Department for
Business, Energy
& Industrial Strategy

WHOLE LIFE COST OF ENERGY CALCULATOR

User Guide

INDUSTRIAL
STRATEGY

OGL

Contents

Glossary / acronyms

Term	Meaning
District heating	A system for distributing heat generated in a centralised location through a system of insulated pipes for residential and commercial heating requirements such as space heating and water heating.
Energy Supply Agreement (ESA)	An agreement between an energy Supplier and an Off-taker for the supply of energy. The intention is for it to be legally binding and to cover terms such as tariff, availability of supply, service conditions etc.
Heat Supply Agreement (HSA)	As above but specifically for heat.
Levelised cost of energy (LCOE)	The LCOE represents the average revenue per unit of energy generated that would be required to recover the costs of building and operating a generating plant during a specified assessment period.
Off-taker	An entity receiving energy from a Supplier; counterparty to an ESA.
Supplier	An entity supplying energy to an Off-taker; counterparty to an ESA.
Whole life cost	All costs associated with owning and operating an asset over its operating life.

Introduction

*The Whole Life Cost of Energy (WLCOE) Calculator generates the **levelised cost** of energy used by a building or group of buildings. By standardising inputs it seeks to generate standardised outputs with a view to supporting negotiations between energy consumers (Off-takers) and district energy suppliers (Suppliers).*

What the Calculator provides: a levelised cost

Understanding the full cost of heating and cooling a building is an important step in assessing the benefits of connecting to a district energy network.

The levelised cost of energy is a concept widely used within the power sector. BEIS' WLCOE Calculator takes the same principles and applies them to heating, cooling and self-supply electricity generation[1].

The key concept underpinning levelised cost is that in the production of energy, costs are incurred over a period of time, often at irregular intervals (Figure 1). These costs include both capital costs (initial investment and periodic replacement) and operational costs (maintenance, general operations and fuel).

The levelised cost is a metric that enables comparison between different generation types with different capital and operational profiles. In the power sector for example, it enables comparison between the unit costs of wind, solar and nuclear on a consistent basis.

The approach can equally be used to compare the relative costs of different heating or cooling methods, as well as allowing for a differentiation between heating types such as steam, domestic hot water, low temperature space heating etc. all of which will require different types of generating plant with different cost profiles.

---

[1] It is important to include any self-supplied electricity generation when considering the overall levelised energy costs of a site. It should however be noted that the Calculator only considers self-supplied electricity generation linked to heat generation such as via gas CHP. It does not allow for electricity only generation such as from solar PV.
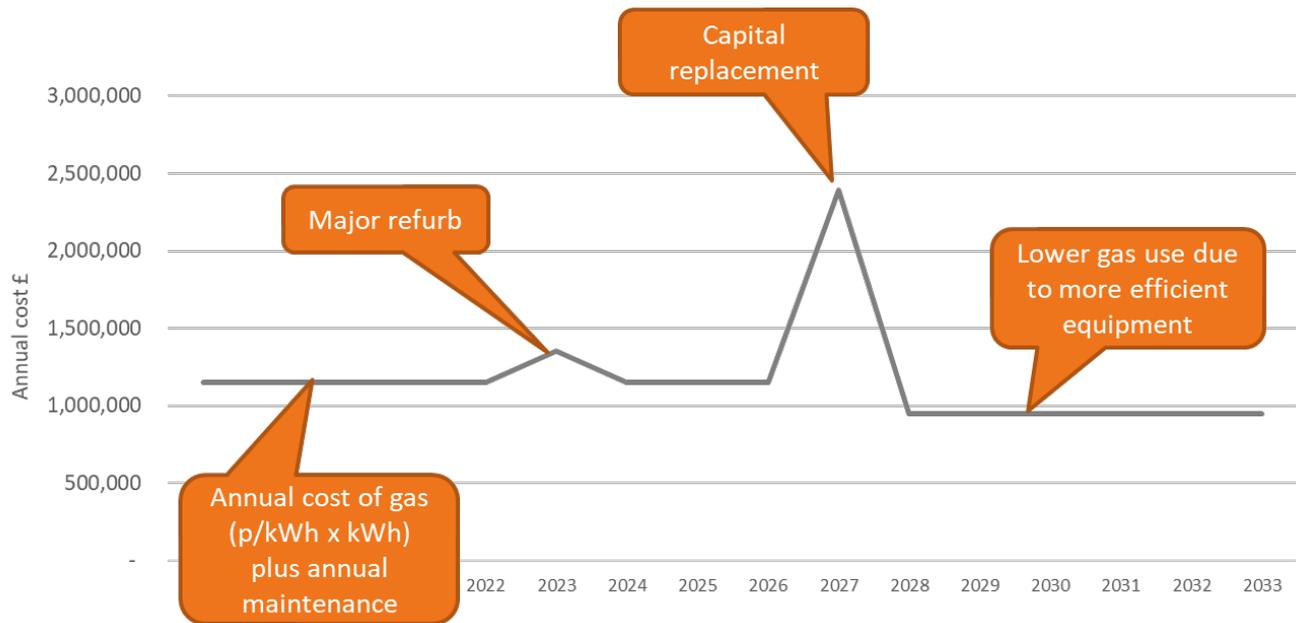
Figure 1 Illustration of 'lumpy' cash flows associated with energy generation; the profile of expenditure and generation and may differ between one system and another

Understanding the whole life cost of heating / cooling is of value to any energy manager, however the specific role envisaged for the Calculator is as a support tool for parties seeking to negotiate an Energy Supply Agreement (ESA) in relation to a district energy system (e.g. a heat network).

