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Scottish House Condition Survey: 2019 Key Findings

A National Statistics publication for Scotland

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 2019 data.

2. This document is periodically updated to reflect changes in definitions and methods used in SHCS reports. The last time substantial methodological changes were made was with the reporting of 2018 SHCS data, when there was an update to the version of RdSAP used in the methodology for assessing the energy efficiency and environmental performance of dwellings. In addition, in July 2019 the Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act received Royal Assent. This Act contained a new definition of fuel poverty which affected the methodology behind how fuel poverty is defined and measured. These changes have been described in detail in the 2018 methodology note.

3. In the reporting of 2019 data, there has been an update to the energy modelling related to improving the accuracy of calculations surrounding hot water losses. In addition, a household's lights and appliances are now assigned as using an off-peak electricity tariff if an off-peak electricity meter is present, even if there is no form of electric heating in the dwelling.

4. The 2019 Key Findings also includes new presentation of disrepair data. Both the energy modelling and the disrepair changes are described in these methodology notes.

5. The description of the energy modelling methodology and outputs in this document includes contribution from the Building Research Establishment (BRE).

2. Modelling Domestic Energy Use

6. 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 and Environmental Impact Ratings; and
    - Fuel Poverty.

7. 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.

8. Prior to the 2013 SHCS Key Findings report, 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. Details on this methodology and the outputs it provided are available in the Scottish Government's Technical Note on Fuel Poverty under the old definition.

9. 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, 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. The 2013 SHCS Methodology Notes provided detailed information on the key measures which were affected by the methodological update.

10. Further changes were introduced for the 2014 Key Findings report to reflect the updated version of BREDEM 2012, version 1.1. Details of what these changes involved were provided in the 2014 Methodology Notes. Further Key Findings reports continue to use the same version of BREDEM 2012.

2.1 Standard Assessment Procedure (SAP)

2.1.1 Energy Efficiency Rating

11. 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, accounting for the energy cost associated with 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.

12. The Energy Efficiency Rating (EER) is expressed on a scale of 1 – 100 where a dwelling with a rating of 1 will have 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.

13. 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;
    - 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.

14. 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.

15. 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.

16. SAP is updated periodically by BRE on behalf of BEIS 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. Modelling of the SHCS data follows the conventions set out in this RdSAP methodology.

17. This report uses two editions of SAP to describe the energy efficiency of the Scottish housing stock, SAP 2009 and SAP 2012. SAP 2009 was adopted in the 2013 SHCS Key Findings report and applied to data back to 2010. The 2019 Key Findings report continues to publish energy performance statistics on this basis to allow an analysis of change over time.

18. SAP 2012, which is the current edition of the SAP methodology, is used from the 2014 Key Findings publication onwards to report on the energy efficiency and the environmental impact of Scotland's homes.

19. SHCS energy modelling for SAP 2012 in this report is based on two versions of RdSAP. The first, RdSAP v9.92 which was released on 7 December 2014, introduced some technical updates and broadening of scope (for example, enabling assessment of 'park homes' as a dwelling type) as well as updating UK carbon factors and fuel costs based upon recent research undertaken by the Department for Business, Energy and Industrial Strategy (BEIS).

20. The latest version of RdSAP (v9.93) was released on 19 November 2017 and contains revisions to the underlying assumptions used within the SAP calculations. The most notable update to the methodology in v9.93 was a change to the default U-values of cavity, solid and stone walls, built prior to 1976. Compared to v9.92, U-values for solid, insulated stone and uninsulated cavity walls have improved, whereas they have declined for insulated cavity walls. These U-values are used to calculate the rate of heat loss through the walls, which contributes to the overall thermal performance of the building fabric of the dwelling. Data on the basis of RdSAP v9.93 is presented for 2018 and 2019 only.

21. The key differences between SAP 2009 and SAP 2012, as well as the different RdSAP versions, are summarised below. The full documentation can be found on the BRE website.

22. The main changes in SAP 2012 compared to SAP 2009 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.
    - 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).

23. The main changes in RdSAP v9.92 compared to RdSAP v9.91 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)'.

24. The main changes in RdSAP v9.93 compared to RdSAP v9.92 include:

- Revision to the thermal performance of external walls; namely updates to the U-values of solid, stone and cavity walls built prior to 1976.

