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Building Zero Carbon - the case for action

Examining the case for action on Zero Carbon Non Domestic Buildings



CAMPAIGN FOR A SUSTAINABLE BUILT ENVIRONMENT

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EXECUTIVE SUMMARY

INTRODUCTION

The UK-GBC Zero Carbon Non Domestic Task Group was formed to help define and build support for an ambitious definition of 'Zero Carbon' for non-domestic buildings that works for industry.

The Task Group believes there is a very strong economic case for establishing a robust definition of zero carbon for non-domestic buildings as soon as possible. The industry stands ready to invest in innovation and skills to meet higher standards, but the lack of detail on policy implementation means that current efforts are fragmented and disparate, creating inefficiencies and the loss of global export opportunities.

Current Policy Status

The Coalition Government has expressed its support for the 2019 zero carbon target for non domestic buildings.¹

While we know now what the uplift will be for Part L 2013 (a 9 per cent aggregate improvement over 2010), we still do not have clarity on the parameters of the zero carbon definition for non-domestic, or what the uplift in Part L will be in 2016, 2019 and beyond. Furthermore, the recent Allowable Solutions consultation did not address how, or even if, Allowable Solutions would apply to new non-domestic buildings.

A MISSED OPPORTUNITY - THE ECONOMIC POTENTIAL OF BUILDING REGULATIONS

Inaction in setting a standard is already costing UK industry both time and money. Indeed, the 2020 Nearly Zero Energy Building requirement under the recast EU Energy Performance of Buildings Directive has already signalled where the bar will be for Europe's property developers in just over five years' time. However, without a clear policy direction in the UK for new low energy non-domestic buildings (as there has been for new homes), the non-domestic sector and their supply chains are not in a position to move forward in unison in order to innovate and deliver competitive solutions. There are pockets of innovation happening to pre-empt the Directive, but this work is currently stifled and disparate because of policy uncertainty. This costs both time and resources, and misses an opportunity to give UK industry a head start and market advantage in developing products and solutions to meet a UK standard, which can be traded into other EU Member State markets.

This Task Group believes that greater policy certainty about future changes to the non-domestic Building Regulations will enable economic growth and unlock significant carbon emissions reductions. Acting now to develop a standard will provide opportunities for UK industry to gain a head start in meeting an EU wide standard from 2020, which could support the rebalancing of the economy and drive export-led growth. By reconfirming the 2019 zero carbon goals now, the UK can begin to **activate both national and internationally based inward investment** into construction supply chains and product innovation pathways.

As highlighted by the Low Carbon Innovation Co-ordination Group (LCICG), "*Innovation in the non-domestic buildings sector represents a significant opportunity to help meet the UK's GHG emissions targets, as well as providing value through avoided energy costs, amounting to*

¹<http://www.publications.parliament.uk/pa/cm201011/cmhänsrd/cm101220/wmstext/101220m0001.htm>

savings of 86MtCO₂ and c. £13bn by 2050. Innovation could help create export opportunities that could contribute an estimated £1.7bn to GDP to 2050.”²

Building Regulations for energy efficiency are therefore needed because there is a market failure in the relationship between developers and designers of the built environment and those who occupy the finished buildings. This is true in both non-domestic buildings and housing. The Task Group believes that Building Regulations are an effective regulatory tool, among many potential policy levers, to address energy consumption and CO₂ emissions in the built environment. Planned changes to the Building Regulations over the past 10 years have seen real benefits to the whole industry - not just energy savings for occupiers but also investment in new technologies and construction methods (reducing build costs for developers) and the up-skilling of all those engaged in building the places where we live and work. We believe the industry could go further with policy certainty.

It is also important to emphasise that improvements in techniques and technologies on new buildings will also benefit the refurbishment of existing buildings by bringing costs down and building the skills of industry.

BARRIERS TO PROGRESS

Current policy implementation

The potential benefits to UK Plc have been jeopardised by the nature of the recent implementation of Part L of the Building Regulations. The stop/start nature of policy implementation, with delayed announcements and incremental improvements which significantly varied from the original consultation options has been unhelpful for the industry. This in turn has failed to motivate investment into innovation or enable the industry to position the UK as a leader in efficient construction skills and technologies.

Impact Assessment

Since January 2013, under the One In, Two-out (OITO) rule, Government departments are

expected to offset any increase in the cost of regulation by finding deregulatory measures of at least twice the value.³ However, the current methodology to assess impact on industry fails to consider broader benefits, or even to allow for innovation in building components and design. This Task Group feels strongly that future analysis of the impact of Building Regulations changes should be broadened - and that the likely outcome will be an economic benefit to a wide set of stakeholders. Fig. 1 sets out the extent of the current Impact Assessment methodology and the

Current Impact Assessment Approach Used	Cost	<ol style="list-style-type: none"> Increased provision of on-site renewables <ul style="list-style-type: none"> Accrues to Builders / Developers <p>Assumes cost of PV drops over time at background rate</p>
	Benefit	<ol style="list-style-type: none"> Reduced operational costs <ul style="list-style-type: none"> Accrues to occupiers of buildings Reduced operational carbon emissions <ul style="list-style-type: none"> Accrues to planet
Actual Industry Impact (suggested approach)	Cost	<ol style="list-style-type: none"> Investment in improved technologies and building practices <ul style="list-style-type: none"> Accrues to product manufacturers and contractors Assumes cost drops over time Investment in improved building designs <ul style="list-style-type: none"> Accrues to designers and developers Assumes cost drops over time Increased provision of renewables <ul style="list-style-type: none"> Assume level of renewables required drops over time Accrues to Builders / Developers <p>Assume cost drops significantly over time due to innovation</p>
	Benefit	<ol style="list-style-type: none"> Reduced operational costs <ul style="list-style-type: none"> Accrues to occupiers of buildings Reduced operational carbon emissions <ul style="list-style-type: none"> Accrues to planet Improved knowledge and skills <ul style="list-style-type: none"> UK industry competitiveness Reduced cost of products / construction over time Exporting new designs and products abroad: <ul style="list-style-type: none"> UK PLC

Fig. 1 Current and Proposed Impact Assessment Methodology

² LCICG, 2012 ‘Technology Innovation Needs Assessment (TINA) Non-Domestic Buildings Summary Report’ <http://www.lowcarboninnovation.co.uk/document.php?o=11>.

³https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211164/bis-13-p96a-sixth-statement-of-new-regulation.pdf

Task Group's proposals for how this should be expanded; which we feel better reflects the real costs and benefits of policy.

THE SOLUTION - A SHARED ROUTE MAP TOWARDS 'ZERO CARBON'

The Task Group believes that the original vision of a zero carbon policy should be maintained; that at some point in the future new buildings should be nearly zero regulated energy and have no CO₂ emissions through investment in renewables and/or, investment in improving existing buildings.

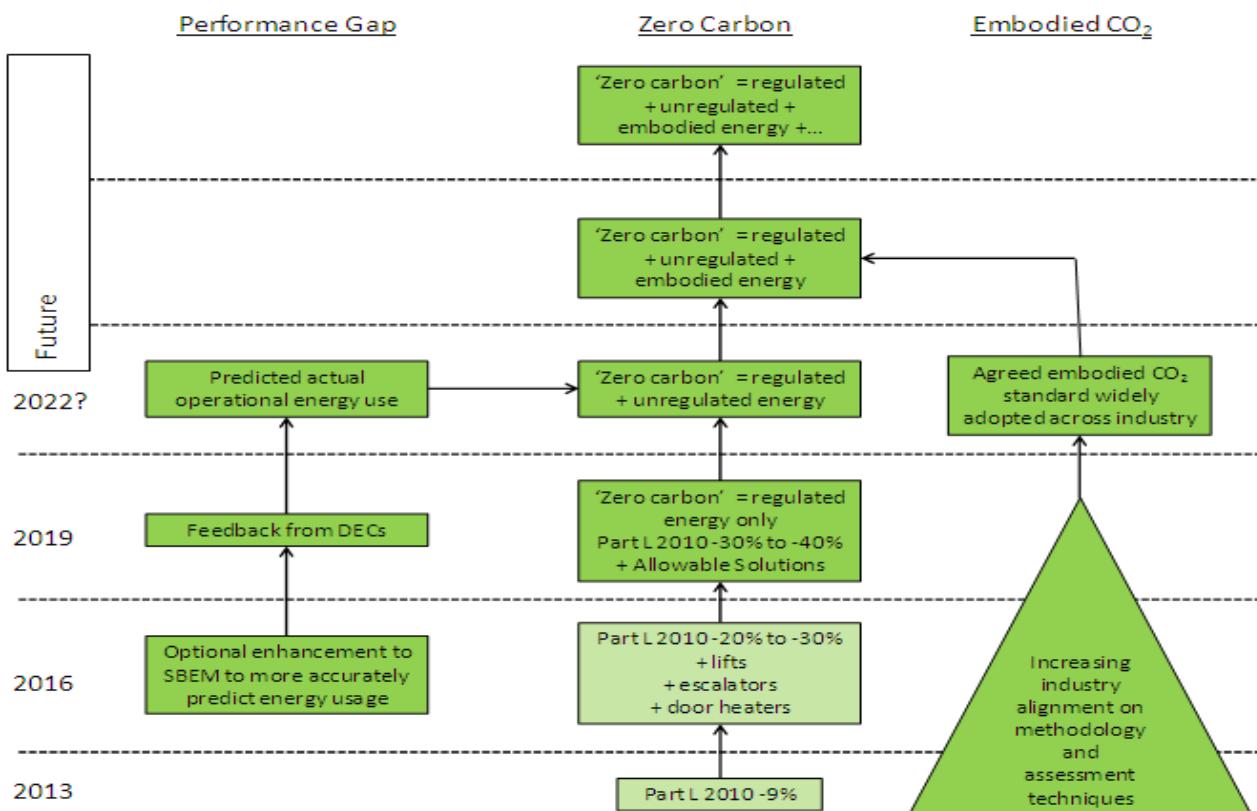


Fig 2 Potential 'Zero Carbon' Roadmap for Non-Domestic Buildings

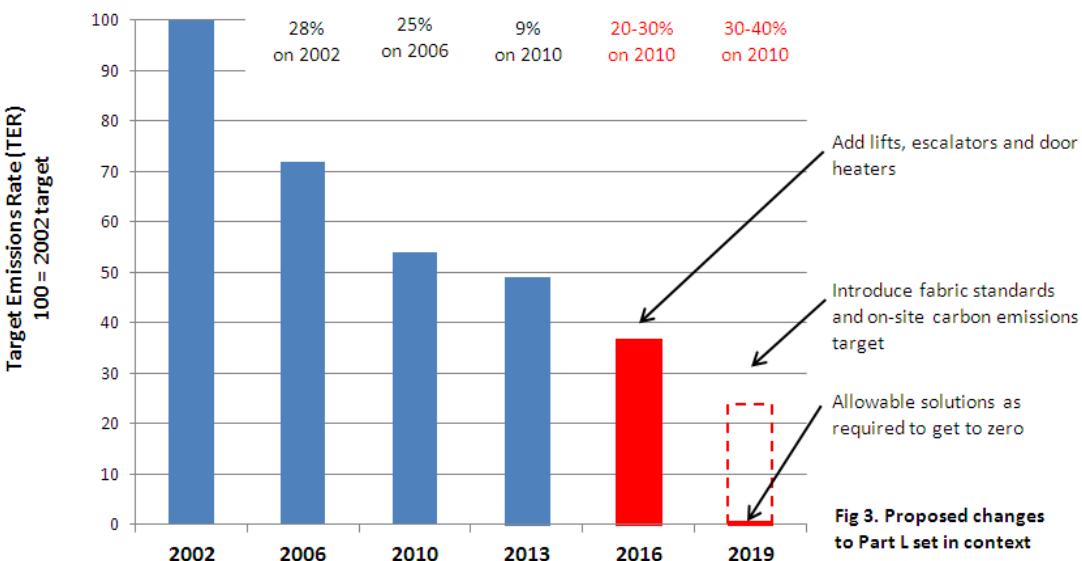
Notes:

The suggested percentage improvements are indicative only and are a representation of the form of the trajectory we'd like to see from government. These figures are aggregate saving across the non-domestic build mix.

We also think that Government policy, in time, should seek to reduce and offset, or otherwise address unregulated energy and the 'capital' carbon associated with the construction of buildings (embodied carbon).

