UK Net Zero Carbon Buildings Standard

University of Reading

29th January 2025

Agenda

1. Welcome
2. The Standard in a nutshell
3. Technical Details
4. The Now & Next
5. Acknowledgments
6. Q&A / Observations

Chris Twinn

LETI member
EDGE think-tank member
Design Council Design Associate
Retrofit Academy Life Fellow
Net Zero Carbon Buildings Standard Governance Board
CIBSE HVAC & NV special interest group committees
Sustainable Development Foundation board member

2. The Standard in a nutshell

UK Net Zero Carbon
Buildings Standard

UK Net Zero Carbon Buildings Standard

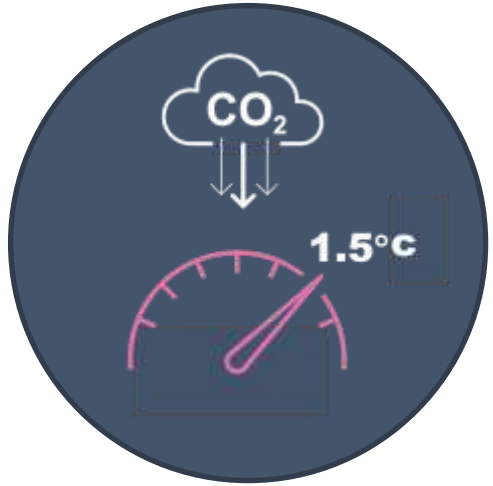
In May 2022 a cross-industry Steering Group, representing stakeholders across the built environment, joined together to develop a Standard for to define the requirements for buildings in the UK to be Net Zero Carbon (NZC).

The UK Net Zero Carbon Buildings Standard, or “The Standard”, will enable our industry to robustly determine whether our built assets are Net Zero Carbon, and in line with the UK’s climate targets.

Rule book

Sectoral

Carbon & Energy



Science-led

More detail on the origin, principles and background of the Standard can be found in our previously issued April Quarterly Update.

Principles of the Standard

Overall principles

- Providing **clear, consistent definitions** and trajectories for Net Zero Carbon (NZC) buildings and the built environment. This will make it simpler to specify and deliver NZC, and also prevent unfounded “NZC” claims
- Driving market transformation **through industry engagement**, uptake and support, collaboratively created by industry for industry, not owned by any one founding organisation or Institute
- Ensuring that the Standard is **easy to understand and use**, with achievable but stretching requirements
- A politically neutral and technologically agnostic standard which **aligns asset-level** requirements with the system-level changes needed for a NZC UK.

Technical Principles

- Creating a Standard which is informed by **climate science** and built environment data
- Including both **operational** and **embodied carbon**
- Prioritising **energy efficiency** and eliminating the performance gap
- **Prioritising reuse** of existing buildings and assets
- Adopting a **whole life carbon** approach
- Enhancing **renewable energy** generation
- Ensuring that buildings are responsive to electricity grid fluctuations

Process of Creating the Standard

The launch of this Pilot Version signifies the culmination of over two years of technical development and collaboration across the built environment, from our founding organisations, expert volunteers, and wider industry stakeholders who have provided data and feedback throughout. We are delighted to share it with you.

