User
Guide

iSBEMie

An Interface for SBEMie (Simplified
Building Energy Model for Ireland)

*For calculating and rating the energy performance of new and existing non-
domestic buildings in the Republic of Ireland - Part of the Non-Domestic Energy
Assessment Procedure (NEAP)*

A User Guide to iSBEMie:

(3) BER Generation

iSBEMie version 5.5.h

13 December 2019

seai SUSTAINABLE
ENERGY AUTHORITY
OF IRELAND

Version history

User guide version	For iSBEMie version	Building Regulations
3rd December 2010	3.5.b (iSBEM)	2007
30th November 2018	5.5.h	2017
13th December 2019	5.5.h	2017

Key changes and additions from previous versions of the User Guide

Changes and additions in version 5.5.h:

NEW

Modified

Further guidance

Changes related to **new** or **modified functionality** in the new version as well as further explanation or clarification of **existing** parameters and functionality in iSBEMie are listed below and denoted in this guide using the "NEW", "Modified" and "Further guidance" icons in the left margin.

- New button to allow attaching an additional interface file created by third party software to the BER XML file in the *General* form (see Section 3.2: General form).

- Modified MPRN parameter to allow input of multiple MPRNs for the same building model (see Section 3.2.2: General Information tab).

- Modified layout of results and location of buttons for accessing output reports in the *Ratings* form (see Section 4.1: The Ratings form).

- New sub-tab showing for Graphic Rating in the Ratings form (see Section 4.1.1: Building Energy Rating tab).

This manual and the adaptation of the software tools described in it, for the Republic of Ireland Building Regulations, were developed by the BRE for Sustainable Energy Authority Ireland (SEAI). This manual is a version specifically adapted for the Republic of Ireland from the original UK User Guide which, together with the software tools described in it, was developed by the BRE for the Ministry of Housing, Communities, and Local Government (MHCLG).

Disclaimer

The iSBEMie User Guide cannot provide legal advice or a definitive interpretation of the law. The guidance provided in this document is limited to the technical operation of the software tool. It is offered in good faith but is not binding on any person(s) or organization. The same applies to the default values in the interface, which should be viewed as conservative suggestions intended to be replaced by actual values.

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Acronyms used in iSBEMie and this guide

AHU	Air Handling Unit
BER	Building Energy Rating
BRIRL	Building Regulations Ireland Part L (The Building Regulations compliance checking module)
CCHP	Combined Cooling, Heat, and Power
CEN	Comité Européen de Normalisation (The European Committee for Standardisation)
CHP	Combined Heat and Power
CO_2	Carbon dioxide
CPC	Carbon Performance Coefficient
ECA	Enhanced Capital Allowance
EER	Energy Efficiency Ratio
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Coefficient
BERgen	Building Energy Rating Generator (The BER generator module)
ETL	Energy Technology List
HEPA	High Efficiency Particulate Air
HTHW	High Temperature Hot Water (boiler)
HVAC	Heating Ventilation and Air Conditioning
HWS	Hot Water System
iSBEMie	Interface for SBEMie
LTHW	Low Temperature Hot Water (boiler)
LZC	Low or Zero Carbon
MPCPC	Maximum Permitted Carbon Performance Coefficient
MPEPC	Maximum Permitted Energy Performance Coefficient
MTHW	Medium Temperature Hot Water (boiler)
NEAP	Non-domestic Energy Assessment Procedure
PVS	Photovoltaic System
RER	Renewable Energy Ratio
SBEMie	Simplified Building Energy Model for Ireland
SSEER	Seasonal System Energy Efficiency Ratio
SSEff	Seasonal System Efficiency
SES	Solar Energy System
SFP	Specific Fan Power
VAV	Variable Air Volume
VRF	Variable Refrigeration Flow
AHU	Air Handling Unit
BER	Building Energy Rating

1. WHAT IS IN THIS GUIDE

1.1.   Scope of the guide

The objective of this document is to give step-by-step guidance on the use of iSBEMie, an interface to SBEMie (Simplified Building Energy Model for Ireland) for the purpose of generating Building Energy Rating (BER) certificates for non-domestic buildings in the Republic of Ireland.

This guide includes:

- How to work through the steps of the input procedure that are specific to BER calculations or different to those for compliance assessments, which are described in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".
- How to obtain the BER Certificate and accompanying Advisory Report.

This guide **does not** include:

- A detailed description of the structure of the NEAP.
- A full definition of the Notional building which is used to produce the BER. This can be found in the NEAP Modelling Guide which is available from SEAI's website at www.seai.ie.
- A description of the contents of the NEAP Construction, Glazing, or Activity databases.
- A detailed description of SBEMie, the calculation engine to which iSBEMie is an interface. This is described in the SBEMie Technical Manual, available for download from SEAI's website at www.seai.ie.
- How to set up iSBEMie to operate on your computer, how to assemble the required information for your own building, how to zone your building, or how to convert files created with previous versions of iSBEMie to be compatible with the current version. This can be found in the User Guide volume "**How to use iSBEMie: Basics**".
- A tutorial. This can be found in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

This manual is one volume in a set of documentations for the iSBEMie User Guide. The other volumes in this set are as follows:

- **How to use iSBEMie: (1) Basics** - Contains an introduction to the use of iSBEMie, an interface for SBEMie (Simplified Building Energy Model for Ireland) - an approach for the Non-Domestic Energy Assessment Procedure (NEAP) for assessing the energy performance of buildings.

- **How to use iSBEMie: (2) Compliance Assessment** - Contains step-by-step guidance on the use of iSBEMie for the purpose of assessing compliance with the building regulations for non-domestic buildings in the Republic of Ireland.

2. CALCULATION BASICS

2.1. Building Energy Rating Certificates in the Republic of Ireland

The calculation procedure required by the NEAP is explained more fully in the NEAP Modelling Guide. SBEMie complies with the NEAP. It is suitable for use with the majority of buildings, but some designs will contain features that mean that more accurate energy calculations may be obtained by more sophisticated calculation methods.

This section briefly defines the "Notional" building, which is the basis of setting the energy rating scale for Building Energy Rating (BER) Certificates for non-domestic buildings in Ireland. The BER of the Actual building is the ratio of the primary energy consumption rate of the Actual building to that of a Notional building (where both values are in kWh/m^2.annum). The BER Certificate also displays the CO_2 Emissions Indicator of the Actual building which is calculated as the ratio of the CO_2 emission rate from the Actual building to that from the Notional building (where both values are in $kgCO_2/m^2$.annum).

BERs are intended to send market signals about the relative performance of comparable buildings, and so it is necessary that the Notional building should be the same for all buildings of a given type. In order to provide this consistency, the Notional building must be the same irrespective of: (a) whether the Actual building is naturally ventilated or air conditioned and (b) the fuel choice in the Actual building.

Detailed specifications of the Notional building are in the 2017 NEAP Modelling Guide (available from SEAI's website at www.seai.ie). Key among them are:

a. The heating and hot water service is always met by a gas-fired system irrespective of whether a fuel other than gas is used in the Actual building, or gas is even available in the locality of the Actual building.

b. Each space which is unconditioned, i.e., unheated and uncooled, in the Actual building will also be unconditioned in the Notional building. In all other cases, the spaces in the Notional building have a fixed servicing strategy regardless of the strategy adopted in the Actual building, such that:

    - Each space in the Notional building is heated to the heating setpoint defined in the Activity Database;

    - Each space in the Notional building is cooled, to a fixed cooling setpoint (mixed-mode cooling), irrespective of whether the particular space in the Actual building has cooling provision or not;

    - Each space in the Notional building is naturally ventilated, irrespective of whether the corresponding space in the Actual building has natural or mechanical ventilation.

The BER is also converted into an energy band/grade on an "A-G" scale, as shown in Table 1 (with A1 being the most efficient and G being the least efficient).

Scale	Band
BER < 0.17	A1
0.17 ≤ BER < 0.34	A2
0.34 ≤ BER < 0.50	A3
0.50 ≤ BER < 0.67	B1
0.67 ≤ BER < 0.84	B2
0.84 ≤ BER < 1.00	B3
1.00 ≤ BER < 1.17	C1

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1.17 ≤ BER < 1.34	C2
1.34 ≤ BER < 1.50	C3
1.50 ≤ BER < 1.75	D1
1.75 ≤ BER < 2.00	D2
2.00 ≤ BER < 2.25	E1
2.25 ≤ BER < 2.50	E2
2.50 ≤ BER < 3.00	F
3.00 ≤ BER	G

Table 1: BER scale and energy bands

NB: The domestic type activities available under the building type "Residential spaces" in iSBEMie are to allow the energy calculations for the generation of one BER certificate for a building which contains residential accommodation above a non-domestic space (e.g., a shop or a pub) provided that the residential space can only be accessed from within the non-domestic space, i.e., the residential part is not designed or altered for use as a separate independent dwelling. In addition to common circulation areas of apartment buildings containing self-contained flats, these are the **only** cases where SBEMie can be used to model domestic areas.

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3. ENTERING A BUILDING INTO iSBEMie

This chapter takes you through each of the iSBEMie data entry forms consecutively (the *General*, *Project Database*, *Geometry*, and *Building Services* forms), giving guidance on what information is required at each stage, wherever it is different to, or in addition to, that required for compliance assessments as described in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.1.   Important note on the default values in iSBEMie

In iSBEMie, there are default values included for various parameters. For example, there are default seasonal efficiencies for HVAC systems and default constructions for envelope elements so that you can select them when defining the envelopes of a zone when learning how to use the tool. These default values are not generous (i.e., usually pessimistic), should be checked by the user, and, if appropriate, changed or added to.

NB: If none of the default values in iSBEMie are changed when modelling a new building, it is likely that the building will achieve a poor BER.

3.2.   General form

The *General* form contains two tabs:

- **File Options** tab
- **General Information** tab

3.2.1. File Options tab

The *File Options* tab has five sub-tabs:
- **File Operations** sub-tab.
- **System Configuration** sub-tab.
- **System Configuration (cont.)** sub-tab.

File Operations sub-tab:

Guidance on functionalities in this sub-tab not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

NEW This sub-tab (shown in Figure 1) allows the user to define an additional interface file created by third party software (i.e., not iSBEMie) for the project whose nct file is currently open in iSBEM. This is useful only if the calculation is for the purposes of a BER, as that additional file will be stored, as is, in the XML file generated by BERgen for lodgement onto the BER National Register. This file can be selected from the folders and files on the user's computer by clicking on the "Choose file" button.
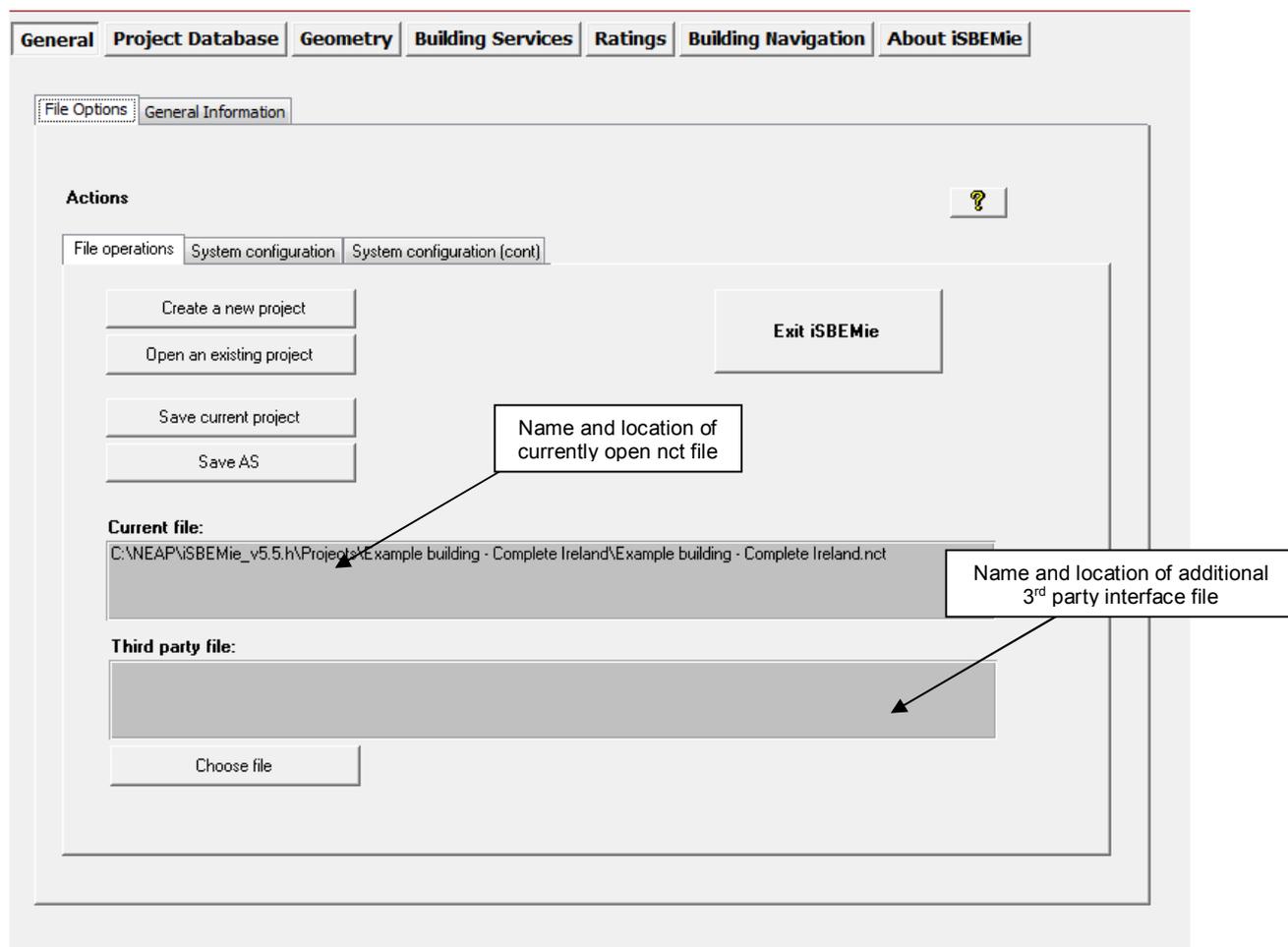
Figure 1: The File Options tab in the General form

Modified

System Configuration sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

System Configuration (cont.) sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.2.2. General Information tab

The *General Information* tab contains a few sub-tabs, as described below, where you can enter as much or as little background information about the project. However, there are also essential parameters to be selected, such as the weather location for the project and the purpose of the analysis. These details can be entered and edited in their respective tabs (see Figure 2). Some of this information may have already been entered when the project was first created (see the User Guide volume "**How to use iSBEMie: Basics**").

The *General Information* tab contains the following sub-tabs:

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- **Project Details** sub-tab.
- **Building Details** sub-tab.
- **Energy Assessor Details** sub-tab.
- **Client Details** sub-tab.

Figure 2: The General Information tab in the General form

Project Details sub-tab:

Guidance on input parameters in this sub-tab not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

In this sub-tab, the following information can be entered (Figure 2):

Building Regulations & BER parameters

1. Purpose of the analysis – purpose for carrying out a calculation using iSBEMie, e.g., Republic of Ireland: Building Energy Rating.

2. Tick box to indicate whether, in addition to producing a BER, you wish to check compliance with Building Regulations and produce a compliance document (relevant for new buildings only).

3. Weather location (pick the closest to your site from the available locations) – there is currently only 1 weather location to be used for all energy calculations in the Republic of Ireland, i.e., Dublin.

4. Stage of analysis – whether 'Existing Building - Final', 'New Building – Final', or 'New Building - Provisional'.

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NB: Final BER certificates are generated in colour and valid for 10 years while provisional ones are generated in greyscale and valid for 2 years.

5. Project complexity – complexity of the building for the purposes of energy assessments for BER Certificates. The options available are:

- 'Level 3' – simple, existing buildings that can be modelled using iSBEMie, e.g., small buildings such as converted houses or doctors' surgeries.

