



Department  
of Energy &  
Climate Change

# Annex C: Scotland

26<sup>th</sup> June 2014

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URN 14D/192

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# Introduction

Data for Scotland are not included in the NEED analysis in the main part of the report as property attribute data equivalent to that held at the Valuation Office Agency for England and Wales are not currently available to DECC. DECC is investigating the possibility of gaining access to these data. However, while these data are not available, provisional estimates based on modelled data have been produced and are presented in this Annex.

These results have been produced using the same methodology used for England and Wales. This includes using the meter point gas and electricity consumption data for properties in Scotland<sup>1</sup>, as published in DECC's sub-national consumption publications<sup>2,3</sup>. It also takes information from the Homes Energy Efficiency Data-Framework (HEED) on energy efficiency measures installed in households. The main difference is that modelled data from Experian have been used for property attributes and household characteristics in this analysis, while in the analysis for England and Wales modelled data are only used for household characteristics.

The use of modelled data for property attributes in Scotland allows analysis to be undertaken. However, it also increases uncertainty in the estimates. Therefore these results should be treated as provisional and interpreted with caution. To help reduce uncertainty, the results for Scotland are based on all properties in Scotland that could be matched to valid consumption data, unlike England and Wales where a sample of properties is used for analysis<sup>4</sup>.

Estimates presented in this Annex will be revised if DECC get access to more accurate property attribute data from the Scottish Assessors. At which point DECC will also look to fully integrate Scottish households into NEED.

This annex outlines for the first time domestic gas and electricity consumption statistics for 2012 (and 2011 in accompanying tables) including consumption by property attributes and household characteristics. It also presents savings in gas consumption for properties installing an energy efficiency measure in Scotland in 2011. Detailed data tables are also being published alongside this annex, these include breakdowns by property attributes and household characteristics (see Annex D for details of all published tables).

Further information on NEED, including its structure, how estimates of domestic electricity and gas consumption by property attributes and household characteristics are produced and 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) can be found in the domestic NEED methodology note: <https://www.gov.uk/government/publications/domestic-national-energy-efficiency-data-framework-need-methodology>.

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<sup>1</sup> Record level consumption data are not available for non-metered fuels.

<sup>2</sup> <https://www.gov.uk/government/collections/sub-national-gas-consumption-data>

<sup>3</sup> <https://www.gov.uk/government/collections/sub-national-electricity-consumption-data>

<sup>4</sup> Match rates for England, Wales and Scotland combined are shown in Annex A – Quality Assurance.

# Domestic consumption

This section presents analysis of domestic gas and electricity consumption in 2012 (2011 results are also included in the accompanying tables) by property attributes and household characteristics for properties in Scotland. Consumption figures presented in this section of the report are based on all properties located in Scotland with valid domestic gas or electricity consumption<sup>5</sup> 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 within the relevant geographic area. 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.

## Headline consumption

In 2012, the median<sup>6</sup> gas consumption for properties in Scotland was 13,900 kWh with median electricity consumption at 3,500 kWh. The equivalent figures for England and Wales are 12,900 kWh and 3,300 kWh respectively, showing that typical consumption in Scotland is slightly higher than in England and Wales for both gas (seven per cent) and electricity (six per cent). Table C.1 below shows that, as with England and Wales, when looking at the distribution there is a range of consumption as can be seen from the lower and upper quartiles<sup>7</sup>.

The table also shows that mean consumption is larger than median consumption, by 10 per cent for gas and 31 per cent for electricity<sup>8</sup>. Compared with the respective figures of 8 per cent and 19 per cent for England and Wales, it shows that there is a significantly larger difference between mean and median electricity consumption in Scotland when compared with the rest of Great Britain, this could be being influenced by the greater proportion of households in Scotland not being connected to the gas network and therefore having to use electricity for a wider range of purposes (18 per cent in Scotland, compared to 10 per cent in England and 15 per cent in Wales)<sup>9</sup>.

**Table C.1: Annual consumption summary statistics for Scotland, 2012, kWh**

	Mean	Standard deviation	Lower quartile	Median	Upper Quartile
Gas	15,300	8,700	9,300	13,900	19,600
Electricity	4,600	3,800	2,200	3,500	5,600

<sup>5</sup> 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.

