Communities and Local Government

Final Regulatory Impact Assessment

Building a Greener Future

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July 2007
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Introduction

1. This Regulatory Impact Assessment covers measures to drive higher environmental performance in new homes and to support the UK target to reduce carbon emissions by 60 per cent.

Purpose and intended effect of measure

Objective

2. This proposal sets a timetable for moving towards zero carbon new homes by 2016 as a contribution to meeting the UK target to reduce carbon emissions by 60 per cent by 2050.

3. We expect that by 2050 about one-third of the housing stock will have been built since 2006. So new homes have a vital role to play in helping the UK meet its target for reducing carbon emissions. We believe that both the planning system and Building Regulations have a part to play in driving changes in the way we design, build and locate development to achieve this agenda.

4. A key strand in achieving the Government's ambition of delivering zero carbon development is by progressively raising the standards set in 2006 Part L of the Building Regulations.

5. Proposals in the *Forward Look* published at the same time as the amendments to Part L in April 2006 suggested that the carbon performance of Building Regulations should improve by 25-30 per cent in 2010.

6. In *Building a Greener Future* consultation paper[1] we consulted on a series of changes to Part L with improvements of 25 per cent in 2010 (in line with the 2006 *Forward Look*), 44 per cent in 2013, and zero carbon in 2016.

7. Analysis of the responses to the consultation shows considerable support for the proposed changes. Two-thirds of respondents said they agreed that new housing should lead the way in delivering low and zero carbon housing. 39 per cent thought that the targets we had set out were achievable within the timescale; with 13 per cent saying they were not achievable; and 16 per cent saying they were not stringent enough. However, there were a range of responses and the issues raised were considered seriously and are addressed in *Building a Greener Future* Policy Statement.[2]

8. Following the launch of the consultation, Communities and Local Government and the Home Builders Federation set up the 2016 Taskforce to identify the barriers to implementation of the zero carbon 2016 target, and put in place measures to address them.

9. The results of the consultation, the work of the Taskforce and the findings of the costs and benefits of the proposed changes to Building Regulations enable us to confirm the Government's commitment to the proposed changes to Building Regulations in 2010, 2013 and the zero carbon standard in 2016. This is set out in the *Building a Greener Future* policy statement.

[1] *Building a Greener Future* consultation paper December 2006: http://www.communities.gov.uk/index.asp?id=1505157
[2] *Building a Greener Future* policy statement http://www.communities.gov.uk/index.asp?id=1505157

10. The *Forward Look* published alongside the *Building a Greener Future* Policy Statement sets out the changes that are likely to be needed to Building Regulations to bring about the 25 per cent and 44 per cent improvements in carbon performance by 2010 and 2013.

11. As new evidence emerges about costs and practicalities, and as technologies develop, we will develop the definition of zero carbon for the purposes of Building Regulations, after full consultation and within a sensible time-frame that will allow the industry to adjust before the planned changes in 2016.

12. This Final Regulatory Impact Assessment (RIA) focuses on the rationale for the timetable and strategy for achieving this. It follows the old RIA format as it was substantially developed prior to the introduction of the new Impact Assessment process.

Background

13. The Stern Review[3] reports that there is an overwhelming body of scientific evidence that climate change is already happening: current levels of carbon dioxide have pushed up global temperatures by 0.5°C already. The review suggests that climate change could shrink the global economy by between 5–20 per cent by 2050.

14. Whilst exact details about the impacts of climate change on the weather we experience and on society still contain some uncertainties, there is a clear body of economic and scientific evidence that urgent action is needed first to slow the growth in carbon emissions and then reverse it.

15. More than a quarter of the carbon dioxide emissions in the UK come from energy used to heat and light our homes. The available technology can make a significant difference to the amount of energy we use for these purposes – particularly in newly built homes. But it is clear that we need to ensure the faster take-up of existing technology and to encourage the development of new technologies that can meet higher efficiency standards at more reasonable costs.

16. Moreover, demand for housing is growing with people living longer and tending to form more, but smaller, households. The most recent projections[4] show that the number of households will grow by over 223,000 each year until 2026. The Government has therefore set a target to increase housing supply to 240,000 new houses per annum by 2016.

17. This essential growth in housing provision needs to be sustainable. The Code for Sustainable Homes[5] considers the sustainability of homes in the round – setting minimum standards for energy and water efficiency as well as options on waste and materials. Standards for carbon are set above the minimum requirements in the Building Regulations.

18. Building Regulations, including Part L, also apply to new non-domestic buildings and whenever building works are carried out on existing buildings. Many of the generic issues relating to improvements in the carbon performance of dwellings will also apply to non-residential buildings. However, the characteristics of these buildings are much more variable, as are issues around occupation periods, internal heat loads,

[3] *Stern Review on the Economics of Climate Change* (October 2006).
[4] Communities and Local Government Statistical Release: New household projections http://www.communities.gov.uk/index.asp?id=1002882&PressNoticeID=2374
[5] The Code for Sustainable Homes www.communities.gov.uk/index.asp?id=IS06120

hot water demands and the balance between heating and cooling. We are therefore working with industry to see what can be achieved in terms of low and zero carbon new non-residential buildings and over what time scale.

Rationale for government intervention

19. Government policy needs to minimise the environmental impact of its ambition to improve the affordability and availability of homes. By setting a new and ambitious direction we believe that we can also help the emerging market in new technologies and products. By helping to drive the demand for new and existing technologies and products we can help to drive innovation and reduce costs.

20. The Stern Review concluded that regulation can play a powerful role in cutting through the barriers to the behavioural changes which are needed to tackle climate change. Stern also concluded that taking strong action to reduce emissions should be regarded as an investment, a cost incurred now and in the coming decades, to avoid the risks of very severe consequences in the future.

21. Regulating environmental standards in housing places an implicit value on reducing carbon emissions, mainly in the form of additional construction costs. In the context of the marginal cost of carbon abatement across a range of technologies and sectors, the Government's Energy White Paper[6] suggested that there remains a large potential in the domestic sector to achieve cost effective carbon savings from efficiency improvements[7]. Micro-generation technologies are currently much less cost effective, but can sell electricity via the grid and do not incur the same distribution costs and transmission losses as traditional much larger sources. Depending on how these issues are resolved the economics of these technologies may change, particularly as markets become more established we would also expect the technologies to become more cost effective.

22. Within the market for new housing there are a number of market failures relevant to the environment and sustainability. In particular, the wider social costs ('externalities') of carbon emissions from homes are not taken into account within private decisions by developers or buyers except insofar as they must comply with the Building Regulations. For example, home owners are not required to pay for these costs they impose on society for future generations and so have little incentive (apart from lowering their fuel bills) to seek to minimise their emissions. Similarly, there is no requirement to pay for the wider costs of building less efficient homes, so developers have no incentive to build to higher environmental standards.

23. In addition, buyers are often unable to judge the energy efficiency, carbon rating or other parameters establishing the sustainability of homes. This means that developers are unable to distinguish their product and gain a profit from sustainability. Whilst Energy Performance Certificates and the Code for Sustainable Homes will provide more information and benchmark standards, the available market mechanisms do not fully addresses the impacts of environmental externalities associated with new homes.

24. Regulation has an important role in limiting the emissions from new homes where the market does not already respond. Setting a forward path for how regulations

[6] *Meeting the Energy Challenge:* A White Paper on Energy (May 2007) http://www.dti.gov.uk/energy/whitepaper/page39534.html

[7] The indicative marginal abatement cost curve places household energy efficiency at the most cost-effective end of the scale.

might develop can stimulate innovation by reducing uncertainty for designers and manufacturers of sustainable technologies and for developers who need to build to the new, higher standards. It will also set a clear framework within which the authorities responsible for ensuring compliance can operate.

