IGBC
IRISH GREEN BUILDING COUNCIL

Net Zero Carbon Definitions

Guidance for IGBC members

April 2024

Document history:

Rev:	Date:	Comment:
A	03/03/2023	Initial outline draft for internal IGBC review.
B	06/04/2023	Updated draft for IGBC member consultation.
C	13/09/2023	Revision for public consultation.
D	12/04/2024	Updated based on feedback from public consultation.

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1 IGBC Net Zero Carbon Definitions

National and international drivers are promoting the achievement of Net Zero Carbon (NZC) emissions from the built environment. In late 2022, the Irish Green Building Council (IGBC) launched the roadmap to decarbonise Ireland's Built Environment, based on the proposed target that all new buildings should achieve NZC performance by 2030, and that all existing building stock should achieve NZC performance by 2050. However, there is currently no official national definition for NZC performance.

Below are the **NZC definitions proposed by the IGBC as guidance for IGBC members and the broader Irish construction industry** who wish to voluntarily demonstrate NZC performance, which were developed with input from IGBC member workshops and public consultation.

Net Zero Carbon Operational Energy:

A 'Net Zero Carbon Operational Energy' building does not exceed local targets for operational energy use intensity and utilises renewable energy sources for all building energy use; such that the annual Global Warming Potential for operational energy of the in-use building life cycle stage (B6) is less than or equal to zero.

Net Zero Whole Life Carbon:

A 'Net Zero Whole Life Carbon' building does not exceed local targets for operational energy use or embodied carbon; such that the sum total Global Warming Potential for all cradle to grave life cycle stages are less than or equal to zero, where residual carbon is compensated for via renewable energy sources, or as a last resort carbon offsetting.

The definitions are purposefully kept as concise as possible, however understanding of several key terms is required; these terms are underlined within the definitions and further clarified in section 2. Also, please see the annexes provided for further details on the industry resources referenced and aligned with, as well as the IGBC's position on important aspects of NZC performance.

- Annex I: Guiding Rationale for IGBC's NZC Definitions
- Annex II: Operational Energy Metrics
- Annex III: The Role of Local Targets
- Annex IV: Observed Issues with Carbon Offsetting

In addition to these definitions, the IGBC is currently leading projects that aim to establish assessment and reporting requirements to demonstrate NZC performance.

- Design4Zero
- INDICATE
- UpfrontCO2

2 Clarifications on key terms of IGBC's NZC Definitions

2.1 Building Life Cycle

Building life cycle stages are as defined by **EN15978:2011**;

- Module A1 – A3 PRODUCT stage **[Cradle to Gate]**
- Module A4 – A5 CONSTRUCTION stage **[Cradle to Practical Completion]**
- Module B1 – B7 IN-USE stage
- Module B8 – B9 IN-USE stage, for infrastructure only
- Module C1 – C4 END-OF-LIFE stage **[Cradle to Grave]**
- Module D1-D2 Beyond building life cycle **[Cradle to Cradle]**

The life cycle stages are illustrated in Figure 1 relative to the system boundaries of different assessments.

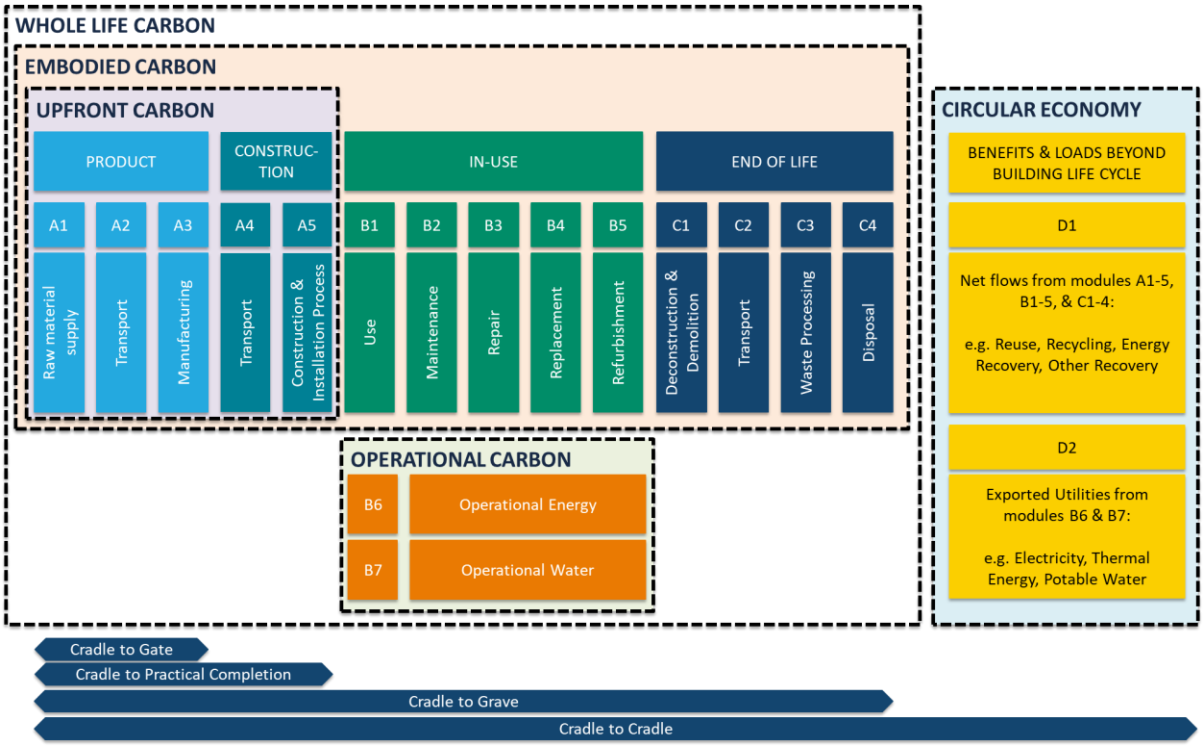

Figure 1: Building life cycle stages and System Boundaries [adapted from EN 15978, EN 17472, and EN 15643]

2.2 Global Warming Potential

There are many gases which, when emitted into the atmosphere in sufficient quantities, can influence the energy balance of the atmosphere (a process called radiative forcing) whereby a greater proportion of the solar energy entering the atmosphere is retained; i.e. these gases influence how the atmosphere retains heat, just like in a greenhouse, hence these gases have been dubbed "Greenhouse Gas" (GHG).

- Water vapour is the dominant GHG in the earth's atmosphere.
- The most prominent GHG in legislation is carbon dioxide, CO_2, often simply referred to as "carbon".
    - CO_2 makes up approx. 0.04% of the earth's atmosphere, where the global average concentration in 2023 is 421 parts per million (ppm), rising from 320ppm over the last 60 years.
    - CO_2 is a primary byproduct from the combustion of hydrocarbon fuels for the release of energy. As such legislation aims to reduce CO_2 emissions by restricting the use of fossil fuels; e.g. heating oil, natural gas, coal.

Global Warming Potential (GWP) is a simplified index that can be used to estimate the potential effect of different GHGs in a relative sense; i.e. the potential radiative forcing effect of one mass-based unit of a given GHG relative to that of a base gas over a given time period.

- The most commonly used GWP metric is GWP100.
    - GWP100 estimates the potential radiative forcing effect of different greenhouse gases over a 100 year period compared to the base gas carbon dioxide, CO_2.
        - It is expressed in terms of "carbon dioxide equivalent", CO_2e.
        - As a simplified metric there are known issues with GWP100 related to its accuracy in representing the different environmental dynamics of 'short-lived' and 'long-lived' greenhouse gases.
    - GWP100 is used to inform the majority of national and international policy related to the concept of anthropogenic climate change.

2.3 Whole Life Carbon

'Whole Life Carbon' (WLC) is the total GWP associated with all building life cycle stages within the 'Cradle to Grave' system boundary; EN 15978 modules A1-A5, B1-B7, and C1-C4.

- This boundary is inclusive of the assessment of both embodied and operational carbon.

GWP of the building life cycle should be calculated and measured as per the guidance of Indicator 1.2 of the EU Level(s) framework, where for the purpose of comparability;

- a minimum scope of building elements, components, products, and materials to be assessed are defined within the Level(s) building description, outlined in Level(s) User Manual 2.
- GWP should be quantified in kilograms of Carbon Dioxide equivalent per metre squared of useful internal floor area per year ($kgCO_2e/m^2/yr$) for a reference study period.
    - Level(s) prescribes a default reference study period of **50 years** irrespective of the expected lifespan of the development being assessed. **N.B.** Other methodologies prescribe a default reference study period of 60 years.

The WLC assessment and reporting should be aligned to the EU Level(s) framework, as Level(s) underpins the revised Energy Performance of Buildings Directive (EPBD) and is also used for EU Taxonomy investment decisions.

When considering the two components of WLC, "embodied carbon" and "operational carbon", note that over time as greater reductions in operational carbon dioxide emissions are achieved, embodied carbon will become the dominant source of a buildings carbon dioxide emissions. Illustrated in Figure 2.

- Currently, the emissions directly associated with the energy used for the functional operation of the building will typically represent 65% or more of the whole life carbon for a new building.

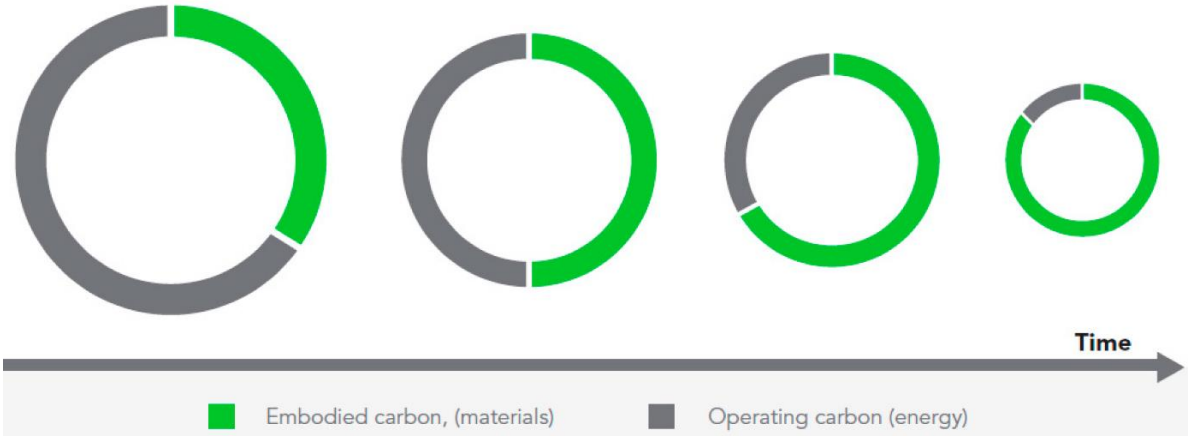

Figure 2: Growing Importance of Embodied Carbon [Reproduced from One Click LCA]

2.3.1 Embodied Carbon:

'Embodied Carbon' is the GWP associated with all construction materials and products over a building's whole life cycle; 'cradle to grave'; EN15978 modules A1-A5, B1-B5, and C1-C4.

'Upfront Embodied Carbon' (or 'Upfront Carbon') refers only to the GWP associated with all construction materials and products up to building handover following construction;

'cradle to practical completion'; EN15978 modules A1-A5. This is typically the largest contributor to the whole life embodied carbon of a building.

The embodied carbon assessment does not include the negative carbon figure produced by sequestration; i.e. the biogenic sequestration of CO_2 in natural building material such as timber or hemp is not subtracted from the total embodied carbon.

- The WLC assessment assumes that the sequestered CO_2 inherent to the material is either passed on to future projects via material reuse/recycling or will be returned to the natural carbon cycle of the environment via incineration or decomposition in landfill in due course at the end of its useful lifecycle. All processes (sequestration/emissions) within the natural carbon cycle are considered carbon neutral, not contributing a net decrease or increase in atmospheric GHG levels.

2.3.2 Operational Carbon:

'Operational Energy' Carbon is the GWP associated with operational energy over the 'in-use' stage of a building's life cycle; EN15978 module B6.

- Calculated and reported in accordance with Indicator 1.1 of the EU Level(s) framework.
- Operational energy of a building is the gross energy use related to the operation of building-integrated technical systems during use (regulated loads) and related to the activities of building occupants (unregulated loads); expressed in terms of Energy Use Intensity (EUI), kilowatt-hours per metre squared of useful internal floor area per year (kWh/m^2/yr), as Final energy.
    - EUI is gross energy use, total metred energy use, inclusive of all energy use related to the building operation (e.g. including external lighting), without subtracting energy use serviced via renewable energy sources.
    - See Annex II for additional information on operational energy metrics.

'Operational Water' Carbon is the GWP associated with operational water use over the 'in-use' stage of a building's life cycle; EN15978 module B7.

- Calculated and reported in accordance with Indicator 3.1 of the EU Level(s) framework.
- Water use should be inclusive of all water use of the building-integrated technical systems and water use related to the activities of building occupants; however, just like regulated and unregulated energy loads, these should be reported separately.
    - Any GWP associated with energy use for on-site water systems is included under operational energy (B6); e.g. pumping, water heating, on-site filtration, or onsite wastewater treatment.

2.4 Local Targets

The 'decarbonisation' of energy supply, in particular the national electricity generation and distribution infrastructure, is an integral part of all NZC policy. However, NZC policy also requires the simultaneous reduction in energy and resource use. From the perspective of the built environment this means achieving certain performance thresholds, reducing the demand side for energy and resources while the supply side is simultaneously decarbonised.

- For the built environment, 'local targets' (also referred to as 'local limits') establish the energy and resource performance required.
- Local targets are called such as they are specific to a locality, typically at a national level, in line with national 'carbon budgets' and national decarbonisation strategies.

Meeting local targets does not mean net zero carbon emissions has been achieved. Local targets simply establish a prerequisite performance for operational and embodied carbon emissions; i.e. that operational and embodied carbon are reduced sufficiently by design, reducing subsequent demand for energy in line with the decarbonisation strategy of national energy infrastructure.

- See Annex III for further detail on the role of local targets in the broader context of NZC.

The RIAI 2030 Climate Challenge, endorsed by the IGBC, provides voluntary local targets for operational energy use, water use, and embodied carbon in Ireland.

- These local targets are specific to three specific building typologies;
    - Domestic Buildings
    - Non-domestic Buildings (New Build Offices)
    - Schools (New Build)
- **Currently, individual projects in Ireland looking to demonstrate NZC performance using the IGBC's NZC definitions given here should use the 2030 targets of the RIAI's 2030 Climate Challenge.**
    - However, alternative targets may be established based on organisational or portfolio level decarbonisation strategies.
    - Operational energy targets can only be verified with metred data, but should be estimated as accurately as possible during design via energy modelling. Meeting recommended performance/efficiency targets for building fabric and technical building systems does not correlate to meeting any given EUI target.

N.B. Local targets will evolve (change) over time as NZC policy evolves with available data and national decarbonisation strategies.

The local targets established by RIAI 2030 Climate Challenge are based on existing data for best performance in new buildings, and they will be periodically reviewed, at least every three years, and updated in accordance with available building performance data.

- The assessment and reporting of operational energy use (all buildings) and embodied carbon (new builds and major renovations) will play a critical role in the evolution of local targets; as greater quality/quantity of collected data will facilitate greater fine tuning of targets.
- It should also be noted that as local targets evolve and are expanded for different building typologies, separate targets may be established for New Builds and Major Renovations.

2.5 Renewable Energy Sources

'Renewable energy' means energy from renewable non-fossil sources.

- **The requirement for all operational energy use to be met via renewable energy sources implies that a NZC building does not utilise energy derived from fossil fuels in any way, on or off site.**
    - Emphasising again the integral role of the decarbonisation of energy supply.

Where a building, new or existing, meets local targets but is reliant on the mains electricity grid to meet some or all of its energy demand then it is not Net Zero Carbon. Only if the mains electricity grid is fully decarbonised would the building be considered Net Zero Carbon in operation.

- Such buildings would be sub-categorised as "Net Zero Carbon Enabled" (or "Net Zero Carbon Aligned", etc.). Such sub-categories will be the primary path to achieving NZC operation for the vast majority of existing building stock.
- While this document's primary aim is to clarify the definition of what constitutes a "Net Zero Carbon" building, future work from the IGBC will elaborate on associated sub-categorisation.

Renewable energy sources may comprise of any combination of on-site or off-site renewable generation.

- Off-site renewable energy generation could be energy provided by renewable energy communities or citizen energy communities, and district heating and cooling based on renewables or waste heat.
- Off-site renewable energy generation is acceptable only if it demonstrates additionality.

- Additionality is the procurement or development of renewable energy generation for the building's use which results in new installed renewable energy capacity that would not have occurred otherwise.

Direct and upstream emissions from renewable energy sources must be included as part of a WLC assessment.

- Direct emissions could include GHG emissions from the use of biomass and biodiesel fuels; i.e. the CO_2 intensity per kWh of energy delivered, not the emissions from combustion in the case of biofuels this re-emitting previously sequestered CO_2 to the natural carbon cycle.
- Upstream emissions could include indirect GHG emissions from energy generation, storage, and distribution.
- The embodied carbon of renewable energy systems is included in the WLC analysis; i.e. there is no exclusion for the embodied carbon of solar PV panels.

As per the EU's Renewable Energy Directive, 'Renewable energy sources' are namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas, and biogas.

- 'Geothermal energy' means energy stored in the form of heat beneath the surface of the earth. Not be conflated with 'ground source', e.g. ground source heat pump, which utilises low grade solar thermal energy stored in the earth's upper surface.
- 'Ambient energy' means naturally occurring thermal energy and energy accumulated in the environment with constrained boundaries, which can be stored in the ambient air (excluding exhaust air), or in surface or sewage water. i.e. low grade thermal energy from ambient air is considered a renewable source of thermal energy.
    - Achieving NZC Operational Energy necessitates meeting all of the building's final energy use from renewable energy sources; ambient thermal energy utilised via a heat pump does not contribute to achieving this. Utilising ambient thermal energy via a heat pump can be an energy efficient way to meet a building's heating demand, but in the context of NZC it is the final electricity energy use of the heat pump that must be met from renewable energy sources.
- Biomass is only considered a renewable energy source if it meets the sustainability criteria for biomass fuels set out in the Renewable Energy Directive of the EU.

2.6 Residual Carbon

'Residual carbon' emissions are the remaining GWP of a building after all methods for reducing it have been exhausted; i.e. where both operational and embodied carbon have been reduced as far as feasibly possible, meeting or exceeding local targets.

Any residual carbon emissions then may, as a last resort, be 'compensated' for via carbon offsetting.

- Carbon offsetting is where GHG emission reductions or removals achieved by one entity are used to offset (compensate for) emissions from another entity. Verified GHG emission reductions or removals are sold in the form of 'carbon credits'.

N.B. Carbon offsetting is not acceptable for achieving NZC operational energy; except where it is demonstrated to not currently be technically feasible due to project specific constraints.

Where offsetting of residual carbon emissions is utilised, it should be done in line with the Oxford Principles for Net Zero Aligned Carbon.

- Additionally, it is the stance of the IGBC that, if utilised, carbon offsetting must;
    - Be from a scheme certified under the EU carbon removal certification framework.
    - Be from a scheme within the EU and local (as close as possible) to the proposed user.
        - i.e. a project in Ireland should endeavour to utilise an offsetting scheme operating in Ireland, or if not, it must still be within the EU.
    - Be **PROMINENTLY DECLARED** as part of any NZC declaration or marketing promotion.
        - i.e. a building/portfolio promoting itself as NZC must state the quantity of carbon offsetting that contributes to it achieving NZC.

The IGBC acknowledges that while there is some merit to the concept of carbon offsetting within the context of net zero carbon policy, the regulation and transparency required to realise its potential in practice is currently lacking.

- See Annex IV for information on observed issues with carbon offsetting.

Annex I: Guiding Rationale for IGBC's NZC Definitions

It is the aim of these definitions to provide concise guidance specific to the Irish construction sector, aligned with international best practice and relevant EU legislation, that can be referenced by those wishing to demonstrate net zero carbon (NZC) performance. The guiding rationale for the development of these definitions and the scope of this document are listed below;

- This document aims to define what constitutes NZC, it does not address issues of feasibility, or how NZC could or should be achieved.
- The definitions are equally applicable to any building developments, new or renovated; where "Building" in the definition can refer to any individual asset of the built environment.
- Developed with strong consideration of;
    - WLC approach as per the IGBC's Building a Zero Carbon Ireland Roadmap, developed as part of World GBC's #BuildingLife initiative.
    - WGBC's Advancing Net Zero programme, which IGBC participates.
    - LETI definitions which have already gained traction within the industry; recently adopted by CIBSE.
        - The CIBSE LETI Net Zero FAQs is endorsed by the IGBC as a reference guide applicable to the IGBC's NZC definition.
- Developed in line with EU Level(s) framework and terminology. Level(s) underpins the Energy Performance of Buildings Directive (EPBD) revision and also acts as Technical Screening Criteria (TSC) for EU Taxonomy investment decisions.
    - WLC assessed as per Level(s) indicator 1.2 'Life cycle Global Warming Potential (GWP)' with life cycle modules and cradle to grave analysis boundary as per EN15978
    - Operational Energy assessed as per Level(s) indicator 1.1 'Use stage energy performance'
    - Operational Water assessed as per Level(s) indicator 3.1 'Use stage water consumption'
- The RIAI 2030 Climate Challenge is referenced as a voluntary source for local targets for Ireland.
    - **Currently, projects in Ireland looking to demonstrate NZC performance using the IGBC's NZC definitions given here should use the 2030 targets of the RIAI's 2030 Climate Challenge.**
    - Local targets are integral to the NZC definitions, but it must be understood that they can and will evolve over time.
- The IGBC discourages offsetting (compensating) residual GWP as a sustainable long-term solution to managing GHG emissions. For this reason, it has adopted the clear stance outlined in section 2.6 of this document.

Annex II: Operational Energy Metrics

Depending on the context, a building's operational energy use can be expressed in different ways. There are a few key terms when referring to operational energy use.

- Regulation derived from the EPBD, Part L compliance (Nearly Zero Energy Building, 'NZEB') and Building Energy Ratings (BER), assess regulated loads only, in terms of primary energy.
- Voluntary Energy Use Intensity (EUI) local targets, such as those proposed by the RIAI's 2030 Climate Challenge, assess a buildings total energy use, regulated and unregulated loads, quantified as final energy.

Regulated & Unregulated Loads:

- Regulated energy: Energy consumed by technical building systems; e.g. fixed installations for heating, hot water, cooling, ventilation, and lighting.
- Unregulated energy: Energy consumed outside of technical building systems; e.g. process energy and energy associated with equipment related to the buildings occupants such as lifts, escalators, security, communication, IT, computers, TVs, white goods, general plug loads, and cooking.

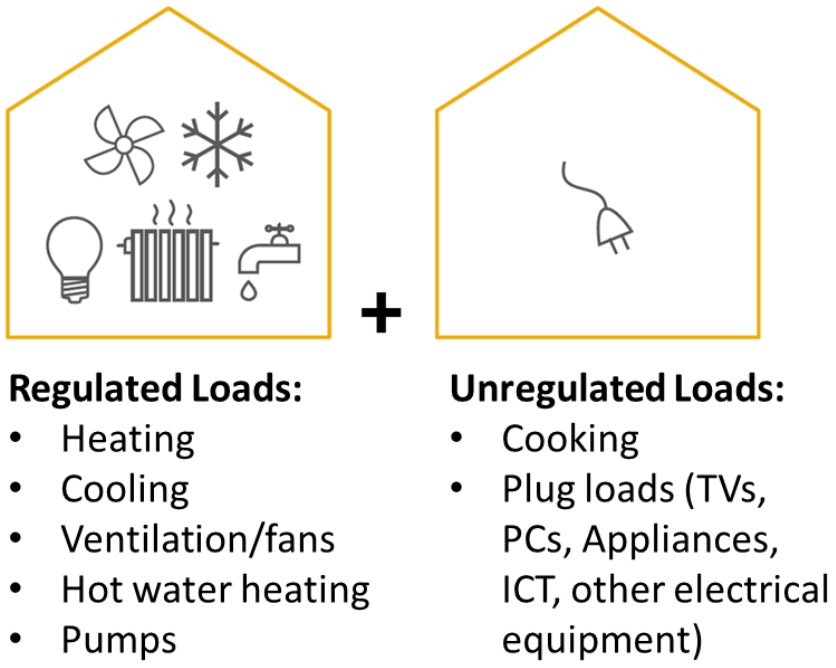

Figure 3: Regulated and unregulated energy loads [Reproduced from LETI Design Guide]

Final & Primary Energy:

- Final Energy: Energy consumed by (delivered to) the end user in the form of electricity, heat, and fuel in order to satisfy energy needs of the building; i.e. the energy use as read at the metre which a consumer would be billed for. Also referred to as 'delivered energy'.

- Primary Energy: Energy, from renewable or non-renewable sources, which has not undergone any conversion or transformation process. It is the final energy multiplied by a factor to account for energy lost during transformation processes such as electricity generation and distribution. The primary energy factors for different energy sources (e.g. grid electricity, fuel oil, and gas) are determined at a national level.

Proposed EPBD Revision:

The term "Net Zero Carbon" (NZC) is distinctly different from the term "Zero-Emissions Building" (ZEB) outlined in the proposed revision of the EU's Energy Performance of Buildings Directive (EPBD).

ZEB is a specific term of the proposed EPBD revision. It will explicitly refer to the regulated operational primary energy use of a building. Whereas, NZC is an industry term, and (dependent on its source) typically refers to the total (regulated and unregulated) final energy use of a building.

Each country of the EU will determine how they will define ZEB at a national level. However, the IGBC endeavours to define NZC such that it's assessment and reporting should be compatible with that eventually defined for ZEB, by being aligned with EU Level(s).

The proposed EPBD revision stipulates that EU countries shall ensure that new buildings achieve ZEB performance in accordance with Article 9b:

- as of January 1st 2028, for new buildings owned by public bodies; and
- as of January 1st 2030, for all new buildings.

Where, among other requirements, article 9b establishes that a zero-emission building:

- Will not cause on-site GHG emissions from fossil fuels.
- Shall offer the capacity to react to external signals and adapt its energy use, generation, or storage, where economically and technically feasible.
- Will comply with an energy performance threshold set at national level.
    - Where the maximum threshold shall be at least 10% lower than the threshold for total primary energy use established for Nearly Zero-Energy Building (NZEB) performance. (NZEB performance is currently the minimum requirement for compliance with Part L of the building regulations.)

N.B. NZC (as defined in this document) includes both operational and embodied aspects, whereas ZEB only relates to operational energy use. However, the proposed EPBD revision also states that countries should ensure that whole life-cycle GWP is calculated and disclosed through their respective energy performance certificate.

Annex III: The Role of Local Targets

NZC Policy:

Ireland has committed to an average 7% per annum reduction in overall GHG emissions from 2021 to 2030 (a 51% reduction from a 2018 baseline) and to achieving net zero GHG emissions by 2050. These targets are aligned with the European Green Deal and were enacted under the Climate Action and Low Carbon Development Act 2021. The Climate Action Plan 2021 (CAP21) sets outs almost 500 actions to support Ireland's journey towards meeting these targets. Most of these actions merely state aspirations or identify known barriers to be overcome. Central to the CAP21 is the sectoral emission targets (or ceilings), which were finalised in 2022. The three which are most directly relevant to the built environment are;

- Electricity (75% reduction)
- Buildings-Commercial and Public (45% reduction)
- Buildings-Residential (40% reduction).

These 2030 sectoral targets will impose restrictions on energy and resource use of every single business and individual, and they will be incrementally increased between 2030 and 2050.

The Supply/Demand Balance of NZC:

NZC operation for the built environment is a balancing act between energy supply and demand. The energy supply is to be decarbonised (increasing renewable energy generation capacity) while, simultaneously, energy demand of the built environment is to be reduced.

There is no national consensus yet as to what level of energy demand reduction is required by the built environment. Industry led estimations are that to be net zero carbon by 2050, an operational Energy Use Intensity (EUI) reduction by as much as 60% would be required. A simplified representation of this relationship is shown in Figure 4.

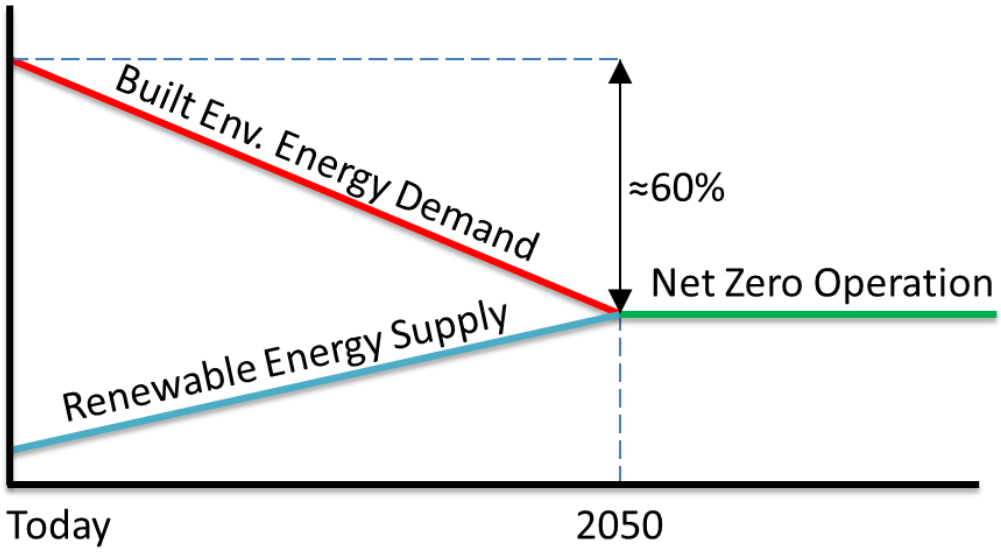

Figure 4: Simplified trajectory to Net Zero Operation

However, this is a very basic description and can give the impression that the achievement of a NZC built environment by 2050 is as simple as full electrification of the building stock with a 100% decarbonised electricity grid. Not only would this be misleading, it would ignore some fundamental difficulties related to this supply and demand dynamic of energy.

The Role of Local Targets and Energy Demand:

According to the SEAI 2022 energy report approximately 22% of Ireland's final energy consumption is electricity (36.4% met from renewables in 2021, N.B. down from 42% in 2020 due to a 'low wind year') with heat and transport representing the remainder, at approx. 42% and 36% respectively; shown in Figure 5.

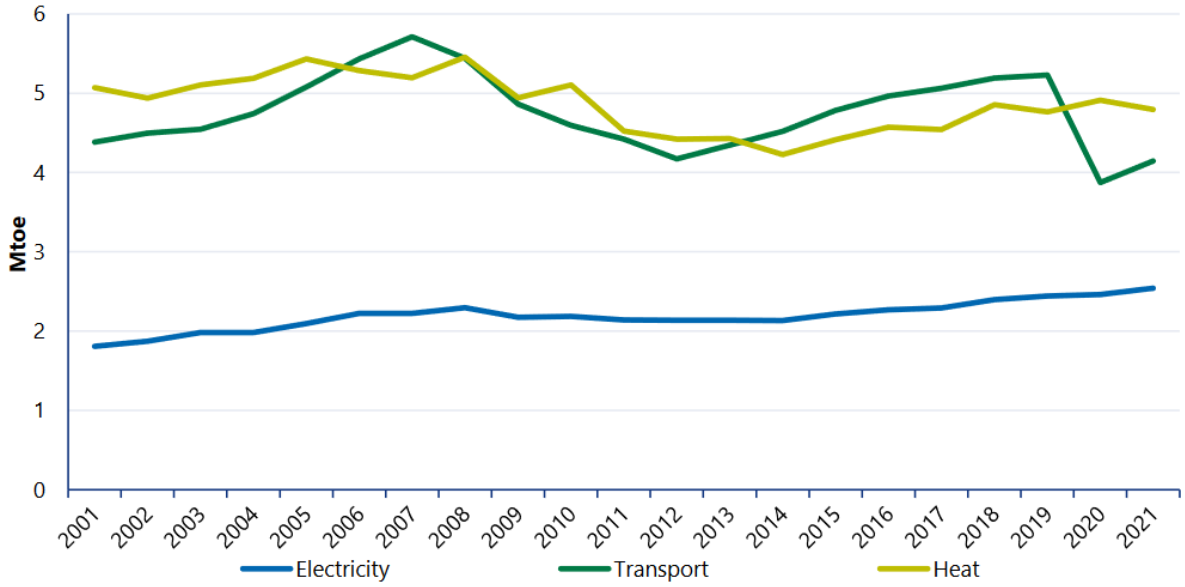

Figure 5: Final Energy in electricity, transport, and heat [SEAI Energy in Ireland Report 2022]

Excluding 'transport' for the simplification of this explanation, the final energy demand for 'heating', predominantly met via heating oil (kerosene) and natural gas (6.8% from renewable, e.g. bio fuels) would need to be transitioned to electricity. When considering this transition, the following should be considered:

- Grid infrastructure and generation capacity.
    - This must be carefully planned and invested in in-line with expected demand.
        - The electricity grid is already experiencing capacity issues under existing demand, transitioning this heat demand to electricity would require significantly increased generation capacity and upgrading of grid infrastructure.
        - Hypothetically, for example, if the current heat demand (not accounting for any new demand) was directly transitioned to electricity, this would almost double (approx. +90%) the current electricity demand. (Simple estimate, allowing for the efficiency of heat pumps but not accounting for distribution losses.)

    - For this reason, before transitioning heating systems to electricity, the heating demand of buildings would need to be reduced as much as possibly via the deep renovation of the building fabric and building systems.
- The difference in thermal energy delivery; oil/gas vs. elec.
    - An oil/gas boiler can deliver intermittent bursts of thermal energy at peak heating demand times, e.g. morning start up.
        - An electric heat pump on the other hand can't. It operates most effectively servicing the base heat load via the continuous supply of low-grade thermal energy, e.g. no extreme intermittent peak loads.
        - The electricity grid is most efficient when supplying a steady demand. Large intermittent surges in demand are difficult for the electricity grid to facilitate, requiring on demand grid capacity to avoid brown/black outs.
    - For this reason, a heat pump is not a direct replacement for an oil/gas boiler. The heating demand of buildings should be reduced via deep renovation of the building fabric, and the heat pump should be controlled and operated in a manner that avoids intermittent peak loads.

These two points emphasise the importance of local targets in achieving NZC operational energy at a national scale and is why operational energy local targets developed by LETI include a total EUI target as well as a heating demand target.

The Evolution of Local Targets:

Finally, local targets are integral to the NZC definitions, but it must be clear that they can and will evolve over time; i.e. if advancing understanding and modelling of how different GHG emissions interact with the environment (e.g. GWP* vs. the simplified GWP100, where GWP* more accurately reflects the radiative forcing effect of short lives GHG's like methane) influence national or EU level strategies on GHG emissions reductions, this could lead to sectoral emissions ceilings being revised, which would be reflected in local targets.

Annex IV: Observed Issues with Carbon Offsetting

The IGBC acknowledges that there is merit to the concept of carbon offsetting in the context of NZC policy, but the regulation and transparency required to realise its potential in practice is currently lacking. Below are some of the key issues observed by the IGBC in relation to the current state of the carbon offsetting market.

Verification of achieved decarbonisation & additionality:

Carbon offsets schemes should clearly demonstrate and quantify CO_2 (or CO_2e) emissions reductions directly from the activities of the scheme. Furthermore, as with renewable energy sources, carbon offset schemes should demonstrate additionality; i.e. would the project have happened in the absence of intervention made possible via the purchase of carbon credits? Additionality is not demonstrated where a project;

- would yield strong financial returns in the absence of revenue from carbon credits,
- would be required regardless for regulatory compliance, or
- would represent common industry practice.

Several studies in recent years have raised serious concerns about the integrity of a significant proportion of carbon offsetting schemes. Where it has been demonstrated that many 'nature-based' offsetting schemes achieve little or none of their stated decarbonisation, nor demonstratable additionality. For example;

- Some schemes are based on preventing the GHG emissions via forest or wetland preservation.
    - A negative environmental impact is not "offset" by avoiding a potential further negative environmental impact.
- Some schemes are based on biogenic sequestration, CO_2 absorbed by plants.
    - These must demonstrate permanent sequestration; i.e. that the plant material is not decomposed or combusted at a later point, releasing the absorbed CO_2.

Furthermore, carbon offsetting schemes, while they may have other environmental benefits and/or may play a role in managing atmospheric GHG levels, divert investment away from innovation and emerging technologies. For example, investment in sequestration via Carbon Capture, Utilisation and Storage (CCUS) technologies diverts investment from research and development in energy systems which has the most promising potential to rapidly decarbonise energy generation. However, the International Energy Agency (IEA) and the Intergovernmental Panel on Climate Change (IPCC) have stated that NZC goals are not possible without CCUS.

Risks from unlimited offsetting:

Even where offsets schemes demonstrate permanent decarbonisation and additionality, they should only be considered acceptable on a voluntary basis, as an interim short-term strategy, and they should have limited use.

In a scenario where NZC were mandated and unlimited carbon offsetting were allowed, this would only facilitate business as usual practices for those that can afford to do so. Not only would this not affect any of the stated desired outcomes, but it would also potentially only serve to stratify commercial markets, squeezing smaller businesses out of competitiveness, against those who can afford the additional operational cost of purchasing offsets.

This is a reason for local targets for operational and embodied carbon, as they aim to minimise the reliance on offsets for the built environment to meet NZC; as any building, asset, or organisation could be deemed to achieve NZC if sufficient offsets are purchased.

This is also the reason why the definition for NZC Operational Energy given here by the IGBC does not allow for the use of offsetting; operational energy use should be directly decarbonised via any combination of on-site or off-site renewable energy sources.

Glossary of Terms

Abr.	Term.
CAP	Climate Action Plan
CCUS	Carbon Capture, Utilisation and Storage
CIBSE	Chartered Institution of Building Services Engineers
EPBD	Energy Performance of Buildings Directive
EUI	Energy Use Intensity
EUI	European Union
GHG	Greenhouse Gas
GWP	Global Warming Potential
IEA	International Energy Agency
IGBC	Irish Green Building Council
IPCC	Intergovernmental Panel on Climate Change
kWh	kilo Watt hour
LETI	Low Energy Transformation Initiative
NZC	Net Zero Carbon
NZEB	Nearly Zero-Energy Building
PPM	Parts Per Million
RIAI	Royal Institute of the Architects of Ireland
TSC	Technical Screening Criteria
WGBC	World Green Building Council
WLNZC	Whole Life Net Zero Carbon
ZEB	Zero Emissions Building