<sup>6</sup> 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 higher.

<sup>7</sup> 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 higher consumption and 75 per cent have lower.

<sup>8</sup> The mean is being influenced by a relatively small number of higher consumers which make it higher than the median.

<sup>9</sup> <https://www.gov.uk/government/publications/sub-national-estimates-of-households-not-connected-to-the-gas-network>

## Domestic consumption

Table C.1 also shows that there is more variation in electricity consumption than gas consumption. The standard deviation is 57 per cent of the mean for gas and 81 per cent for electricity (these figures are consistent with equivalent figures for England and Wales of 55 and 75 per cent respectively). This is because gas is primarily used for heating and cooking, while electricity can be used for a range of purposes.

In the rest of this chapter, median consumption is 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.

## Domestic consumption breakdowns

This section presents domestic gas and electricity consumption by property attributes and household characteristics. It presents the first results for Scotland using NEED for these breakdowns and also makes comparisons with results for England and Wales.

For all of these variables, the numbers of households along with mean and median figures for annual consumption (2011 and 2012) 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 also published alongside this report. The headline and additional tables are published as two Excel documents published alongside this annex: Scotland consumption headline tables 2012 and Scotland consumption additional tables 2012.

## Property attributes

Figure C.1 below shows the typical (i.e. median) annual gas and electricity consumption for households in Scotland by number of bedrooms – this can also act as an indicator of property size, as there is a strong correlation between the number of bedrooms in a property and the floor area of the property.

**Figure C.1: Median electricity and gas consumption, 2012, by number of bedrooms**

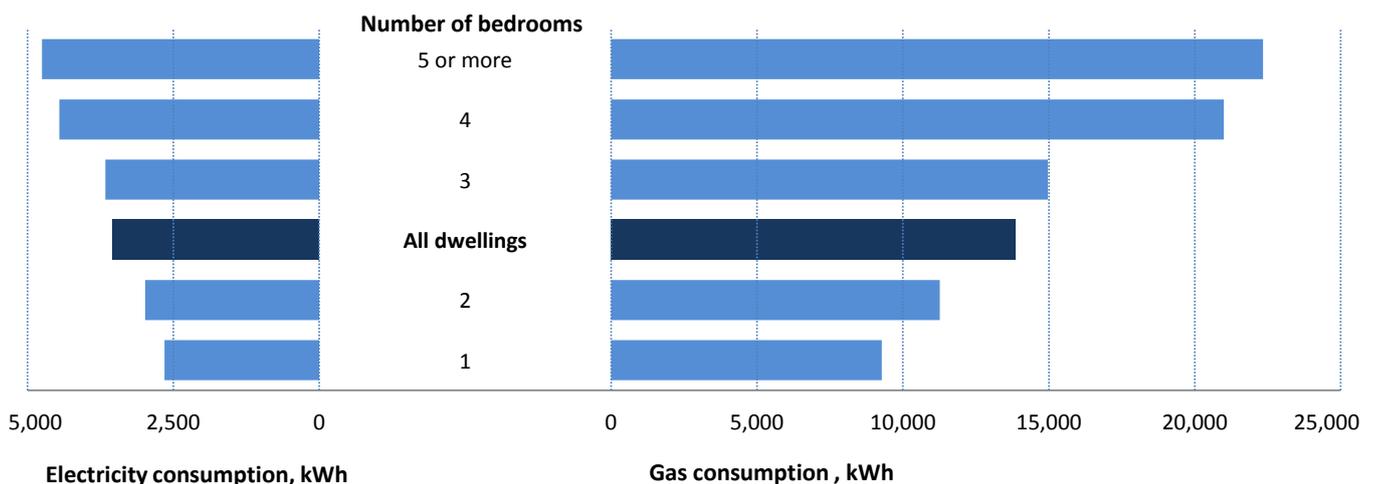
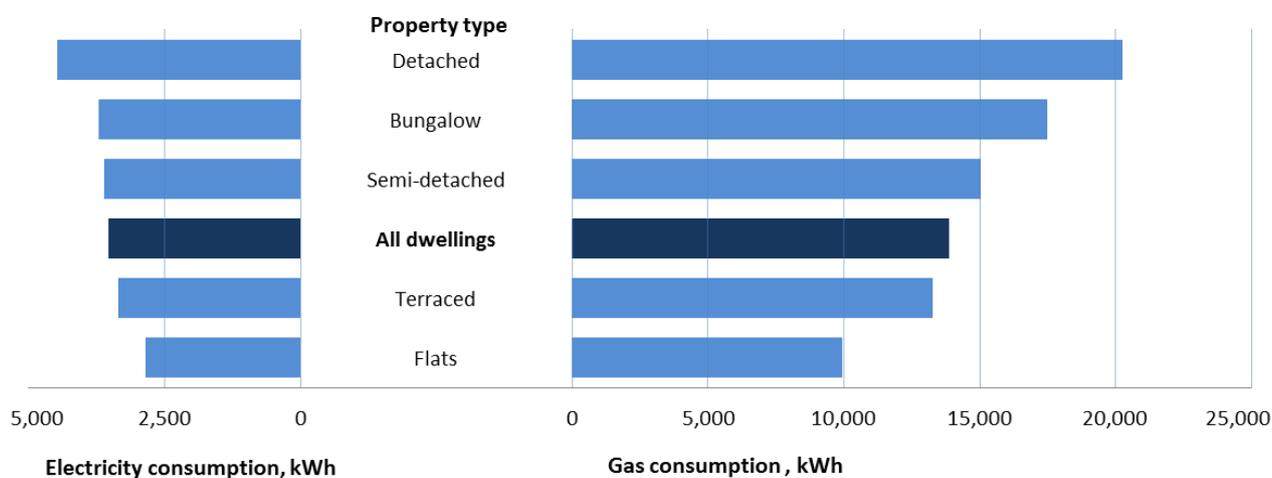


