# Tipperary NZEB Event

# Achieving NZEB- Dwellings

Orla Coyle– NZEB and High Performance Retrofit- Programme Manager
26th November 2019

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

# Domestic – New Buildings - NZEB

*Durkan Homes – Citywest*

25% Improvement on Current Regulations
Same Fabric Performance
- Boiler with Increased PV
- Boiler with MVHR and PV
- Heat Pump

| | |
|---|---|
| MPEPC: | 0.3 |
| MPCPC: | 0.35 |
| RER: | 20% |

# Backstop U values & Air Permeability

| Table 1 | Maximum elemental U-value ($W/m^2K$)[1, 2] | |
|---|---|---|
| Column 1 Fabric Elements | Column 2 Area-weighted Average Elemental U-value (Um) | Column 3 Average Elemental U-value – individual element or section of element |
| Roofs<br><br>Pitched roof<br>- Insulation at ceiling<br>- Insulation on slope<br><br>Flat roof | <br><br>0.16<br>0.16<br><br>0.20 | 0.3 |
| Walls | 0.18 | 0.6 |
| Ground floors[3] | 0.18 | 0.6 |
| Other exposed floors | 0.18 | 0.6 |
| External doors, windows and rooflights | 1.4[4,5] | 3.0 |

*Notes:*
1. *The U-value includes the effect of unheated voids or other spaces.*
2. *For alternative method of showing compliance see paragraph 1.3.2.3.*
3. *For insulation of ground floors and exposed floors incorporating underfloor heating, see paragraph 1.3.2.2.*
4. *Windows, doors and rooflights should have a maximum U-value of 1.4 $W/m^2K$.*
5 *The NSAI Window Energy Performance Scheme (WEPS) provides a rating for windows combining heat loss and solar transmittance. The solar transmittance value $g_{perp}$ measures the solar energy through the window.*

NSAI

NSAI Agrément

| Document Title | NSAI Agrément Certified Air Tightness Tester Scheme | Reference<br>Page<br>Revision | D-IAB-007<br>Page 1 of 10<br>5 |
|---|---|---|---|

**NSAI Agrément Approval Scheme for**

**Certified Air Tightness Tester Scheme Master Document**

**to**

**I.S. EN ISO 9972:2015 - Thermal Performance of Buildings - Determination of Air Permeability of Buildings – Fan Pressurization Method.**

Reduction of air permeability backstop from $7m^3/hr/m^2$ to $5m^3/hr/m^2$

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

# DEAP

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

# Timelines for DEAP Methodology

- DEAP 4.2.0 Workbook (for information).
- DEAP 4.2 online software tool used for BER Publication and compliance checks with ALL versions of TGDs
- DEAP 3.2.1 retired on 31st Oct 2019
- Transitional Arrangement
  - Buildings Complying with 2019 Regulations: must use DEAP 4.2 online software tool to demonstrate compliance and publish BERs
  - Building Complying with 2011 Regulations: may continue to demonstrate compliance using DEAP 3.2.1 and under special circumstances may publish BERs up until 31st Dec 2019. Letter of Engagement and XML must be submitted to SEAI 5 days prior to publication.
  - Existing Buildings must use DEAP 4.2 online software to publish BERs

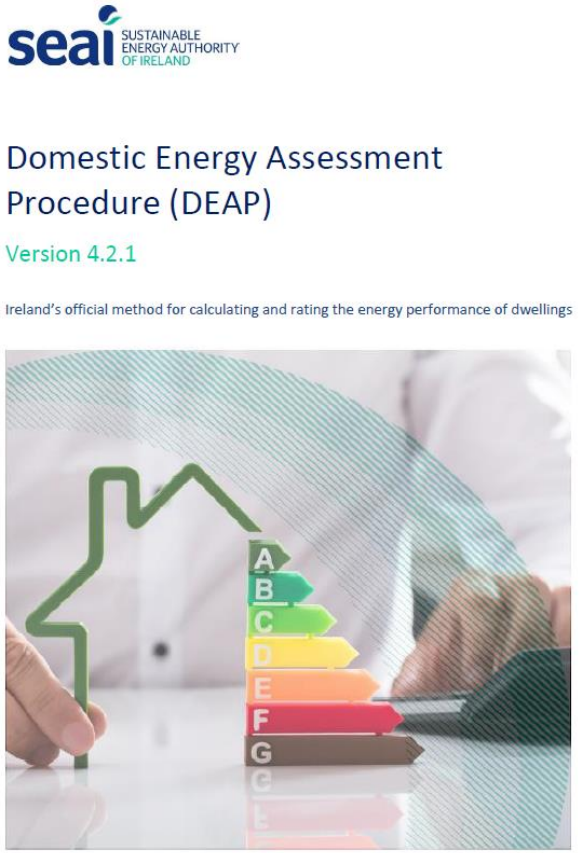
# Software

https://www.seai.ie/home-energy/building-energy-rating-ber/support-for-ber-assessors/domestic-ber-resources/

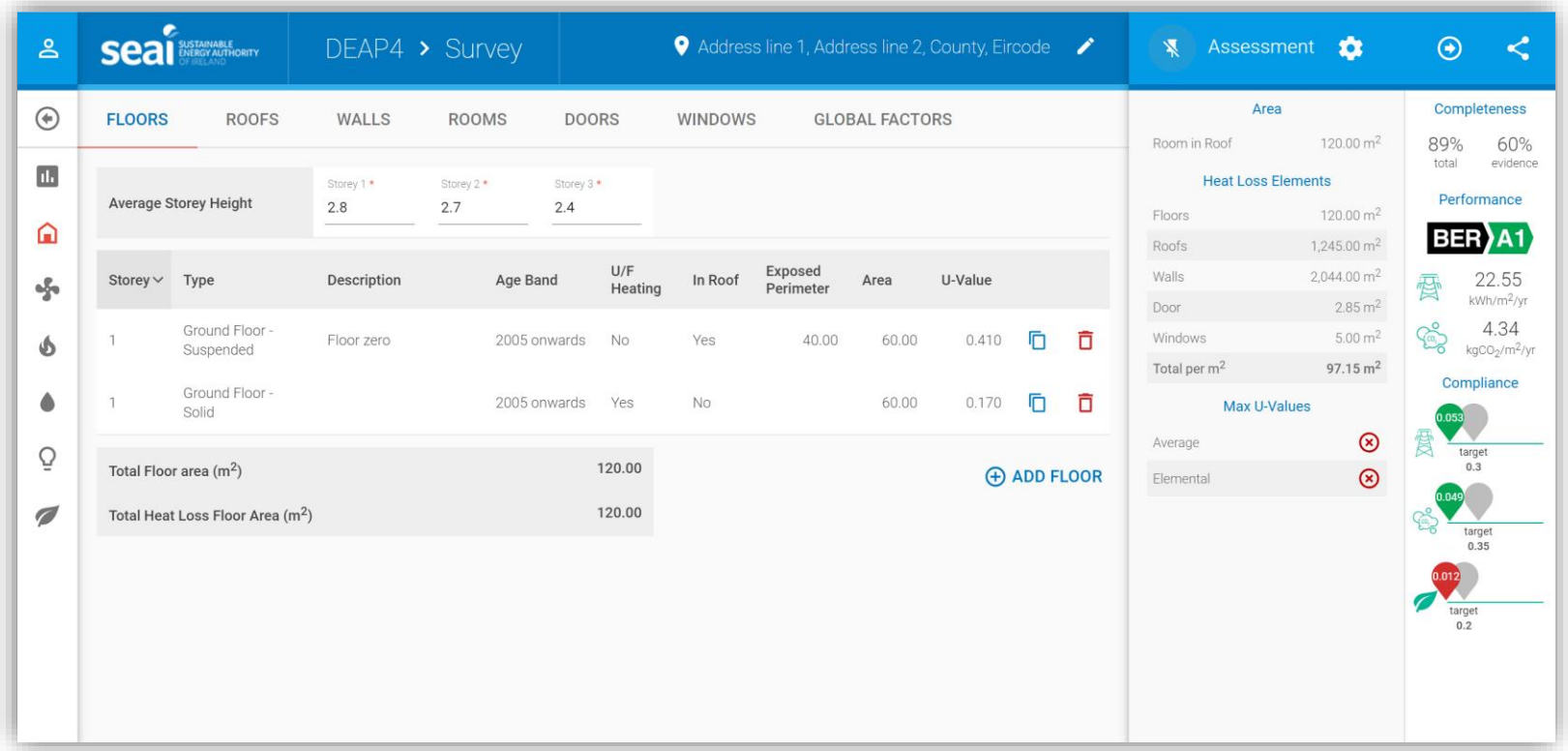
# Documentation

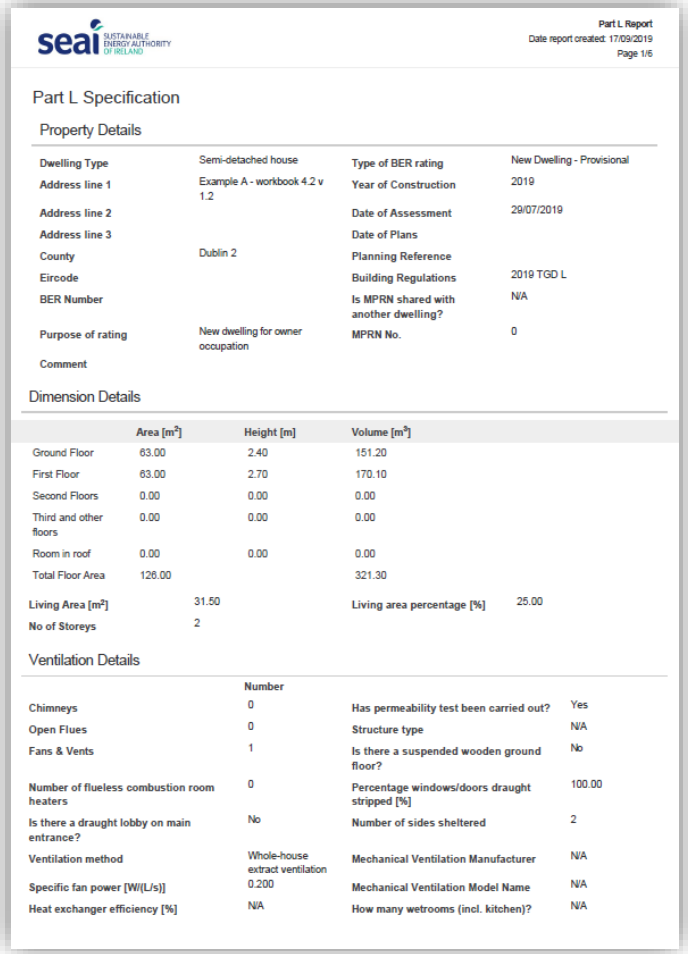
https://www.seai.ie/home-energy/building-energy-rating-ber/support-for-ber-assessors/domestic-ber-resources/

