Evidence Report – Local Plan Review (LPR) Policies SP5 and DM4 Evidence Base

(December 2022)

West Berkshire COUNCIL

Evidence Report – Local Plan Review (LPR) Policies SP5 and DM4 Evidence Base

Contents

1 Purpose of the Evidence Report

1.1 The purpose of this evidence report is to outline the evidence base for Policies SP5 - Responding to Climate Change and DM4 - Building Sustainable Homes and Businesses of the Local Plan Review (LPR) at Regulation 19 consultation.

2 Background

2.1 West Berkshire Council Environment Delivery Team and Planning Policy Team worked with Consultants from Bioregional and Edgars to develop an evidence led approach to the redrafting of Policies SP5 and DM4 of the Local Plan Review (LPR). Following detailed research, analysis and consultation by the team, the direction and proposed policy wording has been finalised for Regulation 19 consultation.

2.2 This report outlines the evidence base for Policies SP5 and DM4 and includes references to sections of Bioregional and Edgars reports within the appendices. In instances where information has been presented but is not within the scope of the policy the information has been struck through. Where information is of a sensitive nature, the text has been redacted.

2.3 The evidence considers the requirement and precedent for carbon reduction which includes the powers, mandates, precedents, and constraints with regards to net zero carbon local plan policy (Appendix A). In this context four policy options have been considered to allow an agreed approach to be taken forward and the redrafting of Policies SP5 and DM4.

3 Policy Context

3.1 Local planning authorities have a binding legal duty to mitigate climate change, established in the Planning and Compulsory Purchase Act 2004.

3.2 This is reiterated in the National Planning Policy Framework (NPPF). The NPPF defines ‘climate mitigation’ as reducing our impact on the climate, primarily by reducing greenhouse gas emissions (this is distinct from ‘climate adaptation’ although the two can be linked). The NPPF states that the plan should achieve ‘radical reductions’ in greenhouse gas emissions in line with the objectives and provisions of the Climate Change Act 2008.

3.3 The Climate Change Act lays down not only the net zero carbon 2050 goal but also interim five-yearly carbon budgets that are periodically signed into law. So far, parliament has legislated six carbon budgets running to 2035. To meet those carbon budgets, the UK will need to achieve all of the following changes to the buildings sector:

- From 2025, new buildings should have 15-20kWh/m2/year space heat demand, a low carbon heat system, no connection to the gas grid, and ideally be net zero carbon

- Heat pump rollout (including to existing buildings) should be dramatically accelerated, with annual installations increasing exponentially from today to 2030

- Expand the use of low-carbon heat networks

• Limited role for hydrogen gas grid in some limited locations after 2030

• Fully decarbonise the electricity grid by 2035

• Construction materials to be used more efficiently and substituted with materials that take less energy to produce (lower embodied carbon).

3.4 These are in addition to changes that must happen in transport, land use and industry. Existing and planned government policy will not fully deliver these changes – even with the new Future Homes Standard in place from 2025 (an update to Part L of building regulations). Any building not built to these standards will need to be retrofitted soon, which will cost owners 5 times as much as it would cost developers to do up front.

3.5 Part L of Building Regulations sets the national technical standard for buildings' energy and carbon. It only covers operational regulated energy use (not unregulated or embodied carbon). Part L regulates buildings' performance on three metrics:

• Target Fabric Energy Efficiency (space heat, homes only) in kWh/m2/year

• Target Primary Energy Rate (all regulated energy use, all buildings): kWh/m2/year

• Target Emissions Rate: kg of CO2/m2/year (all buildings)

3.6 Although updates are being made to Part L – including the Future Homes Standard from 2025 – this will not fully deliver the necessary changes as listed above. This is partly because the official calculation methodologies used for Part L are not accurate in predicting a building's operational energy and carbon emissions. These calculations underestimate space heat demand, do not incentivise truly energy-efficient building design, and about 50% of a building's energy use is ignored by the calculations ('unregulated energy uses'). This means a 'zero-carbon' building as defined by Part L of building regulations would not truly be anywhere near zero carbon.

3.7 Therefore, to truly fulfil its duty to mitigate climate change in line with the Climate Change Act, a local planning authority would need to require development to go beyond the basic standards set by building regulations – as well as reducing car use, enabling development of renewable energy generation, and protecting green infrastructure that removes carbon.

4 Addressing weaknesses

4.1 To address the weaknesses of Building Regulations Part L, the industry does have some more accurate methods to calculate building's energy (including unregulated) and carbon emissions:

• CIBSE TM54, for non-residential buildings: this works by starting with the Building Regulations Part L calculation and then making some adjustments (Note: The new Part L endorses TM54 as suitable to fulfil a new requirement for energy forecasting)

• BREDEM, for homes: Part L methodology was based on BREDEM, but Part L is rigid whereas BREDEM has flexibility to adjust assumptions and include unregulated energy

• Passivhaus Planning Package: A highly accurate building physics model completely unrelated to the Part L methodologies. Can be used without Passivhaus certification.

4.2 Local planning authorities have the power to require new development to do better than the national standard in energy performance, using powers granted by the Planning and Energy Act 2008. Specifically:

• Energy efficiency standards beyond those set by building regulations,

• A proportion of energy use to be from renewable or low carbon sources in the locality.

4.3 'Energy efficiency standard' is defined as a standard that is set out or endorsed by the Secretary of State. Currently, only the Part L methods meet this caveat (SAP, SBEM and potentially TM54 as above). 'Energy use' is not defined, implying that requirements for renewables can include unregulated as well as regulated energy.

4.4 Most net zero carbon local policy precedents require a 30-40% reduction on the Target Emissions rate set by Part L, then the remaining regulated carbon to be offset via payments to the local authority that get ring-fenced for local projects to save that amount of carbon.

4.5 A ministerial statement in 2015 set a limit on local plans' requirements for carbon reductions (-19% on the Part L 2013 Target Emission Rate). That limit has now been exceeded by Part L 2021. A 2018 NPPF consultation confirmed there is no such restriction. A 2022 Inspector's decision in West Berkshire supports the view that the 2015 ministerial statement no longer holds weight.

4.6 The NPPF states that "Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards". Relatedly, it lays out four tests of soundness for a proposed local plan. To be found sound, plans should be:

1. Positively prepared: Responding to needs and facilitating sustainable development

2. Justified: Based on evidence, and having considered reasonable alternatives

3. Effective: Deliverable in the plan period & based on joint work on cross-boundary issues

4. Consistent with national policy: accord with NPPF and other relevant national policy.

4.7 An effective local plan policy for net zero carbon buildings will therefore need to:

• Be based on a definition of 'net zero carbon' (appendix A) that is robust, defensible and verifiable

• Deliver buildings that meet the criteria needed to fulfil the UK's carbon budgets

• Be compatible with the Government's national technical standards (Part L)

• Be specific enough for officers to determine compliance based on application evidence

• Be supported by evidence that it is feasible and viable to deliver

• Be justified in comparison to reasonable alternative policies – for example, by showing that alternatives would not deliver the necessary changes for the Climate Change Act (net zero carbon 2050, and interim carbon budgets).

• Be consistent with national policy and national technical standards – such as by using calculations based on those of building regulations, and showing how the policy might support other national policies e.g. Clean Growth Mission or Heat & Buildings Strategy.

5 Assessing potential policy approaches

5.1 Considering the range of powers, duties, more and less effective approaches to net zero carbon buildings, and potential range of policy levers, no single policy approach would perform perfectly across the full range of topics of concern. It was therefore necessary to assess the various policy options against the following risk topics:

• Climate: How much carbon would this policy save, in an effective way?

• Occupants' energy bills: Will this policy deliver significant bill savings, or might it expose the occupant to unnecessarily high energy bills especially given the current volatility?

• Avoiding the cost, disruption and embodied carbon of retrofit: Will this policy deliver buildings that don't need to have more energy saving measures and renewables installed in future to bring the building up to the standard needed for the net zero carbon transition? (It costs five times as much to retrofit as it does to build to these standards)

• Infrastructure: Does this policy help to limit the burden placed on the electricity grid, whose capacity needs major upgrades as existing buildings and cars switch to electricity?

• Viability/cost: To what extent may the policy increase build costs, professional fees and offset costs that wouldn't result in a sales value uplift?

• Planning powers/ precedents: To what extent does the policy work within existing planning powers or mirror the approach of existing adopted precedent plans?

• Compatibility with national approach: Does the policy use national technical standards and help deliver on nationally stated ambitions around buildings' sustainability?

5.2 Having looked at powers and precedents, we identified a various range of **potential** policy levers that could be deployed to create a net zero carbon new buildings policy (please note this list is not the final recommended approach):

• Requiring improvements on metrics set by the Building Regulations Part L for carbon emissions (TER), Fabric Energy Efficiency (TFEE), and Primary Energy Rate (TPER)

- Either relative (% improvement on the Part L targets)

- Or absolute (such as a Fabric Energy Efficiency of 15-20kWh/m^2/year).

• Setting specific targets for space heat and total energy use intensity both regulated and unregulated, to be fulfilled using alternative calculation methods that are more accurate than Part L (PHPP or TM54)

• Requiring onsite renewable energy generation equal to 100% of energy use

- Either regulated energy only, or

- Including unregulated energy too – and specifying a calculation method

• Requiring use of a process to remedy the energy performance gap between predicted and actual energy use – which can be due to construction errors as well as poor prediction methods

• Requiring any remaining carbon to be offset

- Either regulated energy only

- Or including unregulated energy too – and specifying a calculation method

- Setting a carbon price that reflects nationally recognised values and is high enough to fund local carbon reduction projects

• Requiring embodied carbon to be reduced to specific levels, or just reported on.

5.3 The policy levers listed above are not all mutually compatible. There was therefore a need to identify internal consistent combinations. A 'risk matrix' was created to assess each policy lever against each risk topic.

6 Risk Matrix and Policy Options

6.1 Before an agreed direction on the policies could be taken forward, four possible approaches were considered and appraised. A risk matrix was developed which outlined a range of risk topics and policy components. Each approach was assessed against the risk criteria (appendices B and C). The risk matrix assessed the pros and cons of various net zero carbon policy approaches:

- Effectiveness for carbon reductions

- Effectiveness in protecting occupants from high energy bills and future retrofit

- Risk of the infrastructure or building industry not being ready to deliver the policy

- Risk of transgressing planning powers or contradicting national policy.

6.2 The four different approaches (appendices B and C) which were developed for assessment were:

1. “Safe precedent”: Following the approach already taken in London and Reading, which is well-established and deliverable but does not deliver much in the way of actual carbon reductions compared to current/incoming national building regulations

2. “Cutting edge”: Following an approach being pursued in several emerging local plans

3. “Accelerating future stated national policy”: Following an emerging approach in at least one emerging local plan, which brings forward the National Future Homes Standard and requires the rest of the *regulated* carbon emissions to be offset

4. “Acceleration+”: Similar to Approach 3, but with some tighter targets for fabric energy efficiency and with a requirement to meet regulated and unregulated energy use with 100% renewable energy or offset. This option was later modified following an Officers’ workshop and Portfolio Members’ briefing (Appendices D and E).

6.3 For each of the four policy approaches, the components of the policy were scored from 0 (actively reduces risk) to 5 (high risk). Two of the approaches were discarded due to having unacceptably high risk of failing to fulfil climate goals (Approach 1) or unacceptably high risk of being rejected by the inspector due to using non-national technical standards unless backed up by adopted plan precedents (Approach 2).

6.4 Each approach was put through a ‘risk matrix’ where each component was assessed against the risk topics. Findings were then reviewed with West Berkshire Environment Delivery officers. Embodied carbon policies were removed based on officer feedback that there was a lack of capacity to assess this information if submitted within planning applications.

7 Proposed and agreed approach

7.1 It was proposed to and agreed by the Planning Advisory Group to take forward Approach 4 – “Acceleration+” with modifications whereby the policy would require new buildings to achieve net zero carbon by matching all its operational (regulated and unregulated) energy with renewables on site, or if unfeasible then offset 30 years’ worth of carbon (Appendix E). Within this, the following targets should be achieved:

- ≤15kWh/m2/year space heat demand target in homes, evidenced by the Building Regulations Part L SAP Fabric Energy Efficiency metric.

  Note: The above target was revised to ≤15kWh after further consideration at the officers’ workshop of the scale of Part L’s underestimation of space heat demand

- Deliver the carbon Target Emissions Rate of the Future Homes Standard or Future Buildings Standard (as applicable to development type) before adding renewable electricity generation measures (therefore, through fabric energy efficiency and efficient heat system alone, as per the Part L 2025 notional building)

- Demonstrate the use of a process to reduce the energy performance gap (ensuring the building performs as close as possible to energy predictions)

- After pursuing onsite renewable energy generation to the greatest feasible and viable extent, any remaining operational carbon emissions (regulated and unregulated) to be offset at the nationally recognised carbon price for each year of a 30-year operational lifespan, taking into account grid carbon reductions over that 30-year lifespan if the home is all-electric. The Council will hold these offset payments in a ring-fenced fund to be spent on projects that deliver measurable carbon reductions to the same amount.

7.2 Following discussions at an Officers' workshop and further analysis, the modified 'Approach 4' (above), differs in a number of ways to the original 'Approach 4' presented to officers. Modifications not being pursued at this stage are:

- No to set target for the Part L Primary Energy Rate, as further work would be needed to establish what target may be justified to support national carbon budgets, and its cost and feasibility. PER is a new metric in Part L 2022, so there is not much existing analysis. The policy's other targets can be justified and assessed separately from Part L PER.

- Space heat demand (SAP FEE) Fabric Energy Efficiency target to be 15-20kWh/m2/yr because of underestimation in the calculation method used in building regulations.

- Inclusion of certain specific credits in BREEAM or HQM as a means to fulfil the net zero carbon requirement in non-residential buildings (full credits under BREEAM 'Ene 01' or HQM 'Energy and Carbon 02 - 03' would support this). A similar approach could be taken for other environmental sustainability areas such as water, waste, biodiversity, embodied carbon and climate resilience, however this is beyond the current scope of work which is to look at regulated and unregulated energy and the associated carbon.

7.3 A supporting Supplementary Planning Document (SPD) will be drafted to support the policies.

8 Policy Requirement Evidence - Policy SP5 Responding to Climate Change

8.1 Outlined below is specific policy wording for SP5 and, where relevant, the associated evidence for the Regulation 19 consultation.

8.2 Requirement:

Policy SP5 Responding to Climate Change

The principles of climate change mitigation and adaptation will be embedded into new development, improving the resilience of land, buildings and existing and future communities to the opportunities and impacts arising from climate change. All development should contribute to West Berkshire becoming and staying carbon neutral by 2030.

Depending on the nature and scale of proposals, development will be expected to satisfy all of the relevant following criteria:

- *To withstand predictable effects from climate change for its expected lifetime;*
- *To take advantage of the latest low and zero carbon technologies and innovations, including digital;*
- ***To achieve net zero operational carbon development by applying the energy hierarchy, achieving the highest viable levels of energy efficiency, generating and supplying renewable, low and zero carbon energy, and as a last resort carbon offsetting in accordance with Policy DC3;***
- *To achieve the highest viable levels of energy efficiency;*
- *To generate and supply renewable, low and zero carbon energy for its own use and/or local distribution networks in accordance with policy DM4;*

8.3 Since the regulation 18 consultation, the bold text above relating to achieving net zero operational carbon developments has been added to Policy SP5. The evidence for this amendment is detailed within section 9 of this report.

9 Policy Requirement Evidence - Policy DM4 Building Sustainable Homes and Businesses

9.1 Outlined below is specific policy wording for DM4 and, where relevant, the associated evidence for the Regulation 19 consultation.

9.2 The adopted 'West Berkshire Core Strategy (2006 - 2026) Development Plan Document' outlines that new residential and non-residential developments should meet Sustainable Construction and Energy Efficiency standards in line with Policy CS15. This sets the precedent for the updated policy wording of the Local Plan Review DM4. Since the adoption of the Core Strategy in 2012 there have been changes to national policy, regulation and guidance. The updated policy wording seeks to account for these changes, clarify scope and demonstrate continuous improvement in line with actions required to meet the national policy and regulations (detailed in section 3 and 4) i.e. Net Zero Carbon target by 2050, the declaration by West Berkshire Council of a Climate Change Emergency and updates in best practices.

9.3 Requirement:

New development of one or more new dwellings (C3 or C4 use class) and/or 100sqm or more of new non-residential floorspace, including hotels (C1 use class), residential institutions (C2 use class) or Secure Residential Institutions (C2A use class) should achieve net zero operational carbon emissions (regulated and unregulated energy) by implementing the energy hierarchy.

Proposals should demonstrate application of the energy hierarchy through submission of an Energy Statement or a detailed energy section within the Sustainability Statement (in

accordance with Policy SP5) and which identifies how the following minimum standards of construction are achieved to the greatest extent feasible and viable.

1. *Residential development – Minimum construction standard*

    A. *New development of one or more new dwellings (C3 or C4 use class) will meet the following minimum standards of construction:*

    - *Achieve the carbon Target Emission Rate set by the Future Homes Standard once this is confirmed by central government; in the meantime, achieve 63% reduction in carbon emissions by on-site measures, as compared to the baseline emission rate set by Building Regulations Part L 2021 (SAP 10.2). These regulated carbon emission targets are to be achieved before the addition of on-site renewable electricity generation (which should subsequently be considered in section 3 of this policy).*

    - *Equal to or less than 15kWh/m^2/year space heat demand target, evidenced by the Building Regulations Part L SAP Fabric Energy Efficiency metric.*

    B. *New residential refurbishment developments of 10+ units will meet BREEAM Domestic Refurbishment Excellent as a minimum.*

9.4 The precedent for regulated and unregulated energy to be included within the scope of the policy is outlined within the adopted 'West Berkshire Core Strategy (2006 - 2026) Development Plan Document' . It is widely recognised and agreed that the most efficient and cost effective way to address energy efficiency and subsequent carbon emissions is to follow the Energy Hierarchy (Appendix A). The precedence for the Energy Hierarchy has been set by adopted Planning Policy from other Local Planning Authorities (Appendix F). On this basis, Policy DM4 has been structured to align with the Energy Hierarchy.

9.5 Once confirmed by Central Government, new homes will be expected to *achieve the carbon Target Emission Rate set by the Future Homes Standard* (Appendix A). In the meantime new homes will be expected to achieve 63% reduction in carbon emissions by on-site measures, as compared to the baseline emission rate set by Building Regulations Part L 2021 (SAP 10.2) based on the evidence presented in Figure 3 of Appendix D and Appendix H. A 63% reduction on the 2021 regulations is approximately equivalent to 75% on the Part L 2013 Building Regulations. This figure has been chosen to align with the Future Homes Standard (which the government states will be 75% on the 2013 regulations), so it can be demonstrably shown that the Council has proactively aligning with government policy in the form of the Future Homes Standard.

9.6 With each carbon budget, the Committee on Climate Change lays out a range of sectoral changes (pathways) necessary to deliver it. The pathway to deliver the legislated fourth, fifth and sixth carbon budgets, of which most relevant to build environment and planning, includes 'from 2025, all new homes to have space heat demand of 15-20kWh/m2/year (60-70% less than current building regulations allow) and not be connected to the gas grid (Appendices A and D). The precedent for this is set within a number of emerging Local Plans (Appendix F). The above target was revised to ≤15kWh after further consideration at the officers' workshop of the scale of Part L's underestimation of space heat demand (Appendices C, D and E)

9.7 Islington Local Plan, draft 2019 (Appendix F) seeks new residential refurbishment developments of 10+ units to meet BREEAM Domestic Refurbishment Excellent as a minimum.

9.8 Requirement:

2. *Non-residential development, hotels, residential institutions, secure residential institutions – Minimum construction standard*

New development of 100sqm or more of new non-residential floorspace, hotels (C1 use class), residential institutions (C2 use class) or secure residential institutions (C2A use class) will meet the following minimum standards of construction:

- *Appropriate to the building type, calculate a typical building baseline using a nationally recognised standard and demonstrate a percentage reduction in energy (regulated and unregulated) carbon emissions. These operational carbon emission targets are to be achieved before the addition of on-site renewable electricity generation (which should subsequently be considered in section 3 of this policy).*

- *BREEAM Excellent (BREEAM 2018 or future equivalent)*

9.9 The precedent is set for requiring the calculation of a typical building baseline using a nationally recognised standard (e.g. CIBSE TM54) and demonstrate a percentage reduction in energy (regulated and unregulated) carbon emissions appropriate to the building type within the adopted and emerging policies detailed in Appendices F and A.

9.10 The precedent is set for requiring new non-residential floorspace to achieve *BREEAM Excellent (BREEAM 2018 or future equivalent)* within the adopted West Berkshire Core Strategy (2006 - 2026) Development Plan Document and within the adopted (Cambridge Local Plan, 2018) and emerging (Islington Local Plan, draft 2019) planning policies detailed within Appendix F.

9.11 Requirement:

3. *Renewable Energy*

A. Subsequent to the achievement of the minimum construction standards under parts 1 and 2, new development of one or more new dwellings (C3 or C4 use class) and/or 100sqm or more of new non-residential floorspace, hotels (C1 use class), residential institutions (C2 use class) or Secure Residential Institutions (C2A use class) should include onsite renewable, zero and low carbon energy technologies to achieve net zero carbon operational energy (regulated and unregulated) on site.

B. The Council will support proposals for renewable energy provided that the technology is:

i. Suitable for the location

ii. Not on the most versatile agricultural land (grades 1, 2 and 3a);

iii. Accompanied by a landscape / visual impact assessment; and

iv. Not harmful to residential amenity by virtue of noise, vibration, overshadowing, flicker or other harmful emissions.

9.12 The precedent for requiring onsite renewable, zero and low carbon energy technologies to achieve net zero carbon operational energy (regulated and unregulated) is based on the principles of the Energy Hierarchy, as well as adopted and emerging planning policy from other Local Planning Authorities (Appendices A and F).

9.13 Requirement:

4. Carbon Offsetting

Where a development proposal of one or more new dwellings (C3 or C4 use class) and/or 100sqm or more of new non-residential floorspace, including hotels (C1 use class), residential institutions (C2 use class) and or secure residential institutions (C2A use class) cannot demonstrate that it is net zero carbon in relation operational energy (regulated and unregulated), it will be required to address any residual carbon emissions by:

- *a cash in lieu contribution*

9.14 Policy DM4 will be supported by a 'Supporting Text' section within the Local Plan review and a subsequent guidance document i.e. SPD/SPG which will be produced over the forthcoming months.

9.15 Appendices A and F outline the precedent from adopted and emerging planning policy which requires a payment in lieu contribution for carbon offsetting.

9.16 Appendix A also outlines Cost Viability and Carbon Offsetting sections which include a viability of offsetting any remaining carbon emissions worked example. Further detail and annotations are included in Appendix G to show what would need to be done with these figures to make them reflect the draft policy with both regulated and unregulated carbon to be brought to zero.

10 Conclusion

10.1 The report above and referenced appendices detail the approach taken to update Policies SP5 and DM4 and the evidence in which the policy updates are based on.

11 Appendices

11.1 Appendix A – Appendix A BDG West Berkshire Local Plan Review Carbon Support - Appendices - Rev 05 090522

11.2 Appendix B – Appendix B WBC edits130622_BDG West Berks Local Plan Review Carbon Support Risk matrix

11.3 Appendix C – Appendix C Bioregional West Berks Net Zero Officers Workshop June 2022 – no blanks

11.4 Appendix D – Appendix D West Berkshire Net Zero Carbon Buildings Policy - Summary Paper rev 02 0...

11.5 Appendix E – Appendix E 2022.07.21 PAG Report Net Zero Carbon Building approach to policy

11.6 Appendix F – Appendix F Addendum - NZC local plan support - additional precedents 070622

11.7 Appendix G – Appendix G Briefing_Note_PAG Carbon Offsetting and App A 221115

11.8 Appendix H – Appendix H_Changes to Building Regulations Part L Target [carbon] Emissions Rate (current and incoming), plus carbon emissions

Ends.

Appendix A

BDG West Berkshire Local Plan Review Carbon Support - Appendices - Rev 05 090522

West Berkshire Council Local Plan Review: Zero Carbon policy options - Appendix

09 May 2022

Rev 01

Bioregional

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Appendix 1: Defining ‘net zero carbon’, the rationale for ‘net zero carbon’ in planning and in West Berkshire, and local plan precedents

Introduction

Bioregional has been appointed to provide West Berkshire Council with guidance to support the creation of policies for reduction in buildings’ carbon emissions.

This appendix provides additional background to a ‘risk matrix’ document that was produced to aid decision-making about development management policies.

Local planning authorities (LPA) have a legal duty to deliver carbon reductions through the planning process in line with the Climate Change Act. However, the LPA’s ability to fulfil this duty is constrained by the actual powers granted to the LPA, and is often in tension with LPAs’ other duties such as enabling the delivery of housing and viable developer profits. Beyond these direct duties, constituents may also expect the plan to deliver further benefits such as homes that have low bills and don’t need expensive retrofit in the near future.

This appendix contains a review of:

- Defining ‘net zero carbon’ for the world, the UK, the District and individual development applications – and how these fit together
- The UK’s trajectory to net zero carbon, including necessary measures for net zero carbon buildings and other sectors relevant to the local plan
- Planning duties to support this trajectory
- Planning powers to make the changes needed for the UK’s pathway to zero carbon, and precedents of how those powers have been wielded to date
- How these potential forward-thinking policies may be justified in terms of necessity, feasibility and viability.

Glossary of terms and acronyms

Carbon budget	Amount of greenhouse gas that can be emitted before reaching a level of atmospheric carbon that causes severely harmful climate change
CO_2	Carbon dioxide. Often shortened to ‘carbon’.
CO_2e	Carbon dioxide equivalent. The sum of a mixture of gases, in terms of their climate-changing impact in a 100-year period expressed as the amount of CO_2 that would have the same effect. Often shortened to ‘carbon’.
EUI	Energy use intensity, a measure of how much energy a building uses per square metre of floor.
GHG	Greenhouse gas (CO_2 and several other gases). Often collectively referred to as ‘carbon’.
Part L	Building regulations section that sets basic legal requirements regarding buildings’ energy and CO_2.
Performance gap	The ‘energy performance gap’ is the difference between the amount of energy a building is predicted to use during design, versus the actual amount of energy it uses. The gap is due to poor prediction methodologies, errors in construction, and unexpected building user behaviour.
PV	Photovoltaics: solar panels that generate electricity.
PHPP	Passivhaus Planning Package – a tool to accurately calculate a building’s energy use. It is used to design buildings that seek Passivhaus certification, but can be used without pursuing certification.
SAP	Standard Assessment Procedure – the national calculation method for buildings’ energy and carbon, used to satisfy building regulations Part L.
TER	Target Emission Rate – limit set by Part L of building regulations on CO_2 emissions per square metre of floor.
TPER	Target Primary Energy Rate – limit set by Part L of building regulations on ‘primary energy’ use per square metre of floor. Unlike metered energy, ‘primary energy’ takes into account energy lost to conversion inefficiencies during power generation and distribution, or gas combustion.
TFEE	Target Fabric Energy Efficiency – limit on space heat energy demand per square metre of floor, set by Part L of building regulations. Based only on fabric performance; not affected by building services like heating system, lighting, ventilation[i].
TM54	Method to accurately calculate buildings’ energy use. Devised by Chartered Institution of Building Services Engineers (CIBSE).

Defining ‘net zero carbon’

Overview

At global level, “net zero carbon” means that emissions of greenhouse gases (GHGs) are balanced out by removals of GHGs from the atmosphere.

‘Greenhouse gas’ encompasses a bundle of different gases that have a climate-changing effect. The most common greenhouse gas is carbon dioxide (CO_2) which represents 80% of the UK’s climate impact[ii]. Six other GHGs are also relevant: methane (12%), nitrous oxide (5%), and four types of fluorinated gas (refrigerants, 3%). Some of these have a weaker global warming effect, and some have a stronger effect but stay in the atmosphere for longer and therefore cause more change over time.

As CO_2 stays in the atmosphere for a long time, there is a fixed amount – a ‘carbon budget’ – that we can emit between now and 2100 if the world is to avoid the worst impacts of climate change (limiting global warming to less than 2˚C above pre-industrial climate). The other greenhouse gases are not subject to the ‘budget’ approach, because they stay in the atmosphere for a different amount of time, but should still be reduced as far as possible.

All together, the bundle of greenhouse gases is often referred to as ‘CO_2e’ meaning ‘carbon dioxide equivalent’. This refers to the global warming effect that the gas would have in a 100-year timeframe, compared to that of carbon dioxide. ‘Carbon emissions’ can refer to carbon dioxide, or the whole bundle of greenhouse gases.

‘Net carbon’ or ‘net emissions’ refers to the amount of CO_2 or greenhouse gas that remains after deducting the amount that was removed from the atmosphere, usually over the course of a year.

‘Net zero carbon’ is sometimes used interchangeably with the term ‘carbon neutrality’. These are overlapping concepts which essentially mean the same thing at global level, but at sub-global levels they are used slightly differently[iii], to reflect whether the emissions and removals are achieved *directly by* or purely *on behalf of* a particular country or organisation. This becomes a question of ‘carbon accounting’, discussed next.

Where do the carbon emissions come from and how can they be removed?

The main source of rising GHG levels in Earth’s atmosphere is the burning of fossil fuels (as this is an emission of carbon that had been locked up underground for many thousands of years until recently). Greenhouse gas is also emitted by many other human activities including fertiliser use (nitrogen fertilisers are often made from fossil fuel), ruminant livestock’s digestive systems, breakdown of organic waste, and the chemical reaction during the production of cement.

Greenhouse gas removals are achieved by plants and soils such as forests, grassland and wetland. These are currently the only reliable and scalable means to remove greenhouse gases, as no appropriate and efficient technology has yet been developed. Still, research is underway to develop such technologies, and future carbon removal technology is a significant part of many countries’ long term strategy to limit the total amount of carbon emitted this century.

Carbon accounting methodologies: whose carbon is whose?

Human activities and economies are highly interconnected across local, organisational and international lines. Activity by a person in one location (such as using electricity) can cause carbon emissions by another entity elsewhere (such as burning coal to generate energy in power stations).

Therefore we need ‘carbon accounting’ methodologies to work out what share of carbon emissions ‘belong’ to each entity. That entity could be a person, organisation, building, local area, or country.

Returning to the question of ‘net zero carbon’ compared to ‘carbon neutral’, the Intergovernmental Panel on Climate Change[iv] essentially explains that:

- **‘Net zero carbon’** typically means a balance of **emissions and removals under direct control or territorial responsibility** of the entity reporting them (such as a country, district or sector)
- **‘Carbon neutral’** can also apply to a firm or commodity, and typically also **includes emissions and removals beyond the entity’s direct control or territorial responsibility**.

Following this logic, ‘net zero carbon’ would be the appropriate term if the district or country achieves enough carbon removals within its own area to balance out its own carbon emissions, while ‘carbon neutral’ is a less appropriate term for a country/district but would be the term to use if the emission/removal balance is achieved by buying carbon offset credits from outside that location.

For the purposes of a local plan, we should consider the carbon account of two key entities: firstly the **West Berkshire district**, and secondly **each new building**. The building must be considered in terms of how it fits into West Berkshire’s carbon account, and West Berkshire must be considered in terms of how it fits within the wider UK’s carbon account which is legally bound to achieve net zero carbon emissions by 2050 and steep carbon reductions in the preceding years (discussed later).

Several carbon accounting approaches are commonly used to determine how much carbon a geographical area is responsible for:

- Global Greenhouse Gas Protocol for Cities (GPC) – three scopes
- PAS2070
- BEIS subnational CO_2 inventories released annually
- Tyndall Centre local carbon budgets / SCATTER local carbon emissions accounts

Each of these methodologies is designed to define the area’s ‘carbon account’ based on the degree of direct or financial control the area has over activities that emit or absorb carbon.

Although each methodology differs slightly from the others, a local area would usually achieve ‘net zero carbon’ status when the GHG removals achieved within the local area are equal to greenhouse gas emissions from directly within the local area plus the greenhouse gases due to production of grid energy the local area consumes. If an area exports grid energy to other locations, any emissions associated with the production of that energy would not count towards the area’s carbon account.

The methodologies generally agree that the local area’s carbon account should not include offsets purchased from outside the area. These should be reported separately, if at all. However, such offsets may still help towards the overall UK net zero carbon goal so long as they are within the UK.

The Global Greenhouse Gas Reporting Protocol for Cities (GPC)

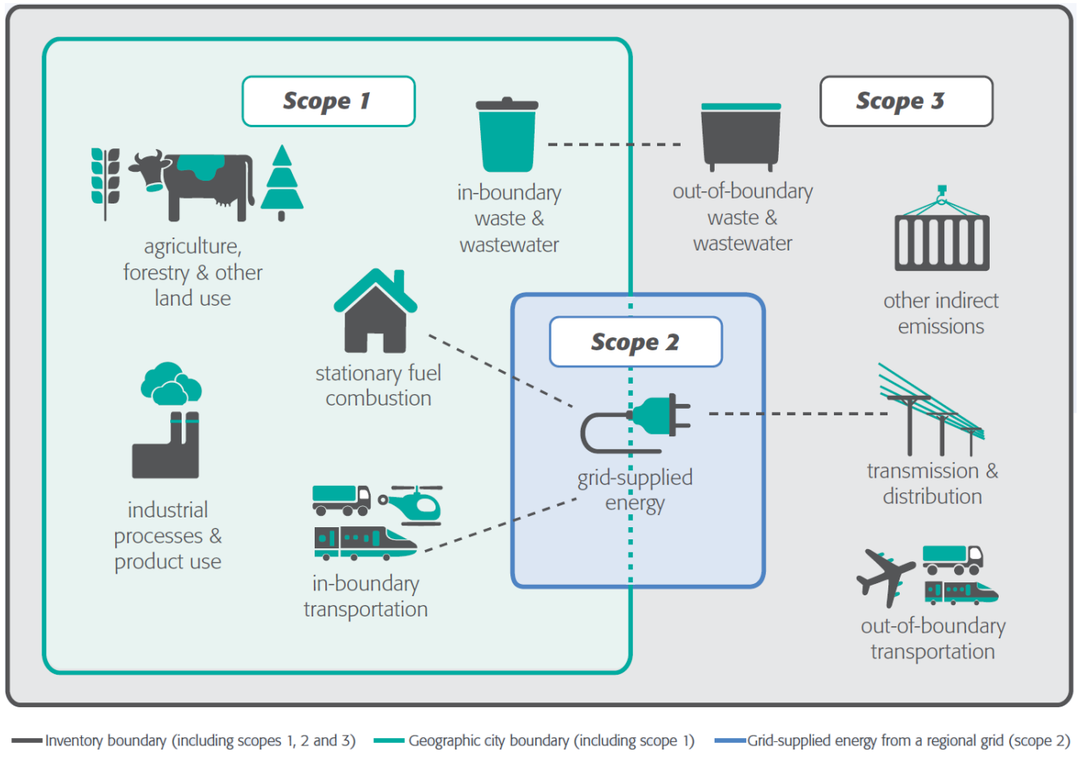
The Greenhouse Gas Reporting Protocol is the most widely used and accepted methodology to account for any entity's carbon emissions. The GPC is a version of that methodology that has been adapted for the use of cities or any other local area. Its aim is to enable local area carbon accounts to be tracked consistently enough to be aggregated to the regional or national level.

The GPC covers several gases (along with CO_2) and splits the account into three 'scopes' which reflect the degree of responsibility and control the local area has:

- Scope 1: emissions directly from within the area – such as through burning fuel, or through methane emissions from livestock kept within that area. Ditto, carbon removals achieved directly within the area, such as by trees growing in the area.
- Scope 2: emissions associated with that area's use of grid electricity which may have been produced inside the area or outside the area.
- Scope 3: emissions that happen outside the area but caused by activity or spending by entities inside the area – such as production and transport of goods imported from elsewhere,.

The GPC states that if an area purchases carbon offsets from outside the area in order to mitigate some of its emissions, these should be reported separately and not deducted from the total.

If West Berkshire chooses to use any external 'offsets' in its quest for emissions reduction (as a last resort), these should be from within the UK so that they fall within the UK's Scope 1 account and thus contribute to the UK's overall net zero carbon goal (which should not include overseas offsets).



PAS 2070

A PAS is a Publicly Available Specification, which is essentially the precursor to a British Standard or EN standard. A PAS defines good practice standards for a product, service or process.

PAS 2070 aims to define good practice for the assessment of the greenhouse gas emissions of a city. It builds on the GHG Protocol for Cities (GPC) to include a wider range of emissions sources and a slightly wider bundle of gases. It also offers two ways of accounting, one of which is equivalent to the GPC's three scopes ("direct plus supply chain"), and the other of which allows exclusion of of emissions from goods produced in the area that are then exported ("consumption-based emissions").

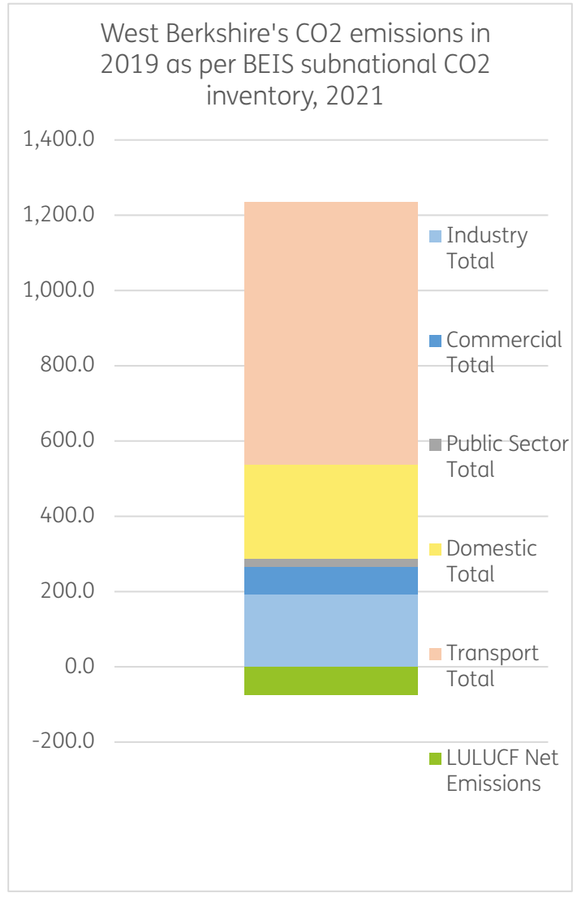
Just like the GPC, PAS2070 notes that if out-of-boundary offsets have been bought (whether by the municipality, businesses, organisations or residents) these should not form part of the total of a city's GHG account by deducting them from the total. Instead, such offsets should be accounted separately.

UK BEIS official subnational CO_2 inventories

The Department of Business, Energy and Industrial Strategy (BEIS) releases annual figures that break the UK's carbon emissions down to a local level[v]. This counts carbon dioxide only, not other greenhouse gases such as methane or nitrogen dioxide. It uses data from the National Atmospheric Emissions Inventory and national statistics on local area's energy consumption. It also exclude aviation, shipping and military transport because there is no real basis for how these would be allocated to local areas.

BEIS subnational CO_2 accounts include only local direct emissions (including from land use and chemical use as well as fuel use) and grid energy use. They are not broken down into 'scopes' but would essentially equate to Scope 1 + Scope 2 as they do not include emissions from the local area's consumption of goods produced elsewhere, except for grid electricity.

The BEIS figures are broken down into several sectors: industry, homes, commercial buildings, public buildings, transport, and land use/agriculture. Transport emissions are accounted for based on traffic flow data on mapped local roads, plus fuel use on inland waterways and trains (electrical trains are accounted for separately in the 'industry' sector).



Tyndall Centre local area carbon dioxide budgets (and SCATTER trajectories)

The Tyndall Centre is a climate change research organisation made up of several UK universities working to get climate science evidence into policy. It created a tool[vi] that produces municipal-level carbon budgets towards a 1.5˚c global climate pathway that are necessary and fair, taking into account each location's sectoral base by looking at its historical portion of the country's emissions.

These trajectories look at the UK's total CO_2 budget to 2050 if the UK is to pull its weight towards a relatively safe global climate pathway considering the equity principle of the Paris Agreement. This is calculated starting with a middle-range global carbon budget likely to limit global climate change to "well below" 2˚C, determined by the IPCC. The UK's CO_2 budget is derived from this global budget based on equity principles that account for our existing level of development and sectoral base, and the local budget is derived from the UK one. The resulting totals are split into five-yearly budgets. West Berkshire's carbon budgets are as follows, and would be used up in 7 years of current emissions levels:

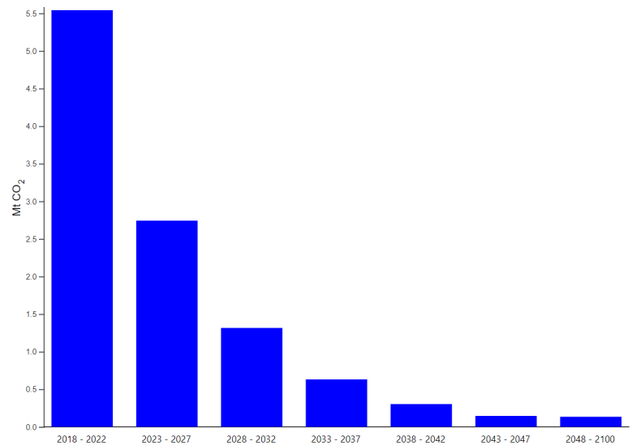


Figure 2: *Cumulative CO_2 emissions for budget period (based on Table 1) from 2018 to 2100 for West Berkshire*

This methodology only covers CO_2 occurring due to energy use (whether in transport, buildings, agriculture or other industries). It does not cover the other six greenhouse gases, or releases of CO_2 from non-energy-use sources such as waste. Other gases are left out because "a cumulative emission budget approach is not appropriate for all non-CO_2 greenhouse gases, as [they have] … differing atmospheric lifetimes and warming effects", with more uncertainties around them.

Tyndall Centre assumes that global forest levels do not change between 2020-2100, assuming afforestation in certain areas to counteract deforestation in others. It recommends that GHG removals achieved by further afforestation are monitored separately from this budget and used instead to compensate for unavoidable non-CO_2 emissions, such as agricultural methane. There is a parallel methodology named SCATTER[1] that builds on Tyndall carbon budgets to estimate these other gases.

Unlike the Committee on Climate Change carbon budgets, Tyndall declines to assume that carbon capture technologies appear in future, as this would risk over-estimating the budget. Offsetting is not part of the budget, because it is designed to reveal the actual CO_2 reductions needed locally.

[1] Setting City Area Targets and Trajectories for Emissions Reduction. https://scattercities.com/

How could carbon accounting methodologies be logically applied to an individual building and how would this impact the carbon footprint of the local area and UK?

There are two ways in which a new building is responsible for carbon emissions:

- Operational carbon: the emissions caused by running of the building, mostly due to energy use.
- Embodied carbon: the emissions that were caused in the production and transport of the materials and their assembly into the finished building. This can also include further embodied carbon emissions as parts of the building are maintained, replaced or eventually demolished.

The Global Greenhouse Gas Protocol 'three scopes' is helpful to conceptualise how the individual building would contribute to West Berkshire District's overall emissions.

Operational carbon emissions of a building are almost entirely Scope 1 (burning of fuel for energy in the building itself, such as a gas boiler) and Scope 2 (use of electricity from the grid, and use of any energy from a heat network if there is one present).

The embodied carbon would be entirely Scope 3 for the building. However, that embodied carbon will contribute to the Scope 1 and 2 emissions of West Berkshire and the UK, because of the transport of material to site, the use of energy to assemble the building, and potentially the production of the material itself. It may also include some Scope 3 if the material was produced overseas.

New development could also cause increased ongoing transport emissions. This would be part of West Berkshire's carbon account (scope 1). However, any increased transport carbon is not counted within the *building's* carbon account. Thus a 'net zero carbon building' does not have to have ensure that no transport carbon is emitted by its occupants or visitors. The same is generally true for the use of the term 'net zero carbon development' in planning policy and the built environment sector. Nevertheless, transport is by far the largest source of carbon emissions in West Berkshire and should be a priority for the local plan to address via the spatial strategy and separate policies.

To follow the carbon budgets for West Berkshire, emissions from transport and from buildings' energy use are the key areas that should be targeted by local plan policy as these are the main ways that a new building's carbon emissions would affect West Berkshire's carbon account.

‘Net zero carbon building’ definition in national building regulations and planning

Building Regulations Part L is the legal tool that controls buildings’ energy and carbon emissions. Most definitions of ‘net zero carbon buildings’ in local and government policy are based on Part L and the associated calculation methods.

Building Regulations Part L looks only at operational energy and carbon. (There is currently no regulatory method to consider embodied carbon, nor to hold new development responsible for the carbon emissions of the new occupants’ transport).

Part L only controls the ‘fixed’ energy uses of a building: space heating/ cooling, hot water, fixed lighting, ventilation, fans, pumps. It ignores plugin appliances, lifts, escalators, and so on (‘unregulated energy’). This means a ‘zero carbon’ building using Part L is not truly zero carbon.

To legally comply with Part L, a proposed development must use an energy and carbon calculation named the Standard Assessment Procedure (SAP, for homes) or the Simplified Buildings Energy Model (SBEM, for non-residential buildings). These calculations are submitted to building control.

SAP and SBEM set limits on the amount of energy a building uses per square metre per year, and the amount of carbon emissions that associated with the building’s energy use. These are the Target Emission Rate (TER) and Target Fabric Energy Efficiency (TFEE). The TFEE relates only to energy used for heating and cooling. The TER is the carbon emissions associated with all ‘regulated’ energy uses.

These limits are set by modelling a ‘notional building’ of the same size and shape as the proposed building, with a range of basic energy saving measures applied (insulation, glazing, air tightness, lighting efficiency, heating system efficiency and so on). Part L defines what these measures are. The proposed building must be designed so that it uses no more energy nor emits more carbon than the ‘notional building’ would. This means the targets vary between buildings, as heat losses are affected not only by the fabric but also the size and shape (more external surface and joins = more heat loss).

Part L is updated periodically, but not often: the current version has been in place since 2013. A new version “Part L 2021” comes into force for new proposals from June 2022, and a further version will arrive in 2025 (the Future Homes Standard). These uplifts come with changes to the ‘notional building’[vii]. In Part L 2021/22 this has some small improvements to fabric (insulation/glazing) and solar panels applied to the roof, but it still has a gas boiler. Together these will make the target emission rate about 31% lower than in Part L 2013. In Part L 2025 the notional building has a heat pump and much better fabric, but no solar panels. Together these measures will make the target emission rate about 75% lower in 2025 than in 2013.

SAP and SBEM methods are also periodically updated to reflect changes in the carbon emissions of grid electricity, the efficiency of various appliances or fittings such as boilers and hot water taps. Nevertheless, it is widely acknowledged that these methods are poor at predicting actual energy use (discussed overleaf) and their periodic updates tend to lag far behind the real-world changes to electricity grid carbon or changes to the efficiency of different heating technologies.

The Government’s consultation on the Future Homes Standard noted that their intent is that the Part L 2025 target emission rate will be low enough that new homes would not use a gas boiler. The 75% reduction on Part L 2013 would be essentially impossible to achieve in a home that has a gas boiler, and is likely to prompt the use of heat pumps in most homes (although some may be able to reach that emissions target using direct electric heating combined with extensive solar panels).

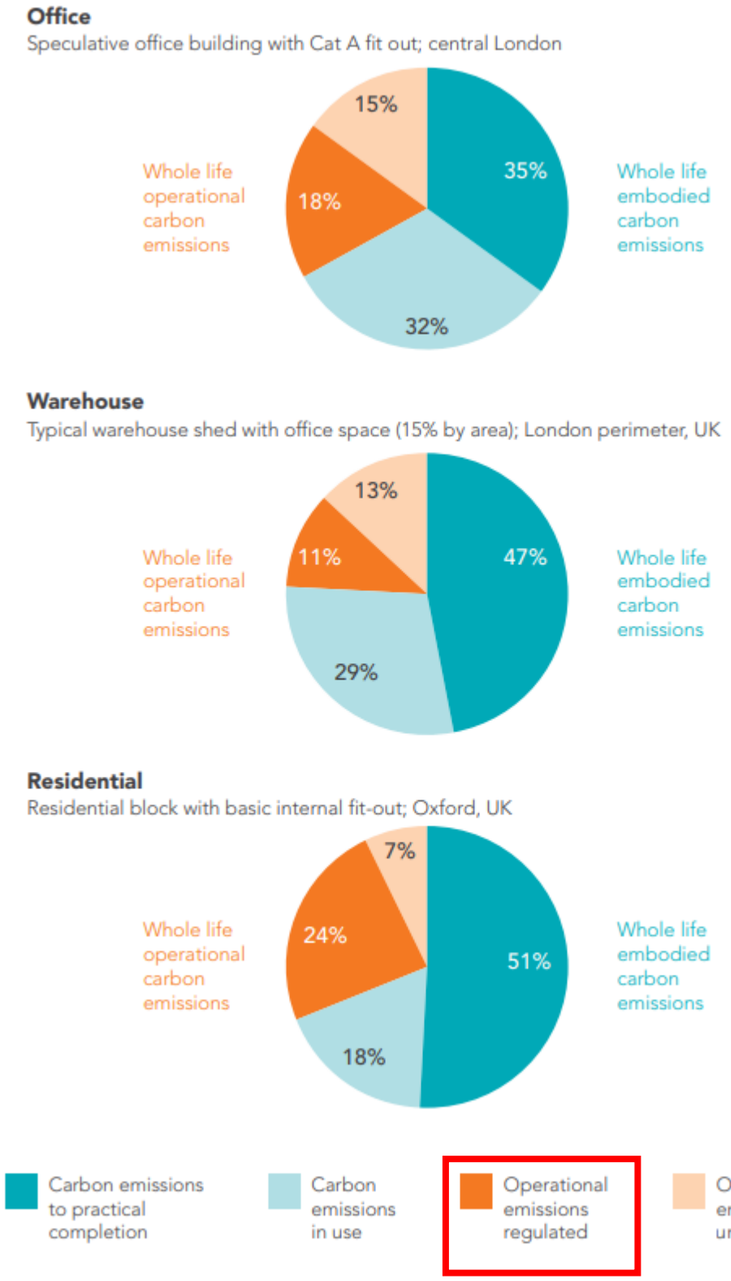


Figure 1 Diagram showing a breakdown of whole-life carbon emissions for four typical building types. Part L of building regulations only looks at the bright orange segments - and even then quite inaccurately. From: UKGBC.

