



HM Government

LOW CARBON CONSTRUCTION ACTION PLAN

Government response to the
Low Carbon Construction
Innovation & Growth Team
Report

JUNE 2011



Devolved Administrations

This response addresses the construction industry as a single entity as the sector operates across the whole of the UK.

When using the term 'Government' we are referring to UK Government, and we are not communicating on behalf of the Scottish Parliament, the National Assembly for Wales and the Northern Ireland Assembly.

The devolved administrations have different responsibilities and powers in relation to construction. For example, the power to set building standards is devolved to the Scottish Parliament and the Northern Ireland Assembly. Welsh Ministers will assume this power in December 2011. Additionally, the application of EU legislation will also vary depending on the devolution of powers. We therefore recommend contacting the devolved administrations directly with any queries regarding their approach to any specific issue.

Useful websites addresses

Scottish Parliament

Built Environment pages

<http://www.scotland.gov.uk/Topics/Built-Environment>

Northern Ireland Assembly

Property and Housing pages

<http://www.nidirect.gov.uk/index/information-and-services/property-and-housing.htm>

National Assembly for Wales

Planning pages

Welsh <http://new.wales.gov.uk/topics/planning/?skip=1&lang=cy>

English <http://new.wales.gov.uk/topics/planning/?lang=en>

Housing and community pages

Welsh <http://new.wales.gov.uk/topics/housingandcommunity/?skip=1&lang=cy>

English <http://new.wales.gov.uk/topics/housingandcommunity/?lang=en>

Sustainable development pages

Welsh <http://new.wales.gov.uk/topics/sustainabledevelopment/?lang=cy>

English <http://new.wales.gov.uk/topics/sustainabledevelopment/?lang=en>

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Executive Summary

An efficient, effective and profitable construction industry is at the heart of any growing economy. A key priority for Government for the year ahead is to boost confidence in the construction industry to encourage investment and stimulate growth.

We are pursuing this on two key fronts.

We are reforming public procurement of construction through the Government's Construction Strategy. By becoming a more consistent and intelligent client we will increase efficiency, driving integration of the supply chain and encouraging greater innovation.

We are facilitating the move to low carbon construction through implementation of the joint Government and industry action plan published here. We are making a clear commitment to the low carbon transition which will create the certainty needed for companies to invest in essential new skills, processes and products.

The IGT mechanism is a very effective way of bringing industry thinking into the heart of Whitehall. It provides a means of focusing discussion and thoughts on a key issue. The construction IGT has reinforced our belief that the process is a good one and the Government was delighted to welcome the report when it was launched in November last year.

While encompassing all of the 65 recommendations, the Government response focuses on the key themes identified by the IGT:

- Through strong leadership and cooperation across the private and public sectors we will demonstrate the benefits and opportunities of low carbon construction.
- We will create greater clarity in a complex landscape, enabling the industry to better understand the opportunities that will be available to them in the future.
- We will ensure that we have the right framework of incentives and interventions to enable the market to flourish and the right levels of skills, research and innovation to enable and support growth.

We will be pursuing the following areas with particular vigour.

1. **The need for a transparent plan.** The Plan for Growth provided greater certainty around the definition of "zero carbon" for new homes. This response sets out further key steps which Government will take in the next 6 months – including the publication of an updated Carbon Plan. We will then look to the industry to identify what more is needed to create the clarity and certainty necessary to stimulate investment in low carbon and growth. It is important that this is a live and evolving discussion.
2. **The need to reform public procurement.** This response echoes the actions in the Government Construction Strategy that are directly relevant to the IGT's recommendations. This includes introducing a progressive programme for the widespread implementation of Building Information Modelling on public works,

encouraging the supply chain to work collaboratively. It also commits to look at further issues once the Strategy has had time to bed in. The Prime Minister has confirmed his commitment to the Better Public Building Awards which will continue and have a new focus on low carbon, to promote and spread best practice.

3. **The need to make the most of export opportunities.** The construction industry, through its work on zero carbon new homes, on retrofitting and on major projects like the Olympics is demonstrating itself to be truly world class. We need to build on the excellent work already in train to ensure we make the most of this in overseas markets.
4. **The need for a new level of cooperation between Government and industry.** We will establish a new joint Government and industry board to ensure that the action plan contained in this response is implemented and continues to grow and develop to ensure its ongoing relevance. This, the Green Construction Board, will sit alongside boards which we are similarly setting up to look at procurement issues.

The response presented here is a starting point, setting out the where we want to go and how we intend to get there. We will continue to build on the strength of co-operation exemplified by the IGT and work in partnership with industry to realise the opportunities of low carbon construction.



Mark Prisk MP

Minister of State for Business & Enterprise

Introduction

Innovation and Growth Team

The Government is delighted to have the opportunity to respond to the final report of the Low Carbon Construction Innovation and Growth Team (IGT). That report was marked by an impressive collaboration across all the industry's disciplines to consider the fundamental question of what the construction industry might need to respond most effectively to the challenges and opportunities presented by the shift to a low carbon economy. It is to the industry's credit that, as well as making a series of recommendations to Government, the IGT chose to make recommendations to the industry itself. This response aspires to respect that spirit of collaboration and co-operation.

Reaction from industry

The IGT called on the industry to suggest areas where it would like to collaborate with Government in the delivery of the report's recommendations. The response from industry has been impressive. We now need to work to provide an effective focus and framework within which those responses can be taken forward together with the actions the Government itself will take.

Government's approach to its response

Given the number of recommendations in the IGT report, coupled with the "expressions of interest" from a wide range of bodies in the industry to get involved in the work either specifically or more generally, the approach we are taking is to organise the work into a series of overarching themes. Government didn't need to look far for those themes as the IGT report identified them with great clarity. Those themes are:

- Leadership and co-operation
- Public sector good practice
- Overcoming complexity
- Affordability and funding
- Incentivisation
- Capacity and skills
- Research, innovation and information
- International opportunities

This means that we are not providing a direct response to each of the individual recommendations in turn but we believe the spirit of almost all of them is covered - if not the precise detail, or precise means of implementation at this time.

It is clear from the discussions we have had with the industry in the period between the publication of the IGT report and this publication that there is lots of support for the notion

that the Government's response should be in the form of an action plan. We have also had strong indications from the industry that they would like their actions to form part of a collaborative action plan with Government.

This response therefore presents an initial action plan and setting industry actions alongside those of Government. The intention is to unify actions planned across Government that have direct relevance to the construction industry and to build a better understanding of what activity this may release from within the industry. We recognise that the weakness of such an action plan is that it provides varying levels of breadth of applicability and depth of detail. Its strength is that it builds on the energy the industry put into the IGT, provides a valuable focus for further action and sets out a common understanding of the position from which discussion and collaboration between industry and Government can now go forward.

This response builds on the very successful Strategy for Sustainable Construction and works closely with the grain of other key policy initiatives in which the industry is already closely collaborating with Government, such as the Infrastructure UK cost study and the Cabinet Office Efficiency and Reform Group work on general construction procurement.

It is important that these all work in concert and that no one objective should be delivered at the expense of another.

Government is determined to continue to build on the success of the IGT in focusing business thinking on developing ideas for removing barriers to a fit for purpose low carbon construction industry. Government is equally keen for that thinking, combined with an effective analysis and a full understanding of the costs and benefits of a particular approach, to feed directly through to policy development and public sector practice. It is our hope that this action plan starts to set out the process by which that might be achieved.

Chapter 1

Leadership and Co-operation

The IGT report called for strong leadership from Government. It also called for the Government to work closely with the industry in developing plans to make the transition to low carbon in a way which will deliver maximum benefits to the UK economy.

If we are to make a success for construction of the transition to a low carbon economy, we need to take the collaboration between Government and industry to the next level and provide strong leadership from both sides. Government and the construction industry need to work closely together to set clear objectives and identify the means of achieving them, to put in place plans that will do so, and then to track the progress of those plans.

As the IGT report stated, leadership needs to start with Government but, beyond that, it needs to cascade to every level of the construction industry's supply chain.

Overarching objectives

It is important that the overall objective is clear – that is the point at which Government leadership must start.

The Climate Change Act 2008 sets a target to reduce to greenhouse gas emissions in the UK by at least 80% from 1990 levels by 2050. The Act requires the Government to set carbon budgets which limit greenhouse gas emissions in the UK for consecutive 5 year periods. These budgets must be set at least 3 budget periods in advance. The first 3 carbon budgets were set in 2009, following advice from the independent Committee on Climate Change (CCC). The Government is seeking Parliament's agreement to accept the CCC's recommendation on the level of the fourth carbon budget (from 2023 – 2027) of 1950 million tonnes of carbon dioxide equivalent (MtCO₂e)¹. This equates to a 50 per cent reduction in greenhouse gases on 1990 levels for each year over the fourth carbon budget period.²

Once that budget has been set in law, Government will publish a report setting out the policies and proposals required in the medium to long term to meet the budget. This will take the form of a revised Government Carbon Plan later this year, following publication of the interim version in March this year.

Meeting carbon reduction targets will create opportunities for businesses across the economy. To help ensure that UK businesses are best placed to take full advantage of

¹ Conditional on EU progress towards the EU emission goal and we will review this by 2014.

² Implementing the Climate Change Act 2008 – The Government's proposal for setting the fourth carbon budget, Policy Statement, May 2011.

these benefits, Government has established a Green Economy Council (GEC). The GEC is now considering the carbon budget question specifically from the perspective of business opportunities.

Work on the Carbon Plan and through the GEC will provide the high level clarity about the overarching objective which the IGT called for. Once they are both available, the additional information which the construction industry requires can be properly considered.

Leading by example

The IGT report went on to say that beneath the high level picture which the Carbon Plan will start to set out, leadership needs to cascade.

One of the most powerful leadership tools is example and one of best ways of ensuring it cascades is through recognising and promoting excellence whenever we find it. Public sector construction procurement provides a particularly valuable opportunity to do this. The Prime Minister has therefore requested that his Better Public Building Award criteria are updated to better regard the excellence we are now seeking – buildings which truly demonstrate that the shift to a green economy is both environmentally and economically sustainable.

The Prime Minister also ensured a step change in the drive to tackle the Government's own carbon emissions. Departments have stepped up to his challenge set on 14 May 2010 to reduce their carbon emissions by 10% in 12 months. The latest data to the end of April puts Government on track to achieve the target.

This was an ambitious and challenging target on energy efficiency, spanning more than 3,300 central government office buildings and 300,000 civil servants. Never before had Government achieved this level of reductions in such a short space of time. Coming only days after the Government took office, this target demonstrated the importance that it placed on sustainability, and the intention to demonstrate leadership by example.

Going forward, the new Greening Government Commitments, published in February 2011, set out the Government's ambitious goals to reduce greenhouse gases, waste and water use and to further improve the sustainability of its procurement, by 2015.

Industry leadership

In addition to some key Government actions, the plan also includes three key actions from the industry. The first is from the UK Green Building Council (UK-GBC) will lead the development of a sector specific Business Plan to show how we could put the UK on track to achieve a 50% reduction in carbon emissions over the next decade, in a way that creates value for business and society. The second is from some members of the Strategic Forum for Construction (SFfC) to develop a construction specific sustainability accreditation scheme, for the whole operation of a business. The third is from the Institution of Civil Engineers (ICE) to develop a route map to low carbon infrastructure (see box 1.1).

Box 1.1 ICE Low-Carbon Route map

The Low-Carbon Route map is a response to the challenge made to the construction industry by the Government's chief construction advisor, Paul Morrell, to play its full part in allowing the transition to a low-carbon future. The final Low Carbon Construction Innovation and Growth Team report identified the importance of

- Developing new products and services
- Building skills and capacity
- Making the transformation in its own structure and practice that will deliver a transition to a low carbon built environment that is both affordable and assured.

The Route map project, focusing on the infrastructure sector of the wider construction industry, will aim to:

- Set out a broad vision for the infrastructure required to meet the 2050 80% carbon reduction targets, and to make the transition to a low-carbon economy and low-carbon future.
- Identify macro-policy level changes to the policy and regulatory frameworks to allow the low-carbon transition to flourish.
- Establish the changes required to education and professional practice to enable a better understanding of the through life carbon impact of infrastructure construction and operation
- Recommend the types of changes the civil engineering profession would need to make to maximise carbon efficiency in infrastructure design.

Methodology

- The Route map is being developed by a group of senior members and others experts, and through engagement with Learned Society Expert Panels and Associated Societies, and in consultation with the wider profession and industry.

Output:

- The project will result in a report to Council in October 2011

Making the shift to a low carbon economy requires action on the broadest front. As this action plan starts to demonstrate, there is a complex matrix of tasks and deliverables with very many owners which need to be delivered to short, medium and long term timetables. This creates a significant programme management task which neither Government, nor industry, has the capability on their own to deliver.

Continuing collaboration

This action plan therefore suggests that a joint Government and Industry Board be created to take forward the programme management task. As well as monitoring the delivery of this action plan, the Board will also update and refresh actions going forward and take collective responsibility for leading the change to a low a carbon economy.

Government will work with the Strategic Forum for Construction and the UK Green Building Council to:-

- Agree terms of reference
- Identify appropriate representatives to sit on the group.
- Integrate the work undertaken under the Strategy for Sustainable Construction into this action plan.

The Department for Business will run the secretariat and host meetings. It is the expectation that both industry and relevant Government Departments will populate and support relevant working groups. DECC, Defra, DCLG, Cabinet Office and BIS will be the key Departments represented on the Group.

Government and industry will then work collaboratively through the “Green Construction Board” (GCB) to drive forward the actions set out in this joint action plan.

Government is also very keen to maintain the valuable dialogue with future industry leaders which the production of the IGT report provided a focus for. BIS will therefore continue to support the 2050 group alongside the Construction Industry Council (CIC) to ensure that the future leaders of the construction industry have a clear voice in driving forward low carbon and sustainable construction methods.

Chapter 1 - Action Plan

Owner	Action	Date	IGT Rec.
DECC	2050 Pathways Analysis update published.	May 2011	3.3 3.4
DECC	Submit energy National Policy Statements (making the case for new energy infrastructure) to Parliament for ratification. ³	May 2011	
DECC	Formal response to the Committee on Climate Change Fourth Carbon Budget Report covering the period 2023 – 2027.	May 2011	3.3 3.4
CIC ⁴ / BIS	CIC will support the continuation 2050 Group alongside BIS, to enable the future leaders of the industry to drive forward the low carbon agenda.	Jun 2011 – ongoing	8.5
DECC	Fourth Carbon Budget level set in law.	Jun 2011	3.3 3.4
BIS / SFfC ⁵	Establish the joint industry and Government Green Construction Board, working closely with Strategic Forum for Construction to agree membership and terms of reference.	Jul 2011	
BIS / SFfC	Agree across Government and with the Strategic Forum for Construction, the core work programme for the GCB based on key shared priorities from the IGT report, the Government's response and the existing Sustainable Construction Strategy.	Sep 2011	
Constructing Excellence	Develop an industry proposal for a construction specific major projects review group to work in collaboration with existing bodies and Government, including setting out the terms of reference, ways of working and membership.	Sep 2011	4.1

³ Carbon Plan March 2011, DECC

⁴ Construction Industry Council

⁵ Strategic Forum for Construction

Owner	Action	Date	IGT Rec.
BIS	First meeting of Green Construction Board	Sep 2011	
ICE ⁶	Develop a route map to Low Carbon Infrastructure and report to ICE Council.	Oct 2011	7.1 3.3
DECC	Publication of the final revised Carbon Action Plan	Oct 2011	3.3 3.4
CIC	Encourage the voluntary use of Display Energy Certificates in buildings operated by members.	Winter 2011	6.22
SfFC	Encourage the voluntary use of Display Energy Certificates in buildings operated by members.	Winter 2011	6.22
RICS ⁷	Have Display Energy Certificate assessments carried out on relevant properties owned and occupied by the organisation.	Winter 2011	6.22
GCB ⁸	Green Construction Board consideration of how far the low Carbon Plan take us towards a plan which make sense for construction. Identification and commissioning of priority areas of work	Dec 2011	3.1 3.3 3.4 5.4
UK-GBC ⁹	Work with legal experts from industry and local government to provide standard frameworks for navigating the complexities of Sustainable Community Infrastructure, such as decentralised energy systems and heat networks.	Dec 2011	
No10	Prime Minister's Better Public Building Award event to disseminate learning and good practice from the winners	Jan 2012	

⁶ Institution of Civil Engineers

⁷ Royal institution of Chartered Surveyors

⁸ Green Construction Board

⁹ UK Green Building Council

Owner	Action	Date	IGT Rec.
UK-GBC	Lead industry in the development of sector-wide Business Plan to show how it could put the built environment on track to achieve a 50% reduction in carbon emissions over the next decade, in a way that creates value for business and society. Phase one to be completed by March 2012	Mar 2012	3.1 3.3
DCLG	Provide clarity for developers, investors and planning authorities through the publication of the National Planning Policy Framework, including introduction of a strong presumption in favour of sustainable development. ¹⁰	Apr 2012	
GCB	Annual Progress report on IGT and Sustainable Construction Strategy Implementation; and publication of updated and refreshed priorities for 2012	Jul 2012	
SfFC	SEC group will work with CPA, CIC, CA ¹¹ and NSCC, to develop a construction-specific accreditation scheme for companies committed to improving their environmental credentials, with consideration to existing schemes and PAS91.	Summer 2012	3.14
EEPH ¹²	Build on EEPH's collation of evidence and the facilitation of stakeholder input to the IGT's 2050 route map, by facilitating and coordinating action plans with industry to achieve consensus on 2020, 2030 and 2050 outcomes.	Oct 2012 onwards	5.4 5.10
DECC	Carbon Budget Progress Review	Early 2014	

¹⁰ Carbon Plan March 2011, DECC

¹¹ Construction Alliance

¹² Energy Efficiency Partnership for Homes

Chapter 2

Public Best Practice

In recognition of the important role the Government could play directly, as 40% of the industry's workload is in the public sector, with central government the largest single client of the industry, the IGT report made a number of recommendations to Government in its role as a client of the industry. These ranged through publishing a forward pipeline of future construction work, trialling innovative forms of procurement and introducing innovative processes such as Building Information Modelling, through to issues around the sponsorship / specification of construction works and post occupancy evaluation.

