Department of Energy & Climate Change

Annex B: Energy Performance Certificate data

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Contents

Introduction

Energy Performance Certificates (EPCs) were first introduced in England and Wales in 2007. Certificates are needed whenever a property is built, sold or rented. EPCs are now also required prior to a property having a measure through the Green Deal[1], Renewable Heat Incentive (RHI) or Feed in Tariffs (FiTs)[2].

An EPC contains:

- information about a property's energy use and typical energy costs; and
- recommendations about how to reduce energy use and save money.

The Reduced Standard Assessment Procedure (RDSAP)[3] is used to assess and compare the energy and environmental performance of dwellings with results included in the EPC. RDSAP assigns a score to a property based on how much energy a dwelling will consume based on standard assumptions about occupancy and behaviour. It quantifies a dwelling's performance in terms of: energy use per unit floor area, a fuel-cost-based energy efficiency rating (the Energy Efficiency Rating) and emissions of CO2 (the Environmental Impact Rating).

The energy efficiency ratings are grouped into bands from A (most efficient with lower running costs) to G (least efficient and higher running costs). Similarly, the environmental impact rating is also grouped into bands A (very environmentally friendly, lower CO2 emissions) to G (not environmentally friendly, higher CO2 emissions).

By 27 April 2014 approximately 11.2 million EPCs had been lodged for dwellings[4], at the end of March 2012 there were around 25 million dwellings in England and Wales[5]. Figure B.1 shows the number of EPCs lodged in each year from 2008 to the end of 2013.

Figure B.1: Number of EPCs by year, for all dwellings

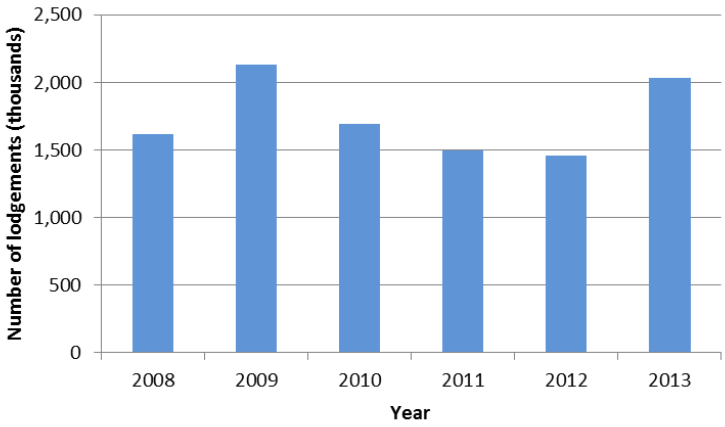
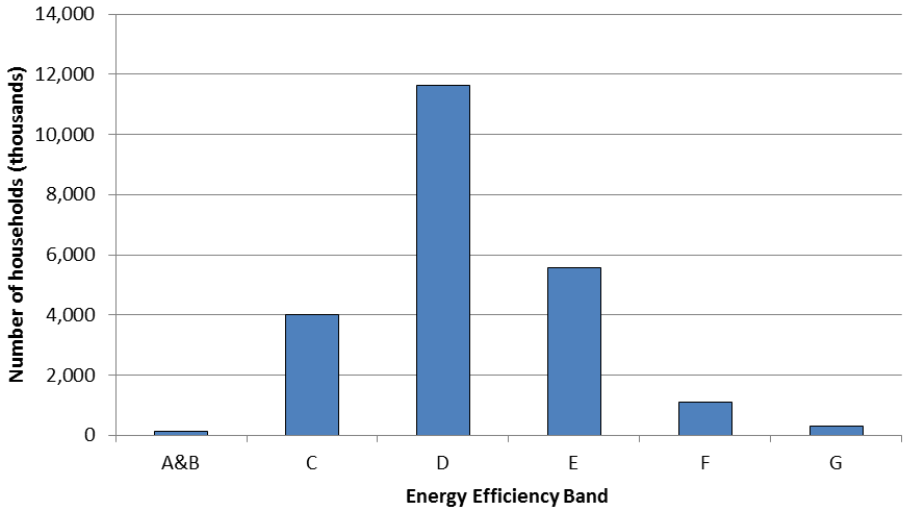


Figure B.2 shows the energy efficiency band of properties in England, based on data from the English Housing Survey (EHS)[6]. It shows that the most common energy efficiency band is D,

[1] https://www.gov.uk/government/policies/helping-households-to-cut-their-energy-bills
[2] https://www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies
[3] https://www.gov.uk/standard-assessment-procedure.
[4] Some properties may have had more than one EPC during the period, therefore there will be fewer than 11.2 million properties with an EPC.
[5] Live tables on dwelling stock published by the Department for Communities and Local Government: https://www.gov.uk/government/statistical-data-sets/live-tables-on-dwelling-stock-including-vacants.

with 11.6 million households or 51.2 per cent of all households in England in this band. Few properties are in bands A and G, therefore results presented for these groups will be subject to greater uncertainty and should be treated with more caution.

Figure B.2: Properties in England by energy efficiency band, EHS 2012



This Annex provides provisional estimates of typical gas and electricity consumption and savings from installation of energy efficiency measures in homes for energy efficiency band and environmental impact band.

