THE HOUSING FORUM
Working with NHBC

Sustainable Refurbishment of the Existing Housing Stock

Interim Working Group Report - April 2009

Executive Summary

Acting Now on Existing Stock

In November 2008 the UK Government passed into law a Bill committing the nation as a whole to achieving an 80% reduction in carbon emissions by 2050 against 1990 levels. The Climate Change Act sets out a structure of 5 yearly carbon budgets to deliver this long-term target. These budgets will be recommended and monitored by the newly formed "Committee on Climate Change" (reference recent consultation).

As carbon emissions arising from energy use in existing housing represent nearly 27% of the UK's total emissions, this legislation will have huge relevance for housing stockholders. There was also an important late amendment to the Bill which could have an impact on the housing sector. The Bill now includes emissions from aviation and shipping. This may in itself seem innocuous however there is an admission from Government that achieving emissions reductions from these two sectors will be a challenge, and the strategy will not necessarily be to achieve an equal reduction from all sectors. Some sectors, such as housing, will need to deliver more than others to make up for the sectors that are deemed to be challenging.

The significant increase in the cost of energy in recent times is leading to a consequent increase in the occurrence of fuel poverty within households and is a growing concern within our society. We need to act now to ensure that our homes are both energy efficient from the perspective of the householder, but also that this efficiency spreads into a significant reduction in our carbon emissions.

The Housing Forum in 2008 commissioned a Working Group to look at how we could achieve "Sustainable Improvement of the Existing Housing Stock". The Report was well received and The Forum decided to build upon this work with an investigation into how the existing housing stock could be improved with specific regards to the carbon agenda.

As part of this Working Group The Housing Forum in collaboration with Wates Living Space and HTA Architects sponsored a Round Table Discussion Forum with the Smith Institute, the details of which were recently published in "Building Magazine"[1] . This formed an extremely solid basis for this report.

1 http://www.building.co.uk/sustain_story.asp?sectioncode=331&storycode=3129619&c=3

This paper recognises that whilst significant work is required to the fabric of our existing housing stock, the occupancy levels and our lifestyles also significantly impact upon our carbon usage and henceforth this is also an area that needs to be addressed.

The report sets out how the housing industry and suppliers of social housing can best deliver against the Government's targets. We have broken the report into three sections and it has been compiled by a team of consultants from all disciplines, Contractors, Suppliers and Housing Management professionals.
*The first section of the report looks at the **"where are we now"** scenario and suggests how best to identify the potential for energy reduction from existing housing, starting with the biggest single user of energy in buildings - people.*

*The second section of our report looks at **"what do we need to do?",** focusing on the technologies from insulation to solar panels and how these measures can be applied to the plethora of different house types based on age and orientation to deliver the required carbon reductions. It provides indications of the likely reductions possible dependent upon the energy reduction measures employed.*

*The third and final section deals with the issue of **"how do we pay for it?"** and proposes new financial models we believe will be required to ensure these works happen.*

Key Findings

- It is possible to achieve carbon reductions of 50-60% in the existing housing stock by adopting simple, tried and tested interventions which are cost effective. These improvements represent bringing existing stock up to an Energy Performance Certificate (EPC) rating of C/D (the full rating range runs from A – G). The works covered under the Decent Homes programme such as insulation to walls and roofs, new doors and windows together with condensing boilers and heating control systems have in the main achieved similar levels of reduction for a portion of the social housing stock.

- Further carbon savings can be achieved beyond that realised within the Decent Homes programme but represent more disruptive and considerably more expensive measures and need consideration to the wider usage of renewable heat and power sources.

- In conjunction with fabric improvement to our existing stock we should also instigate an education programme to influence occupant behaviour and lifestyles. Significant reductions in our carbon emissions could be achieved if people were more aware of the impact that their actions cause.

- Funding solutions do exist for improvements to achieve a Energy Performance Certificate (EPC) rating of C/D however accessibility is poor and more effort needs to be made to increase the spread and visibility of available funding programmes to all sectors of the housing market.

- Within the social housing sector the inability to independently increase rents, or to have an effective alternative financial vehicle to share the benefits of occupants utility cost savings with those that have to invest in the energy saving capital improvement works is a barrier to investment in improving the existing stock.

- Within the private sector market, any linkage between building fabric performance and local taxation is likely to act as a key incentive for owner occupiers to improve the existing stock. However, care needs to be taken to ensure that within the private rented sector the penalty of taxation is not passed onto the tenant through the inaction of the landlord.

- Over £20bn is spent annually within the UK on repair and maintenance of our existing housing stock. Such an amount could provide the necessary capital investment to achieve the carbon targets that the Government has set. We therefore need to consider more widely the “Carbon £” and Whole Life Cost issue of the maintenance work that we carry out as recommended in last year’s Housing Forum Report.

- Whilst this report has very much focussed upon the energy usage within existing dwellings, improvements to water usage and efficiency must also be tackled. A whole house improvement programme should be encouraged.

- A number of one-off Housing Forum Demonstration Projects (e.g. the BRE Stable Block project at Watford) are useful in aiding our knowledge and practical experience of “what can be achieved”, clearly larger scale roll out is needed in all areas of the country to make the public aware of what needs to be done within their own homes.

Recommendations

Where Are We Now?

- In tandem with a fabric improvement programme, investment is needed within an education programme for home occupiers in respect of energy use and lifestyle. As education should be knowledge based, smart meters with a real time internal display will prove invaluable. The regulators for gas, electricity (and water) should work together to mandate smart metering across all households with a universal protocol for internal real time displays to occupants.

- Occupancy issues of homes need to be careful considered, and we would recommend that further debate is needed on how the nation's public housing stock is allocated and what improvements are carried out to achieve a balance between optimum occupancy demands and energy usage.

What Do We Need to Do?

- In order to incentivise and prioritise investment in reducing the carbon emissions from existing stock the Government must set long term targets. Our findings demonstrate that by cost effective improvements we can achieve an Energy Performance Certificate rating of C/D within our housing stock which currently 60% of the stock is failing to achieve.

- The opportunity for policy intervention would be to encourage steps to be taken at the time of sale, lease or alteration. Policy should focus on maximising the potential afforded by these windows of opportunity. The likely benefits of this could be a 50% CO2 reduction in existing stock bringing it up to at least a D rating over time. Consideration would have to be given to heritage and listed buildings. The policy should be set with a long lead-in time to allow adaptations to be made as part of existing investment plans and avoid forcing landlords to undertake ad-hoc works determined by voids. A long time scale would also allow incentive lead policies to be pursued in favour of absolute imposed regulation.

- The Housing Forum last year made calls for a "Code for Sustainable Homes – Refurbishment" to be set up. We further recommend this again as the correct approach to the measurement and target setting for the considerable improvement that is needed. Only by clear target setting and defined measurement can for the target of 80% reduction be achieved.

How Do We Pay For It?

- In order to further incentivise building fabric improvements and the behaviour of occupants a link should be established between the real consumption data through Display Energy Certificates and building performance (through EPCs) with taxation such as council tax in a similar manner to the carbon index on vehicle excise duty. A 'C' rating should be the benchmark for tax neutrality. The revision should be at least revenue neutral to local authorities to protect their income. Within the rented sector care would have to be taken not to penalise the occupants for the lack of energy conservation by the landlord. In this case the landlord should receive the benefit or penalty of such a policy and not the tenant. The taxation benefit for an improved EPC rating would then be some incentive for investment by the landlord.

- In the social housing sector, the landlord's capital investment saves the residents utility costs but they have no formal facility to increase rental values to correspond with this utility cost reduction and thereby recover capital expenditure. (Within the private sector the opportunity exists to gain market advantage or increase rents from improved building performance). A mechanism should be introduced to allow social housing providers to recover capital expenditure through the utility bill benefits of the occupier which could jointly address carbon reduction and fuel poverty issues.

- The measurement via Key Performance Indicators (KPIs) of empty property turnaround times has highlighted and ensured public bodies maximise the occupancy of their housing stock. However this is preventing the opportunity for the house to be substantially 'upgraded' prior to being offered back to future residents. An exception should be made for those public bodies who take advantage and provide significant energy upgrade work as part of the turnaround work. A whole house approach should be encouraged.

Recommendations

- The Housing Forum calls upon the Government to commit to a new initiative beyond Decent Homes of energy upgrade works. Such a large scale initiative will provide the certainty needed for micro generation companies to commence manufacture of significant numbers of renewable systems which would drive down the currently prohibitive unit costs and pay-back times.

- Last year's Housing Forum Report suggested the use of a "Carbon £ound" in relation to lifecycle cost for repair and maintenance work. Evidence suggests that future savings by increasing capital costs now should be reinvested on further energy upgrade work, which in-turn will produce energy savings in future years.

- The capital cost of energy upgrade work to multi-occupancy buildings which include leaseholders should be allowable and recoverable through the service charge provisions of leases.

- At a time when the Government is both trying to reduce carbon emissions and stimulate the economic recovery of many British industries, not least the construction industry. A more targeted focus of VAT reduction being applied to the home improvement market should be considered. We recommend that all low energy products, and, refurbishment to achieve reduced carbon emissions, be zero rated for VAT purposes. This would give considerable incentive to the private individual. A time limit of 5 years should be set on this incentive to accelerate the speed of undertaking improvement works and provide a stimulus to the current economic situation.