‘Net zero carbon building’ – alternative definitions in the construction sector

Green construction experts have recently been developing new approaches to remedy the shortcomings of the national building regulations and legislation in defining and delivering net zero carbon buildings. The main weaknesses in building regulations identified by the sector are:

- Failure to account for ‘unregulated energy’ – that is, plugin appliances, lifts, escalators, and any other uses not covered by building regulations – which can be 50% of total operational energy use[viii]
- Poor accuracy at predicting buildings’ actual energy use (the ‘energy performance gap’), often incorrect by a factor of 200-300%
- Frequently outdated carbon emissions factors for energy, especially electricity
- Failure to sufficiently incentivise energy-efficient building design, due to quite loose standards for airtightness and not setting absolute targets in kWh/m2 that all buildings of a certain type must achieve.
- Failure to address embodied carbon (the carbon that was emitted to produce building materials, transport them to site, and assemble them into a finished building).

For all of the reasons above, a ‘net zero carbon building’ calculated by Part L SAP will in fact be very far from having no carbon impact in operation[ix], before even considering its embodied carbon impacts.

The industry has therefore begun to collaboratively develop new definitions that address not only the end result of net zero carbon, but also inform the design and energy procurement measures that should sensibly be used to achieve it, such as energy efficiency targets and embodied carbon targets.

UK Green Building Council (UKGBC) Framework Definition of Net Zero Carbon, 2019

The UKGBC definition[x] of net zero carbon buildings includes twin tracks: operational and embodied. These twin tracks for net zero carbon buildings can be treated separately. However, buildings seeking ‘net zero carbon construction’ should also aim to fulfil the operational track too.

- Net zero carbon in construction is: “When the amount of carbon emission associated with a building’s product and construction stages up to practical completion is zero or negative, through the use of offsets or the net export of on-site renewable energy.”
- Net zero carbon in operation is: ““When the amount of carbon emissions associated with the building’s operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset.”

UKGBC does not require the building to hit any specific targets for space heating, operational energy use, or embodied carbon , although it encourages reductions to be prioritised before offsetting.

UKGBC’s separate energy procurement guidance[xi] confirms that off-site renewable energy does not have to be via a long-term power purchase agreement, but can be a green tariff so long as that itfulfils certain criteria on ‘additionality’ (so the purchase of the energy brings forward additional renewable energy generation capacity, not just buying up existing renewables present in the grid).The guidance notes that at the time of writing (2021) only three such tariffs existed in the UK. It also lays out that::

- Fossil fuel must not be the primary energy source for heating, hot water and cooking
- All new builds ‘ energy systems should be compatible with being renewably powered

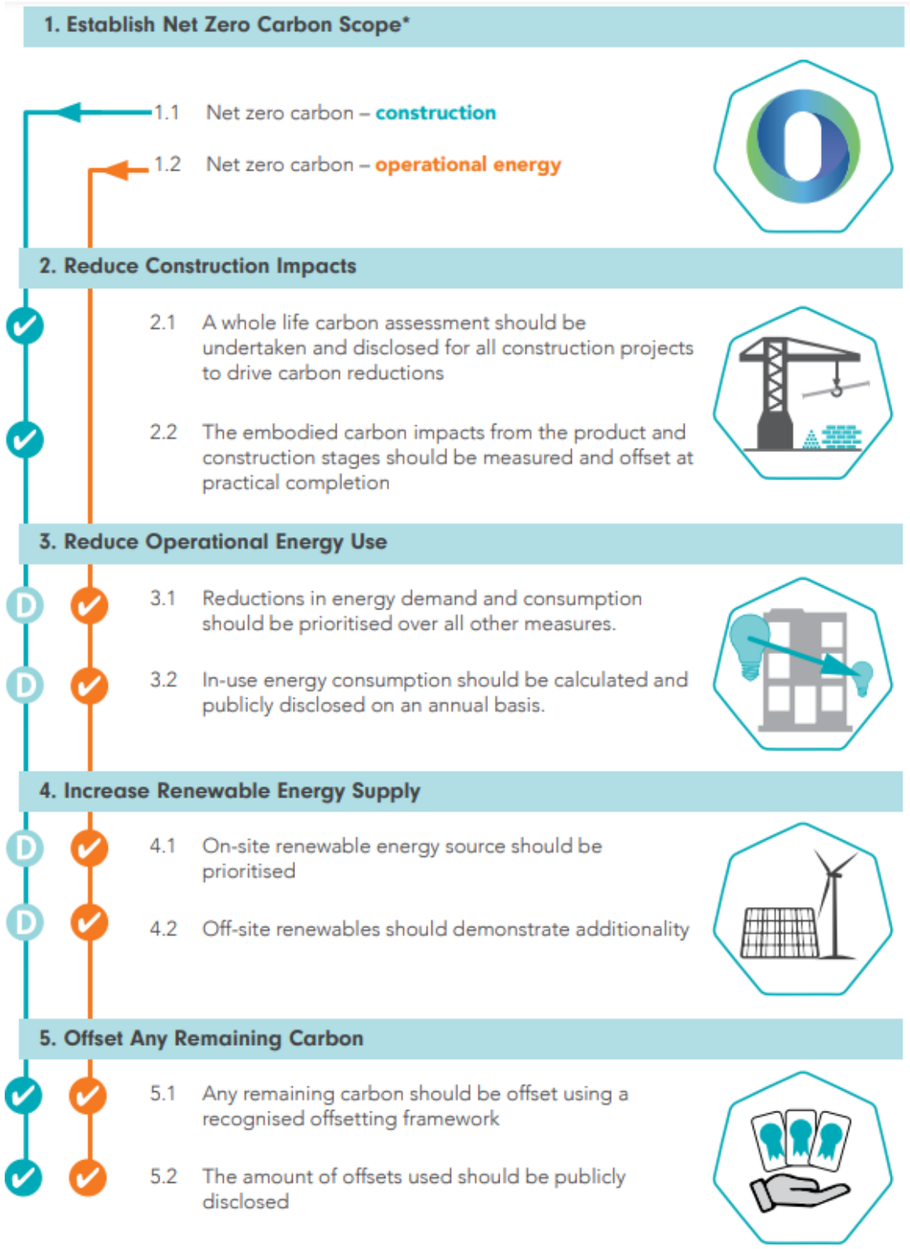


Figure 2 UKGBC Net Zero Carbon Buildings Framework Definition - twin track diagram.

London Energy Transformation Initiative (LETI) Net Zero Operational Carbon

LETI is a coalition of industry-leading green building experts, architects and surveyors.

Its definition[xii] is that the building achieves a zero carbon 'balance' in its energy use across each year. That means that for each unit of energy it consumes from the grid, it exports at least one unit of zero-carbon energy produced by the building itself (through solar panels). Alternatively, the building's energy demands can be entirely met by additional renewable energy supply from off-site.

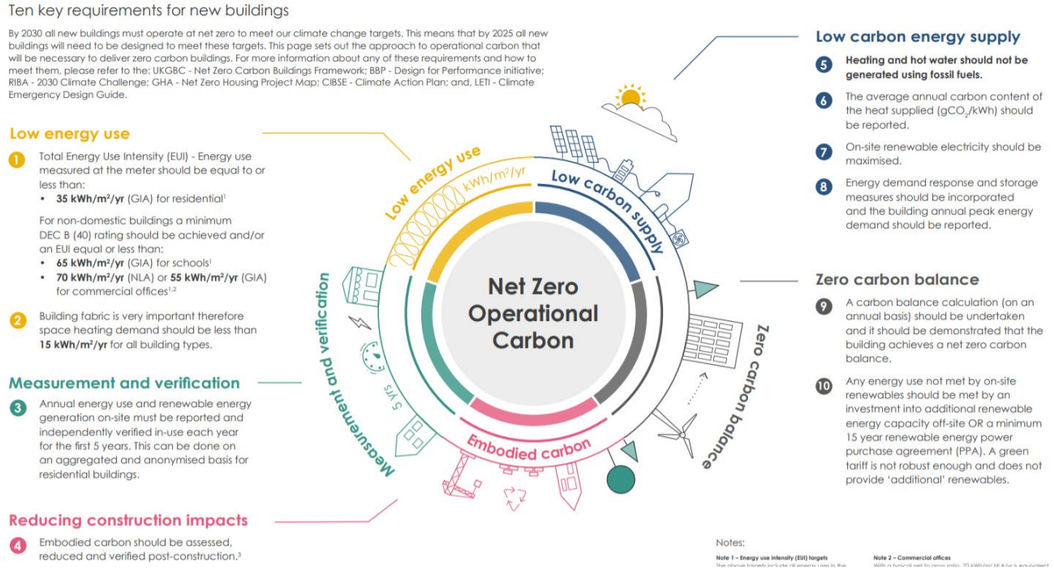
LETI's definition also requires that the building fulfil the following targets:

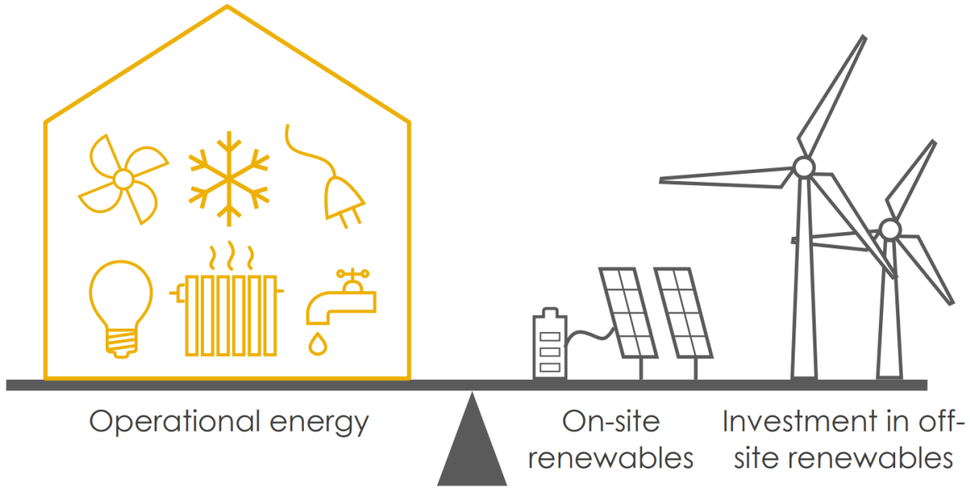
- Space heat demand: 15kWh/m_2/year for all building types.
- Total energy use intensity, including unregulated: 35kWh/m_2/year in homes, 65kWh/m_2/year in schools, or 70kWh/m2/year in commercial offices
    - These targets are designed to ensure the use of heat pumps, as these have a ~300% efficiency which translates a 15kWh space heat demand to a 5kWh energy use.
- All space heat and energy demand targets must be fulfilled using an accurate predictive energy modelling methodology (not the building regulations methods SAP or SBEM[xiii])
- Heating and hot water not to be generated using fossil fuels
- Onsite renewable energy should be maximised

Other sustainable construction frameworks such as the RIBA Climate Challenge[xiv] have adopted similar targets for energy use intensity at similar levels, although not space heating.

LETI also recommends annual reporting of energy use and renewable energy generation on site for 5 years to verify the net zero carbon status, and that embodied carbon should be separately assessed and reported. It offers separate targets[xv] for embodied carbon, but does not expect the embodied carbon to be offset – rather, reduced at source as far as possible.

We note that although UKGBC has not updated its definition (discussed in the previous section), it has now endorsed the LETI definition of net zero carbon[xvi].





Net zero operational balance

Figure 3 Diagram of LETI net zero operational balance. From LETI Climate Emergency Design Guide.

Why must West Berkshire's Local Plan take action towards 'net zero carbon'?

National and international commitments to address climate crisis

The UK is a signatory to the international Paris Agreement 2015, brokered via the United Nations. This commits all signatories to ensure global average temperatures rise is limited to 2˚Celsius on pre-industrial levels, and to pursue a limit of 1.5˚C. This would require very fast and drastic cuts to global carbon emissions, as there is a limited 'carbon budget'[xvii] to be emitted before the 1.5C and 2C limits will be reached – and a rise of 1 ˚C has already happened. If the 1.5˚C or 2˚C limits are breached, climate change impacts will be devastating worldwide, and the word is currently on track to breach 3˚C by the end of the century[xviii].

The Paris Agreement also commits that the extent of each country's carbon reductions is related to wealth and technological ability. As a rich and technologically advanced country, the UK is responsible for faster and deeper cuts. Given the speed and scale of carbon cuts needed[xix] in existing buildings, transport and other energy use, we cannot afford for new buildings to add to the burden.

In 2019 the UK Government declared a climate emergency and updated the legally binding carbon reduction goal for 2050 enshrined in the Climate Change Act 2008. The new goal is to achieve a net zero carbon UK by 2050, rather than the original goal of an 80% reduction on the carbon emissions of 1990. The Act also comes with interim 5-yearly carbon budgets that are devised by the independent Committee on Climate Change (CCC) and then passed into law by Parliament.

The latest five-yearly carbon budgets[xx] mean that compared to the 1990 baseline, the UK must achieve a 78% reduction by 2035 (this would be roughly equivalent to a 65% reduction compared to current levels, which would require an average drop of about 4.3% a year[2]).

The carbon budgets also show that the sectors of buildings, energy and land transport should all achieve steep and rapid reductions and reach zero or near-zero emissions on their own terms. The Committee on Climate Change explains that "a little more or a little less may be achieved in any area, or alternative low carbon options could be used, but the overall level of ambition and delivery must match" the proposed carbon budgets. Given that all sectors face a huge challenge in achieving their own required reductions, this means there is very little room to offset emissions in one sector by reductions or removals in another sector (for example, even highly ambitious levels of tree planting would barely be enough to offset unavoidable emissions from agriculture – see figure shown here - therefore the buildings and energy sectors should not rely on tree planting to make up for insufficient reductions in their own energy use and emissions).

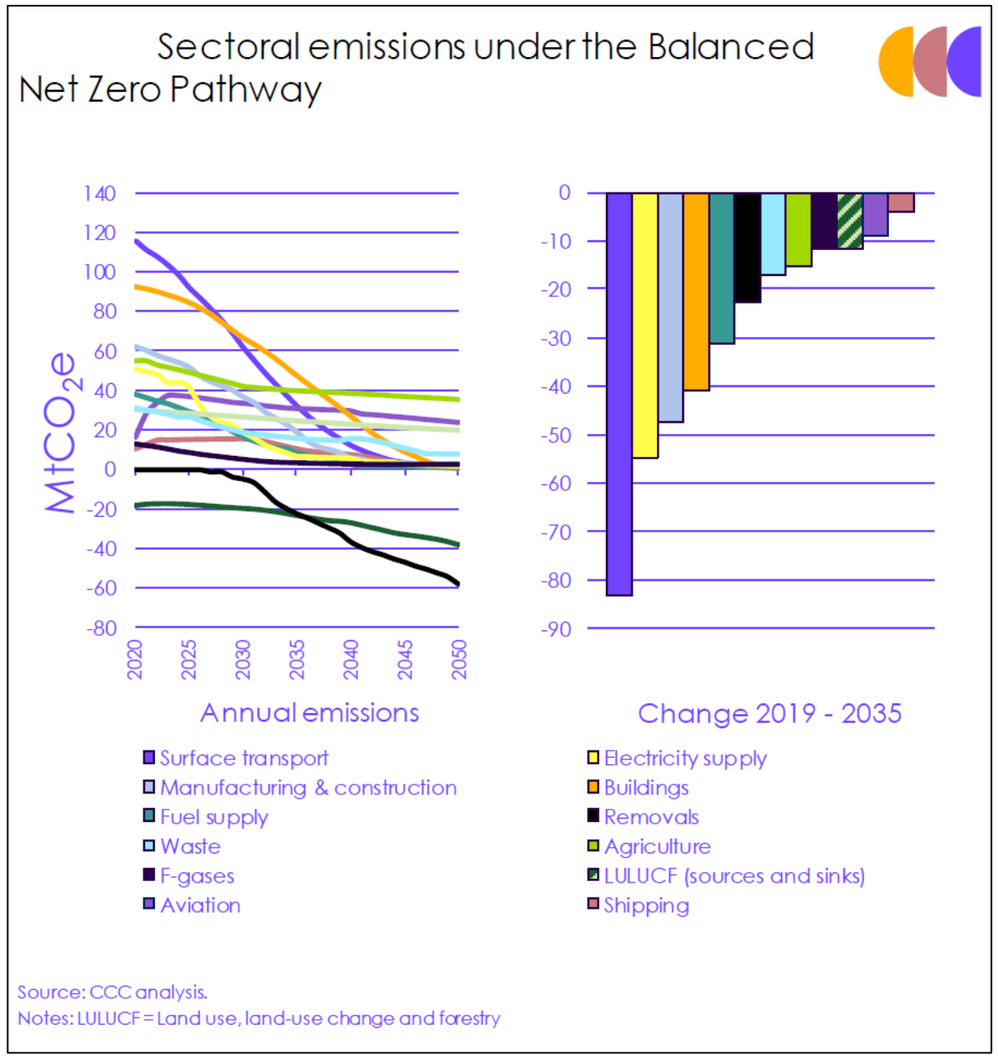


Figure 4 Committee on Climate Change Diagram showing how the carbon emissions of each sector must fall to achieve the 'balanced' pathway towards net zero carbon in 2050 and meet carbon budgets. From Committee on Climate Change (2020), *The Sixth Carbon Budget: The UK's path to net zero.*

[2] For context, the UK's carbon emissions fell by 9.5% in 2020 due to the COVID pandemic but have since rebounded by about half that figure in 2021, while global carbon emissions fell by about 5% in 2020 but have now rebounded to even higher levels than before COVID.

The UK's five-yearly carbon budgets also come with **progress reports** detailing a **combination of actions necessary to stay within the budgets**[3]. These include wide-reaching and ambitious changes to buildings (new and existing), the energy system and transport, as well as agriculture/forestry, industry and waste. Most relevant to local planning are:

- **No new homes connected to the gas grid from 2025** at the latest[xxi] (and ideally be zero carbon[xxii]), instead using low-carbon heat such as heat pumps or gas-free heat networks
- **New homes to have a very low space heat demand of only 15-20kWh/m²/year** (a 60-70% reduction on a new home that just complies with current building regulations[xxiii])
- **Accelerate and scale-up rollout of low carbon heat to existing buildings**, with 3.3. million heat pumps installed in existing homes by 2030, expansion of low carbon heat networks in the 2020s, and a limited role for hydrogen in the existing gas grid in some locations after 2030
- **End the installation of any fossil fuel boilers by 2033 for all existing buildings** including homes, commercial and public buildings, unless in hydrogen gas grid areas
- **Rapid rollout of insulation and other energy efficiency measures to existing buildings**, so that all existing homes for sale from 2028 have EPC rating of C or better, and 15 million homes to receive insulation to their walls, floors or roofs by 2050, to include by 2025:
    - Loft insulations to reach 700,000 per year (from current level of just 27,000/year)
    - Cavity wall insulations to reach 200,000/year (current level: 41,000/year)
    - Solid wall insulations to reach 250,000/year (current level: 11,000/year)
- **Construction materials to be used more efficiently and switching to low carbon materials** (e.g. timber and low-carbon cement) – although this has only a very small role overall
- **Fully decarbonise the electricity grid by 2035**, by:
    - **Scaling-up renewable electricity** to represent 80% of generation by 2050 – primarily wind power but also solar, with much of the wind power being offshore – in step with greater electricity demand as buildings and transport switch away from fossil fuel
    - **Add energy storage to the system**, including batteries, hydropower, and hydrogen
    - **Maintain or restore the existing nuclear power capacity** by building new capacity in the 2030s to replace existing plants that are being retired in the 2020s
- **Reduction in travel mileage by car**, and phase out of new fossil fuel cars and vans from 2032 in favour of fully electric vehicles – and relatedly, decisions on investment in roads should be contingent on analysis justifying how they will contribute to the UK's pathway to net zero and not increase emissions[xxiv]
- **Increase woodland cover to 18% of UK land**, up from 13% today, and restore peatlands.

The wider necessary changes are also not enforced nationally through regulation or other means such as a carbon tax – at least not swiftly enough. Neither current nor incoming building regulations (2013 and 2021 respectively) will achieve most of the measures above. Further building regulations are expected to deliver gas-free new homes from 2025 through the Future Homes Standard, but even that will not deliver buildings are net zero carbon from first operation. None of the above include any regulation around low-carbon materials.

[3] It is important to note that the CCC carbon budgets, while challenging, are really the minimum we must do to play our fair role in preventing catastrophic climate change. Other expert analysis of the UK's true 'fair share' of the global carbon budget has found[3] that the carbon budgets should be about half the size of the budgets that the CCC permits. These experts (at the Tyndall Centre) argue that if the UK does not stick to that fair share, it would be failing in its commitment to the Paris Agreement. These experts (at the Tyndall Centre). Beyond the 'fair share' question, the CCC budgets also include future carbon removals through technologies that do not yet exist, and also 'carbon allowances' through emissions trading schemes. Tyndall Centre experts find it wiser to exclude both of these in case the technologies fail to emerge and because the emissions trading schemes are based in economy, not the science of global carbon budgets.

West Berkshire District's role and commitments

While the UK's carbon budget is derived from the global carbon budget, expert analysis by the Tyndall Centre has also revealed a fair carbon budget for each UK local authority area to pull its their weight towards fulfilling the international Paris Agreement to limit climate change to 2°C. It shows[xxv] that if West Berkshire's emissions continue at the 2017 rate, it will exhaust its whole 100-year carbon budget by 2027. To avoid exceeding the carbon budget, West Berkshire's emissions would need to fall as follows starting from the 2018 baseline:

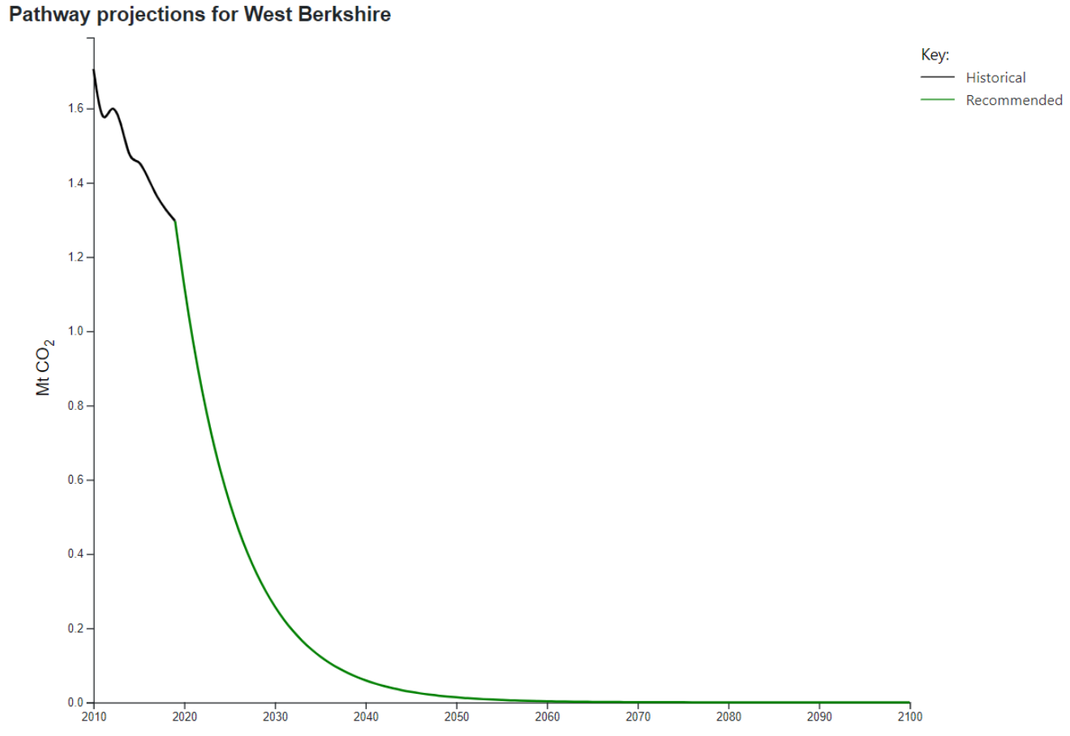


Figure 5 Emissions reduction pathway for energy-only CO_2 emissions to fulfil carbon budgets for West Berkshire from 2018 to 2100 compatible with the Paris Agreement. Tyndall Centre, 2022.

Recognising the global and national urgency of the climate crisis, West Berkshire Council declared a climate emergency in 2019. West Berkshire's 2020 Draft Environment Strategy[xxvi] also sets objectives to achieve a carbon neutral district by 2030, responsible economic growth in line with this aspiration of carbon neutrality, and to enable every resident, business and group to plan their part towards carbon neutrality. Clearly the challenge of transitioning new buildings, existing buildings, transport and the wider energy system to carbon neutrality will not be possible without the support of the local plan.

The Strategy is underpinned by five key themes, to which t District intends to assign a carbon budget:

1. Sustainable transport
2. Buildings
3. Energy
4. Waste and resource efficiency
5. Protecting and enhancing our natural environment.

By shaping what kind of development happens and where, the local plan can help to realise the carbon budgets that West Berkshire eventually sets for these themes, especially transport, buildings and energy.

Achieving a safe future climate would also help to deliver other strategic objectives in West Berkshire's Environment Strategy, including healthy communities and resilience to climate change. A local plan that achieves dramatic carbon reductions will also help to avoid contributing to the risk of West Berkshire's citizens being impacted by financial and health-related harms that would come with climate change. The Committee on Climate Change[xxvii,xxviii] has found (and UK central government has recognised[xxix]) that the changing climate brings risks that the UK population's health, wellbeing and economy would be harmed by climate change in coming decades all of which could affect West Berkshire's citizens. These include:

- Overheating – deaths, health-related productivity losses, additional energy cost for cooling
- Flood – danger to life, health and cost of damage to property and infrastructure
- Drought – perhaps risking the need for expensive solutions to maintain public water supplies
- Future contagious epidemics – ticks are becoming more abundant, and malarial mosquitoes may begin survive in the UK due to warmer winters
- Crop losses or soil damage via droughts, floods, heat and wildfires – impacting jobs in our fragile farming sector, and potentially the availability and affordability of healthy food

All of the above are in addition to the impact on ecology/wildlife of the UK whereby freshwater ecosystems are already being harmed by over-abstraction of water[xxx], and whereby native UK wildlife may struggle to compete with invasive species that move in as our climate becomes milder.

If the local plan does not take all possible steps within its grasp to achieve rapid and drastic carbon reductions, it would arguably be failing to deliver not just on its carbon reduction duties, but also its duties to protect the natural environment and the wellbeing of its population. Those duties are explored next.

Legal duties of the local plan to address carbon reductions in the local area and the UK as a whole

The local plan's impetus to facilitate dramatic carbon reductions and a net zero carbon future is not only a political choice and a scientific need, but also a legal duty.

This section will explain the key pieces of legislation and national government policy that impose this duty, providing context for the level of ambitious carbon reduction that the policies should pursue.

Planning and Compulsory Purchase Act 2004

This is the key foundational legislation that enshrines the local plan's duty to act on climate change. Section 19, paragraph 1a, states that:

> "Development plan documents must (taken as a whole) include policies designed to secure that the development and use of land in the local planning authority's area **contribute to the mitigation of, and adaptation to, climate change**".

Mitigation of climate change means reduction in the impact of human activity on the climate system[xxxi], primarily by reducing the level of greenhouse gas in the atmosphere[xxxii],[xxxiii]. This has two parts: reduction of carbon emissions, and action to increase the sequestration of carbon (removal and storage of carbon by trees, grassland, other green infrastructure, or future technologies).

As outlined previously, if a 2°C global limit is breached, we will hit 'tipping points' where various natural systems will be damaged to the point where they begin to release even more greenhouse gases and result in runaway climate change that may be unmitigable after that point.

Therefore to truly "contribute to the mitigation of climate change", the local plan's policies should facilitate the required carbon budget that would be compatible with staying below a 2°C future. As previously noted, this essentially means there is no room for new development to add to the overall carbon emissions of the UK (given the existing vast challenge of reducing existing emissions). The RTPI and TCPA assert also that "This means that Annual Monitoring Reports should contain assessments of carbon performance against the carbon budget regime set out in the Climate Change Act".

National Planning Policy Framework (NPPF) 2021

This document[xxxiv] is the framework by which the whole planning system is guided, and by which the soundness of local plans (and planning appeals) is judged by the planning inspectorate. Its following paragraphs reaffirm the duty of local plans (and whole planning system) to mitigate climate change:

- **152:** "The **planning system should support the transition to a low carbon future** … shape places in ways that **contribute to radical reductions in greenhouse gas** emissions … [and] encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure".
- **153:** "Plans should **take a proactive approach to mitigating** and adapting to climate change … In line with the objectives and provisions of the Climate Change Act 2008".
- **154:** "New development should be planned for in ways that … help to reduce greenhouse gas emissions, such as through its location, orientation and design".
- **155:** "To help **increase the use and supply of renewable and low carbon energy** and heat, plans should … **provide a positive strategy for energy from these sources** … consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development".

To comply with the above imperative for carbon reductions 'in line with the Climate Change Act' would have to mean taking action to achieve the intermediate 5-yearly carbon budgets that the Committee on Climate Change devises and parliament legislates, as well as the eventual net zero goal in 2050.

Planning Practice Guidance (PPG)

The National Planning Practice Guidance is an online resource that adds further context and interpretation to the NPPF. It is separated into a series of topics, including climate change, renewable energy, planning obligations and viability. It makes several points about the duty and expectation for local plans to address carbon reductions.

Its climate change section[xxxv] confirms that:

> "Addressing **climate change is one of the core land use planning principles** which the National Planning Policy Framework expects to **underpin both plan-making and decision-taking**. To be found sound, Local Plans will need to reflect this principle and enable the delivery of sustainable development in accordance with the policies in the National Planning Policy Framework. These include the **requirements for local authorities to adopt proactive strategies to mitigate and adapt to climate change in line with the … Climate Change Act**".

This section reiterates local plans' climate mitigation duty per the Planning & Compulsory Purchase Act 2004, and that plan makers should be aware of the Climate Change Act goal and carbon budgets.

The section on renewable and low carbon energy confirms that:

- All communities have a responsibility to help increase the use and supply of green energy, albeit not overriding other environmental protections
- Local planning authorities hold decisions over renewable energy development of 50 megawatts or less, and may soon hold decisions over onshore wind over 50MW[xxxvi]. (*Note: As of 2020, energy storage of over 50MW is now the domain of the local planning authority, except pumped hydro[xxxvii]).

Potential tension with other duties

These carbon reduction duties are often in tension with the local plan's other duties – e.g. to enable economic growth and delivery of government-mandated housing targets. It is often assumed or argued that these other objectives could be inhibited if the carbon reduction provisions are so onerous as to present technical challenges or put at risk the developers' anticipated minimum profit margin of 15-20%.

Nevertheless, the NPPF explicitly states that the goal of the planning system is '*sustainable* development' which it defines as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (as per the United Nations definition).

Given that the continued existence of human life on Earth is at risk if the planet exceeds 2C of climate change (as previously discussed) – or at least a good quality of life – there is a strong argument to make that carbon emissions should be treated as the fundamental bottom line for what we can define as 'sustainable' development.

How can West Berkshire's local plan take action towards achieving net zero carbon ?

The local plan can minimise emissions from transport by planning for growth in a way that will actively reduce the need to drive, increase public transport viability, and reserve land for public transport or walking/cycling. This is crucial in West Berkshire where transport emits 60% of the total CO_2 [xxxviii]. However, this document is produced to support decision-making in a local plan review at a stage where there is not much scope to influence the spatial strategy, therefore we here focus on buildings.

The powers afforded to the local plan to set policy requirements towards net zero carbon new development[4] flow principally from the Planning and Energy Act 2008. Further direction how these powers can and should be used is given in the National Planning Policy Framework (NPPF) and National Planning Practice Guidance (PPG). Additionally, formal ministerial statements and other official government policies can also affect interpretation of how those powers should be wielded.

Planning and Energy Act 2008

The Planning and Energy Act 2008 grants Local Planning Authorities the power to:

- require "energy efficiency standards that exceed the energy requirements of building regulations", and
- set "reasonable requirements" for "a proportion of energy used in development in their area" to be from renewable or low-carbon sources "in the locality of the development".

Policies using these powers "must not be inconsistent with relevant national policies"; that is, those relating to energy from renewable sources, low carbon energy, or furthering energy efficiency.

The Act defines "energy efficiency requirements" as standards that are 'set out or referred to in regulations made by the [Secretary of State]' or 'set out or endorsed in national policies or guidance issued by the [Secretary of State']. This is also repeated in National Planning Policy Framework paragraph 154. The only 'energy efficiency standard' currently clearly set out or endorsed in this way is SAP/SBEM, the energy and carbon calculation methodology used for Part L of the building regulations.

This is likely to mean that any energy efficiency requirements must use SAP/SBEM calculations and have the same scope: covering only regulated energy (heating, hot water, fixed lighting, ventilation).

The act does not define 'energy used in their area'. Therefore it is probable that requirements for renewable energy could cover a proportion of the new building's *entire* energy use, not just the share that is 'regulated' by Part L and calculated using SAP/SBEM.

Most definitions and requirements for 'net zero carbon buildings' in local plans are based on Part L and the associated calculation methods (although some make a separate requirement for renewable energy). This means they are subject to the weaknesses that befall Part L in terms of inaccurate calculations of energy and carbon, and a lack of incentive to create an inherently thermally efficient building shape (see previous section on national and alternative definitions of zero carbon).

Town and Country Planning Act 1990

The key parts of this Act relevant to carbon reductions are:

- Section 106[xxxix], planning obligations – this enables the local plan to require payments for the purpose of making an otherwise unacceptable development into an acceptable one. Section 106 obligations are expected to be reasonable, proportional to the development, necessary to make the development acceptable. This has been used in several precedent local plans to require for carbon offsetting payments from new development.

- Section 61[xl] enables the creation of a Local Development Order. This is a legal tool used by local government to achieve specific identified objectives in the local plan by permitting certain types of development that would otherwise need to go through the planning permission process. These have sometimes been used to bring forward renewable energy or addition of low-carbon heat to existing buildings.

Infrastructure Act 2015

Section 37 of this Act[xli] included provision for the Building Regulations to be amended to require provision for off-site carbon abatement measures. This was in relation to the erstwhile anticipation of the national net zero carbon building standard which was scrapped before coming into force. Nevertheless, this is where the concept of 'allowable solutions' to carbon emissions originated, in terms of allowing buildings to be legally accepted as 'net zero carbon' by delivering measures off-site to reduce carbon emissions or increase carbon sequestration, which could include paying others to perform those measures or purchasing carbon offset certificates through a national scheme.

Although the national net zero carbon buildings plan was scrapped and the government has not yet proceeded to enact the national 'allowable solutions' scheme envisioned by the Act, this is still the concept taken echoed in many subsequent local plans in the form of requirements for carbon offsetting either by payments or by direct delivery of projects that will reduce carbon emissions.

National Planning Policy Framework (2021 update)

This guidance document, updated in 2021[xlii], is the framework by which the preparation of local plans is expected to be guided, and by which their soundness is judged by the planning inspectorate.

It expresses four key tests of soundness (all of which appear relevant to carbon):

- Plan should be positively prepared (responding to needs; delivering sustainable development)
- Plan should be justified (having considered alternatives and be based on evidence)
- Plan should be effective and deliverable over the plan period
- Plan should be consistent with national policy (again delivering sustainable development and being in accordance with other statements of national planning policy, where relevant).

[4] Please note that this document focuses on the carbon impact of **buildings**. Beyond this, new development will often also have carbon impacts from the transport induced in the lifestyles of its residents, workers or visitors. This transport carbon would be part of West Berkshire's overall carbon emissions – and would therefore need to be reduced to zero in order to hit the national goal of net zero carbon by 2050 (or 2030 for the local target. Nevertheless the transport carbon is not considered part of the carbon that belongs to the building itself, therefore it is not part of the definition of 'net zero carbon buildings' for which we now explore the legal powers to regulate through planning. Transport and standalone renewable energy are briefly considered in the section entitled "beyond the building".

It reaffirms the ways in which the local plan (and whole planning system) can mitigate climate change, including that:

- Paragraph 154: "New development should be planned for in ways that … can help to reduce greenhouse gas emissions, such as through its location, orientation and design"
- Paragraph 155: "To help increase the use and supply of renewable and low carbon energy and heat, plans should … provide a positive strategy for energy from these sources … [and] consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development".
- Paragraph 158: "When determining planning applications for renewable and low carbon development, local planning authorities should not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions".
- Paragraph 190: "Plans should set out a positive strategy for the conservation and enjoyment of the historic environment, including heritage assets most at risk through neglect, decay or other threats … tak[ing] into account the desirability of sustaining [them] … and putting them to viable uses consistent with their conservation" – This may support a sensitive but permissive approach towards energy retrofit, where this keeps a heritage building fit for long term use.

The NPPF also includes points which could be taken to constrain the extent to which a local plan can require carbon and energy improvements in development, including:

- Paragraph 154b: "Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards."
- Paragraph 157a allows that new development should comply with local requirements for decentralised energy supply unless it is demonstrated to be not feasible or viable.

At present, the relevant 'national technical standards' would largely mean the building regulations Part L uplifts in 2021 and 2025, and perhaps also the electric vehicle charging requirements that are being introduced through the new Part S of building regulations.

Planning Practice Guidance (PPG)

The PPG section on Climate Change[xliii] reiterates several powers relevant to carbon, and also constraints on how those should be exercised. It highlights several opportunities including:

- Reducing the need for travel and providing sustainable transport
- Providing opportunities for renewable and low carbon energy and decentralised energy
- Promoting low-carbon design approaches to reduce energy consumption in new buildings.

It confirms that appropriate mitigation measures in plan-making can be identified by:

- Using available information on the local area's carbon emissions [such as BEIS subnational carbon inventories referenced elsewhere in this appendix]
- Evaluating future emissions from different emissions sources, taking into account probable trends set in national legislation, and a range of development scenarios
- Testing the carbon impact of different spatial options, as emissions will be affected by the distribution and design of new development and each site's potential to be serviced by sustainable transport
- Noting that different sectors have different opportunities for carbon reductions, noting that "In more energy intensive sectors, energy efficiency and generation of renewable energy can make a significant contribution to emissions reduction".

For existing buildings, the PPG notes that many carbon-reducing measures may not require planning permission, but for those that do, "local planning authorities should ensure any advice to developers is co-ordinated to ensure consistency between energy, design and heritage matters."

It reiterates the Planning & Energy Act powers that the local plan can set requirements for new buildings' energy/carbon performance requirements higher than those of national building regulations to a certain extent:

- For homes: up to the equivalent of Level 4 of the Code for Sustainable Homes
    - [However, we note that this limit is probably longer be applicable as it has been exceeded by several adopted precedent local plans, and will be universally exceeded by the national building regulations from 2022.]
- For non-residential buildings, the plan is not restricted or limited in setting energy performance standards above the building regulations
- Requirements for new buildings' sustainability are expected to be set in a way consistent with the government's zero carbon buildings policy … adopt nationally described standards … and be … based on robust and credible evidence and pay careful attention to viability".

The PPG section on renewable and low carbon energy confirms that:

- Local planning authorities hold decisions on renewable energy development of ≤50MW [*the RTPI notes that onshore wind over 50MW is also now a local planning decision[xliv]]
- Neighbourhood Development Orders and Community Right to Build Orders can be used to grant planning permission for renewable energy development
- There are no concrete rules about how to identify suitable areas for renewable energy, but should consider the requirements of the technology and cumulative environmental impacts, and could use tools such as landscape character assessment to inform this
- Identifying suitable areas gives greater certainty to where renewable energy will be permitted – and wind turbine development should only be approved in such identified suitable areas.

The PPG section on viability confirms that:

- Plans should set out the contributions expected from a new development, including for infrastructure, informed by evidence of need and viability-tested alongside other policies
- The role of viability assessment is mainly at plan-making stage, and should not compromise sustainable development but should ensure that policies are realistic and deliverable
- Once the plan is made, the price paid for land is not considered a valid reason for failing to comply with the relevant policies of that adopted plan.

Other government communications that have been interpreted to affect how local plans can wield powers

Written Ministerial Statement, 2015

In 2015, the national government announced that it would update building regulations to deliver the same degree of on-site carbon emissions reduction that the withdrawn Code for Sustainable Homes Level 4 would have delivered (a 19% reduction on Part L 2013). Within this statement it noted that when those changes were made, it would also remove local planning authorities' Energy and Planning Act powers to require higher energy standards. The statement said that in the meantime, local plans should therefore only require a ≤19% reduction on the emissions standard set by Part L 2013, and could not require any other higher standards in construction, layouts or performance.

This, along with the tension between the duties around carbon, viability and housing delivery, has resulted in many local plans adopting 'zero carbon' or 'low carbon' policies that stop far short of requiring new developments to achieve a truly neutral climate impact to the extent that would have been technically feasible.

However, these changes to building regulations and the Energy and Planning Act were in fact never implemented. As a result, the 2015 statement appears not to carry much weight with the planning inspectorate, given that there has been successful adoption of several local plans whose policies go well beyond the supposed limit of a 19% reduction on Part L 2013 (London 35%; Reading 35%; Milton Keynes 39%; Oxford 40%). The London Plan (among others) also requires achievement of other standards relating to 'construction, internal layout or performance' for example the Home Quality Mark or BREEAM, also contrary to the 2015 ministerial statement. The local plans in question were supported by evidence bases that showed how these greater reductions were both technically feasible and financially viable. Subsequently, developers in these locations have for many years proven able to consistently comply with these higher standards.

Future Homes Standard Consultation Response, 2021

This document is the government's response to public consultation on the new Future Homes Standard, which will update building regulations in 2025 with tighter standards in energy and carbon. The document also lays out an interim uplift in force in 2022.

The government had asked whether it should now enact the changes to Planning and Energy Act that would remove local planning authorities' power to require higher standards of energy efficiency and renewable energy, as per the 2015 Written Ministerial Statement. 86% of responses said no.

In the response document, the government confirms that "in the immediate term" it will not enact those changes and that local plans therefore retain their existing powers. The document refers to the previous "expectation" laid out in the 2015 Ministerial Statement (that local plans enforce no more than 19% carbon reduction on Part L 2013), but does not state that this limit or any other limit still applies, and recognises that many local plans go beyond this limit.

The document also lays out an indicative specification for the 'notional building' for the 2021 and 2025 Part L. This is the imaginary building which includes a range of energy efficiency and renewable energy measures, whose carbon emissions rate the actual proposed building must not exceed. It includes several new measures not previously included in the 2013 notional building, including:

Interim uplift 2021/22:	Future Homes Standard 2025
Minor fabric improvements to insulation ability (roof, windows, doors) Solar PV panels covering an area equivalent to 40% of the building's ground floor area Wastewater heat recovery system Still has gas boiler as basic assumption	Major fabric improvements to insulation ability (walls, roof, floors, windows, doors) Low carbon heat pump Solar panels not part of notional building spec Wastewater heat recovery not part of notional building spec
Overall: 31% reduced target emissions rate compared to today	Overall: 75% reduced target emissions rate compared to today (set low enough to ensure no gas boilers

'Planning For the Future' White Paper 2020

In 2020 the government ran a public consultation on a white paper setting out various changes to the planning system. At the time of writing (April 2022) no response to this consultation has been released, so the direction of reforms and policy is not yet clear. The white paper lays out various intents relevant to energy and carbon policy for new and existing buildings. These include:

- **Easier planning permission for energy efficiency and renewable energy measures in existing buildings:** The government commits to update the planning framework for listed buildings and conservation areas to better enable "sympathetic changes to support their continued use and address climate change" because "We particularly want to see more historical buildings have the right energy efficiency measures to support our zero carbon objectives"
- **Different role for local planning authorities in carbon reductions, when the Future Homes Standard is in force**: The government intends that the FHS from 2025 will deliver homes with a 75-80% reduction in (regulated) carbon emissions compared to the Part L 2013 rate and will reach zero carbon when the electricity grid decarbonises, without further retrofitting - and that from 2025, local planning authorities may be expected to "focus more fully on [monitoring and] enforcement" of the national standard, rather than setting different standards at local level.

How have existing local plan precedents used those powers?

Reductions on the building regulations baseline carbon emissions

Using powers granted by the Planning and Energy Act, most local plans lay out their 'low carbon' or 'net zero carbon' policy requirements in terms of a percentage reduction on the Target Emission Rate set by the current version of Part L of Building Regulations (Part L 2013 at the time of writing[5]).

This percentage reduction in on-site carbon emissions usually ranges from 19% to 40%. Some local plans also require the remaining Part L carbon emissions to be offset at a fixed cost per tonne, payable by the developer through a Section 106 payment, to be spent on local projects for carbon reductions.

Older precedent plans have sought a 19% reduction, because this reflected the erstwhile national Code for Sustainable Homes which was previously seen as best practice – and because of a 2015 Written Ministerial Statement previously mentioned which was taken to mean that 19% was the limit.

Later, requirements for higher percentage improvements in Part L carbon emissions were pioneered by the London Plan, justified by evidence assembled by the GLA and its consultants to show that new developments in preceding years had already been typically achieving 30 to 40% reductions[xlv]. Several other adopted local plans have similarly adopted similar requirements (see precedents box).

From 2022 the building regulations Part L will be updated, resulting in a ~31% reduction in the carbon emissions rate compared to Part L 2013. And from 2025, it will be updated a gain to a 75% reduction.

Requirement to demonstrate implementation of the energy hierarchy

Some local plans divide their carbon and energy requirements into several steps prioritising the most effective and long-lasting carbon reduction measures first. This follows **the energy hierarchy**, generally accepted best practice across the building design sector.

The logic is that if energy demand is minimised first, this reduces not only the burden that the new building places on our limited energy resources in operation, but also the amount of new equipment needed to generate and distribute energy to meet that demand. This reduces the materials, carbon and cost involved in producing and installing that equipment (and lowers energy bills).

The energy hierarchy is as follows:

1. Reduce energy demand (also known as 'be lean')
2. Supply energy efficiently (also known as 'be clean')
3. Supply renewable energy (also known as 'be green').

A policy requiring minimum improvements in each stage of the energy hierarchy makes the developer demonstrate that they have applied the hierarchy before resorting to offsets to reach zero carbon. Local plans usually express this as a requirement for the developer to show that they have made a minimum % improvement in the building's carbon emissions rate by measures taken at each stage. Policy compliance is demonstrated in an energy statement submitted with the planning application.

The following sections explore precedent local plan policies in each of these steps and how they were justified. Three more sections then look at offsetting, existing buildings and embodied carbon.

[5] These percentages will be outdated when new versions of Part L come into force in June 2022 and 2025

Precedent local plans requiring percentage reduction on regulated carbon emissions compared to Part L 2013

London Plan 2016, Policy 5.2: 35% reduction on site via the use of the energy hierarchy (expressed at the time as 40% reduction on previous Part L 2010) in both homes and non-residential. To rise to zero carbon for homes from 2016 and other buildings from 2019.

Reading Local Plan 2019, Policy H5: 35% reduction on site and offset the rest to zero (major developments). All other new build housing to achieve 19% reduction on site.

Oxford Local Plan 2020, policy RE1: 40% reduction on site, rising to 50% in 2026, rising to zero carbon from 2030.

New London Plan 2021: 35% on-site emissions reduction, followed by carbon offset payment for the remainder of Part L regulated emissions.

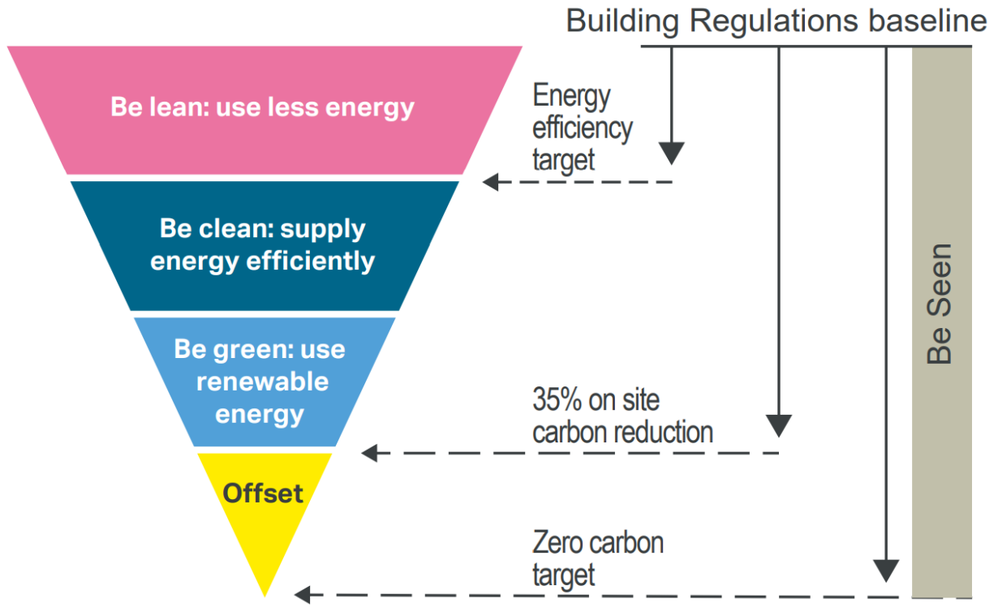


Figure 6 New London Plan (2021) Diagram of the energy hierarchy to reach 35% on-site reduction compared to baseline carbon emissions rate set by Building Regulations Part L 2013.

Reducing energy demand

To achieve legislated target of net zero carbon by 2050, we must reduce our total energy consumption as well as scaling up the supply of renewable energy. In the country's transition to net zero carbon, increased demand will be placed on the electricity grid as fuel sources are switched to electricity (e.g. electrification of heat in existing buildings, and EV charging). Upgrading the electricity grid and expanding renewable generation is already a huge but necessary challenge, involving a great deal of national cost and embodied carbon to produce that infrastructure. It is therefore vital to minimise the additional burden that new buildings place on our energy infrastructure.

Improving the energy efficiency of new homes (minimising their energy demand) is a very cost-effective way to minimise the new infrastructure that will be required to support them in a future zero-carbon energy system. New homes should therefore target reductions in energy demand to reduce the amount of total energy that must be supplied, both from the electricity grid and from other renewable energy sources. Put simply, optimising the efficiency of the building fabric is the starting point for the whole net zero journey.

It is critical to set higher fabric energy efficiency standards to ensure buildings do not need to be retrofitted expensively at a later date (e.g. if the Government proceeds with the recent Committee on Climate Change proposal that no home should be able to be sold unless it reaches EPC Band C by 2028). Fabric efficiency (insulation and airtightness) is particularly pertinent for housing schemes that use heat pumps and MVHR, as these will require highly insulated and draught-proofed buildings to operate efficiently. The previously referenced costs report also found that if a very high of thermal efficiency is reached, the whole construction can become more cost-effective because the developer can then save money on smaller-sized heating systems (pipes, radiators, heat pumps, etc.).

