An investigation of the effect of rising block tariffs on fuel poverty

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Executive Summary

This report examines the effect of introducing Rising Block Tariffs (RBTs) for electricity and gas consumers, specifically considering how different RBTs are likely to affect the number of fuel poor households in England.

Following an initial investigation of the energy requirement of the fuel poor, four RBTs have been considered. Each scenario has been analysed using modified EHCS data, and compared to the base position (in which no block tariff has been applied).

The preliminary stage of this report considers the notional consumption characteristics of both the fuel poor and non-fuel poor households with respect to a number of specified characteristics. This investigation shows that the majority of low income households have a lower than average energy requirement. Fuel poor households, however, tend to be those households with both a low income and a *high* overall energy requirement (although the median electricity use of the fuel poor is below the median of the non fuel poor) In light of these findings, four RBTs have been investigated. However, as the total energy consumption for the fuel poor is higher than for the non fuel poor, it was considered unnecessary to investigate a fully untargeted RBT applied to both gas and electricity simultaneously.

Each of the RBTs results in a modest net reduction in the level of fuel poverty. In particular, the RBTs are successful at removing single elderly households from fuel poverty. Couples with dependent children, however, are more likely to be fuel poor under each of the RBTs. Although households are removed from fuel poverty by all of the RBTs, two of them actually increase the mean fuel bill of the fuel poor, representing a transfer of the burden of fuel costs *onto* the fuel poor group. In addition, three of the RBTs are targeted at specific groups. For these reasons, the results need to be interpreted with care.

The first RBT consists of an electricity block tariff that reduces the price paid for standard electricity by 25% up to the median level of consumption of standard electricity for all households. The tariff has been applied to all households not using electricity as their main heating fuel. No block tariff has been applied to gas consumers. The analysis of this block tariff suggests that implementing this RBT could reduce the total number of fuel poor by approximately 110,000 households in 2006 and approximately 160,000 households in 2022. This block tariff leads to a decrease in the mean fuel bill of the fuel poor.

The second RBT combines the first RBT with an additional 25% reduction in gas costs for all households using mains gas up to the median level of gas consumption of all households. This RBT also reduces the total number of households in fuel poverty, although the tariff actually *increases* the mean fuel bill of the fuel poor group. The analysis shows a reduction of approximately 90,000 fuel poor households in 2006 and approximately 180,000 in 2022. Households remaining in fuel poverty appear to be generally worse off as a result of this tariff.

The third RBT is almost identical to the second RBT, although the gas tariff is instead targeted at households containing someone aged over 60. The analysis of this rising block tariff appears to give the best outcome in terms of reducing the fuel poor figures in both 2006 and 2022. The results show a 190,000 reduction in the level of fuel poverty in 2006 alongside a reduction in the mean fuel bill of the fuel, and a

reduction of 250,000 fuel poor households in 2022 with no change in the mean fuel bill of the fuel poor. Elderly households (in particular single elderly households) are assisted by this tariff.

The final RBT applies a 25% cost reduction to electricity tariffs, up to the median consumption level and only for those who use standard electricity. There is no gas reduction under this scenario. This RBT is similar to the first RBT, but includes all households (rather than only those who do not use standard electricity for their main heating). The outcome of implementing this scenario is similar to that of block tariff one. The level of fuel poverty is reduced by approximately 100,000 households in 2006, followed and approximately 150,000 households in 2022. Unlike the first RBT, however, this tariff causes the mean fuel bill to rise quite considerably due to a significant rise in the fuel bills of households with electric heating systems.

There are potentially significant practical issues in implementing RBTs. This analysis suggests that for RBTs to be most effective they need to be targeted at particular groups. Targeting may be difficult for energy suppliers to achieve without additional information on the characteristics of the households that they supply. Numerous other practical issues exist including the effect of ‘actual’ rather than notional consumption as used here, and the real feasibility of maintaining revenue neutrality for suppliers under such a scheme.

Introduction

The first report of the Committee on Climate Change (CCC) requested that Building Research Establishment (BRE) produce estimates of the level of fuel poverty to 2012, 2017 and 2022 [1]. One mechanism suggested within the CCC report, for the mitigation of fuel poverty, was the introduction of rising block tariffs (RBTs) for electricity and gas. RBTs have also been suggested as a method of constraining excessive consumption [2]. This report outlines the results of analysis of the effect that various RBTs for gas and electricity have on the fuel poor, relative to the original CCC results.

The original analysis of the effect of the carbon budgets was carried out using numerous modified English House Condition Survey (EHCS) datasets simulating different levels of energy efficiency. This allowed predictions of the effect of energy efficiency on fuel poverty in 2012, 2017 and 2022. The appropriate survey cases were selected from these datasets in order to match the predicted energy efficiency characteristics at these dates. Fuel price and income scenarios were then applied to the selected dataset. Because of the numerous possible solutions to match the predicted energy efficiency characteristics, this selection procedure needed to be repeated multiple times. On each repetition the survey cases selected were varied (randomly) to achieve convergence around a solution.

The subsequent analysis of RBTs, presented here, has been conducted by modifying this existing modelling procedure. The facility to vary the tariff structure has been incorporated and numerous additional outputs have been produced to examine the characteristics of the stock.

This report is structured in three parts. The first part introduces the basic principles behind RBTs, fuel poverty and the original estimates of the levels of fuel poverty produced for the first report of the CCC. The second part outlines the notional energy consumption characteristics of the fuel poor, and considers the applicability of RBTs. The third part of the report describes the results from applying RBTs, and is accompanied by a comprehensive set of tables.

Rising block tariffs, fuel poverty & the CCC projections

What are rising block tariffs?

Rising block tariffs are an alternative method of charging for electricity and gas. Essentially they are a way of penalising high energy users, and rewarding low energy users. They have been suggested by various parties (including in a debate in the House of Lords) as a method of inhibiting excessive energy use, as well as a potential mechanism for alleviating fuel poverty [2],[3].

The majority of existing (non-rising block) tariffs for gas and electricity are structured in one of two ways:

a) A tariff consists of a standing charge which is payable (as a cash amount) once per period of connection to the utility, and a price paid per unit of gas / electricity consumed.

b) A tariff consisting of a raised initial price per unit of gas / electricity consumed up until a defined level of consumption, followed by a reduced price for all subsequent units consumed.

The level of consumption which marks the transition from a high to a low price, as described by '*b'* above, is generally set at a very low level. This results in the extra revenue generated by the initial raised price being equivalent to a standing charge, alongside a price paid per unit which is independent of consumption (i.e. the situation described in '*a*'). Therefore, except for very low levels of consumption, the two most common types of tariff structures (*'a'* and *'b'* above) are in fact the same as one another. This is shown in Figure 1 below.

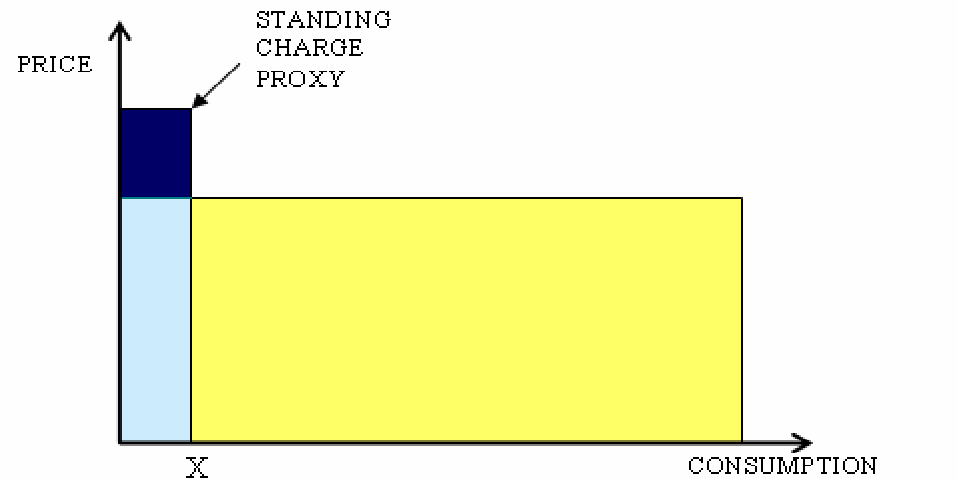

Figure 1: A typical tariff structure for gas or electricity. A higher price is paid for consumption below point x. Point x is generally set at a low level of consumption so the additional revenue from the raised initial tariff (shaded dark blue) is in fact a standing charge by proxy.

Rising block tariffs (RBTs) are structured such that a reduced price (relative to the standard price described above) is paid until a defined level of consumption, followed by an increased price for consumption above this level. This situation is shown in Figure 2 below. Overall revenue to the utilities at the macro-level (as obtained from all consumers) is maintained by ensuring that price paid for usage above the defined level of consumption (point 'y' in Figure 2) is inflated sufficiently to compensate for the reduction below this point. Individual consumers will benefit from reduced fuel bills under an RBT if they are relatively low users of electricity, and will be penalised by increased fuel bills if they are relatively high users.

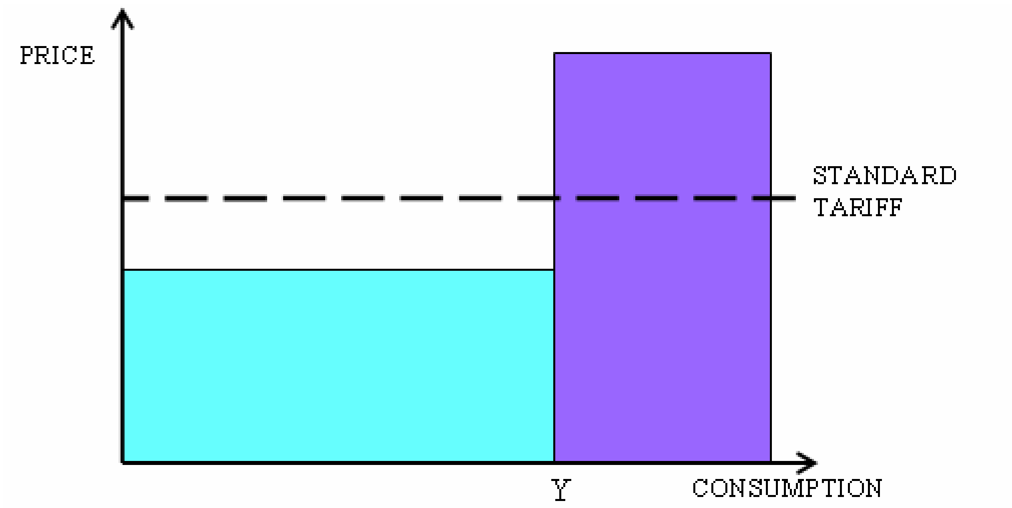

Figure 2: A rising block tariff structure (shown against a line indicating a 'standard' tariff for comparison). The price paid for consumption below point y is reduced. The price paid for consumption above point y is increased.

By increasing the discount relative to the 'standard' tariff, low users of energy will receive greater benefit. However, in order to maintain the revenue, a larger discount will need to be balanced against a greater increase in the raised block. This is shown in Figure 3 below

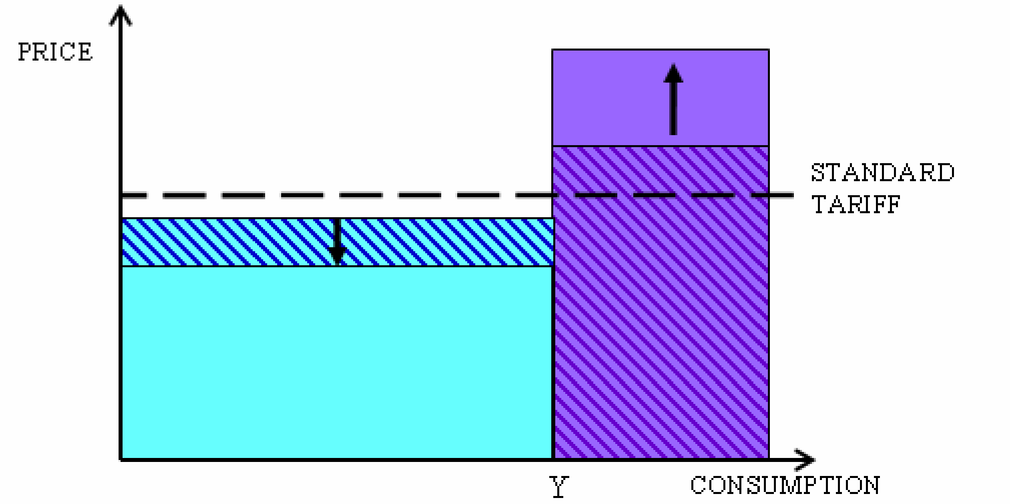

Figure 3: Varying the size of the RBTs. In order to maintain the revenue, a larger reduction in the initial block must be compensated for by a larger increase in the raised block.

What is 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 a defined heating regime.

Fuel poor households are considered to be at greater risk of ill health and death as a result of inadequately heated homes, caused by the high cost of fuel relative to their income.

The energy use in the definition is *notional*, and quantifies a level of usage considered to be required to maintain a warm, healthy environment, alongside sufficient energy use for hot water, lighting, appliances and cooking.

Small households in large dwellings may be classed as under occupying (this takes into account factors such as the number of bedrooms and the total floor area). In this instance, the household is assigned a heating requirement for only part of the house as the entire house is unlikely to be needed. A household that has usually has someone at home in the daytime on weekdays (for example, retired pensioners and those with disabilities), will be assigned a greater requirement than a household which tends to be out in the week (for example, those in full-time work).

A standard minimum temperature is required to be maintained in the home throughout the year in order to provide a suitable level of thermal comfort. In the current fuel poverty definition in England, this stands at 21°C for the primary living zone (i.e. the living room), and 18°C elsewhere.

Full details of the annual calculation method for fuel poverty statistics in England can be found in the online fuel poverty methodology documentation [4]. This methodology is summarised in Appendix B below.

The number of households in fuel poverty in England is calculated annually by BRE on behalf of the Department of Energy and Climate Change (DECC). This analysis uses data from the English House Condition Survey (EHCS). The EHCS provides information on the changing condition and composition of the housing stock and the characteristics of households living in different types of dwelling. The latest results from the EHCS show that in 2006 approximately 2.4 million households in England were fuel poor.

For each case on the EHCS, a 'fuel poverty ratio' is calculated. This calculation has three components – energy prices (unit and standing charges), notional fuel consumption and income. The equation takes the following form:

$$\text{Fuel poverty ratio} = \frac{\sum(\text{Unit Fuel Price} \times \text{Notional Fuel Consumption}) + \sum \text{Standing Charge}}{\text{Income}} \qquad \textbf{[Eqn 1]}$$

If the fuel poverty ratio is greater than 0.1 (i.e. a household spends more than 10% of their income on fuel) then the household is considered to be fuel poor.

Estimates for the level of fuel poverty under the carbon budgets

In 2008, BRE produced estimates for the CCC of the level of fuel poverty under a variety of fuel price, income and energy efficiency scenarios to 2012, 2017 and 2022. These estimates were produced using a scenario model, using data from the EHCS. Base data from 2006 was adjusted to incorporate additional energy efficiency measures, and projections of future incomes and fuel prices (to reflect the various fuel price changes as a result of the carbon budgets) were applied. In addition, the effect of future demographic change was incorporated by adjusting the 'weights' used in the EHCS, and an adjustment to allow for the effect of new build dwellings was also made.

The scenario model simulated the effect of installing energy efficiency improvements. As it is difficult to determine exactly which households will receive a particular energy efficiency measure, the scenario model produced numerous possible outcomes, until reaching convergence around the most likely solution.