- DEAP Manual:
  - Heat Pump Methodology
  - District Heating Systems
  - Water Calculation
  - Lighting Calculation
  - Renewables
- Technical Guidance Documents
- Heat Pump Consultation and Guidance
- Thermal Bridging Calculation



# DEAP 4.2.0



Part L Report
Date report created: 17/09/2019
Page 1/6

## Part L Specification

### Property Details

| | | | |
|---|---|---|---|
| Dwelling Type | Semi-detached house | Type of BER rating | New Dwelling - Provisional |
| Address line 1 | Example A - workbook 4.2 v 1.2 | Year of Construction | 2019 |
| Address line 2 | | Date of Assessment | 29/07/2019 |
| Address line 3 | | Date of Plans | |
| County | Dublin 2 | Planning Reference | |
| Eircode | | Building Regulations | 2019 TGD L |
| BER Number | | Is MPRN shared with another dwelling? | N/A |
| Purpose of rating | New dwelling for owner occupation | MPRN No. | 0 |
| Comment | | | |

### Dimension Details

| | Area [m²] | Height [m] | Volume [m³] |
|---|---|---|---|
| Ground Floor | 63.00 | 2.40 | 151.20 |
| First Floor | 63.00 | 2.70 | 170.10 |
| Second Floors | 0.00 | 0.00 | 0.00 |
| Third and other floors | 0.00 | 0.00 | 0.00 |
| Room in roof | 0.00 | 0.00 | 0.00 |
| Total Floor Area | 126.00 | | 321.30 |

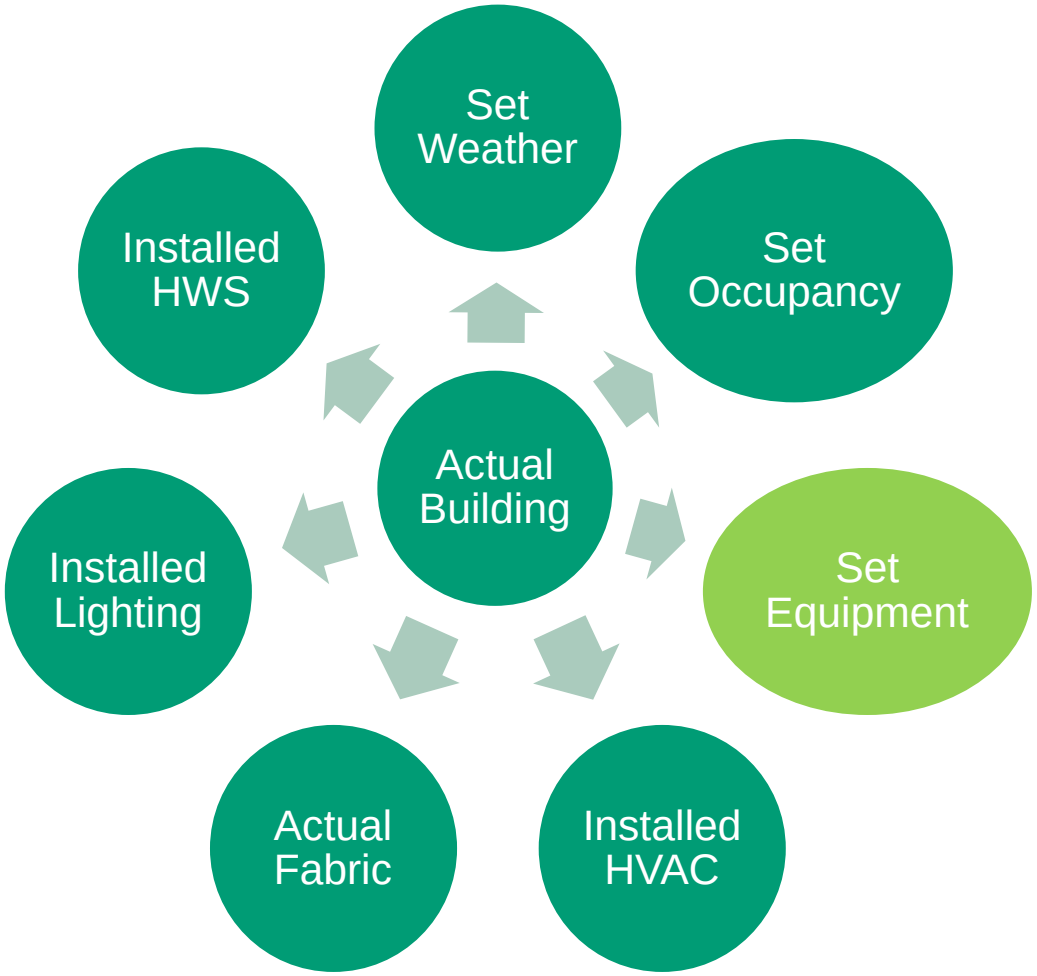
| | | | |
|---|---|---|---|
| Living Area [m²] | 31.50 | Living area percentage [%] | 25.00 |
| No of Storeys | 2 | | |

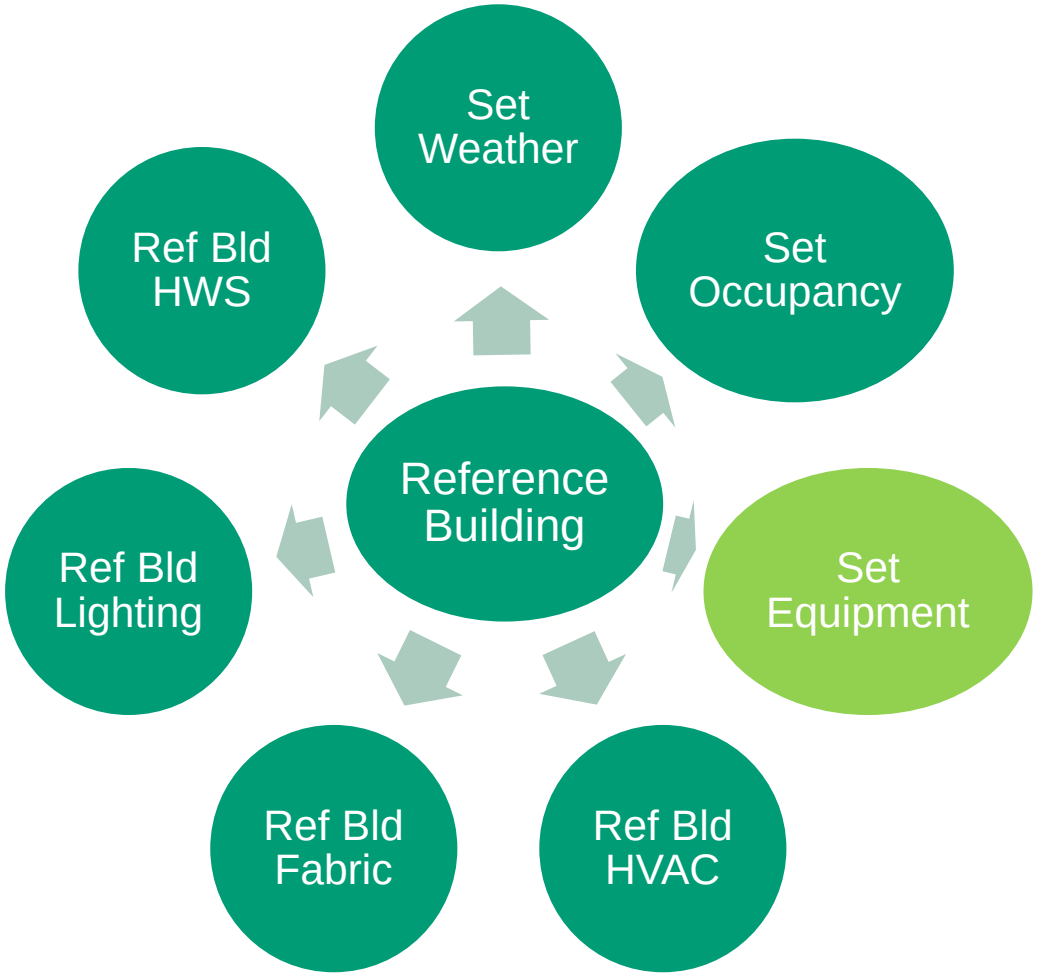
### Ventilation Details

| | Number | | |
|---|---|---|---|
| Chimneys | 0 | Has permeability test been carried out? | Yes |
| Open Flues | 0 | Structure type | N/A |
| Fans & Vents | 1 | Is there a suspended wooden ground floor? | No |
| Number of flueless combustion room heaters | 0 | Percentage windows/doors draught stripped [%] | 100.00 |
| Is there a draught lobby on main entrance? | No | Number of sides sheltered | 2 |
| Ventilation method | Whole-house extract ventilation | Mechanical Ventilation Manufacturer | N/A |
| Specific fan power [W/(L/s)] | 0.200 | Mechanical Ventilation Model Name | N/A |
| Heat exchanger efficiency [%] | N/A | How many wetrooms (incl. kitchen)? | N/A |

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

# DEAP Methodology – Asset Rating – Part L



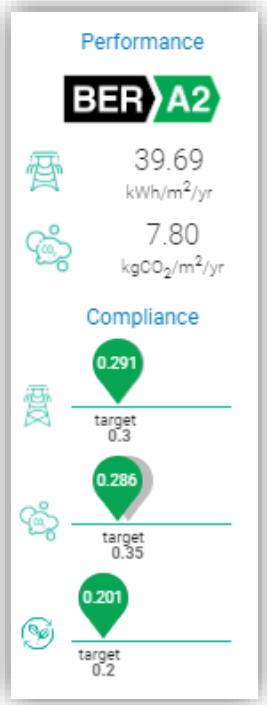

EPC/CPC is ratio of Actual Building to Reference Building

Reference Building is defined in Part L

# DEAP reports on

Results Tab

- Energy Performance Coefficient/ Carbon Performance Coefficient
- Renewable Energy Ratio




Conformity with renewable energy technologies requirement – individual schemes

| | Source | Renewables Primary Energy | Total Primary Energy | RER |
|---|---|---|---|---|
| + Delivered energy | PV/Wind | 1,327.040 | 1,327.040 | |
| + Delivered energy | Other | 0.000 | 0.000 | |
| + Delivered energy | Solar | 0.000 | 0.000 | |
| + Delivered energy | Biomass | 0.000 | 0.000 | |
| + Delivered energy | Biodiesel | 0.000 | 0.000 | |
| + Delivered energy | Bioethanol | 0.000 | 0.000 | |
| + Environmental energy | HP | 0.000 | 0.000 | |
| + Saved energy | CHP | 0.000 | 0.000 | |
| + District heating | District Heating | 0.000 | 0.000 | |
| + Delivered energy | Grid | 0.000 | 39.735 | |
| + Delivered energy | Thermal | 0.000 | 4,729.201 | |
| SUBTOTAL | | 1,327.040 | 6,095.976 | 0.218 ✓ |