- Local Energy Partnership Organisations should be set up to co-ordinate and ensure that high level energy planning provision is in place. Individual households with their own 'zero carbon' approach will not be sustainable and henceforth we need an area-wide group of stakeholders to ensure that the connectivity and optimum utilisation of new energy schemes are adopted.

- In an age of financial turmoil we should not only reassess our home ownership policies but recommend that the financial institutions re-appraise the 'mortgage products' that they provide which would allow greater transferability of the 'cost' of energy upgrade work rather than it being reflected in the 'value' of the property which would be ever increasing. Such a move would encourage the transferability of the cost of upgrade with the associated benefit of lower energy bills.

Section 1 – Where are we now?

The 2008 Climate Change Act requires the UK to reduce its carbon emissions by 80% by 2050 against a 1990 baseline. Table 1 from the Department of Communities and Local Government shows the contribution the residential sector will be expected to make in achieving this reduction. The average household in the UK produces over ten tons of carbon dioxide per year from energy use in the home, consumption of food and products and transport. Under the new target this will need to be 8 tons by 2020 and 2 tons by 2050.

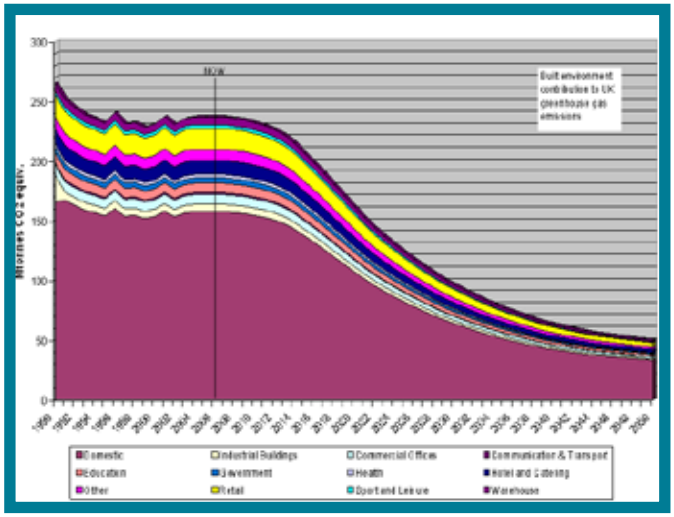


Table 1

Although the reduction of carbon emissions in the existing housing stock will entail a huge programme of physical renovation of its building fabric, this will not be enough on its own. The profile of the occupants of a particular dwelling and their behaviour has a critical impact on the levels of carbon emissions from their homes. As the modelling in section 2 indicates, improvements to the building fabric become uneconomical at a certain point, after which it becomes sensible to concentrate on behavioural change and management of occupancy.

Previous work by The Housing Forum on asset management indicated it was essential for stock holders to have a firm grasp of their stock at the beginning of any refurbishment process. Similarly it is necessary for stock holders to adequately account for the impact of the specific occupancy of this stock if they are to go beyond the reductions in carbon emissions which are available from economically viable improvements to the properties.

There are a number of tools available for measuring energy use in buildings such as SAP, however these largely generalise the energy use from occupants. There are major differences in how identical built forms function in use dependent upon the lifestyle of the occupant. Table 2 gives indicates how these variables could be modelled.

If we are to effectively drive improvement in the energy efficiency of our stock then we must consider the intended occupancy levels and lifestyles of the occupants if we are to achieve optimum solutions.

Such a modelling tool would allow us to obtain a greater understanding of what actually needs to be done to the existing stock to achieve reductions in a cost effective way.

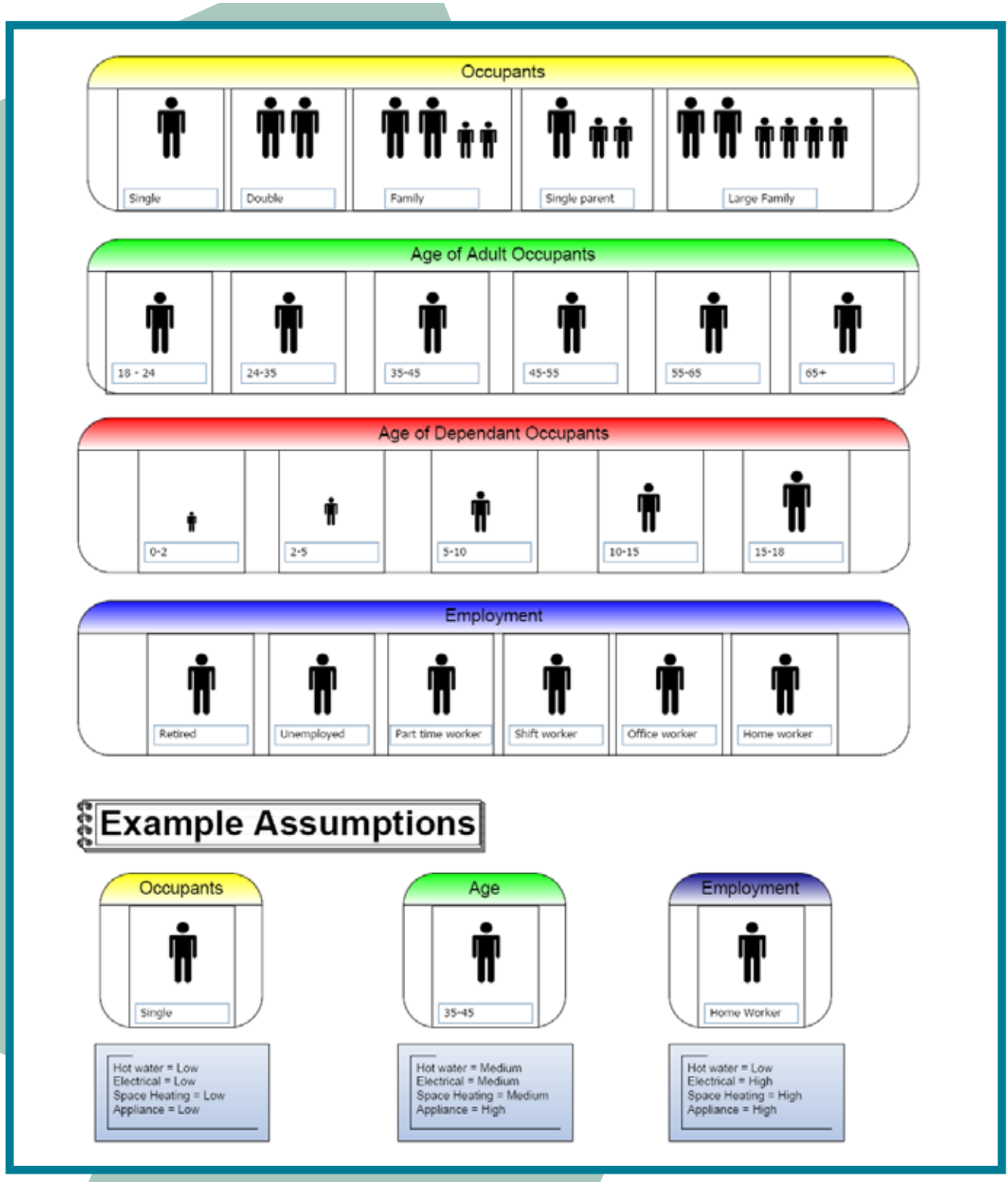


Table 2 - Example of Potential Modelling Tool

Section 1 – Where are we now?

This tool may also assist managers of social housing by enabling them to match people's "energy profiles" to upgrade solutions that will best suit their needs (i.e. a family of five who use a lot of hot water are provided with solar thermal or a heavy heat user or elderly person is provided with a very well insulated property). A tool which modelled the likely 'in use' profile of various types of occupants would be useful in targeting effective refurbishment as well as education.

Taking the example of a solid wall, double glazed Victorian end terraced property, heated by a gas boiler, with two occupants who both work full time. Using the Oxford Environmental Change Institute's website www.imeasure.org. the following data was noted.

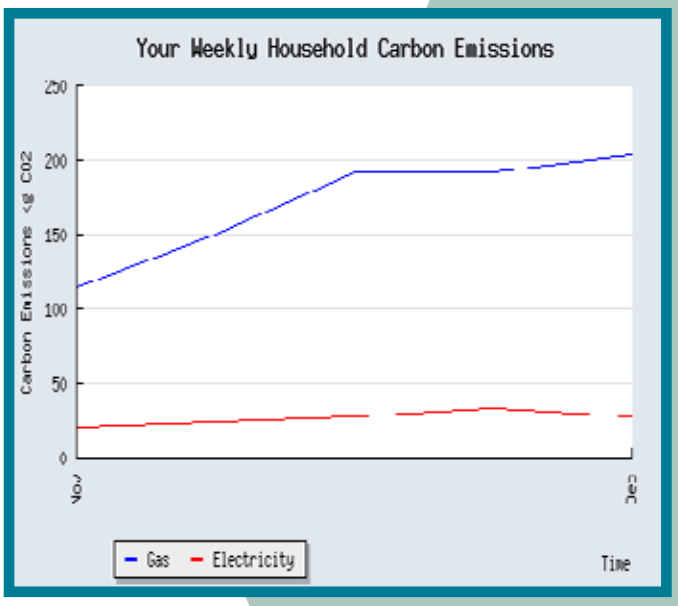


Table 3

The above graph illustrates an expected rise in emissions from heating coinciding with a temperature drop through December.

However if this data is compared with the average data from the website there is a noticeable difference when compared with other properties of the same age, aspect and occupancy.

