

# Estimating the effect of the Carbon Emissions Reduction Target (CERT) on the fuel poor.

January 2009

## Introduction

The Carbon Emissions Reduction Target (CERT) is one of the Government's key mechanisms for improving the energy efficiency of the housing stock. This analysis attempts to quantify the effect of CERT on the level of fuel poverty in England.

The (combined) 2006 English House Condition Survey (EHCS) dataset is taken as the base position. This is the latest available data on domestic energy efficiency and levels of fuel poverty in England. A scenario model simulates the installation of the key CERT measures onto this base and examines the effect upon the fuel poor. The energy cost savings as a result of the installations are used to determine how many households have been removed from fuel poverty.

The analysis has shown that, based on the level of fuel poverty in 2006, approximately 163,000 households are likely to be removed from fuel poverty as a result of the CERT programme. Of these households, approximately 136,000 are classed as 'vulnerable'.

## The Carbon Emissions Reduction Target (CERT)

CERT is one of the Government's key mechanisms for improving energy efficiency in the household sector in Great Britain. The scheme is an obligation placed upon gas and electricity suppliers to achieve overall lifetime savings of 154 MtCO<sub>2</sub> in the period 2008 to 2011. This is equivalent to ~4.2 MtCO<sub>2</sub> per year at the end of this period.

The savings are to be achieved through the installation of energy efficiency improvements. A further requirement of the CERT scheme is that 40% of these savings are achieved in the 'priority group' of low income, disabled and elderly households (see Appendix B for details).

CERT does not specify the exact route that the suppliers must take in order to achieve the savings. An "illustrative mix of measures", however, has been produced by Defra and BRE, which indicates a likely route to achieving the target.

## Fuel poverty

A household is defined as being fuel poor if it is required to spend more than 10% of its income on all household fuel use, in order to meet an adequate heating regime. Fuel poor households are considered to be at greater risk of ill health and death as a result of inadequately heated homes, in turn caused by the high cost of fuel relative to their income.

The Government has commitments to, as far as reasonably practicable, eradicate fuel poverty in England for all vulnerable households by 2010 and all households by 2016. Vulnerable households, as defined for fuel poverty, include all elderly households, households containing children under the age of 16 and the disabled.

The national level of fuel poverty in England is calculated annually using the English House Condition Survey. The most recent data, for 2006, estimates that there are ~2.43 million fuel poor households in England, of which ~1.95 million are vulnerable.

## The methodology

This analysis has modified the 2006 English House Condition Survey dataset to simulate the installation of the measures specified in the CERT illustrative mix. Following this the number of fuel poor households in the improved position has been calculated. This has then been compared to the base position in 2006 to give the number of households removed from fuel poverty (relative to the level in 2006).

The proportion of income a household is required to spend on fuel is described quantitatively by its 'fuel poverty ratio'. This is given by equation 1 below:

$$\text{Fuel Poverty Ratio (FPR)} = \frac{\sum (\text{Unit Fuel Price} \times \text{Fuel Consumption}) + \sum \text{Standing Charge}}{\text{Income}} \quad \text{eqn 1}$$

A household is fuel poor if the fuel poverty ratio is greater than 0.1 (indicating that the required fuel spend is above 10% of household income).

This analysis has examined the effect of the energy efficiency improvements (as likely to be installed under CERT) on this ratio. If an energy efficiency improvement (or set of improvements) reduces the fuel poverty ratio of a household from above 0.1 to below 0.1 then the household can be said to have been removed from fuel poverty. Energy efficiency improvements will affect the 'fuel consumption' term in the above equation. In the case of fuel switching the 'unit fuel price' and 'standing charge' terms will also be affected.

The fuel poverty ratio for all EHCS cases is calculated on behalf of BERR and Defra to allow monitoring of the national level of fuel poverty in England. This analysis has applied CERT improvements onto the base data in the quantities specified in the illustrative mix of measures. Following this stage the fuel poverty ratio is recalculated and the corresponding number of households removed from fuel poverty is counted.

Only the effect of the most significant CERT measures has been analysed. These are:

- a) Cavity wall insulation
- b) Virgin loft insulation
- c) Top-up loft insulation
- d) Hot water cylinder insulation
- e) Fuel switching

f) Solid wall insulation

The installation of various other measures, as listed in the CERT illustrative mix, has not been modelled.

