Department of Energy & Climate Change

National Energy Efficiency Data-Framework

Summary of analysis using the National Energy Efficiency Data-Framework (NEED)

26th June 2014

URN 14D/192

Statistician responsible: Mary Gregory

Prepared by: Claire Pini and Sam Stadnyk

Any enquiries regarding this publication should be sent to us at EnergyEfficiency.Stats@decc.gsi.gov.uk.

Contents

1. Executive summary

The National Energy Efficiency Data-Framework (NEED) was set up by DECC to provide a better understanding of energy use and energy efficiency in domestic and non-domestic buildings in Great Britain. This publication presents:

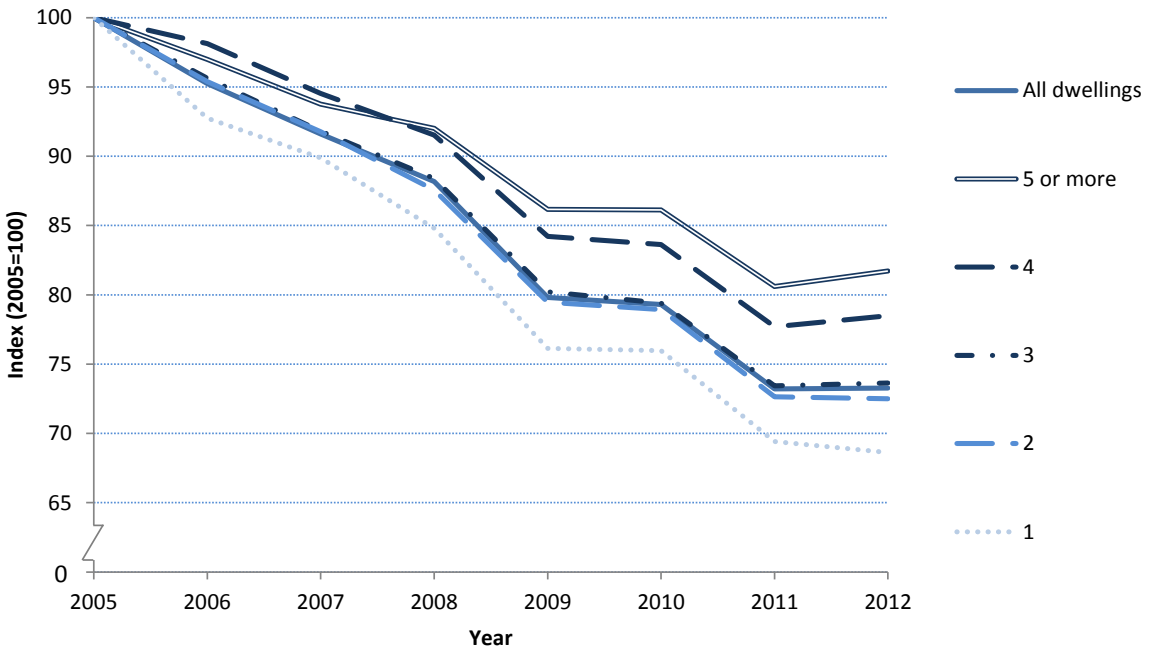
- analysis of domestic gas and electricity consumption in 2012 by property attribute, household characteristics, geography and socio-demographic classification;
- analysis of the impact of installing energy efficiency measures in 2011 on a household's gas consumption; and
- a summary of development's to NEED over the last year including publication of an anonymised dataset.

All results produced for this report are for annual consumption based on a representative sample of data for England and Wales unless stated. Results are produced using the methodology outlined in the domestic NEED methodology note published alongside this report[1].

Domestic consumption

Analysis of domestic consumption provides evidence of how energy is used in households. Figure 1.1 shows the trend in median gas consumption for properties by number of bedrooms. It demonstrates that between 2005 and 2012, median gas consumption for all categories follows a similar trend to the change in typical consumption for all dwellings. However, in general, smaller properties showed a greater percentage decrease in median consumption compared with larger properties.

Figure 1.1: Median gas consumption by number of bedrooms, 2005 to 2012 (2005=100)



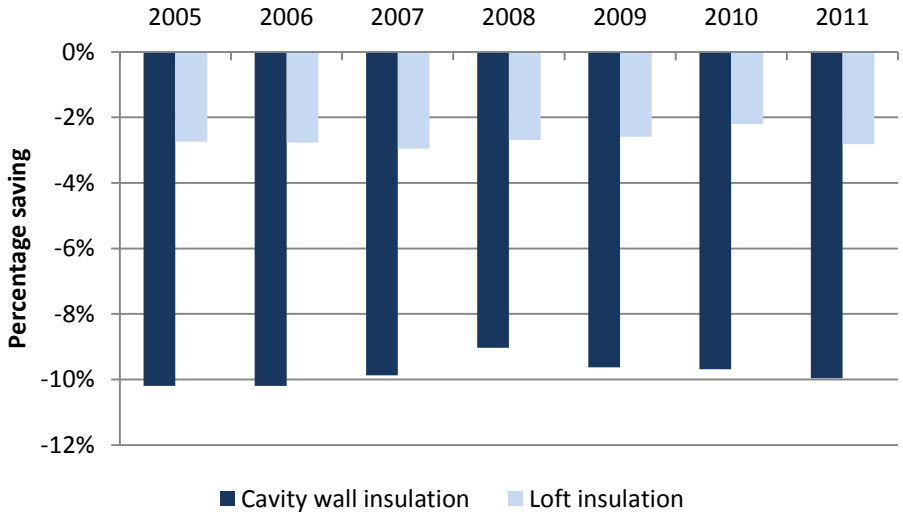
[1] https://www.gov.uk/government/publications/domestic-national-energy-efficiency-data-framework-need-methodology

Although some of the variation in gas and electricity consumption can be explained by variables contained within NEED, there are other factors to consider, for example differences in building construction, differences in performance of heating systems and appliances, and importantly differences in the behaviours of the individuals within each household.

Impact of measures

Estimates of the impact of installing an energy efficiency measure on a household's gas consumption continues to show that considerable savings can be made by properties installing a single energy efficiency measure, or a combination (for example cavity wall insulation and loft insulation). Figure 1.2 demonstrates the typical savings experienced in gas consumption for properties having either cavity wall insulation or loft insulation installed in each year from 2005 to 2011. It shows that the percentage saving seen for both measures is broadly consistent in each of the years presented.

Figure 1.2: Summary of observed savings for energy efficiency measures (median, not weighted)



The savings in gas consumption following installation of measures will differ for different households for a variety of reasons. The savings presented in this report are observed average savings and reflect what occurs in practice rather than theoretical estimates. It provides insight into the range of savings experienced and how typical savings vary for different types of properties and households.

Analytical developments

In addition to the analysis highlighted above, a number of aspects of NEED have also been developed over the past year. The primary focus of development work has been the publication of anonymised record level NEED data in May 2014[2]. Publication of these data allows users to undertake research using this rich data source and increases the value of the data DECC holds.

Other developments include publication of the first results for non-domestic NEED, also in May 2014, and analysis using Energy Performance Certificate (EPC) data and analysis for Scotland for the first time. Further information on these and other developments are covered in Section 5.

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

2. Introduction

The National Energy Efficiency Data-Framework (NEED) project was set up by DECC to assist in its business plan priority to “save energy with the Green Deal and support vulnerable consumers”.

It is a key element of DECC’s evidence base supporting DECC to:

- develop, monitor and evaluate key policies (including the Green Deal);
- identify energy efficiency potential which sits outside the current policy framework;
- develop a greater understanding of the drivers of energy consumption; and
- gain a deeper understanding of the impacts of energy efficiency measures for households and businesses.

The data framework provides the largest source of data available for analysis of consumption and the impacts of installing energy efficiency measures. This report provides updated domestic/household energy consumption results to include 2012 gas and electricity consumption data. It also includes updated estimates of the impact of installing energy efficiency measures on a household’s gas consumption for measures installed in 2011. This report includes new breakdowns, such as consumption by index of multiple deprivation and rural/urban classification. In addition to this there are a number of analytical developments which are outlined in Section 5 and the accompanying annexes, such as preliminary analysis of Energy Performance Certificate (EPC) data linked into NEED and publication of the first results for non-domestic NEED.

Headline results and key findings are presented in this report, with detailed data tables including breakdowns by property attributes and household characteristics published alongside this report (see Annex D for details of all published tables). In addition to the domestic consumption and impact of measures headline results there are a number of other outputs being published:

- Annex A – Quality Assurance: outlines how data contained within domestic NEED compares with other sources of data.
- Annex B – EPC data: presents preliminary analysis on EPC data linked into NEED.
- Annex C – Scotland: presents preliminary analysis of data contained within NEED relating to Scotland.
- Annex D – Data tables: contains details of all published tables.
- Annex E – Summary of Building Regulations: building regulations relating to loft insulation, wall insulation, boiler standards and heating controls.
- Multiple attributes: a table presenting gas and electricity consumption for 2012 by multiple property attributes.
- Table creator: a tool which allows users to create bespoke cross tabulations using gas and electricity consumption data (2005 to 2012) by property attributes and household characteristics.

- Local authority: tables providing gas and electricity consumption for local authorities by different types of properties and households, due to be published on Thursday 31st July.

A domestic NEED methodology note has been published alongside this publication which includes how estimates of domestic electricity and gas consumption by property attributes and household characteristics are produced. It also sets out the methodology for estimating the saving in gas consumption following the installation of retro-fit energy efficiency measures (e.g. cavity wall insulation, loft insulation) and provides background on the users and uses of the data and details of the revisions policy. This note can be accessed from the following link:

https://www.gov.uk/government/publications/domestic-national-energy-efficiency-data-framework-need-methodology

These statistics have been assessed by the UK Statistics Authority against the Code of Practice for Official Statistics. The Statistics Authority published its report on 12 June 2014: http://www.statisticsauthority.gov.uk/assessment/assessment/assessment-reports/index.html.

The Statistics Authority has determined that these statistics can be designated as National Statistics subject to DECC implementing a small number of requirements across the range of DECC statistics assessed, relating to further documentation on the needs of users, improving methodology on assumptions, assessing risks to use of administrative data, improving clarity and linkages between the range of statistics produced and reviewing data release formats. These actions will be taken forward by the end of September.

The remainder of this section gives a brief overview of NEED. For any queries or feedback on this publication please email:

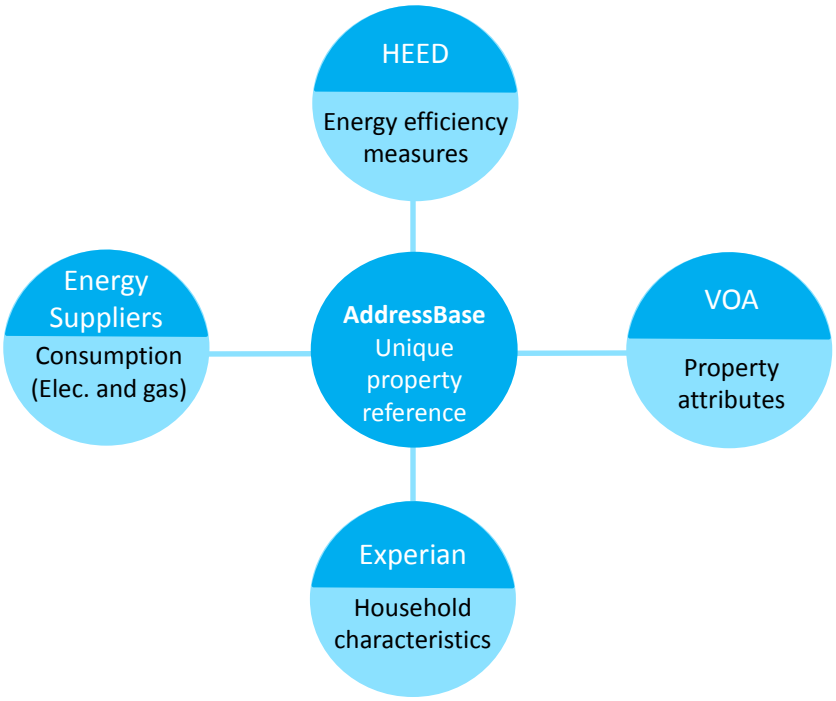
EnergyEfficiency.Stats@decc.gsi.gov.uk

NEED overview

NEED is a framework for combining data from existing sources (administrative and commercial) to provide insights into how energy is used and what the impact of energy efficiency measures are on gas and electricity consumption, for different types of properties and households. The address information in each dataset is used to assign a unique property reference number (UPRN) to each record. Data from different sources can then be matched to each other via the UPRN (Figure 2.1). The principle is the same for both the domestic and non-domestic sector, though different data sources are used.

Four key data sources have been used to analyse domestic energy consumption and the impact of installing energy efficiency measures: meter point electricity and gas consumption data, Valuation Office Agency (VOA) property attribute data, the Homes Energy Efficiency Database (HEED) containing data on energy efficiency measures installed, and data modelled by Experian on household characteristics. In addition to these four main data sources feeding into the framework at a property level there are a number of other indicators that have been assigned to the property based on the geographic location of the property. For example index of multiple deprivation and a fuel poverty indicator assigned based on the Lower Layer Super Output (LSOA).

