EXPLANATORY MEMORANDUM TO

THE HOME ENERGY EFFICIENCY SCHEMES (WALES) REGULATIONS 2011

This Explanatory Memorandum has been prepared by the Climate Change and Water Division and is laid before the National Assembly for Wales in conjunction with the above subordinate legislation and in accordance with Standing Order 24.1

Minister's Declaration

In my view, this Explanatory Memorandum gives a fair and reasonable view of the expected impact of The Home Energy Efficiency Schemes (Wales) Regulations 2011 and I am satisfied that the benefits outweigh any costs.

Jane Davidson AM

Minister for Environment, Sustainability and Housing, one of the Welsh Ministers

6 March 2011

1. Description

The Assembly Government's proposals for tackling fuel poverty were set out in the draft National Energy Efficiency and Savings Plan (NEESP) and the draft Fuel Poverty Strategy, which were published for consultation in 2009. The outcome of both consultations helped to inform the development of the final Fuel Poverty Strategy, which was published in July, and the development of a new fuel poverty programme to replace The Home Energy Efficiency Scheme (HEES). This Statutory Instrument will allow for the delivery of the new fuel poverty programme outlined in the Fuel Poverty Strategy.

2. Matters of special interest to the Constitutional Affairs Committee

The Regulations:

- Enable the delivery of the new fuel poverty programme;
- Enable a wider range of advice to be provided under the new programme and for advice to be available to all householders;
- Define the eligibility criteria for access to Assembly Government funded energy improvement measures, which will be provided as part of an energy improvement package for individual properties;
- Clarify the range of energy improvement measures that can be offered as part of an energy improvement package so householders living in hard to treat homes can benefit from the programme;
- Enable a maximum grant to be approved per property that will enable more expensive energy improvement measures to be provided where it is appropriate and cost effective to do so;
- Clarify the criteria for partial grants; and
- Clarify grant conditions.

3. Legislative background

Section 15 (1) of the 1990 Social Security Act (as amended by section 142 of the Housing Grants, Construction and Regeneration Act 1996) provides that the Secretary of State may make, or arrange for the making of, grants towards the cost of work or advice to improve thermal insulation or otherwise to reduce or prevent energy wastage in dwellings. The Secretary of State's functions under this provision were made exercisable, in relation to Wales, by the Assembly concurrently with the Secretary of State by article 2 of, and Schedule 1 to, the National Assembly for Wales (Transfer of Functions) Order 1999. They are now exercisable in relation to Wales by the Welsh Ministers concurrently with the Secretary of State, by virtue of section 162 of, and Schedule 11 paragraph 30 to, the Government of Wales Act 2006.

The instrument is subject to the negative resolution procedure.

4. Purpose & intended effect of the legislation

The purpose of Regulations is to enable the implementation of a new fuel poverty scheme in Wales, particularly to outline eligibility criteria and the range of measures available.

HEES is the Welsh Assembly Government's main vehicle for tackling fuel poverty in Wales. The scheme provides insulation and heating measures to eligible households in receipt of certain qualifying benefits and credits that are set out in *The Home Energy Efficiency Schemes (Wales) Regulations 2007*. HEES has been successful in assisting over 124,000 households to improve the energy efficiency of their properties and reduce their fuel bills since it was established in 2000, but it has been less successful in targeting households who are fuel poor and in assisting households living in hard to treat properties.

Significant increases in fuel prices in recent years have led to an increase in the number of households in Wales living in fuel poverty. The Assembly Government is committed to tackling fuel poverty and if it is to meet its target to eradicate fuel poverty, as far as is reasonably practicable, in all households in Wales by 2018, action needs to taken to focus resources on those households most in need. Households most likely to be in fuel poverty are those on the lowest incomes, living in the most energy inefficient properties.

The Assembly Government's Fuel Poverty Strategy outlines plans to replace HEES with a new, improved programme of support that will provide advice to all householders on reducing their fuel bills, ensure better co-ordination of energy supplier and Assembly Government funding, and provide Assembly Government funded whole house energy improvement packages to eligible householders who are most in need and living in the most energy inefficient properties.

The eligibility criteria and range of energy efficiency measures available under HEES are set out in Regulations. In order to deliver the new scheme the existing Regulations need to be replaced.

5. Consultation

Details of consultations undertaken are included in the RIA below.

PART 2 – REGULATORY IMPACT ASSESSMENT

7. Options

A Regulatory Impact Assessment, including a full cost/benefit analysis, can be found at Annex 1.

8. Costs & benefits

These can be found at Annex 1.

9. Competition Assessment

We do not consider there to be any competition issues. The proposed Regulation will have no detrimental affect on business, charities or the voluntary sector

10. Consultation

Initial proposals for revising HEES were set out in the draft National Energy Efficiency and Savings Plan (NEESP), which was published for consultation in 2009. A copy of the NEESP consultation document and a summary of the responses received to the consultation can be accessed from the following link:

http://wales.gov.uk/consultations/environmentandcountryside/energysavingsplan/?lang=en&status=closed

Elements within NEESP that focussed on fuel poverty, and the responses received to the consultation, were taken forward in a new draft Fuel Poverty Strategy which was consulted upon and published in 2010. A copy of the Strategy can be accessed from the link below:

http://wales.gov.uk/topics/environmentcountryside/energy/fuelpoverty/strategy/?lang=en

The Strategy sets out the Assembly Government's approach to tackling fuel poverty in Wales including setting up a new, improved all Wales programme of support to replace HEES that will offer advice to all households on reducing their fuel bills and provide Assembly Government funded energy improvement packages to households most in need and living in the most energy inefficient properties.

Stakeholders and the general public were consulted on the Regulations. The consultation was discussed in particular detail with members of the Fuel Poverty Coalition and the Chair of the Ministerial Advisory Group on Fuel Poverty. These groups represent those stakeholders most closely involved with the fuel poverty agenda in Wales. The majority of responses were received from members of these groups. The consultation ran for eight weeks and responses were received from the following:

Age Cymru
Anonymous Individual
Children in Wales
Citizens Advice Bureau
Consumer Focus Wales
Eaga Cymru
Flintshire County Council
Macmillan Cancer Support
National Energy Action (NEA) Cymru
Royal Institution of Chartered Surveyors Wales
SolTex Global
Vale Older Peoples Strategy Forum
Wales Fuel Poverty Charter Coalition
Wood Fuel Wales

A summary of responses follows:

Q1. One of the qualifying criteria for an Assembly Government funded energy improvement package is for a householder to be in receipt of a specified means-tested benefit? Do you agree with the list of means-tested benefits specified in Regulation 2 of the draft Regulations? If you do not agree, please provide details of any other means-tested benefits you think should be included.

Six (of eight) respondents agreed with the list, but that the Regulations will need to possibly change with changes to the benefit system being brought about by the UK Government from 2013. Some stakeholders also commented on the underlying strategy and the criteria being focussed on those in receipt of a means tested benefit.

Outcome: No change to the Regulations. If and when changes to the benefits system occur, the need for consequential changes to the Regulations will be considered.

Q2. Regulation 8 of the draft Regulations sets out the requirements for making an application for a grant for works. Do you agree with the list of requirements? What information do you think a householder should reasonably be expected to provide to confirm their eligibility for:
a. a partial grant
b. an energy improvement package

Seven (of nine) respondents agreed with the requirements set out. Applicants for partial grant should be expected to provide information which is proportional to the value of the grant; possibly - proof of address, tenure and eligibility. One respondent felt that it was unclear whether representatives from trusted organisations can access the scheme on behalf of individuals. There was also some concern about the precise definition of some of the categories of eligibility for the partial grant.

Outcome: The Area Agency will need to work with stakeholders to clarify what information householders should provide to confirm eligibility for the partial grant, and to make clear how organisations can access the Scheme on behalf of vulnerable individuals. The Area Agency will provide and agree with the Welsh Assembly Government a clear definition of “chronic illness” for the purposes of the partial grant. These matters are in general considered to be issue of detailed administration for which it is not necessary to make specific provision in the Regulations. However, the list of eligible categories for the partial grant has been expanded in the Regulations to include pregnant women.

Q3. Do you agree with the list of energy improvement measures set out in Regulation 6 of the draft Regulations for inclusion in an energy improvement package? Are there any other energy improvement measures that you think should be included in the list?

Eight (of nine) respondents agreed with the list. Respondent believed that further clarity on what could be considered “additional works”. Some were unsure about the benefit of including water saving measures and others requested that we consider including double glazing windows, additional building or maintenance work and heat recovering extractor fans.

Outcome: Water saving measures will remain as they offer cost savings to householders at low cost. Additional building or maintenance works are within the scope of Regulation 6(1)(o). Other measures suggested would be covered, where appropriate, by Regulation 6(1)(p).

Q4. Do you agree with the conditions set out in Regulation 9 of the draft Regulations? If you agree that grants for works should be repayable in some cases, if a property is sold, how long after the works are undertaken do you think the requirement to repay all or part of the cost of works should apply?

Some respondents (three of nine) recognised that the scheme should not be used for householders to benefit from increased property value; there was also acknowledgment that the cost of administration should be less than the value of grant reclaimed. However, the majority of respondents (four of nine) were concerned that the threat of repayment could discourage vulnerable applicants. Where respondents favoured repayment it was on a declining scale basis and proportional to cost of works.

Outcome: Regulation 9 has not been amended, as it already provides for the area agency to have discretion as to the imposition of conditions specifically dealing with the scenario above.

Q5. Do you agree that where an energy improvement package is provided in a privately rented property, the landlord should be asked to enter into an agreement that the rent for that property will not be increased, or the improvements funded through the package not taken into account in any rent review? If you agree, how long after the works are undertaken do you think the agreement not to increase rents should apply?

There was considerable agreement amongst respondents (nine of nine) that landlords should not materially benefit from works funded under the scheme. There should be no resulting rent increase (excluding inflationary increases) arising from the works funded under the scheme.

Outcome: Regulation 9(1)(a)(iii) already enables the Area Agency to impose a condition requiring the relevant landlord to agree that rent will not be increased for a specified period. However, the provision has been amended to exclude from the requirements any rent increases which are due to inflation.

Q6. Do you think a limit should be placed on the number of applications a householder can make under the scheme for the same property? If you think there should be a limit, over what time period do you think the limit should apply?

As the scheme is focussed on homes which have a SAP rating of 38 or less, respondents (seven of nine) felt that multiple applications for a property were unlikely.

Outcome: Regulation 6 has effect to give the Area Agency discretion as to whether to approve any application. Given this, and that multiple applications are in any event unlikely, no amendment has been made to the Regulations.

Q7. Overall, do you agree with the new Regulations and/or sub sections that are proposed?

The majority of respondents (five of nine) agreed with the Regulations. Where respondents stated that they did not agree (two of nine) with the Regulations they stated reasons pertaining to the Fuel Poverty Strategy, which was not the purpose of this consultation.

Outcome: Regulations have been amended where identified above.

Q8. We have asked a number of specific questions. If you have any related issues which we have not specifically addressed, please use this space to tell us about them:

Many respondents wished to see the Regulations require the area agency to collaborate with other organisations. One respondent wished to see flexibility around the qualifying SAP score to allow properties that fall just above 38 to qualify. Many respondents expressed views about the underlying strategy, which was not the purpose of this consultation.

Outcome: The Regulations are not the appropriate place to impose collaboration on the area agency. This will be taken forward in the contract agreement between the Assembly Government and the appointed area agency and is reflected in performance indicators related to the development of a referral network.

The performance of the scheme will be reviewed alongside any review of the Regulations to consider the on-going appropriateness of the qualifying SAP score.

10. Post implementation review

The Regulations are required for a new scheme. The new scheme will be subject to review at six and twelve months (annually thereafter). The regulations will be reviewed alongside scheme delivery. The Regulations will also be reviewed if there are any changes to the benefits system (such as the UK Governments proposed changes to the benefits system from 2013).

Annex 1

Regulatory Impact Assessment

What is the Problem under Consideration

1. The Welsh Assembly Government is committed to eradicating fuel poverty in Wales, with the Home Energy Efficiency Scheme (HEES) being its main vehicle for assisting fuel poor households. The HEES scheme is to be re-procured and re-branded as part of the Assembly Government's new Fuel Poverty Strategy.