Details of the modelling process

The modelling process proceeds in the following way:

- a) A case is selected at random for improvement
- b) Any required measures are installed as long as the total number of installations as specified in the illustrative mix has not been reached.
- c) The post-improvement fuel poverty ratio for that case is calculated using the new fuel costs
- d) Another case is selected for improvement.

Measures are installed in turn until each of the totals, as listed in the CERT illustrative mix, has been reached (see Appendix A for details of the limits). When the total is reached no more improvements of this type are installed.

The above process is undertaken for each of the different measures in turn. Because of the random nature of the selection process, repeated runs of the model are required in order to achieve convergence around a mean value for the number of households removed from fuel poverty.

Details of the modelling assumptions

*The base dataset*

All modelling uses the (combined) 2006 EHCS base position, which is the latest dataset available. This dataset contains data collected in the period April 2005 – April 2007, with a nominal reference point of April 2006. As a result, the analysis should be interpreted in the context of the level of fuel poverty in 2006, and results should be presented as relative to the level of fuel poverty in this year. Fuel poverty levels will change yearly as a result of changes in fuel prices and incomes, as well as in the level of energy efficiency.

*Mainstream insulation measures*

The mainstream insulation measures are cavity wall insulation, hot water cylinder insulation and professionally installed loft insulation. It is assumed that these are always installed together in all houses which require them - i.e. if a house selected for improvement is eligible for a combination of loft insulation, cavity wall insulation and hot water cylinder insulation then *all* of these measures will be installed in that dwelling. The implications of this assumption are discussed in the 'conclusions and discussions' section of this report.

Cavity wall insulation is installed in all cavity wall dwellings with uninsulated walls, which are less than four storeys high.

270mm of insulation is applied to any uninsulated loft. 270mm is also applied as a top-up if the existing insulation is less than 71mm thick. 200mm of additional insulation is applied as a top-up to any loft with insulation between 71mm and 100mm thick.

Uninsulated hot water cylinders have an insulating jacket applied. Poorly insulated cylinders have their insulation improved.

#### *Fuel switching*

Fuel switching (to mains gas central heating) is only applied where gas is already present in the dwelling, but there is currently no mains gas central heating present. Fuel switching, when applied, is always carried out in combination with any of the applicable mainstream insulation measures (CWI, loft insulation and cylinder insulation). Note that the reverse is not true: when a case is selected for mainstream insulation, fuel switching is not always applied at the same time.

#### *Solid wall insulation*

When solid wall insulation is applied, it is always applied together with any fuel switching and mainstream insulation measures that may be appropriate. The reverse is not true: when a case is selected for mainstream insulation or fuel switching, solid wall insulation is not always applied at the same time.

#### *DIY loft insulation*

DIY loft insulation is installed in isolation in households selected for this measure. It is not installed together with the other measures (i.e. if a house is selected for DIY loft insulation and also needs cavity wall insulation only the DIY loft insulation is installed). In addition, DIY loft insulation is only installed in the owner occupied and private rented tenures. DIY loft insulation applies the same thicknesses of insulation as applied for 'professionally installed' loft insulation.

#### *Other general assumptions*

The defined fuel poverty heating regimes are applied throughout the analysis. 'Comfort-take' is not included in the modelling process. No fuel price or income scenarios have been applied.

The priority group is defined using the information collected by the EHCS on benefit receipt, and whether the household reference person or their partner is aged 70 or over (see Appendix B for details of the priority group). All benefits, with the exception of 'disablement pension with a constant attendance allowance' have been included in the priority group modelling (information on this benefit is not collected by the EHCS).

The illustrative mix of measures as published by Defra has been used as a constraint on the modelling (by setting the 'control totals' for the total number of installed measures). The illustrative mix covers the whole of Great Britain, and we have therefore adjusted the published figures to represent England by applying a factor of 0.86.

## Results

As described, this analysis requires repeated runs of the improvement model. The full distributions of model runs are shown in figures 1 and 2 below. On average, around 163,000 households (136,000 vulnerable) have been removed from fuel poverty following the CERT improvements. The lower and upper 95% confidence bounds for the total number of fuel poor households removed through the CERT improvements are ~138,000 and ~188,000 households respectively. The 95% confidence bounds for the vulnerable fuel poor removed by CERT are ~114,000 and ~158,000 households.