Figure 2.1: Structure of domestic NEED



NEED has supported a number of DECC policies, with important consequences. It has been used to understand the reduction in consumption for households installing energy efficiency measures. To date NEED has looked at savings from a number of measures, including cavity wall insulation, loft insulation, installation of condensing boilers and solid wall insulation. The estimates from NEED were used to inform "in use factors" for the Green Deal. Data on consumption has informed Fuel Poverty analysis so there is a better understanding of actual consumption for different types of properties and households and therefore a better understanding of how policy options will impact on different households. Furthermore publication of an anonymised version of domestic NEED on 29 May 2014 has further increased the utility of the data by facilitating analysis of record level data by external researchers.

DECC would like to thank all those who made this analysis possible, including: Energy Suppliers, Gas Safe, the Energy Savings Trust and the Valuation Office Agency.

All analysis of domestic properties presented in this report is based on a representative sample of properties in England and Wales, stratified by local authority, number of bedrooms, property type and property age.

The rest of this report covers:

- Domestic Energy Consumption: analysis of domestic gas and electricity consumption by property attributes, household characteristics, geography and socio-demographic classifications.
- Impact of Energy Efficiency Measures in Homes: analysis of the impact of installing energy efficiency measures on a household's gas consumption.
- Analytical Developments: a summary of development's to NEED over the last year including publication of an anonymised dataset.

3. Domestic energy consumption

This section presents analysis of domestic gas and electricity consumption by property attributes, household characteristics, geography and socio-demographic classifications. It also includes trends in energy consumption between 2005 and 2012. For the first time consumption by Fuel Poverty Index[3] (England only), Index of Multiple Deprivation[4,5] and Rural Urban Classification[6] are also being published.

All consumption figures presented in this section are based on valid domestic gas and electricity consumption[7] for properties in the NEED sample and are rounded to the nearest 100 kWh. All gas consumption data are presented on a weather corrected basis, this means that the consumption for each household has been adjusted to account for differences in temperature and wind in each year. This allows for a more consistent comparison of gas consumption over time; however users should note that the weather correction factor applied to the consumption data is modelled and as such may not entirely remove the effects of extreme weather in a single year.

Results are based on a representative sample of approximately four million properties for England and Wales, with the exception of trends in consumption which covers only England between 2005 and 2010 and both England and Wales for 2011 to 2012[8]. A sample is used rather than the complete dataset in order to increase processing speed, reduce cost and to ensure that DECC is not processing more data than necessary.

The relationship between energy use and any individual characteristic is complex, but there is a high correlation between certain characteristics and a household's energy use (for example, size of property or household income). This section provides insight into how each characteristic relates to energy use, but makes no attempt to control for other characteristics. The results presented here are consistent with results for earlier years presented in previous reports.

3.1 Headline domestic consumption

In 2012, the median[9] gas consumption for all properties in the sample was 12,900 kWh with median electricity consumption at 3,300 kWh. However, within the distribution there is a range

---

[3] The definition for Fuel Poverty is introduced in section 2 of the following report: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211180/FuelPovFramework.pdf.

[4] English Indices of Deprivation: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6871/1871208.pdf.

[5] Welsh Index of Multiple Deprivation: https://statswales.wales.gov.uk/Catalogue/Community-Safety-and-Social-Inclusion/Welsh-Index-of-Multiple-Deprivation.

[6] Rural-Urban Classification for Small Area Geographies User Guide and Frequently Asked Questions: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/239478/RUC11user_guide_28_Aug.pdf.

[7] Valid domestic gas consumption is taken to be values between 100 kWh and 50,000 kWh (inclusive). Domestic electricity consumption is considered valid if it is between 100 kWh and 25,000 kWh (inclusive). Gas and electricity consumption values which are suspected to be estimated readings are excluded.

[8] Results for 2005 to 2012 presented in this report can be considered as a continuous trend. The sample used for England for 2005 to 2010 has very similar mean and median consumption values to the sample used for 2011 and 2012 analysis; the biggest difference in any year is less than 50kWh.

[9] The median is the middle value of the distribution, i.e. the consumption value where half of the households have lower consumption and half have a higher one.

of consumption as can be seen from the lower and upper quartiles[10] shown in Table 3.1. The table also shows that mean consumption is larger than median consumption, by 9 per cent for gas and 23 per cent for electricity. In the rest of this section, median consumption has been used to represent typical consumption. It is a more appropriate measure of typical consumption than the mean because the mean can be influenced by a relatively small number of high consuming households that are not typical of the rest of the population. The distribution of gas and electricity consumption in 2012 is shown in more detail in Figure 3.1. It shows some of the high consuming households in the far right tails of the histograms, and also that the distribution for both gas and electricity is skewed towards lower consumption values, but that the skew is more pronounced for electricity.

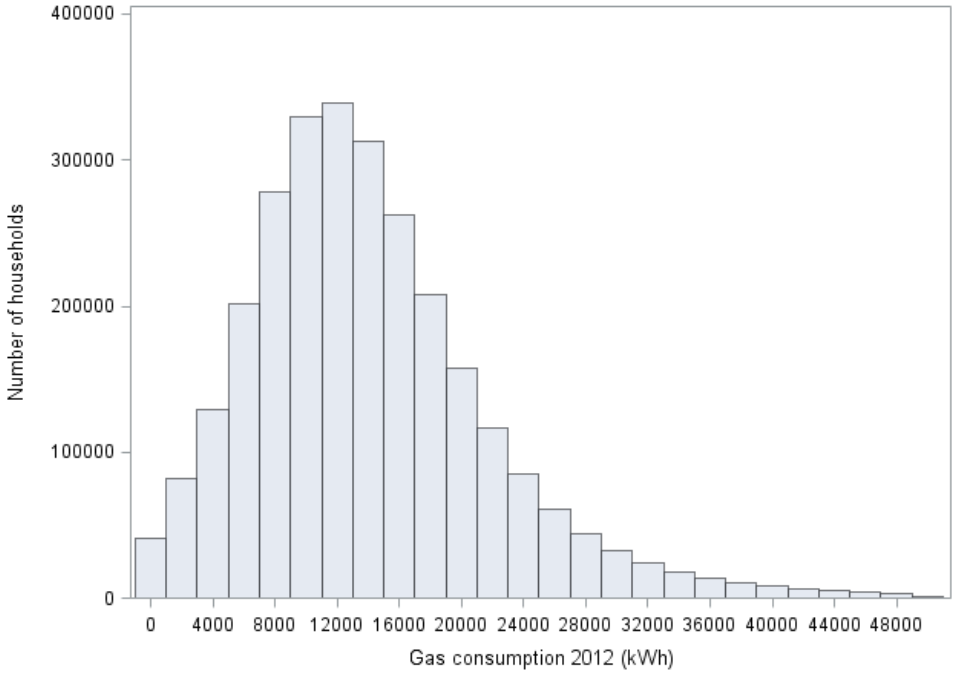
Table 3.1: Annual consumption summary statistics, 2012, kWh

	Mean	Standard deviation	Lower quartile	Median	Upper Quartile
Gas	14,000	7,800	8,800	12,900	18,000
Electricity	4,100	3,100	2,100	3,300	5,100

Table 3.1 also shows that there is more variation in electricity consumption than gas consumption. The standard deviation is 55 per cent of the mean for gas and 75 per cent for electricity. The larger variability (or spread of data) for electricity is likely to be due to the wider range of uses of electricity, including the variation between households that use electricity as the main heating fuel and those that do not as well as the use of electricity for secondary heating.

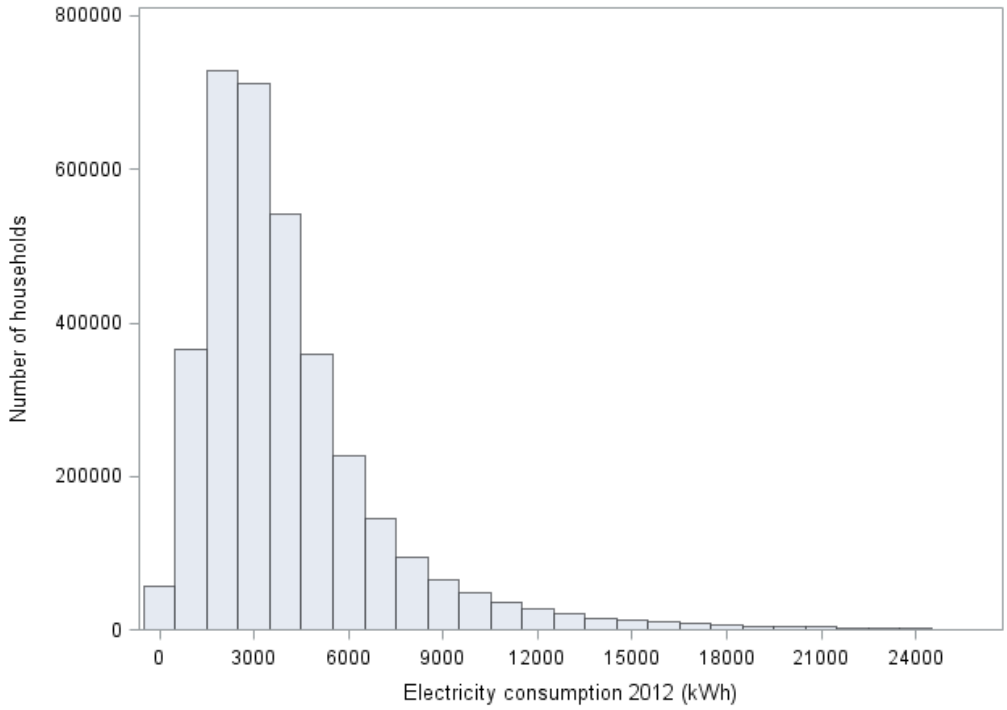
Figure 3.1: Distribution of consumption 2012

(a) Gas consumption (kWh)



[10] Quartiles (including the median) divide the consumption values into four parts containing the same number of households. The lower quartile is the consumption value where 25 per cent of households have lower consumption and 75 per cent have higher. The upper quartile is the consumption value where 25 per cent of households have higher consumption and 75 per cent have lower.

(b) Electricity consumption (kWh)



3.2 Domestic consumption breakdowns

This section presents domestic gas and electricity consumption by property attributes, household characteristics, geography and socio-demographic classifications. This section highlights some of the more interesting findings.

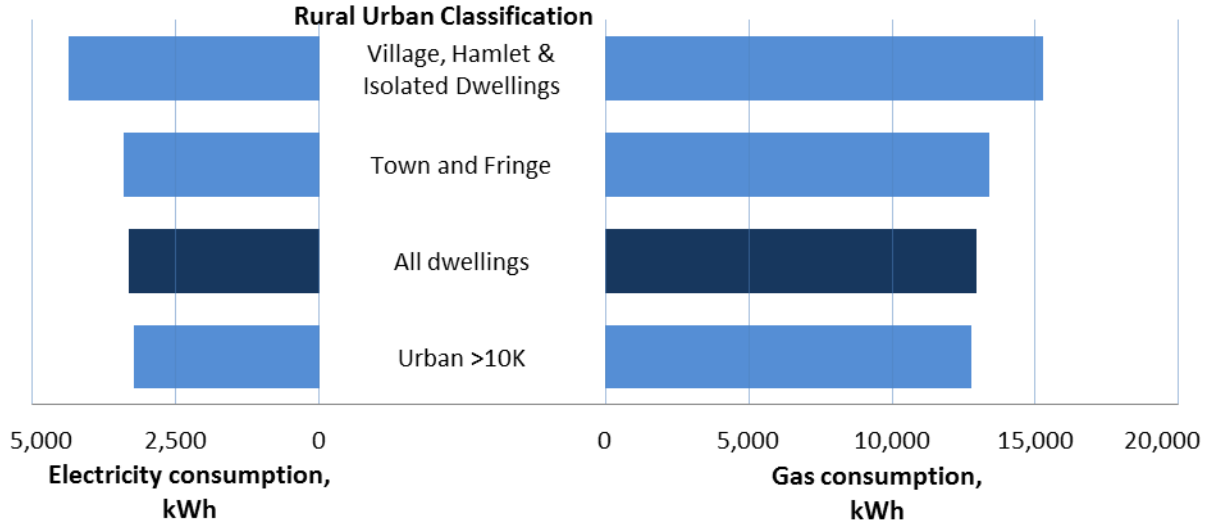
Annex D shows details of all consumption tables available from NEED. For all variables, the numbers of households in the sample along with mean and median figures for consumption are included in the headline tables published alongside this report. Additional statistics to describe the pattern of consumption; such as standard deviation and quartiles are included in the additional tables published alongside this report.

For the first time, domestic consumption has been published by fuel poverty quintile, index of multiple deprivation quintile and rural urban classification. These data are available for 2011 and 2012 annual electricity and gas consumption.

Figure 3.2 below shows typical (i.e. median) gas and electricity consumption for households by rural-urban classification[11].

[11] Rural-Urban Classification for Small Area Geographies User Guide and Frequently Asked Questions: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/239478/RUC11user_guide_28_Aug.pdf.