The results are produced based on the same methodology as that used for the headline NEED results, but use a difference sample of properties; approximately four million properties which have all had an EPC in England and Wales between the introduction of EPCs in 2007 and the third quarter of 2012. The EPC data for each property has been matched to other sources of data used in NEED analysis, including meter point gas and electricity consumption data and energy efficiency measures installed. However, EPC data have been used instead of Valuation Office Agency data for the property attributes information. The sample used for this analysis is the same as the sample published as the NEED End User Licence (EUL) anonymised dataset[7].

As EPCs are required in a very specific group of properties, the dataset used for analysis is not representative of the population of dwellings in England and Wales. For example, properties built since 2008 are more likely to be included in the dataset, and there are a higher proportion of more energy efficiency properties in the EPC data[8]. Results for consumption have been weighted to reflect the housing stock in England and Wales, not just properties which have had an EPC[9]. Estimates of the impact of installing energy efficiency measures reflect the properties in the EPC sample and have not been weighted.

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[6] https://www.gov.uk/government/publications/english-housing-survey-2012-to-2013-headline-report.

[7] Properties included in the dataset are the same, but more detailed data (rather than rounded data or additional banding) has been used for this analysis. More information on the anonymised dataset is available here: https://www.gov.uk/government/ publications/national-energy-efficiency-data-framework-need-anonymised-data-2014.

[8] For example, according to the EHS 2012, one per cent of properties in England are rated A or B. For properties which had an EPC (England and Wales) between 2007 and October 2012, nine per cent were in bands A or B.

[9] Weighting is based on the Valuation Office Agency Property Attributes Data for domestic properties in England and Wales. The weighting factors used are the same as those published in the NEED EUL file.

Further information on EPCs is available on the Department for Communities and Local Government (DCLG) website[10]. Official Statistics on Energy Performance Certificates are published by DCLG at: https://www.gov.uk/government/collections/energy-performance-of-buildings-certificates.

Results

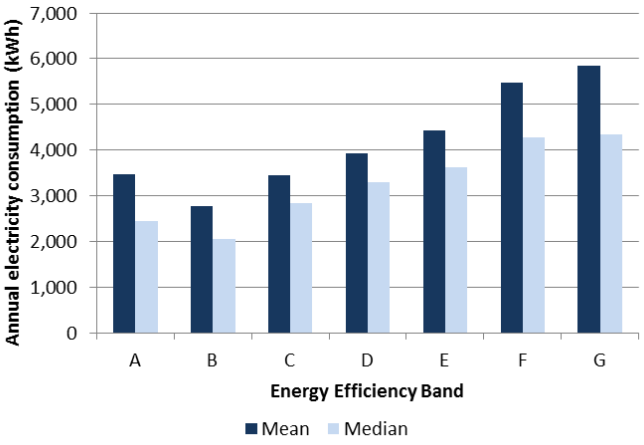
Consumption

Consumption by energy efficiency band

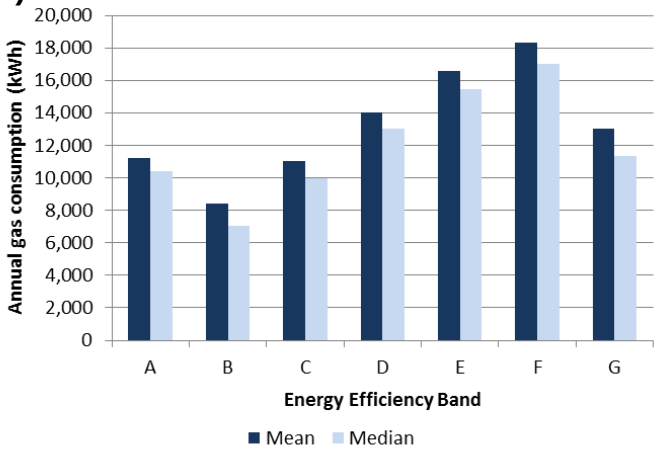
Figure B.3 shows the average annual consumption by energy efficiency band for gas and electricity.

Figure B.3: Average annual consumption by energy efficiency band, 2012

a) Electricity



b) Gas



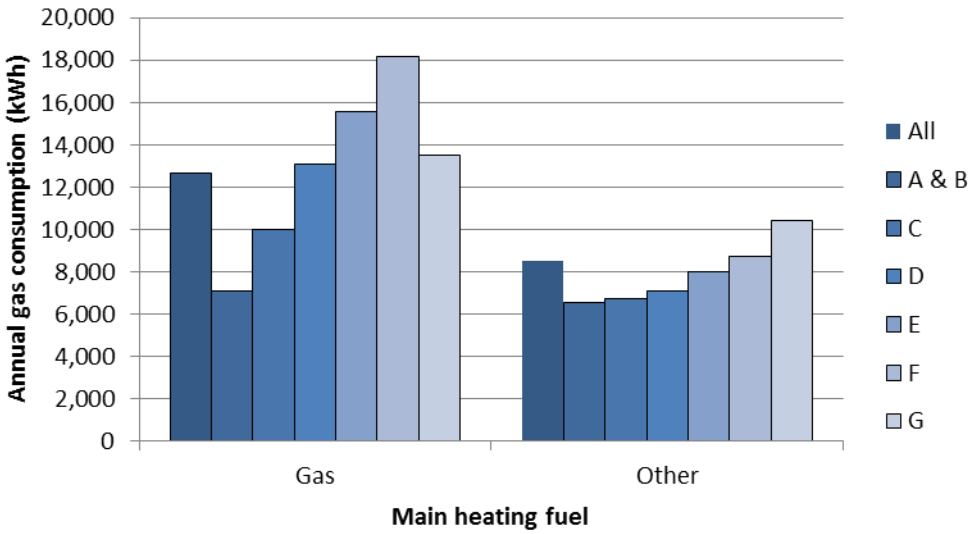
Both charts show that generally the mean and median consumption is higher for properties assessed as being less energy efficient. However, this is not always the case. For electricity and gas, the typical (median) consumption for properties assigned to band A is higher than for band B. For gas, the typical consumption for properties in band G (11,300 kWh) is lower than bands D (13,000kWh), E (15,400kWh) or F (17,000 kWh).