Full details of the modelling procedure can be found in the project report on the CCC website [6]

Numerous results under different scenarios were produced in the original analysis. The scenario which is used a reference scenario in for this new analysis of RBTs is:

- A scenario to 2022 only
- Central fossil fuel price scenario,
- Costs from a carbon price, renewable electricity and renewable heat
- Energy efficiency applied in a non-targeted manner.

This scenario estimated the level of fuel poverty to be 2.67 million households in England in 2022 and 3.46 million households in the UK.

Consumption patterns of the fuel poor.

Before we can consider whether RBTs might help to alleviate fuel poverty it is sensible to consider the consumption patterns of the fuel poor, relative to the non fuel poor.

As discussed above, RBTs benefit low usage households and penalise high usage households. Therefore, for an RBT to benefit fuel poor households, the consumption of gas and/or electricity of the fuel poor must be below the consumption of the non fuel poor. Under this situation the average fuel bills of the fuel poor will be reduced (and consequently the average fuel bill of the non fuel poor will be increased to maintain revenue).

There is some evidence that low income households use less energy than higher income households [2]. This is based upon *actual* consumption of energy, rather than the *notional required* energy as used in the modelling of fuel poverty (see pages 9 & 10). The fuel poverty methodology uses *notional* energy usage, as this level of consumption corresponds to a regime in which healthy temperatures are maintained and there is adequate provision for other energy use. *Actual* consumption would show an amount of 'underspend', where dwellings are insufficiently heated or consumption is constrained because of cost or other reasons. It does not seem appropriate to claim a benefit for the fuel poor from an RBT, or any other sort of tariff, simply because the household is not heating to an adequate level. Therefore, the effect on notional consumption, rather than actual, is of primary interest.

Analysis of notional consumption has been undertaken using the 2006 published fuel poverty dataset for England and is presented below. This dataset uses survey data from the EHCS. Any notional fuel use, fuel prices and incomes given below for 2006 are calculated following the methodology set out for the Government's monitoring of fuel poverty (see Appendix B). All fuel uses given are notional to standard heating regimes and temperatures, and income uses the Government's 'full income' definition.

Energy distribution of the fuel poor.

A summary of notional fuel costs, income and notional energy use split by fuel poverty status in 2006 is given in Table 1 below. On average the fuel poor households tend to have higher notional fuel expenditure and energy use and significantly lower income (approximately a third that of the non-fuel poor).

	Total notional fuel expenditure (£/year)		Total notional energy use (GJ/yr)		Income (£/year)	
	Mean	Median	Mean	Median	Mean	Median
Not fuel poor	990	920	111	105	27,600	22,500
Fuel poor	1,310	1,150	136	124	9,300	8,400
Total	1,030	940	114	107	25,500	20,400

Table 1: Notional energy cost, use and income split by fuel poor/non fuel poor households (Source: 2006 EHCS)

Table 2 below shows the notional energy use by fuel type, with the mean taken for households only when the fuel type is used. This shows a much clearer discrepancy between the fuel poor/non fuel poor households with those in fuel poverty requiring more energy on average than those not in fuel poverty. This is likely to be due to a combination of less efficient heating systems and poorer dwelling fabric leading to greater heat loss from these dwellings.

The large difference in solid fuel energy requirement is likely to reflect the higher level of solid fuel being used for the main heating system in fuel poor households; in contrast, in non-fuel poor households solid fuel systems are more likely to be for secondary (supplementary) heating.

Mean notional energy use GJ (for households where fuel is used)		Gas	Electricity	Oil	Solid
Fuel poverty flag	Not in fuel poverty	97	16	117	30
	In fuel poverty	114	21	141	72

Table 2: Mean notional energy use (GJ/yr) (for households where fuel is used) (Source: 2006 EHCS)

An interesting pattern is seen in the median notional electricity and gas consumption. Whereas for gas the median usage is greater for the fuel poor than the non-fuel poor (mirroring the pattern seen in the mean), for electricity the median usage of the fuel poor is below the non-fuel poor (the opposite pattern to the mean). This is shown in Table 3 below.

Median notional energy use GJ (for households where fuel is used)		Gas	Electricity
Fuel poverty flag	Not in fuel poverty	86	12
	In fuel poverty	92	11

Table 3: Median notional gas and electricity use (GJ/yr) (for households where fuel is used) (Source: 2006 EHCS)

The distribution of total notional energy use is shown graphically in Figure 4. The distribution of notional energy use for the fuel poor and non fuel poor are very similar with the fuel poor households distribution slightly skewed to higher levels of energy use.

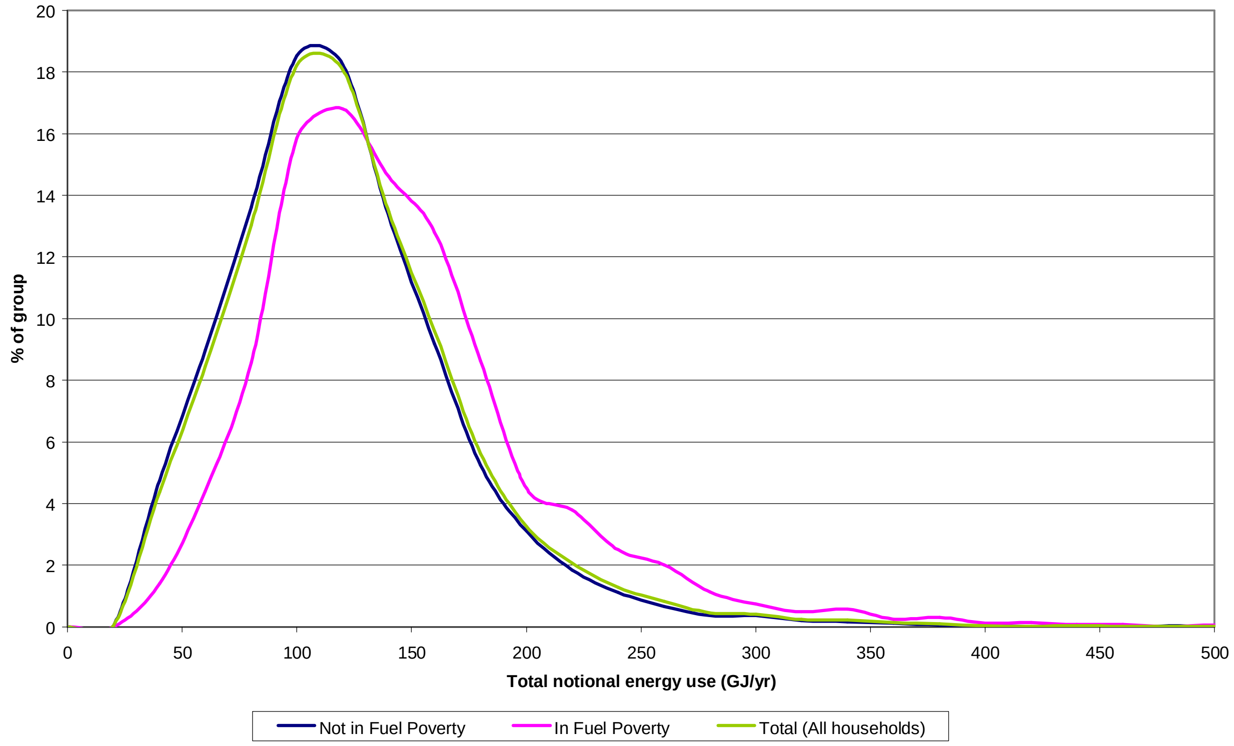

Figure 4: Total notional energy use (GJ/yr) distribution by fuel poverty status

The distribution of notional electricity use is shown in Figure 5. The distribution for fuel poor households is skewed further to the left than for non fuel poor households. This pattern is partly explained by the prevalence of single person fuel poor households. Electricity, in most households, is only used for lights and appliances which is a partially a function of the number of people in the household.

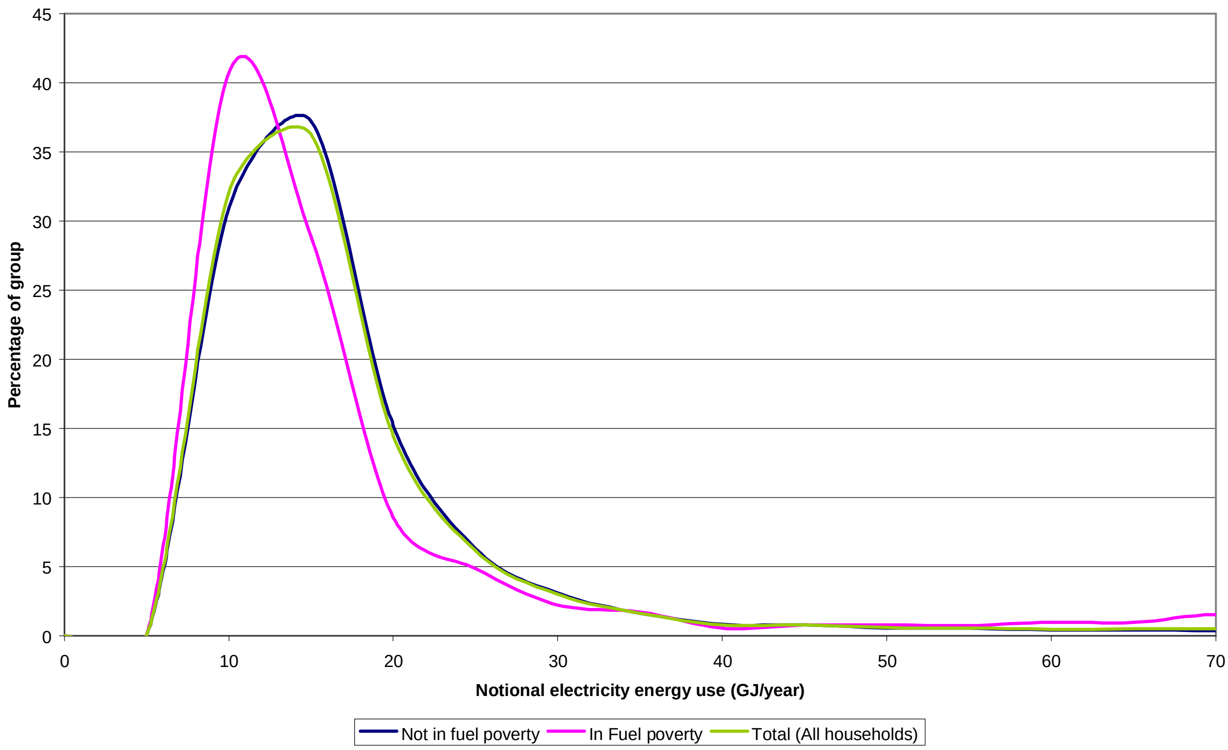

Figure 5: Notional electricity use (GJ/yr) distribution by fuel poverty status

Figure 6 shows the distribution of notional gas energy use for fuel poor and non fuel poor households. Fuel poor households show a tendency to require higher levels of energy. This is due to less efficient heating systems and poorer thermal performance of the dwelling, as well as practical reasons such as under-occupancy and occupants of fuel poor households more likely to be at home during the day (this is described in more detail below).

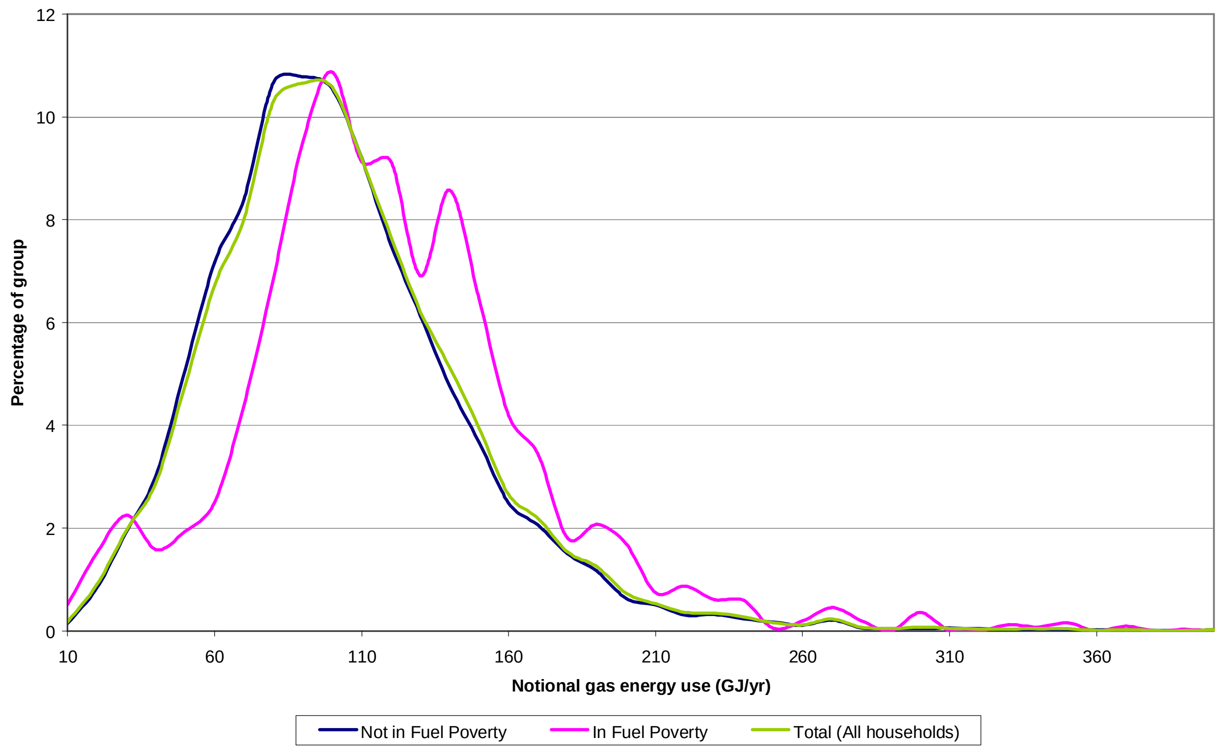

Figure 6: Notional gas energy use (GJ/yr) distribution by fuel poverty status

Average price paid per GJ of notional energy use

Table 4 shows the average price paid per GJ of notional energy use by fuel in 2006. It can be seen that, in addition to requiring more energy, fuel poor households also pay more per unit of energy. One of the primary reasons for the higher tariffs paid by the fuel poor is that they are more likely to be on a payment method which costs more per unit of energy than other payment types, particularly pre-payment meters.

Average price (£) per GJ of energy use*	Not fuel poor	Fuel poor
Mains gas & communal heating	5.82	6.19
Electricity (all tariffs)	21.94	22.74
Oil, LPG & bottled gas	10.54	11.64
Solid fuels	6.72	6.90
All fuels	*8.55*	*9.52*

* Not including standing charges

Table 4: Average price (£) per GJ of energy use by fuel and fuel poverty status

These price averages do not include additional standing charges which are added onto a fuel bill for many fuels (including electricity and gas) on top of a cost per unit used. The standing charges can range from approximately £30-£100 annually per fuel. It is important to note that this standing charge is a fixed charge, and therefore could not be reduced when applying an RBT (e.g. a dwelling using 5GJ of electricity at £22 per GJ would pay 5x22 = £110 + £50 standing charge = £160. Any RBT applied would only affect the consumption dependent £110 part of the bill).

Income by fuel poverty status

Figure 7 shows the income distribution for the fuel poor compared to the non fuel poor. The fuel poor group is clustered just below £10,000/year (shown by the strong peak) and includes many more cases with extremely low incomes. In comparison, the distribution of the non-fuel poor shows a much larger spread with a long positively skewed tail, and contains relatively few low income households.

