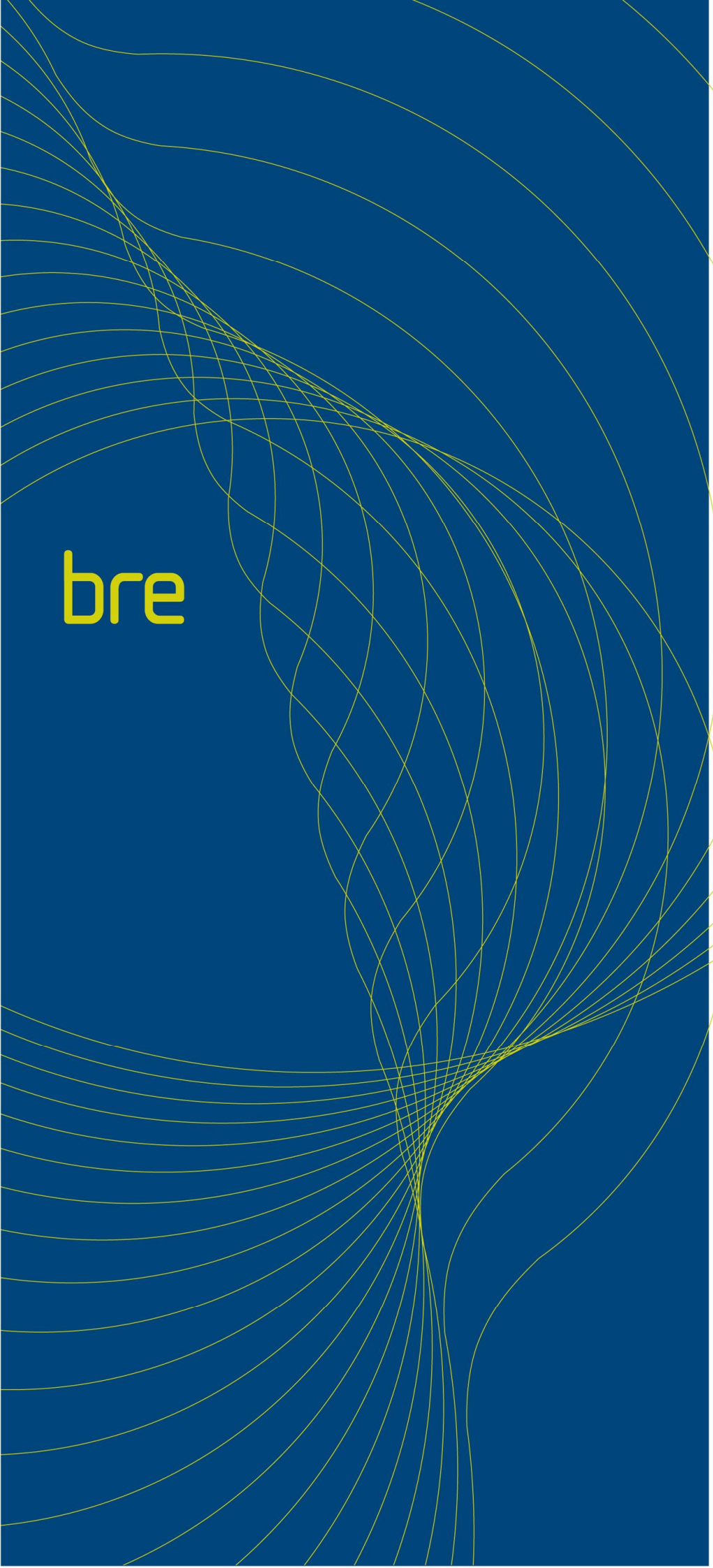

Living in Wales 2008 – Fuel price, income and energy efficiency scenarios to 2018

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10 November 2010

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1 Fuel price, income and energy efficiency scenarios to 2018

1.1 Introduction

In an extension to the work presented to update the fuel poverty statistics to 2009 and 2010, predictive modelling has been carried out on the 2008 Living in Wales data to determine the effects of fuel price changes, household income changes and the installation of energy efficiency measures on the numbers of households in fuel poverty at 2018. A similar modelling study has been carried out previously using the 2004 data[1] in which the potential for removing *vulnerable* households from fuel poverty by 2010 was investigated. For this work, the investigation has focussed on the 2018 target which is, as far as reasonably practical, to eradicate fuel poverty in all households by 2018. However, the primary emphasis has been on the vulnerable households as these are considered the priority group in the alleviation of fuel poverty.