Public procurement

The IGT's recommendations were at the front of the Government's mind when it was developing the Plan for Growth which was published at Budget 2011. Whatever it is we are seeking to achieve through procurement, starting with better value for money, through stimulating economic growth to delivering more sustainable outcomes, there are a number of key issues which need to be addressed.

A clear picture of likely future construction work

The lack of a clear picture of the scale and type of work which is likely to come to market in the short to medium term acts as a major hurdle on the industry's capacity to invest in making the transition to a low carbon economy. The Government has the capacity to provide much greater clarity about the work it will be purchasing from the industry in the future. The IGT report made a number of recommendations about developing a route map for low carbon construction. Clearly, public sector construction is an important component of any route map.

Greater co-ordination across the public sector to secure a more consistent approach with central Government approaching the industry as a single client

Having provided greater clarity on future pipeline, it is important that the demand is presented to the market in a consistent way. The public sector is diverse, as are the services it provides and the construction it procures, but there is capacity for a more consistent approach to the industry, particularly in the way that whole life carbon i.e. operational and embodied, is measured and accounted for.

Improve public procurement practices

The public sector has much to learn from its best procurement practitioners. If these best practices can be codified into a simple set of "standards" it could provide much momentum to the industry in its efforts to make the transition to a low carbon economy. Improving public procurement was a central plank of the construction measures in the

Plan for Growth. It was also implicit in a number of recommendations from the IGT, in particular from the Non-Domestic Buildings Working Group.

Improve what we buy

Similarly, the public sector has much to learn from product and technology innovations which have worked well on particular projects and have the scope to be transferred to other projects – for instance through Government Buying Standards. The Olympics construction programme is a good example of this and the extent to which knowledge can be transferred was central to the work of the Major Projects working group of the IGT.

Encourage a more innovative approach to procurement from the public sector

In the context of a more consistent approach from across the public sector, the IGT was keen for the public sector to trial new and innovative ways of procuring construction, including some specific recommendations on the adoption of Building Information Modelling.

We believe we have set out an ambitious programme of work and are keen to give it the opportunity to gain traction and bite. These actions focus on improving the procurement environment which we believe is the priority at this point in time. However, there were a number of other IGT recommendations which related directly to the Government and its own construction procurement activities – for instance that each Government Department should develop and publish a strategy for producing low carbon buildings of each typology within its programme. These were important recommendations and we are keen that we do not lose sight of them. We will therefore ask the Green Construction Board to further consider these issues and what actions might be taken at a point in the future which they consider appropriate but not more than 18 months from the publication of this report.

Box 2.1 Lion House Case Study

From the outset Defra's requirement for their new office building at Alnwick was for it to be a UK exemplar of the benefits of embedding sustainable development in the design, construction and operation. User involvement from the business case and throughout the design development and early inclusion of facilities management requirements make the building a landmark, low carbon workplace.

The build incorporated energy efficient technologies and responsibly sourced materials to maximise its environmental performance, mitigate carbon emissions and attain the highest BREEAM rating possible. Initial analysis after occupation suggests that the building technologies and sustainability features are outperforming the projected levels and that therefore shorter payback periods are expected.



Lion House has received much external recognition and reward:

- The project achieved a BREEAM Excellent, scoring 80.72% under BREEAM Offices 2006;
- It was the first UK building to be awarded an Energy Performance Certificate³ (EPC) rating of A+;
- The project won the 2008 BREEAM awards, in the category of BREEAM Offices; and
- The project was also awarded 'Sustainable Achievement of the Year 2009' with Property Week, and 'Low Carbon Building of the Year 2008' with the Chartered Institution of Building Services Engineers (CIBSE).

Procured through the innovative use of NEC 3 contract Defra achieved a higher degree of clarity when compared to existing contracts. They used simple language and avoided legal jargon whilst setting out precisely and clearly key duties and responsibilities. NEC's reported strength is in encouraging a partnering approach between contracting parties whilst placing emphasis upon proactive project management and early identification of project risks.

Chapter 2 – Action Plan

Owner	Action	Date	IGT Rec.
All departments	Reduce greenhouse gas emissions, waste generated, water consumption and domestic business air travel and encourage sustainable procurement for the whole central government estate. ¹³	Ongoing to Mar 2015	
EEPH ¹⁴	Build upon EEPH network to inform industry and Government on priorities for pilot projects and field trials and add to EEPH's Knowledge Base and deploy dissemination routes.	Ongoing to March 2012	5.2
RICS ¹⁵	Provide Government with knowledge and experience from pilot projects which they have been involved in and present ideas and solutions for cost effective low carbon procurement.	Ongoing	3.6
Cabinet Office / HMT – IUK ¹⁶ / BIS	The Government will reform the way in which it procures public sector construction and infrastructure to reduce costs by up to 20%. This will include measures to encourage standardisation rather than bespoke designs, setting clear criteria for asset performance and introducing new models of procurement. ¹⁷	Ongoing	3.6
Cabinet Office	Develop specific actions for the implementation of existing and emerging policy in relation to sustainability and carbon for inclusion in the Government Construction Procurement Strategy.	Ongoing	3.6 3.12 3.5 3.13
Cabinet Office	Establish the Government Construction Board and agree it's terms of reference to oversee a combined programme of work related to Government's Construction Strategy and IUK's Infrastructure Cost	Jun 2011	

¹³ Greening Government Commitments (<http://sd.defra.gov.uk/green-government/commitments/>)

¹⁴ Energy Efficiency Partnership for Homes

¹⁵ Royal Institution of Chartered Surveyors

¹⁶ Infrastructure UK

¹⁷ The Plan for Growth March 2011, HM Treasury and BIS

Owner	Action	Date	IGT Rec.
	Review: Implementation Plan		
DECC	Agree a stretching and cost effective level of ambition for longer-term energy reductions in Government and public sector emissions, including potential targets and incentives. ¹⁸	Jul 2011	
RICS	Discuss the use of Ska rating for fit-out of buildings with Government.	Jul 2011	6.2
Cabinet Office / HMT – IUK	The Government will publish quarterly from autumn 2011 a rolling two year forward programme of infrastructure and construction projects where public funding has been agreed. ¹⁹	Autumn 2011 onwards	
IUK	The Government will publish the UKs long term forward view of projects and programmes in the autumn as part of the National Infrastructure Plan 2011. ²⁰	Autumn 2011	3.3
RICS	Work with Oceania to examine the impact of green leases in Australia and present to Government.	Autumn 2011	6.10
Cabinet Office	Refresh and revise the Government Construction Standards (formerly Common Minimum Standards)	Sep 2011	
BIS / DCLG / DECC	Establish a programme of pilot projects to trial process and product innovations	Oct 2011	5.2 3.6
Cabinet Office	Agree the principles of functional requirement setting and review how whole life value will be measured. Roll out new standard setting requirements across Departments	Mar 2012	3.12
Cabinet Office	Improve the data held in the Public Sector Construction Database to provide greater visibility of forward projects and opportunities	Autumn 2012	

¹⁸ Carbon Plan March 2011, DECC

¹⁹ The Plan for Growth March 2011, HM Treasury and BIS

²⁰ The Plan for Growth March 2011, HM Treasury and BIS

Owner	Action	Date	IGT Rec.
	<p>for market management. This is ongoing with the first publication in July 2011.</p> <p>Review with suppliers and departments how pipeline information is being used in practice.</p>		
Constructing Excellence	Undertake a project to determine whether it is possible to deliver, using collaborative working principles, a sustainable retrofit of a school that achieves a 70% reduction in carbon emissions for the same capital cost as refurbishment to Building Regulations standards.	Summer 2012	3.6
Cabinet Office	<p>Introduce a progressive programme of the required use of BIM and begin trialing and a phased roll out</p> <p>Establish:</p> <ul style="list-style-type: none"> - Implementation / mobilisation group - Expected standards - Identify trial projects to achieve delivery via 3D fully collaborative BIM 	<p>Summer 2012</p> <p>May 2011</p> <p>Apr 2012</p> <p>Jul 2012</p>	6.14
Cabinet Office	Introduce a period of post completion operation of the built asset to ensure effective post-occupancy evaluation that projects are designed and delivered to required standards	Summer 2012	6.25
Industry	<p>Establish a collaborative forum, to identify when the use of BIM is appropriate (in terms of the type or scale of project), what the barriers to its more widespread take-up are, and how those barriers might be surpassed, leading to an outline protocol for future ways of working.</p> <p>Member organisations for the forum include BISRIA, British Institute of Facilities Management, Construction Alliance, Constructing Excellence, Centre for Education in the Built Environment, Chartered Institute of Architectural Technologists, CIBSE²¹, Construction Industry Council, Chartered Institute of Building, Construction Products Association,</p>	Jul 2012	3.11

²¹ Secretariat for the collaborative forum provided by CIBSE.

Owner	Action	Date	IGT Rec.
	College of Estate Management, Institution of Civil Engineers, Institution of Structural Engineers, Royal Institute of British Architects, Royal Institute of Chartered Surveyors, National Specialist Construction Council.		

Chapter 3

Overcoming Complexity

The challenge to reduce carbon emissions from the built environment is a vast and complex one, cutting across all sectors of the economy and addressed through layers of policy and legislation that apply from the international, national and regional levels right down to the individual neighbourhood and sectoral levels.

The IGT made a strong call to Government to provide clarity and consistency both at the macro and micro levels to ensure that businesses are able to access and understand the information that is relevant to them so that they can plan effectively for the future and respond to changing demands.

In particular, the IGT has raised the importance of the language and methodologies used to describe and account for carbon to enable effective management and reduction of emissions. The construction industry has developed many carbon accounting methodologies and parts of it are looking to government for a unified approach. Other parts of industry believe that a harmonised approach already exists in the European Standards.

The low carbon landscape

Through this action plan we hope to begin cutting away at these layers to provide the industry with information that is most relevant to them. The favoured mechanism for achieving this by the IGT was the development of market focused hubs such as the model adopted by the Zero Carbon Hub for new homes, and the priority area for action highlighted as the existing homes market.

The Zero Carbon Hub acts as a focal point for industry activity and creates the vital link between Government and the individuals who will be delivering the desired outcomes. Government does not have the capacity to tailor all of its communications to every individual user, from the international company to the self employed tradesperson. The Hub model allows Government to draw on the expertise of the full range of trade associations, professional bodies and other sector partners to inform and develop policy. This relationship needs to be two-way, with both sides listening to the objectives of the other, understanding the constraints within which they operate and collaborating to resolve problems or maximise the potential from opportunities as they arise. The Hub model has proven to be an effective means through which to facilitate this kind of constructive dialogue.

Zero carbon homes policy

A good example of this collaboration in action, on a particular issue raised by the IGT, is shown in the zero carbon homes policy to apply from 2016, published in the Plan for

Growth. Government worked with the Zero Carbon Hub to collect evidence on the right levels of on site carbon reductions. The Hub were able to develop evidence and recommendations on a collaborative basis, working in partnership with the full range of sector interests including house builders, green groups and academia. The Government has since incorporated a number of the Hub's recommendations in the design of the policy, for example, the level of the minimum Fabric Energy Efficiency Standard.

Government will consider establishing an existing homes hub with the industry and will report to the Green Construction Board with their conclusions in autumn 2011. This will build and be based on the proposals received from industry via their collaborative working group²².

Measuring carbon

The approach to carbon accounting has a major effect on the level of emissions reductions achieved. The industry has raised significant concerns about how carbon emissions are being measured and what is being included or left out of the picture, and the effects that this is having on the industry as a whole.

Whole life carbon

Whole life or 'Life Cycle Analysis' (LCA) considers the total environmental impact of a material or product through every stage of its 'life' – from obtaining raw materials (for example through mining and logging) all the way through manufacture, transportation, using the product and recycling and/or disposal. The diagram below shows the stages of a product's life that are typically included in LCA.

Figure 3.1 Life Cycle Analysis

The life cycle approach in Figure 3.1 can be used to think about the carbon that is emitted at each stage of a products 'life'. The IGT developed a broad LCA model for buildings to consider the carbon footprint of construction.

Image courtesy of SolidWorks Sustainability



The term 'embodied carbon', sometimes referred to as 'embedded' carbon,²³ refers to the carbon emissions created during the stages of a product's life up to the point of

²² Including the Energy Savings Trust, Energy Efficiency Partnership for Homes, Construction Products Association, British Energy Efficiency Federation, Energy Technologies Institute, Building Research Establishment, UK Green Building Council and Institute of Sustainability

²³ For the purposes of this paper the terms 'embodied' and 'embedded' are equivalent.

consumption. Broadly speaking these stages constitute the first 4 stages shown in figure 3.1 (raw material extraction, material processing, part manufacturing and assembly of a product) as well as the transportation in between. 'Operational carbon' is how the construction industry generally refers to the 'Product use' stage, the fifth stage in the above diagram, of a building's life cycle.

Reducing whole life carbon

The IGT presented the difficult reality faced by designers and the perverse incentives created by the current focus on operational carbon. There is currently little incentive to reduce the carbon embodied in construction materials, for example if it is cheaper to use heavy materials such as bricks from abroad than the UK the additional carbon emissions generated from transporting them would not be considered in an assessment of the final building. Equally, materials are rated on their contribution to improving energy efficiency and may be selected even if their production generates more emissions than they can save over their lifetime.

It is therefore essential that we understand where carbon emissions are being generated in order to reduce them. Operational approaches do not account for the emissions resulting from the manufacturing or processing of components, their transportation, the construction process or the later demolition, recycling or disposal of waste. This whole life approach can be extended to encompass varying degrees of the construction process, which is reflected in different methodologies.

Operational carbon measurement

The current methodologies used in practice across the construction sector and its clients, such as SAP²⁴ and SBEM²⁵, primarily focus on the energy or carbon emissions used during the life of the asset. This focus on operational carbon measurement is incredibly important as it raises the issues of ongoing energy costs, alongside primary objectives of whether an asset is fit for its intended purpose.

Closing the gap between modelled and actual performance

The IGT highlighted the difference between the modelled energy performance of a built asset and the actual performance. This is due, to a large degree, to the data used by current models being collected in controlled laboratory environments which do not necessarily reflect the variability of the real situations where materials etc. are used. This can be overcome in part by developing more rigorous estimates of energy performance based on real situations and incorporating this into our models, which the Government supports through direct and indirect funding of research. This is particularly important for developing consumer confidence in the retrofit market. There will also be a variation in energy performance depending on how a building is used. The IGT recommended that there be greater connection between those constructing a building and the users to ensure that systems are being used optimally. Chapter 2 sets out how Government will aim to achieve this objective in its own buildings.

