

Modern Energy Partners Insights

Site energy demand estimator technical notes

Version Number	Date Produced	Owner Initials	Key Changes
V1.0	09/12/2021	MA	Initial Release



Purpose

The Site energy demand estimator creates a range of disaggregated building by building energy profiles, based on aggregate information from your site using a set of representative benchmark profiles, for use in the concept design process. It produces a set of half-hourly demand curves for a whole year for the site. This is achieved by scaling the known benchmarks to match your input aggregate data. Where detailed building data is available, this can be removed from aggregate totals, allowing for the remaining building profiles to be estimated using this tool.

While the estimator has been pre-populated with a number of benchmark profiles, new benchmarks can be added using the Benchmark estimator – electricity and gas data, available on the MEP section of the ESC website.

All resources available for download on the ESC website, are underlined in this document.

Process

The Site energy demand estimator spreadsheet resource is complex and takes some time to solve given the large amount of data it contains. This can cause complications and can result in Excel slowing or in some cases temporarily crashing.

Please note it also requires macros to be enable in order to work correctly. If you have any issues with this, please get in touch via mep@es.catapult.org.uk.

To ensure work is not lost, it is advised that:

- The calculation method is set to 'Manual'¹ (which it has been by default); and
- The workbook is saved after every step is completed.

The following steps provide a detailed guide to populating the Site energy demand estimator for a new site.

Building energy and associated benchmarks

Update benchmark reference data (if required)

- 1) The estimator is set up with a range of standard benchmarks. If standard or existing benchmarks are to be used go to step (6).
- 2) If a new benchmark is required for this site, copy the benchmark (either from own sources or using the Benchmark estimator – electricity and gas data available from the ESC website) to the bottom of the table on the '*Energy Benchmarks*' tab. This must be done as **Paste Values** to avoid creating links from the Site energy demand estimator to other spreadsheets. Any external links will result in slowing of the model solve process.
- 3) Sort the *Energy Benchmarks* data by:
 - a. NDB_ActivityClass
 - b. NDB_RetrofittingOption
 - c. BaseTimePeriod

¹ To change, select "Formulas>Calculation Options>Manual" from the top ribbon

- d. BaseCDay
 - e. Product
 - f. BaseDiurnalTimeSlice
- 4) Add the new benchmark name on the '*Lists*' tab in column A and sort alphabetically
 - 5) Note that the dropdowns on the '*Building Energy*' tab are set up to only allow a limited number of additional use categories. If more than this number of benchmarks are added then the user will need to re-define the range of cells from which this dropdown is selected. This can be done by selecting *Formulas* at the top of Excel and clicking on *Name Manager*. The *UseCategory* range should be changed to allow more options to appear in the dropdown.

Populate Building Energy

- 6) Now populate the '*Building Energy*' tab in phases remembering to save the model at each step. It is often possible to group buildings in the representation rather than include a line item for every individual building on a site. This is normally a good approach when individual building data is not available. It means that energy demand outputs can benefit from the averaging process and avoids false confidence in the precision of the outputs. Buildings should be grouped based on their Use Category and Current Heating System type whenever possible and appropriate. For example, all office buildings on a site with individual gas boilers will be represented as a single line item.
 - a. Enter building numbers, plan areas, storeys and names for each building to be modelled. A maximum of 30 buildings can be modelled (represented by the salmon pink coloured area). The column *Floor Area* is set to calculate based on *Plan Area* and *Storeys*. When actual floor areas are known this calculation can be overwritten with those values (this will replace formula).
 - b. If there are insufficient rows of calculations, please get in touch via the contact details on the cover of the spreadsheet.
 - c. Define the current Use Category using the drop down for each building row.
 - d. Define the Current Heating System for each building row using the dropdown for each building.
 - e. Enter any known annual energy consumption values for each building under the '*Existing Heating System*' columns as required. If annual energy consumption is known for the site, then enter this in the appropriate cell, above that for individual buildings. Both individual row and site annual demands can be entered and the scaling process will work correctly.
 - f. Run the macro "Input Data and Update Calculations" (first button in the top left of the '*Building Energy*' tab).
 - g. Then run the macro "Re-Set Energy Scalars to Unity".
 - h. Calculate the spreadsheet and save.
 - i. Run the macro "Calibrate energy scalars to data" (third button in the top left of the '*Building Energy*' tab).
 - j. Calculate the spreadsheet and save.