2. This Impact Assessment looks at the new regulation for Home Energy Efficiency Schemes in Wales. It should be noted that the proposed options are indicative only. Those bidding to run the new scheme have been asked to estimate, using their expertise, the appropriate expenditure amount per house. They have been asked to provide these figures in the context of a number of considerations:

    - Ability to cover hard to treat, rural properties
    - Cost effectiveness of the measures

3. This assessment looks at a number of different 'expenditure per house' proposals to help inform policy makers when deciding on the bid that best addresses the context set above and broader objectives set out below. Hence it is unclear at this stage as to what the specific 'expenditure per house' will be and the analysis presented in this assessment should not be considered as final, but as an indication of what sort of scheme would best cover the social (equity), environmental and economic objectives of the Assembly Government. The final range or maximum investment levels will change as the contract is finalised.

4. In addition, please note that these figures will also change over time as the evidence used to estimate energy and CO_2e savings improves over time.

5. The overall objective of the new programme is to remove as many households as economically practical from fuel poverty or as a minimum to mitigate the risk of fuel poverty in line with the Assembly Government policy objectives through the procurement of an economic and sustainable contract.

6. This economic assessment considers a number of policy options which aim to address the following two objectives:

- Fuel Poverty – improve the energy performance of the housing stock, targeting the groups at the highest risk of fuel poverty. This means targeting those in the most inefficient properties (EPC rating F and G) and those on the lowest incomes (on means tested benefits)[1]. By targeting the scheme on this 'hard to treat' niche, it is designed to not be in competition with other schemes, such as CERT.
- 'One Wales' Climate Change target of cutting GHG emissions by 3% per year

7. The challenges of affordable energy (fuel poverty) and Climate Change are being addressed together. As a result of addressing these two options it is also hoped that the options will help to make the most of economic opportunities in the new 'green economy'.

8. By far the largest potential impact for the policies discussed in this analysis relate to the fuel poor and energy benefits. The analysis to follow in this report highlights that roughly two thirds of the economic benefits come from energy savings. Fuel poverty is defined as having to spend more than 10% of net income (including housing benefit) on all household fuel use to maintain a satisfactory heating regime.

9. The most recent Assembly Government published data on the number of households in fuel poverty in Wales related to 2004 *(Living in Wales 2004 Property Survey)*[2]*.* In 2004, it was estimated that:

    - 134,000 (11%) households in Wales were living in fuel poverty
    - 85% of those households could be classed as vulnerable (i.e. households with a member aged 60 or over, with any dependent children living under 16, or disabled or with long-term illness)
    - 115,000 fuel poor households (85%) were in the private sector (96,000 in owner occupied sector and 19,000 in the private rented sector)
    - 19,000 fuel poor households were in the social housing sector (15%)

10. It is also estimated that in 2006[3]:

    - 72,000 fuel poor households lived in pre-1919 properties which will have solid walls
    - 82,000 lived in off-gas properties
    - 64,500 had un-insulated cavities
    - 30,500 had no central heating

11. The options outlined as part of this assessment have the potential to bring many of these households out of fuel poverty and tackle climate change. In

[1] Living in Wales 2004 property survey data suggests that around half of all households in this group are likely to be in fuel poverty. Data for 2008 is due soon, and it is expected that the proportion of households estimated to be in fuel poverty in this group will rise.
[2] 2008 figures due shortly
[3] Estimates generated by applying 2004 proportions of households with particular characteristics to 2006 levels of fuel poverty.

2004, 71% of fuel poor households lived in homes built before 1919, compared to 7% in homes built after 1964, highlighting the need to target the existing older housing stock.

12. The high prevalence of fuel poverty amongst households using fuels other than mains gas means that it is essential to offer appropriate solutions for hard to treat, rural properties under the new fuel poverty scheme. The incumbent scheme has often been publicly criticised for its failure to provide appropriate solutions in rural areas. Table 1 highlights the estimated levels of fuel poverty against households using different types of fuel as their main source of heating in 2004.

Table 1: Estimated levels of fuel poverty against households using different types of fuel as their main source of heating in 2004.

Main heating fuel	Estimated proportion in fuel poverty	Estimated number in fuel poverty
Mains gas	Around 5%	Around 50,000
LPG	Around 55%	Around 10,000
Oil	Around 20%	Around 20,000
Solid fuel	Around 40%	Around 20,000
Electricity	Around 35%	Around 30,000

13. Climate change results from the negative externalities caused by GHG emissions. The housing stock represents 27 per cent of all UK CO_2e emissions and 17% of Welsh CO_2e emissions. As the Welsh Housing Stock is made up predominantly of housing over 50 years old, it is key that any policy aimed at improving the energy efficiency and reducing GHG emissions from the Welsh housing stock covers the existing housing stock.

Why does the Government need to intervene?

14. Policy design is based on market failure and in this case we are referring particularly to the market failures associated with public goods, externalities and inequality. In simple terms, the market may not always allocate scarce resources efficiently in a way that achieves the highest total social welfare.

15. Market failure can be caused by the existence of inequality throughout the economy. Wide differences in income and wealth between different groups within our economy lead to a gap in living standards between those living comfortably and those experiencing poverty, and particularly relevant to this assessment, fuel poverty.

16. Many cost effective energy efficiency measures exist in the Household Sector, but they may require Government intervention to overcome barriers to uptake including:

- Lack of information – householders do not have a full understanding of all the energy efficiency measures that could be used to decrease their bills and save carbon.
- Limited time horizons – households are generally unwilling to accept long loan periods for energy efficiency because of the likelihood that they will move before they can recoup the costs of their loan.
- Access to credit – credit availability does not reflect the risk associated with recouping the costs of energy efficiency measures, but the wealth of the householder. As a result some groups in society can not access credit at the appropriate level of risk thus restricting their installation of energy efficiency measures.
- High effective discount rates – households may have higher discount rates than market participants or Government.
- Consumer inertia may prevent consumers taking up worthwhile investment opportunities. Some consumers are highly averse to the risk of loss on an investment and do not appear to value the likelihood of possible benefits in the same way.
- Incentive incompatibility in the rented sector – the owner does not pay the energy bill and occupier has no interest in investing in energy efficiency measures because he or she have moved out before any payback period.

17. The fundamental market failure underlying climate change policies is the social cost of CO_2e emissions analysed in the Stern Review:

    " The climate is a public good: those who fail to pay for it cannot be excluded from enjoying its benefits and one person's enjoyment of the climate does not diminish the capacity of another to enjoy it too. Markets do not automatically provide the right type and quantity of public goods, because in the absence of public policy there are limited or no returns to private investors for doing so; in this case, markets for relevant goods and services (energy, land use, innovation etc) do not reflect the consequences of different consumption and investment choices for the climate. Thus climate change is an example of market failures involving externalities and public goods"

18. Until the market price for energy reflects the social cost of CO_2e emissions, the negative externality of CO_2e emissions necessitates government intervention. Lacking a transparent price for CO_2e emissions, agents will fail to factor in the social cost of CO_2e emissions.

Size of Market

19. The importance of the domestic sector for UK energy demand is apparent from Table 2, showing energy consumption by sector and end use (GHGI)

Table 2: Energy consumption by sector and end use 2006 (Thousand tonnes of oil equivalent)

End Use	Domestic	Services	Manufacturing	Transport	Total	Total excluding Transport
Space Heating	26,112	8,771	3,131	-	38,014	38,014
Water Heating	11,248	1,667	-	-	12,914	12,914
Process Use	-	-	12,927	-	12,927	12,927
Drying/Seperation	-	-	2,520	-	2,520	2,520
Cooking/Catering	1,274	1,949	-	-	3,223	3,223
Heat Total	38,634	12,387	18,577	-	69,598	69,598
Other	6,635	5,939	7,409	59,753	79,736	19,983
Total	45,269	18,326	25,986	59,753	149,334	89,581
% of total attributed to heat	85%	68%	71%	-	47%	78%

UK National Emissions Inventory (2005)

20. Table 3 illustrates domestic energy use by fuel. Gas-fired space heating is the single most important fuel and purpose.

Table 3: Domestic energy consumption by fuel and end use 2006 (thousand tonnes of oil equivalent)

End Use	Gas	Oil	Solid Fuel	Electricity	Total
Space Heating	21,848	2,435	494	1,334	26,112
Water Heating	8,841	812	136	1,458	11,248
Cooking/Catering	679	4	4	588	1,274
Heat Total	31,368	3,251	634	3,381	38,634
Lighting and Appliances	3	-	-	6,632	6,635
Overall Total	31,371	3,251	634	10,013	45,269

21. CO_2e emissions associated with this fuel use appear in Table 3:

Table 4: Domestic emissions by fuel and end use 2006 ($MtCO_2e$)

End Use	Gas	Oil	Solid Fuel	Electricity	Total

Space Heating	47	6.9	1.7	8.7	64.4
Water Heating	19	2.3	-	9.5	31.3
Cooking/Catering	1.5	-	-	3.8	5.3
Heat Total	67.5	9.3	2.2	22.1	101
Lighting and Appliances	-	-	-	43.3	43.3
Overall Total	67.5	9.3	2.2	65.4	144.4

22. These tables demonstrate the importance of space and water heating. They emit around 66% of the domestic sector's CO_2e balance.

What Policy Options have been considered?

23. The following Economic Assessment compares the current Home Energy and Efficiency Scheme (HEES) and a number of potential replacement policy options to a 'Do nothing' counterfactual and a 'HEES' counterfactual. The following list summarises each of the options in turn:

    1. Current HEES. Provides loft insulation, cavity wall insulation and 'traditional' heating measures (where the existing system is broken or there is no existing central heating system). Targets householders on qualifying benefits who have children under 16, a long-term illness or disability or over 60. Householders over 80 qualify automatically. Some limited utilisation of alternative funds (i.e. CERT).

    2. Option 1 – Improved advice and referrals. Assumes householders provided with a greater level of advice on benefits, energy use and supplier / tariff switching, and that an effective referral network is set up to refer householders to agencies able to provide support specific to their needs. Targeting as per Option 1.

    3. Option 2 – Improved advice and referrals and improved targeting. Assumes support targeted at householders on means tested benefits who live in an F or G rated property. This improved targeting is estimated to mean that it is estimated that at least 50% of households targeted are fuel poor[4].

    4. Option 3 – Improved advice and referrals, improved targeting and whole house assessments. Assumes that an assessor recommends the most appropriate measures to reduce energy use in a particular home, and is not restricted to a narrow mix of measures. Targeting as per Option 2. Split into a number of maximum level of investment scenarios:

[4] Analysis of the 2004 Living in Wales property survey data suggests that around 50% of households claiming means tested benefits and who lived in an F or G rated home were likely to be in fuel poverty. Estimates based on the 2008 Living in Wales property survey are due to be published shortly, but it is likely that increases in fuel prices will mean that a higher proportion of this target group are now likely to be in fuel poverty.

a. Option 3a – no maximum level of investment. All measures installed that are needed to bring the property to EPC C (rdSAP 69 or above). NB. Some properties unable to reach this level due to technical issues and a restriction on the most cost-ineffective measures (e.g. solar PV).
b. Option 3b - £12,000 maximum level of investment
c. Option 3c - £7,000 maximum level of investment
d. Option 3d - £5,000 maximum level of investment
e. Option 3e - £5,000 maximum level of investment on the gas network (within 30m of an existing gas main), £8,000 maximum level of investment where mains gas is not available.

What is the preferred option?

24. While the whole house assessment based improvement package with a maximum spend of £5,000 per property (Option 3d) has the highest NPV, this option is not the preferred option for the reasons laid out below. The option with the second highest NPV is considered to be the preferred option (Option 3e). Option 3e scores more highly on the social objectives i.e. fuel poverty than Option 3d. Option 3e provides separate on-gas/ off-gas maximum levels of investment, in order to ensure those harder to treat houses in rural locations are covered by the scheme. This has the second highest NPV at £290 million and fuel bill savings at £250 million, and also ensures that at least one measure is affordable in every household considered.

