The Scottish Government
Riaghaltas na h-Alba

Scottish House Condition Survey: 2014 Methodology Notes

PEOPLE, COMMUNITIES AND PLACES

Contents

1. Introduction

1. The purpose of this document is to provide information on the definition and methods of derivation of key indicators measured through the Scottish House Condition Survey (SHCS) which apply to the reporting of 2014 data.

2. This document is periodically updated to reflect changes in definitions and methods used in SHCS reports. The previous edition of this report was published alongside the 2013 SHCS Key Findings report.

3. One of the key changes in this year's report is the review of the methodology for costing the fuel poverty energy requirement. These changes and the impact they make on fuel poverty statistics are described in section 3. The model estimating the energy requirement that underpins fuel poverty statistics has also been updated to the most recent version of BREDEM, and this is addressed in section 2.1. Other changes include the reporting of energy efficiency ratings based on the most recent SAP methodology, SAP 2012, alongside the previously used SAP 2009 method.

4. The report includes in addition background and explanatory information in relation to other statistics published in the 2014 Key Findings report. The discussion of the energy modelling methodology and outputs includes contribution from the Building Research Establishment (BRE).

2. Modelling domestic energy requirements

5. Estimating energy use in dwellings is at the core of assessing the energy efficiency of the housing stock, the greenhouse gas emissions for which it is responsible and the risk of fuel poverty faced by residents. A number of measures produced through the SHCS are based on modelling energy use in the home:

   - Energy Efficiency Ratings: SAP, EPC band, and NHER ratings;
   - Carbon emissions estimate; and
   - Fuel Poverty.

6. The general methodology that underpins all of these estimates is known as BRE Domestic Energy Model (BREDEM). It was first developed in the early 1980s and has been continuously updated as a result of changes to our understanding of dwelling energy consumption and the use of energy in the UK housing stocks.

7. Prior to the 2013 SHCS Key Findings report[1], domestic energy consumption in SHCS statistics was estimated through the use of 'Auto-Evaluator', a software programme developed by National Energy Services Ltd (NES) and National Energy Foundation (NEF) which is based on an earlier version of BREDEM, BREDEM-12, published in 2001[2]. Details on this methodology and the outputs it provided are available in the Scottish Government's Technical Note on Fuel Poverty[3].

8. With the publication of the 2013 Key Findings report, the SHCS moved to an updated methodology which reflects the current industry standard of assessing home energy performance. The new approach is based on BREDEM 2012[4], and is implemented by the Building Research Establishment (BRE) with the use of proprietary energy models. This improvement incorporated several years of cumulative change and resulted in a substantial impact on all energy consumption-based indicators.

9. The 2013 SHCS Methodology Notes provided detailed information on the key measures which were affected by the methodological update. Revised estimates for the key measures of energy efficiency and fuel poverty for the period 2010 – 2012 were published alongside the new figures for 2013 in order to provide some degree of continuity.

2.1 Changes since 2013 report

10. Since the publication of the 2013 SHCS Key Findings report, the underlying methodology used to model household energy consumption, BREDEM 2012, has been revised and aligned more closely with the SAP 2012 methodology. An updated version of the model, BREDEM 2012 version 1.15, was published in January 2015. This version supersedes BREDEM 2012 version 1.0, which was used in our previous report and has been introduced for the analysis of 2014 SHCS data reported in the current report.

11. The main methodological changes which are involved in this update and which affect the calculation of energy consumption, fuel expenditure and emissions are:

- a change to the calculation of the inter-zone heat transfer coefficient;
- a small reduction in the energy content of heated water;
- an alteration to the procedure for calculating the water heating efficiency from a central heating boiler; and

[1] Scottish House Conditions Survey Key Findings 2013
http://www.scotland.gov.uk/Publications/2014/12/6903

[2] Anderson, B.R. 2002: BREDEM-12 Model Description: 2001 update

[3] http://www.scotland.gov.uk/Topics/Statistics/SHCS/TechnicalNote

[4] BRE, BREDEM 2012: A technical description of the BRE Domestic Energy model
http://www.bre.co.uk/filelibrary/bredem/BREDEM-2012-specification.pdf

[5] http://www.bre.co.uk/filelibrary/bredem/BREDEM-2012-specification.pdf

- a small reduction in heat gains produced by warm air heating system pumps.

12. Alongside this, BRE updated the SHCS energy consumption models to produce a SAP 2012 rating. This involved the introduction of several RdSAP 2012[6] assumptions:

- reduced heat pump efficiencies;
- reduced storage radiator responsiveness;
- change to pre-1975 wall U-values for sandstone and granite; and
- an addition of party wall heat losses.

13. In combination, these changes to the underlying energy model are estimated to produce an increase of approximately 2% on average in both the estimates of energy consumption and carbon emissions. This also results in a corresponding increase in the estimate of fuel poverty using the updated methodology, in comparison to the one used for data relating to 2013.

2.2 Standard Assessment Procedure (SAP)

2.2.1. Energy Efficiency Rating (EER)

14. The Standard Assessment Procedure (SAP) is a BREDEM-based methodology which provides the UK Government's recommended system for assessing the energy and environmental performance of dwellings, taking into account the energy needed for space and water heating, ventilation and lighting, and where relevant, energy generated by renewables. SAP ratings allow comparisons of energy efficiency between different dwellings to be made.

15. The Energy Efficiency Rating (EER) is expressed on a scale of 1 – 100 where a dwelling with a rating of 1 will have a very poor energy efficiency and high fuel bills, while 100 represents very high energy efficiency and low fuel bills. Ratings can be greater than 100 for dwellings that generate more energy than they use; however these are rare in the existing stock. Extremely inefficient cases can result in a negative rating. These are reset to a value of 1.

16. Ratings are adjusted for floor area so that they are essentially independent of dwelling size for a given built form. They give a measure of the floor area-weighted fuel costs for the dwelling under standard occupancy and heating regimes. The fuel prices used are averaged over the previous three years across the different areas of the UK. The SAP rating takes into account a range of factors that contribute to energy efficiency, the main of which include:

- the dimensions of the heat loss surfaces of the dwelling;
- materials used for construction of the dwelling;
- thermal insulation of the building fabric;

[6] http://www.bre.co.uk/filelibrary/SAP/2012/SAP-2012_9-92.pdf

- efficiency and control of the heating and hot water systems;
- fuel used for space and water heating;
- ventilation and solar gain characteristics of the dwelling;
- renewable energy technologies.