Stakeholder Engagement Activities

Overview

Call for Evidence

3
Months

4000
Projects

One-one Consultations

18
Months

1000
Organisations

Technical Consultation

3
Months

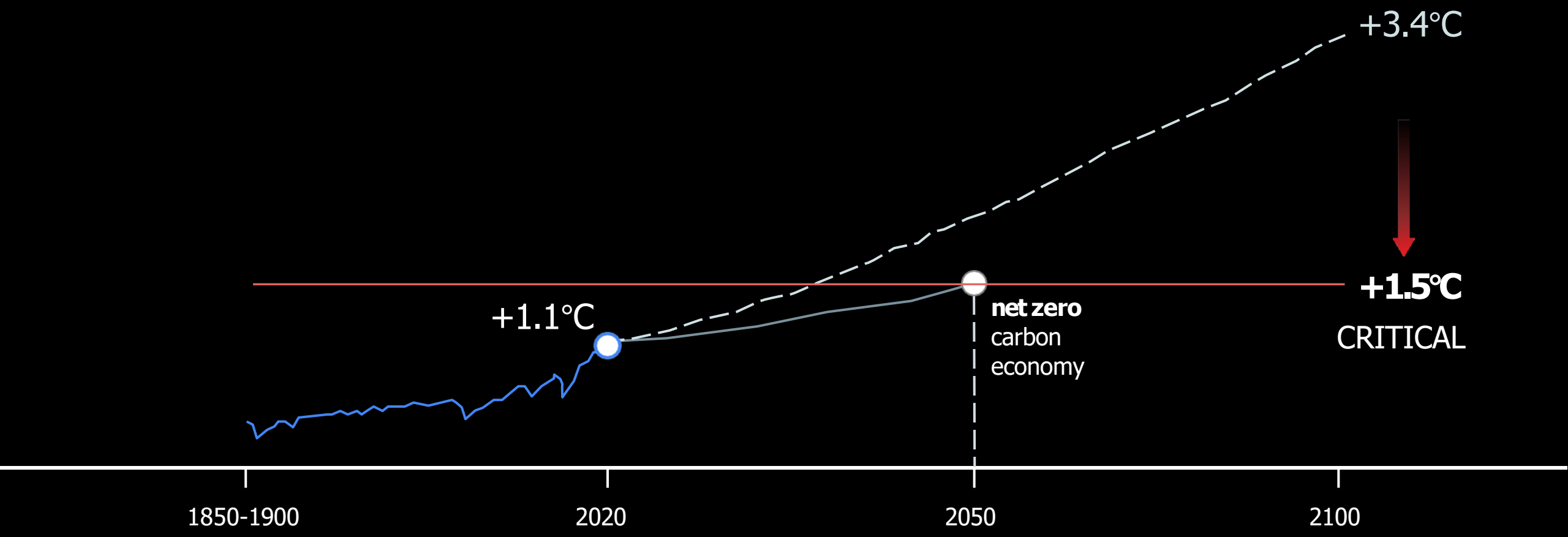
524
People

Workshops

6
Months

226
People

lowering our emissions is **critical**



SOURCE: Basen on data from "Global Warming of 1.5°C", The United Nations Special Report

The Approach to Net Zero Carbon Limits

Two key principles for the Standard are that it should be stretching but achievable, and also that it should be science-based.

To reconcile these aims, two workstreams were established to develop the Net Zero Carbon limits.

The **bottom-up workstream** used benchmarking, case studies and modelling to create Performance Levels*.

The **top-down workstream** established the relevant national carbon and energy 'budgets' to define what the industry needs to achieve to play its part in a NZC UK.

The outputs from these workstreams have been combined to create NZC limits and targets for the Standard.

*Performance levels: These levels provide the technical evidence on what can be achieved by the individual sectors, based on benchmarking, case studies and modelling. They are not limits or targets, but have been used to inform the NZC limits and targets.

UK Carbon Budget Allocation

To deliver decarbonisation in line with a 1.5°C pathway

Top-down Pathways driven by Climate Science

The Top-down Task Group has been developing the methods and principles behind the national budget allocation process.

As well as establishing the Carbon Budget, a Stock Model and a Downscaling Methodology have been developed.