The charts above show gas and electricity consumption in isolation, they do not take into account consumption of other fuels. The less intuitive results shown for typical gas consumption in band G households can partly be explained by the main heating fuel for properties in this category. All properties included in chart B.2 b) have a valid gas consumption in 2012[11], but not all of them use gas as the main heating fuel. Based on the information on the EPCs in the sample used for this analysis, 98 per cent of properties with valid gas consumption in 2012 used gas as the main heating fuel. However, for band G properties, only 33 per cent used gas as the main heating fuel. It is also possible that more band G household have secondary heating fuel, and therefore have a lower requirement for gas.

[10] General information, including how to find EPCs for individual properties is available here: https://www.gov.uk/buy-sell-your-home/energy-performance-certificates. A sample EPC including explanation of content is here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/49997/1790388.pdf.
[11] Gas consumption is considered valid in this report if it is between 100 and 50,000 kWh (inclusive). Electricity consumption is included as valid if it is between 100 and 25,000 kWh.

Figure B.4 shows the typical gas consumption by main heating fuel for each energy efficiency band for properties with valid gas consumption in 2012.

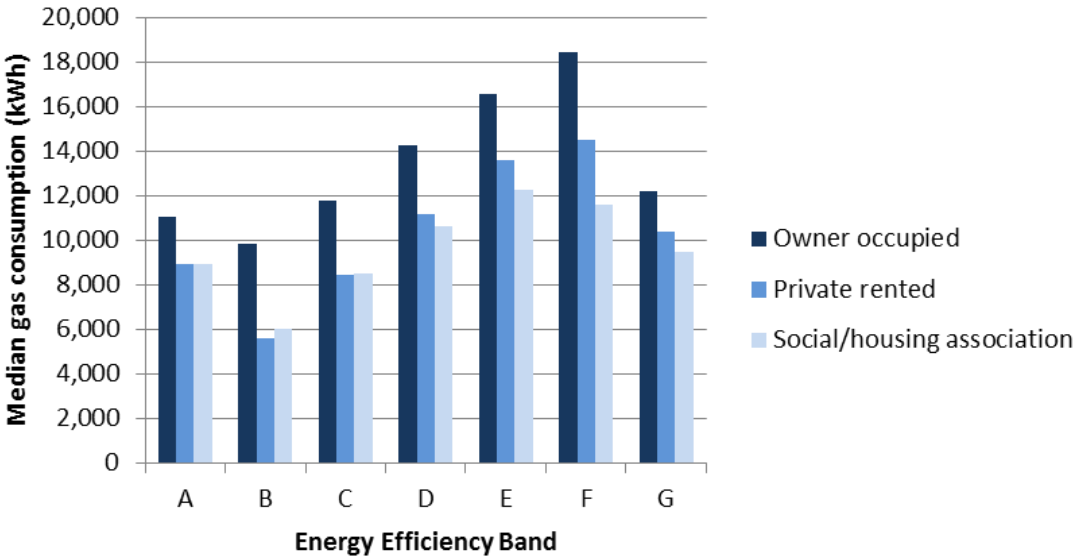
Figure B.4: Median annual gas consumption by energy efficiency band, 2012[12]



The chart shows that for properties that do not use gas as the main heating fuel, the highest typical gas consumption is for band G properties (10,400 kWh). For properties with gas as the main heating fuel the typical consumption for band G properties (13,500 kWh) 26 per cent lower than the typical consumption for band F properties (18,200 kWh) and six per cent above the typical for all properties (12,700 kWh).

The higher consumption observed for properties in band A (see Figure B.3) relative to properties rated as less efficient is likely to be a result of the behaviours of occupants of those households. Initial analysis using modelled data from Experian suggests that the demographics of occupants in band A properties differs from those in bands B and C. For example, 60 per cent of band A properties are owner occupied, relative to 36 per cent in band B and 46 per cent in band C (and 57 per cent of all properties in the sample). However, even within these groups, properties in band A have a higher consumption than properties in band B (and band C for private rented and social), see Figure B.5.