Three scenarios for changes to fuel prices and incomes through to 2018 were obtained from the Department for Energy and Climate Change[2]. The three scenarios reflect three possible situations in 2018 and are based on a detailed analysis of the likely trends in the energy markets. The projections include:

- a low scenario - considered the most optimistic in terms of fuel poverty i.e. a decrease or small increase in fuel prices and the highest income rise
- a medium scenario - considered to represent the mostly likely changes to fuel prices and incomes.
- a high scenario - the most pessimistic in terms of fuel poverty i.e. the largest increases in fuel prices and the lowest income rise.

Throughout this work it has been assumed that the size and composition of the housing stock does not change, and that the fuel price and income changes apply equally across all households. The fuel price and income changes that have been applied are shown in Table 1.

Table 1: Fuel price and income scenarios for 2008 to 2018.

	Fuel price changes to 2018				Income rise to 2018
Scenario	**Gas**	**Electricity**	**Oil**	**Coal**	**All households**
High	46.2%	30.1%	8.5%	-23.1%	11.0%
Med	23.1%	15.8%	-25.0%	-38.5%	16.0%
Low	-6.0%	-5.0%	-42.2%	-61.5%	21.0%

[1] Welsh Assembly Government, 2008. Fuel Poverty in Wales, 2004. Fuel price, income and energy efficiency scenarios to 2010.
[2] DECC Energy and Emissions Projections (Annex F): http://www.decc.gov.uk/en/content/cms/statistics/projections/projections.aspx

The energy efficiency improvement measures have been applied to vulnerable households in fuel poverty under the medium fuel/income scenario. There are five stages to the energy efficiency improvements. The first package of mainstream insulation measures (loft insulation, cavity wall insulation and hot water tank insulation) is currently implemented under the standard HEES programme. The second package consists of heating upgrades. Installation of a central heating system in dwellings without is currently implemented under the HEES Plus programme whilst upgrading existing old, low efficiency boilers is not a measure currently funded by HEES but one that was considered to be a potentially effective improvement based on analysis of the data presented in the main report (Part 1). The third stage consists of the more costly insulation improvements, solid wall insulation and double glazing, that are not currently funded by the HEES Plus programme but are likely to contribute significantly to the alleviation of fuel poverty. The fourth and fifth stages of solar water heating and solar PV are newer technologies that have the potential to contribute significantly to the alleviation of fuel poverty and, with the right incentives, may be installed as mainstream measures within the 2018 timeframe.

The assumption used in this modelling process is that all vulnerable fuel poor households, *regardless of their eligibility* for programmes such as HEES, 'receive' measures in the 'staged' approach and *all accept the measures*. The five stages are detailed below:

Stage 1: Installation of mainstream insulation measures.

Upgrade	**Description**
Roof Insulation	If the roof insulation present is less than or equal to 150mm and the attic space can be insulated then roof insulation is applied so that at least 270mm is present.
Cavity Wall Insulation	If cavity walls are the predominant wall type and more than 50% of the cavity wall is not insulated, then cavity wall insulation is installed. No adjustment to the modelling has been made for cavities that cannot have CWI added due to technical reasons. The latest estimate for this is approximately 5% of cavity wall dwellings.
Cylinder Insulation	If there is a hot water tank present insulation equivalent to a 150mm flexible tank jacket is added.

Stage 2: Heating upgrades.

Upgrade	Description
Central Heating installations:	If gas is available a gas condensing boiler that includes modern heating controls is installed. Water will then be heated through the central heating system: • Using a condensing combination boiler if the floor area of the house is 60m^2 or less *or* there is no hot water tank installed. • Using a condensing boiler with hot water cylinder otherwise. If gas is not available then if the property is *not* a flat, an oil condensing boiler that includes modern heating controls is installed. Water will then be heated through the central heating system: • Using a condensing combination boiler if the floor area of the house is 60m^2 or less *or* there is no hot water tank installed. • Using a condensing boiler with hot water cylinder otherwise. • If the property is a flat, a modern storage radiator system is installed
Fuel switching:	All heating systems fuelled by LPG or bottled gas, solid fuels and standard electricity are replaced. All properties that have gas available but are currently being heated using electricity – this includes storage radiator systems – are replaced.
Boiler Upgrades	Standard and back boilers over 12 years old are upgraded to a 90% efficient boiler. If a water cylinder is present or the dwelling is > 60m^2 a condensing boiler is installed, if a water cylinder is not present or the dwelling is < 60m^2 a combi-condensing boiler is installed.

Note: Communal heating systems are never replaced.

Stage 3: Installation of solid wall insulation and double glazing.

Upgrade	Description
Solid Wall Insulation	If solid walls are the predominant wall type and more than 50% of the solid wall is not insulated then external insulation is installed. No assessment has been made of the suitability of solid walls for external insulation and therefore the numbers of measures installed will be an upper limit. For example some dwellings e.g. those in conservation areas or listed buildings, may not be able to have solid wall insulation applied.
Double Glazing	If any windows are single glazed, these are replaced by sealed double glazed windows.