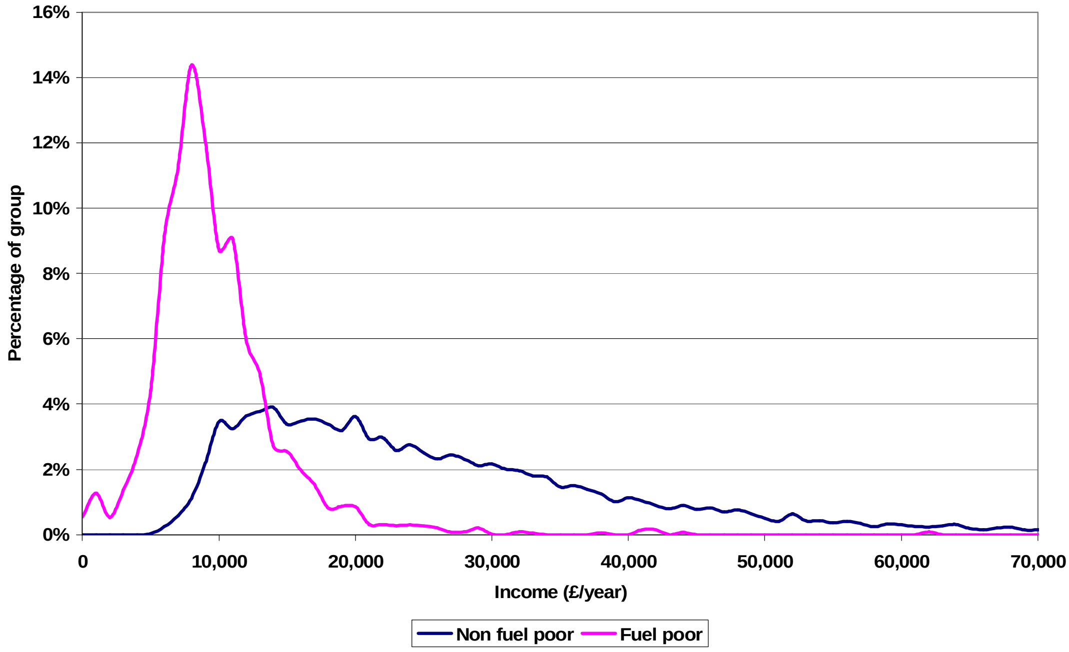

Figure 7: Household income (£/yr) by fuel poverty status (full income definition)

Energy efficiency characteristics of the fuel poor

Figure 4 and Table 1 show that in general fuel poor households tend to require more energy and have a higher fuel spend than non fuel poor households. There are numerous reasons why fuel poor households have a greater requirement for energy use (and expenditure).

The types of factors which affect the energy use and cost for a household include:

- Characteristics of the dwelling fabric
    - Wall type, insulation
- Characteristics of the heating systems
    - Fuel type, efficiency
- Characteristics of the occupying household
    - Heating regimes based on whether a household is:
        - *In all day*
        - *Under-occupying*

The energy efficiency of dwellings in the UK are rated using the Government's Standard Assessment Procedure (SAP). SAP ratings are on a scale between 1 (poorest energy efficiency) and 100 (zero net energy cost). Fuel poor dwellings tend to have lower SAP ratings than non fuel poor dwellings, on average 13 SAP points lower. Fuel poor households are more likely to live in dwellings with a SAP rating less than 30 (31% of the fuel poor live in dwellings with a SAP below 30, compared to 7% of the non fuel poor) and are less likely to live in dwellings with a SAP rating above 50 (only 22% of the fuel poor live in dwellings with a SAP above 50, compared to 53% of the non-fuel poor). This relationship is shown in Figure 8. Lower performance of the fabric and heating system of the dwelling contribute significantly to the higher energy requirements and costs of the fuel poor.

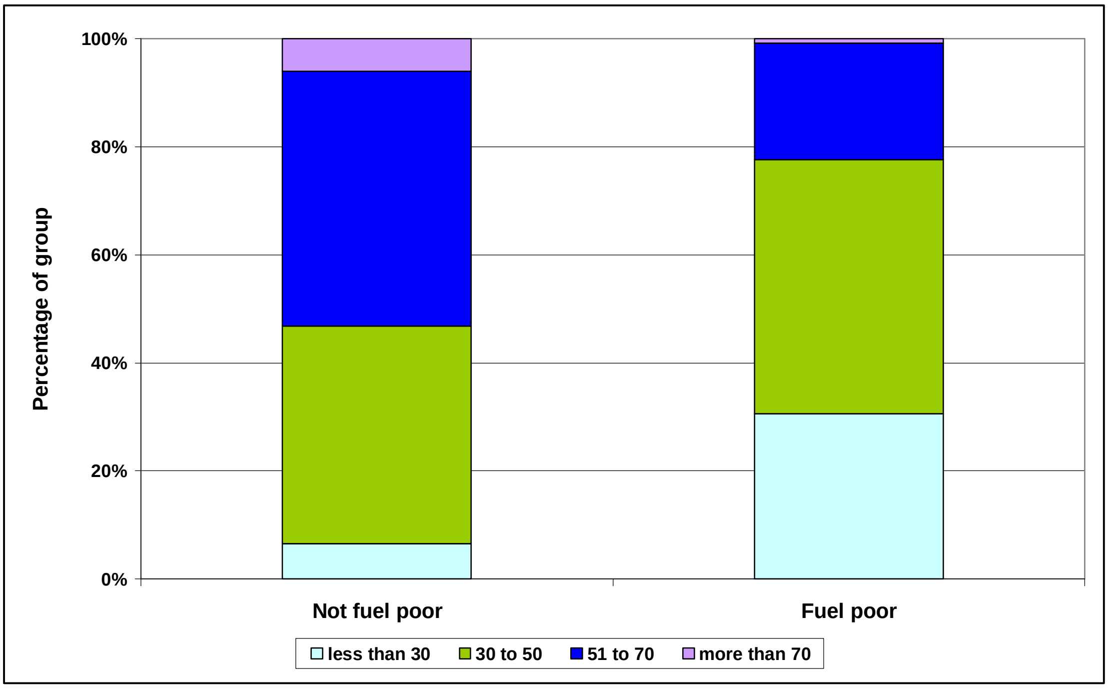

Figure 8: SAP ratings by fuel poverty status

In general, fuel poor households tend to live in older dwellings than non-fuel poor households. 57% of fuel poor households living in dwellings built before 1945, compared to 37% of the non fuel poor, as shown in Figure 9. Older dwellings are more likely to be built from poor fabric (e.g. solid wall, single glazed), and are generally harder to improve.

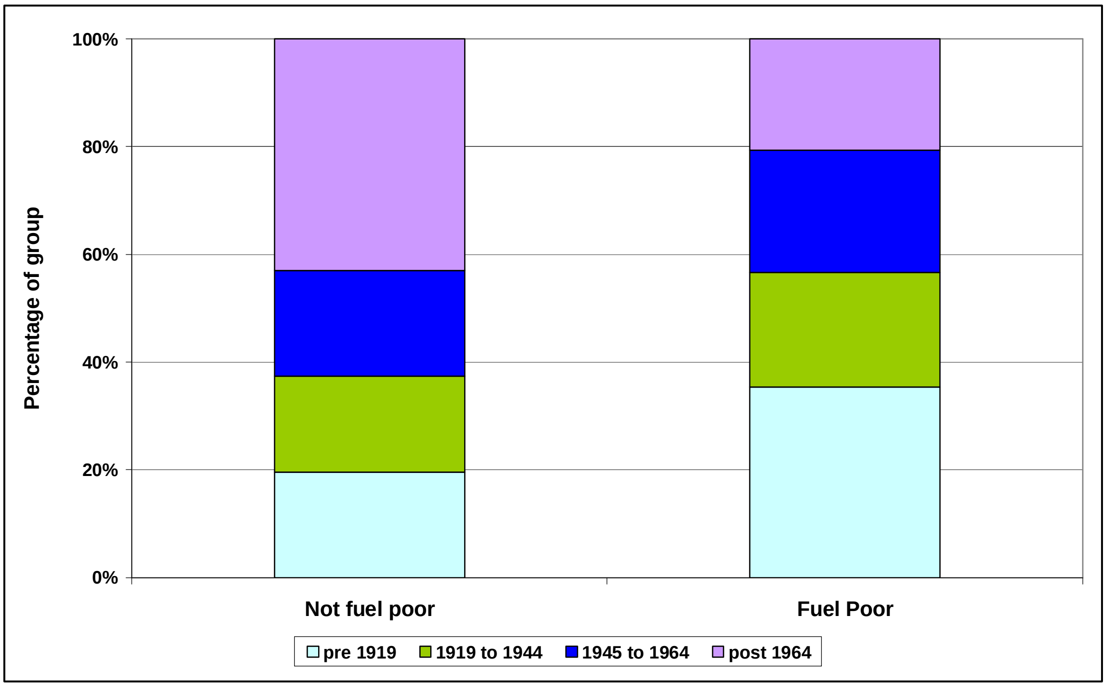

Figure 9: Age of dwelling by fuel poverty status

Fuel poor dwellings also use a different mix of fuels. They use more oil and electric systems which tend to be more expensive than gas for heating most types of dwelling.

The characteristics of the particular household living in the dwelling can also affect the energy use and cost. Fuel poor households are much less likely to be on a 'standard' heating regime (typically someone at work with heating on in the morning and evening only) and are more likely to be a household which is 'in all day' (and therefore is assigned a heating regime where the house is heated all day). This regime will result in a higher notional energy use.

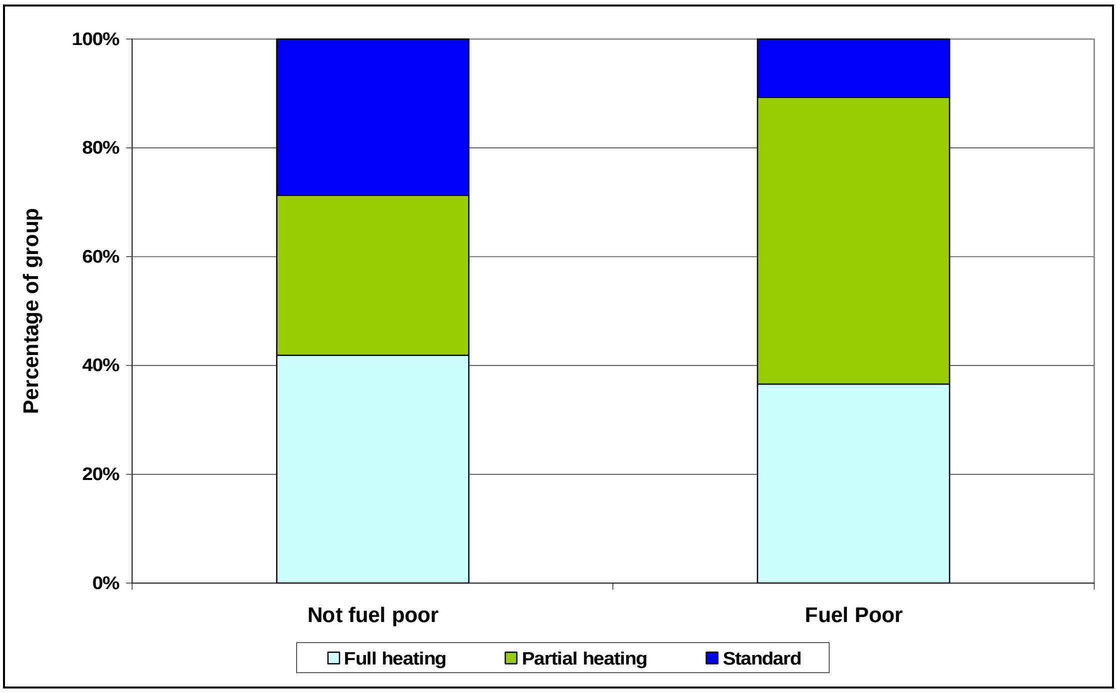

Figure 10: Heating regimes by fuel poverty status

This pattern of heating regimes can be partly explained by the working status of the householder. Fuel poor households are much more likely to be out of full time work or 'inactive' (e.g. retired or disabled). 68% of fuel poor households are unemployed or inactive, compared to only 35% of the non-fuel poor. This is shown in Figure 10 above.

Proportion of total notional cost for electricity by notional electricity use decile

The proportion of total notional fuel cost which is electricity, split by notional electricity use decile is shown in Figure 11 . For most households, approximately, 30% of all energy required to be used is electricity (mainly lighting, appliance and cooking costs only). The higher electricity users (in the top quintile of notional use) are those which use electricity for heating and therefore tend to require a higher proportion of electricity[1].

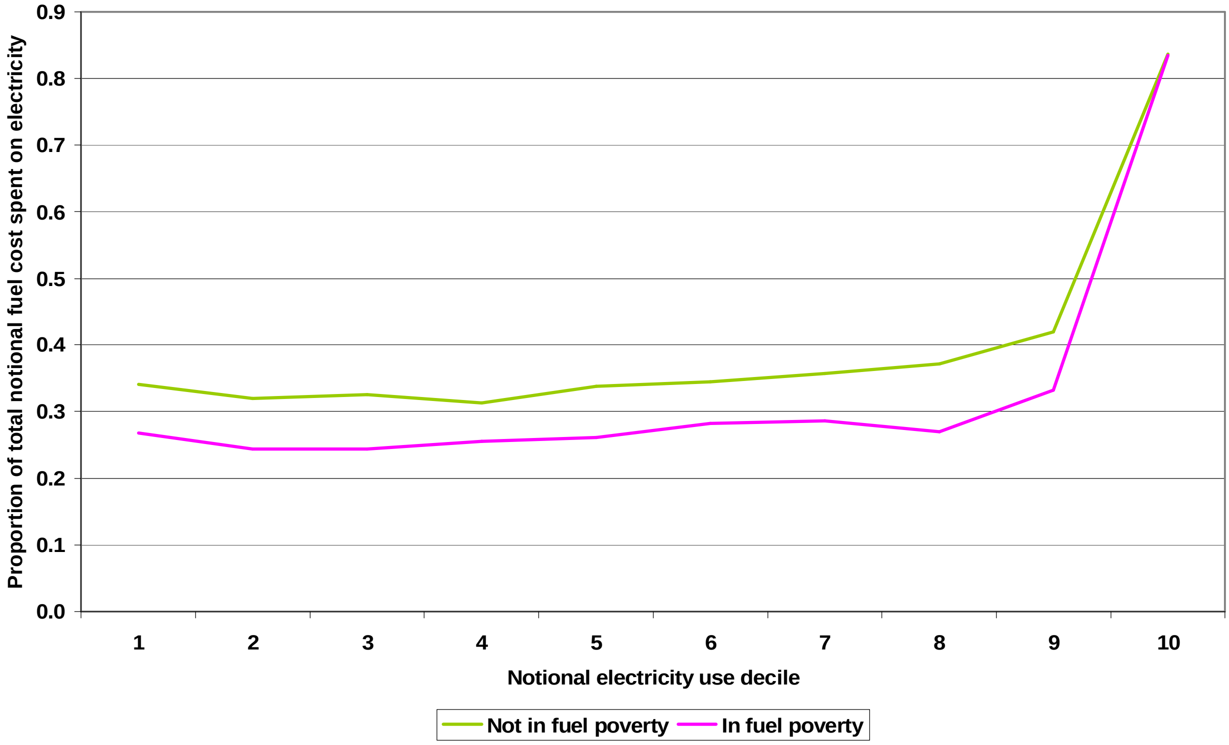

Figure 11: Proportion of total cost for electricity by notional electricity use decile

Distribution of the fuel poor

Plotted below are contour charts of the number of households by notional energy use and energy cost decile against income decile. There is a trend for higher incomes to be associated with a higher notional energy use and fuel spend, and lower incomes to be associated with a low notional energy use and fuel spend. This is shown in Figures 12 and 13 below. These charts show the concentration of households in each of the notional energy use and income deciles. It can be seen that low income households are clustered towards the areas of low notional energy use (the high concentration of households is shown by the dark blue areas) and high income households are clustered towards areas of high notional energy use.

