

Developing regulation of energy efficiency of private sector housing (REEPS): modelling improvements to the target stock – 355 Modelled Archetypes



PEOPLE, COMMUNITIES AND PLACES

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The Scottish Government has been working with a group of stakeholders to develop proposals for consultation that would set minimum standards of energy efficiency in private sector housing in Scotland (excluding new build). To support that work we commissioned research to model improvements to the least energy efficient dwellings in Scotland, namely those with an energy efficiency EPC rating of E, F or G.

Consultation on minimum standards will take place in the next Parliamentary session. More information on the development of proposals can be found [here](#).

355 Modelled Archetypes

Modelling of energy efficiency improvements was carried out on 355 different archetypes, representing the least energy efficient dwellings in the private sector. A 5-page summary of the modelling results for each archetype has been published as part of the research outputs.

Chapters 2 & 3 of the Main Research Report provide a summary of the target stock, based on survey data from the Scottish House Conditions Survey. They describe how the least energy efficient dwellings were identified and how their physical characteristics were used to develop a typology to represent these dwellings.

The key characteristics defining the 355 different archetypes are based on:

- dwelling age
- dwelling type
- wall construction type
- main heating system type and fuel

and there was further segmentation by:

- EPC Band
- dwellings size (for most prevalent archetypes)

Chapter 4 of the Main Research Report describes the methodology adopted for the modelling, which was based on SAP 2012. The modelling results of each archetype were scaled up based on their prevalence in the target stock, in order to produce overall results from the research, which are provided in Chapter 5 of the Main Research Report.

Archetype Template Lookup Table

An Excel Spreadsheet containing a web link to each of the 355 modelling templates is available [here](#).

It provides information on the key characteristics of each archetype along with an ability to select those of particular interest, from drop down lists.

Information is provided on how many dwellings in the target stock are represented by each archetype, overall and by tenure and rurality.

Results are shown on the least cost measures modelled to reach a SAP rating of E (where applicable) and D, with the total capital cost of these measures. The meaning of the measures defined by M1 to M38 is shown separately in the 'Measures' worksheet.

Archetype Modelling Template

Please be aware that each archetype represents a number of dwellings in the target stock. The detailed characteristics, dimensions and presence of energy efficiency measures in each of the archetype examples has been based on real dwellings in the Scottish House Conditions Survey sample, usually selected to be in the middle of the SAP ratings of all dwellings in the same typology group.

This means that modelling results will differ for similar dwellings with different detailed characteristics, dimensions and energy efficiency measures.

For members of the public considering energy efficiency improvements to their own dwelling, the Scottish Government advises that you seek expert advice, as it is unlikely that the archetype examples will match exactly with your dwelling and there could be a range of factors which affect which measure would be most suitable for your dwelling.

In addition, average indicative costs of improvement measures have been used in the modelling. The costs for individual properties will also vary depending on a wide range of factors and members of the public should seek their own quotes.

Scottish households can seek free impartial advice on energy efficiency and find out exactly what support they are eligible for - whatever their circumstances - by calling the Scottish Government Home Energy Scotland hotline on 0808 808 2282 or by going to the following website: www.homeenergyscotland.org.uk.

The modelling templates are made up of a 5-page report and one example has been provided and described at the end of Chapter 4 of the Main Research Report.

Page 1 – Detailed Archetype Description

This page defines the main archetype group based on the key Characteristics described above.

It provides a very detailed description of the archetype dwelling, which has a bearing on which energy efficiency measures are considered and modelled as well as the results of this modelling.

For example, the dimensions of the main house, the construction type of the floor, walls, roof, windows and glazing all determine the starting position of the dwelling's insulation (defined by U-values) and its contribution to the energy efficiency rating.

If the dwellings has any extensions, including room-in-the roof, these details are shown and also contribute to the overall rating.

The type, efficiency and fuel source of main and secondary heating, along with heating controls are described, as well as details of hot water provision and cylinder size, insulation and thermometers. The fuel payment method is recorded as it too has a bearing on fuel costs and the overall rating.

Other details such as presence of low energy lighting, chimneys, flues, extractor fans and draught proofing of doors, windows and presence of lobby areas all feed into the energy efficiency ratings.

The starting point in terms of energy efficiency bands and ratings as well as environmental impacts bands and scores are shown.

Page 2 – Modelled Results of Single Improvements

This page shows the impact of modelling single energy efficiency improvement measures to the dwelling, compared to the starting position or existing baseline. The results in Table 1 are ordered by impact on the SAP energy efficiency rating (lowest to highest)

Results are shown in terms of:

- improvements to energy efficiency (EPC) band rating and (SAP) score
- improvements to environmental impact (EI) band rating and score
- reductions in SAP annual fuel costs (£ per year)
- reductions in SAP CO₂ annual emissions (kg of CO₂ per year)
- reductions in SAP annual delivered energy consumption (kwh per year)

Page 3 – Reasons for Measures Not Assessed in this Property

The research identified up to 38 improvement measures to be used in the modelling. For particular archetypes some of these measures may already be present or they

may not be recommended or applicable. This page confirms the reason why measures were not modelled for each archetype.

Page 4 – Modelled Results and Capital Costs of Single Improvements – over the lifetime of the measure

This page includes the key annual results contained on page 2, but also adds information on the lifetime (in years) and capital cost (in £s) of the measures. This enables calculations to be made on the lifetime reductions in fuel costs, CO₂ emissions and delivered energy for individual measures.

A calculation is included on the cost-effectiveness of individual measures expressed as “net lifetime £ saving / capital costs”, with any value greater than £0 meaning that the modelled fuel bill saving over the lifetime of the measure is greater than the capital cost of installing the measure. A payback period is included, showing how many years it would take for the annual fuel bill savings to cover the capital cost of the measure.

The results shown in Table 3 are ordered by capital cost of the measures (lowest to highest).

Page 5 – Cheapest Package of Improvement Measures to improve the Energy Efficiency Rating to SAP EPC Bands D, E or F

This page provides the outcome of the modelling in terms of identifying the cheapest packages of measures to improve the SAP energy efficiency rating of the archetype dwellings to EPC Bands D, E or F.

The number of scenarios presented depends on the starting position of each archetype. If an archetype is already in EPC Band E, then just one scenario on the cheapest package of measures to reach Band D is shown.

If the archetype has a starting position in Band G, then 3 scenarios on the cheapest package of measures is shown, to reach Band F, Band E and Band D.

The results shown on this page cover the same variables as those described above for page 4, however the results show the **cumulative impact** of adding each measure to the package of measures, until the desired EPC Band is achieved.

Only one package of measures is shown for each scenario, based on the least capital cost.



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