The Calculator is designed to capture costs associated with energy generation for a wide range of configurations. It can be used for a single building with a single plant room and fuel supply point or for a portfolio of buildings or campus with several plant rooms, multiple fiscal meters and varying replacement and investment plans (Figure 2).
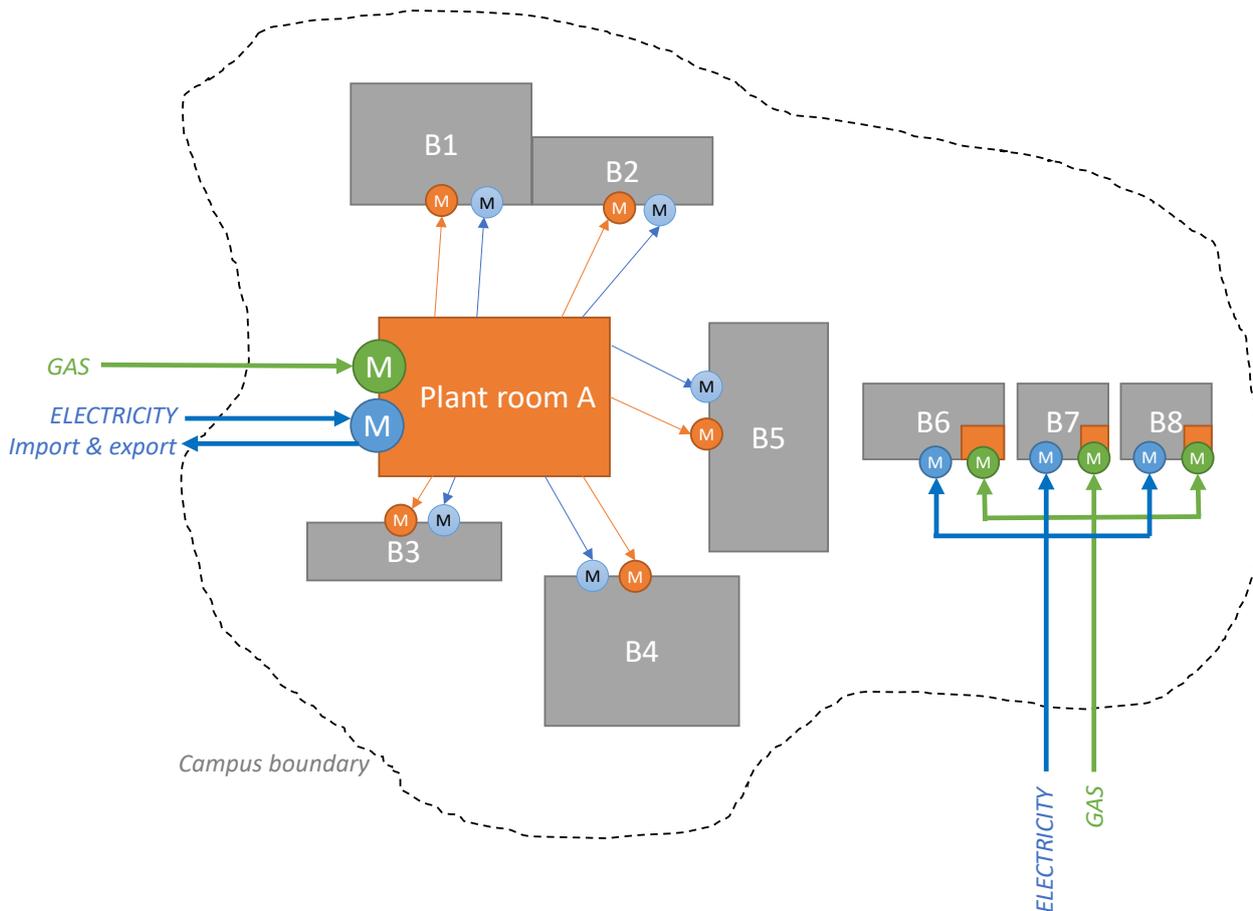
Figure 2 Example assessment boundary combining different plant rooms supplying a range of buildings across a campus

What the Calculator does not provide: a tariff

The Calculator is designed to capture the full whole life costs of heating or cooling a building(s). However, **it does not generate an energy tariff**.

A tariff, e.g. for heat supplied by a district heating network, is a negotiated price that will take into account a broad range of factors. It is likely to consider costs that would be avoided by the Off-taker if connected to the network as well as the Supplier's costs of connection and supply. The aim is to agree a tariff that meets the needs of both parties.

The levelised cost generated by the Calculator is an important starting point for price negotiations but is unlikely to be the final outcome. There are a number of reasons for this:

- The levelised cost expresses the current whole life cost of self-supplying a given energy type in a single p/kWh figure. A tariff will likely reflect, at the very least, a distinction between recovering capital costs, possibly as a fixed standing charge, and operating costs, on a consumption basis.