25. Each year, small improvements are made to the modelling accuracy of RdSAP and details can be found in the relevant year's methodology notes.

26. In 2019, more detailed information on combi boilers from the Product Characteristics Database (PCDB) have been included. The PCDB is a large repository of boiler information, used to assign efficiencies to boilers matched as part of the SHCS modelling process. For certain combi systems, more detailed information is available concerning additional losses associated with hot water. Improvements to the BRE boiler model have allowed this information to be extracted from the PCDB and used as part of the SAP calculation, to improve the accuracy of calculations surrounding hot water losses. The mean BREDEM energy consumption is expected to increase by around 33 kWh per year due to this change.

2.2 Environmental Impact Rating

27. The Environmental Impact Rating (EIR) represents the environmental impact of a dwelling in terms of the carbon emissions associated with fuels used for heating, hot water, lighting and ventilation. This calculation is based on SAP and uses the same heating regime and occupancy assumptions as for the

calculation of EERs. EIRs are adjusted for floor area so they are independent of dwelling size for a given built form. They vary between 1 and 100, where 1 represents very high carbon emissions and 100 very low carbon emissions.

28. EI ratings for 2018 and 2019 in the 2019 Key Findings report have been described in this report based on SAP 2012 under both RdSAP v9.92 and v9.93. EI ratings for 2015-2017 are based on RdSAP v9.92 and EIR relating to 2010-2013 are based on SAP 2009.

2.3 Energy Performance Certificates

29. 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.

30. EPCs are generated through the use of the SAP methodology. For EPCs, Energy Efficiency (EE) and Environmental Impact (EI) ratings are presented over 7 bands, labelled A to G. Band A represents low energy cost and high energy efficiency (or low environmental impact), while band G denotes high energy cost and low energy efficiency (or high environmental impact).

2.4 National Home Energy Rating (NHER)

31. The NHER system was extensively used in SHCS reports prior to the 2013 Key Findings publication to describe the energy efficiency of housing. Detailed discussion of this methodology can be found in the Scottish Government's Technical Note on Fuel Poverty under the old definition.

32. 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 the original NHER measure accurately. To provide some degree of continuity, an emulated NHER measure was developed for the 2013 Key Findings report and has been reported in the Key Findings reports since then. Details on how this measure compares to the original NHER measure are provided in the 2013 SHCS Methodology Notes.

3. Boilers

33. Since 2012, the SHCS has collected enough information to derive a surveyed dwelling's heating system efficiency. For properties with boilers, comparing the efficiency against the minimum standards set by Scottish Building Standards provides an estimate of the domestic dwelling boiler stock compliant with current regulations, and offers another measure of Scotland's energy efficiency levels.

34. Heating system efficiencies are calculated by BRE and are provided for 2012 onwards based on a pre-control adjustment state (i.e. no adjustment is made for a poorly controlled system). In practice, where it has been possible to read an efficiency straight from the PCDB, this has been used. Alternatively, the SAP default has been used.

35. The efficiency cut-offs used to assess compliance of oil boilers with Scottish Building Standards reflect the different standards required of oil combination and oil non-combination boilers. Furthermore, while non-condensing boilers are present in the SHCS sample, the fuel dependent condensing boiler efficiency cut offs are applied for all boilers in the report when assessing building standard compliance.

4. Measuring Fuel Poverty

36. Under the 2001 Housing (Scotland) Act (section 88), the Scottish Government was committed to eradicating fuel poverty as far as practicably possible by November 2016. In June 2016, the Minister for Local Government and Housing informed Parliament that, based on the advice received from experts, it was unlikely that the statutory fuel poverty target would be met. This was confirmed by 2016 and 2017 fuel poverty rates, under the old definition of fuel poverty, of 26.5% and 24.9% respectively.

37. The Fuel Poverty (Targets, Definition and Strategy) (Scotland) Bill was introduced to the Scottish Parliament on 26 June 2018 and the Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019 received Royal Assent on 18th July 2019. This includes a new definition of fuel poverty based on advice from an independent panel of experts and further scrutiny and amendment by the Scottish Parliament.