- 'Level 4' – new and existing buildings that can be modelled using iSBEMie, e.g., small purpose-built office buildings.

- 'Level 5' – new and existing complex buildings that need to be modelled using Dynamic Simulation Models (DSMs), e.g., large office buildings or factories.

NB: If in doubt about whether iSBEMie would be appropriate for modelling your building, refer to SEAI.

Modified **Figure 3: The Building Details sub-tab of the General Information tab in the General form**

Building Details sub-tab:

Guidance on input parameters in this sub-tab not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

In this sub-tab (Figure 3), the following information can be entered:

Building Details

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1. MPRN - the Meter Point Reference Number (MPRN) of the building. One or more MPRNs can be entered for the building modelled, and they will all be recorded in the BER XML file. However, only the first one on the input list will appear on the draft Advisory Report which is generated on the user's computer. Each MPRN must consist of 12 digits, with the first digit being 0, and should not be left blank.

2. Year of construction – the year the building was constructed.

Energy Assessor Details sub-tab:

Guidance on input parameters in this sub-tab not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

This sub-tab (Figure 4) contains one sub-form: *Energy Assessor Details*.

Figure 4: The Energy Assessor Details in the General form

Energy Assessor Details sub-form: in this sub-form, the following information can be entered:

1. Accreditation Scheme – the name of the Accreditation Scheme to which the energy assessor belongs. This parameter is currently always set to SEAI and cannot be changed by the user.

2. Assessor number – the registration number of the energy assessor within their Accreditation Scheme. This parameter must consist of 6 digits, and it should not be left blank.

3. Emp/Trading Name – the employer or the trading name of the energy assessor. **NB:** The input should be exactly as you want it to appear in the XML file.

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4. Emp/Trading Address – the employer or the trading address of the energy assessor. **NB: The input should be exactly as you want it to appear in the XML file.**

5. Assessor Comp. No. – the company number of the energy assessor's employer. This parameter must consist of 6 digits, and it should not be left blank.

Client Details sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.3. Project Database form

Guidance on input in this form is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.4. Geometry form

Guidance on input parameters in this form not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.4.1. Project tab

This tab consists of the following two sub-tabs:

- **General & Geometry** sub-tab
- **Thermal Bridges** sub-tab

General & Geometry sub-tab:

Guidance on input parameters in this sub-tab not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

This sub-tab requires the input of the following information, as shown in Figure 5:

Building Infiltration (Global)

1. Air permeability at 50 pa (m^3/h.m^2) - If the purpose of analysis option that has been selected in the *General* form > *General Information* tab > *Project Details* sub-tab is 'Republic of Ireland: Building Energy Rating' only, i.e., without a simultaneous Building Regulations compliance check, then iSBEMie's default value for air permeability will be 25 m^3/h.m^2. If the relevant box is ticked to also carry out a compliance assessment, then the default value in the interface is 10 m^3/h.m^2. Either way, however, the user can over-write the default value by manually entering an alternative value.

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Figure 5: General & Geometry sub-tab of Project tab in the Geometry form

Thermal bridges sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.4.2. Defining zones – Zones tab

Guidance on input parameters in this tab not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

NB: For BER calculations purposes, we recommend that users generally avoid creating more than 100-150 zones in iSBEMie. However, the processing time will depend on the total number of objects (not just zones), i.e., zones, envelopes, windows, etc. Note that for the BER to be calculated, 3 buildings need to be generated: Actual, Reference, and Notional, i.e., all the objects in the input are multiplied by 3 to give the total number of objects being processed by SBEMie. Hence, creating a project with a very large number of objects will slow down the calculation and may cause it to crash. That said, see guidance on the optional 64-bit version of iSBEMie in the User Guide volume "**How to use iSBEMie: Basics**" which should allow the processing of projects with a larger number of zones, provided your computer has a 64-bit operating system.

Further
guidance

The *Zones* tab contains four sub-tabs:
- **General** sub-tab.

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- **Quick Envelopes** sub-tab.
- **Thermal bridges** sub-tab.
- **Envelope Summary** sub-tab.

General sub-tab:

Guidance on input parameters in this sub-tab not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

To create a zone, you will need to click into the *General* sub-tab of the *Zones* tab, add a new record, and enter the following information:

1. HVAC System – If you have defined your HVAC systems before defining your zones (i.e., if you have started with the *Building Services* form instead of the *Geometry* form), you can select the HVAC system that serves this zone from the drop-down list. If no HVAC system serves the space (i.e., an unconditioned zone that is intended to remain that way), select 'Zones without HVAC system' (spaces which have no heating or cooling, e.g., plant rooms, storage spaces, exposed circulation spaces). If you have not yet defined your HVAC system, this can be left as 'Unassigned' at this stage. You will be able to assign the zones to an HVAC system later within the *Building Services* form so there is no need to define the HVAC system before continuing. If you leave the zone as unassigned, a red warning will appear in the top right-hand corner to let you know how many zones remain unassigned so that you would not proceed with running the calculation before assigning them.

   NB: If a zone is defined as having no heating or cooling, i.e., assigned to 'Zones without HVAC system', but the activity type selected for the zone is one which typically requires conditioning (according to the Activity Database), a red exclamation mark "**!**" will appear next to this parameter as a warning to the user, in case this was done in error. Ultimately, however, the calculation will be carried out using the data input by the user.

   If you do not know the type of the HVAC system in your existing building or its detailed parameters when modelling a building for a BER calculation, you should select one of the following default options from the drop-down menu (see Section 3.5: Building Services form):

   - 'Heating only - Electric resistance' - Heat generated by passing an electric current through resistance wire. Assumed to be electric central heating system with warm air distribution. Fan storage heaters and electric fan converters should be input by defining an HVAC system in the *Building Services* form > *HVAC Systems* tab > *General* sub-tab and selecting the system type "Other local room heater - fanned". If you do not know the heating method (i.e., whether a heated-only building uses electricity or a fuel-based heating system), you should select electric resistance heating as your default.

   - 'Heating only - Other systems' - Assumed to be a wet radiator system with heat generated by fuel combustion. Pumps assumed to be powered by grid-supplied electricity. If you know the fuel type used by the heating system, you can define it in the *Building Services* form > *Global and Defaults* tab > *HVAC System Defaults* sub-tab (see Section 3.5.1: Global and Defaults tab).

   - 'Heating and mechanical cooling' - Assumed to be a constant volume air system with terminal reheat and fixed fresh air. Refrigeration (chillers), fans, and pumps assumed to be powered by grid-supplied electricity. If you know the fuel type used by the heating system, you can define it in the *Building Services* form > *Global and Defaults* tab > *HVAC System Defaults* sub-tab (see Section 3.5.1: Global and Defaults tab).

NB: The default HVAC systems in iSBEMie are representative of existing rather than new buildings and should only be used if you are running a BER calculation for an existing building (not a new building) and do not know the type of the HVAC system in your building or its detailed

parameters as the default efficiencies assumed by iSBEMie for them are quite pessimistic and cannot be edited by the user.

NB: <u>Indirectly conditioned/heated spaces</u> - For spaces such as corridors or access areas, which are not directly served by an HVAC system (i.e., have no direct supply of heating or cooling) but are likely to be indirectly conditioned by the surrounding areas due to the high level of interaction with those spaces (for e.g., allowing the heated air to move freely through permanently-open doors or heat to escape through uninsulated envelopes from the directly conditioned spaces to the unconditioned ones), they should be considered heated/conditioned <u>indirectly</u> by the same HVAC system which serves the surrounding conditioned spaces. Therefore, you should assign the HVAC system of the adjacent conditioned spaces also to that indirectly conditioned zone in iSBEMie (although the space is not directly conditioned, the energy to overcome any losses from or gains to it is still required via the conditioned spaces and, therefore, needs to be included in the calculation). Furthermore, when defining envelope elements between a directly conditioned space and an indirectly conditioned space, they should be labelled as adjacent to a "conditioned adjoining space".

NB: The domestic type activities available under the building type "Residential spaces" in iSBEMie are to allow the energy calculations for a building which contains residential accommodation above a non-domestic space (e.g., a shop or a pub) provided that the residential space can only be accessed from within the non-domestic space, i.e., the residential part is not designed or altered for use as a separate independent dwelling. In addition to common circulation areas of apartment buildings containing self-contained flats, these are the **only** cases where SBEMie can be used to model domestic areas. For more information on the appropriate software tools to use for modelling your building, refer to SEAI.

Infiltration

2. Air permeability at 50pa, in $m^3/h.m^2$ - If the purpose of analysis option that has been selected in the *General* form > *General Information* tab > *Project Details* sub-tab is Republic of Ireland: Building Energy Rating' only, i.e., without a simultaneous Building Regulations compliance check, then iSBEMie's default value for air permeability will be 25 $m^3/h.m^2$. If the relevant box is ticked to also carry out a compliance assessment, then the default value in the interface is 10 $m^3/h.m^2$. Either way, however, the user can over-write the default value by manually entering an alternative value.

Figure 6 shows a zone being defined.

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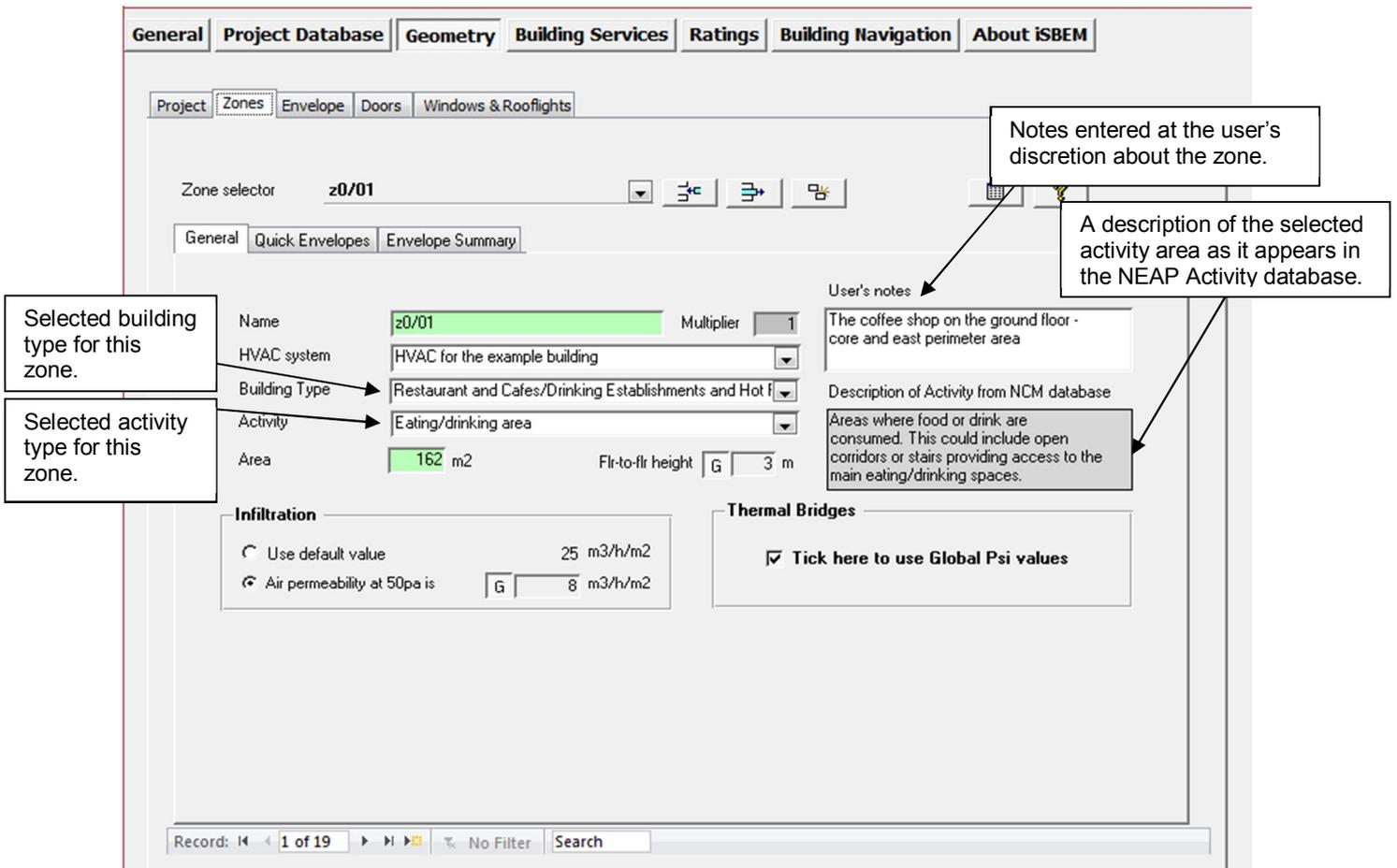
Figure 6: A zone being defined in the General sub-tab of the Zones tab in the Geometry form

Thermal Bridge sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

Envelope Summary sub-tab:

Guidance on this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.4.3. Defining envelopes – Envelope tab

Guidance on input in this tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.4.4. Defining windows and rooflights – Windows & Rooflights tab

Guidance on input in this tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

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3.4.5. Defining doors – Doors tab

Guidance on input in this tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.4.6. Quick Envelopes tab: Short cut to creating envelopes and windows

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.5. Building Services form

Guidance on input parameters in this form not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

This form holds all the information relating to the building services. This information is entered into the following main tabs (these are circled in Figure 7):

- **Global and Defaults** tab – This tab contains some default information on HVAC systems if no or little information is known about the systems in the Actual building. It also requires information on the electric power factor and lighting controls for the whole building.
- **HVAC systems** tab.
- **HWS** tab.
- **SES** tab.
- **PVS** tab.
- **Wind generators** tab.
- **CHP generator** tab (this tab only appears when one of the HVAC systems described in the *HVAC Systems* tab is specified as using CHP).
- **Solar collectors** tab.
- **Zones** tab.
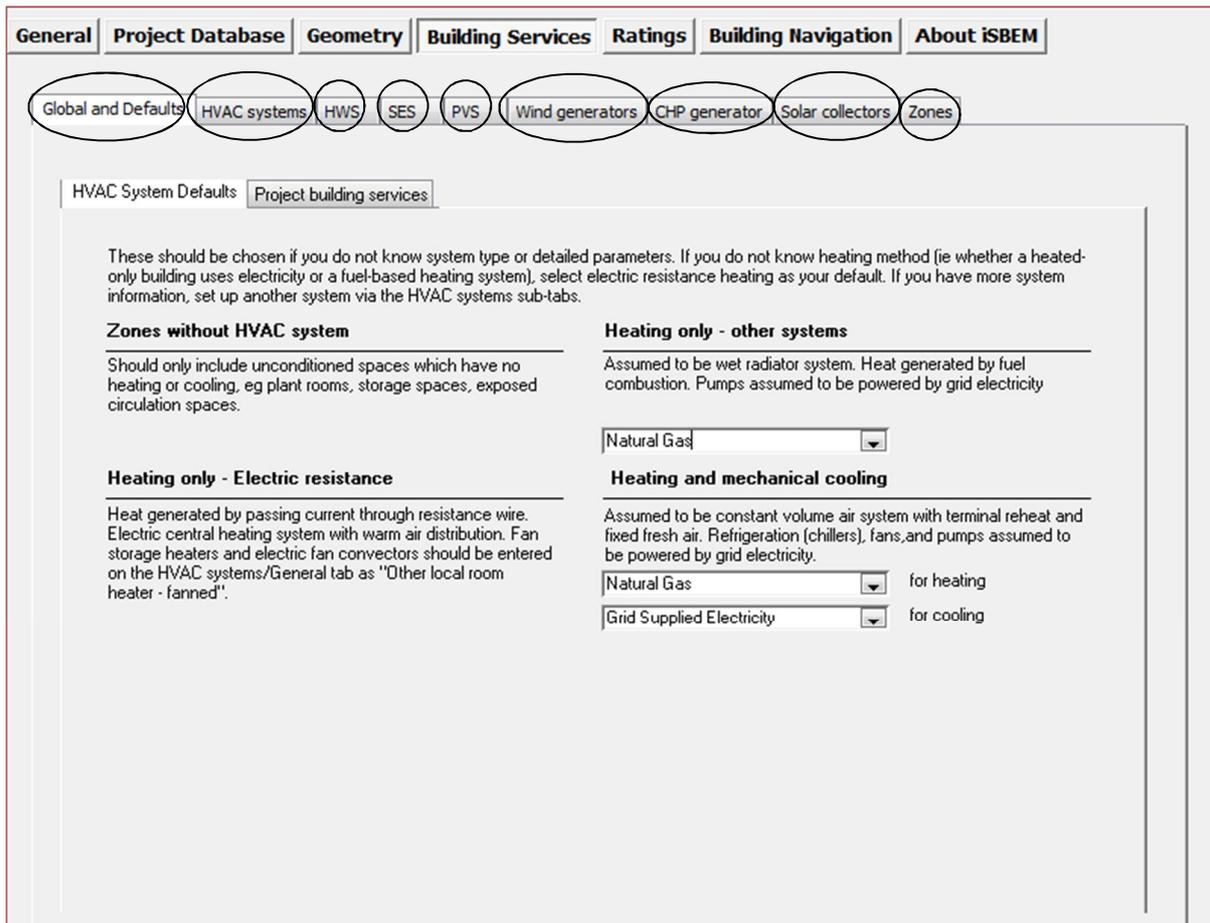
Figure 7: The tabs in the Building Services form