17. SAP is used to compare the energy performance of dwellings and so is not affected by the individual characteristics of the occupying household, nor by the dwelling's geographical location. The calculation is based on a fixed heating pattern of 21°C in the main living area and 18°C elsewhere and 9 hours of heating on a weekday and 16 hours at the weekend.

18. The heating season occurs during the months of October to May. It is based on standard occupancy assumptions with the household size correlating with the total floor area of the dwelling. The dwelling is assumed to be located in the East Pennines region.

19. SAP is updated periodically by BRE on behalf of DECC in order to reflect developments in our understanding of energy consumption, to update data for factors such as prices and temperatures, to incorporate new systems and technologies and to address applications across an increasing range of carbon and energy reduction policy areas. Alongside this, there is a 'reduced data' version of the methodology, RdSAP, which is applied to the assessment of existing buildings. On 7 December 2014, a new edition of RdSAP (version 9.92) was implemented across the UK. It uses the SAP 2012 methodology.

20. This report uses two editions of SAP to describe the energy efficiency of the Scottish housing stock, SAP 2009 and SAP 2012. SAP 2009[7] was adopted in the 2013 SHCS Key findings report and applied to data back to 2010. The 2014 Key Findings report continues to publish energy performance statistics on this basis to allow an analysis of change over time.

21. SAP 2012, which is the current edition of the SAP methodology, is used in the 2014 Key Findings publication for the first time to report on the energy efficiency of the Scottish housing sector.

22. The key differences between SAP 2009 and SAP 2012 are summarised below, for the reduced data and for the full SAP calculation. The full documentation can be found on the BRE website.

23. The main changes to SAP include:

- Climatic data has been extended to allow calculations using regional weather for some elements.
- An allowance for height above sea level is incorporated into external temperature data.

[7] http://www.bre.co.uk/filelibrary/SAP/2009/SAP-2009_9-90.pdf, Table 15 p. 205

- CO2 emission factors have been extensively revised.
- Fuel price and primary energy factors have been revised.
- The options for heat losses from primary pipework have been extended.
- Default efficiencies for heat pumps have been revised.
- Adjustments have been made to the solar water heating methodology (lower savings if electric shower present).
- A new heating type has been added: high heat retention electric storage heaters.
- Low temperature heat emitter options have been extended (previously only underfloor).
- Thermal bridging details have been updated.
- Appendix R (reference values for calculating TER) has been updated.
- Solar radiation calculation has been updated (effects solar gains, solar water heating).

24. The main changes to RdSAP include:

- Provision for dealing with park homes added
- Party wall heat losses included
- Post 2012 age band added
- More wall types included in tables
- Flue gas heat recovery and waste water heat recovery now recognised
- Ability to enter specific data in place of defaults where documentary evidence is available for the U-values of most items and some other features, e.g. solar water heating
- Additional improvement measures included such as glazing only upgrade (keeping existing frames)'

2.2.2. Energy Performance Certificates

25. Energy Performance Certificates (EPCs) were introduced in January 2009 under the requirements of the EU Energy Performance Building Directive (EPBD). They are required when a property is either sold or rented to a new tenant.

26. EPCs are generated through the use of the SAP methodology. For Energy Performance Certificates energy efficiency ratings are presented over 7 bands, labelled A to G. Band A represents low energy cost and high energy efficiency, while band G denotes high energy cost (and low energy efficiency).

2.3 National Home Energy Rating (NHER)

27. The NHER system was extensively used in previous SHCS reports to describe the energy efficiency of the housing sector. Detailed discussion of this methodology can be found in the Technical Note on Fuel Poverty available from the Scottish Government website[8].

28. The NHER methodology used in the SHCS was based on an earlier version of the BRE Domestic Energy Model, BREDEM -12. This has now been superseded and under the updated method, BREDEM 2012, it is no longer feasible to reproduce accurately the original NHER measure. To provide some degree of continuity, an emulated NHER measure was developed for the 2013 Key Findings report and is also reported in this year's main report. Details on how this measure compares to the original NHER measure are provided in the 2013 SHCS Methodology Notes[9].

3. Measuring fuel poverty

29. Fuel Poverty is defined in terms of the ratio between the cost of the energy required to maintain an adequate standard of warmth and other uses of energy in the home, and the income of the household occupying the dwelling[9]. When this ratio exceeds 0.1, the household is considered to be fuel poor. In other words, a fuel poor household would be required to spend more than 10% of its income on all household fuel use.

$$Fuel\ Poverty\ Ratio = \frac{Modelled\ Fuel\ Cost}{(i.e. Modelled\ Energy\ Requirement\ \times Price)} \over Household\ Income$$

3.1 Fuel poverty energy requirement

30. The energy requirement is calculated on the basis of a standard heating regime and other uses of energy in the home. This information is combined with relevant fuel prices to obtain a modelled fuel bill. No information on the actual spend on energy is used in the definition of fuel poverty.

[8] 'Technical Note on Fuel Poverty – Revised', available at http://www.scotland.gov.uk/Topics/Statistics/SHCS/TechnicalNote

[9] For more details see Scottish House Condition Survey 2013 Key Findings Report (http://www.scotland.gov.uk/Publications/2014/12/6903); SHCS Methodology Notes 2013 (http://www.scotland.gov.uk/Topics/Statistics/SHCS/Downloads/MethodologyNotes2013)

31. To estimate the annual household energy consumption, and hence the fuel bill, the SHCS employs the full BREDEM 2012 model. This is considered a more realistic estimate of energy demand than SAP because it uses more information about the occupants and the physical characteristics of the dwelling.

32. The BREDEM calculation for space heating requires that the heating regime for each dwelling is specified in terms of the temperature of the dwelling, or parts of it, and the number of hours heating is required. Under the fuel poverty definition two types of heating regime are applied:

- standard, where living rooms (zone 1) are heated to 21°C and the rest of the dwelling (zone 2) is heated to 18°C for 9 hours during weekdays and 16 hours on weekends; and
- enhanced, where living rooms (zone 1) are heated to 23°C and the rest of the dwelling (zone 2) is heated to 18°C for 16 hours each day of the week.

33. The fuel poverty definition requires that the energy needs of elderly and infirm households are assessed on the basis of the enhanced heating regime. The SHCS defines the terms 'elderly and infirm' as households where at least one person is aged 60 or over and/or reports suffering from limiting long-term illness or disability.

34. As described in section 2.1, the underlying BREDEM 2012 model was updated to version 1.1 for the analysis of 2014 data. This increased the estimate of the fuel poverty energy requirement in comparison to the method used for 2013 data by around 2% and has a corresponding small effect on the estimated level of fuel poverty in 2014. For this reason 2014 and 2013 statistics are not fully comparable.