Getting there will not be easy, but as we set out above, confirming the ambition could bring significant economic as well as environmental benefits. We also recognise that Building Regulations are just one of many regulatory influences on emissions from buildings; achieving zero carbon in new buildings will require other regulatory influences and strong industry investment in methodologies and standards. Therefore the Task Group has proposed a 'routemap' (see Fig.2) for achieving zero carbon buildings, acknowledging it needs further work but calling for Government to adopt the routemap as a shared goal between BIS, DECC, CLG and industry.

UK-GBC has a long history of promoting challenging energy performance standards in new building regulation⁴ which has led to benefits to the developers, designers, owners and occupants. The Task Group supports raising energy efficiency standards in Building Regulations in 2016 and 2019. These should be set in context of a proposed shift towards minimum fabric efficiency standards, an aggregate approach to standards for non-domestic buildings, and a minimum on-site carbon emissions threshold to be achieved before applying Allowable Solutions. This is illustrated in Fig. 3.



TECHNICAL DEFINITION

Extending the definition of ‘regulated energy’

The non-domestic zero carbon definition should initially account for the energy consumption and related CO₂ emissions of the fixed building services, as currently defined in Part L of the Building Regulations. We are also proposing the addition in 2016 of the following items to the definition of fixed building services, used to calculate building emissions: over door heaters, lifts, escalators.

Unregulated emissions

Due to the wide range of building types and uses included in the non-domestic definition, there is a significant variance in ‘unregulated’ loads which includes small power, IT servers, and any other energy uses not covered by the current Part L. This is difficult to predict even within the same building use type. Additionally, those responsible for the design of the building fabric and systems often have no influence on how a building will be fitted out, or how the building will eventually be used. However, the unregulated energy consumed in a building is clearly part of the building energy consumption and should therefore be included in the emissions that make up the zero carbon definition. The Task Group feels that 2019 is probably too soon to add all ‘unregulated’ loads into the zero carbon definition, but this should be considered for future iterations of Building Regulations.

⁴ See for example UK-GBC, 2008, *Definition of Zero Carbon* and UK-GBC, 2007 *Carbon Reductions in New Non Domestic Buildings*

The ‘Zero Carbon’ definition

The definition of zero carbon for non-domestic buildings in 2019 should mirror that proposed for homes, building on the work done by the Zero Carbon Hub’s residential hierarchy of energy performance.⁵ This standardises design approaches for both domestic and non-domestic buildings and provides simplicity to the sector.

Fig.4 Proposed Zero Carbon hierarchy

- Passive measures and building long-life fabric efficiency (Fabric Standard);
- Systems component / systems efficiencies, including on-site renewables as much as is cost effective (Building Energy Usage & Emissions);
- Off-site renewables / carbon mitigation (Allowable Solutions)

Zero Carbon (regulated energy) compliance

3. Zero Carbon (regulated energy) →

Off-site
Allowable
Solutions

Carbon Mitigation
on-site /connected

Building Baseline Energy

Elemental Efficiency

2. Defined maximum energy use →

1. Fabric & systems
minimum efficiencies →

Fitout / Unregulated Energy
Building Regulated Energy

UK-GBC Non-dom zero carbon task group

Fabric standard

A building fabric efficiency target should be included within the non-domestic zero carbon definition. This approach would represent a development of the Building Regulations Part L2A which includes elemental back stops for fabric performance and potentially aligns with the proposed zero carbon definition for domestic buildings which includes a Target Fabric Energy Efficiency (TFEE) rate.

Methodologies and metrics

The SBEM methodology is well known by industry but needs development to reward low carbon systems (such as natural ventilation) and to regain an intuitive relationship between carbon emissions and energy use. Therefore, the notional building baseline should always use a standardised and transparent servicing solution to ensure a consistent target irrespective of design solution. Additionally, Part L and SBEM should be able to accurately account for complex and innovative low carbon design solutions, without penalising simpler buildings.

These changes should be relatively simple to implement - the aim is to create transparency and predictability for the industry, rather than propose wholesale changes which would be counter-productive in providing clarity for the non-domestic zero carbon trajectory.

Simple buildings

Further investigation should be conducted to assess the potential implementation of an alternative, quicker route to compliance for simple buildings using a ‘deemed to satisfy’ method, based on meeting the fabric and system efficiency targets set out in the National Calculation

⁵ <http://www.zerocarbonhub.org/zero-carbon-policy/zero-carbon-policy>

Methodology (NCM) notional building systems and fabric recipe, with no modelling required to meet Building Control approval.

Allowable Solutions

The generic principles and draft framework for Allowable Solutions for homes were recently released by CLG for consultation.⁶ A similar mechanism should be adopted as part of the zero carbon definition for non domestic buildings. This will assist in having the two definitions aligned and will provide a consistent way of offsetting part of the carbon emissions through off-site means, irrespective of building type. The emissions covered by Allowable Solutions are emissions that would not be technically feasible or cost effective to mitigate on-site.

Compliance vs. Operational Consumption

A programme should be put in place to address the performance gap for non-domestic buildings (which is the often significant difference between the Building Emission Rate (BER) predicted by SBEM and the actual metered energy consumption in operational buildings). This should provide a methodology for predicting building emissions from both regulated and unregulated sources more accurately, and allow SBEM to produce both an Energy Performance Certificate (EPC) based on regulated energy and an estimate of the likely operational energy rating based on a range of occupancy scenarios.

CONCLUSION

The Task Group has reinforced the case for Building Regulations, reiterating the need for mandatory regulation in this area and proposing future changes which will continue to challenge the built environment industry. Collectively, as a group of designers, developers, contractors, product suppliers and energy suppliers we argue for increasing future standards in Building Regulations in the non-domestic sector.

We believe there is a very strong economic case for establishing a robust route map towards zero carbon for non-domestic buildings as soon as possible. Establishing the details of Building Regulations for such buildings now gives everyone in the industry time to prepare, levelling the playing field and reducing the burden to all those involved in construction. A clear and specific vision for future policy will encourage investment in product innovation and up-skilling for hundreds of thousands of workers. The knowledge gained from preparing for and meeting higher regulatory standards in the non-domestic sector will be a great opportunity for UK architects, engineers and manufacturers to become global leaders in energy efficient building designs.

By moving before other countries in mandating change in the design of the built environment, the UK can deliver job creation, climate protection and new world-leading manufactured product exports which will support the rebalancing of the UK economy as a whole.

In order to capitalise on these opportunities, we believe Government should work with industry to create a ‘roadmap’ to Zero Carbon 2019 and beyond - setting out the broad parameters of the zero carbon standard which will focus efforts and enable the industry to innovate and evolve. This should not be limited to regulated energy, but encompass the broader scope in the future of energy in-use and embodied carbon. The routemap should recognise that Building Regulations are just one of many policy levers for reducing energy consumption/demand and CO₂ emissions associated with the built environment. In doing this, we call on the entire industry to invest in developing the methodologies, standards and analysis needed to underpin regulatory and policy interventions.

⁶ <https://www.gov.uk/government/consultations/next-steps-to-zero-carbon-homes-allowable-solutions>

RECOMMENDATIONS

- 1) Government should restate its firm commitment to zero carbon non-domestic buildings from 2019 immediately. In order to capitalise on the economic growth and export opportunities of low carbon building knowledge, skills and technology, the UK should be the ‘first mover’ within Europe in defining zero carbon/ ‘Nearly Zero Energy’ Buildings, giving UK industry the certainty to invest and to gain a head start.
- 2) DECC, BIS and CLG should work with industry over the next year to create a ‘roadmap’ to 2019 and beyond - setting out the parameters of the zero carbon standard and enabling industry to invest in innovation and skills.
- 3) The Impact Assessment methodology used by Government to assess the economic costs and benefits of policy should be revised to account for a broader range of impacts to UK Plc.
- 4) Industry, working with Government, should form a Zero Carbon Non-Domestic Buildings Hub to finalise the definition of zero carbon, and facilitate implementation.
- 5) The technical definition of zero carbon should follow a similar model to that for the residential sector: a minimum building efficiency standard and a minimum on-site carbon emissions target. The Allowable Solutions framework should apply to non domestic buildings as well as homes, and follow a similar structure as proposed for homes.
- 6) The definition of regulated energy in 2016 should be extended to cover more fixed building services - lifts, escalators and over-door heaters. Whole life carbon emissions currently outside the scope of Part L should be brought into regulation over time (post 2019). These include other unregulated energy uses and embodied carbon.
- 7) To build the knowledge and data necessary to incorporate embodied carbon into regulations, designers, contractors and manufacturers should be encouraged to take practical steps now to measure and reduce embodied carbon using the applicable CEN/TC 350 standards. Government can assist by incorporating embodied carbon assessment into the BIM component of the Government’s Construction Strategy 2016 and also by giving preference to purchasing products with third party certified Environmental Product Declarations.
- 8) SBEM is currently used to determine Energy Performance Certificate (EPC) ratings and Part L compliance. SBEM should be developed to provide additional and optional functionality which could be used to generate more accurate predictions of energy use in future, possibly presented as a range of results based on different occupancy scenarios, through incorporating feedback from the non domestic buildings sector and operational energy certificates.
- 9) There is a need for industry-wide measurement and disclosure of operational energy use, ensuring like for like building comparison is possible, and including building services/tenant responsibilities. Industry is currently working to encourage greater action in this area, improve existing tools, and develop new approaches. In the longer term, operational energy certificates and their public disclosure should become mandatory for non-domestic buildings.
- 10) Further investigation should be conducted to assess the potential implementation of an alternative, quicker route to compliance for simple buildings.

1. INTRODUCTION

Why a UK-GBC Task Group?

Arguably one of the most significant and radical environmental policies of recent years has been the commitment by subsequent governments to achieving ‘Zero Carbon’ new homes by 2016 and new non-domestic buildings by 2019.

In December 2006, the former Government promised that all new homes would be zero carbon from 2016, with three clear regulatory steps in 2010, 2013 and 2016. This was a ground breaking announcement, and had a galvanising effect on the house-building industry and supply chain. An incredible amount of innovation has taken place which has seen new homes being built to increasingly high environmental standards, and costs falling⁷, en route to 2016.

It is hard to over-state just what a significant impact the 2016 policy has had on the house building industry, genuinely galvanising it into action and catalysing innovation. As a result of this policy, the UK is now competing with countries like Germany and Sweden to produce some of the best quality, most efficient, innovative and well-designed new homes in Europe. The most entrepreneurial companies in the industry are in the process of rethinking and reengineering their business, to become enablers of high-quality, low-cost and low-carbon living, and are already building to/beyond the 2013 Part L standards.

With the setting of the regulatory escalator towards 2016, the Government showed it recognised that small, incremental changes to Building Regulations every few years were simply not enough to precipitate a fundamental change in the construction industry. Equally, most house builders recognised that the best way of delivering higher standards was for Government to set out clearly, and far in advance, what the changes were going to be and when. This would allow companies to invest in research and development and gear up in advance.

Following the announcement of the Zero Carbon 2016 target for homes, in 2007 a UK-GBC Task Group investigated whether a similar target should be set for non domestic buildings. The Task Group’s *Carbon Reductions in New Non-Domestic Buildings* report recommended that a target of 2019 should be set for all new non domestic buildings to be zero carbon. The Labour Government subsequently adopted this as policy and went on to consult on the definition of zero carbon for non domestic buildings. UK-GBC ran a series of consultation workshops around the country with CLG. You can view the consultation [summary report](#) here.

Since the change in government in 2010, the Coalition Government has expressed its support for the 2019 Zero Carbon target for non domestic buildings⁸ and reviewed the definition again. The Department for Communities and Local Government (DCLG) asked Aecom to undertake some work to inform this which can be downloaded [here](#)

Current policy status

The Government published a [Written Ministerial Statement](#) in July 2013 setting out what the next uplift will be for Part L 2013 for non domestic buildings (a 9% aggregate improvement over 2010), but we still do not have clarity on the parameters of the zero carbon definition, or what the uplift in Part L will be in 2016, 2019 and beyond. Furthermore the recent Allowable Solutions consultation did not address how, or even if, Allowable Solutions would apply to new non-domestic

⁷ New analysis produced by Sweett Group for the Zero Carbon Hub shows that the additional costs associated with building to the proposed Zero Carbon Standard have declined significantly since 2011, and are expected to continue to fall as we approach 2020. <http://www.zerocarbonhub.org/news/cost-building-zero-carbon-drops>

⁸<http://www.publications.parliament.uk/pa/cm201011/cmhsrd/cm101220/wmstext/101220m0001.htm>

buildings. What is needed is confirmation of the level of regulation going forward, and recognition of the wider benefits of Buildings Regulations.

