



# What Does Zero Mean?

Our **Christmas** present to you  
- the results





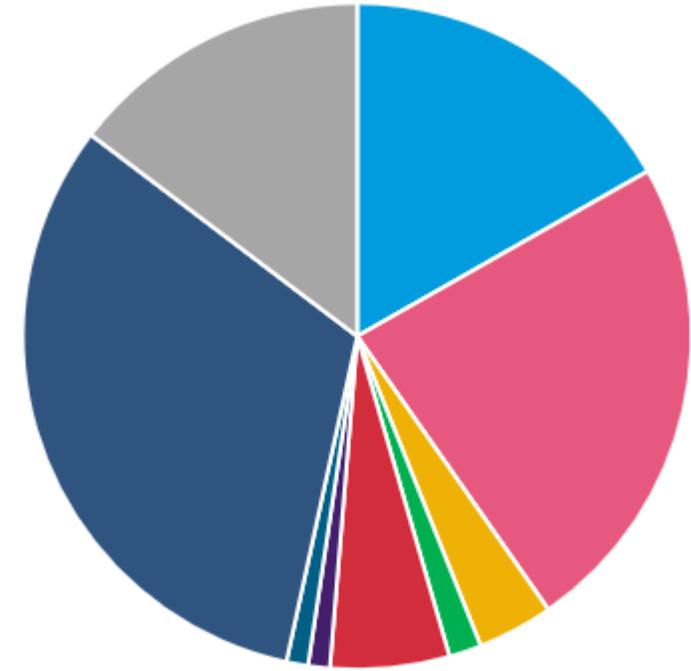
## The respondents

198 responses

### Level of expertise among respondents:

Operational carbon: 175 respondents “expert” or “medium”

Embodied carbon: 147 respondents “expert” or “medium”



- Architect
- Building services engineer
- Client (e.g. developer, housing association)
- Contractor
- Energy modeller
- QS
- Structural engineer
- Sustainability consultant
- Other



@CIBSE

@LETI\_London #WhatsZero

# The survey

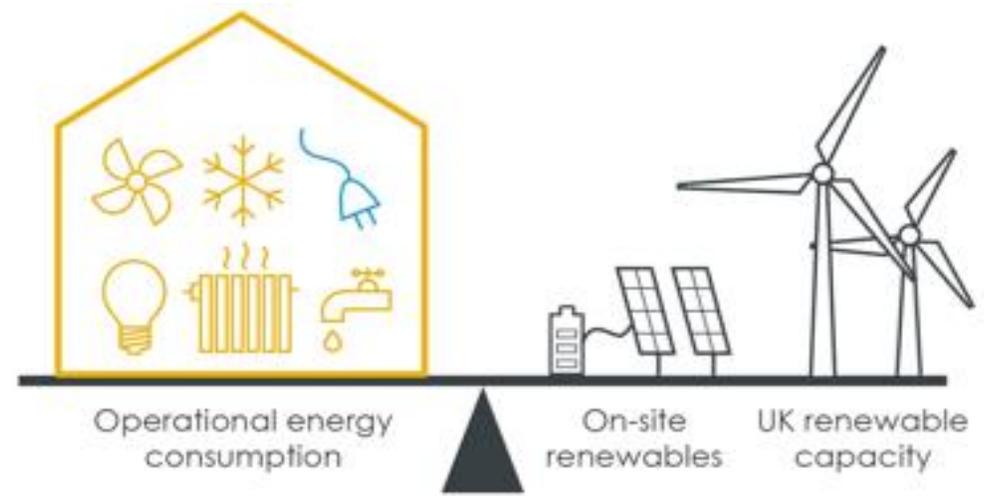
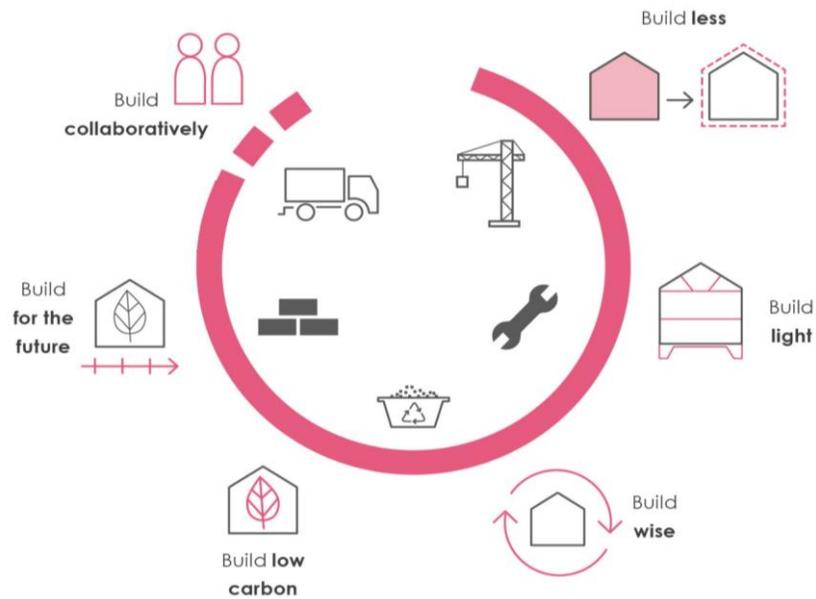


@CIBSE

@LETI\_London #WhatsZero

# What Does Zero Mean?

Complete our survey



## Net Zero Definitions, the FAQs, and the survey

The built environment in the UK and around the world is increasingly committed to achieve Net Zero buildings. To deliver real progress, we need to agree on what this means, in practice and in the detail.

As a step towards this, and building on the work by the UKGBC, in summer 2021 LETI and the Whole Life Carbon Network, supported by the RIBA, produced a [set of definitions](#).

CIBSE and LETI are now working together to produce a set of FAQs on the definitions, and we are running a [survey](#) about it, to make sure the definitions are applied consistently in as many real-life situations are possible, and that they deliver the right outcomes.

In parallel, CIBSE are considering whether to adopt the definitions and are keen to hear views on this.

The survey asks for your opinion on the following:

- Do you agree with the definitions and their interpretation in the FAQs?
- Are the FAQs clear?
- Do you have other questions that you think should be addressed in the FAQs?
- Do you think CIBSE should adopt the definitions?

## List of FAQs in this document – Key questions

### KEY QUESTIONS – NET ZERO CARBON – OPERATIONAL ENERGY

- FAQ1 - Why does a building need to meet energy use targets?
- FAQ2 - What are “local energy use targets”?
- FAQ3 - What if there are no “local energy use targets” for my building type?
- FAQ4 - What type of energy targets should a building meet?
- FAQ5 - How is an EUI calculated in buildings with grid supplies and on-site systems?
- FAQ6 - How are EUIs and associated targets calculated in buildings served by communal or district energy schemes?
- FAQ7 - My building is connected to a community or district energy scheme which uses fossil fuels. Can it be considered NZ Carbon - Operational Energy, as long as it meets the energy target and renewable energy requirements?
- FAQ8 - What are acceptable forms of renewable energy procurement?
- FAQ9 - The electricity grid is decarbonising, is there a point where renewable energy procurement will no longer be required?
- FAQ10 - Will the Net Zero Carbon – Operational Energy definition be valid until 2050, or will it evolve?

### KEY QUESTIONS – NET ZERO EMBODIED CARBON

- FAQ11 - Why does a building need to meet upfront embodied carbon targets?
- FAQ12 - What are “local targets” for embodied carbon?

### KEY QUESTIONS – OFFSETS

- FAQ13 - What role do offsets play?
- FAQ14 - Is any type of offsets acceptable?

### KEY QUESTIONS – NET ZERO CLAIMS

- FAQ15 - Can I acknowledge progress on scale towards Net Zero?
- FAQ16 - Can I acknowledge achievements towards Net Zero Carbon - Operational Energy at different project stages ?
- FAQ17 - Can I acknowledge my building's achievements towards Net Zero Carbon – Operational Energy, within agency constraints?
- FAQ18 - Can I acknowledge my building's achievements towards Net Zero Carbon – Operational Water, in progress or within constraints?
- FAQ19 - Can I acknowledge different stages of progress towards Net Zero Embodied Carbon?
- FAQ20 - Can I acknowledge my building's achievements towards Net Zero Embodied Carbon, within agency constraints?

### KEY QUESTIONS - NET ZERO WHOLE LIFE CARBON

- FAQ21 - To be “net zero whole life carbon”, does the building have to be both NZ operational and NZ embodied carbon?

### KEY QUESTIONS - CIBSE ENDORSEMENT

- FAQ22 - Are these definitions supported by the whole industry?



@CIBSE

@LETI\_London #WhatsZero

## List of FAQs in this document – Detailed questions

### DETAILED QUESTIONS – OPERATIONAL CARBON – ENERGY

- FAQ 23 - Once the electricity grid becomes zero carbon, in the UK and many countries, this will rely on nuclear energy – so, not meeting the definition's requirement for « all energy to be from renewable sources ». Does it mean a building would still need to generate a portion of its energy use from renewable?
- FAQ24 - What are residual emissions? How to calculate them?
- FAQ25 - How does the definition apply if a building is supplied by 'green gas' produced on site from, say, anaerobic digestion?
- FAQ26 - If hydrogen became available for use in buildings or heat networks in the future, the Net Zero Carbon – Operational Energy definition's requirement that all energy should be generated by renewables seems to imply that only 'green' hydrogen would be allowed, and all indirect emissions associated with generation, storage and distribution would have to be offset. Is this understanding correct? If so, how would that be calculated? If not, how would they be calculated in the case of other types of hydrogen (e.g. "grey", "blue")?

### DETAILED QUESTIONS – OPERATIONAL CARBON – WATER

- FAQ27 - How are GHG emissions (and offsets) arising from water supply and wastewater treatment calculated?

### DETAILED QUESTIONS – EMBODIED CARBON

- FAQ28 - How to account for carbon sequestered in timber, wood fibre insulation and other plant-based materials?
- FAQ29 - Where should emissions from refrigerant leakage in use be accounted for?
- FAQ30 - Why are building-mounted PV panels excluded from the LETI embodied carbon targets?
- FAQ31 - Why is the embodied carbon of energy infrastructure not included in the Net Zero embodied definitions?



@CIBSE

@LETI\_London #WhatsZero

# 1. The definitions



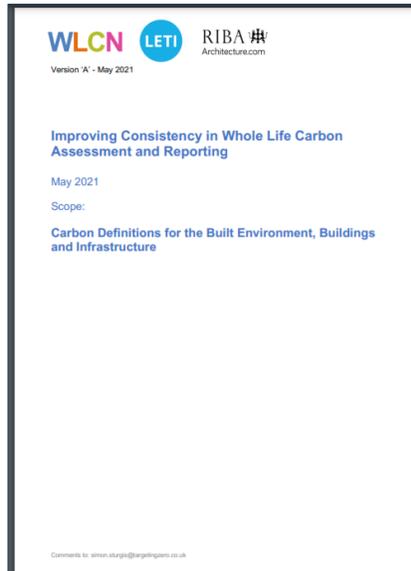
@CIBSE

@LETI\_London #WhatsZero

# LETI – WLCN Net Zero definitions

This FAQ document and the survey are focused on the Net Zero definitions showed on the right hand side. These definitions apply to new build, retrofit and infrastructure.

To view the full set, see the LETI-WLCN-RIBA document here: [www.leti.london/carbonalignment](http://www.leti.london/carbonalignment) . This includes definitions on background terms, such as those used around life cycle assessment.



