



# F & G banded homes in Great Britain

## Research into costs of treatment



energy saving trust<sup>®</sup>

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# 17%

of English Homes are F&G rated

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## 1. Introduction

The Energy Saving Trust, using its Housing Energy Model and working with Element Energy Ltd, has carried out an analysis of the measures required to improve the efficiency of British homes that would receive an F or G banding on an Energy Performance Certificate. The results give us costs for bringing homes to SAP39 – the bottom of the E band. Analysis was undertaken based on stock data from the 2005 English House Condition Survey, although some consideration is given using the more recently available 2007 and 2008 data.

F&G banded homes are more prevalent in the private rented sector than in other tenures. In addition to a review of the characteristics of the overall F&G banded housing stock, this report also analyses the specific condition of the private rented stock of F&G homes.

The number of F&G banded homes is decreasing – according to the English House Condition Survey – from 22% in 2006 to 17% in 2008. Our research found that most of Great Britain's remaining F&G banded homes can be brought to an E band for less than £3,000. However there is a clearly identifiable population of more expensive to improve homes – which cost more than £5,000 to bring into the E band. These were 15% of the F&G banded stock in 2005, and will represent a higher percentage of the F&G banded homes today. These "hard to make decent" homes are particularly prevalent in the private rented sector.

English and Welsh environmental health regulation implies a correlation between F&G banding and a risk of homes being too cold for vulnerable people. This report also explores that correlation. The final section of the report poses considerations and questions based on the research findings – particularly in the light of the government's planned Green Deal.

## 2. Headline results

Based on our research we found that:

- For more modern F&G banded homes (particularly those built in the mid 20th century) basic insulation measures are key to moving into the E band – full loft and cavity wall insulation cost less than £1,000;
- Many homes are in the F&G banding because they have an old, inefficient central heating boiler. Changing to a modern condensing boiler usually costs less than £3,000;
- A minority of F&G banded homes cost over £5,000 – up to a maximum of £9,500 in our analysis – to bring up to an E standard. 15% of homes fell into this "hard to make decent" category in 2005, and the percentage will be higher today;
- Solid wall insulation is not the single most cost effective measure to bring any of the house types we analysed to an E rating, though it could play a key part in improvement strategies for these homes;



- Electric heating is prevalent in many of the lowest SAP-rated homes;
- Even in the private rented sector, where hard to make decent homes are more prevalent, over 60% of homes banded F or G in 2005 could be brought to an E standard for less than £5,000.

It is important to note that our work is based on a comprehensive, but simplified, model of the housing stock and therefore cannot be taken as providing guidance for actions that need to happen in specific individual homes.

### 3. Why look at F&G banded homes?

Our results focus only on bringing homes into the bottom of the E band of an Energy Performance Certificate (EPC) – a SAP rating<sup>1</sup> of at least 39. Why this target? A SAP rating of 39 is a long way from the level of energy efficiency that will be required if we are to achieve our 2050 carbon reduction targets. It is also a long way from the level of energy efficiency that is required to ensure that residents are not at risk of fuel poverty.

The choice of SAP39 reflects:

- The significant percentage of carbon emissions which these homes account for – F&G rated homes make up around 20% of the British housing stock. Based on our modelling, if they were all brought up to an E standard, this would save 9.4Mt CO<sub>2</sub>;
- A perception that F&G rated homes fall below the acceptable minimum standard for energy efficiency in a modern society. In homes below SAP39 residents are exposed to too great a risk either of fuel poverty or of simply not being able to adequately heat their home, no matter how much they spend. This view is given weight by the broad correlation between homes in the F&G banding and homes which constitute a “category one hazard” for excess cold, as defined in English and Welsh environmental health regulation (see below);
- An analogy between homes and other types of energy using consumer products – such as fridges – where energy use is also expressed on the A-G scale. For these products higher energy efficiency standards have been driven in part by regulations and/or retailer agreements which over time remove products in the lowest bands from the marketplace;
- The fact that the Energy Saving Trust has been tasked by the Government with making contact with the owners of F&G rated homes at the point of home sale, to advise them on cost effective improvement actions.

It should be noted that bringing a home to SAP39 is also not necessarily the most cost effective way to make improvements to energy efficiency when the longer term goal is to go above this target. Many measures are more cost effective to deliver as packages, for example internal solid wall insulation and window replacements are usually most cost effectively delivered at the same time.