Figure B.5: Median annual gas consumption by energy efficiency band and tenure, 2012

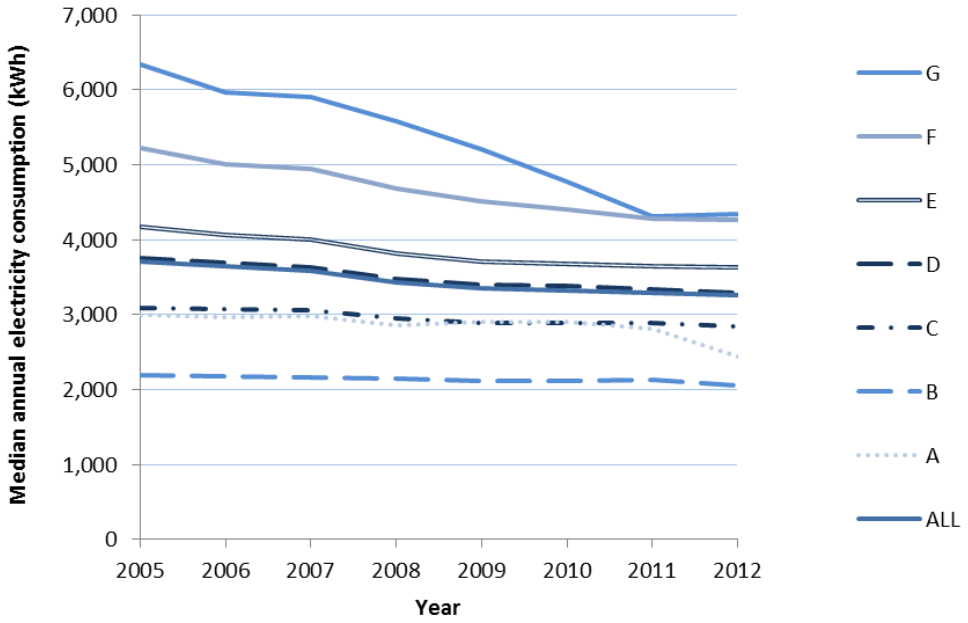


[12] Bands A and B have been grouped because of the small number of properties in band A with a non-gas main heating fuel.

The smaller sample of properties in band A means there is more uncertainty around the estimates and this may be contributing to some of these results. Further work is required to understand to what extent these findings can be explained by the behaviours of occupants or whether there is another cause.

Figure B.6 shows how typical consumption has changed over time for properties in different energy efficiency bands.

Figure B.6: Median annual electricity consumption by energy efficiency band, 2005-2012

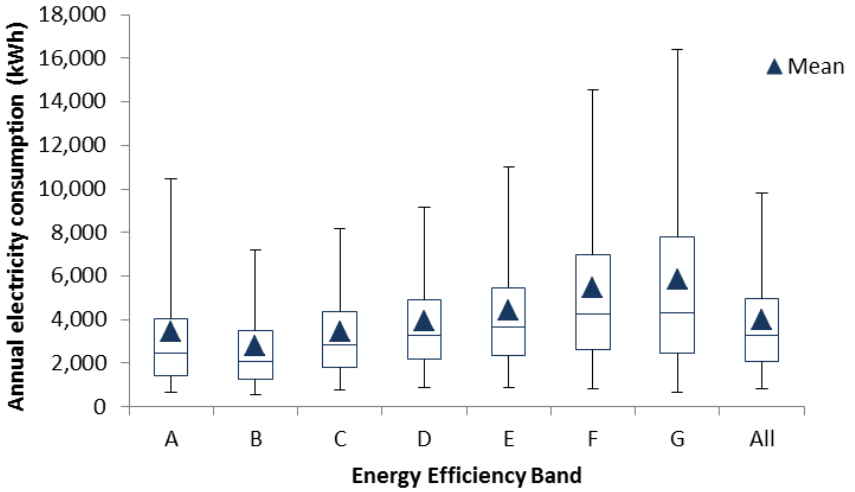


It shows that properties in band G have had a greater reduction in consumption between 2005 and 2012 than properties in other bands. Median electricity consumption for band G properties reduced by 32 per cent over this period, compared to 12 per cent for all properties and 18 per cent for the group with the next biggest reduction (band F). This could in part be due to properties becoming more energy efficient during the period[13].

The focus on median and mean consumption masks the variation in consumption for different households. As with other results from NEED, there is variation in consumption for properties in each energy efficiency band. Figure B.7 shows the variation more clearly. It shows the mean, median, upper and lower quartiles and 5th and 95th percentiles.

[13] Some properties may have changed energy efficiency band between 2005 and 2012. Properties are assigned to the energy efficiency band given on the most recent EPC for the property in October 2012. In some cases this could mean a property has become more energy efficient since the EPC was carried out and should have subsequently change energy efficiency band. In particular, some of the properties in band G may no longer be band G in 2012, for example, if they have switched to gas as the main heating fuel or have had an insulation measure installed. This may at least in part account for the greater reduction in consumption for this group.

Figure B.7: Annual electricity consumption by energy efficiency band 2012



It is clear that within each band there is a range of consumption, and that the range is greater for less efficient properties. The inter quartile range (difference between the upper and lower quartiles) for band G properties is 5,300 kWh compared to 2,200kWh for band B properties.

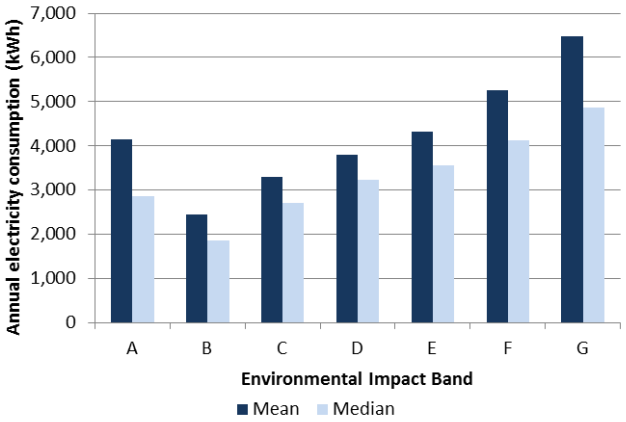
Consumption by environmental impact band

This section gives information for environmental impact band, grouped by bands A (most environmentally friendly) to G (least environmentally friendly). While the energy efficiency band takes into account the cost of fuel bills, the environmental impact band only considers the impact on the environment. So, for example, a property moving from conventional panel heaters to a storage heating system may be considered more energy efficiency but less environmentally friendly. It has an improved energy efficiency rating because the storage heaters are cheaper to run as they can use low-rate night time electricity. However, the amount of electricity required by a storage heater system is greater and therefore the environmental impact rating would be higher.