38. As set out in section 3 of the Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act, a household is in fuel poverty if, in order to maintain a satisfactory heating regime, total fuel costs necessary for the home are more than 10% of the household's adjusted (i.e. after housing costs) net income, and if after deducting fuel costs, benefits received for a care need or disability and childcare costs, the household's remaining adjusted net income is insufficient to maintain an acceptable standard of living. The remaining adjusted net income must be at least 90% of the UK Minimum Income Standard (MIS) to be considered an acceptable standard of living, with an additional amount added for households in remote rural, remote small town and island areas.

39. Extreme fuel poverty follows the same definition except that a household would have to spend more than 20% of its adjusted net income (after housing costs) on total fuel costs to maintain a satisfactory heating regime.

40. Where a household is in fuel poverty, the fuel poverty gap is the annual amount that would be required to move the household out of fuel poverty.

41. The figures presented in the 2019 Key Findings report are a best estimate of fuel poverty rates under the new definition of fuel poverty, following amendments agreed at Stage 2 of the Fuel Poverty (Targets, Definition and Strategy) Bill. The method for the production of the fuel poverty statistics follows the approach introduced in the 2018 Methodology Notes.

42. The majority of elements of the new definition have been captured in the estimates in the 2019 report, including the deduction of Disability Living Allowance, Personal Independence Payments and Attendance Allowance from net household income (at part 2 of the definition, for the comparison to

MIS) and the application of an uplift to the MIS for remote rural, remote small town and island households based on previous studies[1].

43. The Fuel Poverty (Enhanced Heating) (Scotland) Regulations 2020 and Fuel Poverty (Additional Amount in respect of Remote Rural Area, Remote Small Town and Island Area) (Scotland) Regulations 2020 came into force on the 26th February 2020. These regulations set out the types of households for which the enhanced heating regimes are appropriate and specify who is to determine the uplifts to the MIS for households living in remote rural, remote small towns, and island (RRRSTI) areas.

44. The first set of fuel poverty estimates fully compatible with all of the elements of the new definition in the Act, including the regulations above, requires additional information being collected from 2020 onwards[2] and the production of a new MIS for Remote Rural, Remote Small Town and Island areas.

4.1 Fuel Poverty Energy Requirement

45. The energy requirement is calculated on the basis of the households 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.

46. 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 from the physical inspection of dwellings and the household interview conducted as part of the SHCS.

47. 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. The fuel poverty definition requires that the energy needs of "vulnerable" households are assessed on the basis of enhanced heating regimes.

48. For statistics in the 2019 publication, a **satisfactory heating regime** is defined as follows:

[1] The uplifts that were applied to the MIS for households in RRRSTI areas were estimates, based on the approach taken by the 2017 Scottish Fuel Poverty Definition Review Panel which used average data from the MIS for remote rural Scotland published by Highlands and Island Enterprise in 2013. For working age single or couple households the uplift is 15%, for pensioner single or couple households it is 19% and for family households it is 27.5%.

[2] 2020 SHCS fieldwork has been suspended since March 17th due to the effects of COVID-19 and the restrictions around travel. This affects both the social interview and the physical survey. Therefore it may be 2021 or later until all additional information is collected to fully account for all the elements of the new definition in the SHCS fuel poverty estimates.

- For “vulnerable” households (those where at least one member is aged 75 or over, or at least one member has a long-term sickness or disability), 23°C in the living room (zone 1) and 20°C in other rooms (zone 2), for 16 hours every day.

- For other households, 21°C in the living room (zone 1) and 18°C in other rooms (zone 2) for 9 hours a day during the week and 16 hours a day during the weekend.

49. The Fuel Poverty (Enhanced Heating) (Scotland) Regulations 2020, which came into force on the 26th February 2020, sets out four heating regimes which will apply to households going forward. This requires the collection of additional information on home occupancy in the social survey.

50. The four new heating regimes are:

- Enhanced heating regime 1, where living rooms (zone 1) are heated to 23°C and the rest of the dwelling (zone 2) is heated to 20°C for 16 hours every day. This will be applied to households where the dwelling is frequently occupied and at least one member of the household: is aged 75 or over, or has a long-term sickness or disability, or is in receipt of benefits received for a care need or disability.