²⁴ Standard Assessment Procedure for Energy Rating of Dwellings

²⁵ Simplified Building Energy Model

Measuring embodied and whole life carbon

Since the publication of the IGT report, this is the single biggest issue that organisations have made representations to Government on. Some groups are concerned about the impact that the focus on operational carbon will have directly on their businesses. Others are keen to contribute their data, expertise and resources. Many are already developing or contributing to the development of methodologies, design tools and data sets for the assessment of whole life and embodied carbon within a built asset. It is clear that the industry sees this as a vital area and is motivated to address it. However the enthusiasm has resulted in multiple standards and methodologies creating confusion.

A European methodology

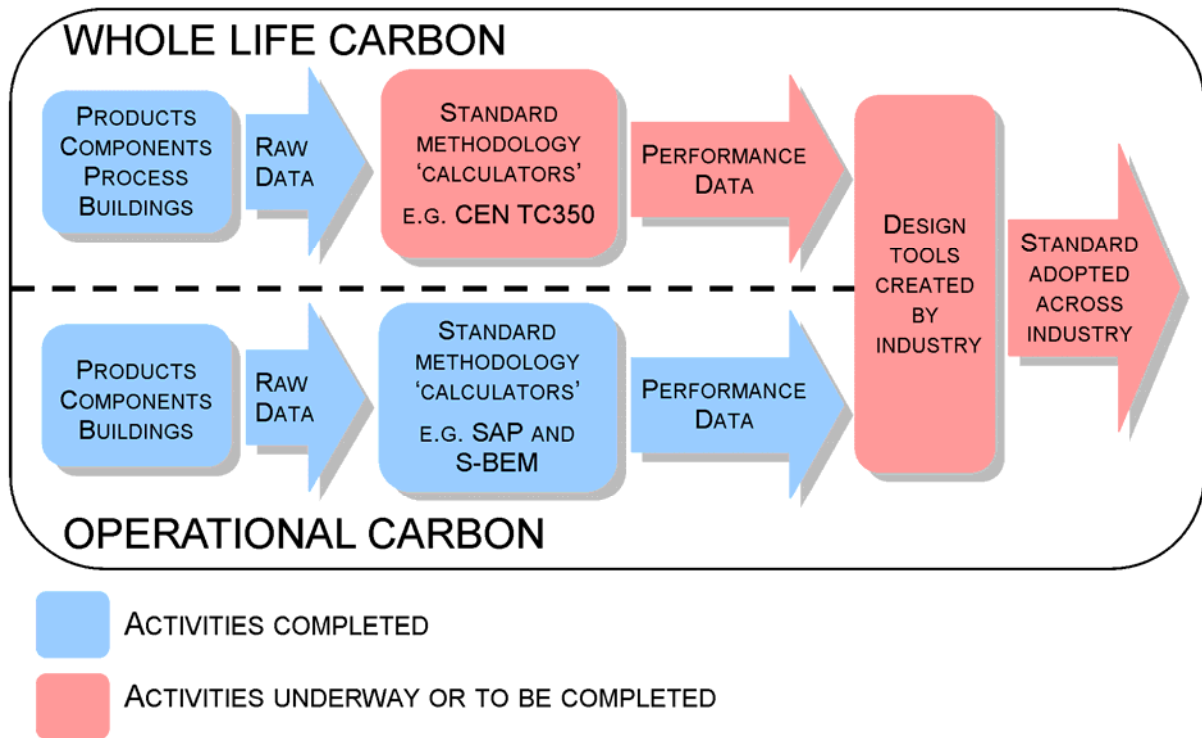
One of the emerging methodologies is being developed by the European Committee for Standardisation on sustainability of construction works (CEN/TC 350). The committee is developing voluntary methods for assessing the sustainability aspects of new and existing construction works and for standards for the environmental product declaration of construction products. The aim is for the standards to be generally applicable and relevant for the assessment of integrated performance of buildings over its whole life cycle. Government is supporting the development of this standard through collaboration with industry and the British Standards Institution.

Publicly Available Standard - PAS 2050

The revised PAS 2050 specification for measuring the greenhouse gas (GHG) emissions of products across the supply chain is due to be published shortly. This UK developed methodology is seen as a standard for measuring GHG emissions over a product's life cycle, covering embodied and operational carbon and as such has gained international recognition and authority. It is being used as the baseline for other international product standards initiatives currently underway. Defra will be working to facilitate the development of guidance and rules by individual industry sectors and product groups. The UK has gained a leadership position in this area through developing PAS 2050 and Defra shall be aiming to maintain that position and related commercial advantage. The focus will be on securing international agreement to ensure a level playing field in what are increasingly global supply chains.

Figure 3.2 - Developing carbon measurement tools

A high level illustration of the process for developing carbon measurement tools for use by the construction industry. Standardised methodologies use the raw data from products, components, processes and whole buildings to produce comparable data sets which can inform decision making in their own right. Once these data sets have been created, a range of design tools can be developed to evaluate the impact of design choices on whole life carbon emissions, e.g. whether to use a steel or wooden frame in a building.



Chapter 3 – Action Plan

Owner	Action	Date	IGT Rec.
DCLG	Continued support for the development of a European standard for embodied carbon measurement tool by CEN TC350 ²⁶	Ongoing	2.2 6.15
Industry	Continued support for the development of embodied carbon measurement tools. Including support from BRE, UK-GBC, CIC, BSI, RICS, EEPH and CPA	Ongoing	2.2 6.15
UK-GBC ²⁷	Developing a series of master classes on sustainability measurement and reporting, and a guide to industry tools and common metrics for carbon reporting.	Ongoing	2.2 6.15
UK-GBC	Work with 28 other European Green Building Councils, their members and industry associations to better coordinate communication with the EU in Brussels regarding the development of policy focusing on carbon reductions from the built environment, including a review of financial mechanisms that have been introduced by governments and the private sector.	Ongoing	
DECC / DCLG	Seek industry advice on the development and maintenance of SAP and SBEM energy/carbon calculation tools.	Ongoing	3.10
SfFC ²⁸	The Sustainable Construction Task Group completed a protocol for measuring carbon emissions for on-site activities in April 2011. Data will be collected from industry and reported annually from 2012 as part of the suite of Construction Industry Key Performance Indicators.	Apr 2011	6.15
DCLG	Government published its approach to zero carbon homes, to apply from 2016. To ensure that it remains viable to build	Mar 2011	5.1

²⁶ European Committee for Standardisation – Technical Committee – Sustainability of construction works

²⁷ UK Green Building Council

²⁸ Strategic Forum for Construction

Owner	Action	Date	IGT Rec.
	new houses, the Government will hold house builders accountable only for those carbon dioxide emissions that are covered by Building Regulations, and will provide cost-effective means through which they can do this. ²⁹		
HMT	The Government will work with industry between now and Budget 2012 to review construction standards and codes, to take out redundancy and duplication where the costs outweigh the benefits. ³⁰	Mar 2011 – Apr 2012	
DCLG	Technical statement on zero carbon homes published.	May 2011	5.1
CIOB ³¹	Launch of Carbon Action 2050 - an online resource to help reduce carbon in the built environment through innovation and best practice in project planning, procurement, design, construction, maintenance and operation. It will also deliver practical solutions for the industry to achieve carbon reductions now and in the longer term.	Jun 2011 onwards	2.2
DECC	Government will consider establishing an existing homes hub with industry and will report to the Green Construction Board with their conclusions in autumn 2011.	Autumn 2011	5.9
BIS	Work with industry to unify and further the use of various embodied and operational carbon calculation tools currently in use or under development.	Autumn 2011	2.2 6.15
Constructing Excellence / EEPH ³²	Develop and publish a transparent, co-ordinated structure for the many organisations involved in research, advice, policy development and delivery for carbon reduction, making clear the role, scope of work and authority of each, and how each connects to Government, whether directly	Winter 2011	3.2

²⁹ The Plan for Growth March 2011, HM Treasury and BIS

³⁰ The Plan for Growth March 2011, HM Treasury and BIS

³¹ The Chartered Institute of Building

Owner	Action	Date	IGT Rec.
	or indirectly.		
DECC / DCLG	Review of SBEM energy carbon calculation tool to support changes to Building Regulations in 2013. Including developing a formal process for product verification, integrating new technologies into SBEM by Oct 2011.	Aug 2012	3.10

³² Energy Efficiency Partnership for Homes

Chapter 4

Affordability and Funding

One of the most important issues across this agenda is how low carbon construction can be funded and be made affordable. Government has developed a package of incentives to address the most significant financial barriers to reducing carbon emissions from the built environment. These are considered both here and in chapter 5.

The Green Deal

The Green Deal is the Coalition Government's flagship policy for improving the energy efficiency of existing buildings in Great Britain and will be available by autumn 2012. It is a new market framework based on a key principle that some energy efficiency related changes to properties pay for themselves, in effect, through the resulting savings on fuel bills. Homes and businesses waste £6 billion in unnecessary energy costs each year. Individuals and businesses cannot afford this waste.

The Green Deal creates a new financing mechanism to allow a range of measures, such as loft insulation or heating controls, to be installed in people's homes and businesses at no upfront financial cost. Repayments will be linked to the property through the gas and electricity meters, rather than to an individual. By removing the financial barriers to the uptake of energy efficiency products, the Green Deal aims to drive consumer demand.

In the UK, a key opportunity lies in the diversity of the range of energy efficient measures that could be delivered under the Green Deal. Focussing on insulation alone, there is scope for the construction industry to carry out improvements in up to 14 million homes.

High levels of consumer demand for the Green Deal could unlock billions of private sector investment in the next decade and provide support for jobs in the green economy. By 2015, the Green Deal could support up to 100,000 jobs³³, including up to 15,000 installers.

According to the Low Carbon Construction IGT report, the value of new business to the construction industry (in its widest sense) could be around £5 billion per annum for 40 years.

The IGT proposed a series of recommendations regarding the Green Deal specifically, which are addressed below.

³³ This is an estimate of gross jobs, which includes supply chain multipliers and assumes the maximum take up of energy efficiency measures in the UK.

The Energy Company Obligation

The Green Deal will operate alongside a new Energy Company Obligation (ECO) which will set concrete targets for domestic energy efficiency improvements which energy suppliers are required to meet.

ECO will be entirely focussed on:

- The needs of lower income and the most vulnerable households
- Properties which are harder or more expensive to improve and for which Green Deal finance is less likely to fully support the cost of improvements

Energy efficiency products

Products installed under the Green Deal must be safe, reliable and capable of performing as intended

Green Deal products will be required to meet minimum health and safety and performance standards already set out in European and domestic legislation, including in building regulations. For many measures, robust standards already exist. DECC recognises that where European legislation harmonises standards, further testing requirements cannot be required.

DECC is also reviewing the existing landscape of certification bodies, and what warranties and guarantees exist. The overall requirements on Green Deal providers and installers will be brought together in a Green Deal Code of Practice being developed by DECC with the assistance of industry experts.

For new products, we will clarify what the process is for verifying performance and bringing them into the “pool” of eligible measures. Working with industry, environmental bodies and academia we want to create a framework which protects consumers and drives innovation. The process could involve building on existing mechanisms such as Appendix Q of SAP³⁴ and/or creating new “systems” based approaches.

Two critical strands of work in this area relate to

- Reaching a position on how to deal with the difference in performance often seen for measures “in situ” compared to performance in laboratory tests. Our framework needs to be sufficiently responsive to allow new evidence of performance to be incorporated over time.
- Whether to create a mechanism to allow companies to voluntarily differentiate the performance of their products – particularly for those where the performance is much better than the market standard. In doing so, we will drive innovation over time. The differentiated performance would need to be formally approved or verified.

³⁴ Appendix Q is the mechanism for approving new products for inclusion into the Standard Assessment Procedure for Energy Rating of Dwellings

Assessment standards

The assessment will be the first step in the Green Deal process, making recommendations to consumers setting out those measures likely to be suitable for the Green Deal. It is important that consumers are confident in the standard and impartiality of the assessment and the assessors themselves. To this end we have appointed UKAS³⁵ as the accrediting body for green deal assessors and are developing a robust standard to ensure the quality and impartiality of the assessment remains. All assessors will need to comply with the Code of Practice being set up under secondary legislation, in order to carry out assessments under the Green Deal. The Code of Practice will require assessors to demonstrate compliance with the standard, with certification bodies quality assuring their work against this standard and reporting to UKAS.

In addition, we are establishing a set of National Occupational Standards for Green Deal assessors against which all assessors will be tested to ensure they have the right skills to practice under the Green Deal.

Installer standards

Even if a measure has a tested ability to save energy it must be fitted to a robust and assured standard to enable these savings in a real life setting.

DECC will set out in a Code of Practice the requirements for all those who operate the Green Deal. It will include clear requirements around standards which will have to be adhered to. For installers, DECC has contracted the British Standards Institution to develop a Publicly Available Specification (PAS 2030) for the installation of energy efficiency measures in domestic and non-domestic buildings. UKAS will then accredit certification bodies to this standard. Members of these bodies will then be entitled to operate under the Green Deal. DECC has worked closely with industry representatives to ensure this approach is both robust, but also proportionate and works within the existing structures of the sector.

The PAS will therefore provide the criteria against which certification bodies should check installation companies to demonstrate that they are able to consistently carry out the installation of relevant measures according to best practice, and have the systems in place to provide consumers with a high level of customer service. This certification will be required in order for companies to be registered as Green Deal installers and to use the Green Deal quality mark. The final PAS 2030 will provide a consistent method of assessing Green Deal installers across the range of measures that qualify under the Green Deal. It is hoped that the PAS will drive standards within the sector and encourage investment in training.

Integration, innovation and increasing capacity in the supply chain

DECC is working with a number of industry groups and forums to take stock of the supply chain's capacity to increase installations rates across all sectors covered by the Green Deal. This includes reviewing the evidence on the number of "feasible" installations possible in each sector and what investments and barriers will need to be overcome to reach this potential.

³⁵ United Kingdom Accreditation Service

In doing so, we will draw on the latest research relating to which new technologies and installation methods can help tackle the more difficult to treat properties and what innovations can drive performance and reduce costs. For example, the Green Deal is drawing on the early findings of the Technology Strategy Board's Retrofit for the Future project and the Energy Technology Institute's Optimising Thermal Efficiency Project.

DECC will also work with industry to identify how to overcome supply chain related barriers to installing "packages" of energy efficiency measures.

The Green Deal consultation in Autumn 2011 will set out DECC's analysis of the readiness of the supply chain and the significant opportunities presented by the Green Deal.

Existing schemes

There are a number of funding schemes available for improving the energy efficiency of homes, with specific targets for the lowest income and most vulnerable households.

Fuel poverty³⁶ is a growing challenge, the numbers have been rising year on year, and since 2005 to 2008 the number of fuel poor households rose from 2.5 million to 4.5 million, an increase of 80%. A key part of the solution to alleviating fuel poverty and reducing people's energy bills is, undoubtedly, to address the thermal efficiency of the building stock, with the potential additional benefit of reducing carbon emissions in the longer term.

Carbon Emissions Reduction Target (CERT)

CERT is an obligation on large energy suppliers to achieve reductions in carbon emissions in the household sector in Great Britain. Suppliers meet their obligations by promoting the uptake of low carbon energy solutions to household energy consumers, thereby assisting them to reduce the carbon emissions from their home. Typically energy companies achieve this through marketing campaigns and offering a subsidy on measures such as insulation.

Last summer, the Government restructured and extended the CERT to December 2012. During the extension, energy suppliers will be required to focus further on the delivery of professionally installed insulation and ensure that more of the most vulnerable, low income homes receive support. To meet their new targets, energy suppliers are expected to install insulation measures in some 3.5 million households, including 100,000 solid wall properties. Over £400 million is expected to be spent on the lowest income, most vulnerable households, with an estimated 185,000 households expected to be removed from fuel poverty.

In achieving their targets to date, including carryover from the previous supplier obligation, energy companies have promoted the installation of insulation measures in

³⁶ Fuel poverty is said to occur when in order to heat a home to an adequate standard of warmth a household needs to spend more than 10% of its income on total fuel use.

approximately five million homes. The introduction of a professional insulation minimum for the extension will ensure even more homes receive the measures that can deliver significant and long lasting energy savings for households. Solid wall insulation (SWI) has been promoted under CERT, and to date approximately 70,000 homes have received SWI. For the extension we have introduced incentives to encourage the development of capacity in the SWI industry ahead of the launch of the Green Deal.

Community Energy Saving Programme (CESP)

CESP is a partnership (involving energy companies, local authorities and the third sector) based energy efficiency programme targeted at designated low income communities across Great Britain. It is a statutory carbon based obligation on energy suppliers and generators, and is designed to deliver whole house retrofits on a street by street basis. Particularly tackling hard to treat homes and providing a range of energy saving measures, in particular solid wall insulation.