25. Where the credibility of new low carbon technology markets is still being established, regulating the whole market can help co-ordinate a strategic shift that can help avoid technology 'lock-in' by setting the overall standard and driving the market to find cost effective solutions. The potential benefits of a regulatory framework are emphasised in the Stern Review, particularly in avoiding lock-in "in markets which are subject to lengthy capital replacement cycles, for example buildings and power sectors".[8]

26. The Regulatory Impact Assessment used to support the amendments of Part L in 2005 also took a forward look at the likely direction of future developments. It seemed likely that the level of performance improvement sought at each review would be in order of 25–30 per cent. We would expect that four successive relative improvements of 25 per cent would mean that by 2015 emissions would only be around 30 per cent of the levels produced by building to 1995 standards.

27. We also need to take account of the Energy Performance of Buildings Directive (EPBD), which had to be transposed into UK law by January 2006. The Directive requires that the energy performance standards should be reviewed every five years. This requirement signals further amendments in (at least) 2010 and 2015.

28. However, in December 2006 we consulted on the scope to go further and proposed a timetable of amendments to the zero carbon standard by 2016. The *Building a Greener Future* Policy Statement confirms the timetable and interim steps.

Consultation

Within Government

29. All government departments have been consulted on the proposals.

Public consultation

30. A full public consultation was carried out between 13 December 2006 and 8 March 2007. Meetings about the consultation proposals have also been held with specific groups and representatives, for example, from the housebuilding industry, local authorities and energy companies.

31. Overall, the majority of responses to the consultation were positive. Two-thirds of respondents said they agreed that new housing should lead the way in delivering low and zero carbon housing. 39 per cent thought that the targets we had set out were achievable within the timescale; with 13 per cent saying they were not achievable; and 16 per cent saying they were not stringent enough.

32. A summary of consultation responses can be found at: www.communities.gov.uk/index.asp?id=1511113_

[8] Stern Review 2006: http://www.hm-treasury.gov.uk/media/0/F/Chapter_17_Beyond_Carbon_Markets_and_Technology.pdf

33. The *Building a Greener Future* Policy Statement published alongside this RIA addresses the key issues raised in the consultation.

34. The accompanying *Forward Look* to the *Building a Greener Future* Policy Statement clarifies the changes to Building Regulations that are likely to be needed to bring about the 25 per cent and 44 per cent improvements in carbon performance in 2010 and 2013.

35. There will be full consultations on the future changes to Part L closer to the target dates of 2010, 2013 and 2016, to capture any emerging issues and lessons learned in the intervening period, including an assessment of the most cost effective ways of achieving the standards.

Options

36. This RIA sets out three options for the changes to Part L of the Building Regulations:

    1. Do nothing, ie do not raise the standards in 2010

    2. Raise carbon performance standards in Part L to 25 per cent higher than 2006 Part L in 2010 and to zero carbon in 2016

    3. As Option 2, but add a further stage of improvement in 2013 with a 44 per cent improvement compared with 2006 Part L

Option 1 – Do nothing

37. This is a baseline against which the costs and benefits of Options 2 and 3 have been assessed. It represents business as usual ie including a voluntary Code for Sustainable Homes, Energy Performance Certificates for new homes from 2008 and assumes that 44 per cent of new homes source 15 per cent of their energy supply from renewable or low carbon sources (a Merton type rule). However, there are a number of reasons why Option 1 is not considered to be a viable option.

38. Although the implementation of existing policy will lead to reductions in emissions, these will be insufficient to enable the domestic sector to achieve the Government's 2050 target, assuming the domestic sector would need to achieve a 60 per cent reduction. Moreover, the achievement of these standards has already been foreshadowed by the Government and should be built into industry expectations.

39. Implementation of the EPBD requires a five yearly review of standards and also seeks to "raise energy standards over the next decade, learning lessons from the standards in comparable European countries".

40. As well as dealing with climate change, there is a growing imperative to constrain growth in energy demand in response to concerns about energy security. The Energy White Paper explained that the UK is already a net importer of oil, and dependent on imported gas at a time when global demand and prices are increasing. Many of the measures needed to cut carbon emissions to address climate change also contribute to creating a healthy diversity of energy supply and address fuel poverty through lower bills for householders.

Option 2

41. Option 2 proposes increasing performance standards in Part L to achieve a 25 per cent improvement on 2006 Part L by 2010 and zero carbon homes in 2016. The main concern with this proposal is that it will require industry to make a huge leap to achieve the zero carbon standard from the 25 per cent improvement. Without an interim step, there is the risk that there will be a dislocation in supply as industry seeks to adjust to the significant change in standards required in the run up to 2016. Moreover, the gap is out of line with the five year review period required under the European Directive.

Option 3

42. Option 3 builds on Option 2, but adds a further stage of improvement in 2013 with a 44 per cent improvement compared with 2006 Part L. This option proposes a 25 per cent improvement on 2006 Part L requirements in 2010, a 44 per cent improvement in 2013 and zero carbon standards by 2016. This is the policy set out in *Building a Greener Future*.

Costs and benefits

Assumptions and uncertainties

43. The preparation of this RIA is subject to a number of uncertainties. Although there is an increasing body of scientific and economic research on the impacts of global warming, the costs of climate change remain uncertain. It is therefore difficult to determine the benefits of reducing carbon emissions with any precision. In monetising the carbon savings we have assumed the social cost of carbon to be £70 per tonne in 2000 prices[9], in line with Government's accepted practice.

44. Moving towards the highest performance standards is likely to involve the application of emerging technologies that have uncertain costs and applicability, leading to uncertainties about the costs of possible carbon savings. As the markets mature it is likely that costs will fall and greater certainty will be available.

45. The assessment of the costs and benefits is based on the Government's previous plans to build 200,000 houses by 2016. The government has recently announced an increase in this trajectory to 240,000.

46. We have commissioned work[10] to develop the previous research commissioned by the Housing Corporation and English Partnerships on the costs and benefits of delivering carbon improvements. As there are a number of ways that zero carbon homes can be delivered, the research has added further detail to the costs and benefits of meeting the 2010 and 2013 standards and has generated scenarios to illustrate a range of zero carbon outcomes.

[9] HM Treasury and Defra, *Estimating the Social Cost of Carbon Emissions* 2002..

[10] To be published – *The costs and benefits of the Government's proposals to reduce the carbon footprint of new housing development*, Cyril Sweett, Faber Maunsell & Europe Economics, July 2007.

47. The overall impact of the policy depends on how the zero carbon standard is achieved, particularly the level of low or zero carbon energy provided at the development level, and how costs fall over time as markets develop and learn to adapt. The range of costs highlights the uncertainties remaining in delivering zero carbon homes. As new evidence emerges about costs and practicalities, and as technologies develop, we will develop the definition of zero carbon for the purposes of Building Regulations, after full consultation and within a sensible time-frame that will allow the industry to adjust before the planned changes in 2016. To take account of this, the consultants were asked to model the impact of the policy as currently defined (ie, the zero carbon standard should be achieved through measures located on the housing development site, or with a physical connection to it); and two further scenarios where the zero carbon definition is based on allowing renewable energy solutions which are sourced offsite (provided that they are additional) to contribute to achieving the zero carbon standard, with or without mandatory high energy efficiency standards.