The Task Group believes there is a very strong economic case for establishing a robust definition of zero carbon for non-domestic buildings as soon as possible. The industry stands ready to invest in innovation and skills to meet higher standards, but the lack of detail on policy implementation means that current efforts are fragmented and disparate, creating inefficiencies and the loss of global export opportunities.

Process

The Task Group was convened in September 2013, and chaired by Sarah Cary of British Land. The members of the group can be found on the back page of this report. The Task Group focused on two areas:

- 1) Building the economic/business case for action - building on the BIS Construction Sector Industrial Strategy, what are the economic benefits to UK plc of delivery zero carbon non domestic buildings? What are the costs of uncertainty, and benefits of setting medium-term policy now?
- 2) The technical detail of the Zero Carbon definition

In December the Task Group issued a consultation document to UK-GBC members and other industry organisations in order to gain a wide range of views. This ran for approximately one month. The responses fed into the Task Group's final conclusions and recommendations.

2. BUILDING REGULATIONS: ONE OF MANY INFLUENCES ON ENERGY IN THE BUILT ENVIRONMENT

The context for Building Regulations

Buildings in the UK account for nearly half of our carbon emissions. Around 26% can be attributed to our homes and around 17% to so-called non-domestic buildings. Furthermore, the Government backed Low Carbon Innovation Coordination Group (LCICG) predicts that by 2050, total UK non-domestic floor area is expected to increase by 35 per cent, so this problem is set to grow.⁹ The term 'non-domestic' buildings includes all buildings which are not homes, of all sizes - from hospitals and schools to offices and supermarkets to corner shops.

A market failure that requires regulation

In a market facing above inflation energy price increases for the foreseeable future, some question whether there is any need for further regulation on energy efficiency at all. This ignores the consistent economic messages that there are significant hidden costs and organisational barriers which prevent the uptake of energy efficiency measures. In particular, the commercial non domestic building industry has yet to find a bridge over the landlord and tenant gap - a way for developers to see the value from investing in increased energy efficiency in new buildings.

⁹ LCICG, Technology Innovation Needs Assessment (TINA), Non-Domestic Buildings Summary Report <http://www.lowcarboninnovation.co.uk/document.php?o=11>

Also, despite current affordability concerns regarding the impact of ‘green policies’ on energy prices, they do not currently reflect the full economic cost of climate change to the UK economy this suggests a need for either higher prices or further policy aligned to key decision points, such as the specification of a new building.

Building Regulations for energy efficiency are therefore needed because there is a market failure in the relationship between developers and designers of the built environment and those who occupy the finished buildings. This is true in both non-domestic buildings and housing. The Task Group believes that Building Regulations are an effective regulatory tool, among many potential policy levers, to address energy consumption and CO₂ emissions in the built environment. Planned changes to the Building Regulations over the past 10 years have seen real benefits to the whole industry - not just energy savings for occupiers but also investment in new technologies and construction methods (reducing build costs for developers) and the up-skilling of all those engaged in building the places where we live and work.

However, mitigation of carbon emissions is not the only driver for action. Indeed, the LCICG project that the potential net value from energy savings from non domestic buildings is c. £13bn to 2050. In 2010, the Carbon Trust¹⁰ reported that a **35 per cent carbon saving is possible for the whole non-domestic building stock with a net benefit to the economy of at least £4bn by 2020**, and the same report noted that a **75 per cent saving by 2050 was achievable at no net cost**. This suggests that new-build should be able to go much further.

Minimum standards in a regulatory context

In approaching zero carbon policy in Building Regulations, the Task Group sought to be mindful of the wider regulatory context for energy in the built environment. In doing this the Task Group called upon current work by the Green Property Alliance Carbon Penalties and Incentives Project.

Reflecting on the various regulatory and policy instruments demonstrated in Figure 1 below, **the Task Group concluded that the current regulatory context highlighted a strong and important role for Building Regulations in setting minimum standards**. Building Regulations are applied at the point of construction and they apply to all stakeholders regardless of ownership, occupation, or use - all those who build and use buildings must take account of Building Regulations. Contrast this, for example, with financial incentives which are optional or taxation, the impact of which takes time to cascade from point of collection through the industry. Minimum technical standards also send a clear message to building product manufacturers.

¹⁰ Carbon Trust, 2010, *Building the future today*

Figure 1 Distribution of policy instruments across the property lifecycle, GPA Carbon Penalties and Incentives Project

					Green Deal	ECA
					RHI	Allowable Solutions
					FIT	FIT
					ECA	RHI
					EU Eco-Design	Green Deal
					CCA	FCA
Incentives	RHI	FIT	ECA			
Pre-construction (Demolition, Planning and Design)	Funding / Financing	Construction	Acquisition (Purchase / Letting)	Occupation / Use	Refurbishment / Redevelopment	
Obligations	Building Regulations	Building Regulations	EPCs	GHG Reporting	Building Regulations	
	EPCs	EPCs	MEPS	DECs	F-Gas Regulations	
	F-Gas Regulations	GHG Reporting	EED Article 6	Smart Metering	HCFCs	
	HCFCs			AirCon		
				ESOS		
				EPCs		
				HCFCs		
				F-Gas Regulations		
Penalties	CIL	Landfill Tax		EU ETS	Landfill Tax	
	Allowable Solutions	HOD		HOD	HOD	
		Aggregate Levy		Carbon Floor	Aggregate Levy	
		Carbon Floor		CRC EES	Carbon Floor	
		CCL		CCL	CCL	
				Landfill Tax		

11

Key

- [Light Green Box] Operational carbon focus – policy in force currently
- [Yellow Box] Operational carbon focus – policy yet to be implemented
- [Light Blue Box] Embodied carbon focus (indirectly) – policy in force.

Abbreviations

AirCon - Air Conditioning Assessments required under the Energy Performance of Buildings Directive

Building Regulations - Part L of the Building Regulations

CCA - Climate Change Agreements

CCL - Climate Change Levy

CIL - Community Infrastructure Levy

CRC EES - CRC Energy Efficiency Directive

DECs - Display Energy Certificates (required of public bodies occupying commercial buildings).

ECA - Enhanced Capital Allowances EED Article 6 - Purchasing by Public Bodies required under the Energy Efficiency Directive

EPCs - Energy Performance Certificates

ESOS - Energy Saving Opportunities Scheme

EU Eco-Design - Eco-Design Directive

FCA - Flat Conversion Allowances

FIT - Feed in Tariff

GHG Reporting - Mandatory Greenhouse Gas Emissions Reporting

HCFCs - HCFC Phase-Out

HOD - Hydrocarbon Oil Duty

MEPS - Minimum Energy Performance Standards, pursuant to the Energy Act 2011

¹¹ Figure 1 is reproduced with the permission of Deloitte LLP © 2014. All rights reserved. Deloitte LLP disclaims any liability arising out of the use (or non-use) of the lifecycle mapping of policy instruments, including any action or decision taken as a result of such use (or non-use).

Each instrument in the figure above performs one or more of the following functions:

Instruments which amplify the price / value effect of the energy consumed and/or carbon emitted in the construction, operation or demolition of buildings

Instruments which require or promote minimum standards of energy performance for new, refurbished or existing buildings

Instruments which apply a reputational effect to organisations with commercial property interests relating to their energy and/or carbon performance

Instruments which require or promote minimum standards of energy and/or carbon performance in the systems and technologies installed in buildings

Instruments with a different principal policy function but through which consequential effects on energy and/or carbon performance in the lifecycle of buildings may arise

Figure 1 excludes consideration of policies aimed specifically at public buildings or dwellings unless they are relevant to the consideration of policy effectiveness for commercial property. It is limited to policies that are operational within England & Wales, excludes instruments specific to energy-intensive (industrial) processes which may be performed within buildings, and excludes instruments specific to travel to and from commercial buildings.

3. THE OPPORTUNITY AND POTENTIAL OF BUILDING REGULATIONS

Given the essential role of Building Regulations in driving change, the Task Group has investigated the economic, social and environmental benefits that stem from the regulations. A summary of the key benefits is outlined below.

Environmental benefits

Stephen Williams, the new Building Regulations Minister stated in a recent speech that ‘more carbon has been saved, over the years, through the Building Regulations than from any other policy area in government’.¹²

The Task Group agrees that Building Regulations have driven down energy use and carbon emissions in recent years, with newer buildings performing better than older construction. From the Government’s energy consumption data, it is clear that the energy intensity of the commercial sector has been reducing since the 1970s and Building Regulations will no doubt have played a part in this. However changes in the carbon intensity of the national grid present a further complicating factor when looking at trends in carbon emissions. Assigning improvements to Building Regulation policies and new-build development as a sub-component of the non-domestic stock is challenging, and typically based on theoretical modeling rather than monitored performance.

With those caveats, DECC estimate¹³ that together, Part L 2002 and 2006 had saved 8.3TWh and 1.9MtCO₂ by 2010 which represented nearly a quarter of the total savings from all energy efficiency improvement programmes and policies in the private and public sectors.

The Task Group’s own estimates demonstrate the magnitude of change which Building Regulations has delivered. Chris Twinn has estimated the cumulative Part L improvement since 1976 when energy first went into the Building Regulations (See Fig. 2). Allowing for a few changes of

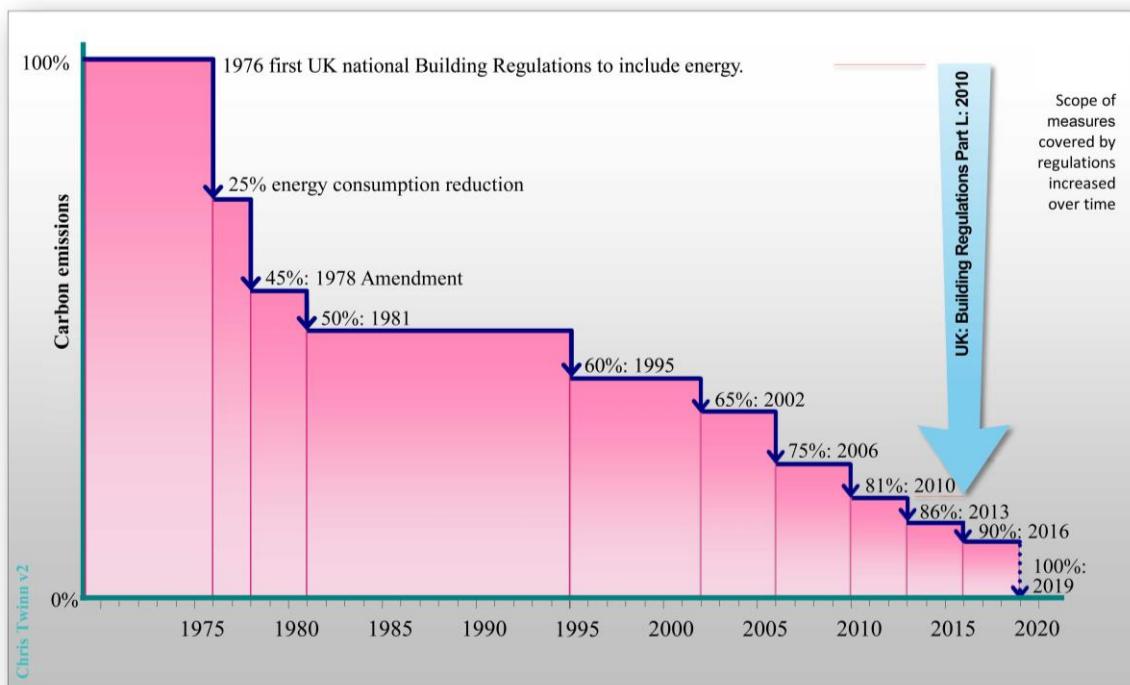
¹² <https://www.gov.uk/government/speeches/national-housing-federation>

¹³ DECC, July 2011, UK Report on Articles 4 and 14 of the EU End-use Efficiency and Energy Services Directive (ESD)

goalposts along the way we are now at about 85% overall improvement. To put this in perspective a 40% improvement today is a mere 6% improvement compared with the early 1970s baseline.