Summary for Part L Conformance (Applies to TGD L 2008/2011/2019 for new dwellings only)

| | | | |
|---|---|---|---|
| BER Number | | Building Regulations | 2019 TGD L |
| BER Result | A2 | Energy Value kWh/m²/yr | 41.66 |
| $CO_2$ emissions [kg/m²/yr] | 7.61 | | |
| EPC | 0.286 | EPC Pass/Fail | Pass |
| CPC | 0.253 | CPC Pass/Fail | Pass |

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

# DEAP reports on

- Fabric Checks
- Infiltration Checks

## Part L Conformance - Fabric

| Conformity with Maximum avg U-value requirements | U-value [W/m²K] | Pass/Fail | Conformity with Maximum U-value requirements | U-Value [W/m²K] | Pass/Fail |
|---|---|---|---|---|---|
| Pitched roof insulated on ceiling | 0.11 | Pass | Roofs | 0.11 | Pass |
| Pitched roof insulated on slope | 0 | Pass | Walls | 0.13 | Pass |
| Flat Roof | 0 | Pass | Floors | 0.14 | Pass |
| Floors with no underfloor heat | 0.14 | Pass | External doors / windows / rooflights | 1.50 | Pass |
| Floors with underfloor heat | 0.00 | Pass | | | |
| Walls | 0.13 | Pass | | | |
| Percentage of opening areas [%] | 24.96 | | | | |
| Average U value of openings | 0.94 | Pass | | | |
| Permeability test carried out and meets guidelines in TGD L | | | | 0.15 \| Pass | |

## Conformity with maximum average U-value requirements

| Average elemental U-values | W/m²K |
|---|---|
| Pitched roof insulated on slope | 0.000 ✓ |
| Pitched roof insulated on ceiling | 0.110 ✓ |
| Flat roof | 0.000 ✓ |
| Floors with no underfloor heat | 0.140 ✓ |
| Floors with underfloor heat | 0.000 ✓ |
| Walls | 0.130 ✓ |
| Percentage of opening areas [%] | 24.960 |
| Average U-value of openings | 0.935 ✓ |
| Permeability test carried out and meets guidelines of TGDL | 0.150 ✓ |

## Conformity with maximum elemental U-value requirements

| Maximum elemental U-Values | W/m²K |
|---|---|
| Roofs | 0.110 ✓ |
| Walls | 0.130 ✓ |
| Floors | 0.140 ✓ |
| External doors windows/rooflights | 1.500 ✓ |

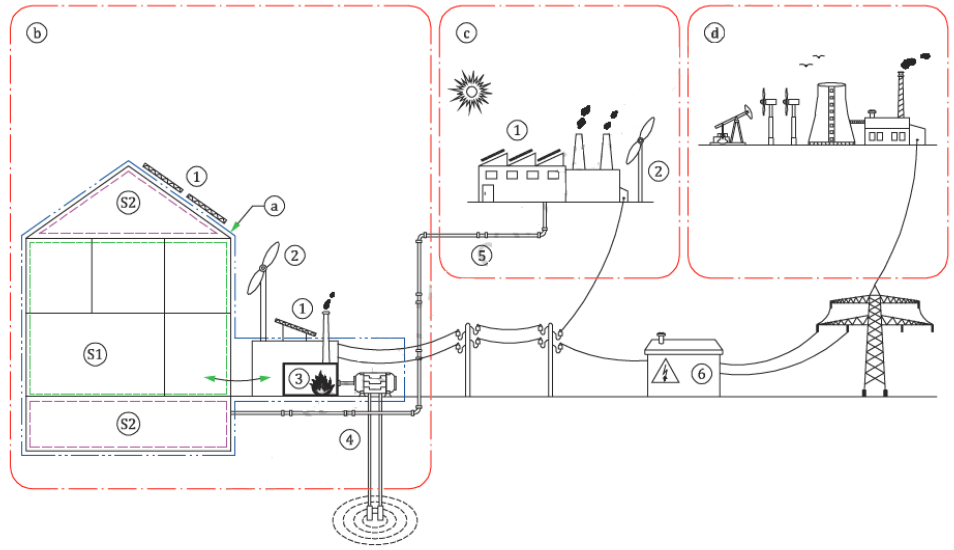
seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

# Changes to the Calculation Methodology

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

# Renewable Energy Ratio

- Calculated in line with ISO 52000
- Included:
  - PV
  - Solar
  - Wind
  - Heat Pump
  - Biomass/ Biogas
  - District heating
  - CHP




**Key**

| | | | |
|---|---|---|---|
| a | assessment boundary (use energy balance) | 1 | PV, solar |
| b | perimeter: on-site | 2 | wind |
| c | perimeter: nearby | 3 | boiler room |
| d | perimeter: distant | 4 | heat pump |
| S1 | thermally conditioned space | 5 | district heating/cooling |
| S2 | space outside thermal envelope | 6 | substation (low/medium voltage and possible storage) |

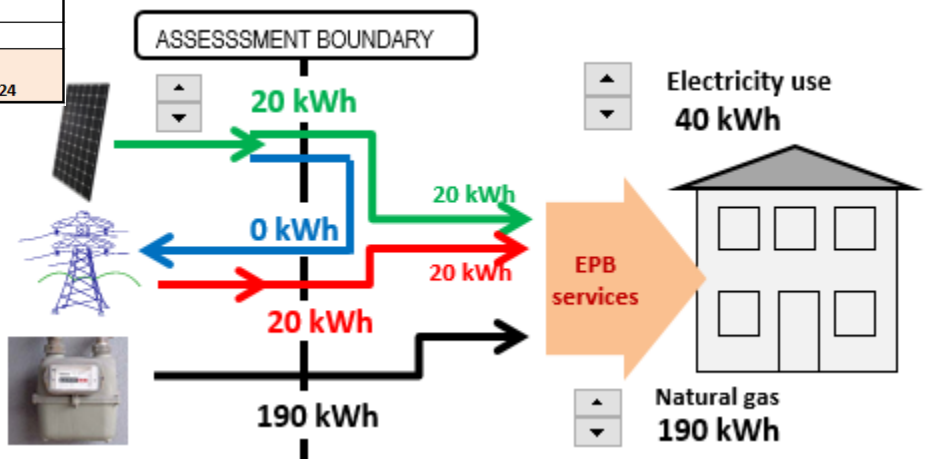
The Renewable Energy Ratio *RER* = $\frac{E_{Pren}\ \text{Primary Energy of the Renewables}}{E_{Ptot}\ \text{Total Primary Energy}}$

# Renewable Energy Ratio - General

**PV/ Wind/Solar/Biomass/ Biogas/ District Heating**

- *Equation 1* $Ep,_{ren} = Generated\ Energy \times Fp,_{ren}$
- Equation 2 $Ep,_{tot} = Generated\ Energy \times Fp,_{ren} + Generated\ Energy \times Fp,_{nren}$

| | | E | fPnren | fPren on-site | EPnren | Epren on-site | EPtot | RER |
|---|---|---|---|---|---|---|---|---|
| | | kWh | | | kWh | kWh | kWh | nrb-os |
| + Delivered energy | PV/Wind | 815.1 | 0 | 2.08 | 0.0 | 1695.4 | 1695.4 | |
| + Delivered energy | Other | 0.0 | 0 | 1 | 0.0 | 0.0 | 0.0 | |
| + Delivered energy | Solar | 0.0 | 0 | 1 | 0.0 | 0.0 | 0.0 | |
| + Delivered energy | Biomass | 0.0 | 0.1 | 1 | 0.0 | 0.0 | 0.0 | |
| + Delivered energy | Biodiesel | 0.0 | 0.3 | 1 | 0.0 | 0.0 | 0.0 | |
| + Delivered energy | Bioethanol | 0.0 | 0.34 | 1 | 0.0 | 0.0 | 0.0 | |
| + Environmental energy | HP | 0.0 | 0 | 1 | 0.0 | 0.0 | 0.0 | |
| + Saved energy | CHP | 0.0 | 0 | 1 | 0.0 | 0.0 | | |
| + Delivered energy | District Heating | 0.0 | 0.6 | 0.4 | 0.0 | 0.0 | 0.0 | |
| + Delivered energy | Grid | -366.5 | 2.08 | 0 | -762.4 | 0.0 | -762.4 | |
| + Delivered energy | Thermal | 5580.6 | 1.1 | 0 | 6138.6 | 0.0 | 6138.6 | |
| TOTAL STEP A | | | | | 5376.2 | 1695.4 | 7071.7 | 0.24 |



# Renewable Energy Ratio (new dwelling compliance)

| PV Example | Delivered Energy | PEF | Primary Energy | |
|---|---|---|---|---|
| Main space | 3521 | 1.1 | 3873 | |
| Secondary space | 770 | 1.1 | 847 | |
| Main water | 2423 | 1.1 | 2665 | |
| Supplementary water | 0 | 0 | 0 | |
| Pumps, fans & electric showers | 130 | 2.08 | 270 | |
| Lighting | 272 | 2.08 | 566 | |
| PV | - 1224 | 2.08 | **-2546** | **(Epren)** |
| Total | | | **5675** | **(Epnren)** |

- Calculate electricity generated by the on-site PV, in kWh.
- Generated electricity is multiplied by the PEF of the PV to determine the total and renewable primary energy.