Stock Model

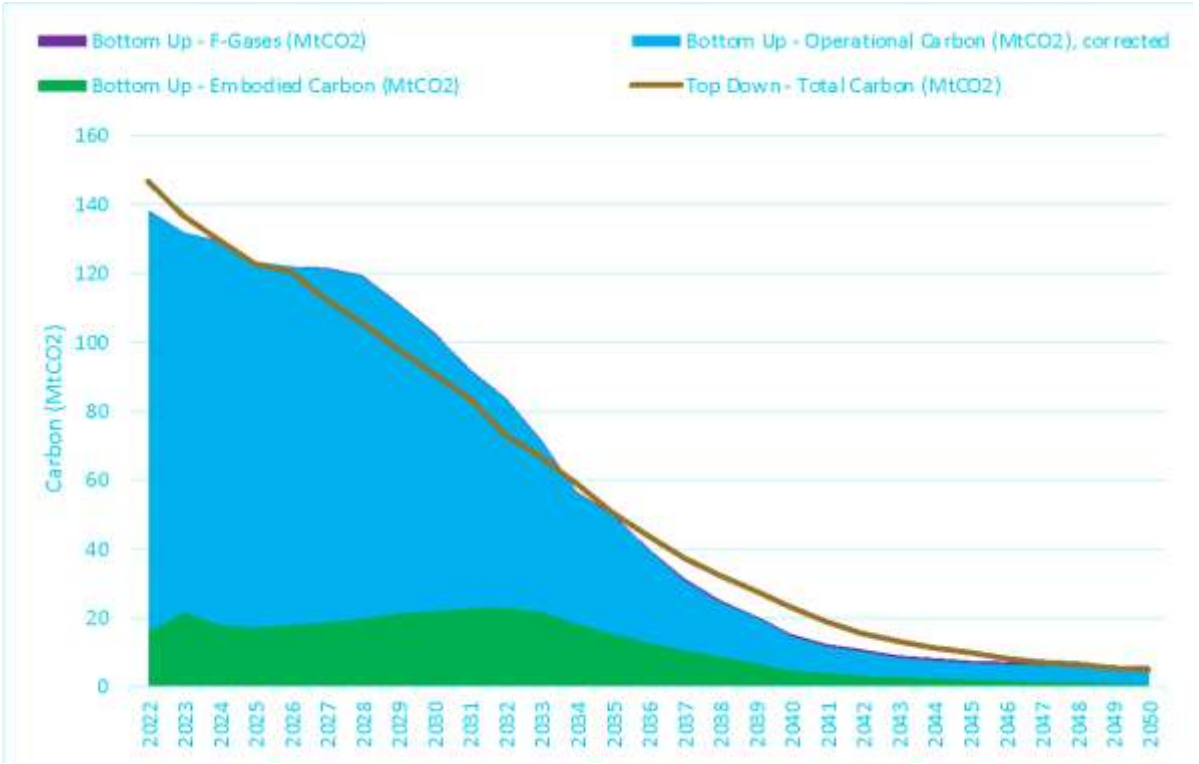
Budgets

Downscaling Methodology

The Top-Down Balancing Model

	2022-2050	2022-2035	2036-2050
OPERATIONAL CARBON (MTCO2)			
Budget (Top Down)	1352	1133	219
Used (Bottom Up)	1,316	1,172	145
Difference	-36	39	-74
Difference, % of TD Budget	-2.6%	3.4%	-34%
EMBODIED CARBON (MTCO2)			
Budget (Top Down)	277.5	240.5	37.0
Used (Bottom Up)	341.5	275.5	66.0
Difference	64.0	35.0	29.0
Difference, % of TD Budget	23%	15%	78%
F GASES (MTCO2)			
Budget (Top Down)	24.3	16.3	8.0
Used (Bottom Up)	14.3	3.6	10.7
Difference	-10.1	-12.7	2.6
Difference, % of TD Budget	-41%	-78%	33%
TOTAL CARBON (MTCO2)			
Budget (Top Down)	1654	1390	264
Used (Bottom Up)	1,672	1,451	221
Difference	18.2	60.8	-43
Difference, % of TD Budget	**1.1%**	**4%**	**-16%**

It is possible to balance the energy and whole-life carbon budget. Whole life carbon is balanced (1.1% over 2025-2050), within the expected margin of error.



This calculation assumes that from 2035, any electricity use over the available electricity budget is applied a non-decarbonised (2021) grid factor. This follows a similar approach to that recommended at project level in the RICS Professional Standard 2023, for energy use over net-zero-compatible levels. This only affects the calculation to 2040, after which the electricity budget is balanced.

3. Technical Details

UK Net Zero Carbon
Buildings Standard

The Standard’s Requirements

Report and meet limits:

- Upfront Carbon
- Operational Energy
- Fossil Fuel Free
- District Heating and Cooling Networks
- Refrigerants
- Heating Delivered

Report and meet targets:

- On-site Renewable Electricity Generation

Reporting only:

- Life Cycle Embodied Carbon
- Operational Water Use
- Electricity Demand
- Cooling delivered to the building

The Standard’s Requirements

Report and meet limits:

- Upfront Carbon
- Operational Energy
- Fossil Fuel Free
- District Heating and Cooling Networks
- Refrigerants
- Heating Delivered

Report and meet targets:

- On-site Renewable Electricity Generation

Optional requirement:

- Offsetting and renewable electricity procurement

Reporting only:

- Life Cycle Embodied Carbon
- Operational Water Use
- Electricity Demand
- Heating and Cooling delivered to the building

Application of the Standard

The Standard is applicable to both **existing and new buildings** in the sectors listed →

Together, these typologies make up the majority of the UK's building stock.

We are seeking Pilot Projects in every one of these sectors [PLUS Heritage], in order to test the application of the Standard to these project typologies.

Homes	**Sport and Leisure**	**Hotels**
Offices	**Retail**	**Commercial Residential**
Schools	**Culture and Entertainment**	**Storage and Distribution**
Healthcare	**Science and Technology**	**Datacentres**
	Higher Education	

Pilot version extract

UK Net Zero Carbon Buildings Standard

Pilot Version rev

Table OE-1: Energy use intensity limits, New Building

← Date of commencement on site	Commercial Residential		Culture & Entertainment			Data Centres		Healthcare	Higher Ed.	Homes		Hotels	Offices (either /GIA or /NIA metrics may be used)				Retail						Schools			Science & Tech.	Sport & Leisure			Storage & Distribution		
	Student resi.	Care homes	Perfor-mance	Collec-tion	Archives	Low utilisation	High utilisation	-	-	Single family homes	Flats	-	General		Call Centres		Trading Floors		Supermarket	High street retail, dept. store	F&B without catering[a]	F&B with catering[b]	Landlord areas[c]	Retail warehouse	Early years	Primary	Secondary incl. SEN	-	Dry	Wet	Fitness	Unconditioned storage	Conditioned storage	Cold store
	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	PUE	PUE	per NHS-NZ Standard	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²NIA/yr	kWh/m²GIA/yr	kWh/m²NIA/yr	kWh/m²GIA/yr	kWh/m²NIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²CPA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr	kWh/m²GIA/yr
2025	75	150	80	60	5	1.4	1.2		100	45	40	125	85	107	127	159	147	184	200	70	215	380	55	80	50	45	60	305	80	350	150	35	80	160
2026	74	147	79	59	5	1.4	1.2		98	45	40	122	83	104	123	154	143	179	194	68	209	370	54	78	50	45	59	297	79	344	148	34	78	154
2027	72	144	77	58	5	1.39	1.19		95	44	40	119	80	100	119	149	138	173	188	66	202	359	53	75	49	44	58	289	78	337	145	33	75	148
2028	70	140	75	56	5	1.38	1.18		92	43	39	116	77	97	115	144	133	167	182	63	195	348	52	72	48	43	57	280	76	330	142	32	72	141
2029	69	137	74	55	5	1.38	1.18		90	43	39	113	75	94	111	139	128	160	176	61	189	338	51	70	48	43	56	272	75	324	140	31	70	135