3.5.1. Global and Defaults tab

In this tab, there are two sub-tabs:

- **HVAC System Defaults** sub-tab
- **Project Building Services** sub-tab

HVAC System Defaults sub-tab:

If no HVAC system serves the space (i.e., an unconditioned zone), you should select the option 'Zones without HVAC system' as the HVAC system for that zone in the *Geometry* form > *Zones* tab > *General* sub-tab or the *Building Services* form > *Zones* tab > *HVAC & HW System* sub-tab (spaces which have no heating or cooling, e.g., plant rooms, storage spaces, exposed circulation spaces.). If you do not know the type of the HVAC system in your existing building or its detailed parameters, you should instead select one of the following default options from the drop-down menu (see Section 3.4.2: Defining zones – Zones tab):

- 'Heating only - Electric resistance' - Heat generated by passing an electric current through resistance wire. Assumed to be an electric central heating system with warm air distribution. Fan storage heaters and electric fan converters should be input by defining an HVAC system in the *Building Services* form > *HVAC Systems* tab > *General* sub-tab and selecting the system type "Other local room heater - fanned". If you do not know the heating method (i.e., whether a heated-only building uses electricity or a fuel-based heating system), you should select electric resistance heating as your system.

- 'Heating only - Other systems' - Assumed to be a wet radiator system where heat is generated by fuel combustion. Pumps assumed to be powered by grid-supplied electricity. If you know the fuel type used by the heating system, you can define it in this sub-tab (Figure 7).

- 'Heating and mechanical cooling' - Assumed to be a constant volume air system with terminal reheat and fixed fresh air. Refrigeration (chillers), fans, and pumps assumed to be powered by grid-supplied electricity. If you know the fuel type used by the heating system, you can define it in this sub-tab (Figure 7).

NB: The default HVAC systems in iSBEMie are representative of existing rather than new buildings and should only be used if you are running a BER calculation for an existing building (not a new building) and do not know the type of the HVAC system in your building or its detailed parameters as the default efficiencies assumed by iSBEMie for them are quite pessimistic and cannot be edited by the user.

Project Building Services sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.5.2. Defining HVAC Systems – HVAC Systems tab

Guidance on input parameters in this tab not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

The building's HVAC system(s) is defined within the first seven sub-tabs of the *HVAC systems* tab.

- **General** sub-tab.
- **Heating** sub-tab.
- **Cooling** sub-tab.
- **Systems Adjustments** sub-tab.
- **Metering Provision** sub-tab.
- **System Controls** sub-tab: This is where heating system controls for each HVAC system can be defined.
- **Bi-valent Systems** sub-tab.
- **Zone Summary** sub-tab.

If no HVAC system serves the space (i.e., an unconditioned zone), you should select the option 'Zones without HVAC system' as the HVAC system for that zone in the *Geometry* form > *Zones* tab > *General* sub-tab or the *Building Services* form > *Zones* tab > *HVAC & HW System* sub-tab (spaces which have no heating or cooling, e.g., plant rooms, storage spaces, exposed circulation spaces). If you do not know the type of the HVAC system in your existing building or its detailed parameters, you should instead select one of the following default options from the drop-down menu (see Section 3.4.2: Defining zones – Zones tab):

- 'Heating only - Electric resistance' - Heat generated by passing an electric current through resistance wire. Assumed to be electric central heating system with warm air distribution. Fan storage heaters and electric fan converters should be input by defining an HVAC system in the *Building Services* form > *HVAC systems* tab > *General* sub-tab and selecting the system type "Other local room heater - fanned" (see below). If you do not know the heating method (i.e., whether a heated-only building uses electricity or a fuel-based heating system), you should select electric resistance heating as your default.

- 'Heating only - Other systems' - Assumed to be a wet radiator system with heat generated by fuel combustion. Pumps assumed to be powered by grid-supplied electricity. If you know the fuel type used by the heating system, you can define it in this sub-tab (Figure 7).

- 'Heating and mechanical cooling' - Assumed to be a constant volume air system with terminal reheat and fixed fresh air. Refrigeration (chillers), fans, and pumps assumed to be powered by grid-supplied electricity. If you know the fuel type used by the heating system, you can define it in this sub-tab (Figure 7).

NB: The default HVAC systems in iSBEMie are representative of existing rather than new buildings and should only be used if you are running a BER calculation for an existing building (not a new building) and do not know the type of the HVAC system in your building or its detailed parameters as the default efficiencies assumed by iSBEMie for them are quite pessimistic and cannot be edited by the user.

General sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

Heating sub-tab:

Guidance on input parameters in this sub-tab not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

1. Effective heat generating seasonal efficiency - If you know the effective heat generating seasonal efficiency for the heat generator, it can be introduced manually into the interface. Otherwise, a (conservative) default value will be used by SBEMie. The default seasonal efficiency value (if no efficiency is input by the user) is based on whether the generator is on the Energy Technology List (ETL) of the 'Enhanced Capital Allowance' (ECA) scheme[i]. If not, you then need to select whether the generator was installed in or after 1998.

   NB: For boiler systems installed from 1998 onwards, a default seasonal efficiency of 0.81 is suggested by the tool, and for boiler systems installed before this period, a conservative default seasonal efficiency of 0.65 is suggested. Note that from around 1989, the boiler industry began producing boilers with efficiencies that would have complied with the above statutory instrument.

   NB: The Effective Heat Generating Seasonal Efficiency is calculated by adding the Heating Efficiency Credits, where applicable, to the Heat Generator Seasonal Efficiency. The Heat Generator Seasonal Efficiency is the ratio of the useful heat output to the energy input over the heating season. The Heating Efficiency Credits are available for additional controls and other measures that go beyond the required minimum controls package (see relevant Regulations documents). Note that the necessary documentation to support the Effective Efficiency calculation may be required by your Accreditation Scheme provider for auditing purposes.

Figure 8 shows a heating system being defined.

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[i] www.eca.gov.uk/etl/

Figure 8: HVAC systems definition, Heating sub-tab

Cooling sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

System Adjustments sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

Metering Provision sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

System Controls sub-tab:

The software also needs to know if you have certain controls in your heating system, which would be considered during the production of the energy efficiency recommendations to accompany the BER Certificate. There are 5 tick boxes in this sub-tab (see Figure 9):
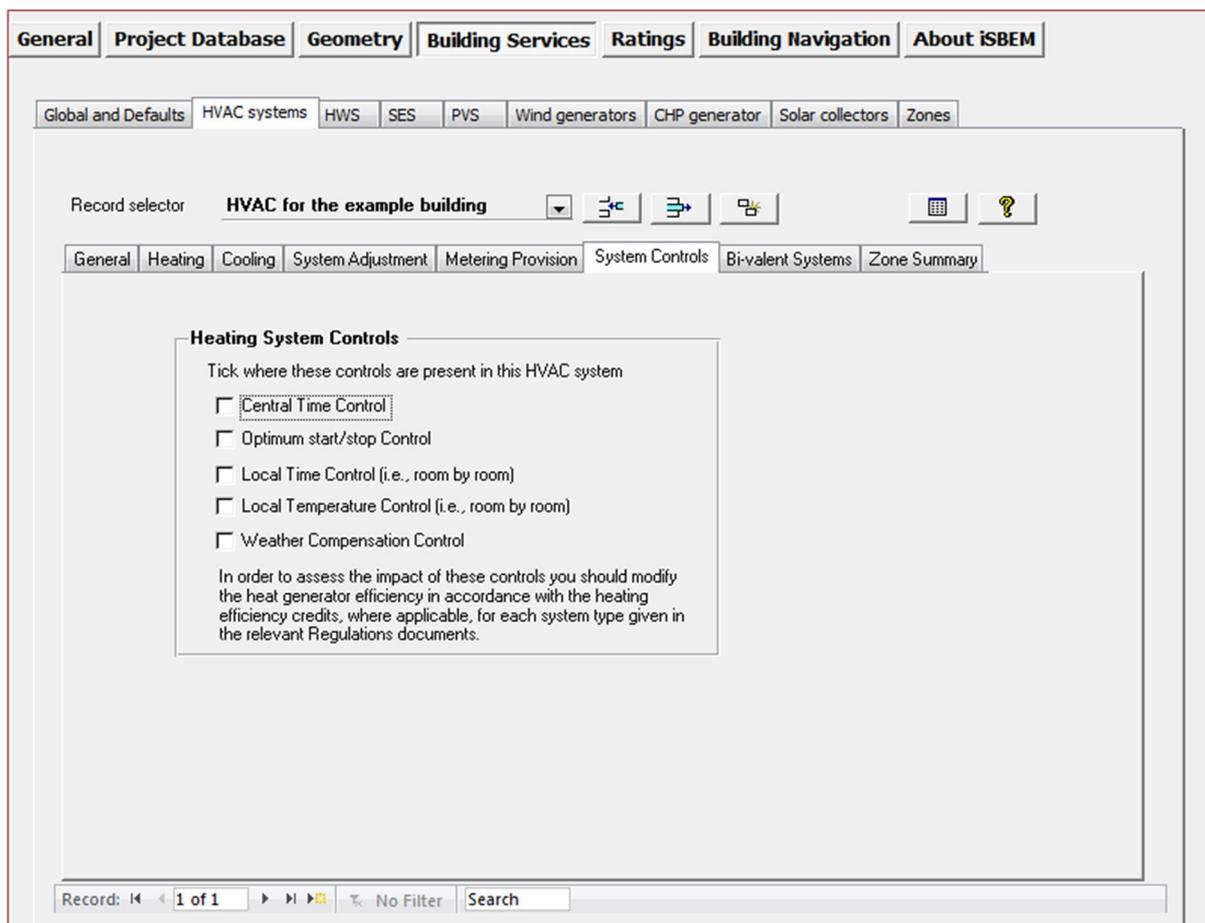
Heating System Controls

1. Tick box to indicate whether the heating system has central time control.

2. Tick box to indicate whether the heating system has optimum start/stop control.

3. Tick box to indicate whether the heating system has local time control (i.e., room by room).

4. Tick box to indicate whether the heating system has local temperature control (i.e., room by room).

5. Tick box to indicate whether the heating system has weather compensation control.

NB: The HVAC system controls defined in the *System Controls* sub-tab are used by SBEMie for generating the Recommendations for the Advisory Report **only** and do not affect the actual energy calculations. Any applicable Heating Efficiency Credits should be included in the Effective Heat Generating Seasonal Efficiency which the user manually inputs in the *Building Services* form > *HVAC systems* tab > *Heating* sub-tab. For details of the minimum controls packages for the different systems, additional controls, and any corresponding available credits, refer to the relevant Regulations documents. Note that the necessary documentation to support the Effective Efficiency calculation may be required by your Accreditation Scheme provider for auditing purposes.

NB: If you have more than one HVAC system defined in your project, the *System Controls* sub-tab will be available for each one of them, i.e., each HVAC system can have control definitions different from the others.

Figure 9: HVAC systems definition: System Controls sub-tab

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Bi-valent Systems sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

Zone Summary sub-tab:

Guidance on this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.5.3. Defining HWS – HWS tab

Guidance on input parameters in this tab not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

The *HWS* tab has four sub-tabs:

- **General** sub-tab.
- **Storage & Secondary Circulation** sub-tab.
- **Assigned** sub-tab.
- **Bi-valent Systems** sub-tab.

General sub-tab:

Guidance on input parameters in this sub-tab not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

A HWS is defined by the following information:

1. Is it later than 1998? - Tick if the system was installed later than 1998. The generator type selected above determines whether this tick box is enabled. Whether this box is ticked determines the default seasonal efficiency used by the tool if no value is input by the user.

    NB: For boiler systems installed from 1998 onwards, a default seasonal efficiency of 0.81 is suggested by the tool, and for boiler systems installed before this period, a conservative default seasonal efficiency of 0.65 is suggested. Note that from around 1989, the boiler industry began producing boilers with efficiencies that would have complied with the above statutory instrument.

2. Effective heat generating seasonal efficiency - If you know the effective heat generating seasonal efficiency for the HWS generator, it can be introduced manually into the interface. Otherwise, a default value will be used by SBEMie. (This field is inactive if the HWS Generator type selected is 'Same as HVAC'). The default value is based on the above tick box on whether the generator was installed in or later than 1998.

    NB: The Effective Heat Generating Seasonal Efficiency is calculated by adding the Heating Efficiency Credits, where applicable, to the Heat Generator Seasonal Efficiency. The Heat Generator Seasonal Efficiency is the ratio of the useful heat output to the energy input over the heating season. The Heating Efficiency Credits are available for additional controls and other measures that go beyond the required minimum controls package (see relevant Regulations documents). Note that the necessary documentation to support the Effective Efficiency calculation may be required by your Accreditation Scheme provider for auditing purposes.