Figure 3.2: Median electricity and gas consumption, 2012, by rural urban classification



It shows that properties classified as village, hamlet and isolated dwelling typically consume the most gas at 15,300 kWh, this compares to 12,800 kWh for urban properties. The same pattern is seen for electricity with properties classified as village, hamlet and isolated typically consuming the most when compared to urban properties, 4,400 kWh compared to 3,200 kWh respectively. The difference between rural and urban properties could be driven by property size, as houses in rural areas tend to be larger than those in urban areas. The large difference in electricity consumption could also be attributed to the fact that a higher proportion of households in rural areas are more likely be properties which are not connected to the gas network and as such would use other fuels, such as electricity, as a main heating fuel rather than gas.

Figure 3.3 shows typical gas and electricity consumption for households by Index of Multiple Deprivation, with LSOAs split into quintiles by rank.

Figure 3.3: Median electricity and gas consumption, 2012, by Index of Multiple Deprivation quintile

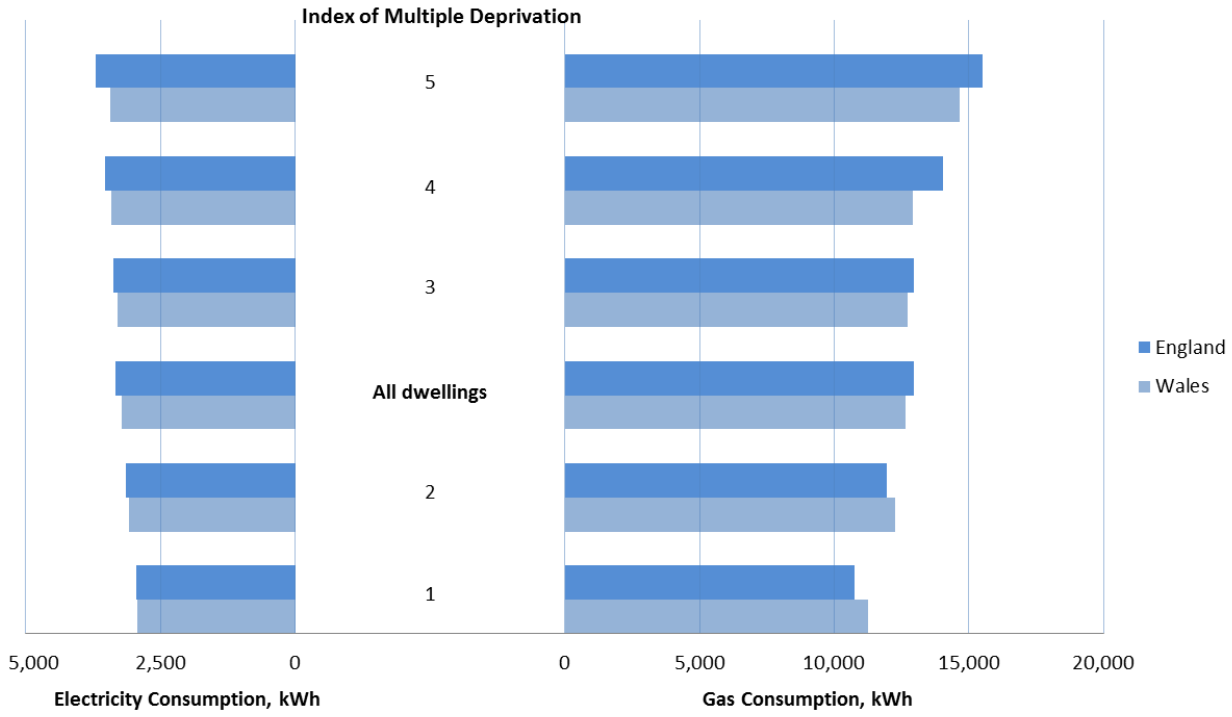
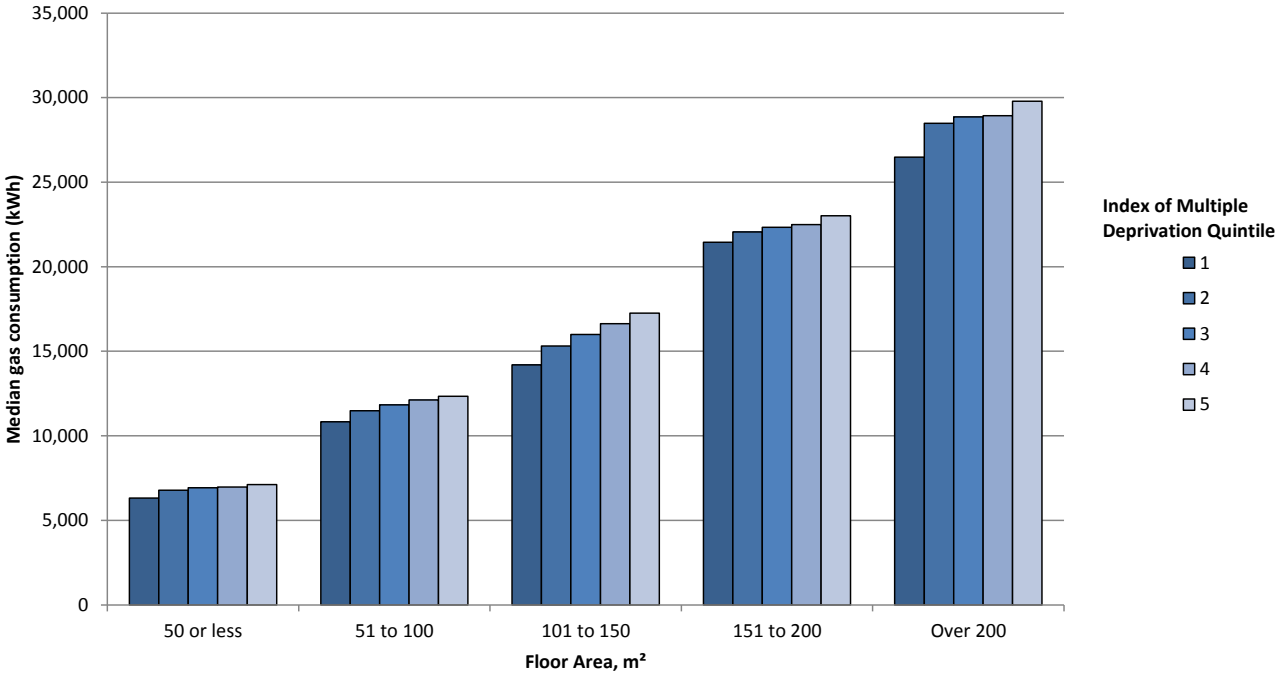


Figure 3.3 shows that when looking at households in England, the most deprived 20 per cent of areas (bottom quintile) typically consume the least electricity and gas (2,900 kWh and 10,800 kWh respectively) and that those in the least deprived areas consume the most (3,700 kWh and 15,500 kWh respectively). The results for typical consumption by Fuel Poverty Index showed a broadly similar trend as for Index of Multiple Deprivation, only with generally smaller differences between quintiles.

Whilst Figure 3.3 shows a broadly linear relationship between the level of deprivation and consumption, there is a significant amount of variation which cannot be explained by a single variable. Figure 3.4 shows typical gas consumption by Index of Multiple Deprivation for England for different property size bands.

It can be seen from the chart that for each floor area band typical consumption is higher for less deprived households. For example, the least deprived households with a floor area less than 50m^2 typically consumed 13 per cent more gas than the most deprived households in the same floor area band (7,100 kWh compared to 6,300 kWh). This pattern of consumption is seen for each floor area band. The pattern seen could be related to the fact that properties in the most deprived areas are more likely to be social housing which is known to be more energy efficient[12], and could therefore be contributing to the lower gas consumption. For the properties with valid gas consumption in 2012, just under half (44 per cent) of properties in the most deprived band are council/housing association properties compared to only three per cent of properties in the least deprived band. In addition to energy efficiency of properties it could also be that households located in more deprived areas are more conscious of the amount they spend on gas and may therefore try to limit the amount they use.

Figure 3.4: Median gas consumption in 2012 by floor area and Index of Multiple Deprivation quintile, England only



[12] The SAP rating is a measure of the overall energy efficiency of the dwelling. In 2012, the average SAP rating in the social sector was 64.6 compared with 57.3 in the private sector. Source: English Housing Survey Headline Report 2012-13, Annex Table 19: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/284649/Headline_Report_tables_and_figures.xls.

Figure 3.4 was created using data from the NEED table creator tool. This tool is designed to provide users with the ability to create bespoke cross tabulations on electricity and gas consumption by property attributes and household characteristics. Two variables can be selected to be considered at once (e.g. Index of Multiple Deprivation quintile and floor area band) with the number of observations, mean and median consumption shown in the table. There is also a choice of fuel (electricity or gas). Where data are available, data for each year from 2005 to 2012 are included. The data used in the creation of the tables can also be downloaded as a comma separated variable (.csv) file for ease of reuse. The tool and data files can be found at the following location: https://www.gov.uk/government/statistical-data-sets/need-table-creator.

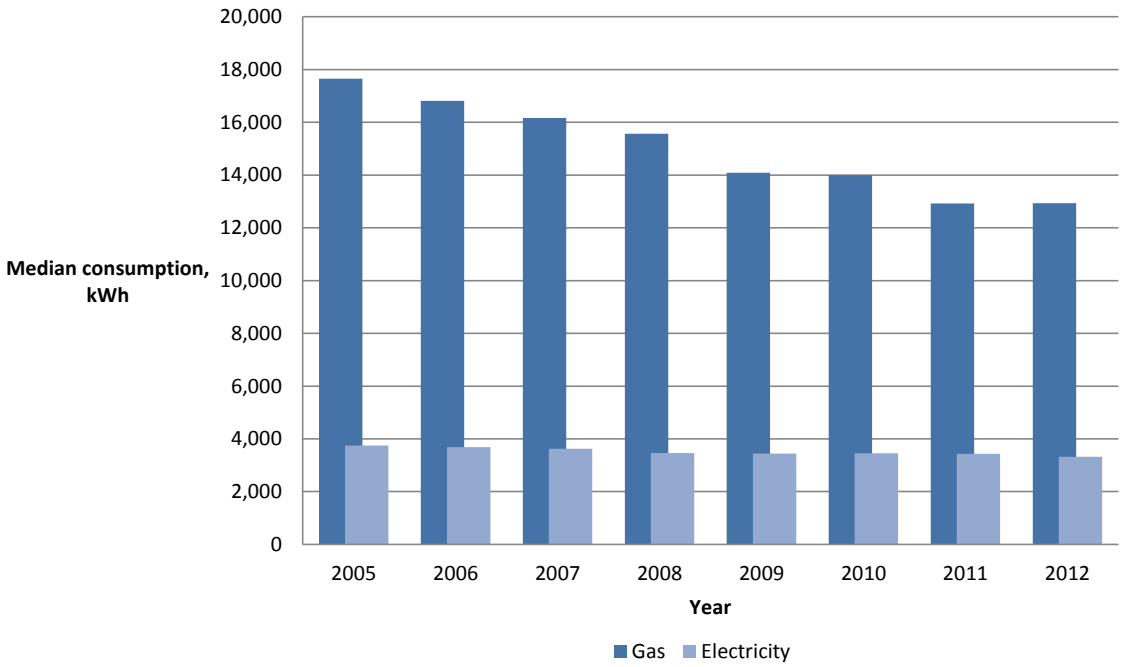
3.3 Trends in domestic consumption

This section provides analysis of the trends in median gas and electricity consumption between 2005 and 2012 for different property attributes and household characteristics. Figure 3.5 shows the median gas and electricity consumption for all households in the NEED sample with valid consumption in each year from 2005 to 2012. Data for 2005 to 2010 cover England only and later data (2011 onwards) cover both England and Wales.

The gas data used in NEED are weather corrected; the consumption for each household has been adjusted to account for differences in temperature in different years. This allows a more consistent comparison for analysis as it eliminates the fluctuation which would be observed as a result of warmer or cooler weather. Electricity consumption data are not weather corrected. The reason for gas consumption data being weather corrected whilst electricity is not is due to the fact that gas is predominantly a heating fuel and hence its use depends heavily on the weather whereas electricity is used for a much wider variety of reasons (and far less often as a heating fuel) so consumption is less affected by the weather. Figure 3.5 shows that median consumption for both gas and electricity has been steadily declining over the period.

Median gas consumption has fallen by just over a quarter (27 per cent) between 2005 and 2012; however consumption between 2011 and 2012 remained broadly consistent. The largest drop was between 2008 and 2009, with a decrease in median annual consumption of nine per cent. Median electricity consumption decreased by 11 per cent between 2005 and 2012, between 2011 and 2012 median electricity consumption fell by 3 per cent.

Figure 3.5: Median gas and electricity consumption 2005 to 2012, kWh



This reduction in consumption over time could be a result of a number of factors. These potentially include; energy efficiency improvements in households[13], such as new boilers, insulation and more efficient appliances; higher prices and the recession; or changes in the building stock and household composition.