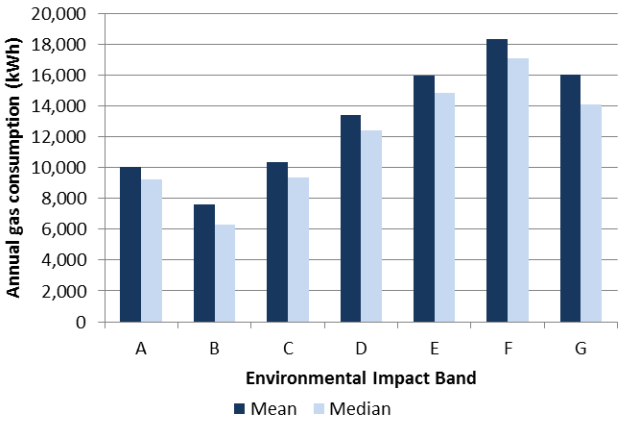
Figure B.8 shows the mean and median electricity and gas consumption by environmental impact band for 2012.

Figure B.8: Average annual consumption by environmental impact band, 2012

a) Electricity



b) Gas



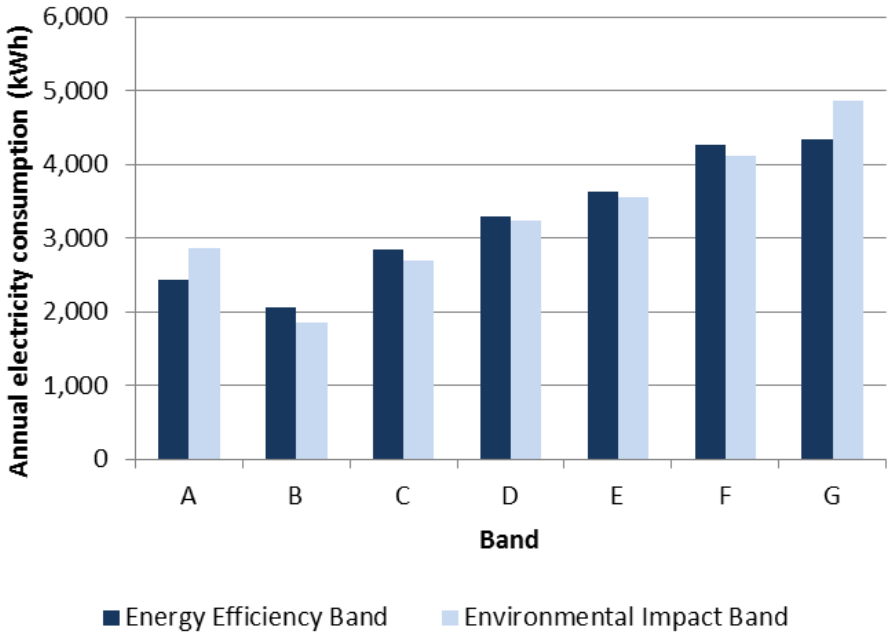
These charts show a very similar picture to the equivalent charts for energy efficiency band (Figure B.3). In general average consumption is greater for properties with a greater environmental impact rating, with the exception of band A for gas and electricity and band G for gas. As with energy efficiency band, the lower consumption in band G for gas is being

influenced by the main heating fuel. Only 43 per cent of properties in this group use gas as the main heating fuel, compared to at least 98 per cent for bands A to E and 90 per cent for band F.

Energy efficiency band compared with environmental impact band

This section compares typical consumption for properties by energy efficiency band and environmental impact band. Figure B.9 shows median annual electricity consumption for both ratings.

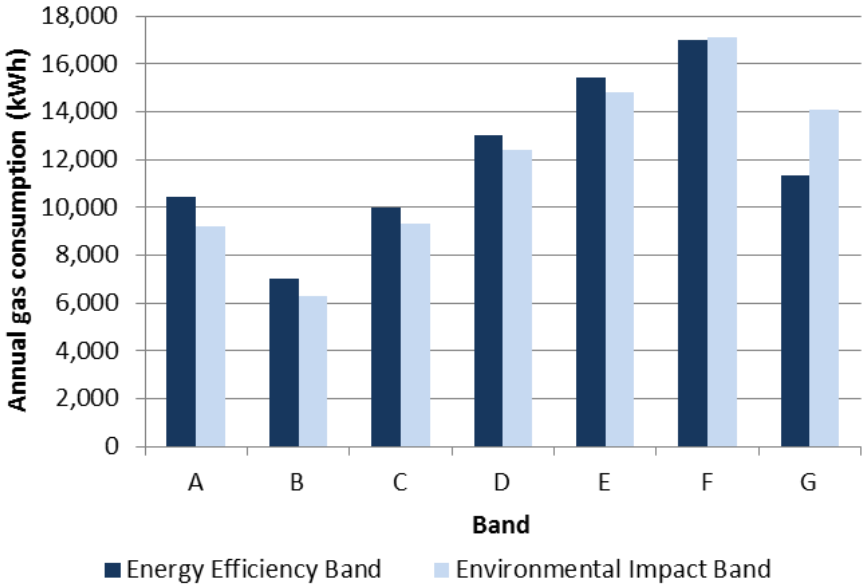
Figure B.9: Median annual electricity consumption by energy efficiency band and environmental impact band, 2012