Results for the period 9 November 2008 – 14 December 2008

Carbon emissions KG CO2	This House	Average
Per Person	114	53
Per Household	228	106

Gas Use as kWh	This House	Average
Per Person	482	187
Per Household	964	369

Electricity use as kWh	This House	Average
Per Person	28	32
Per Household	57	64

As illustrated the carbon emissions from gas, which is used for heating and hot water in this house, compared with the average data collected on this website are double, whilst the electricity use is below the national average. The occupiers of this property have a real time energy display for their electricity meter which gives actual consumption in real time which may explain this. However they do not have the same information for gas usage and in this instance you would suggest that investment in insulation and a more efficient boiler would improve the situation however it may only bring them in line with the average and would not give any greater reduction.

The following graph enforces these findings, several identical properties were modelled using NHER's energy assessor, based on variables of occupant and location.

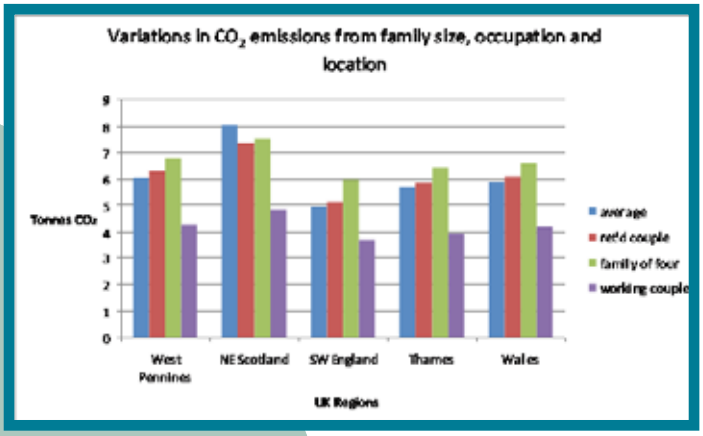


Table 4

In addition variations in aspect in the same location also illustrate great variations in predicted energy use.

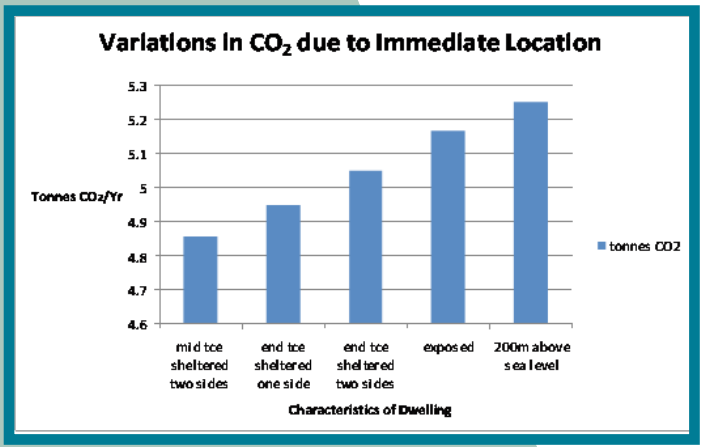


Table 5

The models generated in NHER use standard assumptions for modelling energy and as the previous study using actual meter readings shows there can be huge variations from occupier to occupier.

Our study has led us to the conclusion that a new model for measuring energy use in buildings starting with the occupant and their behaviour is required, if we are to best understand how technologies can be applied to reduce individual carbon emissions. For example installing solar water heating on a property occupied by someone who uses little hot water is going to have a negligible impact on their carbon emissions.

Our recommendations would therefore be:-

- In tandem with a fabric improvement programme, investment is needed within an education programme for home occupiers in respect of energy use and lifestyle. As education should be knowledge based, smart meters with a real time internal display will prove invaluable. The regulators for gas, electricity (and water) should work together to mandate smart metering across all households with a universal protocol for internal real time displays to occupants.

- Occupancy issues of homes need to be careful considered, and we would recommend that further debate is needed on how the nation's public housing stock is allocated and what improvements are carried out to achieve a balance between optimum occupancy demands and energy usage.

Section 2 - What needs to be done?

Introduction

As set out in the Executive Summary the Government is committed to a 80% reduction in the carbon emissions. Is this achievable within the context of the Domestic Dwelling?

Building a Greener Future has set a target for all new built dwellings to be Zero Carbon by 2016. The Housing Forum set out in their 2007 report a need for the introduction of a Code for Sustainable Refurbishment. The current Working Group has further emphasised the need for such a measurement structure.

To achieve an 80% reduction there must be a measurement tool and set of targets to achieve. The Climate Change Act 2008 starts to set out the targets however we would contend that these need to be related to the practical steps that can be understood by housing associations, local authorities and residential stock owners, as well as private individuals. The establishment of a "Code for Sustainable Refurbishment" could be the tool that allows a simpler understanding of what can be achieved via various methods. By the establishment of a measurement tool, together with a set of 5 year targets, a process of change can be instigated in conjunction with the occupant education that has been recommended within section 1.

Clearly to achieve an 80% reduction in carbon emissions from our existing housing stock will not be without both considerable cost and disruption to the occupant. A broad estimate of the cost to upgrade has been suggested to be in the order of £5bn/annum for the next 40 years. The findings in this report suggest that the upgrade cost per dwelling could range between £12,000 to £35,000. At an average upgrade cost of £20,000/ dwelling the total cost is likely to be £500bn or closer to £15bn/annum. Clearly this level of spend would have a significant positive impact upon the Construction Industry over the coming years and would far exceed the spend on the Decent Homes Initiative which has seen considerable employment and local regeneration in the parts of the country where the works have been carried out.

The instigation of this programme of improvements to achieve 80% should be lead by the Public Sector. At a time when central Government are looking to stimulate the economy with substantial investment then a prompt commencement of such an initiative would prove to be extremely beneficial. The benefits, not only to the Construction Industry, would also impact the manufacturing and new micro generation industries. Indeed this level of capital spend and demand will ensure that the base cost of these products is reduced which in turn will significantly impact upon the "pay back" time on these items. This would provide greater incentive to the private householder to invest and in the longer term enjoy significant savings in fuel costs.

By way of simple demonstration therefore of what can be achieved we have undertaken a NHER analysis and SAP calculation using a range of measures on a range of house types with the aim of providing Housing Associations and those interested in refurbishment with some real data and recommendations to help guide decision making. The house types modelled are typical of the general make-up of stock in the United Kingdom i.e.

- Period Terrace
- Tenement / Low Rise Block
- High Rise Block
- 1950's Semi Detached

Methodology & Approach

Assuming the above properties had not received any significant refurbishment works particularly of a thermal nature, a series of efficiency packages were cumulatively added to assess the theoretical improvements in SAP, Energy Performance Certificate Rating, CO2 Emissions and Fuel Costs. Improvements were made in 4 packages which were:-

Low Cost and / or Non Disruptive measures i.e.

- Low Energy Light-bulbs
- Hot Water Tank Insulation
- Heating Controls i.e. TRV's, Programmers and Thermostats

Medium Cost and/or Moderately Disruptive measures i.e.

- New Gas Condensing Boilers
- Loft Insulation
- Cavity Wall Insulation

High Cost and/or Significantly Disruptive measures i.e.

- External Wall Insulation
- Internal Wall Insulation
- Floor Insulation
- Double Glazing

Low Carbon Technology and Renewable Energy Technology i.e.

- Communal Biomass Systems
- Photovoltaic Panels
- Solar Thermal Evacuated Tube

Section 2 - What needs to be done?

High Rise Mid Floor Flat
Floor Area=80m^2

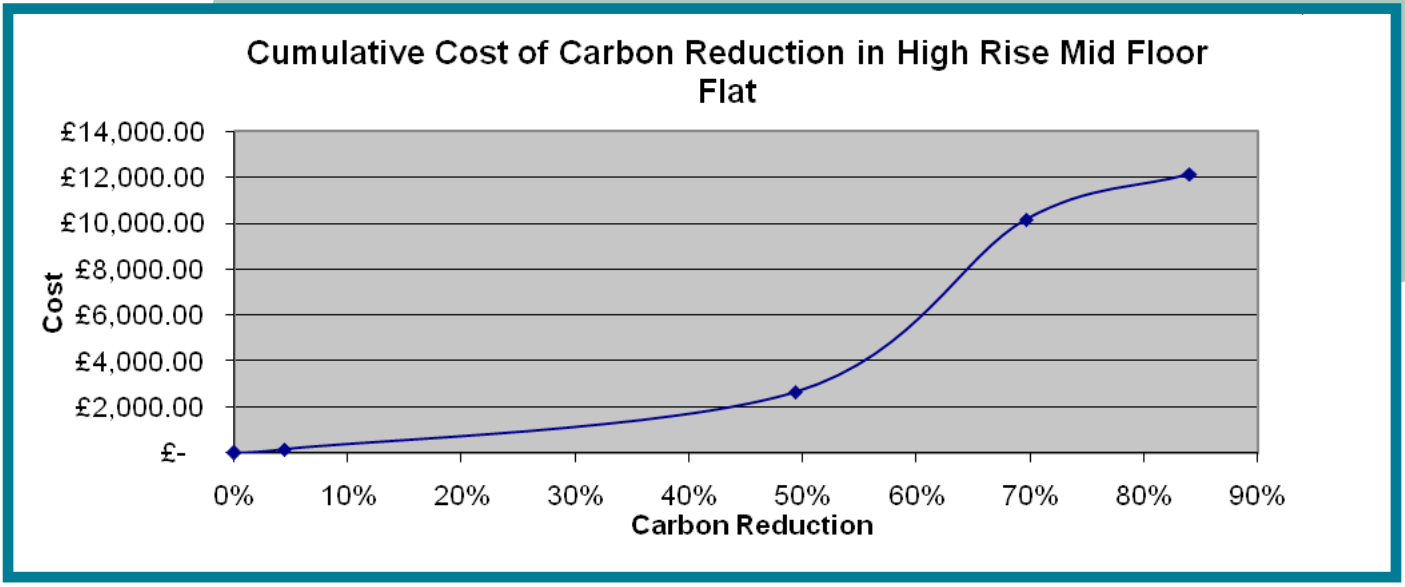
Base Case	
CO2 Emissions	5397kg per annum
SAP Rating	48
Annual Fuel Costs	£1053
Energy Performance Certificate (EPC) Rating	E