- Enhanced heating regime 2, where living rooms (zone 1) are heated to 23°C and the rest of the dwelling (zone 2) is heated to 20°C for 9 hours during weekdays and 16 hours on weekends. This will be applied to households where the dwelling is not frequently occupied and at least one member of the household: is aged 75 or over, or has a long-term sickness or disability, or is in receipt of benefits received for a care need or disability.

- Enhanced heating regime 3, where living rooms (zone 1) are heated to 21°C and the rest of the dwelling (zone 2) is heated to 18°C for 16 hours every day. This will be applied to households where the dwelling is frequently occupied and at least one member of the household is aged 5 or under.

- Standard heating regime, 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. This will be applied to all other households.

51. Where a household fits the criteria for applying enhanced heating regime 1 and enhanced heating regime 3, for example if a member of the household is aged 75 or over and another member is aged 5 or under, enhanced heating regime 1 will be applied.

52. Frequently occupied is defined as: during the morning or afternoon or both on weekdays by any member of the household when it is cold.

4.2 Fuel Poverty Modelled Running Costs

53. 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 is obtained from other sources. Table 1 sets out the sources of information on fuel price for different types of fuels used in the derivation of the fuel poverty indicator.

54. The method for determining the cost of the energy requirement in the production of fuel poverty statistics follows the approach introduced in the 2014 Methodology Notes. However, the current report continues a further small improvement first introduced in the 2016 physical survey through the collection of information on the use of pre-payment meters for all households. This means that we are able to identify pre-payment users and assign the appropriate fuel price for them. All other households are applied a weighted average of standard credit and direct debit tariffs.

55. Fuel prices are averaged over a year and relate to Scotland, or regions of Scotland, where suitable information is available. For metered fuels, some of this information is available from Quarterly Energy Prices (QEP), a BEIS National Statistics publication. Rates for E10, E18 and E24 tariffs are not available from this source and the SHCS uses a bespoke survey of suppliers carried out by Alembic Research. For non-metered fuels the analysis uses prices published as part of the Sutherland Tables publication and SAP 2012.

56. While this method accounts 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.

57. In 2019, a household's lights and appliances are now assigned as using an off-peak tariff if an off-peak electricity meter is present, even if there is no form of electric heating in the dwelling. Historically, the BRE energy model has only modelled off-peak electricity tariffs for households which have an off-peak meter and use some form of electric heating (whether used for space heating or hot water). Where a household does not have a form of electric heating, the lights and appliances were assumed to use standard electricity, regardless of the type of electricity meter selected at L3 of the survey form. This was grounded in the assumption that off-peak electricity is designed to be used with electric heating, and therefore should only be modelled if electric heating is present. For 2019, this assumption has been removed to align more closely with the conventions applied in RdSAP. This change does not affect the energy consumption of a dwelling, only the fuel prices applied to the energy associated with lighting and appliance use. Only 20 records (<1% of the sample) were affected by this change in 2019 therefore the impact on overall modelled energy costs will be minimal.

Table 1: Sources of information on the price of domestic fuel used in costing the energy requirement

Fuel type		
Mains gas, **Electricity 7**, and **Electricity Standard**	**Source**	Department for Business, Energy and Industrial Strategy (BEIS), Quarterly Energy Prices publication, Tables 2.3.4 and 2.2.4
	Geographical area	North Scotland, South Scotland
	Time reference	Annual average
	Payment method	Pre-payment metered fuel price for the relevant households; weighted average of St. Credit and Direct Debit for all other households
Electricity 10, Electricity 18, and Electricity 24	**Source**	Bespoke survey of energy suppliers
	Geographical area	North Scotland, South Scotland
	Time reference	Annual average
	Payment method	Pre-payment metered fuel price for the relevant households; weighted average of St. Credit and Direct Debit for all other households
LPG and solid fuels	**Source**	Sutherland Tables
	Geographical area	Scotland
	Time reference	Annual average
Wood	**Source**	Sutherland Tables (wood chips and wood logs based on pellets price adjusted by SAP ratios)
	Geographical area	Scotland
	Time reference	Annual average
Oil	**Source**	Department for Business, Energy and Industrial Strategy (BEIS), Quarterly Energy Prices publication, Table 4.1.2
	Geographical area	UK
	Time reference	Annual average
District heating prices		SAP 2012 fuel price tables, adjusted by CPI for Gas

4.2.1 Warm Home Discount

58. The Warm Homes Discount (WHD) scheme was launched in April 2011. Energy suppliers are mandated to provide support in the form of discounts and rebates, as well as advice and assistance, to fuel poor customers.