25. The primary reason 3e is preferred to 3d is that some households in fuel poverty would not receive any support under option 3d. Under Option 3d, with a maximum level of investment of £5,000, nearly 10% of households would potentially not receive any measures. In addition, nearly 20% of households that receive just one measure only receive loft insulation only (available via CERT funding in any case). The lower maximum level of investment for 3d compared to 3e means that a higher number of total households could be helped, however, the proportion of those helped in fuel poverty will likely be lower than for 3e.

26. The lower maximum investment threshold for Option 3d also means that this option would be unable to treat as many hard to treat households in rural locations compared to Option 3e because the more cost effective measures required to remove those in these areas from poverty tend to be more expensive. Hence the lower maximum investment for 3d would mean that many of these houses were not covered.

27. Option 3d is also the worst option in terms of householder's estimated running costs after the Assembly Government funded improvement package. Table 5 shows the estimated running costs after the Assembly Government package measures have been installed. It highlights that there is an important trade off to be made between helping individual

householders and helping vulnerable (those in poverty) people across Wales as a whole.

Table 5: Estimated running costs after Assembly Government funded improvements under different maximum level of investment scenarios

Option	Average running cost after improvements	Lowest running costs after improvements	Highest running costs after improvements
Option 3a: Unrestricted investment	£1,400	£800 (prop. ref. 19)	£4,000 (prop. ref. 17)
Option 3b: Max. £12k investment	£1,500	£860 (prop. ref. 72)	£4,200 (prop. ref. 39)
Option 3c: Max. £7k investment	£1,700	£880 (prop. ref. 36)	£5,300 (prop. ref. 17)
Option 3d: Max. £5k investment	£2,000	£910 (prop. ref. 36)	£5,900 (prop. ref. 39)
Option 3e: Max. £5k / £8k investment	£1,700	£910 prop. ref. 36)	£5,300 (prop. ref. 17)

28. The NPV of Option 3e is likely to be able to be increased by placing limitations on investment to ensure that higher levels of investment were only sanctioned where significant additional benefits could be demonstrated. So for example, investment over say £4,000 would only be allowed if the additional investment resulted in at least an equivalent value of fuel bill savings for the householder. This would increase the NPV of this option, potentially bringing it significantly nearer to the NPV of Option 3d. This will be explored as the detailed options proposed by the bidders for the new fuel poverty scheme are analysed.

Cost Benefit Analysis of Options

29. We have used guidance provided by the Treasury Green Book to carry out the following Cost Benefit Analysis (CBA) and the DECC guidance linked to the Treasury Green book to value energy use and emissions of Greenhouse Gases (GHGs)[5].

[5] Valuation of Energy Use and Green House Gases (GHG) Emissions for Appraisal and Evaluation, DECC 2010

30. Each option was considered relative to a 'baseline' level in order to evaluate the impacts of each option relative to 'doing nothing'. However, since the Home Energy and Efficiency Scheme (HEES) is already in place (and is now effectively the 'do nothing' option), we have also analysed the costs and benefits associated with each option relative to a HEES baseline.

31. Emissions have been disaggregated in to traded sector and non-traded sector emissions. The EU Climate and Energy Package (December 2008), introduced separate emissions reduction targets for the traded sector (those covered by the EU Emissions Trading Scheme), and the non-traded sector (that is those emissions not covered by the EU ETS). Emissions in the two sectors are essentially different commodities. Hence they are valued differently. Emissions in the traded sector are valued at the Traded Price of Carbon (TPC), whereas changes in emissions in the non-traded sector are valued at the Non-Traded Price of Carbon (NTPC). These traded and non-traded prices are currently different, but it is assumed that they will converge and become equal in 2030 and subsequently follow the same trajectory. This is based off the assumption that there will be a functioning global carbon market by 2030.

32. Table 6 shows how we have mapped the different fuel types in to the traded and non-traded sectors.

Table 6: Attribution of emissions to the traded and non-traded sectors

Emissions from	Sector
Electricity	Traded
Gas	Non-traded (traded is used by large power generators)
Fuel/heating oil	Non-traded
Transport fuel	Non-traded
Coal	Non-traded (traded is used by large power generators)
Biomass	Non-traded

33. The economic assessment ranks the policy options by their Net Present Values (NPV's). The NPV expresses the future value of costs and benefits in present terms by discounting them. The costs in this economic assessment refer to the costs of implementing the scheme, whilst the quantifiable benefits include energy use savings, CO_2e savings and air quality impacts.

34. Table 7 Highlights the total NPV, Present Value Benefits (PVB), Present Value Costs (PVC) and CO_2e saved versus a 'Do Nothing' baseline. It shows that the NPV of each option is positive - indicating that each option for improving the energy efficiency and carbon performance of existing dwellings in Wales is estimated to generate an overall benefit relative to doing nothing (i.e. in all cases, the benefits of undertaking the target

improvement outweigh the costs). It suggests that 100% of your emissions are abated cost-effectively. The higher the NPV, the higher the overall social benefits of implementation.

Table 7 'Do Nothing' Baseline: Summary of NPV and CO_2e savings

Target Options	Total NPV	PVB	PVC	Total Carbon Saved (tonnes)
Do Nothing'	0	0	0	0
HEES	£52,314,831	£145,776,415	£93,461,584	-544,468
Option 1	£106,478,035	£199,939,619	£93,461,584	-917,211
Option 2	£242,277,957	£335,739,541	£93,461,584	-1,269,663
Option 3a	£91,130,537	£184,592,121	£93,461,584	-895,526
Option 3b	£168,134,635	£261,596,219	£93,461,584	-1,156,441
Option 3c	£216,172,167	£309,633,751	£93,461,584	-1,318,123
Option 3d	£551,270,392	£644,731,976	£93,461,584	-2,627,450
Option 3e	£289,598,860	£383,060,444	£93,461,584	-1,580,312

35. The NPV ranks the options as follows and this document attempts to explain some of the key reasons for the differences between the key policy options under consideration:

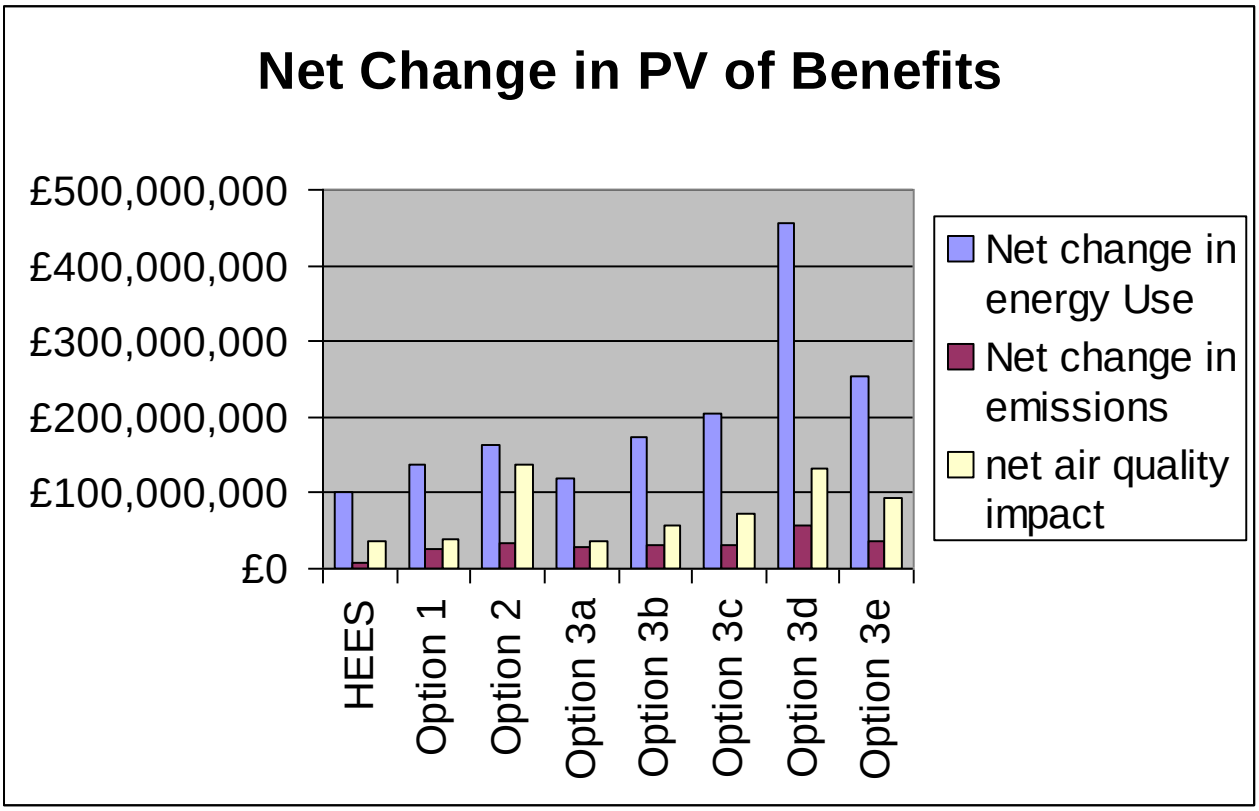
    1. 3d
    2. 3e
    3. 2
    4. 3c
    5. 3b
    6. 1
    7. 3a
    8. HEES

36. Table 7 highlights that the costs are the same for each of the options. Hence, all the NPV's presented in this analysis are driven by the PVB. The PVB and hence NPV is made up of three distinct benefits:

    1. Net Change in Energy
    2. Net change in CO_2e emissions
    3. Air Quality Impacts

37. Graph 1 highlights how each of these three benefits impacts on the PVB of each of the options. It highlights that for the majority of policy options, the majority of the monetary benefits come from the energy bill savings. Approximately two thirds of PVB is made up of energy bill savings. Air quality benefits make up roughly twenty percent of PVB, with emissions reductions making up the final ten to fifteen percent or so.

Graph 1: Construction of PVB for each of the options



38. Table 8 highlights the specific contributions to PVB from each of the three benefits.

Table 8: Contribution of each benefit to PVB

Target Options	Energy use as proportion of PV Benefits	Emissions as proportion of PV Benefits	Net Air Quality as proportion of PV Benefits
HEES	0.69	0.06	0.25
Option 1	0.68	0.12	0.19
Option 2	0.48	0.10	0.41
Option 3a	0.65	0.15	0.20
Option 3b	0.66	0.12	0.22
Option 3c	0.66	0.10	0.23
Option 3d	0.71	0.09	0.21
Option 3e	0.66	0.09	0.24

39. Tables 9 and 10 show the proportion of net benefits attributed to the traded and non-traded sectors. Both tables also show the proportion of traded and non-traded sector benefits as a percentage of the total PVB. It is clear that

benefits attributable to the traded sector make up the majority of PVB, although this does vary between roughly 50% for some options to over 90% for other options. Hence, the majority of benefits are attributable to saving households electricity.