# £3,000

The maximum cost for bringing most F&G rated homes to an E rating



<sup>1</sup> SAP – the Standard Assessment Procedure – is the Government's approved mechanism for measuring home energy efficiency – taking into account lighting, heating and levels of insulation. The SAP scale runs from 1 (low) to 100 (high) and Energy Performance Certificate bands are based on the SAP scores: a G rated home has a SAP rating of less than 21, an F band home has a rating of less than 39.

F&G banded homes were analysed in terms of four key factors affecting energy efficiency



## 4. Methodology

### 4.1 Stage 1 – Analysing the F&G banded stock

The Energy Saving Trust's Housing Energy Model uses data from the national house condition surveys in England, Wales and Scotland, based on a survey of a sample of real homes. The data used for this research was from the 2005 survey (government housing stock information lags by a few years – we will shortly be updating the data in our model to reflect England 2007 statistics). Using this data, homes with a SAP rating of less than 39 were analysed in terms of four key contributors to energy efficiency – house size, heating system, level of insulation and glazing.

### 4.2 Stage 2 – Putting together the standardised house types

The modellers then established a number of standardised characteristics from which to carry out analysis:

- House size – small, medium and large
- Insulation – solid wall, uninsulated cavity wall, filled cavity wall
- Glazing – single or double glazed
- Heating system – Gas, oil, electric or coal

With three parameters for house size, three for insulation, two for glazing and four for heating systems, the modellers had established a baseline picture of 72 different homes, based on all the possible combinations of these different parameters. We established how many homes fell into each of these 72 housing types, and what their average SAP rating was.

Loft insulation was analysed as part of the study but was not included as a set of standardised characteristics. Rather the weighted average of 106mm for the sub-SAP39 stock as a whole was assumed to be standard for all the 72 different house types.

### 4.3 Stage 3 – Modelling the improvements

The Housing Energy Model allows analysts to apply packages of different energy efficiency measures to different house types and presents results in terms of cost savings, SAP rating and carbon emissions saved.

Using the Housing Energy Model the modellers applied different packages of energy efficiency, for example insulation measures combined with double glazing, to the 72 different house types. They were then able to establish which of these gave us the SAP39 target we were aiming for.

Note that in analysing measures, we focused only on what was required to bring the homes to an E band most cheaply. For example, we found that a single glazed semi-detached home with unfilled cavity walls and an older boiler could be brought into the E band most cheaply by installing a modern boiler. Insulating the home's cavity wall is not enough by itself to bring the home to an E band, so this measure is not directly considered in the analysis. Nonetheless tackling the cavity wall remains an important and cost effective energy saving action.

#### 4.4 Stage 4 – Presenting the results

Each of the 72 house types fell clearly into four major cost regimes – describing how they could be most cheaply brought into the E banding.

### 5. The main measures

The main measures that need to be installed in F&G banded homes to bring them to an E band are loft insulation, full cavity wall insulation (in homes with unfilled cavity walls), a modern gas condensing boiler (in homes with older heating systems) and double glazing (in single glazed homes).

We did not find that solid wall insulation was the cheapest measure to bring homes to an E band for any of the house types we looked at. However, solid wall insulation brings many benefits and would be a logical accompaniment to large scale glazing measures. Some, probably most, coal heated homes will be in rural, off-gas areas. In these cases, switching to a modern condensing gas heating system is not an option. We considered that an air-source heat pump based system may be the most cost effective way to achieve an E band in these situations.

### 6. Where are the F&G banded homes?

The vast majority of F&G banded homes are in England and these homes make up a much higher percentage of housing stock in England and Wales than Scotland. Based on our analysis of 2005 house condition surveys from the three countries in Great Britain, the breakdown is as follows.

Table 1: Percentage of F&G banded homes by country

|                                | England | Scotland | Wales    |
|--------------------------------|---------|----------|----------|
| Percentage of F&G banded homes | 22.7%   | 8.9%     | 18.0%    |
| Total number of homes          | ~5M     | ~205,000 | ~220,000 |

Loft and cavity wall insulation, double glazing, modern heating systems – the main measures to bring F&G banded homes to an E



# 21%

reduction in the number of F&G banded homes in England between 2006 and 2008

## 6.1 Changes in the numbers of F&G banded homes in England, 2006-8

It is useful to see how the numbers of F&G banded homes are changing. English House Condition Survey data<sup>2</sup> shows a good rate of reduction of the numbers of F&G rated homes in England between 2006 and 2008.