Figure 10 shows a HWS generator being defined.
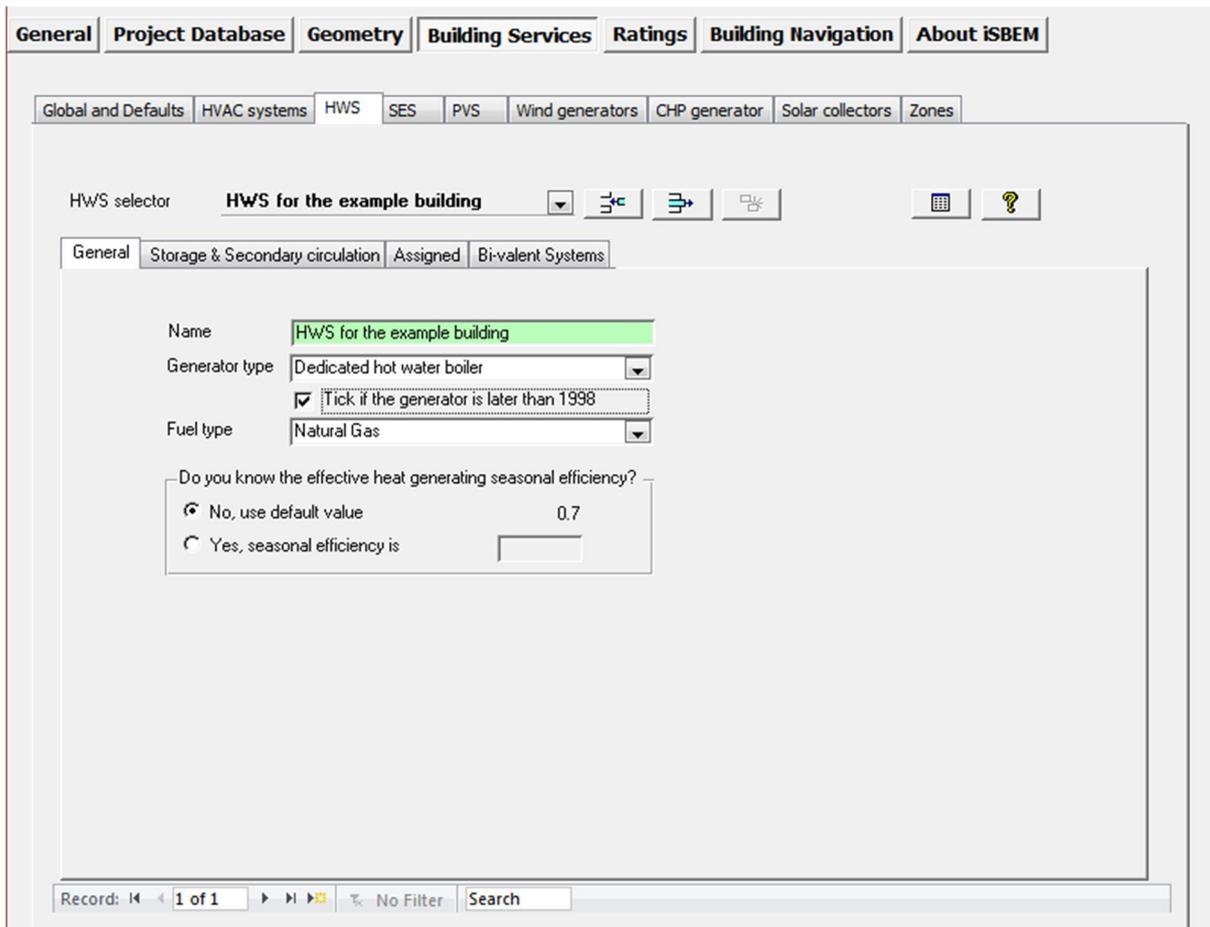
Figure 10: Defining a HWS in the General sub-tab

Storage & Secondary Circulation sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

Bi-valent Systems sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

Assigned sub-tab:

Guidance on this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.5.4. Defining Solar Energy Systems (SES) – SES tab

Guidance on input in this tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

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3.5.5. Defining a Photovoltaic system (PVS) – PVS tab

Guidance on input in this tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.5.6. Defining a wind generator – Wind Generators tab

Guidance on input in this tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.5.7. Defining a CHP generator – CHP Generator tab

Guidance on input in this tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.5.8. Defining a Solar Collector – Solar Collectors tab

Guidance on input in this tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.5.9. Defining the zone-specific building services- Zones tab

Guidance on input parameters in this tab not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

There are eight sub-tabs in the *Zones* tab:

- **HVAC and HWS Systems** sub-tab.
- **Ventilation** sub-tab.
- **Ventilation (cont)** sub-tab.
- **Exhaust** sub-tab.
- **Lighting** sub-tab.
- **Lighting Controls** sub-tab.
- **Display Lighting** sub-tab.
- **Solar Collector** sub-tab.

HVAC and HWS Systems sub-tab:

Guidance on input parameters in this sub-tab not described below is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

The sub-tab is used to specify the HVAC system and HWS for each zone. The following information is required:

HVAC System Parameters

1. HVAC Systems – Here you need to select from the drop-down list (of systems you have already defined in the *HVAC Systems* tab or the default systems) the HVAC system which serves the zone. If no HVAC system serves the space (i.e., an unconditioned

zone), select 'Zones without HVAC system' (spaces which have no heating or cooling and will remain unconditioned, e.g., plant rooms, storage spaces, exposed circulation spaces).

If you do not know the type of the HVAC system in your existing building or its detailed parameters, you should select one of the following default options from the drop-down menu:

- 'Heating only - Electric resistance' - Heat generated by passing an electric current through resistance wire. Assumed to be an electric central heating system with warm air distribution. Fan storage heaters and electric fan converters should be input by defining an HVAC system in the *Building Services* form > *HVAC Systems* tab > *General* sub-tab and selecting the system type "Other local room heater - fanned". If you do not know the heating method (i.e., whether a heated-only building uses electricity or a fuel-based heating system), you should select electric resistance heating as your default.

- 'Heating only - Other systems' - Assumed to be a wet radiator system with heat generated by fuel combustion. Pumps assumed to be powered by grid-supplied electricity. If you know the fuel type used by the heating system, you can define it in the *Building Services* form > *Global and Defaults* tab > *HVAC System Defaults* sub-tab (see Section 3.5.1: Global and Defaults tab).

- 'Heating and mechanical cooling' - Assumed to be a constant volume air system with terminal reheat and fixed fresh air. Refrigeration (chillers), fans, and pumps assumed to be powered by grid-supplied electricity. If you know the fuel type used by the heating system, you can define it in the *Building Services* form > *Global and Defaults* tab > *HVAC System Defaults* sub-tab (see Section 3.5.1: Global and Defaults tab).

NB: The default HVAC systems in iSBEMie are representative of existing rather than new buildings and should only be used if you are running a BER calculation for an existing building (not a new building) and do not know the type of the HVAC system in your building or its detailed parameters as the default efficiencies assumed by iSBEMie for them are quite pessimistic and cannot be edited by the user.

Modified

NB: <u>Indirectly conditioned/heated spaces</u> - For spaces such as corridors or access areas, which are not directly served by an HVAC system (i.e., have no direct supply of heating or cooling) but are likely to be indirectly conditioned by the surrounding areas due to the high level of interaction with those spaces (for e.g., allowing the heated air to move freely through permanently-open doors or heat to escape through uninsulated envelopes from the directly conditioned spaces to the unconditioned ones), they should be considered heated/conditioned <u>indirectly</u> by the same HVAC system which serves the surrounding conditioned spaces. Therefore, you should assign the HVAC system of the adjacent conditioned spaces also to that indirectly conditioned zone in iSBEMie (although the space is not directly conditioned, the energy to overcome any losses from or gains to it is still required via the conditioned spaces and, therefore, needs to be included in the calculation). Furthermore, when defining envelope elements between a directly conditioned space and an indirectly conditioned space, they should be labelled as adjacent to a "conditioned adjoining space".

Figure 11 shows a zone's HVAC and HWS being defined.
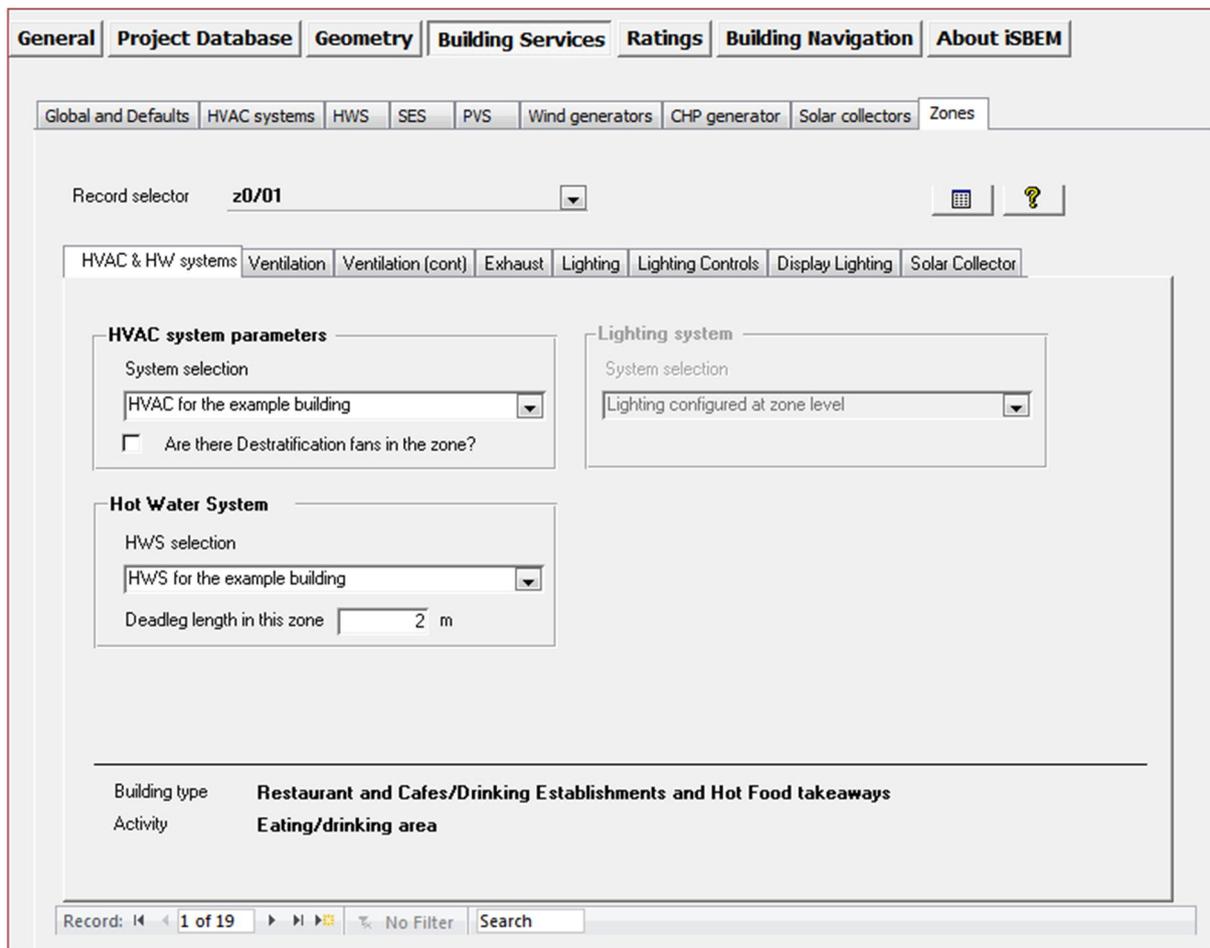
Figure 11: Selecting a zone's HVAC and HWS

Ventilation sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

Ventilation (cont) sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

Exhaust sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

Lighting sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

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Lighting Controls sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

Display Lighting sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

Solar Collector sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.6.   Building Navigation form

Guidance on this form is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

3.7.   About iSBEMie form

Guidance on this form is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

4. CALCULATING AND VIEWING THE ENERGY PERFORMANCE OF THE BUILDING - THE RATINGS FORM AND OUTPUT REPORTS

The energy performance of the building is calculated, and the Building Energy Rating Certificate is generated via the *Ratings* form. The key results are then displayed in this form while further details on the BER and a more detailed analysis of the energy used and CO_2 emitted from the building are given in the iSBEMie output reports. This chapter describes how to calculate the results and access the various outputs.

Modified 4.1. The Ratings form

The *Ratings* form allows the user to run the entered building model through SBEMie and the Building Energy Rating Certificate Generator Module (BERgen) to calculate the energy consumption of the building, CO_2 emissions (and those of the Reference, Notional, and Typical buildings), and its Building Energy Rating. You can do this by pressing the "Calculate BER" button in the *Building Energy Rating* tab > *BER* sub-tab (the button will be entitled "Check Compliance and BER" if the relevant box to also check compliance with Building Regulations was ticked in the *General* form – see Section 3.2.2: General Information tab).

NB: You will be able to monitor on the screen the progress of the calculation process as it is carried out for the different building objects.

In this form, the user can also:

1. View the key results within the interface.

2. Access the following output reports: the *Building Energy Rating Certificate*, the *Advisory Report*, the *SBEMie Main Output* report, *iSBEMie Supplementary Report* and 2 *Data Reflection* Reports for the Actual and Reference buildings.

The *Ratings* form is composed of one tab, which is:

- **Building Energy Rating** tab: displays the annual primary energy consumption, in kWh per m^2 of the building area, and CO_2 emissions, in kg per m^2 of building area, for the Actual and Notional buildings as well as the Actual building's BER, energy band, CO_2 Emissions Indicator. It also displays a break-down of the annual energy consumption by end-use for both the Actual and Notional buildings in kWh/m^2 and allows you to access the generated output reports for more detailed results.

4.1.1. Building Energy Rating tab

The *Building Energy Rating* tab has the following sub-tabs:

- **BER** sub-tab

NEW
- **Graphic Rating** sub-tab

- **Compliance** sub-tab – this tab will be visible <u>only</u> if the tick box to also check building regulations compliance (in addition to generating a BER as the purpose of analysis) has been ticked in the *General* form > General Information tab > *Project details* sub-tab (see Section 3.2.2: General Information tab)

- **Recommendations** sub-tab

- **BER Audit** sub-tab

- **Calculation Logs** sub-tab

- **Calculation Errors** sub-tab

- **Supporting Documents** sub-tab

BER sub-tab:

The *Building Energy Rating* is calculated by clicking on the "Calculate BER" button. This runs the data through the SBEMie calculation engine and the Building Energy Rating Certificate Generator (BERgen). The sub-tab then displays the following calculated results:

1. The delivered energy used per unit floor area (kWh/m^2) annually by the Actual and Notional buildings for heating, cooling, auxiliary energy, lighting, and hot water, and, if available, the energy generated by a CHP in the Actual building.

2. The total delivered energy used per unit floor area (kWh/m^2) annually by the Actual and Notional buildings in terms of electricity and fuel use. For the Actual building, the total value is net of any energy generated by a CHP, if applicable.

3. The Actual building's primary energy rate - This is the annual primary energy consumption per unit floor area for the Actual building, in kWh/m^2.

4. The Notional building's primary energy rate - This is the annual primary energy consumption per unit floor area for the Notional building, in kWh/m^2.

5. The Actual building's Building Energy Rating (BER) - This is the annual primary energy consumption per unit floor area for the Actual building divided by that of the Notional building.

6. The Actual building's energy band - This is the band on the energy scale which corresponds to the Actual building's BER.

7. The Actual building's emission rate - This is the annual CO_2 emissions per unit floor area for the Actual building, in $kgCO_2/m^2$.

8. The Notional building's emission rate - This is the annual CO_2 emissions per unit floor area for the Notional building, in $kgCO_2/m^2$.

9. The Actual building's CO_2 Emissions Indicator - This is the annual CO_2 emissions per unit floor area for the Actual building divided by that of the Notional building.

Also accessible from this sub-tab is the *Building Energy Rating Certificate*, the *Advisory Report*, and supporting recommendations in the form of a secondary not-for-official-submission report with additional information about the recommendations and the Actual building's performance. See Sections: 4.2.5: Building Energy Rating Certificate, 4.2.6: Advisory Report, and 4.2.7: iSBEMie Supplementary Report.

NB: If any changes are made to a project (i.e., input parameters), the "Calculate BER" button needs to be clicked on <u>again</u> upon returning to this tab in order to update the results as the results figures cannot be refreshed unless the calculation is re-run.

NB: You <u>must</u> close all output files before re-running the calculation (so the software can over-write them). Otherwise, an error message will be produced.

Figure 12 shows the *BER* sub-tab in the *Building Energy Rating* tab of the *Ratings* form after the calculation ran successfully for generating a BER. If there were critical un-assignments detected in the project, the user would need to click on the "Objects Assignments" button, identify the un-

assignment, make the correction in the appropriate part of iSBEMie, return to this page, and then click the "Calculate BER" button.