A further final justification for including a minimum improvement on energy efficiency is that it helps with the social needs of affordable living, fuel poverty and healthy homes. An energy-efficient home saves energy bill costs for the home occupiers and also often helps make the home interior more comfortable and conducive to good health (warmer, less draughty, and with less condensation on cold spots on walls or windows thus reducing the chance of respiratory harm from mould growth).

How can we set and justify requirements for improvement at the *energy efficiency* stage?

The Planning and Energy Act 2008 grants Local Planning Authorities the power to require "energy efficiency standards that exceed the energy requirements of building regulations". It defines "energy efficiency requirements" as standards that are endorsed by national regulations, national policies, or guidance issued by the secretary of state. It defines 'energy requirements' as regulated energy only (the energy affected by Part L of building regulations – this does not include plug-in appliances).

Precedent adopted plans generally require a carbon saving to be achieved through energy efficiency ranging from circa 5-15% against the emissions rate set by Building Regulations Part L 2013. In the precedents we have examined, these targets were set according to the typical 'best practice' already being achieved in recent local new developments.

An alternative would be a percentage improvement on the 'Target fabric energy efficiency' (TFEE) set by Part L and SAP. This TFEE limits how much energy per m^2 that a home should need, which depends on building shape and size. By law, new homes must not exceed the TFEE. An improvement on the TFEE would demonstrate effort at this stage of energy hierarchy. To remain current when the Part L of building regulations is updated, the requirement should be expressed in relation to the Part L 2021 TFEE, or as an absolute kWh/m2/year figure that should be achieved in its TFEE calculations.

Precedent: New London Plan (adopted 2021)

As part of its requirement for an overall 35% reduction in carbon emissions against the building regulations baseline, the London Plan requires that part of this reduction is achieved through energy efficiency measures, as follows:

- New homes: 10%
- Other new buildings: 15%.

A topic paper on energy efficiency (within the New London Plan evidence base) explains the evidence that justified how this was set:

London's requirement for a total 35% reduction in Part L carbon emissions in major developments had been in place since 2013, but not much of this was currently being delivered through energy demand reduction. Instead, developers were showing the reduction through energy supply, expedited by grid carbon reductions.

The GLA commissioned a study of the carbon savings achieved through energy efficiency across major developments' energy statements submitted to the GLA in 2013-2017 to understand what was already possible with best practice:

- The average carbon saving achieved from energy efficiency alone was only 3.5% (in homes), 11.6% (non-residential) or 6.3% (mixed-use)
- But much higher performance was achieved in many cases (37% of new home projects achieved at least a 5% reduction, and 13% achieved a 10% reduction)
- New homes could technically achieve a 5 – 10% reduction, and other buildings could technically achieve a 15% reduction in many cases.

The GLA the commissioned a further detailed study of the implications of achieving an energy efficiency target of this sort for a set of typical development types. It found that homes could typically achieve a 10% improvement just through the then-current best practice. It also found that offices could achieve a 15% improvement and schools could get close to this.

These percentage improvements were tested and found to be viable for most development types. They were therefore adopted, with flexibility for certain non-domestic development types such as hotels which would struggle to meet the target due to high hot water demand.

Precedent: Milton Keynes Local Plan 2019

Milton Keynes Local Plan 2019 Policy SC1 includes a requirement for a reduction of **19% on the building regulations carbon emission rate**, followed by a ***further*** **reduction of 20% through the use of renewable energy** and low/zero carbon technologies.

The latter 20% would fall under step 3 of the energy hierarchy ('be green'), implying that the **first 19% must be achieved through the first two steps of the hierarchy (reducing energy demand, and supplying energy efficiently)**[6]. Milton Keynes draft Sustainable Construction Supplementary Planning Document 2020 explains why the overall requirement is considered to be feasible:

> "We do not anticipate that the requirement to exceed the TER[7] by 19% will be unduly onerous for developers, as our analysis of BRUKL[8] data for consented schemes in Milton Keynes indicates that on average an improvement of 41% over the TER is already being achieved at the design stage."

Summary: Range of options for energy efficiency requirements in plan policy

Percentage reduction on Part L 2013 through energy efficiency (demand reduction and efficient supply)	Justification
10% in homes 15% in nondomestic buildings (except hotels and schools, to be considered case-by-case)	Shown to be feasible and viable across London in 2013–2017 via analysis of consented schemes; adopted as minimum policy across London. Although London's viability is different from West Berkshire, this performance was achieved several years ago and should have disseminated to other regions via ongoing industry advances. Not recommended as Part L 2013 baseline is about to become obsolete in 2022.
19% in major residential proposals	Shown to be feasible in Milton Keynes via analysis of recent consented schemes' energy statements; evidently acceptable in planning terms via precedent of the adopted MK local plan. As above, 2013 baseline soon obsolete.
Custom % reflecting typical best practice in West Berkshire	Analysis of recent successful applications in West Berkshire (from building control) thus demonstrably feasible locally. Not recommended as it will not deliver much improvement on existing practice.

Targets based on Part L Target for Energy Efficiency	Justification
Homes: 10% improvement on the Target Fabric Energy Efficiency Rate set by Part L 2021 using SAP10.2 Non-residential: Energy efficiency measures (fabric and supply) to deliver 19% reduction in carbon emissions compared to Part L 2013 or equivalent vs Part L 2021.	From June, the new national baseline will be the new Part L 2021. In 2025 it will be replaced again by the Future Homes Standard, which has upgrades to the building fabric. This 10% figure for homes represents the approximate difference in fabric (average of all building element U-Values and airtightness) between Part L 2021 and Future Homes Standard 2025. Unfortunately the Future Buildings Standard specification 2025 for *non-residential* buildings has not yet been released so no equivalent percentage can be calculated at present. Meanwhile a 19% improvement falls back on what has been demonstrably feasible and viable in Milton Keynes.
Homes and schools: 15-20kWh/m^2/year using Part L SAP10.2. Additional energy reporting with PHPP or TM54.	Homes: kWh limit shown to be necessary for the UK to stick to its carbon budgets between now and 2050, and reach the net zero goal by 2050. Schools & homes: kWh limit shown to be feasible in emerging precedent evidence bases (Greater Cambridge & Central Lincolnshire). PHPP or TKM54 energy reporting needed because SAP is often inaccurate.

[6] This is within reason. Bioregional recently worked on a mixed-use planning application in Milton Keynes whose homes achieved a carbon emissions reduction of approximately 26% using energy efficiency measures only. For the non-residential parts of the scheme this figure was 25%. The scheme then adds renewable/low carbon measures to achieve a further 20% site-wide carbon emissions reduction. The site-wide total carbon emissions reduction is 51.39%. Homes were flatted blocks. Non-residential spaces were office, retail and gym.

[7] Building regulations Target Emission Rate for carbon dioxide

[8] BRUKL is Building Regulations UK Part L: the energy data that must always be submitted in order to pass building control.

Efficient energy supply

This stage of the energy hierarchy is also referred to as 'be clean'.

This step generally refers to measures to use heat networks to distribute heat efficiently and and cleanly and with minimal losses.

Heat networks usually serve several buildings or sites from a common energy source, and can be expanded over time to serve more sites. This has various included:

- Heat networks fed by local waste heat sources such as from waste incineration or data centres which generate a lot of heat as a by-product of their normal activity
- Heat networks fed by large-scale heat pumps (taking energy from air, ground or water sources) at a standalone energy centre that does not 'belong' to any individual new building
- Heat network fed by CHP plant (combined heat and power), essentially a small-scale power station which burns fuel to generate electricity and heat at the same time. This was previously seen as 'efficient' because the CHP plant would be close enough to homes and businesses that the heat could be reused. This is generally no longer seen as a sustainable option because they usually run on fossil gas which needs to be fully phased-out to meet net zero carbon goal and carbon budgets, unless carbon capture technologies emerge in future. The electrical grid now provides electricity at a lower carbon intensity than a CHP plant, and heat pumps are a more efficient and cleaner heat source which is ready to reach zero carbon as the electrical grid decarbonises, and avoids the negative air quality impacts that come with fuel combustion in CHP.

Because local waste energy sources are extremely geographically site-specific, it is not appropriate to seek a universal carbon percentage reduction that should be achieved at this stage of the energy hierarchy.

Local plan precedents are therefore instead expressed as:

- a requirement to connect to an existing or planned heat network, if present
- a requirement to have an energy strategy that is compatible to connect to a future heat network, if the proposed development is within suitable area identified in a heat mapping exercise
- an acknowledgement that lower-carbon energy options may be available, in which case the heat network connection will not be required, and
- an acknowledgement that the requirement may be waived if there are unsolvable feasibility or viability obstacles which make heat networks unsuitable for the specific scheme.

Precedent: New London Plan 2021

Policy SI3: Energy Infrastructure

This policy requires that major development proposals within identified 'Heat Network Priority Areas' should have a communal low-temperature heating system, whose heat source should be selected according the following hierarchy:

a. connect to local existing or planned heat networks
b. use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
c. use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
d. use ultra-low NOX gas boilers (which must meet requirements of a separate air quality policy).

Where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.

Precedent: Milton Keynes Local Plan 2019

Policy SC2: Community energy networks and large scale renewable energy schemes

This policy requires that:

- Major development proposals should consider the integration of community energy networks in the development. This consideration should form part of development proposals and take into account the site's characteristics and the existing cooling, heat and power demands on adjacent sites
- All new developments in proximity of an existing or proposed combined heat and power (CHP), combined cooling, heat and power (CCHP) station or local energy network will be expected to connect to the network unless it can be demonstrated that:
    1. A better alternative for reducing carbon emissions from the development can be achieved; or
    2. Heating and/or cooling loads of the scheme do not justify a CHP connection; or
    3. The cost of achieving this would make the proposed development unviable.

Renewable and low carbon energy at new buildings

Following the energy hierarchy, it is important to decarbonise energy supply: both electricity and heat. This is critical, as the CCC 2019 report ('UK housing: Fit for the future') highlighted the importance of grid decarbonisation in the trajectory towards net zero. Onsite renewable generation supports this in two ways. First, it drives investment in additional renewable electricity, and second, it can simultaneously reduce peak and annual demand on the grid.

Requirements for renewable or low-carbon energy supply can be expressed as:

- A further percentage reduction in carbon emissions against the building regulations baseline, in addition to the percentage achieved through fabric (*see precedent from Milton Keynes*), **or**
- A 'Merton Rule'[9]; where the proposal must include renewable energy generation equipment on-site or near-site, sufficient to meet a certain proportion of the building's own energy demand (see precedents below from Solihull and Oxford). This can be total energy, or regulated energy only. This uses the Energy and Planning Act power to require a 'reasonable' proportion of the development's energy use to be from renewable sources in the locality.

The value of onsite generation has long been recognised in local planning policy, but has not been without its critics. It has sometimes been argued that the prescriptive nature of such policies may not be applicable for all sites and can occasionally lead to the installation of inefficient onsite renewables[xlvi]. Some sites may not be able to meet the requirement if it is set very high, such as if they are overshadowed (and therefore solar panels would not work well), or if it is a tall building where there is a larger amount of internal floor space demanding energy but a relatively smaller roof space for solar panels.

We would therefore recommend including enough flexibility to accommodate unique site constraints, whilst still seeking an ambitious amount of appropriate onsite LZC technologies in all proposals where this is feasible. There are a growing number of adopted precedent policies that include specific targets for onsite renewable generation towards net zero carbon target. In practice, these policies are often applied flexibly where the developer is able to show how and why it was not possible to meet the required metric and that they have nevertheless pursued renewable energy measures to the greatest reasonable and practical extent. (See Oxford precedent).

Defining 'low and zero carbon technologies'

If setting a plan policy requirement under this stage of the energy hierarchy, it will be necessary to define the types of measures that will count as 'renewable / low and zero carbon technologies'. Some technologies, such as solar PV panels, solar thermal and turbines, clearly do count. Some other technologies – in particular heat pumps – may need clarification to help the developer understand where to count these in their energy statement.

Heat pumps are not zero carbon – they still use mains electricity to run. But they can be a low carbon heating system provided they run at high efficiency (they can deliver about three times as much heat energy as they consume in electrical energy, because they work by taking ambient heat from outdoor air, rather than creating it – therefore there is a renewable element to the heat they deliver). To achieve this level of efficiency, they need to provide heat at a relatively low temperature. A developer is more likely to be able to do this if the heat pump is used in combination with improved thermal efficiency and reduced air permeability. (Read more)

The developer could make the heat pump zero carbon by supplying its electricity from a renewable source such as rooftop solar panels, so long as they are generating the renewable electricity at the same time the heat pump is running or if the building can store the solar electricity in a battery for later use. You will need less energy from your solar panels to run your 300% efficient heat pump, compared to using your solar panels to run direct electric heating which can only ever be 100% efficient – therefore you don't need as many solar panels, resulting in savings in embodied carbon.

Carbon savings from heat pumps are usually treated in planning guidance as a step that should be included under the same step of the energy hierarchy as renewables – that is Step 3/'Be Green'. For example, London Plan draft energy guidance[xlvii] asks that heat pumps be accounted for as a Step 3 measure, unless they are powering a heat network, in which case all heat from the heat network would be a Step 2 ('be clean') measure.

Counting heat pumps as a Step 3 / 'be green' measure' gives more flexibility in options for buildings to achieve carbon reductions at this stage even if the building is not suitable for solar panels due to shadow or orientation.

[9] The original Merton Rule (introduced in 2003) required only 10%, but more recently adopted and emerging local plans aim higher.

Precedent: Sutton Local Plan (adopted 2018) Policy 31

In Policy 31, All proposed development must apply the Mayor's energy hierarchy in the following order:

1. being built to 'the highest standards of energy efficient design and layout',
2. supplying energy efficiently (low or zero-carbon heat networks and cooling networks),
3. using on-site renewable energy to achieve a reduction in total CO^2 emissions (regulated and unregulated) of 20% in major developments or 10% in minor developments.

Precedent: Solihull Local Plan: Draft Submission Plan 2020

At a site level, development must apply the 'energy hierarchy' to reduce energy demand for heating, lighting and cooling and minimise carbon dioxide emissions as follows:

- All new dwellings to achieve 30% reduction in energy demand/carbon reduction improvement over and above the requirements of Building Regulations Part L (2013) at the time of commencement up to March 2025.
- From April 2025 for all new dwellings to be net zero carbon.
- Minor non-residential development will conform to at least BREEAM Very Good and major non-residential development will conform to at least BREEAM Excellent.
- Provide at least 15% of energy from renewable and/or low carbon sources for all major housing developments and non-residential developments of 1000sqm or more

Precedent: Milton Keynes Local Plan 2019 (adopted)

Policy SC1 (Sustainable Construction includes that:

K. All proposals of 11+ dwellings or non-residential space over 1,000m^2 must apply the energy hierarchy to achieve:

1. a ≥19% reduction on Building Regulations 2013 carbon emissions,

2. and also a further ≥20% reduction through renewables (onsite or a local network),

3. The developer must then pay to offset remaining carbon emissions (regulated and unregulated – see 'carbon offsets' section further on in this brief).

Carbon offset payments

Carbon offset payments are sometimes set as a Section 106 requirement in order to make a development's unavoidable carbon emissions acceptable through off-site actions to mitigate them.

Carbon offset payments from developers were pioneered by Milton Keynes in 2008 and later adopted by Ashford and Islington, then across London, and now also Reading. These funds are meant to deliver actions that will prevent or remove the same amount of carbon that the development is calculated to emit over a certain number of years. Several key differences arise in how this kind of policy is applied:

- Calculation and scope
- Pricing
- Collection and spending.

Calculation and scope

Key differences here are:

- Whether to offset only regulated carbon emissions as calculated by SAP or SBEM (national calculation methods), or also unregulated emissions and how to calculated these if so
- Number of years of carbon emissions that the developer should pay for
- When the calculation should be performed – i.e. at the time of planning application, or on completion or post-occupation to ensure the offset amount reflects reality.

In the London Plan 2021, only regulated emissions must be offset (as calculated by SAP/SBEM). Some local authorities in London and elsewhere choose to also require offsets for unregulated emissions.

Pricing

- Either tied to a nationally recognised 'carbon price' such as the BEIS carbon valuation,
- Or the cost of delivering local projects that would remove or prevent the same amount of carbon.

The recommended London offset price is supported by a 2017 study by AECOM. This explored the range of costs to enact projects that would save carbon, minus the amount of 'copayment' that can be secured (e.g. if homeowners pay part of the cost towards insulating their home, and the fund pays the rest). It concluded:

> "Given the wide variability in the costs and carbon savings for potential carbon offsetting projects combined with the uncertainty in the percentage copayments that could be secured, it would be difficult to assemble sufficient evidence … to analytically derive a robust [London-wide] carbon price based on the cost of offsetting projects. As such, the approach adopted in this study is to … base [offset] prices … on a nationally recognised carbon pricing mechanism".

The study then identifies a range of projects that could deliver carbon savings at the same cost per tonne that would be set by the nationally recognised carbon price. Many of these projects would actually deliver carbon savings at a lower cost per tonne. This would enable some other projects to be pursued at a higher cost per tonne so that the fund delivers carbon savings at an average cost per tonne that is the same as the payment per tonne that would be received from developers at the nationally recognised price.

The study notes that offsetting must be considered in viability studies, and could be varied by the location in the same way that CIL zones differ. The London Plan 2021 lets boroughs to set their own price, noting that "a nationally recognised non-traded price of £95/tonne has been tested as part of the viability assessment for the London Plan". 2018 Mayoral guidance notes some LPAs have based their price on the average cost of local projects to save carbon, e.g. Lewisham (£104/tonne), which is re-tested in a local viability assessment. We note that it is important not to 'double count' the viability impact of net zero carbon policy, in that the assessment should consider the cost of achieving a degree of carbon reductions on-site as a result of reasonable improvements to the building, and then only apply the cost of offsetting the *remaining* carbon.

Where local plans require offsetting to 'net zero' we have not found any examples that use a non-SAP / non-SBEM method to calculate the *regulated* portion of the carbon emissions that must be offset (although some seek offsetting of the *unregulated* portion using a different method).

Collection and spending of offset payments

London mayoral guidance (2018) notes that offset payments should be collected via Section 106 agreements in the usual way and by the same team, and that:

> "LPAs generally choose to take **payment on commencement of construction** on site. Some choose to **split the payment**, with 50 per cent paid post-construction and 50 per cent prior to occupation. This is up to the LPA to determine. However, taking payment later than commencement of works can mean a high degree of uncertainty as to when funding will be received and is unlikely to enable carbon savings from the offset fund to be delivered before the development is occupied, creating a delay in offsetting a development's carbon impact. LPAs should also note the time limits that apply to discharging Section 106 agreements and ensure funds are collected and spent in this time period."

One potential pitfall is that carbon offset payments received via S106 agreements have sometimes had to be returned after not being spent in the allotted timescale. National Planning Practice Guidance notes that:

> "[S106] agreements should normally include clauses stating when and how the funds will be used by and allow for their return, after an agreed period of time, where they are not."

This can be avoided. London's 2019 annual survey of the use of offset funds notes that in that financial year, "No LPAs reported returning offset payments to developers" and also that "The GLA would not expect offset payments to be returned in any instance and expects LPAs to be collecting offset payments for all applicable developments and identifying suitable projects for spending funds."

The Centre for Sustainable Energy notes that developers can ask for a refund of carbon offset payments that are unspent within 5 years. To avoid this, it recommends setting up:

> "defined structures and processes to stimulate new markets and opportunities for carbon saving measures … [Creating] an open application process to stimulate and attract carbon saving projects from council departments, the market and community that would be

unviable without subsidy, for example community energy projects or insulation schemes. Applications should be proportionate to the scale of the funding provided, the emissions to be saved and the risk profile of projects."

"Programmes of standardised measures, low unit cost, low risk and lower variability of carbon savings (such as the many domestic insulation programmes, run by council housing departments) should be required to apply to the fund just once as a whole programme, with detailed implementation targets, specifications, predicted carbon savings and reporting processes and timetables. Once approved, it should be as simple as possible for residents, communities or businesses to access funding through these programmes."

The 2018 London mayoral guidance encourages LPAs to pool Section 106 carbon offset payments rather than committing to spend them on specific projects. When the guidance was written, local planning authorities were only permitted to pool up to five S106 payments towards the same project, but this restriction was removed in 2019 and this can now be pooled with CIL payments too. Councils using either CIL or S106 must publish an infrastructure funding statement annually. When setting the carbon price, the LPA should factor in a cost to administer the fund and set up a pipeline of projects to be funded.

Precedent: Milton Keynes

A 2016 review of offsetting practices noted that both Ashford and Milton Keynes originally established their local carbon price in 2008 using an estimate of typical costs of making carbon savings elsewhere in their respective districts. This was set at £200/tonne in 2008, plus inflation.

The MK Adopted Local Plan 2019 Policy SC1 retains this requirement: Offsets must be paid for carbon emissions that remain subsequent to complying with the first two requirements for a 19% reduction in Part L 2013 carbon emissions, plus a further 20% emissions reduction through renewable energy.

Milton Keynes adopted Sustainable Construction SPD 2021 notes that Policy SC1 does not require offsetting of *unregulated* emissions. This is notable because the draft version of that SPD (2020) had sought offsets for both both regulated emissions (calculated by SAP in homes or SBEM in non-domestic buildings) and unregulated emissions (calculated by BREDEM for homes; in nondomestic buildings this can be calculated using CIBSE Guide F, CIBSE TM54, or metered evidence from previous work). This requirement appears to have been removed after one public consultee pointed out that the SPD could not require this because the plan policy SC1 itself did not specify that it included unregulated energy.

This SPD confirms that the price remains at £200/tonne plus 'indexation fluctuations' which will be decided at the time of calculation. The developer must only offset 1 year of emissions, but the SPD notes that they may apply an annual multiplier in future iterations of the local plan.

Precedent: New London Plan 2021

Policy SI2 allows offset payments to partially meet the net zero carbon requirement. It applies to:

- Major development only
- Any regulated residual emissions over a period of 30 years, after enough upgrades have been designed-in to result in at least a 35% on-site reduction in the regulated emissions (using SAP/SBEM calculation).

There is no London-wide requirement to offset unregulated emissions, but major developments must still "calculate and minimise" these.

At least one London Borough (Islington) does additionally require an offset for unregulated emissions (as of a 2016 NEF review[xlviii] of practices across London).

The same NEF review found that most London local planning authorities (LPAs) require that the carbon is calculated at the time of the planning application. However, several of these LPAs then update the calculation later:

- Recalculation at detailed design stage or discharge of planning conditions (Croydon, Hackney, Islington, Hillingdon, Kingston)
- Recalculation at 'as built' stage, on completion (Brent, Enfield, City).

The London Plan Policy SI2 requires that each borough must maintain its own fund to hold and use these offset payments. This must be

- Ring-fenced for carbon reducing actions, and
- Its activities monitored and reported on annually.

Mayoral guidance (2018) requires the local carbon offset price per tonne to be based on

  - either a nationally recognised carbon pricing mechanism (starting at £60/ton as the nationally recognised non-traded price, although the Plan 2021 raises this to £95/tonne)
  - or the cost of offsetting carbon emissions across the local planning authority area.

Energy performance gap

The energy performance gap is the difference between the predictions for a designed building's energy use, and the amount of energy it actually uses in operation. This is due to three factors:

1. Poor methods used to predict the energy use of a building (including poor calculations, incorrect assumptions, and exclusion of 'unregulated' energy loads)
2. Errors in construction which lead to worse airtightness or thermal envelope
3. Errors in system operation, and user behaviour different to assumptions (for example, turning up space heating while opening windows to dry laundry, not using heat system as intended, spending more time in the building than anticipated, or bright lighting left on overnight).

Unfortunately, the calculation methods used in Building Regulations Part L (SAP and SBEM) are very poor predictors[xlix] of the actual energy use of a building. SAP and SBEM are compliance tools[l], not really tools to predict energy and carbon performance (even though they purport to be). This is not only due to out-of-date carbon factors used for different energy sources, but the entire methodology.

For this reason, recalculating SAP on completion[10] will not prove that the building *performs* to the same metrics as in the SAP output (kWh/m^2 and CO_2/m^2), only that it is *built* as designed in terms of installed specification of insulation, heating system and renewable energy generation. The nation-wide lack of post-occupation energy monitoring means that both developers and planning/building control enforcers are often unaware of the scale of difference between SAP outputs and actual performance.

Point (2) above relates to how imperfections in the construction process can lead to worse energy performance than predicted. For example, a building may leak a lot of heat if insulation is incorrectly installed, or if a hatch to a cold loft is put in the wrong place and then moved, leaving holes in the air tightness membrane. Lower-spec products or poor substitutions ma be made in the building –for cost-cutting reasons, supply difficulties, or simply because the right person was not on site at the time[li].

Methods to address the performance gap

There are energy modelling methods that give much more accurate predictions than SAP/SBEM, such as the **Passivhaus Planning Package (PHPP)** and the **CIBSE TM54** method. However, local planning may not be legally empowered to require conformance with standards set using these alternative calculation methods because of definitions in the powers granted by Planning & Energy Act 2008 (discussed). The Local Plan may be able to **require *reporting* of predicted energy use using these methods** (subject to viability linked to the cost of the modelling), but it is uncertain whether the plan could require the building to *achieve* a certain metric using them. Of the two, TM54 is more likely to fit with the 2008 Act as it uses building regulations Part L as a starting point[lii].

There are also several quality assurance processes that can be applied during construction to avoid the unnecessary errors that can cause the building to perform worse than expected. Examples include:

- BEPIT (Building Energy Performance Improvement Toolkit) – a set of checks during construction that identify and remedy defects in the construction at every stage up to completion
- Passivhaus process – in addition to using accurate energy modelling, a Passivhaus project undergoes a series of stages during design and construction which improve the build quality
- NEF/GHA Assured Performance Process™ – this maps to the five stages of the RIBA Plan of Work (inception to verification) and involves expert impartial review by accredited assessor.
- Soft Landings – recommended by the UKGBC (as above) but discounted by some local planning authorities as an acceptable 'quality assurance' method (see precedent of Milton Keynes).

There may be other suitable quality assurance processes. These **must** be based on quality of energy performance, not just generic building quality. West Berkshire District would need to decide whether these are acceptable based on their individual merits and evidence that they are effective (verified by track record of previous projects' post-completion testing or post-occupation energy monitoring).

The Local Plan **could require the use of these processes, subject to viability** (again relating to the cost of appointing qualified professionals to undertake these processes). Proposals could submit:

- **Energy modelling:** evidence to be submitted in energy statement with planning application, and recalculation of this if any relevant details are changed at reserved matters / amendments
- **Quality assured construction:** evidence to be submitted along with other documentation to gain sign-off on completion from building control and discharge of planning conditions
- UKGBC Policy Playbook recommends "a recognised performance gap / assured performance tool will be used to minimise the potential performance gap between design aspiration and the completed development. The effectiveness of measures will be reviewed and ratified as part of the post-completion discharge of conditions".

Verifying energy performance post-completion

Post Completion certificates can be issued once Planning Conditions are discharged. Local Authorities can condition to ensure that buildings are performing as anticipated; however, this would require engagement with the main contractor outside of their practical completion contract. Precedents have sought this through an Area Action Plan and site-specific allocations.

There is debate about whether it is reasonable to hold developers accountable for carbon impacts of unregulated energy use which would be untested by Part L SA and largely out of their influence in terms of unconfirmed occupant fit-out, operational hours, occupancy, and other third-party factors.

The following pre-completion testing requirements would help. Outline costs[11] are provided:

- Air tightness testing ~£1000 per property
- Thermographic testing[12] ~£400 per property
- U Value testing ~£400 for a dwelling (3 weeks per property)[13]
- Post-occupancy evaluation testing: ~£5000[14]. (if applied to scalable developments >c.50 dwellings, the economy of scale would reduce the cost burden through sample testing only).

[10] As-built SAP calculations have been used by several local authorities to determine the final amount of offset payments the developer must provide, but it does not verify performance or change the energy performance gap. Relying only on SAP will always mean the developer offsets far less carbon than the building will actually emit – although it does simplify the offset decision-making and data gathering process.
[11] Communities and Local Government (2008), Performance Testing of Buildings BD 2535
[12] Thermographic surveys can only be completed during the heating season. Where building completion occurs outside that season, the applicant could commit test at the earliest opportunity and perform remedial measures where needed. Homeowners must be fully informed.
[13] Accredited construction details are to be checked through thermographic testing performed according to BS EN 13187: 1999 Thermal performance of buildings. Qualitative detection of thermal irregularities in building envelopes. Infrared method. Identified locations with deviations from expected performance are further investigated through a borescope survey and remedial works performed if practical.
[14] https://www.pollardthomasedwards.co.uk/download/PTEpost-occupancy_evaluation2015_LR.pdf

Precedent: Milton Keynes Local Plan 2019

Policy SC1 includes that:

- K. 5 All proposals of 11+ dwellings or non-residential space over 1,000m^2 must
    - "implement a recognised quality regime, which assures that 'as built' performance (energy use, carbon emissions, indoor air quality, and overheating) matches the calculated design performance", and
    - "Put in place a recognised monitoring regime to allow the assessment of energy use, indoor air quality, and overheating risk for 10% of the proposed dwellings for the first five years of their occupancy, and ensure that the information recovered is provided to the applicable occupiers and the planning authority..
- The Sustainable Construction SPD explains that a 'recognised quality regime' must include
    - (1) modelling of different scenarios at design stage and issuing performance targets such as kgCO2e/year or energy use (which must use expected usage profiles rather than standard ones, and should ideally include Dynamic Simulation Modelling using the National Calculation Methodology [SAP or SBEM] as a baseline),
    - (2) processes and plans in place to ensure everyone in construction and dwelling management knows how to avoid common reasons for the performance gap,
    - (3) suitable fabric testing and iterative feedback mechanisms,
    - (4) demonstrating that the 'as built' targets set are achieved, and
    - (5) third-party verification that the quality regime has been carried out.
- The SPD also asserts that the quality regime must ensure the post-occupancy data will be available by implementing a suitable metering and monitoring strategy that can deliver performance data to compare with the designed performance targets.
- The SPD also notes that two suitable regimes are the Quality Assurance sections of Home Quality Mark ONE, and BSRIA Soft Landings Framework.
- The above specified requirement for the 'quality regime' means that the developer must also test the 'as-built' performance and submit data to the council. A report is then submitted to both occupiers and to Milton Keynes Council, which states the performance gap metric and identifies any reasons for deviation from predicted energy usage, carbon emissions, indoor air quality and overheating performance, as well as specific actions that have or will be taken to reduce the gap.

Emerging Precedent: Solihull Draft Local Plan 2021

Policy P9 requires that:All major developments must "implement a recognised quality regime that ensures the 'as built' performance (energy use, carbon emissions, indoor air quality, and overheating risk) matches the calculated design performance of dwellings as specified above [a 30% reduction on Part L 2013 commencing from now, and net zero carbon for all new development commencing from April 2025]"

Precedent: Greater London Energy Monitoring Guidance (2020)

The 'Be Seen' energy monitoring guidance (April 2020) requests that[liii]:

"Analysis guided by CIBSE TM54, which recommends using a tailored Part L model for the estimates of regulated and unregulated loads, should be undertaken and its findings should be reported in the 'be seen' reporting webform. A TM54 analysis gives more accurate predictions of a building's energy use. This approach also aligns with the reporting requirements under the GLA's Whole Life-Cycle Carbon (WLC) Assessment Guidance. The CIBSE TM54 findings should therefore also be used to represent the regulated and unregulated energy requirements for non-residential uses of Module B (operational energy use) of BS EN 15978."

Emerging Precedent: Merton New Local Plan (draft 2021)

This plan is with the inspector over Summer 2022. Its proposed draft with main modifications after inspector's first comments[liv] Policy CC2.3 still includes:

"From 01 January 2025, to meet the following maximum Energy Use Intensity targets:

- Residential – 35 kWh/m2/yr
- Offices – 55 kWh/m2/yr
- iSchools – 65 kWh/m2/yr
- Multi-residential (e.g. student accommodation) – 35 kWh/m2/yr
- Retail – 55 kWh/m2/yr
- Leisure – 100 kWh/m2/yr
- Higher education teaching facilities – 55 kWh/m2/yr
- Light industrial uses – 110 kWh/m2/yr
- GP surgery – 55 kWh/m2/yr
- Hotel – 55 kWh/m2/yr

Supporting text paragraph 2.3.18 explains that these should be calculated with (CIBSE) TM54, (PHPP) methodology or equivalent.

Existing buildings

There is less clear direction in legislation, and fewer precedents available, to demonstrate the acceptability of seeking energy and carbon improvements in existing buildings compared to new ones.

The variety of types, ages, uses and conditions of existing buildings make it impractical to devise universal requirements for their energy and carbon performance that could be reasonably sought through local plan policies. It is difficult or impossible to retrofit them to the same energy performance standard as new builds can achieve, and the workforce has a shortage of skills to do this effectively.

The decarbonisation of existing buildings is actually a more important challenge compared to new buildings, simply due to scale. The Committee on Climate Change has shown[lv] (and Government has recognised[lvi]) that in order for the UK to meet its legally binding carbon reduction goals, it is vital that the existing building stock must be decarbonised via three main courses of action:

- Upgrades to building fabric and other energy efficiency measures
- Switching from gas or oil boilers to low carbon heating (largely heat pumps; some heat networks; and a small role for hydrogen in some areas in the future)
- Decarbonisation of the electricity grid via increases in wind and solar electricity generation to allow phase-out of fossil fuelled power stations.

The rollout of insulation and low carbon heating to existing buildings ('energy retrofit') have been far slower than predicted and needed[lvii]. Heat pump rollout in particularly must be vastly accelerated[lviii]. Both of these can be costly and take many years to recoup the investment through energy bill savings. Perhaps just as importantly, these works are often extremely disruptive to occupants and can risk long-term serious damage[lix,lx] to the building if incorrectly specified and installed, especially older buildings. Nevertheless both are vital for net zero carbon and will deliver economic and wellbeing-related benefits in the long term if implemented correctly.

Take-up of solar panels to existing homes has also dropped steeply[lxi] since the closure of the Feed-In Tariff scheme in 2019, as new installations no longer generate income from energy sent to the grid.

Local plans also have only a very limited influence on the carbon and energy performance of existing buildings, as they can only seek changes to buildings where the building owner is seeking to require a change to the building that requires planning permission.

However: The planning system can (correctly or incorrectly) be perceived by building owners as yet another obstacle to retrofitting, on top of the cost, disruption, and risk of building damage. Owners may (wrongly) assume that certain changes need permission, or that permission is likely to be refused Building owners' willing action and investment is essential to the net zero carbon transition, and therefore it is vital that the planning system becomes a facilitator and not an obstacle to this.

The National Planning Policy Framework confirms that (paragraph 152): "The planning system should support the transition to a low carbon future … [by] encourag[ing] the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure". It also confirms that (paragraph 158) when determining applications for renewable and low carbon development, the local planning authority should not require the applicant to demonstrate the overall need for renewable energy, and should approve the application if its impacts are acceptable or can be made so. This supports a permissive approach towards proposals for the addition of carbon-saving and renewable energy measures to existing buildings.

The role of local plan policy in reducing existing buildings' carbon therefore has two main strands:

1. Removing the actual or perceived planning barriers to energy retrofit changes to buildings.
2. Allocating sites suitable for renewable energy generation and distribution in order to decarbonise the energy that existing buildings use.

Point 1 (a permissive, supportive approach) could be pursued through the following tools:

- A local plan policy that explicitly welcomes energy efficiency and carbon improvements to existing buildings with significant weight attached to those benefits, and signposts the reader to further guidance about how to make such changes acceptable in heritage-sensitive settings
- Supplementary planning guidance that clearly explains the range of retrofit measures that can be effective in improving energy performance of existing buildings, which kinds of changes are acceptable in different settings, how to make acceptable changes in heritage settings (referencing available expert guidance[lxii]), and advising which changes simply do not need permission in most settings
- A Local Development Order giving blanket permission to specific changes in geographic locations that are not considered heritage-sensitive – such as certain acceptable types of upgraded windows, doors, external insulation, or heat pumps visible from the street.

One further option is to seek 'consequential improvements' when changes are being made to a building that require planning permission. This could expand on Building Regulations requirements for the same. We have identified one precedent for this. However, discussions with energy officers at that local authority reveal that this has not proven very effective because very few relevant proposals pass over their desk, and the improvements can only be applied to the part of the building that is undergoing works, not the whole building – which renders many retrofit measures ineffective.

Point 2 (proactive promotion of renewable energy generation and low-carbon energy distribution) could be pursued through the following tools:

- Spatial strategy (allocating or identifying suitable locations for such renewable energy features and potential low carbon heat network locations, in consultation with citizens, local business, conservation bodies and the electrical grid District Network Operator) – this can help to de-risk the prospect for potential investors, site owners and developers of renewable energy
- Infrastructure Delivery Plan – ensuring the electrical grid District Network Operator is ready to make the capacity upgrades necessary to serve a growing proportion of all-electric, gas-free, solar-exporting buildings, electric vehicles, and suitably located large-scale renewable energy
- A Local Development Order that gives blanket permission to add solar panels to buildings in locations not considered heritage-sensitive, expansion of strategic low carbon heat networks.

Precedent for actively welcoming energy improvements to existing buildings: Wokingham Draft Local Plan Update (consultation, 2020)

Draft Climate Change Policy SS8 confirms the local plan will "support retrofitting existing buildings with measures to improve their energy efficiency and generate onsite renewable energy".

Supporting text notes that "Proposals to sensitively refurbish or retrospectively improve the performance to reduce their energy use and improve comfort will be supported. Interventions to upgrade historic buildings should be undertaken sensitively in recognition of their heritage value."

This is supported by policy DH7 (Energy) which includes that:

> "Development proposals which would result in considerable improvements to the energy efficiency, carbon emissions and/or general suitability, condition and longevity of existing buildings will be supported, with significant weight attributed to those benefits[*]. The sensitive retrofitting of energy efficiency measures and the appropriate use of micro-renewables in historic buildings, including listed buildings and buildings within conservation areas will be encouraged, providing the special characteristics of the heritage assets are protected."

*Please note: This first sentence of policy DH7 is identical to Milton Keynes adopted local plan 2019 Policy SC1 (point N), therefore is supported by that precedent.

Precedents: using Local Development Orders to expand renewable and low carbon energy systems and promote energy retrofit

Swindon Borough Council has used LDOs to promote the growth of renewable energy generation and usecl, both on specific sites and in borough-wide terms. Examples include:

- A borough-wide LDO for non-domestic air source heat pumps and district heating
- Hydrogen and electric vehicle charging stations (specific sites) –
- Identifying specific sites for solar photovoltaic arrays including solar farms. The LDO on solar farms has been particularly successful, by de-risking the process. It was created by issuing a 'call for sites' and then assessing these sites against various criteria.

Across several London Boroughs, an LDO was created to make it easier to deliver heating and cooling networkscli. By removing the need to make a separate application for each new network section, this makes the network more flexible for new connections and reduces the costs of expansion. It also creates a common standard for new heat networks.

Milton Keynes local plan 2019 indicates a willingness to use LDOs to encourage wide scale energy retrofit[lxiii].

Embodied carbon

Embodied carbon means the carbon that was emitted in the production and transport of building materials, and their assembly on site. It can also include the emissions associated with maintaining and eventually disposing of a building too. If the latter are included, this is termed 'whole-life embodied carbon'.

These emissions rise largely from fossil fuel energy use to extract and process raw materials such as minerals and metals, then transport them. There can also be emissions from chemical processes to produce building elements (such the carbon dioxide that is cooked off minerals to make cement) or from the breakdown of the material at the end of its lifespan.

Embodied carbon makes up a very large share of the total carbon emissions caused by the creation and use of a building across a typical 'design lifetime' of a building, usually 60 years (see UKGBC pie charts diagram previously referenced). Many commonly used building materials like ordinary cement, steel, aluminium and zinc have inherently high embodied carbon because of how they are produced. Vice versa, plant-based materials like timber can have less than zero embodied carbon because the tree absorbed carbon dioxide from the atmosphere and this is locked up in the material for as long as it is in use.

Unlike operational energy and carbon, there is currently no mechanism to address embodied carbon in national building regulations or other national legislation for planning and building. Still, embodied carbon is relevant for the net zero goals of the UK and West Berkshire because some of materials or products will have been produced here, and all will have been transported within the country or district, and energy will be used during construction.

In the absence of a national regulatory approach to address embodied carbon and without a specific local planning power granted to address it, some local plans have nevertheless taken steps to ensure embodied carbon is not entirely neglected.

Precedent plans have taken one or both of the following approaches:

- Requirement to assess the building's embodied carbon, reported within the planning application
- Requirement to provide narrative about what steps are being taken to minimise embodied carbon, such as reusing existing buildings, use of lower-carbon materials, or efficient design to reduce material use.

Our review has not identified any adopted plan precedents that require a development to achieve a specific numeric target for embodied carbon, whether a limit or a % improvement on a baseline. This may be because of a lack of explicitly granted powers, and the 2015 Written Ministerial Statement that directed local plans not to set 'additional technical standards' relating to the sustainability of housing. It may also simply be because this is an emerging area where local planners do not yet feel confident to set these requirements, robustly justify them at inspection, or interpret whether developers have sufficiently demonstrated their compliance.

There is an industry standard method to calculate a building's embodied carbon: the RICS Whole Life Carbon Assessment for the Built Environment[lxiv], which builds on the relevant British/European Standard (BS EN 15978). This RICS method splits the building's whole-life embodied carbon into a series of 'modules':

- Modules A1 – A5: 'Cradle to completion stage' (from raw material extraction through to completion of the building)
- Modules B1 – B5: The 'use stage' of the building (such as maintenance, repair, replacement and refurbishment)
- Modules C1–C4: 'End of life stage' (deconstruction, demolition, transport, waste processing, and final disposal).

It is important to note that the RICS / EN15978 approach assumes that any carbon that was sequestered by trees and stored in timber is released during the C1–C4 modules. In reality this may be avoided if the timber is eventually reused. This means that a whole-life carbon assessment may not recognise the full benefit offered by timber buildings, which is that the timber would lock up carbon for most of this century. This is a critical period[lxv] in which we are at risk of reaching tipping points for feedback loops of runaway climate change – such thawing permafrost releasing huge amounts of methane, or large areas of rainforest dying back. It matters not only *how much* carbon is emitted, but *when*.

Therefore it makes sense to set targets that exclude modules C1–C4, to give timber buildings the 'credit' for the carbon they will lock up for many decades. B1 – B5 also include many assumptions about uncertain future actions, therefore may need to be omitted from any planning targets due to a lack of robust justification.

Using the RICS 'modules', other building industry specialist bodies have created benchmarks and 'good practice' targets expressed in kilogrammes of embodied carbon per square metre of floor area:

RIBA Climate Challenge embodied carbon targets[lxvi]: Includes all RICS modules **A1–C4**.			
	Business as usual	2025	2030
Homes	1200 $kgCO_2e/m^2$	<800 $kgCO_2e/m^2$	<625 $kgCO_2e/m^2$
Offices	1400 $kgCO_2e/m^2$	<970 $kgCO_2e/m^2$	<750 $kgCO_2e/m^2$
Schools	1000 $kgCO_2e/m^2$	<675 $kgCO_2e/m^2$	<540 $kgCO_2e/m^2$

LETI Embodied Carbon Primer targets[lxvii]: RICS modules **A1–A5 only**.			
	Business as usual	2020	2030
Homes	800 kgCO2e/m^2	500$kgCO_2e/m^2$; (400 including sequestration)	300$kgCO_2e/m^2$ (200 including sequestration)
Office or school	1000 $kgCO_2e/m^2$	600$kgCO_2e/m^2$ (500 including sequestration)	350$kgCO_2e/m^2$ (250 including sequestration).

We are not aware of it having been legally tested whether a local plan can *require* such targets. However they could inform supplementary planning guidance, to educate developers and allow planning officers a point of comparison to assess embodied carbon reports submitted by developers.

If a local plan were to seek to include any of the LETI or RIBA embodied carbon targets as a requirement, there would be challenges from the development sector consultees and potentially also the inspector. One key objection is likely to be the argument that such a requirement could inhibit the delivery of housing targets.

For the best chance of successful adoption of such a policy, it would be useful to produce evidence showing that:

- The target is feasible with existing materials & techniques (the RIBA 2025 and LETI 2020 targets should both meet this criterion)
- The target is achievable in the kind of development that can be expected in West Berkshire's local plan period (e.g. housing type; housing size; other building typologies)
- There is the capability in the design and construction industry to conduct the embodied carbon assessments, evidenced by the fact that the industry in London already reports on embodied carbon to the GLA
- The selected target would not have an unacceptable impact on costs, considering
    - Cost of design
    - Cost of alternative materials / construction methods
    - Cost of the embodied carbon assessment.

The LETI and RIBA baselines are derived from a range of existing project data. Their future targets may also be based on case studies that would support the planning justification, especially around technical feasibility.

RICS may be able to provide estimates of the typical cost of embodied carbon assessments and the number of professionals who are able to conduct such assessments.

We also note that further evidence is continually emerging on this topic, which could help the planning justification for such targets. For example, in early 2022, the UK Green Building Council[lxviii] found that a real-world large low-rise residential development in south-west Cambridgeshire achieved a 20% reduction in embodied carbon reduction at masterplan level, with only a negligible impact on capital costs (0.6%). This was achieved through simple changes such as reducing the area of asphalt in favour of low-carbon permeable paving, and using swales to reduce the need for other drainage infrastructure.

However, all of these evidence topics may be seen as more robust if they are directly relevant to West Berkshire or similar areas.

Relevant data could begin to be assembled by the local authority if it firstly adopts a local plan requirement for major developers to simply *report* on their embodied carbon using the RICS methodology, and ideally also any costs associated with steps taken to reduce embodied carbon as a percentage of overall costs. From these, local benchmarks for 'business as usual' and 'best practice' could be derived for inclusion in a subsequent local plan policy or supplementary planning document.

Precedent: New London Plan 2021

Policy SI 2 includes that:

F. Development proposals referable to the Mayor should calculate whole lifecycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

Emerging precedent: Bristol Draft Local Plan Review 2019

Policy CCS4 of this draft plan includes that:

"The materials used in development should use and manage resources as efficiently as possible accounting for the energy, carbon emissions and other environmental impacts arising from construction and end of life demolition and disposal. Proposals for super-major development* should be accompanied by a whole-life assessment of the materials used."

* Super Major developments are 100 residential units and above, and 10,000sq m of commercial floorspace and above, according to the Pre Application Advice for planning and related applications document.

Justifying the requirements: Necessity, feasibility and viability

Necessity and feasibility

The **necessity** for net zero carbon policies is clearly demonstrated by the previous sections' exploration of the scale and urgency of the climate crisis, the changes necessary to deliver the UK's legislated carbon budgets, the absence of suitably ambitious national regulation or other incentives to deliver those changes, and the Local Plan's legal duty to proactively pursue carbon reductions in line with the Climate Change Act.

The Royal Town Planning Institute[lxix] points out that "Where local plan policy which complies with the duty [to mitigate climate change] is challenged by objectors or a planning inspector on the grounds, for example, of viability, they must make clear how the plan would comply with the duty if the policy were to be removed". This is because that duty stems from the Planning and Compulsory Purchase Act and the Climate Change Act (supported by powers in the Energy and Planning Act). As formal legislation, these hold more weight than other government guidance that might seek to limit the extent of local plans' requirements.

The **feasibility** of identified measures is demonstrable through the fact that all measures have been previously delivered by the building design and construction industry in the UK before today (low heat demand, accurate energy modelling, heat pumps or other low carbon heat, well-oriented solar panels, Section 106 offset payments, and embodied carbon assessment).

Feasibility is further evidenced by supporting documents of several emerging plans that include similar performance requirements. The evidence base for emerging local plan documents in Greater Cambridge[lxx], Central Lincolnshire[lxxi] and Cornwall[lxxii] all include studies showing that these requirements can be fulfilled in typical new buildings expected to come forward in these areas. In these cases, it was shown how recent local developments could have complied with the policy without needing to change the form or orientation of the building – only needing to implement reasonably improved fabric, a heat pump, and solar panels that fit within the existing roof area.

The only potential policy components whose feasibility might be difficult to prove are are the enhanced energy reporting and embodied carbon reporting. These skills are present and growing in the sector, but are not mainstream outside of London projects and so there might be a bottleneck of skilled professionals available to conduct these. The impact of this bottleneck depends on the rate of development proposals that are expected to come forward in West Berkshire (and any other locations making a competing demand for these skills). It should also be noted that these specialist skills will be a far smaller factor in delivery of new homes compared to the severe construction labour shortage[lxxiii] which constrains the whole sector today. As national housing targets are thought to already be too large for the workforce to deliver[lxxiv], energy and carbon modelling should not be assumed to make a significant difference to the feasibility of delivering projects.

On the other hand, setting such requirements would stimulate the industry to expand its capacity to fulfil them. In the absence of data to show whether there is or is not enough capacity in the industry to deliver these reports, a cautious approach could be to require these only in major developments.

Viability of required improvements to the building

The cost of measures to comply with increased building energy performance standards should be considered within a whole-plan viability assessment. Despite a range of aforementioned precedent plans that include carbon reduction requirements, there is not a consistent approach to transparently assessing the cost of policy compliance. Their viability studies have variously applied cost uplifts of:

- £5/m^2 for 'BCIS Energy + Carbon' although it is not explained how this reflects the policy requirements, and somehow reaching £25,000/dwelling for fully zero carbon homes.
- £15,000 per dwelling for a bundle of sustainability measures including carbon and renewable energy– without clarifying the breakdown, or how this cost of policy compliance was identified.
- 1% uplift to overall costs to allow for professional fees, and BCIS cost data reflecting the construction cost of the Code for Sustainable Homes Level 4.

These precedents were successfully adopted and so their viability assessments were deemed sound by the Planning Inspectorate for the purpose of those plans' policies. Nevertheless it will be more robust to use more transparently evidenced cost uplift data, directly linked to policy requirements, if West Berkshire chooses to put forward policies that push the boundaries of precedents.

To support viability assessment of requirements for energy efficiency and renewable energy, there is a variety of credible costs data available. Two key sources are identified:

- National Government Future Homes Standard Consultation Impact Assessment[lxxv]
- Other local plan evidence bases for similar requirements (as cited under 'feasibility'.)

The following table compares estimated cost uplifts in a three-bedroom home for various steps that an effective net zero carbon buildings policy might require (compared to a building regulations Part L compliant baseline), based on the national and local government cost sources.