## Net Zero (Whole Life) Carbon

**A 'Net Zero (Whole Life) Carbon' Asset is one where the sum total of all asset related GHG emissions, both operational and embodied, over an asset's life cycle (Modules A1-A5, B1-B7 (plus B8 and B9 for Infrastructure only), C1-C4) are minimized, meet local carbon, energy and water targets, and with residual 'offsets', equals zero.**

## Net Zero Embodied Carbon

A 'Net Zero Embodied Carbon' asset is one where the sum total of GHG emissions and removals over an asset's life cycle (Modules A1-A5, B1-B5 and C1-C4) are minimized, meets local carbon targets (e.g.kgCO<sub>2</sub>e/m<sup>2</sup>), and with additional 'offsets', equals zero.

## Net Zero Upfront Carbon

A 'Net Zero Upfront Carbon' asset is one where the sum total of GHG emissions, excluding 'carbon sequestration', from Modules A1-A5 is minimized, meets local carbon targets (e.g.kgCO<sub>2</sub>e/m<sup>2</sup>), and with additional 'offsets', equals zero.

## Net Zero Carbon - Operational Energy

A 'Net Zero Carbon – Operational Energy' asset is one where no fossil fuels are used, all energy use (Module B6) has been minimized, meets the local energy use target (e.g. kWh/m<sup>2</sup>/a) and all energy use is generated on- or off- site using renewables that demonstrate additionality. Any residual direct<sup>3</sup> or indirect emissions from energy generation and distribution are 'offset'.

## Net Zero Carbon - Operational Water

A 'Net Zero Carbon - Operational Water' asset is one where water use (Module B7) is minimized, meets local water targets (e.g. litres/person/year) and where those GHG emissions arising from water supply and wastewater treatment are 'offset'.



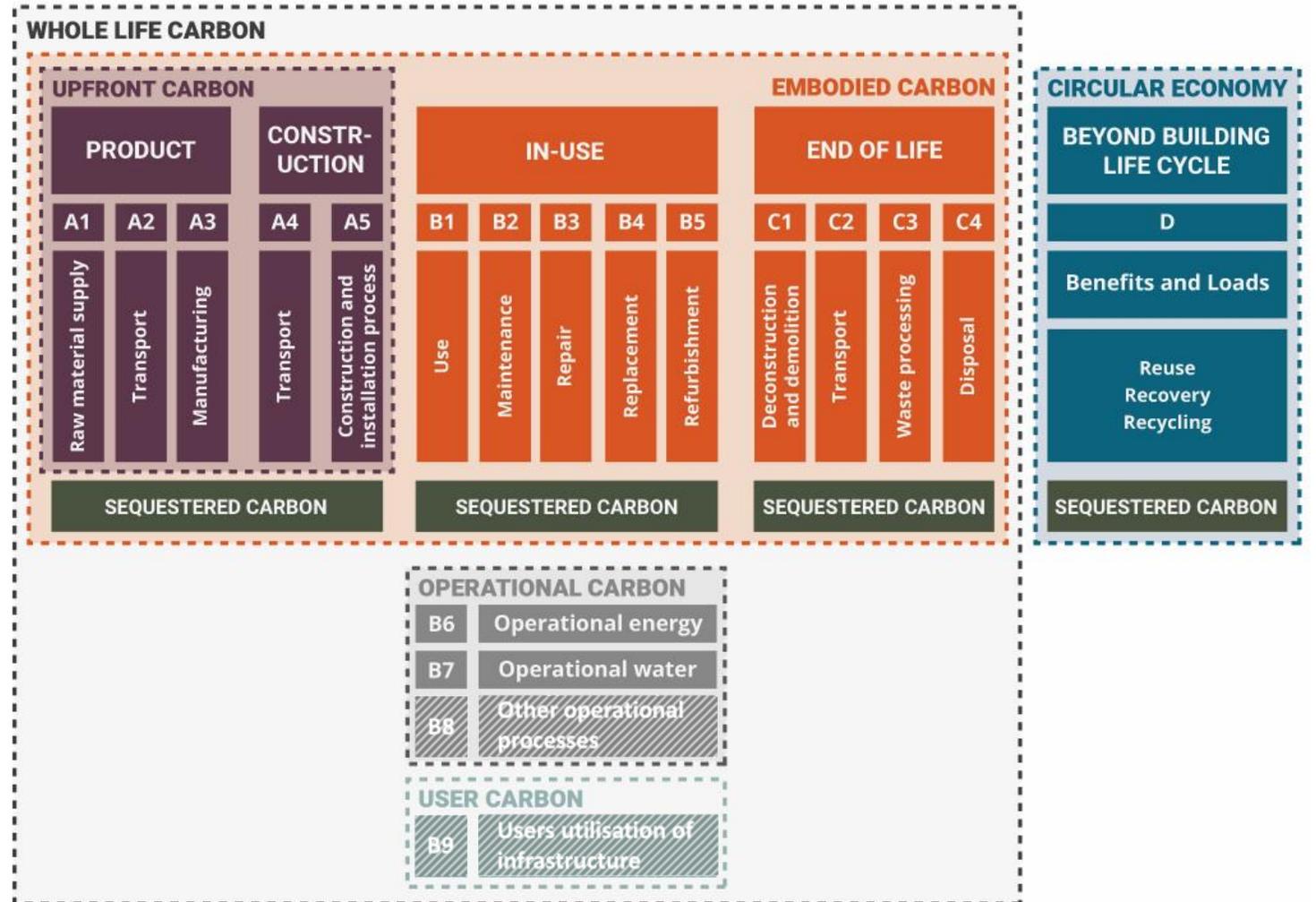
@CIBSE

@LETI\_London #WhatsIsZero

# Whole life carbon terminology

Reference Diagram from the LETI-WLCN Definitions document, showing the Life Cycle Modules adapted from BS EN 15978 and PAS2080 (for Infrastructure).

It shows the modules used in assessing all carbon emissions over an asset's entire lifecycle and the various terms that are used.



NB: Hatched modules are for infrastructure only.



@CIBSE

@LETI\_London #WhatsZero

# 2. Key questions



@CIBSE

@LETI\_London #WhatsZero

# Key questions

## Net Zero Carbon - Operational Energy



@CIBSE

@LETI\_London

#WhatsZero

## Current LETI – WLCN definition

A 'Net Zero Carbon – Operational Energy' asset is one where **no fossil fuels** are used, all energy use (Module B6) has been minimized, meets the local **energy use target** (e.g. kWh/m<sup>2</sup>/a) and **all energy use is generated on- or off- site using renewables** that demonstrate additionality. Any residual direct or indirect emissions\* from energy generation and distribution are 'offset'.

\*see FAQ24 for details on residual emissions.



@CIBSE

@LETI\_London #WhatsZero

# Why does a building need to meet energy use targets?

To be Net Zero Carbon – Operational Energy, a building needs to meet energy use targets because buildings cannot be considered in isolation, achieving Net Zero needs the whole system: in order to contribute to a NZ energy system, buildings need to have low energy use, otherwise a zero carbon grid will not happen, or later and/or at much higher cost (financial & embodied carbon & other resources).

Example targets are on the next page



### Survey

#### Q1- Do you agree a building needs to meet energy targets in order to be Net Zero Carbon – Operational Energy ?

189 responses

- 91%  **Yes, we need to consider resource use and the whole system, thus energy targets are required**
- 4%  No, there should be total flexibility
- 4%  No, there should be other criteria e.g. demand management – please add suggestions in the comments
- 2%  Not sure

#### Q2 - If you answered “yes” to Q1, do you think that a building which is completely off grid, whose whole energy needs are met by on-site renewable energy supplies and storage (e.g. thermal store, batteries), should also be subject to energy targets ?

182 responses

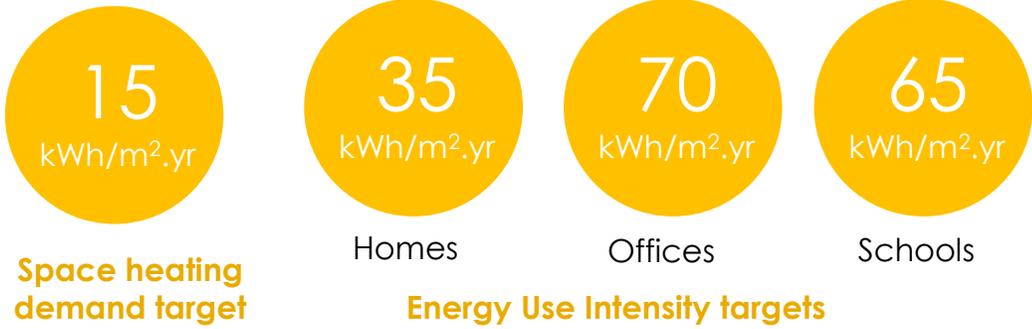
- 84%  **Yes, because resource efficiency still matters for Net Zero: the building will use embodied carbon resources for its energy supplies; meeting energy targets use would help limit the embodied carbon of its supply systems, or generate surplus energy which could be used elsewhere.**
- 15%  No, in that case it should not be subject to energy targets
- 2%  Not sure

#### Q3 - Do you have any other comments on this FAQ?

@LETI\_London #WhatsZero

FAQ2 **What are “local energy use targets”?**

The definition refers to “local targets” in order to be relevant for various countries. In the UK, the main sources of “local energy use targets” currently are the LETI one-pager\* and RIBA 2030 Challenge (2030 target). The LETI energy targets for new buildings\* aim to ensure that, by 2050, UK building energy use would not exceed available renewable energy. They are:



In offices and some non-domestic buildings, energy ratings can also be used (DEC B(40), NABERS 6\*).

Other countries have developed energy targets e.g. Dutch Green Building Council.

\* [www.leti.london/one-pager](http://www.leti.london/one-pager), developed in collaboration with UK-GBC and the BBP, with the support of the Good Homes Alliance, RIBA and CIBSE



Survey

Q4 - Do you know of other sources of energy targets which you think should be added to the list?

Q5 - Do you have any other comments on this FAQ?

## What if there are no “local energy use targets” for my building type?

CIBSE, LETI, RIBA and other industry bodies are working together and it is expected that in the future, consensus will grow on energy targets.

Some sectors are developing their own targets, which may get added here in the future e.g. the upcoming NHS Net Zero standard and upcoming Scottish Futures Trust Net Zero Public Sector Building Standard .

In the interim, for target setting in building types where no target is yet available, a similar approach to other sectors can be taken e.g. energy use equivalent to achieving Passivhaus with a heat pump. Alternatively, a target of DEC B(40) could be used however, how demanding it is will vary in different sectors, and in some cases it may not be ambitious enough.

**Contact CIBSE or LETI if you are interested to create energy use targets for other sectors, or if you would like sources of targets to be added here.**

### Survey

Q6 – If you would like to take part in developing energy targets for other sectors than those currently listed, please add your contact details here, and the sector/s you would be interested in.



@CIBSE

@LETI\_London #WhatsZero

FAQ4 **What type of energy targets should a building meet?**

Net Zero Carbon – Operational Energy

**Space heating demand (kWh/m<sup>2</sup>):** the active heat input required to heat a building. It is influenced by factors such as passive design, fabric performance, internal gains, and heat recovery on the ventilation system. It is independent of the heating system type and efficiency (e.g. boiler, heat pump) which meets that demand.  
*Energy use for heating = Space heating demand \* Heating system efficiency*

**Space cooling demand (kWh/m<sup>2</sup>):** the active cooling input required to cool a building. It is influenced by factors such as passive design, fabric performance, and internal gains. It is independent of the cooling system type and efficiency (e.g. chiller) which meets that demand.  
*Energy use for cooling = Space cooling demand \* Cooling system efficiency*

**Energy Use Intensity (EUI, kWh/m<sup>2</sup>):** the energy consumption per m<sup>2</sup> that is required by a building over a year, included regulated (i.e. domestic hot water, space heating and cooling, lighting, and ventilation) and unregulated loads (e.g. lifts, IT). It is a measure of the building's performance and therefore includes all energy supplied to the building, whether from the grid or on-site systems.