Figure 12: Ratings form after initiating the calculation of the Building Energy Rating for the building in the Building Energy Rating tab

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Figure 13: Ratings form after initiating the calculation of the Building Energy Rating for the building and also assessing its compliance with Building Regulations in the Building Energy Rating tab

Modified

Graphic Rating sub-tab:

NEW

The *Graphic Rating* sub-tab (Figure 14) displays the following:

1. This sub-tab displays a graph of the BER band scale and CO_2 emissions indicator scale and shows where the Actual building's ratings sit on those scales. The same graph is also displayed on the BER report. It also displays the Actual building's calculated primary energy consumption rate, in kWh/m^2, and its CO_2 emission rate, in $kgCO_2/m^2$.
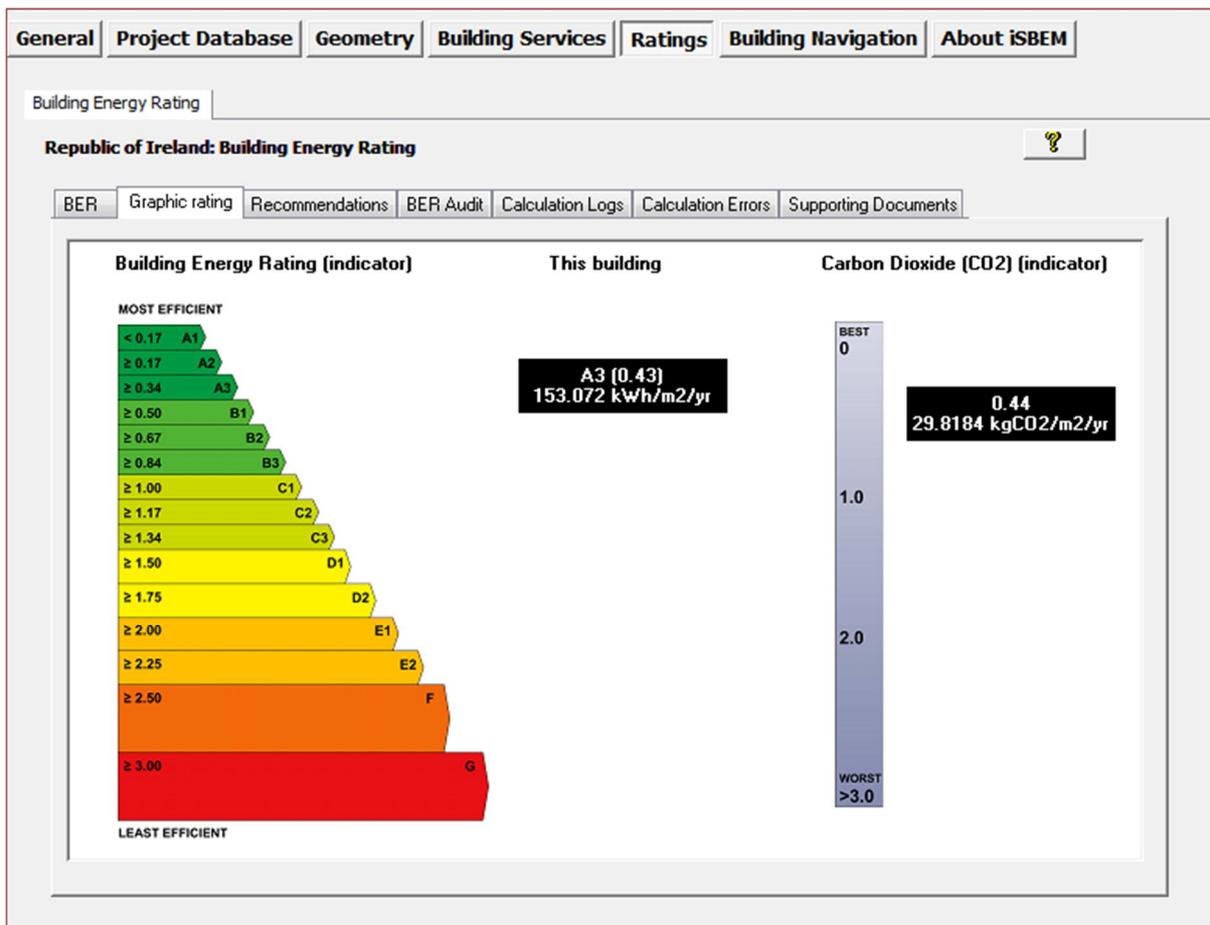
Figure 14: The Graphic Rating sub-tab in the Building Energy Rating tab of the Ratings form

Compliance sub-tab:

Guidance on input in this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

Recommendations sub-tab:

Once the *Building Energy Rating* has been calculated successfully, the BERgen module produces the *BER Certificate* and the *Advisory Report*. The latter contains the NEAP and user-defined recommendations for energy efficiency improvements to the Actual building. This sub-tab (Figure 15) contains the following parameters:

1. There are 4 radio buttons in a box entitled "Show recommendations":

    a. All NEAP – Click this button to view only the NEAP recommendations generated by BERgen.

    b. All USER – click this button to view only the recommendations added by the user. If there are no user-defined recommendations, then iSBEMie will prompt you to add one (see below).

    c. All – Click this button to view both the NEAP recommendations and the ones added by the user.

    d. Only from Report – Click this button to view only the recommendations that have been included in the *Advisory* Report.

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In addition to creating new recommendations in this sub-tab, the energy assessor can also edit the NEAP recommendations generated by BERgen by adding comments and/or modifying the calculated impacts, using the following parameters:

2. Click to edit this recommendation – By ticking this tick-box, you indicate that you wish to edit this particular NEAP recommendation (whose text can be viewed in the grey box entitled "Recommendation") generated by BERgen. If the box is ticked, the following fields become active:

    a. Assessor Comments - You can enter any comments related to the recommendation, for e.g., the reason why you have chosen to edit this NEAP recommendation. These comments will appear in iSBEMie's *Supplementary* Report, <u>not</u> the official *Advisory Report*.

    b. Energy Impact - You can select from the options available in the drop-down menu in order to specify the potential impact of implementing the recommendation on the energy performance of the Actual building. (HIGH = change in total building energy is >4%, MEDIUM = change in total building energy is ≤4% and >0.5%, LOW = change in total building energy is <0.5%).

    c. CO_2 Impact - You can select from the options available in the drop-down menu in order to specify the potential impact of implementing the recommendation on the CO_2 emissions of the Actual building. (HIGH = change in total building CO_2 emissions is >4%, MEDIUM = change in total building CO_2 emissions is ≤4% and >0.5%, LOW = change in total building CO_2 emissions is <0.5%). This impact will appear in the *Advisory Report*.

    d. CO_2 Saved per € Spent - You can select from the options available in the drop-down menu (GOOD, FAIR, POOR, and UNKNOWN) in order to specify the potential CO_2 emissions saved from the Actual building per euro spent on implementing the recommendation in the Actual building.

    e. Payback (drop-down menu) - You can select from the options available in the drop-down menu (LONG, MEDIUM, and SHORT) in order to specify the typical payback time for implementing the recommendation in the Actual building. (LONG = payback is >7 years, MEDIUM = payback is ≥3 years and ≤7 years, SHORT = payback is <3 years). <u>If you know the exact figure for payback time in years, use the next parameter instead.</u>

    f. Payback (number) – Here you can input, in years, the typical payback time for implementing the recommendation in the Actual building. <u>If you do not know the exact figure for payback time in years, use the previous parameter instead.</u>

The following fields, however, remain greyed-out or un-editable as the user is not allowed to modify these parameters of NEAP recommendations:

    a. Category – This describes the category under which the recommendation is classified, such as heating, cooling, etc.

    b. Code – This describes a unique code for each NEAP recommendation. The code of any recommendation created by the energy assessor will be USER.

    c. Recommendation – This describes the text of the NEAP recommendation. This text will appear in the *Advisory Report*.

    d. Applicable to – This describes the object to which the recommendation applies, for e.g., the whole building or a particular HVAC system or HWS.

3. Click to take out – By ticking this tick-box, you indicate that you wish to <u>remove</u> this particular NEAP recommendation, which was generated by BERgen, from the *Advisory Report*.

If the "All USER" radio button is selected in the "Show recommendations" box or the "Add new record" button ▶✳ at the bottom of the screen is clicked, then iSBEMie will prompt you to create a new recommendation.

4. Once you have confirmed that you do wish to add a recommendation to the ones already generated by BERgen, then the following fields become active (Figure 16):

   a. Category - You can select from the options available in the drop-down menu in order to specify the category under which the recommendation will be classified.

   b. Code – This parameter remains set to 'USER' for any user-defined recommendation.

   c. Recommendation – You can enter text to describe the newly-added recommendation. This text will appear in the *Advisory Report*.

   d. Assessor Comments - You can enter any comments related to the recommendation, for e.g., the reason why you have chosen to add this NEAP recommendation. These comments will appear in iSBEMie's *Supplementary* report, not the official *Advisory Report*.

   e. Energy Impact - You can select from the options available in the drop-down menu in order to specify the potential impact of implementing the recommendation on the energy performance of the Actual building. (HIGH = change in total building energy is >4%, MEDIUM = change in total building energy is ≤4% and >0.5%, LOW = change in total building energy is <0.5%). **NB:** If you enter the value as UNKNOWN, SBEMie will set it to LOW.

   f. CO_2 Impact - You can select from the options available in the drop-down menu in order to specify the potential impact of implementing the recommendation on the CO_2 emissions of the Actual building. (HIGH = change in total building CO_2 emissions is >4%, MEDIUM = change in total building CO_2 emissions is ≤4% and >0.5%, LOW = change in total building CO_2 emissions is <0.5%). This impact will appear in the *Advisory Report*. **NB:** If you enter the value as UNKNOWN, SBEMie will set it to LOW.

   g. CO_2 Saved per € Spent - You can select from the options available in the drop-down menu (GOOD, FAIR, POOR, and UNKNOWN) in order to specify the potential CO_2 emissions saved from the Actual building per euro spent on implementing the recommendation in the Actual building. **NB:** If you enter the value as UNKNOWN, SBEMie will set it to POOR.

   h. Payback (drop-down menu) - You can select from the options available in the drop-down menu (LONG, MEDIUM, and SHORT) in order to specify the typical payback time for implementing the recommendation in the Actual building. (LONG = payback is >7 years, MEDIUM = payback is ≥3 years and ≤7 years, SHORT = payback is <3 years). **NB:** If you enter the value as UNKNOWN, SBEMie will set it to LONG. If you know the exact figure for payback time in years, use the next parameter instead.

   i. Payback (number) – Here you can input, in years, the typical payback time for implementing the recommendation in the Actual building. If you do not know the exact figure for payback time in years, use the previous parameter instead.

   j. Applicable to – Here you can specify the object to which the recommendation applies, for e.g., the whole building or a particular HVAC system or HWS. If the option selected is either 'HVAC-SYSTEM' or 'HWS', then the following parameter becomes active:

      i. Name – You need to specify the name of the particular HVAC system or HWS (already defined in iSBEMie) to which the user-defined recommendation refers.

NB: Only recommendations that are defined as applicable to the whole building, i.e., the parameter "Applicable to" has been set to 'BUILDING', appear in the official Advisory

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Report. All the defined recommendations, however, will appear in iSBEMie's Supplementary report.

5. Delete Recommendation – This button allows you to delete a user-defined recommendation.
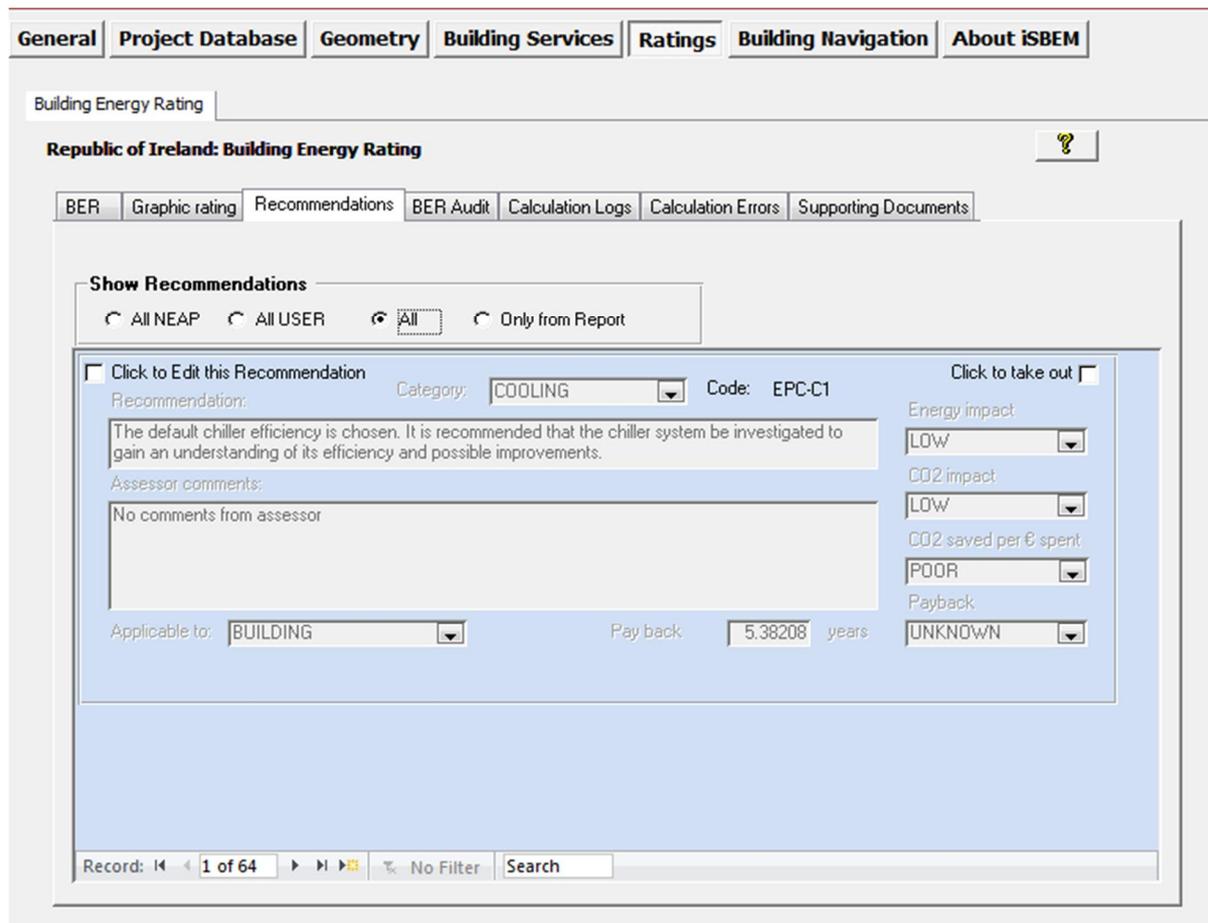
Figure 15: The Recommendations sub-tab in the Building Energy Rating tab of the Ratings form showing a NEAP recommendation

NB: After editing, deleting, or adding any recommendations, you need to re-run the calculation in order to re-generate the Advisory Report with all your editing applied.

NB: The NEAP recommendations are generated for the building and its energy systems when operated according to standard schedules appropriate to the general activities in the building. The Energy Assessor is expected to use their knowledge to remove inappropriate ones and possibly to add further ones. If the Building Energy Rating calculation has made extensive use of default values, some of the recommendations may be based on uncertain assumptions. These recommendations do not cover the quality of operation or maintenance of the building and its systems. There are frequently significant opportunities for energy and carbon savings in these areas and a full "energy audit" to identify them is strongly recommended.

NB: Once a recommendation has been edited by the user, it can no longer be displayed in the *Advisory Report* as being automatically generated by the calculation, and so cannot appear in any of the first 3 tables. It must appear in the fourth table containing the users' added or edited recommendations. This is the case if the 'tick to edit' box is ticked for any particular recommendation (even if no changes are actually made or comments are added by the user after ticking the box).

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Figure 16: The Recommendations sub-tab in the Building Energy Rating tab of the Ratings form showing the active fields for creating a user-defined recommendation

NB: <u>Guidance on editing recommendations:</u> When editing recommendations for a particular project, you are advised to first run the calculation before editing or removing any recommendations in the *Recommendations* sub-tab. Once the calculation has run successfully, you can view the official Advisory Report and identify if there are any recommendations which you feel are not valid for your specific project and you want removed, or new ones you want added based on your knowledge of the project. Then, you can go to the *Recommendations* sub-tab and click on the radio button "Only from report" in order to display only the recommendations that have been triggered by the calculation for this project, rather than all the possible recommendations. Out of these recommendations, you can then tick to remove any ones that are applicable to the whole building, so that they no longer appear on the report. You can also add any new ones making sure you set them as "applicable to the whole building" if you want them to appear on the official report. Once you are done editing, you can re-run the calculation, and save your updated nct file.