3.2 Fuel prices

35. The 2014 Key Findings report contains two improvements to the method for determining the cost of the energy requirement in the production of fuel poverty statistics from the Scottish House Condition Survey. The first relates to the information about fuel prices used in the methodology. The second involves accounting for the contribution of the bill rebates received under the Warm Home Discount scheme. This section provides details on the first of these improvements. The second is discussed in section 3.3.

36. The SHCS does not collect information on the price of fuel which surveyed households use. In order to calculate the modelled fuel bill for the fuel poverty calculation, information on fuel prices has to be gathered from other sources. This is provided by Alembic research and is based on a bespoke survey of energy suppliers for metered fuels and published sources for non-metered fuels. Scotland average prices provided through this survey are then put together in a ratio of 1:9 with average prices for the other UK countries. The resulting UK average price is applied to the fuel poverty energy requirement to derive the modelled fuel costs.

Table 1: Fuel price used in costing energy requirement under previous and current methodology

Fuel		Previous	Current
Mains gas, **Electricity 7**, and **Electricity Standard**	**Source**	Bespoke survey of the big 6 energy supply companies [10]	Department of Energy and Climate Change, Quarterly Energy Prices publication, Tables 2.3.4 and 2.2.4 [11]
	Geographical area	UK	North Scotland, South Scotland
	Time reference	July	Annual average
	Payment method	Standard Credit only	Weighted average of St. Credit, Direct Debit and Pre-payment
Electricity 10	**Source**	Bespoke survey of energy suppliers[10]	Bespoke survey of energy suppliers[10]
	Geographical area	UK	North Scotland, South Scotland
	Time reference	July	July
	Payment method	Standard Credit only	Weighted average of St. Credit, Direct Debit and Pre-payment
Electricity 24	**Source**	Bespoke survey of energy suppliers[10]	Bespoke survey of energy suppliers[10]
	Geographical area	UK	North Scotland, South Scotland
	Time reference	July	July
	Payment method	Standard Credit only	Weighted average of St. Credit, Direct Debit and Pre-payment
LPG and solid fuels	**Source**	Sutherland Tables [12]	Sutherland Tables
	Geographical area	UK	Scotland
	Time reference	Quarterly (July issue)	Annual average
Wood	**Source**	Sutherland Tables (pellets price assumed for chips and wood)	Sutherland Tables (wood chips and wood logs based on pellets price adjusted by SAP ratios)

[10] Survey conducted by Alembic Research

[11] DECC, Annual domestic energy bills
https://www.gov.uk/government/statistical-data-sets/annual-domestic-energy-price-statistics

[12] http://www.sutherlandtables.co.uk/

Oil	**Source**	Department of Energy and Climate Change, Quarterly Energy Prices publication, Table 4.1.1 [13]	Department of Energy and Climate Change, Quarterly Energy Prices publication, Table 4.1.1
District heating prices	**Source**	SAP 2005 fuel price tables, adjusted by Retail Price Index for Fuel & Light [14]	SAP 2012 fuel price tables, adjusted by Consumer Price Index for Gas [15]

37. Table 1 compares the method for producing the modelled cost of the fuel poverty requirement used prior to the current publication with the one which has now been adopted.

38. The previous methodology aimed to reflect an average price charged across the UK in the month of July (or the summer quarter) of the year for which the fuel poverty statistics are produced. This approach does not recognise sufficiently the considerable variation in fuel prices in terms of factors such as region, supplier, type of tariff and payment type and the fact that prices can change levels sharply over short periods of time. A single average UK price relating to a specific time point does not represent well the circumstances that individual households in Scotland face in terms of the cost of energy they require in the course of the year for which the SHCS reports.

39. To address some of these limitations, we adopt a new approach which aims to use prices which are averaged over a year and relate to Scotland or regions of Scotland[16] where suitable information is available. For metered fuels, some of this information is available from Quarterly Energy Prices (QEP), a DECC National Statistics publication[17]. Rates for E10 and E24 tariffs are not available from this source and we continue to use the bespoke survey of suppliers carried out by Alembic Research. Similarly, for non-metered fuels we continue to use previous sources with some adjustments to time reference, geographical region, and other more minor details.

40. Prices for metered fuels vary according to payment method and type of tariff. At the time the original methodology was adopted by the SHCS, standard credit was the dominant payment method for metered fuels. However, in the

[13] DECC, Monthly and annual prices of road fuels and petroleum products https://www.gov.uk/government/statistical-data-sets/oil-and-petroleum-products-monthly-statistics

[14] BRE, SAP 2005, Table 12 http://projects.bre.co.uk/sap2005/pdf/SAP2005_9-83.pdf

[15] BRE, SAP 2012, Table 12 http://www.bre.co.uk/filelibrary/SAP/2012/SAP-2012_9-92.pdf

[16] These regions correspond to the Public Electricity Supplier (PES) areas that existed before market liberalization, now known as Distribution Network Operator (DNO) areas. Of the 14 GB areas there are two in Scotland broadly covering the Central Belt and Borders, and the Highlands and Islands. These areas are referred to here as South Scotland and North Scotland.

[17] Quarterly Energy Prices: https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/quarterly-energy-prices

intervening time, direct debit has become a more common way of paying for fuel. Because it offers a discount to customers, failure to reflect the growing share of this payment type inflates the cost of the fuel poverty energy requirement. Table 2 shows how the share of different payment methods has changed in more recent years. Table 3 shows rates for different payment methods in 2014.

41. To take into account the differences according to payment type, the new method which we adopt takes an average of all three of them. Each price is weighted by the share of the payment method to which it corresponds among all customers in Scotland. This is done for North and South Scotland regions separately. The results are shown under 'overall (average)' and demonstrate that when we account for varying payment methods we arrive at prices which are somewhat lower than standard credit alone.

Table 2: Percentage of standard electricity and gas customers in UK/GB and Scotland[18], 2006 and 2014

		Standard Credit	Direct Debit	Pre-payment
Standard Electricity				
2014	**Scotland**	24%	56%	20%
	UK			
2006	**Scotland**	37%	45%	19%
	UK	41%	46%	14%
Mains Gas				
2014	**Scotland**	25%	57%	17%
	GB			
2006	**Scotland**	42%	49%	9%
	GB	41%	49%	10%

42. While the new method accounts better for some of the variation in the price of metered fuels for individual households across Scotland, there are further differences which are not captured: both across energy suppliers and types of tariffs. The information required for this is not available at present. We will

[18] DECC, Quarterly domestic energy customer numbers
https://www.gov.uk/government/statistical-data-sets/quarterly-domestic-energy-price-stastics

DECC, Special feature – Variation in tariff types and energy bills
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/416052/Variation_in_tariff_types_and_energy_bills.pdf

continue to look for opportunities in future to improve further the accuracy with which differences across individual households are reflected.