Policy requirement	FHS Impact Assessment 2019	Currie & Brown 2021 for Cornwall DPD Evidence Base
Future Homes Fabric	+£2160 (£2560 minus £400 for waste-water heat recovery)	+£1977
Heat pump system (to reach Future Homes carbon emission rate that is 75% lower than Part L 2013, or 35kWh/m^2/year energy use)	Not specified as an individual element	+£1562
Solar panels to meet remaining regulated energy use (*Not part of Future Homes Standard requirements – but shown here to illustrate approximate cost to go from FHS to net zero regulated operational carbon).	£2700 - £3100 (Derived from £1,100 fixed cost + £800 per kWp; estimating that the regulated energy demands of a home with FHS fabric and heat pump could be covered by a ~2 – 2.5kWp system.)	£1328 to meet regulated energy use of 20kWh/m^2/year (Derived from cost of solar panels to meet total energy use in home with efficient fabric and heat pump, minus the share of unregulated energy, rounded up to 6 whole panels.)

It is important to note that the above documents look at cost uplifts compared to a 'business as usual' baseline of a building that complies with Part L 2013. By the time the updated West Berkshire Local Plan is adopted, the new Part L uplift (2021/22) will be in force, which raises the 'business as usual' baseline energy performance and thus the cost difference for 'net zero carbon' will be smaller. The strongest justification would be to commission a similar study of the cost uplifts specific to West Berkshire for a range of building typologies expected to come forward during the local plan period. These cost uplifts could be locally-specific, more reflective of the current market, and could be compared to the baseline cost of complying with the new Part L 2021/22 rather than the 2013 Part L.

Finally, there is some evidence[lxxvi] showing that homes with better energy and carbon performance may command higher sale prices thus aiding viability, but these effects were regionally specific at the time. This effect may increase if the government incentivises carbon performance through the mortgage lending system as suggested in its recent Net Zero Strategy[lxxvii] and Heat and Buildings Strategy[lxxviii].

Viability of offsetting any remaining carbon emissions

The cost of offsetting can be easily assessed, as it is up to the local authority to decide on the cost per tonne of carbon, and the period of time for which the emissions must be offset.

Most precedents choose a period of 30 years and assume that the annual emissions do not change over that time, and nor does the price per tonne of carbon. Their total offset cost would be as follows:

(Annual carbon emissions) x (**£cost per tonne**) x (**30 years**) = £total offset payment.

Regulated carbon emissions can be estimated using the live public record of new dwelling energy performance certificates[lxxix]. This includes average annual regulated CO_2 emissions per dwelling, as calculated by Part L SAP. This can be filtered by local authority area and date. An average of all properties in the last two years gives a reliable typical new build performance under 'business as usual'. In West Berkshire as of May 2022, this average is 1.7 tonnes.

This average typical new build regulated carbon emission in West Berkshire must then be reduced to reflect any proposed policy requirements for on-site improvements – for example, a 75% improvement if the policy will bring forward the Future Homes Standard. Therefore:

(Annual 1.7 tonnes – 75% = 0.43 tonnes) x **30 years** = 12.79 tonnes to offset.

Next the cost of carbon must be decided. The precedents have sometimes conducted a local study to understand the cost to achieve carbon removals or reductions, but most use a £60-90/tonne figure that reflected a previous year's nationally recognised central value per tonne of non-traded carbon. That nationally recognised cost is now[lxxx] £248/tonne and rises by 2% year-on-year to reach £378 in 2050. West Berkshire could either use current value for the whole local plan period as follows:

(12.79 tonnes to offset) x £248 = £3170.90 total offset payment.

Alternatively, West Berkshire could apply an increase to reflect that the value of the home's carbon emissions will go up over time to reflect the changing nationally recognised value:

(0.43 tonnes x 2022 price) + (0.43 tonnes x 2023 price) + (0.43 tonnes x 2024 price) … etc **for all years over a 30-year period**. This would raise the total offset payment to £3,986.

However: If we are going to apply future years' carbon values, it seems reasonable to also recognise that the carbon emissions will also change in future years due to changes in grid electricity generation. Publicly available data for this is also found in the same data set as the national carbon values. Assuming the home is gas-free and all-electric, we can apply the future grid carbon reduction percentages to the home's total regulated carbon. This would work out as follows:

(0.43 tonnes x 2022 price) + (0.41 tonnes x 2023 price) + (0.45 tonnes x 2024 price) … etc **for all years over a 30-year period**. The resulting total is £1,062.

This final total of £1062 is suitable for viability testing alongside the cost of making any required on-site carbon reductions. In practice, only gas-free homes should be allowed to use this final step of the calculation. If the home has gas, the calculation should finish after applying the future £/tonne prices.

If the policy also requires unregulated carbon emissions to be offset too, this amount would be added to the annual amount *after* the 75% reduction is applied, but before multiplying by the years, the grid carbon reductions, and the price. An estimation of the typical amount of unregulated carbon may need analysis by an energy specialist using BREDEM calculations, but there may be some industry averages available elsewhere.

Carbon reductions as an issue of design quality

There is evidence that the new National Planning Policy Framework is leading the Planning Inspectorate to place a greater focus on design quality. A recent analysis[lxxxi] of appeals since July 2021 found that inspectors are no longer dismissing poor design as a reason for refusal simply because of a shortfall in housing land supply, and that the likelihood is very low of the developer being awarded costs if their application is refused on design grounds.

The relevant parts of the NPPF state that:

- "Development that is not well designed should be refused, especially where it fails to reflect local design policies … [and] Significant weight should be given to … outstanding or innovative designs which promote high levels of sustainability". (Paragraph 134)

- "Local planning authorities should seek to ensure that the quality of approved development is not materially diminished between permission and completion". (Paragraph 135)

This is likely to be most relevant to the setting of bold local plan policies on the topic of embodied carbon and the use of specific processes to reduce the energy performance gap. This is because:

- Embodied carbon is related to design quality through durability, heritage. biophilia[15] and generally 'innovative design which promote[s] high levels of sustainability'.

- Energy performance gap remediation processes are created solely for the purpose to 'ensure that the quality … is not materially diminished between permission and completion'.

[15] 'Biophilia' refers to humans' innate attraction to the living natural world, and wellbeing benefits experienced via exposure to it. Renewable materials like timber can support this and also reduce embodied carbon, reflected in today's growing focus on biophilic design in architecture.

Beyond the building: Reducing carbon via the spatial strategy and standalone renewable energy

The local plan's spatial strategy is a vital tool for the minimising the carbon emissions caused by new growth, and potentially even making reductions on the district's existing annual carbon emissions.

Because this document was produced to support a local plan review at a stage where there was not much scope to influence the spatial strategy, we do not go into as much depth here as we have done for buildings. However, this is an incredibly important topic in terms of what planning can do to enable the transition to a net zero carbon future. Therefore for completeness we give an overview here.

The Planning Practice Guidance section on climate[lxxxiii] confirms that location of new development are appropriate carbon reduction measures in local planning, as is deployment of renewable energy. "The distribution … of new development and the potential for servicing sites through sustainable transport solutions, are particularly important considerations".

The key ways in which the spatial strategy can support the net zero carbon transition are:

1. Transport – shaping the spatial pattern of new growth to reduce the use of cars and increase the viability of public transport services
2. Renewable energy
3. Protecting green infrastructure that removes or stores carbon, such as forests, grassland, peatland, or other high-carbon soils
4. Density: this has a smaller impact than points 1 and 2, but higher-density developments generally have smaller sizes per unit, which means less floor space to heat and light.

Transport is now the UK's largest emitter of CO2 – representing 34% of total CO_2 emissions across the UK[16],[lxxxiii] (compared to homes 26%, commercial/public buildings 8%, industry 15%, and land use 3%). In West Berkshire transport is responsible for an even greater proportion at 55% of emissions. Moreover, transport carbon emissions have not been reducing much in the past decade before 2020 (unlike the homes and other buildings sectors which have benefitted from reductions in electricity grid carbon). This is because the small increases in vehicle efficiency (and electric vehicles) have been outweighed by an overall increase in miles driven. A switch to electric vehicles is underway but has been slow and it will be many years before EVs make up the majority of new vehicles, let alone the majority of vehicles on the road (as the ban on sales of new fossil fuelled cars and vans is not till 2035, and the last fossil fuelled cars can be expected to be still in use for at least 14 years[lxxxiv] after that).

There is therefore a strong climate justification to devise the spatial strategy to focus the bulk of development in locations where there is a realistic likelihood of low car use, in particular on public transport corridors and walkable urban locations, and to refrain from allocating any sites where driving will be the only realistic option. Walkable sites also enable more efficient land use due to reduced parking area, while growth in urban locations can share existing infrastructure and thus avoid embodied carbon associated with new infrastructure. Where other considerations constrain this approach (such as green belt designations preventing growth around well-served railway stations or bus routes) there may be grounds to review the relative merit of those designations compared to the climate imperative. This should not be done lightly and should be supported by analysis to explore the differences in carbon emissions that would result in growth in different locations.

Precedent: Spatial carbon analysis for Greater Cambridge Emerging Local Plan

In 2020-21, the emerging Greater Cambridge Local Plan was in the early stages of developing its spatial strategy. There were a number of broad spatial development categories reflecting the potential range of areas where new growth could occur. It also had low, medium and high numbers of housing that might be delivered.

Greater Cambridge Shared Planning service commissioned comparative modelling of the carbon emissions of buildings and transport in different types of location: urban, suburban, public transport corridors, new towns, villages.

This modelling used publicly available data on the area's energy use and emissions of buildings and transport, combined with a locally-specific transport model. It also took into account the different locations' typical densities, home sizes and amount of new infrastructure that would be needed along with housing.

The potential sites being considered for growth were categorised into these different types of location. A range of options were tested, with different numbers of homes spread across different locations. This revealed[lxxxv] a very large difference in carbon emissions in the plan period depending on where homes were built. Village-led growth had far higher carbon emissions than any other option. Growth focussed mainly on public transport corridors was nearly as low-carbon as urban growth, and both were better than new settlements. Applying a range of zero-carbon policies would halve the total emissions, except in villages because their carbon was mostly due to transport, which is influenced more by location than policy.

This informed the further refinement of the growth options, and the modelling was repeated[lxxxvi] for the refined options. As a result, the currently proposed preferred option is led mainly by growth on public transport corridors and urban areas, and does not include significant development in villages (only where they are well connected to existing transport and employment.)

[16] As percentage of UK emissions, before taking into account sequestration by forests and grassland.

Renewables

Allocating (or identifying suitable) sites for renewable energy generation, storage and distribution is a way in which a local plan can proactively facilitate the transition to net zero carbon, not just for new growth but for existing buildings and transport.

The National Planning Policy Framework actively encourages this:

- Paragraph 155: "To help increase the use and supply of renewable and low carbon energy and heat, plans should … provide a positive strategy for energy from these sources … [and] consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development".
- Paragraph 156: "Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans".
- Paragraph 158: "When determining planning applications for renewable and low carbon development, local planning authorities should not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions".
- Paragraph 158b: "Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas."

Growth of renewables, enabling the phase-out of coal in power stations, has been a key driver of the UK's carbon emissions reduction in the past 15 years. Renewables will next have to grow even faster to enable the phase-down of fossil fuel gas in power stations, and to keep pace with larger electricity demand as buildings and transport gradually switch from gas, petrol and diesel to electricity.

As previously cited, to meet the UK's legislated carbon budgets we should be planning to enable for wind and solar power to meet 80% of overall electricity demand by 2050 – which means a growth of 3megawatts per year for both wind power and solar power respectively. Some of the wind power will be offshore, but not all. While some renewable energy installations can be a sensitive subject in some locations, if the UK's net zero carbon transition is to be equitable then all local areas will need to accept a fair share of renewable energy development. The RTPI notes[lxxxvii] that the process of planning for renewable energy can be supported by early and open processes to engage with communities to identify the most suitable sites and understand the need.

The RTPI has also noted that alongside the renewable energy generation, it is also important for the planning sector to bring forward renewable energy storage.

Emerging precedent: City of York Draft Local Plan (2018)

Policy CC1 of this emerging local plan confirms that:

> "Renewable and Low Carbon Energy Generation and Storage: Proposals for renewable and low carbon energy storage developments will be supported and encouraged. Developments should be sited a suitable distance from major residential areas and have suitable fire suppression procedures".

The policy also explains why storage is crucial, acknowledges that this is an emerging field and commits the council to work with experts to understand what the options are and develop an SPD which will include safety considerations.

This plan is still with the inspector as of May 2022, but the CC1 policy stance already formed the basis of a 2019 planning approval for a 50MW battery storage development in greenbelt, due to its location (near a substation) and its contribution to sustainable development, innovation, and energy resilience.

Green infrastructure for carbon sequestration is particularly relevant in West Berkshire as an area with a particularly large proportion of green landscape including designated Areas of Natural Beauty. This green infrastructure has a small but significant effect on reducing the district's overall greenhouse gas account. National figures show[lxxxviii] that in West Berkshire as of 2019, forest and grassland remove 6% of the carbon dioxide emissions that the district's other sectors cause. This is a proportionally larger achievement than the national picture, where the UK's forest and grassland recapture only 0.3% of the UK's overall annual carbon dioxide emissions.

There is therefore a good argument that the site allocations process should be designed to direct new growth away from woodland and grassland – unless a particular greenfield site would give greater carbon savings for other reasons, for example if the site is on a well-served public transport route that would dramatically reduce car use compared to delivering that new growth elsewhere.

Beyond trees and grass, soil can also be a huge store of carbon but this can be emitted if the soil is disturbed – for instance during groundworks or excavation. For example, natural peatland is a rich store of carbon that has been sequestered over many years by plants growing there, and stored thanks to being submerged in water. If drained, peatlands start emitting large amounts of carbon. Data on the distribution of high-carbon soils in the district might justify decisions not to allocate these sites, or development management policies to mitigate and compensate for losses of soil carbon.

Precedent: Central Lincolnshire emerging local plan review – soil carbon mapping

Aware of the region's widely distributed peatland as well as other green infrastructure, the Central Lincolnshire planning team commissioned specialists[lxxxix] to map the area's peatland and estimate the potential amount of carbon that is stored, removed, or emitted by those areas.

It found that while the area of peatland is small, its degraded condition means that it has a noticeable impact on overall emissions. As a result, the emerging plan is proposing Policy S16[xc] which will require assessment and mitigation or compensation of the carbon impacts of development on any carbon sinks including peat.

However, carbon sinks do not appear to have been a criterion in the sustainability appraisal for site allocations as only 2% of the land was identified peatland and therefore not expected to be a common issue confronting many sites.

While not yet adopted and therefore not yet a full legal precedent, this approach could be relevant to other local plans with substantial amounts of high-carbon soils, woodland, grassland or other natural carbon sinks.

References and endnotes

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Appendix B

WBC edits130622_BDG West Berks Local Plan Review Carbon Support Risk matrix

West Berkshire Council Local Plan Review: Zero Carbon policy options
1. Risk matrix

31 May 2022

Rev 02

Written by: Marina Goodyear (Project Manager) Checked by: Lewis Knight (Head of Sustainable Places)

Bioregional

Introduction

Bioregional has been appointed to provide West Berkshire Council with guidance to support the creation of policies for reduction in buildings' carbon emissions.

Local planning authorities (LPA) have a legal duty to deliver carbon reductions through the planning process in line with the Climate Change Act. However, the LPA's ability to fulfil this duty is constrained by the actual powers granted to the LPA, and is often in tension with LPAs' other duties such as enabling the delivery of housing and viable developer profits. Beyond these direct duties, constituents may also expect the plan to deliver further benefits such as homes that have low bills and don't need expensive retrofit in the near future.

Based on our review of the UK's trajectory to net zero carbon, planning powers, precedents, necessary measures for net zero carbon buildings, feasibility and viability (see appendices) we present a suite of identified policy options and their performance in relation to delivering on relevant imperatives.

This performance is expressed in terms of 'risk': that is, the risk that a policy will fail to deliver the required outcomes in terms of carbon reductions bill savings and longevity, or the risk that they may be subject to challenge by developers or the inspector on the grounds of viability, housing delivery, or pushing the boundaries of planning powers available.

Please note that this risk matrix document focuses only on potential measures for buildings, not for transport, standalone renewable energy, or green infrastructure. This is because the carbon outcomes under those topics are best addressed through the spatial strategy and site allocations. This document is produced in support of a local plan review which is at a stage at which we are informed the main remaining decisions are with regards to development management and there is not much scope to influence the spatial strategy. Those other topics will nevertheless be explored in the appendix.

Please note that in the interests of brevity to show all policies on one page, the risk matrix uses acronyms and other short terms that are common in the sectors of climate action, planning, and low-carbon building design. A glossary of these terms and acronyms is provided overleaf.

Glossary of terms and acronyms

BREDEM	Building Regulations Domestic Energy Model. A methodology for (estimating) calculating the energy use and fuel requirements of dwellings based on their characteristics. This was the basis from which SAP was developed.
Carbon, or carbon emissions	Short for 'carbon dioxide' but can also include several other gases with a climate-changing effect, that are emitted to the atmosphere from human activities.
Carbon budget	Amount of greenhouse gas that can be emitted before reaching a level of atmospheric carbon that causes severely harmful climate change
CO_2	Carbon dioxide. Often shortened to 'carbon'.
CO_2e	Carbon dioxide equivalent. The sum of a mixture of gases, in terms of their climate-changing impact in a 100-year period expressed as the amount of CO_2 that would have the same effect. Often shortened to 'carbon'.
Embodied carbon	Carbon that was emitted during the production, transport and assembly of a building, infrastructure, vehicle or other product, before the product is in use. As opposed to 'operational carbon' which is emitted due to energy use when operating the building / infrastructure / vehicle / other product.
EUI	Energy use intensity, a measure of how much energy a building uses per square metre of floor.
GHG	Greenhouse gas (CO_2 and several other gases). Often collectively referred to as 'carbon'.
Part L	Building regulations section that sets basic legal requirements regarding buildings' energy and CO_2.
Performance gap	The 'energy performance gap' is the difference between the amount of energy a building is predicted to use during design, versus the actual amount of energy it uses. The gap is due to poor prediction methodologies, errors in construction, and unexpected building user behaviour.
PV	Photovoltaics: solar panels that generate electricity.
PHPP	Passivhaus Planning Package – a tool to accurately calculate a building's energy use. It is used to design buildings that seek Passivhaus certification, but can be used without pursuing certification.
Regulated energy	The uses of energy within a building that are regulated by Part L of building regulations. This covers fixed energy uses in the building – mainly space heating, space cooling, hot water, permanent lighting, fans/ventilation and pumps.
SAP	Standard Assessment Procedure – the national calculation method for homes' energy and carbon, used to satisfy building regulations Part L.
SBEM	Simplified Buildings Energy Model – the national calculation method for non-residential buildings' energy and carbon, used to satisfy building regulations Part L.
TER	Target Emission Rate – limit set by Part L of building regulations on CO_2 emissions per square metre of floor.
TPER	Target Primary Energy Rate – limit set by Part L of building regulations on 'primary energy' use per square metre of floor. A new metric being introduced to building regulations from June 2022. Unlike metered energy, 'primary energy' takes into account energy lost to conversion inefficiencies during power generation and distribution, or gas combustion.
TFEE	Target Fabric Energy Efficiency – limit on space heat energy demand per square metre of floor, set by Part L of building regulations. Based only on fabric; not affected by building services like heating system, lighting, ventilation[i].
TM54	Method to accurately calculate buildings' energy use. Devised by Chartered Institution of Building Services Engineers (CIBSE).
Unregulated energy	Energy uses within a building or its curtilage but that are not regulated by Part L of building regulations. Examples: plug-in appliances, catering, external lighting among other uses. This can represent 50% of the total energy used at a property, depending on the type and use of the building.

A word on Part L of building regulations: current and future

Many of the policy approaches, powers and precedents described in this document rest on seeking carbon and energy improvements compared to the baseline of a building that achieves basic compliance with building regulations. However, that baseline changes periodically as the building regulations are updated. Imminent further updates will put many of those precedents out of date.

The building regulations lay out the basic standards that all buildings must meet by law. The section on energy and carbon is called Part L, introduced[ii] in 1985, updated in 1995, 2002, 2006, 2010, 2013. It uses a set of calculations (SAP and SBEM) to estimate the building's energy use and carbon emissions. SAP and SBEM calculation methods are also periodically updated.

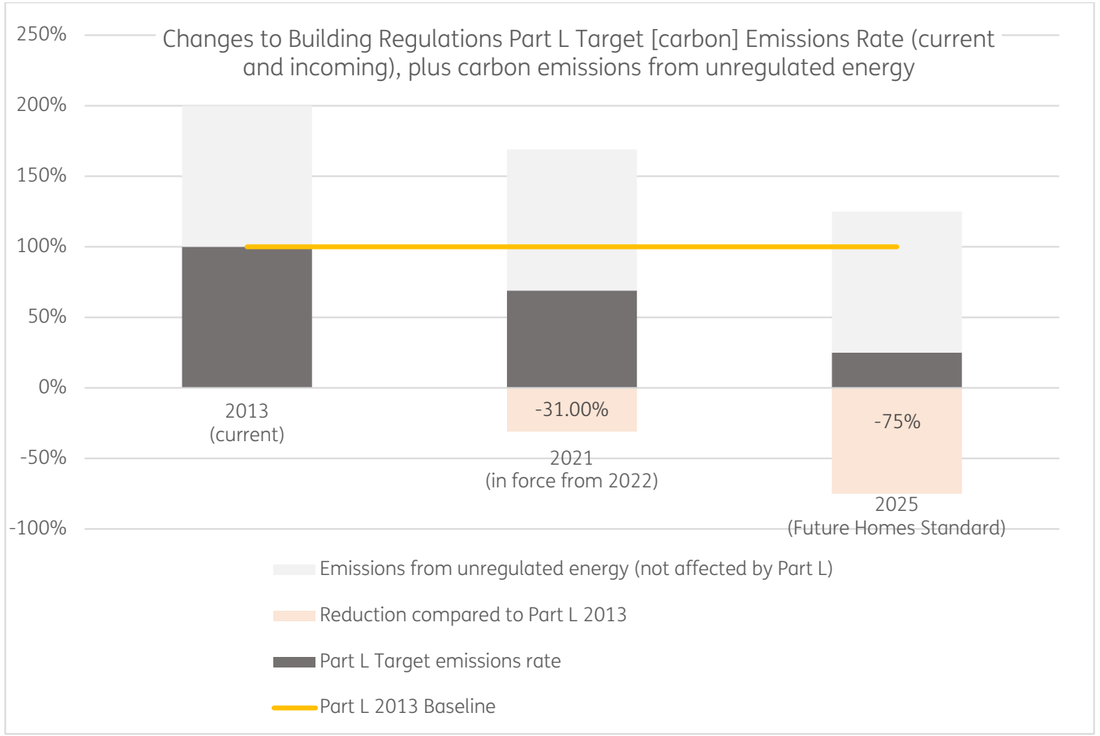
Based on applying a certain minimum standard of building fabric and services to a proposed new building, Part L generates two targets that must be met: the Target Emission Rate (of carbon dioxide) and the Target Fabric Energy Efficiency (energy use, in homes only). Local plan precedents use the Target Emission Rate as the baseline, and ask proposed new buildings to achieve a set % reduction.

The current Part L - used as a baseline by precedent local plans – has been in force since 2013. However, new Part L updates come into force in June 2022 and 2025. These updates come with upgrades to the fabric and services, and updated carbon factors to reflect decarbonisation of grid electricity. Altogether, this results in a more stringent Target Fabric Energy Efficiency and Target Emissions Rate. At this point, the percentage improvements set in precedent local plans will become obsolete because they are based on the old 2013 Part L. The updates in 2022 and 2025 will change to the Target Emission Rate as follows:

- Part L 2021 (in force June 2022) TER is approximately 31% lower than 2013 TER
- Part L 2025 TER will be approximately 75% lower than 2013 TER

  (**Part** L 2025 TER will be therefore approximately 64% lower than Part L 2021 TER).

Part L does not regulate all energy uses in a building, so the 'unregulated' share of emissions is static. This 'unregulated' energy and carbon is the part that is associated with use of plug-in appliances and various other xxx



Risk matrix – explanation of risk topics and policy components

Our review of planning duties, powers and precedents shows that to achieve net zero carbon buildings within a net zero carbon district and UK, there are a range of different requirements that can and should be deployed within the local plan policy. These may be sorted into the following broad themes:

- Energy efficiency
- Efficient, fossil-free and renewable energy supply
- Carbon Offsetting
- ~~Embodied carbon.~~

These themes follow the energy hierarchy, plus offsetting and ~~embodied carbon~~. An effective local plan policy for low- or zero-carbon buildings would cover all of these themes, allowing none to be neglected or concealed. Planning powers and precedents exist for all of them – but to deliver the necessary actions for the scale and urgency of the climate crisis, we would need to build on those and push the boundaries.

A planning policy requirement in each of these themes could have 'low' or 'high' risk depending on whether we focus more on carbon and occupant costs, or on viability and planning acceptability.

This is because of the mismatch between the urgency of the climate crisis and local plans' duty to reduce carbon, versus the powers explicitly granted to local plans and their duty to deliver other outcomes such as rapid housing delivery and developer profits.

An approach that is low risk for planning acceptability and viability is in general higher risk for climate. as it would fail to remedy the status quo of unsustainable carbon emissions, and expose occupants to high energy bills and cost of future retrofit that almost all existing buildings will need if the UK is to reach its net zero carbon future.

It is therefore necessary to differentiate risk across a range of topics. These topics reflect the key areas of debate arising in the literature on the low carbon transition, emerging practice in local planning, and recent experience working with local authorities and developers. The topics' scope is as follows:

Climate (2°C carbon budgets)	Energy bill costs to occupant	Future retrofit costs/disruption	Electrical grid readiness	Delivery / sector readiness	Viability / cost uplift (vs Part L 2021/22)	Planning powers / precedents	Compatibility with national approach
Will this policy deliver carbon and energy savings consistent with what the Committee on Climate Change has shown to be necessary for the UK to meet its legislated carbon budgets? Consider also Tyndall Centre carbon budgets for climate change ≤2°C. Any new build that is not zero carbon will worsen the already-huge challenge faced.	Might this policy permit – or even induce – the developer to deliver a building that exposes its occupants to unnecessarily high energy costs or energy price volatility? Vice versa, is it likely to save bills long term?	Will this policy induce the developer to deliver a building that is fit for the UK's zero-carbon future according to the Committee on Climate Change's identified[iii] necessity for low heat demand and low-carbon heat? (i.e. heat pumps or networks) If not, how disruptive and expensive would future retrofit works be?	Will this induce the developer to minimise the burden that the new building places on the electricity grid, considering that the grid will come under huge stress from switching existing buildings and transport from fossil fuel to electricity? Might this component induce the delivery of buildings that burden the grid more than they need to?	How readily available are the materials, technologies and skills needed to comply with this – including energy calculation skills? How commonplace is this practice or level of performance, and are the relevant workers likely to understand how to deliver it?	How much more would it cost to comply with this policy, compared to a business-as-usual new build? (Based on estimates – by central government and evidence bases of various emerging local plans – of cost uplift for various elements of improved building performance, and project experience of the cost of enhanced professional services in energy & carbon.)	Is the local plan explicitly empowered to require this standard, via the Planning and Energy Act 2008, other legislation or other formal expression of government policy? Is there an existing adopted precedent? If not explicitly empowered but also not explicitly prohibited: • is there an emerging precedent for this? • Can it be shown that this is the only way to fulfil the duty for 'radical' carbon reductions? (NPPF)	To what extent would this policy component: • Use existing national methodologies / metrics for carbon and energy? • Help or hinder other changes that the government commits or intends to achieve with regards to carbon and energy? Such as: ○ Future Homes Standard 2025 ○ Net Zero Strategy (2021) ○ Heat and Buildings Strategy (2021).

In addition, a local plan policy requirement could address each theme in several different ways. The risk level then changes again depending on:

- ***How*** **each theme is addressed** – using national building regulation calculations for energy and carbon, versus requiring the use of far more accurate methods that exist in the industry; or replicating an existing precedent for offsetting versus devising a more effective mechanism
- ***Extent to which*** **the improvement is required**– for example, the amount and type of on-site energy and carbon improvement, or the offset price per tonne of carbon payable by developers.

We therefore assess a range of 'policy components' that each represent a means and extent of requirements under each theme. These are arranged along the vertical axis of our full risk matrix.

Please note that several highly ambitious emerging local plans are currently in the consultation stages, with ground-breaking net zero carbon policies that will thoroughly test the boundaries of existing planning powers. If these are adopted, this would completely change the risk levels in the 'planning powers/precedents' column, especially for Example Approach 3 (shown later).

Risk matrix – all potential policy components for new buildings

		Risk topics (5 = high risk; 1 = low risk; 0 = actively reduces risk)							
		Climate (2°C carbon budgets)	Energy bill costs to occupant	Future retrofit costs/disruption	Electrical grid readiness	Delivery / sector readiness	Viability / cost	Planning powers / precedents	Compatibility with national approach
Energy efficiency	EUI limits (using PHPP/TM54)	0	0	0	0	4	4	5	5
	Space heat demand limits (PHPP/TM54)	0	0	0	0	4	3	4	4
	Process to remedy performance gap	0	0	0	0	3	2	2	2
	EUI & space heat limits – using Part L SAP	3	3	3	2	1	1	2	1
	Future homes fabric % reduction on Part L SAP TFEE	3	3	3	0	1	2	1	1
	Moderate energy efficiency % reduction on Part L TER	4	3	4	3	0	1	1	0
Renewable & fossil-free energy supply	No new gas	0	3	0	3	2	2	3	3
	Onsite PV to match energy use	0	0	0	3	3	4	2	3
	Onsite PV per m^2 ground floor area	1	1	1	2	2	3	3	2
	Renewable % reduction on Part L TER or Part L energy use	4	3	3	2	1	2	0	0
Offsetting	Offset only via local renewable energy	3	3	3	3	3	4	3	3
	Offset via S106 (various projects)	4	4	4	1	0	3	1	1
	Offsetting via global schemes	5	3	4	3	2	1	4	3
~~Embodied carbon~~	~~Embodied carbon – specific targets~~	~~0~~	~~No impact~~	~~No impact~~	~~No impact~~	~~5~~	~~4~~	~~5~~	~~4~~
	~~Embodied carbon – reporting only~~	~~3~~	~~No impact~~	~~No impact~~	~~No impact~~	~~3~~	~~3~~	~~1~~	~~2~~

Discussion of risk matrix and potential policy combinations

The matrix orders the policy components by theme from top to bottom: firstly energy efficiency measures, then energy supply measures, then offsetting, then embodied carbon. *Please note that all of these are explained in more detail in the appendices.*

Most of the components can be seen to have either a lower risk for climate and consumers but a higher risk for viability/planning powers, or vice versa. This is because of the current limitations on powers explicitly granted to Local Planning Authorities and the fact that this is a cutting-edge emerging area of practice and policy without many precedents that go far enough to reduce carbon emissions to a 'safe' level (see appendices).

Only two policy components have a relatively positive risk profile across the full range of risk topics:

- Requiring a process to reduce the energy performance gap – this can significantly reduce actual carbon emissions and occupant energy bills. The power to require this is neither explicitly granted nor explicitly limited by national planning policy and legislation. So long as the process runs only to post-completion (not occupation), it is arguably as acceptable as precedents that require other non-national quality standards like Home Quality Mark or Lifetime Homes. One precedent even names some HQM modules as a suitable process for energy quality assurance.
- Requiring a certain m^2 of PV panels per m^2 of building footprint – this reflects (but could expand on) a measure that is in the new notional building specification in building regs Part L 2021.

Key reasons for components having **higher planning risk are**:

- **Setting requirements that are not based on the national calculation methodology** of building regulations (Part L and SAP) in favour of more accurate methodologies
- **Higher (or unknown) cost of certain measures** – in particular, PV solar panels and some kinds of low carbon heating – although this may change as these become more mainstream and economies of scale take effect
- **Workforce skills at scale to deliver the higher standards** – but as for cost, this will improve as the industry improves its normal practice in response to demand and regulation. This is a good rationale for promoting growth of green construction skills within the district and wider region.

Key reasons for higher risk to **climate and occupants** are:

- **Failing to require use of accurate methodologies** to predict a building's actual carbon emissions in use
- **Requiring only percentage improvements on the carbon and energy limits set by building regulations** (which fail to account for energy used by plug-in appliances, and fail to incentivise inherently thermally efficient building shape)
- **Failing to require steps to deliver energy performance as designed and predicted** (energy performance gap)
- **Failing to ensure that any offsetting mechanism delivers** measurable and certain carbon savings that count towards the local area's carbon footprint and would not have happened without the use of the offset fund, and that the offsetting is truly a last resort. Overly cheap offsets disincentivise the developer from making the on-site energy and carbon improvements to the building that are feasible – raising the risk of buildings being delivered that will need expensive, disruptive retrofit later and meanwhile have high energy bills.

A combination of policy components is vital

It is important to note that none of these policy components is enough on its own to achieve new buildings that deliver the required energy and carbon performance that is needed to support the national and local carbon budgets (see appendices). Any effective net zero carbon buildings approach in a local plan would need to adopt a suite of requirements covering all of the following topics:

- Energy efficiency improvements in design
- Energy performance gap
- Fossil-free energy supply
- Renewable energy supply
- Offsetting, if the policy does not require renewables to match 100% of a building's energy use.

West Berkshire must therefore decide which combination of requirements it is willing to pursue, prioritising either the risk of challenge/delay to adoption, or the risk of failing to achieve the carbon reductions required by climate science and legislation. Some potential examples are as follows

A low-risk approach in planning terms, but which would not deliver much on-site difference compared to the new building regulations from 2022, and would fail to prevent new buildings from adding to the already-huge challenge of drastically cutting existing carbon, could include:

- 35% reduction in on-site regulated carbon emissions (vs Part L 2013)
- Offset regulated carbon at a price per tonne reflecting an out-of-date nationally recognised value of carbon that is not proven to meet cost of delivering local carbon reducing projects.

A relatively high-risk approach in planning terms, but with great efficacy in fulfilling the duty for carbon reductions, could include:

- Limit of annual 15-20kWh/m^2 space heating and 35kWh/m^2 EUI, calculated via PHPP or TM54
- Enough on-site PV to match total energy use on site
- Use of a specific energy performance gap method
- Offset only via local renewable energy schemes, at cost.

A medium-risk approach that works within the bounds of explicitly granted planning powers could be:

- 75% reduction in onsite Part L regulated carbon emissions (in line with Future Homes Standard)
- Offset remaining regulated carbon emissions at the rising nationally recognised cost of carbon over the building's lifetime, taking into account grid decarbonisation.

A medium-risk approach that could achieve significant carbon reductions and gently tests the boundaries of planning powers (so may need local studies on costs and feasibility) could include:

- Specific kWh target for energy efficiency (with Part L TFEE) and 75% reduction on Part TER
- Reporting of PHPP/TM54 space heat demand and EUI, but simply for comparison, not requiring that the building meets the specified targets using the outputs from these methodologies
- Any proven method to address energy performance gap, and test performance on completion
- Onsite PV to match regulated energy needs AFTER other low carbon technologies are applied
- Offset unregulated energy (and any remaining regulated energy that could not be feasibly addressed by onsite PV) via local renewable energy schemes, priced to match local cost of delivering these (including cost of administration and site acquisition).

These four approaches are next explored in individual risk matrices.

<u>Example approach 1:</u> Low risk for planning, high risk for climate, occupant and infrastructure.

Policy requirements	Climate (2 °C carbon budgets)	Energy bill costs to occupant	Future retrofit costs/disruption	Electrical grid readiness	Delivery / sector readiness	Viability / cost	Planning powers / precedents	Compatibility with national approach
35 to 40% total reduction on Part L 2013 TER	5	4	5	4	0	1	0	0
5 to 15% TER reduction to be via energy efficiency* (*heat pumps not included)	3	3	3	3	1	1	0	0
Gas not ruled out	5	3	5	2	0	0	0	2
10% of Part L energy use met with renewable energy supply	4	3	4	2	1	1	0	1
Offset 30 years' worth of emissions at £60-£90/tonne via S106 fund (not tested to meet cost of local carbon saving schemes)	4	4	4	No impact	0	3	1	1

This follows the structure of several 'net zero carbon buildings' policy precedents in local plans that have passed inspection and been successfully implemented with good compliance rates (e.g. London Plan 2013 and 2021; Reading Local Plan 2019; Milton Keynes Local Plan 2019; Oxford Local Plan 2020 – noting that Milton Keynes has a higher offset price per tonne but does not multiply by 30-years).

By failing to explicitly rule out gas heating, this approach risks locking-in additional fossil fuel carbon emissions from new buildings for many years.

The 35-40% reduction in on-site carbon emissions will make very little difference from the 31% reduction that will be enforced by the new Part L uplift from June 2022.

The 35-40% carbon reduction, and the 10% renewable energy supply, are not large enough to push the developer to use a heat pump. Therefore developer is likely to use gas or direct electric heating, as these are cheaper and simpler to install. As electricity is now lower carbon than gas, the developer may choose to deliver part of the 35% carbon savings by using direct electric heating. The occupant would then be hit by high energy bills, as the running cost for direct electric heat is about three times as expensive as gas or heat pump. The 10% renewable energy supply is likely to be met with a small amount of on-site PV, which is not enough to make a large difference to total carbon nor energy bills.

Because the 35% carbon reduction and the 10% renewable energy supply do not mandate a heat pump but would reward direct electric heating, the new buildings may place unnecessary strain on the electricity grid (direct electric heating uses approximately 1 kilowatt of electricity to produce 1 kilowatt of heat, while a heat pump can deliver 3kW of heat using just 1 kW of electricity because it works by borrowing heat from outdoor air).

The relatively small reduction in carbon means the building will have to be retrofitted at a future date to meet the energy performance standards vital[iv] to meet the UK's legally binding climate targets of the Climate Change Act (the retrofit measures will need to include more insulation, heat pump, perhaps also heat recovery from wastewater and ventilation). If the building has a gas boiler system, by the time that boiler breaks then the government may have ended the sale of new gas boilers (2035[v]), in support of its legislated climate targets. The occupant will then have to replace not only the heat source, but also piping and radiators as they may have to switch to a lower-temperature system such as a heat pump or network. The process of retrofit will be highly disruptive to the occupant, may damage the building (especially insulation[vi,vii]), and will cost the future occupant five times as much to retrofit compared to what it would have cost the developer to include in the first place[viii]. That future retrofit is also likely to come with greater embodied carbon as outdated building elements are removed and replaced (especially heating system and windows).

The £60-90 offset price per tonne payable by the developer reflects a previous year's nationally recognised value per tonne of carbon emissions used in various existing local plans (London; Reading). In those precedents this was selected as a justifiable price due to its alignment with national guidance for policy appraisal, but is now out of date. It also now may not be sufficient to cover the actual costs of enacting local projects that deliver measurable and demonstrably additional carbon savings. This would include not just the project implementation but also the administrative cost of devising projects with a measurable carbon benefit, identifying a pipeline of opportunities, project management, any legal negotiation with third-party asset owners (such as buildings that are to receive energy retrofitting), fund administration, and potentially land acquisition (if the project involves tree planting or standalone renewable energy generation). West Berkshire may find it useful to compare that £60-90/tonne figure against its own recent experience of delivering the Grazeley solar farm.

Example approach 2: Minimal risk for climate and occupants; high risk for planning acceptability.

Policy requirements	Climate (2°C carbon budgets)	Energy bill costs to occupant	Future retrofit costs/disruption	Electrical grid readiness	Delivery / sector readiness	Viability / cost	Planning powers / precedents	Compatibility with national approach
EUI limits using PHPP/TM54 (Homes: 35kWh/m²/year. Nondomestic: limit varies)	0	0	0	0	4	4	5	5
Space heat demand limit of 20kWh/m²/year (PHPP/TM54)	0	0	0	0	4	3	5	4
Process to remedy performance gap	0	0	0	0	3	2	2	2
Onsite PV to match total energy use, including unregulated	0	0	0	3	3	4	5	4
Offsetting via local renewable energy, at cost of delivering that renewable energy (S106 or direct investment)	1	3	3	3	3	4	4	3

This approach essentially reflects the operational net zero carbon definition proposed by the range of industry experts that form LETI (see appendices). A similar approach is now being pursued to varying extents in several emerging local plans or development plan documents that are in their early stages, supported by assessments of feasibility and cost (Greater Cambridge; Central Lincolnshire; Cornwall).

The use of PHPP or TM54 energy modelling methods reduces risk to climate and occupants by providing a far more accurate prediction of energy use compared to the industry's usual Part L SAP.

The space heat demand limit reduces risk of carbon emissions and energy costs. It also supports health and comfort as the home will be less subject to temperature fluctuations or condensation.

The EUI limit effectively mandates the use of a heat pump as these are ~300% efficient (allowing them to fulfil a 15kWh heat demand using only 5kWh of electricity, thus shrinking the overall energy use). This rules out fossil gas systems and direct electric heating, thus saving energy bills, minimising the additional demand on the electricity grid, and sparing the occupant from the disruption and cost of future retrofit. Because of the extreme efficiency of heat pumps, their running costs are typically similar to gas, but here the occupant may benefit from even lower bills because onsite solar PV is also required.

The renewable energy target means that the building's roof must be oriented to maximise solar PV generation. This may require adjustment to volume builders' standard designs on some sites, but the target has proven achievable without changing the design or orientation of existing ordinary new builds in Greater Cambridge and Central Lincolnshire (see respective emerging plan evidence bases).

The first reason for high risk to planning acceptability is due to setting targets PHPP or TM54, which are not the same method used to fulfil national building regulations (SAP), thus could be argued not to meet the definition of an 'energy efficiency standard' that the Energy and Planning Act empowers local plans to require. This is not to say that the local plan is explicitly banned from requiring such targets, but the question has not yet been legally tested (it may soon be tested via the emerging plans above).

This approach is also subject to risks relating to the industry's readiness to delivery all of the measures at scale – such as availability of construction materials and systems that perform well enough, and also potential constraints in the number of professionals familiar with the required skillset to design, deliver and verify such high-performing buildings. That is not to say that these skills and materials do not exist, but that further studies may be needed to understand whether this concern could constrain the speed of housing delivery sufficiently to affect West Berkshire's achievement of housing targets.

This approach has some level of risk relating to infrastructure readiness. The extensive on-site PV will export energy to the grid at times of peak generation and low onsite energy demand. This is part of the solution to net zero carbon: the export of clean energy reduces the need for fossil fuel use at power stations, balancing out the times when the building must draw power from the grid. However, in some locations, the grid may not be ready for these exports without capacity upgrades. This risk could be reduced by energy storage (batteries; hot water tanks) or other smart 'demand side response' system.

The renewables and offsetting approach would mean that the building must have enough renewable energy capacity to generate an equal amount of energy to what the building uses per year. The policy would expect this to be delivered on-site, but if necessary it can be delivered on other buildings' roofs or separate land in West Berkshire. This is the most reliable and climate-safe offsetting option we have identified, as it is easily measurable, and clearly additional to what would happen without the funding.

Nevertheless this offsetting approach has 'low' rather than 'zero' risk for climate. This is because the carbon budgets (see appendices) require such drastic cuts that all buildings and sectors will need to become net zero carbon on their own terms, meaning that there will be very little room for trading carbon savings between sectors. This would mean that existing buildings will eventually need their own roof space to deliver their own renewable energy to eliminate their own carbon, rather than being able to lend that roof space to eliminate the carbon of new buildings. Alternatively, delivering the renewable energy generation equipment on open land would compete with other land uses vital to the UK's carbon reduction trajectory such as woodland creation to capture carbon, or local food production. West Berkshire's large proportion of AONB land may also present challenges in delivering this.

Example approach 3: Medium risk for climate and occupants; low risk for planning acceptability

Policy requirements	Climate (2 °C carbon budgets)	Energy bill costs to occupant	Future retrofit costs/disruption	Electrical grid readiness	Delivery / sector readiness	Viability / cost	Planning powers / precedents	Compatibility with national approach
10% improvement on on Part L SAP TFEE 2021 (Future Homes Fabric)	3	3	2	0	1	2	1	0
75% reduction on Part L 2013 SAP TER (Future Homes Standard)	3	3	2	2	1	2	0	0
Recalculate SAP figures on completion (to reflect any design changes and fabric performance) and remedy or offset any shortfall	2	2	2	2	1	2	1	0
Onsite renewables as far as feasible & viable	3	2	1	3	3	4	2	3
Offset 30 years' regulated emissions (with annual national carbon price rises & electricity grid carbon falling) via S106 to fund various local carbon reduction projects	4	4	4	1	0	3	1	1
~~Embodied carbon – reporting only~~	~~3~~	~~No impact~~	~~No impact~~	~~No impact~~	~~3~~	~~3~~	~~1~~	~~2~~

This approach essentially mirrors the emerging Warwick Net Zero Carbon Buildings Development Plan Document (now in Regulation 19 consultation to June 2022). It uses powers explicitly granted by the Energy and Planning Act, and builds on mechanisms of existing precedents. If successful at examination, it will be the most ambitious of any adopted local plan we can identify (precedents to date require onsite carbon reductions of only 35-40% before permitting the rest to be offset).

This set of requirements induces developers to deliver the national Future Homes Standard today instead of waiting until 2025. This includes delivering the indicative Future Homes Standard improved building fabric (which significantly reduces heat demand compared to Part L 2013 and 2021) and the overall Target Emissions Rate (TER). This means the building will have efficient and is almost certain to have a heat pump – given that the Government set the Future Homes Standard emission rate with the aim that it is not likely to be achieved without a heat pump.

Together, these standards mean that the risk of extensive future retrofit costs and disruption are dramatically reduced, compared to business-as-usual new builds in 2022. These requirements can be viability-assessed using cost uplift data from the Government (for Future Homes Fabric[ix]) and other emerging local plan evidence bases produced by expert cost consultants[x].

The renewables requirement is not really strong enough to induce developers to make further renewable provision beyond what they would already have to do to meet the 75% carbon reduction (as heat pumps are a renewable energy measure). It may be difficult for officers to determine whether there is a valid feasibility or viability defence for no further renewable energy on a particular scheme.

The developer will then have offset any remaining regulated carbon emissions that the building would cause during 30 years of operation, via a payment to the council ringfenced to fund carbon-saving projects in the area. This approach is supported by precedents in London, Reading and Milton Keynes – but is made more effective by fine-tuning the calculation. Firstly, it includes increases to the nationally-recognised cost of carbon[xi] that will occur in those 30 years (helping to raise larger funds that are more likely to cover the cost of local carbon reduction projects). Secondly, it takes into account national projections for reductions in the carbon of grid electricity. This provides a financial incentive for developers to use all-electric systems for heating, which will gradually reach zero carbon by 2035[xii] without further action from the building owner, or sooner if the owner adds more solar PV to the roof.

The risks of climate impact, electrical grid impacts and energy bills are significantly reduced compared to business as usual, but still have 'medium' risk for several reasons:

- The policy uses the national energy and carbon calculation methodologies (Part L SAP) which are widely recognised[xiii,xiv] to be poor predictors of the building's actual performance.
- Part L SAP figures would only cover 'regulated' energy, which means there is no policy lever to reduce or offset the carbon associated with 'unregulated' energy such as that used by plug-in appliances (unregulated energy represents about half of total energy used in homes[xv]).
- From 2025 the Future Homes Standard will form the new baseline. At that point this policy's only benefit would be its requirements for offsetting, and embodied carbon reporting.
- Finally, offsetting still places a burden on the Council to deliver and measure 'additional' carbon reductions, and the UK's required drastic carbon reduction trajectory may not leave room for other sectors to pick up the slack for new buildings (see appendices).

Example approach 4: Medium-low risk for climate; medium-low risk for planning

Policy requirements	Climate (2 °C carbon budgets)	Energy bill costs to occupant	Future retrofit costs/disruption	Electrical grid readiness	Delivery / sector readiness	Viability / cost	Planning powers / precedents	Compatibility with national approach
Regulated energy intensity limit using SAP, and 75% reduction on Part L SAP 2013 TER before PV is added	3	2	2	2	1	1	2	1
Space heat demand limit 15-20kWh/m²/year using SAP Fabric Energy Efficiency (DFEE)	2	3	3	0	1	2	1	1
PHPP / TM54 – reporting only, to compare with SAP	2	2	2	1	3	1	3	3
Any one of several named proven processes to remedy performance gap	0	0	0	0	3	2	2	2
Onsite or near-site PV to match regulated energy use unless proven unfeasible	0	0	0	3	3	4	2	3
Offset 30 years' emissions from total energy use, via local renewable energy (with annual national carbon price rises and falling electricity grid carbon; unregulated energy calculated with BREDEM).	2	3	3	3	3	4	3	3
~~Embodied carbon – reporting only; targets to be added from 2025~~	~~2~~	~~No impact~~	~~No impact~~	~~No impact~~	~~3~~	~~3~~	~~2~~	~~No impact~~

This approach builds on the previous 'medium risk' approach while exploring further avenues to address the weaknesses of that approach. Like the previous 'medium risk' approach, it requires the building to meet the Future Homes Standard (a 75% reduction on Part L 2013 SAP carbon emissions, which essentially rules out gas as previously noted). To strengthen the approach, this policy combination then adds detailed requirements for energy use intensity, space heat demand, and PV.

An absolute space heat demand limit means the building must have an inherently thermally efficient form. This is stronger than precedents which just require a percentage improvement on the Part L baseline – because the Part L baseline is relative, not absolute: it is derived from a 'notional' building of the same size and shape. If the proposed building has a complex form with many joins and surface areas that leak heat, Part L would simply allow leeway to use more energy. Setting an absolute limit on space heat demand will remove this weakness of 'relative' improvement and move towards the level of performance vital to make new buildings compatible with the UK's net zero carbon future. The 15-20kWh space heat demand target comes from the Committee on Climate Change and represents a ~60-70% improvement on a typical home's TFEE[xvi] with Part L 2013. To set the EUI limit, West Berkshire may need a specialist study of what the SAP regulated kWh/m²/year TPER figure would need to be in order to fit within a best-practice total EUI feasible for the building type[xvii] or explore using emerging tools such as the South West Net Zero Energy Hub SAP Energy Adjustment Tool[xviii].

As the required standards are all based on the same calculations used in Part L of building regulations, they all work within the Planning and Energy Act powers to set "reasonable requirements" for energy efficiency and a proportion of energy to be met with local renewable supply. Given the climate crisis and the UK's carbon budgets, it is 'reasonable' to require 100% renewable energy and extremely high thermal efficiency; it would be arguably unreasonable to require anything less.

There is still medium climate risk because of the shortcomings of SAP in terms of accurate prediction of energy use, but this weakness is reduced in the following ways:

- Requiring use of a methodology proven to reduce or eliminate the energy performance gap.
- Requiring the developer to also submit calculations that are far more accurate – that is, PHPP or TM54 calculations. The developer would not have to show that the building *achieves* the same kWh/m²/year targets using PHPP or TM54, but these calculations would help officers (and buyers) spot where there may be unreasonably high energy bill costs, and enable more informed discussion with developers about potential improvements to the scheme.
- Requiring not only regulated, but also unregulated carbon emissions to be offset (for 30 years of operation, using the time-sensitive cost calculation explained in Example Approach 3).

