General summary of how wrappers work with the Home Energy Model

A technical explanation of the methodology

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Contents

Background to the Home Energy Model

What is the Home Energy Model?

The Home Energy Model (HEM) is a calculation methodology designed to assess the energy performance of homes, which will replace the government's Standard Assessment Procedure (SAP).

The Home Energy Model is still under development and its first version will be implemented alongside the Future Homes Standard (FHS) in 2025. We are publishing information about the model while it is still at a formative stage to enable industry to participate in the ongoing development process.

Where can I find more information?

This document is part of a wider package of material relating to the Home Energy Model:

Home Energy Model technical documentation (e.g. this document)

What: This document is one of a suite of technical documents, which go into further detail on the methodology and the validation exercises that have been carried out. We intend to update and produce further technical documentation throughout the model development process.

Audience: The technical documentation will be of interest to those who want to understand the detail of how the Home Energy Model works and how different technologies are treated.

The Home Energy Model consultation

What: The Home Energy Model consultation, which explains the overhaul to the SAP methodology and seeks views on the approach taken by the new Home Energy Model.

Audience: The Home Energy Model consultation will be of interest to those who want to understand the proposed changes to the SAP methodology and wider SAP landscape.

The Home Energy Model reference code

What: The full Python source code for the Home Energy Model and the Home Energy Model: FHS assessment has been published as a Git repository. This code is identical to that sitting behind the consultation tool. We are currently considering whether the open-source code could serve as the approved methodology for regulatory uses of the Home Energy Model.

Audience: The reference code will be of interest to those who want to understand how the model has been implemented in code, and those wishing to fully clarify their understanding of the new methodology. It will also be of interest to any potential contributors to the Home Energy Model.

Related content

This document provides a general summary of wrappers and how they relate to the core calculation. For a general summary of the core calculation, see HEM-TP-01 General summary of core calculation. For a summary of the FHS assessment wrapper, see HEMFHS-TP-06 Summary of FHS assessment wrapper.

To understand how this methodology has been implemented in computer code, please see:

src/hem.py

Methodology

1. Overall structure and separation of core and wrappers

The Home Energy Model software is structured to facilitate the use of different sets of assumptions for different policy requirements. Fundamentally, this means that the software is divided into:

- A core calculation component which models heat transfer in the building, demand on heating, cooling and hot water systems and the resulting energy demand for electricity, mains gas etc.
- “Wrapper” components which add pre-processing (e.g., standardisation of occupancy assumptions) and post-processing (e.g., application of emissions and primary energy factors) steps to the core calculation which are suitable for different policies.

The core calculation can be run on its own, but this requires a large amount of input data for a realistic calculation (e.g., hot water draw-off event times and durations for the entire calculation period). Therefore, it is expected that the core calculation would usually be used with some kind of pre-processing step, whether defined in the software itself or externally (e.g., for unofficial purposes).

The application of pre-processing steps by the wrapper means that the input data set required when using the wrapper is different to the input data set required by the core calculation, and the purpose of the wrapper is to transform its own input data set to that required by the core calculation. Usually, it would be expected that this would mean expanding a simpler set of inputs to a more detailed set of inputs and making certain assumptions in order to do so, but it is not a technical requirement that the wrapper input data set is simpler than the core input data set. In transforming the input data set, the wrapper may add, remove or overwrite input data items with which it is provided and will do so according to the policy requirements it is intended to fulfil.

In summary, at the highest level the calculation can be thought of as having three steps where steps 1 and 3 are optional:

1. Wrapper (if applicable): Apply pre-processing of inputs.
2. Core: Run building simulation.
3. Wrapper (if applicable): Apply post-processing of outputs.

Future development

In future, additional wrappers may be defined to suit new purposes, and existing wrappers may be refined.

This publication is available from: https://www.gov.uk/government/publications/home-energy-model-technical-documentation