Figure C.1 shows that properties with more bedrooms are typically consuming a larger amount of gas and electricity than properties with fewer bedrooms. Properties with five or more bedrooms typically consumed 22,300 kWh of gas and 4,700 kWh of electricity. The equivalent figures for properties with one bedroom are 9,300 kWh of gas and 2,600 kWh of electricity. When looking at typical consumption for properties in England and Wales by number of bedrooms the same pattern is seen, i.e. properties with more bedrooms typically consume more gas and electricity. However it should be noted that the difference between the typical

consumption of four bedroom properties in Scotland compared with those that have five or more bedrooms is smaller than when comparing the equivalent categories for England and Wales.

Figure C.2 shows median consumption by type of property.

**Figure C.2: Median electricity and gas consumption, 2012, by property type**



Depending on the type of the dwelling, median gas consumption ranges from 9,900 kWh to 20,300 kWh for gas and from 2,800 kWh to 4,500 kWh for electricity. Detached properties have the largest typical consumption for both gas and electricity. Bungalows have the second highest median consumption for gas and electricity at 17,500 kWh and 3,700 kWh respectively, a finding which is not consistent with England and Wales where instead semi-detached properties typically consume the second highest amount of gas and electricity. The group with the lowest median consumption for both gas and electricity are flats which typically consumed 9,900 kWh of gas and 2,800 kWh of electricity in 2012.

### Household characteristics

The household characteristics of household income, tenure and number of adult occupants for Scotland are based on the same source as data for England and Wales. This allows direct comparisons between typical consumption results from Scotland with England and Wales.

Figure C.3 below shows typical gas consumption for households in Scotland, by household income alongside the equivalent results for England and Wales. It shows that for each income band, Scottish households typically consume more than households in England and Wales, with this difference generally getting wider as income increases. Typical consumption of households with an income less than £15,000 in Scotland is 11,400 kWh compared with 10,900 kWh in England and Wales (a difference of 600 kWh or five per cent) and for households with an income over £150,000 typical consumption in Scotland was 24,900 kWh compared with 20,200 kWh in England and Wales (a difference of 4,700 kWh or 23 per cent)<sup>10</sup>.