Around £350 million worth of energy efficiency measures are expected to be installed in around 90,000 homes by the time the scheme closes in 2012.

Warm Front

The Warm Front Scheme has helped more than 2.2 million households vulnerable to fuel poverty with a range of heating, insulation and other energy efficiency measures. The scheme is now targeted at home owners on certain income-related benefits and living in properties that are poorly insulated and/or do not have a working central heating system.

Future funding

DECC is now carrying out an evaluation of CERT, CESP and Warm Front as we design the Energy Company Obligation, or ECO, which will take over from these schemes in 2013. ECO will build on the strengths of the existing schemes but will be more than just a new phase or extension. ECO will integrate fully and seamlessly into the new Green Deal market, supporting Green Deal in ensuring all households can take advantage of energy efficiency improvements to their homes.

Chapter 4 – Action Plan

Owner	Action	Date	IGT Rec.
RICS ³⁷	Provide advice and support to Government in relation to Green Deal including: <ul style="list-style-type: none"> - the regulation of assessors - share existing information, advice and guidance on retrofitting of homes - highlight the independent professional advice on energy efficiency provided by members - consider producing guides to retrofitting homes and business premises 	Ongoing	3.15 5.6 5.11 6.23
NSCC ³⁸	Contribute to the development of standard solutions for typical properties for the conditions required for the measures to be installed, in collaboration with trade associations. ³⁹	Ongoing	5.11
EEPH ⁴⁰	Build on the EEPH structures for achieving consensus on projects as part of the development of the Green Deal.	Ongoing to March 2012	5.3
DECC	Develop policies to enable application of Green Deal to the commercial sector, alongside household offer. ⁴¹	Ongoing	6.7
DECC / Energy Companies	Deliver the Carbon Emissions Reduction Target (CERT), including priority and super priority group targets to ensure more vulnerable households receive heating and insulation measures.	Ongoing to Dec 2012	5.6 6.8
DECC / Energy Companies	Community Energy Saving Programme (CESP) to deliver community scale energy efficiency measures to around 90,000 low income households.	Ongoing to Dec 2012	5.6 6.8
DECC	Announcement of the intention to establish an Office of National Energy Efficiency within DECC to provide a wider energy	May 2011	

³⁷ Royal Institution of Chartered Surveyors

³⁸ National Specialist Contractors Council

³⁹ Subject to funding

⁴⁰ Energy Efficiency Partnership for Homes

⁴¹ Carbon Plan March 2011, DECC

Owner	Action	Date	IGT Rec.
	efficiency strategy, strong programme management, and a cohesive view of DECC's customer facing policies. Official start date to be confirmed.		
DECC	Work with potential Green Deal providers to facilitate early precursor offers to the Green Deal. ⁴²	Jun 2011 onwards	
RICS	Share findings of the Doing Well by Doing Good research into the impact of energy performance ratings on the value of commercial property in the USA with Government and replicate in the UK subject to data and information availability.	Jul 2011	6.1
UKAS ⁴³	Open call for Green Deal accreditation of certification bodies. First accredited bodies expected April 2012	Jul 2011	3.15 6.19
DECC	Consult on secondary legislation to enable the Green Deal, including the new obligation on energy companies. ⁴⁴	Autumn 2011	5.6 6.8
Industry	Respond to consultation on secondary legislation to enable the Green Deal, including the new obligation on energy companies.	Autumn 2011	5.6 6.8
DECC	Review of existing product certification bodies, including warranty and guarantee schemes. Consult on process for verifying product performance.	Autumn 2011	3.15 5.12
Industry	Respond to consultation on process for verifying product performance.	Autumn 2011	3.15 5.12
DECC / EEPH	Assessment of supply chain capacity to deliver Green Deal retrofit programme by Green Deal Capacity and Innovation Forum	Autumn 2011	5.10

⁴² Carbon Plan March 2011, DECC

⁴³ United Kingdom Accreditation Service

⁴⁴ Carbon Plan March 2011, DECC

Owner	Action	Date	IGT Rec.
	convened by EEPH for DECC		
SFfc ⁴⁵	CCG will lead research through engagement with its client members and advisers, to understand how the market values low carbon buildings, both today and looking into the future, and how incentives interact with the decisions made by owner occupiers, property investors and tenants to build lower carbon buildings and use the more efficiently.	Autumn 2011	6.1
NSCC	Provide Government with additional market sector intelligence to deliver the installation of Green Deal Measures.	Autumn 2011	5.10
Defra	As part of broader sustainability information available under the Green Deal, develop advice on water efficiency.	Jan 2012	
DECC / BSI ⁴⁶	Publication of final Publicly Available Specification (PAS 2030) for the installation of energy efficiency measures into existing domestic and non-domestic buildings	Jan 2012	3.15 6.19
DECC	Lay secondary legislation to enable the Green Deal. ⁴⁷	Early 2012	
DECC / DCLG	Examine the operation of the energy performance of buildings regime to ensure it is capable of supporting Green Deal delivery. ⁴⁸	Apr 2012	5.6
DECC	Develop accreditation process to ensure public confidence in Green Deal measures. Consultation Autumn 2011	May 2012	3.15 5.12
DECC	Green Deal Code of Practice established for products, installers and suppliers under secondary legislation of the Energy Act. Consultation autumn 2011	May 2012	3.15 5.12 6.19

⁴⁵ Strategic Forum for Construction

⁴⁶ British Standards Institution

⁴⁷ Carbon Plan March 2011, DECC

⁴⁸ Carbon Plan March 2011, DECC

Owner	Action	Date	IGT Rec.
NSCC	Work with its member organisations to ensure they understand the requirements and if appropriate are able to implement a means of accrediting their members.	May 2012 onwards	3.15
DECC / Energy Companies	Launch of new Energy Company Obligation to provide energy efficiency improvements for "hard to treat" properties and vulnerable households.	Autumn 2012	5.6 6.8
DECC	Launch of Green Deal	Oct 2012	
DECC	Develop options for generating additional demand for energy efficiency measures alongside the Green Deal finance offer. ⁴⁹	Oct 2012	5.6
DECC	Monitor roll-out of Green Deal	Oct 2012 onwards	

⁴⁹ Carbon Plan March 2011, DECC

Chapter 5

Incentivisation

Achieving a low carbon built environment requires a transformation of the nation's energy, transport, water and communications infrastructure; that new buildings are constructed and used efficiently and that the energy performance of existing buildings be radically improved.

The IGT reinforced the scale of the challenge presented by the need to reduce carbon emissions from the built environment to mitigate the effects of climate change. The reality presented by the IGT that '*There are approximately 25 million existing homes to be retrofitted by the end of 2050*' and '*There are approximately 21 million minutes between now and the end of 2050*' is a sobering one. If we are to realise our ambitions we must optimise the nature and rate of activity, continuing business as usual will not reduce emissions enough to avoid catastrophic climate change.

Incentivising the market

The IGT concluded that the industry is able to deliver low carbon construction but identified that a lack in demand from the market is presenting a significant barrier. Without apparent demand there is little incentive for the supply chain to innovate, offer new products and services or invest in the skills to deliver them. It is crucial that individuals and companies are informed of the benefits and incentivised to request low carbon solutions and make optimal use of them.

Achieving these objectives is dependent on low carbon, or the associated benefits, being valued by the consumer and considered in their behaviour. However, to the individual consumer or organisation the benefits of action are often hard to see and may not be valued economically. Alternatively, a motivated consumer may be prevented from acting due to financial constraints.

Responsibility lies with Government to create a framework of incentives and interventions that will deliver the desired carbon reductions while maintaining a healthy market capable of sustained growth and improvements in productivity. Businesses also have a vital role in driving the market and stimulating demand. For example, by addressing the information asymmetries that exist, informing consumers of the benefits of low carbon solutions in terms that they value such as money savings and improved comfort.

New buildings

The consumer market demands that new domestic and non-domestic buildings meet minimum standards for safety, quality, durability and comfort, and expects them to be as inexpensive as possible to operate and purchase. The planning and building regime provide the framework for these requirements to be met, and, in many cases, the industry exceeds them. The IGT identified that the clear communication of the Government's intention to raise the standards in relation to low carbon construction for new buildings is effectively driving the industry to respond. Although low carbon buildings may not be valued by the market directly, the industry has responded through innovation to minimise the cost of construction while delivering these standards.

The Government has reaffirmed its commitment to drive carbon out of new buildings by setting ambitious zero carbon standards to be applied from 2016 for housing and from 2019 for non-domestic buildings. Similar, though typically less ambitious approaches are being taken across Europe and beyond, focusing on high energy efficiency or low carbon emissions standards, or a combination of the two. The revised Energy Performance of Buildings Directive expects new buildings to be near-zero energy, in cost optimal terms, from 2020.

Stamp Duty Land Tax (SDLT) relief is available for new housing which meet the highest level (level 6) of the code for sustainable homes. In order to qualify for relief a zero-carbon certificate for the home must be issued by an accredited assessor. If the property meets the conditions and costs £500,000 or less then there is no SDLT to pay. Properties costing more than £500,000 get a maximum reduction of £15,000 in the amount of SDLT payable.

Existing buildings

Around 75% of the housing stock that exists today is expected to still be in use in 2050. Reducing emissions from these buildings will need to come from improving energy efficiency, using low-carbon energy to provide lighting, cooking, powering our appliances, space and water heating. This can be achieved through a combination of retrofitting new measures such as insulation and supplying low carbon heat or hot water, and changing consumer behaviours.

The IGT identified a number of barriers to reducing carbon emissions in existing buildings and proposed a number of ways to overcome them.

Stimulating the supply chain

The IGT recommended that public procurement of construction should be used to trial low carbon solutions, creating demand for these products and services. In particular, it was recommended that pilots and trial projects should be undertaken using social housing stock to establish the level of carbon savings which are achievable in practice and create scale of demand to stimulate the domestic retrofit supply chains.

We agree with this approach and a range of initiatives are being undertaken. The Technology Strategy Board's £17 million 'Retrofit for the Future programme' trialed whole house retrofit solutions in over 100 social properties, in collaboration with BIS,

DCLG and the Housing and Communities Agency. Leading to significant product and process innovation, but equally importantly it identified the practical problems and how to overcome them through repetition at scale. The lessons learnt from the first phase of this project are now being expanded through a significant €1 million UK contribution to the European Construction Research Network. This €3.7 million fund for collaborative projects on 'Scaling-up retrofit' will focus on speeding up retrofit processes, and reducing costs.

DCLG has established a number of trail blazer retrofit schemes with local authorities and social landlords to explore the potential for Green Deal operation in the sector and help to stimulate the supply chain, particularly for harder measures such as solid wall insulation. Greater Manchester Housing Retrofit Partnership, which includes the 10 Greater Manchester local authorities and 15 Registered Social Landlords, will be taking forward a number of projects, the first of which is Salix Homes (see box 5.1).

Box 5.1 Greater Manchester Housing Retrofit Partnership

In the largest scheme of this kind to date, improvements such as solid wall insulation and better heating systems will be made to social homes in Manchester to make them more energy efficient.

The scheme will be an opportunity to investigate potential issues with the Green Deal, such as uptake, marketing and independent advice and assessment.

Upgrades will initially be made to up to 16,000 properties within the Greater Manchester Housing Retrofit Programme, and will prepare the way for Greater Manchester's 260,000 social homes to take up the Green Deal.

There is the potential for these retrofit projects to create up to 1,800 jobs and bring a £100 million boost to local businesses carrying out the home improvements, in advance of the Green Deal. It will act as a beacon for both investors and other social housing providers in demonstrating the vast potential for Green Deal finance in that sector.

Meeting the cost of improvements

The Green Deal will provide a mechanism for the owners of commercial and domestic buildings to fund the cost of energy efficiency improvements through savings in energy bills. Funding schemes for the most vulnerable households and most difficult to treat properties are already in place and will be extended. These schemes are explained in detail in chapter 4.

Government will incentivise the take up of renewable energy and heat technologies at the individual buildings and neighbourhood levels through two major schemes. As announced in the Plan for Growth the £850 million Renewable Heat Incentive will encourage £4.5 billion investment in the non-domestic sector in low carbon heat such as solar thermal, biomass and heat pumps by 2020.

By 2020 we estimate that the renewable heat sector will have grown to include around:

- 13,000 installations in industry

- 110,000 installations in the commercial and public sector
- supplying 25% of the heat demand in the industrial, commercial and public sectors
- This is 7 times the number of anticipated installations in 2014.

We are already seeing the market stimulated in anticipation of the launch of the RHI. We expect to see expansion all the way along the supply chain from manufacturers, suppliers, installers as well as diversification of other businesses such as banks and investment companies who can offer finance packages to companies looking to invest in renewable heat plant.

Feed-in tariffs are boosting the market for micro-generation of renewable electricity with thousands of household installations of solar panels and other renewable sources.

Box 5.2 Renewable Heat Incentive

The Renewable Heat Incentive is the first of its kind in the world providing long-term financial support to encourage the uptake of renewable heat. We expect that the RHI will stimulate additional capital investment on heat technologies of £860 million over the period 2011 to 2014; and £7.5 billion from 2011 to 2020.

This is a relatively new market for the UK and our commitment to introduce the RHI alongside existing renewable financial incentive schemes, the Renewables Obligation and the Feed In Tariffs sends a strong signal to the renewables sector.

Anything from a pub to a public library, a chemical plant to a district heating scheme will be eligible under the RHI to install technologies like biomass boilers, heat pumps and solar thermal. Community projects will also be eligible, provided they are aimed at providing heat to more than one house.

The tariffs will be paid for 20 years to eligible technologies that have installed since 15th July 2009 with payments being made for each kWh of renewable heat which is produced.

Once in the scheme the level of support an installation will receive is fixed but adjusted annually with inflation. However, as with feed-in tariffs, we expect the levels of support available for new entrants to the RHI scheme will decrease over time as the costs of the equipment and installation reduce through economies of scale.

For the first phase of household renewable heat incentive, there will be direct payments to subsidise the cost of installing qualifying renewable heat system in homes. Known as the 'Renewable Heat Premium', this will help families cover the purchase price of green heating systems. Those taking up the Premium will then be eligible for the RHI tariff from October 2012 providing they meet the conditions of the RHI scheme.

Enabling consumers to understand and maximise the benefits of low carbon construction

As the IGT report recognised, it is essential that the evidence base used to make policy and delivery decisions is well-rounded and builds on an understanding of individuals, groups, organisations and communities and how they function and interact. Social and customer insight research brings together a wide-range of disciplines which can bring a broad understanding to an issue. By understanding and acting on social evidence, it is more likely we will successfully meet our ambitious targets and effectively tailor our policies to achieve maximum impact.

Drawing on consumer insight work we need to help consumers understand the benefits of making energy efficiency improvements.

DECC has commissioned two pieces of research which help to assess factors that might influence consumer demand for the Green Deal. An economic model is also being created to simulate consumer uptake of energy efficiency measures under a number of parameters. The model will be populated with data from the consumer survey.

An industry-wide Call for Evidence and Literature Review on the costs and benefits of a range of measures was issued in March 2011. Over 300 responses were received. The Review will add to the evidence base on how household improvements perform and what benefits people can realise. Evidence was gathered on the following measures and we expect to publish a summary of the findings later in 2012.

Measures ⁵⁰	
Heating, ventilation and air conditioning	<ul style="list-style-type: none"> Condensing boilers Heating controls Under-floor heating Heat recovery systems Mechanical ventilation (non-domestic) Flue gas recovery devices
Building fabric	<ul style="list-style-type: none"> Cavity wall insulation Loft insulation Flat roof insulation Internal wall insulation External wall insulation Draught proofing Floor insulation Heating system insulation (cylinder, pipes) Energy efficient glazing and doors
Lighting	<ul style="list-style-type: none"> Lighting fittings Lighting controls
Water heating	<ul style="list-style-type: none"> Innovative hot water systems Water efficient taps and showers

⁵⁰ This list is not exhaustive. Participants will be invited to share information on measures not listed.

Measures ⁵⁰	
Microgeneration	Ground and air source heat pumps Solar thermal Solar PV Biomass boilers Micro-CHP

Informed consumers

Existing requirements to provide Energy Performance Certificates (EPCs) on sale and rental present a real opportunity to empower people to make informed choices about their energy use. However, at present, few people are acting on the recommendations in the EPC and as a consequence it is not fulfilling its potential to support change. The Energy Performance Certificate has the potential to form the basis of the impartial assessment of the property that will be required for the Green Deal. The call for evidence launched by Lord Marland and Andrew Stunell last December, highlighted a number of areas where improvements to the EPC and surrounding framework could be made, both to improve its ability to stimulate action on sale and rental and to support future policy ambitions such as under the Green Deal. DECC and CLG are currently working to put each of these improvements in place to deliver a robust framework capable of supporting current and future policies.