48. Due to the uncertainties around how developers will respond to the challenge we cannot predict the technology mix that will prevail over time. For the purpose of this RIA, a broad range of current technologies were modelled including photovoltaic (PV), solar heating, biomass heating, combined heat and power (CHP), micro/medium/large scale wind generation and energy efficiency measures. Assumptions were made as to the applicability of different technologies in development types. The scenarios we have illustrated in this RIA are therefore based on modelling that optimises the mix of currently known technologies to generate least-cost solutions for meeting each required level of carbon standards, with consideration of how learning rates may drive costs down over time. More detail of the modelling will be published in due course, in the final report of this work.

49. A range of development scenarios were modelled, to represent the different development types for current and projected new build. The costs and benefits vary by development type to reflect the relative mix of dwelling size and type and the suitability of different technologies (scaled to how it would be used in different developments) in each scenario, according to the location, density and size of development. The key development types were as follows:

- **Small development:** fewer than 10 units of different housing types, but no flats, representing low density, rural sites, and making up around 15 per cent of new build.

- **City infill:** flats only, with an average of 18 units, high density city sites, and making up around 3 per cent of new build;

- **Market town:** an average of 100 units, of 75 per cent houses and 25 per cent flats, making up around 70 per cent of new build. These sites could be part of a larger site, but are treated separately for the purposes of modelling;

- **Urban regeneration:** large sites of on average 750 units, comprising 90 per cent flats, representing large brownfield, high density, mixed use sites making up around 10 per cent of new build.

50. The modelling has illustrated that there may be a role for offsetting[11], particularly where rigid application of on-site zero carbon could potentially create perverse incentives eg for small infill sites to be left vacant. However, there is already evidence that the range of appropriate technologies is growing over time, and the costs are falling. We expect much better evidence to emerge over the next few years about what can be achieved, and at what cost. We think therefore it is right to return to the issue of offsetting and offsite solutions when we have more evidence to determine the right approach.

Sectors and groups affected

51. All aspects of the housebuilding industry will be affected by the proposed options. Developers would have to make decisions about how they plan developments. Housebuilders will have to adopt new technologies, products and techniques and the real estate sector may have to adapt to marketing homes of different standards.

52. However, the building industry is having to do this in any case to meet new demands from customers and to match international competitors. The policy and firm timetable will contribute to increasing the rate of innovation and will provide the clarity and long range certainty that the sector is calling for. Landowners are also likely to be affected depending upon the degree to which costs of meeting the Building Regulations requirements are passed back to them through lower land prices.

53. Owners and occupiers will benefit from the improvements, both financial and non-monetary, that they will receive from living in more sustainable homes. More generally the environmental benefits of improving the carbon performance of new build will affect wider society.

54. The energy sector will be indirectly affected as improvements in carbon performance of buildings will reduce the demand for energy within the domestic sector compared to the do nothing scenario. It will also encourage wider take up of and investment in distributed generation infrastructure, and may require new relationships to be developed between developers and energy service companies or energy suppliers. In parallel, manufacturers of sustainable technologies (such as renewable energy technologies) will be affected as a result of the impact on demand for these technologies.

55. Altering the Building Regulations will have an impact on the public sector, in particular on local government, who will need to implement and monitor building standards against the new regulations.

56. There are unlikely to be any specific impacts on the voluntary and community sectors, nor are these proposals likely to adversely affect any specific group in terms of race, gender or disability. Impacts on the rural economy in the longer term are expected to be negligible, particularly as it is more likely that there will be more space available for the relevant technologies, eg for large wind turbines.

[11] The modelling used Renewable Obligation Certificates as a proxy.

57. Finally, the higher environmental targets for Building Regulations complement a range of other Government initiatives to address the challenges of climate change set out in the Energy White Paper. These include measures to address the energy supply and demand side, for example initiatives aimed at the planning system, measures aimed at improving the energy efficiency of appliances, the Code for Sustainable Homes and policies aimed at encouraging energy efficient behaviour by consumers.

Health impact assessment

58. Experience from programmes such as Decent Homes and Warm Front suggests that improving the thermal comfort of dwellings (which will be a direct result of the proposed improvements to Building Regulations) has direct health benefits and can improve the quality of life for the occupants of the dwellings. Part F of the Building Regulations which covers ventilation will be reviewed at the same time as Part L and will look specifically at indoor air quality issues.

Breakdown of costs and benefits

Summary

59. The costs and benefits of these proposals can be broadly categorised into three groups: economic, social, and environmental. Within these groups there are certain sectors identified that will specifically be affected. The costs and benefits of both Options 2 and 3 are described together in this section, drawing out the key differences where they occur.

60. The number of variables (type of development, technology mix etc) means that we have presented ranges of costs and benefits. The main variable affecting costs is whether developers are allowed to offset ie secure renewable energy offsite, for example at the expense of less stringent energy efficiency requirements. We will be looking at this issue as we develop our experience of implementing the policy.

61. There is also a difference in overall costs depending on whether it is assumed that construction or lifetime costs would be minimised. Construction costs may be higher for example even though lifetime costs are lower, because higher standard energy efficiency measures may be more costly to install but realise higher benefits over time in terms of reduced fuel bills and carbon savings.

62. Uncertainties about the costs of achieving zero carbon also mean that we have modelled the impact of achieving the 2010 and 2013 targets up to when the 2016 changes come in, as an illustration of the shorter term costs and benefits.

63. The options presented in the tables below are net of Option 1 ie show the costs and benefits compared to Option 1. They are based on minimising the construction costs.

Table 1: Changes in 2010 and 2013

Total benefits (£m) (PV)	Total costs (£m) (PV)	Net present value (£m)	Lifetime savings of policy to 2065 ($MtCO_2$)	Cost effectivenes (£/$MtCO_2$)	Percentage change in build cost above Part L 2006 to reach standard	Annual carbon savings in 2020 $MtCO_2$	Annual carbon savings in 2050 $MtCO_2$	Impact on energy bill in 2013 per dwelling (£)
2.327	–4,220	-1,893	14	149	5.4	1.19	4.39	Savings between £25 and £146

PV: Present value
$MtCO_2$: Million tonnes of carbon dioxide

64. Overall, the net impact of achieving the first two changes is estimated at a net present value (NPV) cost of around £1.9 billion over the period from 2008 to when the third set of changes come in 2016. This illustrates the costs of the policy before zero carbon is introduced into Building Regulations. There are benefits in terms of fuel bill savings and carbon savings but these are not as significant as those achieved with the introduction of the zero carbon standard. If the impact of on-going costs and benefits are taken into account in technology choices, then the overall costs to the economy is reduced to £0.85bn, though the capital costs will be higher.

Zero carbon homes – a range of costs

65. The potential costs and benefits of achieving zero carbon is uncertain, depending on how it is delivered, what technologies are used and how costs change over time. Therefore the modelling has explored three scenarios to achieve zero carbon through:

    a) unlimited offsetting[12] (through zero carbon solutions offsite) but ensuring that there are minimum standards in the home based on current 2006 Building Regulations;

    b) allowing offsetting[12] (through zero carbon solutions offsite) but requiring a high standard of energy efficiency (Energy Saving Trust Advance Practice) in the home to be met first;

    c) requiring zero carbon measures located on the housing development site, or with a physical connection to it.

[12] Based on the assumption that developers are given an alternative of offsetting through purchase of Renewable Obligation Certificates (ROCs) at a cost of £1,500 per tonne of carbon dioxide. This figure is derived from a current ROC price of £83/tCO_2 taken over the 29 year lifetime of a technology (taking large wind turbine as an example) presented as a present value.