Stage 4: Solar thermal water heating.

Description
A 4m^2 panel is installed on houses only

Stage 5: Solar PV.

Description
Assume an 800 kWh annual input of electricity. Installed on houses only.

The individual improvement modelling stages are cumulative (i.e. each stage builds on the earlier stages). After stage 2, a profile of the vulnerable households has been carried out to determine the nature of the households and dwellings where the occupants remain in fuel poverty. In addition, an 'income gap analysis' has been undertaken to determine how much additional income is required in order to remove the remaining vulnerable households from fuel poverty. This 'income gap analysis' has also been repeated after stage 5.

1.2 Results

Numbers of improvement measures applied

The numbers of energy efficiency improvement measures installed at each of the five stages are shown below in Tables 2 to 6. For each stage, improvement measures are only installed into the vulnerable households remaining fuel poor after the improvement works of the previous stage. It can be seen from the tables that the number of improvement measures installed increases, going from the low scenario to the high scenario, due to the greater number of households being predicted to be in fuel poverty as a result of the higher fuel prices.

Table 2: Numbers of mainstream insulation measures installed by 2018 to the vulnerable fuel poor at the 2008 base position for each fuel price/income scenario.

	Number of measures installed (000s)		
Improvement measure	Low fuel price/(high)income scenario	Medium fuel price/income scenario	High fuel price/(low)income scenario
Roof insulation	81	157	227
Cavity wall insulation	47	91	111
Cylinder insulation	91	166	229

Table 3: Number of heating system upgrades installed by 2018 to the vulnerable households remaining in fuel poverty after Stage 1.

	Number of measures installed (000s)		
Improvement measure	Low fuel price/(high)income scenario	Medium fuel price/income scenario	High fuel price/(low)income scenario
Central Heating installation	8	10	13
Fuel switching	7	14	21
Boiler upgrade	47	95	136

Table 4: Number of extra insulation measures installed by 2018 to the vulnerable households remaining in fuel poverty after Stage 2.

	Number of measures installed (000s)		
Improvement measure	Low fuel price/(high)income scenario	Medium fuel price/income scenario	High fuel price/(low)income scenario
Solid wall insulation	53	122	185
Double glazing	35	83	122

Table 5: Number of solar thermal water heating systems installed by 2018 to the vulnerable households remaining in fuel poverty after Stage 3.

	Number of measures installed (000s)		
Improvement measure	Low fuel price/(high)income scenario	Medium fuel price/income scenario	High fuel price/(low)income scenario
Solar Hot water	72	164	274

Table 6: Number of solar PV systems installed by 2018 to the vulnerable households remaining in fuel poverty after Stage 4.

	Number of measures installed (000s)		
Improvement measure	Low fuel price/(high)income scenario	Medium fuel price/income scenario	High fuel price/(low)income scenario
Solar PV	65	153	257

Table 7 summarises the predicted numbers of vulnerable households remaining fuel poor at 2018 after each stage of the improvement process. Results for each of the three fuel price/income scenarios are shown so that an understanding of the effect of the fuel price/income scenarios can be seen. Figure 1 shows the effect of the addition of each energy efficiency improvement modelling package on the numbers of vulnerable households in fuel poverty under the medium fuel price/income scenario at 2018. The black bar shows the position at 2008 and the first hatched bar shows the numbers of vulnerable households predicted to be fuel poor in 2018 if no energy efficiency improvements were made to these households' dwellings. Each subsequent hatched bar shows the number of vulnerable fuel poor remaining after each stage of the improvements.

Table 7: Summary of the numbers of vulnerable households remaining in fuel poverty at each stage of the improvement modelling process.

Income and fuel price scenarios	Number of vulnerable fuel poor households (000s) @ 2018					
	Base position: (No improvements)	**Stage 1:** *Mainstream insulation*	**Stage 2:** *+ Heating improvements*	**Stage 3:** *+ Solid Wall Insulation and Double glazing*	**Stage 4:** *+ Solar Hot water*	**Stage 5:** *+ Solar PV*
High scenario	428	394	353	298	280	232
Medium scenario	292	261	227	175	165	133
Low scenario	152	125	96	76	70	54

Figure 1: Graph showing the numbers of vulnerable households in fuel poverty at each stage of the improvement modelling process for the medium fuel price/income scenario.