59. 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. However, unless this is accounted for in the survey, the modelled fuel bill and therefore fuel poverty would be overestimated.

60. The publication of the 2014 SHCS Key Findings report introduced an allowance for the WHD rebate in the estimation of the number of fuel poor households in Scotland and the 2014 Methodology Notes contain a detailed description of the methodology. This was based on modelling households' eligibility for the scheme. This method has been used in all subsequent Key Findings reports.

61. 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. 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 provided by Ofgem, are used to flag all households in the SHCS dataset who meet these criteria. Because of limitations in the available survey information, some approximations are necessary.
- 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 2019 data, the same as the previous five years of the scheme) 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.

62. Improvements to the methodology behind the modelling of WHD receipt will be made alongside the implementation of all the elements of the new definition of fuel poverty.

63. The value of the WHD rebate (£140) is subtracted from the total cost of the modelled energy requirement for all households who are selected through the simulation method as beneficiaries from the scheme.

4.3 Household Income

4.3.1 Definition of the household's adjusted net income for the measurement of fuel poverty

64. The adjusted net income against which fuel poverty is assessed under the new definition is defined as the income of all members of the household, including dependants, after housing costs. This includes income from the following sources:

- usual earnings from employment;

- profit or loss from self-employment;
- all Social Security benefits (including Council Tax Reduction[3], 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).

65. Under this definition, the household's adjusted net income is calculated net of the following items:

- income tax payments;
- National Insurance contributions;
- Council Tax;
- Rent or mortgage costs
- 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.

4.3.2 Measurement of income in the SHCS

66. The household income figure used in the SHCS comprises the net income of the Highest Income Householder (HIH) and their spouse/partner collected through the household interview on a self-reported basis. Due to this, the survey will underestimate income for households with more than two earners or benefit recipients and may therefore overstate fuel poverty for this group. The inclusion of income of any other member of the household will be introduced, along with other developments, when producing the first set of fuel poverty estimates fully compatible with all of the elements of the new definition in the Act. This requires additional information being collected from 2020 onwards[4].

[3] Council Tax Reduction replaced Council Tax Benefit in 2013. In practice, the amount awarded is subtracted from the council tax bill, but in the survey it is recorded as an additive component to household income.

[4] 2020 SHCS fieldwork has been suspended since March 17th due to the effects of COVID-19 and the restrictions around travel. This affects both the social interview and the physical survey. Therefore it may be 2021 or later until all additional information is collected to fully account for all the elements of the new definition in the SHCS fuel poverty estimates.

67. 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.

68. All income data are thoroughly checked for inconsistencies by the survey contractor, IPSOS MORI, 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). 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. The amounts for these income sources are therefore assumed to have had tax already deducted, where applicable

69. The total household income figure is then adjusted by deducting housing costs, which includes the council tax, water and sewerage charges and rent or mortgage costs incurred by members of the household.

70. Where respondents have not provided information about the amount of council tax they pay, this has been modelled based on the council tax band of their dwelling and some household characteristics which make them eligible for certain discounts. In 2012 and 2013, when the SHCS was first integrated into the SHS, no questions about the council tax liability of households was asked as part of the survey. For these years all council tax payments have been modelled as described in the 2013 SHCS Methodology Notes. Council tax questions were re-introduced in 2014 and since then, where respondents provide an answer, it has been used in the calculation of net household income. Where this information is not provided, council tax is imputed using the same method as in the preceding years.

71. In 2015 some additional quality assurance rules were introduced in the modelling of council tax. In 2017, questions collecting household council tax information were amended to distinguish between cases where the reported amount included discounts/reductions or not.