Table 2: Unlimited offsetting

Total benefits (£m) (PV)	Total costs (£m) (PV)	Net present value (£m)	Lifetime savings of policy to 2065 ($MtCO_2$)	Cost effectivenes (£/$MtCO_2$)	Percentage change in build cost above Part L 2006 to reach standard	Annual carbon savings in 2020 $MtCO_2$	Annual carbon savings in 2050 $MtCO_2$	Impact on energy bill in 2013 per dwelling (£)
5,883	–7,575	–1,692	157	22	1*	2.72	19	Cost of £21 to Saving up to £63

* Does include cost for offsite solutions

66. Allowing offsetting (through additional zero carbon solutions offsite) as a solution to achieving zero carbon has been estimated to place the lowest net cost on the economy: £1.7bn. However, the benefits to householders through lower fuel bills are lower than under the scenarios below. Householders may even see a rise in fuel bills under this scenario as offsetting solutions will not benefit the householder and when compared with the baseline in Option 1. There could also be an opportunity cost as the land used to provide the additional zero carbon energy for existing homes and other users. However, there could also be an opportunity cost if land on a housing development is used for zero or low carbon energy sources; in this case there is an opportunity cost as that land could be used for additional homes.

Table 3: Unlimited offsetting with high energy efficiency standards

Total benefits (£m) (PV)	Total costs (£m) (PV)	Net present value (£m)	Lifetime savings of policy to 2065 ($MtCO_2$)	Cost effectivenes (£/$MtCO_2$)	Percentage change in build cost above Part L 2006 to reach standard	Annual carbon savings in 2020 $MtCO_2$	Annual carbon savings in 2050 $MtCO_2$	Impact on energy bill in 2013 per dwelling (£)
8,471	–11,924	–3,453	165	32	6*	2.72	19	Saving between £11 and £111

* Does include cost for offsite solutions

67. If high minimum energy standards (Energy Savings Trust Advance Practice) are required before offsetting (through additional zero carbon solutions offsite) solutions are permitted then the overall cost to the economy is increased compared with the scenario above to £3.5bn. Householders will benefit from fuel bill savings as the homes will be more energy efficient than under the above scenario but there is still an opportunity cost though on a smaller scale.

Table 4: Zero carbon as currently defined – requiring measures located on the housing development site, or with a physical connection to it

Total benefits (£m) (PV)	Total costs (£m) (PV)	Net present value (£m)	Lifetime savings of policy to 2065 ($MtCO_2$)	Cost effectivenes (£/$MtCO_2$)	Percentage change in build cost above Part L 2006 to reach standard	Annual carbon savings in 2020 $MtCO_2$	Annual carbon savings in 2050 $MtCO_2$	Impact on energy bill in 2013 per dwelling (£)
22,047	–34,324	–12,277	125	110	19	2.79	15	Saving between £114 and £359

68. As currently modelled, delivering zero carbon new homes through measures located on the housing development site, or with a physical connection to it, has a higher cost to the UK economy than the other scenarios; of £12.3bn. This scenario does generate the highest potential fuel bill savings for householders which could be up to £359 per year due to a mix of high energy efficiency standards and on-site renewable energy. Whether households realise this saving under this or the other scenarios will depend on how energy is delivered and whether some of this saving will be recouped by energy service companies in order to make the delivery of renewable onsite energy a viable business over a long-term investment period. These fuel bill savings do not reflect the cost of the capital investment of the low and zero carbon technologies.

69. However, the overall net cost to the economy under this scenario can be reduced to £10,753m if the standards are achieved through technologies that deliver higher ongoing net benefits. Although the percentage increase in construction costs above Part L 2006 is slightly higher through choosing solutions that maximise ongoing benefits, the increase is marginal. For example, in 2016 the percentage increase in costs above Part L is 19.4 per cent under a scenario which maximises net ongoing benefits compared with 19 per cent under the scenario based on minimising capital outlay.

Table 5: Option 2

Total benefits (£m) (PV)	Total costs (£m) (PV)	Net present value (£m)	Lifetime savings of policy to 2065 ($MtCO_2$)	Cost effectivenes (£/$MtCO_2$)	Percentage change in build cost above Part L 2006 to reach standard	Annual carbon savings in 2020 $MtCO_2$	Annual carbon savings in 2050 $MtCO_2$	Impact on energy bill in 2013 per dwelling (£)
21,148	–32,935	–11,787	120	110	19	2.54	15	Saving between £114 and £359

70. Option 2 has been modelled on the same basis as the scenario set out in Table 4 ie requiring measures located on the housing development site, or with a physical connection to it. This has a slightly lower cost than the equivalent Option 3 scenario (see Table 4). However, Option 2 achieves fewer carbon savings in the early stages. Also, Option 3 achieves carbon savings sooner.

Marginal abatement costs

71. Achieving the 2010 and 2013 changes has a cost over the period 2008-2016 of around £150 per tonne CO_2. Achieving zero carbon with no offsite generation costs £110 per tonne CO_2, due to the higher potential carbon savings that can be made through zero carbon. To put that into context, heat microgeneration is one of the currently most expensive carbon abatement technologies, at around £140/ per tonne CO_2[13]. However, we would expect the distributed generation technologies needed to achieve zero carbon to become more cost effective over time, partly driven by the policy itself, and for the construction industry to find innovative ways of achieving it, in conjunction with energy suppliers. With offsetting allowed, this cost could fall to a lower limit of £22 per tonne CO_2.

Technology solutions

72. The modelling has indicated that, when developers minimise the up front capital costs, the dominant technologies that contribute to meeting each standard are likely to be broadly as follows:

- 25 per cent improvement: energy efficiency (EST Advanced Practice in market town sites and Best Practice standard in others), PV electricity and solar water heating, with some large scale wind generation and biomass heating on the largest sites, probably requiring a management agent or energy service company;

[13] See Marginal Abatement Cost Curve, Chapter 10, Energy White Paper, DTI, 2007.

- 44 per cent improvement: Similar to the 25 per cent but with more of the carbon saving coming from biomass heating and PV; and

- Zero carbon as currently defined: varied technology mixes, but with limited scope for large scale wind generation in most developments the dominant solution indicated in the modelling is biomass CHP and PV. However, if offsetting (with or without high energy efficiency standards) is allowed within the definition then the offsetting option is selected as this is a cheaper method of achieving the zero carbon outcome than the other technologies in the model.

73. In the case of city infill sites (approximately 3 per cent of new build), the modelling work indicated that there may be a shortfall of 10-15 per cent in the required carbon savings to meet the zero carbon standard, due to difficulties in the application of technologies to these sites at present, particularly in electricity generation. With more innovative layouts, particularly allowing more roof space per dwelling for PV panels, it may be possible to cover the shortfall. In mixed use sites this is less likely to be a problem, as use of CHP systems may be more viable.

Benefits

Economic

Households

74. The main economic benefit of Options 2 and 3, compared with the base case, is the financial savings for households from reduced energy bills as a result of the improvements in (a) the energy efficiency of the new buildings (b) the potentially lower cost of fuel from renewable sources.

Table 6: Energy Bill Savings

	Impact of 2010 and 2013 changes	**Option 3: Impact of 2010, 2013 and 2016 changes presented as a range based on zero carbon scenarios modelled and described above**	**Option 2: (with full on-site energy)**
Annual average impact on fuel bill in 2016 per dwelling (£)	Savings between £25 and £146	Cost of £21 to saving up to £359	Savings between £114 and £359

75. The savings to households from achieving the 25 per cent improvement in 2010 are likely to be achieved mostly from improvements to the fabric standard, thus raising the overall level of energy efficiency in the building and reducing energy demand. The benefits from lower fuel bills range from between £25 and £105 per year, compared to the baseline, depending largely upon the size of the property.