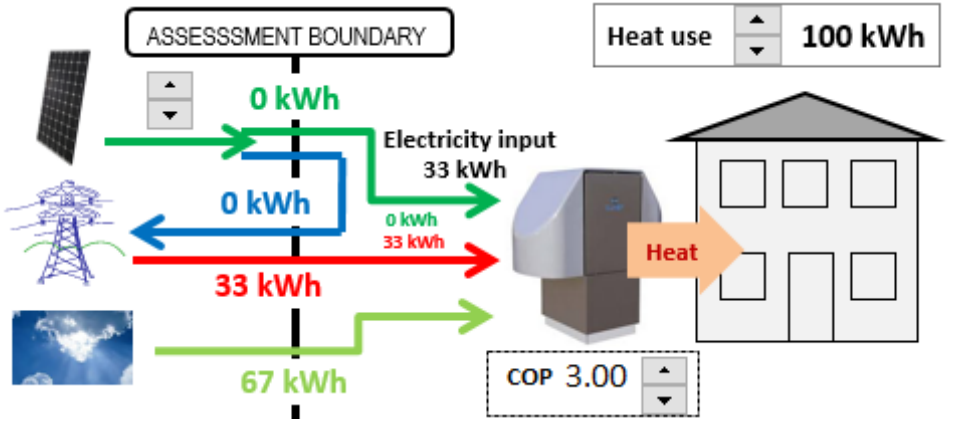
$$\mathbf{RER} = \frac{\mathbf{Epren}}{\mathbf{Eptot}} = \frac{\mathbf{2546\ kWh/y}}{\mathbf{5675 + 2546 = 8221\ kWh/y}} = \mathbf{0.31}$$

# Renewable Energy Ratio – Heat Pump

**Heat Pump**

- *Environmental Energy = (Htg Demand$_{HP}$ - Consumed Energy$_{HP}$)*

| | | E | fPnren | fPren on-site | EPnren | Epren on-site | EPtot | RER |
|---|---|---|---|---|---|---|---|---|
| | | kWh | | | kWh | kWh | kWh | nrb-os |
| + Delivered energy | PV/Wind | 0.0 | 0 | 2.08 | 0.0 | 0.0 | 0.0 | |
| + Delivered energy | Other | 0.0 | 0 | 1 | 0.0 | 0.0 | 0.0 | |
| + Delivered energy | Solar | 0.0 | 0 | 1 | 0.0 | 0.0 | 0.0 | |
| + Delivered energy | Biomass | 0.0 | 0.1 | 1 | 0.0 | 0.0 | 0.0 | |
| + Delivered energy | Biodiesel | 0.0 | 0.3 | 1 | 0.0 | 0.0 | 0.0 | |
| + Delivered energy | Bioethanol | 0.0 | 0.34 | 1 | 0.0 | 0.0 | 0.0 | |
| + Environmental energy | HP | 1842.4 | 0 | 1 | 0.0 | 1842.4 | 1842.4 | |
| + Saved energy | CHP | 0.0 | 0 | 1 | 0.0 | 0.0 | | |
| + Delivered energy | District Heating | 0.0 | 0.6 | 0.4 | 0.0 | 0.0 | 0.0 | |
| + Delivered energy | Grid | 1571.3 | 2.08 | 0 | 3268.4 | 0.0 | 3268.4 | |
| + Delivered energy | Thermal | 0.0 | 1.1 | 0 | 0.0 | 0.0 | 0.0 | |
| TOTAL STEP A | | | | | **3268.4** | **1842.4** | **5110.8** | **0.36** |



# Renewable Energy Ratio (new dwelling compliance)

| HP Example | Delivered Energy | PEF | Primary Energy | |
|---|---|---|---|---|
| Main space | 538 | 2.08 | 1119 | |
| Secondary space | 447 | 1.1 | 492 | |
| Main water | 949 | 2.08 | 1974 | |
| Pumps, fans & electric showers | 175 | 2.08 | 364 | |
| Lighting | 272 | 2.08 | 566 | |
| Total | | | **4,515** | **(Epnren)** |

| HP Example | Heat Use | HP % | Elec. Use (Del. Energy) | Environmental Energy | |
|---|---|---|---|---|---|
| Main space | 2365 | 4.4 | 538 | 1827 | |
| Main water | 2088 | 2.2 | 949 | 1139 | |
| Total | | | | **2966** | **(Epren)** |

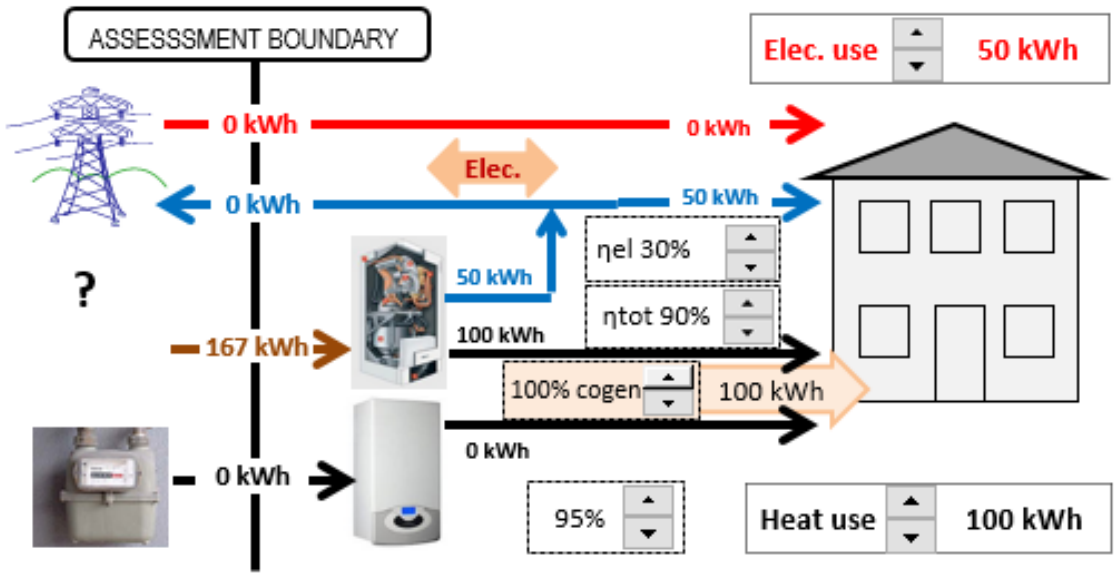
$$\text{RER} = \frac{\text{Epren}}{\text{Eptot}} = \frac{2966 \text{ kWh/y}}{4515 + 2966 = 7481 \text{ kWh/y}} = 0.40$$

# Renewable Energy Ratio – CHP

**CHP**

- Saved Energy =

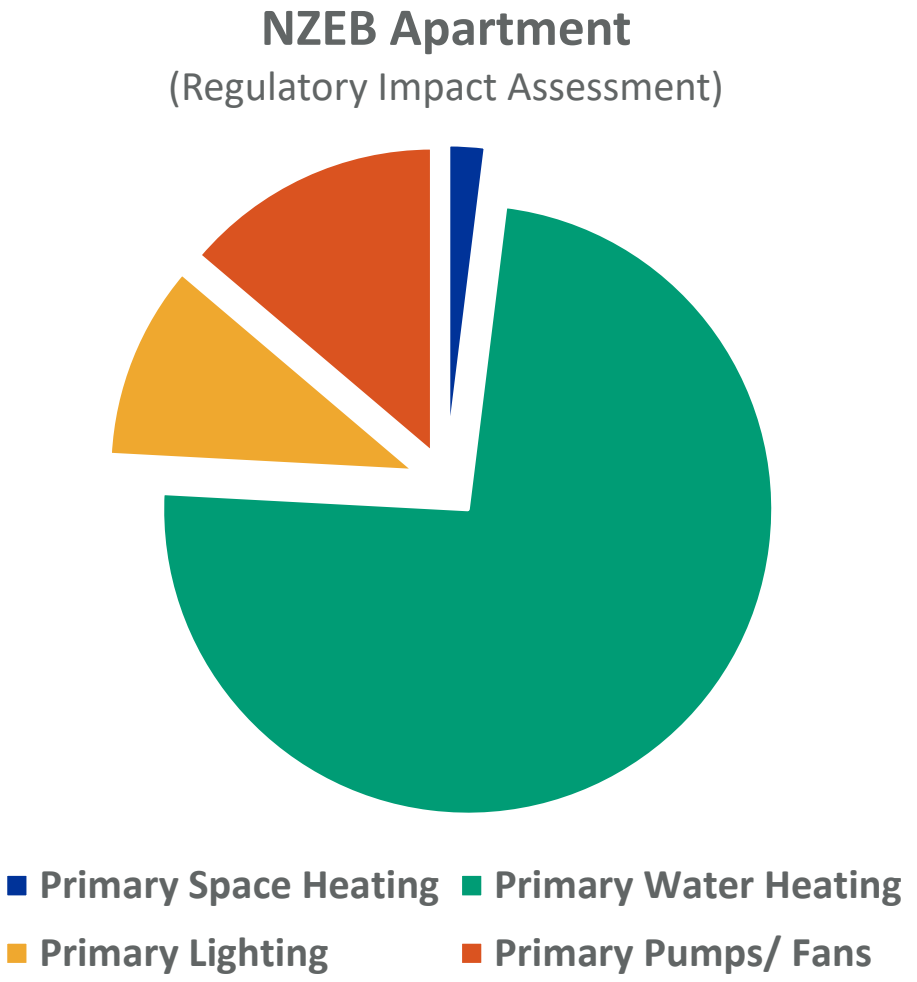
$$\text{Heat Demand}_{CHP} \times [(PEF_{gas} / 0.9) + ((CHP_{eff\_elec} \times PEF_{elec}) / CHP_{eff\_heat}) - (PEF_{gas} / CHP_{eff\_heat})]$$



# Water Heating – Changes to energy demand calculation

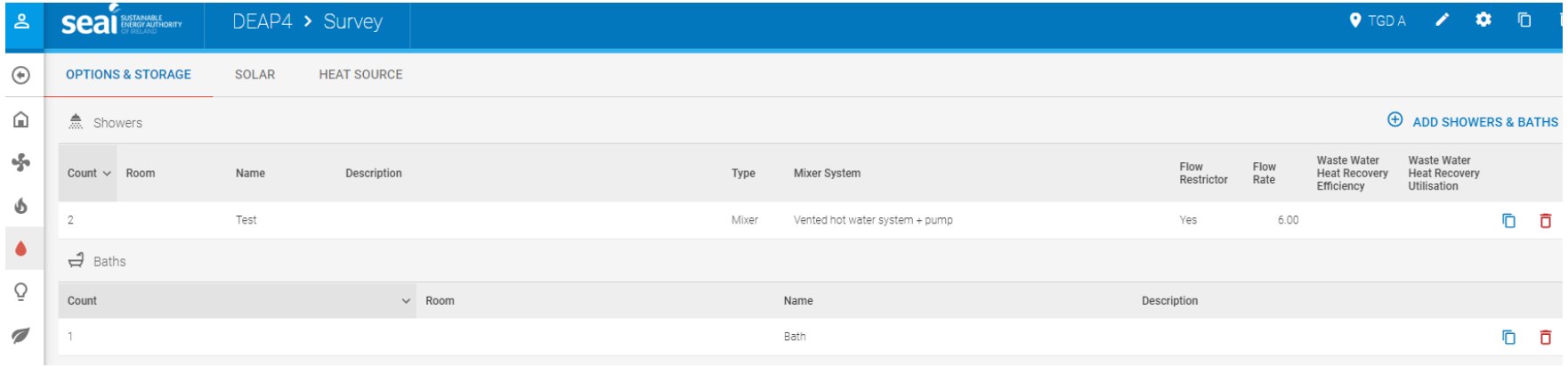
**New methodology will take account of**

- Updated occupancy rates
- Shower types and presence of baths
- Electricity used by electric showers
- Low water use fittings