Low Cost/Non Disruptive Improvements - Results	
CO2 Emissions	5161kg/y
CO2 Saved%	4%
SAP	52
Fuel Costs	£1001
Fuel Saving	£52
EPC Band	E
Cost of Improvement	£150

Medium Cost/Moderately Disruptive Improvements - Results	
CO2 Emissions	2732kg/y
CO2 Saved%	49%
SAP	68
Fuel Costs	£824
Fuel Saving	£229
EPC Band	D
Cost of Improvement	£2500

High Cost/Highly Disruptive Improvements - Results	
CO2 Emissions	1637kg/y
CO2 Saved%	70%
SAP	80
Fuel Costs	£694
Fuel Saving	£359
EPC Band	C
Cost of Improvement	£7500

Low Carbon/Renewable Energy Improvements	
CO2 Emissions	862kg/y
CO2 Saved%	84%
SAP	76
Fuel Costs	£608
Fuel Saving	£445
EPC Band	C
Cost of Improvement	£2000



Period Terrace
Floor Area=90m2

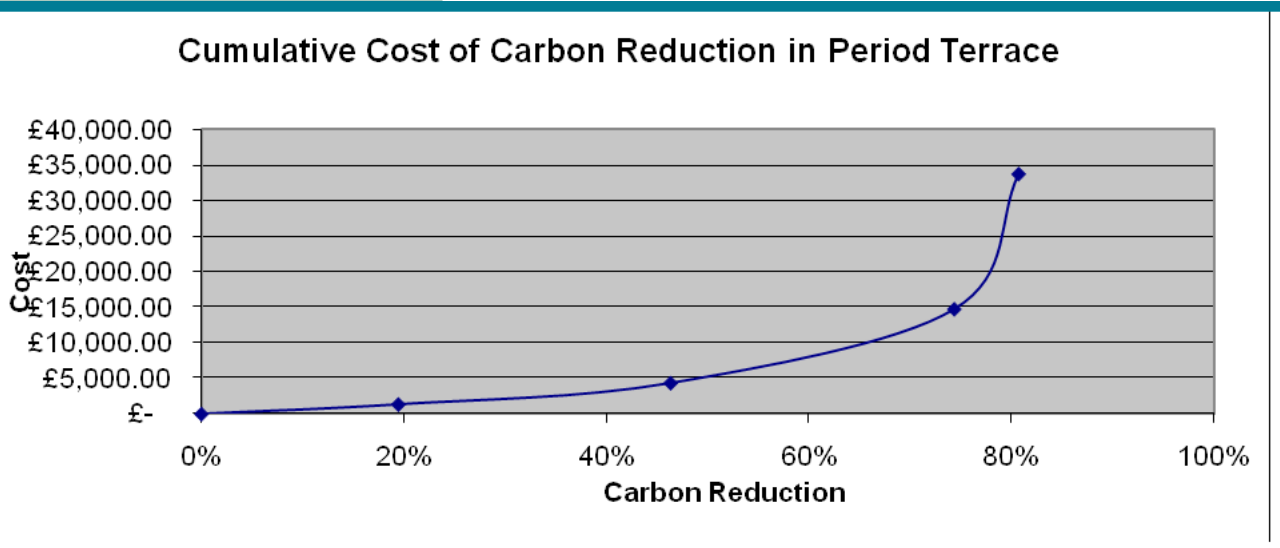
Base Case	
CO2 Emissions	7906kg per annum
SAP Rating	37
Annual Fuel Costs	£1251
Energy Performance Certificate (EPC) Rating	F

Low Cost/Non Disruptive Improvements - Results	
CO2 Emissions	6370kg/y
CO2 Saved%	19%
SAP	48
Fuel Costs	£1116
Fuel Saving	£135
EPC Band	E
Cost of Improvement	£1350

Medium Cost/Moderately Disruptive Improvements - Results	
CO2 Emissions	4246kg/y
CO2 Saved%	46%
SAP	64
Fuel Costs	£884
Fuel Saving	£367
EPC Band	D
Cost of Improvement	£3000

High Cost/Highly Disruptive Improvements - Results	
CO2 Emissions	2033kg/y
CO2 Saved%	74%
SAP	82
Fuel Costs	£628
Fuel Saving	£623
EPC Band	C
Cost of Improvement	£10400

Low Carbon/Renewable Energy Improvements	
CO2 Emissions	1531kg/y
CO2 Saved%	81%
SAP	87
Fuel Costs	£578
Fuel Saving	£673
EPC Band	B
Cost of Improvement	£19000



Section 2 - What needs to be done?

Tenement/Low Rise Top Floor Flat
Floor Area=67m^2

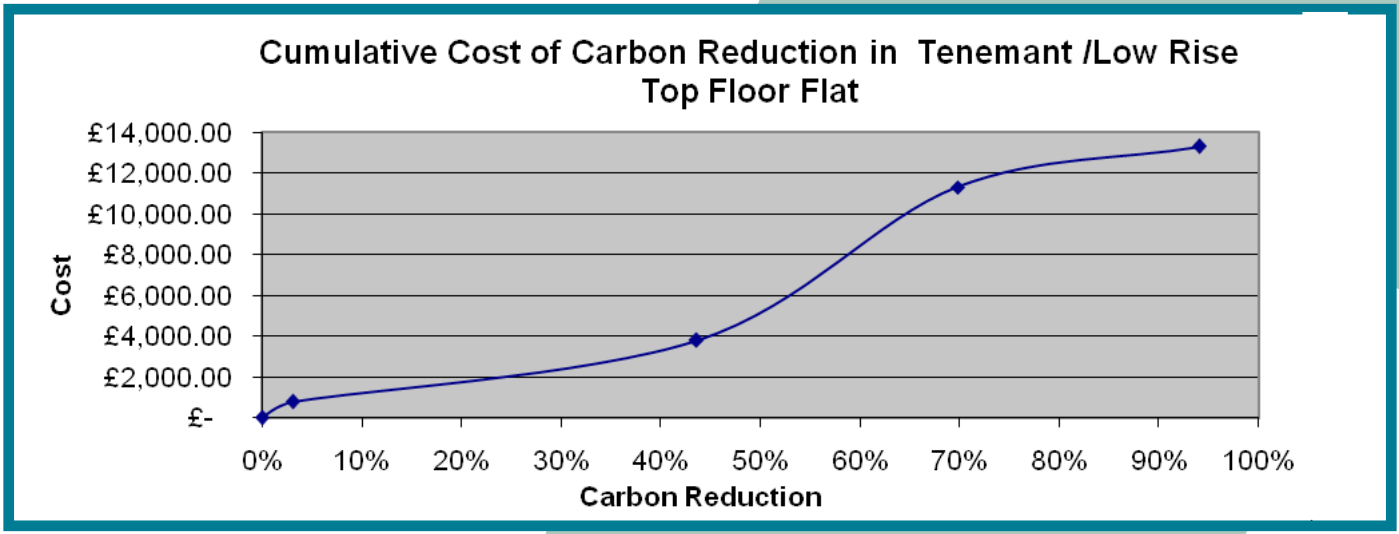
Base Case	
CO2 Emissions	5156kg per annum
SAP Rating	48
Annual Fuel Costs	£980
Energy Performance Certificate (EPC) Rating	E

Low Cost/Non Disruptive Improvements - Results	
CO2 Emissions	4996kg/y
CO2 Saved%	3%
SAP	51
Fuel Costs	£980
Fuel Saving	£30
EPC Band	E
Cost of Improvement	£800

Medium Cost/Moderately Disruptive Improvements - Results	
CO2 Emissions	2908kg/y
CO2 Saved%	44%
SAP	70
Fuel Costs	£710
Fuel Saving	£432
EPC Band	C
Cost of Improvement	£3000

High Cost/Highly Disruptive Improvements - Results	
CO2 Emissions	1558kg/y
CO2 Saved%	70%
SAP	82
Fuel Costs	£548
Fuel Saving	£436
EPC Band	B
Cost of Improvement	£7500

Low Carbon/Renewable Energy Improvements	
CO2 Emissions	306kg/y
CO2 Saved%	94%
SAP	83
Fuel Costs	£548
Fuel Saving	£453
EPC Band	B
Cost of Improvement	£2000