[1] The figures given for each quintile are averages, which masks the large number of the cases with electric space heating which solely use electricity as a fuel.

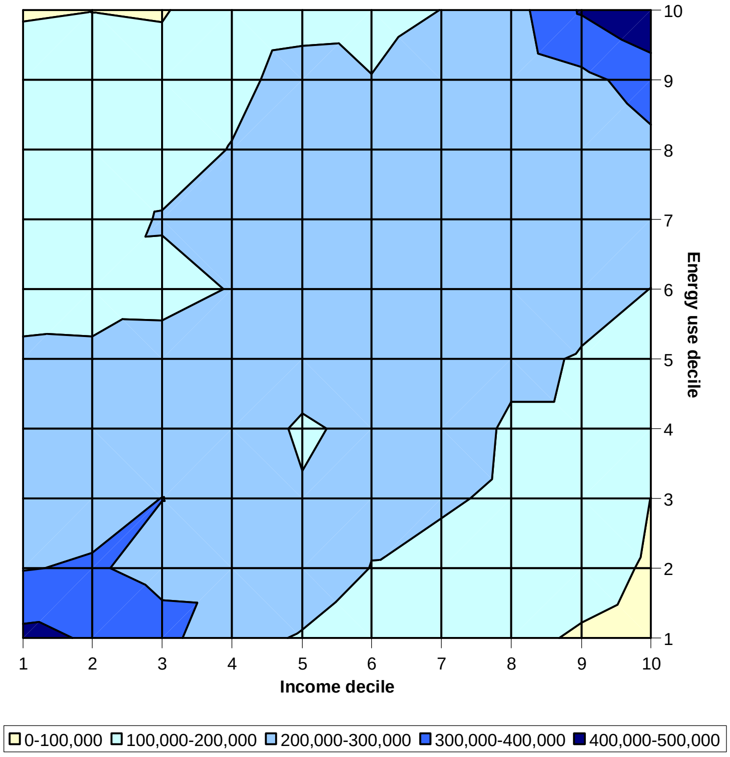

Figure 12: Contour chart showing distribution of households by income and notional energy use decile. Colour banding shows number of households by notional energy use and income decile (dark blue is highest concentration of households).

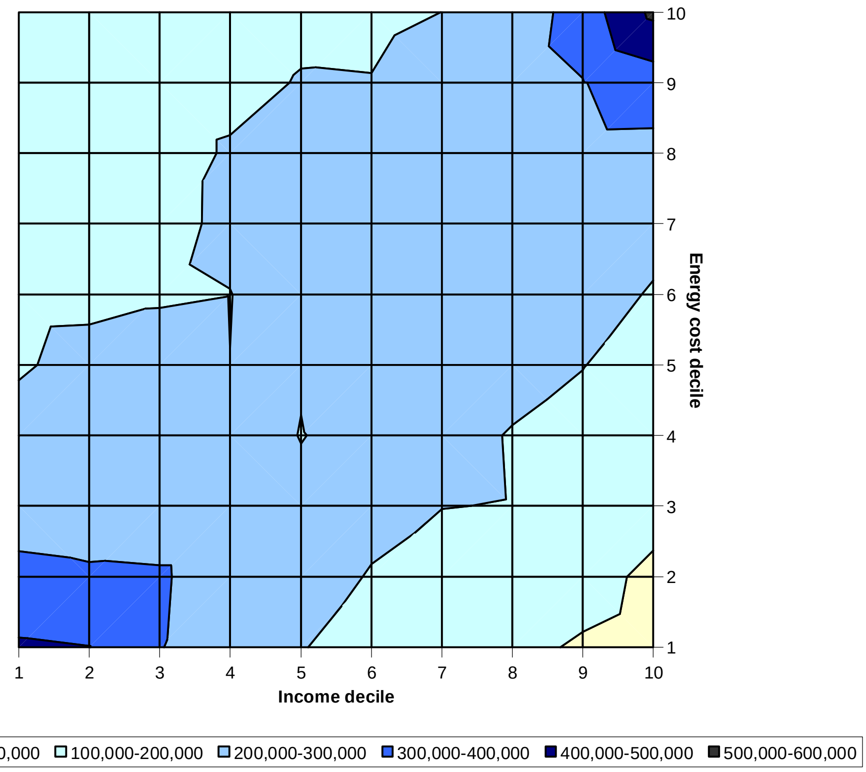

Figure 13: Contour chart showing distribution of households by income and notional energy cost decile. Colour banding shows number of households by notional energy cost and income decile (dark blue is highest concentration of households).

It might be assumed that, because fuel poor households are closely associated with low income, they require less energy and have lower notional costs. This is, however, not the case. Figure 14 & Figure 15 below show the concentration of fuel poor households (rather than the number of all households shown in Figures 12 and 13). It can be seen that fuel poor households are in fact highly concentrated in the areas of low income and high energy use. The majority of low income households have a low energy requirement, whereas the fuel poor tend to be low income households with a *high* energy requirement.

When considering the lowest income decile, 100% of cases in the 4-10th notional fuel cost deciles are fuel poor (this is due to the costs for all 6 of these deciles being more than 10% of the upper band of the 1st income decile). The only dwellings which are protected from fuel poverty in this 1st income decile are those with the lowest fuel costs (those in both the 1st income decile and the 1st fuel cost decile) only 9% of this group are fuel poor. This group makes up nearly 20% of households in the first income decile – this is probably because those on lower incomes are more likely to be single person households, living in smaller dwellings. As income increases through the deciles, the threshold for fuel poverty is higher and this is reflected by the increasing fuel cost decile achieved before any household is fuel poor.

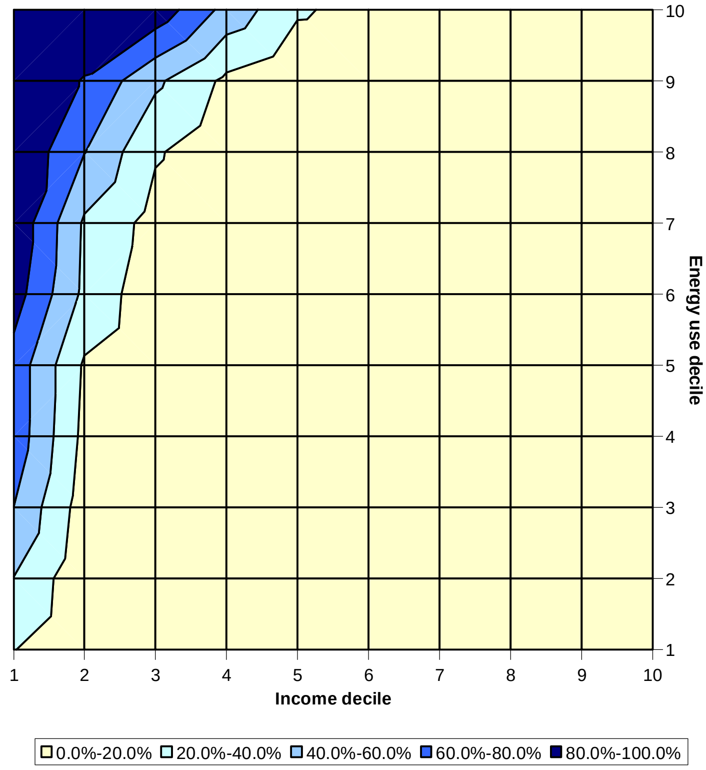

Figure 14: Contour chart showing distribution of fuel poor households by income and notional energy use decile. Colour banding shows number of fuel poor households by notional energy use and income decile (dark blue is highest concentration of fuel poor households).

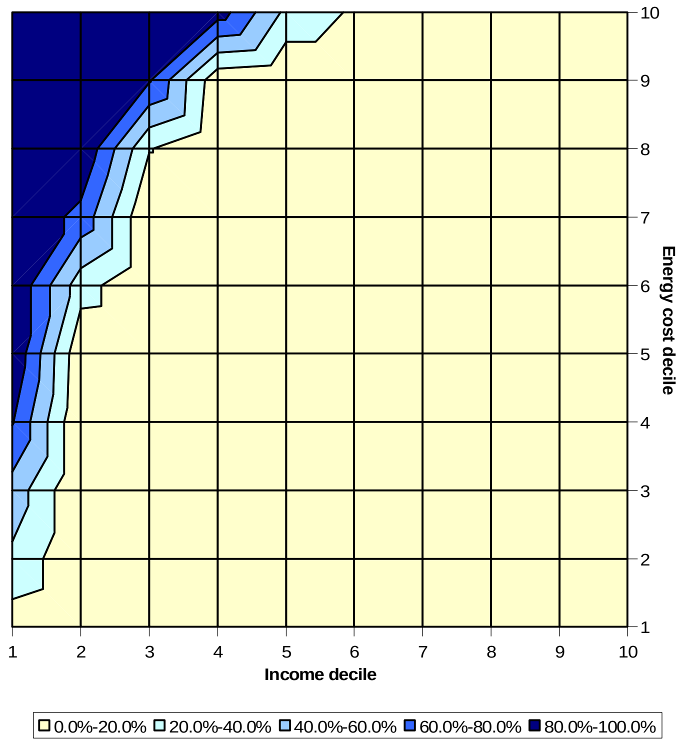

Figure 15: Contour chart showing distribution of fuel poor households by income and notional energy cost decile. Colour banding shows number of fuel poor households by notional energy cost and income decile (dark blue is highest concentration of fuel poor households).

The fuel poor in 2022

In 2022, the fuel poor become increasingly dominated by single, low-income households. This is a result of an overall increase in the number of these types of household in the population as a whole, alongside enhanced energy efficiency moving other higher income household types out of fuel poverty. The lowest income households are more likely to be in severe fuel poverty and therefore will need to benefit to a greater degree from energy efficiency in order to remove them from fuel poverty. Higher income fuel poor households are likely to be in less severe fuel poverty, and energy efficiency improvements will, therefore, be more likely to remove them from fuel poverty.

The proportion of single person households that are fuel poor has increased from 54% to 65% between 2006 and 2022, resulting in an even greater dominance of this category of household among the fuel poor. The number of fuel poor single person households aged over 60 has increased from 34% to 37%, while the number of fuel poor single person households aged under 60 has increased from 20% to 28%. At both dates, the predominant group of fuel poor households are those with a Household Reference Person[1]

[1] The household reference person is defined as the occupant with the highest income in the household.

(HRP) without a partner. This group accounts for 76% of the fuel poor in 2022, an increase from 68% in 2006.

Older households are more likely to be fuel poor in both 2006 and 2022, although there is not a particular increase in the overall likelihood of being fuel poor between these dates. Elderly households are most at risk of entering fuel poverty, with 44% and 45% of the fuel poor households having an HRP aged 65+ years old in 2006 and 2022 respectively. Similarly, 24% of the fuel poor households in 2006 and 25% of fuel poor households in 2022 contain someone (not necessarily the HRP) aged over 85.

In 2022, the fuel poor become increasingly dominated by the very poorest households. 52% of those in fuel poverty are in the lowest income decile in 2006, rising to 63% of the fuel poor in 2022. We can associate this increase with energy efficiency acting to remove higher income households (likely to be closer to 10% fuel spend threshold) from fuel poverty. This pattern can be seen in the distribution of the fuel poor in 2006 and 2022 by income decile shown in Figure 16 below.

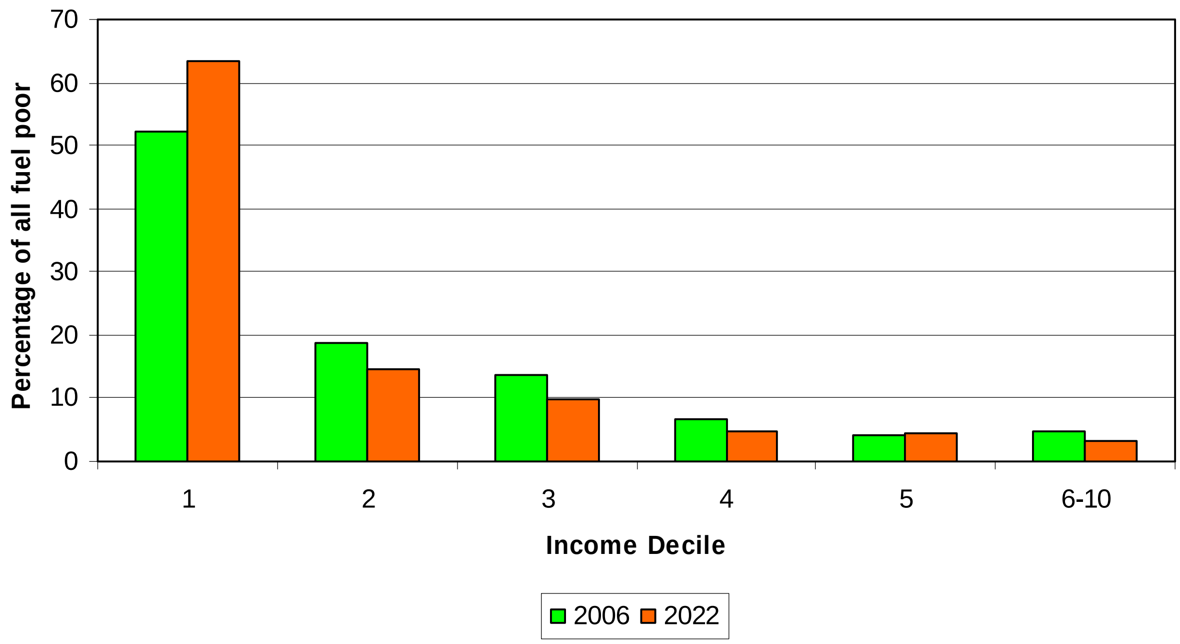

Figure 16: Distribution of the fuel poor by income decile in 2006 and 2022.

Following the installation of energy efficiency measures we see the fuel consumption of the fuel poor decrease. Figure 17 below compares consumption of gas in 2006 with consumption for gas in 2022. It is evident that in 2022 less of the fuel poor are in the higher bands of gas consumption, and more of the fuel poor are in the lowers bands. We can associate this with energy efficiency improvements reducing the space and water heating requirement of fuel poor dwellings.