72. These question changes are reflected in calculations of net household income after council tax necessary for the fuel poverty estimate, in particular where Council Tax Reduction (CTR) is accounted for. While in practice the application of CTR results in a lower Council Tax bill, the survey records the saving as an additive contribution to overall household income.

73. Where a respondent provides a council tax value net of any discounts or reductions, any contribution to income from (CTR) is removed from their household income total, as this will be reflected in the partial council tax value

reported. If the respondent provides a full council tax value, any declared CTR is left incorporated in the overall household income total.

74. The rent and mortgage figures used in the SHCS are collected through the household interview section of the SHCS on a self-reported basis. Mortgage costs given for the household are assumed to be paid by the HIH and their partner/spouse alone. Rent costs given for the household are adjusted for the amount the HIH and their partner/spouse pay for when the total number of contributing adults are taken into consideration.

75. For the purposes of calculating fuel poverty, household records with missing rent or mortgage cost data are assumed to have no rent or mortgage costs.

76. Improvements to the methodology behind the measurement of income after housing costs will be made alongside the implementation of all the elements of the new definition of fuel poverty.

4.3.3 Missing income information imputation

77. 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.

78. In order for the survey to be able to produce income, 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.

79. Hot Deck imputation was used for all missing income 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.

80. The imputation of missing income data has been carried out by the survey contractor, Ipsos MORI.

4.4 Benefits Received for a Care Need or Disability

81. Benefits received for a care need or disability includes: disability assistance, personal independence payment, attendance allowance, severe disablement allowance and disability living allowance received by members of the household.

82. For statistics in the 2019 publication, we deduct all relevant care and disability benefits except Severe Disablement Allowance, at part 2 of the definition.

83. The benefit figures used in the calculation of fuel poverty are collected through the household interview section of the SHCS on a self-reported basis. Benefits received for a care need or disability are subtracted from the household's net income (after housing costs) alongside fuel costs and childcare costs, which is then compared against the MIS for the purpose of determining if the household's remaining adjusted net income is sufficient to maintain an acceptable standard of living in the second part of the fuel poverty calculation.

84. In 2018, questions collecting household benefit information were heavily revised in the 2018 social questionnaire and included further questions on the benefits received by all members of the household. The benefits received for a care need or disability data used in the 2018 and 2019 Key Findings report comprises those received by the HIH and their spouse/partner only. The inclusion of stated benefits received by any other member of the household will be introduced, alongside the implementation of all the elements of the new definition of fuel poverty.

4.5 Childcare Costs

85. As with 2018, in the 2019 Key Findings report, childcare costs were not included in the calculation of fuel poverty. The inclusion of childcare costs will be introduced, alongside the implementation of all the elements of the new definition of fuel poverty.

86. Childcare costs, against which fuel poverty is assessed, means the paid costs incurred for any care or supervised activity provided for a child who is below school age or who is receiving primary education other than that provided during the child's education or where the main reason for incurring the costs is the child's participation in the activity. These costs are subtracted from the household's net income (after housing costs) alongside fuel costs and benefits received for a care need or disability, which is then compared against the MIS for the purpose of determining if the household's remaining adjusted net income is sufficient to maintain an acceptable standard of living in the second part of the fuel poverty calculation.

87. Since 2018, childcare costs are collected through the household interview section of the SHCS on a self-reported basis for all children aged between 0-11.

4.6 UK Minimum Income Standard (MIS)

88. The UK MIS figures used in the calculation of fuel poverty are obtained from annual budgets produced by the Centre for Research in Social Policy at Loughborough University. These annual budgets are based on detailed lists of goods and services required by different household types. MIS values for

each year and household type are calculated from these annual budgets after the deduction of: council tax, water and sewerage charges, rent costs, childcare costs and fuel costs.

89. The households in the SHCS are categorised as 1 of 17 household types[5] based on information collected in the social interview then the corresponding MIS value[6] for that year and household type are assigned to the household.

4.6.1 MIS remote rural, remote small towns, and island (RRRSTI) uplift

90. In recognition of the higher living costs that can apply in RRRSTI areas in Scotland, for the purpose of this calculation for households living in these areas, an additional amount is added to the relevant UK MIS figure. The households which receive this RRRSTI uplift are identified by their urban rural classification.