There is precedent[xix] for seeking TM54 calculations to support accuracy, and BREDEM calculations to estimate unregulated energy use. This policy combination applies that precedent to offsetting too: the amount of carbon to be offset is calculated to include not only the regulated energy (using SAP) but also unregulated energy (using BREDEM). The methods are compatible, as SAP is based on BREDEM[xx].

Finally, offsetting only via renewable energy projects ensures that this policy avoids forcing other sectors (land use or existing buildings) to pick up avoidable excess carbon of new buildings, given that these other sectors will already struggle to get their own carbon emissions to net zero as needed for UK's required carbon reduction trajectory. Offsets may be made via Section 106 payments to follow precedent, or the developer could invest directly. West Berkshire's experience of delivering the Grazeley solar farm may inform a verdict about the administrative burden of such schemes and cost per tonne of carbon saved. Any energy produced by the 'offset' renewable energy farms must not be sold onwards with Renewable Energy Guarantee of Origin, as their carbon savings already 'belong' to the development (sale of the REGO certificates to a third party would double-count the carbon savings).

What about existing buildings?

Existing buildings are not included in the previous risk matrices for new build policy requirements, as both the potential policy requirements and the risk topics must be looked at differently in existing buildings compared to new builds.

This is firstly because existing buildings are so varied in type, age, use, heritage value, and condition. This makes it impractical to set reasonable universal requirements for energy efficiency, low carbon heat or renewable energy. Existing powers and precedents largely focus on *new* buildings.

Secondly, local plans also have only a very limited influence on the carbon and energy performance of existing buildings, as they can exert influence where the building owner is seeking to make a change to the building that requires planning permission.

Nevertheless, planning permission can be (rightly or wrongly) perceived as a barrier to the energy retrofit actions that are urgently needed at scale across our building stock in order for the UK to have a chance of meeting its carbon reduction goals. This problem must be addressed if the local plan is to fulfil its duty to deliver carbon reductions in line with the goals of the Climate Change Act.

There is at least one precedent where a local plan attempted to require greater 'consequential improvements' to existing buildings' energy efficiency when changes are made that need permission, expanding on Building Regulations requirements for the same. However, discussions with energy officers at that local authority reveal that this has not proven very effective because very few relevant proposals pass over their desk, and the improvements can only be applied to the part of the building that is undergoing works, not the whole building – which renders many retrofit measures ineffective.

The role of local planning in reducing existing buildings' carbon therefore has two main strands:

1. **Removing the actual or perceived planning barriers to energy retrofit changes to buildings** – by adopting policy language that is actively permissive and supportive towards such changes, supported by guidance about what changes are acceptable in different settings and what changes don't need permission; potentially also deploying Local Development Orders alongside the local plan (giving greater certainty to what is permitted – see precedents in appendix).
2. **Allocating sites suitable for renewable energy generation and distribution in order to decarbonise the energy that existing buildings already use** – such as by allocating sites for wind, solar, biogas, electrical grid capacity upgrades (including storage), or heat networks. This can make it more viable to deliver such projects, by de-risking the application process. This may also make energy cheaper in the long term by reducing reliance on volatile oil/gas prices.

Beyond the risk topics for new buildings, further risk topics become relevant for existing buildings:

- Heritage: Is this policy approach likely to conflict with, or be overruled by, heritage concerns (including natural heritage such as North Wessex Downs AONB)? Conversely, could this approach bring forward energy improvements that keep existing heritage buildings suitable for use for longer, thus preserving viable use and avoiding embodied carbon of replacing them?
- Enforceability: Is this policy approach likely to be applicable and enforceable in many cases? Would it help planning officers to identify compliance, whether quantitative or qualitative?

We present only one risk matrix for existing buildings, as all policy components are mutually compatible and can be applied singly or together. All components 'actively reduce' climate risk, as all help improve existing emissions (unlike new builds, which worsen the status quo unless zero carbon).

Policy component	Climate (2°C carbon budgets)	Energy bill costs to occupant	Electrical grid readiness	Delivery /sector readiness	Viability / cost	Enforceability / implementation	Heritage	Planning powers / precedents
Actively welcome proposals that result in better energy efficiency, low carbon heat and extended fitness for use of existing buildings, and proposals for renewable energy generation (on buildings, or standalone solar) or low carbon heat networks, with significant weight attached	0	0	0	1	No impact	3	3	2
Require higher 'consequential improvements' to energy efficiency, building on Part L2B	0	0	0	3	5	4	4	2
Offer guidance on effective energy retrofit measures, clarity on when permissions are needed, and heritage-acceptable measures	0	0	0	1	No impact	1	0	1
Spatial strategy: allocate/identify sites for renewables	0	0	2	No impact	0	0	3	1
Spatial strategy: Allocate/identify sites for energy storage	0	0	0	No impact	0	0	1	1
Spatial strategy: Allocate/identify routes for heat networks	0	0	No impact	No impact	No impact	0	1	1
Local Development Order permitting retrofit, renewables or heat networks (specific measures & specific locations)	0	0	1	No impact	0	0	2	1

References and endnotes

[i] AECOM & Zero Carbon Hub (2012), *Fabric energy efficiency for Part L 2013*.
https://www.zerocarbonhub.org/sites/default/files/resources/reports/Fabric_Standards_for_2013-Worked_Examples_and_Fabric_Specification.pdf
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[ix] HM Government Ministry of Housing, Communities & Local Government (2019), *The Future Homes Standard consultation impact assessment*.
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https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal
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https://www.gov.uk/government/news/plans-unveiled-to-decarbonise-uk-power-system-by-2035
[xiii] Etude, CIBSE, Levitt Bernstein, Elementa, WSP, Clarion Housing Group, and UCL (2021), *Making SAP and RdSAP 11 fit for Net Zero: 15 minute summary. A report for the Department of Business, Energy and Industrial Strategy*. https://www.etude.co.uk/wp-content/uploads/2021/06/Making-SAP-and-RdSAP-11-fit-for-Net-Zero-Summary.pdf

[xiv] UK Green Building Council (2021), *Net Zero Whole Life Carbon Roadmap: A pathway to Net Zero for the UK Built Environment*. https://www.ukgbc.org/wp-content/uploads/2021/11/UKGBC-Whole-Life-Carbon-Roadmap-A-Pathway-to-Net-Zero.pdf

[xv] Centre for Sustainable Energy/Currie + Brown (2018) *Cost of carbon reduction in new buildings: Final report*. The document states that in homes, unregulated energy typically adds an additional 80 to 95% to a home's regulated energy load, making it 45-49% of the total. https://www.bathnes.gov.uk/sites/default/files/sitedocuments/Planning-and-Building-Control/PlanningPolicy/LP20162036/cost_of_carbon_reduction_in_new_buildings_report_publication_version.pdf

[xvi] AECOM & Zero Carbon Hub (2012), *Fabric energy efficiency for Part L 2013*. https://www.zerocarbonhub.org/sites/default/files/resources/reports/Fabric_Standards_for_2013-Worked_Examples_and_Fabric_Specification.pdf. Please note this AECOM document considers two potential TFEE levels that were being considered in 2012 for inclusion in the 2013 building regulations. Government later confirmed that the 'interim TFEE' option was the one adopted in Part L 2013.

[xvii] While 35kWh/m2/year is considered the cutting edge best practice energy use intensity figure for homes, other various types of nonresidential building will need to have different targets for energy use intensity that reflect their different uses. For examples, see targets from LETI, RIBA, and evidence bases of emerging local plans in Cornwall, Central Lincolnshire and Greater Cambridge referenced elsewhere in this document.

[xviii] South West Energy Hub (2021 – onwards), *SAP Energy Adjustment Tool*. https://www.swenergyhub.org.uk/seat/

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Appendix C

Bioregional West Berks Net Zero Officers Workshop June 2022 – no blanks

Net zero carbon planning policy

Workshop for West Berkshire planning officers
Workshop date: Thursday 16th June 2022

Bioregional

1. Introductions

Who's here today?

West Berkshire District Council

- Emily Ashton-Jelley
  - Principal Environment Delivery Officer
- Jenny Graham
  - Environment Delivery Manager
- Viv Evans
- Bryan Lyttle

Bioregional (sustainability non-profit)

- Lewis Knight BSc MSc PIEMA
  - Programme Manager/Head of Sustainable Places Team
- Marina Goodyear BA MSc
  - Project Manager, Sustainable Places Team

Edgars (planning consultancy)

- Paul Slater BSc (Hons) MSc MRTPI
  - Associate Director

Our recent work in net zero carbon local plan policy

On what experience do we draw, in our work for West Berkshire?

Cherwell
2019 + 2022

- 2019: Review of potential policy options to respond to climate emergency declaration
- 2022: Local Plan partial review
  - Net zero carbon policy support
  - Duties & needs for net zero carbon policy
  - Powers to address net zero
  - Precedents
  - Range of potential policy components
  - Implementability of policies on specific sites

Greater Cambridge
2020 – present

- Full local plan from earliest stages (Reg 18 consultation later in 2022)
- Full evidence base for net zero carbon:
  - Definition & planning powers
  - Analysis of spatial growth options (buildings + transport)
  - Carbon reduction targets linked to climate science & law
  - Draft policy wording
  - Feasibility + costs of NZC builds
  - Offsetting advice
  - Stakeholder engagement
  - Worked with engineers Etude.

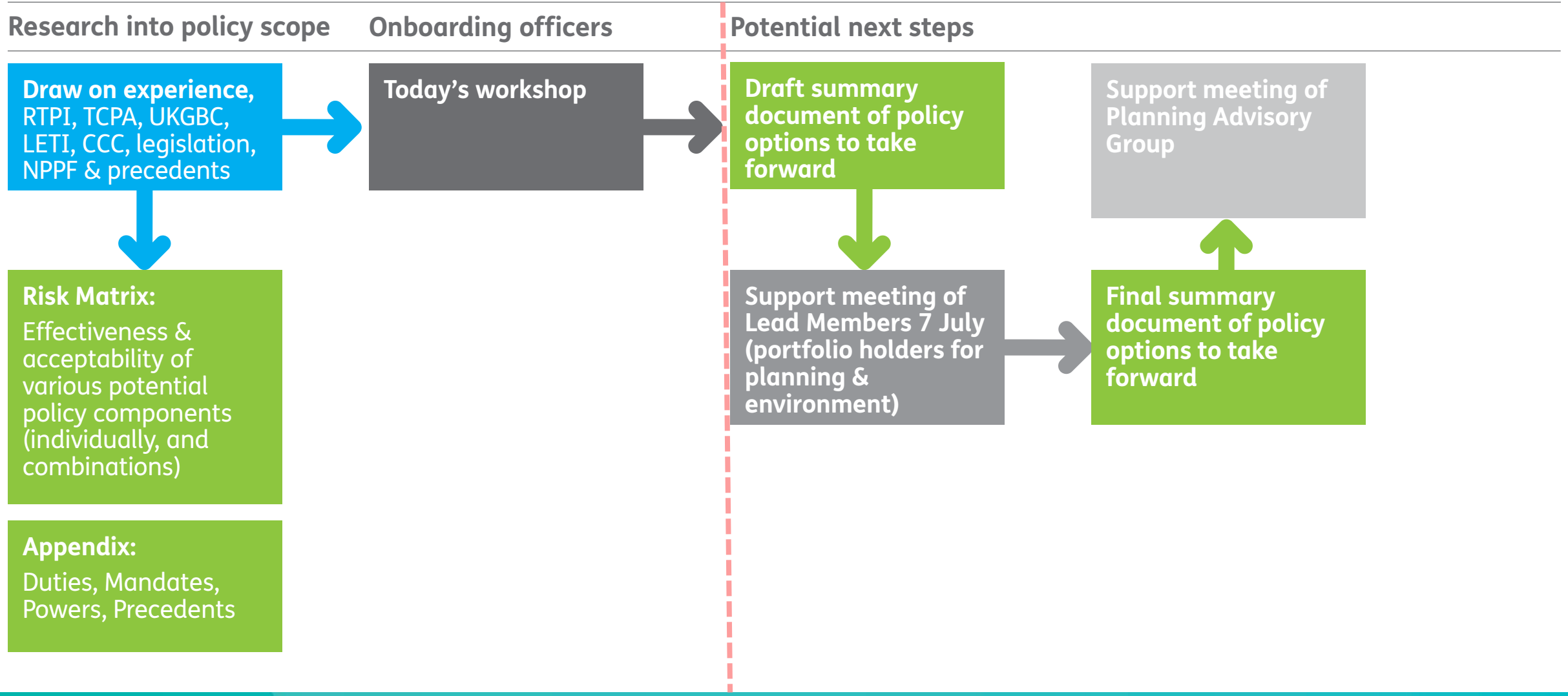
Central Lincolnshire
2020 - present

- Local Plan Review (incl. spatial)
- As per Greater Cambridge but with additional elements:
  - Carbon sequestration value of green infrastructure (peat)
  - Infrastructure requirements (electricity + transport)
  - Decentralised energy
  - Monitoring framework for policies (ongoing)

Warwick
2021 - present

- Net Zero Carbon Buildings DPD (development plan document)
- Reg 18 + 19 consultation responses
- Redrafted policy in response to consultation
- Collated further evidence (effective policy; viability)
- Working with Edgars planning consultancy
- Now at Reg 19 consultation.

Our work with West Berkshire



Purpose of today's workshop

What are we hoping to achieve today?

Get everyone up to speed with why and how net zero carbon policies can/should be set

- Defining 'net zero carbon'
- Duties & mandates
- Powers
- Policy architecture (components; mechanisms)
- Precedents
- Risks & strengths of different potential policy options

Explore two promising policy approaches in more detail

- As per document circulated by EAJ in advance of this session
- 'Risk matrix'
- Consider implementation

Discussion & consensus

- Clarify your questions
- Consensus on next steps.

2. Our findings to date

Why we need net zero carbon local plan policy

Duties and mandates

Global science & agreements

IPCC Special Report on 1.5C Climate Change

Limited global carbon budget to avoid catastrophe

- Current trajectory: 4C
- Already happened: 1C

Paris Agreement:

- 2C limit
- 1.5C aim
- Equity principle: Richer countries, larger cuts

UK climate legislation

Climate Change Act 2008 (& 2019)

- Net Zero 2050
- Interim 5-yearly carbon budgets

Committee on Climate Change pathways to net zero

- Low carbon heat 2025
- Space heat demand 15-20kWh/m^2/yr
- Upscale renewables
- Transport – less car use; electrification
- Agriculture & aviation will need offsets

UK planning law & guidance

Planning & Compulsory Purchase Act 2004

"must … contribute to mitigation of … climate change"

National Planning Policy Framework

"support the transition to a low carbon future"

"contribute to radical reductions in GHGs"

"proactive approach in line with Climate Change Act"

"increase use & supply of renewable and low-carbon energy"

Gaps in national regulation

Building regulations does not deliver net zero carbon buildings (not even the Future Homes Standard)

Transport emissions remain stubbornly stable; insufficient regulatory or market incentives

No national offsetting mechanism

Why we need net zero carbon local plan policy

Not just net zero 2050 – but also reductions in the meantime

IPCC Special Report on 1.5C Climate Change

Climate Change Act
- Net Zero 2050
- Interim 5-yearly carbon budgets

Limited global carbon budget to avoid catastrophe
- Current trajectory: 4C

Paris Agreement:
- 2C limit
- 1.5C aim
- Equity principle: Richer countries, larger cuts

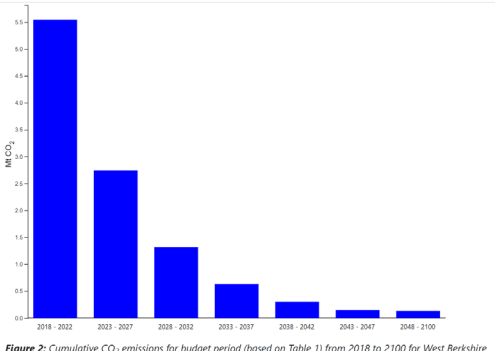
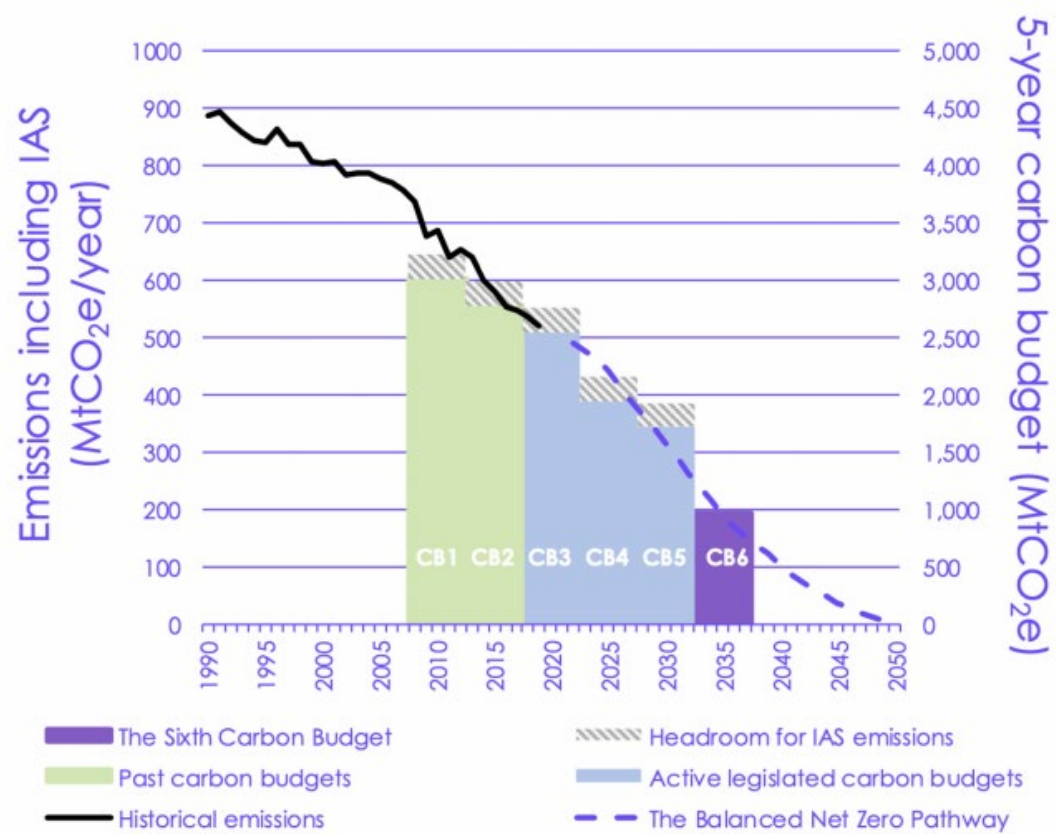


Figure 2: Cumulative CO_2 emissions for budget period (based on Table 1) from 2018 to 2100 for West Berkshire



Why we need net zero carbon local plan policy

Committee on Climate Change – sectoral changes needed for carbon budgets

New homes

- **Not connected to gas grid** from 2025 at the latest
- **Use low-carbon heat** (pumps or gas-free networks)
- Space heat demand 15-20kWh/m²/year
  - (60-70% less than Part L 2013)
- Ideally zero carbon

Existing buildings & energy system

- Accelerate / scale-up rollout of low carbon heat:
  - **3.3. million heat pumps** to be installed in existing homes by 2030
  - Expansion of low carbon heat networks in 2020s
  - **Limited role for hydrogen in some locations** after 2030 in gas grid
- **No installation of fossil fuel boilers from 2033**
- **Fully decarbonise electricity grid** by 2035 (2050: 80% renewables / 20% nuclear)

Transport

- Reduce travel mileage by car
- New cars/vans all EV from 2032
- Not invest in road capacity unless proven how the road will support the UK's pathway to net zero

Land use

- Increase woodland cover to 18% (today: 13%)
- Restore peatlands.

Why we need net zero carbon local plan policy

What carbon reductions do we need in each sector to meet the carbon budgets?

IPCC Special Report on 1.5C Climate Change

Limited global carbon budget to avoid catastrophe
- Current trajectory: 4C

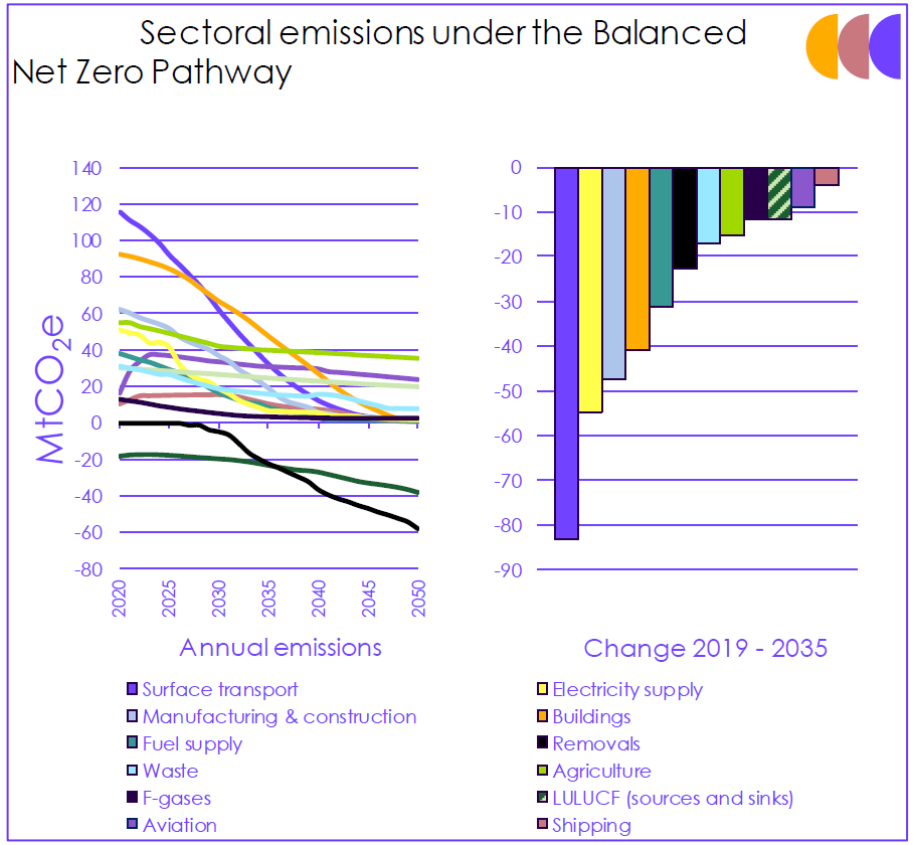
Paris Agreement:
- 2C limit
- 1.5C aim
- Equity principle: Richer countries, larger cuts

Climate Change Act
- Net Zero 2050
- Interim 5-yearly carbon budgets

Committee on Climate Change pathways to net zero
- Low carbon heat 2025
- Space heat demand 15-20kWh/m²/yr
- Upscale renewables
- Transport – less car use; electrification
- Agriculture & aviation will need offsets

Lack of legislation & regulation to deliver the pathways

Current national policy will not deliver this



Defining net zero carbon

Scope of what is included in 'net zero' varies by scale and sector

Global level

- Greenhouse gases emitted = same amount removed
- Today: removals are only achieved by green infrastructure
- "Greenhouse gases":
  - Carbon dioxide (80%)
  - Methane (12%)
  - Nitrous oxide (5%)
  - Refrigerants (3%)

National level

- Greenhouse gases emitted = same amount removed
- Today: removals are only achieved by green infrastructure
- Future: anticipate development of GHG removal technology
- Should not include international offsetting (Committee on Climate Change)
- "Greenhouse gases":
  - Carbon dioxide (80%)
  - Methane (12%)
  - Nitrous oxide (5%)
  - Refrigerants (3%)

West Berkshire District

- Goods, energy and services are mobile across boundaries
- Therefore: need a carbon accounting methodology.
- Methodologies differ in terms of:
  - CO^2 only, or all GHGs?
  - Sectors included?
  - How to count emissions that are mobile across boundaries
- Methodologies agree about:
  - Not counting purchased offsets from outside the area

Buildings

- Definitions vary in:
  - CO^2 only, or all GHGs?
  - Operational carbon only?
  - Include embodied carbon?
  - Calculation method?
  - Offsetting – what counts?

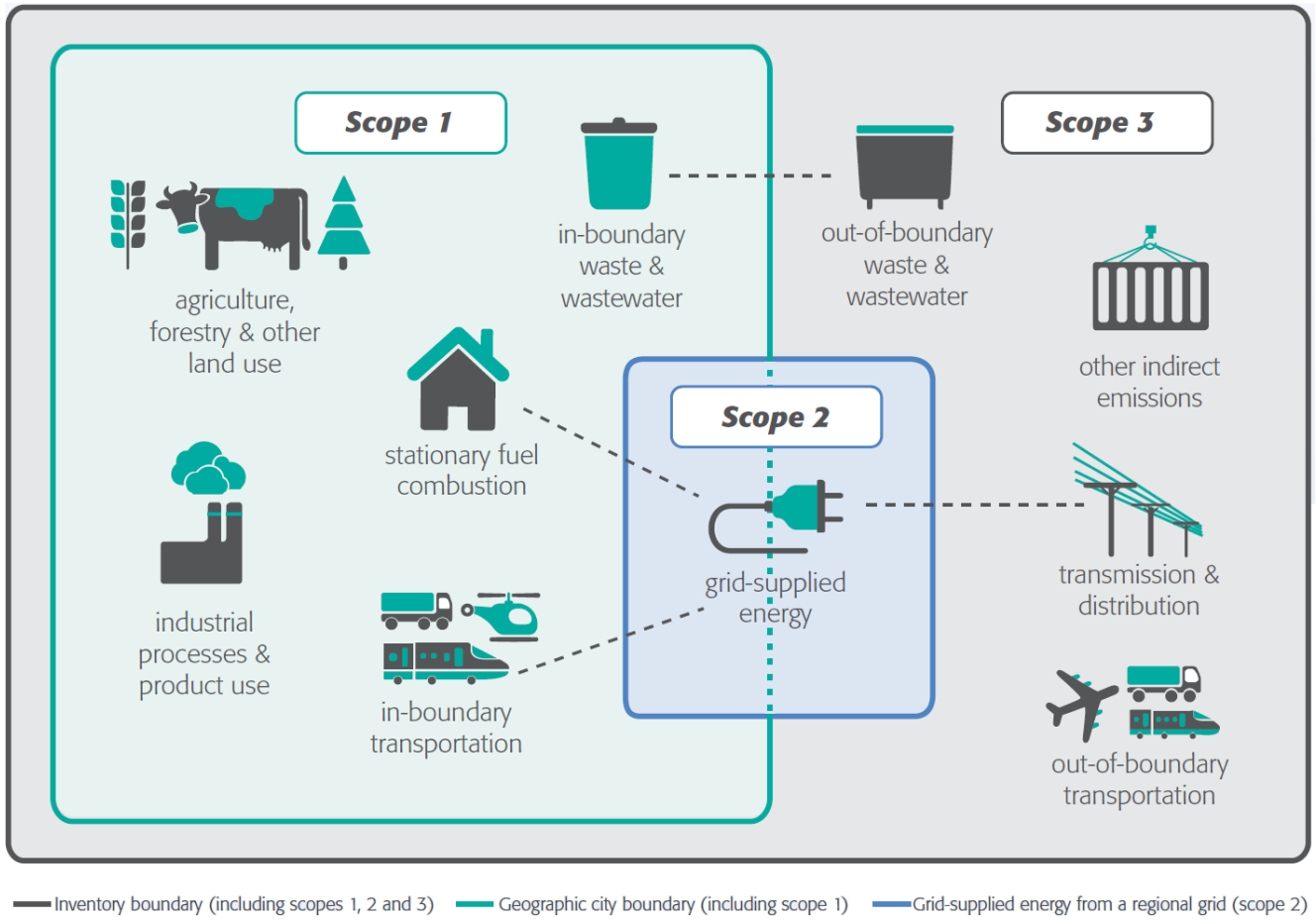
Industry & government definitions:

- Building Regulations Part L (with SAP or SBEM)
- UKGBC
- LETI

Defining net zero carbon

GHG Protocol for Cities - the lead area-scale carbon accounting methodology

- Named “for cities” but applies to any area
- Assists comprehension of how buildings and other activities will fit into the overall carbon footprint of the local area
- Buildings will cause carbon emissions by:
  - Energy use – for appliances and outdoor lighting etc, as well as heat / light / other ‘regulated’ energy uses
  - Production, construction & transport of materials (embodied carbon)
  - Inducing travel* by occupants & visitors
    - (*This is part of the carbon of the local area, but is not part of the definition of a ‘net zero carbon building’).



Defining net zero carbon

Buildings

Building Regulations Part L

- Sets national minimum standards for **some aspects** of building's energy & carbon
- Calculations: SAP (homes) & SBEM (other)
- Two targets: kWh/m^2/year, and CO_2/m^2/year
- 'Notional building' – no incentive for inherently thermally efficient building form
- **Not designed to account for a building's actual carbon emissions**
  - Ignores 'unregulated energy' (plug-ins)
  - Calculation is poor at predicting actual energy use; carbon factors often old
  - **Energy performance gap** (design vs use)
- CO_2 only - no other gases
- Updated in 2022 & 2025 (Future Homes)
- Operational only – not embodied

UKGBC (UK Green Building Council)

Operational net zero carbon means:

- "The amount of carbon emissions associated with the building's operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset."
- Procuring renewable energy and/or offsets according to UKGBC guidance
- To be verified when building is in use.

Embodied net zero carbon means:

- "The amount of carbon emission associated with a building's product and construction stages up to practical completion is zero or negative, through the use of offsets or the net export of on-site renewable energy"

LETI (London Energy Transformation Initiative) Operational Net Zero Carbon

Definition is designed to:

- Aid design decisions
- Allow accurate calculation of carbon emissions
- Allow verification.

Definition is:

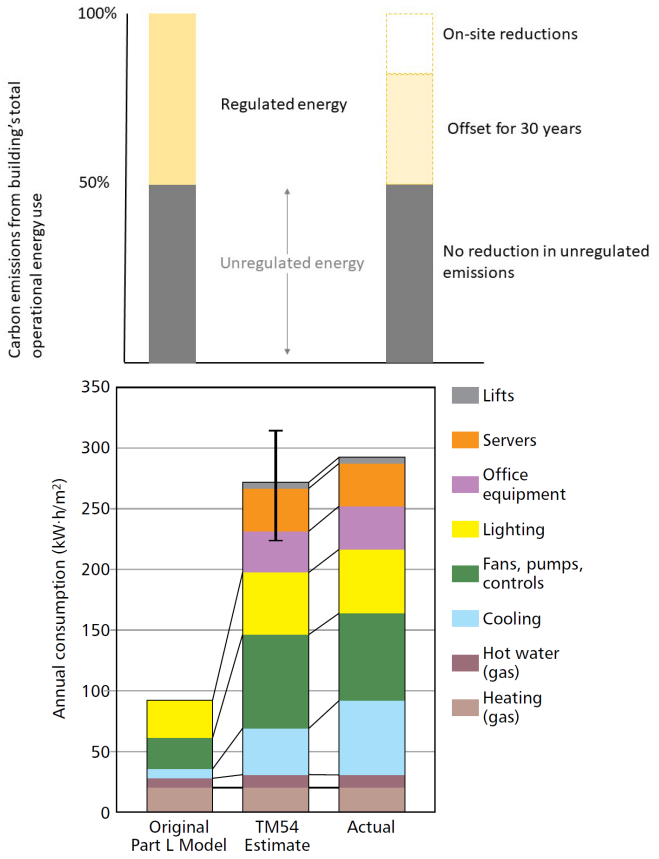
- **Building's annual energy use is equal to its annual renewable generation** (export the excess; draw from electricity grid when not enough on site) OR invest in off-site
- 15kWh/m^2/year space heat demand
- 35 – 70kWh/m^2/year total energy use intensity
- No fossil fuels used for heating & hot water
- Monitor & report use & generation for 5 years.

This definition **has now been endorsed by UKGBC**.

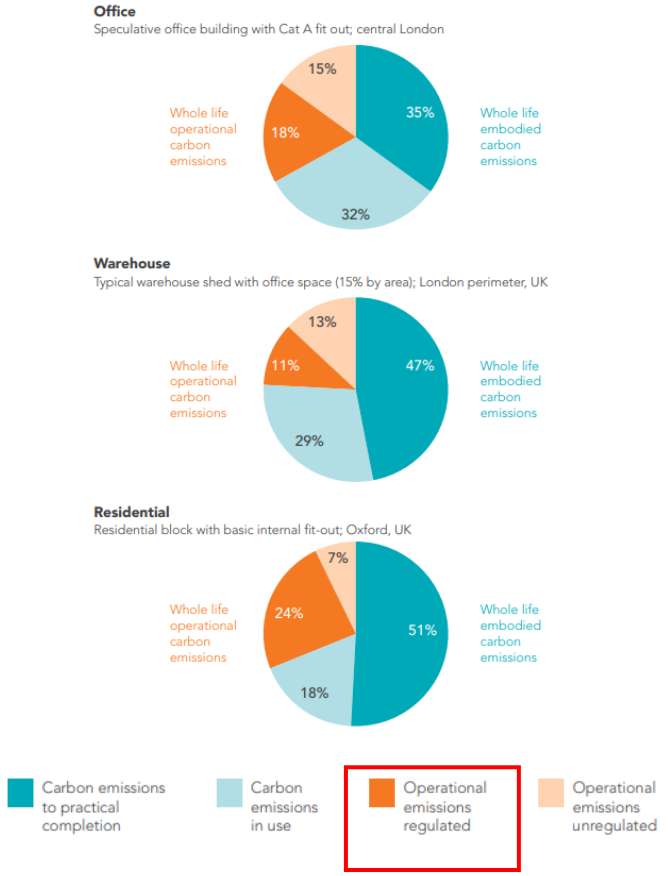
Defining net zero carbon

Why should any building need other calculations than Part L?

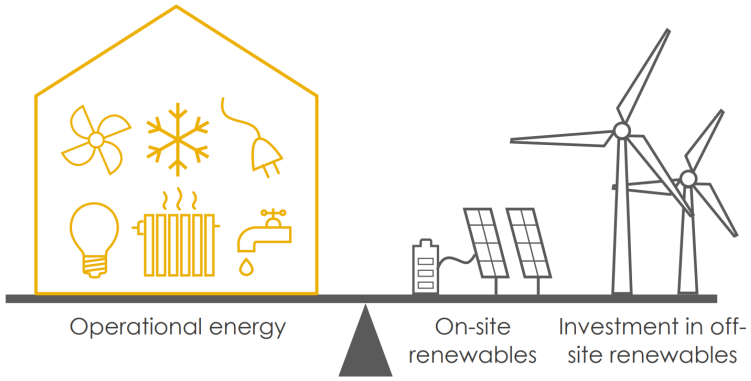
Building Regulations Part L



UKGBC (UK Green Building Council)



LETI (London Energy Transformation Initiative) Operational Net Zero Carbon



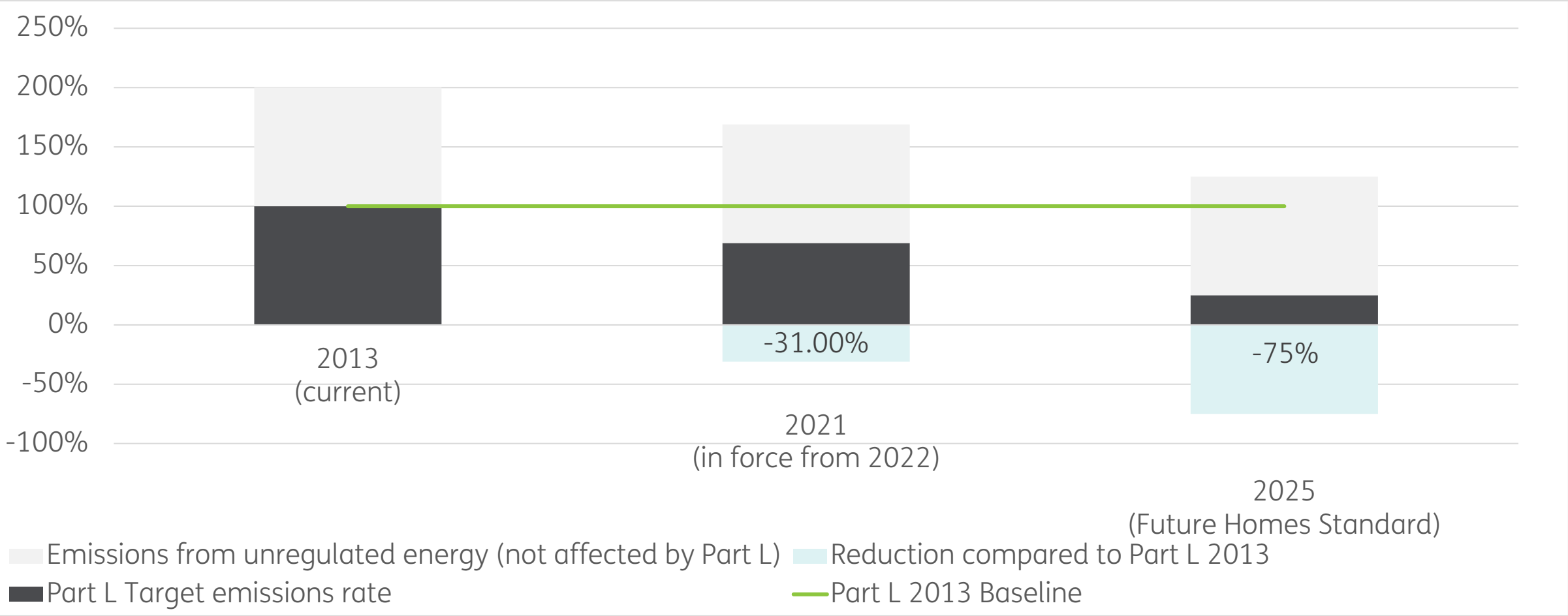
Net zero operational balance

LETI uses PHPP or TM54 calculations, which are far more accurate in modelling the building's actual thermal properties and user behaviour.

(TM54 is used generally in non-residential builds - it begins with Part L SBEM, but adjusts for accuracy)

Part L target emissions rate: recent, current, future

Note: This is before considering the energy performance gap



How can a local plan act on net zero buildings?

Powers

Planning & Energy Act 2008

- "Energy efficiency standards" that exceed those of building regs – BUT "standards"= "set out or endorsed by Sec of State"
- "Reasonable" requirements for a proportion of energy used … to be from low-carbon or renewable sources "in the locality"

Town & Country Planning Act 1990

S106 Planning Obligations

- Used in several precedents to deliver carbon offsetting.

Local Development Orders

- Can bring forward renewables, low carbon energy networks, existing building energy efficiency retrofit

National Planning Policy Framework (2021)

Location, orientation & design of new development

Positive strategy for renewable energy (do not require demonstration of need for this energy)

Positive strategy for conservation of historic environment, including "viable uses consistent with conservation"

Planning Practice Guidance

Reduce need to travel; sust transport

Create opportunities for renewables ≤50MW

Promote low-carbon energy efficient design in new buildings

(unrestricted in non-residential)

Identify measures via local data; future trends; spatial tests; sectoral differences

How can a local plan act on net zero buildings?

Potential Constraints

Planning & Energy Act 2008

- **"Energy efficiency standards"** means standards that are "set out or endorsed" by Sec of State (laws, regulation, policy statements)
- **Probably means Part L calculation methods**
- Now being tested by emerging precedents

Written Ministerial Statement 2015

Local carbon reduction requirements should be no more than Code for Sust Homes Level 4 (19% reduction on Building Regs 2013)

- BUT: already exceeded by London, Reading, Milton Keynes, and new Part L
- AND: Statement was written in relation to legislation that was never

NPPF (2021)

Building sustainability requirements should "reflect the Government's policy for national technical standards"

S106 obligations: necessary, directly related, proportional

Feasibility and viability are valid reasons to not comply with local requirements for decentralised energy

Planning Practice Guidance

Repeats 2015 WMS statement re Code for Sust Homes

Repeats NPPF re 'national technical standards'

Local standards should be:

- **Based on robust credible evidence**
- **Paying careful attention to viability**

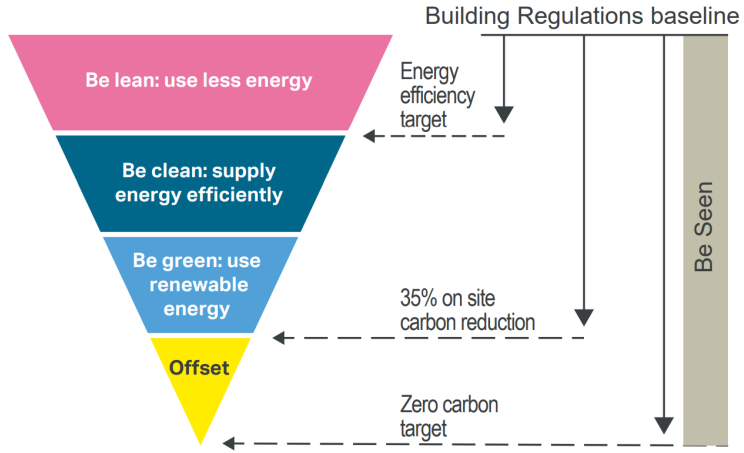
How can a local plan act on net zero buildings?

A few adopted precedents – net zero and energy hierarchy

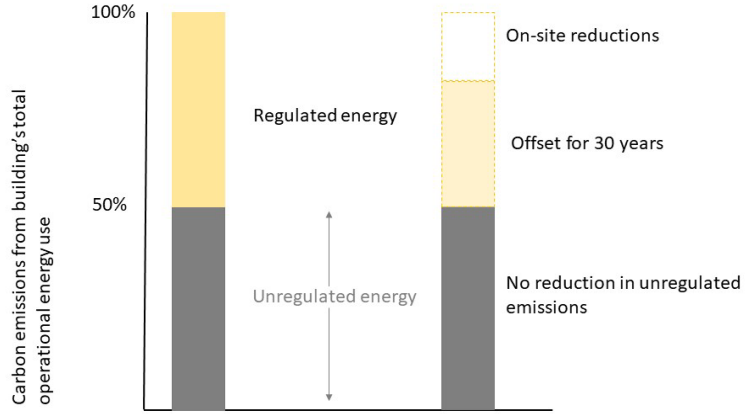
London, Reading, Milton Keynes, Oxford

- Require 35-40% percentage reduction on the Part L Target Emission Rate (TER)
- Apply energy hierarchy:
  1. Energy efficiency (reduce demand) to deliver 10-19% TER reduction
  2. Clean & efficient energy supply (e.g. heat networks if available)
  3. Renewables.
- Offset remaining Part L emissions at £90/tonne for 30 years in major developments (1 year x £90 x 30) OR £200/tonne x 1 year
- Offset fund ringfenced for local projects
  - *Administrative burden*
  - *Sometimes unspent / returned*
  - *Offset price is outdated (old BEIS value)*

The 'energy hierarchy' pyramid means that offsetting should be the last and smallest step.



In reality, these policies allow most of the reductions to be achieved through offsetting – and usually neglect unregulated carbon.



How can a local plan act on net zero buildings?

A few adopted precedents - renewables

Merton

- "Merton Rule"
- 10% of energy needs to be supplied via on-site renewable generation
- Adopted by many other local plans since Merton's pioneer policy

Milton Keynes

- 20% reduction in Part L Target Emissions Rate to be achieved by renewable energy measures (major developments only)
  - *after* the initial reduction of 19% has been achieved through energy efficiency / energy supply measures
  - Renewable energy measures can be on-site, or local renewable networks.
- Target based what is already achievable – revealed by analysis of energy statements submitted in previous years.

Sutton

- 20% reduction in Part L Target Emissions Rate to be achieved by renewable energy measures, in major developments

Swindon (standalone renewables)

- Used Local Development Orders to promote growth of renewable energy generation
- Specifically: identifying specific sites for solar arrays
  - Began with 'call for sites'
  - Sites assessed against various criteria
- This LDO de-risks the process of developing renewables.

[This is a separate topic from net zero carbon individual buildings – but is relevant to the district's wider net zero carbon transition]

Getting through inspection

The four tests of 'soundness' (NPPF 2021)

Plan should be positively prepared

- Responding to objectively assessed needs
- Delivering 'sustainable development'

Plan should be justified

- Based on evidence
- Having considered reasonable alternatives

Plan should be effective

- Deliverable in the plan period
- Based on effective joint working on cross-boundary strategic matters

Plan should be consistent with national policy

- Enable delivery of 'sustainable development'
- In accordance with suite of NPPF policies
- In accordance with other statements of national planning policy, where relevant

3. ‘Risk matrix’ approach to policy options

Why a risk matrix?

Mismatch between duties/needs, and planning powers to fulfil them

Climate

- Carbon budgets & net zero goal
- Necessary sectoral changes
- Responsibility proactively accepted, shirked, passed on, or postponed
- Opportunities grasped or missed

Occupiers / users of building

- Energy bills
- Future retrofit: costs; disruption

Infrastructure & sectoral readiness

- Electrical grid
- Technical feasibility
- Materials availability
- Skills availability

Planning acceptability

- Viability
- National technical standards
  - Current
  - Incoming (Part L 2025)
- National strategy / formally stated future policy direction
- Explicitly granted powers
- Explicitly stated restrictions
- Adopted precedent plans

Range of potential policy components

Based on precedents, or building on existing powers		Description	Precedent or rationale
Energy efficiency	EUI limits (using PHPP/TM54)	• kWh/m2/year targets for space heat and total energy use intensity (EUI) • Targets set at a level to ensure excellent fabric and most efficient heat systems • Demonstrated using a proven effective calculation methodology	LETI / UKGBC – highly effective at reducing carbon emissions. Committee on Climate change – space heat limit necessary for carbon budgets. Precedents (emerging): Merton, Greater Cambridge, Central Lincolnshire, Cornwall, Salt Cross
	Space heat demand limits (PHPP/TM54)		
	Process to remedy performance gap	Require demonstration that the new building has been through a proven process in design and construction to ensure it performs as expected. (Various processes exist)	Milton Keynes Local Plan 2019, London Plan Energy Monitoring Guidance 2020
	EUI & space heat limits – using Part L SAP	Requiring new builds to hit kWh/m2/year targets for space heat demand and total energy use intensity – but using Building Regulations calculation (less accurate)	Using 'national calculation methodology' to stay within Planning & Energy Act Powers and to make submission evidence straightforward – but still setting absolute targets, not relative ones
	Future homes fabric % reduction on Part L SAP TFEE	Requiring new builds to show a % reduction on the Target for Fabric Energy Efficiency that is set by Part L of building regulations (kWh/m^2/year)	Using 'national calculation methodology' to stay firmly within the bounds of Planning & Energy Act Powers and to make submission evidence more familiar
	Moderate energy efficiency % reduction on Part L TER	Requiring new builds to show a % reduction on the Target Emissions Rate that is set by Part L of building regulations	Well-precedented approach (London, Milton Keynes, Reading, Oxford, others) albeit only weakly effective in terms of carbon Definitely within Planning & Energy Act power – derived from national standards
Renewable & fossil-free energy supply	No new gas	Not giving permission to new builds that propose to connect to the gas network	Committee on Climate change – necessary from 2025 for carbon budgets. Building Regs Part L 2025 is designed to indirectly deliver this in most cases
	Onsite PV to match energy use	Requiring demonstration that solar panels will generate an equal amount of energy as the amount the building consumes, per year	LETI / UKGBC – highly effective at reducing carbon emissions. Precedents (emerging): Merton, Greater Cambridge, Central Lincolnshire
	Onsite PV per m^2 ground floor area	Requiring an amount of solar panel area in relation to the building's footprint (to ensure its roof will certainly be able to accommodate this)	Based on new aspect of Building Regs notional building in Part L 2021/22 – thus staying within bounds of Planning & Energy Act. Flexible to building shape.
	Renewable % reduction on Part L TER or Part L energy use	Requiring demonstration that renewable energy technologies will deliver a certain target % reduction on the Building Regs Part L Target Emission Rate or energy use	Well-precedented approach (London; Milton Keynes) Works within Planning & Energy Act Powers by being derived from building regs
Offsetting	Offset only via local renewable energy	Requiring that any remaining energy use or carbon emissions are reduced to 'zero' by investment in local renewable energy, directly or via Section 106 payments	Emerging precedents: Central Lincolnshire, Greater Cambridge; others Supports Committee on Climate Change need to scale-up renewables
	Offset via S106 (various projects)	As above, but with S106 offset fund able to be spent on a variety of local projects	Well-precedented approach (London; Milton Keynes; Reading)
	Offsetting via global schemes	As above, but permitting developer to buy cheap overseas carbon offset credits	Less impact on viability – but less local benefit and less incentive for good design

Risk matrix overview

		Risk topics (5 = high risk; 1 = low risk; 0 = actively reduces risk)							
Potential policy components – from existing precedents, emerging precedents, or interpretation of existing powers		Climate (2°C carbon budgets)	Energy bill costs to occupant	Future retrofit costs/disruption	Electrical grid readiness	Delivery / sector readiness	Viability / cost	Planning powers / precedents	Compatibility with national approach
Energy efficiency	EUI limits (using PHPP/TM54)	0	0	0	0	4	4	5	5
	Space heat demand limits (PHPP/TM54)	0	0	0	0	4	3	4	4
	Process to remedy performance gap	0	0	0	0	3	2	2	2
	EUI & space heat limits – using Part L SAP	3	3	3	2	1	1	2	1
	Future homes fabric % reduction on Part L SAP TFEE	3	3	3	0	1	2	1	1
	Moderate energy efficiency % reduction on Part L TER	4	3	4	3	0	1	1	0
Renewable & fossil-free energy supply	No new gas	0	3	0	3	2	2	3	3
	Onsite PV to match energy use	0	0	0	3	3	4	2	3
	Onsite PV per m^2 ground floor area	1	1	1	2	2	3	3	2
	Renewable % reduction on Part L TER or Part L energy use	4	3	3	2	1	2	0	0
Offsetting	Offset only via local renewable energy	3	3	3	3	3	4	3	3
	Offset via S106 (various projects)	4	4	4	1	0	3	1	1
	Offsetting via global schemes	5	3	4	3	2	1	4	3
~~Embodied carbon~~	~~Embodied carbon – specific targets~~	~~0~~	~~No impact~~	~~No impact~~	~~No impact~~	~~5~~	~~4~~	~~5~~	~~4~~
	~~Embodied carbon – reporting only~~	~~3~~	~~No impact~~	~~No impact~~	~~No impact~~	~~3~~	~~3~~	~~1~~	~~2~~

4. Potential policy approaches assessed via the risk matrix

Four potential policy approaches

Combining policy components into coherent approaches

Approach 1: 'Safe' precedent

- 35-40% reduction on the Target Emissions Rate set by Part L 2013
- 5-15% of this reduction to be via energy efficiency measures
- 10% of Part L energy use to be met with renewables
- Offset 30 years of Part L emissions via S106, £60-90/tonne
- Precedents: London, Milton Keynes, Oxford
- **Discounted – ineffective. Not much improvement on Part L 2021/22. No absolute targets. Offsets insufficient to fund local carbon reduction projects.**

Approach 2: Cutting edge

- Space heat demand target of 15-20kWh/m2/year
- Energy use intensity target of 35kWh/m^2/year (homes) or 55-70kWh/m^2/year (others)
- PV to match annual energy use
- All calculations PHPP or TM54
- Energy performance gap process
- Offset only via renewable energy
- **Discounted – high planning risk (non national methods); likely to need local evidence on feasibility/cost; requires scarce energy specialist skills.**

Approach 3: Accelerating future stated national policy

- Targets set to reflect Future Homes Standard (all Part L calcs):
  - 10% improvement on Part L 2021 fabric efficiency (TFEE)
  - 75% reduction on Part L 2013 Emissions Rate (TER)
- Recalculate SAP on completion with input from surveys
- Onsite renewables as far as feasible & viable
- Offset 30 years' Part L emissions at national carbon £value (rises over time); calculation to reflect electricity grid changes – spend on various local projects
- Cost impact info available ✓

Approach 4: Acceleration+

- Targets for energy efficiency and carbon using Part L calcs:
  - Regulated energy use intensity (kWh/m^2/year; to be set)
  - Space heat demand 15-20kWh/m^2/year
  - 75% reduction on Part L Target Emissions Rate (TER) before PV solar panels
- Energy performance gap process
- PV to match regulated energy use onsite/nearsite, unless unfeasible
- Offset as per approach 3 but also including unregulated carbon; spent only on local renewables
- Cost info mostly available ✓

Approach 3

Accelerating future stated national policy

	Risk topics (Risk topics (5 = high risk; 1 = low risk; 0 = actively reduces risk)							
Policy requirements	Climate (2˚C carbon budgets)	Energy bill costs to occupant	Future retrofit costs/ disruption	Electrical grid readiness	Delivery / sector readiness	Viability / cost	Planning powers / precedents	Compatibility with national approach
10% improvement on on Part L SAP TFEE 2021 (Future Homes Fabric)	3	3	2	0	1	2	1	0
75% reduction on Part L 2013 SAP TER (Future Homes Standard)	3	3	2	2	1	2	0	0
Recalculate SAP figures on completion (to reflect any design changes and fabric performance) and remedy or offset any shortfall	2	2	2	2	1	2	1	0
Onsite renewables as far as feasible & viable	3	2	1	3	3	4	2	3
Offset 30 years' regulated emissions (with annual national carbon price rises & electricity grid carbon falling) via S106 to fund various local carbon reduction projects	4	4	4	1	0	3	1	1

Approach 4

Acceleration+

Policy requirements	Risk topics (Risk topics (5 = high risk; 1 = low risk; 0 = actively reduces risk)							
	Climate (2˚C carbon budgets)	Energy bill costs to occupant	Future retrofit costs/ disruption	Electrical grid readiness	Delivery / sector readiness	Viability / cost	Planning powers / precedents	Compatibility with national approach
Regulated energy intensity limit using SAP, and 75% reduction on Part L SAP 2013 TER before PV is added	3	2	2	2	1	1	2	1
Space heat demand limit 15-20kWh/m^2/year using SAP Fabric Energy Efficiency (DFEE)	2	3	3	0	1	2	1	1
PHPP / TM54 – reporting only, to compare with SAP	2	2	2	1	3	1	3	3
Any one of several named proven processes to remedy performance gap	0	0	0	0	3	2	2	2
Onsite or near-site PV to match regulated energy use unless proven unfeasible	0	0	0	3	3	4	2	3
Offset 30 years' emissions from total energy use, via local renewable energy (with annual national carbon price rises and falling electricity grid carbon; unregulated energy calculated with BREDEM).	2	3	3	3	3	4	3	3

5. Discussion points

Discussion points

What planning submission information would officers be comfortable with processing – now or with training?