- Other aspects of a tariff might include seasonal adjustments, control based tariffs, comfort based tariffs etc. These go beyond the scope of the Calculator but the outputs generated by the Calculator could form the basis of negotiating such tariffs.

- Importantly, inflation is treated differently in deriving the levelised cost and a heat tariff.

  The levelised cost derived by the Calculator is the **average** revenue in p/kWh per unit of energy generated that would be required to recover the costs associated with generating that energy i.e. it is a flat figure and assumes no inflation is applied.

  In contrast, a negotiated tariff as part of an ESA would almost certainly include an escalation clause to manage the risk that underlying commodity prices change in future.

  As such, **under no circumstances should the levelised cost derived by the Calculator be taken as the initial value (i.e. in year 0) of an energy tariff for inclusion in an ESA.** To derive the initial value of an energy tariff (i.e. one that would be subject to escalation within the terms of the ESA) a separate calculation would need to be performed. This is currently outside of the scope of the Calculator.

How to use the Calculator

Overview

A goal of the BEIS WLCOE Calculator is to standardise inputs thereby making both inputs and outputs easier to interpret and communicate to stakeholders as well as being comparable across sites.

It does this by having a User Input Form which captures data in a structured way ensuring the calculation of outputs is straightforward and transparent.

Figure 3 gives a high-level map of the tool, each box representing a tab within the workbook. Blue boxes represent input tabs, the primary one being the User Input Form. Input data feeds through to the calculation tabs (black and grey) which in turn feed through to the output tabs (purple). The following sections describe what the User needs to do, and what the Calculator does, to arrive at a levelised cost (in p/kWh) of each of the User's different energy types.
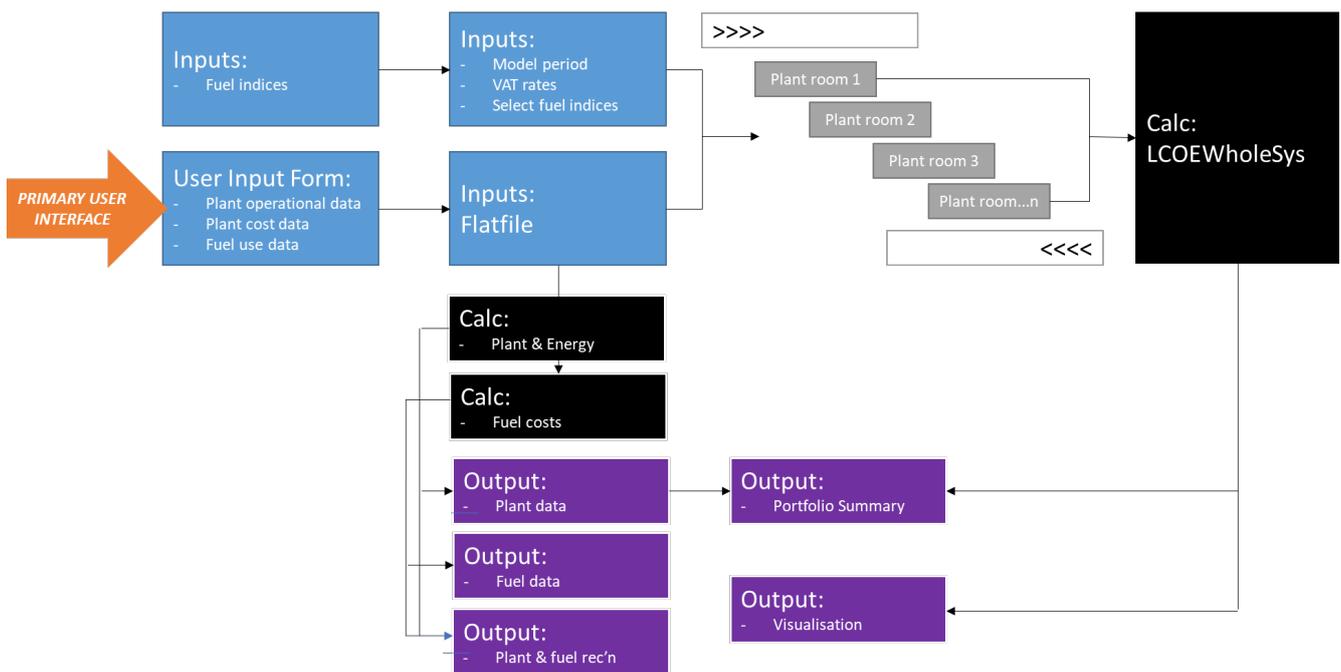
Figure 3 Model map

Four simple steps

STEP 1: Gather your data

STEP 2: Input your data

STEP 3: Check your data and amend if necessary

STEP 4: Review and share your outputs

STEP 1 – GATHER DATA

Input data required by the Calculator is likely to come from two main sources, technical data in relation to plant and equipment and supplier invoices in relation to fuel inputs and maintenance costs. Information required is:

Plant and plant room data

- Technical data for all plant items in all plant rooms. This includes plant capacities (kW), efficiencies (%), and annual fuel use (kWh)

- Maintenance costs, whether they can be allocated directly to a specific piece of plant (e.g. an annual CHP service contract), or whether they are more easily assigned to a plant room as a whole

- Plant life and replacement costs i.e. the year each piece of plant was purchased, its assumed useful life, and the cost of replacement (in current value terms).