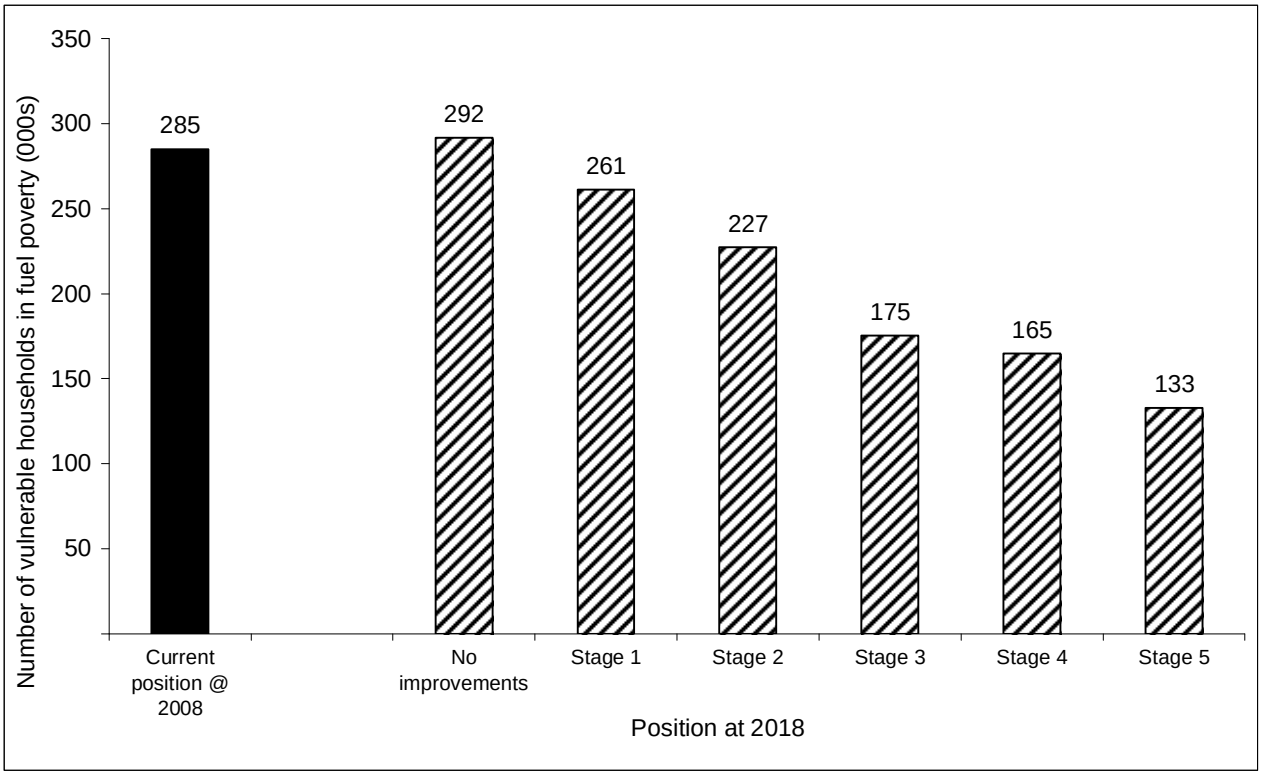
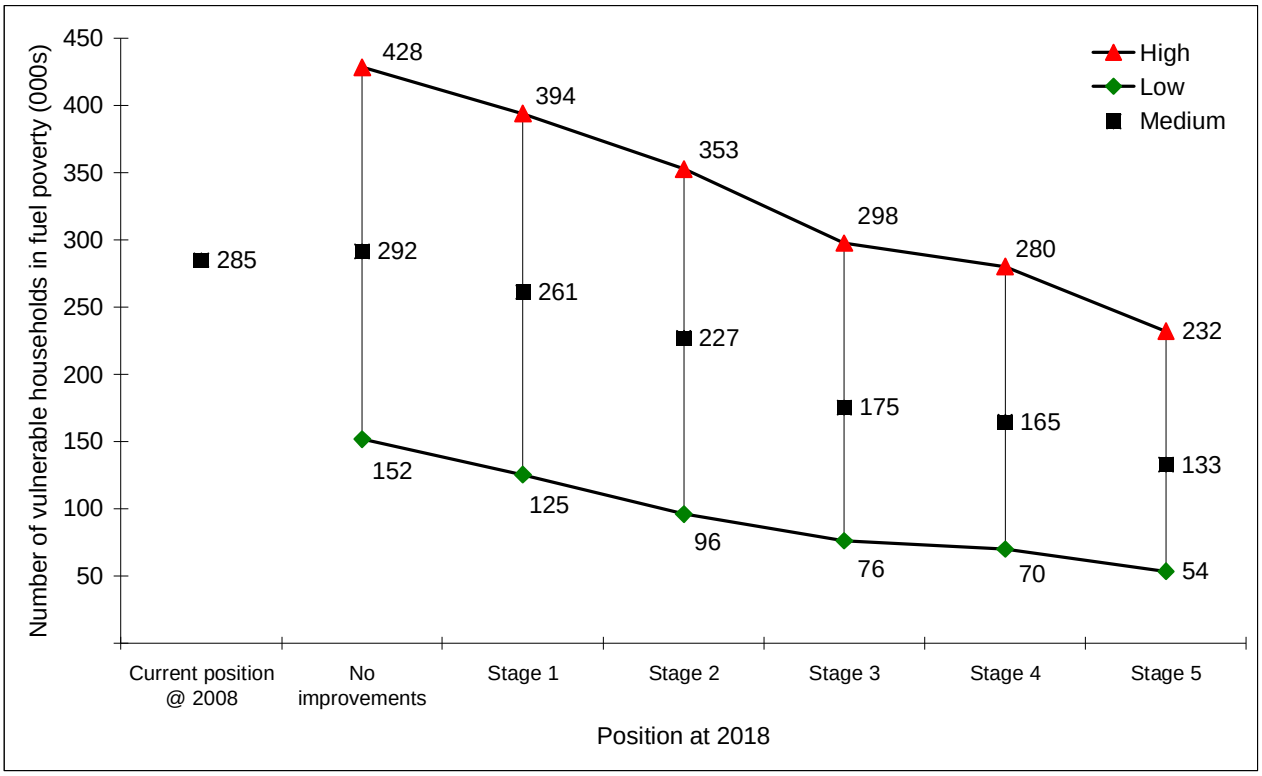