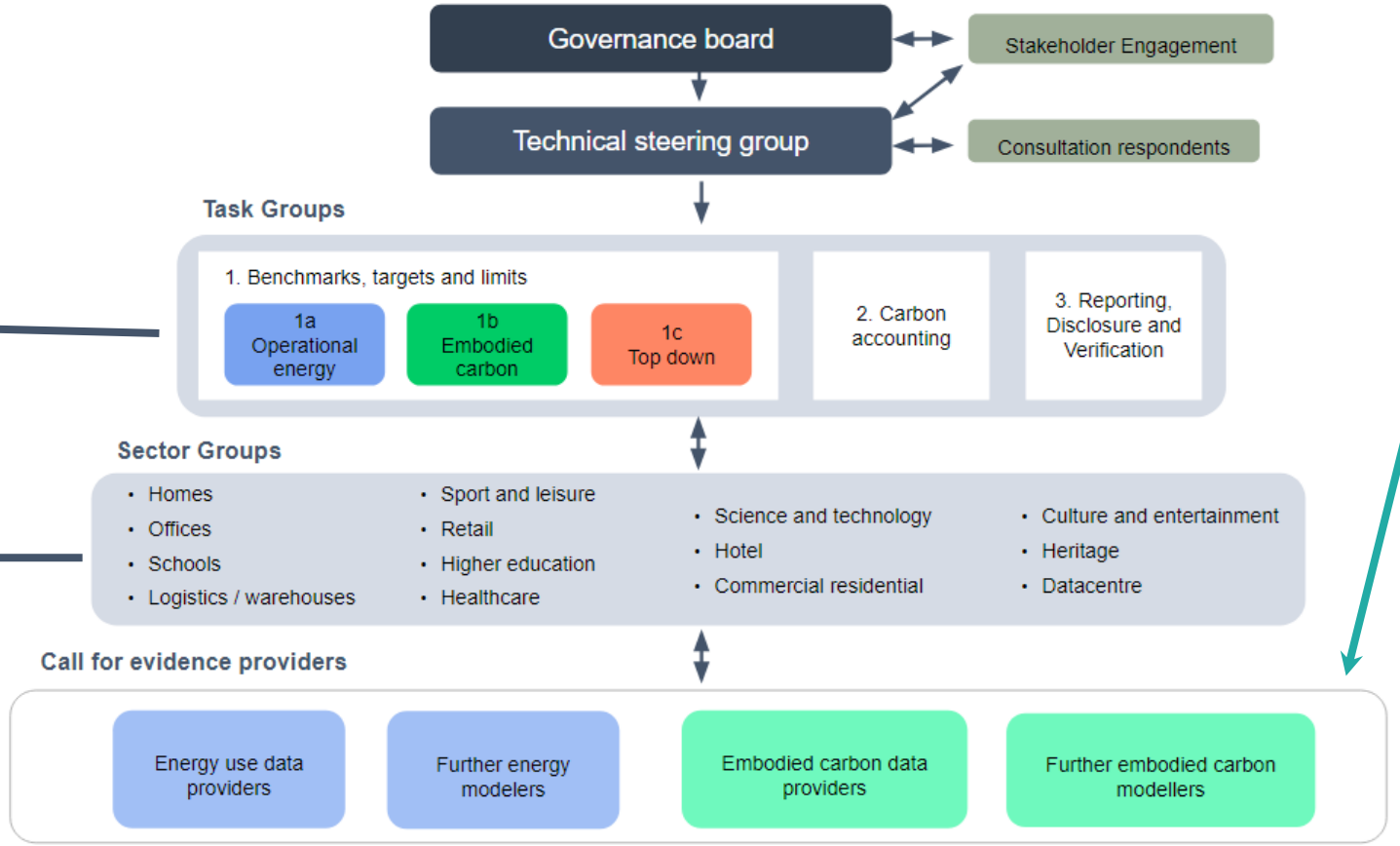
Approach to NZCBS limit setting

	Operational Energy	Upfront Carbon
New build	• To incentivise low energy buildings • Limits to be achievable but ambitious **Limits** = Best Practice at construction. This improves, so later New Build will have more onerous limits than today's.	• To incentivise low upfront carbon • Limits to be achievable but ambitious **Limits** = Best Practice at the time of its build. This improves, so later New Build will have lower limits than today's.
Existing buildings / retrofit	• To incentivise low energy buildings • Limits to be achievable by most buildings once retrofitted, to support mass role out **Limits** = ultimately, by 2040 buildings have to meet the equivalent of a Medium Retrofit. This improves, so later retrofits will have more onerous limits than today's. As option, this can be met in steps, with less onerous early steps if buildings have a Retrofit Plan.	• To prohibit the highest upfront carbon retrofits • To encourage retrofit **Limits** = Typical Practice (i.e. Best Practice but assuming a lot of works) at the time of the works. This improves, so later retrofits will have lower limits than today's.

Knowledge gathering

140+
Task Group members

190+
Sector Group members



800
Projects embodied carbon data

3200
Projects metered operational energy (large datasets)

200+
Projects metered operational energy (individual projects)

How the limits evolve over time: Operational Energy

Retrofit "step by step":
Not achieving the end point limit on 1st verification, but with a Retrofit Plan and improvements over time to meet the intermediate limits and the end point limit by 2040.

Retrofit "in one go": *achieving the end point limit from its 1st verification. Limits are fixed based on the time the retrofit commenced onsite i.e. once verified as a Retrofit using the "in one go" limit, a building will retain the same operational energy limit in future verifications.*

New build:
Limits are fixed based on the time the development commenced onsite i.e. once verified as a New Build, a building will retain the same operational limit in future verifications.