Fuel data

- Financial data on fuel delivered to each supply point in each plant room e.g. unit cost (p/kWh), fixed cost (p/day), other charges and levies, plus typical annual consumption (kWh) for gas supplied via each fiscal meter, as obtained from the relevant supply invoice.

STEP 2 – INPUT DATA

> **Tip**: *when using the Calculator, it is best to ensure AutoSave is turn OFF.*
>
> **Tip**: *If you are using the Calculator for the first time, before inputting any data it is recommended to go to the Workbook Reset tab and clicking on the Global Reset button. This button restores the Calculator to its "factory" settings.*

User Input Form

The primary user interface is the User Input Form (see Figure 4 for a screen shot). There are four sections, all of which need to be completed. Further instructions can be found within the workbook in the grey boxes to the right of the input areas.

> **Tip**: *note that there are two ways to input plant and energy data to the Calculator, either here via the User Input Form using a line by line approach, or as described below via the Flat File tab as a bulk import.*

- Section 1: Plant room data

In this section you need to input the name of each of the plant rooms within your site boundary. This may be a central plant room serving several buildings and / or several single plant rooms each serving a single building.

If you account for plant maintenance at an aggregated level (i.e. for a plant room as a whole), you can input these costs here. Alternatively (or as well as), specific plant related costs (e.g. a CHP service contract) can be input in Section 3 below.

- Section 2: Plant room selection

Once you have input all your plant rooms, you can move on to adding your plant data. First, here in Section 2, select the plant room for which you want to add data.

- Section 3: Plant + equipment data for selected plant room

This is a core part of the Calculator and is where you input cost and operational data associated with each piece of energy generating equipment. The process will be iterative to the extent you have more than one piece of equipment in each plant room (you can input up to 15 separate pieces of plant per plant room).

The section is split into 4 parts; the first part describes the plant and energy **input** (e.g. gas boiler of 500kW and 90% efficiency utilising 2.5 GWh of fuel per year); the subsequent 3 parts describe the energy **output** – heating types, cooling or electricity – generated by that piece of plant. It is here that you input plant capacities and efficiencies in respect of the energy output.

- Section 4: Fuel use data

As for the plant section, using Section 4 will be iterative – you can input up to 10 separate fuel sources per plant room.

The Calculator asks for information on the delivery point (e.g. MPRN number for gas, or a store location for biomass), fuel costs (unit charge p/kWh, standing charge £/day) and levies (CCL p/kWh), and fuel import (kWh per year through that meter / delivery point).

It is important that:

- All fuel sources which supply a particular plant room are input to the Calculator (up to a maximum of 10 per plant room).

- Where a fuel source / delivery point (e.g. a particular fiscal meter) supplies more than one plant room, the User should ensure that only the portion of fuel that is used in the plant room selected in Section 2 is included.

You will note that Sections 3 and 4 both include fuel use data in kWh. In Section 3 the User is asked to input the fuel used by a particular piece of plant. In Section 4 they are asked to input the total fuel imported at a named delivery point for that plant room. The idea is that by using different sources of information (e.g. plant data from plant room engineers; fuel data from invoices held by the finance department), the User can undertake some reasonableness checks by comparing and reconciling these two sources (see under Step 3 below).

> **Tip**: note that it is only the fuel use entered in Section 3 in relation to plant operations that is used in the levelised cost calculations. Fuel import data input in Section 4 is for information and cross checking only.

HNDU COUNTERFACTUAL ENERGY COST CALCULATOR
USER INPUT FORM

The "Visualisation" button creates a visual representation of the plant rooms, overall energy balance and costs. See Visualisation tab.

GENERATE VISUALISATION

Tool integrity checks: | OK

NOTES

SECTION 1: ADD PLANT ROOM DETAILS

To add a new plant room:
1. Add plant room name and other relevant information in the yellow boxes.
2. Press 'ADD NEW PLANT ROOM' - summary information will appear in the box to the right. **This may take time.**
3. Repeat for each plant room.

ADD NEW NEW PLANT ROOM   **AMEND PLANT ROOM DETAILS**   **DELETE RECORD**

Plant room name:	text	
Maintenance costs - external	*i.e. maintenance procured from third party suppliers*	£ / pa
Mgt & maintenance - internal	*i.e. mgt & maintenance provided by internal FM team*	£ / pa

CLEAR FORM

1. Input plant room data as instructed. This will update the file and enable plant data to be added below.
2. To amend details, select the plant room that needs amending using the adjacent text box, amend the data in the yellow boxes and click 'Amend Plant Room Details'.
3. It is NOT possible to delete the first plant room, but all subsequent plant rooms can be deleted if necessary.

SECTION 2: SELECT PLANT ROOM

Select the plant room from the drop down list for which you want to add information on plant / equipment (Section 3) and on fuel (Section 4).