- Energy statements?
- Part L SAP/SBEM calculations?
- PHPP/TM54 calculations?
- Documentation to demonstrate that the energy performance gap has been mitigated?
- Offset calculations – static, or declining over time?
- Post-occupation energy monitoring?
- Studies proving non-feasibility?

Offsetting: what are the opportunities and caveats?

- Setup & admin of fund?
- Identifying fundable projects?
- Collaborate or mutually learn with other local planning areas that have similar requirement – e.g. Reading?
    - In future: potentially pool resources for efficiency?

Value of 'informational' planning requirements (as opposed to 'target' compliance)

- Do officers see the value in gathering information for the purpose of future target setting and as a developer education exercise?
    - PHPP / TM54 energy calculations
    - In-use energy monitoring data
    - Embodied carbon calculations

How far are we willing to push the boundaries – and which 'risks' do we prioritise?

- Energy and carbon calculation methods – national standards, or accurate ones?
- Legislated national carbon targets and building users' bills/disruption?
- Viability & feasibility – do we need custom local assessments or are we willing to draw on others'?

Discussion points

Further questions?

Thank you

Appendix D

West Berkshire Net Zero Carbon Buildings Policy - Summary Paper rev 02 0...

West Berkshire Local Plan Review Net Zero Carbon planning policy development support:

Summary paper for council members

Work to date and potential next steps

Bioregional – 06/07/2022 Version 02

Contents

Optimal policy approaches and recommended approach

Four different approaches were developed. After initial discussions, approaches 3 or 4 are thought to be preferable because they:

- Are consistent with national technical standards such as the Future Homes Standard (reduces planning risk)
- Use national calculation methods, therefore fit within the power to require 'energy efficiency standards' as per the Planning and Energy Act 2008 (reduces planning risk)
- Are more effective than existing precedents (reduces climate risk), by
    - taking the required carbon reductions far further than the precedents
    - using a nuanced calculation of carbon offsetting, that rewards gas-free buildings, and reflects ongoing changes in electricity grid carbon and national carbon costs.
- Can be supported by existing feasibility and cost evidence from recent national policy impact papers and other emerging local plan evidence bases (reduces planning risk).

During the officers' workshop, the following caveats were raised:

- The policy should not be weaker than the previous plan Policy CS15 (to the extent that this is possible without the erstwhile Code for Sustainable Homes)
- There is limited ability in the department at present to assess energy statements – especially if these use non-standard calculation methodologies
- Consider the evidential requirements of the policy, to assess compliance

Approach 4 in particular has the following additional benefits beyond Approach 3:

- It sets an *absolute* standard of performance rather than a relative standard – which incentivises developers to design buildings of an efficient shape1 as well as applying a good standard of building fabric and services (reduces climate risk and occupant bills)
- This absolute performance standard could be aligned with the specific performance factors that are needed for the Climate Change Act carbon budget (reduces climate risk)
- It would deliver more renewable energy than Approach 3 (reduces climate risk)
- It includes unregulated energy as well as regulated energy (reduces climate risk), thus
    - Helping to maintain and strengthen the approach of existing CS15 policy
    - Addresses carbon emissions that are neglected by building regulations – so developments will either deliver more renewable energy, or pay more in offsets

[redacted]

[redacted]

[redacted]

[redacted]

[1] This remedies a key weakness of Building Regulations Part L, which sets targets in relation to a building of the identical size and shape to the proposed building. This means Part L gives no incentive to design a building that does not have a complicated shape with excess external surface area or excess joins, both of which will leak far more heat than a building that has a simpler shape.

Introduction

Bioregional has been appointed by West Berkshire Council Environment Delivery Team to support the development of robust, enforceable and effective net zero carbon policies in the emerging Local Plan Review. In this work, Bioregional has collaborated closely with WBC officers, and has drawn on the support of qualified planning professionals from Edgars.

Bioregional is an environmental charity whose mission is to enable good lives within the means of our single planet. We do this through partnerships in all sectors. This appointment is led by our Sustainable Places team, which works with local government and developers. Our recent experience has had a strong focus on local planning for climate and carbon, including evidence bases and policy development for emerging plans in Greater Cambridge, Central Lincolnshire, Warwick and Cherwell, as well as net zero carbon strategy advice for LEPs in Berkshire and Oxon.

Edgars is a professional planning consultancy since 2007, whose director previously worked in local government for 20 years. In this appointment, Edgars qualified planners provide technical planning input via reviews of outputs and attendance at meetings with officers and members.

Our scope of work has been to explore precedents, powers and potential to set stronger policies for net zero carbon, and assist WBC in understanding the advantages and risks involved in pursuing various potential policy approaches in next steps of WBC's current Local Plan Review.

The emerging Local Plan Review has had several rounds of development and consultation. It is due for a final consultation this summer, with a view to adoption at end of 2022. We understand that at this stage there is not much scope to influence the spatial pattern of growth (and how this impacts transport carbon emissions and growth of renewable energy). Therefore we here focus mainly on policies to reduce the carbon emissions of buildings - although our full reports also touch on the vital importance of spatial planning in the net zero carbon transition.

To date, Bioregional has produced the following:

- 1. Separate appendix report explaining the following:
    - The national background (legislation, regulation, government policy)
    - Powers and precedents for planning policies towards achieving net zero carbon
    - Ways to define 'net zero carbon' for a building, for the District, and for the country
    - Net zero carbon buildings – how they can be defined, designed and verified.
- 2. 'Risk matrix' assessment of various net zero carbon policy approaches' pros and cons:
    - Effectiveness for carbon reductions
    - Effectiveness in protecting occupants from high energy bills and future retrofit
    - Risk of the infrastructure or building industry not being ready to deliver the policy
    - Risk of transgressing planning powers or contradicting national policy.
- 3. Workshop with planning officers (16th June) to present the work and discuss next steps
- 4. Producing this summary paper and attending lead members meeting on 7th July.

Our potential next step, if West Berkshire officers and members choose to proceed with this, is:

- 5. Iterate summary paper if needed, and attend Planning Advisory Group on 21st July.

Local planning authorities have a binding legal duty to mitigate climate change, established in the Planning and Compulsory Purchase Act 2004.

This is reiterated in the National Planning Policy Framework. The NPPF defines 'climate mitigation' as reducing our impact on the climate, primarily by reducing greenhouse gas emissions (this is distinct from 'climate adaptation' although the two can be linked). The NPPF states that the plan should achieve 'radical reductions' in greenhouse gas emissions in line with the objectives and provisions of the Climate Change Act 2008.

The Climate Change Act lays down not only the net zero carbon 2050 goal but also interim five-yearly carbon budgets that are periodically signed into law. So far, parliament has legislated six carbon budgets running to 2035. To meet those carbon budgets, the UK will need to achieve the following changes to the buildings sector:

- From 2025, new buildings should have 15-20kWh/m^2/year space heat demand, a low carbon heat system, no connection to the gas grid, and ideally be net zero carbon
- Heat pump rollout (including to existing buildings) should be dramatically accelerated, with installations annually increasing exponentially from today to 2030
- Expand the use of low-carbon heat networks
- Limited role for hydrogen gas grid in some limited locations after 2030
- Fully decarbonise the electricity grid by 2035
- Construction materials to be used more efficiently and substituted with materials that take less energy to produce (lower embodied carbon).

These are in addition to changes that must happen in transport, land use and industry. Existing and planned government policy will not fully deliver these changes – even the new Future Homes Standard in place from 2025 (an update to Part L of building regulations). It will cost owners 5 times as much to retrofit these measures, as for developers to include them up front.

Part L of Building Regulations sets the national technical standard for buildings' energy and carbon. It only covers operational energy use (not embodied carbon). Part L regulates buildings' performance on three metrics:

- Target Fabric Energy Efficiency (space heat, homes only) in kWh/m^2/year
- Target Primary Energy Rate (all regulated energy use, all buildings): kWh/m^2/year
- Target Emissions Rate: kg of CO_2 /m^2/year (all buildings)

Although updates are being made to Part L – including the Future Homes Standard from 2025 – this will not fully deliver the necessary changes as listed above. This is partly because the official calculation methodologies used for Part L are not accurate in predicting a building's operational energy and carbon emissions. These calculations underestimate space heat demand, do not incentivise truly energy-efficient building design and about 50% of a building's energy use is ignored by the calculations ('unregulated energy uses'). This means a 'zero-carbon' building as defined by Part L of building regulations would not truly be anywhere near zero carbon.

Therefore, to truly fulfil its duty to mitigate climate change in line with the Climate Change Act, a local planning authority would need to require development to go beyond the basic standards set by building regulations – as well as reducing car use, enabling development of renewable energy generation, and protecting green infrastructure that removes carbon.

To address the weaknesses of Building Regulations Part L, the industry does have some more accurate methods to calculate building's energy and carbon emissions. Specifically:

- CIBSE TM54, for non-residential buildings: this works by starting with the Building Regulations Part L calculation and then making some adjustments
- BREDEM, for homes: Part L methodology was based on BREDEM, but Part L i rigid whereas BREDEM has flexibility to adjust assumptions and include unregulated energy
- Passivhaus Planning Package: A highly accurate building physics model completely unrelated to the Part L methodologies. Does not require Passivhaus certification.

Local planning authorities have the power to require new development to do better in energy performance, using powers granted by the Planning and Energy Act 2008. Specifically:

- Energy efficiency standards beyond those set by building regulations,
- A proportion of energy use to be from renewable or low carbon sources in the locality.

'Energy efficiency standard' is defined as a standard that is set out or endorsed by the Secretary of State. Currently, only the Part L methods meet this caveat. 'Energy use' is not defined, implying that requirements for renewables can include unregulated as well as regulated energy.

Most net zero carbon local policy precedents require a 30-40% reduction on the Target Emissions rate set by Part L, then the remaining regulated carbon to be offset via payments to the local authority that get ring-fenced for local projects to save that amount of carbon.

A ministerial statement in 2015 set a limit on local plans' requirements for carbon reductions (-19% on the Part L 2013 Target Emission Rate). That limit has now been exceeded by Part L 2021. A 2018 NPPF consultation confirmed there is no such restriction. A 2022 Inspector's decision in West Berkshire supports the view that the 2015 statement no longer holds weight.

The NPPF states that "Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards". Relatedly, it lays out four tests of soundness for a proposed local plan. To be found sound, the plan should be:

1. Positively prepared: Responding to needs and facilitating sustainable development
2. Justified: Based on evidence, and having considered reasonable alternatives
3. Effective: Deliverable in the plan period & based on joint work on cross-boundary issues
4. Consistent with national policy: accord with NPPF and other relevant national policy.

An effective local plan policy for net zero carbon buildings will therefore need to:

- Be based on a definition of 'net zero carbon' that is robust, defensible and verifiable
- Deliver buildings that meet the criteria needed to fulfil the UK's carbon budgets
- Be compatible with the Government's national technical standards (Part L)
- Be specific enough for officers to determine compliance based on application evidence
- Be supported by evidence that it is feasible and viable to deliver
- Be justified in comparison to reasonable alternative policies – for example, by showing that alternatives would not deliver the necessary changes for the Climate Change Act.
- Be consistent with national policy and national technical standards – such as by using calculations based on those of building regulations, and showing how the policy might support other national policies e.g. Clean Growth Mission or Heat & Buildings Strategy.

Policy aims, and a range of policy levers

Considering the range of powers, mandates more and less effective approaches to net zero carbon buildings, and potential range of policy levers, no single policy approach would perform perfectly across the full range of topics of concern. It was therefore necessary to assess the various policy options against the following **risk topics**:

- **Climate:** How much carbon would this policy save, in an effective way?
- **Occupants' energy bills:** Will this policy deliver significant bill savings, or might it expose the occupant to unnecessarily high energy bills especially given the current volatility?
- **Avoiding the cost, disruption and embodied carbon of retrofit:** Will this policy deliver buildings that don't need to have more energy saving measures and renewables installed in future to bring the building up to the standard needed for the net zero carbon transition? (It costs five times as much to retrofit as it does to build to these standards)
- **Infrastructure:** Does this policy help to limit the burden placed on the electricity grid, whose capacity needs major upgrades as existing buildings and cars switch to electricity?
- **Viability/cost:** To what extent may the policy increase build costs, professional fees and offset costs that wouldn't result in a sales value uplift?
- **Planning powers/ precedents**: To what extent does the policy work within existing planning powers or mirror the approach of existing adopted precedent plans?
- **Compatibility with national approach**: Does the policy use national technical standards and help deliver on nationally stated ambitions around buildings' sustainability?

We identified the following potential policy levers based on precedents and powers:

- **Requiring improvements on metrics set by the Building Regulations Part L** for carbon emissions (TER), Fabric Energy Efficiency (TFEE), and Primary Energy Rate (TPER) (glossary)
    - Either relative (% improvement on the Part L targets)
    - Or absolute (such as a Fabric Energy Efficiency of 15-20kWh/m^2/year).
- **Setting specific targets for space heat and total energy use intensity** both regulated and unregulated, using PHPP or TM54 calculations for accuracy
- **Requiring onsite renewable energy to meet 100% of energy use**
    - Either regulated energy only, or
    - Including unregulated energy too – and specifying a calculation method
- **Requiring use of a process to remedy the energy performance gap** between predicted and actual energy use – which can be due to construction errors as well as poor prediction methods
- **Requiring any remaining carbon to be offset**
    - Either regulated energy only
    - Or including unregulated energy too – and specifying a calculation method
    - Setting a carbon price that reflects nationally recognised values and is high enough to fund local carbon reduction projects
- **Requiring embodied carbon to be reduced to specific levels, or just reported on**.

The policy levers are not all mutually compatible, so we identified internally consistent combinations. A 'risk matrix' was created to assess each policy lever against each risk topic.

Finding potential policy combinations

We identified four potential approaches:

1. **"Safe precedent":** Mirroring the adopted approach in London, Reading and Milton Keynes
    a. 35-40% reduction on Part L regulated carbon emissions (Target Emission Rate)
    b. The remaining Part L regulated carbon offset at £60-90/tonne; no requirement around unregulated energy/unregulated carbon).
2. **"Cutting edge":** Mirroring the emerging approach in Greater Cambridge and others
    a. True net zero carbon on site through renewables
    b. Low absolute targets for energy efficiency (space heat, and total energy use) as per LETI operational net zero carbon definition
    c. Calculated using accurate but non-national methods TM54 or PHPP.
3. **"Accelerating future stated national policy":**
    a. Bringing forward the 2025 Future Homes Standard today, via % improvements in regulated carbon emissions (Target Emissions Rate) and fabric energy efficiency,
    b. Requiring 30 years' worth of remaining emissions to be offset at the latest nationally recognised carbon value (starting at ~£250/tonne this year) taking into account the national predicted grid carbon reductions over that 30 year period.
4. **"Acceleration+":** Similar to approach 3, but requiring:
    a. Future Homes Standard target emissions rate to be achieved solely through energy efficiency and low carbon heat (i.e. before solar panels are added)
    b. 15-20kWh/m^2/year space heat demand using Part L Fabric Energy Efficiency metric in homes (and perhaps specific energy-related BREEAM credits in non-resi)
    c. A target for kWh/m^2/year to be achieved in Part L Primary Energy Rate metric
    d. Solar panels or other renewables to match the development's energy use (could be regulated only, or also include unregulated)
    e. Any one of several named processes to deliver energy performance as designed
    f. Offsetting any remaining emissions as per Approach 3.

Each approach was put through our 'risk matrix' where each component was assessed against the risk topics. Findings were then reviewed with West Berkshire environment officers. Embodied carbon policies were removed officer feedback that there was a lack of capacity to assess this if information on embodied carbon were submitted within planning applications.

Approach 1 was dropped because it would not deliver much improvement on the new Part L and would fall far short of delivering the changes needed for national carbon budgets.

Approach 2 was dropped for high risk of failure at inspection (due to using non-national calculation methodologies and potentially high costs), at least without the budget and timescale to assemble more robust local bespoke viability and feasibility evidence.

Approaches 3 and 4 were considered potentially suitable and were taken to a workshop with senior officers in the West Berkshire planning team.

Appendix: Overview of process and findings to date

Powers, mandates, precedents, and constraints with regards to net zero carbon local plan policy

The UK's legal commitments on climate change – and why we're not on track
The UK is a signatory to the international 2015 Paris Agreement to mitigate climate change. This Agreement recognised a need for global action to address implications of climate science from the Intergovernmental Panel on Climate Change (IPCC). The latest IPCC reports show that:

- If global average temperatures rise over 2°C on pre-industrial levels, the effect would be devastating, reaching tipping points that may cause runaway climate change (e.g. escape of methane trapped in polar ice, or die-off of forests which capture carbon).
- A rise of 1.5°C will be far less harmful than 2°C – and we have already hit 1°C
- There is a limited global 'carbon budget' before we hit 1.5°C or 2°C

Paris Agreement signatories therefore agree to take action to achieve a 2°C limit and pursue a 1.5°C limit. There is no concrete agreement on how the global carbon budget is split between countries, but signatories agree that richer countries should make faster/greater carbon cuts.

The UK's Climate Change Act 2008 (2019 update) legally obliges the UK to achieve net zero carbon status by 2050. It also obliges the UK to set and adhere to carbon budgets for each 5-yearly period until 2050. The first six have been legislated to date, covering up to 2035.

The independent Committee on Climate Change (CCC) devises these budgets which parliament then passes into law. The budgets are based on what is technically possible and necessary to stay within the CCC's estimate of a fair share of the global budget for 2°C. The UK hit the first three carbon budgets but is not on track for the fourth or fifth, and current national policy will not deliver them nor the net zero end goal.

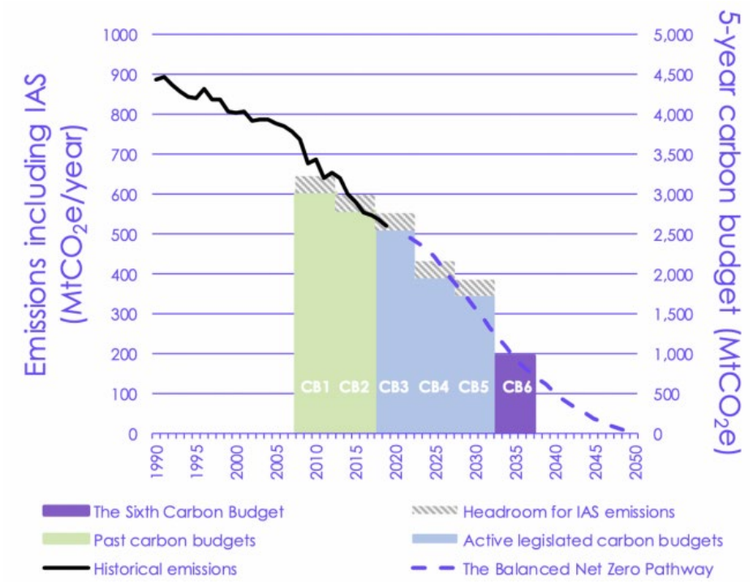


Figure 1: Current, past and future legislated carbon budgets and the fall in annual emissions that must occur to deliver them. From Committee on Climate Change (2020), The Sixth Carbon Budget.

What needs to happen to deliver the UK's legislated carbon budgets?
With each carbon budget, the Committee on Climate Change lays out a range of sectoral changes (pathways) necessary to deliver it. The pathway to deliver the legislated fourth, fifth and sixth carbon budgets – of which most relevant to built environment and planning – includes:

- From 2025, all new homes to have space heat demand of 15-20kWh/m^2/year (60-70% less than what current building regulations allow) and not be connected to the gas grid.
- Dramatically accelerate rollout of heat pumps to existing buildings (plus some heat networks and a limited role for hydrogen in some as-yet unknown locations after 2030).
- By 2033, end the installation of any fossil fuel boilers for all existing buildings.
- From 2028, all home sales to have EPC rating of C+ (via insulation, better windows etc).
- Fully decarbonise the electricity grid by 2035 – renewables to be 80% of supply in 2050.
- Construction materials used more efficiently and switching to low-carbon materials.
- Reduction in travel mileage by car, and phase-out new fossil fuel cars from 2032.
- Increase woodland cover to 18% of UK land, up from 13% today.

The pathway rests on all these changes combined. If changes in one topic are under-delivered, we must to make even greater carbon savings in other topics. Figure 2 shows that buildings, transport and electricity should all reach zero carbon (as agriculture, waste and aviation cannot, thus must be balanced by the UK's whole capacity for carbon removals by land or future carbon removal technology that it is hoped will be developed).

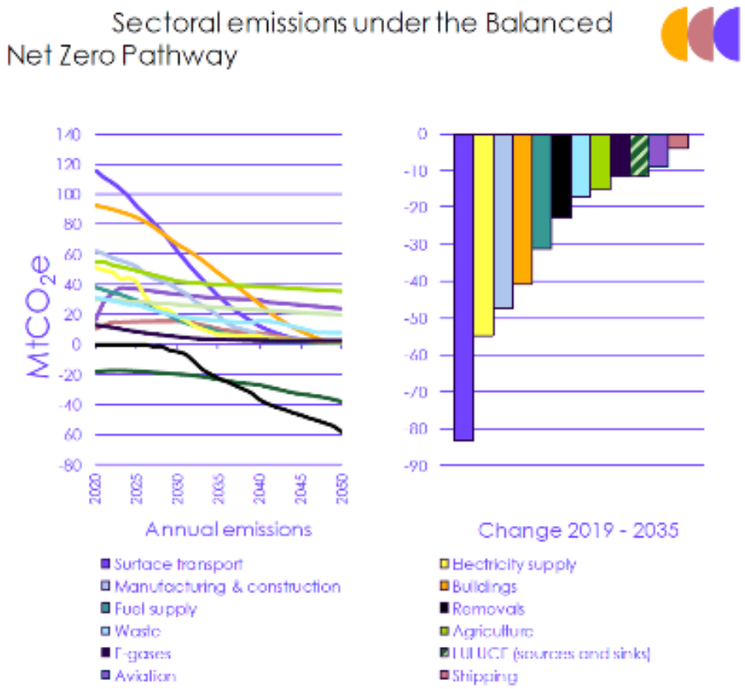


Figure 2: How each sector's emissions must fall in order to deliver the legislated carbon budgets. From Committee on Climate Change (2020), The Sixth Carbon Budget: The UK's path to net zero.

Why must the local plan act to reduce carbon emissions?

Local plans are required by the Planning and Compulsory Purchase Act (section 19) to:

> "include policies designed to secure that the development and use of land in the [local] area contribute to the mitigation of, and adaptation to, climate change".

Mitigation means reducing the level of carbon in the atmosphere, by reducing emissions and/or removing carbon from the air. Adaptation means readying ourselves for the changes to climate.

The National Planning Policy Framework (NPPF) – against which the proposed local plan will be examined – reiterates this by saying emphasising that purpose of the planning system is sustainable development, which includes mitigating climate change. It continues:

- "The planning system should support the transition to a low carbon future … [and] shape places in ways that contribute to radical reductions in greenhouse gas emissions".
- "Plans should take a proactive approach to mitigating and adapting to climate change … in line with the objectives and provisions of the Climate Change Act 2008".
- "Development should be planned for in ways that … reduce greenhouse gas emissions, such as through its location, orientation and design."
- "Plans should [have] a positive strategy for energy from [renewable, low carbon] sources".

As explained in the previous section, the 'objectives and provisions of the Climate Change Act' include the legislated five-yearly carbon budgets as well as the net zero end goal. Because of the major gaps in national policy to deliver those legislated budgets (as previously noted), there remains a large task for local plans to mitigate climate change in line with those objectives.

Why not just rely on Building Regulations and the Future Homes Standard?

'Part L' is the section of building regulations that sets basic standards for new buildings' energy use and carbon emissions. Most definitions of 'net zero carbon buildings' in local and government policy are based on Part L and its associated calculation methods 'SAP' and 'SBEM'.

Using SAP or SBEM, Part L sets limits on the amount of energy a building uses per square metre per year, and carbon emissions associated with that energy use. The limits are set by modelling a 'notional building' of the same size and shape as the proposed building, with a range of energy efficiency features applied (insulation, glazing, airtightness, lighting, heat system and so on).

Part L and SAP/SBEM are periodically updated to increase the energy efficiency standard and to reflect grid decarbonisation. This lowers the Target Emissions Rate (Figure 3) that is used as the baseline by most precedent local plan policy. A new version applies as of June 2022. Part L 2025 (Future Homes Standard) will have a Target Emission Rate low enough to rule out gas heat.

A 'zero carbon' building defined using Part L in fact far from zero carbon:

- **Part L looks only at the building's operation.** (There is no regulatory method for embodied carbon, nor to hold new development responsible for occupants' transport carbon).
- **Part L only controls the 'fixed' energy uses:** space heating/cooling, hot water, fixed lights, ventilation, fans, pumps. It ignores plugin appliances, lifts, etc. ('unregulated energy').
- **SAP and SBEM calculations drastically underestimate** the building's energy use by 50-70%, and their carbon factors for electricity go out-of-date quickly.

Part L fabric standards are too lax to hit the required space heat demand of 15-20kWh (except perhaps in flats from 2025, before factoring in the SAP/SBEM underestimation). Analysis has shown that a home built to the Future Homes Standard would have a space heat demand of about 43-70kWh/m2/year but SAP would underestimate this as 17-25kWh/m2/year.

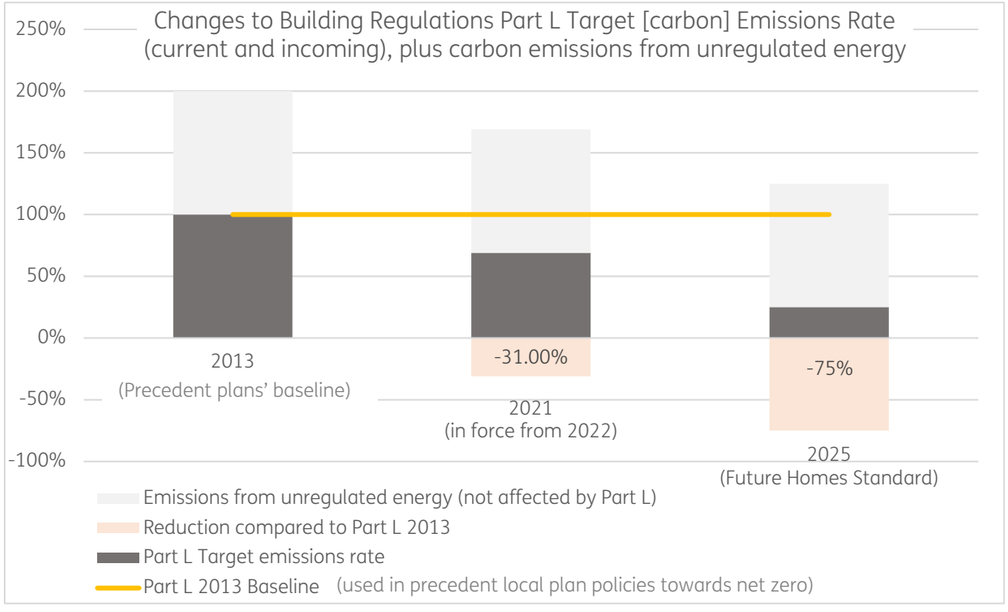


Figure 3: Illustration of the difference in Target Emissions Rate of building regulations in 2022 and 2025, compared to 2013. Half of the home's carbon emissions are from unregulated energy, thus remains unchanged.

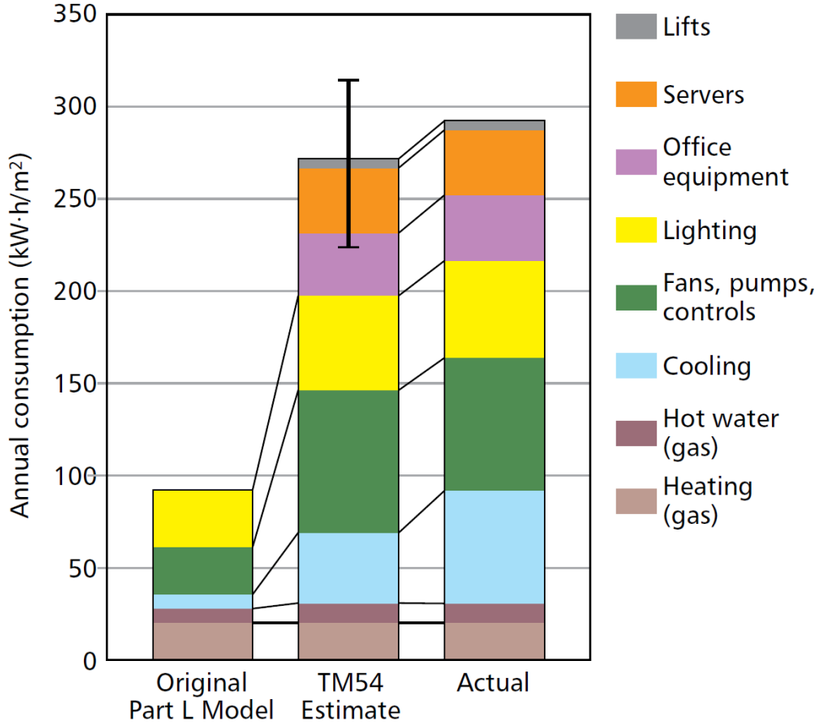


Figure 4: Graph showing difference in predicted energy use using Part L (SBEM) at an office, versus predicted energy use using an alternative methodology (CIBSE TM54), and the actual measured energy use in operation. Credit: CIBSE.

Infographic: The UK's climate commitments and why they need further action

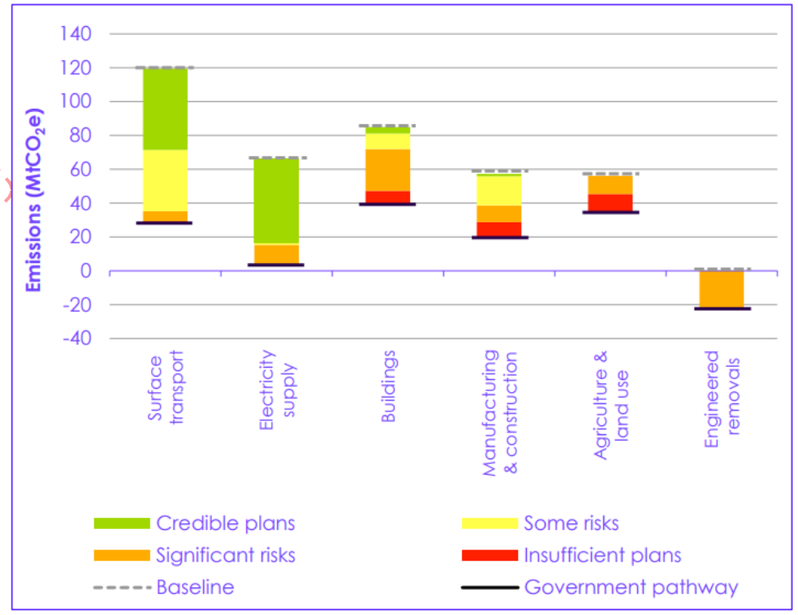
IPCC Special Report on 1.5 °C Climate Change

Climate Change Act

- Net Zero 2050
- Interim 5-yearly carbon budgets

Major gaps in legislation & regulation to deliver the sector pathways, including buildings & construction (existing buildings, and new buildings shaped by Part L)

Carbon budgets at risk in 2035 due to policy gaps



Limited global carbon budget to avoid catastrophe

- Current trajectory: 4C

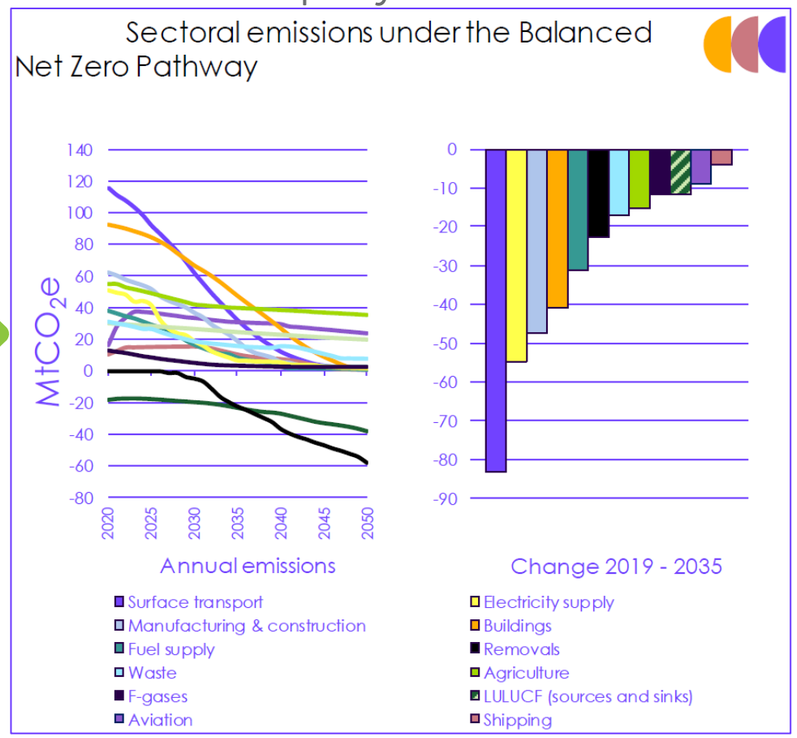
Paris Agreement:

- 2C limit
- 1.5C aim
- Equity principle: Richer countries, larger cuts

Committee on Climate Change pathways to net zero

- Low carbon heat 2025
- Space heat demand 15-20kWh/m^2/yr
- Upscale renewables
- Transport – less car use; electrification
- Agriculture & aviation need offsets via forests & carbon capture

Current national policy will not deliver this



Industry alternative definitions of 'zero carbon buildings'

Because of the failure of Building Regulations to define and deliver net zero carbon buildings compatible with the Climate Change Act, the industry has developed other definitions. Both approaches below cover *total* energy use, not just the share covered by building regs Part L.

The UK Green Building Council (UKGBC) 'Framework Definition for Net Zero Carbon Buildings' which has two parts: net zero carbon in operation, and net zero carbon in construction:

- Net zero carbon in construction is: "When the amount of carbon emission associated with a building's product and construction stages up to practical completion is zero or negative, through the use of offsets or the net export of on-site renewable energy."
- Net zero carbon in operation is: "When the amount of carbon emissions associated with the building's operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset."

UKGBC does not set any specific targets for space heating, operational energy use, or embodied carbon, although it encourages reductions to be prioritised before offsetting. UKGBC has produced guidance defining what counts towards offsite renewables and offsetting.

The London Energy Transformation Initiative (LETI) is a coalition of over 1,000 industry-leading green building experts (engineers, architects, developers and others). Although it began in London, its targets and definitions are applicable anywhere in the UK.

LETI developed a definition of operational net zero carbon as follows, based on what is necessary for the UK's carbon budgets and what is technically possible now:

- A net zero operational carbon building is one that balances all of its energy needs with renewable energy either from on-site sources or by investing in off-site renewable energy that would not otherwise have been generated. The building must also achieve:
  - Space heat demand of 15-20kWh/m^2/year
  - Total energy use intensity of 35kWh/m^2/year (homes)
    - Or: Schools 65kWh/m^2/year; offices 55-70kWh/m^2/year.

These total energy use intensity figures cover both regulated and unregulated energy. They are set at levels that essentially can only be met if the building has a heat pump, because a heat pump operates at ~300% efficiency (therefore it can deliver 15kWh space heat by using only 5kWh, leaving 'room' for the home's other energy needs of up to 30kWh/m^2/year).

LETI's 'Embodied Carbon Primer' guide also sets recommended targets for embodied carbon in kilogrammes per square metre of internal floor area, but does not require these to be offset.

Calculation methodologies (alternative to Building Regs Part L)

Accurate energy calculations and in-use verification are key for both the LETI and UKGBC definitions. This means that the heat demand, energy use, carbon, and renewable energy targets cannot be fulfilled using Building Regulations Part L SAP/SBEM methods. Two much more accurate calculation methodologies are available: CIBSE TM54, and PHPP (see glossary). TM54 is suitable only for nonresidential buildings, and works by making adjustments to the SBEM calculation method. PHPP can be used in any building and is unrelated to SAP or SBEM.

Embodied carbon can be calculated with a generally accepted industry method produced by the Royal Institute of Chartered Surveyors, based on British Standard/EN 15978.

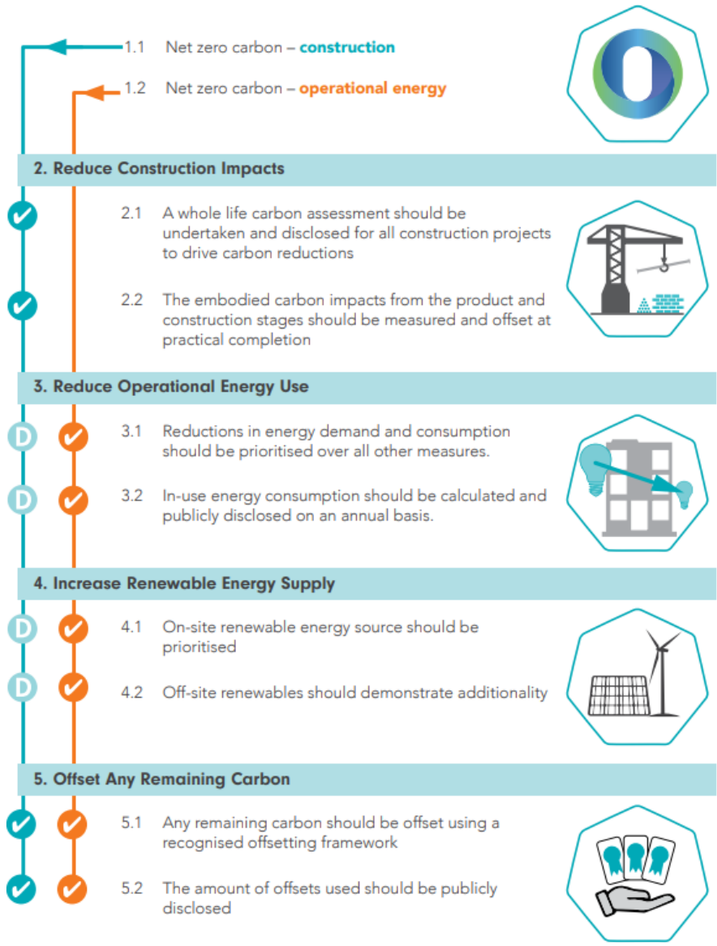


Figure 5: The two scopes of a net zero carbon building according to the UKGBC Framework.

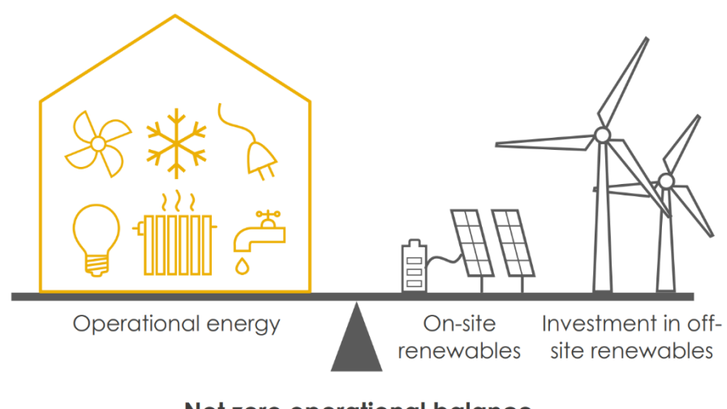
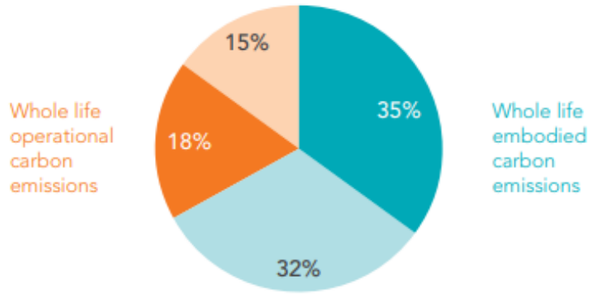


Figure 6: LETI diagram to illustrate its definition of operational net zero carbon.

Infographic: How new buildings cause carbon emissions and how this relates to West Berkshire's carbon account

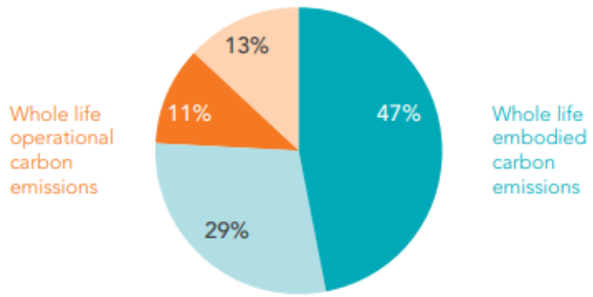
Office

Speculative office building with Cat A fit out; central London



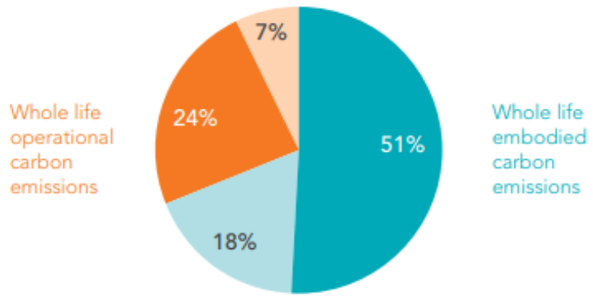
Warehouse

Typical warehouse shed with office space (15% by area); London perimeter, UK



Residential

Residential block with basic internal fit-out; Oxford, UK



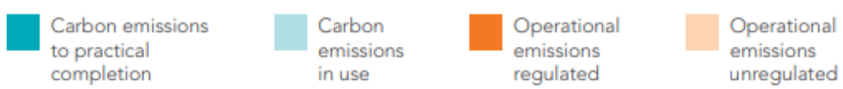


Figure 7 UKGBC diagram of three case study buildings' carbon emissions from operational energy use (orange) and embodied (blue). For full net zero carbon, the dark blue sections would need to be offset, and the orange section offset or met with renewable energy.

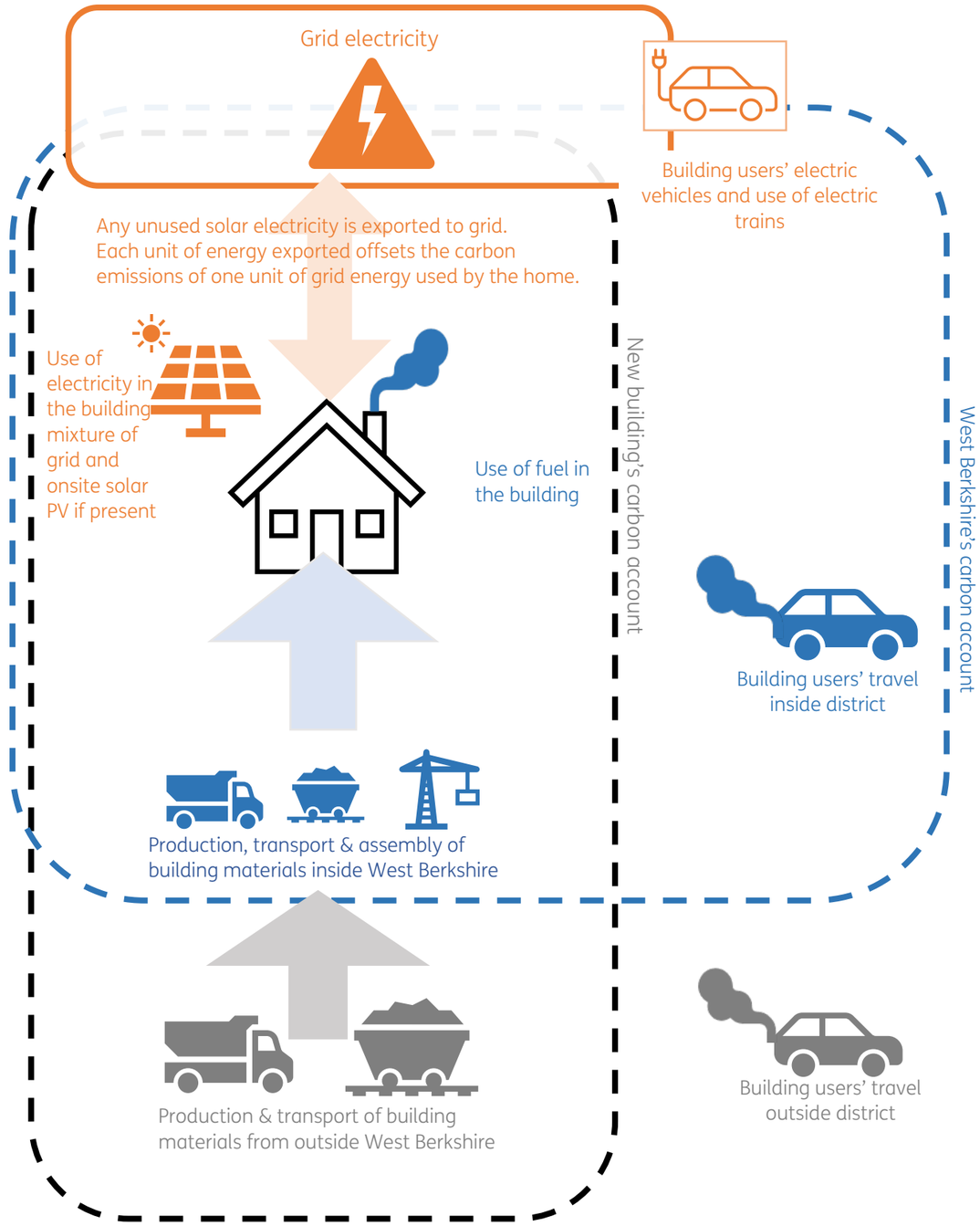


Figure 8: Diagram to illustrate how a new building's energy use, embodied carbon, and occupants' transport habits affect the carbon account of West Berkshire as a whole. Bioregional, 2022.

How far can local plan policy go in mitigating climate change?
There are four main ways in which a local plan can mitigate climate change.

- Transport: Locate new growth where there is a realistic prospect of low car use
- Energy: Actively encourage the development of renewable energy generation
- Buildings: Require new buildings to have excellent energy efficiency, low-carbon heat (not gas) and renewables; remove planning barriers to retrofit of existing buildings
- Green infrastructure: Protect landscapes that achieve significant carbon removals.

We here focus on the powers to address carbon emissions of buildings.