1950's Semi Detatched
Floor Area=100m^2

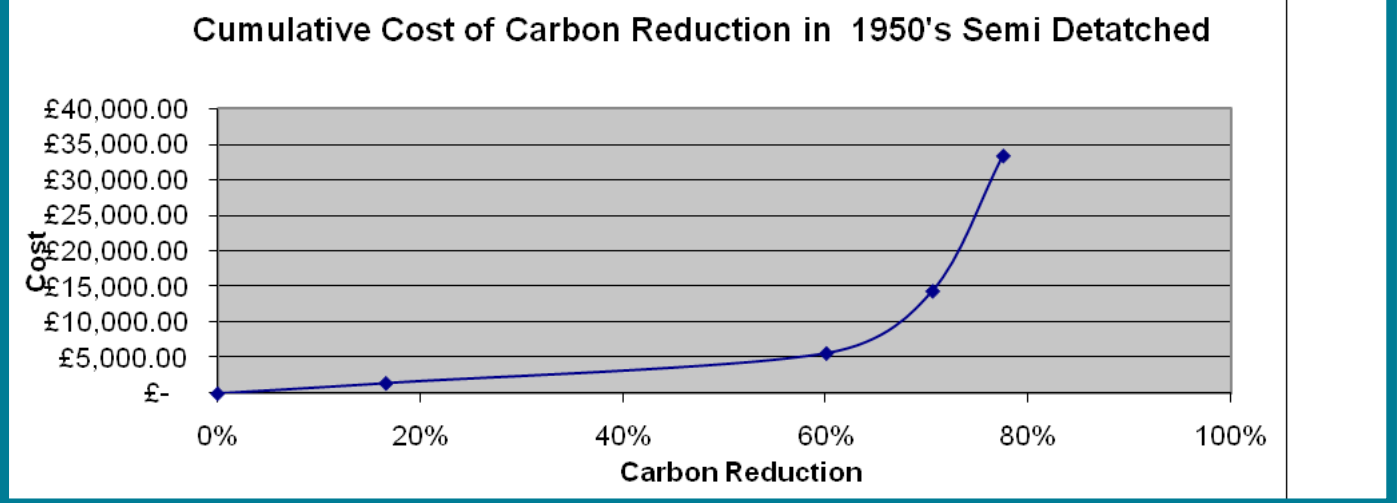
Base Case	
CO2 Emissions	8272kg per annum
SAP Rating	38
Annual Fuel Costs	£1350
Energy Performance Certificate (EPC) Rating	E

Low Cost/Non Disruptive Improvements - Results	
CO2 Emissions	6898kg/y
CO2 Saved%	17%
SAP	48
Fuel Costs	£1235
Fuel Saving	£115
EPC Band	E
Cost of Improvement	£1450

Medium Cost/Moderately Disruptive Improvements - Results	
CO2 Emissions	3304kg/y
CO2 Saved%	60%
SAP	74
Fuel Costs	£829
Fuel Saving	£521
EPC Band	C
Cost of Improvement	£4200

High Cost/Highly Disruptive Improvements - Results	
CO2 Emissions	2437kg/y
CO2 Saved%	71%
SAP	80
Fuel Costs	£729
Fuel Saving	£621
EPC Band	C
Cost of Improvement	£8750

Low Carbon/Renewable Energy Improvements	
CO2 Emissions	1860kg/y
CO2 Saved%	78%
SAP	86
Fuel Costs	£675
Fuel Saving	£675
EPC Band	B
Cost of Improvement	£19000



Section 2 - What needs to be done?

It can be clearly seen that it is possible to upgrade housing to such a level that the 80% reduction is achievable. It should be stressed however that we do believe that scale is required in the first instance to ensure that the necessary components are bulk manufactured to reduce price levels. Furthermore we would recommend the setting up of Local Energy Partnership Organisations with a number of wide ranging stakeholders to ensure that the totality of the regional area was co-ordinated and that housing needs for energy were also integrated with the need for energy improvement schemes to schools, retail and commercial premises. Such organisations would ensure that the widest interest of their own regions were fully considered and also would allow best practise to be circulated.

Difficulties with refurbishment

Tackling carbon reduction in existing stock is challenging not only due to the shear scale of the problem but also due to a number of other complex issues and factors. The challenge of cost is clearly significant but outside the scope of this document but other difficulties include Disruption, Hertitage and Combi Boilers.

Disruption

A major difficulty for social housing providers is the disruptive nature of many of the measures believed to be essential in delivering the carbon challenge for example;

- In Solid Wall Housing internal wall insulation may require the displacement of the tenant and reduces room size.
- External wall insulation can require external wall features e.g. downpipes, guttering fascias to be removed and reinstalled and may affect window profiles.
- Solar technology requires scaffolding to be erected. Solar thermal requires internal plumbing alterations which can be disruptive.
- Community Biomass systems can be disruptive to install. Replacing a community gas boiler may not require tenant removal but replacing a block of flats on electrical storage heaters may result in significant disruption.

Many local authorities and social housing landlords have strict voids policy which means that they cannot leave a property void for a significant amount of time. Waiting for a group of properties to become void to take action is not an option. These turnaround KPIs could be hindering the effective improvement of existing housing stock. Void and vacated properties are an ideal time for energy upgrade work to be carried out but the necessity to do cosmetic improvements and re-house quickly within specified time limits precludes the ability to allow upgrade improvements to take place. Decanting tenants can be hugely disruptive and difficult to manage especially when dealing with tower blocks for the elderly and vulnerable. It is possible to decant tenants from one floor to the next, although during major works such as installing a community heating system or internal wall insulation this may not be suitable or possible. The most cost effective approach for social landlords will be to undertake the energy improvement works as part of a planned programme and not on an ad-hoc basis determined by voids. Policies, therefore, need to be set with a long time frame to allow for effective planning of works

Heritage

Although there is a need for all domestic properties to reduce their carbon emissions, it may be difficult in areas or properties deemed rich in heritage or where maintaining the external features may be a priority. Refurbishment in such situations must be handled sensitively and all alternative efficiency measures (such as internal wall insulation) and energy systems should be explored before specifying any which would modify the building's external façade and features.

Combi Boilers

Over the last 15-20 years, social housing providers as well as private homeowners have been opting for smaller space saving combi boilers. One effective way of reducing carbon is to install solar thermal systems. Many small properties are restricted with regard to installing solar hot water systems as the hot water systems do not accept a hot water feed and have in the recent past had their storage systems removed. This makes reducing carbon emissions more difficult in these properties as either floor space has to be taken up for hot water storage or alternative solutions persued.

Refurbishment, Air Quality & Ventilation

There has been a strong focus in recent years on the effects of greenhouse gasses on the atmosphere, however some harmful gases can also be found inside our homes. In the UK on average people spend 90% of their time indoors and indoor air pollution is not always fully considered. As the environmental impacts of the housing sector are being improved there is not as much free air flow allowing indoor air pollutants to be ventilated and released. Clearly the design of energy upgrade works must allow for the correct ventilation systems and air change requirements. Occupancy behaviour and numbers also impact the air quality of dwellings.

Our recommendations would therefore be:-

- In order to incentivise and prioritise investment in reducing the carbon emissions from existing stock the Government must set long term targets. Our findings demonstrate that by cost effective improvements we can achieve an Energy Performance Certificate rating of C/D within our housing stock which currently 60% of the stock is failing to achieve.

- The opportunity for policy intervention would be to encourage steps to be taken at the time of sale, lease or alteration. Policy should focus on maximising the potential afforded by these windows of opportunity. The likely benefits of this could be a 50% CO2 reduction in existing stock bringing it up to at least a D rating over time. Consideration would have to be given to heritage and listed buildings. The policy should be set with a long lead-in time to allow adaptations to be made as part of existing investment plans and avoid forcing landlords to undertake ad-hoc works determined by voids. A long time scale would also allow incentive lead policies to be pursued in favour of absolute imposed regulation.

- The Housing Forum last year made calls for a “Code for Sustainable Homes – Refurbishment” to be set up. We further recommend this again as the correct approach to the measurement and target setting for the considerable improvement that is needed. Only by clear target setting and defined measurement can for the target of 80% reduction be achieved.

References

DEFRA: 2008
http://www.defra.gov.uk/environment/statistics/globatmos/gagccukem.htm

GHG online: 2009
http://www.ghgonline.org

Good Practice Guide 268: Energy Efficient Ventilation in dwellings – a guide for specifiers
Energy Saving Trust 2005.

Section 3 - How do we finance the improvement?

Introduction

A recent report of decency rates in the public and private sectors indicated a significantly higher level of Non-Decency amongst private-sector dwellings, irrespective of ownership or tenancy.

Stakeholder	Rate of Non-Decency
Owner Occupiers	35%
Private Landlords	50%
Registered Social Landlords (RSLs)	29%
Local Authorities (LAs)	38%

Table 1 – Non-Decency rate by tenure types[1]

Of those dwellings that were non-decent, 59% (4.8 million) fail the appropriate Housing Health and Safety Rating System (HHSRS) criteria, with excess cold being most common Category 1 hazard[2]. Whilst the Decent Homes programme should eliminate the majority of such failings in public-sector stock by 2012, no similar programme exists for privately held stock.

Stakeholder	UK 1000s from DCLG 25/09/07
Owner Occupiers	18,522 (70%)
Private Landlords	2,995 (11.5%)
Registered Social Landlords (RSLs)	2,191 (8.5%)
Local Authorities (LAs)	2,704 (10%)
All Dwellings	26,412

Table 2 - The mix of tenure types within the UK existing housing stock[3]

The significant investment in the Decent Homes programme has resulted in improved energy performance. However, by 2006, the average Standard Assessment Procedure (SAP) rating of 57[4] was significantly worse than the suggestedaverage target of SAP 80 required for the existing stock to deliver its share of the Climate Change Committee's 80% reduction of emissions by 2050. It was also expectedthat such an improvement in SAP rating would also reduce fuel poverty.