# Water heating – Hot water required for showers

- Daily hot water requirement is calculated individually for each shower in the dwelling & then summed
- For each shower, hot water requirement depends on
  - *No. of occupants (floor area) & adjusted to account for a bath if present*
  - Shower flow rate - (*Hot water pressure) depends on plumbing arrangement, pumps, flow restrictors*






seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

# Water Heating – Entering showers in DEAP

**Instantaneous Electric Shower**

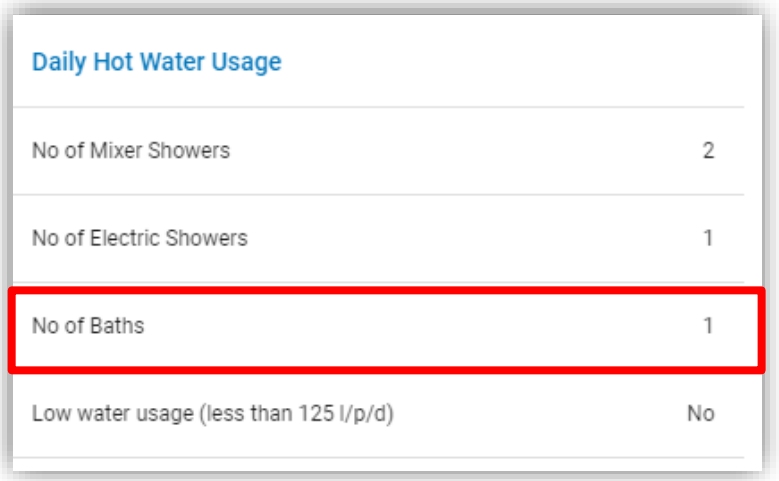
- Don’t use any hot water - they only have a cold water feed
- The significant amount of electricity they use is accounted for in DEAP
- Also affects the heat gain calculation in DEAP

| Storage | |
|---|---|
| Storage loss [kWh/y] | 243.34 |
| Storage loss adjusted for dedicated solar storage [kWh/y] | 243.34 |
| Primary circuit loss [kWh/y] | 360.00 |
| Primary circuit loss adjusted for occupancy [kWh/y] | 309.77 |
| Output from main water heater [kWh/y] | 2,224.92 |
| Heat gains from water heating system [W] | 120.26 |
| Annual heat gains from water heating system [kWh/y] | 1,053.46 |
| Output from supplementary water heater [kWh/y] | 0.00 |
| WWHRS input to main system [kWh/y] | 0.00 |
| WWHRS input to supplementary system [kWh/y] | 0.00 |
| Electricity Consumption from Electric Showers [kWh/y] | 220.38 |

# Water Heating – Bath in dwelling

- The amount of hot water used in baths depends on
    - no. of occupants (floor area) & adjusted to account for a shower if present

**$V_{d,bath}$ = DHW used per bath * the number of baths per day**



| Daily Hot Water Usage | |
|---|---|
| No of Mixer Showers | 2 |
| No of Electric Showers | 1 |
| No of Baths | 1 |
| Low water usage (less than 125 l/p/d) | No |

| | | |
|---|---|---|
| Is a Bath present within Dwelling | Yes | No |
| **Hot Water Usage from Showers** | | |
| No of Showers Taken | 1.72 | 2.21 |

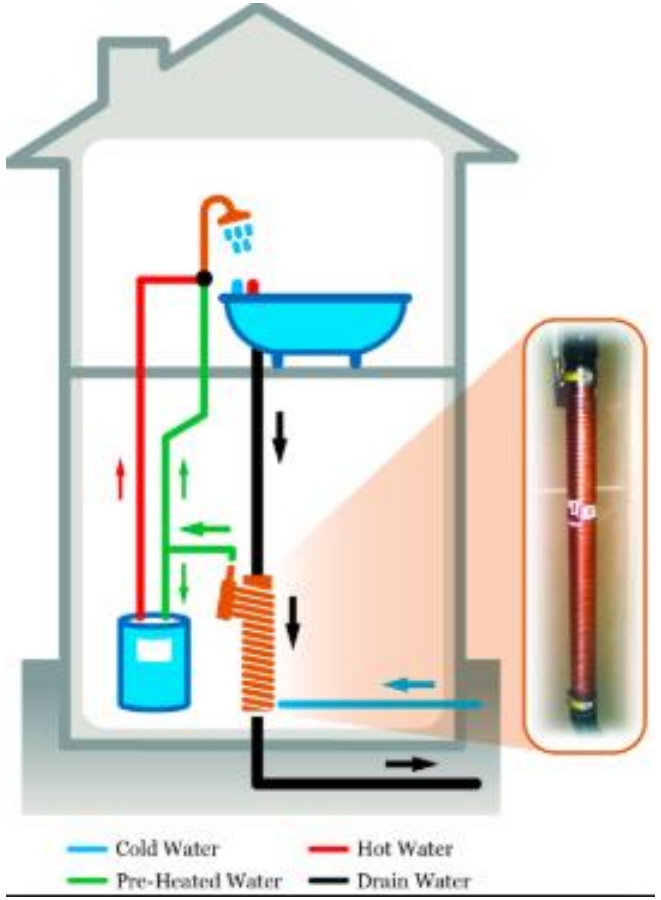


SUSTAINABLE ENERGY AUTHORITY OF IRELAND

# Water Heating – instantaneous waste water heat recovery

- Use a heat exchanger to recover heat from waste warm water to pre-heat the cold water feed of a shower

- The energy recovered depends on
  - the number and type of systems that are installed.



# Water Heating – reduced water consumption (target ≤ 125 l/p/d)

- Where the design of the system reduces overall water consumption within the dwelling, the methodology will allow the benefits to be accounted for in the Hot Water Energy Demand.

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

**DEAP - Water Efficiency Calculation Tool**

**Version 1.0**

The purpose of this utility is to enable the calculation of the water efficiency calculation methodology for assessing the whole house potable water consumption in the dwellings in the SEAI DEAP (Domestic Energy Assessment Procedure) software.

Assessors should proceed to the relevant "Input" tab

Version 1.0

| Colour Key | MPRN: | BER Number: | Element | | |
|---|---|---|---|---|---|
| User Input | | | | | |
| Constant | Date of Survey | Address | Year of Construction | | |
| Calculated Value | | | | Water Consumption | 103.10 |
| | Assessor No | Assessor Name | Comment | | |
| | | | | | |

igures from manufacturers' product details should be entered into Table 1 to calculate the consumption of each fitting in litres per person per day. Where there are multiple fittings of the same type hat have various flow rates or capacities (e.g. hot and cold taps with different flow rates), Tables 2.1 to 2.7 on the Multiple Fittings should be used to determine the average flow rate or capacity of uch fittings. The consumption of water softeners in litres per person per day is calculated using Table 3. All values throughout the water efficiency calculator should be rounded to two decimal places vith the exception of the total water consumption figures, which should be rounded to one decimal place.

Table 1

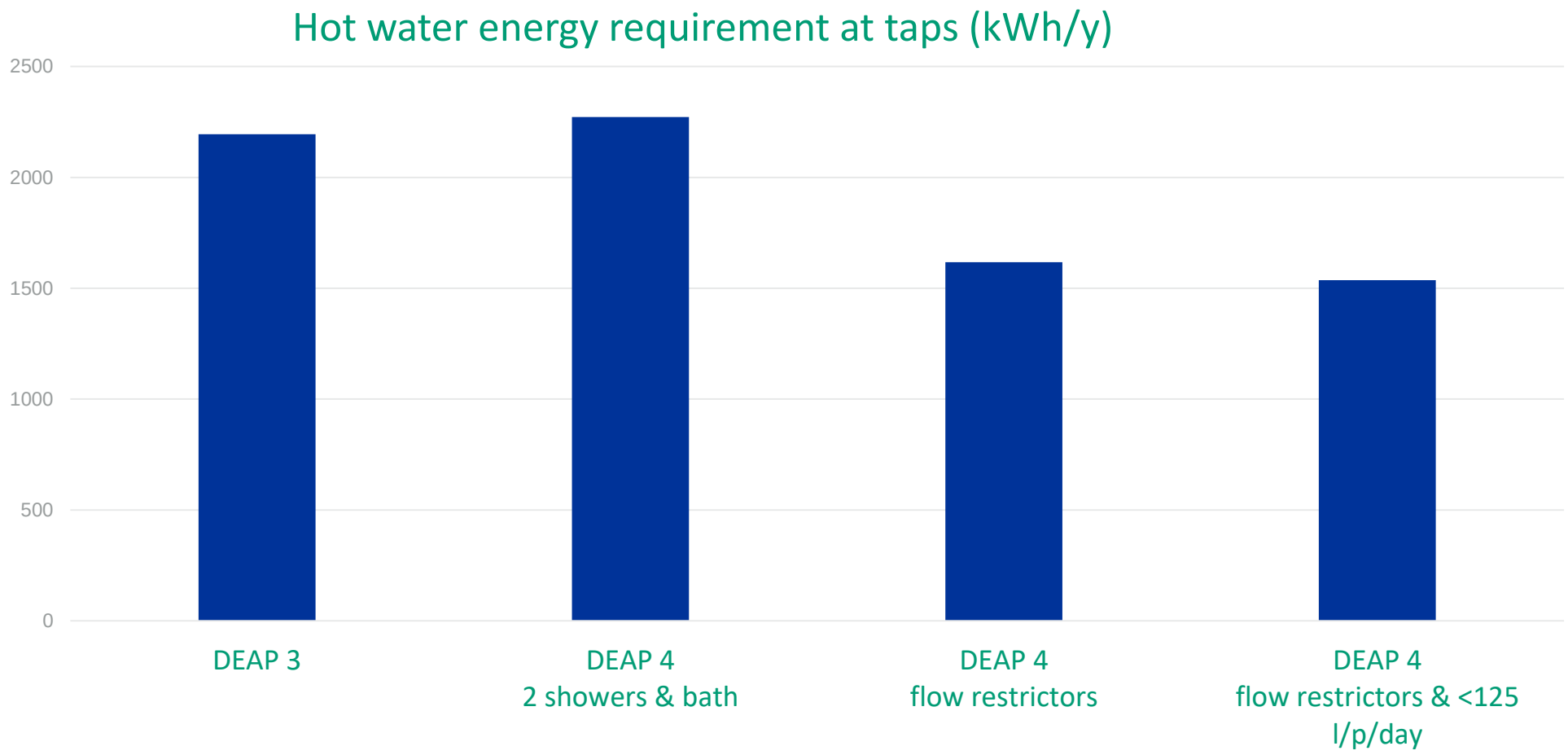
| Installation Type | Unit of Measure | (1) Capacity/ Flow Rate | (2) Use Factor | (3) Fixed Use (litres/person/day) | (4) Litres per person per day (1) x (2) + (3) |
|---|---|---|---|---|---|
| WC (Single Flush) | Flush Volume (litres) | 0 | 4.42 | 0 | 0 |
| WC (Dual Flush) | Full Flush Volume (litres) | 8 | 1.46 | 0 | 11.68 |
| | Part Flush Volume (litres) | 4 | 2.96 | 0 | 11.84 |
| WCs (Multiple Fittings) | Average effective flushing volume (litres) | | 4.42 | 0 | 0 |
| Taps (excluding Kitchen/ utility room taps) | Flow rate (litres/minute) | 6 | 1.58 | 1.58 | 11.06 |
| Bath (where shower also present) | Capacity to overflow (litres) | 50 | 0.11 | 0 | 5.5 |

| Daily Hot Water Usage | |
|---|---|
| No of Mixer Showers | 2 |
| No of Electric Showers | 1 |
| No of Baths | 1 |
| Low water usage (less than 125 l/p/d) | No |