Table 9: PVB in Traded Sector

Target Options	Net change in energy Use	Net change in emissions	net air quality impact	PV benefits	Proportion of Traded Sector benefits to PVB
HEES	£121,203,320	£13,362,594	£1,797,372	£136,363,286	93.5%
Option 1	£121,633,145	£13,409,982	£1,803,746	£136,846,873	68.4%
Option 2	£165,182,148	£18,211,234	£2,449,551	£185,842,934	55.4%
Option 3a	£85,867,908	£9,466,886	£1,273,369	£96,608,163	52.3%
Option 3b	£161,050,685	£17,755,743	£2,388,284	£181,194,712	69.3%
Option 3c	£204,677,955	£22,565,623	£3,035,250	£230,278,829	74.4%
Option 3d	£477,811,651	£52,678,452	£7,085,658	£537,575,760	83.4%
Option 3e	£265,552,663	£29,277,024	£3,937,985	£298,767,672	78.0%

Table 10: PVB in Non-Traded Sector

Target Options	Net change in energy Use	Net change in emissions	net air quality impact	PV benefits	Proportion of Non-Traded Sector benefits to PVB
HEES	-£20,586,656	-£4,341,426	£34,341,211	£9,413,129	6.5%
Option 1	£15,127,601	£11,546,440	£36,418,705	£63,092,746	31.6%
Option 2	-£2,630,642	£16,712,263	£135,814,986	£149,896,607	44.6%
Option 3a	£33,720,009	£18,788,012	£35,475,938	£87,983,958	47.7%
Option 3b	£12,659,365	£12,800,365	£54,941,778	£80,401,507	30.7%
Option 3c	£1,181,435	£9,766,655	£68,406,833	£79,354,923	25.6%
Option 3d	-£22,170,320	£3,515,412	£125,811,123	£107,156,216	16.6%
Option 3e	-£11,012,675	£7,102,755	£88,202,692	£84,292,772	22.0%

40. Table 11 highlights the proportional breakdown of PVB by the traded and non-traded sector. A positive number indicates a positive contribution towards PVB, whilst a negative number suggests a negative contribution. For instance for option 3e, the non-traded energy contribution is negative, suggesting that this option actually leads to a rise in energy use in the non-traded sector (fuel switching) and hence has a negative impact on energy benefits (bill savings). As touched on above, traded sector energy benefits contribute the most towards PVB of all the options. However there is a difference of nearly 40% between some options. With the exception of option 3a, contributions towards PVB from emissions savings are also larger in the traded sector than the non-traded sector. 3a is an exception, because

it has the largest proportion of energy savings in the non-traded sector, which has a higher carbon price than the traded sector at present. Almost all air quality benefits are attributed to the non-traded sector for all options, given that the majority of these benefits come from reducing coal use. This will be explained in more detail below.

Table 11: Proportion of PVB for each option

	Energy		Emissions		Air Quality	
Target Options	Non-Traded	Traded	Non-Traded	Traded	Non-Traded	Traded
HEES	-14.1%	83.1%	-3.0%	9.2%	23.6%	1.2%
Option 1	7.6%	60.8%	5.8%	6.7%	18.2%	0.9%
Option 2	-0.8%	49.2%	5.0%	5.4%	40.5%	0.7%
Option 3a	18.3%	46.5%	10.2%	5.1%	19.2%	0.7%
Option 3b	4.8%	61.6%	4.9%	6.8%	21.0%	0.9%
Option 3c	0.4%	66.1%	3.2%	7.3%	22.1%	1.0%
Option 3d	-3.4%	74.1%	0.5%	8.2%	19.5%	1.1%
Option 3e	-2.9%	69.3%	1.9%	7.6%	23.0%	1.0%

41. This report now examines each of the three contributors to PVB in turn.

Net Change in Energy

42. As table 8 highlighted, the majority of PVB is made up of net energy benefits. Table 12 shows the breakdown of energy benefits by fuel type. A positive number highlights a net reduction in the use of that fuel type i.e. all the electricity figures are positive, suggesting that there are net savings for fuel bills by reducing electricity useage in all options. A negative number suggests the use of that fuel type has increased. Annex A gives more details of the estimated net change in each of the fuel types and the energy prices used in the DECC/IAG tool.

43. What is clear is that fuel switching is relevant to the overall net energy benefits. Some options switch households from one fuel type to another (this may be driven by location, long term running costs and cost effectiveness considerations) which can mean that the use of some fuel types actually increases for some of the options.

Table 12: Present value of energy benefits by fuel type

	Electricity	Gas	Coal	Oil	Total
HEES	£121,203,320	-£26,004,760	£16,031,148	-£10,613,044	£100,616,664
Option 1	£121,633,145	£3,924,132	£16,155,099	-£4,951,631	£136,760,745
Option 2	£165,182,148	-£44,141,534	£60,750,561	-£19,239,669	£162,551,506
Option 3a	£85,867,908	£8,318,286	£14,130,471	£11,271,251	£119,587,916
Option 3b	£161,050,685	-£5,497,072	£24,328,043	-£6,171,607	£173,710,050
Option 3c	£204,677,955	-£16,168,764	£30,935,232	-£13,585,034	£205,859,390
Option 3d	£477,811,651	-£109,439,269	£51,539,188	£35,729,761	£455,641,330
Option 3e	£265,552,663	-£31,722,648	£40,155,243	-£19,445,270	£254,539,988

44. The key energy benefits originate from reducing electricity useage. This is highlighted in table 13. This table shows the contribution each fuel type makes towards the total energy benefits shown in table 10. Some options show a percentage larger than 100%, indicating that benefits from reducing this particular fuel type negate the reduction in benefits from increasing the use of another fuel type. Some options increase the use of gas (due to fuel switching) and hence gas can have a negative impact on net energy benefits. All the options show positive benefits from reducing the use of coal, but similarly to gas, some options entail switching the householder to oil and this means oil has a negative impact on the net energy benefits for some of the policy options.

Table 13: Contribution of each fuel type towards the net energy benefit of each option

	Electricity	Gas	Coal	Oil
HEES	120.5%	-25.8%	15.9%	-10.5%
Option 1	88.9%	2.9%	11.8%	-3.6%
Option 2	101.6%	-27.2%	37.4%	-11.8%
Option 3a	71.8%	7.0%	11.8%	9.4%
Option 3b	92.7%	-3.2%	14.0%	-3.6%
Option 3c	99.4%	-7.9%	15.0%	-6.6%
Option 3d	104.9%	-24.0%	11.3%	7.8%
Option 3e	104.3%	-12.5%	15.8%	-7.6%

Net change in CO_2e emissions

45. The benefits from CO_2e savings from the policy options contribute around ten to fifteen percent towards total PVB (as highlighted in table 8). This makes up the smallest contribution towards PVB, after energy and air quality benefits. Table 14 highlights how the CO_2e benefits are distributed across the fuel types.

Table 14: Present value of CO_2e benefits by fuel type

	Electricity	Gas	Coal	Oil	Total
HEES	£13,362,594	-£11,678,181	£11,754,423	-£4,417,668	£9,021,168
Option 1	£13,409,982	£1,762,244	£11,845,307	-£2,061,111	£24,956,422
Option 2	£18,211,234	-£19,823,018	£44,543,772	-£8,008,491	£34,923,497
Option 3a	£9,466,886	£3,735,564	£10,360,801	£4,691,646	£28,254,898
Option 3b	£17,755,743	-£2,468,617	£17,837,906	-£2,568,925	£30,556,107
Option 3c	£22,565,623	-£7,261,046	£22,682,456	-£5,654,755	£32,332,278
Option 3d	£52,678,452	-£49,146,834	£37,789,772	£14,872,474	£56,193,864
Option 3e	£29,277,024	-£14,245,962	£29,442,790	-£8,094,072	£36,379,779

46. Table 8 highlighted how CO_2e emission savings contribute towards total PVB and how this could be disaggregated by the traded and non-traded sector. It highlighted that the majority of the emission contributions to PVB originated from the traded sector i.e. from electricity (with the exception of option 3a). However, at first glance table 12 shows that for the majority of options, the monetary value of CO_2e savings is just as large for coal (a non-traded fuel) as it is for electricity. One reason for this is that coal also has a relatively high CO_2e conversion factor, as does electricity. In addition the cost of carbon is much higher for non-traded fuels (such as coal) than traded fuels (such as electricity). However, the reason that traded fuels make up the largest proportion of monetised CO_2e benefits in total is that for several options some non-traded fuels (gas and oil) actually have a negative contribution towards total monetised CO_2e benefits. This is because for some options, fuel switching leads to an increase in their use.

47. Table 15 highlights the above point more clearly. It shows the contribution each fuel type makes towards total CO_2e benefits. The contributions from electricity to CO_2e benefits are a lot less than the electricity contributions towards the energy savings, with the contributions from coal considerably higher. As touched on above, the conversion factors used to quantify the CO_2e emissions for each of the fuel types has an impact here. Electricity and coal have the highest conversion factors. Coal is approximately three quarters of the electricity conversion factor, oil roughly two thirds and gas less than half of the electricity conversion factor.

Table 15: Contribution of each fuel type towards the CO_2e benefit of each option

	Electricity	Gas	Coal	Oil
HEES	148.1%	-129.5%	130.3%	-49.0%
Option 1	53.7%	7.1%	47.5%	-8.3%
Option 2	52.1%	-56.8%	127.5%	-22.9%
Option 3a	33.5%	13.2%	36.7%	16.6%
Option 3b	58.1%	-8.1%	58.4%	-8.4%
Option 3c	69.8%	-22.5%	70.2%	-17.5%
Option 3d	93.7%	-87.5%	67.2%	26.5%
Option 3e	80.5%	-39.2%	80.9%	-22.2%

Net Change in Air Quality Impacts

48. The benefits from Air Quality Impacts contribute around twenty percent towards total PVB of the various policy options (see table 8). The air quality impacts are calculated by applying a marginal air damage cost to the energy decrease/increase. Table 14 highlights the Present value of air quality impacts. A positive number once again suggests a benefit, whilst a negative number suggests a cost i.e. a rise in that fuel type as a result of the policy option caused by fuel switching.

Table 16: Present Value of Air Quality Impacts

	Electricity	Gas	Coal	Oil	Total
HEES	£1,797,372	-£509,174	£37,370,426	-£2,520,041	£36,138,583
Option 1	£1,803,746	£76,537	£37,513,362	-£1,171,194	£38,222,451
Option 2	£2,449,551	-£861,952	£141,232,979	-£4,556,041	£138,264,538
Option 3a	£1,273,369	£161,493	£32,660,779	£2,653,666	£36,749,307
Option 3b	£2,388,284	-£107,249	£56,509,234	-£1,460,208	£57,330,062
Option 3c	£3,035,250	-£315,826	£71,940,658	-£3,217,999	£71,442,083
Option 3d	£7,085,658	-£2,131,411	£119,503,780	£8,438,755	£132,896,781
Option 3e	£3,937,985	-£619,968	£93,431,249	-£4,608,590	£92,140,677

49. It is clear from table 16 that coal is responsible for the majority of the air quality benefits. This is because coal has considerably higher avoided cost of air quality impacts. The marginal air damage cost for coal is around one hundred and seventeen times as large as gas, roughly thirty nine times as large as electricity and seven times as large as oil.

50. Table 17 highlights exactly how much of the air quality benefits are influenced by the different fuel types. The positive impact of reducing coal useage on air quality is very evident.

Table 17: Contribution of each fuel type towards the Air Quality Impacts of each option

	Electricity	Gas	Coal	Oil
HEES	5.0%	-1.4%	103.4%	-7.0%
Option 1	4.7%	0.2%	98.1%	-3.1%
Option 2	1.8%	-0.6%	102.1%	-3.3%
Option 3a	3.5%	0.4%	88.9%	7.2%
Option 3b	4.2%	-0.2%	98.6%	-2.5%
Option 3c	4.2%	-0.4%	100.7%	-4.5%
Option 3d	5.3%	-1.6%	89.9%	6.3%
Option 3e	4.3%	-0.7%	101.4%	-5.0%

Cost Effectiveness

51. Table 18 show the cost effectiveness (CE) and CO_2e saved of each option. Each of the target options has a net positive impact on CO_2e emissions, indicated by a negative figure. Each of the target options also has a negative CE figure, representing a net social benefit per tonne of CO_2e. A negative CE suggests that these measures save money as well as CO_2e (for example, better insulating homes saves on fuel bills). A positive CE would represent a net cost per tonne of CO_2e. In order to assess the cost effectiveness of the policy options we need to compare it to the carbon cost comparator (a proxy for the relevant carbon price). A CE below the cost comparator would imply cost effectiveness, whilst a figure above the cost comparator would imply the policy is cost ineffective. All the options presented in 16 are lower than their cost comparator, apart from the non-traded component of HEES. The traded sector Cost Comparator is £21. The Non-traded sector Cost comparator is £43.