1 Energy Saving Trust, seminar on The Refurbishment Pathway Toward 2050, The State of the Nation, R Hartless
2 Energy Saving Trust, seminar on The Refurbishment Pathway Toward 2050, The State of the Nation, R Hartless
3 Housing Forum – Existing Housing Working Group Report April 2008
4 English House Condition Survey 2006

Government funding and initiatives

Initially, direct Government funding into the existing Housing Stock was targeted primarily towards energy saving and the eradication of 'fuel poverty[5]' rather than overall carbon emissions. In 2001, the Government committed to eradicate fuel poverty in vulnerable households by 2010 and all households in England by 2016. However, the Government is currently predicted[6] to fall short of this target, particularly due to recent fluctuations in the price of energy and the current economic climate. Table 3 below provides an overview of the initiatives and related funding magnitude targeting improvement of existing homes.

Initiative	Timeframe	Funding
Part L 2006	Reviews planned for 2010, 2013, 2016	No direct additional funds
Energy Performance Certificates (EPC)	Continual with review of first impacts underway at EU level	No direct additional funds
Decent Homes	Started 2002 running to 2010	£20 billion 2002 – 2007. Total expected to be £40 billion by 2010
Warm Front	Started 2000 running to 2010	Over £850 million 2005 – 2008. Further 74 million announced in Sept 2008.
Carbon Emissions Reduction Target (CERT)	Started as EEC 2002 running to 2011 at least	£2.8 billion between 2008 – 2011 (Note – Funds from Energy Suppliers)
Landlords Energy Saving Allowances	Started 2004 running 2015	£1500 per property (total across England and Wales unknown)
Low Carbon Building Programme (LCBP)	Started 2006. Phase 1 (Householder) to endJune 2010 Phase 2, (Public Sector and Charitable bodies)to end June 2009.	LCBP 1: £2,500 per property LCBP 2: £0 to £10 million fund
Bio-Energy Capital Grant Scheme	Round 5 open until April 2009, available to Local Authorities and Housing Associations to access and provides capital grants to support the installation of biomass-fuelled heat and combined heat and power projects. Further information can be found at http://www.decc.gov.uk/bioenergy-grants/	Max single award £500,000 per installation.
Community Energy Saving Programme (CESP)	Due to start spring/summer 2009 and launch in approx 100 fuel poor areas.	£350 million over 3 years intended for partnerships and aimed at community scale/ street-by-street measures. Details unknown.
Green Homes Service	Due to start December 2008 but currently in discussion between EST and DECC	Expected to be £26 million p.a.

Table 3 - Government funding and initiatives with direct relevance to the existing housing stock (England & Wales only).

5 BERR definition of Fuel Poverty - http://www.berr.gov.uk/whatwedo/energy/fuel-poverty/
6 Friends of Earth legal challenge Oct 2008 - http://www.foe.co.uk/resource/press_releases/fuelpoverty_courtcase_06102008.html

Section 3 - How do we finance the improvement?

Decent Homes

Decent Homes is a large scale programme delivering improvements to the existing social housing stock. It is expected to have provided around £40bn by 2010. However it is important to note that a significant proportion of this has been sourced by Housing Associations themselves rather than any additional Government funding streams. The works improve living conditions through new bathrooms, kitchens, double glazing and heating systems but is considered by many to be a missed opportunity as it failed to set high standards of environmental performance. There is currently much speculation as to how the standard will be taken forward after 2010. Some suggest a 'Decent Homes Plus' that will have a greater carbon reduction theme and expand to include 'Decent Communities' or 'Sustainable Homes'. The Housing Forum, in its previous report[7] reviewed the effectiveness of the Decent Homes programme in relation to the sustainability of existing stock and made robust recommendations to extending the current initiative to include measures to deal with fuel poverty and affordable warmth within remaining Decent Homes Programmes.

Warm Front

This programme, targeting fuel poverty in lower income owner occupier and rented homes, commenced in 2000. Since then, 1.6m homes have been treated with insulation and heating measures. The maximum grant of £2700 per household (or £4000 if oil heating) is has been criticised as[8] insufficient to help poorer occupants receive replacement central heating systems without further financial support.

Carbon Emissions Reduction Target (CERT)

This is the principal driver of energy efficiency improvements in existing homes placing an obligation on energy suppliers to achieve targets for promoting reductions in carbon emissions in the household sector. It doubles the levels of funding from its predecessor (Energy Efficiency Commitment - EEC) by providing £2.8 billion between 2008 and 2011, with an addition £560 million announced in September 2008, for improvements to both Priority and Non-Priority Groups. Approximately 40% of the target funding is aimed at Priority Groups, which include people on 'passport benefits' and vulnerable households (ie. one that contains children, the elderly or somebody who is disabled).

CERT is the only company[9] led initiative to deal with existing stock in Europe. Other European countries have implemented consumer led initiatives where government financial support has been provided via grant and tax incentive schemes.

The direct measures currently eligible include; loft, cavity wall and some solid wall insulation, draught proofing, glazing, lighting, appliances, microgeneration and combined heat and power. The scheme also provides for Demonstration Actions often geared to trialling consumer reaction and adapting behaviour to take advantage of new technologies.

Low Carbon Building Programme Phase 2

This is BERR's £50m capital grant stream for the installation of microgeneration technologies for social housing, schools and other public sector buildings and charitable bodies. It is currently anticipated that funds will be committed through to mid-2009, but this will depend on the actual rate of applications and significant sums currently remain unspent.

Technologies available through this programme include solar pv, ground source heat pumps, biomass, wind, and solar thermal.

Bio-Energy Capital Grants Scheme

This DECC scheme provides capital grants to support the installation of biomass-fuelled heat and combined heat and power projects, including anaerobic digesters, in England. It is open to industrial, commercial and community sectors, but not householders and individuals. The maximum grant rate is variable, up to a maximum of 40% of the difference in cost of installing the biomass boiler or CHP plant compared to installing the fossil fuel alternative, with a maximum single award is £500,000 per installation. Round 5 closes at the end of April 2009 and the window may be extended if there are unallocated

7 'Sustainable Improvement of the Existing Stock, Housing Forum Working Group Report, April 2008.

8 http://www.ageconcern.org.uk/AgeConcern/warmfront-ACHTA-release-040209.asp

9 List of CERT contacts - http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/Contact/Documents1/Contacts.pdf

funds remaining at the end of this period.

Landlords Energy Saving Allowance (LESA)

First introduced in 2004, with effect from April 2006, landlords can receive Income Tax reductions up to £1,500 per building to install energy efficiency measures. The list of applicable actions has been expanded over its lifetime to now include cavity wall, solid wall, floor and loft insulation plus draught proofing and hot water tank and piping insulation. To date industry take up has been poor and believed by some[10] to need greater promotion via landlords associations.

Green Homes Service

This DEFRA funded and EST managed nationwide public advice service was expected to be launched in December 2008 but is now subject to discussion with DECC as to how it will relate to their Communities Energy Saving Programme (CESP). It will provide both technical and delivery advice for occupants wanting to improve energy, water, waste and recycling performance. The annual budget of around £26 million will primarily be used to target homes with the lowest EPC ratings of 'F' and 'G'.

Larger Regeneration Scale Funding Streams

Further research is required into the following areas to assess their applicability to large scale energy efficiency improvements to the existing stock:

Neighbourhood Renewal Funds (NRF)

Non ring fenced grants (extra resources) for most deprived LA's (in collaboration with LSP's) to improve services. NRF total allocation 2007/2008 was £525 million. From 2007/08 NRF will operate in the context of Local Area Agreements (LAA). Those LSPs will need to continue to demonstrate through the LAA how they are narrowing the gap between the most deprived areas/ groups and the rest of the population.

Market Renewal Pathfinders

Nine Market Renewal Pathfinders were created during April 2002. The programme is intended to rebuild housing markets in North and West Midlands. £1.2 billion has been invested between 2002 and 2008 and the Government has committed a further £1.038 billion to the programme over the period 2008-2011. The Fund is used to finance capital investment in the housing market and supporting infrastructure that other regeneration programmes have not been able to make on a strategic and long-term scale. The programme has been directly responsible for the refurbishment and improvement of around 40,000 homes, with just under 10,000 properties demolished, and 1,100 new properties constructed.

Linking New Build Activity To Existing Stock Improvement

When considered from a technical / energy demand perspective there appear to be significant benefits available from aligning low / zero carbon new build activity with the existing stock. For example, with the increased usage of Combined Heat and Power (CHP) systems for higher Code for Sustainable Homes developments, their improved insulation performance of new build means that energy demand is lead by electrical power. Whilst CHP can provide this, due to increased efficiencies, it also produces significant quantities of heat which the new homes do not require, which would otherwise go to waste.

However the poor fabric performance of the existing stock means that the demands for heat are significantly higher than those of new build. There is therefore a possibility to link the two complementary demand profiles and gain greater benefits both financially and environmentally. In reality developing methods to fund such cross sector activity is one of the biggest challenges to this concept; Section 106 agreements could provide a spur for such activity.