BER Audit sub-tab:

The *BER Audit* sub-tab (Figure 17) contains four sub-forms as follows:

- **Construction** sub-form – contains the audit trail information relating to the construction input parameters, i.e., construction specification of walls, floors, roofs, windows, rooflights, and doors.

- **Geometry** sub-form - contains the audit trail information relating to the geometry input parameters, i.e., definitions of thermal bridges; air permeability; and shading systems on glazing.

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- **HVAC & HWS** sub-form - contains the audit trail information relating to the HVAC and HWS input parameters, i.e., heating and cooling system type; heating and cooling efficiencies, duct and AHU leakage, specific fan power, HWS generator efficiency, metering and controls provision, and high pressure drop air filtration.

- **Lighting** sub-form - contains the audit trail information relating to the lighting input parameters, i.e., lamp type, lighting controls, and parasitic power.

This sub-tab is where the energy assessor provides supporting evidence for over-riding any of the default values in iSBEMie. This information is necessary for the audit trail regarding all the parameters that are used to carry out the energy calculations for the generation of the BER Certificate, should any of the default values or settings be changed by the energy assessor. Each of the above four sub-sub-tabs contains the following:

1. Accept defaults – this is the list of defaults set in iSBEMie for each of: Construction, Geometry, HVAC & HWS, and Lighting, which the energy assessor can over-ride.

2. Assessor walk-though inspection – supporting evidence based on a walk-through inspection by the energy assessor.

3. Inspection by other: Sales particulars - supporting evidence based on sales particulars.

4. Inspection by other: Technical inspection - supporting evidence based on a technical inspection by someone other than the energy assessor.

5. On-site measurements of input parameters for assessment - supporting evidence based on on-site measurements of the input parameters.

6. Other sources - supporting evidence based on other sources.

7. Comments – additional information that the energy assessor would like to include for the audit trail.

Figure 17: The BER Audit sub-tab in the Building Energy Rating tab of the Ratings form

Calculation Logs sub-tab:

Log files for the SBEMie calculation (SBEMIE.log) and the BER generator, BERgen, (BERGEN.log) can be viewed in this sub-tab (Figure 18).

A log file for the compliance checking module, BRIRL, (BRIRL.log) is also visible in this sub-tab if the tick box to also check building regulations compliance (in addition to generating a BER as the purpose of analysis) has been ticked in the *General* form > General Information tab > *Project details* sub-tab (see Section 3.2.2: General Information tab).
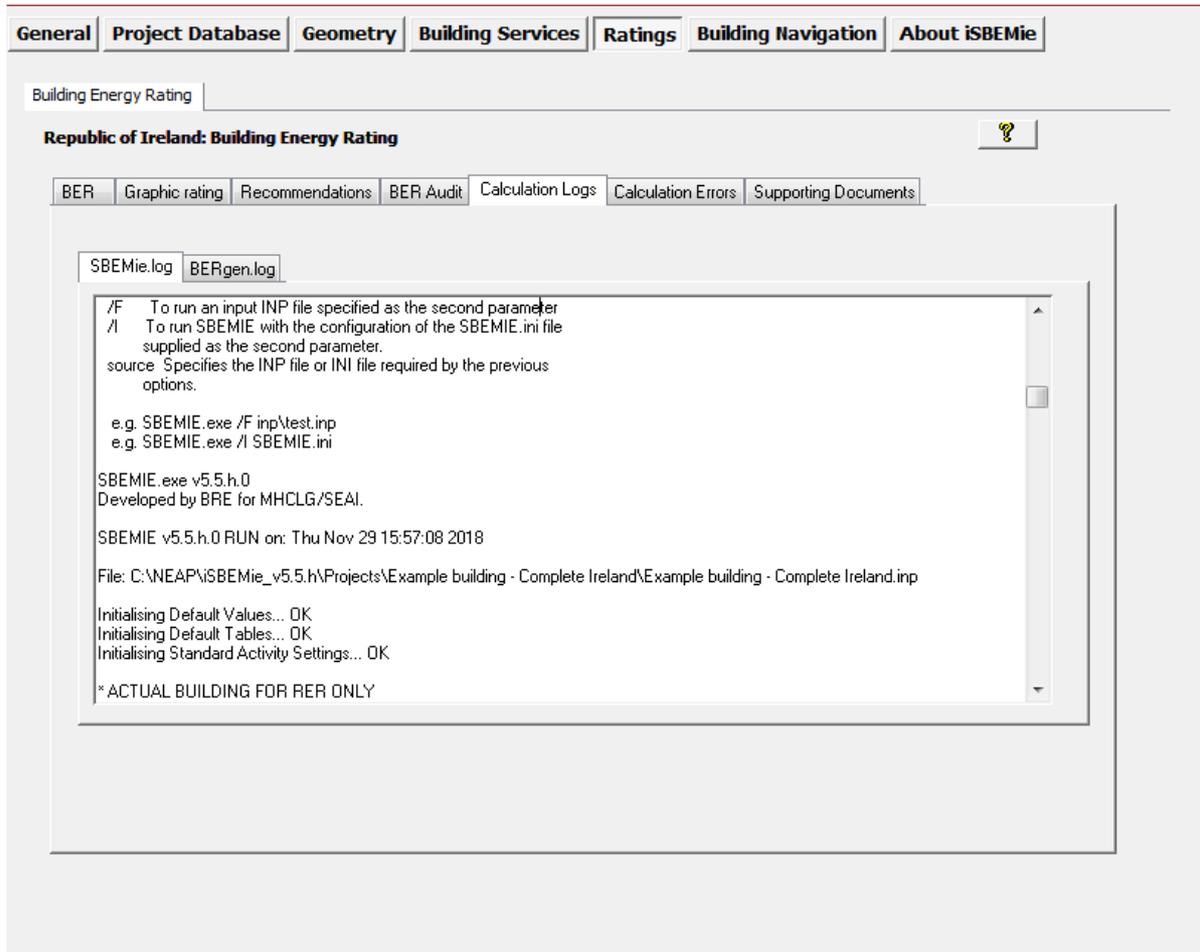
Figure 18: The Calculation Logs sub-tab in the Building Energy Rating tab of the Ratings form

Calculation Errors sub-tab:

Error files for the SBEMie calculation (SBEMIE.err) and the BER generator, BERgen, (BERGEN.err) can be viewed in this sub-tab (Figure 19). If the calculation crashes, you can refer to these files for any error messages produced during the calculation.

An error file for the compliance checking module, BRIRL, (BRIRL.err) is also visible in this sub-tab if the tick box to also check building regulations compliance (in addition to generating a BER as the purpose of analysis) has been ticked in the *General* form > General Information tab > *Project details* sub-tab (see Section 3.2.2: General Information tab).

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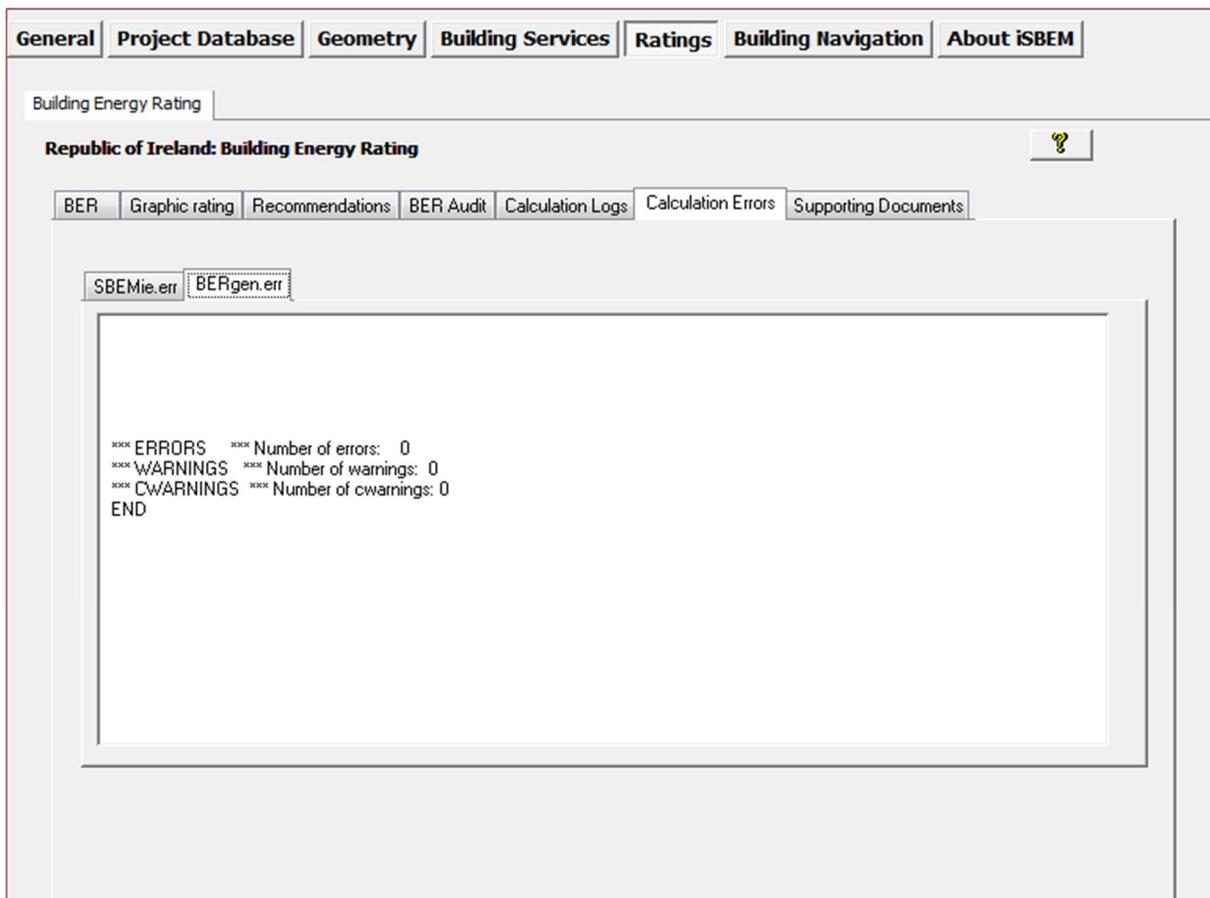
Figure 19: The Calculation Errors sub-tab in the Building Energy Rating tab of the Ratings form

Supporting Documents sub-tab:

Guidance on this sub-tab is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

4.2. iSBEMie Output reports

Output reports when running iSBEMie for Building Energy Rating Certificates:

If the calculation were run to generate the Building Energy Rating Certificate, then iSBEMie produces the following output reports:

1. SBEMie Main Output Document

2. Building Energy Rating Certificate

3. Advisory Report

4. Data Reflection Report – for the Actual Building

5. Technical Output Report – for the Actual Building

6. Technical Output Report – for the Notional Building

7. Technical Output Report – for the Reference Building

8. iSBEMie Supplementary Report

As described previously, the first four reports are accessible from within iSBEMie, using the appropriate buttons in the *Ratings* form > *Building Energy Rating* tab > *BER* sub-tab and the *Ratings* form > *Building Energy Rating* tab > *Supporting Documents* sub-tab. These reports are all stored in the same location as the project files, along with the *Technical Output* Reports, which can only be accessed from the "Projects" folder. The default location for the project files is within the specific project folder (created when the project was first created, see in the User Guide volume "**How to use iSBEMie: Basics**") within the iSBEMie_v5.5.h folder, e.g., C:\NEAP\iSBEMie_v5.5.h\ Projects\Example building - Complete Ireland.

9. XML file for lodgement on the National BER Register

One more file is produced when running the BER calculation and generating a BER Certificate. This file is the XML message required for the official submission/lodgement of the BER Certificate with the National Register. It contains all the data used in the generation of the BER Certificate and the Advisory report. Note that the draft BER Certificate and Advisory Report produced on your computer will <u>always</u> contain the watermark.

4.2.1. SBEMie Main Output Document

Guidance on this document is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

4.2.2. Data Reflection Report – Actual Building

Guidance on this document is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

NB: The *Data Reflection* Reports in html format are generated, and the related access buttons become visible in the *Ratings* form, <u>only</u> if the relevant box has been ticked in the *General* form > *File Options* tab > *System Configuration* sub-tab.

4.2.3. Technical Output Report – Actual Building

Guidance on this document is the same as that provided in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

4.2.4. Technical Output Report – Notional Building

This is a comma-separated-values '.csv' file (which can be opened using Microsoft Excel) for the Notional building similar in format to the technical output report for the Actual building described in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

4.2.5. Building Energy Rating Certificate

This report can be accessed from the *Ratings* form > *Building Energy Rating* tab > *BER* sub-tab by clicking on the "Calculate BER" button and is stored in the same location as the project files as described in Section 4.2.8: Accessing the reports from the project folder. The file is in "pdf" format.

This report gives a summary of the energy performance of the building and its CO_2 emissions. It contains the following sections:

- Administrative information: in the form of the building name, address, type, total floor area, main heating fuel (the fuel which delivers the greatest total thermal output for space or water heating), and servicing environment (the servicing strategy which contributes the largest proportion of the building's primary energy consumption). It also contains the energy assessor's details and the certificate's number and validity dates.

- Building Energy Rating Indicator: displays the building's calculated BER, its primary energy consumption rate, in kWh/m^2, and where the building's BER fits on a scale of the building energy efficiency bands.

- Carbon Dioxide Emissions Indicator: displays the building's calculated CO_2 Emissions Indicator, its CO_2 emission rate, in kgCO$_2$/m^2, and where the building's CO_2 Emissions Indicator fits on a scale of buildings emissions.

NB: Final BER certificates are generated in colour and valid for 10 years while provisional ones are generated in greyscale and valid for 2 years.

NB: If <u>none</u> of the zones in the building have been defined as conditioned, the "building environment" will be set by the calculation to be "Unconditioned".

NB: If <u>none</u> of the zones in the building as defined have space or water heating energy consumption, the "main heating fuel" will be set by the calculation to be "Other".

NB: Buildings which are currently unconditioned, i.e., they have no building services currently installed, but which are expected to be installed in the future, should be modelled in iSBEMie, for the purposes of producing a BER with assumed building services of the types that are most likely to be installed in those class of buildings and which have the minimum acceptable specification standards that meet the requirements in TGD-L of the Building Regulations in force when the building was constructed.

See APPENDIX A: A.1 for a sample *Building Energy Rating Certificate* for the Example building.

NB: You <u>must</u> close all output files before re-running the calculation (so the software can over-write them). Otherwise, an error message will be produced.

4.2.6. Advisory Report

This report can be accessed from the *Ratings* form > *Building Energy Rating* tab > *BER* sub-tab by clicking on the "Advisory Report" button and is stored in the same location as the project files, as described in Section 4.2.8: Accessing the reports from the project folder. The file is in "pdf" format.

This report contains some administrative information about the building and the energy assessor and a list of recommendations (generated by the calculation and input by the energy assessor) for energy-efficiency improvements in the building. It contains the following sections:

- Administrative Information: contains information on the MPRN, the software used to produce the report, and the validity dates of the report.

- Energy Assessors Details: contains details about the energy assessor.

- Background: contains information on the legislation and the servicing strategy of the property.

- Introduction: contains information on the calculation tool used.

- Recommendations: contains a list of recommendations, edited by the energy assessor, for the improvement of the energy performance of the building and their respective potential impact on the CO_2 emission rate of the building. The recommendations are grouped into the following sub-sections: short payback (up to 15 recommendations),

medium payback (up to 10 recommendations), long payback (up to 5 recommendations), and other recommendations created by the energy assessor (up to 10 recommendations).

NB: Only recommendations that are defined as applicable to the whole building, i.e., the parameter "Applicable to" has been set to 'BUILDING', appear in the official Advisory Report. All the defined recommendations, however, will appear in iSBEMie's Supplementary report.

- <u>Next Steps</u>: contains information on the steps that need to be taken following the production of the reports.

- <u>Glossary</u>: contains definitions of some of the terms used in the report.

