and renewable technologies. This is the total cost of the technology over its operating life, including capital, maintenance and energy costs. The new Feed-In Tariff (FIT) and the forthcoming Renewable Heat Incentive (RHI) should be included as part of the financial analysis as they can significantly shorten payback periods.

If thermal efficiency of the building is high then heat pumps (both ground and air) are options with a short payback period. Although the upfront costs of PV panels are comparatively high, the FITs provide favourable rates and make this an attractive technology from a lifecycle cost perspective.

Extensions to existing buildings or conversion of buildings, such as barns into uses which require the building to be heated, also require the structure to meet the new standards on thermal insulation and air tightness. Payback periods for improvement scenarios for existing dwellings are generally shorter because greater annual savings in energy costs are achievable when compared to dwellings constructed to current building standards<sup>1</sup>.

The Regulations do not take into account the embodied energy in the structure of existing buildings which should be taken into consideration when deciding whether to demolish and replace a building or convert it to a new use.

Improvements in energy performance to older buildings can be achieved by improving the lighting systems and incorporating more energy efficient heat sources such as biomass. Improvements to thermal insulation of the property should be considered and carried out sympathetically in Listed Buildings. Each building should be reviewed on a case-by-case basis.

### How we can help

Our Architects and Building Surveyors work closely with the Sustainability, Renewables and Energy team to find the most cost-effective solutions for our clients. For further information please contact Richard Henderson or Lucy Morgans:

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