Table 2: Percentage of homes in England by EPC Banding, 2006 and 2008

| EPC Banding       | A/B  | C    | D    | E    | F    | G    |
|-------------------|------|------|------|------|------|------|
| 2006              | 0.2  | 7.0  | 29.8 | 41.3 | 17.5 | 4.3  |
| 2008              | 0.3  | 10.0 | 35.4 | 37.4 | 13.4 | 3.5  |
| Percentage change | 120% | 44%  | 20%  | -8%  | -23% | -17% |

There is more movement from the F band than from the G band. Changes in the numbers of F banded homes can be linked to current policies – Carbon Emissions Reduction Target (CERT) funded cavity wall and loft insulation and a requirement in Building Regulations to install a condensing boiler in most situations.

However, for the G banded homes the rate of change is slower, probably because these homes require expensive, wholesale changes to the heating system or they are large homes that would need double glazing or solid wall insulation to reach the E band. Double glazing is required in Building Regulations, but windows have a longer replacement cycle than heating systems. There are also no policy instruments supporting the financing of double glazing and limited policy measures supporting financing for solid wall insulation<sup>3</sup>. There is also no strong driver encouraging homeowners in inefficient homes to switch away from electric heating systems.

## 7. F&G rated homes in Great Britain – Analysis of costs to improve

In terms of cost to improve, there are four main groups of homes. We estimated that the overall total cost of improving to an E standard all homes that would be banded F or G in 2005 would be £12.5bn. For owner occupiers the cost of investment in these measures will be repaid over time through lower fuel bills. Many of the changes to F&G rated homes – for example heating system improvements – may also be reflected in the overall valuation of homes, for sale and potentially also for rental.



<sup>2</sup> English Housing Survey Headline Report 2008-09, Communities and Local Government, 2010. Data Reproduced under the terms of the Click-Use Licence.

<sup>3</sup> The Government's Community Energy Saving Programme encourages energy suppliers to support the installation of solid wall insulation measures, however, this is a limited programme targeting deprived communities around the country.

### 7.1 The Cheaper to Treat Band (37% of GB homes in 2005) – Cost less than £1,000 to improve

These homes can be brought into the E banding through basic cavity wall and loft insulation measures. Of the 72 house types we analysed, the single most common house type fell into this banding – 19% of F&G rated homes (around 1m homes) are larger or medium sized (probably semi-detached or detached), gas heated, double glazed and with an unfilled cavity wall. All these homes can be brought out of this banding through cavity wall and loft insulation. Generally these homes fall into the F banding.

### 7.2 The Boiler Band (around 47% of GB homes) – generally cost less than £3,000 to improve

These homes can be brought into the E banding most cost effectively by changing to a modern heating system: in particular to condensing boilers for oil fired and gas fired heating systems.

Around 10% of homes in this band are currently coal heated, and there is a particularly large carbon saving potential from changing the heating fuel in these homes. For these homes, which are usually in rural areas, we considered that air source heat pumps may be the most appropriate solution. However, installing air source heat pumps may require larger scale changes to the heating system that cost well above the £3,000 limit.

### 7.3 The Windows Band (1.5% of GB homes) – cost £3,000 - £5,000 to improve

This is a small group of smaller homes (flats or terraces), electrically or oil heated and single glazed. These homes can be most cost effectively brought into the E banding through changing to double glazed windows, sometimes accompanied by basic insulation measures (loft and cavity wall insulation). As these are small homes, it is assumed that this can be achieved for less than £5,000.

On average, these homes just fall into the G banding before improvement, with a SAP rating of 23.

### 7.4 Expensive to treat homes (around 15% of GB homes) – cost £5,000 - £9,500 to improve

A typical home in this band is larger on average, at least a large semi-detached house. They are generally electrically and oil heated homes, and are built with solid wall construction (though note that many solid wall homes do not fall into this band and can be improved more cheaply). Around 50% of these homes are single glazed and they are all expensive to heat.

The average SAP value for these homes is less than 20 – well into the G banding. These homes may be treated by:

- Double glazing and improvements to loft insulation. As these are larger homes, double glazing is assumed to cost over £5,000
- Fuel switching (e.g. from electricity to gas). This is likely to involve large scale and expensive changes to heating systems.