See APPENDIX A: A.2 for a sample *Advisory Report* for the Example building.

NB: You <u>must</u> close all output files before re-running the calculation (so the software can over-write them). Otherwise, an error message will be produced.

NB: The NEAP recommendations are generated for the building and its energy systems when operated according to standard schedules appropriate to the general activities in the building. The Energy Assessor is expected to use his or her knowledge to remove inappropriate ones and possibly to add further ones. If the Building Energy Rating calculation has made extensive use of default values, some of the recommendations may be based on uncertain assumptions. These recommendations do not cover the quality of operation or maintenance of the building and its systems. There are frequently significant opportunities for energy and carbon savings in these areas and a full "energy audit" to identify them is strongly recommended.

4.2.7. iSBEMie Supplementary Report

This report can be accessed from the *Ratings* form > *Building Energy Rating* tab > *BER* sub-tab by clicking on the "Supporting Recommendations" button and is stored in the same location as the project files as described in Section 4.2.8: Accessing the reports from the project folder. The file is in "pdf" format.

This report gives a summary of building's energy and CO_2 emissions performance for the different end-use categories and a full list of recommendations (generated by the calculation and/or input by the user) for energy-efficiency improvements in the building (i.e., not just the recommendations that appear in the official *Advisory Report* described in section 4.2.6: Advisory Report. It provides:

- The name and type of the building.
- A key to the colour codes used in displaying the recommendations.
- The current performance of the building for each of the following categories, such as the attributed percentage of the total building's CO_2 emissions and overall energy performance:
  - Heating
  - Cooling
  - Hot water
  - Lighting
  - Renewables
  - Overheating
  - Envelope
  - Fuel-Switching
  - Auxiliary
  - Other

- Recommendations related to each of the above categories, and for each recommendation, a set of information is displayed, such as the potential impact of implementing the recommendation on the energy performance and CO_2 emissions of the building, the potential saving in CO_2 emissions per euro spent, and any additional comments input by the energy assessor. It also includes any comments added by the Energy Assessor to any of the NEAP recommendations.

NB: Any NEAP recommendations removed by the Energy Assessor from the official *Advisory Report* will still appear in the *iSBEMie Supplementary* report.

See APPENDIX A: **Error! Reference source not found.** for a sample *iSBEMie Supplementary Report* for the Example building.

4.2.8. Accessing the reports from the project folder

All of the above reports are accessible from the specific project folder (created when the project was first created, in the User Guide volume "**How to use iSBEMie: Basics**"). The default location for this folder is within the main **Projects** folder within the **iSBEMie_v5.5.h** folder, e.g., "C:\NEAP\iSBEMie_v5.5.h\ Projects\ Example building - Complete Ireland". The reports have the following file names and extensions:

Output reports when running iSBEMie for Building Energy Rating Certificates:
1. SBEMie Main Output Document – "project name"**_sbem. pdf**
2. Building Energy Rating Certificate – "project name"**_ber[ber].pdf**
3. BER Advisory Report – "project name"**_ber[adv].pdf**
4. Data Reflection Report - Actual Building – "project name"**_dr.pdf**
5. Data Reflection Report - Actual Building – "project name"**_dr.htm**
6. Technical Output Report - Actual Building – "project name"**_sim.csv**
7. Technical Output Report - Reference Building – "project name"**_ref_sim.csv**
8. Technical Output Report - Notional Building – "project name"**_not_sim.csv** `[Modified]`
9. Supplementary Advisory Report.– "project name"**_ber[sadv].pdf** `[Modified]`
10. XML file for the Building Energy Rating Certificate and the BER Advisory Report – "assessor number"."project name"**. xml**

The project folder for the "Example building - Complete Ireland" file is shown in Figure 20 with the output reports highlighted when running iSBEMie for Building Energy Rating Certificate.

Also highlighted is **the NCT file which is the file that is read by iSBEMie and where all the input data has been stored.** If you need to share a project with your colleagues, this is the only file you need to send them. They will be able to open it through iSBEMie and generate all the other files.

Other files highlighted in Figure 20, 4 error files (with the extension **.err**) are highlighted which contain warnings or error messages generated by SBEMie or BERgen during the calculation. These are text files which can be opened by any text editor on your computer, for e.g., MS Notepad. The contents of these files can also be viewed in the *Calculation Errors* sub-tab in the *Ratings* form (see section 4.1.1: Building Energy Rating tab).

NB: You <u>must</u> close all output files before re-running the calculation (so the software can over-write them). Otherwise, an error message will be produced.

Figure 20: Contents of the Projects folder showing the iSBEMie output reports when running iSBEMie for Building Energy Rating Certificates

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APPENDIX A: Sample Output Reports

A.1. Sample Building Energy Rating Certificate

A.2.   Sample Advisory Report

Advisory Report

BER Number: voidvoidvoid   **Building Energy Rating: A3**

Street Name One
Street Name Two
Town Name One
Town Name Two
Co. Carlow
A65 F4E2
MPRN: 00000000000

Building Type(s): Offices and Workshop businesses

ADMINISTRATIVE INFORMATION	
Issue Date:	29 Nov 2018
Valid Until:	28 Nov 2028 (*)
Useful Floor Area (m²):	2900
Main Heating Fuel:	Natural Gas
Building Environment:	Air Conditioning
Calculation Tool Used:	iSBEMie v5.5.h using calculation engine SBEMIE v5.5.h.0

ENERGY ASSESSOR DETAILS	
Assessor Name:	<insert name>
Assessor Company Number:	111111
Assessor Number:	111111
Assessor Scheme:	SEAI

(*) Unless superseded by a later advisory report   Page 1 of 7

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1. Background

Statutory Instrument No. 666 of 2006, European Communities (Energy Performance of Buildings), gives effect to certain provisions of Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.

A Building Energy Rating (BER) and advisory report is to be supplied by the owner to a prospective buyer or tenant when constructed, sold or rented. The objective of the rating is twofold:

To give prospective buyers and tenants information about the energy performance of buildings.

To give builders/developers and vendors/landlords, an incentive to upgrade the energy performance of the building by giving visible credit to superior standards.

The BER must be accompanied by an "Advisory Report" setting out recommendations for cost-effective improvements to the energy performance of the building. However there will be no legal obligation on vendors or prospective purchasers to carry out the recommended improvements. This provision of the EPBD has been transposed into Irish legislation by S.I. No. 666 of 2006.

2. Introduction

This Advisory Report was produced in line with the approved methodology and is based on calculation tool iSBEMie v5.5.h using calculation engine SBEMIE v5.5.h.0 .

The BER and Advisory Report for new buildings is based upon the design drawings and building specifications taking account of amendments during the construction phase. The focus of the advisory report for new buildings is to provide occupants with advice on to assist them with maximising the energy efficiency of their new building through best use of features and services installed.

For existing buildings the BER and Advisory Report will also be based on a survey of the building.

3. Recommendations

The following sections list recommendations selected by the energy assessor for the improvement of the energy performance of the building. The recommendations are listed under four headings: short payback, medium payback, long payback, and other measures.

a) Recommendations with a short payback

This section lists recommendations with a payback of less than 3 years:

Recommendation	Potential impact
Consider replacing T8 lamps with retrofit T5 conversion kit.	HIGH
Introduce HF (high frequency) ballasts for fluorescent tubes: Reduced number of fittings required.	LOW

b) Recommendations with a medium payback

This section lists recommendations with a payback of between 3 and 7 years:

No recommendations of medium term payback have been identified

c) Recommendations with a long payback

This section lists recommendations with a payback of more than 7 years:

Recommendation	Potential impact
Add time control to heating system.	LOW
Add optimum start/stop to the heating system.	LOW
Consider installing building mounted wind turbine(s).	LOW
Some walls have uninsulated cavities - introduce cavity wall insulation.	LOW
Add local temperature control to the heating system.	LOW

d) Other recommendations

This section lists other recommendations selected by the energy assessor, based on an understanding of the building, and / or based on a valid existing energy report.

Recommendation	Potential impact

The assessor must introduce the text for the recommendation here	LOW

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4. Next steps

a)Your Advisory Report

Statutory Instrument No. 666 of 2006 requires that the Building Energy Rating (BER) Certificate must be accompanied by an "Advisory Report" setting out recommendations for cost-effective improvements to the energy performance of the building.

This advisory report has been lodged on the BER register. Access to the report, to the data used to compile the report, and to previous similar documents relating to the same building can be obtained by request through (www.sei.ie/ber) using the report reference number of this document.

b) Implementing recommendations

The recommendations are provided as an indication of opportunities that appear to exist to improve the building's energy efficiency.

The recommendations are derived from a set of recommendations automatically produced by the calculation tool, reviewed, commented on and amended by the BER assessor as he / she found appropriate in the light of his / her knowledge of the building and its current or intended use. Any recommendations in Section 3d (Other recommendations) have been inserted by the BER assessor.

These recommendations do not include matters relating to operation and maintenance which cannot be identified from the calculation procedure.

c) Legal disclaimer

The advice provided in this Advisory Report is intended to be for information only. Recipients of this Advisory Report are advised to seek further detailed professional advice before reaching any decision on how to improve the energy performance of the building.

5. Glossary

a) Payback

The payback periods are based primarily on data provided by the UK Good Practice Guides and Carbon Trust energy survey reports and are average figures calculated using a simple payback method. It is assumed that the source data is correct and accurate using up to date information and that these data are applicable to Ireland.

The figures have been calculated as an average across a range of buildings and may differ from the actual payback period for the building being assessed. Therefore, it is recommended that each suggested measure be further investigated before reaching any decision on how to improve the energy efficiency of the building.

b) Primary Energy and Carbon Dioxide Emissions Impact

The High / Medium / Low potential impact indicators against each recommendation are provided to distinguish, between the suggested recommendations, those that would have the most impact on primary energy and carbon dioxide emissions from the building. For automatically generated recommendations, the potential impact indicators are determined by the software, but may have been adjusted by the Energy Assessor based on his / her knowledge of this building. The potential impact of other recommendations is determined by the assessor.

c) Valid Advisory Report

A valid report is a report that has been:

- Produced within the past 10 years
- Produced by a registered Building Energy Rating Assessor
- Lodged on the register managed by Sustainable Energy Ireland.

A provisional BER certificate and related advisory report, where applicable, shall be valid for a period not exceeding 24 months from the date of its issue.

A.3. Sample Supplementary Report

Supplementary Report
Not for Official Submission

Building name   **Date:** Thu Aug 23 14:48:10 2018

Example building

Building type: Offices and Workshop businesses

This report lists recommendations for energy-efficiency improvements to the building.

Key to colour codes used in this report

Included by the calculation
Included by the user
Excluded by the user

Recommendations for HEATING

HEATING accounts for 2.1% of the CO_2 emissions
The overall energy performance of HEATING provision is GOOD
The overall CO_2 performance of HEATING provision is GOOD
The average energy efficiency of HEATING provision is GOOD
The average CO_2 efficiency of HEATING provision is GOOD

Add time control to heating system.

Code:	EPC-H2
Energy Impact:	LOW
CO_2 Impact:	LOW
CO_2 Saved per Euro Spent:	POOR
Applicable to:	Whole building

Comments:

Add local time control to heating system.

Code:	EPC-H5
Energy Impact:	LOW
CO_2 Impact:	LOW
CO_2 Saved per Euro Spent:	POOR
Applicable to:	Whole building

Comments:

Add local temperature control to the heating system.

Code:	EPC-H6
Energy Impact:	LOW
CO_2 Impact:	LOW
CO_2 Saved per Euro Spent:	POOR
Applicable to:	Whole building

Comments:

Add optimum start/stop to the heating system.

Code:	EPC-H7
Energy Impact:	LOW
CO_2 Impact:	LOW

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CO2 Saved per Euro Spent: POOR
Applicable to: Whole building

Comments:

Add weather compensation controls to heating system.
Code: EPC-H8
Energy Impact: LOW
CO2 Impact: LOW
CO2 Saved per Euro Spent: POOR
Applicable to: Whole building

Comments:

Add time control to heating system.
Code: EPC-H2
Energy Impact: LOW
CO2 Impact: LOW
CO2 Saved per Euro Spent: POOR
Applicable to: HVAC for the example building

Comments:

Add local time control to heating system.
Code: EPC-H5
Energy Impact: LOW
CO2 Impact: LOW
CO2 Saved per Euro Spent: POOR
Applicable to: HVAC for the example building

Comments:

Add local temperature control to the heating system.
Code: EPC-H6
Energy Impact: LOW
CO2 Impact: LOW
CO2 Saved per Euro Spent: POOR
Applicable to: HVAC for the example building

Comments:

Add optimum start/stop to the heating system.
Code: EPC-H7
Energy Impact: LOW
CO2 Impact: LOW
CO2 Saved per Euro Spent: POOR
Applicable to: HVAC for the example building

Comments:

Add weather compensation controls to heating system.
Code: EPC-H8
Energy Impact: LOW
CO2 Impact: LOW
CO2 Saved per Euro Spent: POOR
Applicable to: HVAC for the example building

Comments:

Recommendations for COOLING

COOLING accounts for 10.1% of the CO2 emissions
The overall energy performance of COOLING provision is GOOD
The overall CO2 performance of COOLING provision is GOOD
The average energy efficiency of COOLING provision is GOOD
The average CO2 efficiency of COOLING provision is GOOD

There are no recommendations for COOLING

Recommendations for HOT-WATER

HOT-WATER accounts for 14.4% of the CO2 emissions
The overall energy performance of HOT-WATER provision is GOOD
The overall CO2 performance of HOT-WATER provision is GOOD
The average energy efficiency of HOT-WATER provision is GOOD
The average CO2 efficiency of HOT-WATER provision is GOOD

There are no recommendations for HOT-WATER

Recommendations for LIGHTING

LIGHTING accounts for 31.7% of the CO2 emissions
The overall energy performance of LIGHTING provision is GOOD
The overall CO2 performance of LIGHTING provision is GOOD

Consider replacing T8 lamps with retrofit T5 conversion kit.
Code: EPC-L5
Energy Impact: MEDIUM
CO2 Impact: HIGH
CO2 Saved per Euro Spent: GOOD
Applicable to: Whole building

Comments:

Introduce HF (high frequency) ballasts for fluorescent tubes: Reduced number of fittings required.
Code: EPC-L7
Energy Impact: LOW
CO2 Impact: LOW
CO2 Saved per Euro Spent: GOOD
Applicable to: Whole building

Comments:

Recommendations for RENEWABLES

Consider installing building mounted wind turbine(s).
Code: EPC-R2
Energy Impact: LOW

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CO2 Impact:	LOW
CO2 Saved per Euro Spent:	POOR
Applicable to:	Whole building

Comments:

Consider installing PV.

Code:	EPC-R4
Energy Impact:	LOW
CO2 Impact:	LOW
CO2 Saved per Euro Spent:	POOR
Applicable to:	Whole building

Comments:

Recommendations for OVERHEATING

There are no recommendations for OVERHEATING

Recommendations for ENVELOPE

Some floors are poorly insulated - introduce and/or improve insulation. Add insulation to the exposed surfaces of floors adjacent to underground, unheated spaces or exterior.

Code:	EPC-E1
Energy Impact:	LOW
CO2 Impact:	LOW
CO2 Saved per Euro Spent:	POOR
Applicable to:	Whole building

Comments:

Some solid walls are poorly insulated - introduce or improve internal wall insulation.

Code:	EPC-E3
Energy Impact:	LOW
CO2 Impact:	LOW
CO2 Saved per Euro Spent:	POOR
Applicable to:	Whole building

Comments:

Some walls have uninsulated cavities - introduce cavity wall insulation.