Updating values

- 7) If any changes are made to the input data, then it is essential that the following process is followed to ensure that the demand scaling is correct:
- Run the macro “Input Data and Update Calculations” (first button in the top left of the ‘*Building Energy*’ tab).
 - Run the macro “Reset energy scalars to unity” (second button in the top left of the ‘*Building Energy*’ tab).
 - Calculate the spreadsheet and save.
 - Run the macro “Calibrate energy scalars to data” (third button in the top left of the ‘*Building Energy*’ tab).
 - Calculate the spreadsheet and save.

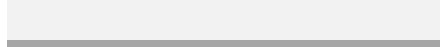
Site energy demand estimator export

The ‘Prepare and Export Demand Data’ button on the ‘*Building Energy*’ tab (fourth from left) will export data from the model and produce a set of half-hourly demand curves for a whole year for the site. Note that this will open a new Excel workbook which should then be saved by the user as required. Details of the contents of this export file are available in a separate document: [Site energy demand estimator output guidance](#).

Site energy demand estimator tab details

The following tables provide details of the information contained on each tab of the [Site energy demand estimator](#). User Input cells are identified by colour. Users should not modify any other cells in the model and the worksheets will be protected to prevent this.

Tabs are coloured as follows:

Sheet Colour in Model	Sheet Type
	Cover / User notes
	Input Sheet
	Benchmark data

Cell Colour in Model	Cell Type
	Input Cell
	Calculations Cell

Building Energy tab details:

Sheet / Cell	Description	User Input
Building Energy	Option selection and energy calculations for each building - current and future	
I10	Annual Electricity Demand: Site Annual electricity demand by building in kWh (User input)	X



	- All electricity should be captured, including any used for heating - Provision for site wide electricity consumption should be captured if required - Energy centre should be separately identified if applicable (i.e. GSHP, ASHP)	
J10	Annual Gas Demand: Site gas demand for all buildings in kWh (User input) Energy centre should be separately identified if applicable (gas fuelled)	X
K10	Annual Biomass Demand: Site Annual biomass demand for all buildings in kWh (User input) Energy centre should be separately identified if applicable (biomass fuelled)	X
L10	Annual Heat Network Demand: Site heat network demand for all buildings in kWh (User input) - For sites with an energy centre supplying the heat network, the energy centre should be captured separately, with provision for any network losses - For sites being supplied by an external heat network, this indicates the total imported energy into buildings	X
P10:S10	Sum of values in columns below	
(Input Data and Update Calculations)	Button to run macro to refresh all information on the sheet and calculate any interim values	X
(Re-set Energy Scalars to Unity)	Button to run macro to set energy scalars to unity. This will mean that benchmark energy demands are used unmodified.	X
(Calibrate Energy Scalars to Data)	Button to run macro to set energy scalars. This will mean that benchmark energy demands are modified to match site energy consumption values	X
(Prepare and Export Demand Data)	Button to run macro to export all information	X
B	Building Number - from site map	X
C	Plan Area from site map (from OS or other mapping)	X
D	Perimeter from site map (from OS or other mapping)	X
E	Storeys from site survey	X
F	Building name - site information	X
G	Use Category - from site survey, categories based on BEES – drop-down of options	X
H	Current Heating System – drop-down of options	X
I	Site Annual electricity demand by building in kWh (User input)	X
J	Site Annual gas demand by building in kWh (User input)	X
K	Site Annual biomass demand by building in kWh (User input)	X
L	Site Annual heat network demand by building in kWh (User input)	X



N	Heating Fuel (on site) - look up based on current heating system selected	
O	Floor Area Adjusted - calculated from plan area and number of storeys (this can be overwritten if the total floor area not in use and not being heated)	Overwrite possible
P	Annual electricity Demand - look up from Electricity Demand Curves tab based on current heating system	
Q	Annual gas demand - look up from Gas Demand Curves tab based on current heating system.	
R	Annual Biomass Demand - look up from Biomass Demand Curves tab based on current heating system	
S	Annual heat network demand - look up from Heat Network Demand Curves tab based on current heating system	
U	Estimated direct CO ₂ emissions - heat and electricity combined	

Other Input Data details

Sheet / Cell	Description
Energy Benchmarks	Energy used by 1/2 hour time slices. Broken down by Building use classification, heating system, characteristic day and energy vector. Benchmarks can be updated / added to if required.
Lists	Contains Use Category list used in drop-downs, to be amended if new use cases are added along with benchmarks.

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