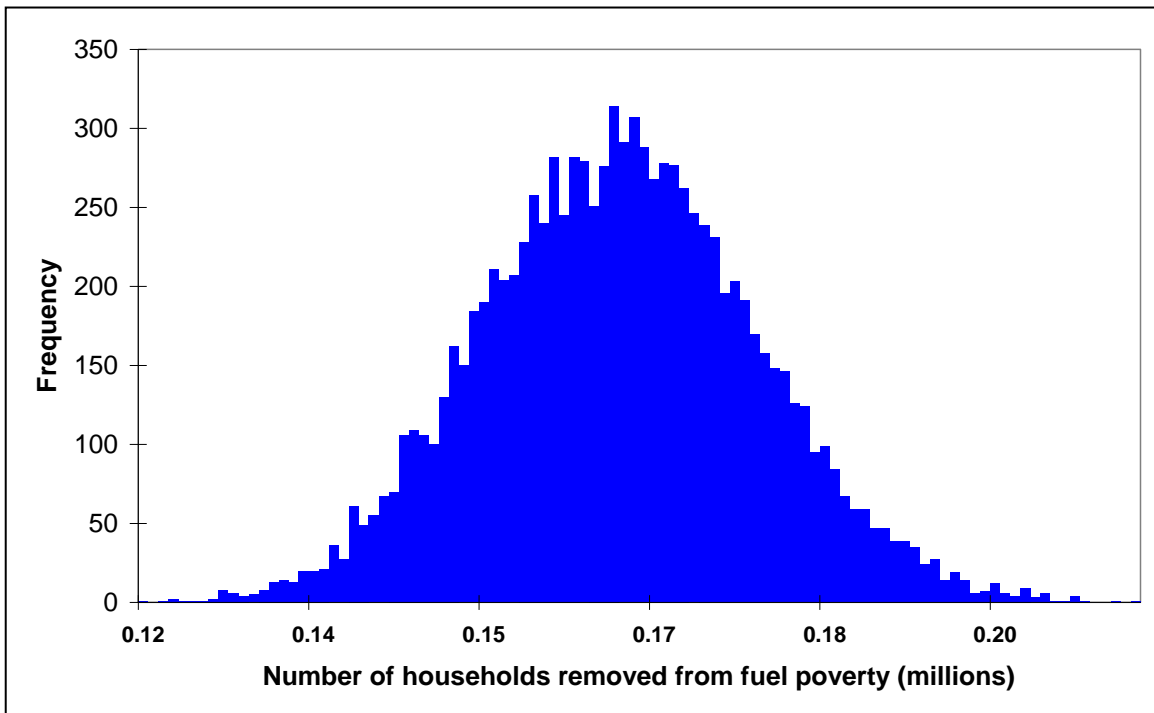


Figure 1: Distribution of possible values (after model convergence) for the number of households in England likely to be removed from fuel poverty after CERT. Based on the 2006 level of fuel poverty in England.