0

SECTION 3: ADD PLANT & EQUIPMENT DATA

To add information on the pieces of generating plant in the plant room selected:
1. Enter details in the yellow boxes in the form below
2. Press 'ADD NEW PLANT ITEM'
3. Repeat for each additional item (up to a maximum of 15)

ADD NEW PLANT ITEM   **AMEND EXISTING PLANT ITEM**   **DELETE EXISTING**   **DESELECT PLANT FROM LISTBOX**

Plant room ID		1
Plant room name:		

1. 0 | £0 | 0 yrs | £0

CLEAR FORM

Plant name	*Your own internal reference*	text
Plant type		drop down
Fuel input type		drop down
Fuel supply point	*i.e. supply point for fuel used by this item*	Location / MPAN
Avg annual fuel use (metered)		kWh
Replacement cost	*Use today's prices*	£
Original purchase date		yyyy
Estimated life		Nr. yrs
Avg annual maintenance costs	*Costs specific to this item*	£/pa
Heat output type	*i.e. what form of heat is generated?*	drop down
Thermal capacity (rated / installed)		kW
Avg annual thermal capacity factor	*set at 100% if not known*	%
Gross thermal efficiency (boiler plate)		%
Gross thermal efficiency (actual)	*gross thermal output (kWh) as % of fuel input*	%
Is efficiency estimated or measured? (heat)		drop down
Electrical output - % used on site		%
Electrical capacity (rated / installed)		kW
Avg annual electrical capacity factor	*set at 100% if not known*	%
Electrical efficiency (boiler plate)		%
Electrical efficiency (actual)	*electrical output (kWh) as % of fuel input*	%
Is efficiency estimated or measured? (elec)		drop down
Cooling output	*Cooling type i.e. refigeration or space cooling?*	drop down
Cooling capacity (rated / installed)		kW
Avg annual cooling capacity factor	*set at 100% if not known*	%
Cooling efficiency (boiler plate)		%
Cooling efficiency (actual)		%
Is efficiency estimated or measured? (cool)		drop down

4. To change plant data that has already been entered, select the item you want to amend by highlighting it in the list box, enter the revised details in yellow boxes in col F and click on the 'Amend Existing Plant Item' button.
5. If you want to delete an item of plant, select it in the listbox and press 'Delete Existing'.
6. If you have entered information in yellow boxes and want to use this to create a new item but have already selected an item in the list box, press the 'Deselect Plant From Listbox' button and then press 'Add New Plant Item'.

SECTION 4: ADD DATA REGARDING FUEL USE WITHIN EACH PLANT ROOM / AREA

To add information on fuel used in the plant room selected (**IMPORTANT: READ NOTES IN COL R**):
1. Enter details in the yellow boxes in the form below
2. Press 'ADD NEW FUEL SOURCE'
3. Repeat for each additional item (up to a maximum of 10)

ADD NEW FUEL SOURCE   **UPDATE EXISTING FUEL**   **DELETE EXISTING**   **DESELECT FUEL TYPE**

Plant room ID		1
Plant room name:		

1. 0 | 0 | 0 kWh/pa

CLEAR FORM

Fuel		type
Delivery point / meter no.		Location / MPAN
Avg annual import	*say, 3 year average - as used by the PLANT ROOM (note 9)*	kWh
Unit cost	*as per current invoice*	p/kWh
Standing charge	*as per current invoice*	£/day
CCL	*as per current invoice*	p/kWh
Other charges	*as per current invoice*	p/kWh

7. This is where fuel costs are entered; if no data is input here the LCOE cannot be calculated.
8. All fuel sources which supply a particular plant room need to be added.
9. Where a fuel source / delivery point (e.g. a particular fiscal meter) supplies more than one plant room, it is important to ensure that only the portion of fuel that is used in the plant room selected is included here.

END OF PAGE

Figure 4 Screen shot of the User Input Form showing the 4 sections that need to be populated. Additional notes and guidance are provided in the grey boxes.

General Inputs tab

There are a number of inputs to consider that apply globally to all plant rooms (Figure 5). These are:

- Appraisal period: this is the number of years of cash flows to be included in the levelised cost calculation.

- Discount rate: typically the discount rate used would be your hurdle rate for investment in any replacement capex.

- Lead time for capital replacement: this is the amount of time (default value 1 year) that it is expected to take to install and commission a piece of new equipment.

- VAT rates: in some circumstances, and Off-taker may not be able to recover all the VAT incurred on purchases. Global irrecoverability rates for fuel, operating and replacement costs can be input here.

- Selected fuel indices: a range of different fuel price indices are provided with the Calculator (see section below on the Fuel Indices tab) and it is important to select the preferred option here.

INPT; General

Appraisal start year	*Year*	2019	
Month start	*Month*	Jan	
Appraisal period	*Years*	40	
Discount rate (for LCOE calcs)	*%*	0.0%	

GENERATE VISUALISATION

The "Visualisation" button creates a visual representation of the plant rooms, overall energy balance and costs.