Figure 2 shows the effect of the energy improvement packages on the numbers of vulnerable households in fuel poverty at under all three fuel price/income scenarios and this figure effectively shows the 'range' in the projections of the numbers of fuel poor households by 2018 due to the different fuel price/income scenarios.

Figure 2: Graph showing the range of numbers of vulnerable households in fuel poverty at each stage of the improvement modelling process due to the different fuel price/income scenarios.



Profile of the households remaining in fuel poverty after Stage 2: mainstream insulation and all heating measures

It is useful to understand the characteristics of the households remaining in fuel poverty after the standard insulation and all heating measures have been applied (i.e. after roof insulation, cavity wall insulation, cylinder insulation, central heating installation, fuel switching and boiler upgrades have been applied to dwellings where applicable) in order to inform the process of targeting grants for further improvement measures and benefits. A profile of the household and dwelling characteristics of the 227,000 vulnerable households remaining in fuel poverty under the medium fuel price/income scenario has been carried out with the results tabulated below (Tables 8 – 29). Only statistics with a percentage standard error of less than 20% have been reported – where sensible, sub-groups of variables have been combined to reduce the standard error. Those variables for which this was not possible have been replaced by an asterisk (*) as they are considered too unreliable to be reported on.

Table 8: Tenure of the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Tenure	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Owner Occupied	159	(69.9)	201
Private Rented	27	(11.7)	34
Local Authority	25	(11.1)	33
Housing Association	17	(7.3)	17
Total	227	(100.0)	285

Table 9: Household size of the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Household size	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
1	108	(47.5)	126
2	78	(34.2)	99
3	23	(10.3)	28
4 or more	18	(8.0)	33
Total	227	(100.0)	285

Table 10: Household composition of the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Household composition	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Single pensioner	81	(35.5)	94
Married couple pensioner	31	(13.6)	40
Single person, not a pensioner	27	(12.0)	31
Two adult household, not pensioners, without children	27	(12.0)	37
Single parent households	34	(15.1)	40
Two adult household with children	25	(10.8)	41
Other	*	*	*
Total	227	(100.0)	285

Table 11: Vulnerability of the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Vulnerability of Households	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Household contains someone 60+ years old	146	(64.4)	183
Household contains someone < 16 years old	47	(20.8)	64
Household contains someone long term sick/disabled	115	(50.6)	138

Table 12: Working status of the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Working status of Household	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Working	37	(16.2)	61
Unemployed	11	(5.1)	14
Inactive	178	(78.4)	210
Unknown	*	*	*
Total	227	(100.0)	285

Table 13: Banded income of the vulnerable households remaining in fuel poverty after the Stage 2 improvements.

Banded Income	Number of households (000s)	% of households	Full income (median)	Fuel expenditure (median)	*Number of fuel poor vulnerable households at 2008*
1st decile (lowest)	99	(43.5)	8,333	1,265	99
2nd decile	63	(27.6)	11,583	1,373	72
3rd decile	33	(14.3)	14,413	1,588	44
4th decile	15	(6.4)	17,273	1,875	26
5th to 10th deciles	19	(8.2)	23,173	2,594	45
Total	227	(100.0)	11,458	1,458	285

Table 14: Benefit receipt in the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008 and a comparison with the situation in 2008.