76. Reaching the 44 per cent standard in 2013 saves between £25 and £146 per annum compared to current standards, based on even higher energy efficient fabric standards, combined with improvements in heating and lighting and in some cases through the installation of renewable energy technologies such as PV.

77. These estimates are based on the likely savings that could be achieved in a home that meets the 25 per cent or the 44 per cent standard today. Over time, however, the savings accrued will be subject to unknown variations in fuel prices, and the fuel supply mix.

78. For zero carbon, there are a number of emerging technologies and fuels that could be used, each with variable fuel prices, capital costs of installation and variable running costs. As shown in Table 6, fuel bills could be reduced by as much as £359 where the zero carbon standard is achieved through energy efficiency measures and provision of on-site renewable energy. Table 6 shows a range which includes a net increase in energy costs when unlimited offsetting is allowed. As explained above, this is because of the different assumptions between the options.

79. Under the modelling, the technologies employed to achieve the zero carbon standard vary according to development type and how it is defined. For example under the scenario in Table 4, an urban regeneration site (with 750 units of medium density) could derive its energy needs from biomass CHP and PV. Under this scenario fuel bills could go down by £120. On a small development (of fewer than 10 units and no flats), fuel bills could go down by as much as £359 using biomass CHP and PV, but it is also more feasible to use micro-wind generation to get additional relatively cost effective savings. The higher saving in small developments is also due in part to the larger average size of dwelling, in which it is easier to make relatively large gains.

80. Depending on the increased scarcity of fossil fuels and issues over energy security, the relative prices of different fuel types may change over time and the fuel bill savings from moving to renewable sources could potentially be higher in the future than indicated here.

81. The extent to which the householder actually benefits from this potential saving will depend on the method for delivering the energy and running costs. For example, if an energy service company is established to deliver the energy, then they may fix the cost of energy supplied to the home at, or just below, grid energy prices to allow them to recoup their initial capital cost. However, in some cases, and depending on the level of energy efficiency required, the fabric standard will be improved and the household will be guaranteed to realise some saving through lower energy demand.

82. If developers' costs are increased because of the need to introduce high energy efficiency standards, these could be passed on in higher prices. Home buyers may be willing to pay an additional premium for higher environmental standards, equivalent to the savings they might expect from lower fuel bills. This may lead to a small increase in the price of a new build, but is likely to be negligible in terms of average house prices, particularly as the prices are largely determined by location and size characteristics and by prices in the second hand market.

83. Under Option 2, the fuel bill savings are likely to be the same in 2010 and 2016 as under Option 3 but overall the benefits of the policy are lower because energy efficiency standards are not raised in 2013. This is illustrated by comparing the difference between the present value of ongoing costs and benefits under Options 2 and 3; under Option 3 these are estimated to be £195m higher. These benefits are predominantly associated with fuel bill savings. And the total present value of benefits is higher under Option 3 by £898m.

84. The distribution of household benefits, where they occur, is difficult to quantify. Nonetheless, the vast majority (nearly 70 per cent) of new homes are occupied by married or cohabiting couples[14], particularly with dependent children, so assuming this trend continues, we would expect most benefits to accrue to this group.

Construction industry

85. An indirect benefit from setting the future performance standard of homes should be in eliminating inefficient technologies and construction products from the market. This has the potential to drive innovation and product improvements in terms of efficiency and reliability, where there is currently little incentive from developers to push for product improvements.

86. By reducing uncertainty in the markets for sustainable products and technologies, and by signalling an expected increase in demand for them, these markets should increase in scale and be promoted across the whole country. We are working with the Renewable Advisory Board to assess the role of renewable technologies in meeting this policy.

87. These markets are becoming increasingly global, as other countries begin to invest in low carbon and energy efficient technologies. Increased domestic demand may drive companies to develop in the UK that can compete more effectively internationally. The Construction Products Association is working to ensure that its members understand the opportunities of the zero carbon homes policy and can see the best ways to adapt their business to reflect this.

88. A further indirect economic benefit will be the reduction in uncertainty within the construction industry around potential future changes to Building Regulations. By indicating a clear direction and timetable for changes, the industry should be able to smooth and even reduce through efficiencies, costs incurred in interpreting and learning the new requirements and planning for implementation. This timetable can be seen as a compensatory simplification measure.

89. Learning rates driven by the policy are small generally, in comparison to external factors, driving costs down by between one to two per cent over the period to 2025, except in the case of energy efficiency fabric standards, which are driven mostly by local learning rates as part of the construction process. Learning rates associated with the EST Advanced Practice standard would be driven particularly strongly by a policy requiring this as a minimum 'backstop', as current levels of build to this standard are low in comparison (approximately 10,000 units are expected to be built to this standard next year).

90. Learning rates between Options 2 and 3 are similar. However, we would expect that they would be marginally higher under Option 3 for some technologies, as it would require the market to change faster than under Option 2.

[14] Based on household composition data, showing current owner occupiers who were the first occupants of their homes built between 2000 and 2005 (source: *Survey of English Housing*, 2005-06, Communities and Local Government).

Environmental

Carbon emissions

91. The key environmental benefit of the proposal will be the reduction in carbon dixoide emissions from new homes by achieving higher carbon performance standards over time. Compared to the baseline case, reaching the 25 per cent improvement will save for each new home built around 0.3 tonnes of carbon dioxide per year. The 44 per cent improvement will save around 0.7 tonnes of CO_2. Achieving zero carbon will save around 2.7 tonnes of CO_2 per house, an additional 2 tonnes to the 44 per cent standard.

92. On the earlier projected net new build rate of 200,000 dwellings a year, the profile of improvements in the new stock is expected to deliver an estimated saving of 2.79 million tonnes of carbon dioxide ($MtCO_2$) in 2020, and a saving of between 15 and 19 $MtCO_2$ in the year 2050, over and above projections of current standards.

93. Long-term projections of emissions should, of course, be treated with caution, due to the large uncertainties over long time horizons. Nonetheless, assuming the domestic sector takes a proportionate share of our national 60 per cent emissions reduction target, and accounting for rising energy demand as a result of growing household numbers and appliance use, projections to 2050 indicate that we may need to save as much 110 $MtCO_2$ per annum by 2050. Our estimated savings of between 15 and 19 $MtCO_2$ per annum by 2050 represent around one-sixth of the required saving to meet the 2050 target in the domestic sector.

94. Under Option 2, the carbon savings are smaller at 2.54 $MtCO_2$ in 2020 because some carbon savings which will come on stream in 2013 under Option 3 will not be realised under Option 2. By 2050, it is estimated that Options 2 and 3 will deliver around the same carbon savings of between 15 and 19 $MtCO_2$ depending on the definition of zero carbon. However, the additional carbon benefits of Option 3 are demonstrated by the undiscounted carbon savings to 2065; Option 3 generates between 125 and 165 $MtCO_2$ depending on the definition compared with 120 $MtCO_2$ under Option 2. This takes into account the carbon savings from these homes up to 2065 when the technologies will have come to the end of their life.

95. Monetising these carbon savings using a central estimate of £25 per tonne CO_2 (£70 per tonne of Carbon in 2000 prices), and assuming a £1 real increase per annum for the social cost of carbon, gives a discounted value for the carbon savings for homes built to 2025 of approximately £1.5 billion.

96. The above estimates apply only to completely new constructions. Depending on how the Building Regulations will apply to the conversion of existing buildings, there should be further, albeit relatively smaller, savings per dwelling associated with higher energy performance standards of conversions and extensions. Conversions are expected to represent approximately 5-10 per cent of new net additions to 2016 and beyond.