CAPITAL REPLACEMENT ASSUMPTIONS

Lead in time for capital replacement	*Years*	1

VAT ASSUMPTIONS

Note: global VAT assumptions input here can be over-ridden on each plant room LCOE calculation tab (between >>> and <<< on the tab list)

		Rate	% VAT irrecoverable
VAT on fuel purchases	*%*	20.0%	0.0%
VAT on repex	*%*	20.0%	0.0%
VAT on opex	*%*	20.0%	0.0%

SELECTED FUEL INDICES

User needs to select an appropriate fuel index using drop downs associated with yellow cells below. Bespoke indices can be added on the INPT; Fuel Indices tab.

Biofuel	*index*	[USER INPUT PROFILE 3]	12
Biomass	*index*		0
Coal	*index*		0
Electricity	*index*	IAG Central Electricity: Domestic	2
Gas	*index*	IAG Central Gas: Commercial/ Public sector	6
Heat	*index*		0
LPG	*index*		0
Oil	*index*	IAG Central Oil: Domestic	8
Other	*index*		0
RDF	*index*		0

UNIT CONVERSIONS

p to £	*Factor*	100
kW to MW	*Factor*	1,000
Days in year	*Days*	365

END OF SHEET

Figure 5 Screen shot of General Inputs tab

Fuel Indices tab

This tab is pre-populated with real price indices for a range of different fuels and consumer types. These are published periodically by BEIS for energy policy appraisal[2]. The User can also input their own indices if preferred.

> **Tip**: note that *real* prices are used in the Calculator, that is, *no money inflation is included*.

Flat File tab

This is where all the data input via the User Input Form is stored. The format has been designed to enable the tool to select and draw down inputs as appropriate for the calculations.

If you have input data via the User Input Form you will not need to touch this tab.

However, if you have a large number of plant rooms and pieces of equipment it may be quicker to input the data directly to this sheet rather than via the User Input Form. If so, it is important not to add or change any columns on the sheet.

To input data directly, paste **values** into the tab "INPT; FlatFile" from cell B13 onwards (Figure 6). Then press the "Manual Flat File Import" button. Note that to successfully import you must ensure that where drop downs are used in the main input form ("INPT; User Input Form") the labels are **exactly the same** as those in the lists set out in Appendix 2.

	MANUAL FLAT FILE IMPORT			Note, this tab is populated automatically with data input via the User Input Form. However, you can input data directly to the tab if considered easier (e.g. if you have large numbers of plant rooms etc.). To do so, paste values into the yellow input cells below and then press the "Manual Flat File Import" button. This will update the tool accordingly. Note that, for this to work **you must at least input a plant room name,** and it is important not to leave blank rows between plant rooms.		FLAT FILE INTEGRITY CHECK:	OK
						LC INTEGRITY CHECK:	OK
						TOOL INTEGRITY CHECK:	**OK**

Plant room ID	Plant room name:	Maintenance costs external	Mgt & maintenance - internal	Plant name 1	Plant type 1	Fuel input type 1	Fuel supply point 1	Avg annual fuel use (metered) 1	Replacement cost 1	Original purchase date 1	Estimated life 1	Avg annual maintenance costs 1	Heat output type 1	Thermal capacity (rated / installed) 1	Avg annual thermal capacity factor 1
#		£	£	text	type	type	MPAN no.	KWh	£	mm/yy	Nr. yrs	£	type	kW	%

Figure 6 Screen shot of INPT; FlatFile tab

---

[2] See https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

STEP 3 – CHECK DATA

The Calculator generates output sheets that enable you to review and check your inputs in a systematic way.

- OUTP; Plant Data: this sheet contains all the plant data you have input in relation to each plant room in a standard format.

- OUTP; Fuel Data: this sheet contains all the fuel data you have input in relation to each plant room in a standard format.

These two output sheets are designed to be easy to check. If you spot any errors or anomalies, you can go back and amend them via the User Input Form. Simply call up the relevant plant room and piece of equipment and amend as instructed on the tab.

- OUTP; Plant v fuel rec

This sheet adds together the fuel use as entered for each piece of plant (Section 3 of the User Input Form) and compares it with the fuel use entered in relation to the fuel supply point(s) (Section 4 of the User Input Form). The data is aggregated according to the supply point reference (e.g. MPRN number) for each plant room.

Differences between the two data sources may need investigating. Some may be easily explained e.g. if fuel imported at a particular fuel supply point also supplies cooking equipment and therefore does not appear in the plant data section. Note that the important number for the levelised cost calculations is the **fuel use per item of plant** (input via Section 3) rather than the fuel imports (input via Section 4).

STEP 4 – REVIEW OUTPUTS

> For details on how outputs are calculated see Appendix 1.

The main output tabs that show the levelised cost are:

- OUTP; Portfolio Summary

This output sheet shows the levelised cost of the different types of energy used in your building / portfolio based on your input data. It also aggregates and summarises key information for each plant room.