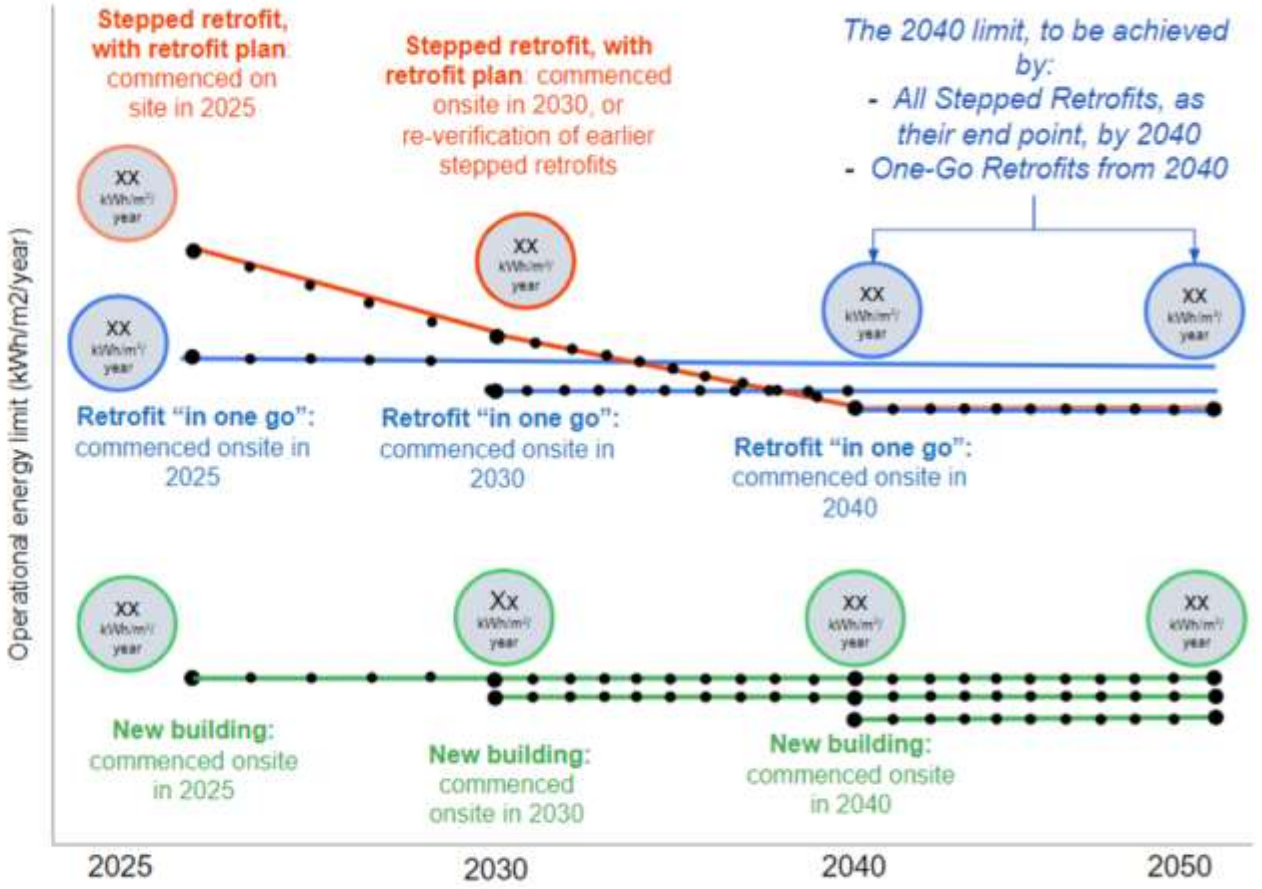
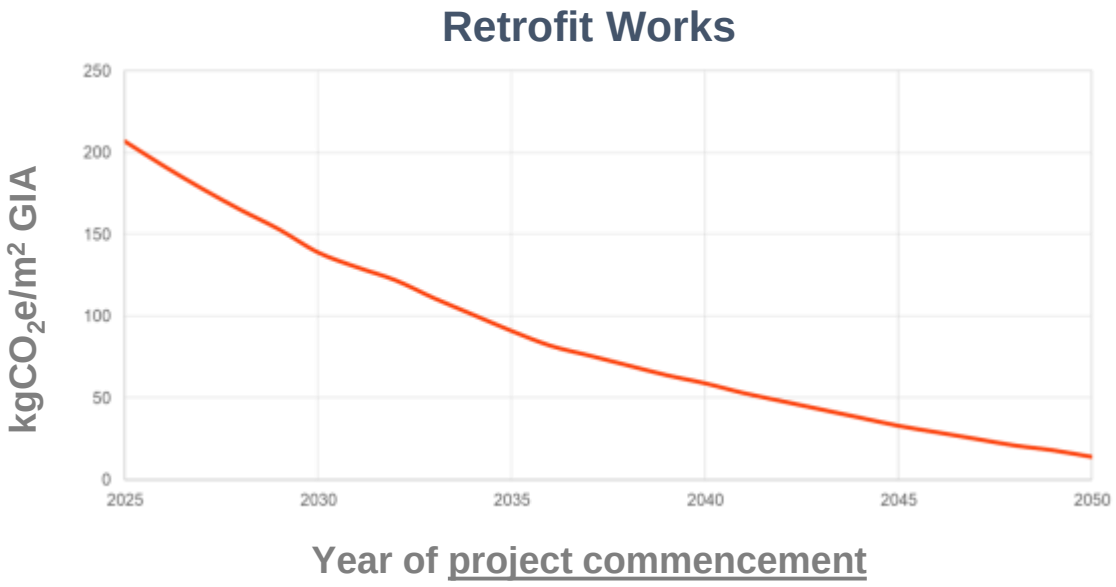