Despite this, consumption exhibited a very similar pattern when comparing Scotland with England and Wales, with typical consumption generally increasing as household income increased. There was one exception to this trend for Scotland; typical gas consumption for the income band of £20,000 to £29,999 was slightly lower than that of the previous income band of £15,000 to £19,999.

<sup>10</sup> Only 0.5 per cent of all properties in Scotland had household income of £150,000 or more compared to 1.1 per cent of properties in England and Wales. It is possible the figure for England and Wales is biased by a relatively small number of very wealthy higher consumers.

Domestic consumption

When looking at electricity, typical consumption for each income band follows a very similar pattern to gas. The one difference being that typical electricity consumption in Scotland was slightly less than that for England and Wales for the income band of £100,000 to £149,999.

**Figure C.3: Median gas consumption for Scotland and England and Wales, 2012, by household income**

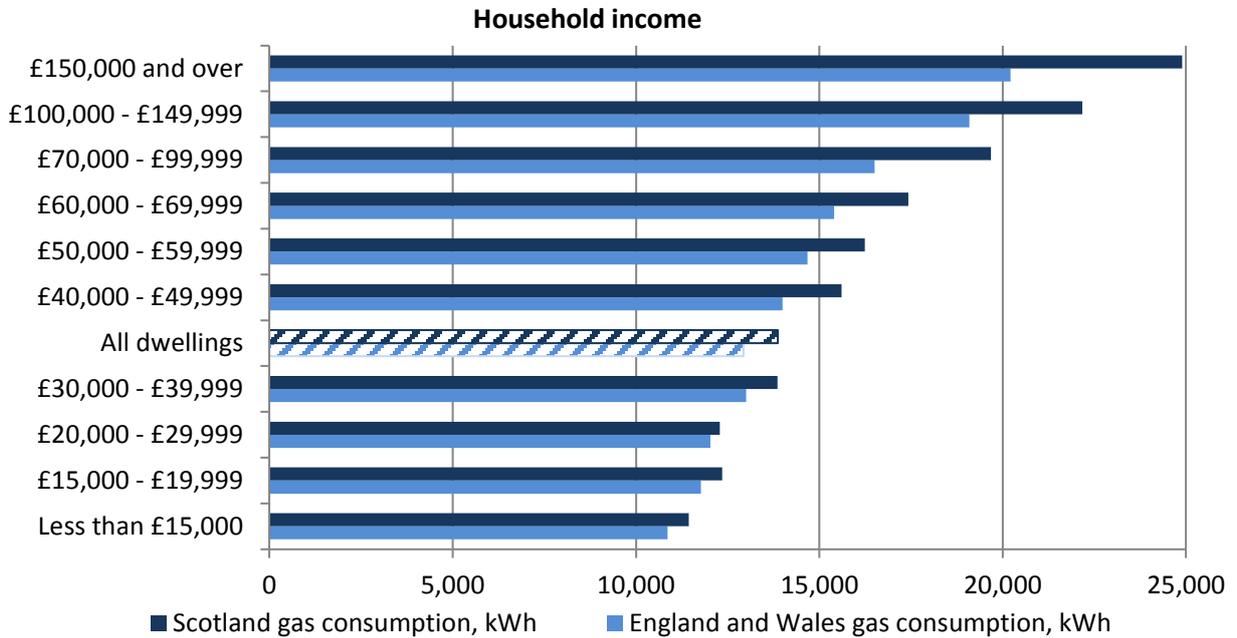


Figure C.4 below shows typical gas consumption for households in Scotland, by tenure alongside the equivalent result for England and Wales.