- Visualisation

This is designed to help you understand energy flows across your site and can be used for communication with stakeholders. The visualisation can be created via buttons on either the User Input Form or the General Inputs tab.
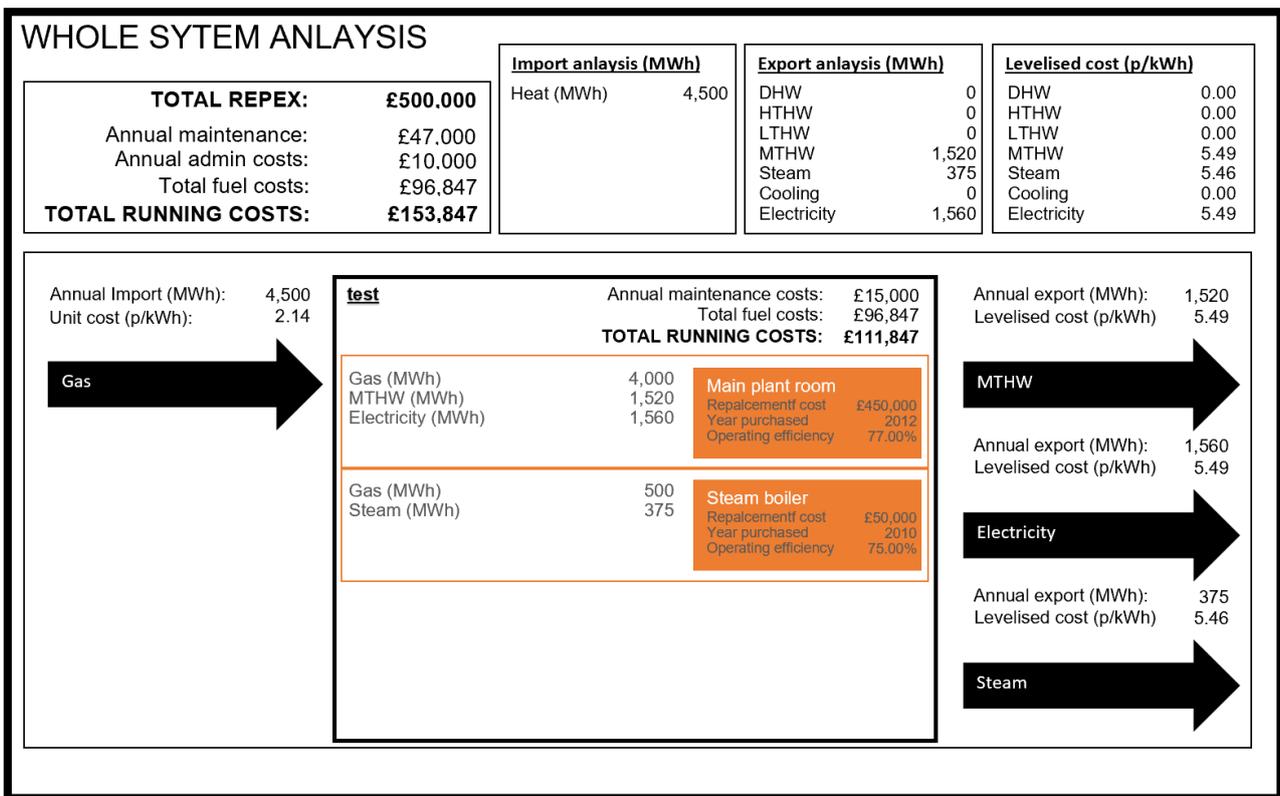
Figure 7 Example visualisation generated by the Calculator for one plant room

Appendix 1: Detailed WLCOE Calculations

Workbook structure

The model follows a standard inputs, calculations, outputs logic. Users have full control over inputs. This section describes how these inputs are used to generate the outputs.

For each plant room added on the User Input Form, the Calculator creates a worksheet (the tabs are numbered 1, 2, …n and appear between arrows tabs >>> <<<). These worksheets are identical in structure enabling them to be summed in worksheet **CALC; LCOE WholeSYS** to generate a levelised cost for the overall portfolio.

The sections below describe the core levelised cost formula and the approaches taken to derive its various inputs.

The levelised cost calculations are repeated separately for each energy **output** type i.e. heat (in different forms), electricity and cooling.

> **Important note**: *where a single piece of plant delivers more than one energy output type (the most notable example being a CHP engine generating heat and electricity)*, **costs are apportioned on the basis of relative energy output** *(kWh).*

Core levelised cost formula

The levelised cost calculation represents a time value adjusted whole life cost of energy expressed as a p/kWh value. The formula is:

WLCOE (p/kWh) =

$$\frac{\sum_{t=1}^{x} \frac{NPCx}{(1+r)^n}}{\sum_{t=1}^{x} \frac{(EDx)}{(1+r)^{x-0.5}}}$$

Where:

x = period over which assessment is being made (in years)

n is the period x adjusted for the timing of the cost – for example asset purchases are assumed to occur on the last day of the period (therefore n = x) while operating costs are assumed to relatively even across the year (therefore n = $x - 0.5$ where 0.5 would adjust the timing to the middle of the year which is equivalent to the midpoint).

NPC = Net project costs (in pence) over time period x

r = the real discount rate (as a %)

ED = energy demand in a given period x (as kWh)

Assessment period (x)

This is input by the User via the General Inputs tab. The Calculator creates flags as determined by this value to limit all cash flows to the period selected.

The assessment period has a significant impact on levelised cost. Essentially, the shorter the appraisal period the higher the levelised cost as shown in Figure 7. To the extent that the levelised cost is used in tariff negotiations, it will be important to align the appraisal periods used by both parties.