SUSTAINABLE ENERGY AUTHORITY OF IRELAND

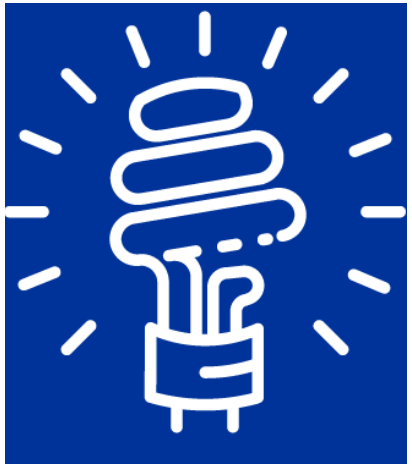
# Water Heating – Impact of changes



# Lighting – Changes to lighting demand calculation

**Portable Lighting:**

- Efficiency improved based on UK Household Electricity Survey



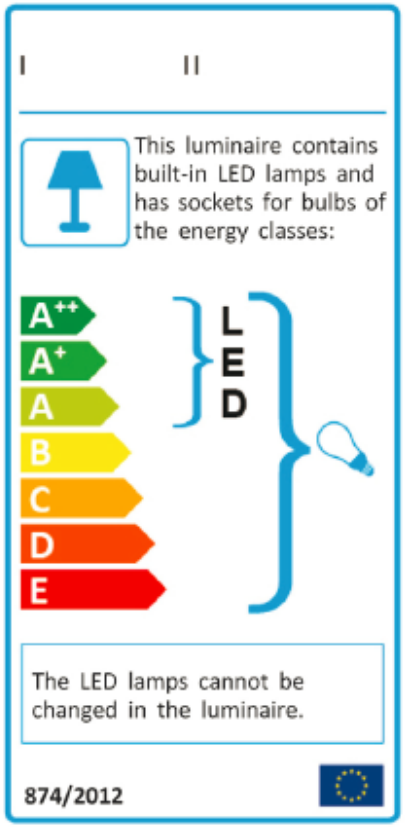
**Fixed lighting:**

- **Lighting Design Known:** input wattage and efficacy based on design of the installed lighting
- **Lighting Design Unknown:** the assessor enters no. of each lamp type

# Lighting – Changes to lighting demand calculation

**Benefits:**

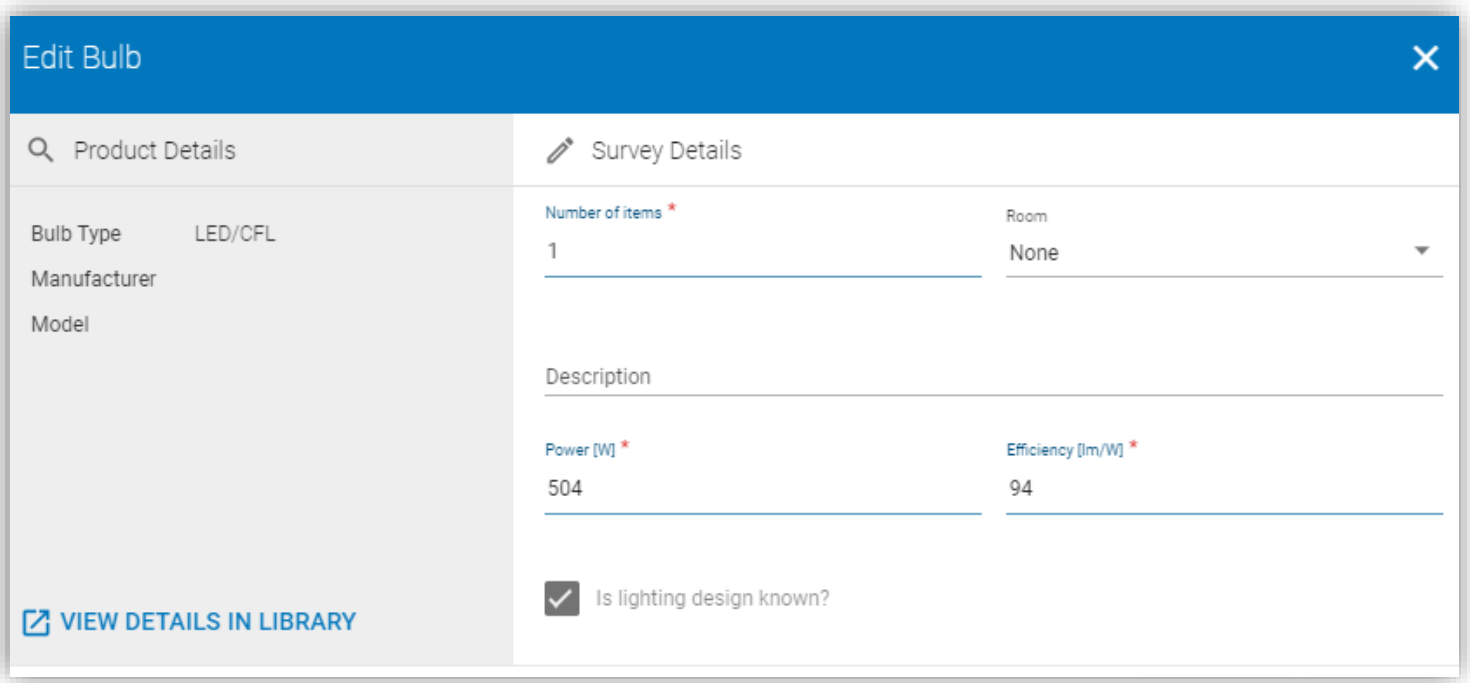
- Takes account of different lighting designs
- Takes account of new high performance light fittings, such as LEDs
- Where lighting is overdesigned, the additional energy use is accounted for
- Where lighting is under-designed, the lighting is supplemented with portable lighting, therefore encouraging adequate lighting to be designed.



# Lighting – Lighting Design Known

**Input**

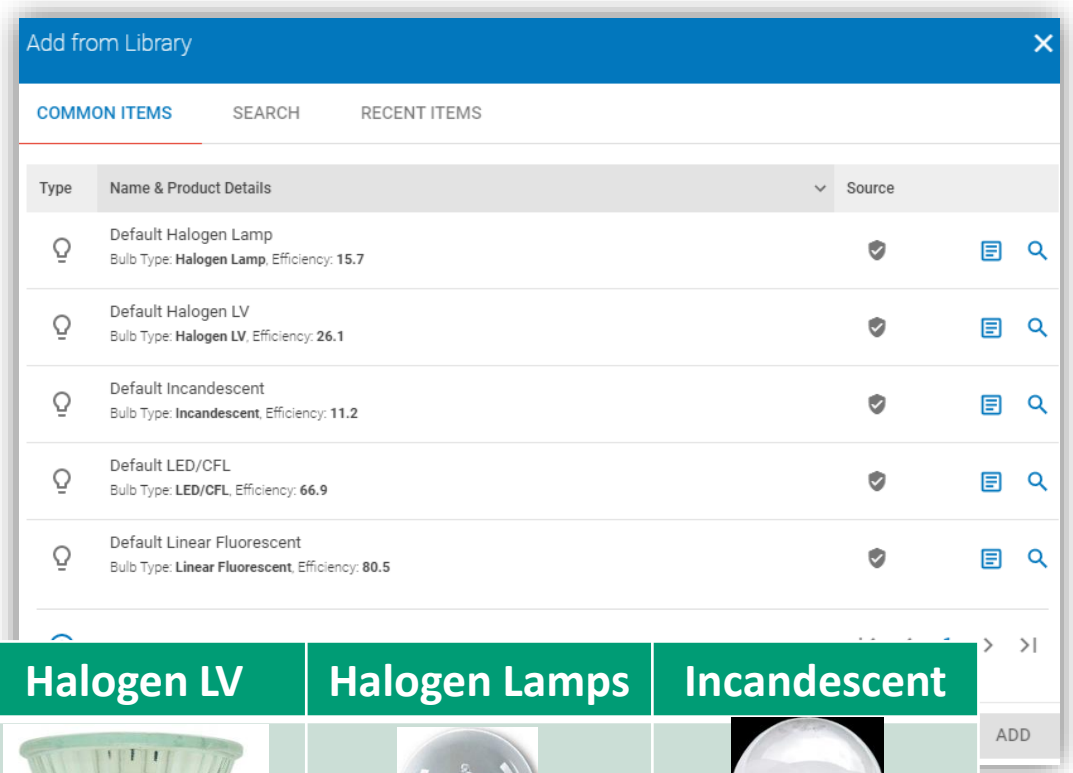
- Enter Lamp Power in Watts
- Enter lamp efficacy in lumen/watt **if available** or default lumen/watt is applied