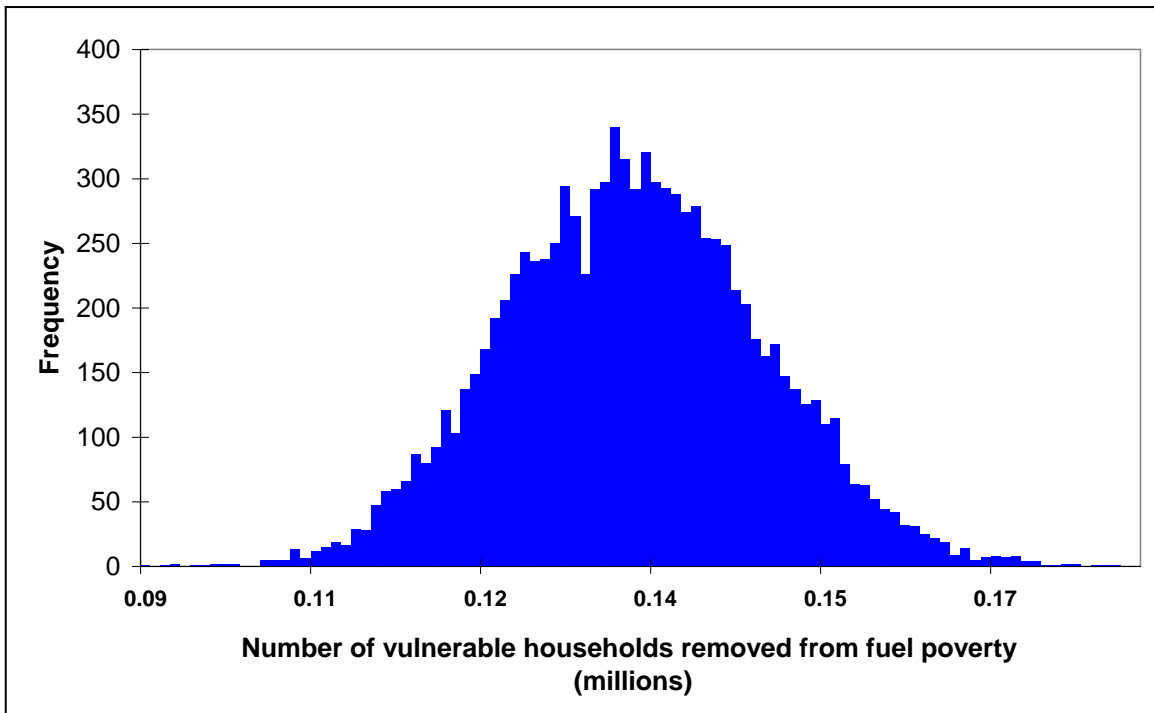


Figure 2: Distribution of possible values (after model convergence) for the number of vulnerable households removed from fuel poverty after CERT. This based on the 2006 recorded level of fuel poverty in England.

The results of the modelling are summarised in table 1 below.

	Number removed from fuel poverty relative to 2006 base position	Number of vulnerable households removed from fuel poverty relative to the 2006 base position.
Mean after all CERT improvements	163,000	136,000
Lower 95% confidence bound	138,000	114,000
Upper 95% confidence bound	188,000	158,000

Table 1: Number of households removed from fuel poverty after simulating the installation of all CERT measures. Results rounded to nearest 1000 households.

It is also of interest to look at the effect of CERT on those close to fuel poverty, i.e. spending 8 - 9% of their income on fuel. Table 2 below shows the number of households spending between 9 - 10% on fuel who, following CERT improvements spend less than 9%. Table 3 shows the number spending between 8 - 9% on fuel who, following CERT improvements, spend less than 8%.

These results show that there are an additional 104,000 households (86,000 vulnerable) originally spending 9-10% on their fuel, which following the CERT improvements now spend < 9% on fuel. There are also an additional 145,000 households (123,000 vulnerable) originally spending between 8-9% on fuel now spending < 8% on fuel.

	Number of households spending 9-10% of income on fuel, which spend < 9% on fuel following CERT improvements.	Number of vulnerable households spending 9-10% of income on fuel, which spend < 9% on fuel following CERT improvements.
Mean after all CERT improvements	104,000	86,000
Lower 95% confidence bound	84,000	67,000
Upper 95% confidence bound	125,000	104,000

*Table 2: Number of households originally spending between 9-10% on household fuel, who after CERT improvements, spend less than 9%. Results rounded to nearest 1000 households.*

	Number of households spending 8-9% of income on fuel, which spend < 8% on fuel following CERT improvements.	Number of vulnerable households spending 8-9% of income on fuel, which spend < 8% on fuel following CERT improvements.
Mean after all CERT improvements	145,000	123,000
Lower 95% confidence bound	122,000	102,000
Upper 95% confidence bound	167,000	144,000

*Table 3: Number of households originally spending between 8-9% on household fuel, who after CERT improvements, spend less than 8%.*

## Conclusions and discussion of results

An improvement model has been run which simulates the installation of CERT improvements onto the 2006 English House Condition Survey dataset. This model suggests that around 163,000 households may be removed from fuel poverty by the CERT programme, relative to the 2006 base position. Of these approximately 136,000 households are vulnerable households.

These results need to be considered in the context of the level of fuel poverty in 2006. The 2006 EHCS recorded ~2.43 million households as being in fuel poverty. Of these ~1.95 million are vulnerable. The results shown above are equivalent to a ~7% reduction in the overall level of fuel poverty (and an equivalent reduction in the number of vulnerable households relative to the total number of vulnerable households).