**Energy ratings:** examples include Display Energy Certificates (DEC) and NABERS ratings. They can vary with factors such as occupancy density and weather, and provide a scale rather than a single target. NABERS allow landlord and tenanted areas to be rated separately.

Survey

**Q7 - If you agree that meeting Net Zero Carbon – Operational Energy needs energy targets, what do you think they should be (tick ALL that apply):**

185 responses

- 90%  Energy use e.g. EUI, energy rating
- 58%  Space heating and/or cooling demand
- 23%  Space heating and/or cooling demand, but only for building types where that demand is dominant e.g. heating in housing, cooling in offices.
- 14%  Other – please add your suggestions in the comments
- 3%  Not sure

Q8 - Do you have any other comments on this FAQ?



@CIBSE

@LETI\_London #WhatsIsZero

# How is an EUI calculated in buildings with grid supplies and on-site systems?

**Energy Use Intensity (EUI, kWh/m<sup>2</sup>):** the energy consumption per m<sup>2</sup> that is required by a building over a year, included regulated (i.e. domestic hot water, space heating and cooling, lighting, and ventilation) and unregulated loads (e.g. lifts, IT). It is a measure of the building's performance and therefore includes all energy supplied to the building, whether from the grid or on-site systems.

An EUI includes all energy used, from all sources. Energy supplied by on-site renewables is **not** deducted, it still counts towards the building's EUI. For example, the EUI of a building will be the same whether the building has on-site PVs or not.

The EUI relates to floor area. The floor area definition used in the EUI targets will depend on the building type (e.g. GIA, NIA etc).

For stand-alone buildings, an EUI is the sum of energy supplies to the building (including supplies from on-site systems).

Q9 - Do you have any comments on this FAQ?



@CIBSE

@LETI\_London #WhatsIsZero

## How are EUIs and associated targets calculated in buildings served by communal or district energy schemes?

There are several considerations in calculating an EUI for a building connected to a district or communal scheme, compared to calculating it for a building with stand-alone supplies:

- How to account for energy used by the system (generation, distribution and storage): counting only heat “at the meter” into a building’s EUI would not be comparable with EUIs for stand-alone buildings, which do include systems.
- A district energy scheme may use a variety of energy sources, such as electricity, gas, or waste heat, and it may generate electricity as well as heat (if it has CHP). As a result, how to account for the scheme into the EUI, a simple building measure, is not straightforward.

The EUI could be calculated based on heat delivered alone, and the targets could be adjusted to only consider thermal demand. The EUI would then be compared with an adjusted target, including thermal demand rather than energy used to meet that demand. This would NOT be consistent with the approach for buildings with individual systems, which does consider system efficiency, and it could remove an incentive for energy schemes to decarbonise. *(this is option 1 on the next page)*

To consider not only the building but the scheme serving it, one way could be to have targets for buildings (i.e. an adjusted EUI, as above) and targets for the district energy scheme performance (e.g. carbon content of heat and distribution efficiency). *(this is option 2 on the next page)*

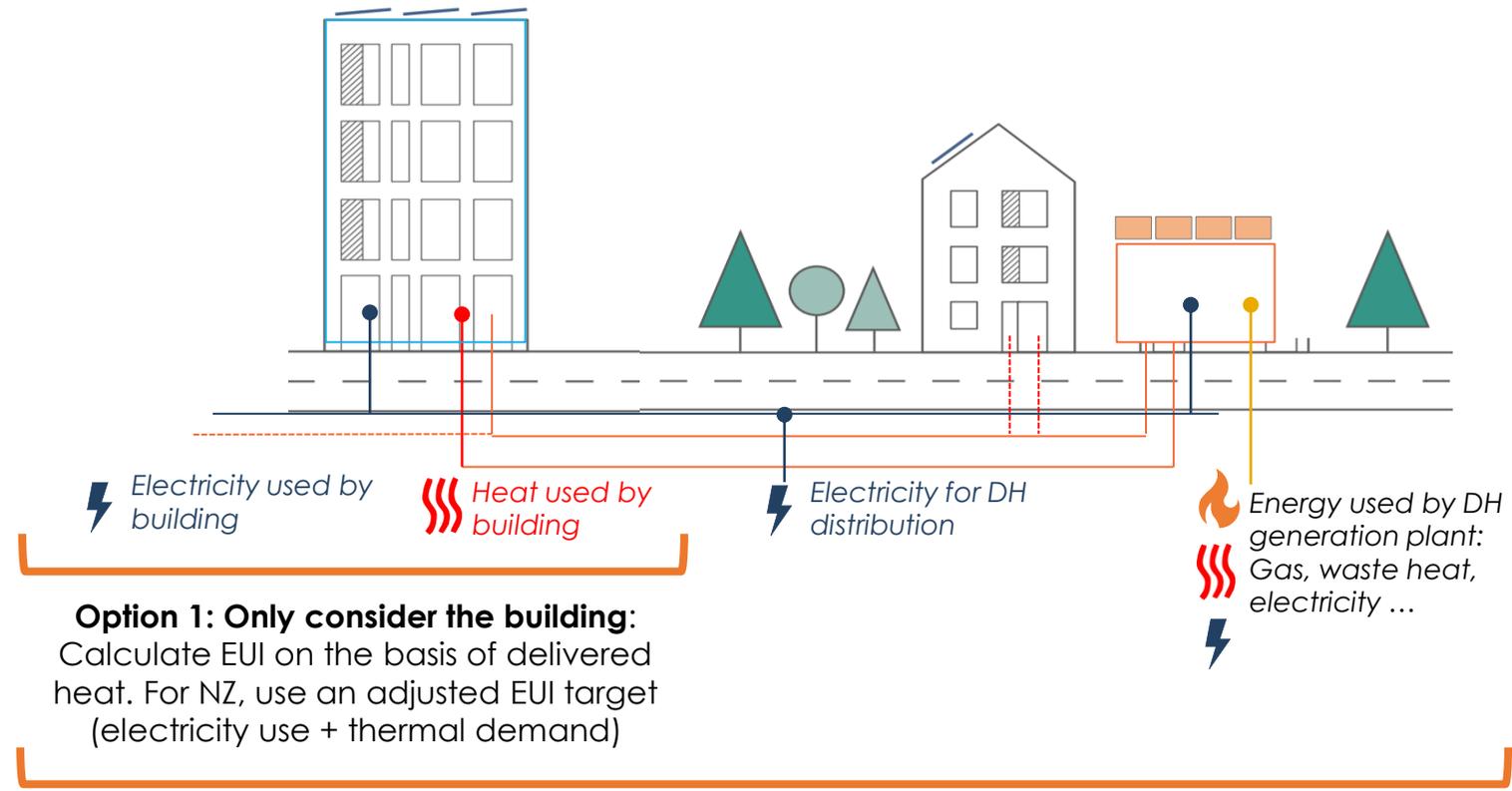
Alternatively, the building’s EUI could take account of the scheme’s total energy use for generation, distribution etc, apportioned to energy delivered to individual buildings. This would provide direct comparisons with buildings served by individual systems, against the same energy targets. However, how to account for several energy sources within the EUI needs consideration. *(this is option 3 on the next page)*



@CIBSE

@LETI\_London #WhatsIsZero

# How are EUIs and associated targets calculated in buildings served by communal or district energy schemes?



**Option 1: Only consider the building:**  
 Calculate EUI on the basis of delivered heat. For NZ, use an adjusted EUI target (electricity use + thermal demand)

**Option 2: Consider the building AND the DH scheme, separately:**  
 EUI calculation and target as per Option 1 + DH performance criteria (e.g. carbon content of heat, distribution losses)

**Option 3: Consider the building AND the DH scheme, together:**  
 Apportion DH energy use within EUI calculation. For NZ, use same EUI target as for stand-alone buildings. Apportionment could be in different ways e.g. straight energy use, electricity-equivalent on the basis of primary energy\* or of carbon



@CIBSE

@LETI\_London

#WhatsIsZero

\* Note gas has a lower primary energy factor than electricity

# How are EUIs and associated targets calculated in buildings served by communal or district energy schemes?

See previous pages for illustrations on these questions

## Survey

### Q10 – How should an EUI and its target be calculated for buildings served by a communal / district energy scheme?

179 responses

- 16%  Option 1: The EUI should be electricity use + delivered heat “at the meter”. To achieve NZ, it should meet an adjusted target (e.g. electricity + thermal demand).
- 31%  Option 2: As per Option 1 AND for NZ, the energy scheme should meet performance criteria.
- 31%  Option 3: The EUI should include apportioned energy used by the scheme (see Q11 on how to do this). The NZ energy targets should be as for stand-alone buildings.
- 2%  Other – please add your suggestions in the comments
- 20%  Not sure

### Q11 – In Option 3 above, how do you think different energy sources should be accounted for?

159 responses

- 14%  Simple addition of heat and different energy sources
- 24%  Heat and all energy sources added as “electricity equivalent” on the basis of primary energy
- 34%  Heat and all energy sources added as “electricity equivalent” on the basis of carbon emissions
- 4%  Other – please add your suggestions in the comments
- 4%  Not sure



@CIBSE

@LETI\_London #WhatsZero

Q12 – Do you have any other comments on this FAQ?

FAQ7

# My building is connected to a community / district energy scheme which uses fossil fuels. Can it be considered NZ Carbon - Operational Energy, as long as it meets the energy target and renewable energy requirements?

Net Zero Carbon – Operational Energy

No. In this situation, the building does rely on fossil fuels, and the network may not decarbonise for a very long time.

However, it is possible that the building could claim to be Net Zero Carbon - Operational Energy “**compatible**” or “**in transition**”– see FAQ17 – Net Zero claims within agency constraints.

Survey

Q13 -Do you have any comments on this FAQ?



@CIBSE @LETI\_London #WhatsZero

# What are acceptable forms of renewable energy procurement?

If meeting all energy used by onsite renewables is not feasible then renewable energy must be procured.

At the time of the initial publication of the LETI One-Pager, no green tariff was considered robust enough to guarantee additional renewable energy capacity, and therefore only Power Purchase Agreements (PPAs) were considered acceptable.

However, over the last 3 years, the sector has evolved and further guidance on renewable energy procurement has been developed. As a result, it is considered that in addition to PPAs, some green tariffs are acceptable to meet the Net Zero Carbon – Operational Energy definition, as long as the Green tariffs that meet the guidance set out in the UKGBC Renewable Energy Procurement & Carbon Offsetting Guidance for Net Zero Carbon Buildings\*.

A summary of the UKGBC green tariff guidance is set out overleaf

## Survey

### Q14 - Which forms of renewable energy procurement do you think are acceptable to meet the Net Zero Carbon – Operational Energy definition (tick ALL that apply):

179 responses (+3 omitted as contradictory)

- 56%  An investment into additional renewable energy capacity off-site
- 55%  A renewable energy power purchase agreement (PPA), for a minimum period e.g. 15 years.
- 66%  A green tariff that meets the guidance set out in the UKGBC Renewable Energy Procurement & Carbon Offsetting Guidance for Net Zero Carbon Buildings
- 4%  Any green tariff
- 8%  Other – please add your suggestions in the comments
- 9%  None of the above: the only option should be to meet all energy use from on-site renewable energy systems
- 7%  Not sure

Q15 - Do you have any other comment on this FAQ?