Reducing emissions from the built environment depends on individuals using the buildings efficiently. One of the most powerful enablers of behavioural change is information. Our vision is for every home in Great Britain to have smart energy meters, giving people far better information about, and control over, their energy consumption. This will not only help households save money, but also assist them in playing their part in reducing carbon emissions.

Smart metering will enable energy suppliers to offer improved customer service and will open up new products and services, such as the provision of tailored energy efficiency advice and more innovative tariffs.

Infrastructure

IGT made specific recommendations to the industry with regard to effective planning and delivery of next generation infrastructure to deliver both capital and operational reductions in carbon emissions. The Government is committed to supporting the transformation of the UKs infrastructure to meet the challenges of the 21st century.

In the Plan for Growth we set out our intentions for the Green Investment Bank (GIB) to overcome the barrier of financing major infrastructure projects. The GIB will be capitalised with an initial £3 billion and will begin operation in 2012-2013, a year earlier than planned. The £500 million Ofgem Low Carbon Networks Fund, launched in 2010, has already allocated four major grants for innovative electricity distribution network projects totalling £60 million. Ofgem has now announced similar innovation incentives for the electricity transmission and gas distribution and transportation networks totalling £400 million over the period 2013 to 2021.

What might we do in the future?

It may be necessary to consider introducing further incentives and interventions to drive emissions out of our buildings as we approach our 2050 target date. It is clear from the IGT that there is a programme of work that needs to be undertaken to both evaluate the effectiveness of existing incentives and interventions and to be in a position to go further. This includes work such as reviewing the effectiveness and methodologies for Energy Performance Certificates and Display Energy Certificates and their advisory reports on building improvements.

The IGT called for Government to introduce a suite of measures to provide more confidence to the sector that consumer demand will increase, including planning for regulation, whilst allowing for the possibility that it may not be required. Government are proposing, through powers in the Energy Bill, to introduce a minimum energy efficiency standard of 'E' from 1st April 2018 for privately rented properties. In addition, from 1st April 2016 no tenant would be unreasonably refused consent from their landlord for a Green Deal. Government has committed to working with the sector to encourage improvements ahead of these enforcement dates.

The IGT proposed a number of useful proposals to stimulate market demand including setting minimum energy performance standards on marketing or sale of properties, mandating the use of green leases in public buildings, requiring energy efficiency improvements when completing other works and early and extended introduction of the requirement for non-domestic buildings to use Display Energy Certificates. Government welcomes these suggestions and will consider the evidence for making these changes alongside other proposals, through a number of ongoing reviews set out in the action plan below. In addition, the recent Budget confirmed the Government's commitment to act to incentivise and encourage take-up of the Green Deal. DECC will work with the Treasury and other departments to consider possible options

Box 5.3 Review of Building Regulations

The review of Part L of the Building Regulations (due to be completed 2013) takes forward the Government commitments towards zero carbon new buildings and to improving the energy efficiency of existing buildings. The review will look specifically at:

- performance standards for dwellings and non-domestic buildings
- improving compliance
- 'as built' performance
- whether to require additional energy efficiency improvement to existing buildings as a consequence of undertaking other major works (e.g. an extension).

A public consultation is planned for December 2011 and DCLG has set-up four working groups to bring together initial views from across industry and consumer groups and submit their proposals to Government by July.

Box 5.4 Reducing the burden of regulation on business

Reducing regulation is a key priority for the Coalition Government. Through eliminating the avoidable burdens of regulation and bureaucracy, the Government aims to promote growth, innovation and social action. Striking the right balance - 'a level of regulation that promotes competition and stability without impinging on businesses' ability to operate' - is therefore a core element of the Government's strategy for supporting economic growth.

In some cases, regulation will be the most effective way of achieving policy outcomes and it will be necessary to implement our European obligations. But the number of cases where it is accepted that Government has to use 'command and control' regulation will be much reduced. And where regulation is needed, the design and enforcement framework of that regulation is now subject to greater scrutiny than ever before.

To eliminate the avoidable burdens of regulation and bureaucracy, the Government has committed to:

- Remove existing regulation that unnecessarily impedes growth;
- Introduce new regulation only as a last resort;
- Reduce the overall volume of new regulation;
- Improve the quality of the design of new regulation;
- Reduce the regulatory cost to business and civil society groups;
- Move to a risk-based enforcement regime where inspections are minimised
- Ensure that, as far as possible, micro businesses should be subject to no new regulation after 1 April 2011.

To improve European regulation and to reduce the burdens it imposes, the Government has committed to:

- Work with European partners to encourage smarter regulation by applying more rigorous use of evidence in the EU;
- Ensure UK policy-makers are involved in the development of European directives at the earliest stage;
- Avoid gold-plating to ensure that EU directives are not transposed in such a way that they disadvantage UK businesses relative to their EU competitors.

Chapter 5 – Action Plan

Owner	Action	Date	IGT Rec.
DCLG	Government will look for opportunities for public sector buildings to act as anchor loads for district heating schemes, subject to economic and technical feasibility.	Ongoing	6.11
EEPH ⁵¹	Continue facilitation of social housing providers and supply chain delivery sectors to develop economies of scale for the installation of energy efficiency measures, microgeneration products and holistic refurbishments.	Ongoing	5.8
BIS	Design of Green Investment Bank published. ⁵²	May 2011	
CIBSE ⁵³	Publish review of Display Energy Certificate benchmarks.	May 2011	6.21
TSB ⁵⁴	Scaling-up retrofit call for proposals closes.	May 2011	5.2 5.8
DECC	Publication of the final Microgeneration Strategy.	Summer 2011	5.6
DECC	Develop regulations for new Renewable Heat Incentive scheme to provide financial support for renewable heat, and lay before Parliament. ⁵⁵	Jun 2011	5.6
DfT	Develop nationwide strategy to promote the installation of electric vehicle infrastructure, including a decision on whether to use an energy Regulated Asset Base and/or changes to planning/building regulations. ⁵⁶	Jun 2011	7.1
DECC	Implement Renewable Heat Premium Payments on domestic renewable heat	29 Jul 2011	5.6

⁵¹ Energy Efficiency Partnership for Homes

⁵² Carbon Plan March 2011, DECC

⁵³ Chartered Institution of Building Services Engineers

⁵⁴ Technology Strategy Board

⁵⁵ Carbon Plan March 2011, DECC

⁵⁶ Carbon Plan March 2011, DECC

Owner	Action	Date	IGT Rec.
	systems installed since 15 th Jul 2009. Payments will end in Oct 2012		
DECC	Findings on consumer insight and uptake of the Green Deal will be published alongside the Consultation document.	Autumn 2011	6.1
DECC	Publication of a summary of the findings of the industry-wide call for evidence and literature review on costs and benefits of energy efficiency measures.	Autumn 2011	5.5
TSB	Scaling-up retrofit projects begin.	Oct 2011	5.2 5.8
DCLG	<p>Improve EPC compliance by changing the regulations to extend the duty to:</p> <ul style="list-style-type: none"> - Sellers or landlords of non-domestic and domestic buildings to either have or have commissioned an EPC before marketing a property for sale or rent. - those acting on behalf of the seller or landlords of such properties, e.g. an estate agent or managing agent, to satisfy themselves that an EPC is available or has been commissioned before marketing can begin; - including EPC information in written particulars for marketing non-domestic properties - estate agents and managing agents to make the EPC available to potential buyers or tenants of non-domestic properties when they provide information in writing or conduct viewings. 	Oct 2011	6.24
BIS	Put staff and back office systems in place for the Green Investment Bank, in preparation for the launch of the incubation phase. ⁵⁷	Dec 2011	

⁵⁷ Carbon Plan March 2011, DECC

Owner	Action	Date	IGT Rec.
DCLG	As part of the Part L 2013 Review explore potential to extend current Building Regulations to require additional energy efficiency improvements to existing buildings where work is already planned (consequential improvements).	Dec 2011	5.6 6.5 6.2
BIS	Continue market testing for the role of the Green Investment Bank beyond the incubation phase. ⁵⁸	Dec 2011	
DCLG	Review of Part L 2013 conservation of fuel and power of the Building Regulations – public consultation launched	Dec 2011	5.6 6.2 6.5
Industry	Respond to public consultation on Part L 2013 conservation of fuel and power of the Building Regulations	Mar 2012	5.6 6.2 6.5
DCLG	Consultation on revisions to Part L 2013 conservation of fuel and power of the Building Regulations closes	Mar 2012	5.6 6.2 6.5
DCLG / DECC	Consult on proposals to improve the content, format and quality of Energy Performance Certificates (EPCs) to support the Green Deal and ensure requirements are complied with. ⁵⁹	Apr 2012	5.6 6.20
Industry	Respond to public consultation on the content, format and quality of Energy Performance Certificates (EPCs) to support the Green Deal and ensure requirements are complied with.	Apr 2012	5.6 6.20
DECC	Subject to consultation, work with industry to confirm technical specifications and begin roll out of smart meters across Britain. ⁶⁰	Jul 2012	5.6
DECC	Guidance on Renewable Heat Incentive tariff payments published.	Summer Autumn 2012	5.6

⁵⁸ Carbon Plan March 2011, DECC

⁵⁹ Carbon Plan March 2011, DECC

⁶⁰ Carbon Plan March 2011, DECC

Owner	Action	Date	IGT Rec.
BIS	Green Investment Bank operational	Sep 2012	
DCLG	Implement the EPBD recast in line with the launch of the Green Deal.	Autumn 2012	6.20
DCLG	Analyse responses to consultations on Building Regulations and publish final proposals	Summer 2012	5.6 6.2 6.5
DCLG	Consider options for extending DEC's to the commercial sector and work with the sector on voluntary take up.	Oct 2012	6.20
DECC	Implement Renewable Heat Incentive tariff payments for domestic buildings, and community district heating.	Oct 2012	5.6
DCLG / DECC	Encourage local authorities to become involved in delivering energy efficiency in their areas and social landlords to take action to improve the energy performance of their stock, using the Carbon Emissions Reduction Targets and the Green Deal to augment Decent Homes funding where appropriate, to stimulate the Green Deal and provide greater certainty to suppliers. ⁶¹	Oct 2012	5.2 5.6 5.8
DCLG	Support local authorities and social landlords to undertake trail.	Late 2012	5.2 5.8
DfT	Release second round funding to successful bidders for Plugged-in-Places pilots programme to encourage the establishment of electric vehicle recharging infrastructure. ⁶²	Mar 2013	
DCLG	Project on adapting the built environment will include investigation of the potential impact and likelihood of overheating in buildings.	Apr 2013	8.3
DCLG	Undertake research into indoor air quality with a view to feeding findings into future	Apr	8.3

⁶¹ Carbon Plan March 2011, DECC

⁶² Carbon Plan March 2011, DECC

Owner	Action	Date	IGT Rec.
	reviews of the Building Regulations.	2013	
DECC	Conduct four yearly review of Renewables Obligation (RO) Banding (levels of financial support for different technologies) to ensure that the RO provides the correct level of support to maintain investment in large-scale renewable energy generation. ⁶³	Apr 2013	5.6
DECC	Undertake first major review of Feed-in Tariffs for small scale renewable energy, consult and implement changes. ⁶⁴	Apr 2013	5.6
BIS	First annual data released on the funds in and size of investments made by the Green Investment Bank	May 2013	
DCLG	Introduction of zero carbon build standard for new homes. ⁶⁵	2016	3.6 5.6
DECC / DCLG	Government intend to target the least efficient properties in the private rented sector through regulation. From 2016, domestic tenants who ask for consent for the Green Deal from their landlord should not be unreasonably refused. From 2018 there will be a minimum energy efficiency standard of EPC rating 'E' Prior to this it will work to incentivise the voluntary take-up of Green Deal measures by private sector landlords.	April 2016 April 2018	5.3 6.2 6.9
DECC	Conduct four yearly review of Renewables Obligation (RO) Banding (levels of financial support for different technologies) to ensure that the RO provides the correct level of support to maintain investment in large-	Apr 2017	5.6

⁶³ Carbon Plan March 2011, DECC

⁶⁴ Carbon Plan March 2011, DECC

⁶⁵ Carbon Plan March 2011, DECC

⁶⁶ Carbon Plan March 2011, DECC

Owner	Action	Date	IGT Rec.
	scale renewable energy generation. ⁶⁶		
DCLG	Enable all new non-domestic buildings to be zero carbon. ⁶⁷	2019	3.6 5.6

⁶⁷ Carbon Plan March 2011, DECC

Chapter 6

Capacity and Skills

The IGT has made it clear that the imperative to reduce carbon emissions from the built environment requires significant changes to construction methods. All areas will be affected, from the design and planning of new buildings and infrastructure, to the materials, products and processes in use as well as the maintenance and management of these built assets. New practices and technologies require new skills and the application of current expertise in new ways. The need to consider whole life carbon emissions from both the capital and operational phases requires a new systems thinking approach that cannot be addressed by professions and trades in isolation.

Organisational issues

The Sector Skills Councils (SSCs) covering the built environment and partners⁶⁸ have been collaborating through their Built Environment Skills Alliance (BESA) to develop skills action plans to meet the needs of the wider built environment sector for a number of years. They carry out this role in partnership with professional bodies, academia and industry. The BESA partnership is flexible and agile enough to organise itself to respond to new and emerging skills needs. A recent example of this is the work of three of its members who have formed the Green Deal Skills Alliance (GDSA) to develop and deliver a low carbon skills action plan focussed initially on the domestic retrofit market to support the successful introduction of the Green Deal next year. The GDSA has been successful in securing funding from the Employer Investment Fund (EIF) to take this work forward.

BESA is also engaged in developing proposals for European funding and have been piloting work in Wales. BESA will be able to draw on its membership to develop the skills needed for decarbonising new domestic buildings, existing and new non-domestic buildings, and major infrastructure projects, as part of a coherent whole life-cycle approach to delivering domestic and overseas growth in the Built Environment.

Understanding existing capacity and capability

The starting point for any delivery plan must be to understand the existing capacity and capability of the construction supply chain, including what changes are likely to take place over time, for example due to retirement. BESA will use the Green Deal to kick start the integration of SSC-held Labour Market Intelligence (LMI), standards and

⁶⁸ Asset Skills, Summit Skills, Construction Skills, Pro Skills, EU Skills, The Engineering Construction Industry Training Board, LANTRA and Construction Industry Council

qualifications in anticipation of growth in the retrofitting of existing domestic buildings. The industry is also in active dialogue with DECC regarding the capability of different professions and trades to deliver the future retrofit programme.

It is essential that the industry drives the demand for skills to ensure they meet market requirements. In order for this to happen the industry needs to have a clear understanding of the existing status of low carbon construction skills, the scale and specification of future skills needs and clear mechanisms to influence the content and availability of training schemes.

The fundamental changes in the construction sector means that we must ensure that future generations of construction professionals and trades people are attracted to the industry and have the basic skills to enable them to enter this employment market.

Leadership

The opportunities presented by a low carbon economy can only be captured by UK industry if they have the necessary skills to deliver the products and services required by the market. With over 26 million homes requiring energy efficiency improvements through retrofitting alone the scale of the opportunity is highly significant.

The apparent lack of market demand for low carbon solutions, particularly in the domestic retrofit market, is failing to stimulate the industry to increase the number of skilled workers. BESA will deliver a proactive campaign to stimulate SME awareness of the emerging retrofit market, and boosting demand for skills, ahead of Green Deal launch in October 2012.

Future and new skills

The IGT concluded that delivering energy efficient buildings or infrastructure requires a system-thinking approach, viewing all systems as part of a whole product. Examples of collaborative working across the supply chain have demonstrated that this can deliver both the whole system thinking that is required and financial efficiency savings to achieve low carbon objectives.

The Royal Academy of Engineering and partners are currently undertaking a skills survey of industry and developing an econometric case to establish centres of excellence in building engineering physics, following on from their 'Engineering a Low Carbon Built environment' report published in January 2010.