UK Roadmap Zero Carbon for all new buildings

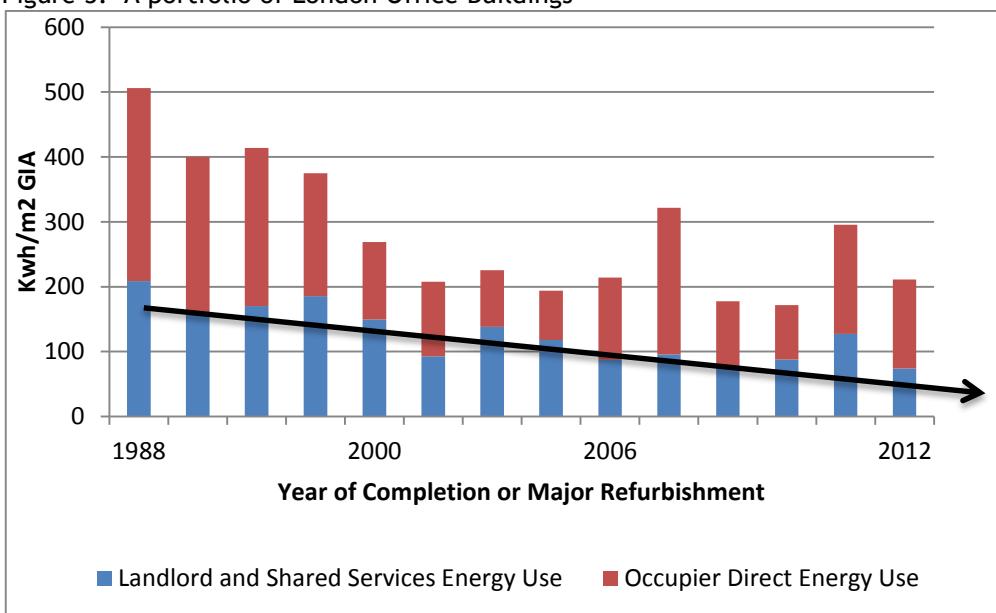
Figure 2



TwinnSustainabilityInnovation

Figure 3 demonstrates the impact of building regulations in a portfolio of London office buildings constructed since 1998. In particular the 50% decrease in 'landlord and shared services' energy is consistent; landlord and shared service energy is, in the majority, regulated energy which is covered by the building regulations. The variation in occupier direct energy use reflects the variation in densities, small power and hours of operation.

Figure 3: A portfolio of London Office Buildings



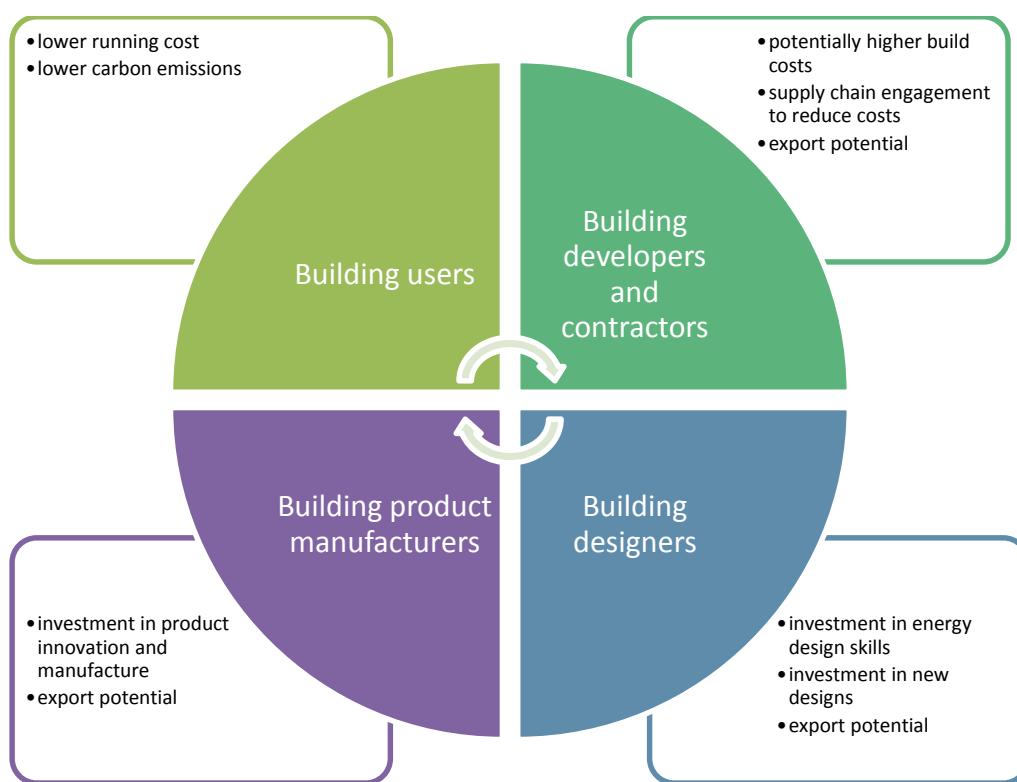
Innovation and investment benefits: beyond carbon and cost savings to innovation and green growth

Beyond these direct benefits, the Task Group thinks that clarity on a challenging building regulations trajectory will bring wider overall benefit to UK PLC. Certainty about the trajectory towards zero carbon will encourage product innovation and investment in skills and knowledge about improved building standards. This in turn will reduce the cost of achieving challenging standards and support financial growth and the 'export' potential of UK knowledge to other countries grappling with green building standards.

More than contractors and occupiers - a wider benefit

It's worth considering who is affected by building regulations. Architects, product manufacturers, real estate investors, building engineers, letting agents, urban planners, contractors, and design consultants: all of these organisations and individuals will benefit from a challenging standard for building regulations.

Figure 4: Example of industry actors affected by building regulations



Innovation

When Building Regulations are understood as regulation which affects the entire supply chain for new buildings, the potential of zero carbon broadens. A challenging set of building regulations will drive innovation in products and continue to grow UK corporate reputation for green buildings and carbon management. When product manufacturers see a market opportunity in future regulation, they will invest in new productions, installation skills, and alternative technologies. By reconfirming the 2019 zero carbon goals now, the UK can begin to **activate both national and internationally based inward investment** into construction supply chains and product innovation pathways.

The Low Carbon Innovation Co-ordination Group (LCICG) highlighted the innovation and investment potential in a 2012 report, "Innovation in the non-domestic buildings sector represents a significant opportunity to help meet the UK's GHG emissions targets, as well as providing value through avoided energy costs, amounting to savings of 86MtCO₂ and c. £13bn by 2050. Innovation could help create export opportunities that could contribute an estimated £1.7bn to GDP to 2050."¹⁴

To undertake innovation on both a "revolutionary or evolutionary" basis a strategic business plan and business cases must be produced highlighting economics, management and other fields of practice or requirements that will enable the product to naturally grow within the market. Construction product business plans typically focus on the future with solution developments taking approximately one to three years to bring to market, dependent on new process equipment or services being required. When policies are sporadically changing direction, many business cases are made risk averse or terminated, and investment in innovative products or solutions avoided.

Without certainty, design and product solutions into the market are slow to develop, resulting in a number of market forces being abnormal, i.e. elevated prices for new solutions. It can also have an adverse effect, in that innovation is stifled because the period between regulation changes means that the return on investment for a solution may not be warranted and hence existing solutions are merely improved rather than meeting the exact needs of the customer or consumer.

Case Study: Technology Strategy Board

Over the last five years the Technology Strategy Board (TSB) has invested £83 million of innovation funding through the Low Impact Buildings innovation platform, supported by industry match funding of £34 million. The TSB was established as a response to the pressing need to ensure the UK's new and existing building stock is fit for purpose in a low carbon economy.

The direct economic benefits of this investment are estimated to have been £1.5 billion over the past five years, and three quarters of the organisations supported are SMEs with fewer than 250 staff.

*2013, Industrial Strategy: government and industry in partnership, Construction 2025*¹⁵

Green Export Potential

There is a real opportunity in Building Regulations to strengthen the reputation and value of UK companies abroad for green building. The UK construction and manufacturing sectors already have an existing competitive advantage in this sphere thanks to Government policies like Zero Carbon Homes 2016. The estimated cost of delivering zero carbon homes has halved in three years, representing a fraction of the estimated costs compared to when the target was launched in 2007. This reduction in cost is in large part due to industry investment in skills and product innovation, enabled through having policy certainty.¹⁶

The UK is seen as a leader in sustainable design and construction, and setting a challenging target for Building Regulations can further drive the value of UK companies, designs and construction

¹⁴ LCICG, 2012 'Technology Innovation Needs Assessment (TINA) Non-Domestic Buildings Summary Report' <http://www.lowcarboninnovation.co.uk/document.php?o=11>.

¹⁵ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/210099/bis-13-955-construction-2025-industrial-strategy.pdf

¹⁶ New analysis produced by Sweett Group for the Zero Carbon Hub shows that the additional costs associated with building to the proposed Zero Carbon Standard have declined significantly since 2011, and are expected to continue to fall as we approach 2020. <http://www.zerocarbonhub.org/news/cost-building-zero-carbon-drops>

techniques abroad. The Task Group has direct experience of when UK expertise in low carbon and environmental design has led to business opportunities abroad. We believe a challenging target for Building Regulations would set the 'gold standard' for energy performance, and with it a 'gold standard' of UK reputation to deliver exciting sustainable built environments.

"It is equally a fact that UK-based businesses have a global reputation for architecture, design and engineering, competitive whole life costs and sustainable construction solutions."

Construction 2025, the UK Government's Industrial Strategy for Construction

This is particularly true in the context of Europe and the forthcoming implementation of the Energy Performance of Buildings Directive. The 2020 Nearly Zero Energy Building requirement under the recast EU Energy Performance of Buildings Directive has already signalled where the bar will be for Europe's property developers in just over five years' time. By confirming the zero carbon target now the UK can begin to motivate both domestic and inward investment into the supply chains and product innovation pathways which can create a suite of innovative exports which will find a market in Europe. The exports will also be welcome in nations with large-scale building and infrastructure development programmes such as China, Brazil, India, UAE etc.

Conversely, without a clear policy direction in the UK for new low energy non-domestic buildings (as there has been for new homes), the non-domestic sector and their supply chains are not in a position to move forward in unison in order to innovate and deliver competitive solutions. There are pockets of innovation happening to pre-empt the Directive, but this work is currently stifled and disparate because of policy uncertainty. This costs both time and resources, and misses an opportunity to give UK industry a head start and market advantage in developing products and solutions to meet a UK standard, which can be traded into other EU Member State markets.

A further benefit of early action and one which can further enhance export led economic rebalancing in the UK, is the opportunity it will unlock for UK firms to access European R&D funding. In late 2013, the European Commission launched its new Horizon 2020 R&D framework funding programme, replacing the former FP7 programme. Within this programme hundreds of millions of Euros have been provisioned between 2014 and 2020 to support innovation in the area of the built environment and support the implementation of EU legislation such as nearly zero nearly energy buildings from 2020.

The opportunity for UK Plc here is simple. By moving first in setting an appropriately ambitious target and standard, UK industry can more rapidly convene itself and secure EU funding to develop greener building products and services. These will not only serve the UK market but thereafter represent export products to other European Member States under the same requirement to set standards for nearly zero energy buildings. In a nutshell, by moving first, the UK Government can provide UK industry with a head start in securing EU funding to develop products and bring them down their cost curves and thus create a competitive advantage for UK businesses.

This is a big prize at stake for UK Plc. LCICG suggest that the additional global market value of innovative products in this sector could reach c. £488bn over 2010 to 2050, of which £200bn would be accessible to the UK. Of this, innovative products could provide an additional value of £1.7bn in value to the UK.

Case study: BRE Activities in China

BRE have forged a reputation as a world class organisation through using cutting edge research to create products, tools and standards that help to drive positive change in the built environment.

After visiting the BRE Innovation Park in 2011, the Chinese Premier Li-Keqiang (the then Chinese Vice-Premier) made a commitment to encourage collaboration on sustainable building development between China and the UK which he hoped would see developments in China showcasing the UK's world leading materials, products and designs for sustainable buildings, and support the development of a low carbon supply chain.

BRE were introduced to Vanke (china's largest private real estate developer) to set up an Innovation Park on Beijing's Green Building Park and collaborate on key areas of research in low carbon construction. BRE is working closely with UKTI and FCO colleagues in the UK and China to maximise the engagement of British companies in the park, and a British consortium are currently designing the visitor centre which will be BREEAM assessed.

Since becoming involved with the Beijing Green Building Park, numerous other opportunities have been created for both BRE and other UK consultants due to the demand for UK expertise in sustainable, low carbon development. **These opportunities have come about as a direct result of the UK's approach to the regulatory framework and standards that have gained international recognition for driving innovation in buildings.**

Case Study: M&S High Street Sustainable Learning Store in India

Marks & Spencer (M&S) opened its first high street sustainable learning store in India at South Extension Market in Delhi - as part of M&S' drive to become the world's most sustainable major retailer by 2015.

Trading over three floors, the new 20,000 sq ft store hosts a range of sustainable construction and design features to reduce energy usage and waste. The store will provide M&S with valuable insight into sustainable building practices in India, which it will use to support future projects in the country.