97. Option 3 is also expected to generate an increased contribution from renewables to the total UK electricity demand of around one per cent by 2020.

Wider environmental benefits

98. Further ancillary benefits from the policy will be from air quality impacts[15] for example the reduced damage costs and health impacts from reduced pollutants such as particulate matter, oxides of nitrogen and sulphur dioxide. These benefits can be assessed in more detail when the energy impacts from the likely technology mixes are better known.

99. A potential indirect effect of the policy, in so far as it can drive learning rates in new technologies, might be beneficial spill-over effects to the existing stock of homes. With cost reductions as a result of the policy between one to two per cent, the effect on the cost of installation and therefore on take-up as a result of policy cost reductions is likely to be small. Nonetheless, the benefits from improving skills and capacity for installation, as well as the potential to drive reliability improvements and to improve public acceptability and awareness, may drive further take-up of these technologies for retrofitting existing homes.

100. Option 3 drives learning rates of between 13 per cent and 16 per cent, which could result in lower installation costs for householders living in existing homes who are looking to install renewable energy technologies.

Social

101. The social benefits of the proposed options are likely to be very difficult to quantify. However, experience from programmes such as Decent Homes and Warm Front suggests that improving the thermal comfort of dwellings has direct health benefits and can improve the quality of life for the occupants of the dwellings.

102. Higher environmental standards may also contribute to reducing fuel poverty, with reclaimed energy bills over time.

Costs

Economic

One-off, transitional costs

103. There are likely to be some transitional costs, such as training for those involved in local government, housebuilders, developers and architects.

104. The cost of training for building control officers and approved inspectors was estimated to be £0.56m (2006 prices) for the last changes to Part L in 2006. Further analysis of the costs of administration and compliance will be carried out for each change to Part L in 2010, 2013 and 2016.

[15] *Air Quality Damage Cost Guidance, Interdepartmental Group on Costs and Benefits Interim Guidance*, Defra, November 2006,

105. The short term labour costs associated with installation are accounted for in the assumptions behind the capital costs of building to the higher energy standards in Building Regulations.

Annual, on-going costs – construction

106. The major cost of the options is the increase in construction costs of meeting the higher levels of energy performance standards. Our modelling suggests that construction costs vary widely depending largely on:

- dwelling type (size and external wall area etc);
- development type (small scale city infill, larger urban extension); and
- technology mix used to achieve compliance.

107. Due to uncertainties around future costs and the mix of technologies developers adopt, it is not possible to predict the full additional construction costs to the economy.

108. Table 7 sets out the expected increase in construction costs arising from meeting the 2010 and 2013 standards; for each of the Option 3 scenarios modelled above; and for Option 2.

109. The additional build costs in 2010 and 2013 above current Part L costs are estimated to be around 3.3 per cent and 5.4 per cent respectively. This varies around house type and development type. For example, it is estimated that an average end terrace might cost an additional £2,442 and £3,789 in 2010 and 2013 respectively, on the basis of current technologies. For a market town development, the additional costs per unit would be around £2,588 and £3,754 in 2010 and 2013. The lowest cost technologies that deliver the required standards in 2010 and 2013 were found in the model to include a mix of higher energy efficiency standards, and this was predominant for the 2010 standard, but with biomass heating, wind generation (where relevant) and PV also being used in 2010 and 2013.

Table 7: Increases in construction costs

		Option 3			
		Impact of 2010, 2013 and 2016 changes presented as a range based on zero carbon scenarios modelled and described above			
	Impact of 2010 and 2013 changes (in 2014)				**Option 2**
Percentage change in build cost above Part L 2006	5.4	Table 2 1	Table 3 6	Table 4 19	19

110. For zero carbon, with all energy generated onsite, the costs have been estimated to rise by on average 19 per cent above the cost of Part L 2006, within a range of 13 to 30 per cent, depending on the dwelling type, development scenario and mix of technologies and whether energy generation is applied at district/development or individual dwelling level. This is equivalent to an increase in build cost of between £9,000 to £25,000 per dwelling.

111. If unlimited offsetting is allowed the costs of meeting the requirement are much reduced, to only one per cent above current Part L costs. With a high energy efficiency requirement, the additional cost is around six per cent from 2016.

112. Over time, we would expect the costs of construction to fall, according to (a) learning rates as uptake of some technologies increases internationally, and (b) local and national learning rates, driven by the policy, increasing uptake in the UK. For key technologies, our modelling applies learning rates to illustrate this effect. For example, the cost of PV is expected to fall by around 50 per cent by 2025, and the materials associated with EST Best and Advanced Practice fabric standards are expected to fall by 5-10 per cent by 2025. The overall effect of this is that the total additional construction costs of achieving zero carbon are expected to fall from the estimated 19 per cent to 13-16 per cent of Part L costs by 2025.

113. Eco-towns, which will be exemplar green developments of between 5,000 and 20,000 new homes, will demonstrate the potential for building to higher levels ahead of the proposed changes to Building Regulations. The schemes will benefit from being able to design in high standards from the start to maximise resource saving, including zero carbon development, and the benefits of integrated services and transport. To illustrate the potential additional cost of building to zero carbon on this scale, our estimates for an 'urban regeneration' development (of 750 homes) indicated additional construction costs of 14 per cent in 2014, but we can expect this cost to come down due to economies of scale in an eco-town development.

Balance of costs on developers, landowners and buyers

114. The incidence of additional construction costs may fall on different groups. It is possible that some of the cost may be passed forward to households through a price premium on houses but this is considered to be unlikely as the price of new housing is determined primarily by the second-hand market.

115. We commissioned academic analysis[16] to simulate the potential impacts on the housing market, particularly on the number of new homes constructed and house prices. Results from the modelling suggest that the impact of the enhanced Building Regulations and associated construction cost increases would have only a marginal effect on new housing supply and prices. For example, a 20 per cent increase in costs was modelled and the effect was a less than 1 per cent fall in supply and an increase in price of around £170 per home. The model shows this effect to be short-term, as the regulations change, with output and prices returning quickly to previous levels.

[16] To be published – *Carbon Reduction Housing Market Simulations*, Prof Glen Bramley (Heriot-Watt University) and Dr Chris Leishman (Glasgow University), May 2007, based on an established model described in *Urban Studies* Vol. 42, No. 12, 2213–2244, (2005)

116. This result suggests that costs will not, on the whole, be passed through to buyers. The second explanation for the modelling results is that recent research shows that the price elasticity of supply is very low, so developers continue to build the same number of units even if costs rise. In practice this means that most of the additional costs are passed back through land prices. In the short-run, where developers hold land-banks, developers have less flexibility in the costs that they face and so may have to absorb part of the costs themselves for the first step to the 25 per cent improvement.

117. However, in the longer term and when developers have certainty about the additional costs that they are likely to face, they will seek to pass the cost back to the landowner through a reduction in the land price. Apart from providing certainty for the industry, this is another reason why there is an advantage in setting a clear timetable for future regulation.

118. The loss in land value clearly has an opportunity cost and, in some cases, where the return from the next best use is marginal (eg in mixed use high value sites), land may be switched away from residential use. It is also likely to reduce the overall base from which infrastructure revenues are drawn eg from Section 106 payments.

Operation and maintenance costs

119. Using on-site renewables may have different costs for operation and maintenance compared to current heating systems and electricity supply. These costs include the annual cost of operation and maintenance, periodic replacement of components and the cost of fuel, where applicable with renewable energy. These costs are offset in the most part by the energy bill savings accrued. In the majority of cases, regardless of the technology, the NPV of the ongoing costs and benefits is positive.