91. The uplifts that are applied to the MIS for households in RRRSTI areas are estimated, based on the approach taken by the 2017 Scottish Fuel Poverty Definition Review Panel which used average data from the MIS for remote rural Scotland published by Highlands and Island Enterprise in 2013. In RRRSTI areas, the uplift for:

- adult (aged 16-64) single or couple households is 15%
- pensioner (aged 65 or over) single or couple households is 19%
- family households is 27.5%
- mixed (1 adult and 1 pensioner) couple households is 17% (the average of 15% and 19%)

4.7 Median Fuel Poverty Gap

92. The figure taken to determine the actual median fuel poverty gap for each household is the lower of either:

- the amount required so that the fuel costs necessary for the home are no longer more than 10% of the household's adjusted net income (after housing costs), or

[5] Household type categories used in the calculation are: single adult (aged 16-64); adult couple; single pensioner (aged 65 or over); pensioner couple; any-age lone parent +1 child; any-age lone parent + 2 children; any-age lone parent + 3 or more children; any-age couple +1 child; any-age couple +2 children; any-age couple +3 children; any-age couple +4 or more children; mixed couple (1 adult 1 pensioner); large (adult couple and >2 members); large (pensioners couple and >2 members); large (mixed couple – 1 adult 1 pensioner and >2 members); large (no spouse, pensioner HiH and >2 members); large (no spouse, adult HiH and >2 members).

[6] Large (adult couple and >2 members) and large (no spouse, adult HiH and > 2 members) households are assigned the couple MIS. Large (pensioners couple and >2 members) and large (no spouse, pensioner HiH and > 2 members) households are assigned the pensioner couple MIS. Mixed (1 adult 1 pensioner) couple and large (mixed couple – 1 adult 1 pensioner and > 2 members) households are assigned the average MIS of the couple and pensioner couple MIS values.

- the amount required which, after deducting fuel costs, benefits received for a care need or disability and childcare costs, means the household's remaining adjusted net income is sufficient to maintain an acceptable standard of living.

4.7.1 Adjusted Median Fuel Poverty Gap

93. Time trends in the fuel poverty gap have been presented as the median gap before adjustment and the median gap adjusted to 2015 prices. The adjusted median gap figures have been presented in order to assess progress against the 2040 fuel poverty gap target set out in the Act.

94. The adjustment has been calculated in alignment with the increases or decreases in the annual average consumer prices index (CPI) over the period from 2015 to the year which the figure relates to.

5. Scottish Housing Quality Standard

95. The Scottish Housing Quality Standard (SHQS) is a minimum standard for all social housing in Scotland and was introduced in February 2004. In order to meet this standard a dwelling must meet 5 sets of broad criteria: compliant with the tolerable standard, free from disrepair, energy efficient, provided with modern facilities and services and healthy, safe and secure. A target was set for local authority landlords and registered social landlords to bring their housing stock up to the SHQS standard by April 2015.

96. Private owners and private landlords are currently under no obligation to bring their properties up to this standard. However SHCS collects the same data for all dwellings to allow comparison across the housing stock. Since 2012 this target has been incorporated in the Scottish Social Housing Charter and the performance of landlords has been monitored by the independent Scottish Housing Regulator (SHR).

97. The SHCS collects information on 54 out of all 55 elements comprising the SHQS requirements[7]. 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.

98. The SHQS guidance acknowledges that there may be situations where certain social rented properties could be exempted from meeting certain elements of the SHQS for technical or other reasons. 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 CWI 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.

99. An exemption can arise when a property is capable of meeting SHQS on a particular element but the landlord believes that it is not possible to meet it 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 too narrow to fill, poor access for work to take place, persistent exposure of walls to moisture.

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

100. 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.

101. 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, as described in the 2013 Key Findings report. This was amended in 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 in this report with years prior to 2014.

102. In addition, the 2014 Key Findings report introduced small corrections to the data processing relating to failure thresholds for the energy efficient criterion (energy efficiency rating and 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 years prior to 2014 cannot be ruled out, when considering detailed breakdowns.