# Lighting – Lighting Design Unknown (default)

**Input**

- Number of each bulb type
- Applies **default** lumen/watt based on lamp type

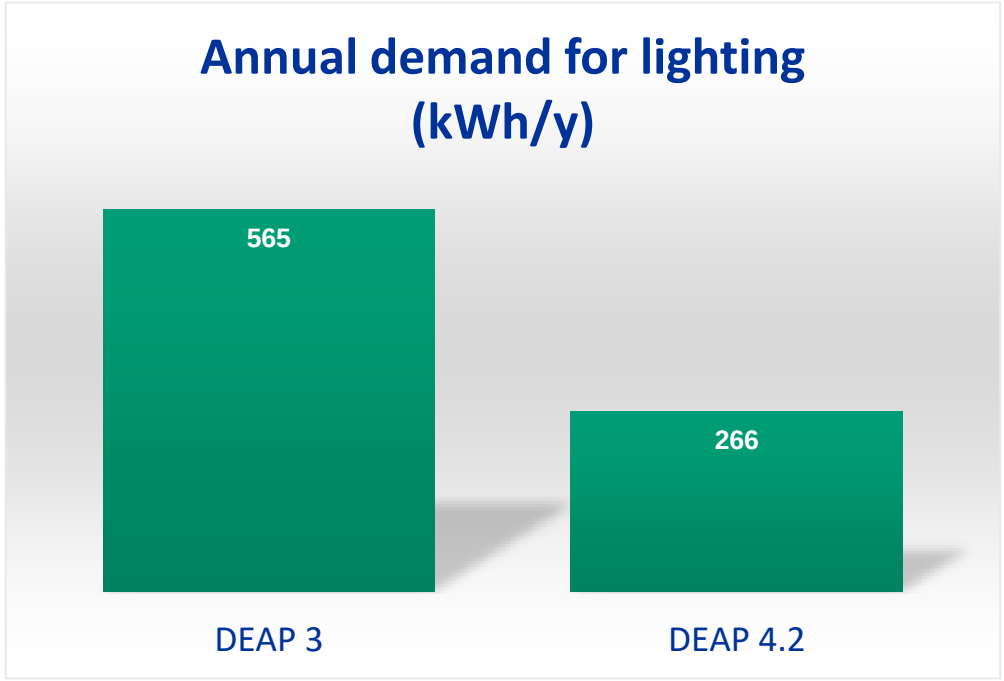


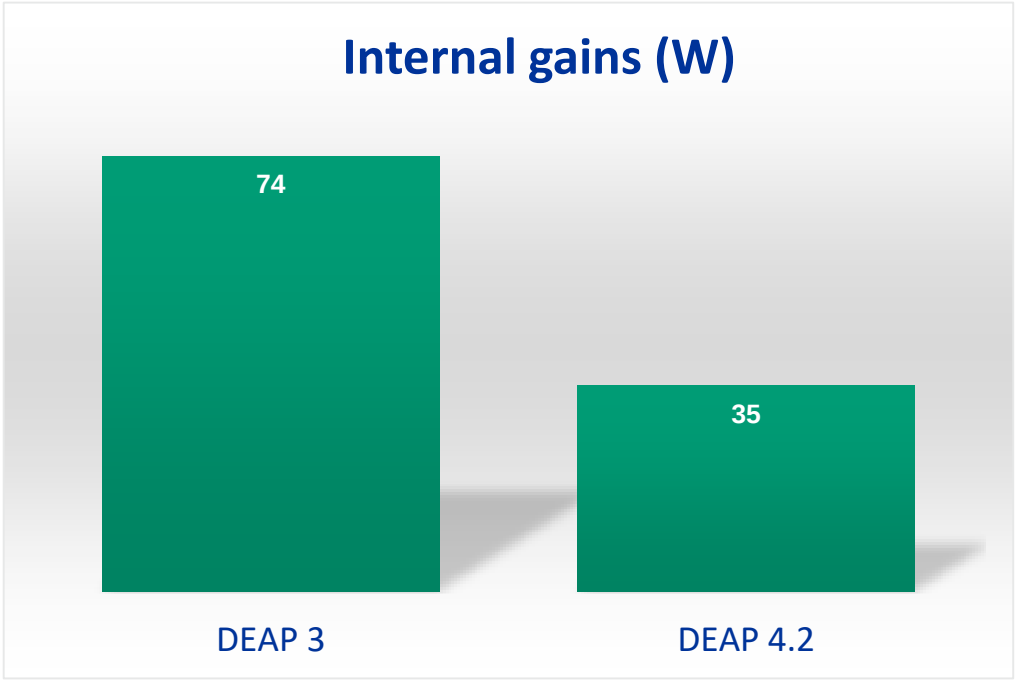

| Lamp Type | Linear Fluorescent | LEDs/CFLs | Halogen LV | Halogen Lamps | Incandescent |
|---|---|---|---|---|---|
| |  |  |  |  |  |
| **Lumen/watt** | **80.5** | **66.9** | **26.1** | **15.7** | **11.2** |



SUSTAINABLE ENERGY AUTHORITY OF IRELAND

# Lighting – Impacts of changes

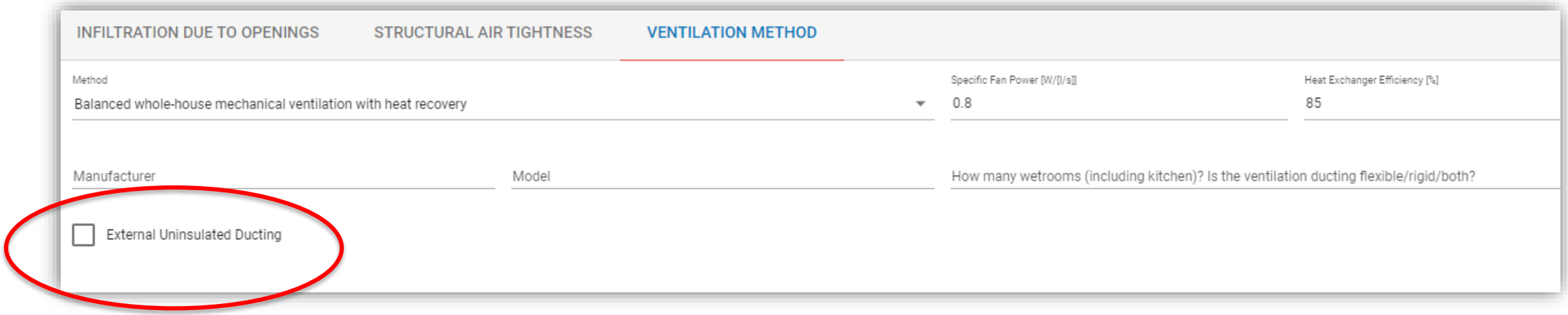



- 100% CFLs/LEDs in 120 sqm dwelling

# Ventilation – Changes to MVHR input

- Efficiency adjustment factor for MVHR systems where ductwork outside the insulated dwelling envelope is **uninsulated**.
- Reduces heat exchanger efficiency by 15% → Increases ventilation heat loss



# Ventilation – Exhaust Air Heat Pumps

- Where Exhaust Air Heat Pumps are used, enter the Air Flow Rate from the test data
- Where ventilation rate exceeds default, additional load is accounted

Exhaust Air Flow Rate [$m^3/h$] *

120

| Ventilation | |
|---|---|
| Ventilation Method | Exhaust Air Heat Pump |
| Electricity for ventilation fans [kWh/y] | 49.76 |
| Heat gains from ventilation fans [W] | 0.00 |
| Effective air change rate [ac/h] | 0.515 |
| Ventilation heat loss [W/K] | 33.74 |

Exhaust Air Flow Rate [$m^3/h$] *

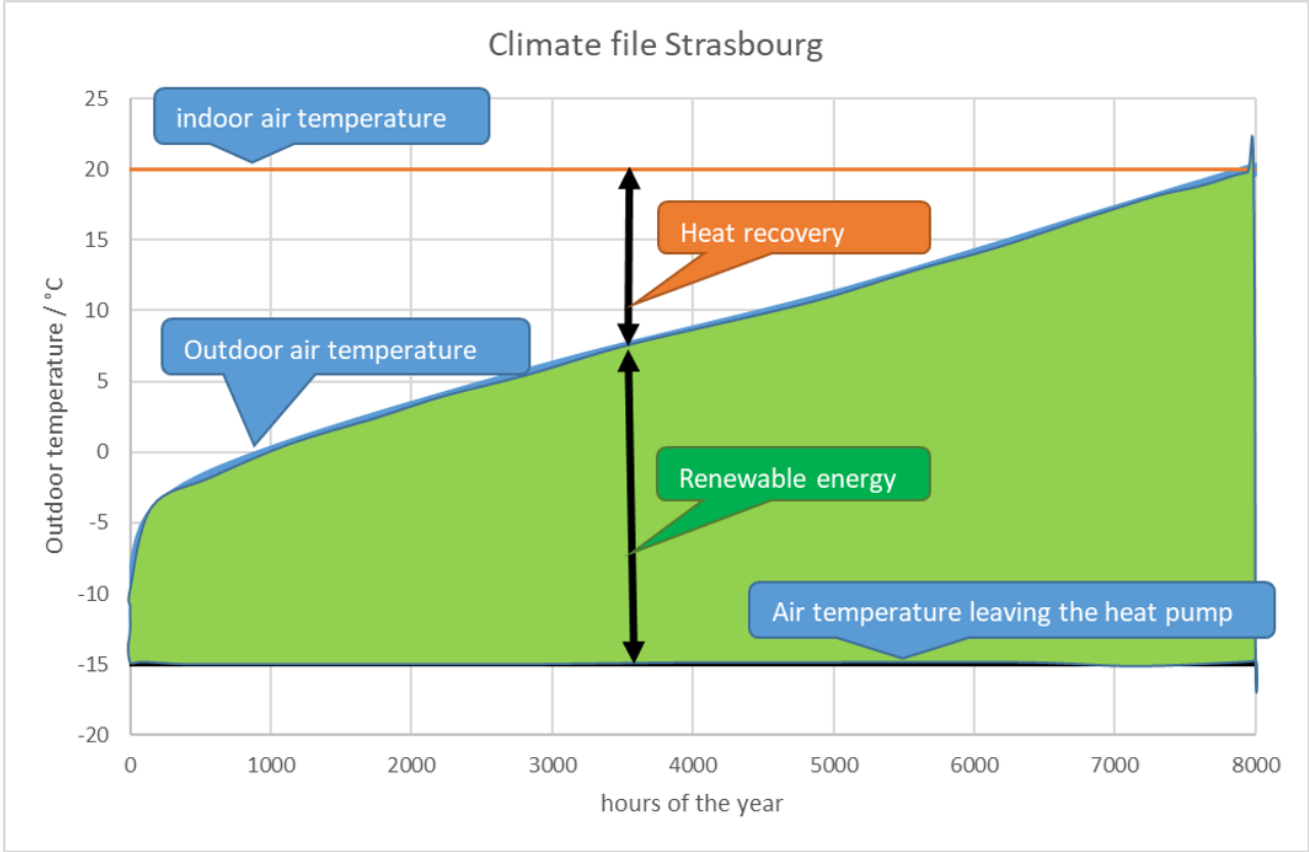
250

| Ventilation | |
|---|---|
| Ventilation Method | Exhaust Air Heat Pump |
| Electricity for ventilation fans [kWh/y] | 81.39 |
| Heat gains from ventilation fans [W] | 0.00 |
| Effective air change rate [ac/h] | 0.843 |
| Ventilation heat loss [W/K] | 55.19 |

# Exhaust Air Heat Pumps – Renewable Contribution

Renewable Contribution in line with Renewable Energy Directive

% Renewable based on load provided by Heat Pump versus load provided by Heat Pump and Ventilation system specific to Irish weather data