The Planning and Energy Act 2008 grants the local plan the power to set requirements for new developments to perform better than the national building regulations on energy and carbon. Specifically, the Act enables local plans to set "reasonable requirements" for the following:

- "Energy efficiency standards that exceed the energy requirements of building regulations"
- "A proportion of energy used in development in their area" to be from renewable or low-carbon sources "in the locality of the development".

The Act defines "energy efficiency requirements" as standards that are set out, referred or endorsed by regulations, national policies or guidance issued by the Secretary of State. This is repeated in National Planning Policy Framework. The only 'energy efficiency standard' that clearly meets this caveat is SAP/SBEM, the calculations used for Part L of building regulations.

The Act does not set any such restrictive definition for 'energy used in the development'. This may mean that unregulated energy, as well as regulated energy, can be covered by any requirements for renewable energy so long as the requirement is 'reasonable'. However, the National Planning Policy Framework does note that: "Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards". This may prevent the use of calculation methods incompatible with SAP/SBEM.

A ministerial statement in 2015 said local plans should only seek up to a 19% reduction on the carbon target of building regs Part L 2013. That statement is obsolete, as Part L 2021 exceeds it and the Government has since set a clear national policy direction towards net zero (per a recent inspector's decision in West Berkshire). A 2018 NPPF consultation response also confirms there is no such restriction in requiring energy efficiency standards over building regulations.

Precedents

The identified **adopted** precedent local plans approach 'net zero carbon' in one of two ways:

- **Post-2015 local plans** require a 30 – 40% reduction in the Part L 2013 Target Emissions Rate, and the remaining annual regulated CO_2 emissions to be offset via Section 106 payements at £60-90 per tonne to be (Milton Keynes), often multiplied to cover 30 years (London; Reading). Offsets are spent on local projects to measurably reduce carbon.
    - Oxford does not require offsets, but steps-up the % reduction to reach 100% in 2030.
    - The % reduction is usually set to reflect what is known to be feasible by analysis of recent schemes' Part L SAP/SBEM figures (London; Milton Keynes).
    - The price per tonne of CO_2 emissions for London (and borrowed by Reading) was set several years ago to reflect a nationally recognised price set by BEIS.

Plans structured in this way are enforceable but allow developers to deliver the majority of the carbon savings through offsets, and also leave unregulated energy unaddressed (Figure 9).

The offsetting mechanism can raise valuable funding but places a burden on the local authority to find effective ways to spend it (or contract this to a third-party expert, as in Milton Keynes). £60-90/tonne paid to offset carbon may not be enough to fund local projects that save the same amount of carbon. Finally, offsetting lets new builds take credit for savings in other sectors – but the UK needs those savings to happen as well as, not instead of, savings in new buildings.

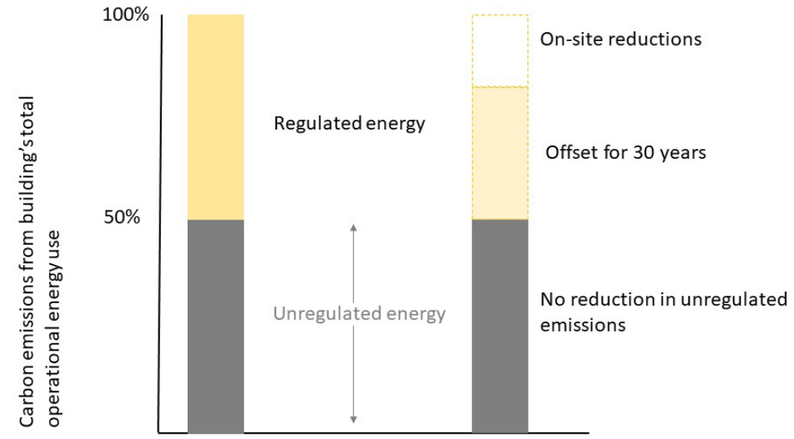


Figure 9: Diagram to illustrate how precedent 'net zero carbon buildings' policies work when based on a 30% reduction on Building Regulations 2013 target emissions rate, followed by offsetting

Pre-2015 local plans are often based on the Code for Sustainable Homes, which would have made all new homes net zero carbon from 2016 by a national definition that never eventually appeared. In general such policies are no longer applicable since the withdrawal of that Code.

- West Berkshire's existing local plan takes this approach. However, it was worded so that the Code for Sustainable Homes requirements were arguably separate from the requirement for renewable or low carbon energy to meet the whole of the development's energy needs (in theory covering both regulated and unregulated energy). As a result, a recent inspector's appeal decision in West Berkshire held that the 100% renewable/low carbon energy requirement could be upheld. But: neither the Inspector's decision nor the West Berkshire Local Plan say whether or how unregulated energy should be included in the calculation of the energy use that should be met by renewable/low-carbon energy.

Many existing local plans also require improved energy efficiency or renewable energy, measured either as a % of Part L carbon emissions savings delivered by those measures, or as a % of the development's energy use (usually regulated only) to be met with onsite renewables.

Several emerging local plans are attempting to require net zero carbon buildings using the LETI approach, with set targets for space heat, total energy use (regulated and unregulated) and 100% renewable energy supply, calculated using PHPP or TM54 instead of Part L SAP/SBEM (Greater Cambridge, Central Lincolnshire, Merton, and Salt Cross). The inspector has so far asked one of these to remove these requirements. The inspector's reasoning has not yet been released but may relate to feasibility, justification, or departure from national calculation methodologies. There is precedent (London) for energy reporting via alternative methods (BREDEM and TM54), including unregulated energy – although not requiring specific targets to be met for this.

Overview of 'risk matrix' approach to assessing potential policy combinations

Considering the range of powers, mandates more and less effective approaches to net zero carbon buildings, and potential range of policy levers, no single policy approach would perform perfectly across the full range of topics of concern. We therefore developed an approach to assess various different potential policy components against the following **risk topics**:

- **Climate:** How much carbon would this policy save in an effective way?
- **Occupants' energy bills:** Will this policy deliver significant bill savings, or might it expose the occupant to unnecessarily high energy bills especially given the current volatility?
- **Avoiding the cost, disruption and embodied carbon of retrofit:** Will this policy deliver buildings that don't need to have more energy saving measures and renewables installed in future to bring the building up to the standard needed for the net zero carbon transition? (It costs five times as much to retrofit as it does to build to these standards)
- **Infrastructure:** Does this policy help to limit the burden placed on the electricity grid, whose capacity needs major upgrades as existing buildings and cars switch to electricity?
- **Viability/cost:** To what extent may the policy increase build costs, professional fees and offset costs that wouldn't result in a sales value uplift?
- **Planning powers/ precedents**: To what extent does the policy work within existing planning powers or mirror the approach of existing adopted precedent plans?
- **Compatibility with national approach**: Does the policy use national technical standards and help deliver on nationally stated ambitions around buildings' sustainability?

Policy levers we identified were:

- Requiring improvements on **regulated carbon and energy** metrics set by the Building Regulations Part L SAP/SBEM for carbon emissions (TER), space heat / fabric energy efficiency (TFEE), and overall primary energy use (TPER) (see glossary)
    - Either relative (% improvement on the Part L targets)
    - Or absolute (as a specific kWh/m^2/year or CO_2/m^2 year target).
- Requiring specific targets for space heat / fabric energy efficiency and total energy use intensity both regulated and unregulated, using PHPP or TM54 calculations for accuracy
- Requiring onsite renewable energy to meet 100% of energy use
    - Either regulated energy only
    - Or including unregulated energy too – in which case a calculation method must be specified
- Requiring use of a proven process to help remedy the gap between predicted and actual energy use – which can be due to construction errors as well as poor prediction
- Requiring any remaining carbon to be offset
    - Either regulated energy only
    - Or including unregulated energy too – in which case a calculation method must be specified
    - Setting a carbon price that reflects nationally recognised values and is high enough to fund local carbon reduction projects
- Requiring embodied carbon to be reduced to specific levels, or just reported on.

Finding optimal policy combinations

We identified four potential approaches (all excluding embodied carbon on feedback from officers):

5. **"Safe precedent":** Mirroring the adopted approach in London, Reading and Milton Keynes
    a. 35-40% reduction on Part L regulated carbon emissions (Target Emission Rate)
    b. The remaining Part L regulated carbon offset at £60-90/tonne; no requirement around unregulated energy/unregulated carbon).
6. **"Cutting edge":** Mirroring the emerging approach in Greater Cambridge and others
    a. True net zero carbon on site through renewables
    b. Low absolute targets for energy efficiency (space heat, and total energy use) as per LETI operational net zero carbon definition
    c. Calculated using accurate but non-national methods TM54 or PHPP.
7. **"Accelerating future stated national policy":**
    a. Bringing forward the 2025 Future Homes Standard today, via % improvements in regulated carbon emissions (Target Emissions Rate) and fabric energy efficiency,
    b. Requiring 30 years' worth of remaining emissions to be offset at the latest nationally recognised carbon value (starting at ~£250/tonne this year) taking into account the national predicted grid carbon reductions over that 30 year period.
8. **"Acceleration+":** Similar to approach 3, but requiring:
    a. Future Homes Standard target emissions rate to be achieved solely through energy efficiency and low carbon heat (i.e. before solar panels are added)
    b. 15-20kWh/m^2/year space heat demand using Part L Fabric Energy Efficiency metric in homes (and perhaps specific energy-related BREEAM credits in non-resi)
    c. A specific target for kWh/m^2/year energy use using the Part L Primary Energy Rate metric (to be set)
    d. Solar panels or other renewable energy to be added to fully match the development's energy use (could be regulated or also include unregulated)
    e. Any one of several named processes to deliver energy performance as designed
    f. Offsetting any remaining emissions as per Approach 3.

These approaches were put through our 'risk matrix' where each component was assessed against the risk topics. Findings were then reviewed with West Berkshire environment officers.

Approach 1 was dropped because it would not deliver much improvement on the new Part L and would fall far short of delivering the changes needed for national carbon budgets.

Approach 2 was dropped for high risk of failure at inspection (due to using non-national calculation methodologies and potentially high costs), at least without the budget and timescale to assemble more robust local bespoke viability and feasibility evidence.

Approaches 3 and 4 were considered potentially suitable and were taken to a workshop with senior officers in the West Berkshire planning team.

Glossary & acronyms

BREDEM	Building Research Establishment Domestic Energy Model. A calculation methodology used to estimate a home's total energy consumption based on its characteristics, split by fuel type. A variation of this model is used in the Home Quality Mark and can be used in some BREEAM certification that have a residential element e.g. BREEAM Communities.
Carbon / carbon emissions	Short for 'carbon dioxide' but can also include several other gases with a climate-changing effect (methane, nitrous oxide, refrigerants)
Carbon budget	Amount of carbon that can be emitted before reaching a level that causes severely harmful climate change
CO_2	Carbon dioxide: Often shortened to 'carbon'.
CO_2e	Carbon dioxide equivalent: The sum of a mixture of gases, in terms of their climate-changing impact in a 100-year period expressed as the amount of CO_2 that would have the same effect. Often shortened to 'carbon'.
DFEE	Dwelling Fabric Energy Efficiency: a metric used in Building Regulations Part L to describe a proposed building's space heat demand. Expressed in kWh/m^2/yr
Embodied carbon	Carbon that was emitted during the production, transport and construction of a building. Can include its renovation and eventual demolition too. As opposed to 'operational carbon' emitted due to energy consumption during use.
EUI	Energy use intensity, a measure of how much energy a building uses per square metre of floor. Expressed in kWh/m^2/year.
GHG	Greenhouse gas (CO_2 and several other gases: nitrous oxide, methane, refrigerants). Often collectively referred to as 'carbon'.
kWh/m^2/yr	Kilowatt-hours per square metre per year. Used for EUI or space heat demand.
Part L	Building regulations section that sets basic legal requirements regarding buildings' energy and CO_2.
PER	Primary Energy Rate. A metric to express how much primary energy is used per square metre in a building. This concept has been used in certifications like BREEAM and HQM for several years, but has only just been introduced to Building Regulations Part L as of this year. The Part L Primary Energy rate will take into account all primary energy used by 'regulated energy uses' (see definition elsewhere in this glossary) whereas BREEAM and HQM would take into account the primary energy used in 'unregulated energy uses' too.
Performance gap	The difference between predicted and actual energy use of a building.
Primary energy	Primary energy' is a term takes into account not just the energy use at the meter, but also all the energy that was 'lost' or used to produce and distribute that energy before it reaches the building. For example, when electricity is produced at a gas power station, the conversion of gas to electricity is not perfectly efficient and so more than 1 kWh of gas is used to produce each kWh of electricity. After that, some of the electricity is lost during the process of transmission through the grid (this is true for electricity of any source). In contrast, electricity produced from on-site renewables is not subject to fuel conversion inefficiencies or distribution losses before it reaches the building.
PV	Photovoltaics: solar panels that generate electricity.
PHPP	Passivhaus Planning Package: a tool to accurately predict building energy use.
Regulated energy	Energy uses in a building that are regulated by Part L of building regulations.
SAP	Standard Assessment Procedure: national calculation method for homes' energy and carbon, used to satisfy Part L.
SBEM	Simplified Buildings Energy Model: national calculation method for non-residential buildings' energy and carbon, used to satisfy Part L.
TER	Target Emission Rate: limit set by Part L on CO_2 emissions per m^2 of floor.
TPER	Target Primary Energy Rate: limit set by Part L on 'primary energy' use per m^2 of floor. A new metric introduced to Part L from June 2022. Both homes and non-residential buildings are now subject to a TPER. The Part L Target Primary Energy Rate will take into account all primary energy used by 'regulated energy uses' (see definition elsewhere in this glossary). This is new for homes (which previously only had a space heating target, TFEE) and for other buildings (which previously did not have any energy efficiency target, only a carbon emissions rate target, TER).
TFEE	Target Fabric Energy Efficiency: Part L target for space heat demand (DFEE)
TM54 (by CIBSE)	Method to accurately calculate buildings' energy use by adjusting SBEM.
Unregulated energy	Energy uses in a building that are not regulated by Part L.

Appendix E

2022.07.21 PAG Report Net Zero Carbon Building approach to policy

West Berkshire Local Plan Review: Net Zero Carbon planning policy development

Committee considering report:	Planning Advisory Group (PAG)
Date of committee:	21.07.22
Portfolio Member:	Councillor Steve Ardagh-Walter
Date Portfolio Member agreed report:	07.07.22
Report Author:	Emily Ashton-Jelley and Jenny Graham - WBC (structure) Marina Goodyear – Bioregional (technical content)

1 Purpose of the Report

1.1 Bioregional has been appointed by West Berkshire Council (WBC) Environment Delivery Team to support the development of robust, enforceable and effective net zero carbon policies in the emerging Local Plan Review. In this work, Bioregional has collaborated closely with WBC officers (Environment Delivery and Planning), and has drawn on the support of qualified planning professionals from Edgars. The scope of work has been to explore precedents, powers and potential to set stronger policies for net zero carbon, and assist WBC in understanding the advantages and risks involved in pursuing various potential policy approaches in the next steps of WBC's current Local Plan Review.

1.2 Given the stage of the work on the Local Plan Review there is not much scope to influence the spatial pattern of growth (and how this impacts transport carbon emissions, growth of renewable energy, or carbon sequestration by green landscapes). However, sustainability principles have clearly been considered in determining the location of proposed development and ensuring the key areas for growth are where there is good access to services and facilities. The main focus of this work has therefore been on policies to reduce the carbon emissions of buildings, although the Bioregional full reports also touch on the vital importance of spatial planning in the net zero carbon transition.

1.3 Bioregional has considered improvements which can be made to current draft policies SP5 and DC3 of the draft Local Plan Review, building on the already forward-thinking

Policy CS15 of the adopted Local Plan. The improvements aim to ensure new policies are not weaker than what is currently adopted, but bring the mechanisms of the policy up to date with current and incoming national policy.

1.4 This report presents an overview of four potential policy approaches considered, and recommendations as to the preferred option to be taken forward. Once the recommendations have been agreed, this will allow updates to be made to Policy SP5 and DC3 of the Local Plan Review and a detailed evidence pack to be collated for examination by the Planning Inspector.

1.5 There is a glossary of terms included at the end of the Appendix.

2 Recommendation(s)

2.1 **The recommendation** is to take forward a modified 'Approach 4': New builds should achieve net zero carbon by matching all its operational (regulated and unregulated) energy with renewables on site, or if unfeasible then offset 30 years' worth of carbon. Within this, the following targets should be achieved:

- ≤15kWh/m^2/year space heat demand target in homes, evidenced by the Building Regulations Part L SAP Fabric Energy Efficiency metric
- Deliver the carbon Target Emissions Rate of the Future Homes Standard or Future Buildings Standard (as applicable to development type) before adding renewable electricity generation measures (therefore, through fabric energy efficiency and efficient heat system alone, as per the Part L 2025 notional building)
- Demonstrate the use of a process to reduce the energy performance gap (ensuring the building performs as close as possible to energy predictions)
- After pursuing onsite renewable energy generation to the greatest feasible and viable extent, any remaining operational carbon emissions (regulated and unregulated) to be offset at the nationally recognised carbon price for each year of a 30-year operational lifespan, taking into account grid carbon reductions over that 30-year lifespan if the home is all-electric. The Council will hold these offset payments in a ringfenced fund to be spent on projects that deliver measurable carbon reductions to the same amount.

2.2 Following discussions at an Officers' workshop and further analysis, the modified 'Approach 4' (above), differs in a number of ways to the original 'Approach 4' presented to officers. Modifications not being pursued at this stage are:

- No to set target for the Part L Primary Energy Rate, as further work would be needed to establish what target may be justified to support national carbon budgets, and its cost and feasibility. PER is a new metric in Part L 2022, so there is not much existing analysis. The policy's other targets can be justified and assessed separately from Part L PER.

- Space heat demand (SAP FEE) Fabric Energy Efficiency target to be 15-20kWh/m^2/yr because of underestimation in the calculation method used in building regulations.

- Inclusion of certain specific credits in BREEAM or HQM as a means to fulfil the net zero carbon requirement in non-residential buildings (full credits under BREEAM 'Ene 01' or HQM 'Energy and Carbon 02 - 03' would support this). A similar approach could be taken for other environmental sustainability areas such as water, waste, biodiversity, embodied carbon and climate resilience, however this is beyond the current scope of work which is to look at regulated and unregulated energy and the associated carbon.

2.3 It is also recommended that:

(a) Once the approach has been agreed an updated Policy SP5 and DC3 carbon policy will be drafted for consultation by officers and members. A supporting SPD could be recommended to support the policies in the future.

(b) Following the redraft of associated carbon policies, evidence on the viability and feasibility will be gathered in preparation for examination by the Planning Inspector.

(c) Adequate provision for the delivery and implementation of the policy is assessed which could include officer training, additional resource and management of an offsetting fund.

3 Executive Summary

3.1 Four different policy approaches were developed:

1. "Safe precedent": Following the approach already taken in London and Reading, which is well-established and deliverable but does not deliver much in the way of actual carbon reductions compared to current/incoming national building regulations

2. "Cutting edge": Following an approach being pursued in several emerging local plans

3. "Accelerating future stated national policy": Following an emerging approach in at least one emerging local plan, which brings forward the National Future Homes Standard and requires the rest of the *regulated* carbon emissions to be offset

4. "Acceleration+": Similar to Approach 3, but with some tighter targets for fabric energy efficiency and with a requirement to meet regulated and unregulated energy use with 100% renewable energy or offset. This option was later modified following an Officers' workshop.

3.2 Following detailed discussion between Bioregional and WBC Environment Delivery and Planning, approaches 3 and 4 were presented to Portfolio Members from Planning and Environment for discussion and a steer.

3.3 Approaches 3 and 4 are thought to be preferable because they:

• Are consistent with national technical standards such as the Future Homes Standard (reduces planning risk)

• Use national calculation methods, therefore fit within the power to require 'energy efficiency standards' as per the Planning and Energy Act 2008 (reduces planning risk)

• Can be supported by existing feasibility and cost evidence from recent national policy impact papers and other emerging local plan evidence bases (reduces planning risk).

• Are more effective than existing precedents (reduces climate risk), by

- taking the required carbon reductions far further than the precedents

- using a nuanced calculation of carbon offsetting, that rewards gas-free buildings, and reflects ongoing changes in electricity grid carbon and national carbon costs.

3.4 Approach 4 in particular has the following additional benefits beyond Approach 3:

• It sets an absolute standard of fabric performance rather than a relative standard – which incentivises developers to design buildings of an efficient shape as well as applying a good standard of building fabric and services (reduces climate risk and occupant bills)

• This absolute fabric performance standard is aligned with the specific performance factors needed for the Climate Change Act carbon budgets (reduces climate risk)

• It would deliver more renewable energy than Approach 3 (reduces climate risk)

• It includes unregulated energy as well as regulated energy (reduces climate risk), thus

- Helping to maintain and strengthen the approach of existing CS15 policy

- Addresses carbon emissions that are neglected by building regulations – so developments will either deliver more renewable energy, or pay more in offsets

3.5 The following caveats and points need be taken into account when deciding whether to pursue Approach 4, and/or to modify the approach before pursuing it further.

- **Further Policy refinements:** perhaps further tightening the ≤15kWh/m^2/year fabric energy efficiency target to compensate for how much the national calculation methodologies underestimate energy use; confirming a method suitable to account for the unregulated portion of the energy in a way that is compatible with national regulated energy calculations (three potential methods have been identified); explore whether to recognise the achievement of specific BREEAM or HQM credits as a means to fulfil the net zero carbon requirement and exploring ways to make the policy resilient to potential future changes in national policy / national building regulations.
- **Consider how planning decisions will treat noncompliance** in the event that the development takes place in an area without grid capacity to allow solar panels
- **Assembly of evidence** for inspection / examination
- **Delivery and implementation** – offsetting fund and resourcing/staff capacity.

4 Supporting Information

Introduction

4.1 The purpose if the report is to seek consent from the Planning Advisory Group to take forward modified Approach 4 – "Acceleration+" which would result in a redraft of policy SP5 and DC3 of the Local Plan Review (with a supporting SPD developed in the future) and the gathering of evidence to support the examination of the updated policies by the Planning inspector.

4.2 Buildings' operational energy (regulated and unregulated) and associated carbon in the context of the planning system is a complex and detailed subject with a variety of nuances. This has required detailed examination of potential policy options, including the risks associated with them in terms of climate risk and planning acceptability risk. The pursuit of a modified Approach 4 has been recommended following detailed work by Bioregional in consultation with WBC.

To date, Bioregional has produced the following:

- Separate appendix report explaining the following:
  - The national background (legislation, regulation, government policy)
  - Powers and precedents for planning policies towards achieving net zero carbon
  - Ways to define 'net zero carbon' for a building, for the District, and for the country
  - Net zero carbon buildings – how they can be defined, designed and verified.

- 'Risk matrix' assessment of the pros and cons of various net zero carbon policy approaches:
  - Effectiveness for carbon reductions
  - Effectiveness in protecting occupants from high energy bills and future retrofit
  - Risk of the infrastructure or building industry not being ready to deliver the policy
  - Risk of transgressing planning powers or contradicting national policy.

- Workshop with planning officers (16th June) to present the work and discuss next steps

- Summary paper and attendance at Portfolio Members' briefing on 7th July.

Background

4.3 Local planning authorities have a binding legal duty to mitigate climate change, established in the Planning and Compulsory Purchase Act 2004.

4.4 This is reiterated in the National Planning Policy Framework. The NPPF defines 'climate mitigation' as reducing our impact on the climate, primarily by reducing greenhouse gas emissions (this is distinct from 'climate adaptation' although the two can be linked). The NPPF states that the plan should achieve 'radical reductions' in greenhouse gas emissions in line with the objectives and provisions of the Climate Change Act 2008.

4.5 The Climate Change Act lays down not only the net zero carbon 2050 goal but also interim five-yearly carbon budgets that are periodically signed into law. So far,

parliament has legislated six carbon budgets running to 2035. To meet those carbon budgets, the UK will need to achieve all of the following changes to the buildings sector:

- From 2025, new buildings should have 15-20kWh/m^2/year space heat demand, a low carbon heat system, no connection to the gas grid, and ideally be net zero carbon
- Heat pump rollout (including to existing buildings) should be dramatically accelerated, with annual installations increasing exponentially from today to 2030
- Expand the use of low-carbon heat networks
- Limited role for hydrogen gas grid in some limited locations after 2030
- Fully decarbonise the electricity grid by 2035
- Construction materials to be used more efficiently and substituted with materials that take less energy to produce (lower embodied carbon).

4.6 These are in addition to changes that must happen in transport, land use and industry. Existing and planned government policy will not fully deliver these changes – even with the new Future Homes Standard in place from 2025 (an update to Part L of building regulations). Any building not built to these standards will need to be retrofitted soon, which will cost owners 5 times as much it would cost developers to do up front.

4.7 Part L of Building Regulations sets the national technical standard for buildings' energy and carbon. It only covers operational regulated energy use (not embodied carbon). Part L regulates buildings' performance on three metrics:

- Target Fabric Energy Efficiency (space heat, homes only) in kWh/m^2/year
- Target Primary Energy Rate (all regulated energy use, all buildings): kWh/m^2/year
- Target Emissions Rate: kg of CO_2/m^2/year (all buildings)

4.8 Although updates are being made to Part L – including the Future Homes Standard from 2025 – this will not fully deliver the necessary changes as listed above. This is partly because the official calculation methodologies used for Part L are not accurate in predicting a building's operational energy and carbon emissions. These calculations underestimate space heat demand, do not incentivise truly energy-efficient building design, and about 50% of a building's energy use is ignored by the calculations ('unregulated energy uses'). This means a 'zero-carbon' building as defined by Part L of building regulations would not truly be anywhere near zero carbon.

4.9 Therefore, to truly fulfil its duty to mitigate climate change in line with the Climate Change Act, a local planning authority would need to require development to go beyond the basic standards set by building regulations – as well as reducing car use, enabling development of renewable energy generation, and protecting green infrastructure that removes carbon.

4.10 To address the weaknesses of Building Regulations Part L, the industry does have some more accurate methods to calculate building's energy (including unregulated) and carbon emissions:

- CIBSE TM54, for non-residential buildings: this works by starting with the Building Regulations Part L calculation and then making some adjustments (Note: The new Part L endorses TM54 as suitable to fulfil a new requirement for energy forecasting)
- BREDEM, for homes: Part L methodology was based on BREDEM, but Part L is rigid whereas BREDEM has flexibility to adjust assumptions and include unregulated energy
- Passivhaus Planning Package: A highly accurate building physics model completely unrelated to the Part L methodologies. Can be used without Passivhaus certification.

4.11 Local planning authorities have the power to require new development to do better than the national standard in energy performance, using powers granted by the Planning and Energy Act 2008. Specifically:

- Energy efficiency standards beyond those set by building regulations,
- A proportion of energy use to be from renewable or low carbon sources in the locality.

4.12 'Energy efficiency standard' is defined as a standard that is set out or endorsed by the Secretary of State. Currently, only the Part L methods meet this caveat (SAP, SBEM and potentially TM54 as above). 'Energy use' is not defined, implying that requirements for renewables can include unregulated as well as regulated energy.

4.13 Most net zero carbon local policy precedents require a 30-40% reduction on the Target Emissions rate set by Part L, then the remaining regulated carbon to be offset via payments to the local authority that get ring-fenced for local projects to save that amount of carbon.

4.14 A ministerial statement in 2015 set a limit on local plans' requirements for carbon reductions (-19% on the Part L 2013 Target Emission Rate). That limit has now been exceeded by Part L 2021. A 2018 NPPF consultation confirmed there is no such restriction. A 2022 Inspector's decision in West Berkshire supports the view that the 2015 ministerial statement no longer holds weight.

4.15 The NPPF states that "Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards". Relatedly, it lays out four tests of soundness for a proposed local plan. To be found sound, plans should be:

1. Positively prepared: Responding to needs and facilitating sustainable development
2. Justified: Based on evidence, and having considered reasonable alternatives
3. Effective: Deliverable in the plan period & based on joint work on cross-boundary issues
4. Consistent with national policy: accord with NPPF and other relevant national policy.

4.16 An effective local plan policy for net zero carbon buildings will therefore need to:

- Be based on a definition of 'net zero carbon' that is robust, defensible and verifiable

- Deliver buildings that meet the criteria needed to fulfil the UK's carbon budgets
- Be compatible with the Government's national technical standards (Part L)
- Be specific enough for officers to determine compliance based on application evidence
- Be supported by evidence that it is feasible and viable to deliver
- Be justified in comparison to reasonable alternative policies – for example, by showing that alternatives would not deliver the necessary changes for the Climate Change Act (net zero carbon 2050, and interim carbon budgets).
- Be consistent with national policy and national technical standards – such as by using calculations based on those of building regulations, and showing how the policy might support other national policies e.g. Clean Growth Mission or Heat & Buildings Strategy.

4.17 Considering the range of powers, duties, more and less effective approaches to net zero carbon buildings, and potential range of policy levers, no single policy approach would perform perfectly across the full range of topics of concern. It was therefore necessary to assess the various policy options against the following risk topics:

- Climate: How much carbon would this policy save, in an effective way?
- Occupants' energy bills: Will this policy deliver significant bill savings, or might it expose the occupant to unnecessarily high energy bills especially given the current volatility?
- Avoiding the cost, disruption and embodied carbon of retrofit: Will this policy deliver buildings that don't need to have more energy saving measures and renewables installed in future to bring the building up to the standard needed for the net zero carbon transition? (It costs five times as much to retrofit as it does to build to these standards)
- Infrastructure: Does this policy help to limit the burden placed on the electricity grid, whose capacity needs major upgrades as existing buildings and cars switch to electricity?
- Viability/cost: To what extent may the policy increase build costs, professional fees and offset costs that wouldn't result in a sales value uplift?
- Planning powers/ precedents: To what extent does the policy work within existing planning powers or mirror the approach of existing adopted precedent plans?
- Compatibility with national approach: Does the policy use national technical standards and help deliver on nationally stated ambitions around buildings' sustainability?

Having looked at powers and precedents, we identified a various range of **potential** policy levers that could be deployed to create a net zero carbon new buildings policy (please note this list is not the final recommended approach):

• Requiring improvements on metrics set by the Building Regulations Part L for carbon emissions (TER), Fabric Energy Efficiency (TFEE), and Primary Energy Rate (TPER)

- Either relative (% improvement on the Part L targets)
- Or absolute (such as a Fabric Energy Efficiency of 15-20kWh/m^2/year).

• Setting specific targets for space heat and total energy use intensity both regulated and unregulated, to be fulfilled using alternative calculation methods that are more accurate than Part L (PHPP or TM54)

• Requiring onsite renewable energy generation equal to 100% of energy use

- Either regulated energy only, or
- Including unregulated energy too – and specifying a calculation method

• Requiring use of a process to remedy the energy performance gap between predicted and actual energy use – which can be due to construction errors as well as poor prediction methods

• Requiring any remaining carbon to be offset

- Either regulated energy only
- Or including unregulated energy too – and specifying a calculation method
- Setting a carbon price that reflects nationally recognised values and is high enough to fund local carbon reduction projects

• Requiring embodied carbon to be reduced to specific levels, or just reported on.

4.18 The policy levers listed above are not all mutually compatible. We therefore next identified internally consistent combinations. A 'risk matrix' was created to assess each policy lever against each risk topic.

Proposals

4.19 Four potential policy approaches were identified, based on the range of existing and emerging local plan precedents and industry best practice in delivering zero carbon buildings. These were titled:

- Approach 1: "Safe Precedent"
- Approach 2: "Cutting Edge"
- Approach 3: "Accelerating future stated national policy"
- Approach 4: "Acceleration+".

For further detail of the components of each approach, please see section below titled 'Other options considered'.

- Each component of each policy was assessed against the range of risk topics outlined in section [4.17] above.
- For each of the four policy approaches, the components of the policy were scored from 0 (actively reduces risk) to 5 (high risk). Two of the approaches were discarded due to having unacceptably high risk of failing to fulfil climate goals (Approach 1) or unacceptably high risk of being rejected by the inspector due to using non-national technical standards unless backed up by adopted plan precedents (Approach 2).

4.20 The proposal is to take forward Approach 4 – "Acceleration+" with modifications whereby the policy would require new buildings to achieve net zero regulated and unregulated carbon by demonstrating the following steps:

a. Future Homes Standard (or Future Buildings Standard) Target Emissions Rate to be achieved solely through energy efficiency and low carbon heat (i.e. before solar panels are added)

b. 15-20kWh/m^2/year space heat demand using Part L Fabric Energy Efficiency metric in homes (and perhaps specific energy-related BREEAM credits in non-residential)

- *Note: The above target was later revised to ≤15kWh after further consideration at the officers' workshop of the scale of Part L's underestimation of space heat demand.*

c. A target for kWh/m^2/year to be achieved in Part L Primary Energy Rate metric

- *Note: The PER target was removed after engagement with Planning Officers and further analysis of the further burden of justification and implementation*

d. Solar panels or other renewables to match the development's energy use (regulated and unregulated energy)

e. Any one of several named processes to deliver energy performance as designed

f. Requiring 30 years' worth of remaining emissions (from regulated and unregulated energy use) to be offset at the latest nationally recognised carbon value (starting at ~£250/tonne this year) taking into account the national predicted grid carbon reductions over that 30 year period.

4.21 Each approach was put through a 'risk matrix' where each component was assessed against the risk topics. Findings were then reviewed with West Berkshire Environment Delivery officers. Embodied carbon policies were removed based on officer feedback that there was a lack of capacity to assess this information if submitted within planning applications.

4.22 In light of the proposal to take forward approach 4, members need to be aware of the following risks:

a. Consider how planning decisions will treat noncompliance in the event that the development takes place in an area without grid capacity to allow solar panels
b. The inspector may find the evidence produced to support the policy unsound
c. Currently no resources to deliver the carbon offsetting fund
d. Resourcing and staff capacity: As with any effective net zero carbon policy, officers will need time and knowledge to assess energy statements (Part L calculations, plus unregulated energy via BREDEM and TM54) and check developers' offset calculations.

4.23 Nevertheless the proposals are recommended given the inability to fulfil the duty to mitigate climate change in line with the Climate Change Act and the council's declared

intent to combat the climate emergency. Additionally, the risks could be mitigated in the following ways:

a. Be receptive to offsetting as a first resort rather than a last resort in locations where grid capacity is limited, or consider a 'cost cap' for grid upgrades above which offsetting would not have to be a last resort after renewables
b. Ensure the evidence (on feasibility, viability, necessity and consistency with national approaches) is collated in a convincing and logical way (consulting with the District's legal and planning advisors) and that WBC's representatives at examination are well-prepared to explain it when questioned.
c. Consider seeking grant funding for the initial setup of the offset fund, after which the fund should become self-sufficient through offset payments – and consider seeking support of the Thames Valley Berkshire LEP and/or pooling resources and expertise with other Berkshire district authorities to improve efficiency and consistency.
d. Provide training to planning officers in interpreting energy statements (perhaps seeking funding or support from the LEP as above) and/or consider appointing external third-party expert support in energy statement interrogation until WBC's officers have developed the required level of expertise (it may be possible to charge the cost of this to developers).

4.24 We note that some further technical policy refinement may be needed to the proposed approach. There is no expectation of the Council to give a verdict on these technical matters; however, for the sake of a fully informed Council decision we wish to highlight that some further time resource may be needed from the planning and environment officers (with support from the external consultants if desired.) The refinements are:

- Explore whether 15kWh/m^2/year in Part L SAP is a tight enough space heat demand target for homes, given how much SAP underestimates this – if not, further analysis would be needed to determine what the target should be instead (based on any available existing robust evidence about the scale of the underestimation, and justifying this for the inspector)
  Explore mechanisms to set targets for good fabric energy efficiency (low space heat demand) in non-residential buildings, which are not subject to a fabric energy efficiency metric in Part L.

- Confirm a calculation method by which developers would have to calculate unregulated energy (in a way that is compatible with the building regulations methods): – we suggest BREDEM (homes) and TM54 (non-residential), both compatible with Part L calculation methods. An alternative is SAP Appendix L although it is thought that this might overestimate unregulated energy use.
- Explore whether to recognise the achievement of specific BREEAM or HQM credits as a means to fulfil the net zero carbon requirement (full credits under BREEAM 'ene 01' or HQM 'energy and cost 02 + 03' would support this).

- Exploring ways to make the policy resilient to potential future changes in national policy / national building regulations.

5 Other options considered

5.1 Investigations took place to find potential policy combinations. Bioregional identified four potential approaches:

1. **"Safe precedent":** Mirroring the adopted approach in London, Reading and Milton Keynes

a. 35-40% reduction on Part L regulated carbon emissions (Target Emission Rate)

b. The remaining Part L regulated carbon offset at £60-90/tonne; no requirement around unregulated energy/unregulated carbon).

2. **"Cutting edge":** Mirroring the emerging approach in Greater Cambridge and others

a. True net zero carbon on site through renewables

b. Low absolute targets for energy efficiency (space heat, and total energy use) as per LETI operational net zero carbon definition

c. Calculated using accurate but non-national methods TM54 or PHPP.

3. **"Accelerating future stated national policy":**

a. Bringing forward the 2025 Future Homes Standard today, via % improvements in regulated carbon emissions (Target Emissions Rate) and fabric energy efficiency,

b. Requiring 30 years' worth of remaining emissions to be offset at the latest nationally recognised carbon value (starting at ~£250/tonne this year) taking into account the national predicted grid carbon reductions over that 30 year period.

5.2 Approach 1 was not pursued because it would not deliver much improvement on the new Part L and would fall far short of delivering the changes needed for national carbon budgets.

5.3 Approach 2 was not pursued for high risk of failure at inspection (due to using non-national calculation methodologies and potentially high costs), at least without the budget and timescale to assemble more robust local bespoke viability and feasibility evidence.

5.4 Approaches 3 and 4 were considered potentially suitable and were taken to a workshop with senior officers in the West Berkshire planning team.

6 Next Steps

6.1 In order to progress the Net Zero Carbon Policy, the following next steps are proposed:

- Redraft policy SP5 and DC3 of the Local Plan Review in light of the agreed approach.
- A supporting SPD to be developed once redrafted policy SP5 and DC3 of the Local Plan Review has been approved by PAG.

- Assemble inspection / examination evidence on the viability and feasibility of the following:

  - Unregulated energy calculation – requiring professional skills and resource
  - Applying a process to address the energy performance gap
  - Complying with energy performance standards

- Be ready to give narrative on why these policies are justified (necessary and feasible)

- Examine Offsetting fund. While a requirement to offset carbon emissions can raise valuable funds, it does place an administrative burden on the local authority:

  - To identify ways to spend the fund to deliver measurable, reliable carbon savings
  - To identify a pipeline of projects to be funded
  - To monitor and report on the projects funded and carbon emissions saved, showing that the carbon savings were made at the same cost paid per tonne.
  - We note that other local (unitary) authorities in Berkshire have recently begun development carbon offset funds – this could be valuable for knowledge sharing

- Resourcing and staff capacity: As with any effective net zero carbon policy, officers will need time and knowledge to assess energy statements (Part L calculations, plus unregulated energy via BREDEM and TM54) and check developers' offset calculations.

7 Conclusion

7.1 The recommendations within section 2 have been proposed for the following reasons:

a. To support in addressing the climate emergency declared unanimously by WBC in July 2019. In doing so WBC highlighted the fact that the Council, our partners and our local communities all needed to play their part in response.
b. WBC Net Zero Carbon target for council operation is 2030, with an ambition to strive towards district carbon neutrality through enabling, promoting, encouraging and incentivising action.
c. It supports the strategic objectives of the Environment Strategy and projects within the Environment Delivery Plan, as well as contributing significantly to fulfil the duty of the local plan to mitigate climate change in line with the Climate Change Act 2008
d. Addressing energy usage within new homes future-proofs homes from increases in energy costs and supports the adaption of housing in the context of climate change, for example thermal efficiency and overheating.
e. Mitigates against future costly retrofitting.

8 Appendices

8.1 Appendix A – Overview of process and findings to date

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4	15/07/22	WBC final draft for PAG	JG

Appendix A

Appendix: Overview of process and findings to date

Powers, mandates, precedents, and constraints with regards to net zero carbon local plan policy

The UK's legal commitments on climate change – and why we're not on track
The UK is a signatory to the international 2015 Paris Agreement to mitigate climate change. This Agreement recognised a need for global action to address implications of climate science from the Intergovernmental Panel on Climate Change (IPCC). The latest IPCC reports show that:

- If global average temperatures rise over 2°C on pre-industrial levels, the effect would be devastating, reaching tipping points that may cause runaway climate change (e.g. escape of methane trapped in polar ice, or die-off of forests which capture carbon).
- A rise of 1.5°C will be far less harmful than 2°C – and we have already hit 1°C
- There is a limited global 'carbon budget' before we hit 1.5°C or 2°C

Paris Agreement signatories therefore agree to take action to achieve a 2°C limit and pursue a 1.5°C limit. There is no concrete agreement on how the global carbon budget is split between countries, but signatories agree that richer countries should make faster/greater carbon cuts.

The UK's Climate Change Act 2008 (2019 update) legally obliges the UK to achieve net zero carbon status by 2050. It also obliges the UK to set and adhere to carbon budgets for each 5-yearly period until 2050. The first six have been legislated to date, covering up to 2035.

The independent Committee on Climate Change (CCC) devises these budgets which parliament then passes into law. The budgets are based on what is technically possible and necessary to stay within the CCC's estimate of a fair share of the global budget for 2°C. The UK hit the first three carbon budgets but is not on track for the fourth or fifth, and current national policy will not deliver them nor the net zero end goal.

What needs to happen to deliver the UK's legislated carbon budgets?
With each carbon budget, the Committee on Climate Change lays out a range of sectoral changes (pathways) necessary to deliver it. The pathway to deliver the legislated fourth, fifth and sixth carbon budgets – of which most relevant to built environment and planning – includes:

- From 2025, all new homes to have space heat demand of 15-20kWh/m^2/year (60-70% less than what current building regulations allow) and not be connected to the gas grid.
- Dramatically accelerate rollout of heat pumps to existing buildings (plus some heat networks and a limited role for hydrogen in some as-yet unknown locations after 2030).
- By 2033, end the installation of any fossil fuel boilers for all existing buildings.
- From 2028, all home sales to have EPC rating of C+ (via insulation, better windows etc).
- Fully decarbonise the electricity grid by 2035 – renewables to be 80% of supply in 2050.
- Construction materials used more efficiently and switching to low-carbon materials.
- Reduction in travel mileage by car, and phase-out new fossil fuel cars from 2032.
- Increase woodland cover to 18% of UK land, up from 13% today.

The pathway rests on all these changes combined. If changes in one topic are under-delivered, we must to make even greater carbon savings in other topics. Figure 2 shows that buildings, transport and electricity should all reach zero carbon (as agriculture, waste and aviation cannot, thus must be balanced by the UK's whole capacity for carbon removals by land or future carbon removal technology that it is hoped will be developed).

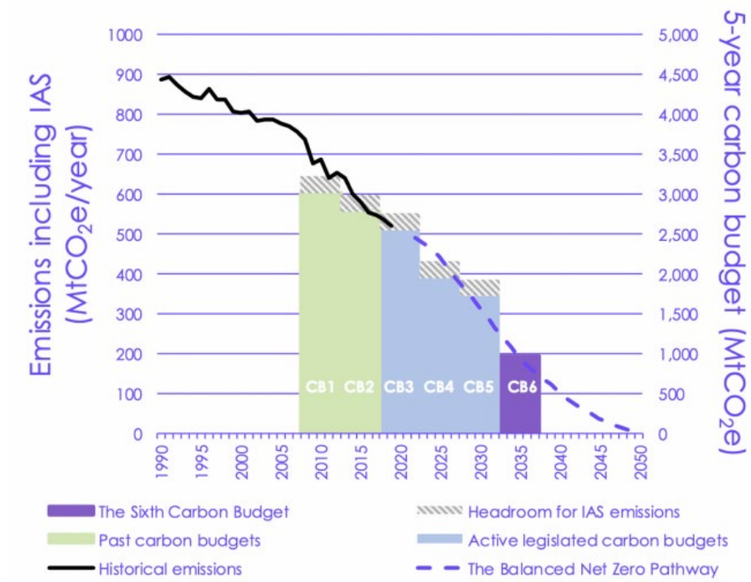


Figure 1: Current, past and future legislated carbon budgets and the fall in annual emissions that must occur to deliver them. From Committee on Climate Change (2020), The Sixth Carbon Budget.

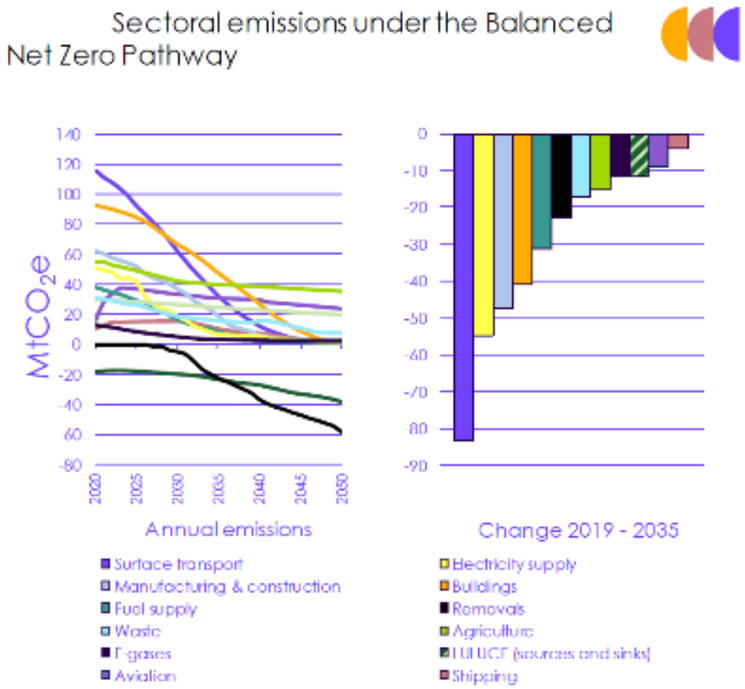


Figure 2: How each sector's emissions must fall in order to deliver the legislated carbon budgets. From Committee on Climate Change (2020), The Sixth Carbon Budget: The UK's path to net zero.

Why must the local plan act to reduce carbon emissions?

Local plans are required by the Planning and Compulsory Purchase Act (section 19) to:

> "include policies designed to secure that the development and use of land in the [local] area contribute to the mitigation of, and adaptation to, climate change".

Mitigation means reducing the level of carbon in the atmosphere, by reducing emissions and/or removing carbon from the air. Adaptation means readying ourselves for the changes to climate.

The National Planning Policy Framework (NPPF) – against which the proposed local plan will be examined – reiterates this by saying emphasising that purpose of the planning system is sustainable development, which includes mitigating climate change. It continues:

- "The planning system should support the transition to a low carbon future … [and] shape places in ways that contribute to radical reductions in greenhouse gas emissions".
- "Plans should take a proactive approach to mitigating and adapting to climate change … in line with the objectives and provisions of the Climate Change Act 2008".
- "Development should be planned for in ways that … reduce greenhouse gas emissions, such as through its location, orientation and design."
- "Plans should [have] a positive strategy for energy from [renewable, low carbon] sources".

As explained in the previous section, the 'objectives and provisions of the Climate Change Act' include the legislated five-yearly carbon budgets as well as the net zero end goal. Because of the major gaps in national policy to deliver those legislated budgets (as previously noted), there remains a large task for local plans to mitigate climate change in line with those objectives.

Why not just rely on Building Regulations and the Future Homes Standard?

'Part L' is the section of building regulations that sets basic standards for new buildings' energy use and carbon emissions. Most definitions of 'net zero carbon buildings' in local and government policy are based on Part L and its associated calculation methods 'SAP' and 'SBEM'.

Using SAP or SBEM, Part L sets limits on the amount of energy a building uses per square metre per year, and carbon emissions associated with that energy use. The limits are set by modelling a 'notional building' of the same size and shape as the proposed building, with a range of energy efficiency features applied (insulation, glazing, airtightness, lighting, heat system and so on).

Part L and SAP/SBEM are periodically updated to increase the energy efficiency standard and to reflect grid decarbonisation. This lowers the Target Emissions Rate (Figure 3) that is used as the baseline by most precedent local plan policy. A new version applies as of June 2022. Part L 2025 (Future Homes Standard) will have a Target Emission Rate low enough to rule out gas heat.

A 'zero carbon' building defined using Part L in fact far from zero carbon:

- **Part L looks only at the building's operation.** (There is no regulatory method for embodied carbon, nor to hold new development responsible for occupants' transport carbon).
- **Part L only controls the 'fixed' energy uses:** space heating/cooling, hot water, fixed lights, ventilation, fans, pumps. It ignores plugin appliances, lifts, etc. ('unregulated energy').
- **SAP and SBEM calculations drastically underestimate** the building's energy use by 50-70%, and their carbon factors for electricity go out-of-date quickly.

Part L fabric standards are too lax to hit the required space heat demand of 15-20kWh (except perhaps in flats from 2025, before factoring in the SAP/SBEM underestimation). Analysis has shown that a home built to the Future Homes Standard would have a space heat demand of about 43-70kWh/m2/year but SAP would underestimate this as 17-25kWh/m2/year.

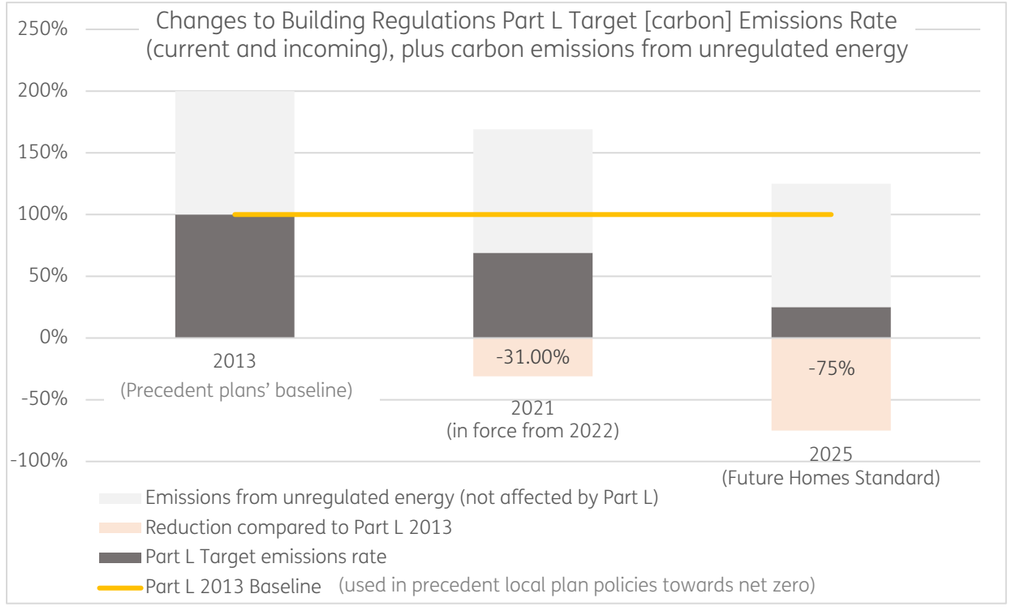


Figure 3: Illustration of the difference in Target Emissions Rate of building regulations in 2022 and 2025, compared to 2013. Half of the home's carbon emissions are from unregulated energy, thus remains unchanged.