The store in India takes on board lessons learnt from UK sustainable learning store trials and has managed to achieve a Gold LEED rating.

Sustainable features include: Heat transmitting glass helping to maintain in-store temperatures and cut UV ray penetration by 90%; solar reflective tiles that keep the store cool; use of ENERGY STAR certified equipment; energy meters to monitor the store's energy performance; rain water harvesting; dedicated recycling bins; the use of rapidly renewable raw materials, such as engineered wood; excellent public transport links and reserved parking spaces for car pools.

M&S is always striving to achieve the highest performing buildings that can simultaneously meet commercial needs. Legislation has managed the cost of carbon, alongside other external factors, to enable M&S to create meaningful business cases for low carbon innovation in their stores. The next bold step is for zero carbon non-domestic building legislation to add further weight to the business case and allow M&S to maintain their leading edge when promoting Plan A beyond the UK.¹⁷

¹⁷ For further information, please contact: sylvie.sasaki@marks-and-spencer.com

Building Regulations can support other government goals

Demand side regulation supports energy security and a smart energy future

Policy intervention can serve to address a number of market failures across the buildings value chain and create a platform for export led growth from construction products. However, positive externalities in other sectors could also be achieved. One such sector is the UK energy sector. In order to reach the economy-wide 80% CO₂ reduction by 2050 set out in the 2008 Climate Change Act, academics and industry experts alike point to the critical need to decarbonise the UK power system. DECC's 2050 Pathways work points to a way of achieving this aim through a combination of off-shore wind and nuclear power, however there will be a need for both supply side energy mix diversity and for the demand side to play a part.

In recent years, courtesy of a mix of incentives, such as the Feed-In Tariff (FiT) and other support schemes, the UK has experienced a surge in the installation of distributed energy technologies, like roof mounted photovoltaic (PV) panels. In addition to this the Zero Carbon Homes policy has further pump primed the market for distributed energy technologies underpinned by the Code for Sustainable Homes in the new build sector.

Consequently, the combined effect of a policy trajectory and customer incentives have served to bring increased power to the people through self-generation. The importance of this growth in distributed energy installations and customer uptake should not be underestimated. Indeed, the UK's energy transition towards a decarbonised power system by the 2030s will bring with it the risk of increased generation intermittency as larger and larger numbers of intermittent generation assets join the grid (e.g. wind power). In order for the UK to maintain a stable balance between supply and demand there will be a need for the demand side to play its part.

Therefore, where electricity generated at distributed level within our built environment can be harnessed supply side capacity shortfalls can be met with a 'demand side response'. The inherent diversity that exists within the non-domestic building stock (where distributed energy solutions such as Combined Heat & Power (CHP) and PV technologies can be deployed at varying scales) presents UK PLC with an opportunity to work towards addressing tomorrow's energy intermittency challenges today by encouraging the embedding of the right distributed energy solutions at the right scale.

With the zero carbon target for non-domestic buildings we have a once in a generation opportunity to future proof our new non-domestic building stock, lock in energy efficiency and energy data and thereby secure them as smart energy assets of tomorrow in their own right. This will mean that they are 'demand side ready' for smart energy system participation.

Certainty about medium term regulation is essential

For the timely and cost-effective delivery of zero carbon from 2019, policy consistency and certainty over 5-10 years is essential.

FiTs

In the non-domestic sector, perhaps the most obvious example of medium to long term policy certainty being good for industry is the example of Feed in Tariffs. The cost of renewable technology, most notably solar photovoltaics, has decreased markedly since the introduction of FiTs in 2009. As early as 2011, the Government's 2011 Comprehensive Review consultation

document pointed to cost decreases of some 30% since the inception of FiTs, a trend which has continued and is expected to continue, albeit at a reduced rate, until 2015¹⁸.

As the industry approaches a milestone change in Building Regulations, much effort is put into preparing for this. This effort is most effectively invested when the goal is clear. When policies change without warning, or do not move forward in line with industry's expectations, then companies are unable to undertake developments of new products and solutions to meet the new regulations or legislations.

The Task Group is aware of examples where unforeseen and last minute changes to policy have resulted in business justification being terminated for capital investment in new products and manufacturing lines.

Green Deal

Recent changes to incentives in the domestic sector provide a clear example of how uncertainty and last minute changes and delays to policy can negatively impact the construction industry. Reports suggest that some 4000 job losses in the insulation industry can be attributed to the delays in launching the Green Deal. Moreover, with the withdrawal of the proposed "consequential improvements" legislation for domestic properties, CLG removed one of the major supports for the Green Deal, a move which, according to CLG's own estimates, will lead to 2.2 million fewer Green Deals.¹⁹

Even the Zero Carbon Homes 2016 policy, which has provided a relatively consistent policy framework over the last seven years, has not been immune to sudden and unexpected policy shifts. As house builder Crest Nicholson puts it:

"The stop/start nature of the 2016 Zero Carbon Homes policy over recent years has been unhelpful to the housebuilding industry. Uncertainty in Government policy and regulatory trajectory undermines industry confidence and innovation. Developers are not able to develop prototypes and prove performance, and suppliers are unable to commit to research and capital investment."

Darren Dancey, Group Technical Director, Crest Nicholson

Such short-sighted actions from government not only lead to wasted time and resources but also mean that businesses effectively engage with the new policy unprepared. For this reason, the Task Group strongly advises that the details of the 2019 policy update should be available well in advance, to allow industry to effectively prepare for the changes. Certainty about the trajectory towards zero carbon would encourage product innovation and investment in skills and knowledge about improved building standards. This in turn will reduce the cost of achieving challenging standards and support financial growth and the 'export' potential of UK knowledge to other countries grappling with green building standards.

¹⁸ CEPA Ltd. and Parsons Brinckerhoff, 'Updates to the Feed-in Tariffs Model: Documentation of Changes for Solar PV Consultation', 26 October 2011, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42835/3365-updates-to-fits-model-doc.pdf.

¹⁹ Pedro Guertler, Sarah Royston, and David Robson, 'Somewhere between a "Comedy of Errors" and "As You like It"? A Brief History of Britain's "Green Deal" so Far', in *European Council for an Energy Efficient Economy: Summer Study*, 2013, http://www.ukace.org/wp-content/uploads/2013/06/1-306-13_Guertler.pdf.

Case Study: AIMC4

The AIMC4 consortium raised almost £6.5M of investment in research and development, half of which came directly from industry.

"The concept of AIMC4 was born from a consensus between the consortium partners that they wanted to develop robust technical and commercial solutions to meet the energy requirements of Level 4 of the Code for Sustainable Homes using fabric-first solutions and in advance of the anticipated changes that will apply in England to Approved Document L1A."*²⁰

Case Study: Automotive Industry

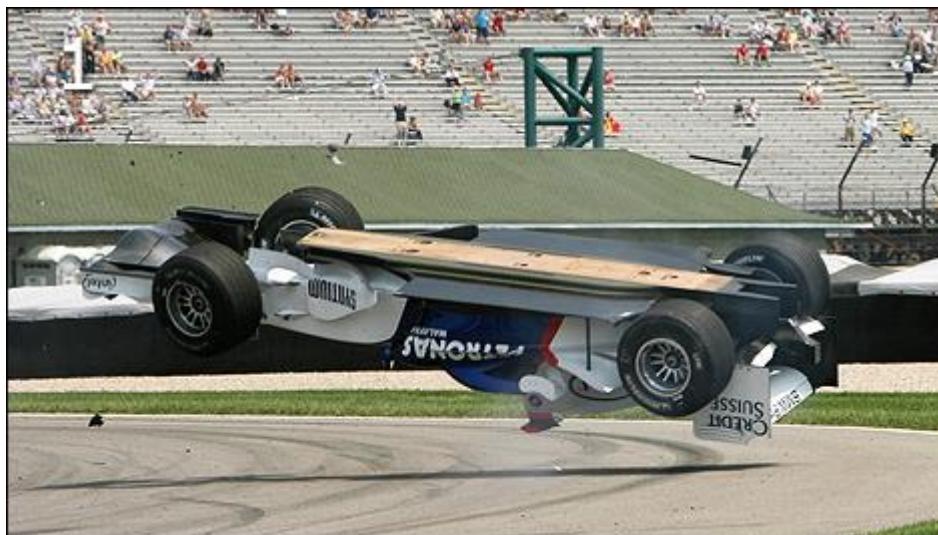
While many in the construction industry view increases in regulation as barriers to their organisations to thrive, the motor industry has many examples of using regulation to spur innovation.

Formula 1 racing has been and continues to be a fantastic laboratory for testing new grounds and technical innovations. Driver safety, the necessity to drive costs down, and the need to reduce environmental impacts have increased standardisation between rival teams, although arguably increased the technical innovations as a result.

Mercedes motorsport chief Toto Wolff recently commented on the impact of the sport "*F1 has always been successful and has become the number one motorsport brand because it is about the innovation and competition among racing drivers and also the teams. Competition also comes with innovation.*

What we are getting next year is just 'wow'! One third more fuel efficiency and trying to maintain the level of performance, plus trying to fit all of that under the skin of a racing car."

The challenge will be to set standards which are achievable by large and small organisations with a clearly defined strategy for implementation.



²⁰ Paul Cartwright and Christopher Gaze, *Lessons from AIMC4 for Cost-Effective, Fabric-First, Low-Energy Housing* ([Garston]: IHS BRE Press, 2013).

Full carbon fibre chassis: Probably the most valuable innovation in terms of safety. The surviving cell made of carbon fibre provide drivers with outstanding protection in case of an accident

The UK's Industrial Future

The recently published *UK Industrial Strategy: Construction 2025* draws a firm link between reducing the cost of construction, reducing build and refurbishment times, significant reductions in green house gas emissions in the built environment, and reducing the trade gap in import(exports for construction materials. Written jointly by industry and government it sets out symbiotic targets for a 50% reduction in emissions from the built environment, a 50% reduction in the construction products trade gap, and a 33% reduction in construction costs.

The strategy makes a deliberate point of calling for clarity on low carbon opportunities in support of business confidence. A challenging trajectory for Building Regulations will send a clear signal about construction opportunities.

"Developing greater clarity and certainty around the sustainable and low carbon construction opportunities which are emerging is essential to give businesses and consumers the confidence to invest in the potential of these new markets."

4. REVISITING THE REGULATORY IMPACT ASSESSMENT

The Task Group feels strongly that the Government's impact assessment for Building Regulations should be broadened to reflect a wider set of affected stakeholders and greater potential for innovation and growth.

Since January 2013, under the One In, Two-out (OITO) rule Government departments are expected to offset any increase in the cost of regulation by finding deregulatory measures of at least twice the value.²¹ However, the current methodology to assess impact on industry fails to consider broader benefits, or even to allow for innovation in building components and design.

We recognise that the purpose of the impact assessment is to evaluate policy options to address a market failure. In this case, how non domestic building users accrue benefits made by others - investment in building greener buildings.

However the current impact assessment only takes into account the following:

- Additional construction cost based on currently available measures and technologies.
- Maintenance and replacement capital cost savings
- Energy and carbon cost savings to end consumers
- Avoided cost of renewables
- Air quality damage costs
- Learning rates for Low and Zero Carbon technologies

We believe that future impact assessments should take account of all potential components of value creation including the following in addition to those mentioned above:

- Rates of learning about alternative design and construction methodologies to meet future regulations reducing cost of meeting regulation

²¹https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211164/bis-13-p96a-sixth-statement-of-new-regulation.pdf

- Rates of innovation in product design increased given policy certainty reducing cost of meeting regulation
- Additional construction cost taking account of new product innovation
- Avoided energy transmission and distribution costs
- Avoided capital cost of expanding, upgrading and replacing centralized energy generation and distribution infrastructure
- Value of low carbon building services and products developed as a result of policy certainty leading to job creation, GDP growth and inward investment,
- Growth in UK market due to ‘expert export’ of to overseas markets
- R&D funding secured from Europe e.g. from Horizon 2020 (Euro 6bn available for secure, clean and efficiency energy, and Eur3bn for climate action, environment, resource efficiency and raw materials)

Fig. 5 below sets out the extent of the current Impact Assessment methodology and the Task Group’s proposals for how this should be expanded; which we feel better reflects the real costs and benefits of policy.