Table 18 'Do Nothing' Baseline: Summary of Carbon Savings and Cost Effectiveness for the Traded Sector and Non-Traded Sector

Target Options	Total Carbon Saved In Non-Traded Sector (tonnes)	Non-Traded Cost Effectiveness (£/Co2e)	Total Carbon Saved in Traded Sector (tonnes)	Traded Cost Effectiveness (£/Co2e)	Total Carbon Saved
HEES	101,228	560	-645,696	-60	-544,468
Option 1	-269,226	-353	-647,985	-144	-917,211
Option 2	-389,676	-579	-879,987	-255	-1,269,663
Option 3a	-438,076	-165	-457,451	-179	-895,526
Option 3b	-298,463	-491	-857,978	-168	-1,156,441
Option 3c	-227,727	-906	-1,090,396	-178	-1,318,123
Option 3d	-81,968	-6,683	-2,545,482	-196	-2,627,450
Option 3e	-165,613	-1,706	-1,414,699	-184	-1,580,312

52. Some caution should be noted when interpreting these figures. Those policies with the largest NPV's and/or the highest CO_2e will not necessarily be the policy options with the highest negative CE figures. Box 1 explains this concept in more detail. We use NPV's in this analysis to rank the policy options. Cost effectiveness is used as a compliment to this analysis.

Box 1: Cost Effectiveness Indicator

The cost effectiveness indicator of a policy is derived by dividing the NPV excluding the carbon benefits of the traded or non-traded sector (depending on the sector of interest) by the tonnes of carbon saved in the traded or non-traded sector (expressed as a change and therefore a negative number).

Cost Effectiveness (£/tCo2e) = NPV – PVB carbon (either traded or non-traded sector)

$$CostEffectiveness(£/tCo2e) = \frac{NPV - PVBcarbon(eithertradedornontraded}{-(Totalcarbonsavedeither\ \text{int}\ hetradedornontraded\ \text{sec}tor(tonneofCo2e)}$$

It is important to note the sign convention. A positive number of the cost effective indicator represents a net cost per tonne of Co2, whilst a negative number is a net benefit of Co2e. This is different from the standard convention where if a policy has a positive NPV then it has a net benefit.

In order to identify whether a policy is cost effective, the cost effectiveness indicator should be compared against the traded or non-traded sector cost comparator defined as the weighted average discounted traded or non-traded sector cost of carbon.

If the cost effectiveness indicator (a proxy for the net social cost of the policy) is lower than the relevant comparator (a proxy for the relevant carbon price) then 100% of the emissions are being abated in a cost-effective way or the policy is cost effective. If the cost effectiveness indicator is higher than the relevant comparator then 0% of the emissions are being abated cost effectively.

The following table highlights an example:

Policy	A	B	C
NPV	10	10	10
Carbon Savings	-2	-4	-6
Cost Effectiveness	-5	-2.5	-1.5

In this example, each policy has a positive NPV. The most cost effective policy option is option A. This may not seem intuitive at first glance given that option C saves the most carbon. However, we need to remember that a negative cost effective figure actually means society is saving money as well as carbon and the larger the negative number, the more benefits society receives per tonne of carbon saved. For instance, policy A delivers more benefits to society per tonne of carbon saved than policy B or C. For instance, for every tonne of Co2e saved in policy A you get five times as much benefit to society, whilst you only get 2.5 times as much benefits for a tonne of Co2e saved for policy B and 1.5 times for policy C.

53. Table 19 highlights all options versus a 'HEES' baseline. What is clear from this table is all the proposed policy options have a positive NPV compared to the 'HEES' baseline, suggesting that each has a higher benefit to society than the current HEES scheme. Once again options 3d and 3e have the highest NPVs.

Table 19: 'HEES' Baseline: Summary of Costs and Benefits

	Total NPV	PVB	PVC
HEES	£0	£0	£0
Option 1	£54,163,204	£54,163,204	£0
Option 2	£189,963,126	£189,963,126	£0
Option 3a	£38,815,706	£38,815,706	£0
Option 3b	£115,819,804	£115,819,804	£0
Option 3c	£163,857,336	£163,857,336	£0
Option 3d	£498,955,561	£498,955,561	£0
Option 3e	£237,284,029	£237,284,029	£0

54. Table 20 highlights the CO_2e savings for each of the considered options in the traded and non-traded sector. It shows that all the options save more CO_2e than the current HEES scheme.

Table 20: 'HEES' Baseline: Summary of CO_2e saved

Target Options	Total Carbon Saved In Non-Traded Sector (tonnes)	Total Carbon Saved in Traded Sector (tonnes)	Total Carbon Saved
HEES	0	0	0
Option 1	-370,454	-2,290	-372,743
Option 2	-490,904	-234,292	-725,196
Option 3a	-539,304	188,245	-351,059
Option 3b	-399,691	-212,282	-611,973
Option 3c	-328,955	-444,701	-773,656
Option 3d	-183,196	-1,899,787	-2,082,983
Option 3e	-266,841	-769,003	-1,035,845

Sensitivity Analysis

55. The results were sensitivity tested using the DECC toolkit energy and carbon Price scenarios. All the analysis carried out above used the central scenarios for energy and carbon prices as advised in the model. These were then tested against the following; high energy price scenario, low energy price scenario, high carbon price scenario and low carbon price scenario. Details of these prices can be found in Annex A.

56. It is worth noting that the difference between the low energy price scenario and the central scenario is larger than the difference between the high energy price scenario and the central scenario. This means the NPV is much more sensitive under a low price energy scenario than a high price scenario.

57. Table 21 highlights the impact of changing the central scenario for energy to the DECC high and low price scenario for a 'do nothing' baseline. The table highlights that a high energy price scenario improves the NPV, whilst a low energy price scenario puts downward pressure on the NPV. However, the overall results remain the same. Options 3d and 3e have the highest NPV's.

Table 21: Sensitivity testing energy prices for the 'do nothing' baseline

	Central Scenario NPV	High Energy Price Scenario NPV	Low Energy Price Scenario NPV
HEES	£52,314,831	£68,084,833	£14,560,335
Option 1	£106,478,035	£133,953,084	£53,434,637
Option 2	£242,277,957	£262,200,228	£191,362,728
Option 3a	£91,130,537	£117,288,477	£47,567,439
Option 3b	£152,993,859	£201,355,233	£102,426,037
Option 3c	£216,172,167	£253,544,878	£138,169,379
Option 3d	£551,270,392	£635,295,822	£390,030,592
Option 3e	£289,598,860	£333,991,365	£193,767,758

58. Table 22 highlights the impact of changing the central scenario for the carbon price to the DECC high and low price scenarios for a 'do nothing' baseline. It highlights that changing the CO_2e price from the central scenario does not effect the NPV considerably and by much less than a change in the energy price.

Table 22: Sensitivity testing carbon prices for the 'do nothing' baseline

	Central Scenario NPV	High Carbon Price Scenario NPV	Low Carbon Price Scenario NPV
HEES	£52,314,831	£55,551,228	£47,907,559
Option 1	£106,478,035	£117,677,541	£94,103,502
Option 2	£242,277,957	£258,003,178	£224,957,008
Option 3a	£91,130,537	£104,335,273	£77,076,281
Option 3b	£152,993,859	£181,719,594	£152,993,859
Option 3c	£216,172,167	£230,186,567	£200,180,493
Option 3d	£551,270,392	£574,344,183	£523,580,741
Option 3e	£289,598,860	£304,997,047	£271,635,325

59. Table 23 highlights the impact of changing the central scenario for energy to the DECC high and low price scenario for a 'HEES' baseline. As highlighted above, a move to the lower energy price scenario has more impact on the NPV than a move to the higher energy price scenario.

Table 23: Sensitivity testing energy prices for the 'HEES' baseline

	Central Scenario NPV	High Energy Price Scenario NPV	Low Energy Price Scenario NPV
HEES			
Option 1	£54,163,204	£65,868,251	£38,874,302
Option 2	£189,963,126	£194,115,395	£176,802,393
Option 3a	£38,815,706	£49,203,644	£33,007,104
Option 3b	£100,679,028	£133,270,400	£87,865,702
Option 3c	£163,857,336	£185,460,045	£123,609,044
Option 3d	£498,955,561	£567,210,989	£375,470,257
Option 3e	£237,284,029	£265,906,532	£179,207,423

60. Table 24 highlights the impact of changing the central scenario for the carbon price to the DECC high and low price scenarios for a 'HEES' baseline. As highlighted above, the impact of varying the CO_2e price is less than the impact of varying the energy price.

Table 24: Sensitivity testing carbon prices for the 'HEES' baseline

	Central Scenario NPV	High Energy Price Scenario NPV	Low Energy Price Scenario NPV
HEES			
Option 1	£54,163,204	£62,126,313	£46,195,943
Option 2	£189,963,126	£202,451,950	£177,049,449
Option 3a	£38,815,706	£48,784,045	£29,168,722
Option 3b	£100,679,028	£126,168,366	£105,086,300
Option 3c	£163,857,336	£174,635,339	£152,272,934
Option 3d	£498,955,561	£518,792,955	£475,673,182
Option 3e	£237,284,029	£249,445,819	£223,727,766

Potential Impact on 3% target

61. Table 25 highlights the estimated CO_2e savings for each option by 2020 and the estimated potential contribution to the 3% target.

Table 25: Potential impact on 3% target

Target Options	Total Carbon Saved in Traded Sector and Non-traded Sector (MtCo2e)	Total Annual Carbon saved in Traded and Non-Traded Sector (Mt Co2e)	Potential Contribution to 3% Target
HEES	-0.218	-0.024	-0.02%
Option 1	-0.355	-0.039	-0.02%
Option 2	-0.491	-0.055	-0.02%
Option 3a	-0.342	-0.038	-0.02%
Option 3b	-0.449	-0.050	-0.03%
Option 3c	-0.514	-0.057	-0.04%
Option 3d	-1.035	-0.115	-0.07%
Option 3e	-0.620	-0.069	-0.05%

Specific Impact Assessments

62. It is expected that the local nature of the scheme will help encourage local firms to bid for the installation work. In conjunction with other energy efficiency schemes being funded through the Assembly Government (e.g. Arbed) there is the potential to provide incentives for re-skilling in 'energy efficiency installation measures' and help support employment. However, it is not possible at this stage to estimate the net impact on employment.

63. We will be carrying out further research to reach a better understanding of how individual energy efficiency policies have an impact on health.

Equality Impact Assessment

1. Distributional Impacts

64. Measures to save energy and reduce CO_2e are usually paid for by all consumers when the policy is funded by energy companies. The costs and benefits of these measures can therefore fall unequally on different income groups because not everyone will incur the same proportional relative increase in their energy bills.

65. The majority of funding for the new fuel poverty scheme will come directly from Welsh Assembly Government funds. Hence it will ensure that fuel poor households are targeted and hence we do not expect this policy to have a negative distributional impact on bills.

66. Some funding for measures will come from the energy company obligation. This is a policy set by the UK Government. Ensuring that Welsh Assembly Government programmes utilise energy company funding will help to ensure that Wales gets its 'fair share' of activity under the energy company obligations and therefore that Welsh consumers gain as much as they contribute to such schemes.

2. Fuel Poverty

67. Fuel poverty occurs when a household needs to spend more than 10% of its income on fuel to maintain the WHO adequate level of warmth i.e. 21 degrees centigrade in a living room and 18 degrees centigrade in all other rooms. Whether a household is in fuel poverty or not is determined by an interaction of a number of factors, but three specifically stand out. These are:

- The energy efficiency status of the property

- The cost of energy, and
- Household income

68. Since relatively few UK households can afford to spend a substantial proportion of their income on domestic heating, a large percentage of fuel-poor people live in homes that are persistently cold and damp (Liddell, 2008). Living for long periods of time in such cold and damp conditions – rather than being fuel poor per se – is thought to generate significant health risks (see below).

69. Each of the policy options presented in this economic assessment is aimed at removing households from fuel poverty.

70. Fuel poverty cuts across a number of equality groups areas including disability, race and age.

71. In 2004, around 80% of the fuel poor in Wales were in the lower three income deciles and around 40% were living in F&G rated homes. Energy prices rose sharply in 2008 leading to upward pressure on fuel poverty, so the incidence of fuel poverty in each income group is likely to be higher now. Updated fuel poverty estimates for Wales are due to be published later in 2010.