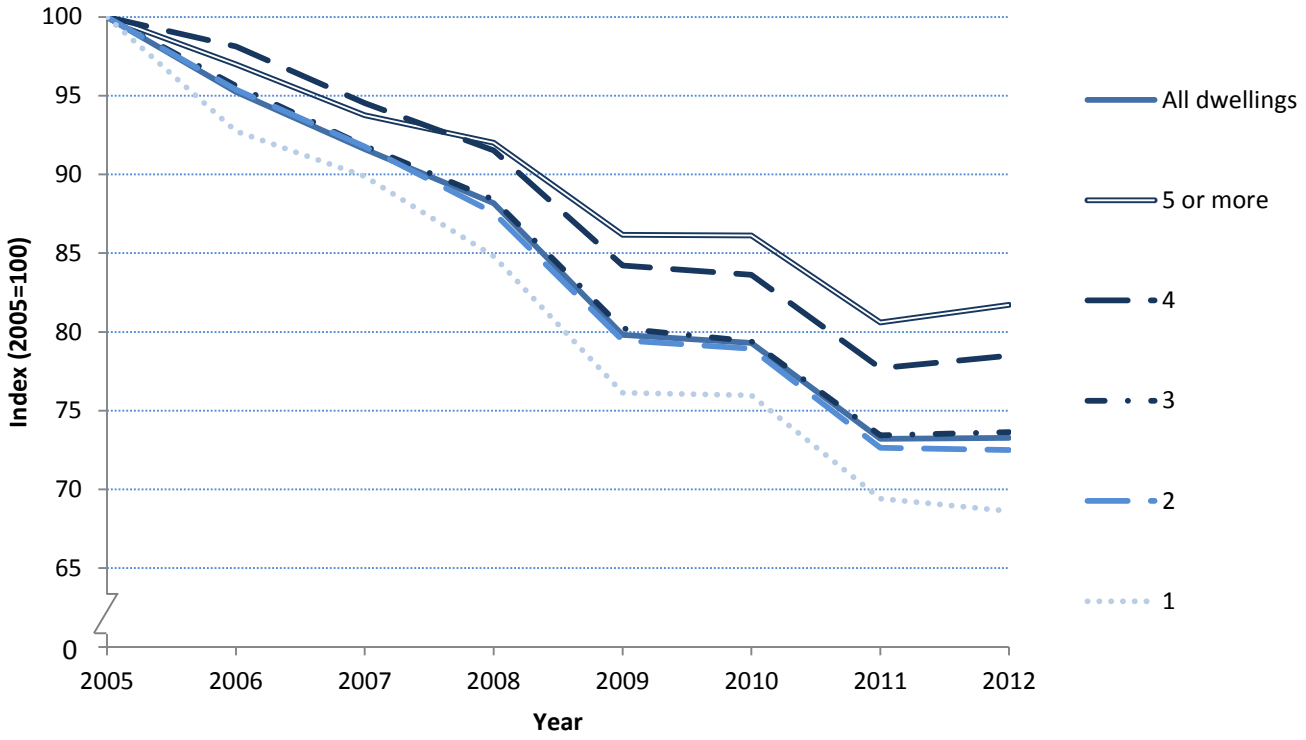
The change in median consumption for the property attributes, household characteristics, geography and socio-demographic classifications follow a similar pattern to that for all dwellings. However, certain households will be more or less affected by the different factors described above.

The remainder of this section provides some highlights of changes over time for different property attributes and household characteristics. All changes in consumption are shown as an index relative to a 2005 baseline (2005=100)[14].

Trends in domestic consumption by property attributes

Figure 3.6 shows the trend in median gas consumption for properties by number of bedrooms. It demonstrates that between 2005 and 2012, median gas consumption for all categories follows a similar trend to the change in typical consumption for all dwellings. However, in general, smaller properties showed a greater percentage decrease in median consumption when compared with larger properties. For example, in 2012 typical gas consumption for properties with one bedroom was 31 per cent lower than in 2005, but for properties with five or more bedrooms the reduction was only 18 per cent.

Figure 3.6: Median gas consumption by number of bedrooms, 2005 to 2012 (2005=100)



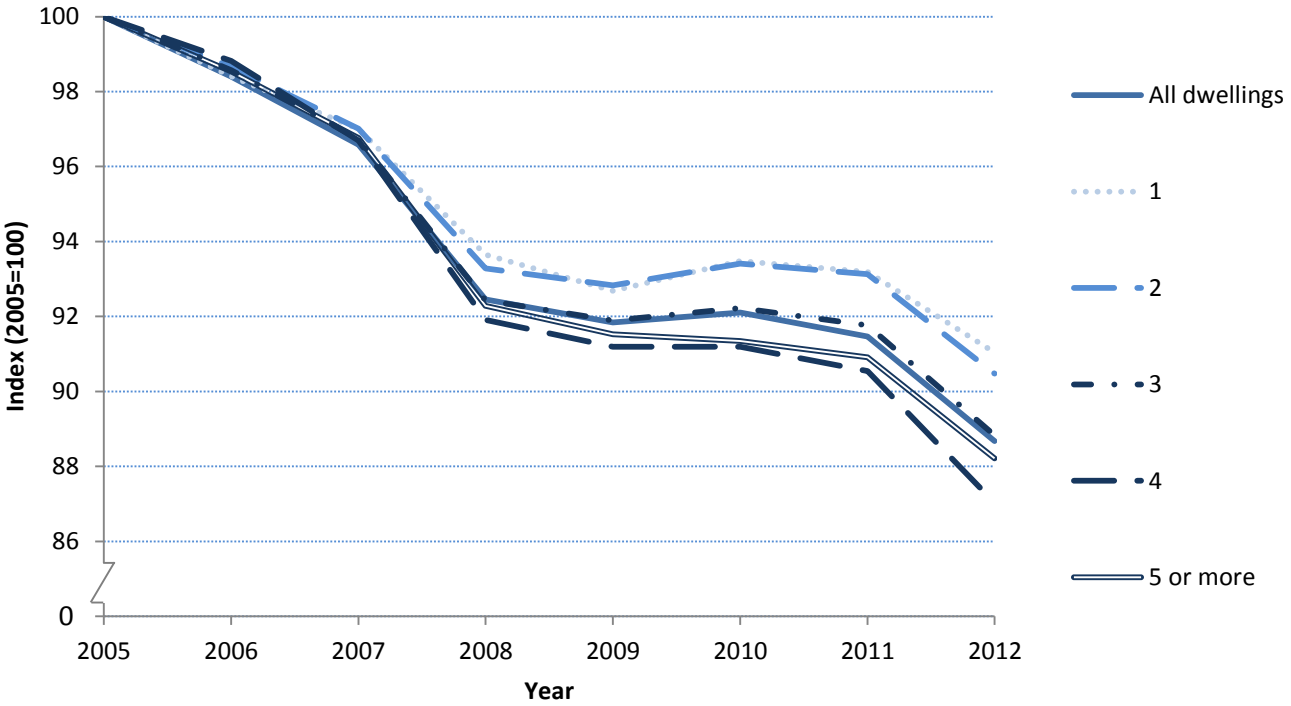
[13] The energy efficiency of the housing stock has improved between 2005 and 2012. The average SAP rating of a dwelling increased by 9.5 points from 49.0 in 2005 to 58.5 in 2012. The SAP rating is a measure of the overall energy efficiency of a dwelling. English Housing Survey Headline Report 2012-13, Annex Table 19: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/284649/Headline_Report_tables_and_figures.xls.

[14] Note that the y-axis for these charts does not start at zero in order to allow differences between groups to be seen more clearly.

Figure 3.6 also illustrates that when comparing 2012 gas consumption with 2011 it is the first year in the time series where the change in consumption for different groups has been in different directions. For one bedroom properties, typical gas consumption decreased by 1.1 per cent between 2011 and 2012 whereas for five or more bedroom properties over the same period typical consumption increased by 1.4 per cent. It should be noted that the comparative increase of consumption from 2011 to 2012 decreases in severity as the number of bedrooms decrease, with two bedroom properties only reducing typical gas consumption by 0.2 per cent.

Figure 3.7 shows the equivalent information for median electricity consumption. It shows that in general larger properties show a greater decrease in their median consumption compared with smaller properties. For example in 2012 typical electricity consumption for properties with one bedroom was 9.0 per cent lower than in 2005 compared with 11.8 per cent lower for five bedroom properties. Figure 3.7 also highlights a drop in typical electricity consumption by number of bedrooms when comparing 2012 consumption with 2011. When looking at properties with one bedroom typical electricity consumption has dropped by 2.3 per cent, this decrease is larger for all other bedroom groups, with four bedroom properties seeing the biggest decrease in typical electricity consumption at 3.9 per cent. The chart also highlights that there is less variation in the trend for electricity consumption. There is a smaller decrease in electricity consumption over the period compared to that of gas and the difference between different groups of properties is less significant than that of gas consumption.

Figure 3.7: Median electricity consumption by number of bedrooms, 2005 to 2012 (2005=100)



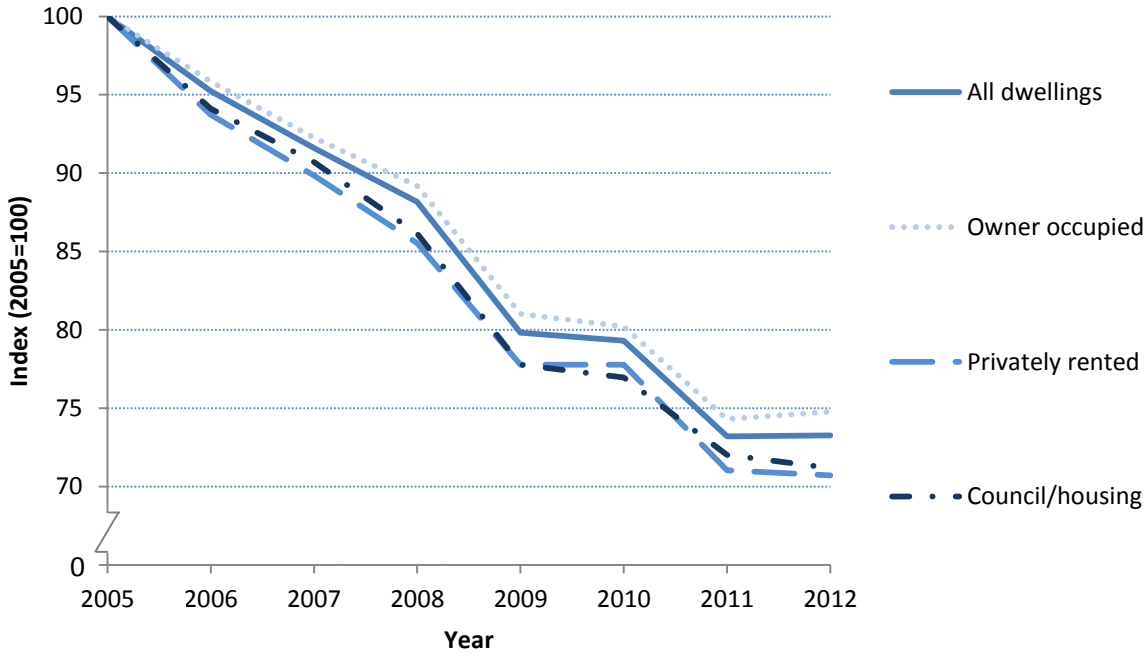
Consumption by floor area and property type broadly follows the same trends outlined above for number of bedrooms. This is to be expected as these variables have a strong correlation with the size of the property, so would be expected to exhibit similar trends. For example, one would generally expect a detached house to be bigger than a terraced house or flat, and that a five bedroom house would have a larger floor area than a one bedroom property.

When looking at consumption by property age, in general older properties tended to reduce consumption by the greatest amount between 2005 and 2012, with newer properties typically reducing consumption by less. However, this distinction is not as clear cut as with the other property attributes mentioned above.

Trends in domestic consumption by household characteristics

Figure 3.8 shows the trend in median gas consumption for properties by tenure. It shows that those either renting their home or in council housing saw a typical reduction in gas consumption of 29 per cent between 2005 and 2012. This compares to those who own their own property reducing their typical consumption by slightly less, at 25 per cent. When looking at consumption in the most recent year, 2012, compared with 2011, it can be seen that the only group to increase the amount of gas typically consumed is those in owner occupied properties, with an increase of 0.6 per cent. When looking at those either renting their home or in council housing a decrease in typical gas consumption is seen (0.5 per cent and 1.2 per cent respectively).

Figure 3.8: Median gas consumption by tenure, 2005 to 2012 (2005=100)



4. Impact of energy efficiency measures in homes

This section analyses the impact of installing energy efficiency measures on a household's gas consumption. In January 2013 the Government launched two new energy efficiency schemes: the Green Deal and Energy Company Obligation (ECO). Both of these schemes aim to reach properties that previous Government schemes did not, by tackling a number of key barriers to the take-up of energy efficiency measures (Green Deal) and providing measures to low income and vulnerable consumers, and those living in 'hard to treat' properties (ECO). This continuing emphasis on energy efficiency means it remains important to understand how these measures impact on a household's gas use, both to help understand the impact of past policy and help with the effective design of new policies.