Fig. 5 Current and Proposed Impact Assessment

Current Impact Assessment Approach Used	Cost	<ol style="list-style-type: none"> Increased provision of on-site renewables <ul style="list-style-type: none"> • Accrues to Builders / Developers <p>Assumes cost of PV drops over time at background rate</p>
	Benefit	<ol style="list-style-type: none"> Reduced operational costs <ul style="list-style-type: none"> • Accrues to occupiers of buildings Reduced operational carbon emissions <ul style="list-style-type: none"> • Accrues to planet
Actual Industry Impact (suggested approach)	Cost	<ol style="list-style-type: none"> Investment in improved technologies and building practices <ul style="list-style-type: none"> • Accrues to product manufacturers and contractors • Assumes cost drops over time Investment in improved building designs <ul style="list-style-type: none"> • Accrues to designers and developers • Assumes cost drops over time Increased provision of renewables <ul style="list-style-type: none"> • Assume level of renewables required drops over time • Accrues to Builders / Developers <p>Assume cost drops significantly over time due to innovation</p>
	Benefit	<ol style="list-style-type: none"> Reduced operational costs <ul style="list-style-type: none"> • Accrues to occupiers of buildings Reduced operational carbon emissions <ul style="list-style-type: none"> • Accrues to planet Improved knowledge and skills <ul style="list-style-type: none"> • UK industry competitiveness Reduced cost of products / construction over time Exporting new designs and products abroad: <ul style="list-style-type: none"> • UK PLC

The following figure is adapted from the 2009 *Zero carbon for new non-domestic buildings Impact Assessment* and aims to illustrate the potential ‘value at stake’ if research and development funding is targeted at those technologies which are important to the achievement of higher carbon reduction targets but where the capital cost of the measure is currently disproportionate to the amount of carbon reduced. It may be that alternative technologies/materials can be found to provide the same function at much lower cost and greater energy efficiency.

Key technologies such as PV are benefiting from significant manufacturing and supply chain scale efficiencies as well as technology innovation with the result that learning rates have generally been under estimated in previous impact assessments.

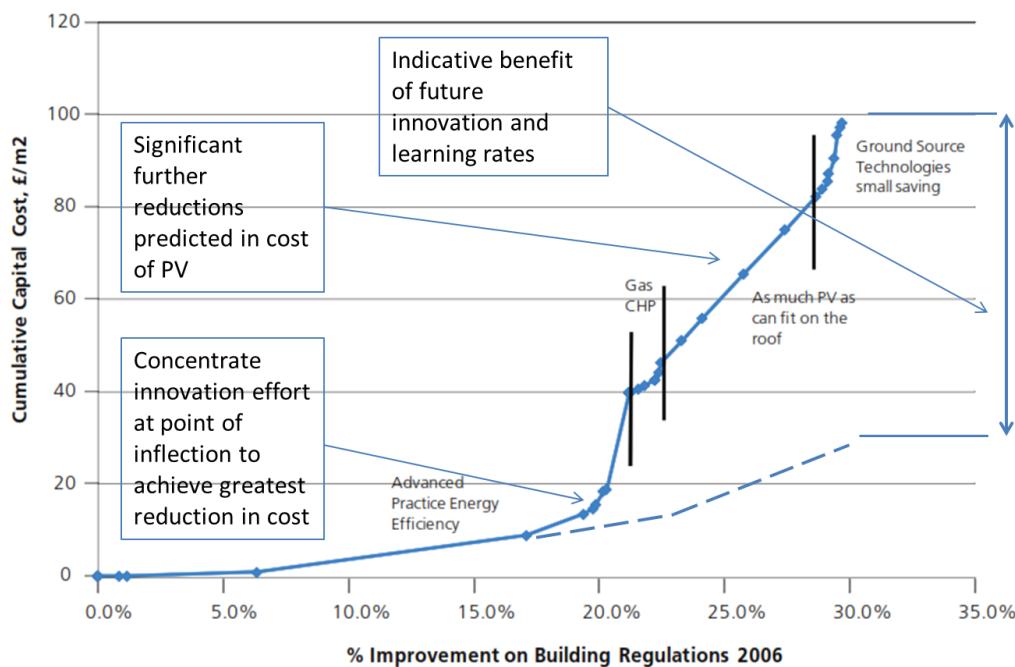


Figure 6: Illustration of benefit of innovation and learning rates on cost of improving on 2006 Building Regulations for a standalone large city office without biomass²²

As highlighted earlier, to use the domestic section as an example, the cost of meeting the Zero Carbon Homes policy has reduced from a range of £15,000 to £40,000 in 2006/7 when the policy was first announced to between £2,200 and £7,500 in 2014²³. Costs are predicted to fall further between 2014 and 2020 as housebuilders continue to improve their designs and construction techniques, and the cost of key technologies reduce in response to rising global demand for low carbon building solutions.

These cost reductions have been achieved through a combination of factors including; refinement of the policy, removing unregulated emission from the definition of zero carbon Homes; innovation in air tightness and thermal bridging solutions by housebuilders; and increasing efficiencies in the manufacturing and distribution of PV, Air Source Heat Pumps, and higher performance glazing.

Whilst some of these improvements would have occurred in the absence of a UK Zero Carbon Homes policy, it is unlikely that this level of cost reduction would have been achieved without a clear policy trajectory with milestones, and sufficient notice to give companies the confidence to invest in the necessary research and development programmes which would typically form part of 3 or 5 year business planning cycles.

²² Basic graphic sourced from DCLG, ‘Zero carbon for new non-domestic buildings Impact Assessment’, November 2009
²³ Zero Carbon Hub and Sweett Group, ‘Cost analysis: Meeting the zero carbon standard’, February 2014

5. TECHNICAL ASPECTS OF THE ZERO CARBON DEFINITION

Aims

The aim of the zero carbon non-domestic building policy is to deliver low energy in use buildings. This recognises the fact that the vast majority of the non-domestic stock will never be truly ‘net zero carbon’ in practice, through on-site means alone. The Task Group believes that a truly zero carbon building goal is one the industry aspires to and as such the name of the policy should remain, although the definition of the policy may vary over time to include more elements as industry consensus, calculation methodologies and innovation develops.

The non-domestic sector covers a very broad range of building sizes and use types, from boutique hotels to out of town retail parks to large city centre offices. The energy efficiency regulations which apply to these buildings must be suitable for all building types, developers and end uses. At the same time, the continuing drive towards energy efficiency should increasingly promote the reduction in energy usage and CO₂ emissions from new buildings.

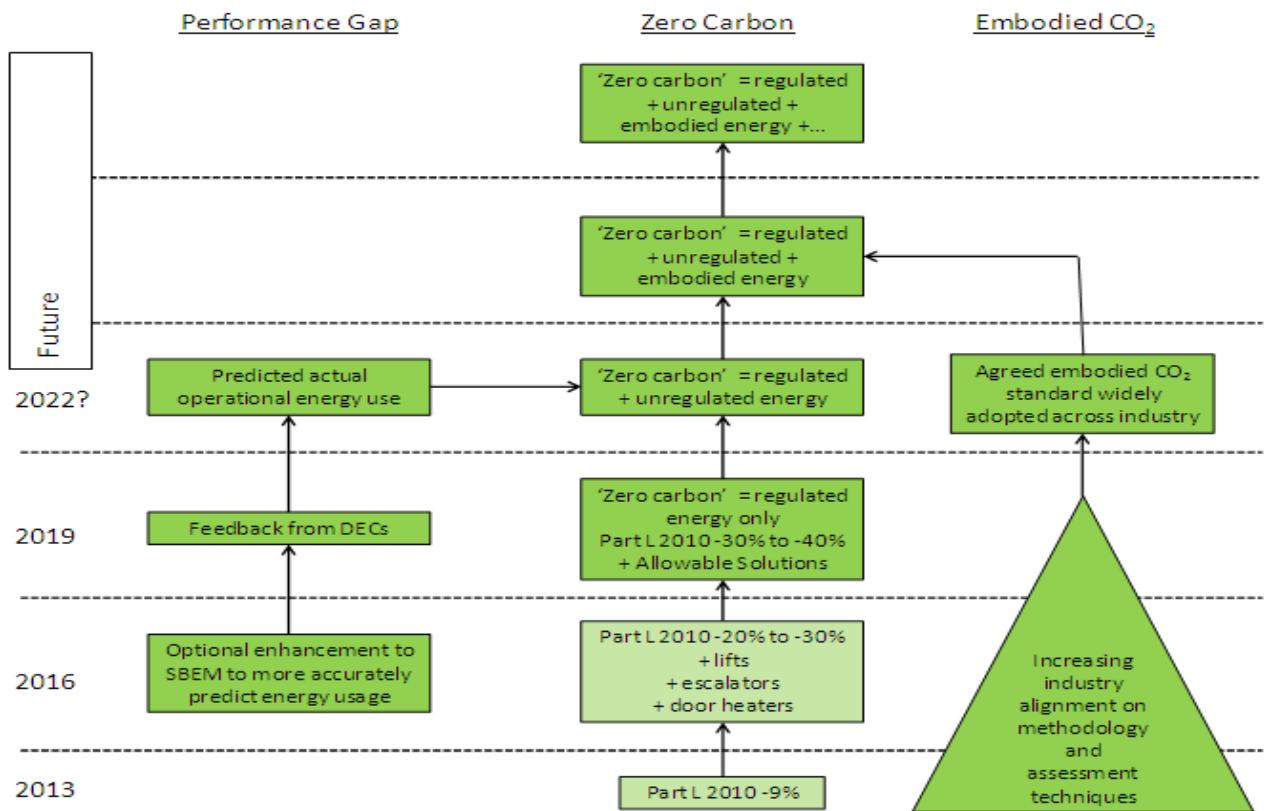
Unlike homes, the end uses and energy profiles from non-domestic buildings can vary dramatically depending on the usage. The policy mechanisms the industry adopts to meet the zero carbon standard must be capable of accounting for all these uses in a fair and equal manner.

For the reasons stated in previous sections, the construction industry would benefit from the definition of a clear trajectory to take us to 2019, and possibly beyond. This trajectory would include such details as:

- Inclusion of additional factors in the definition of regulated energy
- Proposed CO₂ emission reduction targets for Part L in 2016 and 2019
- The inclusion of unregulated energy in the zero carbon definition
- The inclusion of embodied energy in the zero carbon definition
- Proposals to address the performance gap between predicted and operational energy usage

This may look something like the following roadmap:

Figure 7: Potential Roadmap to Zero Carbon for Non Domestic Buildings



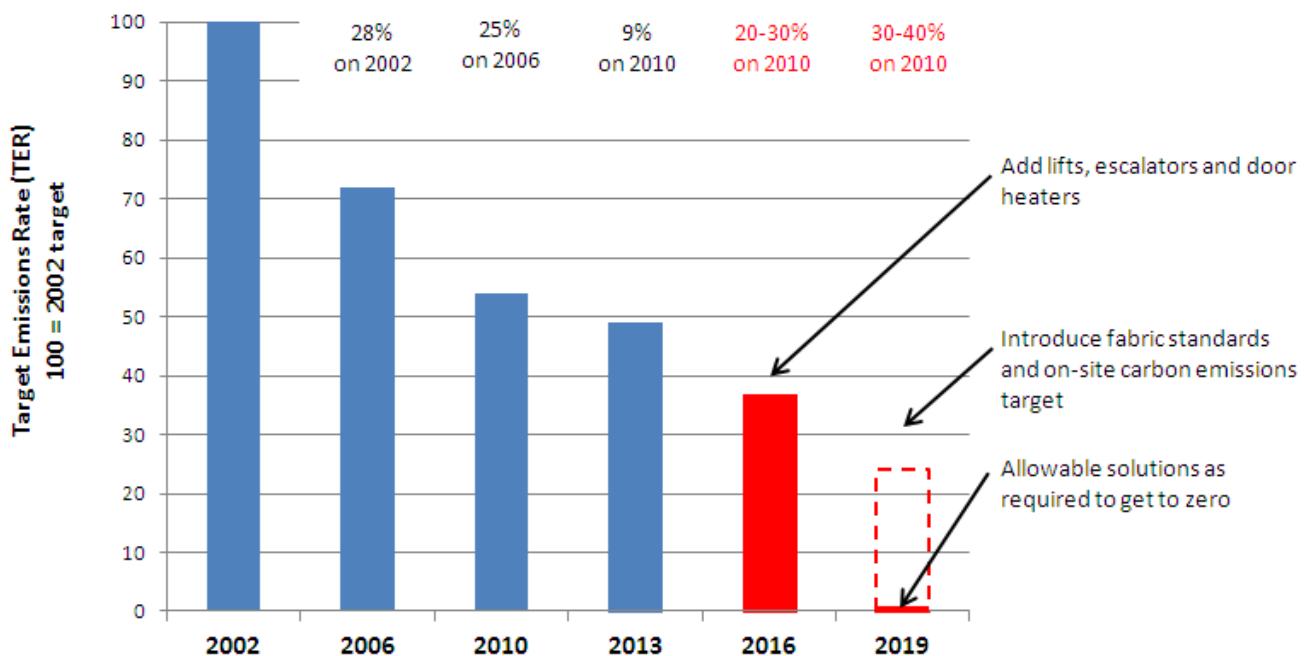
Notes:

The suggested percentage improvements are indicative only and are a representation of the form of the trajectory we'd like to see from government. These figures are aggregate saving across the non-domestic build mix.