Receipt of any benefit	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Yes	175	(76.9)	225
No	52	(23.1)	60
Total	227	(100.0)	285

Table 15: Receipt of a HEES eligible benefit in the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Receipt of a HEES eligible benefit	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Yes	36	(15.8)	46
No	191	(84.2)	240
Total	227	(100.0)	285

Table 16: Receipt of a HEES Plus eligible benefit in the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Receipt of a HEES plus eligible benefit	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Yes	114	(50.0)	137
No	114	(50.0)	148
Total	227	(100.0)	285

Table 17: Receipt of any HEES eligible benefit in the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Receipt of any HEES eligible benefit	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Yes	124	(54.5)	153
No	103	(45.5)	135
Total	227	(100.0)	285

Table 18: Under-occupancy in the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Under-occupancy	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Not underoccupying	105	(46.1)	135
Underoccupying	122	(53.9)	150
Total	227	(100.0)	285

Table 19: Dwelling age characteristics of the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Age of Dwelling	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Pre 1850	15	(6.5)	23
1850 - 1899	43	(18.9)	48
1900 - 1918	41	(17.9)	48
1919 - 1944	28	(12.4)	37
1945 - 1964	50	(21.8)	63
1965 - 1974	22	(9.5)	32
1975 - 1980	9	(3.8)	11
1981 - 1990	9	(3.8)	12
Post 1990	12	(5.2)	12
Total	227	(100.0)	285

Table 20: Dwelling type characteristics of the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Dwelling Type	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
End terrace	28	(12.3)	31
Mid terrace	52	(22.9)	57
Semi detached	70	(30.8)	89
Detached	62	(27.1)	91
Purpose built flat	10	(4.4)	11
Non-residential + flat	6	(2.5)	8
Total	227	(100.0)	285

Table 21: Dwelling size characteristics of the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Dwelling Size	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
<60	12	(5.4)	17
60-80	49	(21.5)	59
80-100	70	(30.6)	84
100-120	32	(14.0)	39
120-150	18	(7.9)	24
>150	47	(20.6)	63
Total	227	(100.0)	285

Table 22: Central heating present in the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Central Heating	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Central heating present	227	(100.0)	274
No central heating present	0	(.0)	11
Total	227	(100.0)	285

Table 23: Main heating system characteristics of the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Main heating system	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Boiler system with radiators	210	(92.4)	256
Storage radiators	17	(7.4)	17
Warm air/other systems	0	(.0)	*
Room/portable heaters	0	(.0)	11
Communal	1	(.3)	*
Total	227	(100.0)	285

Table 24: Main heating fuel characteristics of the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Main heating fuel	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Mains gas	168	(74.1)	180
Bottled gas/LPG	0	0	10
Heating oil	41	(18.2)	58
Solid fuel	0	0	16
Standard Electricity	*	*	4
Off peak Electricity	16	(7.0)	17
Communal heating	*	*	*
Total	227	(100.0)	285

Table 25: On/off the gas network for the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Off the Gas Network	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
On the gas network	168	(73.9)	186
Off the gas network	59	(26.1)	99
Total	227	(100.0)	285

Table 26: Cavity walls predominant in the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Cavity walls predominant?	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Yes	116	(51.0)	157
No	111	(49.0)	128
Total	227	(100.0)	285

Table 27: Urban/rural characteristics of the vulnerable households remaining in fuel poverty after the Stage 2 improvements and a comparison with the situation in 2008.

Urban or Rural	Number of households (000s)	% of households	*Number of fuel poor vulnerable households at 2008*
Rural	90	(39.7)	130
Urban	137	(60.3)	155
Total	227	(100.0)	285

Table 28: Number of the vulnerable households remaining in fuel poverty after the Stage 2 improvements that had a mainstream insulation measure applied.

Any mainstream insulation measure applied	Number of households (000s)	% of households
No	43	(18.8)
Yes	184	(81.2)
Total	227	(100.0)

Table 29: Number of the vulnerable households remaining in fuel poverty after the Stage 2 improvements that had a mainstream insulation or heating measure applied.

Any mainstream insulation or heating measure applied	Number of households (000s)	% of households
No	41	(17.9)
Yes	186	(82.1)
Total	227	(100.0)

Income Gap Analysis after mainstream insulation and heating measures

A useful tool to understanding what is necessary to alleviate fuel poverty is to carry out an 'Income Gap analysis'. In this process, the full income of each vulnerable household remaining in fuel poverty is incremented in £500 steps and at each step, the number of fuel poor households remaining is calculated. This analysis has been carried out for the medium scenario only.