Figure 8 Approach taken to operational energy limits (for information)

How the limits change over time: Embodied Carbon

The example table shows the trajectories for single family homes



Embodied emissions are expected to decrease over time as the construction industry adopts more sustainable materials and practices. Improvements in low-carbon technologies, increased use of recycled materials, and innovations in design are all helping to reduce the carbon footprint associated with building construction and material production. Additionally, stricter regulations and evolving standards are pushing the industry towards lower embodied carbon targets, ensuring that future buildings contribute less to overall carbon emissions.

The Standard's Sections

Standard sections

Introductions - Sections 1-3

Scope, normative references, and terminology

General Principles - Section 4

Sets out the overarching requirements of the Standard

Assessment, Submissions and Limits - Section 5

Technical requirements for each aspect of the Standard

Verification & Communication - Sections 6-7

An initial summary of these sections, which will be published in Version 1

Annexes

Limits & Targets - Annex A

The numerical requirements of the Standard

Submission Proforma - Annex B

A spreadsheet for submitting numerical evidence of conformity with the Standard for verification.

Principles of Equivalence - Annex C

How existing schemes can demonstrate equivalence with aspects of the Standard

Roles & Responsibilities - Annex D

The likely roles and responsibilities required for implementing the Standard

4. The Now & Next

UK Net Zero Carbon
Buildings Standard

Now & Next: Pilot Testing, and Verification

Pilot Testing the Standard

The Pilot Testing Programme will launch in early 2025.
You can register your interest here.
The purpose of this testing is to help us understand the experience of applying the Standard to buildings / projects across a full range of sectors and building classifications.

Testing projects at each stage, across our sectors:

Due to the need to gather varied industry feedback, we will be selective of Pilot projects to enable us to gather a broad range of views and project types.

Development of Verification

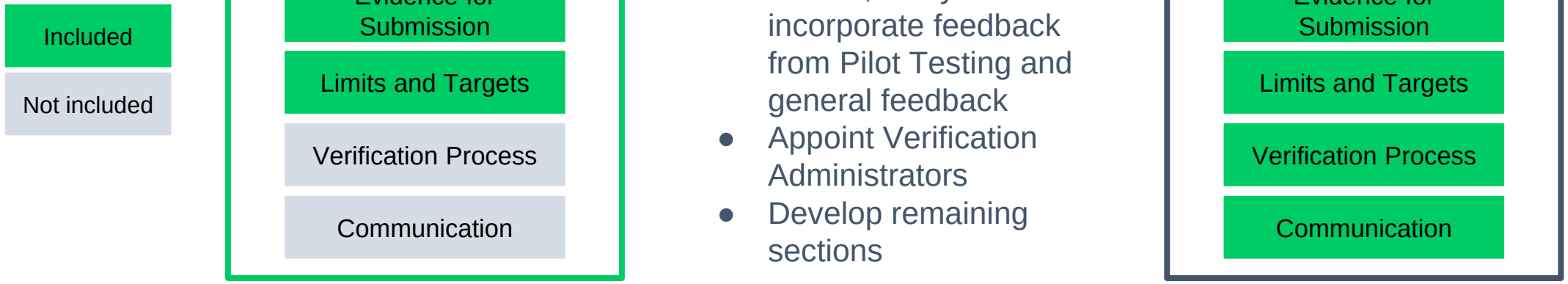
Verification of the Standard will need to be managed by organisations that will be known as Verification Administrators (VAs). It's important that we make sure these VAs have the right experience and know-how to run the Standard's verification.

We will soon be launching an open tender for organisations to apply to become VAs.

The VAs' input is necessary to finalise the Verification and Communication sections of the Standard.

Version 1 is planned for late 2025.

Up Next: What is the Pilot Version?



Now: Pilot Projects at different Stages

We are seeking Pilot Projects (both new build and retrofits/refurbishments) in the following stages of their evolution:

- Design
- Construction
- At or near Practical Completion
- Recently Occupied (less than 1 year)
- In Occupation (min 75%) for more than 1 year

Testing the Standard in each of these stages will help us to ensure that Version 1 takes on board the “real life” experience of actual projects which would be seeking to demonstrate conformity to the Standard.

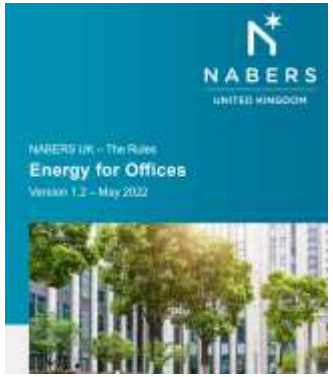
We will be sorting the Pilot Projects that we choose into cohorts based either on their:

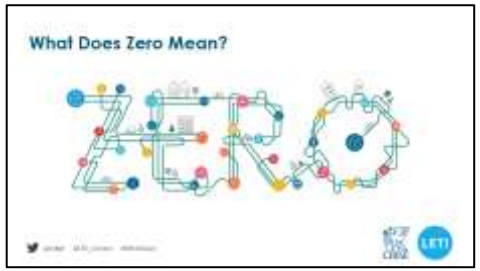
- **Stage of evolution** (Design, Construction, In operation etc); and/or
- Their **sector/building typology**.