Results presented in this section refer to the savings in gas consumption for households using gas as the main heating fuel. All gas consumption data are presented on a weather corrected basis, this means that the consumption for each household has been adjusted to account for differences in temperature and wind each year. Results cover the installation of energy efficiency measures over the period 2005 to 2011. Estimates are based on observed savings, so they are savings after comfort taking[15] and do not take into account the quality or coverage of the energy efficiency measure being installed. For example, estimates could include some properties which have only had cavity wall insulation installed in three of their four external walls. This means that individuals have the potential to make a greater saving than the results presented in this report. There is also the potential for households to make smaller savings than those presented here, since there are a number of factors that can impact the amount of gas a household consumes (for example, a change in number of occupants). The estimates set out below provide insight into the range of savings experienced and how typical savings vary for different types of properties and households.

The method used compares the gas consumption in properties before and after an energy efficiency measure has been installed with the change in consumption over the same period for similar properties which have not had a measure installed. To do this, intervention and comparator groups are created – with the intervention group containing properties which have received the energy efficiency measure being considered (and no other measure), and the comparator group containing similar properties that have not had an energy efficiency measure installed[16]. A more detailed explanation of the methodology used can be found in the Domestic NEED methodology note: https://www.gov.uk/government/publications/domestic-national-energy-efficiency-data-framework-need-methodology.

[15] Comfort taking is where some households take the benefit of the insulation measure through increased warmth rather than entirely through energy saving. For example, a household may have had their thermostat set lower than they wanted in order to lower their gas use, but after installation of an energy efficiency measure they could choose to increase the temperature on their thermostat and use the same amount of energy since their property should now retain the heat better than before due to the improved energy efficiency.

[16] This group has no energy efficiency measure recorded as being installed in HEED. These properties may have a measure installed which has not been recorded in HEED, for example the homeowner installing their own loft insulation. It should be noted that - with the exception of professional loft insulation - it is equally possible that properties in the intervention group could have installed their own loft insulation, and this will also not be recorded in HEED.

The Domestic Energy Consumption section of this report presents gas and electricity consumption figures for the representative NEED sample which can help to put results presented in this section into context.

All headline figures in this report refer to weighted figures; i.e. the savings have been adjusted to be representative of the complete housing stock rather than just the properties which have had the measure installed through a Government scheme in the year under consideration (the intervention group). Breakdowns by property attributes and household characteristics are not weighted.

The headline results are presented below. Detailed data tables including breakdowns by property attributes and household characteristics have been published alongside this report. Details of all published tables can be found in Annex D.

4.1 Impact of installing a single energy efficiency measure

This section presents headline results and key findings for the impact of installing a single energy efficiency measure in a household in 2011. It covers cavity wall insulation and loft insulation[17].

Loft insulation installations included in these results cover installations into lofts which had no insulation (virgin loft insulation), and installations into lofts which were already partially insulated (top-up loft insulation). Therefore, households with very little or no existing insulation can expect to save more than the typical savings outlined. Conversely, properties which already have a reasonable amount of loft insulation, or where the existing insulation is being replaced, are likely to experience smaller savings.

It is also possible that these figures slightly underestimate savings because of the potential for DIY loft insulation to be installed in the comparator group, but not in the intervention group. This will mean the comparator group may have experienced some savings as a result of insulation which is not accounted for in the intervention group. Taking into account the prevalence of DIY insulation in the population, this would lead to an underestimate of the savings of less than 100 kWh. Given the scale of the potential issue and the accuracy of reported estimates, no adjustment has been made to the results to account for this, but users should be aware of this possibility when interpreting results.

Savings for properties installing a boiler in 2011 have not been presented. This is due to data quality concerns with new historic data on boiler installations received late in the publication process. Further quality assurance is required before these data can be used with confidence. It is planned that further quality assurance of these new boiler data will be carried out and savings for boilers then repeated to take into account the additional data. Typical savings following installation of a boiler will then be published for 2005 to 2011 as a complete time series; this will include savings estimates for 2008 and 2009 for the first time. It is also likely that there will be revisions to previously published estimates of boiler savings as a result of the additional historic data now available. To enable savings in gas consumption experienced for properties installing a combination of energy efficiency measures to be presented, provisional estimates for households with boilers installed in 2011 have been included in Section 4.3. These 2011 boiler saving estimates were calculated without the additional historic data and should therefore be treated as provisional.

[17] Estimates of savings from installations of loft insulation are based on professional installations only, as recorded in HEED. It does not cover properties which have had loft insulation installed by the homeowner themselves (DIY loft insulation) or properties which had their loft insulated when built (as built).

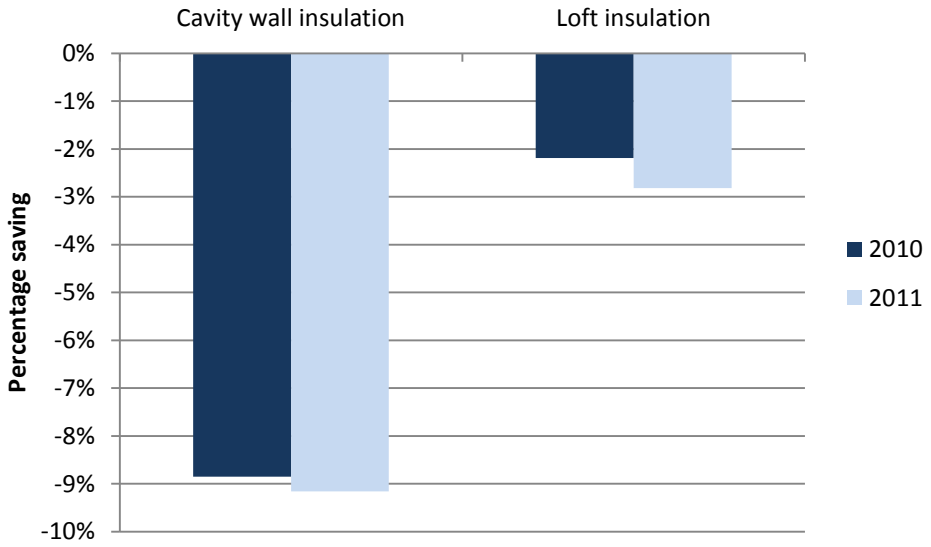
Table 4.1 below shows the savings experienced in gas consumption for properties having cavity wall and loft insulation installed in 2011. It shows that the typical saving for properties installing cavity wall insulation was 9.2 per cent, representing a saving of 1,500 kWh. Properties installing loft insulation saw a typical saving of 2.8 per cent, or 400 kWh.

Table 4.1: Summary of observed savings (weighted) – single energy efficiency measure installed in 2011

Energy efficiency measure		Percentage saving	Saving (kWh)
Cavity wall insulation	Median	-9.2%	-1,500
	Mean	-7.7%	-1,400
Loft insulation	Median	-2.8%	-400
	Mean	-2.0%	-400

Figure 4.1 compares the 2011 savings with savings for energy efficiency measures installed in 2010. The typical observed percentage saving for cavity wall insulation and loft insulation installed in 2011 has increased slightly compared with that seen in 2010, by 0.3 and 0.6 percentage points respectively.

Figure 4.1: Summary of observed saving for energy efficiency measures installed in 2010 and 2011 (median, weighted)

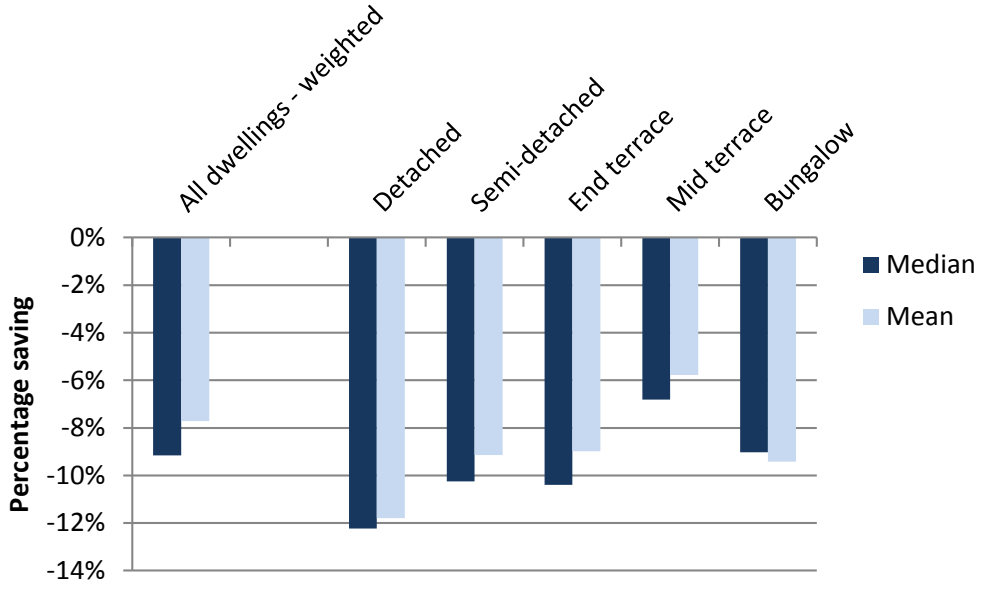


The rest of this section highlights savings by different types of property attributes. For example when looking at cavity wall insulation just under two thirds (63 per cent) of installations included in the intervention group were in three bedroom properties. For context about half of the properties (48 per cent) in the NEED sample have three bedrooms[18], in addition the most common type of property in the NEED sample is three bed semi-detached properties, making up 20 per cent of the sample. Figure 4.2 below shows the observed percentage savings in gas consumption for these three bedroom properties installing cavity wall insulation in 2011 by property type. It shows that when looking at three bedroom properties, detached properties experienced the greatest typical saving, with mid terraced properties seeing the smallest

[18] Based on all properties which have a valid electricity consumption in 2012.

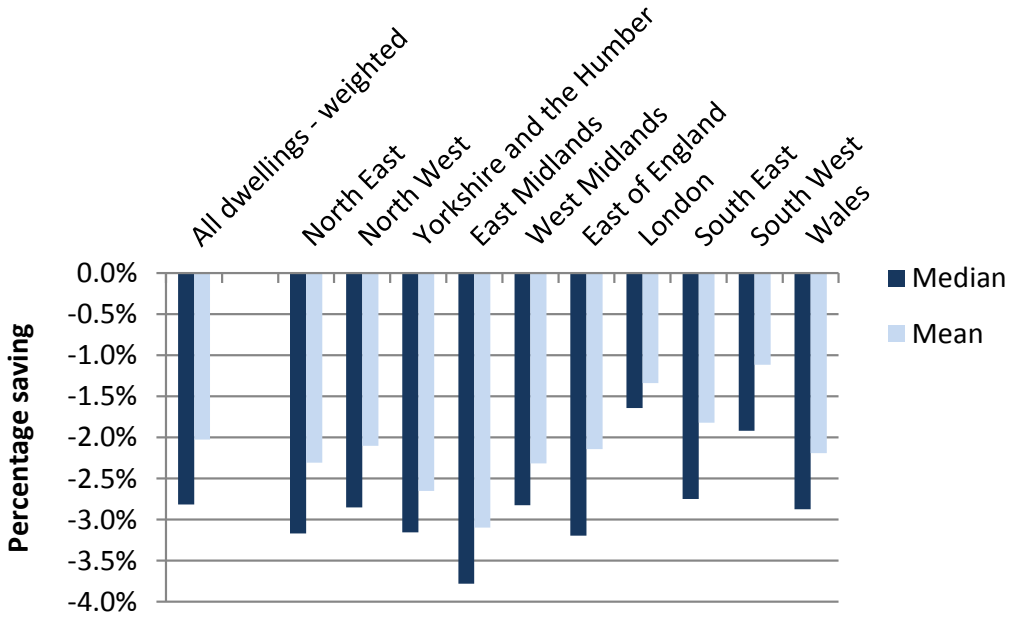
reduction in gas consumption. It is to be expected that mid terrace properties would see the smallest savings since they only have two external walls, whereas detached, semi-detached and end terrace all have at least three.

Figure 4.2: Observed savings for three bedroomed properties having cavity wall insulation installed in 2011, by property type



The analysis above shows how the type of property can help to explain the savings shown. The chart below (Figure 4.3) shows observed percentage savings for properties with lofts insulated in 2011 by region. It demonstrates how savings can vary at the region level, possibly due to the make-up of properties in each region. The smallest typical saving was seen for properties in London, with a saving of 1.6 per cent, followed by the South West at 1.9 per cent. When excluding London and the South West, typical savings then ranged between 2.8 per cent (West Midlands and the South East) and 3.8 per cent (East Midlands). One possible explanation for the smaller saving seen in London is the fact that the proportion of bungalows is lower, compared with other regions. Typically bungalows are the property type which see the largest saving since they have a larger roof area than other property types.

Figure 4.3: Observed savings for properties having loft insulation installed in 2011, by region



The next section looks at properties which had solid wall insulation installed in 2011.

4.2 Impact of installing solid wall insulation in 2011

All figures on solid wall insulation should be interpreted with care since they are based on a much smaller number of records and a less diverse housing stock than other energy efficiency measures presented in this report.

Results for 2011 are based on approximately 830 measures, this sample size is a lot smaller than sample sizes included in the impact of a single measures section of this report (for comparison, cavity wall insulation results for 2011 are based on 12,480 measures). There are a number of reasons for this reduced sample size, the first being that not as many properties have received this measure compared to others. According to Ofgem reports, approximately 22,000 properties[19] in Great Britain had solid wall insulation installed in 2011 through the Carbon Emissions Reduction Target[20] (CERT) and Community Energy Saving Programme[21] (CESP). This compares with around 520,000 properties having cavity wall insulation installed through CERT and CESP in the same year.