As noted above, solid wall insulation is not identified in our research as the most cost effective measure to bring any of the homes we modelled out of the F or G banding. However, this does not mean it should not form a key part of an improvement strategy for larger, solid wall homes.

# 47%

of homes banded F&G in 2005 could be improved by installing a modern heating system



# 14 tonnes

of carbon dioxide could be saved each year by improving a larger coal heated F/G rated home

## 8. Carbon savings from tackling F&G banded homes

In an analysis of carbon savings, we found that the greatest savings were to be made from tackling the homes in band 2 (the "boiler band") above. Tackling band 2 would achieve a total carbon saving of 5.25 Mt CO<sub>2</sub>.

Tackling coal heated homes – 5% of the F&G rated homes – was also identified as a major area where carbon savings could be made. For example, changing away from coal in a large, single glazed, solid walled home would save nearly 14 tonnes of carbon dioxide a year. Six tonnes would be saved even in a small property with filled cavities and double glazing.

Overall, we estimate that bringing all the homes banded F&G in 2005 to an E standard would achieve a carbon saving of 9.4Mt CO<sub>2</sub>. This is equivalent to the annual emissions from heating, lighting and appliances of all the households in Manchester, Birmingham, Liverpool, Bristol, Belfast, Cardiff, Edinburgh and Glasgow combined.

## 9. The Private Rented Sector

### 9.1 Private Rented Sector Homes: costs to bring to an E standard

The private rented sector makes up about 11% of GB homes, with the vast majority of these in England. The average SAP rating of private rented sector homes in England in 2007<sup>4</sup> was the same as that for owner occupied homes. However, this disguises a significant variation within the private rented sector, where there are higher percentages of both good (A&B rated) and of poor (F&G rated) homes than in the owner occupier sector, but fewer homes in the middle bandings<sup>5</sup>. In particular there is a strikingly high number of G rated homes.

Given the over-representation of G rated homes in the private rented sector, it is unsurprising that the Energy Saving Trust's analysis of the specific costs of treating F&G rated private rented homes showed some significant differences from our analysis of the overall stock.

In the private rented sector we found the vast majority of homes fell into either a sub-£3,000 improvement cost bracket, or would cost over £5,000 to treat<sup>6</sup>:



<sup>4</sup> English House Condition Survey 2007, Annual Report (EHCS2007), CLG 2009,

[www.communities.gov.uk/documents/statistics/pdf/1346262.pdf](http://www.communities.gov.uk/documents/statistics/pdf/1346262.pdf)

<sup>5</sup> The private rented sector has large numbers of old, solid wall properties but also a stock of new, much more energy efficient flats and houses, many of which entered the sector during the recent buy-to-let boom. See EHCS 2007.

<sup>6</sup> It should be noted that these bandings are based on bringing PRS homes to SAP40, rather than SAP39.

- **Lower cost changes to heating systems and some fabric measures (usually sub-£3,000 cost) – 63% of homes**

The majority of these homes can be treated with basic insulation measures or the installation of an oil or gas condensing boiler, for homes where there is an existing wet heating system, for a cost under £3,000. Some homes in this grouping are smaller homes requiring double glazing to come to an E standard.

- **Higher cost heating system changes and high cost glazing measures (over £5,000 cost) – 33% of homes**

In this banding are homes requiring wholesale installation of new heating systems (usually because they are predominantly electrically heated) or large scale double glazing.

Key to note is that the third of these bandings – with costs of over £5,000 to improve – is significantly larger than for the overall stock: 33% of privately rented homes fall in this band, as opposed to 15% for the overall stock. This is due to the fact that the sector contains larger and more solid wall homes, and more electrically heated homes.

Electrically heated homes remain a major causal factor for lower SAP ratings in the private rented sector. Electric heating does not always lead to high fuel costs and carbon emissions. However, where electric heating is combined with overall lower levels of insulation and larger house sizes a poor SAP rating and high bills are often the result. The chart below shows how electric heating is predominant in the lowest SAP rated homes in the private rented sector:

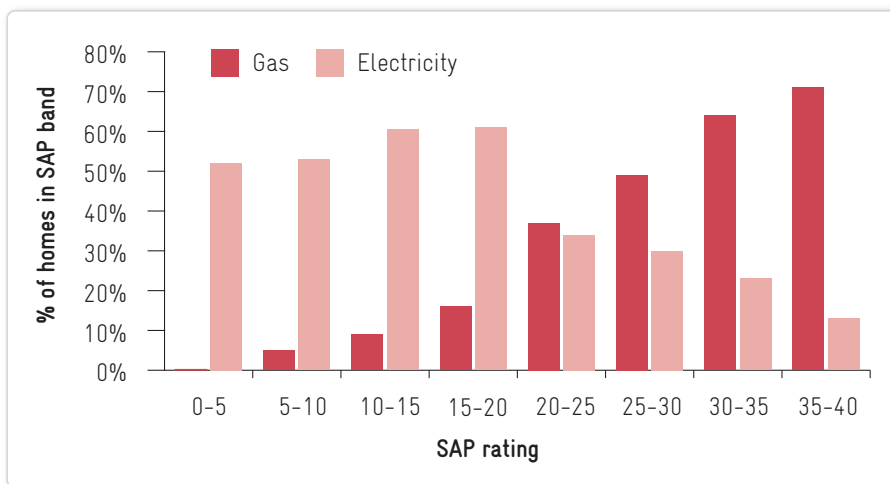


Figure 1: Percentage of private rented homes with a given SAP rating using gas and electricity as primary heating (other heating fuels not represented)

The English House Condition Survey shows that 17% of private rented homes are electrically heated, compared with just 6% of owner occupied homes. Landlords may favour electric heating over gas, because of:

- 1) Cost to install;
- 2) Gas safety regulations which require at least annual inspection of gas heating systems;
- 3) A lack of enforcement of regulation around highly energy inefficient homes (see 9.2 over page).

## G banded

homes are twice as common in the private rented sector as in the rest of the English stock

.....

**Environmental health regulations suggest that most F&G banded homes could pose an excess cold health risk to vulnerable people**

.....

## 9.2 Environmental Health Regulation and F&G rated homes

The Housing Health and Safety Rating System (HHSRS) is the risk assessment tool used by Environmental Health Officers in homes in England and Wales. One of the most serious risks identified in HHSRS is excess cold, arising from poor energy efficiency of the home<sup>7</sup>.

Environmental health powers in relation to homes are particularly used to protect tenants in the private rented sector as they do not have control over the physical condition of their home. The HHSRS excess cold criterion is also used in the social rented sector, as the absence of a Category 1 (serious) excess cold hazard is the basic requirement for energy efficiency within the Decent Homes Standard. Local authorities have a duty under the 2004 Housing Act (which introduced HHSRS) to keep the housing stock in their area under review for environmental health hazards.

Government publications (the English House Condition Survey, Decent Homes Guidance<sup>8</sup>) suggest a correlation between a Category 1 (serious) excess cold hazard and a SAP rating of below 35 – close to the SAP39 boundary between an E and F on an Energy Performance Certificate. The Official HHSRS Operating Guidance states that a SAP calculation may be used to identify a Category 1 Hazard. However, it is not clear in practice to what extent Environmental Health Officers can use an F&G banding – or indeed any SAP rating – as a direct indicator of a Category 1 hazard.

It seems likely that in practice, HHSRS is very often used to assess the adequacy (i.e. capacity to heat the home, regardless of cost) of a heating system rather than its energy efficiency – which would take heating cost into account. A 2007 report from the Energy Efficiency Partnership for Homes<sup>9</sup> identified a lack of guidance for local authorities in this area, an issue which has not yet been addressed (anecdotal evidence suggests however, that, in the absence of guidance, many local authorities are increasingly regarding F&G homes as constituting a Category 1 hazard).



7 See Housing Health and Safety Rating System: Operating Guidance, ODPM, February 2006

[www.communities.gov.uk/documents/housing/pdf/142631.pdf](http://www.communities.gov.uk/documents/housing/pdf/142631.pdf)

8 See page 24 of EHCS2007: "EHCS estimates a Category 1 excess cold hazard is present in the home if its energy efficiency (SAP) rating is below a threshold equivalent to SAP 35 under the 2001 SAP methodology," and page 18 of A Decent Home: Definition and guidance for implementation: June 2006 – Update, CLG, 2006: "A SAP rating of less than 35 (using the 2001 SAP methodology) has been established as a proxy for the likely presence of a Category 1 hazard from excess cold."