Levels of fuel poverty will change on an annual basis due to changes in fuel prices, household income and energy efficiency. It is difficult to predict the effect of CERT given a different base level of fuel poverty. For higher levels of fuel poverty, perhaps as a result of higher fuel prices, CERT has the potential to remove more households, simply by there being more fuel poor households in the first place. The potential may also be reduced by higher fuel prices, however, by making fuel poverty more severe for many households (they will spend an even greater proportion of their income on fuel). In these cases CERT improvements may be unable to reduce their fuel bills sufficiently to remove them from fuel poverty.

It is important to recognise that the CERT illustrative mix includes several other measures not considered as part of this analysis. These are generally of low predicted frequency, or likely to have such a small effect on any particular household's bills (such as compact fluorescent lightbulbs), that they can reasonably be ignored for the purposes of this analysis. There remains the potential, however, for a small number of additional households to be removed from fuel poverty by these other measures.

It has been assumed that certain measures are installed together where they are required – i.e. if a home requires both cavity wall insulation and loft insulation both will be always installed in dwellings that are improved. In reality, this may not be the case. A householder may decide to only install certain required measures for reasons of cost or convenience. If the model assumptions were changed so that the measures in question were *not* always installed together where required, additional installations in other dwellings would need to take place in order to match the scenario controls limits set out in the illustrative mix (recall that the scenario model is dependent on the number of measures installed as opposed to number of dwellings treated). It is difficult to determine the likely effect of this. It may be that by not installing a measure, for example a loft insulation top-up, along with the other insulation measures, a household will no longer be removed from fuel poverty. Similarly, by applying the loft insulation top-up to a different dwelling (as would be required in order to match the illustrative mix) another household could be removed from fuel poverty instead. If the likelihoods of these two households being removed from fuel poverty by a loft insulation top-up are identical then the overall number of households removed from fuel poverty would be unaffected.

A further consideration is the possibility that suppliers will choose different numbers or types of measures to achieve their CERT targets to those listed in the illustrative mix. The illustrative mix was constructed in such a way as to attempt to achieve the required savings through the lowest cost (and most likely) route. Therefore, it seems unlikely that the actual delivery of CERT will be very different to that predicted. An additional uncertainty exists in the factor used to adjust the illustrative mix to represent England (from Great Britain). This is unlikely to have a large effect, however, as the difference in improvement potential between the different nations in Great Britain is not large, and English households form the majority of households in Great Britain.

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January 2008



## Appendix A: Scenario control limits

The control limits specify the number of installations which are installed during each run of the model. They are based on the illustrative mix of measures as published by Defra.

The control limits are adjusted from the Great Britain totals to reflect England only by applying a factor of 0.86.

<b><i>Control limit</i></b>	<b><i>Number of installations</i></b>
Priority Virgin Loft Insulation	180,600
Non-Priority Virgin Loft Insulation	180,600
Priority TopUp Loft Insulation	722,400
Non-Priority TopUp Loft Insulation	722,400
Priority DIY Loft Insulation	64,500
Non-Priority DIY Loft Insulation	451,500
Priority Cavity Wall Insulation	1,053,500
Non-Priority Cavity Wall Insulation	1,440,500
Priority Cylinder Insulation	129,000
Non Priority Cylinder Insulation	129,000
Priority Fuel Switching	77,400
Non Priority Fuel Switching	60,200
Priority Solid Wall Insulation	83,420
Non-Priority Solid Wall Insulation	45,580

## Appendix B: The priority group

Under CERT, 40% of the target savings must be obtained in the priority group. The priority group includes households containing someone aged 70 or over, and households in receipt of one or more of the following benefits:

- Council tax benefit
- Income support
- Housing benefit
- Jobseekers allowance (income based)
- Attendance allowance
- Disability living allowance
- Disablement pension which includes a constant attendance allowance
- War disablement pension (with mobility supplement or constant attendance allowance)
- Child tax credit (where the consumer's relevant income is £15,592 or less)
- Working tax credit (where the consumer's relevant income is £15,592 or less)
- State pension credit

All of these qualifying benefits have been modelled in this analysis, with the exception of disablement pension with a constant attendance allowance. Information on this benefit is not collected on the EHCS.