43. One potential weakness of the move from the use of standard credit rate to a price averaged across three different payment types relates to the treatment of customers on pre-payment tariffs. The overall average is generally lower than the pre-payment rate. Because prepayment meters are more common among lower income groups which are at a higher risk of fuel poverty, using the lower weighted average price may have a disproportionate effect on the estimate of fuel poverty for this group.

Table 3: Prices for Mains Gas and Standard Electricity by Region, by payment type and overall average, 2014 [19]

				North Scotland	South Scotland	Overall (GB Gas or UK eStd)
Mains Gas	Unit Prices	St. Credit	p/kWh	4.59	4.61	4.65
		Direct Debit	p/kWh	4.27	4.18	4.23
		Pre-payment	p/kWh	4.55	4.57	4.64
		Overall (Average)	p/kWh	4.40	4.36	4.41
	Fixed Costs	St. Credit	£/a	98.10	97.44	98.02
		Direct Debit	£/a	78.32	87.26	85.99
		Pre-payment	£/a	98.35	96.94	97.59
		Overall (Average)	£/a	86.54	91.56	91.08
Standard Electricity (eStd)	Unit Prices	St. Credit	p/kWh	15.42	13.97	14.53
		Direct Debit	p/kWh	14.82	12.98	13.62
		Pre-payment	p/kWh	15.47	13.80	14.67
		Overall (Average)	p/kWh	15.08	13.38	14.04
	Fixed Costs	St. Credit	£/a	93.46	88.56	78.42
		Direct Debit	£/a	65.11	74.92	63.94
		Pre-payment	£/a	93.01	89.56	76.55
		Overall (Average)	£/a	77.14	81.21	70.04

[19] DECC, QEP Table 2.3.4 (Gas) and QEP Table 2.2.4 (Electricity)
https://www.gov.uk/government/statistical-data-sets/annual-domestic-energy-price-statistics

44. To explore this hypothesis we examined information from the SHCS on the way households pay for their fuel. This information is only available for a quarter of the physical survey sample and is not sufficient to inform the method for allocating fuel price information to individual households. However, it can be used to explore further the impact that the method may have for households using pre-payment meters. As this analysis is based on a small sample, the conclusions are somewhat tentative.

45. In 2014, 19% of the sub-sample for which information was available were paying for their energy by pre-payment meters. Around half of them were fuel poor. Using prepayment rates instead of weighted average prices (Table 3) changes the status of 1.5% of all households on pre-payment meters from 'not fuel poor' to 'fuel poor'. This suggests that the method has a very small effect which is most likely offset when average prices are assigned to households who pay for their energy by direct debit (which is lower than the average rate).

46. Nevertheless, to ensure that we do not in any way undercount fuel poor households information on the use of pre-payment meters for all households participating in the physical survey will be collected in the forthcoming 2016 fieldwork. This will enable us to identify this high risk group and assign the appropriate fuel price for them. In the medium to long term we will continue to look for opportunities to improve the information on payment methods for all households in the SHCS.

3.3 Warm Home Discount

47. The Warm Homes Discount (WHD) scheme was launched in April 2011[20]. Energy suppliers are mandated to provide support in the form of discounts and rebates, as well as advice and assistance, to customers at risk of fuel poverty.

48. The SHCS does not collect information on whether respondents receive direct financial support under this scheme. In fact it would be difficult to collect such information as many people are not aware that they are benefiting from a rebate. SHCS publications so far have not included an allowance for the WHD rebate in the estimation of the number of fuel poor households in Scotland. This leads to an overestimation of the modelled fuel bill and therefore fuel poverty.

49. This year's main report includes for the first time the contribution of the WHD in estimating the level of fuel poverty. In the absence of actual information on receipt, this has been modelled on the basis of information about the eligibility criteria of the scheme and the estimated number of recipients in Scotland. This broadly follows the method applied by DECC in their Annual Fuel Poverty Statistics Report[21].

[20] https://www.ofgem.gov.uk/environmental-programmes/social-programmes/warm-home-discount-whd

[21] https://www.gov.uk/government/statistics/annual-fuel-poverty-statistics-report-2015; https://www.gov.uk/government/publications/fuel-poverty-methodology-handbook-2013

50. The approach consists of the following stages:

- Details of the number of households in receipt of each component of the WHD are provided by Ofgem for GB as a whole. As no geographic breakdown is available, it is assumed that the number of recipients in Scotland is proportional to Scotland's share of households in GB (9.2%).
- Details of eligibility for each element of the WHD scheme are provided by Ofgem, and households which meet these criteria are flagged in the SHCS dataset. Because of limitations of the available survey information, this is only possible to do for the Core and Broader Group elements of WHD.
- A series of runs are made, where a sample of likely recipients is drawn at random from the pool of all eligible households. For each sample the WHD rebate amount (e.g. £140 for 2014 data) is subtracted from the modelled household fuel bill. The estimated number of households in receipt of the Core and Broader Group element of the WHD in Scotland is used to constrain the size of the sample which is selected.
- A representative iteration based on the number of fuel poor households among modelled recipients is selected from all runs as the best estimate of the set of household in the survey who benefit from the Core or Broader Group element of the WHD scheme.

3.3.1. Elements of the WHD scheme and eligibility criteria

51. The WHD scheme is made up of 4 elements. Each uses different criteria for eligibility. The corresponding information is not always collected in the SHS interview and in some cases it has been necessary to simplify the criteria or make certain assumptions in order to determine if a household would be eligible for support under the scheme.

3.3.1.1 Core Group

52. Under the Core Group (CG) element households receive an electricity bill rebate, currently worth £140 rising from £120 at the beginning of the scheme. Eligibility criteria have changed in the period the scheme has been in operation. This is summarized below:

- Year 1 (2011-2012): Recipients of Pension Credit Guaranteed Credit only
- Year 2 (2012 – 2013): Recipients of Pension Credit Guaranteed Credit only and households where someone receives both Guaranteed and Savings Credit and is over 80 years old
- Year 3 (2013- 2014): Recipients of Pension Credit Guaranteed Credit only and households where someone receives both Guaranteed and Savings Credit and is over 75 years old
- Year 4 (2014- 2015): Recipients of Pension Credit Guaranteed Credit irrespective of whether they receive the savings elements of pension credit.