[www.communities.gov.uk/documents/housing/pdf/138355.pdf](http://www.communities.gov.uk/documents/housing/pdf/138355.pdf)

SAP 35 in SAP2001 is broadly comparable with SAP35 in SAP2005 (the currently used methodology) – see p. 69 of The Government's Standard Assessment Procedure for Energy Rating of Dwellings, BRE/Defra 2005 [projects.bre.co.uk/SAP2005/pdf/SAP2005.pdf](http://projects.bre.co.uk/SAP2005/pdf/SAP2005.pdf)

9 Tackling fuel poverty using the Housing Health and Safety Rating System, Energy Efficiency Partnership for Homes, 2007, [www.eeph.org.uk/uploads/documents/partnership/Final%20EEPH%20HHSRS%20Report.pdf](http://www.eeph.org.uk/uploads/documents/partnership/Final%20EEPH%20HHSRS%20Report.pdf)

## 10. Conclusions and considerations

### 10.1 F&G rated homes and Environmental Health Regulations

A figure close to SAP39 as a key marker for home condition is already implied in English and Welsh environmental health regulation. However, work by the Energy Efficiency Partnership for Homes in 2007 highlighted that environmental health professionals required additional guidance on the use of SAP (and, by extension, F&G banding) to identify dangerously cold homes. An important question remains about the relationship between a Category 1 excess cold hazard, F&G banding, and therefore the expected basic decent level for energy efficiency in English and Welsh rented homes.

### 10.2 Tackling homes that are hard to make decent

Homes that cost over £5,000 to bring to an E band – mostly currently G banded – can be categorised as “hard to make decent”. These homes are especially prevalent in the private rented sector. Hard to make decent homes are a subset of – not the same as – “hard to treat” (solid walled and/or off-gas) homes.<sup>10</sup>

A vital consideration for future providers of the Government’s planned Green Deal will be how to target homes that are hard to make decent – the homes with the highest carbon emissions and where residents are at high risk of fuel poverty. Particularly important will be ensuring that owners of larger, older homes can benefit from the Green Deal, especially where they are upgrading a very old boiler or installing a whole new modern heating system in electric or coal heated homes.

### 10.3 Encouraging Action on F&G Banded Homes at Home Sale

Home sale is a key trigger point for encouraging action on the energy efficiency of homes – whether this is undertaken by buyers or sellers. This is the moment at which home buyers and sellers receive the Energy Performance Certificate, with its list of recommendations.

It is also a time when buyers are accessing financing, and when the “hassle factor” of taking action is reduced because home owners are already facing disruption. Action on F&G banded homes could also be effectively promoted at the time of home sale because improvements to heating systems may well be reflected in the house sale price.

To ensure we maximise action by home buyers, further advice, beyond the EPC, is essential. One part of this advice is provided by the Energy Saving Trust which – working with the Department for Communities and Local Government – is writing to the buyers of all F&G banded homes, reminding them of the EPC and with advice on the improvements they can make.

The worst performing homes are particularly prevalent in the private rented sector, categorised as “hard to make decent”



<sup>10</sup> Many solid wall homes or off-gas homes can be brought out of the F&G banding for less than £3,000.

Home sale is a key trigger point for encouraging action on the energy efficiency of homes



#### 10.4 Communicating that “F&G Banded Homes are Poor Homes”

Raising awareness of the costs of heating F&G banded homes, and the damaging environmental impact of these homes, should also be a priority for environmental and fuel poverty focused organisations. The message should be that – at least in energy terms – F&G banded homes are poor homes (or at the very least, homes that need urgent improvements). Such a message will not just promote action on these homes but more broadly raise the profile of the EPC banding system. Higher awareness of the banding will increase the part it plays in the valuation of homes and will drive action to improve the energy performance of all homes, not just F&G banded homes.

## About the Energy Saving Trust

The Energy Saving Trust is the UK's leading impartial organisation helping people save energy and reduce carbon emissions. We do this by providing expert insight and knowledge about energy saving, supporting people to take action, helping local authorities and communities to save energy and providing quality assurance for goods, services and installers.

## About this report

The UK Government has made a legal commitment to reduce the UK's carbon emissions by 80% by 2050. UK housing is about a third of the problem and therefore a third of the solution. F&G rated homes are the least efficient of all the housing stock. Many of these homes could be improved with straightforward measures and at relatively low cost. This research looks at the issues and recommends the solutions.

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