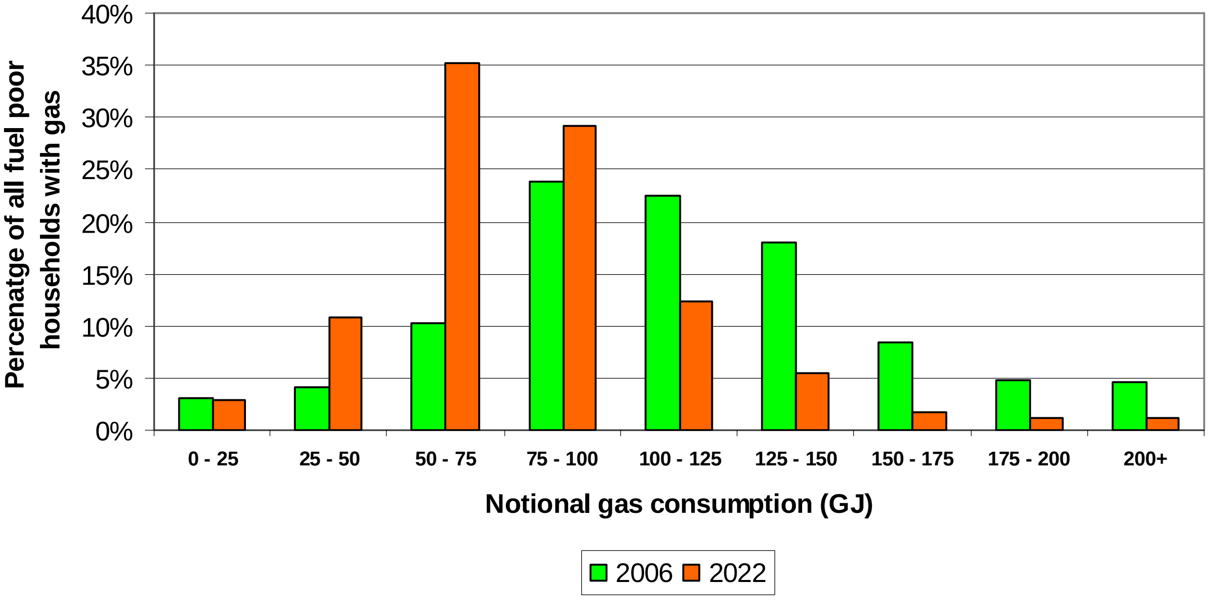

Figure 17: Notional gas consumption of the fuel poor in 2006 and 2022.

Figure 18 below shows a comparison of gas consumption of the fuel poor and the non-fuel poor in 2022. It can be seen that in 2022 fuel poor households continue to consume more gas than non fuel poor households.

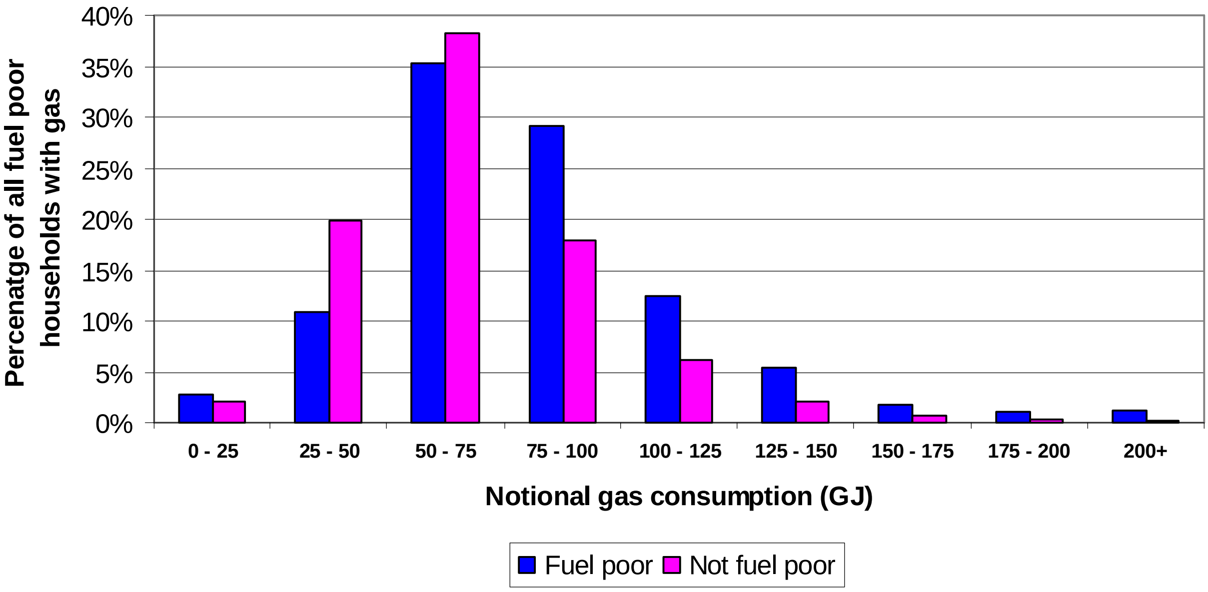

Figure 18: Notional gas consumption of the fuel poor and non-fuel poor in 2022.

It is difficult to draw firm conclusions about many of the dwelling characteristics of the fuel poor in 2022 because the grossing methodology used to simulate the situation in 2022 was only controlled to two factors: ‘Age of HRP’ and ‘Household Type’. The analysis does suggest that more of the fuel poor in 2022 may use fuels other than gas, and that more may be in ‘non-cavity’ (predominantly solid wall) homes. This is consistent with the energy efficiency scenarios applied to the base data not being as effective at treating hard-to-treat homes (concentrating on cavity wall insulation and gas boiler upgrades etc.). This will result in homes eligible for the measures applied in the scenarios being removed from fuel poverty, while the fuel consumption of fuel poor households not eligible for these measures is unaffected (with these households remaining fuel poor). However, other significant changes to the distribution of dwelling characteristics , unaccounted for by the grossing methodology used, may occur to 2022 and it would be imprudent to make any strong inferences about the dwelling characteristics at this date based on this analysis.

Applying rising block tariffs to fuel poor

Defining the tariffs

As stated above, RBTs will only have a beneficial effect upon the fuel poor if the consumption of this group is below that of the non-fuel poor. This is because, in order to maintain the total revenue to the energy suppliers, higher users must subsidise the usage of lower users.

As the analysis above demonstrates, the overall notional consumption of the fuel poor is higher than the non-fuel poor, suggesting the introduction of RBTs may be detrimental to the fuel poor. Gas consumption of the fuel poor is higher than the non-fuel poor, as is mean electricity consumption. However, the median electricity consumption of the fuel poor is lower than the non-fuel poor. We can associate this with high users of electricity (probably with electrical heating systems) raising the mean significantly.

There appears, therefore, some limited potential for RBTs to be beneficial to the fuel poor if applied to electricity consumption of households without electrical heating systems. RBTs applied to gas consumption seem likely to have a negative effect on the fuel poor without targeting any specific groups.

Following consideration of the evidence, four tariffs have been specified to examine the scale of any positive and negative effects. Three of the four tariffs are targeted at different groups of the fuel poor and some tariffs apply only to electricity, where as others apply to both electricity and gas.

Rising block tariff 1 (RBT1):

RBT1 has been chosen in light of the evidence that fuel poor households have a lower median energy requirement than non-fuel poor households. The tariff does not apply to households with electric heating systems with the hope that very high users of electricity will not be adversely affected.

Electricity: A reduction of 25% to be applied to all consumption of standard electricity (not economy 7 or similar off-peak tariff) below the median standard electricity consumption of all households. To be applied to all households not using electricity as their main heating fuel. Revenue to be recouped through a raised block above this point for all households to whom the tariff has been applied.

Gas: No RBT applied.

Rising block tariff 2 (RBT2):

RBT2 has been chosen to investigate the effect of introducing a rising block tariff for gas. The evidence above is that the fuel poor require more gas than the non-fuel poor, so it can be assumed that this effect will be negative. The scale of any negative effect, however, is also of interest were an RBT to be introduced as a mechanism of constraining emissions or for other reasons.

Electricity: A reduction of 25% to be applied to all consumption of standard electricity (not economy 7 or similar off-peak tariff) below the median standard electricity consumption of all households. To be applied to all households not using electricity as their main heating fuel. Revenue to be recouped through a raised block above this point for all households to whom the tariff has been applied.

Gas: A reduction of 25% to be applied to all consumption of mains gas below the median mains gas consumption of all households. To be applied to all households using mains gas. Revenue to be recouped through a raised block above this point for all households to whom the tariff has been applied.

Rising block tariff 3 (RBT3):

RBT3 looks at the possible effect of targeting a block tariff at the elderly, and has been introduced in light of the initial results from RBTs 1 & 2 (the results are outlined below). The positive effect of RBT1 is combined with a targeted gas tariff, as an attempt to remove the negative impacts associated with RBT2.

Electricity: A reduction of 25% to be applied to all consumption of standard electricity (not economy 7 or similar off-peak tariff) below the median standard electricity consumption of all households. To be applied to all households not using electricity as their main heating fuel. Revenue to be recouped through a raised block above this point for all households to whom the tariff has been applied.

Gas: A reduction of 25% to be applied to all consumption of mains gas below the median mains gas consumption of all households. To be applied to all households containing someone aged over 60 only. Revenue to be recouped through a raised block above this point for all households using mains gas (not just elderly households).

Rising block tariff 4 (RBT4):

RBT4 is a non-targeted standard electricity tariff. It is of interest as it would be the easiest to apply in practice (requiring no targeting by energy suppliers). It only applies to electricity.

Electricity: A reduction of 25% to be applied to all consumption of standard electricity (not economy 7 or similar off-peak tariff) below the median standard electricity consumption of all households. To be applied to all households using standard electricity (not just those without electric main heating). Revenue to be recouped through a raised block above this point for all households to whom the tariff has been applied.

Gas: No block tariff applied.

Methodology:

This analysis has examined the level of fuel poverty in 2006 and 2022 under these rising block tariffs.

The 2006 analysis has modified the 2006 EHCS fuel poverty data directly. For the 2022 estimates the original model, used to determine the level of fuel poverty as published in the first report of the CCC has been adapted.

The original model takes into account numerous factors including:

- Changing fuel prices as a result of the carbon budgets
- Changing household incomes
- The effect of energy efficiency improvements
- Changing population demographics
- The effect of new-build housing

The effect of fuel price changes is included in the modelling by inflating the prices used in the base data by the fuel price scenarios presented to BRE by the CCC. The original analysis examined eight different fuel price scenarios, to three periods in time. This analysis of RBTs only uses one of these scenarios (central fuel and electricity price rises accounting for the effects of a carbon price, renewable electricity and renewable heat) to 2022.

Full details of the methodology used in the original analysis, and carried forward into this subsequent analysis, is included in the documentation which accompanied the first report of the CCC [6].

For both 2006 and 2022, RBTs have been included by isolating fuel consumption and applying an adjusted price for electricity and gas as appropriate. The level of the raised block has been set by ensuring that the total revenues from both gas and electricity respectively are maintained after each RBT has been applied.

This analysis also includes further breakdowns of the characteristics of the stock. This includes further analysis of the age of fuel poor occupants, household income, household type, main heating fuel type, wall type and government office region.

The analysis has been carried out for England only, although the likely implications of the results below for Scotland, Wales and Northern Ireland are discussed below.

Results:

The full results of this analysis for both 2006 and 2022 are included in the tables accompanying this report (Appendix A). The key results of each tariff are discussed below.

The results of each RBT should be compared against the base position, which shows a level of fuel poverty in 2006 of 2.43 million households and in 2022 of 2.67 million households. The key assumptions on the original modelling procedure (as described in [6]) should also be taken into consideration when interpreting results for 2022.

The results described below concentrate on the effect of the RBTs on different household types and ages of householder, as the most significant differences between the tariffs are to be found in these factors. Other breakdowns of the data (wall type, region and main heating fuel) can be found in the tables in Appendix A. Typically the differences in these factors are small, and seem likely to be driven by the characteristics of the household.

Results of rising block tariff 1 (RBT1):

The first RBT has been applied to standard electricity only, and excludes any households who may use electricity as their main heating fuel. A 25% discount has been applied to all households using less than the median level of standard electricity consumption of all households (see tables A1 and A2 for details), with households using above this level required to pay an inflated rate of 92% above the ‘standard’ tariff in 2006 and 93% above the ‘standard’ tariff in 2022. The high percentage increase of the second block tariff is required to ensure that the revenue is maintained for all households. Households will, in fact, need to have a consumption level much greater than the median if they are to pay an inflated bill. In order to generate an increased bill, the additional fuel cost generated from consumption above the median will need to be greater than the saving resulting from the 25% discount for all consumption below the median. This is shown in Figure 19.

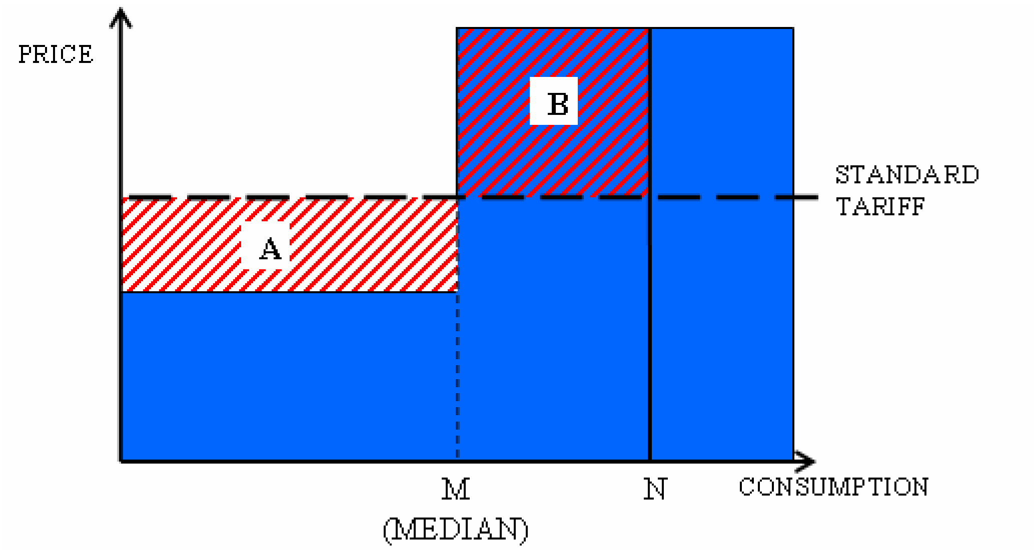

Figure 19: Increased and decreased bills under a rising block tariff. The raised block begins above a consumption of M. Only at consumption above N will households pay an increased bill relative to the standard tariff (when shaded area B exceeds the area of shaded area A).

As we have speculated above, the introduction of this RBT acts to reduce the mean fuel bill of the fuel poor (i.e. those that were fuel poor before the introduction of the block tariff) by an average of £5 in 2006 and £8 in 2022 (tables A3 and A4).

RBT1 has acted to reduce the overall number of fuel poor households by approximately 110,000 households in 2006 and 160,000 in 2022. It should be noted that this is the *net* movement of households. Households will have been made fuel poor by this block tariff, as well as being removed from fuel poverty.

We can also consider the effect of the block tariff on the proportion of income spent on fuel, as shown through the fuel poverty ratio (FPR) - see equation 1 on page 10. Despite having a generally positive effect, we can see that for some households things have become worse (see tables A21 and A22). The introduction of the block tariff has increased the number and proportion of households in the extreme fuel poverty (spending more than 20% of their income on fuel use).

The transfer required (expressed in terms of reduced fuel bills) to remove all households from fuel poverty has generally decreased, although there is also an increase in the proportion of households who require their fuel bills reduced by more than £750 to remove them from fuel poverty. This is a result of some households being particularly penalised by this tariff. This is shown in tables A23 and A24.

We observe that single person households, and in particular single elderly households, have been assisted by this tariff. The proportion of fuel poor households with an HRP aged over 65 has decreased, as has the proportion of fuel poor households which are in the ‘single person’ household types. However, large household types, in particular the ‘couple with dependent children’ group, are more likely to be fuel poor under this RBT.

The proportion of fuel poor households in the lower income deciles has decreased slightly and has increased slightly in the higher income deciles. This demonstrates that RBT1 aids the removal of low-income households from fuel poverty, but at the expense of the higher-income households.

Results of rising block tariff 2 (RBT2):

RBT2 builds directly on the first rising block tariff, by combining the same electricity tariff structure with a rising block tariff for gas. On top of the electricity discount, a 25% discount is applied to all mains gas usage below the median level of consumption of all households, with revenue recouped through an increased price paid for usage above this level (approximately 83% higher than the 'standard' tariff in 2006 and 89% higher than the 'standard' tariff in 2022).