53. The SHCS collects information on whether the household reference person (HRP) or their partner receives Pension Credit, however no detailed information on the particular elements of Pension Credit is collected. For this reason all Pension Credit recipients in the survey have been assumed to be eligible for the Core Group of WHD. This is a larger and slightly better-off group of households than the households who would in reality be eligible for the Core Group element. Around 70% of all households we assume to be eligible in 2011 are unlikely to qualify for the rebate. The corresponding figures for subsequent years are 47% for 2012, 40% for 2013, and 24% for 2014. This means that WHD recipients in the survey are selected from a broader pool and there is a risk that the effectiveness of WHD in targeting fuel poor households is understated in the modelling. This also means that the impact WHD has in helping reduce the level of fuel poverty may be understated, particularly in the earlier years.

3.3.1.2 Broader Group

54. The benefits under the Broader Group (BG) are the same as those under the core group, but broader eligibility criteria are applied and there are some differences across energy suppliers. Qualifying criteria usually require a combination of:

- One of a range of benefits covering disability, low incomes and job-seeking; and
- One of a range of vulnerability characteristics such as having young children, elderly and infirm household members or low incomes.

55. Not all eligibility criteria used in the BG element apply in Scotland or are available in the SHCS. For example the following have not been included in the modelling: receipt of free school meals, eligibility for free NHS prescriptions, receipt of Child Disability Living Allowance OR Child Tax Credit disability premium, requiring constant carer assistance, suffering from Alzheimer's or Dementia, MATEX or MADEX exemption certificate, relies on mains powered medical equipment.

3.3.1.3 Legacy Tariffs

56. In 2011-2013, suppliers could offer discounted/social tariffs or rebates to vulnerable customers, similar to those provided under the Voluntary Agreement which existed prior to the Warm Home Discount scheme. No information was available about the recipients or characteristics of households receiving Legacy tariff reductions. It has not been therefore possible to model this element of the WHD scheme using the SHCS.

3.3.1.4 Industry Initiatives

57. The Industry Initiative element enables suppliers to provide assistance, beyond direct financial support, to customers in fuel poverty or at risk of fuel poverty. It was not possible to determine the beneficiaries of Industry Initiatives from the available data.

3.3.2. Recipients of WHD: simulation

58. Table 4 shows the number of beneficiaries and the value of the WHD scheme in GB and in Scotland for each element of the scheme. It has been assumed that Scotland benefits proportionately to its share in the total number of households in Great Britain.

59. In calculating the fuel poverty energy bill we only allow for the benefits received under the Core and the Broader Group elements of WHD. Together they account for around 47% of the overall value of the scheme in 2011, 76% in 2012, 86% in 2013, and 94% in 2014 (see Table 4). Our method therefore somewhat underestimates the impact of the scheme on the cost of energy for the population of vulnerable households as a whole, particularly in the earlier years. As a consequence, this may lead to slightly overstating the level of fuel poverty among households eligible for the scheme.

Table 4: Elements of the Warm Home Discount scheme, Years 1-4

		Scheme Year			
		2011/12	**2012/13**	**2013/14**	**2014/15**
Core Group	GB Beneficiaries	701,746	1,157,879	1,236,770	1,427,108
	Scotland Beneficiaries	64,561	106,525	113,783	131,294
	Rebate value	£120	£130	£135	£140
	GB Spend (£M)	84.2	150.5	167.0	199.8
	Scotland Spend (£M)	7.7	13.8	15.4	18.4
	Percent of Total Spend	35.5%	53.1%	57.4%	61.3%
Broader Group	GB Beneficiaries	234,297	489,494	605,472	758,132
	Scotland Beneficiaries	21,555	45,033	55,703	69,748
	Rebate value	£120	£130	£135	£140
	GB Spend (£M)	28.1	63.6	81.7	106.1
	Scotland Spend (£M)	2.6	5.9	7.5	9.8
	Percent of Total Spend	11.8%	22.4%	28.1%	32.5%
Legacy Spending	GB Beneficiaries	1,444,176	966,823	376,693	0
	Scotland Beneficiaries	132,864	88,948	34,656	0
	Average Rebate/Discount per HH	£71	£71	£71	£0
	GB Spend (£M)	102.9	47.3	19.8	0.0
	Scotland Spend (£M)	9.5	4.4	1.8	0.0
	Percent of Total Spend	43.3%	16.7%	6.8%	0.0%
Industry Initiatives	GB Spend (£M)	22.3	21.9	22.3	20.1
	Scotland Spend (£M)	2.1	2.0	2.1	1.8
	Percent of Total Spend	9.4%	7.7%	7.7%	6.2%
Total Spend	GB Spend (£M)	**237.5**	**283.3**	**290.8**	**326.0**
	Scotland Spend (£M)	**21.9**	**26.1**	**26.8**	**30.0**

Note: No information is available on the geographic distribution of WHD beneficiaries. It has been assumed that the number of recipients in Scotland is proportional to Scotland's share of the number of households in GB (9.2%).

60. Using the information on number of recipients, for each year of SHCS data between 2011 and 2014 a large number of samples are drawn from the pool of households estimated to be eligible for the CG or the BG element of WHD. One of these samples is selected so that it represents a 'middle' case in terms of the number of fuel poor households it contains within various subgroups such as income decile, tenure, region, age of oldest person in household, and vulnerability. All households within the selected sample are assigned a WHD rebate.

61. Table 5 shows the proportion and number of fuel poor households in the selected representative sample for each year from 2011 – 2014.

Table 5: Simulated recipients and fuel poor recipients of WHD in the SHCS by year

Year	WHD Recipients	of whom Fuel Poor	
2011	86,000	39,000	45%
2012	152,000	85,000	56%
2013	169,000	93,000	55%
2014	202,000	120,000	60%

Note: Figures for 2013 and 2014 are based on the new prices method.