Chapter 6 – Action Plan

Owner	Action	Date	IGT Rec.
UK-GBC	Developing the STEP (Sustainability Training and Education Programme) Lifelong Learning Framework, to create a cross-sector sustainability curriculum comprised of new and existing courses for professionals from all disciplines, which will form the basis of a new sustainability qualification.	Apr 2011 - Apr 2013	
CIOB ⁶⁹	International shared learning through professional networks. The CIOB has facilitated best practice through its membership across the globe including Olympics in Beijing 2008 and London 2012 and are looking forward to Brazil in 2016. CIOB are also facilitating technology agreements such as Cherwell District Council and Chongqing District Council in China being an example of this.	Ongoing	
CIOB	Greening the construction curriculum so the future leaders are ready. Developing this through the chartered Environmentalist qualification.	Ongoing	
BESA ⁷⁰	Develop a built environment skills roadmap to underpin UK and devolved nations policy and strategy aimed at achieving UK and EU 2020 carbon reduction targets. Secure comprehensive cross-sector endorsement for the 2020 Skills Roadmap.	2011 - 2012	3.8
GDSA	Develop a strategy to address skills gaps and shortages, building on existing EEPH ⁷¹ research for the retrofit market, and informed by retrofit pilots under way in Wales and Scotland.	2011	3.8

⁶⁹ The Chartered Institute of Building

⁷⁰ Built Environment Skills Alliance – composed of Asset Skills, Summit Skills, Construction Skills, Pro Skills, EU Skills, The Engineering Construction Industry Training Board and Construction Industry Council

⁷¹ Energy Efficiency Partnership for Homes

Owner	Action	Date	IGT Rec.
GDSA	Establish a standards-led Green Deal Competency Framework that identifies all the National Occupational Standards, qualifications, accredited training and other competency-based schemes, relevant to the occupations within the Green Deal footprint.	2011	3.8
GDSA	Develop the proposed BSI Green Deal Accreditation Standard, and the associated industry Code of Practice and Certification Scheme that will be established under secondary legislation to ensure that all Green Deal job roles have an industry-agreed level of competence and qualification as identified in the Green Deal Competency Framework.	2011-2012	3.8
GDSA	Identify the constituent elements of a Common Knowledge Framework for the Green Deal workforce and if necessary, develop or revise National Occupational Standards and qualifications to encourage more integrated delivery of whole house measures across the Green Deal and enhanced levels of customer service.	2011 - 2012	3.8
GDSA	Identify and address inconsistencies and gaps across the Green Deal Competency Framework, through the development of new National Occupational Standards and qualifications, teaching support materials, trainer upskilling programmes and training programmes.	2011 - 2012	3.8
GDSA	Update and integrate separately held LMI, develop shared professional standards and qualifications frameworks, and make sure the skills offer is coherent and Green Deal ready.	October 2012	3.8
GDSA	Launch an integrated communication campaign, including promotional events to generate growth linked to jobs and skills by: <ul style="list-style-type: none"> raising SME awareness of low carbon growth opportunities and productivity 	2011 - 2012	3.8

Owner	Action	Date	IGT Rec.
	<p>issues</p> <ul style="list-style-type: none"> stimulating the emerging Green Deal market targeting particular skills shortage areas such as energy advisors and insulation installers 		
BESA	Support up to 1,000 Green Deal apprenticeships for occupations within the Green Deal Competency Framework, subject to demand from employers.	2011-2013	3.8
BESA	Work with HE partners, and with professional bodies, to develop an integrated approach to professional skills development	2011 - 2016	3.8
GDSA	Develop a Train the Trainer and accreditation scheme to ensure the training provider network has the capacity to deliver Green Deal training.	2012-2013	3.8
RAE ⁷²	The Royal Academy of Engineering and partners are currently undertaking a skills survey of industry and developing an econometric case to establish centres of excellence in building engineering physics.	Early 2012	

⁷² Royal Academy of Engineering

Chapter 7

Research and Innovation

To address the challenges of climate change will require innovative solutions, not just developing new technologies and bringing them to market, but also improving the construction process, and the way we manufacture and use traditional materials. The need to consider the whole life carbon impacts of construction requires new integrated approaches based on system thinking, making best use of information and managing the operation of assets more effectively.

Research and innovation activity

The IGT identified a number of critical research areas and underpinning approaches such as:

- ongoing monitoring of new-build and retrofitted properties to assess the actual performance of measures against modelled predictions
- building performance data should be collected in consistent and so comparable protocols and formats, for example CIBSE's TM22 method⁷³
- data and practical experience should be shared between industry, its knowledge base and Government, for example through initiatives such as RIBA's web-based Carbon Buzz and the Energy Data Observatory⁷⁴
- research into consumer demand and how they value and use energy efficient, low carbon buildings. Cross-disciplinary research, including behavioural studies are suggested.
- research into systems-level approaches to managing and operating buildings to reduce carbon emissions and optimise energy usage
- avoiding unintended consequences of changes in building design such as Sick Building Syndrome by developing industry standards for and means of ensuring good indoor air quality

Many of the themes identified by the IGT are already being addressed by basic or applied research, development, demonstration and dissemination activities undertaken in both the UK and collaboratively through mechanisms such as the European Framework Programmes.

The UK Government provides funding both directly through individual departments and indirectly, through agencies and organisations with specific expertise, and seeks to

⁷³ CIBSE TM22 – Energy Assessment and Reporting Method

⁷⁴ Recommended in: *Powering our Lives – Sustainable Energy Management and the Built Environment*, Foresight, 2008

influence both the direction of major European research programmes and wider participation in such activities by both UK industry and the research base.

There is no doubt that there is currently a significant effort and focus of activity seeking to improve the energy efficiency of the built environment and reducing the carbon emissions from construction by the sector itself, the science and engineering knowledge-base and the two in collaboration.

In the UK in 2008-09, businesses from across the economy spent £15.5 billion on research⁷⁵ and Government spent £9.4 billion⁷⁶. While much of this research may be considered generic or underpinning, it is clear that many scientific breakthroughs and new technologies in automotive, aerospace, materials science or information technology for example may potentially result in radical breakthrough applications in the construction sector.

The IGT raised concerns about whether all the benefits from this research are being realised, whether activities are being prioritised effectively and knowledge being shared and utilised effectively.

Departmental research – an example

BIS is the lead partner in a European project to establish a public procurement network aiming to reduce the carbon emissions and energy requirements of healthcare buildings. The Low Carbon Building Healthcare (LCB-Healthcare) project is one of three projects established under the Lead Markets Initiative. The project is aimed at creating a European Lead Market Public Procurement Network to stimulate innovation for low carbon building solutions in the health service sector. The project includes demonstration pilots in four countries and will create a sustainable European network to enable the spread of best practice and the development of joint activities at the European level.

The project consortium comprises four country partners: the Department of Health, England & Wales; the Directorate for Health Affairs, Norway; the Dutch Centre for Health Assets, Netherlands; Rawicz Hospital, Poland, a pan-European network (the European Health Property Network – EuHPN) and the Department for Business, Innovation and Skills, UK.

LCB-Healthcare is one of three public procurement networks funded under the EU Lead Market Initiative. The Network for Sustainable Construction & Innovation through Procurement (SCI-Network) is one of the other projects. SCI-Network brings together a number of European public authorities that work together to find sustainable construction solutions and encourage innovation in construction procurement.

⁷⁵ Annual Innovation Report 2010, BIS

⁷⁶ Incorporating the science budget, higher education funding councils and direct government expenditure, Annual Innovation Report 2010, BIS

Research Councils

The research councils have aligned their activities to address major strategic challenges such as climate change, avoid duplication and maximise impact, collaborating with users of the resulting research. A key programme of activity relevant to securing a low carbon built environment is the UK Energy Programme, led by the Engineering and Physical Sciences Research Council⁷⁷ (EPSRC). The programme aims to position the UK to meet its energy and environmental targets and policy goals, looking across energy options, supply and usage. On energy efficiency alone this programme is currently funding £26.4 million on industrial aspects, £37.9 million on domestic, commercial and public buildings and £35.9 million on transport systems.

EPSRC also supports a significant portfolio of fundamental research in areas such as structural engineering (£18.7 million), the built environment (51.2 million) and sustainable land management (£22.6 million) at universities such as Salford, Loughborough, Cambridge and Imperial College, as well as doctoral training activities including 'Technologies for sustainable built environments' at the University of Reading and 'Urban Sustainability and Resilience' at University College London.

Technology Strategy Board

The Technology Strategy Board (TSB) provides funding and knowledge transfer mechanisms to accelerate economic growth by stimulating and supporting business-led innovation. Adopting a challenge lead approach, programmes of work are co-ordinated through collaborative innovation platforms. The Low Impact Buildings Innovation Platform has been operating since 2008, and to date has invested over £36 million of funding into the construction sector. The TSB has committed to extend the platform and funding to the end of 2014, building on previous projects and expanding into new areas such as climate change adaptation through around 50 Design for Future Climate' projects, and is starting to explore district level considerations in its 'Integrating with sustainable infrastructure' programme.

The TSB's forward work programme will build on previous projects such as Retrofit for the Future, a £17 million SBRI⁷⁸ programme which pilots whole house approaches to achieve 80% carbon reduction in existing houses. The knowledge from this work will inform the Scaling-up retrofit competitions in 2011 and 2013, which will look at how to effectively speed up and reduce costs and risks in the retrofitting process. The Build Process competition to be launched in spring 2012 will take the experience of the AIM-C4 project and extend this to the wider industry; where house builders aimed for 44% reductions (Code for sustainable Homes level 4 energy) in operational carbon emissions, compared to the 2006 Building Regulations standard, through build fabric only innovations at a competitive price.

Industry partnerships

The Government and its agencies, such as the Highways and Environment Agencies, also support research and innovation in partnership with industry. An example from the

⁷⁷ Working with the Biotechnology and Biological Sciences Research Council, the Economic and Social Research Council, the Natural Environment Research Council, and the Science and Technology Research Council.

⁷⁸ Small Business Research Initiative

housing sector is the partnership with the Zero Carbon Hub which assists in policy development and implementation.

The UK construction sector also benefits from a strong group of industrial research bodies including established, renowned research companies and membership based organisations.

These organisations remain a key conduit for Government to industry and allows the industry to enable access to cost shared research activity, advice, guidance and best practice.

Co-ordinating activity and sharing outcomes

Across the wide range of activities and players relating to low carbon construction, there are a number of initiatives to enable sharing of information.

Modern Built Environment - Knowledge Transfer Network

The Modern Built Environment - Knowledge Transfer Network (MBE-KTN), funded by the TSB, is a resource for the benefit of the construction sector resource which brings together individuals, organisations and active programmes from across the public, private and academic sectors, involved in developing and exploiting new innovations in the built environment. The MBE-KTN provides advice on the various support mechanisms (public and private) available to the research base and industry, stimulating technology-enabled innovation in areas which offer the greatest scope for boosting UK growth and productivity. This also provides a coherent industry voice to inform Government policy making and the private investment community, giving clarity on the issues affecting innovative energy technology exploitation at various stages along the innovation pipeline.

The MBE-KTN has developed a number of activities in response to the IGT report. It's Innovation to Mainstream activity helps bring innovation to the marketplace through working with the supply chain to enable innovative solutions developed by SMEs and Universities to be incorporated into the supply chains of major industry. The MBE KTN is actively pursuing two workstreams around User Behaviour and Building Performance Evaluation which raise awareness of the importance of these emerging areas in terms of delivering low carbon buildings.

The MBE KTN Infrastructure Programme commenced in August 2010 with the overall objective to identify the innovation gaps and needs of the civil infrastructure sector and to broker new collaborations to exploit funding opportunities for the infrastructure sector. The programme delivery team is led by CIRIA and has a management group comprising of representatives of the Technology Strategy Board, EPSRC, BIS, Institution of Civil Engineers, and Transportation KTN. The programme is supporting high level projects such as the Innovation and Knowledge Centre for Smart Infrastructure based at University of Cambridge and the Infrastructure Transition Research Consortium based at Oxford University. It is helping to broker new collaborations and promote knowledge exchange and development of new technologies to facilitate a transition towards low carbon infrastructure design and management, with a particular focus on the sustainable whole-life management of the UK's extensive stock of existing infrastructure assets.

The National Platform for the Modern Built Environment

The National Platform is a small group formed of key industry, knowledge-base and public sector R&D funders, which acts to identify the strategic medium and longer-term research priorities for the UK sector and ensure there is appropriate provision to take these forward in the UK, in conjunction with Europe or further afield. Its secretariat is provided by the MBE-KTN and it feeds into European priority setting, including activities such as the public-private Energy Efficient Buildings initiative through affiliation to the EeB Association and the European Construction Technology Platform.

UK Energy Research Centre

The UK Energy Research Centre, funded by the RCUK⁷⁹ Energy Programme, is a virtual hub for UK energy research and the gateway between the UK and the international energy research communities. They provide an essential co-ordination role, ensuring that information is shared effectively across individual disciplines and that skills are being developed in new and emerging fields.

Energy Technologies Institute

Collaborative funding for such as the Energy Technologies Institute, bring together major international players in the field of energy generation and supply with experts in innovation, providing matched funding for research and technology development. This group is now developing a work programme focusing on demand for energy from building users.

Low Carbon Innovation Group

The Low Carbon Innovation Group brings together many of the players mentioned above to align work programmes and avoid duplication. Figure 7.1 illustrates the relationships between the different bodies and their focus on different elements of the innovation pipeline.

Low Carbon Innovation Delivery Review

Government acknowledges that the low carbon innovation landscape is complex. DECC is leading a joint cross Government review, alongside BIS, Defra, DCLG, DfT and HMT, of low carbon innovation delivery, focusing on support for innovation with the primary stated purpose of meeting our low carbon goals. This includes innovation to meet short term innovation needs, such as making technological improvements to existing devices; and innovation to develop new technologies in support of longer term goals, such as the UK's commitment to an 80% reduction in greenhouse gas emissions by 2050.

Specifically, the review will look at options for enhancing the delivery of direct public support for low carbon innovation technologies, focussed on the spending review period and beyond, in order to:

- strengthen strategic focus and enhance coordination across the landscape by identifying and implementing best practice in accordance with, or improving on, the

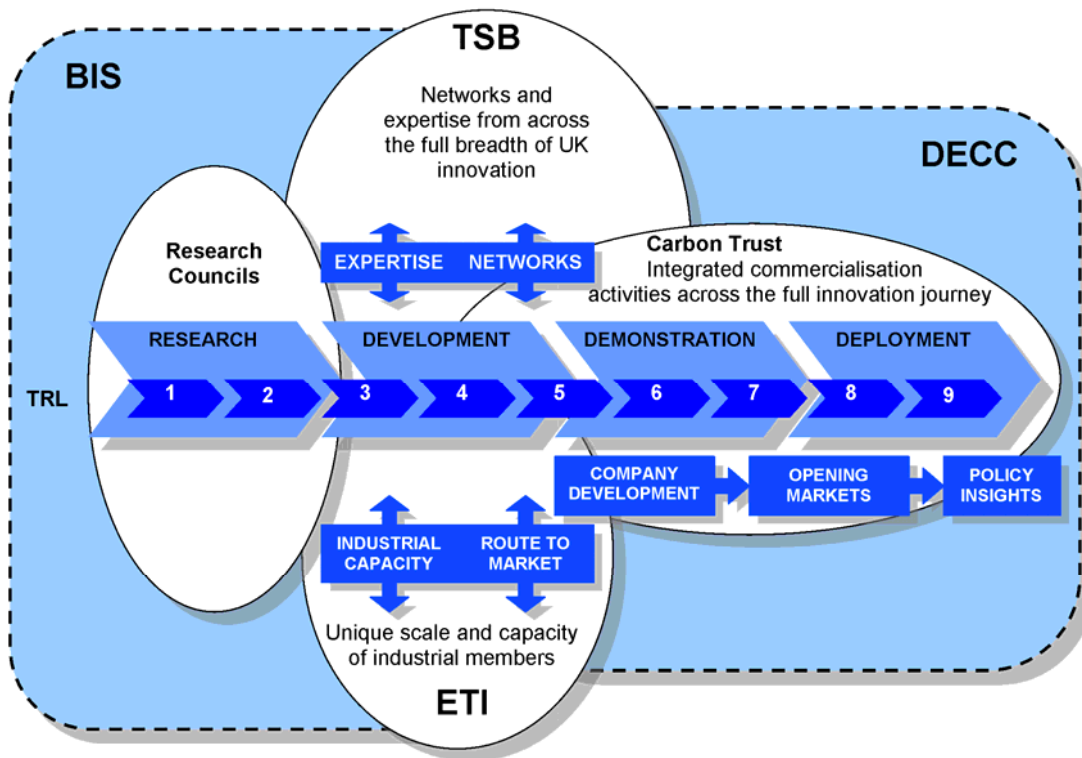
⁷⁹ Research Councils UK

National Audit Office’s recommended approach in their report, Government Funding for Developing Renewable Energy Technologies

- review current arrangements for appraising, developing, delivering, monitoring and evaluating low carbon direct support programmes, in line with NAO recommendations
- improve access channels for innovators working to commercialise low carbon technologies, by identifying options for making the low carbon landscape more transparent and improving communication; and
- Identify any options for landscape simplification within the project scope.