**Figure C.4: Median gas consumption for Scotland and England and Wales, 2012, by tenure**

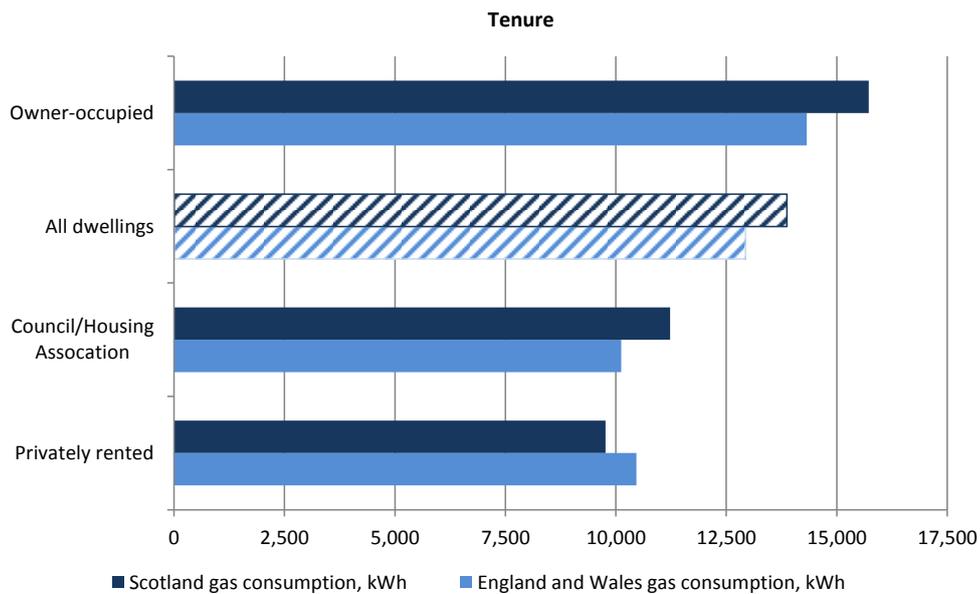


Figure C.4 shows that for owner occupied and council/housing association households, typical gas consumption for Scotland was slightly higher (1,400 kWh and 1,100 kWh respectively) than the equivalent categories for properties in England and Wales. However, typical consumption of

gas in privately rented households was slightly less (700 kWh) in Scotland compared with England and Wales, which may indicate these properties are smaller in Scotland.

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).

When looking at typical electricity consumption by tenure, the highest typical consumption is again seen by those in owner-occupied households (3,700 kWh in Scotland and 3,500 kWh in England and Wales). The lowest typical consumption was seen in council/housing association households for both Scotland and England and Wales (3,000 kWh and 2,800 kWh respectively). Although, when looking at Scotland, those in council/housing association households typically consume the least electricity, typical consumption for those in privately rented properties is very similar (both 3,000 kWh). When comparing this result with typical electricity consumption in England and Wales there is more of a difference in consumption between those in council/housing association households and privately rented (2,800 kWh and 3,000 kWh respectively).

Figure C.5 below shows typical gas consumption for households in Scotland by the number of adult occupants alongside the equivalent estimates for England and Wales.