The chart shows that for bands B to F consumption for properties in the specified environmental impact band is lower than properties in the same named energy efficiency band. For bands A and G the opposite is seen. Median consumption for properties with environmental impact band G is 12 per cent higher than for properties in energy efficiency band G (17 per cent for band A). These findings reflect the difference in the way the two measures are calculated. The energy efficiency band takes into account the costs of the fuel used while the environmental impact band only considers the impact on the environment.

Figure B.10 compares median gas consumption by energy efficiency band and environmental impact band.

Figure B.10: Median annual gas consumption by energy efficiency band and environmental impact band, 2012



Like electricity in Figure B.9, in most cases the typical gas consumption for any given environmental impact band is lower than the typical gas consumption for the equivalent energy efficiency band. However, the median gas consumption for properties with environmental impact band G is 24 per cent higher than for properties in energy efficiency band G. These findings are a result of the difference in the way the two measures are calculated and reflect the fact that 33 per cent of properties with valid gas consumption in energy efficiency band G use gas as the main heating fuel, compared to 43 per cent for properties with environmental impact band G.

Impact of installing energy efficiency measures

Properties can experience significant savings as a result of installing energy efficiency measures. Access to EPC data has allowed consideration of how observed savings vary for properties with different energy efficiency ratings for the first time. The methodology used to produce these estimates is the same as the approach used for the headline estimates presented in the report, with some small changes to reflect the different data available[14].

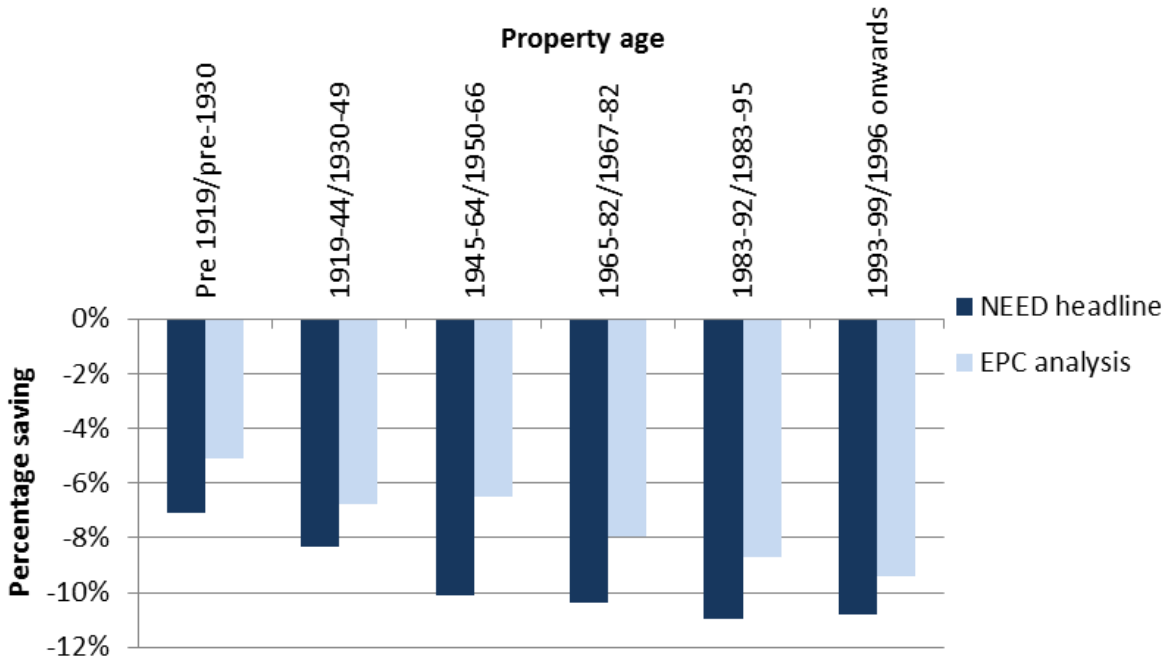
These estimates are provisional and included to provide an indication of the savings. Properties are included in the energy efficiency band given when the EPC was carried out. This means in some cases the energy efficiency rating of the property may have changed prior to the cavity wall insulation being installed. In many cases the rating will change after cavity wall insulation has been installed.

Savings estimates for all properties using EPC data are lower than the headline savings in this report. Further work is required to understand the reasons for this, but it is likely to be influenced by the bias in the EPC data sample, for example it includes more properties with a higher turnover of occupants (properties that have been sold recently and properties which are rented). However, the results provide a valuable indication of relative savings. To put these results in

[14] EPC data are used for property attributes for this analysis rather than Valuation Office Agency (VOA) data. This means there are some differences. For example, floor area band has been used instead of number of bedrooms, as number of bedrooms is not available on the EPC data. The property age categories also differ slightly to those used at VOA.

context, Figure B.11 shows the NEED headline savings by property age compared to those calculated using the EPC data[15].