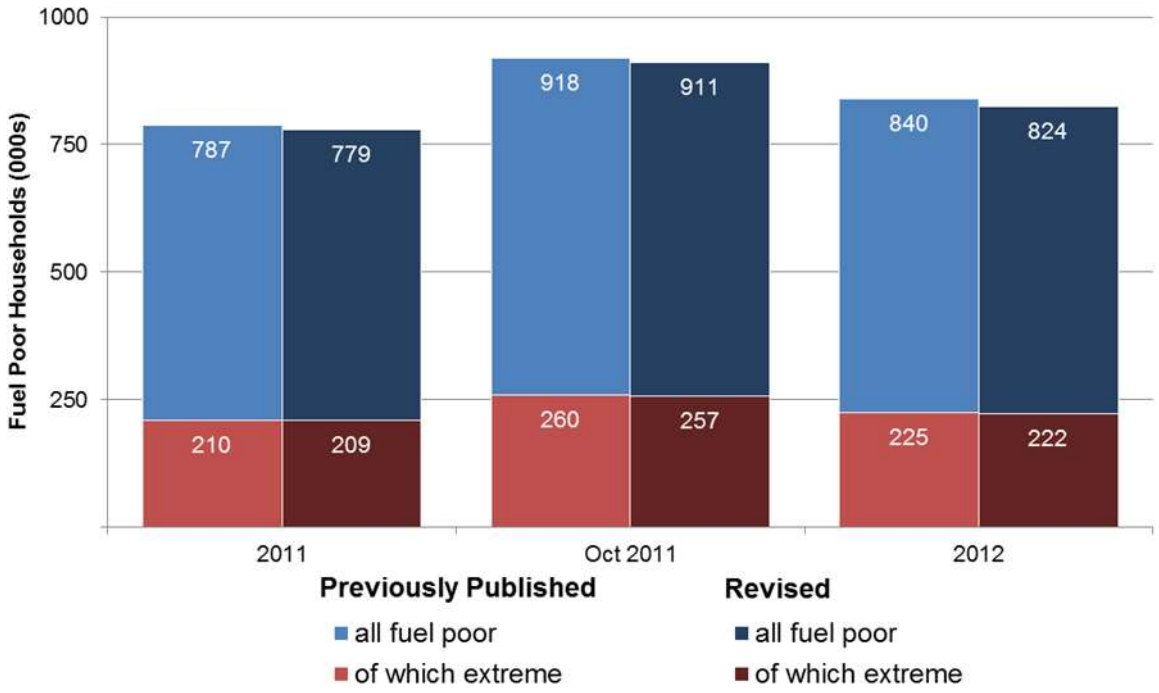
3.4 Effect of the methodological changes on the estimates of fuel poverty

62. The contribution of WHD was incorporated in the estimates of fuel poverty for all years 2011 – 2014. The new method for sourcing price information was only implemented for 2013 and 2014, as modelled energy consumption estimates were not available in the necessary detail for earlier years. In this section therefore, the impact of the methodological change is shown separately for 2011 and 2012 (WHD) and for 2013 (WHD and new prices combined) against previously published fuel poverty estimates.

3.4.1. The effect of accounting for Warm Home Discount

63. Figure 1 and Table 6 show the results from applying a WHD rebate to the modelled fuel bills of households selected by the method described above for 2011 and 2012. These results are compared to previously published estimates of fuel poverty for these years.

Figure 1: Households in fuel poverty and extreme fuel poverty before and after simulation of WHD, 2011-2012



64. Accounting for WHD leads to a small reduction in fuel poverty in the SHCS sample. This is a reduction of 0.3 percentage points (equivalent to around 8,000 households) in 2011 and 0.7 percentage points (equivalent to 16,000 households) in 2012.

Table 6: Fuel poverty estimates - previously published and after allowing for WHD, 2011-2012

	2011		Oct 2011		2012	
	Previous	Allowing for WHD	Previous	Allowing for WHD	Previous	Allowing for WHD
Households						
All Fuel Poor	787,000	779,000	918,000	911,000	840,000	824,000
Extreme	210,000	209,000	260,000	257,000	225,000	222,000
Rate						
All Fuel Poor	33.2%	32.9%	38.8%	38.5%	35.2%	34.5%
Extreme	8.9%	8.8%	11.0%	10.9%	9.4%	9.3%
Households Reduction						
All Fuel Poor		8,000		8,000		16,000
Extreme		1,000		3,000		3,000
Percentage Points Reduction						
All Fuel Poor		0.3		0.3		0.7
Extreme		0.0		0.1		0.1

3.4.2. The combined effect of new prices method and accounting for WHD

65. Table 7 and Figure 2 show the effect of the methodological change for 2013. The overall impact on fuel poverty levels measured in the SHCS sample is a reduction of 3.3 percentage points (equivalent to around 80,000 households). Using the new prices method has a larger share of the overall impact. It accounts for 2.8 percentage points decline in the fuel poverty figure (or around 83% of the overall impact).

Figure 2: Combined effect of using new fuel price method and accounting for WHD, 2013

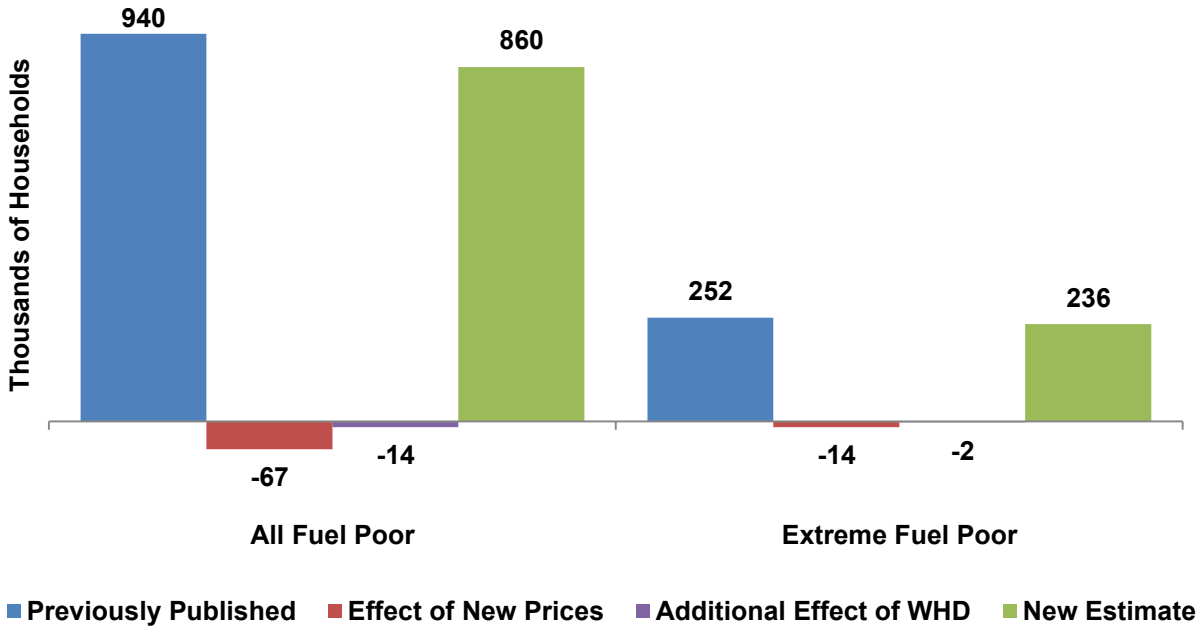


Table 7: Combined effect of applying new fuel prices method for WHD on fuel poverty estimates, 2013