This will allow us and all Pilot Project participants to share knowledge and experience derived from applying the rules of the Standard to their projects.

We will be organising a series of seminars and workshops both online and in person, bringing the sector specific cohorts and the design evolution specific cohorts together

Up Next: Aligning existing industry guidance





Upfront Carbon, A1-5 (exc. sequestration)

	Band	Office	Residential	Education	Retail
	A++	<100	<100	<100	<100
	A+	<225	<200	<200	<200
LETI 2030 Design Target	A	<350	<300	<300	<300
	B	<475	<400	<400	<425
LETI 2020 Design Target	C	<600	<500	<500	<550
	D	<775	<675	<625	<700
	E	<950	<850	<750	<850
	F	<1100	<1000	<875	<1000
	G	<1300	<1200	<1100	<1200

CRREM

Up Next: Equivalence with the Standard

Many existing industry schemes are driving towards the same goals as the Standard.

One of our overarching goals is to create alignment across these industry schemes, such that achieving one can help buildings to achieve another.

To this end we are allowing built environment schemes/standards to demonstrate **equivalence** with the Standard.

How this should be done is set out in Annex C: Principles of Equivalence.

A scheme's equivalence might only apply for a specific requirement (e.g. operational energy), for a particular sector or sub sector, or building classification (e.g. new build). This will be worked out on a case-by-case basis.

We will be engaging with schemes and standards over the coming months to determine whether equivalence can be achieved, and this will be recorded in Annex C.

We have already started working with schemes that could offer equivalence, such as NABERS UK, and we look forward to working with other schemes/standards on this.

Interested? Contact equivalence@nzcbuildings.co.uk

Indicative process for schemes/standards to demonstrate equivalence

In-use Certifications and Ratings Analysis

– By Sistemiq on Behalf of LOTUF

	In-use certifications and energy ratings											
Certification/Rating	**BREEAM**	**BREEAM (NEW)**	**LEED**	**LEED (NEW)**	**LEED ZERO (NEW)**	**DGNB**	**Green Star**	**ILFI**	**UK NZCBS**	**NABERS**	**Energy Star**	**EPC**
Primary geography	Global	Global	Global	Global	Global	Germany	Australia	US	UK	Australia	N. Am	Europe
Certification/rating type	**Holistic**	**Holistic**	**Holistic**	**Holistic**	**Holistic**	**Holistic**	**Holistic**	**Carbon**	**Carbon**	**Energy**	**Energy**	**Energy**
Scheme version	v6.0	v7	v4.1	v5	v5	v2020	Perf. v2	ZC v1.1	TBC	[…]	[…]	[…]
Targets whole building emissions												
Top performance consistent with or better than 1.5°C pathways (Operational)												
Minimum EUI performance to be certified										N/A	N/A	N/A
Minimum operational carbon performance to be certified										N/A	N/A	N/A
Prioritise abatement over offsets										N/A	N/A	N/A
Actual data required (energy/operational)												
Carbon performance targets are public, clear and reference to 1.5°C pathways												
Performance of certified assets is shared and transparent												

Under consultation or development

Fully meets criteria

Partially meets criteria

Does not meet criteria

Key gaps vs. decarbonisation and transparency principles

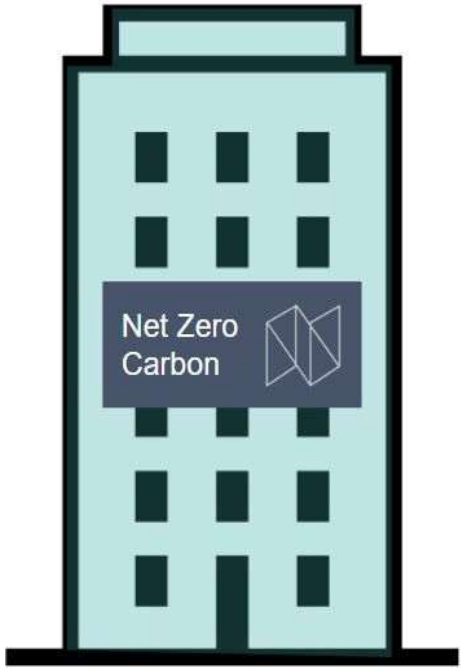
Up Next: Delineated Approach to Buildings

The Standard Pilot Version has been developed to apply to whole buildings, to determine whether they are Net Zero Carbon aligned.