Planning Section 106

Section 106 (S106) of the Town and Country Planning Act 1990 allows a local planning authority (LPA) to enter into a legally-binding agreement or planning obligation, with a land developer over a related issue. The obligation is sometimes termed as a 'Section 106 agreement'. Such agreements can cover almost any relevant issue and can include sums of money. Possible examples of S106 agreements could be:

- the developer will establish and transfer ownership of

10 http://www.parliament.the-stationery-office.com/pa/cm200708/cmselect/cmcomloc/432/43206.htm

an area of woodland, used as a carbon sink, to a LPA with a suitable fee to cover its future maintenance

- the local authority will restrict the development of an area of land, or permit only specified operations to be carried out on it in the future, for example, amenity use
- the developer will create access to or for district heating plant
- the developer will provide a certain proportion of affordable housing

Brent Council have a 'Standard Charge' structure for Section 106 providing contributions for Education / Training, Sustainable Transportation, Open Space, Sport and Air Quality.[11]

Similarly, Milton Keynes Council has introduced a carbon offset fund for new developments. Developers seeking planning permission for new homes are taxed on their carbon emissions with funds raised being used to upgrade the efficiency of the existing homes through the offer of cavity wall and loft insulation at subsidized prices. Developers pay a one-off tax, on completion of the development, of £200 per tonne of carbon dioxide generated by the development each year. This works out at £400 for a typical new home.

Community Infrastructure Levy

The Community Infrastructure Levy (CIL), which is currently being progressed through parliament, gives Local Authorities in England and Wales the ability to demand charges from developers of new developments in their area. These charges will be based on the size and impact of the development in question. Funds will be used to improve the local and sub-regional infrastructure as part of the Local Development Framework (LDF). The levy is not expected to become active before Spring 2009.

The total funding raised by the CIL is dependent on the number of LAs that decide to exploit its potential. Initial CLG estimates are hundreds of millions of pounds of additional funds.

Activities that are expected to fall within this funding stream are transport, schools and health centres, flood defences, play areas, parks and other green spaces. Affordable housing is to remain within the remit of Section 106. It is hoped that Regional Development Agencies will be able to access more long term strategic funding for infrastructure by being reimbursed by the CIL income stream, a process called 'forward funding'.

The Planning Bill strictly specifies that CIL funds can only be used for infrastructure needed to support the development area. This might limit funding potential in relation to the existing stock to district heat mains rather than investment in fabric improvements.

ESCo Arrangements

An Energy Service Company (ESCo) arrangement brings capital funding into the construction process and provides finance for the operation. Their remuneration is gained by being the provider of energy and is directly tied to the energy savings achieved.

Renewable energy features include the installation of a community energy scheme using CHP and/or other heat sources where one central heat source can be divided to service a number of heat slaves. This approach works more efficiently within a tower block or where you have a collection of units within an area.

Benefits include;

- An improved energy solution for the dwellings
- Reduction in the build costs
- Improved energy rating
- Reduction in energy costs for the end users
- Potential cash back arrangement for surplus energy
- Alternative energy solutions can be added to improve the efficiency and reduce carbon footprint
- Grants available for use of renewable energy (Min 20% renewable)

11 Brent Council Section 106 - http://www.brent.gov.uk/Planning.nsf/e35824689957a84280256623005fc7af/b5aedb21ed7e4f43802571f0004d257b!OpenDocument

Future Funding

Future funding and delivery routes include the Growth Point funding stream, managed by the Housing and Communities Agency (HCA). £12m of the £605m growth fund will be made available specifically to help some of the growth authorities develop exemplar schemes in response to climate change where solutions may take the form of site or area wide proposals that deliver new communities with innovative approaches to the provision of low carbon energy and environmental technologies.

Zero Carbon Home Definition Consultation

Ever since Government made clear its aim for all domestic new build to be 'zero carbon' from 2016 industry has been seeking clarification on exactly what this means. A consultation has been launched presenting a number of scenarios that may in future be deemed acceptable in 2016. The following provides a brief overview:

- The proposed approach is founded upon on site based actions (energy efficiency and LZC power / heat) to a defined '**compliance level**', then residual emissions are to be covered by a set of '**allowable solutions**' (offsite LZC electrical production, creation of heat networks to surround existing buildings, funding refurbishment of older buildings, etc)
- There is currently discussion around feasible '**compliance levels**' of 44%, 70% or 100% reduction in regulated emissions compared to 2006. From the wording 70% appears to be the Government's preferred option for onsite action, in conjunction with Passiv Haus level back stops for the fabric.
- Proposed '**allowable solutions**' after first meeting the 'compliance level' include:
  - On site carbon compliance beyond the minimum standards (towards or complete mitigation of emissions from regulated, cooking and appliances) – This is in effect the current Code Level 6 approach where use of domestic energy appliances is incorporated into the zero carbon calculations and reaching of higher compliance levels.
  - Credit for energy efficient appliances and advanced forms of building controls (such as whole house shut down when owner is out.) – Allows for use of the highest energy efficient appliances however there may exist limitations to some aspects of this being a key driver as part will be covered by EU product labelling schemes.
  - Credit for export of LZC heat from development to existing properties that previously used fossil fuels – This is likely to be a key concept for the future.
  - Credit for Section 106 Planning Obligations paid by developer towards local LZC infrastructure as the Milton Keynes example above. This solution is good in principal and requires a robust method for calculating the amount of carbon savings to be assigned and therefore attributed to the financial contribution made by the developer. This applicability of this solution is also likely to be project dependent.
  - Credit for retrofitting works undertaken by developer to improve existing buildings close to development – This is potentially another key concept for future. However, it is important to ensure there is an effective link with the Local Authority to maximise effectiveness. There may exist links into the Community Energy Saving Programme currently being developed. Note: this entails delivery of more difficult energy measures in existing homes as simple measures may have been exhausted via current schemes such as CERT.
  - Credit for investment by developer in LZC infrastructure (limited to UK and UK waters) where benefits (carbon or financial) of ownership are passed to the home purchaser – Essentially, this concept sees large developers investing £X million into sustainable infrastructure offsite to their development. For instance in the development of an off shore wind farm to offset emissions from their next 5 years worth of new developments or in a low carbon heat distribution network not related to their development.
  - Credit for offsite renewable electricity with direct

physical connection, as long as does not breach regulatory restrictions.

An initial assessment suggests that both the 'Credit for export of LZC heat' and 'Retrofit works to existing buildings' offer the most potential for future funding streams. These in fact fit well with the results of a small social housing landlord survey conducted as part of this research.

Social Housing Sector Survey

A questionnaire was circulated via the Housing Forum, the G15 (London Housing Associations) and the Building Research Housing Group (Steering Committee). A number of one to one interviews were also conducted. Enquiries focused on the several areas, with responses highlighting the following anecdotal trends:

- **Present funding** – Decent Homes plays a dominate role in refurbishment activities, answers ranging from 50 to 95% of all activity, but does not include specific sustainable requirements other than those required to provide 'a reasonable degree of thermal comfort', usually through effective insulation and efficient heating system. CERT was also credited for funding insulation and some renewable technology installation, but to a much smaller degree (5 – 20% of all activity). Administration time in order to claim such funds was seen as a downside by some. Finally some of the more progressive groups reported use of LCBP funds for renewable technologies. However the high capital cost and requirement for 50% alternative funding was seen as an issue.

- **Procurement methods** – The vast majority of respondents procure via Strategic Partnering or Consortiums, proportions of work ranging from 20 – 80% of planned improvements. Some groups had the ability to combine smaller projects into single large programmes to secure preferential rates from suppliers. Whole life costing in conjunction with resident conferences were commonly used criteria for component selection.

- **Stock Condition**[12] – Decent Homes has clearly increased the frequency of stock surveying however the balance between 'actual' and 'cloned' ranges significantly from only 15% all the way to full 100% actual survey data. The comparatively recent requirements for EPCs means that a comparatively small percentage of EPCs (typically 5 – 10%) were due to re-letting frequencies.

- **Present Targets** – Only a small proportion of respondents indicated that they were not on track to achieve all Decent Homes by 2010. Due to funding issues one group has a revised target for 2013. Asset management systems are being used to predict future 'non decent' failures over 15 – 30 years but with only one respondent mentioning a tool such as EcoHomesXB to help with strategic sustainability issues.

- **Ways forward** – A selection of ideas for future funding were presented and their potential for success rated. The ones that prompted most response were:

  - **Council Tax reductions related to energy performance of dwelling (Medium potential)** – Positives included tenants' perception of a fairer system. Negatives were the increased benefit burden and ensuring that any savings were used for sustainability improvements.

  - **Rental increases proportionate to energy savings (Medium potential)** – Positives being this is the major HA income stream so could significantly increase funds. Negatives were clearly proving the tenant cost savings and the fact around 70% of social tenants have their rent paid via benefits.

  - **Expansion of Section 106 agreements to include refurbishment (High potential)** – Positives included creation of additional, targeted funds. Negatives were the current financial climate and the associated collapse in new build activity.

  - **Next generation Green Homes Plus programme (High potential)** – Positives included the drive of a government led standard, especially if linked to a mandatory measurement such as EcoHomesXB/EPC ratings to activate

12 See The Housing Forum 'Gateways in the Asset Management Process' Toolkit at http://www.constructingexcellence.org.uk/tools/gamptoolkit/default.jsp

any additional funds. Negatives were a concern that standards maybe increased without any additional funding. Many groups are finding achievement of Decent Homes performance a challenge so achieving carbon reductions of up to 80% appear impossible without financial assistance.

In summary the majority of social housing providers who responded, or were interviewed, are acutely aware of the need for enhanced sustainability and particularly carbon emission reductions. Despite their desire to take action, most are exceedingly limited by funding opportunities. Decent Homes activities demand the most attention with funds from CERT and LCBP being accessed by some to increase insulation and renewable energy technologies.