Our initial analysis of the consumption of the fuel poor and non-fuel poor suggested that the fuel poor tend to consume more gas. We would expect that the introduction of this tariff would have a negative effect on the fuel poor relative to the base position. As shown in tables A3 and A4 this is indeed the case. The average fuel bill of the fuel poor is considerably higher than in the base position (~£34 in 2006 and ~£38 in 2022), representing a transfer of fuel costs onto the fuel poor.

Despite this negative effect on the fuel poor, the overall level of fuel poverty appears to have dropped by around 90,000 households in 2006 and 180,000 households in 2022 compared to the base position. Compared to RBT1 this is an additional ~20,000 households becoming fuel poor as a result of the gas RBT. We cannot say that the gas tariff would have this effect were it to be applied in the absence of an electricity RBT. For each individual household with both fuels the combination of gas and electricity tariffs will interact with each other. A particular household may require the positive effect of both the gas and electricity RBTs to be removed from fuel poverty, or may be moved into fuel poverty by the gas RBT, only to be removed by the electricity RBT.

RBT2 shows the seemingly opposite effects of increased fuel bills for the fuel poor, combined a reduction in the total number of fuel poor households. Although the mean fuel bill has increased, some fuel poor households have had their fuel costs reduced sufficiently to remove them from fuel poverty. Conversely, some non-fuel poor households have been badly affected by the block tariffs and become fuel poor. More fuel poor households have moved out of fuel poverty than non-fuel poor households moved *into* fuel poverty, hence the reduction in the total number of fuel poor. Although the tariff is effective at removing some of these households from fuel poverty, it does this at the expense of the group as a whole, which overall is worse off. A number of households are moved out of fuel poverty but those left in fuel poverty are generally worse off, some significantly so.

This is also seen in the effect on the FPR and the transfer required to remove a household from fuel poverty. The situation has generally become worse, with an considerable increase in the proportion of income spent on fuel and in the income transfer required to remove a household from fuel poverty.

Similarly to RBT1 this tariff is most effective at removing smaller household types (in particular single person households and elderly households) from fuel poverty. Larger households and younger household types tend to become fuel poor following this tariff.

Results of rising block tariff 3 (RBT3):

The third tariff combines a RBT with a tariff targeted at a specific group. This tariff uses the same assumptions as RBT2, but targets the discounted tariff block for gas at elderly households only. All households on gas are required to pay an increased tariff above the median to compensate for this discount, but the discount is applied to elderly households only. As a result, the higher block for gas only needs to be increased by ~ 36% (in 2022) above the original 'standard tariff' (as opposed to ~90% in 2022 under RBT2). This tariff structure attempts to preserve the positive effect of removing elderly households from fuel poverty as observed under RBT2, while minimising the negative impacts on the fuel poor.

This tariff is the most effective of all the tariffs considered at removing households from fuel poverty. There are approximately 190,000 fewer fuel poor households following the introduction of this tariff in 2006 and 250,000 fewer fuel poor households in 2022. Elderly groups, in particular single person elderly households, have been removed from fuel poverty, at the expense of younger households.

This tariff also results in reduced fuel bills for the fuel poor relative to the base position in 2006 and has a neutral effect on the mean fuel bill of the fuel poor in 2022. This is clearly preferable to the increase in bills resulting from RBT2.

In both 2006 and 2022, the effect on the FPR is to increase the proportion of households in extreme fuel poverty (spending more than 20% of income on fuel), indicating that there are households that are being heavily penalised by this tariff, despite the indicators of a positive effect for the fuel poor. Similarly, when we consider income transfer we observe a greater proportion of the fuel poor requiring fuel bill reductions of more than £1,000 to remove them from fuel poverty.

The targeting of the tariff at the elderly has been particularly successful. Tables A9 and A10 show that, as a result of this tariff there are ~250,000 fewer households in fuel poverty where the HRP (Household Reference Person) is aged over 65 in 2006, and ~270,000 fewer households in 2022. This has reduced the proportion of the fuel poor with an HRP aged over 60 in 2006 from 44% to 37% (and in 2022 from 45% to 38%).

Results of rising block tariff 4 (RBT4):

The fourth tariff is a variation on RBT1. As previously, the tariff only applies to standard electricity use, but whereas RBT1 excluded any households using electricity for their main heating, this tariff is applied to *all* households regardless of their heating system. This tariff is only strictly non-targeted RBT, and would be likely to be simpler to apply in practice than the other RBTs examined. No RBT is applied for consumption of mains gas.

The overall effect on the total number of fuel poor households is very similar to the first RBT. Approximately 100,000 fewer households are fuel poor relative to the base position in 2006 and 150,000 fewer households in 2022. Those removed from fuel poverty tend to be smaller household types, including the elderly.

Following the application of this tariff we observe a substantial rise in the mean fuel bill of the (pre-RBT) fuel poor by ~£30 in both 2006 and 2022 (see tables A3 and A4). This is in contrast to the results of RBT1, where the mean fuel bill of the fuel poor is seen to fall. By including those households with electric main heating, high users of standard electricity have been severely affected. These high users are likely to have substantially increased fuel bills as they will have considerable usage above the median consumption of all households.

Along with the increase in the mean fuel bill of the fuel poor, we observe more households spending a greater proportion of their income on fuel, and more households requiring greater reductions in their fuel costs to remove households from fuel poverty.

Scale of the effect in 2006 and 2022.

Generally, there is a decline in the number of households in fuel poverty in 2006 under each of the tariffs, with a larger decline seen in 2022.

One of the possible reasons for this pattern seen is that the number of elderly and single households increases in the 2022 stock compared to 2006. The RBTs are seen to be particularly effective at removing these household types from fuel poverty.

The energy efficiency of the stock is significantly improved by 2022 and therefore some of the worst dwellings will become more energy efficient. This will consequently cause the stock to become more uniform and will bring those who are in fuel poverty closer to the 10% fuel expenditure line, and easier to remove from fuel poverty.

Conclusions:

This analysis has considered the suitability and effect of four RBTs on the number of fuel poor households in England.

The initial part of this analysis examined the notional consumption characteristics of the fuel poor and the non-fuel poor. It was found that the fuel poor have a greater mean requirement for gas and electricity usage than the non-fuel poor, although the median requirement of fuel poor households for electricity was below the median requirement of the non-fuel poor. Low income households tended to have lower energy requirements than higher income households, although fuel poor households were an exception to this, having both low income and *high* energy use.

In light of this initial investigation, four RBTs were chosen for further analysis.

The first of these applied to the use of standard electricity only, for households not using electricity for their main heating. The second tariff combined this tariff with an RBT applied to all users of gas. The third tariff targets modify this further by targeting elderly households specifically. The fourth tariff is an alternative 'standard electricity only' tariff (similar to the first tariff investigated), but also including those households using electricity for their main heating.

Each of the RBTs applied resulted in a modest net reduction in the level of fuel poverty. The tariff with the greatest effect was RBT3, which succeeded in removing approximately 190,000 households out of fuel poverty in 2006 and 250,000 households in 2022. This represents a reduction of almost 10% from the base position. In particular, the RBTs have been successful at removing single elderly households from fuel poverty. Couples with dependent children, however, are more likely to be fuel poor under each of the block tariffs. This is shown in Figure 20 below.

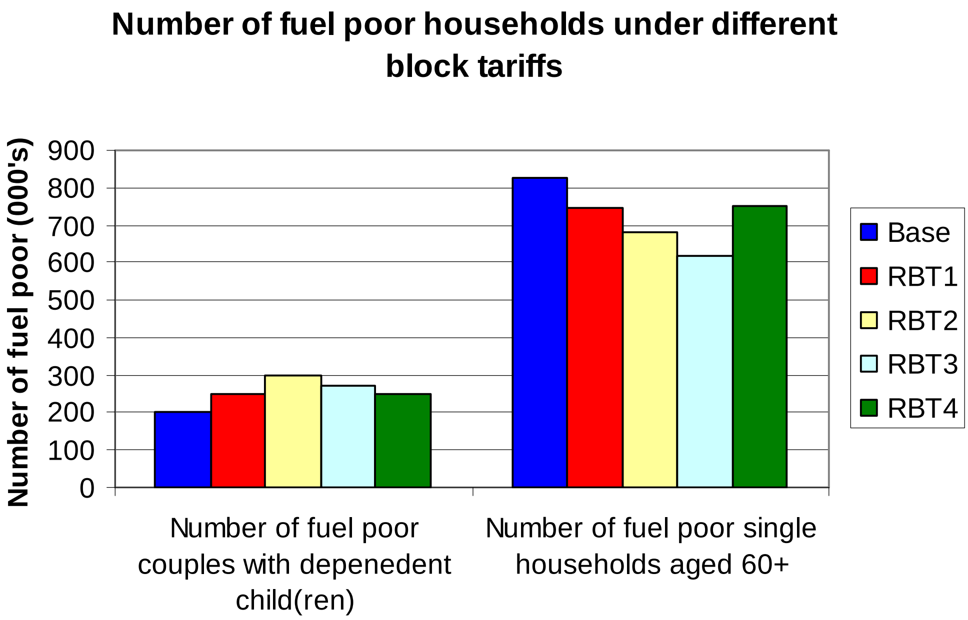

Figure 20: Total number of fuel poor households under different rising block tariffs

These patterns are to be expected. Consumption is related to both the number of occupants in a dwelling, and its floor area. Household types requiring a smaller area and fewer people are benefiting from these tariffs (as their fuel bills are dominated by the reduced tariff block) with larger household types being penalised.

Despite the reduction in headline fuel poverty levels, the effect on fuel bills shows a negative effect for some of the RBTs. The effect on the fuel bills of the (pre-block tariff) fuel poor and non-fuel poor is shown in Figure 21 below. It can be seen that the mean fuel bill of the fuel poor rises under RBTs 2 and 4, and falls under RBTs 1 and 3.

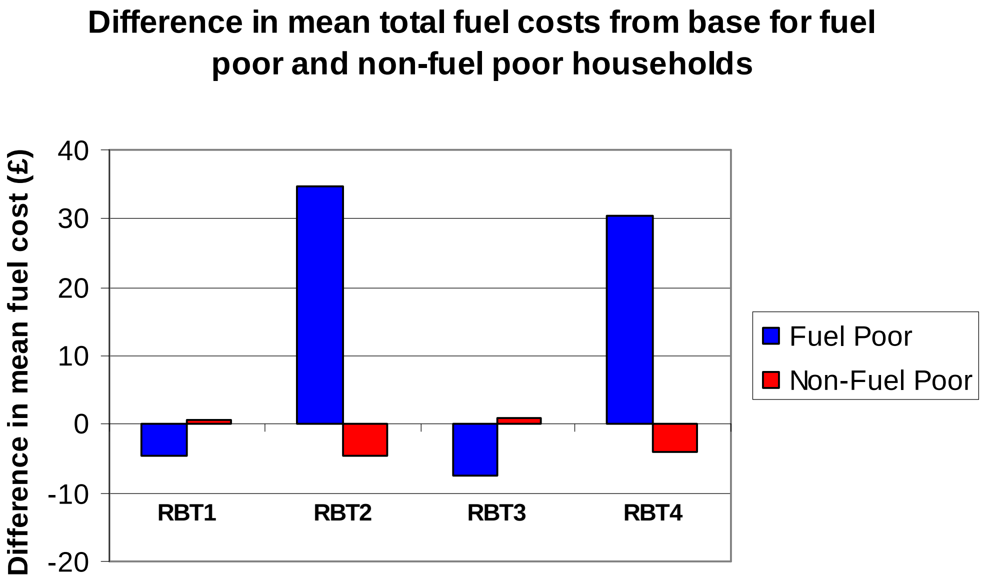

Figure 21: Difference in mean total fuel costs (£) from base position for fuel poor and non-fuel poor households.

The headline effects on the overall fuel poverty figures, therefore, need to be interpreted with great care. Although households are removed from fuel poverty by all of the RBTs, RBTs 2 and 4 actually increase the mean fuel bill of the fuel poor, representing a transfer of the burden of fuel costs *onto* the fuel poor group.

This apparent dichotomy between the effect of the tariff on the overall level of fuel poverty, and the effect on average fuel bill is explained by the binary definition of fuel poverty: if you increase fuel bills for a household that is already fuel poor, they will remain fuel poor; similarly, if you decrease bills for a non-fuel poor household, they will remain non-fuel poor. Under RBTs 2 and 4, more fuel poor households have moved out of fuel poverty than non-fuel poor households moved *into* fuel poverty, hence the reduction in the total number of fuel poor, although this is achieved at the expense of the group as a whole, which overall is worse off.

The results calculated are for England only. The effect of rising block tariffs in Scotland, Wales and Northern Ireland has not been examined directly, although inference for the effect in these countries can be made. It seems likely that the relative scale of the effect of the tariffs would be similar for Wales and Scotland, where the mix of fuels used by households is not very different to England. Climatic differences in Scotland will lead to a greater requirement for heating use, therefore the tariffs which only affect electricity for non-heating use may have slightly less effect. It would not be proper to draw too many conclusions for the effect of RBTs 2 and 3 (those that include a gas RBT) in Northern Ireland from this analysis due to the dominance of fuel oil usage in this nation, although it is reasonable to say that the overall effect of these tariffs would be much reduced. In Northern Ireland, an alternative structure that is applicable to a non-metered fuel such as oil would need to be proposed.

As a method of mitigating against the rise in fuel poverty, RBTs appear to have limited potential. The maximum reduction achieved (through a targeted RBT) is of the order 250,000 households. Nevertheless, this reduction is achieved at no overall cost to the energy suppliers, and (if applied correctly) RBTs may be able to form a small part of any mitigation. The analysis has also shown that RBTs, if introduced as a mechanism for constraining use, could be designed in such a way as to limit any negative impact upon the fuel poor. A poorly designed RBT which disregards the greater overall energy requirement of the fuel poor could, however, result in increased costs and hardship for fuel poor households.

Alongside the headline results, it is important to consider the practicality of implementing rising block tariffs in the context of the energy market.

Three of the four block tariffs which have been investigated are in some way targeted at particular households. This raises the question of what a simple targeted social tariff (as opposed to an RBT) could have achieved. This is beyond the scope of this analysis, but this simpler solution should be considered further. There are significant practical reasons which may make targeting a tariff difficult to achieve and should be recognised in the consideration of the effectiveness of block tariffs. RBTs 1, 2 and 3 all target electricity users which do not have a electric main heating system. Energy suppliers do not have direct access to the type of heating systems in the properties they supply, and any proxy (for example high electricity use) may be subject to considerable variation. Similarly, targeting elderly households directly (as in RBT3) is not possible for energy suppliers as they do not hold the necessary information on the ages of their customers.

The introduction of RBTs may also pose some practical issues of funding between suppliers and for the functioning of the energy market. For example, with a smaller proportion of the stock contributing to the supplier's revenue, suppliers may become concerned that they are not guaranteed to cover their fixed costs. This could potentially lead to suppliers increasing their fuel prices, increasing fuel poverty. Fuel prices would no longer be cost reflective which would create a problem for regulators and others when monitoring price settings.

Another practical limitation of RBTs is that it is difficult to ensure revenue neutrality for the suppliers of the fuel. The median consumption level can only be determined at the end of the period, therefore requiring calculations to be made after this time and possible rebates made in order to account for the discount given on the relevant tariff. This puts further constraint on the practicality of the block tariffs as in reality the calculations that are required to allocate block tariff reductions would be difficult to obtain. It may be possible to use historical consumption patterns to inform the tariffs, but there would remain a degree of variation year-on-year.