103. A minor error was identified in the method used to compile the data for the Energy Efficiency criterion in 2018. This also affected the overall SHQS failure rate for the year. Both have been revised in this 2019 publication. The correction reduces the 2018 energy efficient failure rate by 0.4 percentage points and the overall failure rate by 0.4 percentage points. The energy efficiency criterion failure rate for 2018 is therefore similar to 2017 rather than a statistically significant increase as reported previously. For the social sector, the correction reduces the 2018 energy efficient failure rate and the overall failure rate by 0.3 percentage points. For the private sector, the reduction for each is 0.5 percentage points.

6. Disrepair to Critical Elements

104. The main change to the report in 2019 is to the information presented relating to disrepair. In order to aid understanding of the statistics, data is now presented in terms of disrepair to critical elements and disrepair only to non-critical elements.

105. Presence of disrepair, critical elements, urgent disrepair and extensive disrepair are calculated in the same way as all previous reports. However, two new variables are presented – urgent disrepair to critical elements and extensive disrepair to critical elements. Existing measures, such as critical and urgent disrepair, consider instances of these two types of disrepair co-existing in the same dwelling. However, it is possible that the urgent disrepair may refer to a non-critical element. These new variables are therefore intended to provide a clearer picture of the severity of disrepair of critical elements.

7. Gas Grid

106. Gas network coverage reported in the 2019 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.

107. The geographical location of sampled dwellings is recorded as part of the SHCS 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 the usual maximum distance for a standard domestic gas connection is considered to be covered by the gas grid.

108. 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, as set out in the SGN guidance.

109. 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.

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

111. **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 usual standard connection specification. This is more suitable for measurements in rural areas where we can assume the land surrounding dwellings is larger.

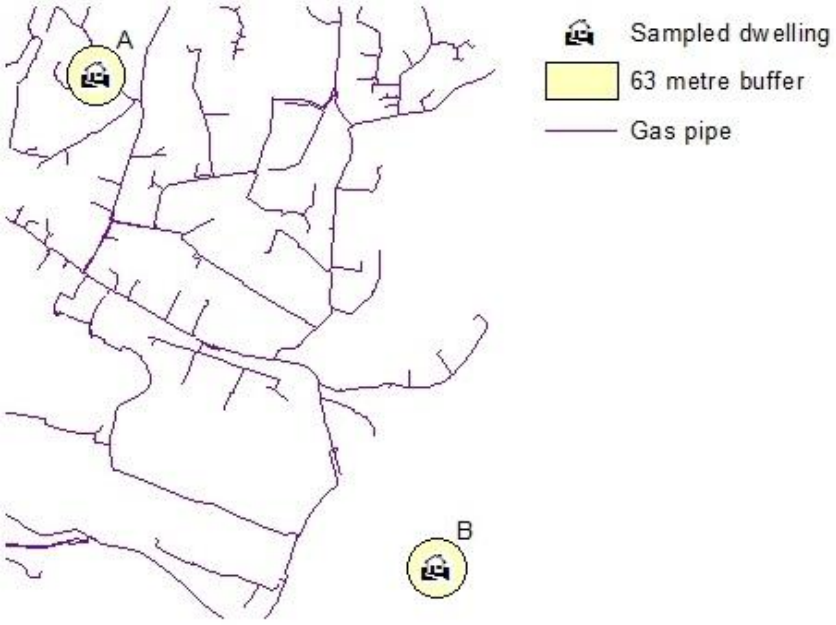
112. **Option B**. Ignore the 40 m distance within the property boundary and set the definition of off-grid as 'more than 23 m between building centroid and gas pipe'. This may result in over-counting off-grid dwellings, because it doesn't take into consideration the land surrounding the building.

113. 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.

114. When determining the distance between dwellings and distribution gas pipes, the SHCS does not include pipes owned and operated by Independent Gas Transporters (IGT). Consequently, there is a chance a dwelling connected to the gas network via an IGT will be classed as outwith the coverage of the gas grid. This could potentially increase the off-grid count, particularly among dwellings in new housing developments, which form the largest residential share of the IGT market.

115. 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.



116. The gas grid coverage 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, and conversely, it may be further way but have a gas connection.

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REVISIONS TABLE

	Date	Changes
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