Code:	EPC-E4
Energy Impact:	LOW
CO2 Impact:	LOW
CO2 Saved per Euro Spent:	POOR
Applicable to:	Whole building

Comments:

Recommendations for FUEL-SWITCHING

There are no recommendations for FUEL-SWITCHING

Recommendations for AUXILIARY

AUXILIARY accounts for 41.6% of the CO2 emissions
The overall energy performance of AUXILIARY provision is FAIR
The overall CO2 performance of AUXILIARY provision is FAIR

There are no recommendations for AUXILIARY

Recommendations for OTHER

The assessor must introduce the text for the recommendation here

Code:	USER
Energy Impact:	LOW
CO2 Impact:	LOW
CO2 Saved per Euro Spent:	POOR
Applicable to:	Whole building

Comments:

APPENDIX B: List of parameters required by iSBEMie for BER calculations

Form: General

Tab: General Information

Sub-tab: Project details
- Purpose of analysis
- Additionally check Building regulations?
- Weather (location)
- Stage of analysis
- Project complexity

Sub-tab: Building details
- Building type
- Name of project
- Building address
- County
- Eircode
- Location description
- MPRN(s)
- Year of construction

Sub-tab: Energy Assessor's details
  Sub-form: Energy Assessor's details
  - Name
  - Telephone number
  - Email address
  - Address
  - County
  - Eircode
  - Assessor number
  - Employer/Trading name
  - Employer/Trading address
  - Assessor company number

Sub-tab: Client's details
- Name
- Telephone number
- Address
- County
- Eircode

Form: Project Database

Tab: Construction for walls

Sub-tab: General
- Name of construction
- Does it involve metal cladding?
- Globally used in walls that connect zone to
- Definition of construction of walls using one of the following 3 options:
  1) Library
      - Category
      - Library
  or
  2) Inference procedures
      - Building sector
      - Building Regulations compliance
      - General description
  or

3) Enter parameters manually
- o U-value [W/m^{2}K]
- o κ$_m$ [kJ/m^{2}K]

Tab: Construction for roofs
<u>Sub-tab: General</u>
- Name of construction
- Does it involve metal cladding?
- Globally used in roofs that connect zone to
- Definition of construction of roofs using one of the following 3 options:
  1) Library
     - o Category
     - o Library
  or
  2) Inference procedures
     - o Building sector
     - o Building Regulations compliance
     - o General description
  or
  3) Enter parameters manually
     - o U-value [W/m^{2}K]
     - o κ$_m$ [kJ/m^{2}K]

Tab: Construction for floors
<u>Sub-tab: General</u>
- Name of construction
- Globally used in floors that connect zone to
- Definition of construction of floors using one of the following 3 options:
  1) Library
     - o Category
     - o Library
  or
  2) Inference procedures
     - o Building sector
     - o Building Regulations compliance
     - o General description
  or
  3) Enter parameters manually
     - o U-value [W/m^{2}K] *or* $1/{R_f}$ [W/m^{2}K] if uncorrected for insulation
     - o κ$_m$ [kJ/m^{2}K]
     - o Has the U-value been corrected to account for insulation to counter heat loss through floors in contact with the ground?

Tab: Construction for doors
<u>Sub-tab: General</u>
- Name of construction
- Definition of construction of doors using one of the following 3 options:
  1) Library
     - o Category
     - o Library
  or
  2) Inference procedures
     - o Building sector
     - o Building Regulations compliance
     - o General description
  or

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3) Enter parameters manually
- o U-value [W/m^{2}K]
- o κ_m [kJ/m^{2}K]

Tab: Glazing
Sub-tab: General
- Name of construction
- Definition of construction of glazing using one of the following 3 options:
1) Library
  - o Category
  - o Library

or

2) Inference procedures
  - o Building Regulations compliance
  - o Number of panes
  - o Coating
  - o Frame material

or

3) Enter parameters manually
  - o U-value - for glazing in vertical inclination [W/m^{2}K]
  - o T-solar – for normal incidence
  - o L-solar – for normal incidence

Form: Geometry

Tab: Project
Sub-tab: General & Geometry
- Global air permeability at 50pa [m^3/h.m^2]
- Building (clockwise) rotation [degrees]
- Global zone floor-to-floor height [m]
- Maximum number of storeys
- Building area [m^2]

Sub-tab: Thermal Bridges
- Global Psi value [W/mK] for junctions involving metal cladding for each of:
  - o Roof-Wall
  - o Wall-Ground floor
  - o Wall-Wall (corner)
  - o Wall-Floor (not ground floor)
  - o Lintel above window or door
  - o Sill below window
  - o Jamb at window or door
- Global Psi value [W/mK] for junctions not involving metal cladding for each of:
  - o Roof-Wall
  - o Wall-Ground floor
  - o Wall-Wall (corner)
  - o Wall-Floor (not ground floor)
  - o Lintel above window or door
  - o Sill below window
  - o Jamb at window or door

Tab: Zones
Sub-tab: General
- Zone name
- HVAC system which serves the zone
- Building type
- Activity type in the zone

- Zone area [m^2]
- Zone floor-to-floor height [m], or select global value
- Air permeability at 50pa [m^3/h.m^2] in the zone, or select global value
- Zone multiplier
- Description of zone
- Define the following Psi values for thermal bridges in the zone or use global values?
    - Zone Psi value [W/mK] for junctions involving metal cladding for each of:
        - Roof-Wall
        - Wall-Ground floor
        - Wall-Wall (corner)
        - Wall-Floor (not ground floor)
        - Lintel above window or door
        - Sill below window
        - Jamb at window or door
    - Zone Psi value [W/mK] for junctions not involving metal cladding for each of:
        - Roof-Wall
        - Wall-Ground floor
        - Wall-Wall (corner)
        - Wall-Floor (not ground floor)
        - Lintel above window or door
        - Sill below window
        - Jamb at window or door

Tab: Envelopes
Sub-tab: General
- Envelope name
- Zone which envelope belongs to
- Type of envelope
    - Pitch angle [degrees] *(field enabled if envelope type is roof or floor/ceiling)*
    - Perimeter length [m] *(field enabled if envelope type is wall)*
- Envelope connects space to, or select global value
- Envelope construction
- Envelope area [m^2]
- Envelope orientation
- Is there a solar collector (SC) on this wall? *(field enabled if envelope type is wall)*
    - SC name
    - SC area [m^2]
- Definition of any thermal bridges in the envelope additional to global values
    - Thermal bridge multiplier
    - Thermal bridge length [m]
    - Thermal bridge Psi [W/mK]
    - Thermal bridge description

Tab: Doors
Sub-tab: General
- Door name
- Envelope which door is in
- Door type
- Door construction
- Door area [m^2]
- Definition of any thermal bridges in the door additional to global values
    - Thermal bridge multiplier
    - Thermal bridge length [m]

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- Thermal bridge Psi [W/mK]
- Thermal bridge description

Tab: Windows & Rooflights
Sub-tab: General
- Window/Rooflight name
- Envelope which window/rooflight is in
- Glazing type
- Window/Rooflight projected area [m^2]
- Ratio of developed area to projected area of window/rooflight
- Ratio of roof area covered by rooflight array to area of rooflight glazing
- Is it a display window?
- Frame factor
- Aspect ratio
- Shading position on window/rooflight
  - Shading colour
  - Shading translucency
- Transmission factor due to fins and overhangs
- Is overhang a brise-soleil?
- Definition of any thermal bridges in the window/rooflight additional to global values
  - Thermal bridge multiplier
  - Thermal bridge length [m]
  - Thermal bridge Psi [W/mK]
  - Thermal bridge description

Form: Building Services
Tab: Global and Defaults
Sub-tab: HVAC System Defaults
- Fuel type for default Heating only – Other systems
- Fuel type for default Heating and mechanical cooling systems

Sub-tab: Project building services
- Do the lighting systems have provision for metering?
  - Is there monitoring and testing with alarm for out-of-range values? *(field enabled if lighting systems have provision for metering)*
- Electric power factor
- The overall CO_2 emission factor for the district heating network. *(field enabled only if the heat source and fuel type of any of the HVAC systems is set to be district heating)*
- The overall primary energy factor for the district heating network. *(field enabled only if the heat source and fuel type of any of the HVAC systems is set to be district heating)*
- The renewable primary energy factor for the district heating network. *(field enabled only if the heat source and fuel type of any of the HVAC systems is set to be district heating – for RER)*
- Process primary energy exported [kWh/annum] *(for RER)*
- Process primary energy used [kWh/annum] *(for RER)*

Tab: HVAC Systems
Sub-tab: General
- HVAC system name
- HVAC system type
  - Heat recovery in ventilation system *(field enabled if there is mechanical ventilation at HVAC level)*
    - Heat recovery seasonal efficiency
    - Variable heat recovery efficiency?

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Sub-tab: Heating System
- Heat source
- Fuel type for heat generator
- Does this heating system also use CHP?
- Effective heat generating seasonal efficiency for heat generator
- Heat generator radiant efficiency *(field enabled if HVAC is a radiant system)*
- Does the heating system qualify for ECA *(relevant only if default efficiency value is used)*?
  - Was the heating system installed in or after 1998 *(relevant only if default efficiency value is used)*?

Sub-tab: Cooling System *(enabled only if HVAC system provides cooling)*
- Generator type
- Generator kW
- Fuel type for cooling generator
- Seasonal energy efficiency ratio for cooling generator
- Nominal energy efficiency ratio for cooling generator
- Does the cooling system qualify for ECA *(relevant only if default efficiency value is used)*?
- Does the system have mixed-mode operation strategy?

Sub-tab: System adjustment *(enabled only if there is mechanical ventilation at HVAC level)*
- Has the ductwork been leakage tested?
  - CEN classification it meets
- Does the AHU meet CEN leakage standards?
  - CEN classification it meets
- Specific fan power [W/(l/s)]
- Variable speed pumping?
  - Type

Sub-tab: Metering Provision
- Does the HVAC system have provision for metering?
  - Is there monitoring and testing with alarm for out-of-range values? *(field enabled if HVAC system has provision for metering)*

Sub-tab: Bi-valent Systems
- Heat source
- Fuel type for heat generator
- Effective heat generating seasonal efficiency for heat generator
- Proportion of heating load provided by heat generator

Sub-tab: System Controls
- Does the HVAC system have central time control?
- Does the HVAC system have optimum stop/start control?
- Does the HVAC system have local time control?
- Does the HVAC system have local temperature control?
- Does the HVAC system have weather compensation control?

Tab: HWS
Sub-tab: General
- HWS name
- HWS generator type
  - Fuel type for HWS generator *(field enabled if hot water is not generated by HVAC system)*
  - Effective heat generating seasonal efficiency for HWS generator *(field enabled if hot water is not generated by HVAC system)*
  - Was the HWS installed later than 1998 *(relevant only if default efficiency value is used)*? *(field enabled if hot water is not generated by HVAC system)*

Sub-tab: Storage & Secondary Circulation

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- Is the system a storage system?
  - Storage volume [litres]
  - Insulation type on storage vessel
    - Insulation thickness [mm]

  or
  - Storage losses [MJ/month]
  - Does the system have secondary circulation?
    - Circulation losses [W/m]
    - Pump power [kW]
    - Loop length [m]
    - Is there time control on the secondary circulation?

Sub-tab: Bi-valent Systems
- Heat generator type
- Fuel type for heat generator
- Effective heat generating seasonal efficiency for heat generator
- Proportion of water heating load provided by heat generator

Tab: SE Systems

Sub-tab: Collector Parameters
- SES name
- HWS which SES is in
- SES area [m^2]
- SES multiplier
- SES orientation
- SES inclination [degrees]
- Do you know the collector performance parameters according to EN 12975-2?
  - Zero-loss collector efficiency factor
  - Collector heat loss coefficient [W/m^{2}K]
  - Temperature dependence of heat loss coefficient [W/m^{2}K]
  - Incidence angle modifier of collector

Sub-tab: Solar Storage & Collector Loop
- Solar storage volume [litres]
- Solar pre-heating type
  - Insulation type on storage vessel
    - Insulation thickness [mm]
- Do you know the heat transfer rate of the heat exchanger(s) in the collector loop?
  - Heat transfer rate [W/K]
- Do you know the overall heat loss coefficient of all pipes in the collector loop?
  - Heat loss coefficient [W/K]

Sub-tab: Auxiliary Energy & Distribution Losses
- Are the distribution pipes between the solar energy system and the back-up system insulated? *(field enabled only if the solar pre-heating type is a separate solar cylinder)*
- Circulation system
  - Do you know the nominal power of the pumps?
    - Nominal power of the pumps [W]

Tab: PV Systems

Sub-tab: General
- PVS name

either
  - PVS type
  - PVS area [m^2]

or
  - PVS peak power

- PVS multiplier
- PVS orientation
- PVS inclination [degrees]
- PVS overshading
- PVS ventilation strategy

Tab: Wind Generators
<u>Sub-tab: General</u>
- Wind generator name
- Terrain type
- Horizontal axis?
  - Diameter of blades [m]
- Other axis?
  - Area swept by blades [m^2]
- Hub height [m]
- Wind generator power [kW]

Tab: CHP Generator
<u>Sub-tab: General</u>
- Fuel type
- Heat efficiency
- Electrical efficiency
- CHPQA Quality Index
- % of building space heat supplied by CHP
- % of building hot water supplied by CHP
- Is it a tri-generation system?
  - % of building space cooling supplied by CHP
  - Chiller efficiency

Tab: Solar Collectors
<u>Sub-tab: General</u>
- SC name
- SC type
- SC control type
- SC shading factor
- TSC type
- TSC operation
- TSC absorptivity
- NTSC collector height [m]
- NTSC air temperature coefficient [K/(W/m^2)]
- Air flow rate coefficient

<u>Sub-tab: Air flows</u>
- Is SC provided with independent fan?
  - SC supply specific fan power [W/(l/s)]
- SC design air flow rate [m^3/s]

Tab: Zones
<u>Sub-tab: HVAC, HWS, and Lighting systems</u>
- HVAC system which services the zone
- Are there de-stratification fans in the zone?
- HWS which serves the zone
- Dead leg length for HWS in the zone [m]

<u>Sub-tab: Ventilation</u>
- Zonal ventilation system – natural or mechanical *(field enabled if there is <u>no</u> mechanical ventilation at HVAC level)*

- o Specific fan power for supply & extract [W/(l/s)] (*field enabled if there is mechanical ventilation at zone level*)
- o Demand-controlled ventilation?
  - ▪ Flow regulation type
- Does activity require high pressure drop air treatment?

Sub-tab: Ventilation (cont.)
- Heat recovery in the zone ventilation (*field enabled if there is mechanical ventilation at zone level*)
  - o Heat recovery seasonal efficiency
  - o Variable heat recovery efficiency?
- Specific fan power for system terminal units [W/(l/s)]

Sub-tab: Exhaust
- Is there mechanical exhaust in the zone?
  - o Flow rate of mechanical exhaust [l/s.m^2]
  - o Specific fan power for exhaust [W/(l/s)]
  - o Extract system serves single or multiple rooms?

Sub-tab: Lighting
- Design illuminance [lux]
- Provide information on lighting using one of the following 3 options:
  1) Full lighting design
  - o Total wattage [W]

  or

  2) Lighting chosen but calculation not carried out
  - o Lumens per circuit wattage
  - o Light output ratio

  or

  3) Lighting parameters not available
  - o Lamp type
- Are air-extracting luminaries fitted?

Sub-tab: Lighting Controls
- Type of lighting controls in the zone
  - o Local manual switching?
  - o Photoelectric?
    - ▪ Dimming or switching?
    - ▪ Type of sensors?
    - ▪ Different sensor for back of zone?
  - o Constant illuminance control?
    - ▪ Parasitic power for photoelectric control and/or constant illuminance control
  - o Do you want SBEMie to perform automatic daylight zoning for lighting controls?
    - ▪ Percentage area of zone where lighting is controlled by daylight.
- Type of occupancy sensing in the zone
  - o Parasitic power for occupancy sensing

Sub-tab: Display Lighting
- Does display lighting use efficient lamps? (*field enabled for activities with display lighting*)
  - o Lumens per circuit wattage for display lighting
- Is there time-switching for display lighting? (*field enabled for activities with display lighting*)

Sub-tab: SC
- Name of SC system providing pre-heated air to this zone
- Percentage of the total air pre-heated by the SC system that is provided to this zone

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