The findings from the review will be made public in late summer/early autumn 2011.

Figure 7.1 Low Carbon Innovation Group



Supporting business research activity

When surveying construction products manufacturers, the IGT found that funding for research was one of the least significant barriers to low carbon innovation. However, as our new framework of incentives begins to take effect it will become increasingly important for businesses to be able to access financial support for innovation, particularly for smaller businesses and new start-ups.

R&D tax relief (R&D tax credits)

The SME R&D tax credit scheme (available to companies with fewer than 500 employees) is being developed to make it more competitive, simpler and effective.

Several important changes were announced in Budget 2011 following a HM Treasury-led consultation with business which addressed recommendations made by Sir James Dyson. Changes included increasing the rate of relief to 200% of qualifying R&D expenditure from 1 April 2011 and to 225% from 1 April 2012, subject to EU State aid approval. The rate of relief under the large company scheme remains at 130% of qualifying R&D expenditure.

Also announced were the removal of both the PAYE/NIC cap on the amount of payable credit that can be claimed and the minimum expenditure (currently £10,000) rule. These changes will be introduced in Finance Bill 2012. The Government will consult on options to allow relief through the large company scheme for sub-contracted activity which forms part of a wider R&D project.

After further consultation with business, HM Treasury aim to publish draft legislation this autumn.

R&D Tax Credits are available to businesses in all sectors undertaking qualifying R&D⁸⁰. It is not known how many construction companies meet these criteria but in the year to end March 2009 there were 125 claims from construction contractors - 85 under the SME scheme and 40 under the large company scheme, totalling about £5m⁸¹.

To help ensure that companies are not missing out, BIS, working with HM Treasury and HMRC and industry, will be developing case studies featuring companies from a range of sectors, including construction, illustrating key features of the scheme, addressing common concerns and providing advice on how to prepare a first claim. Publication of the portfolio of case studies is envisaged by December, 2011.

BIS and HM Treasury/HMRC are also available to make presentations and otherwise contribute to workshops arranged by the sector and or financial advisors serving the sector, although advice about individual claims would be beyond the scope of these sessions.

Government proposes to build on existing support provided by HMRC R&D specialist units to companies on individual claims, by introducing a more formal system of voluntary advance assurances for smaller companies and for new start ups. The intention is that companies applying for and receiving such an assurance would be able, unless their business substantially changes, to rely on it in making their claims for a subsequent period. Introducing such a system raises issues including exactly what information would need to be provided to obtain an assurance, and what the likely volume and uptake would be. HMRC will therefore be operating a pilot scheme to determine how best to make this work without, for example, introducing disproportionate new information requirements.

⁸⁰ see the DTI 2004 Guidelines on the Meaning of R&D for tax purposes

⁸¹ This does not reflect the full level of relief claimed by construction companies. Classification is based on the coding recorded by Companies House when companies register, or notify a change in their sector.

Grant for research and development

The Technology Strategy Board launched the grant for research and development scheme on 4 April 2011 replacing the scheme previously offered by regional development agencies. Funding of up to £250k is available to any UK SME for projects of up to 2 years, in strategically important areas of science, engineering and technology, from which successful new products, processes and services could emerge.

Three types of grant are available:

Proof of market grant

This grant enables companies to assess the commercial viability of a project, through market research, market testing and competitor analysis, intellectual property position, initial planning to take the project to commercialisation, including assessing costs, timescales and funding requirements.

Proof of concept grant

SMEs may use this grant to explore the technical feasibility and commercial potential of a new technology, product or process, including initial feasibility studies, basic prototyping, specialist testing and/or demonstration to provide basic proof of technical feasibility, intellectual property protection, investigation of production and assembly options.

Development of prototype grant

This funding is used by companies to develop a technologically innovative product, service or industrial process, and can include projects such as small demonstrators, intellectual property protection, trials and testing, including clinical and market testing.

Small Business Research Initiative

The Small Business Research Initiative (SBRI) is a mechanism to enable innovation in products and services through the public procurement of R&D. It provides innovative solutions to public sector challenges, a route to market for new ideas and new business opportunities for technology companies. The TSB champions the SBRI and provides support through a process which is simple to use for both public and private sector stakeholders. Since re-launch in April 2009, the scheme has moved from two pilots to having 58 full competitions, resulting in over 2,100 applications from industry and 579 contracts awarded with a value just over £39.2 million.

Box 7.1 Adapting to Climate Change

Opportunities for UK Business from Climate Change Adaptation in the Built Environment

Building a competitive green economy is not only about reducing carbon emissions, it is also about building resilience to the changing climate. The UK is a leader in many areas such as science and new techniques for adaptation. Improving the built environment's resilience to climate impacts will create opportunities across the construction supply chain, for urban planners, building designers, commercial landlords, owners, and technology manufacturers, through to developers of homes and commercial buildings. Technology installers will also see opportunities arising in retrofit markets, addressing adaptation requirements at the same time as installing mitigation measures will also improve longer-term resilience whilst reducing energy requirements. Recent research for Defra identified business opportunities in adaptation to all the major climate risks to the built environment: flooding, water efficiency, overheating and subsidence. Increased awareness of these risks could stimulate demand for retrofit solutions.⁸²

Adaptation and Resilience to a Changing Climate (ARCC)

ARCC is a suite of EPSRC-funded research projects looking at the impacts of climate change and possible adaptation options in the built environment and its infrastructure. The research aims to:

- Enable the design of urban systems that are more resilient to climate change;
- Provide quantitative evidence of the impacts of climate change in the built environment;
- Develop new methodologies and practical decision-making tools to further the understanding and assessment of adaptation options;
- Assess robust, risk-based adaptation strategies for use by decision makers and policy makers.

MyPlace youth community centre, a zero-carbon building currently being built in the London Borough of Havering. Weather files from the University of Exeter's PROMETHEUS



⁸² http://randd.defra.gov.uk/Document.aspx?Document=GA0403_9268_FRP.pdf

project have been used during the design process. (image: Jacobs Engineering)

Scientists at the University of Exeter's Centre for Energy and the Environment have created probabilistic weather files for over 40 locations across the UK that enable building professionals to design new buildings and formulate retrofit solutions to meet the challenges posed by changing local climates. The files, which are free to download, are based on the latest UK Climate Projections (UKCP09). Their creation was inspired by the need to end the practice of modelling buildings using historic weather data, which could render new buildings unfit for purpose. They have now been used in the design process of more than £3 billion worth of building projects, including Britain's first zero-carbon school, an eco-town and several of the climate change adaptation projects funded by the Technology Strategy Board's Design for Future Climate competition.

<http://www.ukcip-arcc.org.uk/>

<http://centres.exeter.ac.uk/cee/prometheus>

Chapter 7 – Action Plan

Owner	Action	Date	IGT Rec.
HMRC	Pilot R&D tax credit voluntary assurance scheme.	To be announced	6.18
EEPH ⁸³	Build upon EEPH's current framework of coordinating with industry and across Government departments on the need for research projects, the scoping thereof and collaboration on delivery. Build upon the protocol which DECC is setting up with the EEPH for defining and executing projects in 2011/2012.	Ongoing to March 2012	5.2
EEPH	Enhance the EEPH Knowledge Base to direct professionals to sources of data, funds and programmes.	Ongoing	3.9
TSB ⁸⁴	Building Performance Evaluation £8 million open programme. Quarterly calls for applications: <ul style="list-style-type: none"> - 11 May 2011 - 14 September 2011 - 18 January 2012 - 23 May 2012 	2010 - 2012	5.7 5.8
HMT	R&D tax credits - SME scheme rate of relief increased to 200% of qualifying expenditure.	1 April 2011	6.18
HMT	Publication of the detailed response to the consultation on R&D tax credits.	May 2011	6.18
TSB	Scaling-up Retrofit €1 million EU collaboration competition closes.	End May 2011	5.2
TSB	Design for Future Climate £2.5 million competition opens for applications. Closing date 29 June 2011	31 May 2011	5.2

⁸³ Energy Efficiency Partnership for Homes

⁸⁴ Technology Strategy Board

Owner	Action	Date	IGT Rec.
Industry	Industry to respond to HMT with comments on R&D tax credit proposals.	Summer 2011	6.18
DECC	Publication of the Low Carbon Innovation Delivery Review	Autumn 2011	5.7 5.8
TSB	Build Process £4 million competition launched.	Spring 2012	5.2
DCLG	Seek provisions within the Energy Bill to enable wider access to EPC and DEC data sources.	Spring 2012	3.9
HMT	R&D tax credits - SME scheme rate of relief increased to 225% of qualifying expenditure and minimum expenditure restriction abolished.	1 April 2012	6.18
TSB	Retrofit Funding Models £1.5 million competition launched.	Summer 2012	6.1
TSB	Integrating with sustainable infrastructure £5 million competition launched.	Early 2013	7.2 7.3
TSB	Launch of: <ul style="list-style-type: none"> - Management and operation £3 million competition - Scaling-up retrofit £3 million competition 	2013	5.2
TSB	Launch of: <ul style="list-style-type: none"> - New build non-domestic building £4 million competition - Non-domestic building retrofit £5 million competition - Sustainable infrastructure II £5 million competition 	2014	5.2

International Opportunities

The transition to a low carbon resource efficient economy is a global environmental and economic imperative and represents a huge economic opportunity for the UK internationally. The IGT identified the importance of using major projects such as the London Olympics 2012 in promoting the UK's excellence.

Targeted Government action to support trade and investment delivers real and significant benefits. In the last twelve months UK companies attributed £6 billion additional annual profit to the actions of UKTI⁸⁵, up from £2.5 billion in 2007, equating to £22 additional profit for every £1 spent on export promotion and £42 billion of additional business.

The benefits of international trade are huge. The Global Construction Perspectives and Oxford Economics report⁸⁶ estimates the global construction market is worth an estimated \$7.5 trillion, representing 13.4% of global GDP. It is estimated that by 2020, construction will be a \$12.7 trillion global market, an overall growth of 70% in the next decade. Emerging and high growth markets need to expand their infrastructure rapidly to ensure they can sustain economic growth. The construction, environment and water, and transport sectors are vital to any modernising economy and offer enormous opportunities to UK companies. These sectors also have huge low carbon potential.

Promoting UK excellence

The UK's approach embeds low carbon throughout the entire construction process from the design and manufacture of innovative products to its world leading architects and engineers developing energy efficient and sustainable buildings. The UK construction sector leverages its unique expertise and experience by drawing together ideas from all around the world to provide comprehensive, low carbon construction solutions.

The first 'green building' was coined in the UK in 1996 (INTEGER Millennium House at BRE⁸⁷) and subsequently in Hong Kong and Beijing. UK firms are now creating designs for low carbon cities around the world using UK and international standards and best practice. With world class research capability, UK construction products and services deliver cost effective carbon reduction for buildings and developments.

⁸⁵ UK Trade & Investment

⁸⁶ Global Construction 2020 Report, Global Construction Perspectives and Oxford Economics 2011

⁸⁷ Building Research Establishment

UKTI strategy

In the Trade & Investment White Paper⁸⁸ Government reasserted its Coalition Agreement commitment to ‘strengthen our support for UK low carbon and environmental goods and services exporters, particularly through UK Trade & Investment and the Exports Credit Guarantee Department’. UK Trade and Investment, jointly funded by BIS and the FCO is responsible for attracting investment to the UK and supporting UK businesses to trade internationally.

In its new five year strategy⁸⁹ UKTI sets out how, in partnership with other Government Departments and business, it will work to realise the Government’s ambitions for growth through trade and investment. Across the board UKTI has two main ambitions;

- To encourage significantly more SMEs to export by targeting a range of new services at innovative and high growth enterprises. This includes a major new approach to e-connectivity and programmes to link SMEs to trade finance, credit insurance and venture capital, as well as using existing award-winning bespoke products aimed at boosting export capability and breaking into new markets.
- Secondly, UKTI will help bring high value opportunities home through a programme of intensive support for larger companies seeking to win overseas contracts ranging from £250 million upwards. The market for very large scale, high value projects, which also bring major supply chain opportunities for SMEs, runs into trillions of pounds and covers a wide range of sectors.

UKTI will play a central role in delivering a whole of Government approach to attracting inward investment to the UK by: Creating a pipeline of up to 750 foreign direct investment projects per annum, of which most would be characterised as high quality, which benefit the UK economy through productivity spillovers, and by bringing new ideas and ways of working, as well as valuable knowledge and technologies. These projects will be R&D intensive and also promote growth and competition. Targeting institutional investors, such as Sovereign Wealth Funds and overseas pensions funds, to win investment for large scale infrastructure and regeneration projects in the UK. Ministers will play an active role in developing and sustaining winning relationships with investors, as well as with the UK’s top exporters, and these customers will be able to call on expertise and resources from across Government, to ensure they receive a seamless, “one-stop” service.

The low carbon agenda underpins and is a key driver of the UKTI Infrastructure Directorate’s work promoting UK capabilities overseas. A significant number of promotional activities will have low carbon themes. Inward missions will focus on showcasing the UK’s offer to international decision makers and stakeholder through targeted meetings and visits to low carbon projects. Outward missions will showcase the UK’s low carbon construction offer to overseas stakeholders, decision makers and companies through seminars and targeted meetings.

⁸⁸ Trade and Investment for Growth, February 2011, Department for Business, Innovation and Skills

⁸⁹ Britain Open for Business, May 2011, UK Trade & Investment

UKTI has spearheaded the development of a new 'infrastructure toolkit' created to enable the UK's infrastructure sector (spanning construction, energy, financial services, ICT, mass transport and environment/water) to promote its strengths and capabilities in a consistent and compelling way. Sustainability, in addition to partnership and innovation, are the overarching themes. The toolkit, developed in with a range of industry partners, offers a resource of messages, case studies and marketing tools to reinforce and UK plc's activities internationally. The toolkit will be further developed further, drawing in ideas and ownership from across the broadest span of Government and industry with an interest in sustainable infrastructure.

UK Know How Campaign

UKTI launched the UK Know How Campaign in 2010 to champion the UK's low carbon excellence across all sectors to overseas buyers, decision makers and investors, including through:

- Outward and inward trade missions
- International trade exhibitions – UK stands
- Press and media coverage of activities
- Ministerial and key speeches/briefing
- Case studies - highlighting opportunities and successes
- Web and social media content in UK and in-market

The campaign covers all markets where there is a clear opportunity to promote the UK's capability, with priority targeting of China, India, Brazil and the West Coast of North America. Each of these priority markets has a plan for 2011/12, developed in conjunction with the Foreign and Commonwealth Office (FCO) and DECC. The country plans will serve to reinforce the UK as a hub of low carbon excellence.

UKTI will continue to work with Government departments such as DCLG, DECC, DEFRA and FCO to help business access overseas low carbon opportunities.

Olympics

London 2012 provides the UK with an unrivalled opportunity to showcase its low carbon capabilities in delivering a 'sustainable and green' games. This attracts considerable interest from international visitors. UKTI is working with the Government Olympic Executive (GOE) and the Olympic Delivery Authority (ODA) to showcase London 2012 to appropriate international visitors. UKTI is working to help the UK companies involved to promote this capability to future host cities. April 2011 saw the UKTI launch 'Springboard to Success' a directory of UK companies with expertise in major events.

Working with key stakeholders UKTI will deliver a major international conference showcasing the UK's capability in delivering large scale projects through the exemplar case study of the Olympic Park. The event would help to deliver the international business legacy from the UK hosting the London 2012 Summer Olympics by highlighting

UK businesses involved and the transferable learning lessons, particularly in the areas of sustainability and low carbon.

UKTI is working closely with partners across Government to assist the Rio authorities to achieve a sustainable Games in 2016.