72. The 'current HEES option' and the improved advice and referrals option (Option 1) are thought to have a limited impact on fuel poverty because only 29% of recipients were thought to be in fuel poverty in a review of the scheme in 2005. Half of these fuel poor households were thought to have been removed from fuel poverty as a result of the support provided through the scheme. Option 1 does not change the targeting of the scheme or the level of support to any great extent.

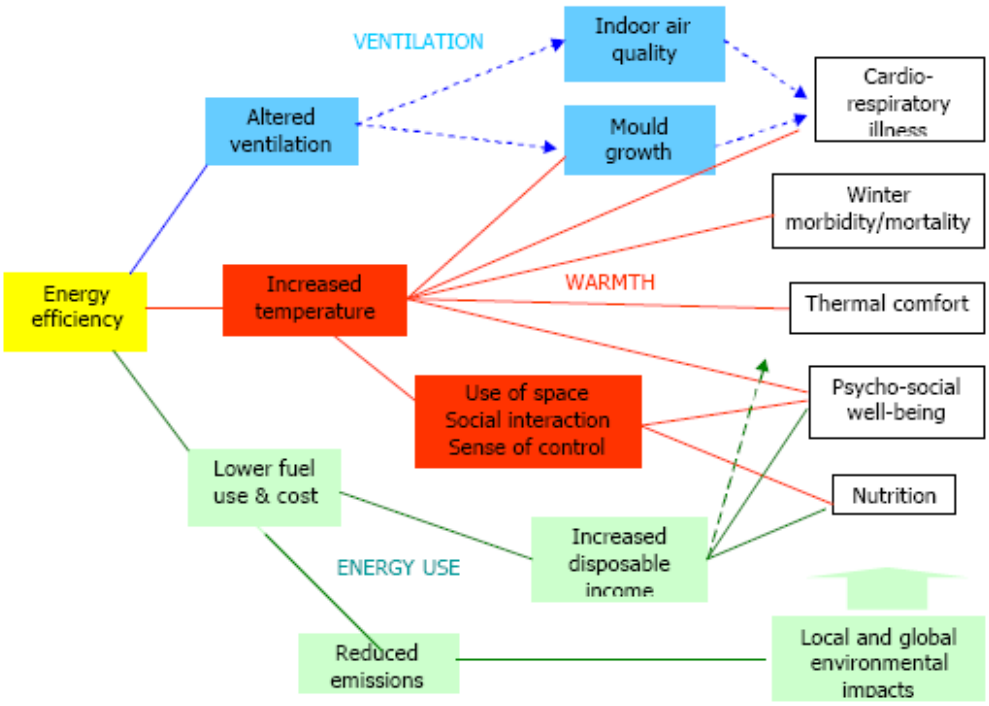
73. The improved targeting option (Option 2) is thought to increase the proportion of households targeted that are estimated to be fuel poor to at least 50%. This estimate is based on 2004 levels of fuel poverty so the real figure is likely to be significantly higher than this. The options that increase the amount spent per household (e.g. Options 3a, 3b, 3c and 3d) are also likely to increase the proportion of households removed from fuel poverty compared to the current scheme.

74. The whole house assessment based improvement package with a maximum level of investment of £5,000 (Option 3d) is estimated to result in the highest fuel bill savings overall (around £450 million). This is because a large number of households can receive Welsh Assembly Government funded measures, as well as a large number receiving CERT funded loft insulation or cavity wall insulation and energy advise.

75. The option with the different maximum levels of investment on-gas compared to off-gas (Option 3e) has the second highest estimated bill saving at around £250 million.

3. Health

76. Diagram 1[6] highlights the complex nature of linking energy efficiency policies with health benefits



77. The relationship between fuel poverty and health is complex.

78. In terms of health benefits, on the counterfactual basis of no activity, measures delivered by the proposed policy options are expected to be accrued to those more vulnerable households, namely the fuel poor, as referred to in the previous section. Focusing on the fuel poor should reinforce the equitable distribution of benefits under the scheme.

79. More broadly, the fuel poor are more likely to suffer as a result of living in poorly heated homes. Many studies have found that poorly heated homes can increase the chances and the frequency of both the young and elderly from suffering from ailments such as Asthma, Bronchitis, Pneumonia and Influenza. As a result of these illnesses, such vulnerable householders could require additional emergency assistance/and or hospitalisation. Illness in the young can affect their development and lead to days off school and work for their parents. There is a cost to the economy as a result of the

[6] Health Impact Evaluation of England's Home Energy Efficiency Scheme (warm front): Summary of Papers, Dec 2005.

health impacts of cold, damp housing, although it is difficult to quantify this link.

80. We are carrying out further research to reach a better understanding of how individual energy efficiency policies have an impact on health.

4. Rural Proofing

81. The characteristics of rural housing are different to those found in urban areas. This, coupled with the generally lower density of properties in rural areas compared to urban, present a different set of challenges to any delivery approach.

82. To date, energy supplier company funded (CERT) measures have tended to focus on the most cost-effective areas, which tend to be dense urban areas. Therefore, rural areas have not been targeted to the same extent. Under the proposed preferred option, WAG funding will specifically target rural areas.

83. We expect the cost of providing advice to be the same as for households in urban areas, but the cost of providing energy improvement measures for homes will be higher in rural areas. This is because many homes will be off the gas grid and/or solid wall properties that will require expensive measures to improve the energy performance of the property and help reduce the fuel bills of the household. .

5. Age Impact

84. The elderly form a large proportion of those in fuel poverty (in 2004 around 40% of fuel poor households in Wales were pensioner households) and as such will continue to be a key target group in the new preferred option, 3d.

85. It is estimated that nearly 40% of households living in F and G rated properties in 2004 in Wales were headed by someone over 60, and that over a third of households headed by someone over 60 were in receipt of a means tested benefit in 2004. According to estimates based on 2004 Living in Wales property survey data, 1 in 10 households headed by someone over 80 would be eligible for the new scheme under the preferred option.

86. Evidence suggests that older people are in general more vulnerable to detrimental health impacts if they are fuel poor or live in homes which are not adequately heated, compared to the average healthy adult of working age.

6. Impact on the disabled and sick

87. Although the preferred option, 3d does not directly target the disabled or long term sick, with 38% of fuel poor households across the UK containing someone who is registered disabled or long term sick, we would expect the policy outlined to improve the quality of life for these households.

7. Gender and race equality

88. It is not anticipated that there will be any disproportionate impact on gender or race as a result of this policy.

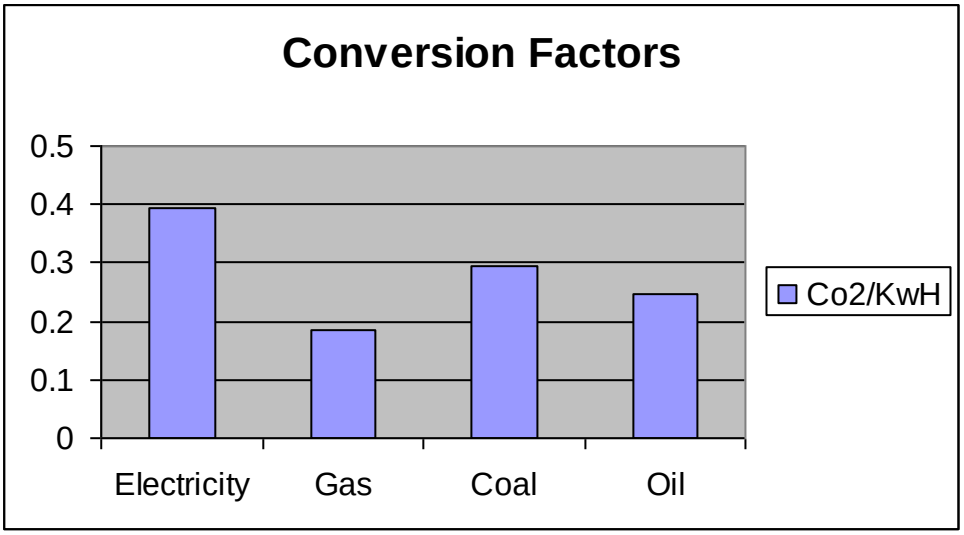
89. We will monitor the gender and ethnic origin of recipients of the new scheme to ensure that these groups are not under-represented.

8. Welsh Language

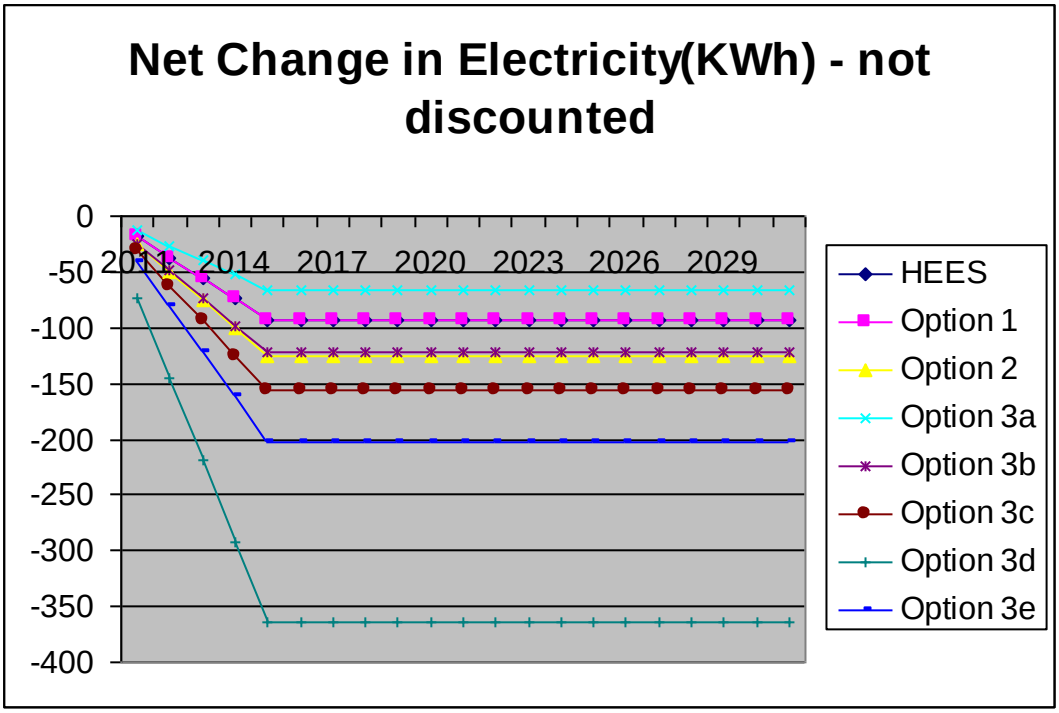
90. While promotion of the language is unlikely as a result of this policy, support for the language is expected to occur/continue.