UK-GBC has a long history of promoting challenging energy performance standards in new building regulation²⁴ which has led to benefits to the developers, designers, owners and occupants. The Task Group supports raising energy efficiency standards in Building Regulations in 2016 and 2019. These should be set in context of a proposed shift towards minimum fabric efficiency standards, an aggregate approach to standards for non-domestic buildings, and a minimum on-site carbon emissions threshold to be achieved before applying Allowable Solutions. This is illustrated in Fig. 8.

²⁴ See for example UK-GBC, 2008, *Definition of Zero Carbon* and UK-GBC, 2007 *Carbon Reductions in New Non Domestic Buildings*

Figure 8



Regulated emissions

The non-domestic zero carbon definition should initially account for the energy consumption and related CO₂ emissions of the fixed building services, as currently defined in Part L of the Building Regulations. This includes emissions related to building heating, cooling, lighting, hot water, fans and pumps. We are also proposing the addition of the following items to the definition of fixed building services, used to calculate building emissions:

- Over door heaters
- Lifts
- Escalators

These items are currently not picked up in the assessment methodology. Yet they remain a part of the building services infrastructure which consumes energy. Design teams are able to influence the energy consumed by these items through selection of energy efficient systems and products. The zero carbon definition should aim to reward the selection of more energy efficient products by including these items against the targets set by the zero carbon standard. There are a number of calculation methodologies available for design teams to assess the annual energy consumption of all three of these items and it should therefore not pose too much of a technical challenge to incorporate these items into the national calculation methodology in the 2016 update to Part L, prior to the adoption of the zero carbon standard in 2019.

Similarly, the potential inclusion of external and display lighting, car park ventilation and lighting should also be further investigated, since these emissions are inextricably linked to the building under assessment and there may be significant potential for emissions reduction through the selection of energy efficient systems.

Unregulated emissions

Due to the wide range of building types and uses included in the non-domestic definition, there is a significant variance in unregulated loads (associated with IT equipment, catering, refrigeration, etc) which is difficult to predict even within the same building use type (e.g. offices). Variance of unregulated electrical capacity allocation can be upwards of 50% of the total supply of a non-domestic building, though this varies greatly dependant on the building specification and occupier use. Additionally, those responsible for the design of the building fabric and systems often have no

influence on how a building will be fitted out, or how the building will eventually be used. However, the unregulated energy consumed in a building is clearly part of the building energy consumption and should therefore be included in the emissions that make up the zero carbon definition.

A certain amount of investigation will be necessary to determine methods of assessing and incentivising low energy fit-out and related emissions. For cases where the end fit-out is not known, assumptions could be made using typical benchmark figures. This provides a more holistic approach to assessing building energy usage and will, in turn, drive savings for occupiers through other policy mechanisms, such as the CRC. This investigation means that 2019 is probably too soon to add unregulated loads into the zero carbon definition. However, the assessment and inclusion of unregulated loads will also help to close the performance gap between predicted and operational energy usage.

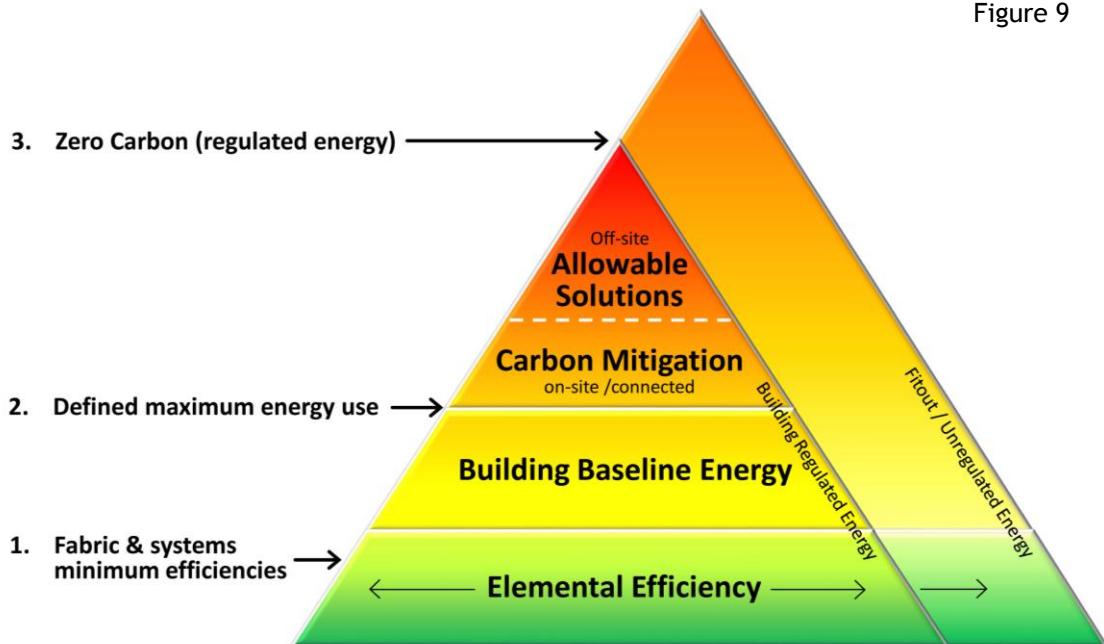
The ‘Zero Carbon’ definition

The definition of zero carbon for non-domestic buildings should mirror that proposed for homes, building on the work done by the Zero Carbon Hub’s residential hierarchy of energy performance. This standardises design approaches for both domestic and non-domestic buildings and provides simplicity to the sector.

- Passive measures and building long-life fabric efficiency (Fabric Standard);
- Systems component / systems efficiencies, including on-site renewables as much as is cost effective (Building Energy Usage & Emissions);
- Off-site renewables / carbon mitigation (Allowable Solutions)

Zero Carbon (regulated energy) compliance

Figure 9



UK-GBC Non-dom zero carbon task group

Fabric standard

A building fabric efficiency target should be included within the non-domestic zero carbon definition. This approach would represent a development of the Building Regulations Part L2A which includes elemental back stops for fabric performance and potentially align with the proposed zero carbon definition for domestic buildings which includes a Target Fabric Energy Efficiency (TFEE) rate.

This fabric standard should include the energy demand for lighting, in addition to heating and cooling, due to the high level of energy consumption associated with lighting for many non-domestic buildings, and to reflect the role of delivering better day-lighting through improved fabric design. However the current daylight assessment metric needs to be developed as feedback from measured building energy use indicates that daylight energy use savings are over estimated. The fabric standard approach will focus design teams on ‘passive’ measures of building design, ensure they are built into the building fabric and help to save energy regardless of how the building is occupied or operated.

Further investigation is required as to how this fabric standard should be defined, how it would vary for different non-domestic building types and whether poorer fabric standards would be acceptable for buildings with high internal heat gains.

Methodologies and metrics

The current calculation methodology for assessing the energy efficiency of new build non-domestic buildings is based on the National Calculation Methodology (NCM) and implemented through the Simplified Building Energy Model (SBEM) and accredited third party software. This methodology consists of comparing the actual building CO₂ emission rate (BER) with a target CO₂ emission rate (TER). If the BER is no worse than the TER, the building complies with the emissions requirements of Part L. The TER is defined using a notional building of the same size and shape, with the same activity types as the actual building, but with a specific recipe of fabric and systems defined by the NCM.

The SBEM methodology is well known by industry but needs development to reward low carbon systems (such as natural ventilation) and to regain an intuitive relationship between carbon emissions and energy use. Therefore, the notional building baseline should always use a standardised and transparent servicing solution to ensure a consistent target irrespective of design solution. This would also reduce opportunities for manipulation of notional building emission targets to artificially inflate actual building pass margins. As building emission targets are further reduced as we approach 2019, designers are employing ever more complex and innovative solutions to meet the more stringent targets implemented through Part L and the calculation methodology should be able to accurately account for these, without penalising simpler buildings.

These changes should be relatively simple to implement - the aim is to create transparency and predictability for the industry, rather than propose wholesale changes which will be counter-productive in providing clarity for the non-domestic zero carbon trajectory.

Simple buildings

Further investigation should be conducted to assess the potential implementation of an alternative, quicker route to compliance for simple buildings using a ‘deemed to satisfy’ route to compliance, based on meeting the fabric and system efficiency targets set out in the NCM notional building systems and fabric recipe, with no modelling required to meet Building Control approval. Any adoption of this methodology would need to be studied in detail to ensure it complies with the requirements of the Energy Performance of Buildings Directive and its requirement for buildings to have energy performance certificates, based on actual building geometry and systems.

This methodology could provide an impetus to deliver cost effective products, solutions and details that meet the requirements of the compliance route without requiring complex modelling through SBEM or third party software. An assumed level of residual CO₂ emissions could be pre-calculated to determine the offsetting required through Allowable Solutions.

Allowable Solutions

The generic principles and draft framework for Allowable Solutions for homes was recently released by DCLG for consultation. A similar mechanism should be adopted as part of the zero carbon definition for non domestic buildings. This will assist in having the two definitions aligned and will provide a way of offsetting part of the carbon emissions through off-site means. The three year gap between the introduction of Allowable Solutions for homes in 2016 and the adoption of the zero carbon standard for non-domestic buildings in 2019 would also provide a period for the Allowable Solutions market to mature. The emissions covered by Allowable Solutions are emissions that would not be technically feasible or cost effective to mitigate on-site.

The percentage of the predicted CO₂ emissions of the building that would need to be covered through the Allowable Solutions will have to be researched in more detail. The Allowable Solutions, as proposed for the domestic sector from the Zero Carbon Hub, apply after a certain level of emissions reduction has been achieved. This means that specific levels of carbon savings would have to be achieved on-site before moving to off-site solutions.

Embodied carbon

Capital Carbon, as defined by the Green Construction Board in its “Low Carbon Roadmap for the built environment”, currently represents about 18% of the total emissions from the built environment. The scope of this category includes emissions arising from design services, material extraction, manufacturing, on site construction activities, and the distribution of people and products. Of this 18%, materials accounts for around half.

The European Construction Products Regulation (CPR) was adopted in April 2011 and implemented in the UK in 2012. The CPR defines relevant product-specific information in the Basic requirements for construction works (BCRW). BRCW 3 (hygiene, health and the environment) and BRCW 7 (sustainable use of natural resources) each contain requirements related to the environmental impacts of materials throughout the lifecycle of the construction works.

At present no decision has been taken as to how compliance with these legally binding requirements will be demonstrated, but the regulation states that Type 3 Environmental Product Declarations (EPD) should be used when available. To date, the European Commission has not issued a mandate to CEN to implement EPD within harmonised specifications (hEN) although it has recently indicated its intention to do so during 2014.

The publication of EN15804 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products is acknowledged as an attempt to obtain contract and convergence in EPD. Unfortunately, EN 15804 still allows for a degree of interpretation, resulting in variability between EPD from different schemes across Europe.

Voluntary harmonisation is underway via the “ECO platform”, an umbrella organisation for European EPD programmes, which is coordinating its activities with CEN/TC 350. As harmonised Standards emerge from CEN they will be adopted by voluntary EPD Programmes. However, in the short to medium term there remains some variability between EPD produced to EN 15804. This is why the group believes that embodied carbon calculations would not be reliably feasible in a regulatory environment until 2022 - 2025.

Renewable Technologies

The extent to which the inclusion of on-site renewable technologies are promoted through Part L is a subject of some debate within the industry. The government does not want to promote one form of technology over another in meeting Part L emissions reduction targets and policy incentives for on-site renewables are already in place through Feed-in Tariffs and the Renewable Heat Incentive scheme. However, mandated CO₂ emissions targets should continue to push innovation and promote on-site carbon mitigation. Therefore, it seems reasonable that the amount of on-site renewables is not mandated through Part L and that decisions on how to meet emissions targets remain with design teams, enabling them to provide cost effective and flexible solutions.