In addition, properties which had solid wall insulation are more likely to be excluded from the analysis in NEED. Firstly, solid wall insulation is often installed in flats which are excluded from the impact of measures analysis due to difficulties with matching information to the correct flat within a building and therefore to the correct annual consumption. Secondly because solid wall insulation is often installed in properties which do not have gas as the main heating fuel, and therefore could not be included in this analysis, since record level consumption data are not available for non-metered fuels. Finally solid wall insulation is often installed in combination with another energy efficiency measure, such as a new boiler or loft insulation, this means it would be excluded from this analysis of purely solid wall insulation.

It is also often the case that solid wall insulation is installed in a number of properties in close proximity to each other at the same time, due to the cost savings which can be made by using this approach. This is seen in the data analysed for this report. The 830 measures included in this analysis have been installed in 190 lower layer super output areas (LSOAs)[22]. This is a greater spread than the measures analysed for 2010, when 790 measures were installed in just 94 LSOAs. Additionally, when looking at installations in 2010 two thirds of installations were in just 16 LSOAs. This concentration of measures by geographic area is not seen to the same extent for 2011.

When interpreting the results for solid wall insulation installed in 2011 consideration of the data outlined above should be taken into account. The typical annual percentage saving for solid wall insulation in 2011, when weighted to be representative of the housing stock, is 14.2 per cent, which represents around 1,800 kWh. The mean saving seen was 13.8 per cent, or 2,000 kWh.

Figure 4.4 shows savings for properties with solid wall insulation installed in 2011 by property age.

---

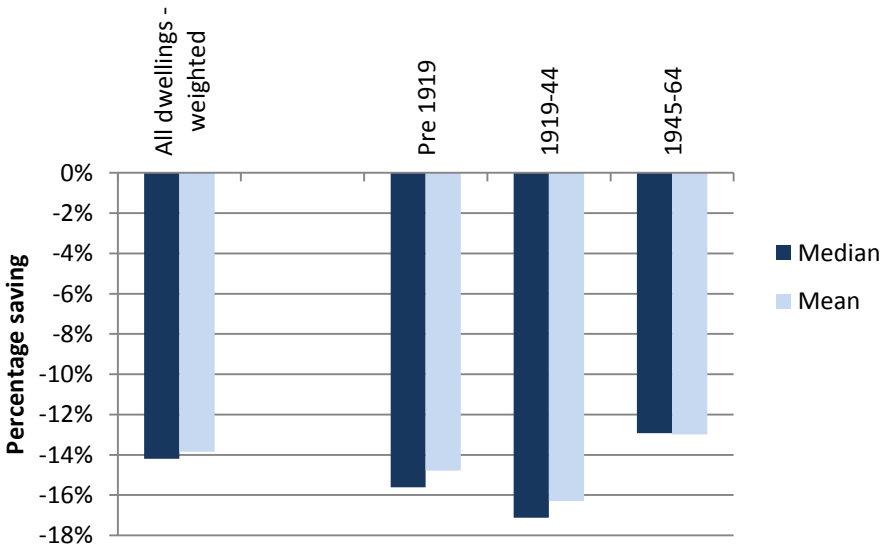
[19] Source: DECC, Green Deal, Energy Company Obligation and Insulation Levels in Great Britain, Quarterly Report to December 2013: https://www.gov.uk/government/collections/green-deal-and-energy-company-obligation-eco-statistics.

[20] https://www.ofgem.gov.uk/environmental-programmes/energy-companies-obligation-eco/previous-energy-efficiency-schemes

[21] https://www.ofgem.gov.uk/environmental-programmes/energy-companies-obligation-eco/previous-energy-efficiency-schemes

[22] Lower layer super output area (LSOA) is a geographic area made up of a number of output areas. Super output areas were designed to improve the reporting of small area statistics. Each LSOA contains between 400 and 1,200 households. There are 32,844 lower layer super output areas in England and 1,909 in Wales.

Figure 4.4: Observed savings for properties having solid wall insulation installed in 2011, by property age[23]



As already stated these results are based on small numbers so should be treated with caution, however presenting these findings show that there is some variation in savings by property age. It shows that, as expected from models, older properties experience greater typical savings following solid wall insulation being installed. Properties built between 1919-44 had the largest typical saving, typically a reduction in gas consumption of 17.1 per cent in the year after installation of solid wall insulation. This compares with 15.6 per cent for properties built pre 1919 and 12.9 per cent for properties built between 1945-64. Savings by property age may have implications for savings seen under different Government schemes, for example if a particular Government scheme was to focus on a specific age range of properties then smaller or larger typical savings could be seen due to this.

Alongside the work being carried out by the DECC statistics team, research is also being carried out by DECC in the field to improve understanding of the performance of solid wall properties in the UK housing stock and the effect on energy post-insulation. The research is investigating heat losses through solid walls and other parts of the dwelling, before and after insulation, with the intension to improve models of Solid Wall dwellings, understand the unintended consequences of solid wall insulation, and improve tools for assessing the energy savings from solid wall properties. The first results of this research are expected to be published later in 2014.

4.3 Impact of installing a combination of energy efficiency measures

This section builds on the impact of installing a combination of energy efficiency measures analysis presented in the November 2013 NEED report. The results presented here are based on a larger number of records than those presented in the previous NEED report, which means results should be more reliable. The number of properties in each combination considered (with the exception of the cavity wall and loft insulation combination which was based on the NEED sample since this included a large number of records for this combination) was boosted by selecting the properties in the intervention group from the complete NEED dataset, rather than the representative sample used for the analysis of the measures individually.

[23] Properties built in 1965 or later have been excluded from this chart due to the small numbers in the sample.

The combinations of measures considered in this section are:

- cavity wall insulation and loft insulation;
- cavity wall insulation and a boiler;
- loft insulation and a boiler; and
- cavity wall insulation, loft insulation and a boiler.

Limitations to data sources as outlined in the impact of a single measure section also apply to data used for the analysis set out in this section. As noted earlier, boiler data has been included in this section to allow the savings in gas consumption following a combination of measures being installed to be presented. However it should be noted that the boiler data used in this section has not been updated to include additional historic data which means results should be treated as provisional. Combinations involving solid wall insulation have not been presented due to the small number of records in these groups.

The headline results are presented below. Detailed data tables including breakdowns by property attributes and household characteristics have been published alongside this report. A list of all published tables relating to this report can be found in Annex D.

Table 4.2 below summarises the median and mean percentage and kWh savings experienced in gas consumption when installing a combination of energy efficiency measures in the same year. Headline figures presented are weighted to be representative of the complete housing stock, rather than just the properties which had the combination of measures installed in the year under consideration. As with the impact of a single energy efficiency measure section, breakdowns by property attributes and household characteristics are not weighted.

Table 4.2: Summary of observed savings (weighted) – combinations of energy efficiency measures installed in 2011

Energy efficiency measure		Percentage saving	Saving (kWh)
Cavity wall insulation, loft insulation	Median	-11.8%	-1,800
	Mean	-10.6%	-2,000
Cavity wall insulation, boiler	Median	-17.1%	-2,800
	Mean	-15.1%	-2,900
Loft insulation, boiler	Median	-13.1%	-2,000
	Mean	-10.8%	-2,100
Cavity wall insulation, loft insulation, boiler	Median	-19.7%	-3,100
	Mean	-17.1%	-3,300

The table shows that the greatest savings can be made by installing all three measures in combination, a typical saving of around a fifth of annual gas consumption (19.7 per cent). The next largest typical reduction is for properties with cavity wall insulation and a boiler installed in 2011, with a typical reduction in gas consumption of 17.1 per cent.

In all but one (loft insulation and boiler) of the combinations above, the saving from installing the measures in combination are slightly lower than the sum of the savings for each individual measure. This would be expected as each measure will contribute to a reduction in consumption, reducing the energy used and therefore reducing the potential for saving from the other measures. For example, for the installation of each measure separately the estimated typical savings are 9.6 per cent (boiler[24]), 9.2 per cent (cavity wall insulation) and 2.8 per cent (loft insulation). These savings sum to 21.6 per cent. However, if each is applied in order, it gives a saving of 20.2 per cent, similar to the 19.7 per cent typical saving shown in Table 4.2 for the installation of all three measures in the same year.

This finding differs to the results presented for 2010 in the November 2013 NEED report, when the estimated savings for installing a combination of measures in the same year was the same as or greater than the sum of the measures when installed independently. This was raised as an area for further investigation. To enable increased confidence in the findings the number of properties considered in the analysis was increased for the 2011 analysis. The sample for the combination of measures for 2011 was boosted as described above. This led to around four times more properties being included in the intervention group for 2011 compared to 2010[25].

In addition, results for properties installing cavity wall insulation, loft insulation and a boiler in 2010 have also been re-produced using a larger number of properties; based on selecting records for the intervention group from the complete NEED dataset rather than the NEED analysis sample. This increased the number of properties which had this intervention from 510 to 3,110. Based on this larger set of properties, the weighted typical saving for installing the three measures in 2010 was 20.8 per cent (compared to 24.1 per cent previously published), which is lower than the sum of the savings for each measure on its own (21.8 per cent). This highlights the importance of the sample size and reinforces the need to treat results based on smaller sample sizes with caution (such as the solid wall results set out in this report and detailed breakdowns by some of the less common property attributes presented in the accompanying tables).

4.4 Sustainment of energy efficiency measures

All figures presented in this section are weighted to be representative of the housing stock rather than just properties which had each respective measure installed. The median kWh figures presented in this section will not match those in sections 4.1 since the figures presented here show median consumption for the intervention and comparator groups separately whereas kWh figures presented in the previous two sections are based on more sophisticated analysis using matched pairs.

The impact of measures analysis primarily compares gas consumption in the year before and after installation of an energy efficiency measure to get an estimate of the annual saving from installing energy efficiency measures. The difference in consumption for the intervention and comparator group has been looked at for cavity wall insulation and loft insulation installed in 2005, 2006 and 2007 to analyse whether the savings observed in the year immediately after installation of an energy efficiency measure continue.

For both measures the median gas consumption the year before installation of the energy efficiency measure is similar, as illustrated when looking at 2004 in Figure 4.6. This is because one of the variables used to select the comparator group was gas consumption in the year before the intervention was installed – to ensure the properties compared were as similar as

[24] Saving for properties installing a boiler in 2011, calculated without the additional historical boiler data referred to in Section 4.1, and should therefore be treated as provisional.

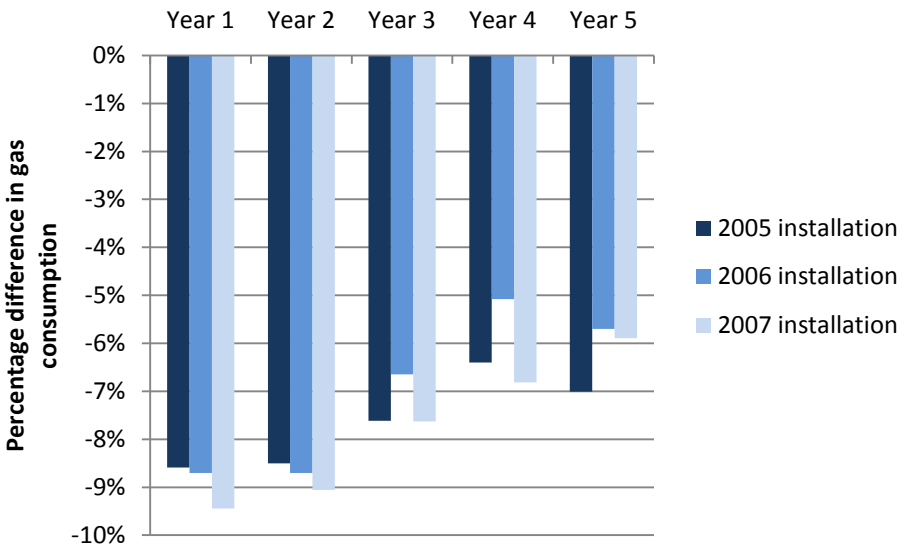
[25] For all combinations except cavity wall and loft, which was already a large sample and therefore wasn't boosted.

possible. The consumption for the two groups then diverges in the year that the energy efficiency measure was installed.

Cavity wall insulation

Figure 4.5 shows the percentage difference in gas consumption between the intervention and comparator groups for properties installing cavity wall insulation in 2005, 2006 and 2007. When looking at properties which had cavity wall insulation installed in 2005, 2006 and 2007 the biggest difference in median gas consumption is consistently seen in the year immediately after installation of cavity wall insulation (year 1 in Figure 4.5). For each of the three years looked at properties which had cavity wall insulation installed typically used nine per cent less gas than similar properties which did not have a measure installed, in the year immediately after installation of the measure. In each of the three years considered, the gap between typical gas consumption for the two groups then reduces over time, though as demonstrated by Figure 4.5, it does not follow an entirely consistent pattern. As consumption data is available up to 2012 and measures installed have been looked at between 2005 and 2007 it is possible to compare where these three groups are at five years after installation of the measure. Properties which had cavity wall insulation installed in either 2005, 2006 or 2007 were typically using between six and seven per cent less gas than the comparator group of similar properties five years after installation of the energy efficiency measure.