Further issues exist with possible issues of competition between suppliers, ensuring the competitiveness of the market and interaction with existing social tariff. The issues of practicality have not been considered here, but should be investigated further as they are of significance to the practicality of RBTs.

This analysis should be considered as a preliminary investigation of the feasibility of RBTs. It does not attempt to optimise tariffs for any particular parameter, and has several inherent assumptions. Among the most significant is the use of notional fuel spend (rather than actual fuel spend). The fuel poverty definition is centred around the concept of energy *requirement* rather than actual use. As a result, block tariffs need to be considered in this context. A fuller investigation of the effect of actual spend would need to be made to understand the effect of rising block tariffs 'on the ground' (not least in terms of revenue to energy suppliers), although for extended time horizons we might expect actual and required fuel use to converge as energy efficiency improves.

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Appendix A – Tables of results

	Electricity			Gas		
	Median consumption (GJ)	**Reduced block (relative to 'standard tariff')**	**Raised block (relative to 'standard tariff')**	**Median consumption (GJ)**	**Reduced block (relative to 'standard tariff')**	**Raised block (relative to 'standard tariff')**
Rising block tariff 1	11.07	-25%	+ 91.9%	0	-25%	0%
Rising block tariff 2	11.07	-25%	+ 91.9%	86.49	-25%	+ 82.8%
Rising block tariff 3	11.07	-25%	+ 91.9%	86.49	-25% (elderly households) 0% (non-elderly households)	+ 28.5% (all households)
Rising block tariff 4	11.07	-25%	+ 78.2%	0	-25%	0%

Table A1: Inflation / reduction factors applied for each rising block tariff in 2006

	Electricity			Gas		
	Median consumption (GJ)	**Reduced block (relative to 'standard tariff')**	**Raised block (relative to 'standard tariff')**	**Median consumption (GJ)**	**Reduced block (relative to 'standard tariff')**	**Raised block (relative to 'standard tariff')**
Rising block tariff 1	9.77	-25%	+ 93.2%	0	-25%	0%
Rising block tariff 2	9.77	-25%	+ 93.2%	60.34	-25%	+ 89.2%
Rising block tariff 3	9.77	-25%	+ 93.2%	60.34	-25% (elderly households) 0% (non-elderly households)	+ 35.7% (all households)
Rising block tariff 4	9.77	-25%	+ 79.7%	0	-25%	0%

Table A2: Inflation / reduction factors applied for each rising block tariff in 2022

	Fuel Poor		Non-Fuel Poor	
	Mean total fuel cost (£)	**Difference from base**	**Mean total fuel cost (£)**	**Difference from base**
Base	1314.2	N/A	990.5	N/A
Rising block tariff 1	1309.7	-4.5	991.1	0.6
Rising block tariff 2	1349.0	34.8	986.0	-4.5
Rising block tariff 3	1306.6	-7.6	991.4	0.9
Rising block tariff 4	1344.5	30.3	986.5	-4

Table A3: Average total fuel bill in 2006 of the pre-block tariff fuel poor / non-fuel poor

	Fuel Poor		Non-Fuel Poor	
	Mean total fuel cost (£)	**Difference from base**	**Mean total fuel cost (£)**	**Difference from base**
Base	1469.2	N/A	1125.8	N/A
Rising block tariff 1	1460.8	-8.5	1126.6	0.8
Rising block tariff 2	1507.5	38.2	1118.1	-7.7
Rising block tariff 3	1469.6	0.4	1125.0	-0.8
Rising block tariff 4	1503.9	34.7	1119.9	-5.9

Table A4: Average total fuel bill in 2022 (real terms from 2006) of the pre-block tariff fuel poor / non-fuel poor

	Household type												Total	
	Couple (no dependent children)		Couple (with dependent children)		Lone Parent (with dependent children)		Other multi- person household		One person under 60		One person 60+			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	560,000	23.2%	200,000	8.4%	210,000	8.7%	140,000	5.6%	490,000	20.1%	830,000	34.1%	**2,430,000**	**100.0%**
Rising block tariff 1	540,000	23.1%	250,000	10.7%	200,000	8.7%	130,000	5.6%	460,000	19.7%	750,000	32.1%	**2,320,000**	**100.0%**
Rising block tariff 2	590,000	25.1%	300,000	12.6%	220,000	9.3%	140,000	5.8%	420,000	17.9%	680,000	29.2%	**2,340,000**	**100.0%**
Rising block tariff 3	500,000	22.5%	270,000	12.3%	220,000	10.0%	140,000	6.1%	480,000	21.5%	620,000	27.7%	**2,240,000**	**100.0%**
Rising block tariff 4	530,000	22.8%	250,000	10.7%	200,000	8.7%	130,000	5.7%	470,000	20.0%	750,000	32.3%	**2,330,000**	**100.0%**

Table A5: Number of fuel poor in 2006 split by household type

	Household type												Total	
	Couple (no dependent children)		Couple (with dependent children)		Lone Parent (with dependent children)		Other multi- person household		One person under 60		One person 60+			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	480,000	18.0%	150,000	5.6%	170,000	6.3%	140,000	5.1%	740,000	27.6%	1,000,000	37.4%	**2,670,000**	**100.0%**
Rising block tariff 1	460,000	18.4%	210,000	8.2%	170,000	6.7%	130,000	5.2%	660,000	26.3%	880,000	35.2%	**2,510,000**	**100.0%**
Rising block tariff 2	500,000	20.1%	240,000	9.8%	190,000	7.5%	130,000	5.4%	610,000	24.5%	810,000	32.8%	**2,490,000**	**100.0%**
Rising block tariff 3	450,000	18.5%	240,000	9.8%	190,000	7.9%	130,000	5.5%	680,000	28.2%	730,000	30.1%	**2,420,000**	**100.0%**
Rising block tariff 4	470,000	18.6%	200,000	8.1%	160,000	6.2%	130,000	5.2%	680,000	26.8%	880,000	35.1%	**2,520,000**	**100.0%**

Table A6: Number of fuel poor in 2022 split by household type

	Main Wall Type				Total	
	Cavity Wall		Solid & Other Wall Types			
	Count	% of FP	Count	% of FP	Count	%
Base	1,340,000	54.9%	1,100,000	45.1%	**2,430,000**	**100.0%**
Rising block tariff 1	1,250,000	53.8%	1,080,000	46.3%	**2,320,000**	**100.0%**
Rising block tariff 2	1,210,000	52.0%	1,120,000	48.1%	**2,340,000**	**100.0%**
Rising block tariff 3	1,180,000	52.8%	1,060,000	47.3%	**2,240,000**	**100.0%**
Rising block tariff 4	1,240,000	53.6%	1,080,000	46.5%	**2,330,000**	**100.0%**

Table A7: Number of fuel poor in 2006 split by main wall type

	Main wall type				Total	
	Cavity wall		Solid & Other Wall Types			
	Count	% of FP	Count	% of FP	Count	%
Base	1,430,000	53.4%	1,240,000	46.6%	**2,670,000**	**100.0%**
Rising block tariff 1	1,320,000	52.4%	1,200,000	47.6%	**2,510,000**	**100.0%**
Rising block tariff 2	1,190,000	47.8%	1,300,000	52.2%	**2,490,000**	**100.0%**
Rising block tariff 3	1,190,000	49.5%	1,220,000	50.5%	**2,420,000**	**100.0%**
Rising block tariff 4	1,320,000	52.4%	1,200,000	47.6%	**2,520,000**	**100.0%**

Table A8: Number of fuel poor in 2022 split by main wall type

	Age of HRP								Total	
	16-29		30-44		45-64		65+			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	200,000	8.2%	370,000	15.3%	790,000	32.6%	1,070,000	43.9%	**2,430,000**	**100.0%**
Rising block tariff 1	180,000	7.9%	400,000	17.1%	760,000	32.8%	980,000	42.2%	**2,320,000**	**100.0%**
Rising block tariff 2	190,000	8.0%	420,000	18.0%	790,000	33.7%	940,000	40.3%	**2,340,000**	**100.0%**
Rising block tariff 3	200,000	8.9%	430,000	19.0%	800,000	35.6%	820,000	36.5%	**2,240,000**	**100.0%**
Rising block tariff 4	190,000	8.3%	400,000	17.0%	760,000	32.7%	980,000	42.1%	**2,330,000**	**100.0%**

Table A9: Number of fuel poor in 2006 split by age of HRP

	Age of HRP								Total	
	16-29		30-44		45-64		65+			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	280,000	10.6%	400,000	14.9%	800,000	29.8%	1,190,000	44.6%	**2,670,000**	**100.0%**
Rising block tariff 1	260,000	10.4%	420,000	16.9%	750,000	29.7%	1,080,000	43.0%	**2,510,000**	**100.0%**
Rising block tariff 2	260,000	10.3%	440,000	17.6%	740,000	29.8%	1,050,000	42.2%	**2,490,000**	**100.0%**
Rising block tariff 3	270,000	11.4%	460,000	19.2%	760,000	31.4%	920,000	38.0%	**2,420,000**	**100.0%**
Rising block tariff 4	270,000	10.8%	410,000	16.5%	750,000	29.9%	1,080,000	42.8%	**2,520,000**	**100.0%**

Table A10: Number of fuel poor in 2022 split by age of HRP

	Age of Partner										Total	
	No partner		16-29		30-44		45-64		65+			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	1,660,000	68.2%	50,000	2.0%	160,000	6.5%	290,000	12.0%	280,000	11.3%	**2,430,000**	**100.0%**
Rising block tariff 1	1,530,000	66.0%	50,000	2.0%	200,000	8.4%	290,000	12.6%	260,000	11.0%	**2,320,000**	**100.0%**
Rising block tariff 2	1,450,000	62.0%	50,000	2.3%	220,000	9.2%	350,000	15.0%	270,000	11.6%	**2,340,000**	**100.0%**
Rising block tariff 3	1,460,000	65.0%	50,000	2.2%	210,000	9.2%	310,000	13.9%	220,000	9.7%	**2,240,000**	**100.0%**
Rising block tariff 4	1,550,000	66.4%	50,000	2.3%	190,000	8.3%	290,000	12.3%	250,000	10.8%	**2,330,000**	**100.0%**

Table A11: Number of fuel poor in 2006 split by age of partner

	Age of Partner										Total	
	No partner		16-29		30-44		45-64		65+			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	2,030,000	76.2%	40,000	1.6%	110,000	4.2%	240,000	8.9%	250,000	9.2%	**2,670,000**	**100.0%**
Rising block tariff 1	1,840,000	73.3%	40,000	1.8%	150,000	5.9%	250,000	9.8%	230,000	9.2%	**2,510,000**	**100.0%**
Rising block tariff 2	1,740,000	69.8%	50,000	2.0%	170,000	6.7%	280,000	11.2%	250,000	10.2%	**2,490,000**	**100.0%**
Rising block tariff 3	1,730,000	71.6%	50,000	2.2%	170,000	6.8%	260,000	10.6%	210,000	8.8%	**2,420,000**	**100.0%**
Rising block tariff 4	1,850,000	73.3%	50,000	2.0%	140,000	5.7%	250,000	9.8%	230,000	9.3%	**2,520,000**	**100.0%**

Table A12: Number of fuel poor in 2022 split by age of partner

	Household Income deciles												Total	
	1		2		3		4		5		6-10			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	1,270,000	52.2%	460,000	18.8%	330,000	13.6%	160,000	6.7%	100,000	4.1%	110,000	4.7%	**2,430,000**	**100.0%**
Rising block tariff 1	1,190,000	51.0%	400,000	17.2%	290,000	12.6%	180,000	7.5%	120,000	5.2%	150,000	6.4%	**2,320,000**	**100.0%**
Rising block tariff 2	1,020,000	43.7%	380,000	16.4%	330,000	14.0%	210,000	9.1%	160,000	7.0%	230,000	9.8%	**2,340,000**	**100.0%**
Rising block tariff 3	1,090,000	48.5%	380,000	16.8%	290,000	12.9%	180,000	8.1%	140,000	6.3%	170,000	7.4%	**2,240,000**	**100.0%**
Rising block tariff 4	1,190,000	50.9%	400,000	17.2%	290,000	12.6%	170,000	7.4%	120,000	5.3%	150,000	6.5%	**2,330,000**	**100.0%**

Table A13: Number of fuel poor in 2006 split by household full income decile

	Household Income deciles												Total	
	1		2		3		4		5		6-10			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	1,690,000	63.3%	390,000	14.6%	260,000	9.9%	130,000	4.7%	110,000	4.3%	100,000	3.2%	**2,670,000**	**100.0%**
Rising block tariff 1	1,510,000	60.1%	340,000	13.4%	260,000	10.5%	150,000	5.9%	140,000	5.7%	110,000	4.5%	**2,510,000**	**100.0%**
Rising block tariff 2	1,270,000	51.1%	370,000	14.8%	330,000	13.3%	180,000	7.2%	170,000	6.9%	170,000	6.7%	**2,490,000**	**100.0%**
Rising block tariff 3	1,340,000	55.4%	340,000	14.1%	280,000	11.7%	170,000	6.9%	160,000	6.4%	130,000	5.4%	**2,420,000**	**100.0%**
Rising block tariff 4	1,500,000	59.6%	340,000	13.4%	260,000	10.3%	150,000	6.1%	150,000	6.0%	120,000	4.7%	**2,520,000**	**100.0%**

Table A14: Number of fuel poor in 2022 split by household full income decile

	Government Office Region																		Total	
	North East		Yorkshire and the Humber		North West		East Midlands		West Midlands		South West		East of England		South East		London			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	180,000	7.4%	270,000	11.2%	420,000	17.1%	240,000	9.7%	300,000	12.5%	260,000	10.5%	220,000	9.2%	290,000	12.0%	250,000	10.5%	**2,430,000**	**100.0%**
Rising block tariff 1	170,000	7.1%	260,000	11.3%	390,000	17.0%	230,000	9.7%	290,000	12.7%	250,000	10.8%	210,000	8.9%	280,000	12.2%	240,000	10.4%	**2,320,000**	**100.0%**
Rising block tariff 2	160,000	6.7%	270,000	11.4%	410,000	17.4%	240,000	10.3%	300,000	13.0%	250,000	10.5%	200,000	8.4%	290,000	12.2%	230,000	10.0%	**2,340,000**	**100.0%**
Rising block tariff 3	140,000	6.4%	250,000	11.2%	390,000	17.6%	230,000	10.2%	290,000	12.8%	240,000	10.8%	290,000	8.4%	270,000	12.2%	240,000	10.5%	**2,240,000**	**100.0%**
Rising block tariff 4	160,000	7.1%	260,000	11.2%	400,000	17.0%	230,000	9.7%	290,000	12.6%	250,000	10.8%	210,000	8.8%	290,000	12.4%	240,000	10.4%	**2,330,000**	**100.0%**

Table A15: Number of fuel poor in 2006 split by Government Office Region

	Government Office Region																		Total	
	North East		Yorkshire and the Humber		North West		East Midlands		West Midlands		South West		East of England		South East		London			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	190,000	7.1%	280,000	10.5%	420,000	15.9%	260,000	9.8%	330,000	12.4%	290,000	11.0%	260,000	9.8%	340,000	12.6%	290,000	11.0%	**2,670,000**	**100.0%**
Rising block tariff 1	170,000	6.7%	250,000	10.1%	410,000	16.4%	240,000	9.7%	320,000	12.6%	280,000	11.0%	240,000	9.6%	320,000	12.7%	280,000	11.1%	**2,510,000**	**100.0%**
Rising block tariff 2	160,000	6.5%	270,000	10.7%	400,000	16.0%	240,000	9.7%	330,000	13.2%	270,000	11.0%	240,000	9.6%	300,000	12.2%	280,000	11.2%	**2,490,000**	**100.0%**
Rising block tariff 3	150,000	6.4%	250,000	10.5%	400,000	16.4%	230,000	9.6%	310,000	12.8%	270,000	11.3%	230,000	9.3%	300,000	12.5%	270,000	11.3%	**2,420,000**	**100.0%**
Rising block tariff 4	170,000	6.7%	250,000	10.1%	410,000	16.3%	250,000	9.8%	310,000	12.5%	280,000	11.1%	240,000	9.5%	330,000	13.1%	280,000	11.1%	**2,520,000**	**100.0%**