Compliance vs. operational consumption

Currently, there is some confusion in the industry regarding what the outputs from the compliance methodology refer to. The use of standardised internal conditions, building hours of operation, and heat gains in assessment calculations, together with simplified methods of calculating building energy usage and associated CO₂ emissions means that the energy consumption figures and CO₂ emissions calculated for Building Control compliance rarely tally with those that appear on utility meters.

This ‘performance gap’ makes it difficult for the industry to accurately track how the emissions from real buildings are changing with time, and the impact Building Regulations relating to building energy efficiency are having on the actual emissions from our non-domestic building stock. The wider implementation of operational energy certificates (such as Display Energy Certificates) to all non domestic buildings would provide essential feedback in addressing the performance gap. Although the government has ruled out making this mandatory in the past, certain parts of the industry are providing leadership by adopting operational energy certificates voluntarily.

It is therefore proposed that a programme is put in place to address the performance gap for non domestic buildings and provide a methodology for predicting building emissions from both regulated and unregulated sources more accurately. Initially, at a basic level, the compliance software should only produce ‘compliance’ figures. Users should be given the option to then develop building energy models, using more sophisticated input parameters to enhance the ‘compliance’ figures into ‘operational’ figures. To generate ‘operational’ figures requires more user input that may not suit all developments. The difference between these figures should be clearly stated by the compliance software. These figures should be presented as a range of figures, to show sensitivity to inputs and operational factors, in an analogous manner to vehicle CO₂ emissions. CIBSE TM54 or the non domestic Green Deal assessment could form the basis of this methodology. The generation of more accurate ‘operational’ figures will provide feedback to the industry and will work in tandem with feedback from operational energy certificates which monitor actual building energy usage.

UK-GBC is working with a range of organisations from across the sector to investigate how operational energy use can be addressed, and to implement a programme of activity to drive the agenda forward. The first step in this project is to undertake a scoping exercise to investigate the issue in more detail, including the current state of the operational energy use data landscape, and an appraisal of the key options for addressing barriers identified.

At some point in the future, the feedback from operational energy certificates and optional enhancements to the basic compliance figures should be incorporated into SBEM, forming the basis of a robust and accurate calculation methodology, applied through Part L.

7. GETTING TO 2019

The above sections propose a framework 'road map' for how we think the future of Building Regulations should be conceived. The Task Group has also discussed that industry organisations, practitioner companies and government departments must work together immediately if the proposed timeline is to be achieved.

Indeed, we recognise that when government confirms the intention to establish a challenging target for future of non domestic building regulations it is likely that industry will have to fund initial research and investigation to initiate quick development of the regulations. The key work items that need to be addressed include:

- Development of energy efficiency standards for non-domestic buildings (following decisions on the metric, building on the consultation and further analytical work).
- Scoping of a detailed delivery timeline, reflecting the implementation challenges and new stock likely/needed to build up knowledge across the non-domestic building types, and enabling monitoring.
- Dissemination and communication of information and advice to industry.
- Identification of further research and development needs to be undertaken on non-domestic buildings to match the domestic projects/knowledge base.

In considering what form, structure and which stakeholders should work together to shape the detail of future regulations it is useful here to consider and assess the experiences and results achieved to date by the Zero Carbon Hub. The Zero Carbon Hub was established in 2008 to bring house builders, their supply chains and other key stakeholder groups to actively collaborate with UK Government in preparing for Zero Carbon Homes delivery in 2016. The primary objective of the Zero Carbon Hub has been to facilitate the mainstream delivery of zero carbon homes from 2016. This was the first time that such a public and privately funded entity had been established to execute such a task, and represented an innovative response to a challenging target.

The Task Group discussed whether non domestic building regulations could be delivered through a separate entity or an expansion of the existing Zero Carbon Hub. The volume of work which would need to be progressed on both the policy framework and delivery challenges in order build on what has already been done for homes is significant. The existing Zero Carbon Hub structure and capabilities would require significant enhancing to extend focus to non-domestic buildings

However, there are a number of delivery benefits to combining the work here, these include; the ability to implement a robust, comprehensive methodology for carbon accounting across mixed-use communal energy systems; the ability to facilitate solutions on a greater scale, resulting in economies of scale and a wider array of potential solutions; and a better ability to effectively engage with communities and Local Authorities in delivering the benefits of supplying communally-generated low and zero carbon energy to mixed-use schemes. In many instances failure to ensure a joined-up approach in these areas may result in additional barriers which could jeopardize the domestic 2016 target as well as the deliverability of a non-domestic 2019 target.

Consistency

With the increasing prevalence of mixed-use schemes, it is important that domestic and non-domestic practitioners are given consistent messages that ensure they are aligned in their approach to zero carbon. A co-ordinated, consistent policy will be easier to communicate and will enable the development industry and its supply-chain to deliver more cost-effective solutions.

Community systems

Larger scale, community-based solutions are often more cost-effective overall, and are generally more efficient, thus achieve greater carbon reductions. Such systems generally tend to work

better where a larger, diversified demand is available; therefore non-domestic buildings will have a key role to play in securing the viability of such schemes. This, combined with the fact that other Government initiatives, including DECC's 2013 Heat Strategy and incentive schemes such as Feed in Tariffs (FiTs) and the Renewable Heat Incentive (RHI) are actively seeking to encourage decentralised energy systems, points toward a resurgence of community-based schemes in the UK.

Allowable Solutions

One of the potential Allowable Solutions previously proposed under both the domestic and non-domestic definitions of zero carbon consulted on in 2008 is the export of low and zero carbon heat. Following the 2013 Government consultation on the next steps for Zero Carbon Homes and Allowable Solutions, the relevance of such an option appears to still hold. However, there is currently no robust accounting methodology for apportioning the emissions associated with mixed-use district schemes, and no one organization with the remit to do the sort of cross-sector stakeholder engagement required in order to develop such a methodology.

Allowing the carbon accounting methodologies for domestic and non-domestic buildings to be developed in isolation (as is currently the case) will lead to a fragmented and confusing approach. This in turn increases the risk, and potentially the costs, to new-build development which will inevitably be asked to act as a catalyst for delivering decentralised energy.

If an Allowable Solutions framework is taken forward as an option to support the delivery of zero carbon non-domestic buildings, logic would serve that that extensive work already undertaken by the Zero Carbon Hub in collaboration with industry stakeholders should be built upon and integrate the needs of the non-domestic building sector. Indeed a universally applied Allowable Solutions framework covering both homes and non-domestic buildings would present opportunities to unlock economies of scale in terms of delivery and administration and could therefore offer domestic and non-domestic property developers alike a cost effective route to compliance.

Scale

Relying on the new-build residential sector alone may not deliver sufficient scale to attract the level of investment required in order to kick-start the 'allowable solutions' market. Ensuring that the domestic and non-domestic approaches are aligned will enable allowable solutions to be delivered on a much larger scale, resulting in benefits to developers and communities as well as investors.

Local Authorities

Local Authorities have a crucial role to play in terms of securing public buy-in and also providing anchor loads/customers for communal energy systems. Local Authority buildings are largely non-domestic and having a single body dealing with the domestic and non-domestic routes to zero carbon could aid engagement in this area and be a valuable asset to Local Authorities.

Funding

By covering non-domestic buildings as well as domestic, the Zero Carbon Hub could gain access to a greater variety of funding opportunities, potentially increasing both public and private contributions.

Communication

Many of the Hub's current stakeholders²⁵ operate in both domestic and non-domestic markets. A single point of contact for information would be of much greater value in these instances. Furthermore, a co-ordinated message is much easier to communicate, making the Hub's information dissemination role simpler.

²⁵ e.g. architects, consultants et al

Conclusion

The example of the Zero Carbon Hub serves to emphasise both the value and importance of complementing the setting of an ambitious target for industry to deliver with a vehicle through which to both guide and drive its own innovation and capability building processes towards achievement of the target. The Zero Carbon Hub in its six years of operation has played a critical role in bringing both industry and Government together to collaborate on resolving both policy and implementation challenges related to the delivery of the world-leading 2016 Zero Carbon Homes policy.

This Task Group firmly believes that achieving the Zero Carbon Standard proposed in this report for non-domestic buildings from 2019 will require a ‘hub-like’ entity to be established. However a number of key questions will need to be answered ahead of establishing such a vehicle.

- How will such a vehicle be constituted and funded?
- Should the vehicle be exclusively industry based or jointly governed with accountability to a senior cross industry expert group such as the current 2016 Task Force?
- Which stakeholder groups should be involved?
- How will the progress of the organisation be measured, and what against?

The UK Green Building Council and its members is keen to work with Government and other key stakeholder groups to address these questions.

8. CONCLUSIONS AND RECOMMENDATIONS

The Task Group has reinforced the case for Building Regulations, reiterating the need for mandatory regulation in this area and proposing future changes which continue to challenge the built environment industry. Collectively, as a group of designers, developers, contractors and product suppliers, and energy suppliers we argue for increasing future standards in Building Regulations in the non-domestic sector.

We believe there is a very strong economic case for establishing a robust route map towards zero carbon for non-domestic buildings as soon as possible. Establishing the details of Building Regulations for such buildings now gives everyone in the industry time to prepare, levelling the playing field and reducing the burden to all those involved in construction. A clear and specific vision for future policy will encourage investment in product innovation and up-skilling for hundreds of thousands of workers. The knowledge gained from preparing for and meeting higher regulatory standards in the non-domestic sector will be a great opportunity for UK architects, engineers and manufacturers to become global leaders in energy efficient building designs.

By moving before other countries in mandating change in the design of the built environment, the UK can deliver job creation, climate protection and new world-leading manufactured product exports which will support the rebalancing of the UK economy as a whole.

In order to capitalise on these opportunities, we believe Government should work with industry to create a ‘roadmap’ to Zero Carbon 2019 and beyond - setting out the broad parameters of the zero carbon standard which will focus efforts and enable the industry to innovate and evolve. This should not be limited to regulated energy, but encompass the broader scope in the future of energy in-use and embodied carbon. The routemap recognises that Building Regulations are just one of many policy levers for reducing energy consumption/demand and CO₂ emissions associated with the built environment. In doing this, we call on the entire industry to invest in developing the methodologies, standards and analysis needed to underpin regulatory and policy interventions.

Recommendations

- 1) Government should restate its firm commitment to Zero Carbon non-domestic buildings from 2019 immediately. In order to capitalise on the economic growth and export opportunities of low carbon building knowledge, skills and technology, the UK should be

the ‘first mover’ within Europe in defining Zero Carbon/ ‘Nearly Zero Energy’ Buildings, giving UK industry the certainty to invest and to gain a head start.

- 2) DECC, BIS and CLG should work with industry over the next year to create a ‘roadmap’ to 2019 and beyond - setting out the parameters of the zero carbon standard and enabling industry to invest in innovation and skills.
- 3) The Impact Assessment methodology used by Government to assess the economic costs and benefits of policy should be revised to account for a broader range of impacts to UK Plc.
- 4) Industry, working with Government, should form a Zero Carbon Non-Domestic Buildings Hub to finalise the definition of zero carbon, and facilitate implementation.
- 5) The technical definition of Zero Carbon should follow a similar model to that for the residential sector: a minimum building efficiency standard and a minimum on-site carbon emissions target. The Allowable Solutions framework should apply to non domestic buildings as well as homes, and follow a similar structure as proposed for homes.
- 6) The definition of regulated energy in 2016 should be extended to cover more fixed building services - lifts, escalators and over-door heaters. Whole life carbon emissions currently outside the scope of Part L should be brought into regulation over time (post 2019). These include other unregulated energy uses and embodied carbon.
- 7) To build the knowledge and data necessary to incorporate embodied carbon into regulations, designers, contractors and manufacturers should be encouraged to take practical steps now to measure and reduce embodied carbon using the applicable CEN/TC 350 standards. Government can assist by incorporating embodied carbon assessment into the BIM component of the Government’s Construction Strategy 2016 and also by giving preference to purchasing products with 3rd party certified Environmental Product Declarations.
- 8) SBEM is currently used to determine Energy Performance Certificate (EPC) ratings and Part L compliance. SBEM should be developed to provide additional and optional functionality which could be used to generate more accurate predictions of energy use in future, possibly presented as a range of results based on different occupancy scenarios, through incorporating feedback from the non domestic buildings sector and operational energy certificates.
- 9) There is a need for industry-wide measurement and disclosure of operational energy use, ensuring like for like building comparison is possible, and including building services/tenant responsibilities. Industry is currently working to encourage greater action in this area, improve existing tools, and develop new approaches. In the longer term, operational energy certificates and their public disclosure should become mandatory for non-domestic buildings.
- 10) Further investigation should be conducted to assess the potential implementation of an alternative, quicker route to compliance for simple buildings.

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