10% discount							
Levelised cost of heat	Years	10	15	25	35	40	Project
	p/kWh	12.46	10.15	9.06	8.77	8.77	8.77
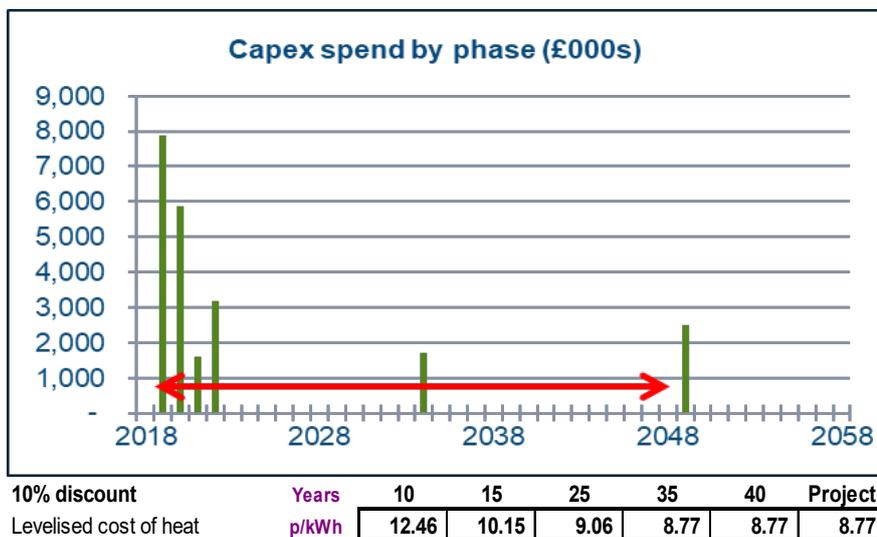
Figure 8 Illustration of the impact of assessment period on levelised cost

Net Present Cost (NPC)

Note: *The Calculator generally works on the basis of single cell inputs entered via the User Input Form. However, it is recognised that in some cases variables may be forecast to change over time, e.g. planned energy efficiency measures may be put in place that will reduce fuel requirements. In this case, the User can input a time variable profile into the model. This is done on the relevant plant room calculations tab (i.e. the relevant grey tab between the >>> and <<< markers).*

The elements of the NPC and how they are determined are described in Table 1.

Table 1 Explanation of each element of the Net Present Cost

Cost element	How it is determined	Comments
Fuel – variable cost element, annual (£/yr)	Annual variable cost = fuel use (kWh) x variable fuel price (p/kWh) x real fuel price index	Real price fuel indexation is applied here. The Calculator uses the index for the relevant fuel type as selected by the User in the General Inputs tab.
Fuel – fixed cost element, annual (£/yr)	Annual variable cost = fixed fuel price (£/day) x days in year	No indexation applied. Days in the year adjusted for leap years.
Maintenance – plant room (£/yr)	Total annual plant room cost split across each energy type according to its relative share of total plant room energy output	
Maintenance – plant specific (£/yr)	Annual plant maintenance cost split across each energy type according to its relative share of plant energy output	
Replacement costs	Year in which replacement cost is incurred = purchase year + economic life	Note that it is assumed that replacement cash flow occurs at the end of the replacement year and is discounted using the End of Period discount rate
Terminal value	Equal to the replacement cost less the amount depreciated by the end of the assessment period, where annual depreciation = replacement cost / useful life	The terminal value is treated as a capital receipt in the final year of the assessment period in order to reflect the fact that a piece of equipment purchased towards the end of the assessment period may still have some value in use at that point.

Cost element	How it is determined	Comments
VAT	Applied to all costs where deemed to be irrecoverable (i.e. VAT rate x % irrecoverable)	

Real discount rate (r)

The discount rate needs to be entered by the User via the General Inputs tab. The model assumes REAL rates are used, i.e. excluding the effects of inflation.

The model applies the discount factor according to the best approximation of the timing of the cash flows within a year, that is beginning, middle or end.

Operational and fuel costs are deemed to occur in Middle of the Period (i.e. period value $x - 0.5$), while replacement costs are deemed to occur at End of Period (i.e. period value x).

The discount rate is a core part of the levelised cost calculation. The discount rate selected may depend on the User's investment hurdle rate for plant replacement costs and will be an important factor to consider in tariff negotiations.

Energy Demand (ED)

The denominator of the levelised cost formula is the annual energy output (kWh) in each year of the appraisal period, discounted at the assumed discount rate (r).

Appendix 2: Drop down lists

Plant Type:
Ancillary equipment
Back up generator - diesel
Battery
Boiler - biomass
Boiler - gas
Chiller - electric
Chiller - other
CHP - biomass
CHP - gas
Heat pump - air
Heat pump - water
Other
Thermal store

Fuel input
Biofuel
Biomass
Coal
Electricity

Gas
Heat
LPG
Oil
Other
RDF

Heat output
DHW
HTHW
LTHW
MTHW
Steam

Efficiency
Estimated
Measured

Cooling Output
Refrigeration
Space cooling

This publication is available from: www.gov.uk/government/publications/calculating-the-full-cost-of-energy-used-by-buildings

If you need a version of this document in a more accessible format, please email enquiries@beis.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.