Figure 3 shows the 'Income Gap' distribution for the vulnerable households remaining in fuel poverty after the Stage 2 energy efficiency improvements. Each bar represents £500 and the frequency for each bar represents the number of households that require that amount of additional income in order to remove them from fuel poverty. For example, approximately 17,000 vulnerable households would be removed from fuel poverty at this stage of the improvement process if their incomes were increased by £500. A further 15,000 would be removed if their incomes were increased by £1000. The number of households removed from

fuel poverty by an individual increment peaks at 20,000 households for the addition of £3000, at which point a cumulative 105,000 households have been removed. Following this, progressively fewer households are removed from fuel poverty with each additional increment. These diminishing returns for each additional income amount can be seen more clearly in Table 30. The data in this table also show that it would require the addition of £12,000 to every vulnerable fuel poor household in order to remove 95% of them from fuel poverty.

Figure 3: The 'Income Gap' distribution for vulnerable fuel poor households after the Stage 2 improvements. Each bar represents £500.

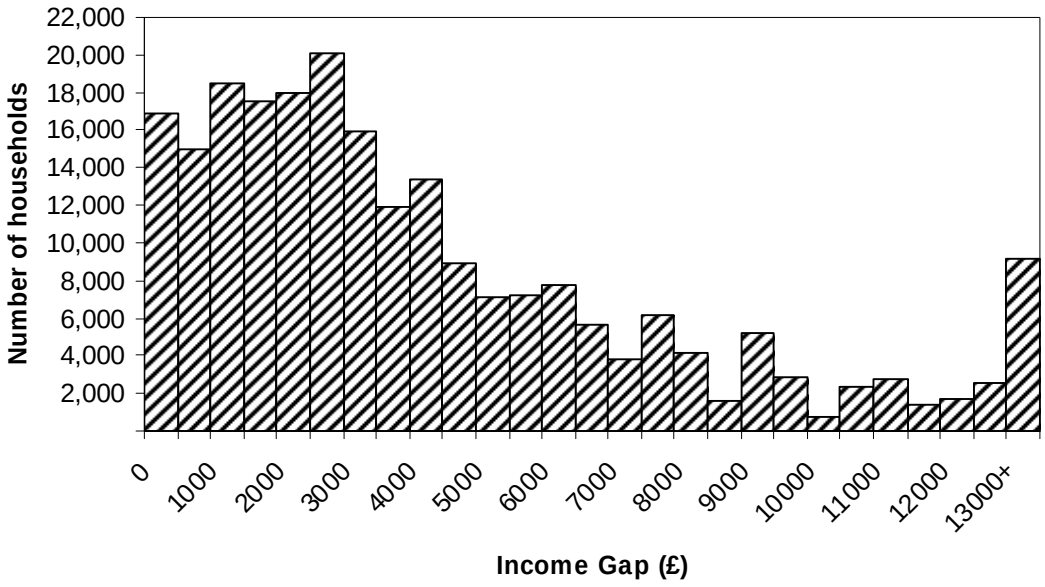


Table 30: Number of vulnerable fuel poor households remaining, and the number of households removed from fuel poverty with each income increment after Stage 2 improvements.

Additional Income	No. of Vulnerable Fuel Poor Households (000s)	No. of households removed from fuel poverty	Cumulative no. of households removed from fuel poverty
£0	227		
£500	211	17	17
£1000	196	14	31
£1500	178	19	49
£2000	160	18	67
£2500	142	18	85
£3000	122	20	105
£3500	106	16	121
£4000	94	12	133
£4500	81	13	146

Additional Income	No. of Vulnerable Fuel Poor Households (000s)	No. of households removed from fuel poverty	Cumulative no. of households removed from fuel poverty
£5000	72	9	155
£5500	65	7	162
£6000	58	7	169
£6500	50	8	177
£7000	44	6	183
£7500	40	4	187
£8000	34	6	193
£8500	30	4	197
£9000	29	2	199
£9500	23	5	204
£10000	21	3	207
£10500	20	1	207
£11000	18	2	210
£11500	15	3	212
£12000	13	1	214
£12500	12	2	215
£13000	9	3	218

Income Gap Analysis after all measures.

A further income gap analysis was undertaken after the final stage of the improvement modelling. As it can be seen from Table 7, approximately 133,000 vulnerable households will remain in fuel poverty at 2018 under the medium fuel price/income scenario. Figure 4 and Table 31 shows that the addition of £2500 would remove just over half of these remaining fuel poor households from fuel poverty.

Figure 4: The 'Income Gap' distribution for vulnerable households remaining in fuel poverty after all the improvements. Each bar represents £500.