\* <https://www.ukgbc.org/ukgbc-work/renewable-energy-procurement-carbon-offsetting-guidance-for-net-zero-carbon-buildings/>



@CIBSE

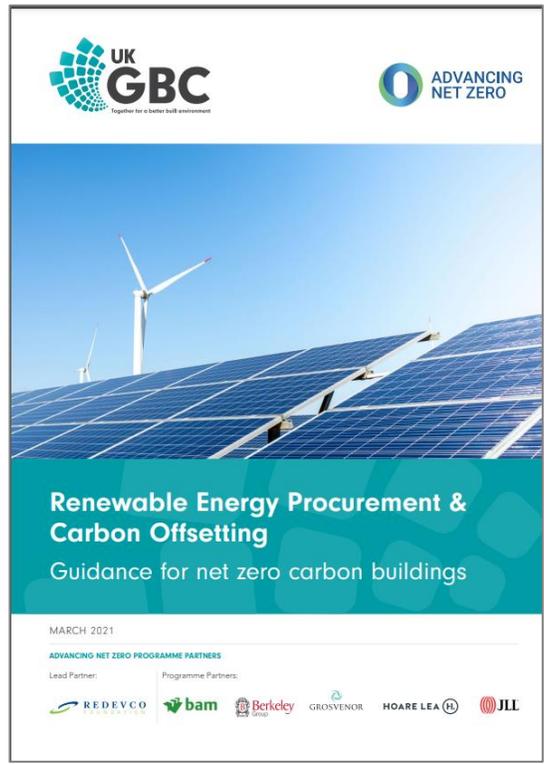
@LETI\_London #WhatsIsZero

# FAQ8 What are acceptable forms of renewable energy procurement?

## Guidance on Green Tariffs from UKGBC

The quality of electricity procurement is determined by whether the following three principles determining the quality of renewable energy procurement are met:

- **Energy attribute** – there must be ownership and claim of the energy attribute of the renewable electricity generated, either by self-consumption of on-site renewable generation or via REGOs.
- **Renewable sourced** – electricity must be generated from renewable sources.
- **Additionality** – procurement must result in demonstrable additionality.



For more information: <https://www.ukgbc.org/ukgbc-work/renewable-energy-procurement-carbon-offsetting-guidance-for-net-zero-carbon-buildings/>

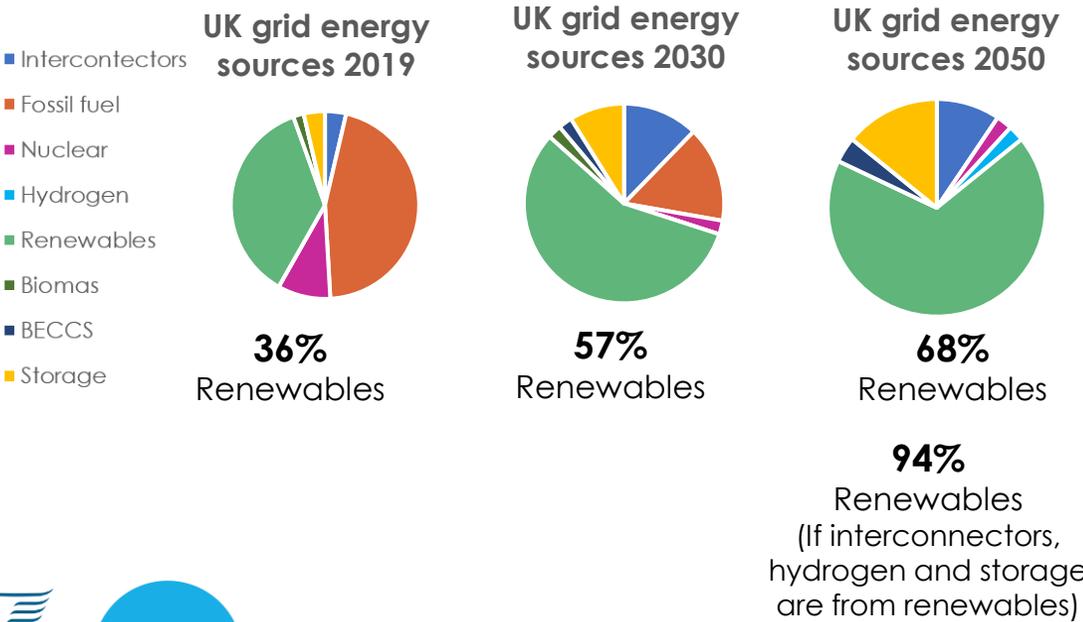


FAQ9

## The electricity grid is decarbonising, is there a point where renewable energy procurement will no longer be required?

The definition requires ALL energy use to be met by on- or off-site renewable energy sources (e.g. if a building uses 10,000 kWh of grid electricity per year, this all needs to be covered by on-site generation, PPAs or green tariffs, even if a portion of grid electricity is produced by renewables).

The UK grid is continuing to decarbonise, with various scenarios to achieve net zero (or near) well before 2050.



### Survey

#### Q16 - When do you think that, to meet Net Zero Carbon - Operational Energy, renewable energy procurement should no longer be required:

184 responses

- 1%  When over 50% of the UK grid electricity is generated from renewables
- 7%  When over 80% of the UK grid electricity is generated from renewables
- 13%  When over 95% of the UK grid electricity is generated from renewables or other zero-carbon sources
- 64%  **Regardless of the proportion of UK grid electricity which is generated from renewables, buildings must meet their needs either through on-site renewable energy generation or by procuring 100% of their energy from renewables**
- 8%  Other – please add your suggestions in the comments
- 8%  Not sure

#### Q17 - Do you have any other comments on this FAQ?



Ref: National Grid Future Energy Scenarios, 2020



@CIBSE @LETI\_London #WhatsIsZero

# Will the Net Zero Carbon – Operational Energy definition be valid until 2050, or will it evolve?

As illustrated in FAQ8, the UK electricity grid is rapidly decarbonising. It is expected to become net zero in 2035, under government commitment. Similar evolutions are expected around the world.

The definition is currently based on reducing annual energy use and generating from renewable energy sources. However, it could evolve to respond to a changing context, especially to support the UK's electrification and include requirements for demand management (e.g. peak demand, storage provision, other demand management indicator). The focus on annual energy use and renewable energy generation could also potentially evolve.

### Now

- Energy target (e.g. kWh/m<sup>2</sup>)
- Renewable procurement
- Residual emissions offset



### 2035/40 ??

- Energy target (kWh/m<sup>2</sup>)
- Renewable procurement (??)
- Demand management (e.g. peak, flexibility)
- Residual emissions offset



@CIBSE

### Survey

**Q18 - Should the Net Zero Carbon - Operational Energy definition be valid until 2050 or should it evolve? Note this is a question on principles, not the specific targets.**

184 responses

- 16%  We need a definition today that will be valid until 2050
- 80%  **It may evolve depending on what we find out e.g. how the grid evolves**
- 3%  Not sure

**Q19 - If you think it should evolve, what requirements do you think it should include in the future? (tick ALL that apply)**

163 responses

- 77%  **An energy target related to annual energy use, because resource use will still matter (i.e. as current)**
- 69%  **A requirement for on- or off-site renewables to contribute to total renewable generation capacity (i.e. as current)**
- 77%  **A requirement for demand management (e.g. peak demand, demand flexibility) (i.e. a new requirement)**
- 45%  A requirement for residual emissions offset (i.e. as current)
- 6%  Other – please add your suggestions in the comments
- 7%  Not sure

Q20 - Do you have other comments on this FAQ?

@LETI\_London #WhatsZero

# Key questions

## Net Zero Embodied Carbon



@CIBSE

@LETI\_London #WhatsZero

## Current LETI – WLCN definition

A '**Net Zero Embodied Carbon**' asset is one where the sum total of GHG emissions and removals over an asset's life cycle (Modules A1-A5, B1-B5 and C1-C4) are minimized, meets local carbon targets (e.g.kgCO<sub>2</sub>e/m<sup>2</sup>), and with additional 'offsets', equals zero.

### Upfront Carbon

Upfront Carbon' emissions are the GHG emissions associated with materials and construction processes up to practical completion (Modules A1-A5). Upfront carbon excludes the biogenic carbon sequestered in the installed products at practical completion.

### Embodied Carbon

The 'Embodied Carbon' emissions of an asset are the total GHG emissions and removals associated with materials and construction processes throughout the whole life cycle of an asset (Modules A1-A5, B1-B5, C1-C4).



@CIBSE

@LETI\_London #WhatsZero

# Why does a building need to meet upfront embodied carbon targets?

Net Zero Embodied Carbon

To be Net Zero Embodied Carbon, a building needs to meet embodied carbon targets because buildings cannot be considered in isolation, achieving Net Zero needs consideration of the whole system: in order to contribute to a NZ economy, buildings need to use resources as efficiently as possible.

There are not enough offsets available, at a UK scale and at a global scale, to keep emitting carbon and purchasing offsets without first reducing emissions.

In the UK, the intention of the embodied carbon targets being developed (e.g. by LETI) is to limit the embodied carbon to a value that is achievable in practice and also in line with sectorial carbon budgets.

**Why the embodied carbon targets are not zero**  
With current materials available, unless the building is made of 100% reused or natural materials, and all the energy used in their transportation to site and in site activities is zero carbon, there will be carbon emissions associated with constructing buildings.

## Survey

### Q21 – Achieving Net Zero Upfront Carbon should require to:

178 responses

- 4%  Calculate and offset upfront carbon (no targets)
- 23%  Meet upfront carbon targets (no offsets)
- 63%  **Meet upfront carbon targets AND offset upfront carbon**
- 2%  Achieve absolute zero carbon (i.e. no offsets & the target is zero – note this is currently technically not feasible, as explained in the FAQ)
- 3%  Other – please add your suggestions in the comments
- 4%  Not sure

### Q22 – Achieving Net Zero Embodied Carbon should require:

178 responses

- 4%  Calculate and offset upfront and total embodied carbon (no targets)
- 21%  Meet upfront and total embodied carbon targets (no offsets)
- 57%  **Meet upfront and total embodied carbon targets AND offset upfront and total embodied carbon**
- 4%  Achieve absolute zero carbon (no offsets, the target is zero – same caveat as above on technical feasibility )
- 7%  Other – please add your suggestions in the comments
- 6%  Not sure



@CIBSE

@LETI\_London #WhatsZero

Q23 - Do you have any other comments on this FAQ?

## What are “local targets” for embodied carbon?

The definition refers to “local targets” in order to be relevant for various countries. In the UK, such targets have not yet been developed as currently:

- There is not complete consensus on what is achievable on individual buildings (“Bottom Up” approach to targets), and
- There is not enough information available on sectoral UK carbon budgets to understand the embodied carbon budgets available for new and refurbished buildings (“Top Down” approach to targets). The UKGBC’s 2021 Whole Life Carbon Net Zero Roadmap project is expected to generate sectoral carbon budget estimates, which would assist in future more detailed building-level target setting, so that embodied carbon targets align to net zero.

For the time being, possible targets can be found in the LETI “Embodied Carbon Target Alignment” document, where current best-practice performance for projects in the design phase is considered to be a C rating, while a B and above is considered a robust stretch target. They are likely to evolve over time with increased understanding of what is possible and required to achieve. Through TM65, CIBSE intend to increase knowledge on the embodied carbon impact of building services, and will feed this into industry targets. We are hoping that in the future, consensus will grow on a single approach to embodied carbon targets.