ANNEX A

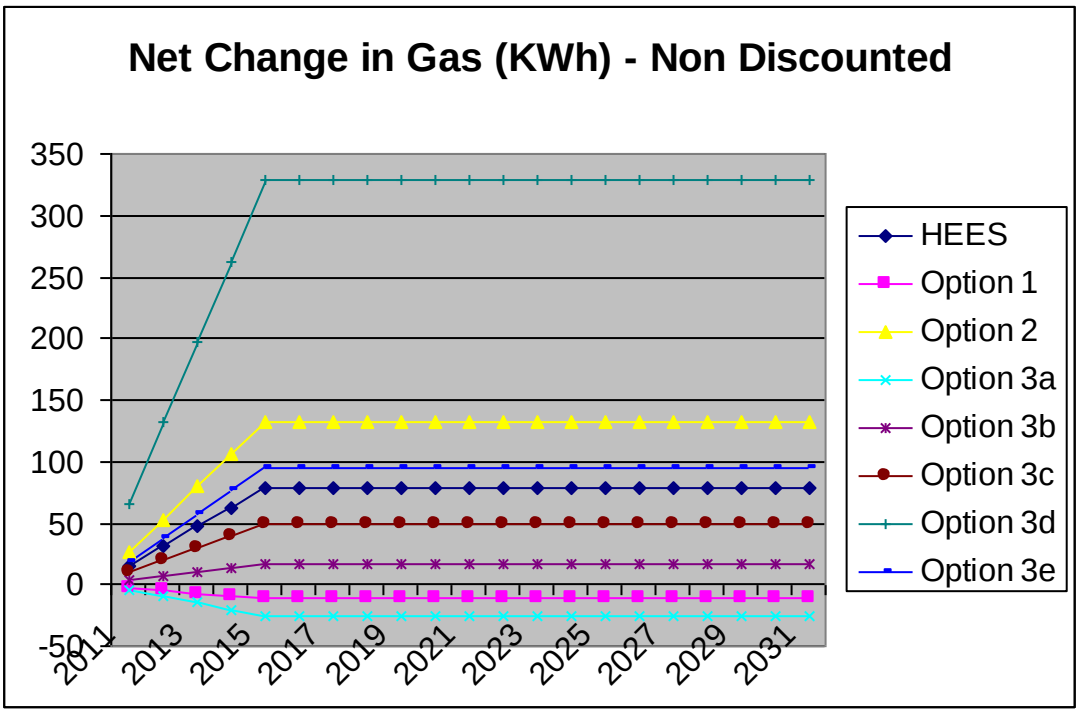
Graph 1: Conversion factors for converting fuel use to CO_2e/KWh



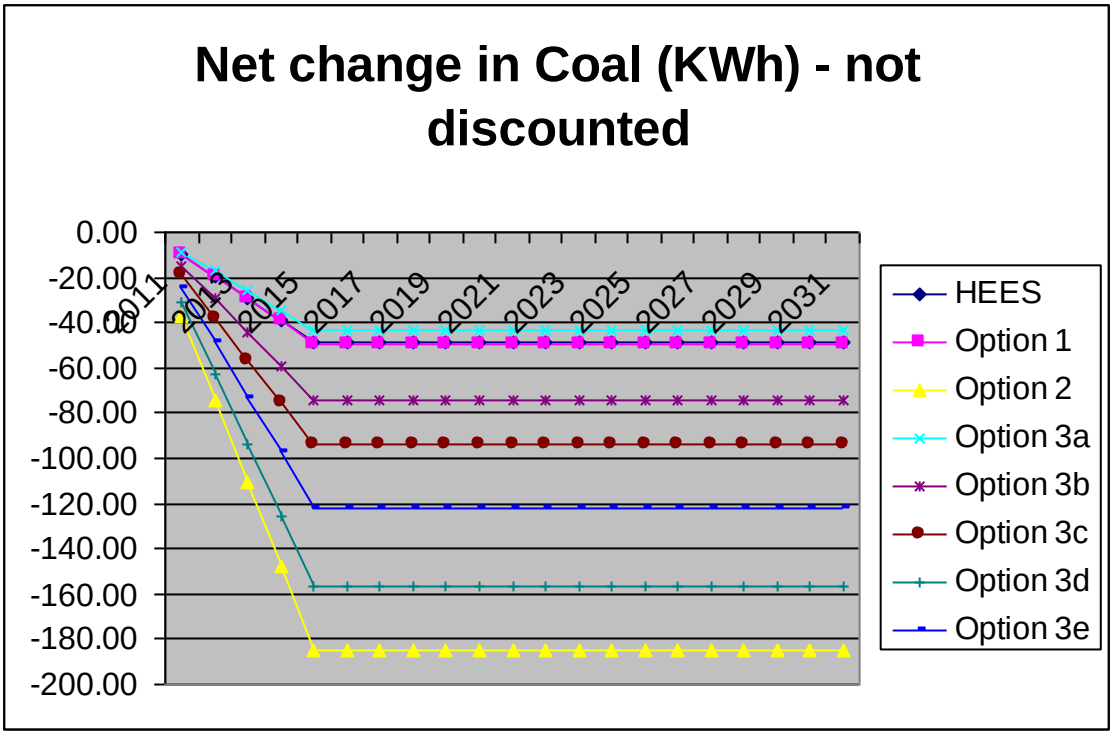
Graph 2a: Net change in Electricity (KWh)



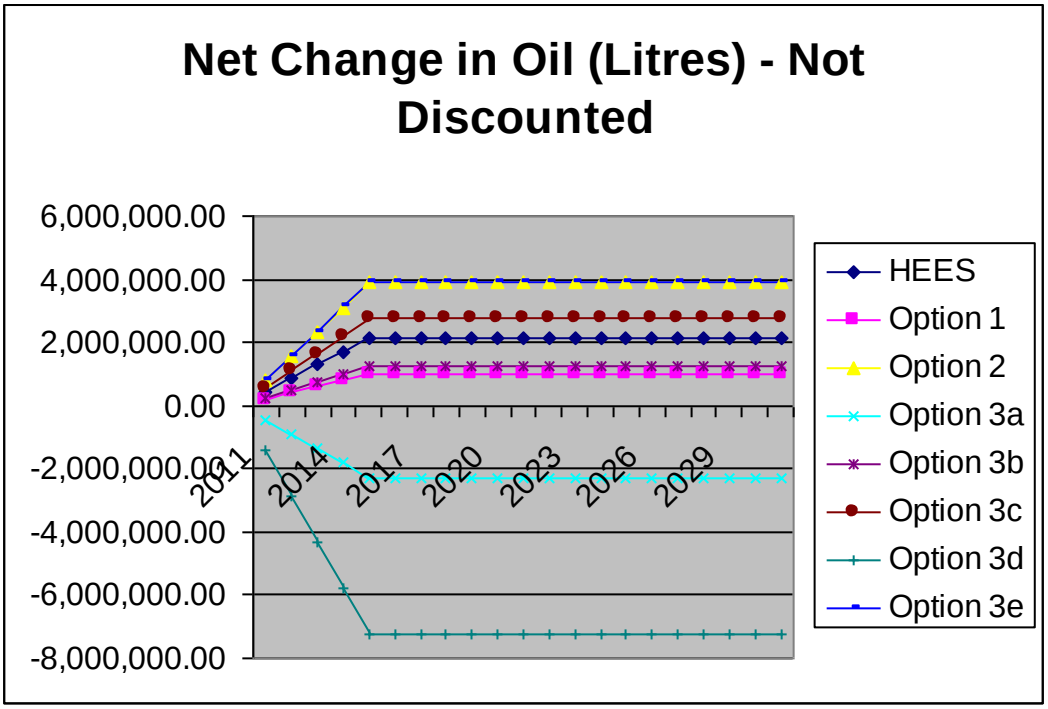
Graph 2b: Net change in Gas (KWh)



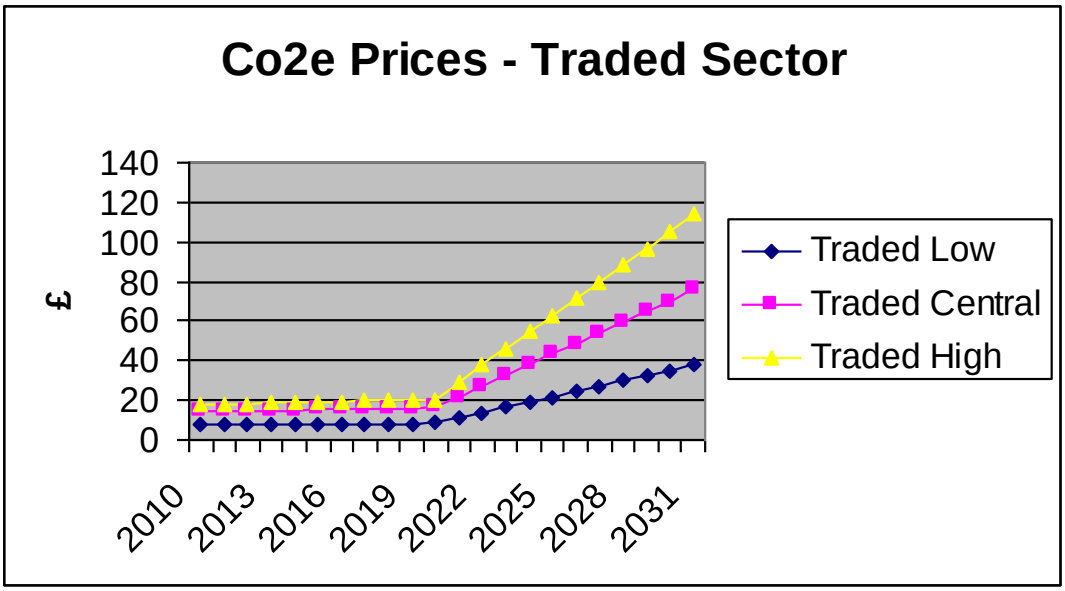
Graph 2c: Net change in Coal (KWh)



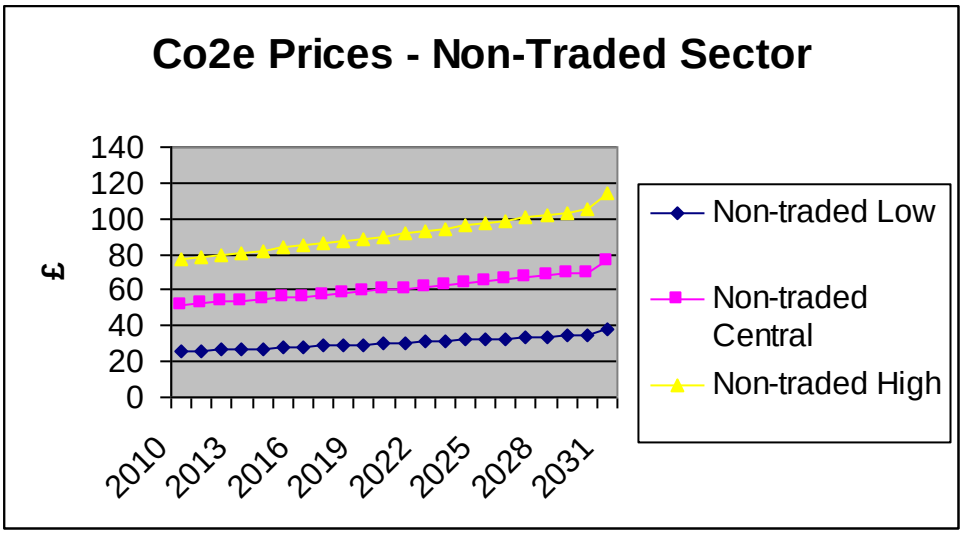
Graph 2d: Net change in Oil (KWh)



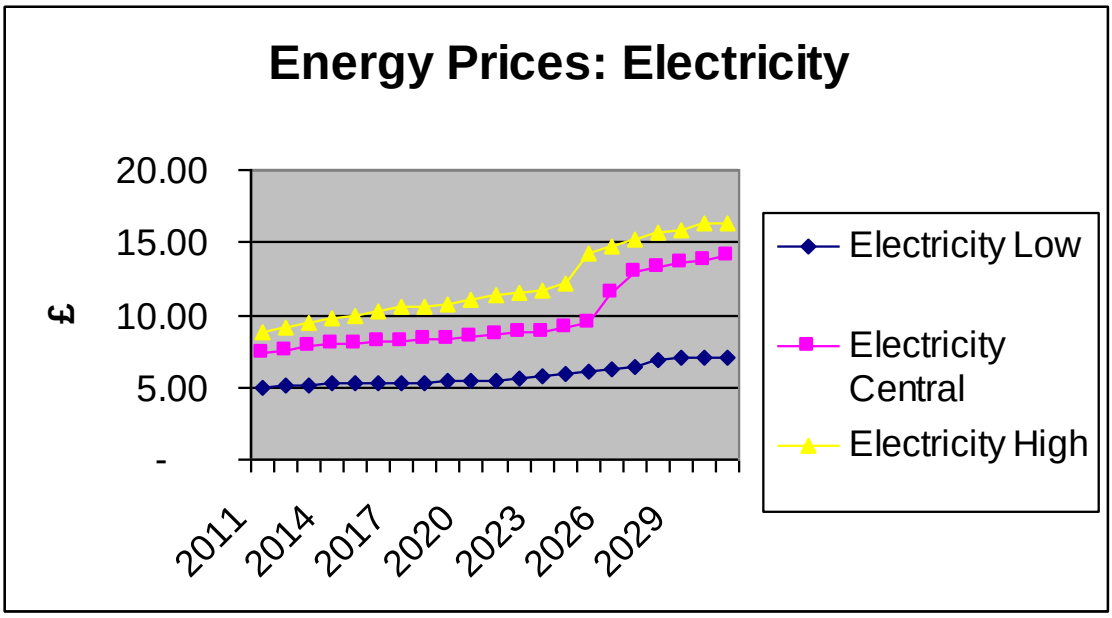
Graph 3a: Traded CO_2e Prices used in Scenario Testing



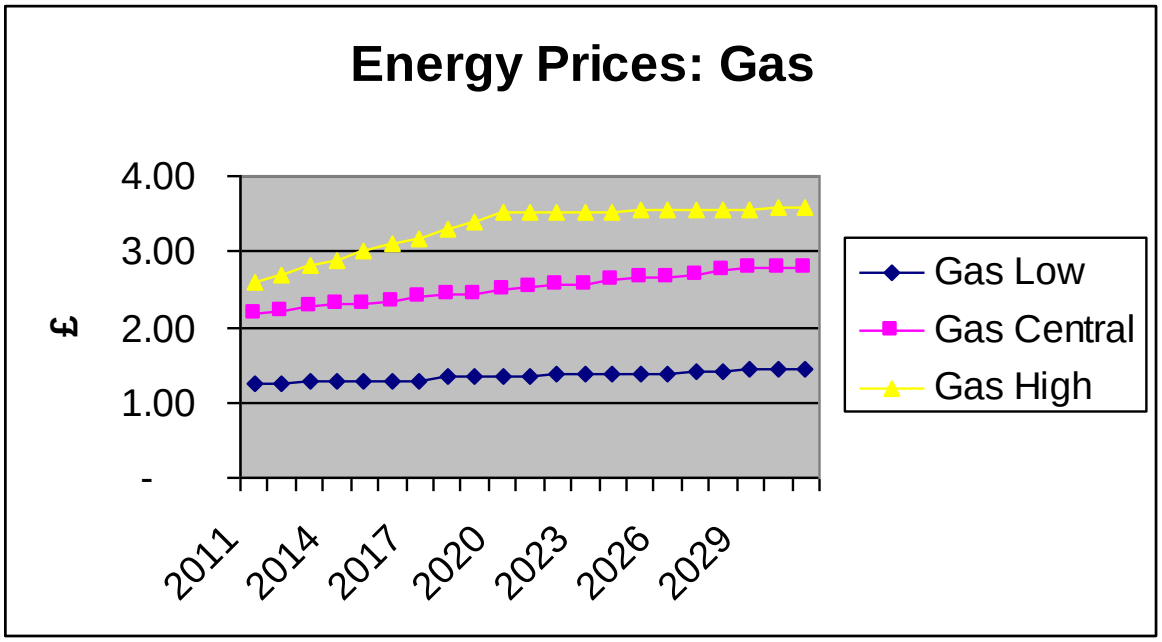
Graph 3b: Non-Traded CO_2e Prices used in Scenario Testing



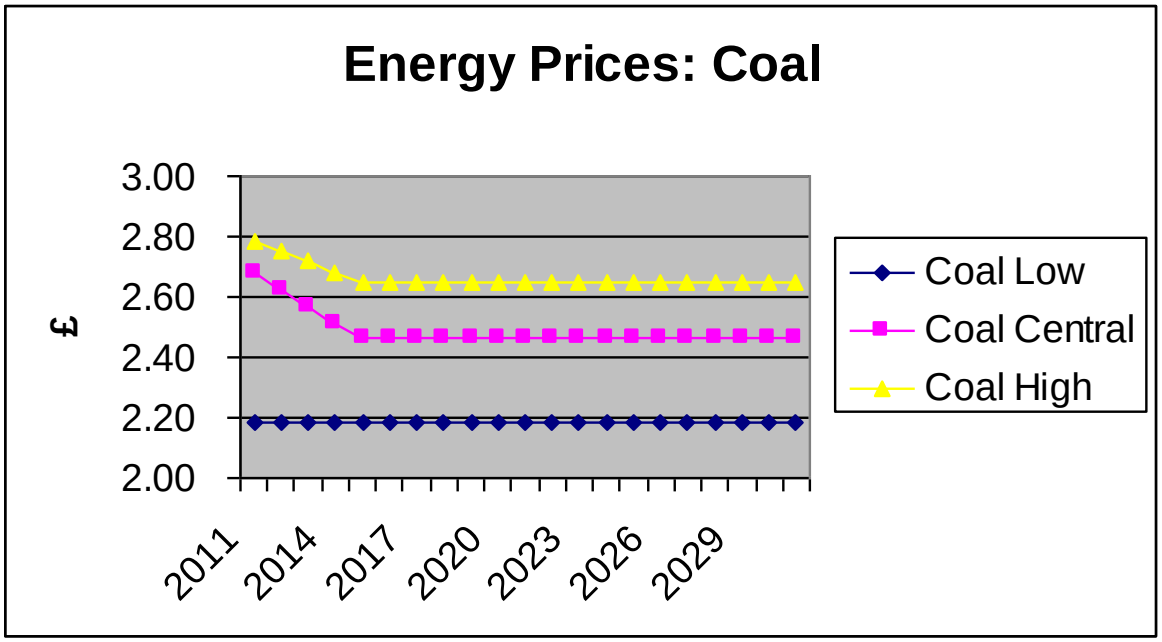
Graph 4a: Electricity prices used in Scenario Testing


Energy Prices: Electricity
£
20.00
15.00
10.00
5.00
-
2011
2014
2017
2020
2023
2026
2029
Electricity Low
Electricity Central
Electricity High

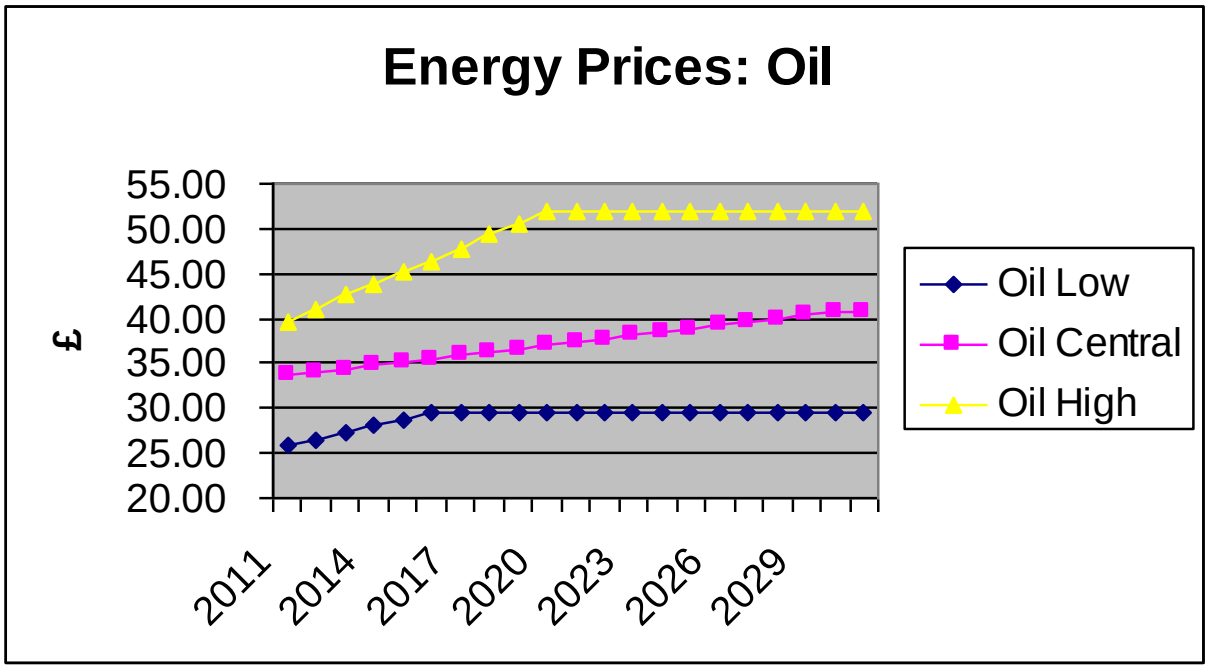
Graph 4b: Gas prices used in Scenario Testing



Graph 4c: Coal prices used in Scenario Testing



Graph 4d: Coal prices used in Scenario Testing



Assumptions Used in the Analysis

Types of Dwellings

91. Table 24 shows a summary of the property mix for options 3a, 3b, 3c, 3d and 3e.

Table 24: Summary of property mix (sample size 37 for now)

Fuel Used Before	DETACHED	SEMI/END TERRACE	MID-TERRACE	FLAT	TOTAL
COAL	8%	5%	3%	0%	16%
ELECTRIC	14%	32%	3%	0%	49%
LPG	11%	3%	0%	0%	14%
MAINS GAS	5%	8%	5%	0%	19%
OIL	3%	0%	0%	0%	3%
TOTAL	41%	49%	11%	0%	100%

Types of measures installed under each option

92. Each of the options presented has a different maximum investment limit. This will affect the scope of the potential measures installed under each option. For instance, option 3b has a maximum investment ceiling of £12,000, and it will have a wider selection of measures available than option 3d for instance which has a maximum investment ceiling of £5,000. This is because the cost of each of the different measures differs considerably, from for instance a few hundred pounds for loft insulation to over £10,000 for external wall insulation. Note costs of each measure also vary considerably by property type. The range of estimated costs for external insulation falls between <£5000 to >£10,000.

93. The measures considered include:

- Loft Insulation (LI)
- Cavity Wall Insulation (CWI)
- External Wall Insulation (EWI)
- Internal Wall Insulation (IWI)
- Gas Central Heating (GCH)
- Oil Central Heating (OCH)
- LPG-R
- Electric Storage Heater (ESH)
- Air Source Heat Pumps (ASHP)
- Solar Hot Water (SHW)
- Photovoltaics (PV)

94. Table 25 summarises the average fuel bill savings and CO_2e savings for measures where data is available from our sample.

Table 25: Fuel bill and Co2 savings per measure

Measure	Value of fuel bill savings (£/yr, predicted 2010-2020 prices)	Co2 saving calculated using BREDEM model (kg/yr) - NO COMFORT TAKING APPLIED	Lifetime Co2 saving (tonnes)	Cost of measure (excluding admin)	n
Loft Insulation	**£405**	**2180**	**92**	**£345**	**19**
Cavity Wall Insulation	**£323**	**1596**	**67**	**£462**	**2**
External Wall Insulation	**£170**	**586**	**21**	**£6,540**	**2**
Internal Wall Insulation	**£606**	**2892**	**104**	**£7,868**	**1**
Fuel Switching (to gas CH)	**£1,234**	**7630**	**114**	**£2,870**	**13**
Air Source Heat Pumps	**£885**	**4376**	**79**	**£6,000**	**3**
Solar Hot Water	**£141**	**501**	**10**	£3,500	
Photovoltaics	n/a	n/a	n/a	n/a	n/a

95. Depending on the property being treated, some measure combinations may be more beneficial from an energy bill saving perspective, but less beneficial from a CO_2e saving potential. For instance, putting in electric storage heaters may be the most cost effective way to remove a Household from fuel poverty, but not the most advantageous in terms of CO_2e saving. However, although electricity is currently the most carbon intensive heating fuel, this is forecast to change in the future as the grid is decarbonised.

96. The best measure installed, to date, in terms of energy bill saving to cost ratio is loft insulation

97. The worst measures installed in terms of energy bill saving to cost ratio are ASHP, SHW and EWI

Table 26: Estimated percentage splits of measures installed under each of the policy options

	LI	CWI	EWI	IWI	GCH	OCH	LPG-R	ESH	ASHP	SHW	AV measures per prop
Option X	18%	5%	15%		20%				13%	29%	2.2%
Option 3b	18%	5%	8%		20%	5%			8%	24%	1.9%
Option 3c	18%	5%			20%	6%	1%		6%	17%	1.6%
Option 3d	18%	5%			20%		4%				1.0%
Option 3e	18%	5%			20%	6%	1%		5%	6%	1.3%