Through consultation and engagement we have understood that for some sectors there will be value in the ability for the Standard to differentiate between areas or between responsibilities (e.g. for base build or for tenanted offices to assess their performance separately);

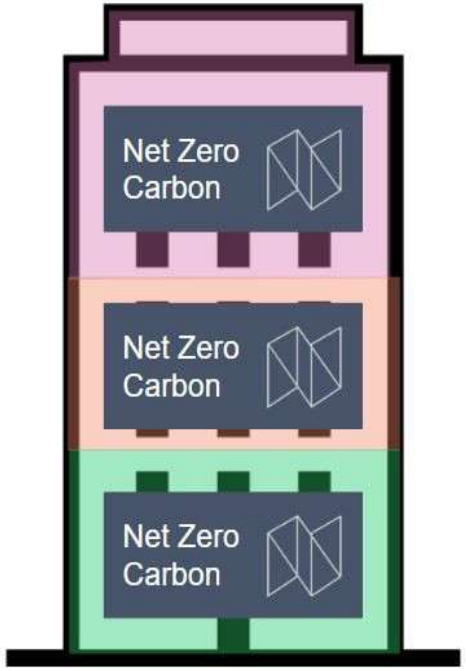
For this reason, we are developing a way to apply the Standard's methodology following a delineated approach. We are engaging with experts from the relevant sectors to develop this approach, ready for inclusion in Version 1 of the Standard.

Pilot Version



Whole Building approach

Version 1



Delineated approach

5. Acknowledgements

UK Net Zero Carbon
Buildings Standard

Thanks from the Core Team

Your support has been essential in developing the Standard

Governance Board

Related Argent - David Partridge (**Chair)**

Founding Members

BBP - Sarah Ratcliffe

BRE - Jonathan Rickard

CIBSE - Anastasia Mylona

IStructE - Patrick Hayes

LETI - Chris Twinn

RIBA - Judit Kimpian

RICS - Charlotte Neal & Amit Patel

UKGBC - Smith Mordak

Observer members

ICE - Lewis Barlow

PIA - Bill Hughes

RIAS - Angel Morales-Aguilar & Chris Stewart

Technical Steering Group

- Katie Clemence-Jackson (Chair) - **QODA Consulting**
- Adam Baranowski - **BBP**
- Christine Pout - **BRE**
- Clara Bagenal George - **LETI (Etude)**
- Fabrizio Varriale - **RICS**
- Jane Anderson - **WLCN**
- Jess Hrivnak - **RIBA**
- Julie Godefroy - **CIBSE**
- Sam Wallis **- Envision**
- Tom Wigg - **UKGBC**
- Will Arnold - **IStructE**

Supported by

- Rosie Bard – **Orms**
- Zoe Black - **RIAS**
- Zoe Watson - **Zoe Watson Consulting**
- Daniel Doran - **Lifecycle Sustainability**
- Lynn Urbanik **- Passivhaus Trust / LETI**
- Mina Hasman, Julia Skeete & James Woodall – **SOM**
- Issy Budd - **Wasps Studios**
- Ciara Durkin - **Laing O'Rourke**
- Ellie Burkill - **XCO2**
- Jack Poulton **- SimpsonHaugh Architects**

To all of our Contributors - Thank You

- Task groups
- Sector Groups
- Modellers & Analysts
- Data Providers
- Project Managers
- Administrators & Secretariats
- Comms & Engagement
- Stakeholders
- Consultation Respondents
- Technical Steering Group
- Governance Board

140+
Task Group members

190+
Sector Group members

500+
Consultation Respondents

800
Projects embodied carbon data

3200
Projects metered operational energy (large datasets)

200+
Projects metered operational energy (individual projects)

Your support is essential to the Standard

Wider support

The UK NZCBS team would like to thank the organisations that sponsored industry engagement events, administrative support and provided in-kind assistance.

Diamond Sponsors:

Landsec

British Land

mace

Related Argent

Skidmore, Owings & Merrill

Gold Level Sponsors:

Construction LCA

Mitsubishi Electric

Silver Level Sponsors:

BAM Nuttall

Bennetts Architects

Derwent London

Envision

GPE (formerly Great Portland Estates)

ORMS

QODA Consulting

The Crown Estates

Legal Sponsors:

Mishcon de Reya

Bronze Level Sponsors:

Daikin

Federated Homes

Howells

Jestico & Whiles

Perkins and Will

Sheppard Robson

Socius

SimpsonHaugh

Sponsors:

OakNorth Bank

In conclusion: The UK Net Zero Carbon Buildings Standard will provide:

- A **clear definition of Net Zero Carbon** for buildings/assets, not for companies.
- A Standard against which buildings/assets can be verified to **increase integrity and avoid greenwashing.**
- A Standard around which the built environment sector can unite to **prevent proliferation and duplication.**
- A Standard which investors can use to **inform investment decision-making.**
- A Standard which could be used for **sustainable finance, lending and debt.**
- A Standard which occupiers can use when **buying or leasing buildings.**
- A Standard which **policy-makers at national, city and local level** could incorporate into **planning and building regulations, procurement and leasing.**

University of Reading NZC workshop
Personal observations:

1. NZCBS requires measured – not predictions
   - Addressing the performance gap
2. Site (asset) level NZC not needed
   - Zero Carbon “Aligned” for delivering national NZC
3. Upstream players deliver much of the carbon change
   - Hence Operation Energy and Embodied Carbon
4. Existing stock is +80% of carbon emissions
   - Relative impact of new-build
   - Lack of retrofit intervention mechanisms
5. Suitability for smaller clients?
   - 99% / 78% of property industry is SME / Micro-orgs
   - Cost of compliance
6. Evolving future focus towards Grid stability support?
   - Carbon → Annual kWh → Peak kW

6. Q&A

UK Net Zero Carbon Buildings Standard

UK NZC Buildings Standard

info@nzcbuildings.co.uk

nzcbuildings.co.uk

Press Enquiries:
press@nzcbuildings.co.uk