	Previously Published[22]	After New Prices	After New Prices & WHD	Reduction due to New Prices	Reduction due to WHD in addition to New Prices	Reduction due to Combined effect
Households	**000s**	**000s**	**000s**	**000s**	**000s**	**000s**
All Fuel Poor	940	873	860	67	14	80
Extreme	252	238	236	14	2	16
Rate	**%**	**%**	**%**	**Points**	**Points**	**Points**
All Fuel Poor	39.1%	36.4%	35.8%	2.8	0.6	3.3
Extreme	10.5%	9.9%	9.8%	0.6	0.1	0.7

66. Incorporating the WHD rebate contributes an additional 0.6 percentage points reduction in the estimated level of fuel poverty (or around 17% of the

[22] Scottish House Conditions Survey – Key Findings 2013, http://www.gov.scot/Publications/2014/12/6903

overall effect of the methodological change). The revised fuel poverty rate for 2013 stands at 35.8% (equivalent to 860,000 households).

3.5 Government Electricity Rebate

67. In 2014 the UK government introduced the Government Electricity Rebate (GER), a £12 government contribution to help lower the impact of environmental and social policy costs on consumer energy bills[23]. It is delivered by energy suppliers as a rebate to domestic electricity bills.

68. The value of the rebate is subtracted from the total cost of the fuel poverty energy requirement.

3.6 Household income

3.6.1. Definition of household income for the measurement of fuel poverty

69. In the Fuel Poverty Statement (FPS), the income against which fuel poverty is assessed is defined as the total income of all members of the household, including dependants. This includes income from the following sources:

- usual earnings from employment;
- profit or loss from self-employment;
- all Social Security benefits (including Housing Benefit, Social Fund, maternity, funeral and community care grants, but excluding Social Fund loans) and Tax Credits;
- income from occupational and private pensions;
- investment income;
- maintenance payments, if a person received them directly;
- income from education grants and scholarships (including for students, top-up loans and parental contributions);
- the cash value of certain forms of income in kind (free school meals, free welfare milk, and free school milk).

70. Under this definition, income is calculated net of the following items:

- income tax payments;
- National Insurance contributions;
- Council Tax;

[23] https://www.gov.uk/guidance/government-electricity-rebate

- contributions to occupational pension schemes (including additional voluntary contributions) and any contribution to personal pensions;
- all maintenance and child support payments, which are deducted from the income of the person making the payment; and
- parental contributions to students living away from home.

71. In the measurement of fuel poverty income is taken before housing costs.

3.6.2. Measurement of income in the SHCS

72. The household income figure used in the SHCS to implement the Fuel Poverty Statement definition comprises the net income of the Highest Income Householder (HIH) and his or her spouse/partner. The income of any other member of the household is not included. Household income comprises all earned income (from employment, self-employment, part-time and casual work), all income from state benefits (including Council Tax and Housing Benefit), student income, non-state pensions, investment income and any other regular non-work income.

73. The survey collects Information on the receipt of the Winter Fuel Payment and this is included in the household income of all households with a person aged 60 or over who had stated that they have received this payment.

74. The total household income figure is then adjusted by deducting council tax and water and sewerage charges. Due to a change to the collection for the 2012 and 2013 fieldwork, council tax for these years was imputed as described in section 3.2.4 of the 2013 SHCS Methodology Notes publication[24]. In 2014 the council tax question was reinstated and where respondents had provided an answer it was used in the calculation of net household income. Where this information was not available council tax was imputed using the same method as in the two preceding years.

75. All income data are thoroughly checked for inconsistencies and corrected where the source of error can be readily identified. Mostly, errors are due to incorrect recording of the period for the income amount (e.g. per annum amounts were incorrectly recorded as per month).

76. Where amounts given covered a period of less than a year, it is assumed that they are typical incomes for the purpose of calculating the annual income. Earnings data are requested net (after tax and national insurance), but gross amounts are collected if the respondent was unable to provide a net amount. Tax and national insurance are calculated for the amounts given gross and deducted to give the net annual income. Many benefits are not taxable. The amount received is requested for benefits and other regular income sources.

[24] SHCS Methodology Notes 2013 (http://www.scotland.gov.uk/Topics/Statistics/SHCS/Downloads/MethodologyNotes2013)

The amounts for these income sources are therefore assumed to have had tax already deducted, where applicable

3.6.3. Differences between SHS income measurement and FPS definition

77. The main difference between the income and benefits data collected in the SHCS and the FPS definition is that the survey only measures the income of the Highest Income Householder (HIH) and his or her spouse/partner. No income information is obtained for any other household members. Therefore, the survey will underestimate income for households with more than two earners or benefit recipients and may therefore overstate fuel poverty for this group.

3.6.4. Missing income information imputation

78. Although some level of item non-response is inevitable across all aspects of the social and physical surveys (e.g. where a householder refused to answer a particular question, or a surveyor could not get into a loft), in most situations this does not affect the power of the survey to produce valid and useful estimates. The exception to this is the assessment of income, where there is generally a higher proportion of item refusals.

79. In order for the survey to be able to produce income and housing costs, a statistical process known as imputation is carried out. Imputation involves replacing missing values with the values associated with other households which have the same characteristics, defined according to the nature of the missing item.

80. Hot Deck imputation was used for all missing income and housing costs items. In Hot Deck imputation, the sample is divided into imputation classes based on the relevant characteristics of cases and these classes contain potential donor cases. A donor case is selected at random from the imputation class and the item value for that case is assigned to the case with the missing item value. The relevant characteristics were chosen using regression analysis.

81. The imputation of missing income and housing costs data has been carried out by the survey contractor, Ipsos MORI.

4. Scottish Housing Quality Standard

4.1 Measurement

82. The Scottish Housing Quality Standard (SHQS) is a minimum standard for all social housing in Scotland. In order to meet this standard a dwelling must meet 5 broad criteria: compliant with the tolerable standard, free from serious disrepair, energy efficient, provided with modern facilities and services and

healthy, safe and secure. Social landlords must ensure that all their dwellings meet the SHQS in 2015[25].

83. The Scottish House Condition Survey (SHCS) provides the official measure of SHQS progress at national level, as laid out at the time of the introduction of SHQS in 2004. Information on the number of dwellings in the social housing sector that have reached the standard is published annually as part of the SHCS Key Findings report and relate to the previous year.