**Figure C.5: Median gas consumption for Scotland and England and Wales, 2012, by number of adult occupants**

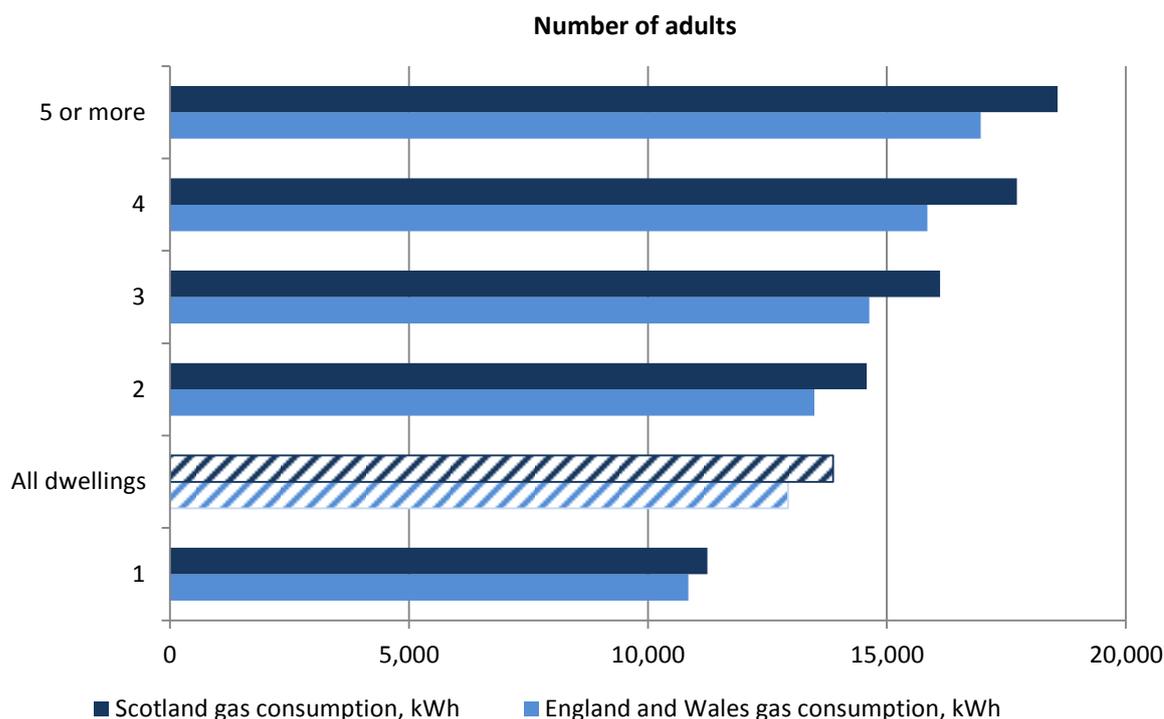


Figure C.5 shows that for each occupancy band, Scottish households typically consume more than households in England and Wales, with this difference generally getting larger as the number of occupants increases. Typical consumption of households with one adult occupant in Scotland was 11,200 kWh compared with 10,800 kWh in England and Wales (a difference of 400 kWh) and for households with five or more adult occupants typical consumption in Scotland was 18,600 kWh compared with 17,000 kWh in England and Wales (a difference of 1,600 kWh).

Despite this however, consumption exhibited a very similar pattern for Scotland and England and Wales, with typical consumption generally increasing with each additional adult occupant,

as would generally be expected. Typical consumption for electricity follows a very similar trend to gas.

## Impact of measures

This section outlines the impact of installing energy efficiency measures on a household's gas consumption specifically for properties in Scotland. Impact of measures results for England and Wales were first published by DECC in 2011 and have been developed to cover measures installed between 2005 and 2011 in the latest publication. This is the first time results for Scotland have been produced, and cover the impact of installing cavity wall insulation and loft insulation in 2011.

The methodology used to produce these results is the same as that used to produce results for England and Wales, with the exception of the source for data relating to property attributes. Results for England and Wales use property attribute information held by the Valuations Office Agency (VOA). Property attribute data modelled by Experian has been used as an alternative for Scotland. This contains information on property age, property type and number of bedrooms which allows a representative comparator group to be created in the same way as it has been for analysis related to England and Wales estimates. However, because the property attribute data are modelled there will be additional uncertainty in estimates resulting from this modelled data. Results should be treated as provisional and interpreted bearing in mind this uncertainty.

The domestic NEED methodology which contains detailed information on the impact of measures methodology can be accessed from the following link:

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

Results presented refer to the savings in gas consumption for households using gas as the main heating fuel. Estimates are based on observed savings, so they are savings after comfort taking<sup>11</sup> 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 its 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, change in number of occupants).

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<sup>11</sup> 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 using the same amount of energy to achieve greater warmth, since the property should retain heat better than before the insulation was installed.

## Headline results

This section sets out headline results for the impact of installing a single energy efficiency measure in a household in 2011. It covers cavity wall insulation and loft insulation<sup>12</sup>. 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.

Table C.2 below shows the savings experienced in households' gas consumption for cavity wall insulation and loft insulation installed in 2011. It shows that the greatest typical saving is seen for properties installing cavity wall insulation, with a typical saving of 9.9 per cent, or 1,800 kWh. Properties installing loft insulation saw a typical saving of 2.9 per cent, which represents a saving of 500 kWh.