Chapter 8 - Action Plan

Owner	Action	Date	IGT Rec.
UKTI	Continue to promote the international legacy of the London 2012 Olympic Games through a series of events helping UK companies targeting host cities of future major sports events including: <ul style="list-style-type: none"> - Sochi 2014 Winter Olympics - Russia 2018 World Cup - Brazil 2014 World Cup - Rio 2016 Summer Olympics 	Ongoing	4.3
UKTI	Continue to develop the China Sustainable Cities programme targeting opportunities in Chongqing, Wuhan and Hangzhou	Ongoing	
UKTI	Identify, evaluate and prioritise the largest and most valuable overseas projects and help UK businesses access these through sustained, long term support.	Ongoing	
ODA ⁹⁰	Launch of the Olympics learning website.	Oct 2011	4.3
UK-GBC ⁹¹	The UK-GBC will support the Olympic Delivery Authority (ODA) Learning Legacy – lessons learned from the London 2012 Games construction project. UK-GBC will be organising more than 20 learning forums and master classes in 2011 and 2012 including a major conference event at Ecobuild 2012.	2011 - 2012	4.3
SfC ⁹²	Launch of action plan to make the most of the new products, services and learning from the Olympics.	Jul 2011	4.3

⁹⁰ Olympic Delivery Authority

⁹¹ UK Green Building Council

⁹² Strategic Forum for Construction

Annex A

UKTI Activity Plan 2011/12

Market	Sector	Activity
Australia	Environment & Water	Outward Seminar Mission
Brazil	Sports	Launch of Rio2016 report
	Sports	UK Pavilion at Rio Sports Expo 2011
	Sports	Outward mission re. Rio2016 focussed on UK capability
	Sports	Soccerex Global convention 2011
	Sports	Outward mission re. FIFA World Cup 2014 focussed on UK capability (linked to Soccerex)
	Construction	Santander Bank inward mission
	Transport	Transport Inward mission
	Construction	Brazil infrastructure inward mission
	Sports	Inward mission re. Rio2016
China	Construction	UK / China Construction Working Group Meeting
	Airports	UK/China Airports working Group
	Construction	Sustainable Regeneration Workshop
	Infrastructure	Sustainable Cities Mission
	Construction	Regional City Trade Mission
	Environment & Water	Outward Trade Mission
	Construction	IGEBEC 2012 (Green buildings conference and exhibition)
	Infrastructure	Sustainable Cities mission
	Transport	Transport Inward mission
	Infrastructure	China Sustainable Cities Conference
Dubai	Infrastructure	Britain in the Region Infrastructure Showcase event

Market	Sector	Activity
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France	Rail	Outward mission
	Sports	Inward mission re. Euro2016
Global	Transport	World Transport Showcase
	Rail	Railtex Meet the Buyer
	Construction	World Roads Congress support for UK delegation
	Ports	Major Ports Project Seminar
	Construction	Olympic Construction Conference
	Infrastructure	Sustainable World 2012 including EcoBuild 2012
	Sports	Regional activity to further increase awareness of opportunities around global sports events
Gulf	Transport	Transport Outward Mission
Gulf/China	Infrastructure	Global Infrastructure HVO Conference
Hong Kong	Construction	Sustainable Regeneration Workshop
India	Infrastructure	UKTI-FT India Infrastructure Summit
	Infrastructure	Outward Mission Green Bldg Congress, Mumbai/Delhi
	Transport	Transport Outward Mission
Indonesia	Construction	Indonesia Seminar
	Construction	Outward Mission
Malaysia/Singapore	Transport	Transport Outward Mission
Nigeria/Ghana	Transport	Transport scoping report
Poland	Rail	Trako exhibition
Qatar	Construction	Building Green, Intelligent and Sustainable Communities Mission
Russia	Airports	Sustainable airports conference
	Sports	Soccerex Russian Forum 2011
	Airports	Inward Mission
	Sports	Inward mission Sochi 2014 re. sports education, overlay and sports equipment
	Sports	Outward mission re. FIFA 2018 World Cup
	Sports	Outward mission to Moscow and possibly Sochi re. 2014 Winter Olympic Games

Market	Sector	Activity
Russia	Construction	Inward sustainable design and technologies mission
Saudi Arabia	Transport	Saudi Arabia combined outward mission
	Construction	Outward mission
South Africa	Construction	Infrastructure seminar
South Korea	Sports	Outward mission re. Asian Games 2014, Unversiade 2015 & possibly Winter Olympics 2018
Spain	Rail	Low Carbon seminar
Turkey	Construction	3rd market partnering event
	Rail	inward visit
United Arab Emirates	Airports	Partnering activity at Dubai Airshow
	Construction	Sustainable construction outward mission
	Sports	Outward mission to Infrastructure Conference
UK	Construction	Ecobuild
	Construction	International conference focusing on the successful delivery of the London Olympic Park
	Large Research Facilities	ITER Inward Mission on Procurement Opportunities
Ukraine	Sports	Inward mission re. Euro2012 event delivery & 2020 Olympic Games bid
USA	Construction	Low Carbon Economy / Green Buildings Webinars

Annex B

Summary of Recommendations

from the Final Report of the Low Carbon Construction Innovation and Growth Team

Carbon and the Built Environment

Recommendation 2.1: That as soon as a sufficiently rigorous assessment system is in place, the Treasury should introduce into the Green Book a requirement to conduct a whole-life (embodied + operational) carbon appraisal and that this is factored into feasibility studies on the basis of a realistic price for carbon.

Recommendation 2.2: That the industry should agree with Government a standard method of measuring embodied carbon for use as a design tool and (as Recommendation 2.1 above) for the purposes of scheme appraisal.

Cross- industry Issues

Recommendation 3.1: That the Government should treat the transition to low carbon as a series of major projects, subject to independent review, and with the normal controls that exist for Government projects that are so designated.

Recommendation 3.2: That Government and industry should establish and publish a transparent, co-ordinated structure for the many organisations involved in research, advice, policy development and delivery for carbon reduction, making clear the role, scope of work and authority of each, and how each connects to Government, whether directly or indirectly.

Recommendation 3.3: That the Government should published an adequately detailed programme of actions expected to achieve the 2050 target of an 80% reduction in carbon emissions.

Recommendation 3.4: That the programme should include interim (say 5-yearly) milestones to show the expected trajectory of work to achieve the planned reductions, to provide the industry with some visibility of the possible nature and volume of work.

Recommendation 3.5: That each Government Department should develop and publish a strategy for producing low carbon buildings of each typology within its programme, consistent with the above programme and trajectory.

Recommendation 3.6: That Government (Efficiency and Reform Group, working with the Chief Construction Adviser) should investigate proposals received from the industry for alternative approaches to the procurement of integrated teams, to establish whether they could be developed into workable propositions, and thereafter be trialled, with a view to delivering, over time, a zero or close to zero carbon building for no more than a building built only to current Building Regulations.

Recommendation 3.7: That Government, industry and the organisations themselves should investigate the desirability, practicality and means of merging Asset Skills, Construction Skills and Summit Skills, so that the integration that is a theme of this report is also reflected in the skills regime.

Recommendation 3.8: That a group comprising representatives from Government, the industry and skills providers is tasked with considering how, in the light of the changing skills landscape, greater collaboration, co-operation and integration between professions, between trades, between trades and professions, and between them and the construction products and materials industry can be promoted to develop a single strategic view on future skills needs.

Recommendation 3.9: That Government and industry should agree a full schedule of data needs for the transition to a low carbon built environment, and a method, source of funds and programme for collecting, analysing and disseminating it.

Recommendation 3.10: That a joint industry/Government group is formed, charged with making clear recommendations to resolve the difficulties summarised above, and a basis for the long term funding of the development and maintenance of carbon compliance tools.

Recommendation 3.11: That the industry should work, through a collaborative forum, to identify when the use of BIM is appropriate (in terms of the type or scale of project), what the barriers to its more widespread take-up are, and how those barriers might be surpassed, leading to an outline protocol for future ways of working.

Recommendation 3.12: That Government and the industry should routinely embed the principles of “Soft Landings” into their contracts and processes, so that a building is not regarded as complete until it performs in accordance with its design criteria.

Recommendation 3.13: That Government should commission a programme of independently conducted, properly funded, published studies of the energy performance of buildings in the public estate built since the introduction of the 2006 revision of the building regulations by comparison with their design criteria.

Recommendation 3.14: That the industry should investigate the scope for setting up a construction-specific accreditation scheme for companies committed to improving their environmental credentials, considering also the different needs and the different business models across the supply chain, to establish the practicality and merits.

Recommendation 3.15: That industry should work with Government to address the above questions with a view to developing a proposition that offers consumer protection to those commissioning work financed by the Green Deal.

Major Projects

Recommendation 4.1: That the industry should set up a Working Group to consider the creation of a body which would become the authority whose stamp of approval would provide sustainability legitimacy for major projects, and be responsible for organizing the capture and dissemination of knowledge and experience gained on projects that fall within its terms of reference.

Recommendation 4.2: To recognise the urgency and importance of climate change, it is proposed that carbon reduction is given greater prominence in Environmental Impact Assessments, with a mandatory target or 'gateway' of performance derived from the MPRG assessment.

Recommendation 4.3: That the industry and Government should work together to use the occasion of the London Olympics as a showcase of how to implement plans for a low carbon built environment, embracing design and engineering; works execution right through the supply chain; materials, product and component manufacture; and all other construction-related services.

Housing

Recommendation 5.1: That Government should publish a working nationwide definition of zero carbon and allowable solutions for new homes that takes full account of the real cost of delivery.

Recommendation 5.2: That further pilots and trials should be encouraged through greater collaboration, and monitored throughout to increase learning and experience, and to ensure the right roll-out strategy is delivered.

Recommendation 5.3: That a consensus on both modelled and actual performance improvement data should be established from the various previous and current studies, through a knowledge-sharing process, to inform what actions need to be taken to deliver the overall target.

Recommendation 5.4: That the industry and Government should develop the very preliminary route map drafted by the IGT into as detailed a plan of action as possible, looking at what needs to be delivered and how.

Recommendation 5.5: That Government, in formulating the Green Deal customer offering, should take full account of all relevant current trials, customer research and feedback from Energy Companies and Retailers.

Recommendation 5.6: That Government, in addition to the Green Deal finance package, should introduce a suite of measures including regulation, fiscal incentives and penalties to ensure success.

Recommendation 5.7: That the industry should establish a Platform or Panel with public-sector funders, to form a collective view on strategic research, development and deployment priorities, creating and owning a Strategic Retrofit Research Agenda.

Recommendation 5.8: That social housing stock should be used to kick start larger-scale retrofit using RMI investment and other funds.

Recommendation 5.9: That Government, with the industry, should set up an Existing Homes Hub to bring together the key participants to formulate and monitor delivery of the retrofit programme, all in accordance with the principles set out above.

Recommendation 5.10: That, based on the assumption that a major programme of refurbishment will start over the next five years, the industry should start by carrying out a full assessment of its ability to deliver.

Recommendation 5.11: That the industry should develop standardised solutions for the refurbishment of existing stock, covering the key processes that will be needed.

Recommendation 5.12: That the industry should, with insurance providers, investigate an assurance and insurance package that meets the needs of consumers.

Non-Domestic Buildings

Recommendation 6.1: That Government should commission research to understand how the market values low carbon buildings – both today and looking into the future, and how incentives interact with the decisions made by owner occupiers, property investors and tenants to build lower carbon buildings and use them more efficiently.

Recommendation 6.2: That Government should review the application of the Building Regulations to refurbishment and tenant fit-out, with a view to introducing more rigorous requirements.

Recommendation 6.3: That Government should support research into the level of non-compliance associated with the EPBD and Part L of the Building Regulations, and the impact of this non-compliance on carbon emissions; to review compliance mechanisms to ensure the greatest impact at the lowest cost to business; and to amend the EPBD and Part L compliance mechanisms accordingly.

Recommendation 6.4: That Government should institute a programme of long term monitoring to review the practical outcomes associated with the EPBD and Part L, to inform future revisions.

Recommendation 6.5: That Government should introduce minimum standards for existing buildings by mandating that all non-domestic buildings should have an EPC rating of F or better by 2020.

Recommendation 6.6: That Government should signal its intention to use fiscal incentives to create market demand for low carbon buildings, and incentives to operate buildings better.

Recommendation 6.7: That Government should create a low cost loan and/or “pay-as-you-save” scheme to finance investments in capital intensive energy efficiency measures in non-domestic buildings.

Recommendation 6.8: That Government should create an “energy efficiency obligation” scheme obliging energy suppliers to drive uptake of low capital cost measures among smaller energy users, funded through a levy on energy bills.

Recommendation 6.9: That Government should require landlords and tenants co-operate to agree an Energy Management Plan for their buildings, to accompany the DEC.

Recommendation 6.10: That Government should mandate the use of “Green Leases” for buildings occupied by the public sector.

Recommendation 6.11: That Government should address barriers to district heating networks by requiring public sector buildings to act as anchor loads, and encourage the private sector to do the same.

Recommendation 6.12: That the industry and its clients should recognise the critical importance to the adoption of modern methods of construction of a design freeze date that is set at the start of a project and rigorously adhered to, and consider how this can be routinely embedded into the practices of the industry.

Recommendation 6.13: That the industry should work with Buildoffsite to update its lexicon for inclusion in contracts used by the industry, adopting terminology relevant to a 21st century industry, to facilitate the transition to low carbon.

Recommendation 6.14: That Government should mandate the use of Building Information Modelling for central Government projects with a value greater than £50 million.

Recommendation 6.15: That the industry should develop a “Comparator” tool which allows companies to assess accurately the lifecycle cost of different methods of construction and the levels of risk implicit in that assessment.

Recommendation 6.16: That Government should extend the right to claim Enhanced Capital Allowances to low carbon whole building structures.

Recommendation 6.17: That Government should reinstate, or even increase, Industrial Buildings Allowances for low carbon buildings or components, including pre-manufactured, to reduce the cost base and encourage more efficient construction processes.

Recommendation 6.18: That Government should allow pre-acceptance of research and development proposals for R&D tax credits.

Recommendation 6.19: That the industry should explore the potential for Accreditation Schemes, such as those operated by BSI and Lloyd’s Register, to be adopted more widely.

Recommendation 6.20: That Government should bring forward the mandatory requirement for the posting of Display Energy Certificates in all non-domestic buildings as

quickly as possible, and in advance of the July 2013 date required by the EPBD, with ratings and accompanying recommendations made widely available.

Recommendation 6.21: That Government should commission a review of the benchmarks used to calculate DEC ratings in order to ensure that they are consistent and robust, and that they effectively differentiate on energy performance for buildings of different types; and that the process should be simplified to the greatest practical degree.

Recommendation 6.22: That companies operating in the construction and property sectors should, as an act of leadership but also to aid transformation of the market, commit to the voluntary posting of Display Energy Certificates in their own buildings, following the practice mandated for public sector buildings and applying the same principles.

Recommendation 6.23: That Government, working with the industry, should ensure that businesses have access to independent, objective advice and support on the implementation of energy efficiency measures.

Recommendation 6.24: That Government should require EPCs to be displayed at the point of marketing for non-domestic buildings in order to maximise their influence on buyers' decision-making.

Recommendation 6.25: That Government, through the ERG, should mandate a requirement for post-occupancy evaluation on all central Government projects, implemented through the procurement process and requiring the involvement of design and construction members beyond the point of practical completion.

Infrastructure

Recommendation 7.1: That infrastructure owners, policy makers and regulators should set out clearly the policy context and performance requirements for their infrastructure needs and engage with the industry to agree optimal conceptual infrastructure solutions that facilitate substantive carbon reduction before determining any specific approach.

Recommendation 7.2: That the industry needs to develop models to support the evaluation of optimal conceptual infrastructure solutions and detailed approaches that take a systems engineering approach to the balancing of the capital and operational carbon costs and benefits.

Recommendation 7.3: That the industry should research opportunities to achieve substantive reductions in carbon from better engineering of infrastructure (through design, standards, specifications and measurement) and roll out the new evaluation models and approaches through industry-wide programmes of training and professional development.

2050 Group

Recommendation 8.1: That a multidisciplinary consultation platform should be established now, with Government support, to bring together all of the professional, practical and academic energies of the built environment.

Recommendation 8.2: That Government and industry should work towards greater shared knowledge with other countries and become more unified in their approach to reducing emissions.

Recommendation 8.3: That, to avoid the risk of a new generation of sick buildings, the promotion of the health and well-being of occupiers should be placed on an equal footing with the current emphasis on carbon reduction.

Recommendation 8.4: That the industry should agree and implement Indoor Air Quality standards to include Indoor Air Quality plans, and enforceable targets for a maximum allowable concentration of toxic contaminants and emissions in interior environments for buildings with sealed envelopes.

Recommendation 8.5: That the 2050 Group should continue to work together after the completion of the IGT's final report.

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