84. The SHCS collects information on 54 out of all 55 elements comprising the SHQS requirements[26]. This is done as part of the broader survey of the condition of the dwellings in the sample. When conducting the fieldwork, surveyors are not consciously making an assessment of SHQS compliance. Information on each of the 54 elements of SHQS is only a small part of the wide range of other information they collect. This information is subsequently collated independently into the 5 broad criteria and indicators of overall compliance by Scottish Government analysts. In this way the conclusions drawn from the fieldwork are kept independent of the data collections with a view to objectivity.

85. The SHQS guidance acknowledges that there may be situations where some social rented properties could be exempted from meeting certain elements of the SHQS for technical or other reasons[27]. An abeyance can be granted where it is technically feasible to make an upgrade but a social issue prevents the landlord from doing so. For example a dwelling may be suitable to have cavity wall insulation but the tenant refuses to allow the work to be done. The upgrade is expected to be carried out after the problem has been resolved or at change of tenancy.

86. An exemption can arise when the landlord believes that it is not possible to meet the SHQs on a particular element for technical, disproportionate cost or legal reasons. For example, a wall cavity is present but it is not possible/desirable to fill it for 'technical' reasons, such as the cavity being too narrow to fill, poor access for work to take place, or persistent exposure of walls to moisture, etc.

87. The SHCS does not collect information on whether the landlord has asked for an abeyance or exemption for an element of the SHQS, and because of this the statistics from the SHCS do not take account of these. This means that SHCS statistics would overstate SHQS failure rates.

[25] http://www.gov.scot/Topics/Built-Environment/Housing/16342/shqs

[26] Only one element of the SHQS is not assessed using SHCS data: no information is collected on external noise insulation .

[27] http://www.gov.scot/Topics/Built-Environment/Housing/16342/shqs/annexi

4.2 Changes for 2014

88. In the 2012 and 2013 data collections a small routing error in the questionnaire relating to tenure meant that a small number of dwellings could not be classified as part of the private or the social rented sector[28]. This has been amended for 2014 and all dwellings in the survey can now be classified by tenure. This introduces a small inconsistency in the basis for the figures relating to the social sector between 2014 and the preceding 2 years.

89. In addition, small corrections to the data processing relating to failure thresholds for the energy efficiency criterion were made for 2014. This relates to the energy efficiency rating threshold and the thickness of the hot water tank insulation. Although the overall effect of these corrections on failure rates in the social sector were broadly neutral, some discontinuities with previous years cannot be ruled out, particularly when considering detailed breakdowns.

5. Gas network coverage

90. Gas network coverage reported in the 2014 SHCS Key Findings report is determined on the basis of the distance between the dwelling and low/medium pressure gas distribution pipes. The information on the location of low and medium pressure gas distribution pipes is provided by Scotia Gas Networks who operate the gas distribution network in Scotland. This data includes both the national gas network and the Scottish Independent Undertakings (SIU). An SIU network is a town gas supply, owned and managed by Scotia Gas Networks, but which is not connected by pipeline to the rest of the gas grid.

91. The geographical location of sampled dwellings is recorded as part of the Scottish House Condition Survey collection. It is therefore possible to compare directly the location of dwellings in the SHCS with the location of gas distribution pipes in the Scottish network. A dwelling which is within a standard domestic gas connection distance is considered to be covered by the gas grid.

92. In order for a property to be eligible for a standard domestic gas connection, the property boundary must be within 23 metres from the gas pipe, and the gas meter must be within 40 metres from the property boundary.[29]

93. The SHCS does not contain information regarding any land surrounding a dwelling. It is only therefore possible to measure the distance from the building centroid to the gas pipe, and not the property boundary.

94. This gives two options for selecting a threshold value for distance from the gas grid beyond which the dwelling is considered ‘off-grid’:

[28] Details available in section 6.2 of the 2013 SHCS Key Findings report.

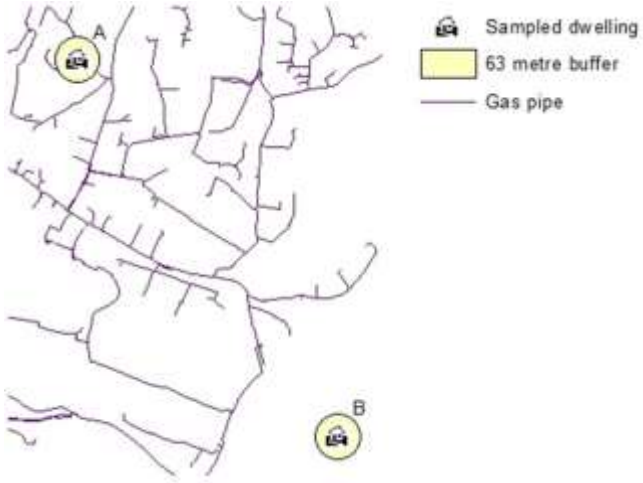
[29] See https://www.sgn.co.uk/Connect/Before-you-start/Domestic-Connection/

95. **Option A** . Set a threshold value equal to the sum of the maximum distances (23 m + 40 m) and define off-grid as further than 63 m from the gas pipe. This method potentially under-counts off-grid dwellings: where a dwelling is within 63m of a pipe but its surrounding land accounts for less than 40m of this distance, it will be counted as 'on grid' even though it does not meet the standard connection specification. This is more suitable for measurements in rural areas where we can assume the land surrounding dwellings is larger.

96. **Option B.** Ignore the 40 m distance within the property boundary and set the definition of off-grid as 'more than 23 m between building centroid and gas pipe'. This may result in over-counting off-grid dwellings, because it doesn't take into consideration the land surrounding the building.

97. Since grid coverage is lower in rural areas, and rural dwellings are more likely to have surrounding land, we have opted to use 63 m as the threshold distance to determine gas network coverage (Option A). This will therefore result in a conservative measure of dwellings off the gas grid in urban areas if the density of gas distribution pipes is low.

98. Using GIS mapping software, dwelling locations and gas distribution pipes are plotted together. Where a gas distribution pipe does not intersect with a 63m ring around a dwelling location, that dwelling is said to be off the gas grid. In the example below, dwelling A is on the network, while dwelling B is not.



99.

100.

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106. This measure does not reflect the presence of gas supply to the building. A dwelling may be located within 63m of a gas distribution pipe and not be connected to the gas grid

This version is current as at 15-12-2015

REVISIONS TABLE

	Date	Changes
First Published 1.0	15/12/2015	

UPDATES PAGE