@CIBSE

@LETI\_London #WhatsIsZero

### Survey

#### Q24 – What is your opinion on UK Net Zero embodied carbon targets (tick ALL that apply):

172 responses

- 33%  Use the LETI targets for upfront and for whole life embodied carbon – if so, which rating (please add your suggestion in the comments)
- 15%  Use the LETI targets, but only for upfront embodied carbon – if so, which rating (please add your suggestion in the comments)
- 13%  Use the RIBA 2030 Challenge targets - 2025 target
- 28%  Use the RIBA 2030 Challenge targets - 2030 target
- 23%  Create targets which align with the UKGBC Roadmap budgets per sector (this may be difficult, but is being explored by the UKGBC)
- 3%  Other – please add your suggestions in the comments
- 5%  None, we are not ready – if so, please detail what you think would be required, or what would be an approach to create targets.
- 22%  Not sure

Q25 - Do you have any other comments on this FAQ?

# Key questions

## Offsets



@CIBSE

@LETI\_London #WhatsZero

## Current LETI – WLCN definition

“Carbon offset” means emission reductions or removals achieved by one entity can be used to compensate (offset) emissions from another entity.

### **Offsetting Methodology**

*Modules A1-A5 should be offset post completion based on a verified post practical completion carbon assessment of A1-A5.*

*Modules B1-B7 (plus B8 and B9 for Infrastructure) should be offset annually, based on verified calculations based on actual activities rather than those predicted at design stage.*

*Modules C1-C4 are offset post deconstruction and disposal.*

Offsets



@CIBSE

@LETI\_London #WhatIsZero

## What role do offsets play?

Offsets are not allowed to cover carbon emissions from energy use: the definition requires energy use to be met from renewable energy sources, as ultimately to become net zero carbon, all buildings will need all energy use to be met by zero carbon sources.

Offsets are only allowed in Net Zero definitions for unavoidable emissions, in a transition period while all parts of the economy debarbonise:

- Embodied carbon emissions, while still meeting local embodied carbon targets
- Operational carbon – energy use: not allowed, except to cover residual direct and indirect emissions from energy generation and distribution (see details in FAQ24 on residual emissions)
- Operational carbon – water use: for those GHG emissions arising from water supply and wastewater treatment, while still meeting local water use targets

### Survey

*Questions in the following pages ask your opinion on the situations when offsets should be allowed (if any), and if so which criteria they should meet.*

## FAQ14 Is any type of offsets acceptable?

No. Some offset schemes are not a reliable guarantee that carbon savings will be achieved.

The UKGBC - Renewable Energy Procurement & Carbon Offsetting Guidance for Net Zero Carbon Buildings defines 8 quality criteria for offsets (Table 13):

- 1 – real
- 2 – avoid leakage
- 3 – measurable
- 4 – permanence
- 5 – additional
- 6 – independently verified
- 7 – unique
- 8 – avoid social and environmental harms.

The UKGBC guidance also sets as minimum requirements that offsets shall be through an approved international or domestic carbon standard, and registration requirements (Table 14\*). Approved standards are as listed by ICROA or UK Environmental Reporting Guidelines, and example are provided e.g. Gold Standard, UK Woodland Carbon Code (Figure 7\*).

Offsets



\* <https://www.ukgbc.org/ukgbc-work/renewable-energy-procurement-carbon-offsetting-guidance-for-net-zero-carbon-buildings/>



@CIBSE

### Survey

**Q26 – When do you think that offsets meeting the UKGBC criteria and requirements should be allowed (tick ALL that apply):**

167 responses (+2 omitted as contradictory)

- 34%  For embodied carbon – upfront
- 35%  For embodied carbon – whole life
- 27%  For residual emissions in operational carbon – energy use (see FAQ24 on residual emissions; these are specific types of emissions e.g. from the transmission and distribution of electricity; the large majority of emissions from energy use do NOT qualify for offsets)
- 25%  For residual emissions in operational carbon – water use (these are emissions from water treatment and supply)
- 29%  For all of the above
- 2%  For all of the above, and in other cases too – please add your suggestions in the comments
- 14%  For none of the above: offsets shouldn't be allowed under the NZ definitions
- 6%  Possibly, but with changes to the UKGBC criteria – please see Q28
- 12%  Not Sure

Q27 - Do you have any other comments on this FAQ?

@LETI\_London #WhatsIsZero

## Is any type of offsets acceptable?

There are different types of carbon offsets which meet the UKGBC criteria:

- “Compensation”: where carbon emission savings are achieved elsewhere: this reduces *emissions*, but doesn't reduce actual atmospheric carbon *levels*.
- “Neutralisation”: where carbon is removed from the atmosphere.

### Types of Carbon Offsets:

Compensation Emission reduction	Neutralisation Carbon removals
<b>Energy efficiency improvements</b> (Retrofit), Carbon capture and storage in industrial processes	<b>Nature based</b> solutions, such as reforestation and ecosystem restoration. Other solutions may become available for long-term storage e.g. mineralisation.

Neutralisation offsets are encouraged, and over time they should form the very large majority of offsets as there will be few remaining emissions to reduce e.g. while offsets to retrofit other properties may be acceptable now, in the future those properties will already be retrofitted.

Offsets



@CIBSE

@LETI\_London #WhatsIsZero

### Survey

#### Q28 - In addition to the UKGBC criteria, do you think more requirements should be placed on the type of offsets?

155 responses

- 21%  No, both compensation or neutralisation are acceptable types of offsets
- 17%  Yes, only neutralization-based offsets should be acceptable
- 19%  Yes, both compensation or neutralisation are acceptable types of offsets but they must be in the country that the project is based in
- 17%  Yes, only neutralization-based offsets are acceptable and they should in the country that the project is based in (no such scheme is currently available at scale in the UK)
- 5%  Yes, others – please add your suggestions in the comments
- 22%  Not sure

Q29 - Do you have any other comments on this FAQ?

# Key questions

## Net Zero claims



@CIBSE

@LETI\_London #WhatsZero

## Net Zero claims for buildings

Net Zero Carbon, whether operational or embodied, is only achieved based on actual performance, when claims can be verified. This is essential to achieve real carbon emissions savings.

However, it can be useful to recognise **buildings which are on a journey towards Net Zero and cannot yet claim full compliance**, for several reasons:

**Existing buildings:** Where existing buildings find it difficult to meet Net Zero compliant energy targets, recognising progress towards it could drive improvements.

**Time:** Where the actions carried out on a project are compliant with Net Zero, but the project's stage is not yet advanced enough for all requirements to be achievable.

**Finances available beyond the building itself:** Where requirements related to the building itself have been met, but allowances elsewhere in the system have not been purchased (e.g. offsets, renewable energy procurement)

**Agency:** Where a building is constrained to be supplied by non-compliant plant (e.g. landlord plant or district scheme which uses fossil fuels or is not efficient enough).

The following pages propose "sub-definitions" to respond to these constraints.

They would not represent full Net Zero status, but complement them by acknowledging progress and different levels of agency.

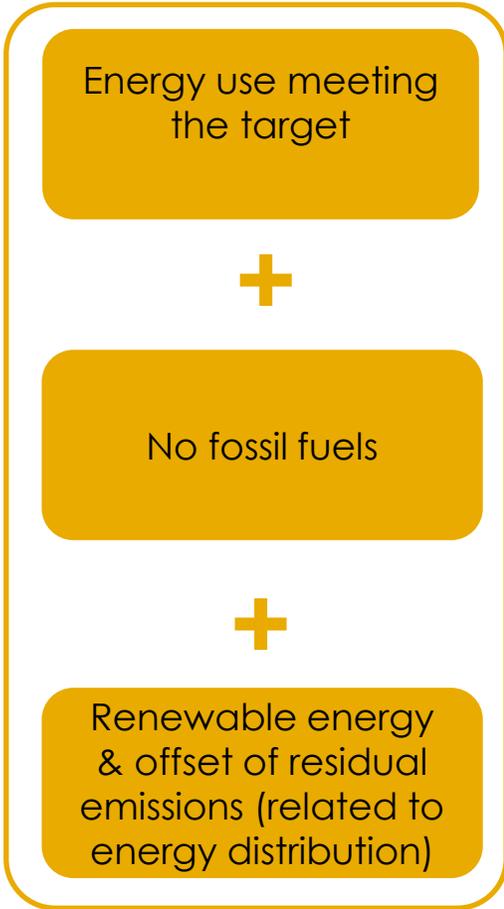
At the same time, it is important not to allow "greenwash", and make sure flexibility is only provided where there is a good reason for it, and where it can encourage further improvements towards Net Zero.

Your views are sought on whether the proposed "sub-definitions" are useful and achieve that balance.

# Net Zero claims for buildings

Net Zero claims

## Operational Energy Net Zero



## not yet Net Zero: options

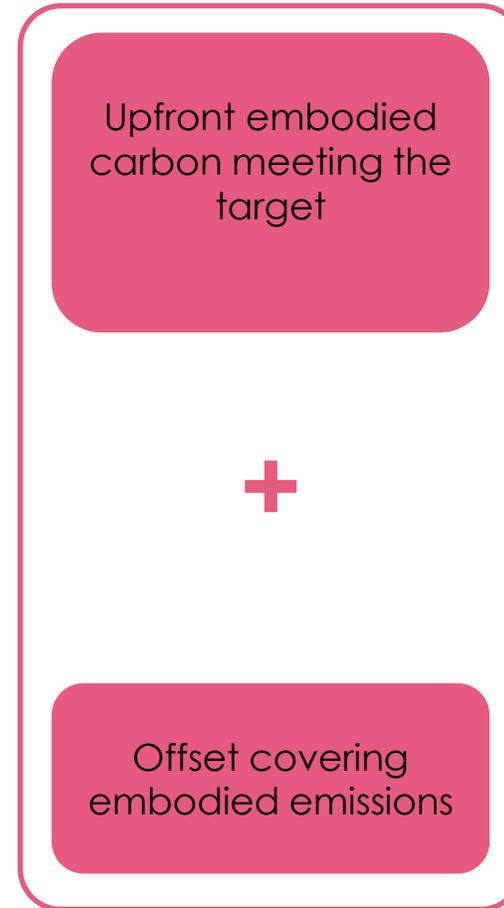
**In progress** e.g. energy use meeting intermediate targets on NABERS or RIBA 2030 Challenge scale.  
*(For existing buildings)*

**Compatible**  
or

**In transition** i.e. compatible + net zero roadmap  
*(For buildings constrained by landlords, tenants, or network)*

**Ready**  
Where renewable energy procurement and/or offsets have not been purchased

## Embodied Net Zero



## not yet Net Zero: options

**In progress** e.g. using LETI scale.

**Compatible**  
For core buildings without a fit-out yet:

**Ready**  
Where a building is built, and upfront targets are met but offsets have not been purchased



@CIBSE

@LETI\_London #WhatsZero

FAQ15 **Can I acknowledge progress on scale towards Net Zero?**

Another way to acknowledge progress towards Net Zero could be related to energy use, with a scale towards the end target.

The aim would be to encourage continued improvements – as such, it would probably be more relevant to existing buildings, while new buildings can already be designed and built to achieve Net Zero and avoid future retrofit needs.

Similarly to the other sub-definitions, this should make it clear it is NOT full Net Zero status, but progress towards it.

Survey

**Q30 - Do you think there should be the possibility for existing buildings to claim progress towards Net Zero, if their energy use doesn't yet meet the energy target but the building meets the other requirements? (tick ALL that apply, and add your comments on how you think it could be done e.g. using NABERS ratings for energy use, using LETI embodied carbon scale for embodied carbon)**

*159 responses (+8 omitted as contradictory)*

- 64%  **Yes, for energy use, only for existing buildings; new buildings should already meet energy targets compliant with Net Zero**
- 14%  Yes, for energy use, but it should be available for new buildings as well as existing ones
- 21%  Yes, for embodied carbon
- 11%  No, it should be Net Zero or nothing
- 7%  Other – please add your suggestions in the comments
- 4%  Not sure.

Q31 - Do you have any other comment on this FAQ?



# Net Zero claims for buildings – Timings and purchase of off-site renewables / offsets

## Net Zero claims

	 <b>In design</b>	 <b>Enabled</b>	 <b>Ready</b>	 <b>Net Zero</b>
	Being designed	Built, not yet operating	Operating	Operating <i>time</i>
<b>Operational</b>	<ul style="list-style-type: none"> <li>✓ Energy performance modelling meeting the energy targets</li> <li>✓ No fossil fuels</li> </ul>	<ul style="list-style-type: none"> <li>✓ As-built energy performance modelling meeting the energy targets</li> <li>✓ No fossil fuels</li> </ul>	<ul style="list-style-type: none"> <li>✓ Metered energy data meeting the energy targets</li> <li>✓ No fossil fuels</li> <li>○ No offsets for residual emissions</li> <li>○ Renewable energy not covering all energy uses</li> </ul>	<ul style="list-style-type: none"> <li>✓ Metered energy data meeting the energy targets</li> <li>✓ No fossil fuels</li> <li>✓ On- or off-site renewable energy for all energy use</li> <li>✓ Offsets for residual emissions</li> </ul>
<b>Embodied</b>	<ul style="list-style-type: none"> <li>✓ Embodied calculations meeting the upfront targets</li> <li>✓ Embodied calculations meeting the total embodied target</li> </ul>	<ul style="list-style-type: none"> <li>✓ As-built embodied calculations meeting the upfront targets</li> <li>✓ Total embodied calculations meeting the total embodied target</li> </ul>	<ul style="list-style-type: none"> <li>✓ As-built embodied calculations meeting the upfront targets</li> <li>✓ Annual embodied calculations meeting the Stage B embodied targets</li> </ul>	<ul style="list-style-type: none"> <li>✓ As-built embodied calculations meeting the upfront targets</li> <li>✓ Offset at PC for upfront emissions</li> <li>✓ Annual calculations meeting the Stage B embodied targets</li> <li>✓ Annual offsets for Stage B embodied emissions</li> </ul>



@CIBSE

@LETI\_London #WhatsZero

## Can I acknowledge achievements towards Net Zero Carbon - Operational Energy at different project stages ?

**Net Zero Carbon – Operational Energy** : Verified as 'Net Zero Carbon' on an annual basis, using measured energy use and a third party verified assessment.

**NZ Carbon in design– Operational Energy** : a building that is being designed to meet the energy use targets, with design stage predictive energy modelling calculations meeting the energy use targets.

**NZ Carbon enabled – Operational Energy** : a completed building, with as-built predictive energy modelling meeting the energy use targets, but with no energy use data yet. This “enabled” building could be handed over by a project team, for the occupier to follow-on with compliant operation to meet Net Zero.

**NZ Carbon ready – Operational Energy** : a building in operation, with metered energy use meeting the energy targets, and no reliance on fossil fuels (from its own plant or its communal / district supply), but no offsets for residual emissions and no/insufficient renewable energy supplies. The building is “ready” to become Net Zero with grid decarbonisation, or with procurement of relevant offsets and renewable energy.

### Survey

**Q32 - Do you agree that Net Zero Carbon – Operational Energy should only be claimed once a building is in use, annually, based on metered data and compliant renewable energy supplies?**

167 responses

- 80%  Yes
- 1%  No, design information should be enough
- 5%  No, as-built information should be enough
- 10%  Other – please add your suggestions in the comments
- 4%  Not sure

**Q33 – Do you agree that the following additional NZ Operational Carbon definitions are useful? (tick ALL that apply)**

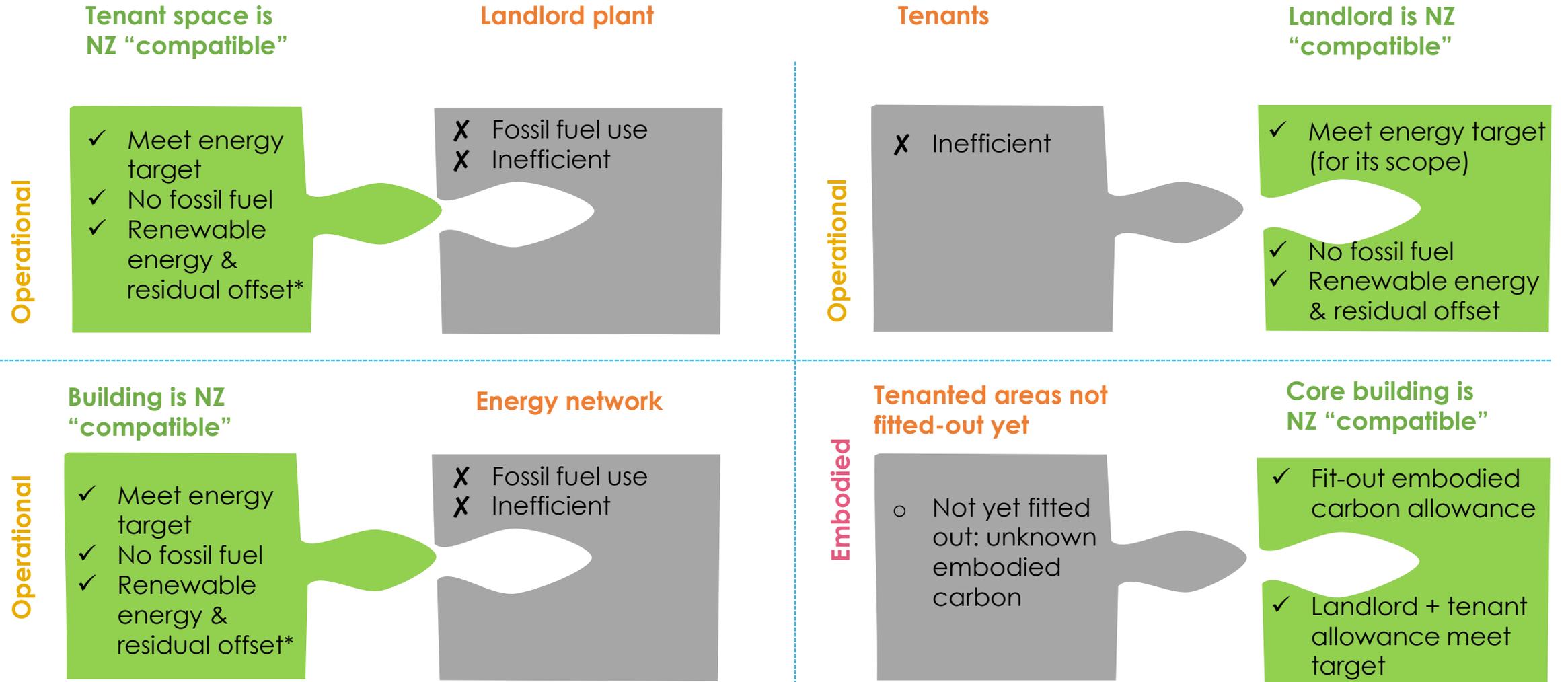
161 responses (+4 omitted as contradictory)

- 75%  Yes, “in design” is useful to show design achievements
- 68%  Yes, “enabled” in useful to show built achievements
- 67%  Yes, “ready” is useful to show achievements on the building itself, without purchasing offsets or renewable energy
- 10%  No, it should be Net Zero verified in use, or nothing
- 6%  Other – please add your suggestions in the comments
- 4%  Not sure.

Q34 - Do you have any other comments on the FAQ?

@LETI\_London #WhatsZero

# Net Zero “compatible”: constrained by another party



Net Zero claims



\* for electricity, if supply if within the tenant’s choice



@CIBSE

@LETI\_London #WhatsIsZero

## Can I acknowledge achievements towards Net Zero Carbon - Operational Energy, within agency constraints?

**Net Zero Carbon Compatible - Operational Energy:** a building which meets the energy targets and renewable energy procurement requirements, but which is constrained by factors outside its control, from other parties:

- Landlord plant (in the case of tenanted areas)
- District energy supply which it has to connect to (e.g. by local planning requirements)
- Tenant energy use (in the case of landlord plant).

*See also diagram on previous page.*

### Survey

**Q35 - Do you agree that the definition of “compatible” is useful? (tick ALL that apply - if you agree with its usefulness but would modify the details, please tick “yes” and add your suggestions in the comments)**

*151 responses (+ 3 omitted as contradictory)*

- 54%  **Yes, “compatible” is useful to acknowledge buildings which have done everything they can but are served by an energy network not compliant with Net Zero**
- 39%  Yes, “compatible” is useful to acknowledge buildings which have done everything they can but are served by landlord plant not compliant with Net Zero
- 42%  Yes, “compatible” is useful to acknowledge “core” buildings, including central plant, which have done everything they can but where the tenants have high energy use not compliant with Net Zero
- 25%  No, it should be Net Zero including all plant and energy uses, or nothing
- 5%  Other – please add your suggestions in the comments
- 11%  Not sure.

Q36 - Do you have any other comments on this FAQ?

# Net Zero “in transition”: constrained by another party, but that party has a Zero Carbon roadmap

Operational

Tenant space is NZ “in transition”

- ✓ Meet energy target
- ✓ No fossil fuel
- ✓ Renewable energy & residual offset\*

Landlord plant

- ✗ Fossil fuel use
- ✗ Inefficient
- ✓ Zero carbon roadmap

$$\text{Tenant space is NZ “compatible”} + \text{Landlord plant has fossil fuels but has a zero carbon roadmap} = \text{Tenant space is NZ “transition”}$$

Net Zero claims

Operational

Building is NZ “in transition”

- ✓ Meet energy target
- ✓ No fossil fuel
- ✓ Renewable energy & residual offset\*

Energy network

- ✗ Fossil fuel use
- ✗ Inefficient
- ✓ Zero carbon roadmap

$$\text{Building space is NZ “compatible”} + \text{Energy network has fossil fuels but has a zero carbon roadmap} = \text{Building is NZ “transition”}$$



\* for electricity, if supply if within the tenant’s choice



@CIBSE

@LETI\_London #WhatsZero

## Can I acknowledge achievements towards Net Zero Carbon - Operational Energy, within agency constraints?

Net zero carbon **in transition** – Operational Energy : a “compatible” building where the landlord or district/communal supplies have a compliant **zero carbon roadmap** including the following:

- Future plant, distribution efficiencies, operating temperatures, storage plant requirements etc, and associated design implications.
- Resulting carbon content of heat
- Implications for tenants / energy consumers
- Incorporation in the business model (including how capitals will be made available, future revenue streams, and how this will affect energy bills).
- Commitment to implementation, and timeline.

See also diagram on previous page.

### Survey

**Q37 - Do you agree that the definition of “in transition” is useful? (tick ALL that apply; if you agree with its usefulness but would modify the detail, please tick “yes” and add your suggestions in the comments)**

153 responses (+1 omitted as contradictory)

- 51%  Yes, “in transition” is useful to acknowledge buildings which have done everything they can but are served by an energy network not compliant with Net Zero, where the network has a suitable zero carbon roadmap
- 39%  Yes, “in transition” is useful to acknowledge buildings which have done everything they can but are served by landlord plant not compliant with Net Zero, where the landlord plant has a suitable zero carbon roadmap
- 31%  Yes, “in transition” is useful to acknowledge “core” buildings, including central plant, which have done everything they can but where the tenants have high energy use not compliant with Net Zero
- 24%  No, it should be Net Zero including all plant and energy uses, or nothing
- 7%  Other – please add your suggestions in the comments
- 12%  Not sure.

Q38 - Do you have any other comment on this FAQ?

## Can I acknowledge achievements towards Net Zero Carbon - Operational Water, within time or agency constraints?

For Net Zero Operational Carbon – Water, the same principles apply as for energy use i.e.:

**Net Zero Carbon – Operational Water** needs to be verified in use, based on metered water bills

Net Zero Carbon **enabled** – Operational Water: water use targets are met in design and as-built, but the building is not occupied yet.

Net Zero Carbon **ready** – Operational Water: water use targets are met in use, but no offsets have been purchased to cover residual emissions from water use.

Net Zero Carbon **compatible** - Operational Water is for:

- Tenanted areas, which meet the local target minus an allocation for landlord water use
- Landlord areas, which meet the local target minus an allocation for tenant water use.

This may not be relevant in building types where water use is dominated by either the landlord or tenant, and no “reward” to the other actor would be meaningful.

Survey

### Q39 - Do you agree with this approach, which would acknowledge constraints to reach Net Zero Carbon – Operational Water, in a similar way to Operational Energy?

150 responses

- 59%  **Yes, the same principles can be followed**
- 7%  No, the principles should be different for water – please add suggestions in comments
- 5%  No, because these principles should not apply to Operational Energy nor Water
- 7%  Other – please add suggestions in comments
- 22%  Not sure

Q40 – Do you have any other comments on this FAQ?

# Can I acknowledge different stages of progress towards Net Zero Embodied Carbon?

**NZ upfront carbon:** a building already built, where the upfront embodied carbon at Practical Completion (PC) meets the target and has been offset.

**NZ embodied carbon:** a building already built, where the upfront embodied carbon at Practical Completion meets the target and has been offset. On an annual basis, the in use (Stage B) embodied carbon is calculated, and offset.

### Survey

**Q41 - Do you agree that Net Zero Upfront Carbon should only be claimed with evidence of upfront embodied carbon at PC, and offsets at PC for upfront embodied carbon?**

164 responses

- 81%  Yes
- 3%  No, design information should be enough
- 3%  Other – please add your suggestion in the comments
- 13%  Not sure

**Q42 - Do you agree that Net Zero Embodied Carbon should only be claimed on an annual basis in use, with evidence of upfront embodied carbon calculations and offsets at PC, and of annual calculations and offsets for in-use (Stage B) embodied carbon?**

163 responses

- 58%  Yes
- 2%  No, design information should be enough
- 6%  No, as-built information should be enough
- 13%  No, one-off calculations and offsets for the whole building life should be enough
- 6%  Other – please add your suggestion in the comments
- 16%  Not sure

Q43 - Do you have any other comments on this FAQ?



@CIBSE

@LETI\_London #WhatsIsZero

## Can I acknowledge different stages of progress towards Net Zero Embodied Carbon?

**NZ embodied carbon in design:** a building that is being designed to meet the embodied carbon targets

**NZ embodied carbon enabled:** a building already built, where the upfront embodied carbon at Practical Completion meets the target and has been upset. This building has the potential to be net zero embodied carbon, if the Stage B targets are met and offset

**NZ embodied carbon ready:** a building already built, which has met the upfront embodied carbon at Practical Completion and is meeting the annual Stage B embodied carbon targets, but the embodied carbon has not been offset yet. The building is “ready” to become Net Zero with with procurement of relevant offsets.

*See also diagram on page 38.*

### Survey

#### Q44 – Do you agree that the following additional NZ Embodied Carbon definitions are useful? (tick all that apply)

159 responses (+2 omitted as contradictory)

- 69%  Yes, “in design” is useful to show design achievements
- 64%  Yes, “enabled” in useful to show built achievements
- 54%  Yes, “ready” is useful to acknowledge achievements on the building itself, without purchasing offsets
- 15%  No, it should be Net Zero verified and offset, or nothing
- 4%  Other – please add your suggestions in the comments
- 8%  Not sure

Q45 - Do you have any other comments on this FAQ?

## Can I acknowledge my building's achievements towards Net Zero Embodied Carbon, within agency constraints?

**Net Zero Compatible Embodied Carbon:** applies to landlord areas in new buildings which are not yet fully fitted-out, if:

- an appropriate embodied carbon allowance has been left for the relating MEP and FF+E that have yet to be installed, and
- this allowance together with the landlord-controlled embodied carbon meet the embodied carbon target, and
- the allowance has been communicated to the tenants.

Survey

Q46 - Do you have any comments on this FAQ?

# Key questions

## Net Zero Whole Life Carbon



@CIBSE @LETI\_London

FAQ21

# To be “net zero whole life carbon”, does the building have to be both NZ operational and NZ embodied carbon?

**Yes.** To be “NZ whole life carbon”, a building should meet both NZ operational (energy and water) and NZ embodied carbon definitions. There should not be “balancing” of one against the other, because of the need for resource efficiency: both energy demand reduction **and** upfront embodied carbon reduction apply.

## Survey

### Q47 - Do you agree with the approach?

162 responses

- 69%  **Yes, we should not be able to trade operational and embodied carbon against each other, we have to reduce both as much as possible.**
- 25%  No, what matters is whole life carbon, so a building should be able to have flexibility on how to achieve it.
- 6%  Not sure

Q48 – Do you have any other comment on this FAQ?

Trade offs



@CIBSE @LETI\_London #WhatsIsZero

# Key questions

## CIBSE endorsement



FAQ22 **Are these definitions supported by the whole industry?**

The LETI-WLCN definitions are supported by the RIBA.

There are huge benefits in the whole sector having a common set of definitions, so all disciplines, clients, investors, occupants are clear on what is being achieved or aimed at, and therefore, in parallel with the creation of these FAQs, CIBSE is considering whether to adopt them.



Survey

**Q49 - Do you think that CIBSE should adopt the current set of definitions? (i.e. this would cover the Net Zero principles, not the FAQs or targets, which are more specific)**

159 responses

- 38%  Yes, adopt them as they are.
- 11%  Yes, adopt them as they are, but only for the UK. If so, please add suggestions as to what in the definitions should be changed for other regions, and why.
- 26%  Yes. Ideally the definitions should be tweaked, but on balance the benefits for industry to have a joint set of definitions mean CIBSE should adopt them, whether or not these tweaks happen.
- 9%  CIBSE should only adopt them subject to changes – please add your suggestions for essential changes in comments or refer to the survey question where you have detailed it
- 1%  No, CIBSE should develop another set of Net Zero definitions
- 0%  No, we don't need a common set of definitions
- 4%  Others – please add suggestions in comments
- 10%  Not sure

Q50 - Do you have any other comments on this FAQ?

# 3. Detailed questions



# Detailed questions

## Operational Carbon - Energy



@CIBSE @LETI\_London

FAQ23

Once the electricity grid becomes zero carbon, in the UK and many countries, this will rely on nuclear energy – so, not meeting the definition’s requirement for « all energy to be from renewable sources ». Does it mean a building would still need to generate a portion of its energy use from renewable?

See FAQ9.

Regardless of the proportion of renewables in the grid, onsite renewables are recommended, especially for new builds, to contribute to the country’s total net zero generating capacity.

Note also that in all of the Future Energy Scenarios by the National Grid between now and 2050 nuclear represents less than 5% of energy sources.

Survey

Q51 - Do you have any comments on this FAQ?



FAQ24 **What are residual emissions? How to calculate them?**

Net Zero Carbon – Operational Energy

There are several types of emissions associated with energy use. The dominant and most “obvious” ones are those directly associated with energy consumption e.g.:

- from the burning of biomass: the “net” carbon emissions are zero as carbon was absorbed during biomass growth, but there are GHG emissions during combustion due to the release of methane and N2O
- from the burning of gas
- from the consumption of electricity which was not generated by renewable or nuclear energy.

In addition, there are Well-to-Tank emissions (WTT) from the production, processing and delivery of a fuel. This applies to biomass (e.g. processing and transport of pellets), natural gas (e.g. extraction and processing), and to electricity (e.g. if it is generated using biomass or gas).

The total emissions also need to account not only for the electricity used by the building, but also that which is lost in Transmission & Distribution (T&D) (and its WTT emissions).

In the UK, government factors are available for all types of emissions.



Survey

Q52 - Do you have any comments on this FAQ?

**Note – Example calculations will be provided in a variety of scenarios at final publication of the FAQs, by which time it is expected that updated carbon factors will be published by government for use in Building Regulations. The examples will make it clear what is already accounted for in Building Regulations calculations, and what is additional and needs to be accounted for, for the purpose of the NZ definitions.**

# How does the definition apply if a building is supplied by 'green gas' produced on site from, say, anaerobic digestion?

If anaerobic digestion happens onsite the green gas is deemed renewable and the building can qualify as net zero (if it meets other requirements).

While additional guidance may develop, and more certainty on the carbon benefits of green gas tariffs, currently, buildings that burn natural gas, but buy a green gas tariff, do not meet the net zero definition. Recommendations are provided in the UKGBC Renewable Energy Procurement & Carbon Offsetting Guidance for Net Zero Carbon Buildings\* for consumers who do wish to purchase such tariffs to support the growth of the UK green gas market or for ESG purposes.

\* <https://www.ukgbc.org/ukgbc-work/renewable-energy-procurement-carbon-offsetting-guidance-for-net-zero-carbon-buildings/>

## Survey

### Q53 - Do you agree with the approach in this FAQ?

105 responses

- 50%  Yes
- 16%  No, the building cannot be called Net Zero if it uses green gas, even if that green gas is produced on site
- 6%  No, some green gas tariffs are acceptable, and buildings that purchase such tariffs should be able to claim net zero – please add your suggestion the comments on the type of green gas tariffs which should be accepted
- 8%  Other – please add your suggestions in the comments
- 20%  Not sure

### Q54 - Do you have any other comments on this FAQ?



If hydrogen became available for use in buildings or heat networks in the future, the Net Zero Carbon – Operational Energy definition’s requirement that all energy should be generated by renewables seems to imply that only ‘green’ hydrogen would be allowed, and all indirect emissions associated with generation, storage and distribution would have to be offset. Is this understanding correct? If so, how would that be calculated? If not, how would they be calculated in the case of other types of hydrogen (e.g. "grey", "blue")?

Hydrogen is not yet available for use in UK buildings.

The government have recently consulted on a low-carbon hydrogen standard. Subject to the outcome of the consultation, hydrogen meeting that standard may be accepted under these definitions; this cannot be confirmed at this stage. Schemes supplied by hydrogen seeking recognition under this set of definitions should contact CIBSE for discussions on a case by case basis.

In the case of “blue” hydrogen, evidence would be required of low leakage from extraction and throughout the production process, and effective carbon capture in practice. In the case of “green” hydrogen, renewable capacity meeting the demand from electrolysis would be required, demonstrating additionality. In all cases, residual emissions from the production of hydrogen would need to be offset, as in all scenarios under the definitions.

Survey

Q55 - Do you have any comments on this FAQ?



# Detailed questions

## Operational Carbon - Water



# How are GHG emissions (and offsets) arising from water supply and wastewater treatment calculated?

GHG emissions associated with water supply and wastewater treatment should be calculated using carbon factors supplied by the water company (counting both water supply and treatment); if this is not available, the government GHG conversion factors can be used, for the year that the water is used .

The 2021 factors are shown below:

- Water supply: 0.149 kg CO<sub>2e</sub> /m<sup>3</sup> of water supplied to the building
- Wastewater treatment: 0.272 kg CO<sub>2e</sub> /m<sup>3</sup> of waste water that needs to be treated.

### Survey

Q56 - Do you have any comments on this FAQ?



# Detailed questions

## Embodied Carbon



## How to account for carbon sequestered in timber, wood fibre insulation and other plant-based materials?

The carbon sequestered during the growth of timber and other plant- and bio-based materials ( e.g. leather, wool and fungi) is NOT deducted from their upfront embodied carbon during an embodied carbon assessment, because its release or transfer at the building's end of life or at some point in the building's lifecycle is also considered, depending on how these materials are dealt with or disposed of (e.g. they may go to landfill, or be burnt in an energy-from-waste plant or re-used ). Therefore, both the removals (= sequestration) and the emissions at end of life are only accounted for when carrying out whole-life embodied carbon (Stage A-C).

*Survey*

Q57 - Do you have any comments on this FAQ?

# Where should emissions from refrigerant leakage in use be accounted for?

Under EN 15978, the convention is to count emissions from refrigerant leakage within module B1 (i.e. embodied carbon – in use phase). This convention has been adopted by CIBSE TM65, and it is the recommended approach at this stage.

However, this may change in future revisions of EN 15978- and/or the RICS professional statement. Other options include counting refrigerant leakage as follows:

**As part of B6 – Energy use, because refrigerant leak is associated with energy use.**

The downsides of this option are: refrigerant leakage is not unavoidable, it is a result of poor installation and maintenance rather than energy use itself; if under B6, is it would still need separate design stage predictions and in-use accounting; for Net Zero status, it would need another set of B6 targets, separate from the energy use targets.

**As part of B2 – Maintenance, as this would highlight the importance of maintenance procedures to reduce refrigerant leakage**

The downsides of this option are: it could “hide” refrigerant leak emissions under other maintenance-related embodied carbon impacts

**In a new additional B module: this would have the advantage of making the impact of refrigerant leakage clear.**

The downsides of this option are: the industry is still learning LCA modules and would have to learn a new one.

Embodied carbon



@CIBSE

### Survey

#### Q58 - If the way to account for emissions from in-use refrigerant leakage was revised in the future, where do you think they should be counted:

104 responses

- 27%  No change, they make sense within B1
- 38%  Change the convention: including these emissions within B1 makes leakage seem “intrinsic” and these emissions not being addressed, just offset instead
- 36%  Not sure

#### Q59 - If you think the convention should change, where do you think emissions from refrigerant leakage should be accounted for, instead of B1:

86 responses

- 10%  As part of B6 – Energy use, as refrigerant leak is associated with energy use
- 15%  As part of B2 – Maintenance, as maintenance is important to reduce refrigerant leakage
- 33%  In a new B module, as this would highlight the impact of refrigerant leakage
- 5%  Other – please add your suggestions in the comments
- 37%  Not sure

Q60 - Do you have any other comments on this FAQ?

@LETI\_London #WhatsIsZero

## Why are building-mounted PV panels excluded from the LETI embodied carbon targets?

The current LETI embodied carbon targets exclude PV systems. The rationale is that PVs are part of the wider energy system, helping to decarbonise electricity. The embodied carbon of that wider infrastructure is not included in buildings embodied carbon targets, so including PVs would not provide a “fair” comparison and could disincentivise their installation\*.

However, arguments for including them are:

- As they are installed within a specific building contract, excluding them potentially means their embodied carbon is not counted anywhere else.
- The boundary is not always clear e.g. when PVs are integrated as a façade element (as these elements ARE included in embodied carbon targets).
- It could incentivise manufacturers to develop products of reduced embodied carbon and increased output.

An alternative could be to include the quantum of PVs that relate to the energy used by the building, but exclude those that over-provide and export to the grid.

**The next page illustrates the embodied carbon of PVs.**



\* Solar thermal systems are included as these systems only connect to the building, not to a wider network/infrastructure.



@CIBSE

@LETI\_London #WhatsIsZero

### Survey

#### Q61 - Do you think PV systems should be included in a building embodied carbon target?

126 responses

- 8%  No, onsite PV systems should remain excluded
- 29%  No, onsite PV systems should remain excluded from the building target, however if PV systems are provided they should meet an embodied carbon target (e.g. kgCO<sub>2</sub>/kW<sub>peak</sub> or kgCO<sub>2</sub>/kWh annual output), to incentivise energy efficient and low embodied carbon systems
- 32%  Yes, building mounted PVs should be included in building embodied carbon targets
- 6%  PV systems providing less than and up to 100% of the building's energy consumption (on an annual basis) should be included, with any over-provision should be excluded as it contributes to the wider system instead
- 16%  Onsite PVs need to be included in the embodied carbon target, but also offsite renewables as otherwise it could discourage the installation of on-site systems
- 2%  Other – please add your suggestion in the comments
- 7%  Not sure

Q62 – Do you have any other comment on this FAQ?

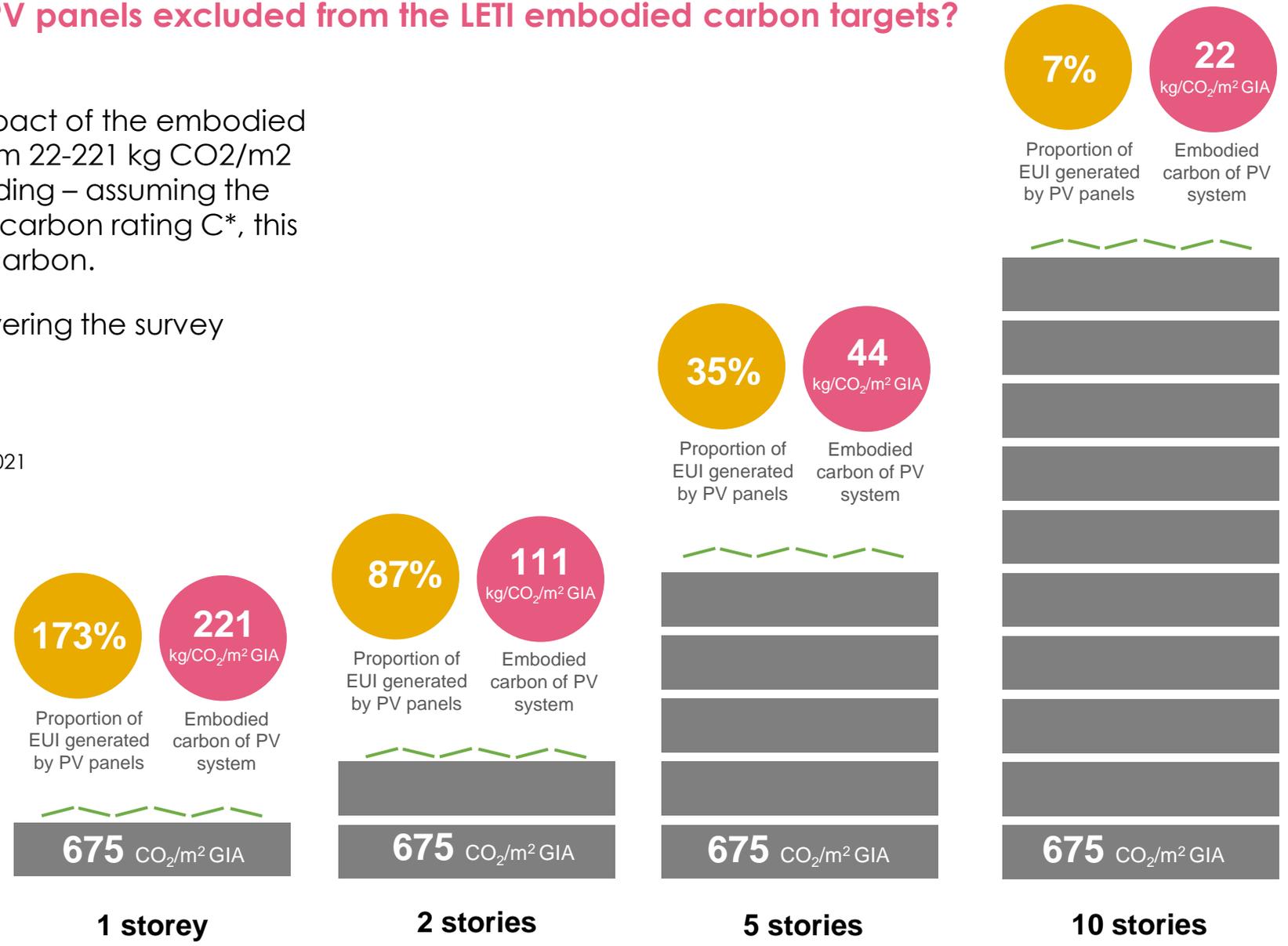
# Why are building-mounted PV panels excluded from the LETI embodied carbon targets?

This image shows the relative impact of the embodied carbon in PV systems can be from 22-221 kg CO<sub>2</sub>/m<sup>2</sup> compared to the rest of the building – assuming the building meets a LETI embodied carbon rating C\*, this could add 3-33% of embodied carbon.

This provides context when answering the survey questions on this FAQ.

\* [LETI Embodied Carbon Target alignment](#), 2021

Embodied carbon



## Why is the embodied carbon of energy infrastructure not included in the Net Zero embodied definitions?

The current Net Zero definitions for buildings do not include calculating and offsetting the embodied carbon associated with energy infrastructure required to supply buildings, where these are part of the wider national system; this means for example that items such as power cables, transformers, PV farms, wind turbine, storage (such as hydro or compressed air, or batteries) etc are excluded from the Net Zero definitions for buildings.

Typically these are accounted for in different sectorial budgets (power sector, infrastructure), rather than buildings.

Embodied carbon



@CIBSE

### Survey

#### Q63 - Should the embodied carbon of wider energy infrastructure (beyond buildings themselves) become included in the Net Zero definitions?

120 responses

- 39%  No, it should remain excluded from Net Zero definitions applying to buildings. It should be accounted for elsewhere (e.g. in Net Zero definitions for infrastructure projects).
- 37%  No, it should remain excluded from Net Zero definitions applying to buildings, but the impact of building decisions on that infrastructure should be assessed and considered in decision making; for example, demand reduction measures on the building, such as better fabric performance, may in some cases increase the embodied carbon of the building, but reduce the required wider energy infrastructure and its embodied carbon
- 17%  Yes, it should become included in Net Zero definitions. It should be calculated and offset, and possibly subject to a target – please add your suggestion in the comments
- 4%  Other – please add your suggestion in the comments
- 3%  Not sure

Q64 – Do you have any other comments on this FAQ?

@LETI\_London #WhatsIsZero

# Anything else?



@CIBSE @LETI\_London

## Any other comments?

The definitions and FAQ are meant to support industry.

If you are unsure about something or need more information, please let us know!

### *Survey*

Q65 - Do you have any other question on the definitions, which you think should be addressed in the FAQ? For example, it could be wording which you think is unclear, or a situation where you are not sure how the definitions would apply, or you think they may lead to the wrong energy or carbon outcome. Please detail in the comments.

Q66 - Do you have any other comment or question on the definitions or FAQ? Please detail in the comments.



@CIBSE

@LETI\_London #WhatsZero

# THANK YOU!

For any question on this document or the survey, contact:

Clara Bagenal-George [clara@leti.london](mailto:clara@leti.london)  
Julie Godefroy [jgodefroy@cibse.org](mailto:jgodefroy@cibse.org)



@CIBSE

@LETI\_London #WhatIsZero