However, it would be incorrect to state that all issues would be solved by greater funds. For example, the issue of technical and tenant challenges when having to deal with solid wall properties was raised and the somewhat contradictory Key Performance Indicators (KPIs) set for re-occupation of void properties. The current targets make any significant whole house refurbishment appear more operationally 'high risk' if the work is likely to prolong the vacancy period. This suggests a more holistic approach to measuring a social landlord's stock management is required.

Our recommendations would therefore be:-

- In order to further incentivise building fabric improvements and the behaviour of occupants a link should be established between the real consumption data through Display Energy Certificates and building performance (through EPCs) with taxation such as council tax in a similar manner to the carbon index on vehicle excise duty. A 'C' rating should be the benchmark for tax neutrality. The revision should be at least revenue neutral to local authorities to protect their income. Within the rented sector care would have to be taken not to penalise the occupants for the lack of energy conservation by the landlord. In this case the landlord should receive the benefit or penalty of such a policy and not the tenant. The taxation benefit for an improved EPC rating would then be some incentive for investment by the landlord.

- In the social housing sector, the landlord's capital investment saves the residents utility costs but they have no formal facility to increase rental values to correspond with this utility cost reduction and thereby recover capital expenditure. (Within the private sector the opportunity exists to gain market advantage or increase rents from improved building performance). A mechanism should be introduced to allow social housing providers to recover capital expenditure through the utility bill benefits of the occupier which could jointly address carbon reduction and fuel poverty issues.

- The measurement via Key Performance Indicators (KPIs) of empty property turnaround times has highlighted and ensured public bodies maximise the occupancy of their housing stock. However this is preventing the opportunity for the house to be substantially 'upgraded' prior to being offered back to future residents. An exception should be made for those public bodies who take advantage and provide significant energy upgrade work as part of the turnaround work. A whole house approach should be encouraged.

- The Housing Forum calls upon the Government to commit to a new initiative beyond Decent Homes of energy upgrade works. Such a large scale initiative will provide the certainty needed for micro generation companies to commence manufacture of significant numbers of renewable systems which would drive down the currently prohibitive unit costs and pay-back times.

- Last year's Housing Forum Report suggested the use of a "Carbon £ound" in relation to lifecycle cost for repair and maintenance work. Evidence suggests that future savings by increasing capital costs now should be reinvested on further energy upgrade work, which in-turn will produce energy savings in future years.

- The capital cost of energy upgrade work to multi-occupancy buildings which include leaseholders should be allowable and recoverable through the service charge provisions of leases.

  At a time when the Government is both trying to reduce carbon emissions and stimulate the economic

- recovery of many British industries, not least the construction industry. A more targeted focus of VAT reduction being applied to the home improvement market should be considered. We recommend that all low energy products, and, refurbishment to achieve reduced carbon emissions, be zero rated for VAT purposes. This would give considerable incentive to the private individual. A time limit of 5 years should be set on this incentive to accelerate the speed of undertaking improvement works and provide a stimulus to the current economic situation.

- Local Energy Partnership Organisations should be set up to co-ordinate and ensure that high level energy planning provision is in place. Individual households with their own 'zero carbon' approach will not be sustainable and henceforth we need an area-wide group of stakeholders to ensure that the connectivity and optimum utilisation of new energy schemes are adopted.

In an age of financial turmoil we should not only reassess our home ownership policies but recommend that the financial institutions re-appraise the 'mortgage products' that they provide which would allow greater transferability of the 'cost' of energy upgrade work rather than it being reflected in the 'value' of the property which would be ever increasing. Such a move would encourage the transferability of the cost of upgrade with the associated benefit of lower energy bills

Dwelling	Base Case	Low Cost / Non Disruptive	Medium Cost	High Cost/ Disruptive	Low Carbon Renewable Energy Technology
High Rise	Mid-floor flat (typical flat type for high rise blocks) 80m2	Low Energy Lighting	Gas Boiler Combi	External Wall Insulation (0.22)	Biomass Communal
	Uninsulated cavity walls	Heating Controls		Double Glazing & Modern Door	
	2 External Walls			Air Tightness Improvements	
	Old large volume storage heaters				
	Manual Controls				
	Hot water dual immersion 150lt Cylinder				
	25mm jacket insulation				
	Single glazed windows with metal frame without thermal break				
	Solid uninsulated doors				
	80m2				
	No low energy light fittings				

Appendix – Assumptions Tables for Section 2

Dwelling	Base Case	Low Cost / Non Disruptive	Medium Cost	High Cost/ Disruptive	Low Carbon Renewable Energy Technology
Tenenment	Top Floor Flat 67.5m2	Low Energy Lighting	Gas Boiler Combi	Internal Wall Insulation	Biomass Communal
	Solid Brick Wall 9 inches	Heating Control	Loft Insulation	Floor Insulation	
	3 External Solid Walls			Double Glazing & Modern Door	
	50mm - 75mm Loft Insulation			Air Tightness Improvements	
	Central heating gas combi 65%				
	Fully programmable with room radiator valves				
	Single glazed windows with metal frame without thermal break				

Dwelling	Base Case	Low Cost / Non Disruptive	Medium Cost	High Cost/ Disruptive	Low Carbon Renewable Energy Technology
Victorian Terrace	End terrace 2 Storey Terraced Property 90m2	Low Energy Lighting	Gas Boiler Traditional	External Wall Insulation (0.22)	PV
	Solid Brick Wall 9 inches	Heating Control	Loft Insulation	Floor Insulation	Solar Thermal
	3 External Solid Walls	Hot Water Tank Jacket		Double Glazing & Modern Door	
	50mm - 75mm Loft Insulation			Air Tightness Improvements	
	Standard Gas Central heating 65% Efficiency 79 - 97 Floor Mounted Boiler				
	no programmer - no room thermostat - trv or interlock				
	Hot Water from Boiler				
	25mm insulation jacket on Hot Water Cylinder				
	Suspended Timber floor				
	Air changes 14.3 (EST Advance Insulation Standards)				
	Single glazed windows with wooden frame				
	solid wooden floor front and back				
	No low energy light-bulbs				

Appendix – Assumptions Tables for Section 2

Dwelling	Base Case	Low Cost / Non Disruptive	Medium Cost	High Cost/ Disruptive	Low Carbon Renewable Energy Technology
1950's Semi Detached	1950's Semi Detached 2 Storey House 100m2	Low Energy Lighting	Gas Boiler Traditional	External Wall Insulation (0.22)	PV
	Uninsulated cavity walls	Heating Control	Loft Insulation	Floor Insulation	Solar Thermal
	50mm - 75mm Loft Insulation	Hot Water Tank Jacket	Cavity Wall Insulation	Double Glazing & Modern Door	
	Standard Gas Central heating 65% Efficiency 79 - 97 Floor Mounted Boiler			Air Tightness Improvements	
	Programmer but no thermostat, no TRV or Interlock				
	Hot Water from Boiler				
	25mm insulation jacket on Hot Water Cylinder				
	concrete floor				
	Air changes 19.3 (EST Advance Insulation Standards)				
	Single glazed windows with wooden frame				
	Solid wooden front door and back door				
	No low energy light-bulbs				

Appendix – Assumptions Tables for Section 2

U Value Assumptions

Building Element	Standard	Best Practice	Best Practice
Uninsulated Solid Walls (E)	2.1	Insulated Solid Walls (E)	0.35
Uninsulated Solid Walls (I)	2.1	Insulated Solid Walls (I)	0.45
Uninsulated Cavity Walls	1.6	Insulated Cavity Walls	0.45
Air change before refurbishment	14.3 (EST Advance Insulation Standards)	Sealed	5
Single Glazed Aluminium	5.8	Double Glazed (BFRC)	2
Single Glazed Wooden	4.7		
Single Galzed PVS	4.7		
Suspended timber floor	0.45 - 0.7 = 0.57	Insulated Floor	0.25
Concrete ground floor	0.45 - 0.7 = 0.57	Insulated Floor	0.25
50-75mm Loft Insulation	0.99	300mm Loft Insulation	0.16
Solid Doors	Wooden 3.0	Solid doors	1

The Housing Forum is very grateful for the contributions of the following people:

Ian Burnett	Wates Living Space
Rory Bergin	HTA Architects
Bob Cockerton	Higgins Construction
Paul Davies	Wates Living Space
Mike De'Ath	HTA Architects
Luke Driscoll	Echelon Consultancy
Andrew Eagles	Sustainable Homes
Matt Fulford	EC Harris
Paul Greenwood	United House
David Griffin	EC Harris
David Hannon	The Matrix Partnership
Ross Holleron	Inbuilt
John Kiely	Savills
Andrew Mellor	PRP Architects
Emily Munn	Inbuilt
Tim Pollard	Wolseley
Nia Prys-Williams	PRP Architects
Brian Stannett	Polypipe
Neil Watts	Breyer Group
Nic Wedlake	Peabody Trust
Tom Whatling	United House
Andrew Vickery	Trowers and Hamlins

The views expressed in this Report reflect the wide range of contributions made by Working Group members, but would not necessarily be shared by the individual members, or their organisations.

The Housing Forum
Candlewick House
120 Cannon Street
London EC4N 6AS
T 0207 648 4070
E info@housingforum.org.uk
W www.housingforum.org.uk

THE HOUSING FORUM
Working with NHBC