# Examples

# Comparison of Mid Floor Apartment

| Parameter | Part L 2019<br>Gas Boiler | Part L 2019<br>Heat Pump | Part L 2019<br>Exhaust Air Heat Pump |
|---|---|---|---|
| Wall U Value | 0.13 W/m2K | 0.13 W/m2K | 0.13 W/m2K |
| Party Wall U value | 0.19 W/m2K | 0.19 W/m2K | 0.19 W/m2K |
| Window U Value | 0.9 W/m2K | 0.9 W/m2K | 0.9 W/m2K |
| Thermal Bridging | 0.05 | 0.05 | 0.05 |
| Air Permeability & Ventilation | 3 m3/hr/m2<br>MVHR SFP 0.8<br>HR 85% | 3 m3/hr/m2<br>cMEV SFP 0.2 | 3 m3/hr/m2<br>EAHP SFP – 0.2<br>100 m3/h |
| Secondary Heating | NA | NA | NA |

# Comparison of Mid Floor Apartment

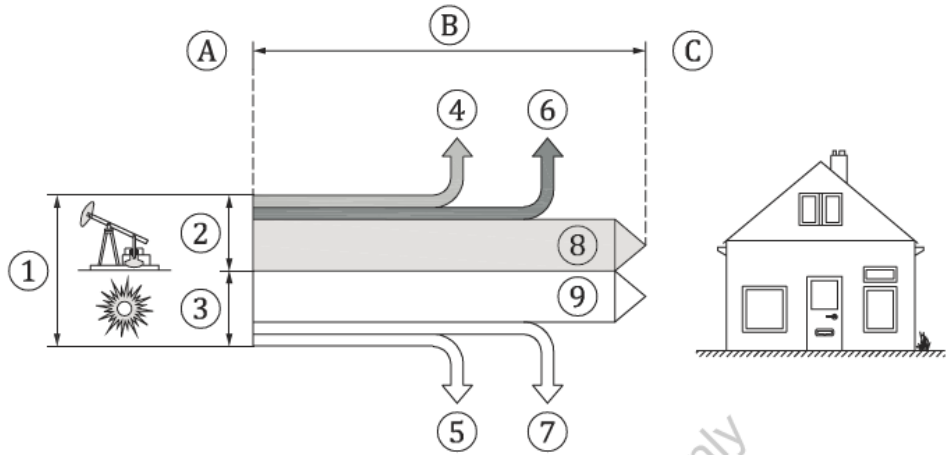
| Parameter | Part L 2019 Gas Boiler | Part L 2019 Heat Pump | Part L 2019 Exhaust Air Heat Pump |
|---|---|---|---|
| Space Heating | Boiler 91.3% | Heat Pump 400% Htg & 210% HW | EA Heat Pump 400% Htg & 210% HW |
| Controls | Time & Temperature | Time & Temperature | Time & Temperature |
| HW | Flow Restrictor on Shower 125 l/person/day | Flow Restrictor on Shower 125 l/person/day | Flow Restrictor on Shower 125 l/person/day |
| Lighting | 94 lumen/cW<br>4 W/m2 | 94 lumen/cW<br>4 W/m2 | 94 lumen/cW<br>4 W/m2 |
| Photovoltaic | 0.6 kWp | 0 | 0 |
| Primary Energy/ C02 | 37 kWh/m2 / 7 kgCO2/m2 | 40 kWh/m2 / 8 kgCO2/m2 | 40 kWh/m2 / 8 kgCO2/m2 |
| EPC/ CPC | 0.28 / 0.26 | 0.29 / 0.28 | 0.29 / 0.28 |
| RER | 0.23 | 0.34 | 0.20 |

# Going Forward

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

# Technical Developments

- Primary Energy Factor
- District Heating Schemes Primary Energy Factors



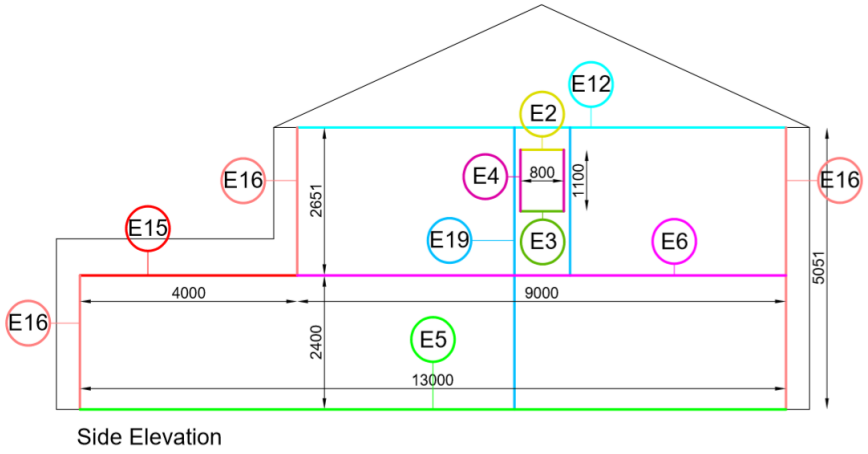

$$f_{Ptot} = \frac{①}{⑧+⑨} \qquad f_{Pnren} = \frac{②}{⑧+⑨} \qquad f_{Pren} = \frac{③}{⑧+⑨}$$

**Key**

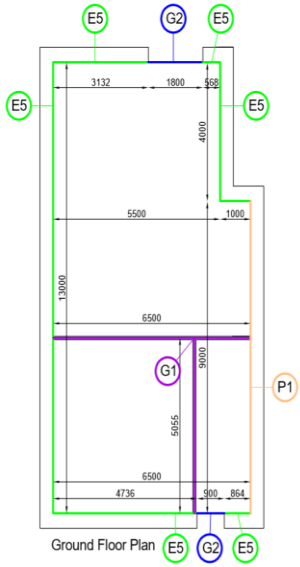
| | | | |
|---|---|---|---|
| A | energy source | 4 | non-renewable infrastructure related energy |
| B | upstream chain of energy supply | 5 | renewable infrastructure related energy |
| C | inside the assessment boundary | 6 | non-renewable energy to extract, refine, convert and transport |
| 1 | total primary energy | 7 | renewable energy to extract, refine, convert and transport |
| 2 | non-renewable primary energy | 8 | delivered non-renewable energy |
| 3 | renewable primary energy | 9 | delivered renewable energy |

# Guidance

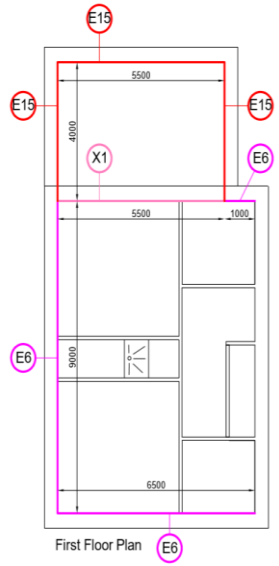
- Water Efficiency Calculator
- Thermal Bridging Guidance
- Heat Pump Designer/ Installer
- Group Heating Systems



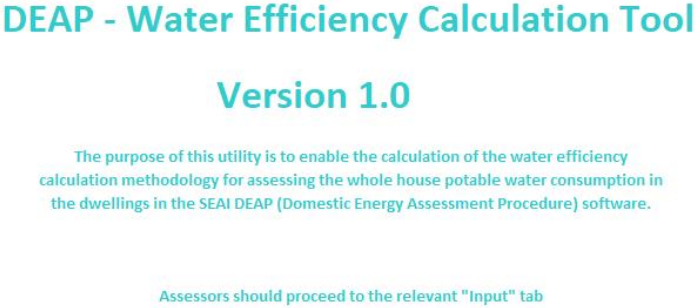
Side Elevation



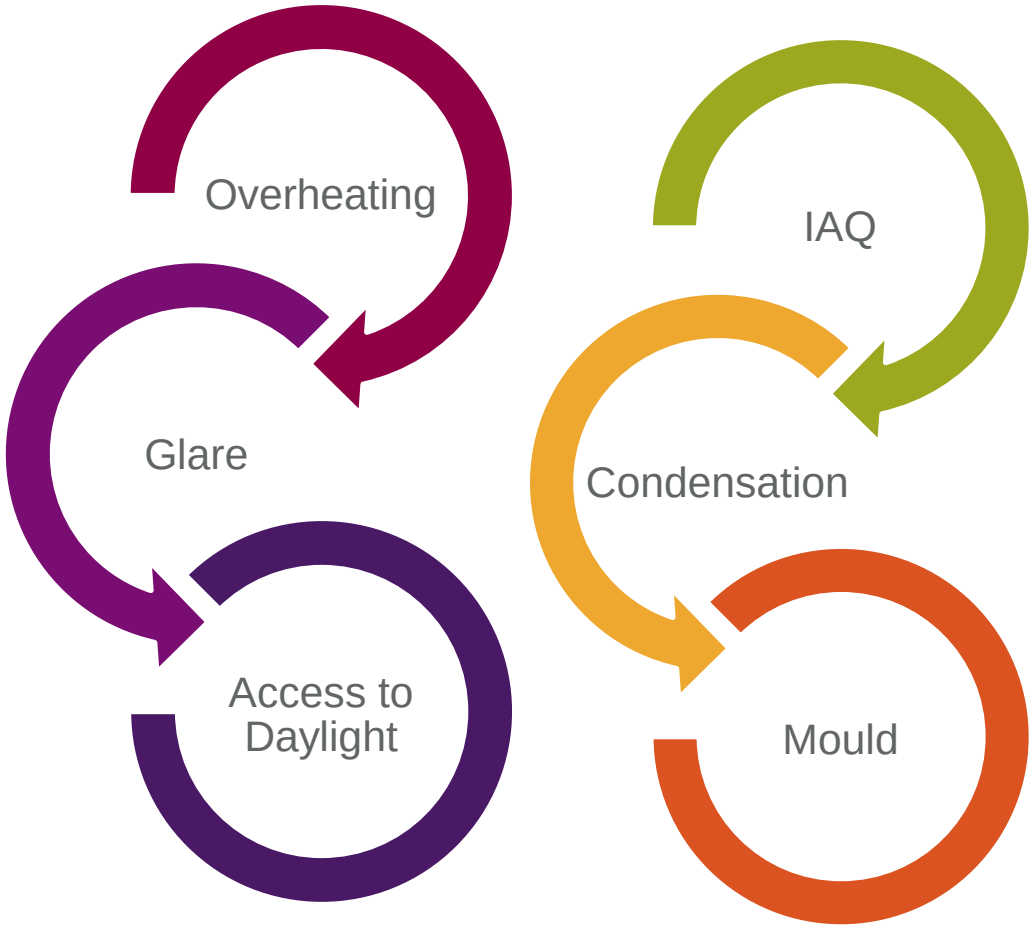
Ground Floor Plan



First Floor Plan



# Internal Environmental Quality




# Questions

@ seai_ie

Ireland's European Structural and Investment Funds Programmes 2014-2020

Co-funded by the Irish Government and the European Union

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND