



UK Net Zero Carbon Buildings Standard

Quarterly Update

April 2023



Hello

Welcome to the first edition of the UK Net Zero Carbon Buildings Standard's (UK NZCBS) quarterly publication.

While significant progress has been made in defining what 'net zero' means for buildings in the UK, professionals spanning sectors across the built environment have called for a single, agreed methodology. With support from across the industry, leading organisations BBP, BRE, the Carbon Trust, CIBSE, IStructE, LETI, RIBA, RICS and UKGBC, have joined forces to develop the UK's first NZCBS – the Standard.

Once launched, the Standard will provide the industry with the tools and confidence to robustly measure if our built assets are net zero carbon and inline with current UK climate targets.

In September 2022 a Governance Board was established, of which I have the privilege to be Chair. I am supported by a diverse membership of specialists helping to drive forward this initiative at pace. The Board has been joined by representatives from the Property Industry Alliance, the Royal Incorporation of Architects in Scotland and the Institution of Civil Engineers.

Today, there are more than 350 people contributing directly in a voluntary capacity to the creation of the Standard.

In November we launched a 'Call for Evidence' and, when it closed in January this year, we had received embodied carbon assessments for 800 individual buildings and metered operational data for 3,000 buildings across the UK.

On behalf of the Board, I would like to say a huge thank you to everyone who has contributed to the work on the Standard – your support and continued collaboration will go a long way to help us achieve our goal.

As we look ahead to the rest of the year, and we seek to consult and engage with you and the wider built environment sector, I am optimistic about how the Standard is taking shape, with performance levels and metrics beginning to be defined.

In our first edition you can read all about the journey so far and how your contributions are helping towards the creation of the Standard as well as finding out what's coming next.

My ask of all of you is to spread the word, keep sharing information and get in touch if you would like to be more involved, either by contacting me directly or through info@nzcbuildings.co.uk.

There will be plenty of opportunities in the coming months to share your thoughts as well as test, challenge and validate the Standard as it emerges.

On behalf of the Governance Board, I hope to see and speak to many of you soon.



David Partridge

Chair

UK Net Zero Carbon Buildings Standard Board



**UK Net Zero Carbon
Buildings Standard**



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Background

Why does the industry need a Net Zero Carbon Buildings Standard?



**UK Net Zero Carbon
Buildings Standard**

Evidence-based, outcome-led



In May 2022 a cross-industry Steering Group, representing stakeholders across the built environment, joined together to develop a Standard for verifying UK buildings as net zero carbon¹. The Standard will enable our industry to robustly verify that our built assets are net zero carbon and inline with our nation's climate targets.

It was determined by the Steering Group that a Standard was needed in order to provide:

- A clear definition of net zero buildings that can be used consistently across the industry
- Increased integrity for our sector and avoid greenwashing
- Something which the sector can coalesce to prevent standard proliferation and duplication
- A tool for investors and financiers to inform decision-making around sustainable finance, lending and debt
- Occupiers with confidence when buying, leasing and occupying buildings
- A tool for policy-makers at national, regional and local levels to guide and influence decisions in planning, procurement and leasing.

What will it cover?

The Standard will set out metrics by which net zero carbon performance is evaluated, as well as performance targets and limits that need to be met.

These will include (inter alia) energy use, upfront embodied carbon, and lifecycle embodied carbon, with other metrics – such as space heating/cooling demand and peak load – also under consideration. It will also cover the approach to carbon accounting, procuring renewable energy, and the treatment of residual emissions, including carbon ‘offsetting.’ As the Standard develops, the scope and output will likely evolve.

Who is it for?

The Standard is for developers, contractors, asset owners and managers, occupiers, investors, financiers and funders, consultants, building industry professionals, building managers and product/material manufacturers, suppliers, and distributors.

It is for anyone who wants to either fund,

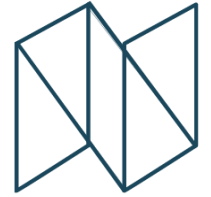
procure, design, or specify a Net Zero Carbon Building and anyone wanting to demonstrate that their building is net zero in accordance with an industry-agreed Standard.

Will it be science-based?

The aim is to deliver a Standard that sets out the levels of performance buildings will need to achieve to deliver net zero by 2050 and a 78% reduction by 2035 in the UK, i.e., what is known to be required to stand a reasonable chance of mitigating global warming to 1.5°C inline with the scientific evidence base from the IPCC. The Standard will incorporate performance targets that have been derived from an analysis of the UK's Sixth Carbon Budget and from data gathered across different sectors within the built environment.

¹ While the Task Groups and Sector Groups will agree the Standard's definition of net zero carbon, the current working assumption is that it will be based on or similar to the definition from the Whole Life Carbon Network: "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 A0-A5, B1-B8, C1-C4) are minimised, meet local carbon, energy and water targets or limits, and with residual 'offsets', equals zero."

Underpinning principles of the Standard



The Standard provides a rulebook for verifying new and existing buildings as meeting net zero carbon.

The following key principles underpin the technical requirements for net zero carbon buildings as they are being developed for the purposes of this Standard – which should also be reflected in any and all building related policies and regulations.

1. Prioritising energy efficiency and eliminating the performance gap

This involves transitioning away from the practice of relative compliance with notional building targets (e.g. EPCs), and instead adopting metrics of absolute performance outcomes in terms of energy use intensity (e.g. Energy Use Intensity targets in kWh/m²/yr).

As part of this we need energy modelling methodologies that can predict energy consumption as accurately as possible and we also need new types of contracting models, more rigorous testing, commissioning, and data sharing requirements and mandatory energy performance disclosure rules for certain asset types.

2. Adopting a whole life carbon approach

As operational emissions from buildings in use reduce over time, the relative significance of embodied emissions from construction and refurbishment materials, mechanical and

engineering services and property maintenance will become more significant. The Standard will include limits on embodied carbon (e.g. kgCO₂/m²) in addition to limits on operational energy.

It is imperative that we also adopt a whole life carbon approach to the decarbonisation of buildings within the bounds of regulations and policy, starting with the introduction of mandatory life cycle assessments (for new construction and major refurbishments), and soon thereafter introducing limits to upfront carbon emissions for different asset types.

3. Enhancing renewable energy generation

Maximising the potential for buildings to generate onsite renewable energy in order to substantially accelerate the transition away from fossil fuel-based electricity generation to renewable sources will become increasingly critical as we have to accommodate growing demands from the electrification of heating and transport.



4. Ensuring that buildings are responsive to fluctuations of the electricity grid

We need to move towards measures to limit peak demand and enable load shifting for both regulated and unregulated loads.

Part of this will involve the installation of Demand Side Response (DSR) technologies and approaches, such as thermal storage, electrical batteries, smart appliances, and managed/V2G electric vehicle charging.

5. Prioritising the reuse of existing buildings and assets

To maximise resource efficiency and drive out embodied or whole life carbon emissions it is essential that we take a holistic view of the built stock that already exists, reusing and retaining it as much as possible through retrofit, refurbishment and change of use or repurposing works.

This should be the default preference above demolition and new build – with the latter only

being granted planning permission if it can be shown that it materially lowers the whole life carbon impacts of an asset due to its inability to meet high performance outcomes, and only where significant efforts have been made to reduce the embodied carbon of any new buildings.

While the development of the Standard is a voluntary initiative, it is nevertheless crucial that its underlying principles are matched, if not yet met, by regulatory standards, in due course, so as to avoid inefficient design and construction practices that waste time and expenditure.

Application of the Standard



The approach will be applicable to both existing and new buildings.

To start with, the focus will be on the most common building typologies, especially those for which industry stakeholders have already robust performance data available to inform the setting of performance targets.

The Standard is seeking to develop performance targets and limits for the following typologies.

Homes	Sport and Leisure	Hotels
Offices	Retail	Commercial Residential
Schools and Further Education	Culture and Entertainment	Logistics / Warehouses
Healthcare	Heritage	Datacentres
	Science and Technology	

The people behind the Standard



The Standard's project team is made up of more than 350 voluntary experts from all parts of the built environment industry.

Overseen by the **Governance Board**, the Board is responsible for:

- Overseeing the development of the Standard and ensuring that it is both technically and philosophically robust and fit for purpose
- Leading engagement with all parts of the built environment sector with the aim that the Standard will become universally adopted
- Establishing appropriate resources to develop and launch the Standard and to support its ongoing maintenance and operation.

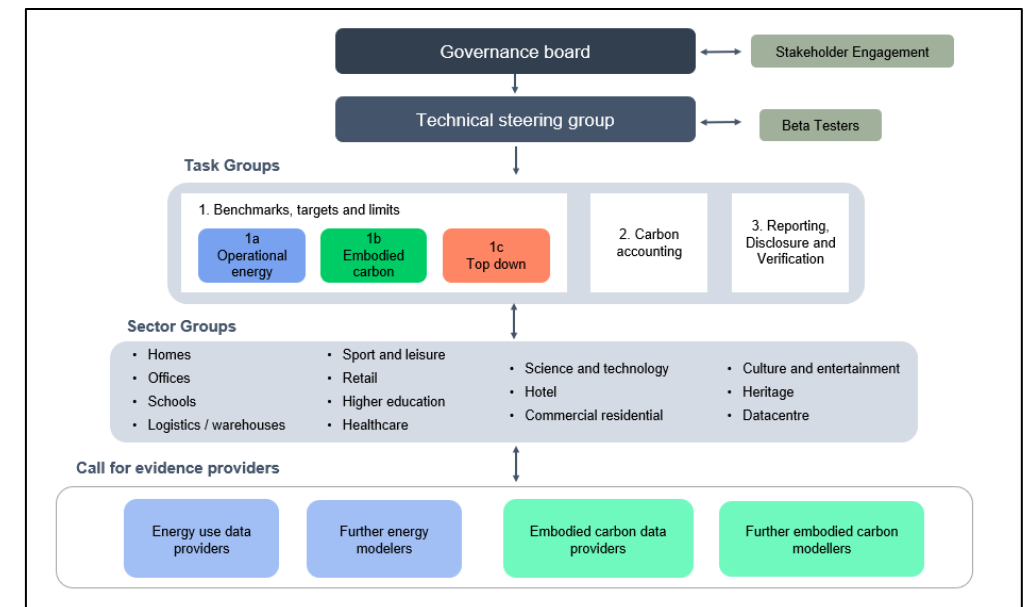
The **Technical Steering Group (TSG)** oversees the specification, design, development and launch of the Standard independently from the overall project governance.

By separating the technical elements of the Standard's development from the overarching strategic issues, this will allow the right individuals, with the necessary expertise and technical knowledge, to contribute and manage the development of the details of the Standard

through the TSG, whilst strategic decision-making and organisational level buy-in is secured within the Governance Board forum.

The TSG is supported by a series of **Task Groups** and **Sector Groups**. There are currently 140+ people in the Task Groups and 190+ people in the Sector Groups.

More than 100 organisations provided data as part of the Call for Evidence carried out between November 2022 – January 2023.



UKNZCBS Delivery Structure

Task Groups



The Task Groups are responsible for developing the detail of the range of technical considerations which underpin the content of the Standard and provide recommendations to the Technical Steering Group and drafting parts of the Standard and technical annexes.

- The **Operational Energy Task Group** is responsible for defining operational energy performance levels³, and inputting into the setting of operational energy limits. The performance levels will form the starting point for the operational decarbonisation trajectory over time of each sector.
- The **Embodied Carbon Task Group** is responsible for defining embodied carbon performance levels⁴, and inputting into the setting of embodied carbon limits. The performance levels will form the starting point for the decarbonisation trajectory of each sector.
- **Sector Groups** have also been convened to bring together experts in different sectors.

These groups will facilitate the collection of embodied carbon data and energy and operational carbon data for their sector, and to provide advice around the decarbonisation of that sector.

- The Task Groups both work in conjunction with Top-Down Task Group which is responsible for developing a methodology for aligning the benchmarks⁵ provided for Operational Energy and Embodied Carbon with the UK national carbon budget to produce a complete suite of budget-aligned and science-based net zero carbon performance targets.
- The **Carbon Accounting Task Group** is responsible for setting out the rules for measuring embodied and operational carbon, and for identifying acceptable external options for mitigating the impact of measured carbon.
- The **Reporting, Disclosure and Verification Task Group** is responsible for defining the terminology, scope, and boundary of any net zero carbon claims. It will also agree the approach to, and requirements for, verifying

net zero carbon claims in line with these definitions. It will also develop guidance for reporting and disclosure in support of the verification of such net zero claims.

At least one member of the Technical Steering Group is involved in each of the five Task Groups to provide continuity, feedback and technical expertise to the main subject strands of the emerging Standard.

³ 'Operational Carbon – Energy' (Module B6) are the GHG emissions arising from all energy consumed by an asset in-use, over its life cycle.
⁴ '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 A0-A5, B1-B5, C1-C4, with A0 assumed to be zero for buildings).
⁵ This project employs the following definitions for the terms benchmark, limit, and target: Benchmark – The current sector average for buildings today (for embodied carbon these are buildings completed in 2022, for operational energy this is buildings of any age with operational data today). Limit – A maximum performance level that must not be exceeded, if a building is to comply with the Standard (e.g., maximum embodied carbon) Target – A minimum performance level that must be met or exceeded, if a building is to comply with the standard (e.g., minimum renewable energy generation)

Development of the Standard

How will the net zero limits be developed?



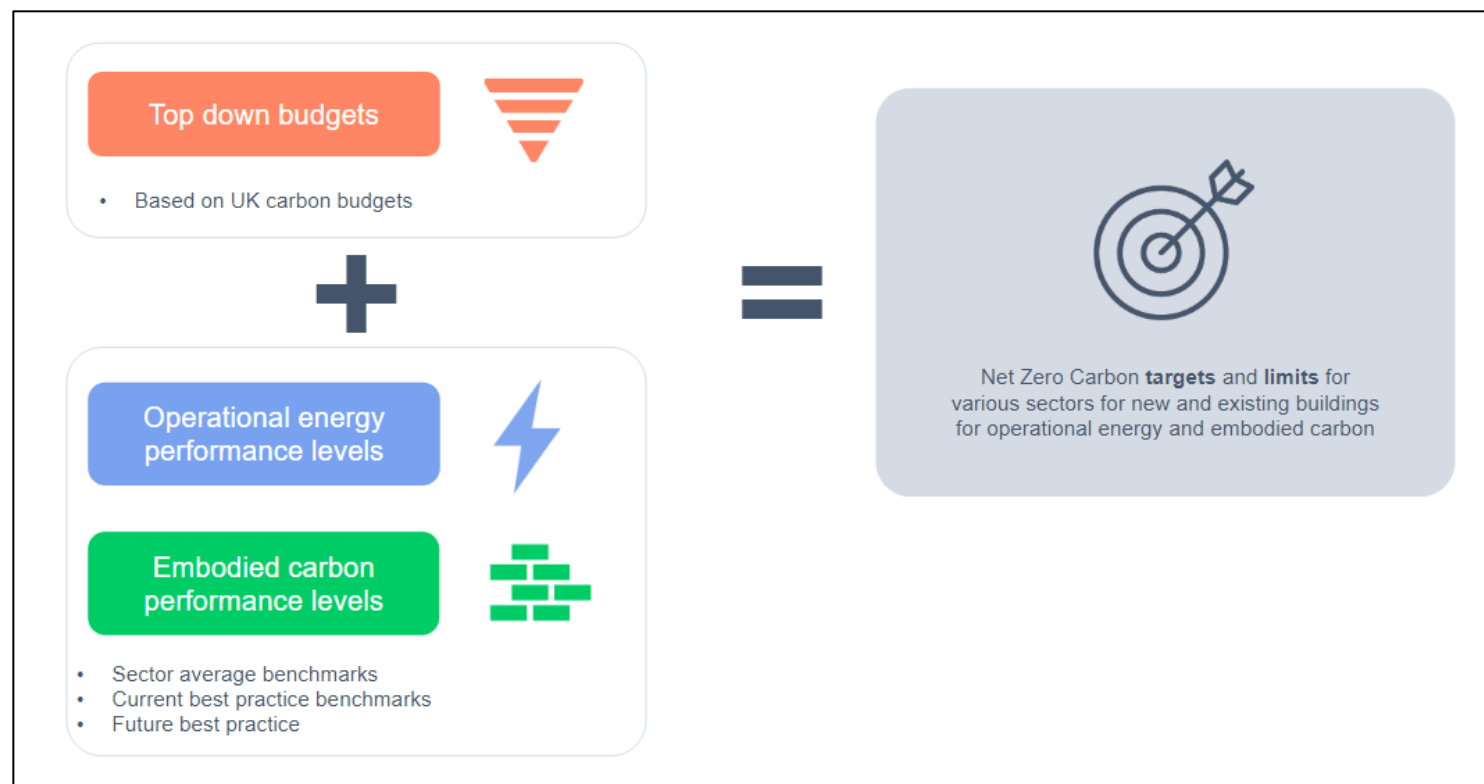
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Development of net zero limits

Operational energy and embodied carbon performance levels determined from Call for Evidence, will be reconciled with the top-down carbon and energy budgets for the UK to develop targets and limits for various sectors for new and existing buildings for operational energy and embodied carbon.

The diagram (right) illustrates at a high level how the Standard's target and limits will be developed.



Development of the Standard's targets

Development of net zero limits



Top down

The top-down task group will establish the relevant national carbon 'budgets' energy budgets, and potentially further budgets.

This includes the total building-level renewable generating capacity required to ensure that the built environment is aligned with science-based trajectories needed to achieve net zero.

The aim is to be net zero by 2050 with a 78% reduction by 2035 in the UK, i.e., what is known to be required to stand a reasonable chance of mitigating global warming to 1.5°C.

It will also align with the energy demand reductions projected to be required to enable a net zero carbon energy supply sector.

A science-based limit setting tool will be developed, which will incorporate a stock model and growth projections, and will use this to downscale carbon budgets to set top-down limits.

Bottom-up performance levels

The operational energy task group, embodied carbon task group, and the sector groups will use a "bottom up" approach to define various performance levels using benchmarking, case studies and modelling, to provide the technical evidence on what can be achieved by the individual sectors.

Bringing together top down & bottom up

Ideally, the "bottom up" evidence will show that the "top down" budgets generated by the Top-Down Task Group can already be met; otherwise, in some sectors this may mean that net-zero compatible targets are only considered achievable subject to further future improvements above those set out in industry roadmaps to science based trajectories (e.g., future improvements in plant efficiency, future decarbonisation of the steel or cement industries beyond current plans).

In cases where there is a gap between what is considered achievable and what the carbon budgets demand, the Operational Energy, Embodied Carbon, and Top-Down Task Groups will consider whether the carbon budget distribution or decarbonisation assumptions are required to be revisited, with assistance from the Technical Steering Group and Governance Board where necessary.

Call for Evidence

Delving into the data



UK Net Zero Carbon
Buildings Standard

Call for Evidence



To develop the Standard, performance levels will be developed for operational energy usage and embodied carbon based on best practice performing buildings today, for future years based on the industry's required decarbonisation trajectory.

To do this, the project collected case study data from the real estate and built environment industry. This data is critical to ensure that the Standard is reflective of the best available evidence, and that the Standard development process is as inclusive as possible.



Operational energy

1. In-use energy data based on meter readings for best practice buildings

- Representing **best in class existing buildings** currently in operation

2. Energy models and modelers available in January

- Representing **best in class buildings** in design or construction or operation
- Modeling and scenario testing in order to determine net zero compatible performance levels
- Energy model itself does not need to be shared, just the data.

3. Larger operational energy data sets

- Representing **average sector performance level**
- Email energydata@nzcbldings.co.uk if you are responsible for a relevant dataset, or are able to recommend a dataset for a specific sector or multiple sectors



Embodied carbon

1. Data from embodied carbon models

- Representing **average sector performance for existing buildings and buildings in design and construction.**

2. Embodied carbon modellers available in January

- Volunteers to run 'what-if' scenarios on their projects to help us determine possible routes to industry decarbonisation. There's a check-box for this in BECD.
- Once the Standard has been drafted, all data-providers are contacted to ask them to check the data they inputted and **refresh for alignment where possible**

3. Larger embodied carbon data sets

- Email embodieddata@nzcbldings.co.uk if you are responsible for a relevant dataset, or are able to recommend a dataset for a specific sector or multiple sectors

Call for Evidence summary

Data capture

Metered energy data from individual project submissions from best-in-class buildings for over 200 projects and will be combined with data from predictive energy models to inform the performance levels.

From the data submitted the emerging metric for verification of operational energy will be based on at least 12 months of In-use metered energy data, and buildings will need to meet energy limits set by the standard based on **kWh/m²/yr** as the principal unifying metric.

Our Sector Groups are developing relevant additional denominators for each sector (for example kWh/person/yr). There will be checks available at design stage and at Practical Completion to ensure that the project is on track to align with the Standard, through predictive energy modelling (aligned with CIBSE TM54).

Embodied carbon on 836 projects was submitted from a variety of projects, see summary table. Over half of the assessments were carried out between RIBA Design Stage 4-6, which provides a suitably robust assessment.

Embodied carbon limits will be set for upfront embodied carbon (A1-A5) and life cycle embodied carbon (A1-A5, B1-B5, C1-C4) in **kgCO₂/m²**. Verification will be based on a post completion embodied carbon assessment.

Other metrics beyond the operational energy and embodied carbon limits are being developed including those relating to onsite renewables.

836

Embodied carbon data

3,200

Projects metered
operational energy data
from large data sets

200+

Projects metered
operational energy data
from individual projects

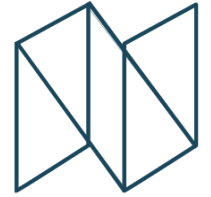
Thank you

A huge thank you to everyone who responded to the Call for Evidence and contributed data.



AEW	Focus Consultants	Renaissance Associates Ltd
AHMM	Glenn Howells Architects	Ridge
AHR	Hawkins Brown	RPS
Anne Thorne Architects LLP	Haworth Tompkins	Savills
Architype Ltd	Hilson Moran	SD Structures
Argent LLP	Introba (formerly Elementa Consulting)	Sir Robert McApline
Arup	ISG Ltd.	Smith and Wallwork
Atkins	JLL	Staffordshire University
Bam	Kirsty Maguire Architect	Sustainable Construction Services
BDP	Knight Frank Investment Management	Swansea Council
BE Design	Lamington Group	Swansea University
Big Yellow Group	Landsec	Timber Development
Bouygues	LEAP	Tooley Forster
Bruntwood	Lendlease	Treveth Holdings LLP
Bryden Wood	London Legacy	Turner & Townsend
Buro Happold	longevity Partners	University of Liverpool
BWB Consulting	Mace Group	University of Reading
Certified	Martin Ingham	Walsh
Chapman bds	Max Fordham LLP	Wates Group
City of London	Method Consulting	Welsh School of Architecture
Commercial Services Group	New River	Whitby Wood
Cundall	Nigel Dutt	Wilkinson Eyre
Curtins	Nottingham Trent University	Willmott Dixon Holdings Ltd
Cushman and Wakefield	Pilbrow and Partners	Woolgar Hunter
Davies Maguire	Price Myers	Workman
dRMM	Purcell	WSP
Eckersley O'Callaghan Engineers	Qoda Consulting	XCO2
Fiera Real Estate	Ramboll	

Processing and analysis



The data on operational energy and embodied carbon that has been submitted to the project will be used to develop performance levels which will inform the targets and limits for each sector for the Standard.

The illustration on page 19 demonstrates the process that will be followed to incorporate operational energy data into the project.

Data enters the project in the bottom left corner of the diagram – either in the form of individual building records or large datasets. Data deemed representative of current typical performance will be processed by the Embodied Carbon Task Group (potentially with Sector Group assistance) / Sector Groups to develop statistics on the distribution of performance levels today, allowing medians and percentiles to be derived.

This will be used to develop benchmark performance levels for the sector and consider whether further disaggregation within the sector

by building type is necessary.

Data for good-performing and best-performing buildings within the sector will be used to develop current best practice and future best practice performance levels. This process will also be informed by performance modelling and sector group expertise.

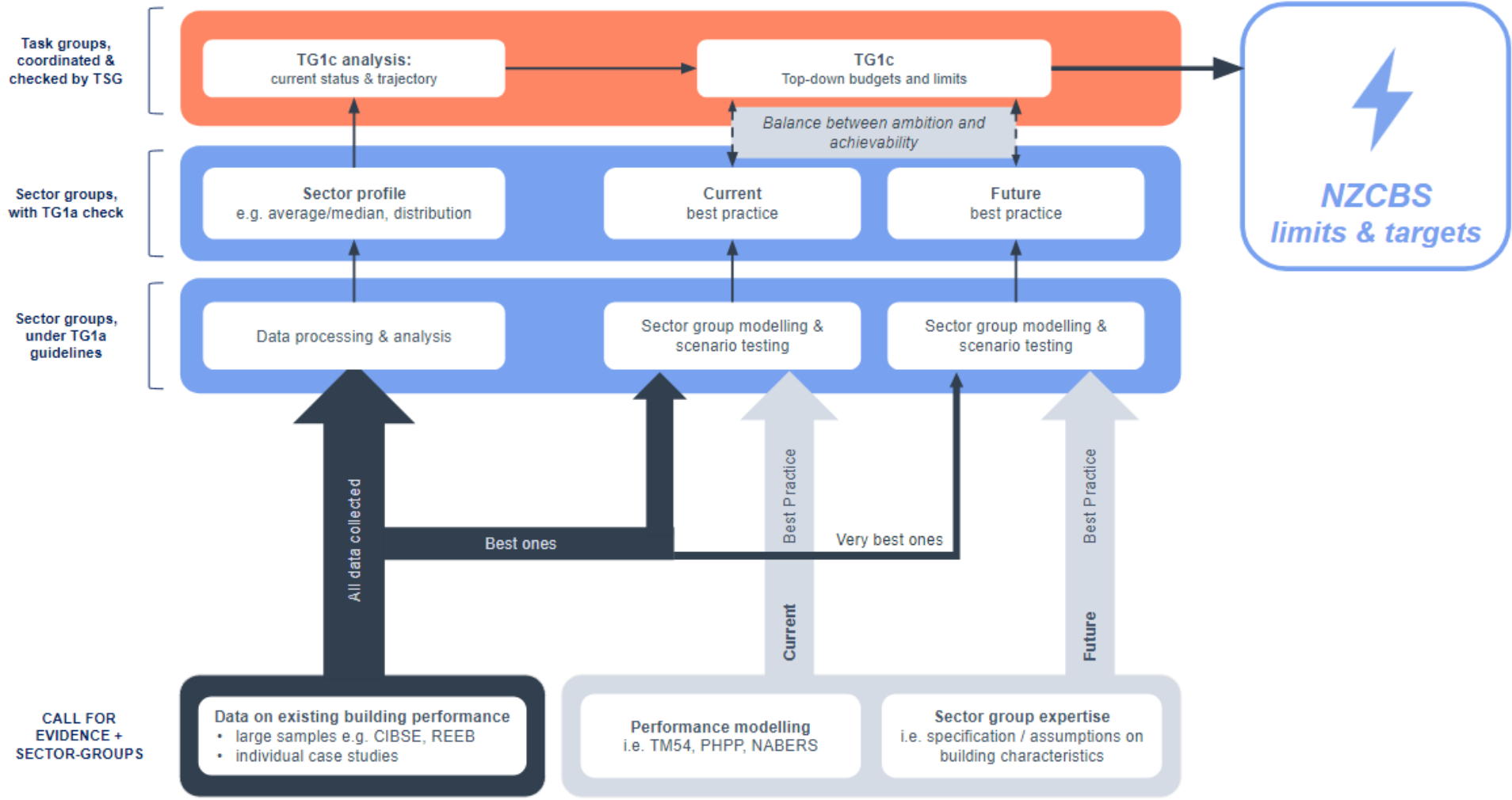
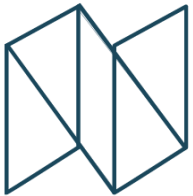
These current best practice and future best practice performance levels may be different for existing and new buildings (or based on other building characteristics, where the evidence supports this approach) - this will be decided by the Sector Groups in conjunction with the Operational Energy Task Group.

The current best practice and future best practice performance levels will be compared with the results of modelling of the top-down carbon budgets and limits undertaken by the Top-Down Task Group. Where this demonstrates agreement, it will be possible to select limits for the given sector. Where there is

a difference between the ‘bottom-up’ and ‘top-down’ performance levels, this will be reconciled between the Operational Energy / Embodied Carbon Task Group, the Top-Down Task Group and the Sector Groups.

This may require redistribution of carbon budgets or a review of the underlying assumptions of the modelling.

In action



Industry-wide Engagement



UK Net Zero Carbon
Buildings Standard

Upcoming consultation

Get
Involved

Critical to ensuring that the Standard will be adopted by the whole real estate and built environment industry is an extensive programme of engagement and consultation.

Our first major consultation event is programmed for the end of Q2 2023, at which point we will be publishing draft Performance Levels for Operational and Embodied carbon for new developments.

Please register your expression of interest to attend the consultation event email info@nzcbuildings.co.uk

Owners	Lenders	Occupiers
Investors	Funders	Contractors and their Supply Chain
Developers	Insurers	Housebuilders



Implementation of the Standard

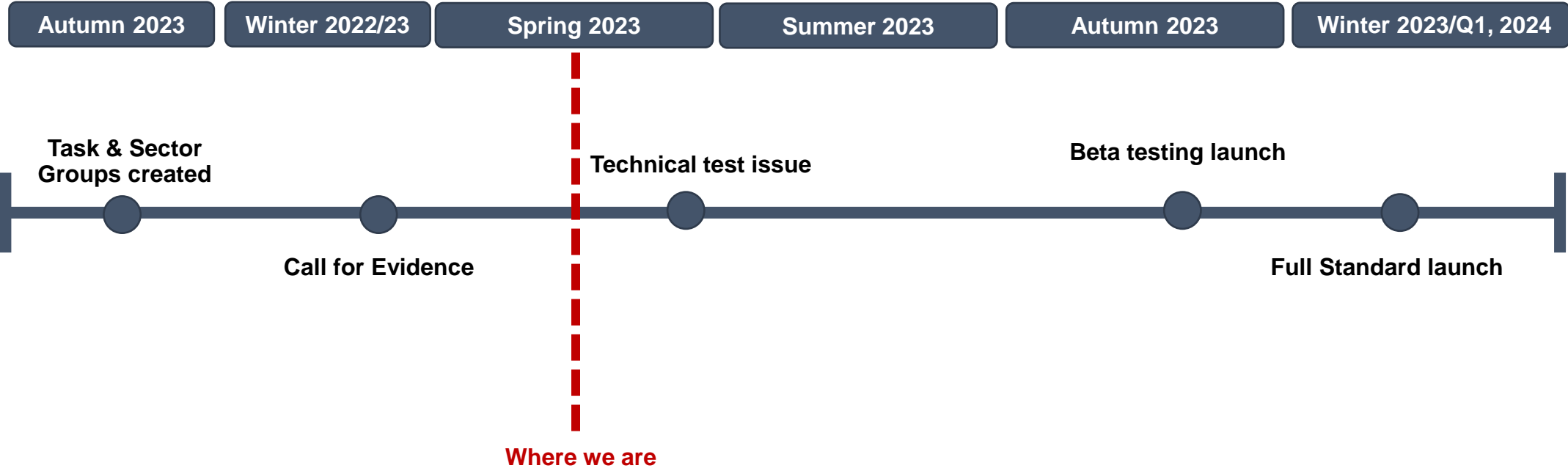
The Net Zero Carbon Building Standard is a 'Standard' and not a certification scheme. It will provide a consistent standardised approach to assessing whether a building can be defined as 'Net Zero Carbon' which can then be used as the basis for verification by other independent bodies.

An important aspect of the programme of work to develop the Standard will be establishing the on-going governance infrastructure to secure the integrity of the Standard, ensure its effective implementation and increase uptake including:

- Providing guidance concerning the appropriate use of the Standard.
- Developing guidelines concerning the appropriate communication of the Standard.
- Establishing the competency requirements for bodies, organisations and individuals to verify buildings in accordance with the requirements of the Standard.

- Monitoring the use of the Standard in order to:
 - to record the number of assets being verified; and
 - ensure that the competent bodies/organisations/individuals are utilizing the standard appropriately.
- Providing regular updates to the Standard to ensure its continuing relevance and technical accuracy and to incorporate evolving data and evidence.
- Developing communication and advocacy activities to engage with and support organisations, initiatives and policy makers seeking to use the Standard.

Project timeline



With thanks



From the UK Net Zero Carbon Buildings Standard

Board Members

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Hywel Davies – **CIBSE**
Patrick Hayes – **IStructE**
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Sarah Ratcliffe – **BBP**
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Chris Stewart – **RIAS**
Chris Twinn – **LETI**

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- Jess Hrivnak - **RIBA**
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- Matthew Collins - **RICS**
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- Tom Wigg - **UKGBC**
- Will Arnold - **IStructE**

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- Mina Hasman – **SOM**
- Ed Shearer – **Arup**
- Rachel Dixon – **Arup**
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- Karen Shi – **Cundall**

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