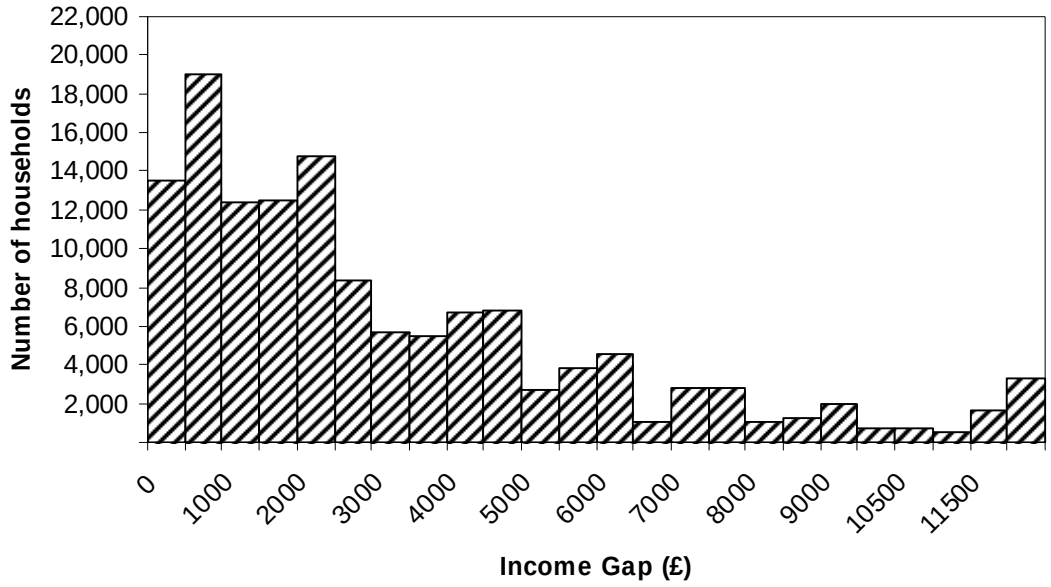


Table 31: Number of vulnerable fuel poor households remaining, and the number of households removed from fuel poverty with each income increment after all energy efficiency improvements. * represents sample sizes below the limits of statistical reliability.

Additional Income	No. of Vulnerable Fuel Poor Households (000s)	No. of households removed from fuel poverty	Cumulative no. of households removed from fuel poverty
£0	133		
£500	120	13	13
£1000	101	18	32
£1500	89	12	44
£2000	76	12	56
£2500	62	15	71
£3000	53	8	80
£3500	48	6	85
£4000	42	5	91
£4500	35	7	97
£5000	29	7	104
£5500	26	3	107
£6000	22	4	111
£6500	18	5	115
£7000	17	1	116

Additional Income	No. of Vulnerable Fuel Poor Households (000s)	No. of households removed from fuel poverty	Cumulative no. of households removed from fuel poverty
£7500	14	3	119
£8000	11	3	122
£8500	10	1	123
£9000	9	1	124
£9500	*	*	*
£10000	*	*	*

1.3 Discussion and summary

A modelling study has been carried out to investigate the potential for alleviating fuel poverty by 2018. The analysis has used three scenarios for changing fuel prices and incomes and has simulated the application of energy efficiency improvements in five stages. The number of households remaining in fuel poverty at each stage, under each fuel price/income scenario, has been evaluated and after Stage 2 an income gap analysis and profiling of the fuel poor households has been carried out. The income gap analysis has been repeated after Stage 5.

The results show that if all the energy efficiency improvements were applied, at 2018 there would be between 54,000 and 232,000 vulnerable households remaining in fuel poverty, depending on the fuel price/income scenario used. If the medium fuel price/income scenario is taken to be the 'most likely' situation, there would be approximately 133,000 vulnerable households in fuel poverty at 2018. The application of the 'mainstream' insulation and heating measures still has the potential to remove a significant number of vulnerable households from fuel poverty; there would be approximately 65,000 less fuel poor households compared to the position that would arise if no improvements were made. A further 49,000 households could be removed from fuel poverty if their incomes were supplemented by £1500. Alternatively, ~52,000 households could be removed from fuel poverty by the addition of solid wall insulation and/or double glazing.

There are two important considerations to bear in mind when analysing these results. The first is that the final three stages of the energy efficiency improvements include the installation of costly measures that currently are not routinely funded by the HEES grant or any other energy efficiency grants. In the case of solid wall insulation, this measure is still relatively uncommon and its potential as a mainstream measure is logistically more challenging. Additionally, the modelling methodology assumes that all solid walls can be insulated and therefore no allowance is made for solid walls that, for whatever reason, cannot have this measure installed. The contribution that this measure makes towards the alleviation of fuel poverty is therefore an overestimate.

The second consideration, and one that is particularly important, is that the results from this theoretical study imply a perfect targeting of the measures to households that require them, and a 100% uptake of the measures offered. In reality this would likely not be the case and therefore it is important to consider that additional resources would inevitably be required in order to achieve the results predicted by this modelling study.