120. There are scenarios where the costs of offsetting (using the price of Renewables Obligation Certificates as a proxy) will outweigh the benefits from reduced energy bills. This will be the case where developers are allowed to maximise offsetting, without having to meet high energy efficiency requirements.

Administration and compliance costs

121. A further cost of the policy will be in implementing, monitoring and enforcing the new Building Regulations. Given that the systems are already in place, the additional costs to local authorities of implementing these new standards are not expected to be large. The main cost will be in training in assessing the new standards.

122. The cost of training for building control officers and approved inspectors was estimated to be £0.56m for the last changes to Part L in 2006 which applies to England and Wales. Further analysis of the costs of administration and compliance will be carried for each change to Part L in 2010, 2013 and 2016.

Environmental

123. It is estimated that 10 per cent of energy use in the UK is associated with construction materials and methods (Green Guide to Specification, 2001). Embodied energy is defined as the energy used to manufacture, transport and assemble buildings. However, the definition of net annual zero carbon emissions used in *Building a Greener Future* does not include the carbon embodied in the products incorporated in the construction of new dwellings.

124. The 2010, 2013 and 2016 changes to Part L will require a change in the methods, products and technologies used in building new homes. Depending on the embodied energy of these products and technologies, a new home may therefore have a greater embodied energy than a new home built today.

125. A literature review was, undertaken to assess whether the additional products and technologies needed to achieve the higher standards would lead to homes that produced more carbon emissions through their construction than they save through the lifetime of the home.

126. The review showed that the data varied significantly for the different technologies, and this was largely due to the manufacturing process and the type of fuel used. In many cases, the literature gave data on embodied energy rather than embodied carbon, and the latter depends on the fuel used in manufacturing. In order to compare embodied carbon and energy, assumptions need to be made about the fuel used.

127. In summary, the review found that the carbon payback periods (ie the time taken for the emissions saved to balance the embodied carbon) for energy efficiency measures and renewable energy technologies are generally low in comparison to the carbon saved over the life expectancy of the technology. For example, insulation to achieve advance practice energy efficiency standards has a payback of around 2.5 years; PV thin film and PV crystalline have a pay back between one and four years for the former and two to ten years for the latter; and micro-wind generation techology has a payback of 13-20 months.

128. In the future, the literature suggests that there will be product performance and efficiency improvements that would lead to lower embodied carbon in renewable technologies. Estimates suggest that PV systems might have an improved payback period of up to 50 per cent.

129. An indirect environmental cost may arise from the impact of growing and transporting the biomass to developments which require it for energy supply. As set out in the Government's Biomass Strategy[17], we are already seeking to deliver an expansion of biomass production. There is significant potential to expand the UK supply of biomass without any detrimental effect on food supplies and to do so in a sustainable manner. Imports will also have a role to play in meeting the demand for biomass and the Biomass Strategy sets out the steps we are taking to ensure sustainable practices are at the heart of our policies.

[17] UK Biomass Strategy May 2007: http://www.defra.gov.uk/environment/climatechange/uk/energy/renewablefuel/pdf/ukbiomassstrategy-0507.pdf

Social

130. As there are unlikely to be any net costs to households, the distributional impacts have not been assessed.

Small firms' impact test (SFIT)

131. Small firms (building fewer than 50 homes per year) represent approximately 14-16 per cent of housing units built each year.

132. Learning rates to adapt to the new regulatory changes may vary by size of firm. Larger firms are more likely to be able to invest in developing the most cost effective solutions at first, with smaller firms learning from their example over time. However, the National Centre for Excellence in Housing will be leading a national research programme to look at the technologies and solutions to deliver zero carbon homes by 2016. The Centre will be disseminating the research with the aim of supporting large and small firms alike to learn about and adapt to the future changes to Building Regulations.

133. The range of technologies available to achieve the higher energy efficiency standards and zero carbon will depend on the characteristics of the development site including:

- number of dwellings;
- size and density of development;
- type of dwellings (houses, terraces, flats);
- mix of domestic and non-domestic properties; and
- location specifics (orientation, wind speed, ground conditions etc).

134. Given the technologies likely to be used to achieve the 2016 standards, it is expected that it may be easier for some development types to comply with the regulations than others. The ability to achieve zero carbon standards is more associated with the size and type of the development than the size of the firm.

135. Small firms may benefit where energy service companies take on the responsibility for supplying renewable energy irrespective of the size of development. However, small firms may be less able to establish effective relationships with energy providers than large volume builders, who may be more used to this way of working.

Competition assessment

136. The recent OFT guidance on competition effects was followed for the competition assessment. We examined the impact of the proposed regulations on the market for housing construction and for construction products, including emerging technologies for renewable energy generation. The competition assessment identified that the regulatory timetable to zero carbon in 2016 will have some impact on competition in the construction industry. However, the proposals are not likely to limit the ability of firms to compete and it will create new opportunities for product differentiation and for new products in the construction products market and should encourage competition. The possible impacts are discussed in more detail below.

Market for housing construction

137. In 2006, there were 24,500 housebuilding firms, of which 22,900 had 13 employees or less. The top ten housebuilders had a share of 42 per cent of the total value of new homes and 52 per cent of the total number of orders. There is evidence that some volume housebuilders may have market power over the supply of new housing at a regional or local level.

138. Current barriers to entry into the house building market include:

- the need for developers to understand the development and planning control framework, including Building Regulations;
- vertical integration in house building, through ownership of land banks by developers, which raises barriers to entry or expansion by limiting, or foreclosing altogether, access to land to a non-integrated firm. Land banks and construction need to be financed up front and only relatively large house builders are likely to able to bear the associated risks;
- the need to develop good relationships and reputation with local authorities, land owners and local building contractors; and
- market risk associated with volatile house prices and changes in local market conditions.

Limits to the number or range of suppliers

139. As the Building Regulations will affect all developers, it is not expected that the proposed tightening of regulations will directly affect the number of developers. It is possible that the additional cost of construction may add to up-front financing requirements and risk, which could favour larger builders and encourage further concentration of the market. However, this would depend on the extent to which developers have to bear the burden of capital investment in low and zero carbon energy generation, or whether it can be undertaken by energy service companies. By making the commitment to changes in the Building Regulations well in advance this should also reduce uncertainty around developers' investment decisions over time.

140. New firms entering the market will be required to understand and comply with the tighter Building Regulations. This will have a minor effect on the cost of entering the market but is expected to be small in comparison with the existing barriers to entry. In the short-term, uncertainties around the more cost-effective technical solutions may act as a barrier. Larger firms are more likely to be able to invest in developing these techniques at first, with smaller firms learning from their example over time.

Limits to the ability of suppliers to compete

141. The proposed policy will impose a minimum standard of carbon standard for all new dwellings. However, there is nothing to stop developers from proposing to build homes to higher environmental standards to differentiate themselves, such as through the existing Code for Sustainable Homes voluntary assessment scheme and Energy Performance Certificates. A survey for the Energy Saving Trust[18] found that almost half (44%) of respondents were willing to pay an additional £5,000 – £10,000 for a home built to high environmental standards. An Ipsos Mori poll[19] showed that 73% said that energy efficient or water saving features would be fairly or very important in choosing their next home; 92% of respondents want to see sustainability features offered as options on new homes and over half (52%) are prepared to pay more. Although survey results on 'willingness to pay' can paint a more positive picture than when it comes to real circumstances, these findings indicate a recognition that higher environmental standards are worth paying for.