Figure 4.5: Percentage difference in gas consumption between the intervention and comparator groups for properties installing cavity wall insulation in 2005, 2006 and 2007



Loft insulation

As found in the previous NEED report the trend for properties having loft insulation installed is different to that seen for the other two measures considered. When looking at loft insulation installed in either 2005, 2006 or 2007 results follow less of a pattern, where the biggest difference in median consumption is not in the year after the measure was installed. Figure 4.6 illustrates the median consumption for the intervention and comparator group for loft insulation installed in 2005.

Figure 4.6: Loft insulation installed in 2005, long term gas consumption (weighted)

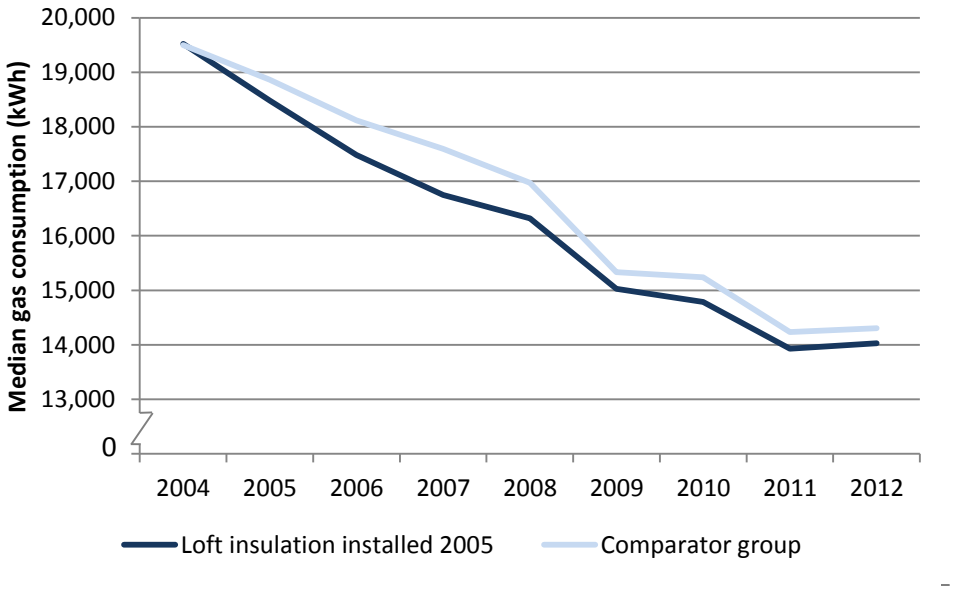


Figure 4.6 shows that the biggest difference in median consumption for properties installing loft insulation in 2005 and the comparator group was in 2007 rather than the year post intervention but as with cavity wall insulation savings do continue. One possible reason for the larger saving in 2007 is that, as shown in the impact of measures section of this report, properties installing loft insulation see a smaller reduction in their gas consumption than the other measures looked at. This means other changes in the property such as change of occupants or time spent in the house could have more of an impact for this measure than others.

5. Analytical developments

In addition to the analysis outlined in earlier sections of this report, DECC continues to develop NEED to get increased value from the data it holds. This section summarises developments since the last NEED report in November 2013. More detailed results from some of this new analysis are published in annexes.

Feedback from users and stakeholders has consistently shown a desire for access to property level data from NEED. Therefore a large amount of the developmental focus in the last 18 months has been on producing an anonymised record level NEED dataset that users can access and interrogate themselves. On 29 May 2014 DECC published the NEED public use file. This is a sample of 49,815 records selected to be representative of the housing stock in England and Wales. It is available to all via the DECC website and data.gov.uk. At the same time, DECC also produced a larger end user licence file. This is a sample of 4 million records (4,086,448) which has been submitted to the UK Data Archive for release and will be available from them within a few weeks. More information, including the public use file for download and a link to the end user licence file (once it is published) is available on the Government website: https://www.gov.uk/government/publications/national-energy-efficiency-data-framework-need-anonymised-data-2014.

In addition to the publication of an anonymised dataset, significant progress has been on other aspects of NEED since the 2013 publications:

- DECC has expanded the analysis available for England and Wales, presenting domestic consumption by rural urban classification, index of multiple deprivation and fuel poverty indicator (England only) in this report for the first time.
- NEED has undergone assessment by the UK Statistics Authority (UKSA) against the Code of Practice for Official Statistics[26]. The Statistics Authority has determined that these statistics can be designated as National Statistics subject to DECC implementing a small number of requirements across the range of DECC statistics assessed, relating to further documentation on the needs of users, improving methodology on assumptions, assessing risks to use of administrative data, improving clarity and linkages between the range of stats produced and reviewing data release formats. These actions will be taken forward by the end of September.
- Preliminary analysis of data from Energy Performance Certificates (EPC) for England and Wales has been produced and is presented in Annex B, including results by energy efficiency band and environmental impact band.
- Initial analysis for Scotland has been undertaken, including consumption by property type and household characteristics and headline estimates of the impact of installing energy efficiency measures, see Annex C.
- DECC has worked with other organisation to gain access to new and updated sources of data (additional data on boiler installations has been provided and DECC

[26] http://www.statisticsauthority.gov.uk/assessment/assessment/assessment-reports/index.html

is working with FENSA to get access to latest data on installation of new glazing) to allow more comprehensive analysis.

- The spine for NEED has been converted from the Unique Property Reference from the National Land and Property Gazetteer to Ordnance Survey's AddressBase. DECC has also developed the capability to undertake address matching internally with good results, providing greater flexibility in analysis of new data sources.
- Data on properties with solar PV through Feed-in Tariffs has been linked into NEED to enable analysis on this specific group of properties and their use of electricity, analysis of these data will be published later in the year.
- The first analysis of non-domestic NEED was published in May 2014, including the concept of the framework, issues found, plans for improvement, preliminary results and a proposed weighting methodology. The Report can be accessed from the following link: https://www.gov.uk/government/publications/the-non-domestic-national-energy-efficiency-data-framework-nd-need.

As noted above two annexes published alongside this report provide more detail on two specific areas developed since the last NEED report:

- Annex B – Energy Performance Certificate data: presents preliminary analysis on EPC data linked into NEED.
- Annex C – Scotland: presents preliminary analysis of data contained within NEED relating to Scotland.

A summary of results from these annexes is presented below, further detail is contained within the annexes.

5.1 EPC data

Energy Performance Certificates (EPCs) were first introduced in England and Wales in 2007. Certificates are needed whenever a property is built, sold or rented. 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. An EPC gives a property an energy efficiency rating from A (most efficient) to G (least efficient), with 51 per cent of properties in England rated band D in 2012[27].

Property level EPC data have been matched to other sources of data used in NEED analysis, including meter point gas and electricity consumption data and energy efficiency measures installed, to allow analysis by energy efficiency band and environmental impact band. The analysis presented is based on the same sample used for the NEED anonymised dataset published in May 2014. Estimates of consumption are weighted to represent the England and Wales housing stock. Results for the impact of installing energy measures are not weighted.

Domestic consumption

Figure 5.1 below shows mean and median gas and electricity consumption by energy efficiency band. Both charts show that generally the mean and median consumption is higher for properties rated as less energy efficient, although there are some exceptions. For both fuels,

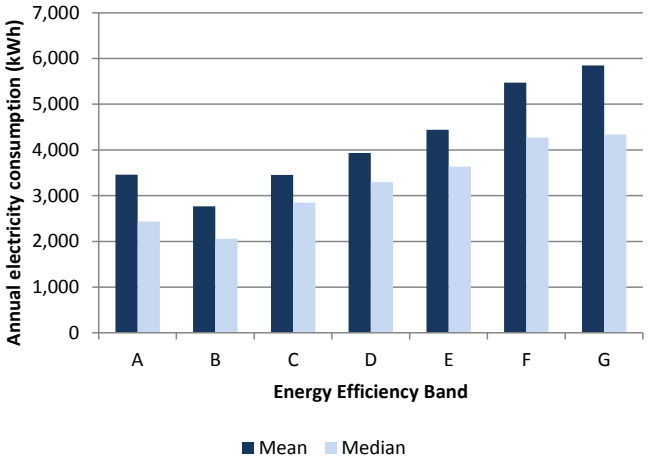
[27] https://www.gov.uk/government/publications/english-housing-survey-2012-to-2013-headline-report

the typical consumption for properties assigned to band A is higher than for band B. For gas, the typical consumption for properties in band G is lower than for bands D, E and F.

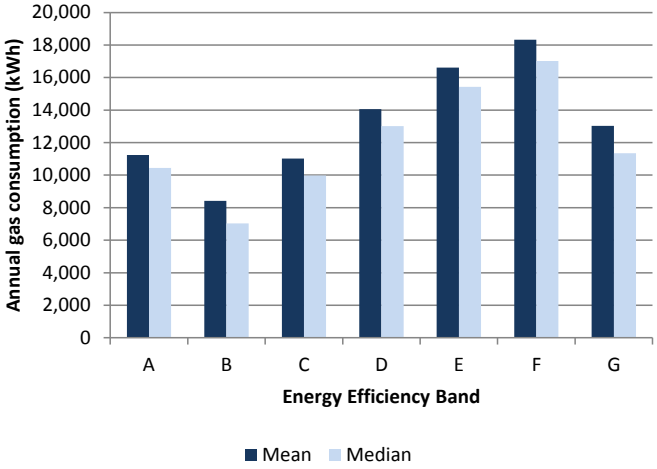
The lower gas consumption for band G properties is influenced by the greater use of non-gas fuels for heating. Based on the information on the EPCs in the sample used for this analysis, 98 per cent of properties with valid gas consumption in 2012 used gas as the main heating fuel. However, for band G properties, only 33 per cent used gas as the main heating fuel. It is also possible that more band G households use secondary heating fuels, and therefore have a lower requirement for gas. The sample size for band A is smaller than the sample for other energy efficiency bands[28], and therefore is more strongly influenced by individuals' preferences.

Figure 5.1: Annual gas and electricity consumption by energy efficiency band, 2012

a) Electricity

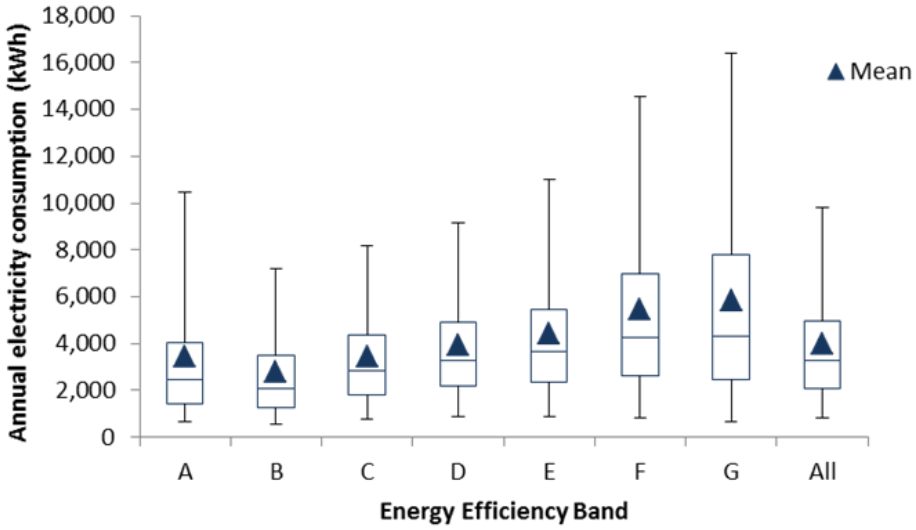


b) Gas



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 5.2 shows the variation more clearly. It shows the mean, median, upper and lower quartiles and 5th and 95th percentiles. Within each energy efficiency band there is variation in the consumption for different properties. The range in consumption is greater for less efficient properties.

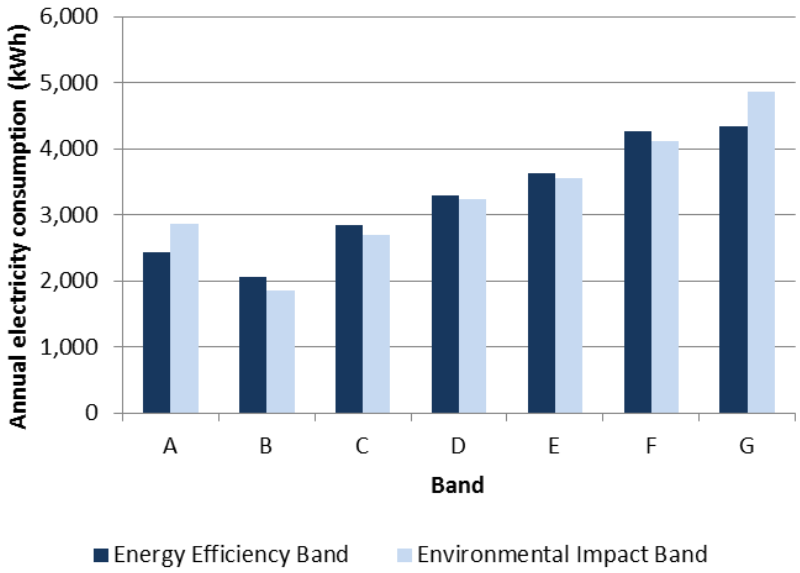
Figure 5.2: Annual electricity consumption by energy efficiency band, 2012



[28] Less than 1,000 records, compared to 17,000 in band G and more than 100,000 in every other category.