**Table C.2: Summary of observed savings – single energy efficiency measure installed in 2011**

Energy efficiency measure		Percentage saving	Saving (kWh)
Cavity wall insulation	Median	-9.9%	-1,800
	Mean	-9.0%	-1,900
Loft insulation	Median	-2.9%	-500
	Mean	-2.4%	-500

**Figure C.6: Summary of observed savings for energy efficiency measures installed in 2011 for Scotland compared with England and Wales (median)**

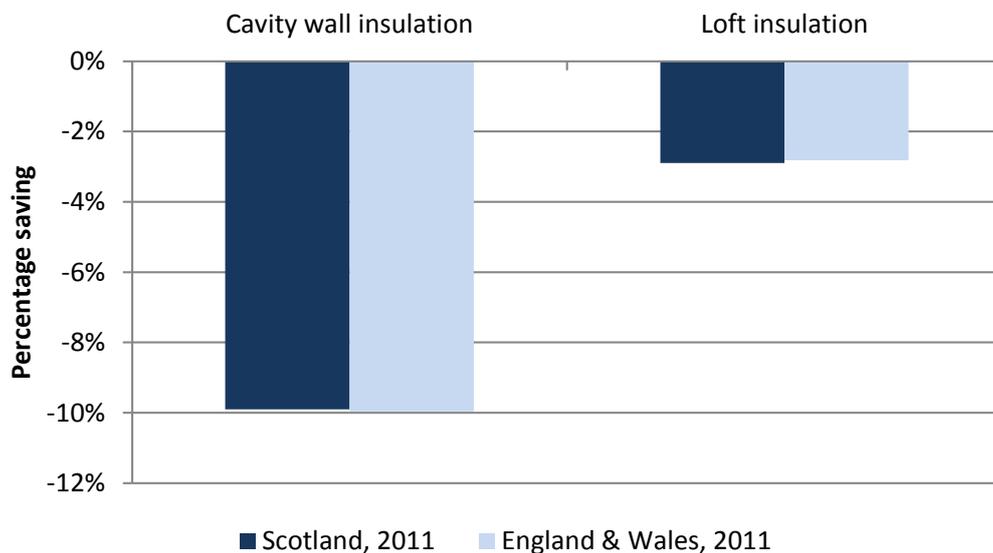


Figure C.6 shows the typical observed savings experienced by properties installing an energy efficiency measure in 2011 for Scotland compared with England and Wales. It shows that the typical saving for properties installing cavity wall insulation and loft insulation is very similar for

<sup>12</sup> 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).

## Summary

properties in Scotland and England and Wales, with a difference of less than 0.1 percentage points. However, because the typical gas consumption is higher in Scotland compared to England and Wales, the saving in kWh is higher for Scotland. For cavity wall insulation, the typical saving for England and Wales is 1,500 kWh compared to 1,800 kWh in Scotland.

The estimates for England are based on the NEED headline savings estimates. To understand more about the different data source is having on the Scotland estimates, impact of measures results for England and Wales have been reproduced for properties installing an energy efficiency measure in 2010 using Experian property attribute variables instead of those held by VOA. The difference in the typical observed saving for properties installing cavity wall insulation in 2010 was less than 0.1 percentage points. This compares with a difference of 0.4 percentage points for properties installing loft insulation in 2010. This shows that headline results from the two different sources are broadly comparable.

Detailed results by property attributes and household characteristics have not been included in this report due to the increased impact the uncertainty surrounding these estimates has on individual groups. The methodology used for calculating the estimates means that any mismatches in properties being matched with similar properties as a result of modelled data not being accurate will be accentuated when results for different break downs are considered. However, like results for England and Wales, households experience a range of savings. The actual savings experience by households will depend on a variety of factors including the consumption in a property before the measure is installed, physical attributes of the property and how householders use energy.

## Summary

This annex has outlined the first results for Scotland using data available in NEED. The domestic consumption section contains headline domestic gas and electricity consumption figures for properties in Scotland for 2012 (and 2011 in accompanying tables) based on modelled data produced by Experian. Both the headline figures and additional breakdowns are compared to England and Wales to look for similarities and differences between the two groups.

The impact of measures section presents estimated savings in gas consumption following the installation of an energy efficiency measure in Scotland in 2011. Headline results for Scotland are compared with those for England and Wales, and show that for cavity wall insulation and loft insulation the headline typical savings experienced are very similar.

It is hoped that DECC can obtain property attribute data from the Scottish Assessors, which is used to put properties in 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.

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