Table A16: Number of fuel poor in 2022 split by Government Office Region

	Age of oldest person in household														Total	
	16-24		25-34		35-49		50-59		60-74		75-84		85+			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	110,000	4.3%	170,000	6.9%	480,000	19.5%	400,000	16.4%	690,000	28.5%	440,000	17.9%	160,000	6.5%	**2,430,000**	**100.0%**
Rising block tariff 1	100,000	4.1%	170,000	7.2%	500,000	21.6%	380,000	16.3%	630,000	27.2%	410,000	17.5%	150,000	6.3%	**2,320,000**	**100.0%**
Rising block tariff 2	90,000	3.9%	180,000	7.8%	520,000	22.2%	390,000	16.7%	650,000	27.8%	380,000	16.2%	130,000	5.6%	**2,340,000**	**100.0%**
Rising block tariff 3	100,000	4.4%	180,000	8.1%	540,000	24.2%	410,000	18.3%	550,000	24.6%	340,000	14.9%	120,000	5.5%	**2,240,000**	**100.0%**
Rising block tariff 4	100,000	4.2%	180,000	7.5%	500,000	21.5%	370,000	16.0%	630,000	27.1%	410,000	17.4%	150,000	6.3%	**2,330,000**	**100.0%**

Table A17: Number of fuel poor in 2006 split by age of oldest person in household

	Age of oldest person in household														Total	
	16-24		25-34		35-49		50-59		60-74		75-84		85+			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	160,000	5.9%	210,000	7.7%	490,000	18.4%	390,000	14.8%	750,000	28.2%	500,000	18.8%	170,000	6.2%	**2,670,000**	**100.0%**
Rising block tariff 1	140,000	5.6%	200,000	8.0%	520,000	20.6%	360,000	14.4%	690,000	27.3%	450,000	18.0%	150,000	6.1%	**2,510,000**	**100.0%**
Rising block tariff 2	140,000	5.5%	210,000	8.4%	520,000	21.1%	350,000	14.0%	700,000	28.2%	430,000	17.4%	140,000	5.5%	**2,490,000**	**100.0%**
Rising block tariff 3	150,000	6.1%	220,000	9.3%	550,000	22.7%	390,000	16.1%	610,000	25.3%	380,000	15.5%	120,000	5.1%	**2,420,000**	**100.0%**
Rising block tariff 4	150,000	5.9%	200,000	8.0%	510,000	20.1%	360,000	14.4%	690,000	27.6%	405,000	17.7%	160,000	6.2%	**2,520,000**	**100.0%**

Table A18: Number of fuel poor in 2022 split by age of oldest person in household

	Main heating fuel												Total	
	Mains Gas		Communal Heating		Standard Electricity		Other Electricity		Oil		Solid Fuel			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	1,670,000	68.6%	20,000	0.7%	110,000	4.4%	210,000	8.6%	280,000	11.4%	150,000	6.3%	**2,430,000**	**100.0%**
Rising block tariff 1	1,560,000	67.0%	20,000	0.8%	110,000	4.6%	210,000	9.0%	280,000	11.9%	160,000	6.7%	**2,320,000**	**100.0%**
Rising block tariff 2	1,580,000	67.5%	20,000	0.8%	110,000	4.5%	210,000	8.8%	280,000	11.8%	160,000	6.6%	**2,340,000**	**100.0%**
Rising block tariff 3	1,480,000	65.9%	20,000	0.8%	110,000	4.7%	210,000	9.3%	280,000	12.3%	160,000	7.0%	**2,240,000**	**100.0%**
Rising block tariff 4	1,540,000	66.0%	20,000	0.8%	140,000	5.9%	210,000	9.0%	270,000	11.6%	160,000	6.7%	**2,330,000**	**100.0%**

Table A19: Number of fuel poor in 2006 split by main heating fuel

	Main heating fuel												Total	
	Mains Gas		Communal Heating		Standard Electricity		Other Electricity		Oil		Solid Fuel			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	1,740,000	65.2%	30,000	1.1%	120,000	4.6%	310,000	11.7%	300,000	11.4%	160,000	6.1%	**2,670,000**	**100.0%**
Rising block tariff 1	1,570,000	62.4%	30,000	1.1%	120,000	4.8%	310,000	12.4%	320,000	12.8%	160,000	6.5%	**2,510,000**	**100.0%**
Rising block tariff 2	1,570,000	63.3%	30,000	1.1%	110,000	4.6%	300,000	12.0%	310,000	12.6%	160,000	6.4%	**2,490,000**	**100.0%**
Rising block tariff 3	1,490,000	61.6%	30,000	1.2%	120,000	4.8%	300,000	12.6%	320,000	13.3%	160,000	6.6%	**2,420,000**	**100.0%**
Rising block tariff 4	1,550,000	61.5%	30,000	1.1%	160,000	6.3%	300,000	12.1%	320,000	12.7%	160,000	6.4%	**2,520,000**	**100.0%**

Table A20: Number of fuel poor in 2022 split by main heating fuel

	Fuel poverty severity (effect on fuel poverty ratio)						Total	
	Fuel spend >= 10% & <15% of income		Fuel spend >= 15% & <20% of income		Fuel spend >= 20% of income			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	1,640,000	67.3%	440,000	18.1%	350,000	14.6%	**2,430,000**	**100.0%**
Rising block tariff 1	1,550,000	66.5%	420,000	17.9%	360,000	15.6%	**2,320,000**	**100.0%**
Rising block tariff 2	1,490,000	63.6%	450,000	19.1%	400,000	17.3%	**2,340,000**	**100.0%**
Rising block tariff 3	1,480,000	66.0%	390,000	17.4%	370,000	16.6%	**2,240,000**	**100.0%**
Rising block tariff 4	1,500,000	64.4%	440,000	18.8%	390,000	16.8%	**2,330,000**	**100.0%**

Table A21: Effect of block tariffs on fuel poverty severity in 2006

	Fuel poverty severity (effect on fuel poverty ratio)						Total	
	Fuel spend >= 10% & <15% of income		Fuel spend >= 15% & <20% of income		Fuel spend >= 20% of income			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	1,830,000	68.8%	480,000	17.8%	360,000	13.4%	**2,670,000**	**100.0%**
Rising block tariff 1	1,720,000	68.5%	440,000	17.5%	350,000	14.0%	**2,510,000**	**100.0%**
Rising block tariff 2	1,620,000	65.1%	480,000	19.2%	390,000	15.6%	**2,490,000**	**100.0%**
Rising block tariff 3	1,600,000	66.0%	450,000	18.6%	370,000	15.4%	**2,420,000**	**100.0%**
Rising block tariff 4	1,670,000	66.5%	450,000	17.8%	400,000	15.7%	**2,520,000**	**100.0%**

Table A22: Effect of block tariffs on fuel poverty severity in 2022

	Reduction in fuel costs (transfer) required to remove household from fuel poverty										Total	
	Transfer < £250		Transfer >= £250 & < £500		Transfer >= £500 & < £750		Transfer >= £750 & < £1000		Transfer >= £1000			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	1,200,000	48.8%	610,000	25.1%	290,000	12.0%	160,000	6.7%	180,000	7.5%	**2,430,000**	**100.0%**
Rising block tariff 1	1,120,000	48.1%	560,000	24.2%	270,000	11.5%	180,000	7.6%	200,000	8.6%	**2,320,000**	**100.0%**
Rising block tariff 2	980,000	41.8%	570,000	24.6%	330,000	14.1%	180,000	7.6%	280,000	11.9%	**2,340,000**	**100.0%**
Rising block tariff 3	1,040,000	46.2%	520,000	23.1%	290,000	12.9%	180,000	7.9%	220,000	9.9%	**2,240,000**	**100.0%**
Rising block tariff 4	1,090,000	46.8%	550,000	23.7%	260,000	11.1%	180,000	7.9%	250,000	10.6%	**2,330,000**	**100.0%**

Table A23: Reduction in fuel costs (transfer) required to remove household from fuel poverty in 2006

	Reduction in fuel costs (transfer) required to remove household from fuel poverty										Total	
	Transfer < £250		Transfer >= £250 & < £500		Transfer >= £500 & < £750		Transfer >= £750 & < £1000		Transfer >= £1000			
	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	% of FP	Count	%
Base	1,230,000	46.1%	660,000	24.8%	350,000	13.0%	180,000	6.6%	250,000	9.4%	**2,670,000**	**100.0%**
Rising block tariff 1	1,130,000	45.0%	610,000	24.2%	330,000	13.2%	170,000	6.6%	280,000	11.0%	**2,510,000**	**100.0%**
Rising block tariff 2	970,000	39.0%	590,000	23.7%	370,000	14.9%	190,000	7.8%	360,000	14.5%	**2,490,000**	**100.0%**
Rising block tariff 3	1,010,000	41.8%	560,000	23.2%	360,000	14.8%	190,000	7.7%	300,000	12.5%	**2,420,000**	**100.0%**
Rising block tariff 4	1,130,000	44.7%	580,000	23.2%	320,000	12.6%	160,000	6.3%	330,000	13.2%	**2,520,000**	**100.0%**

Table A24: Reduction in fuel costs (transfer) required to remove household from fuel poverty in 2022 (real terms 2006 costs)

Appendix B – The modelling of fuel poverty

The number of households in fuel poverty in England is calculated annually by BRE on behalf of the Department of Energy and Climate Change (DECC). This analysis uses data from the English House Condition Survey (EHCS). The EHCS provides information on the changing condition and composition of the housing stock and the characteristics of households living in different types of dwelling. The latest results from the EHCS show that in 2006 approximately 2.4 million households in England were fuel poor.

Originally carried out every five years until 2001, the EHCS now operates on an annual basis in which approximately 8,000 dwellings are surveyed each year. Published analyses, including for the monitoring of fuel poverty in England, use two years' datasets combined to give a sample size of around 16,000 dwellings/households.

Comprehensive data about the housing stock and occupants are collected in two main components of the EHCS: the 'physical' and 'interview' surveys. The physical survey is undertaken by trained surveyors and collects comprehensive information about the key physical attributes of the dwelling. The interview survey includes responses obtained from the Household Reference Person (HRP) or their partner about the occupants of the dwelling.

The EHCS dataset is collected using a complex clustered stratified sampling frame. In order to account for this, and any bias caused by survey non-response, a set of weights (grossing factors) are applied to the survey analysis. These weights scale the sample to the national totals and act to remove any bias.

To calculate the number of households that are fuel poor, household level information on fuel costs (a combination of fuel prices and energy consumption) and incomes are required.

For each case on the EHCS, a 'fuel poverty ratio' is calculated. This calculation has three components – energy prices (unit and standing charges), notional fuel consumption and income. The equation takes the following form:

$$\text{Fuel poverty ratio} = \frac{\sum(\text{Unit Fuel Price} \times \text{Fuel Consumption}) + \sum \text{Standing Charge}}{\text{Income}}$$

Where the following applies for each household:

- The unit fuel price (£/GJ) is applied to each fuel type
- Notional Fuel consumption (GJ) is the energy use required for each fuel type
- Standing charges (£) are applied where applicable for each fuel type
- Income (£) is the annual income of the whole household
- For every household all applicable use and cost values are summed for each fuel type.

If the fuel poverty ratio is greater than 0.1 (i.e. a household spends more than 10% of their income on fuel) then the household is considered to be fuel poor.

Energy consumption

The amount of fuel consumed to provide the energy needs of each household is required as one of the components of the fuel poverty calculation.

Under the fuel poverty definition, the energy required to heat and power a home includes energy for:

- Space heating - ES (GJ).
- Water heating - EW (GJ).
- Lights and appliances - EL&A (GJ).
- Cooking - EC (GJ).

The BRE Domestic Energy Model (BREDEM) [5] is used to predict the energy use of a household where:

Total household fuel consumption = ES + EW + EL&A + EC.

Total notional household energy use includes energy for space and water heating (to meet defined standards) and energy for lights, appliances and cooking. The amount of energy required to heat a dwelling will depend on the building specification such as insulation levels, heating systems and the geographical location of the dwelling. A household's demand for energy will depend on the number of people within the household and the habits of these individuals (which are estimated using BREDEM algorithms). Energy consumption is independent of household income. Information from the EHCS is used to provide details about both dwellings and households.

Fuel prices

The price each household pays for its fuel depends on four main factors:

- The household's location within England (fuel prices vary regionally)
- The choice of supplier
- The choice of tariff
- The method of payment where relevant (i.e. payment by direct debit, credit etc).

Information on the exact tariff, or the supplier, is not collected in the EHCS. The survey does however collect information on the geographical location of each case and on the method of payment (for metered fuels). This allows the application of an average fuel price for each region and method of payment.

The prices for the majority of fuels are produced by DECC (metered fuels) or a series of reports called the Sutherland Tables (non-metered fuels). DECC provides average annual prices (April to March) for gas, standard electricity and off-peak (Economy 7) electricity. These prices are split by the electricity supply regions/gas distribution zones and three methods of payment; direct debit, standard credit and pre-payment.

The prices paid for the majority of non-metered fuels (with the exception of wood) are taken from the Sutherland Tables. These are independently produced reports which provide the average prices paid for fuels, split into four broad geographical regions. The prices of wood, communal heating, Economy 10 and Economy 24 electricity are based on the price published in the SAP 2005 specification[1].

By combining the information on method of payment, geographical location and the fuel prices themselves, we are able to calculate a fuel price for each different fuel that is specific to each household.

Incomes

In modelling incomes for fuel poverty, two definitions have been adopted:

- "Basic income" excludes income related directly to housing.
- "Full income", used for targets, includes income related directly to housing (i.e. Housing Benefit, Income Support for Mortgage Interest, Mortgage Payment Protection Insurance, Council Tax Benefit and the payment of council tax).

For both definitions 'income' refers to that of the entire household, net of income tax and national insurance. That is the income of the Household Reference Person (HRP) and any partner, plus any other adult member.

The EHCS collects detailed information about the income of the HRP and any partner from different sources (wages, pensions, benefits, savings and investments and other sources e.g. rent from property). Respondents are asked separately about each source and which, if any, State benefits they receive. This information is collated and modelled to produce total net income for the primary benefit unit (HRP and any partner/spouse). Less detailed information is collected from the respondent (who is always in the primary benefit unit) about the income of any additional benefit units in the household. The EHCS also collects information on housing and council tax benefit, council tax bands, Income Support for Mortgage Interest (ISMI) and Mortgage Payment Protection Insurance (MPPI).

There are three major steps involved in modelling household incomes for fuel poverty. First, the Primary Benefit Unit (PBU) Income is calculated for the HRP and partner in each household. Next, the fuel poverty 'basic income' is modelled for each household and from this, the fuel poverty 'full income' is modelled. For the purpose of this analysis, the level of fuel under the 'full income' definition has been used.

[1] The Government's Standard Assessment Procedure for the Energy Rating of Dwellings. 2005 Edition, revision 2. BRE. 2008. http://projects.bre.co.uk/sap2005