Figure B.11: Typical percentage saving following installation of cavity wall insulation in 2011, by property age



The differences in results vary from EPC savings being 64 per cent of NEED headline savings (1945-64/1950-66) to 87 per cent (1993-99/1996 onwards). Part of this variation will be due to the differences in periods considered, however it will also result from the measures included in the two samples (neither set of results are weighted and there is bias in the EPC sample towards newer and smaller or more energy efficient properties).

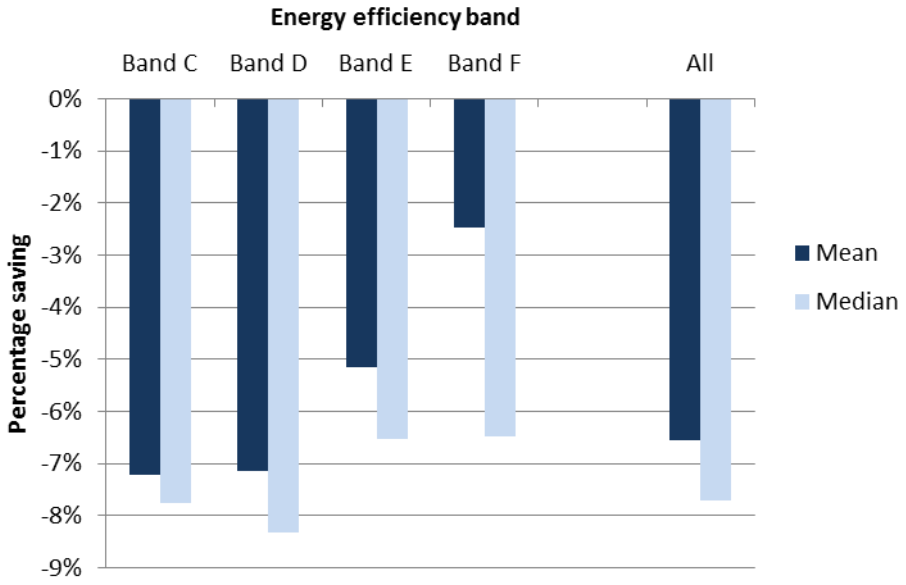
In addition, data quality and uncertainty outlined in the main part of the report also apply to the estimates produced here. There is significant variation in savings experienced by households much of which is down to behaviour of individuals and how they use their homes.

Cavity wall insulation by energy efficiency band

Figure B.12 shows the observed savings in annual gas consumption for properties which had cavity wall insulation installed in 2011 by energy efficiency band.

[15] First dates are NEED VOA years; second dates are EPC year groups. EPC groupings have been used to match VOA as closely as possible.

Figure B.12: Percentage saving following installation of cavity wall insulation in 2011, by energy efficiency band[16]



The figure shows that properties in band D had the greatest median saving (8.3 per cent) and band C had the greatest mean saving (7.2 per cent). Properties assessed as less energy efficiency, (bands E and F) had lower observed savings (both had a median saving of 6.5 per cent).

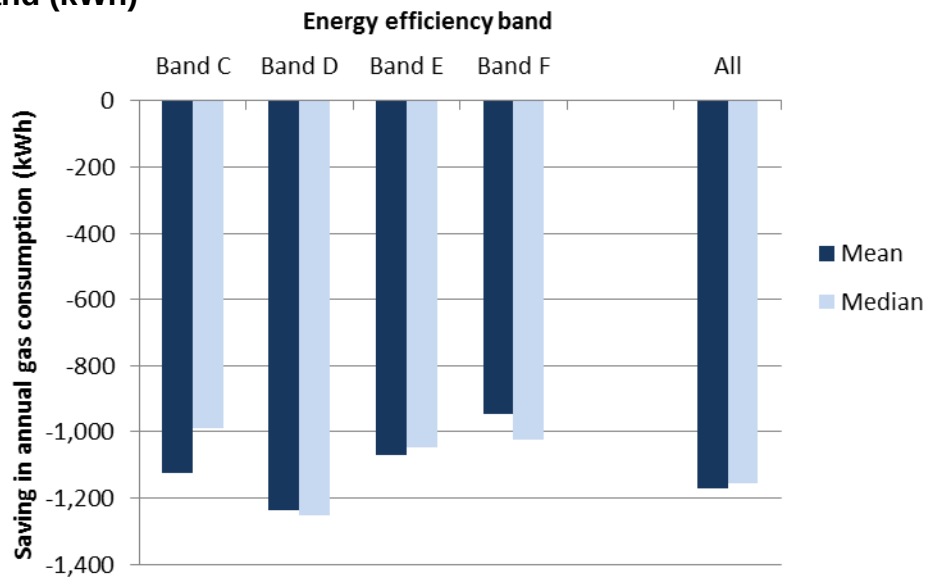
Properties in band F show the largest difference between mean (2.5 per cent) and median (6.5 per cent) consumption, this is because there are a small number of properties with large estimated savings having an impact on the mean for this category. For example, if the 20 properties (of the 350 in this category) with the largest percentage increase in consumption were excluded then the mean saving would be 6.9 per cent. This small number of higher consuming properties is having a greater influence in band F than they would in other bands because of the relatively small number of properties in this group in the sample (the next smallest group is band C with 2,200 properties having cavity wall insulation installed in 2011). In all bands, there is significant variation in the savings experienced by households including households which do not have a reduction in consumption following a measure being installed. Some of these increases in consumption will be a result of occupants changing, for example, if cavity wall insulation is installed when new owners move into a property they may also undertake an extension or spend more time in the home, leading to an overall increase in the gas use. Some of the variation will also result from the matched pairs used for the analysis[17]; this variation evens out for larger samples, but can have an influence on smaller samples such as results for band F shown above.