142. However, there is little evidence to date that developers have attempted to differentiate their products on the basis of energy efficiency alone. House prices are determined largely by the existing stock, rather than new homes, meaning that developers have limited ability to achieve gains through a price premium with modern construction and design features.

143. Building standards will be performance based which will allow developers to use the most cost efficient means to achieve the higher energy and zero carbon standard for each development. As there are a range of potential technical solutions to meet the requirements, it is still possible that developers could compete on the design or type of energy supply offered, which can vary in ongoing costs or benefits to consumers, depending on the fuel type and maintenance requirements.

144. Firms will also continue to be able to differentiate their products on the basis of a wider set of sustainability criteria. The Code for Sustainable Homes provides a standard assessment of sustainability on which firms will be able to compete if desired over and above the minimum standards set by Building Regulations.

Suppliers' incentives to compete vigorously

145. The proposed regulations are not expected to have an effect on firms' incentives to compete. In fact, higher standards of building regulations should provide opportunities to innovate and may increase the level of competition between existing firms, particularly in minimising costs in order to compete effectively for land, over which developers currently compete vigorously and is core to the success of firms in the sector.

Limits to the number or range of suppliers

146. The future higher carbon standards in Building Regulations are likely to stimulate demand for innovative construction products which will reduce carbon emissions from new homes. This may include building fabric products, such as wall insulation

[18] Energy Saving Trust, Press release March 2006: www.energysavingtrust.org.uk/aboutest/news/pressreleases/index.cfm?mode=view&press_id=503

[19] *Sponge: Eco chic or Eco geek? The Desirability of New Homes* March 2007. www.spongenet.org/library/Eco%20Chic%20Or%20Eco%20Geek%20Exec%20Summ.pdf

or high performance glazing, but also newer technologies such as micro-generation or combined heat and power units.

147. As these are developing technologies the market is currently characterised by small firms with limited production capacity. The regulations will provide certainty over future demand for more products that reduce the CO_2 impact of energy use in the home (ie both energy efficient and energy production which is zero carbon). It is likely that markets for these technologies that are not primarily driven by global demand will concentrate as they mature and as technical solutions to meeting the standard become dominant.

148. Indeed, imports account for a growing proportion of UK construction products sales, partly a reflection of the wider process of global trade and technology and information-sharing. Import penetration is particularly high for the type of products that would be required to meet the regulations. Specific shortages that may occur initially should be short-term until the market can adjust to meet demand.

Limits to the ability and incentives of suppliers to compete

149. The revised regulations, by increasing certainty of demand in the future should help attract greater competition and therefore innovation into the market for renewable technologies, in so far as domestic demand can influence the markets.

150. It is possible that the range of suppliers may become limited over time, if the market tends towards one or two dominant technical solutions for achieving compliance. This is less likely for technologies that are become increasingly demanded internationally, as a variety of suppliers will be able to operate in and across a wider market.

151. By increasing the market size for these products, and therefore the gains from entering the market, it is anticipated that there will be greater competition between firms.

Enforcement, sanctions and monitoring

Enforcement and sanctions

152. Local authority building control departments will enforce the proposals through the existing mechanisms and sanctions provided through the Building Act. Failure to comply with the Building Regulations is a criminal offence. Local authorities also have powers to require the removal or alteration of work that does not comply with the Building Regulations.

153. The local authority's enforcement powers are suspended in a case where building control is being carried out by an approved inspector. However, if a person carrying out building work fails to comply with instructions from an approved inspector to rectify non-compliant work, the approved inspector must cancel the Initial Notice which brought the project under his supervision. Building control then reverts to the local authority where the enforcement powers lie.

Monitoring and review

154. As part of the approach to consultation on the future changes to Part L in 2010 and 2013, the Government will be surveying implementation of the 2006 amendments. A similar approach will be adopted in the run up to 2016. The aim of these surveys is to determine how the regulatory provisions are working, whether the projected CO_2 savings are being achieved, and to tailor new amendments accordingly.

Implementation and delivery plan

155. The *Forward Look* published alongside the *Building a Greener Future* policy statement illustrates the changes to construction designs that might be needed to reach the 25 per cent and 44 per cent improvements in carbon standards in 2010 and 2013 respectively. The Government will consult on the proposed detailed changes to the Building Regulations before the 2010, 2013 and 2016 changes. In advance of the first change in 2010, we will continue to engage with industry to ensure the first amendment in the series contains no surprises and is practically achievable in the market by that date.

156. The 2016 Taskforce is also looking at the measures needed across a broad range of areas, including skills and technology development, to implement the zero carbon 2016 target.

Post-implementation review

157. Consultations on the future changes to Part L in 2010 and 2013 will include surveying implementation of the 2006 amendments. A similar approach will be adopted in the run up to 2016. The aim of these surveys is to determine how the regulatory provisions are working, whether the projected CO_2 savings are being achieved, and to tailor the new amendments accordingly.

Summary and recommendation

Option	**Total cost Economic, environmental, social**	**Total benefit Economic, environmental, social**	**£/MtCO_2**
1 – Do nothing	–	–	–
2 – A 25 per cent improvement to Part L 2006 in 2010 and zero carbon standards by 2016	£32,935m	£21,148m	£110/MtCO2
3 – A 25 per cent improvement to Part L 2006 in 2010, a 44 per cent improvement in 2013 and zero carbon standards by 2016	£7,575m m to £34,324m based on scenarios modelled	£5,883 to £22,047m based on scenarios modelled	£22-110/MtCO2

158. The results of this Regulatory Impact Assessment shows that there will be an overall net cost to the economy under the scenarios modelled. The cost benefit equation depends on decisions on the mix of policy interventions and in particular on the degree to which offsetting is allowed within the definition of zero carbon.

159. Our analysis suggests that it is possible to achieve zero carbon homes at a cost which would add as little as 1 per cent to the construction costs of new homes. This is based on a policy approach which allows unlimited offsetting. This is not our current definition of zero carbon as it would reduce incentives to achieve the highest level of energy efficiency first. A policy scenario based on a mix of driving up energy efficiency standards, with offsetting, would add 6 per cent to construction costs. The modelling suggests that the highest cost scenario could increase construction costs by around 19 per cent. But the extent to which this cost would be borne by the housebuilder or whether they would seek to pass it back to the landowner is uncertain.

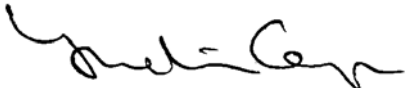
160. As new evidence emerges about costs and practicalities, and as technologies develop, we will develop the definition of zero carbon for the purposes of Building Regulations, after full consultation and within a sensible time-frame that will allow the industry to adjust before the planned changes in 2016. In that context, we will examine whether, and to what extent, there is a case for offsetting as a mechanism to meet the zero carbon standard.

161. The differences in costs and benefits between Options 2 and 3 are marginal. Option 2 omits one of the milestones in the timetable for achieving zero carbon homes. Given that there is no significant net benefit to be gained from omitting that milestone, it would seem better to retain it to ensure that there is a steady progression to achieving the 2016 target, rather than the huge leap in performance which would be needed if industry was required to move from a 25 per cent improvement to a 100 per cent improvement in one stage.

162. The evidence of this assessment suggests that an approach based on Option 3 is achievable at an acceptable cost, when all the variables and the opportunity to adjust policy in the light of experiences are taken into account. In this respect, further regulatory impact assessments will be undertaken for each of the changes to the Building Regulations as they are made in 2010, 2013 and 2016, to confirm the direction of policy and detail of implementation.

Declaration and publication

I have read the Regulatory Impact Assessment and I am satisfied that the benefits justify the costs

Signed 

Yvette Cooper MP