Typical consumption by environmental impact band follows a similar pattern to that seen for energy efficiency band. Figure 5.3 compares typical gas consumption for both ratings.

Figure 5.3: Median annual electricity consumption by energy efficiency band and environmental impact band, 2012



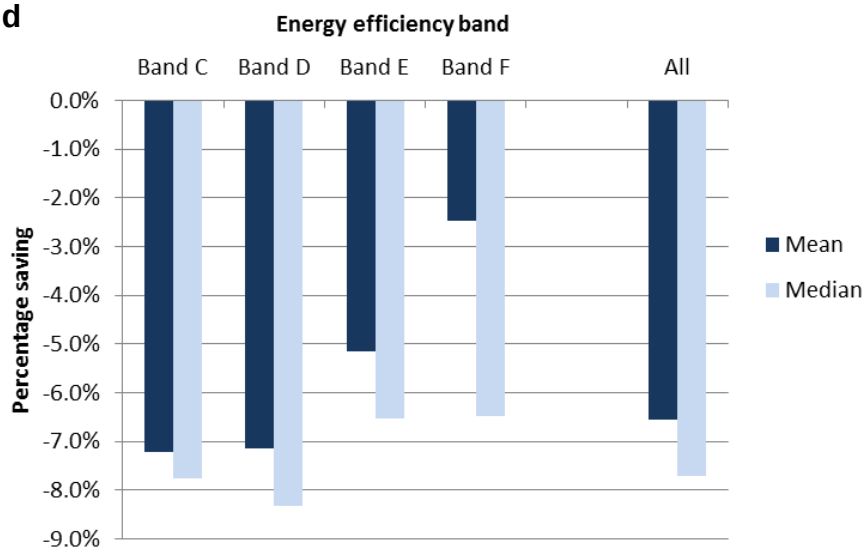
The chart shows that for bands B to F consumption for properties in the specified environmental impact band is lower than properties in the same named energy efficiency band. For bands A and G the opposite is seen. Median consumption for properties with environmental impact band G is 12 per cent higher 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. For example, a property with an electric storage heater would have a better energy efficiency rating than a property with conventional panel heaters but a worse environmental impact rating. This is because the storage heater could have lower bills as a result of using lower rate night time electricity but it would require more electricity overall and therefore have a worse environmental impact.

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. Figure 5.4 shows the observed savings for cavity wall insulation installed in 2011 by energy efficiency band, savings for loft insulation are also shown in Annex B.

These estimates are provisional and included to provide an indication of the savings. Further information on some of the limitations of this analysis and the differences compared with headline savings from NEED are covered in Annex B. 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 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.

Figure 5.4: Median savings for energy efficiency measures installed in 2011 by energy efficiency band



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 savings of 6.5 per cent).

More detailed analysis will be required to understand more about these findings. However, initial analysis suggests there may be a few possible reasons for the lower percentage savings 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 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, i.e. greater comfort taking. Further analysis would be required to confirm this.

5.2 Scotland

Data for Scotland are not included in NEED analysis in the main part of this report as property attribute data equivalent to that held at the Valuation Office Agency for England and Wales are not currently available to DECC. However, while these data are not available, provisional estimates for Scotland based on modelled data have been produced. This section provides highlights of findings for Scotland, with more detail set out in Annex C.

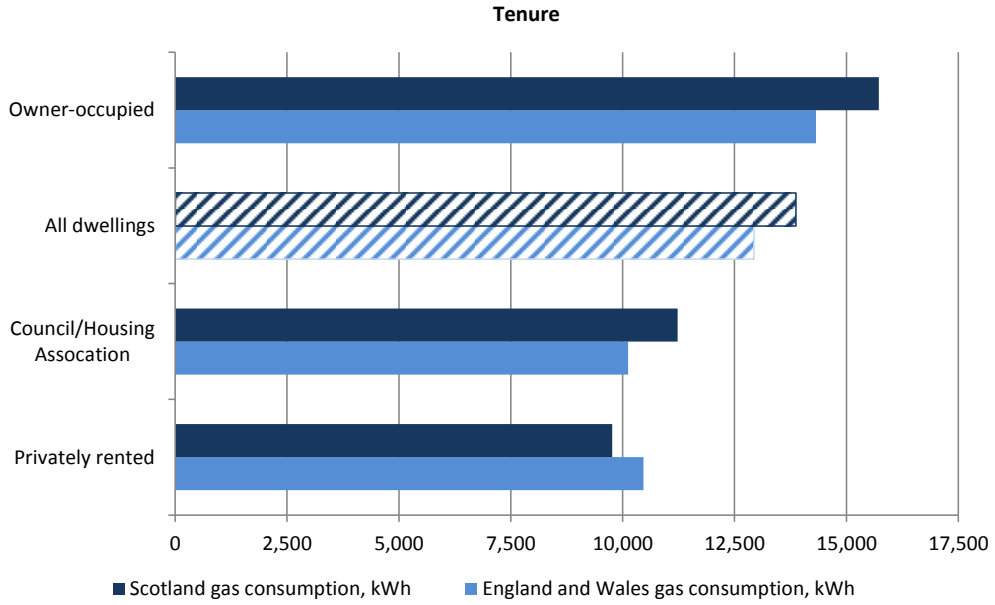
Domestic consumption

For the first time domestic gas and electricity consumption statistics for 2011 and 2012 consumption by property attributes and household characteristics have been presented for Scotland. Figure 5.5 below shows median gas consumption for Scotland compared with England and Wales, by tenure. It shows for owner occupied and council/housing association households, typical gas consumption for Scotland was slightly higher (1,400 kWh and 1,100 kWh respectively) than the equivalent categories for properties in England and Wales. However, typical consumption of gas in privately rented households was slightly less (700 kWh) in Scotland compared with England and Wales.

For Scotland and England and Wales, the highest typical consumers for gas by tenure were those in owner-occupied households (15,700 kWh in Scotland and 14,300 kWh in England and

Wales). However, for Scotland the lowest typical consumers were those in privately rented accommodation (9,800 kWh) whereas in England and Wales the lowest typical consumption was found in council/housing association households (10,100 kWh).

Figure 5.5: Median gas consumption for Scotland and England and Wales, 2012, by tenure



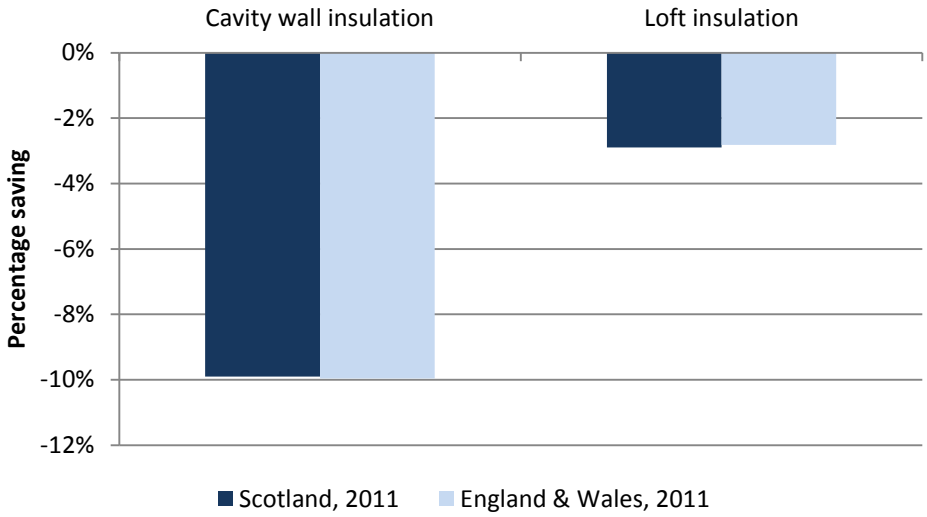
Further charts covering a number of variables are presented in Annex C, along with comparisons with results for England and Wales. Detailed data tables including breakdowns by property attributes and household characteristics have also been published alongside this report (Scotland consumption headline tables 2012 and Scotland consumption additional tables 2012).

Impact of installing energy efficiency measures

The impact of installing an energy efficiency measure on a household's gas consumption has also been looked at for properties in Scotland. Properties installing cavity wall insulation had a typical saving of 9.9 per cent, or 1,800 kWh. Properties installing loft insulation had a typical saving of 2.9 per cent, which represents a saving of 500 kWh. Figure 5.6 shows the typical observed savings experienced by properties installing an energy efficiency measure in 2011 for Scotland compared with England and Wales. It shows that the typical saving for properties installing cavity wall insulation and loft insulation is very similar for both groups, with a difference of less than 0.1 percentage points[29].

[29] To understand more about the impact of using Experian data for the Scotland analysis, compared to the VOA data used for England and Wales results for England and Wales were reproduced using Experian data instead of VOA. The analysis was carried out for measures installed in 2010. The difference in the typical (median) observed saving for properties installing cavity wall insulation in 2010 was less than 0.1 percentage points. For loft insulation the difference was 0.4 percentage points.

Figure 5.6: Summary of observed savings for energy efficiency measures installed in 2011 for Scotland compared with England and Wales (median)



It is hoped that in future DECC can obtain property attribute data from the Scottish Assessors, which is used to allocate properties to council tax bands in Scotland. This will then enable further investigation into the preliminary results for Scotland, including reviewing the accuracy of results presented above and providing more detailed breakdowns for the impacts of energy efficiency measures installed in homes.

6. Summary and next steps

The report brings back together the two NEED reports published separately in 2013 covering domestic consumption and the impact of installing energy efficiency measures on households' gas consumption.

The domestic consumption analysis presented enables gas and electricity headline consumptions values to be analysed by property attributes, household characteristics, geography and socio-demographic classifications. This means that consumption can be looked at by property type for example, to see which types of property consume the most and how trends in consumption vary for different types of households between 2005 and 2012. The results of this work provide important evidence to DECC and other users on how energy is consumed amongst different groups of interest.

The impact of measures analysis shows that there are significant savings from installations of all the energy efficiency measures considered in this report and provides further support for the value of installing each of these measures individually or in combination. Results by property attributes and household characteristics, along with distributions of savings published, provide an insight into the variation in savings that different properties are likely to experience. The longer term savings associated with installing measures have been explored for cavity wall insulation and loft insulation for a wider range of years than previously presented. These findings show that properties continue to experience savings in the years after installation of a measure.

As outlined in the introduction, NEED has developed significantly over the past year and DECC plans to continue to develop NEED in future to meet the requirements of users inside and outside the department.

The core output from NEED will continue to be the analysis produced in this annual report; with the next publication planned for May 2015 (which will be confirmed on the UK National Statistics Publication Hub). It is anticipated that by then the report will be a National Statistics output and it will cover consumption data for 2013 and the impact of energy efficiency measures installed in 2012.

In addition to the annual National Statistics outputs NEED is also used to support monitoring and evaluation of DECC policies on a more ad hoc basis. Analytical outputs from this work will be made available through future NEED reports and via articles in existing DECC publications[30]. Work planned includes:

- Interaction of household policies: information on households benefitting from a range of DECC policies, including Green Deal, Energy Company Obligation, Renewable Heat Incentive and Feed-in Tariffs will be linked through NEED to provide a better understanding of the interaction of different DECC policies which affect households.
- Feed-in Tariffs (FITs): Data on properties with solar PV through FITs has been linked into NEED and will be used to understand more about these properties and their use of electricity.

[30] Including statistical publications linked to specific policies or through wider DECC publications such as Energy Trends: https://www.gov.uk/government/collections/energy-trends.

- Energy Performance Certificate (EPC) data: this report includes initial results based on analysis of EPC data for England and Wales. Further, more detailed, analysis for England and Wales will be undertaken and published in future and it is expected that analysis for Scotland can also be included.
- Scotland: this report includes consumption and impact of measures analysis by property attributes and household characteristics for Scotland. This analysis is based on Experian modelled data, DECC is hoping to gain access to data from the Scottish Assessors. This would provide a more accurate source of property attribute information and enable analysis for Scotland to be more consistent with analysis for England and Wales.
- Anonymised dataset: DECC plans to publish an updated anonymised dataset in spring 2015. This dataset or datasets will be informed by the planned review and include gas and electricity consumption data for 2013.
- Non-domestic NEED (ND-NEED): Following the first publication of results from non-domestic NEED, the next steps are to work further on the matching and weighting methodology. Work will then be done to assess whether the grossed up data, post-weighting, is nationally representative and consider what future outputs might be valuable.

DECC will continue to engage with users to ensure future priorities reflect the views of users and would welcome input by email at: EnergyEfficiency.Stats@decc.gsi.gov.uk.

Department of Energy & Climate Change
3 Whitehall Place
London SW1A 2AW
www.gov.uk/decc
URN: 14D/192