Figure B.13 shows the savings in kWh following installation of cavity wall insulation in 2011. It shows that the mean and median are much closer (particularly for band F) than when looking at the percentage savings. It again shows that the typical saving for band D properties is greater than for bands E and F (less energy efficient properties).

[16] Bands A, B and G have not been included in the chart due to small sample sizes.

[17] For example, if the properties in the intervention group and comparator group both had a change of occupant, it is possible the property with cavity wall insulation installed could see an increase in consumption while the equivalent property without an energy efficiency measure could have a decrease. When compared to each other this would suggest a large increase in consumption for the property in the intervention group, which does not reflect the benefit of the cavity wall insulation which has been installed.

Figure B.13: Saving following installation of cavity wall insulation in 2011, by energy efficiency band (kWh)

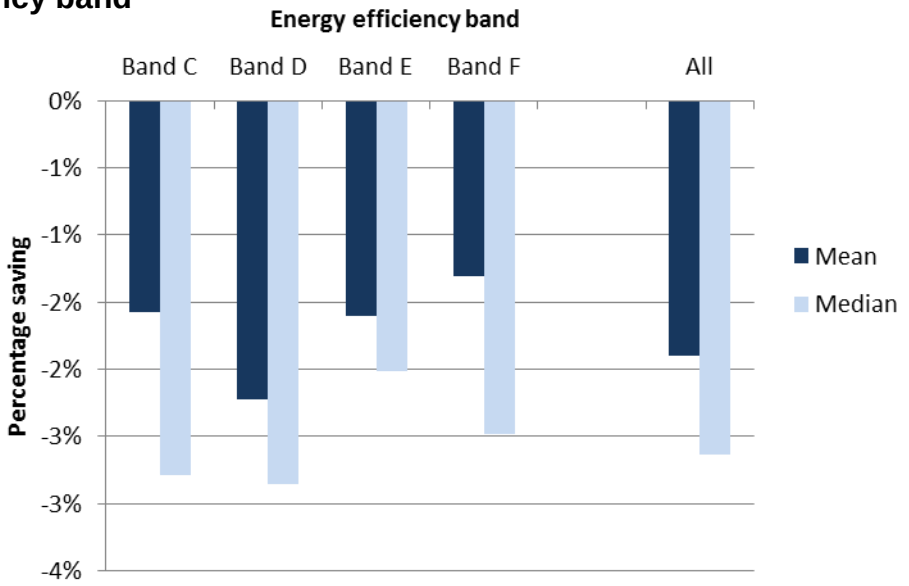


More detailed analysis will be required to understand more about the findings seen in figures B.12 and B.13. However, initial analysis suggests there may be a few possible reasons for the lower savings seen for less energy efficient properties. For example, based on information in the EPC, ten per cent of the properties in band F with cavity wall insulation installed in 2011 did not have cavity walls as the predominant wall type (compared to less than three per cent in bands C and D) and eight per cent of band F properties had a fuel other than gas recorded as the main heating fuel (compared to less than 0.5 per cent for bands C and D). It is also possible that households living in less energy efficient properties are more likely to take the benefit of the insulation in heating homes to higher temperatures rather than reduced bills. Further analysis would be required to confirm this.

Loft insulation by energy efficiency band

Figure B.14 shows the observed average annual savings in gas consumption for properties with loft insulation installed in 2011.

Figure B.14: Typical percentage saving following installation of loft insulation in 2011, by energy efficiency band[18]



[18] Bands A, B and G have not been included in the chart due to small sample sizes.

The figure shows that properties in band D had the greatest mean and median savings (2.2 and 2.9 per cent respectively). Properties in band E had the lowest median saving (2.0 per cent) and properties in band F had the lowest mean saving (1.3 per cent). As with cavity wall insulation, it appears that more energy efficient properties are experiencing greater savings following installation of measures. Again this could be due to use of gas as the main heating fuel or because of greater comfort taking by households in less energy efficient properties. However, more detailed analysis will be undertaken to understand this in more detail.

Results for environmental impact band showed broadly similar findings, with more energy efficient properties experiencing smaller percentage savings, these are shown in the accompanying tables.

Summary

This analysis sets out preliminary results for consumption and potential savings following the installation of energy efficiency measures by energy efficiency band and environmental impact rating. This has been made possible by the use of EPC data.

Access to these data provide a wealth of possibilities for future analysis and the preliminary findings have highlighted a number of areas which would benefit from further investigation. DECC plans to undertake further analysis of EPC data in future, but also hopes additional value will be gained from these data through its publication of the anonymised NEED datasets[19]. These datasets enable other individuals to undertake analysis themselves using the record level data. Any insights or comments resulting from this analysis would be welcomed and can be provided by email to: energyefficiency.stats@decc.gsi.gov.uk.

[19] https:// www.gov.uk/government/ publications/national-energy-efficiency-data-framework-need-anonymised-data-2014

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