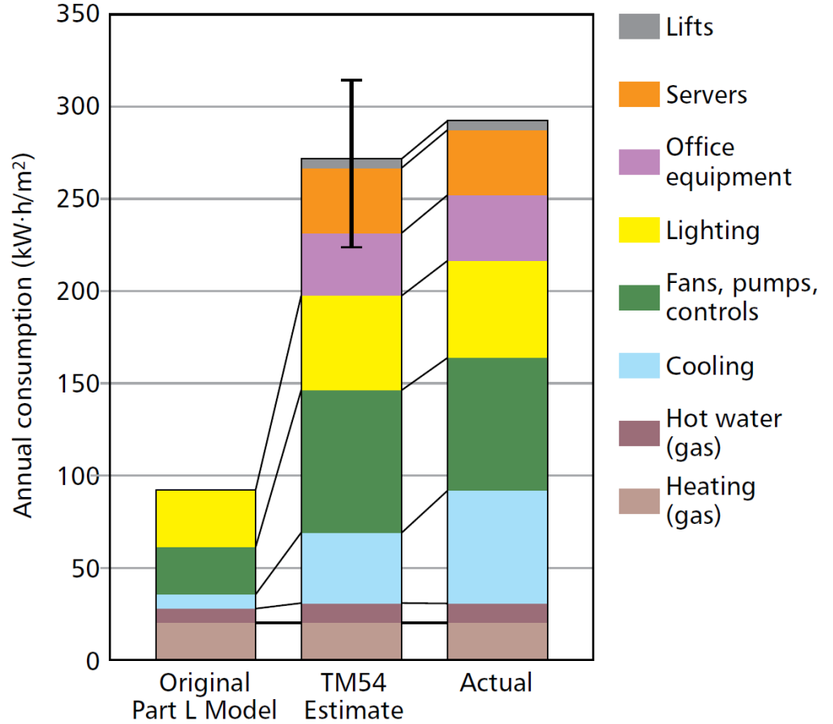


Figure 4: Graph showing difference in predicted energy use using Part L (SBEM) at an office, versus predicted energy use using an alternative methodology (CIBSE TM54), and the actual measured energy use in operation. Credit: CIBSE.

Infographic: The UK's climate commitments and why they need further action

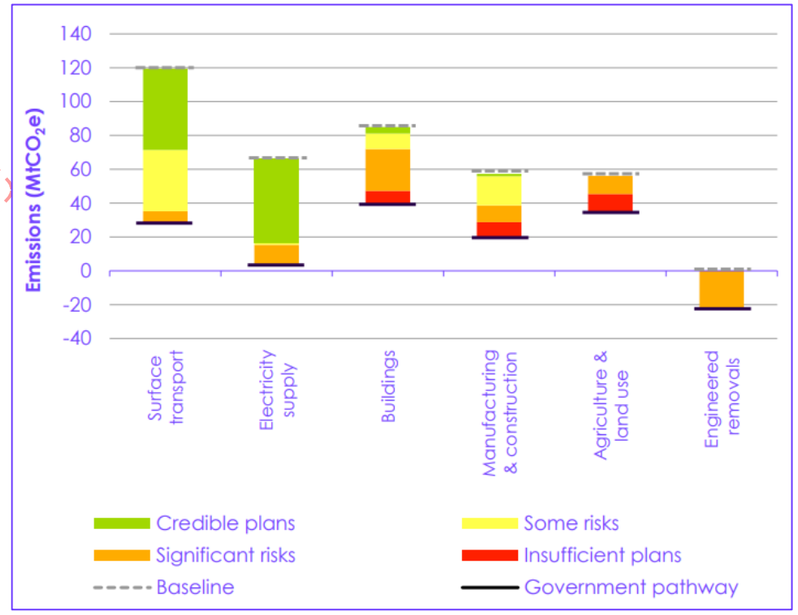
IPCC Special Report on 1.5 °C Climate Change

Climate Change Act

- Net Zero 2050
- Interim 5-yearly carbon budgets

Major gaps in legislation & regulation to deliver the sector pathways, including buildings & construction (existing buildings, and new buildings shaped by Part L)

Carbon budgets at risk in 2035 due to policy gaps



Limited global carbon budget to avoid catastrophe

- Current trajectory: 4C

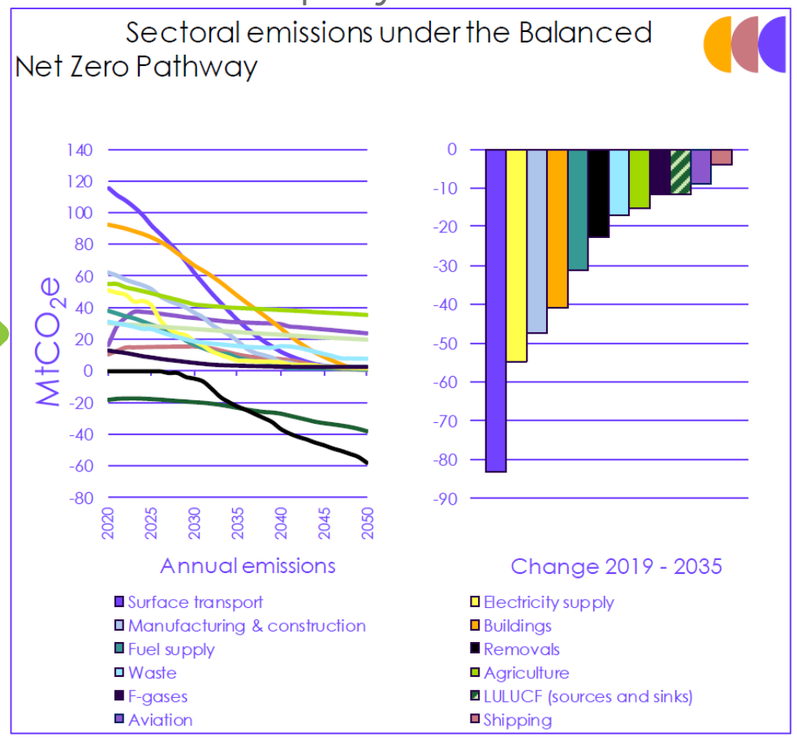
Paris Agreement:

- 2C limit
- 1.5C aim
- Equity principle: Richer countries, larger cuts

Committee on Climate Change pathways to net zero

- Low carbon heat 2025
- Space heat demand 15-20kWh/m^2/yr
- Upscale renewables
- Transport – less car use; electrification
- Agriculture & aviation need offsets via forests & carbon capture

Current national policy will not deliver this



Industry alternative definitions of 'zero carbon buildings'

Because of the failure of Building Regulations to define and deliver net zero carbon buildings compatible with the Climate Change Act, the industry has developed other definitions. Both approaches below cover *total* energy use, not just the share covered by building regs Part L.

The UK Green Building Council (UKGBC) 'Framework Definition for Net Zero Carbon Buildings' which has two parts: net zero carbon in operation, and net zero carbon in construction:

- Net zero carbon in construction is: "When the amount of carbon emission associated with a building's product and construction stages up to practical completion is zero or negative, through the use of offsets or the net export of on-site renewable energy."
- Net zero carbon in operation is: "When the amount of carbon emissions associated with the building's operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset."

UKGBC does not set any specific targets for space heating, operational energy use, or embodied carbon, although it encourages reductions to be prioritised before offsetting. UKGBC has produced guidance defining what counts towards offsite renewables and offsetting.

The London Energy Transformation Initiative (LETI) is a coalition of over 1,000 industry-leading green building experts (engineers, architects, developers and others). Although it began in London, its targets and definitions are applicable anywhere in the UK.

LETI developed a definition of operational net zero carbon as follows, based on what is necessary for the UK's carbon budgets and what is technically possible now:

- A net zero operational carbon building is one that balances all of its energy needs with renewable energy either from on-site sources or by investing in off-site renewable energy that would not otherwise have been generated. The building must also achieve:
  - Space heat demand of 15-20kWh/m^2/year
  - Total energy use intensity of 35kWh/m^2/year (homes)
    - Or: Schools 65kWh/m^2/year; offices 55-70kWh/m^2/year.

These total energy use intensity figures cover both regulated and unregulated energy. They are set at levels that essentially can only be met if the building has a heat pump, because a heat pump operates at ~300% efficiency (therefore it can deliver 15kWh space heat by using only 5kWh, leaving 'room' for the home's other energy needs of up to 30kWh/m^2/year).

LETI's 'Embodied Carbon Primer' guide also sets recommended targets for embodied carbon in kilogrammes per square metre of internal floor area, but does not require these to be offset.

Calculation methodologies (alternative to Building Regs Part L)

Accurate energy calculations and in-use verification are key for both the LETI and UKGBC definitions. This means that the heat demand, energy use, carbon, and renewable energy targets cannot be fulfilled using Building Regulations Part L SAP/SBEM methods. Two much more accurate calculation methodologies are available: CIBSE TM54, and PHPP (see glossary). TM54 is suitable only for nonresidential buildings, and works by making adjustments to the SBEM calculation method. PHPP can be used in any building and is unrelated to SAP or SBEM.

Embodied carbon can be calculated with a generally accepted industry method produced by the Royal Institute of Chartered Surveyors, based on British Standard/EN 15978.

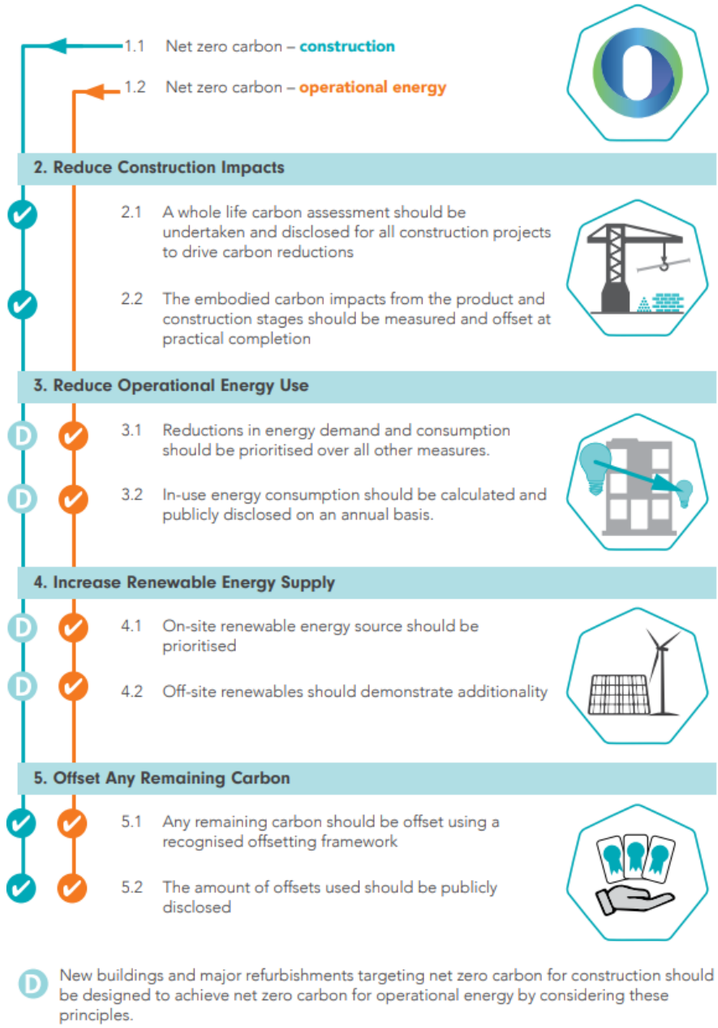


Figure 5: The two scopes of a net zero carbon building according to the UKGBC Framework.

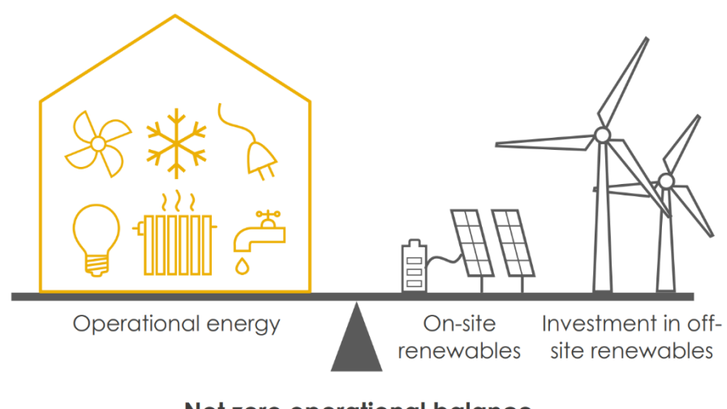
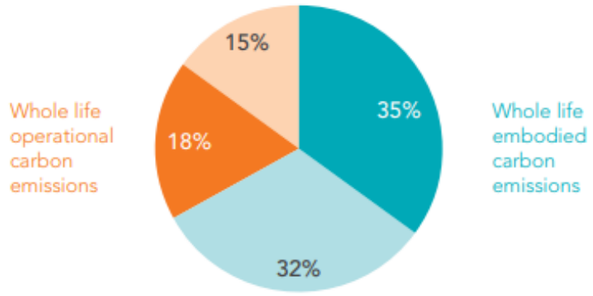


Figure 6: LETI diagram to illustrate its definition of operational net zero carbon.

Infographic: How new buildings cause carbon emissions and how this relates to West Berkshire's carbon account

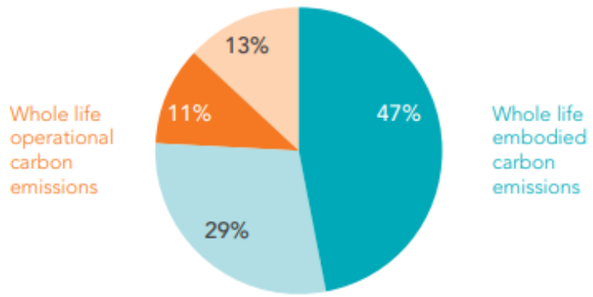
Office

Speculative office building with Cat A fit out; central London



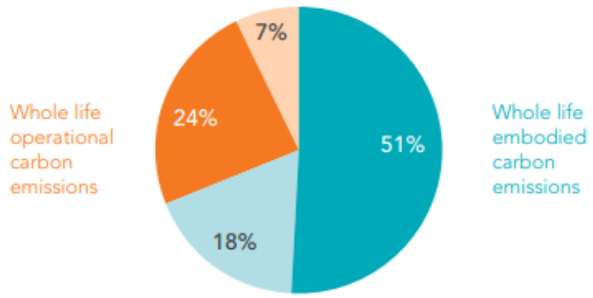
Warehouse

Typical warehouse shed with office space (15% by area); London perimeter, UK



Residential

Residential block with basic internal fit-out; Oxford, UK



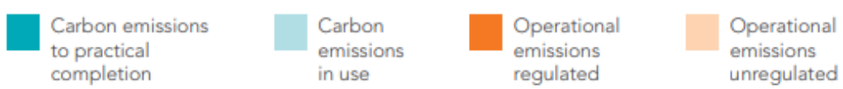


Figure 7 UKGBC diagram of three case study buildings' carbon emissions from operational energy use (orange) and embodied (blue). For full net zero carbon, the dark blue sections would need to be offset, and the orange section offset or met with renewable energy.

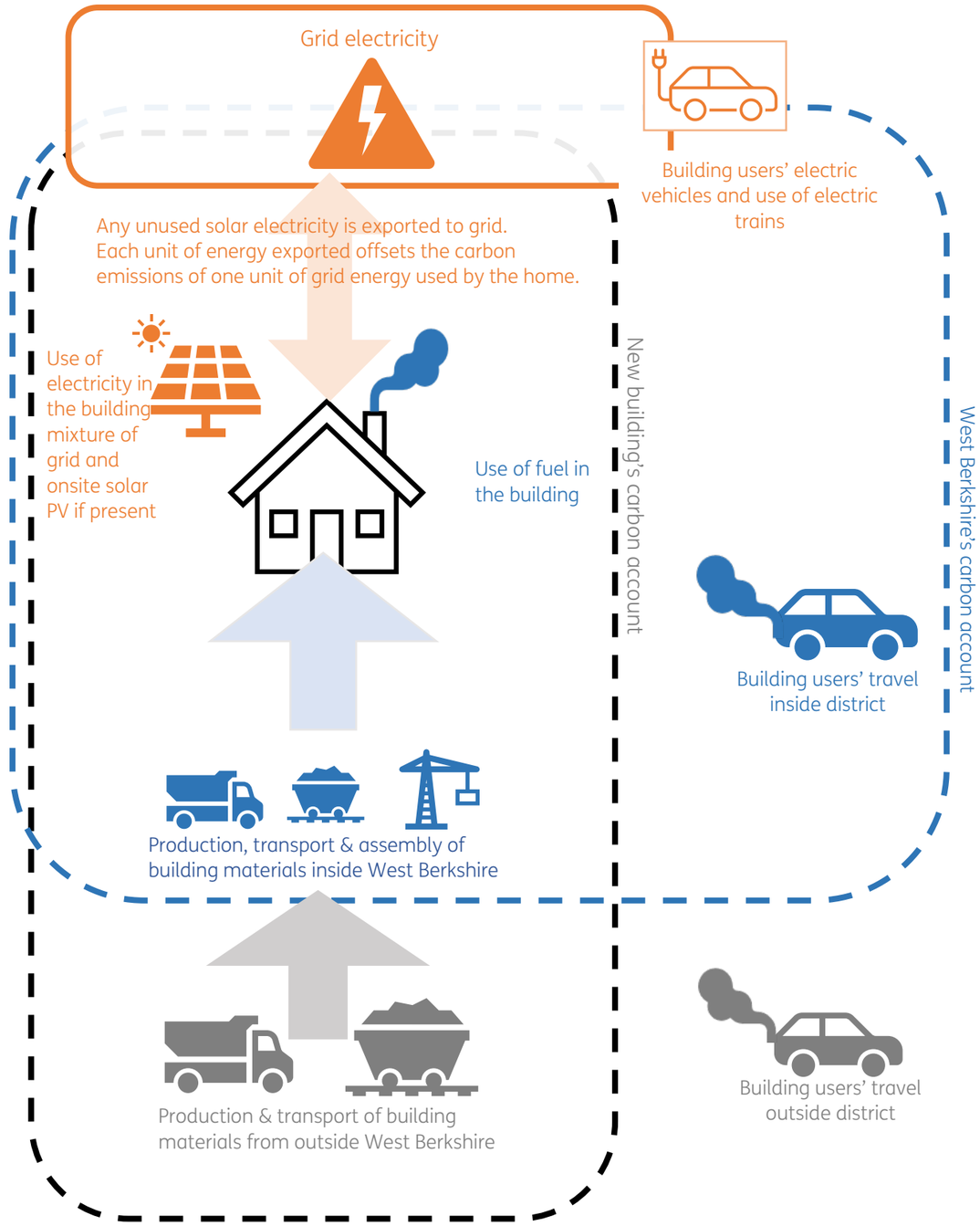


Figure 8: Diagram to illustrate how a new building's energy use, embodied carbon, and occupants' transport habits affect the carbon account of West Berkshire as a whole. Bioregional, 2022.

How far can local plan policy go in mitigating climate change?
There are four main ways in which a local plan can mitigate climate change.

- Transport: Locate new growth where there is a realistic prospect of low car use
- Energy: Actively encourage the development of renewable energy generation
- Buildings: Require new buildings to have excellent energy efficiency, low-carbon heat (not gas) and renewables; remove planning barriers to retrofit of existing buildings
- Green infrastructure: Protect landscapes that achieve significant carbon removals.

We here focus on the powers to address carbon emissions of buildings.

The Planning and Energy Act 2008 grants the local plan the power to set requirements for new developments to perform better than the national building regulations on energy and carbon. Specifically, the Act enables local plans to set "reasonable requirements" for the following:

- "Energy efficiency standards that exceed the energy requirements of building regulations"
- "A proportion of energy used in development in their area" to be from renewable or low-carbon sources "in the locality of the development".

The Act defines "energy efficiency requirements" as standards that are set out, referred or endorsed by regulations, national policies or guidance issued by the Secretary of State. This is repeated in National Planning Policy Framework. The only 'energy efficiency standard' that clearly meets this caveat is SAP/SBEM, the calculations used for Part L of building regulations.

The Act does not set any such restrictive definition for 'energy used in the development'. This may mean that unregulated energy, as well as regulated energy, can be covered by any requirements for renewable energy so long as the requirement is 'reasonable'. However, the National Planning Policy Framework does note that: "Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards". This may prevent the use of calculation methods incompatible with SAP/SBEM.

A ministerial statement in 2015 said local plans should only seek up to a 19% reduction on the carbon target of building regs Part L 2013. That statement is obsolete, as Part L 2021 exceeds it and the Government has since set a clear national policy direction towards net zero (per a recent inspector's decision in West Berkshire). A 2018 NPPF consultation response also confirms there is no such restriction in requiring energy efficiency standards over building regulations.

Precedents

The identified **adopted** precedent local plans approach 'net zero carbon' in one of two ways:

- **Post-2015 local plans** require a 30 – 40% reduction in the Part L 2013 Target Emissions Rate, and the remaining annual regulated CO_2 emissions to be offset via Section 106 payements at £60-90 per tonne to be (Milton Keynes), often multiplied to cover 30 years (London; Reading). Offsets are spent on local projects to measurably reduce carbon.
    - Oxford does not require offsets, but steps-up the % reduction to reach 100% in 2030.
    - The % reduction is usually set to reflect what is known to be feasible by analysis of recent schemes' Part L SAP/SBEM figures (London; Milton Keynes).
    - The price per tonne of CO_2 emissions for London (and borrowed by Reading) was set several years ago to reflect a nationally recognised price set by BEIS.

Plans structured in this way are enforceable but allow developers to deliver the majority of the carbon savings through offsets, and also leave unregulated energy unaddressed (Figure 9).

The offsetting mechanism can raise valuable funding but places a burden on the local authority to find effective ways to spend it (or contract this to a third-party expert, as in Milton Keynes). £60-90/tonne paid to offset carbon may not be enough to fund local projects that save the same amount of carbon. Finally, offsetting lets new builds take credit for savings in other sectors – but the UK needs those savings to happen as well as, not instead of, savings in new buildings.

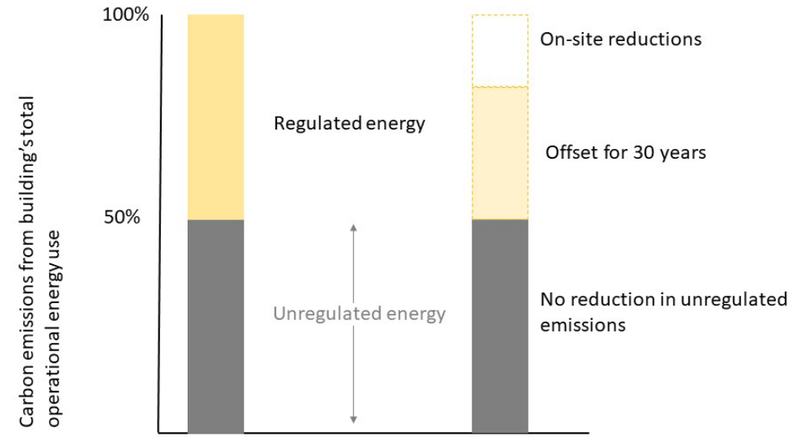


Figure 9: Diagram to illustrate how precedent 'net zero carbon buildings' policies work when based on a 30% reduction on Building Regulations 2013 target emissions rate, followed by offsetting

Pre-2015 local plans are often based on the Code for Sustainable Homes, which would have made all new homes net zero carbon from 2016 by a national definition that never eventually appeared. In general such policies are no longer applicable since the withdrawal of that Code.

- West Berkshire's existing local plan takes this approach. However, it was worded so that the Code for Sustainable Homes requirements were arguably separate from the requirement for renewable or low carbon energy to meet the whole of the development's energy needs (in theory covering both regulated and unregulated energy). As a result, a recent inspector's appeal decision in West Berkshire held that the 100% renewable/low carbon energy requirement could be upheld. But: neither the Inspector's decision nor the West Berkshire Local Plan say whether or how unregulated energy should be included in the calculation of the energy use that should be met by renewable/low-carbon energy.

Many existing local plans also require improved energy efficiency or renewable energy, measured either as a % of Part L carbon emissions savings delivered by those measures, or as a % of the development's energy use (usually regulated only) to be met with onsite renewables.

Several emerging local plans are attempting to require net zero carbon buildings using the LETI approach, with set targets for space heat, total energy use (regulated and unregulated) and 100% renewable energy supply, calculated using PHPP or TM54 instead of Part L SAP/SBEM (Greater Cambridge, Central Lincolnshire, Merton, and Salt Cross). The inspector has so far asked one of these to remove these requirements. The inspector's reasoning has not yet been released but may relate to feasibility, justification, or departure from national calculation methodologies. There is precedent (London) for energy reporting via alternative methods (BREDEM and TM54), including unregulated energy – although not requiring specific targets to be met for this.

Glossary & acronyms

BREDEM	Building Research Establishment Domestic Energy Model. A calculation methodology used to estimate a home's total energy consumption based on its characteristics, split by fuel type. A variation of this model is used in the Home Quality Mark and can be used in some BREEAM certification that have a residential element e.g. BREEAM Communities.
Carbon / carbon emissions	Short for 'carbon dioxide' but can also include several other gases with a climate-changing effect (methane, nitrous oxide, refrigerants)
Carbon budget	Amount of carbon that can be emitted before reaching a level that causes severely harmful climate change
CO_2	Carbon dioxide: Often shortened to 'carbon'.
CO_2e	Carbon dioxide equivalent: The sum of a mixture of gases, in terms of their climate-changing impact in a 100-year period expressed as the amount of CO_2 that would have the same effect. Often shortened to 'carbon'.
DFEE	Dwelling Fabric Energy Efficiency: a metric used in Building Regulations Part L to describe a proposed building's space heat demand. Expressed in kWh/m^2/yr
Embodied carbon	Carbon that was emitted during the production, transport and construction of a building. Can include its renovation and eventual demolition too. As opposed to 'operational carbon' emitted due to energy consumption during use.
EUI	Energy use intensity, a measure of how much energy a building uses per square metre of floor. Expressed in kWh/m^2/year.
GHG	Greenhouse gas (CO_2 and several other gases: nitrous oxide, methane, refrigerants). Often collectively referred to as 'carbon'.
kWh/m^2/yr	Kilowatt-hours per square metre per year. Used for EUI or space heat demand.
Part L	Building regulations section that sets basic legal requirements regarding buildings' energy and CO_2.
PER	Primary Energy Rate. A metric to express how much primary energy is used per square metre in a building. This concept has been used in certifications like BREEAM and HQM for several years, but has only just been introduced to Building Regulations Part L as of this year. The Part L Primary Energy rate will take into account all primary energy used by 'regulated energy uses' (see definition elsewhere in this glossary) whereas BREEAM and HQM would take into account the primary energy used in 'unregulated energy uses' too.
Performance gap	The difference between predicted and actual energy use of a building.
Primary energy	Primary energy' is a term takes into account not just the energy use at the meter, but also all the energy that was 'lost' or used to produce and distribute that energy before it reaches the building. For example, when electricity is produced at a gas power station, the conversion of gas to electricity is not perfectly efficient and so more than 1 kWh of gas is used to produce each kWh of electricity. After that, some of the electricity is lost during the process of transmission through the grid (this is true for electricity of any source). In contrast, electricity produced from on-site renewables is not subject to fuel conversion inefficiencies or distribution losses before it reaches the building.
PV	Photovoltaics: solar panels that generate electricity.
PHPP	Passivhaus Planning Package: a tool to accurately predict building energy use.
Regulated energy	Energy uses in a building that are regulated by Part L of building regulations.
SAP	Standard Assessment Procedure: national calculation method for homes' energy and carbon, used to satisfy Part L.
SBEM	Simplified Buildings Energy Model: national calculation method for non-residential buildings' energy and carbon, used to satisfy Part L.
TER	Target Emission Rate: limit set by Part L on CO_2 emissions per m^2 of floor.
TPER	Target Primary Energy Rate: limit set by Part L on 'primary energy' use per m^2 of floor. A new metric introduced to Part L from June 2022. Both homes and non-residential buildings are now subject to a TPER. The Part L Target Primary Energy Rate will take into account all primary energy used by 'regulated energy uses' (see definition elsewhere in this glossary). This is new for homes (which previously only had a space heating target, TFEE) and for other buildings (which previously did not have any energy efficiency target, only a carbon emissions rate target, TER).
TFEE	Target Fabric Energy Efficiency: Part L target for space heat demand (DFEE)
TM54 (by CIBSE)	Method to accurately calculate buildings' energy use by adjusting SBEM.
Unregulated energy	Energy uses in a building that are not regulated by Part L.

Appendix F

Addendum - NZC local plan support - additional precedents 070622

Local Plan Review: Policy Options for Net Zero Carbon Developments

Addendum: Further precedents

02 June 2022

Rev 01

Bioregional

Written by: Marina Goodyear (Project Manager). Checked by: Lewis Knight (Head of Sustainable Places)

Setting absolute targets for energy use intensity, space heat demand and renewable energy generation, and use of accurate calculation methodologies

Emerging precedent: Salt Cross Area Action Plan[i]

Proposed Policy 2 (Net Zero Carbon Development) opens by stating that:

> "Proposals for development at Salt Cross will be required to demonstrate net zero operational carbon on-site through ultra-low energy fabric specification, low carbon technologies and on-site renewable energy generation. An energy strategy will be required with outline and detailed planning submissions, reconfirmed pre-commencement, validated pre-occupation and monitored post-completion demonstrating [policy compliance]".

The policy sets energy target metrics to be calculated using **PHPP or CIBSE TM54**:

- **Space heat demand** of 15kWh/m^2/year
- **Energy use intensity**:
  - Residential – 35 kWh/m^2/year
  - Office – 55 kWh/m^2/yr
  - Research labs – 55 –240 kWh/m^2/year
  - Retail, sports/leisure – 80 kWh/m^2/yr
  - Community space (e.g. healthcare) – 100 kWh/m^2/year
  - School – 65 kWh/m^2/year
- On-site renewable energy to match 100% of energy consumption.

The Inspectors' requested Main Modifications[ii] (26th May 2022) asks for the whole opening paragraph to be removed and replaced with text requiring only that proposals "demonstrate an ambitious approach to the use of renewable energy [and] … a high level of energy efficiency in new buildings. An energy statement will be required for all major development, which should include the consideration of the feasibility of incorporating the following principles". The Inspector then asks to "remove references to absolute requirements and KPIs that must be met and instead to reframe as standards for consideration as part of an energy statement".

If the modifications are implemented, it would no longer be a zero carbon policy. The removal of all mandatory numeric targets would mean no boundary beyond which planning officers could determine that a proposal fails to comply – making the policy weaker than adopted precedents in London, Reading and Milton Keynes.

The Inspectors' accompanying note[iii] states that "we are not satisfied that Policy 2 is either consistent with national policy or justified". Their full report is not yet available to explain why they reached this conclusion. It may be because of the requirement to meet the targets using PHPP or TM54 calculations instead of SAP, the national calculation method. Also, although the AAP and its evidence base refer to the global climate science and the UK's net zero carbon target, they do not explicitly clarify how these particular energy targets are necessary for the UK to meet its legislated carbon budgets, thus necessary in order for the plan to meet its legal duty to mitigate climate change in line with the Climate Change Act.

Emerging Precedent: Merton New Local Plan (draft 2022)

This plan is with the inspector over Summer 2022. Its proposed draft with main modifications after inspector's first comments[iv,v] Policy CC2.3 still includes the following maximum **Energy Use Intensity** targets from Jan 2025:

- Residential and Multi-residential – 35 kWh/m^2/year
- Offices, retail, GP surgery, hotel, higher education – 55 kWh/m^2/yr
- Schools – 65 kWh/m^2/yr
- Leisure – 100 kWh/m^2/yr
- Light industrial uses – 110 kWh/m^2/yr

Supporting text paragraph 2.3.18 explains that major developments should calculate these with (CIBSE) TM54, (PHPP) methodology or equivalent,. Minor residential schemes are permitted to instead calculate these with Part L SAP.

Supporting text notes that the targets match those identified by the London Energy Transformation Initiative to be consistent with achieving national net-zero carbon targets (paragraph 2.3.21) and proven feasible by technical modelling for another emerging local plan. For comparison, para 2.1.14 notes that typical current Part L EUI is 140/kWh/m^2/year.

The policy also includes the following **space heat demand** targets, with SAP:

Development type	Until 31/12/2022	01/01/2023 – 31/12/2024	From 01/01/2025
Block of flats & mid-terrace house	<43 kWh/m^2/year	39 kWh/m^2/year	15 kWh/m^2/year
Semi-detached, end-terrace & detached house	52 kWh/m^2/year	46 kWh/m^2/year	20 kWh/m^2/year
Non-residential (target flexible)	-	-	15 kWh/m^2/year

Supporting text paragraphs 2.3.9 – 2.3.13 explain that the gradual uplift allows developers to adapt, and that the 2022-24 targets reflect the Zero Carbon Hub 'interim fabric energy efficiency standard' and 'full fabric energy efficiency standard' which have been demonstrated to be feasible, viable, and achieved in a number of schemes in Merton. The 2025 space heat demand matches what the Committee on Climate Change and London Energy Transformation Initiative have found is necessary for the UK to meet its carbon reduction targets (Para 2.3.8).

In Policy CC2.4, proposals must not have gas boilers from 2023. Proposals must demonstrate "how the proposal has made the best potential use of roof space" to maximise renewable energy generation, and that this should meet "100% of energy demand … where possible". These are justified by the fact that all buildings will need to achieve this by 2050, and any delay to implementation means large retrofit costs and three times as much avoidable carbon emitted meanwhile (paragraphs 2.4.2 – 2.4.7, and 2.4.19).

Emerging precedent: Central Lincolnshire Local Plan

This proposed submission underwent Regulation 19 consultation in March-May 2022[vi].

Proposed Policy S7 (Reducing Energy Consumption - residential) includes that:

> "Unless covered by an exceptional basis …, all new residential development proposals must include an Energy Statement which confirms in addition to the requirements of Policy S6 that all such residential units:
>
> 1. Can generate at least the same amount of renewable electricity on-site (and preferably on-plot) as the electricity they demand over the course of a year, such demand including all energy use (regulated and unregulated), calculated using a methodology proven to accurately predict a building's actual energy performance; and
> 2. 2. To help achieve point 1 above, target achieving a space heating demand of around 15-20kWh/m^2/yr and a total energy demand of 35 kWh/m2/yr … No unit to have a total energy demand in excess of 60 kWh/m^2/yr [which means] the amount of energy used as measured by the metering of that home, with no deduction for renewable energy."

The policy also includes a clause to address the energy performance gap:

> "The Energy Statement must include details of assured performance arrangements. As a minimum, this will require:
>
> a) The submission of 'pre-built' estimates of energy performance; and
> b) Prior to each dwelling being occupied, the submission of updated, accurate and verified 'as built' calculations of energy performance. [This] should also be provided to the first occupier … Weight will be given to proposals which demonstrate a deliverable commitment to on-going monitoring of energy consumption … which has the effect … of notifying the occupier [if] their energy use appears to significantly exceed the expected performance of the building, and explaining to the occupier steps they could take to identify the potential causes."

Proposed Policy S8 (Reducing energy consumption – non-residential) replicates the clauses except with a higher permitted total energy demand of 70-90kWh/m^2/year. The assured performance clause is also mirrored.

If a non-residential proposal can demonstrate why the metrics are not achievable, it can instead source renewable energy from off-site, pay the local authority to deliver equivalent renewable energy or other offsite infrastructure to deliver the appropriate carbon saving, or connect to a decentralised energy scheme.

Alternatively, a non-residential proposal may demonstrate achievement of BREEAM Excellent or Outstanding, instead of complying with the energy metrics.

Central Lincolnshire's proposed policies are supported by a similar evidence base to those of Greater Cambridge, described opposite.

Emerging precedent: Greater Cambridge Local Plan (First Proposals 2021[vii])

Policy CC/NZ will aim require and guide net zero carbon new builds, to include:

- Space heat demand of 15-20 kWh/m^2/year in all new developments
- No new developments to be connected to the gas grid; all heating low-carbon
- Total energy use intensity targets to be achieved as follows:
  - Dwellings including multiresidential: 35 kWh/m^2/year
  - Office, retail, higher education, hotel, GP surgery: 55 kWh/m^2/year
  - School: 65 kWh/m^2/year
  - Leisure: 100 kWh/m^2/year
  - Light industrial: 110 kWh/m^2/year
- Proposals should generate at least the same amount of renewable energy (preferably on-plot) as they demand over the course of a year [including] all energy use (regulated and unregulated), calculated using a methodology proven to accurately predict a building's actual energy performance.

The need and deliverability of this policy is evidenced by a suite of net zero carbon evidence base pieces including:

- Local area carbon reduction targets that would represent a fair local contribution to the national net zero carbon transition and Paris Agreement
- Expert analysis by the Committee on Climate Change and various building industry experts about what must happen in the buildings sector to deliver the national net zero goal and interim carbon budgets – including proposed targets for heat demand, total energy use, and on-site renewable energy generation – and explaining how/why this is not delivered by building regulations, current in or incoming
- Technical feasibility studies which modelled whether it was possible to reach the proposed zero carbon energy balance in the typical types of development expected to come forward in the plan period (based on applying a range of energy improvement measures to real recent development proposals that received permission) – this showed that the targets were feasible
- Cost modelling to show the cost uplifts to meet the modelled energy improvement measures, as above, for inclusion in the viability assessment.

The supporting text notes that the alternative – having no policy and relying instead on incoming uplifts to building regulations – would fail to fulfil the plan's statutory duty to help fulfil the Climate Change Act and would fail to play Greater Cambridge's role in helping the UK fulfil its commitment to the Paris Agreement to limit climate change to 1.5C or 2C.

The plan is still in its relatively early stages as of May 2022. It completed its First Proposals/Preferred Options consultation in December 2021, and the first draft of the local plan itself is expected be released in Autumn 2022.

Emerging Precedent: Cornwall Climate Emergency Development Plan Document

This emerging plan has been through Regulation 19 consultation, and is about to undergo independent examination in Summer 2022[viii].

Policy SEC1 (Sustainable Energy and Construction) includes that:

1. The energy hierarchy must be implemented
2.
   a. Major non-residential development (over 1,000m^2) to achieve BREEAM Excellent
   b. New residential development to achieve all of the following
      i. Space heating demand of <30kWh/m^2/year
      ii. Total energy consumption of <40kWh/m^2/year
      iii. On-site renewable generation to match the total energy consumption, with a preference for roof-mounted solar PV.
      Where it is not feasible or viable to include enough renewable energy generation to match total energy consumption:
         - renewable energy generation should still be maximised as much as possible
         - connection to an existing or proposed district energy network
         - offset 'the residual' by a contribution to Cornwall Council's Offset Fund.

This is supported by evidence in the form of modelling analysis[ix] by expert green building engineers. This analysis used accurate energy modelling method (PHPP) to identify a range of energy performance targets that are feasible in Cornwall and can reach the net zero carbon target in a variety of ways (different combinations of fabric / energy efficiency and renewable energy measures). This evidence piece also compared the proposed 'net zero carbon' building performance options against how a building would perform if it simply met the Future Homes Standard. The analysis included cost information for each modelled building that could be used in the viability assessment for the DPD.

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Precedent: New London Plan (adopted 2021)

The London Plan[x] Policy SI2 requires that "major development should be net zero-carbon" demonstrated through a "detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy" as follows:

1. "be lean" – use less energy
2. "be clean" – exploit secondary energy resources, and supply cleanly and efficiently
3. "be green": maximise generation and storage of renewable energy
4. **"be seen":** monitor, verify and report on energy performance.

Net zero carbon is officially measured by a 35% reduction in on-site carbon emissions compared to a building regulations baseline, but the policy also requires that:

- "Major development proposals **should calculate and minimise** carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, **i.e. unregulated emissions**."

Regarding Point 4 of the energy hierarchy, supporting text explains that:

- Para 9.2.10: "The move towards zero-carbon development requires comprehensive monitoring of energy demand and carbon emissions … Major developments are required to monitor and report on energy performance, such as by displaying a Display Energy Certificate (DEC), and reporting to the Mayor for at least five years via an online portal to enable the GLA to identify good practice and report on the operational performance of new development in London".

Supplementary planning guidance[xi] has been produced in support of this. It confirms that

- Paragraphs 3.2.5 – 3.2.6: "For **non-residential uses**, energy consumption (kWh/m^2) and carbon emissions (tonnes CO2/m2) estimates should be informed and then reported using two separate methodologies. Applicants will firstly be required to submit the Building Regulations Part L figures, … Additionally, analysis guided by **CIBSE TM54**, which recommends using a tailored Part L model for the estimates of **regulated and unregulated loads**, **should be undertaken and its findings should be reported in the 'be seen' reporting webform**. A TM54 analysis gives more accurate predictions of a building's energy use. … The CIBSE TM54 findings should therefore also be used to represent the regulated and unregulated energy requirements for … Module B6 (operational energy use) of BS EN 15978, in line with the [Whole Life Carbon] requirements".
- Paragraph 4.3.4: **Major residential** developments should "[estimate] **unregulated** energy consumption using the **BREDEM** (BRE Domestic Energy Model) 2012 methodology".
- Paragraph 4.3.6: **Major non-residential** developments should "Produce a draft whole building DEC11 certificate and submit the associated xml file. The predicted energy consumption should be undertaken using the **CIBSE TM54 methodology**. This method tailors a Part L calculation to reflect the expected occupancy and usage of the building and calculates unregulated loads, again based on expected use and occupancy of the building.

Energy performance gap

Emerging Precedent: Merton New Local Plan (draft 2021)

This plan is with the inspector over Summer 2022. Its proposed draft with main modifications after inspector's first comments[xii] Policy CC2.3 includes a range of space heat and energy use intensity targets whose compliance must be demonstrated using calculations with (CIBSE) TM54, (PHPP) methodology or equivalent.

The supporting text explains that these calculation methodologies help to reduce the performance gap because they generate much more accurate predictions of energy use, compared to the SAP methodology used to fulfil Building Regulations Part L.

Requiring specific BREEAM or HQM credits to address carbon or climate

BREEAM is a sustainability standard that covers energy, water, wellbeing, transport, ecology, materials, waste, pollution, management and innovation. It is devised, owned and its certifications issued by the BRE (Buildings Research Establishment). It is available for a variety of development types: new construction, refurbishment, in-use, and communities. BREEAM is available for many types of use class, but it is typically used in non-domestic settings (and multi-residential such as student housing).

A development can achieve one of a range of BREEAM ratings depending on the percentage of credits that it fulfils: Pass, Good, Very Good, Excellent or Outstanding. Evidence of compliance with each credit must be submitted to the BRE which checks and verifies the evidence before issuing a final rating.

Many existing, adopted and successfully implemented local plans set a requirement for new developments and even refurbishments to achieve a certain BREEAM rating (typically 'Excellent').

Some local plans also require achievement of a rating under the Home Quality Mark, which is the BRE's residential equivalent to BREEAM with more of a focus on what matters to home occupants (such as bills, usability and reliability). The plans typically encourage at least a three-star or four-star rating.

Each BREEAM rating also has specific mandatory minimum credits[xiii] that must be fulfilled as part of the overall score. For example, to gain a rating of BREEAM Excellent, a new development must achieve at least 4 credits under the 'Ene 01' topic which is about the energy use and carbon emissions of the building. However, there are many more Ene 01 credits that could be achieved (up to 9 credits for energy performance, up to four credits for accurately predicting the building's operational energy performance, and up to five credits for exemplary performance).

To reflect the local priorities of specific local authority areas, some local plans have begun to require specific BREEAM credits, not just the overall rating. One evidence report for net zero carbon local planning[xiv] states that "Whist there is not an explicit net-zero [carbon] BREEAM standard, this would be met when achieving three exemplary credits under Ene 01". These exemplary credits are achieved if there is a >100% reduction in both regulated and unregulated energy.

Precedent: Cambridge Local Plan (adopted 2018)

Policy 28[xv] covers carbon reduction, community energy networks, sustainable design and construction, and water use. Among many other criteria, it requires that new nonresidential developments must (unless not technically feasible or viable):

- Achieve BREEAM Excellent (from 2016 onwards)
- Achieve full (5/5) available credits in BREEAM topic Wat 01.
    - (According to the BREEAM New Construction 2018 manual[xvi], this would require a 55% reduction in predicted water use, compared to a BREEAM baseline. BREEAM offers a calculator for this).

In Bioregional's experience working on a recent proposed scheme in Cambridge, this Wat 01 requirement is typically applied flexibly. The scheme in question achieved three of the five available credits, which was the most that could be achieved without water recycling systems which were thought to be prohibitively expensive at the time, and would have needed a lot of space which would be better used for other purposes.

Emerging Precedent: Islington Local Plan (draft 2019)

This plan was submitted to the Secretary of State (inspector) in February 2020[xvii].

The latest version of the plan available is still the draft submission version from 2019[xviii].

Its proposed draft policy S3: Sustainable Design Standards requires that new developments achieve:

- In non-residential development, a BREEAM Excellent rating (using the appropriate BREEAM manual for new construction or refurbishment as applicable)
- In residential refurbishment, a BREEAM Excellent using the BREEAM Domestic Refurbishment 2014 manual
- In residential development, a four-star HQM rating if residential.

Additionally, the policy requires the following BREEAM credits to be achieved.

In new construction and non-domestic refurbishment:

- At least 50% of credits on Environmental impacts from construction products (Mat 01)
- At least 1 credit on Responsible sourcing of materials (Mat 03), in addition Criterion E(i)
- At least 50% of credits on Construction waste management (Wst 01)
- All credits on Water consumption (Wat 01), or a minimum of 3 credits where rainwater and/or greywater recycling is demonstrated not to be feasible
- The second credit on energy monitoring (Ene 02 – Sub-metering of high energy load and tenancy areas), where feasible
- Reasonable endeavours must be made to achieve two credits under the Ene 01 exemplary level criteria, in order to demonstrate zero carbon development
- BREEAM New Construction only - all 4 credits for Energy modelling and reporting as part of Reduction of energy use and carbon emissions (Ene 01).

In domestic refurbishment:

- At least 50% of credits on Environmental impact of materials (Mat 01)
- At least 50% of credits on Responsible sourcing of materials (Mat 02)
- All credits on Refurbishment site waste management (Was 2).

The inspector's list of issues for discussion[xix] does raise the question of what evidence has informed the choice of standards and minimum ratings to apply, and this was schedule for a hearing on 27th September 2021[xx]. However, the outcome of this assessment does not yet appear to be available as none of the subsequent inspectors' letters refer to this policy or the topic of sustainable construction[xxi].

More effective offsetting schemes for new development that cannot feasibly achieve net zero carbon status on site

As previously outlined in the original appendix document, existing carbon offset mechanisms in local plans are affected by the following problems:

1. Using only Part L SAP to calculate the amount of carbon to be offset – this fails to account for unregulated energy and is affected by the performance gap (i.e. SAP is highly inaccurate in predicting actual energy and carbon performance) and the carbon factors used in SAP are generally several years out of date with the rapidly decarbonising electricity grid
2. Failing to account for the decarbonisation in the electricity grid over the period for which carbon is expected to be offset – thereby unfairly penalising electricity use compared to gas use
3. Risk of spending offset funds on measures that may not deliver measurable, permanent carbon savings that are additional to what would have happened in the absence of the fund – or not spending them at all due to a lack of projects
4. Risk of the amount paid for offsets not being sufficient to enact projects that will save the same amount of carbon that is emitted
5. Risk of the offset fund becoming a 'leak' whereby the new buildings sector becomes able to shirk its achievable responsibility to achieve carbon emissions, and pass on this responsibility to other sectors (such as land use or existing buildings) when in fact all sectors need to rapidly reach net zero carbon if the UK is to hit its legislated carbon goals – meaning we need absolute carbon cuts, not just displacement of emissions between sectors.

There are various emerging precedent plans that are attempting to remedy the potential pitfalls of carbon offsetting mechanisms for new development in their area.

Regarding point 5 on offsets as 'leakage': This point largely is a caveat that funds to offset carbon from new buildings should ideally be used to deliver renewable energy, and not to deliver land-based carbon sequestration such as afforestation. This is because Committee on Climate Change and Tyndall Centre analysis (referenced previously in this document) show that the UK's carbon budgets mean that the land use/agriculture sector needs all its carbon sequestration capacity for its own purpose. That sector is already expected to be unable to reach net zero carbon in 2050, which will have to be balanced by even greater afforestation, large reductions in beef and dairy and fertiliser, or future unproven innovations in farming techniques. The same is true for the aviation sector. Meanwhile the UK has a relatively limited amount of land that can be converted to forest or other carbon-sequestering land (given the competing land uses such as food production, renewable energy generation, and built uses). The argument is therefore that any carbon savings achieved by expansion of green infrastructure should be used to balance out the emissions of sectors that actually cannot feasibly reach net zero carbon, not those of sectors that can technically achieve this.

The existing buildings sector, like the new buildings, is one of the sectors considered relatively feasible to decarbonise and should therefore do this under its own steam. If new buildings 'offset' their emissions by taking credit for insulation or heating systems to be added existing buildings, the existing buildings cannot reciprocate. The offset emissions are not really 'gone', they just appear in a different building's account. Either way, renewables must be added to the energy system to address the emissions of both buildings at source – so it makes sense for any 'offset' scheme to simply deliver those renewables directly.

One counter-argument to this is that an offset scheme could route cash to the purpose of existing building retrofit actions that are vital for the net zero carbon future but currently lack financial mechanism to deliver them, such as heat pumps or insulation in hard-to-insulate properties. In contrast, the necessary expansion in the UK's renewable energy generation may simply come about through market forces. That is, the energy sector has cash to invest, proven technologies and relative certainty of profits from their investment, in contrast to building occupants who often do not have the cash, the certainty about retrofit technologies/measures, or the certainty of returns on investment (given the removal of the feed-in tariff system and various high-profile horror stories about incorrectly installed insulation and heat pumps) and also are discouraged by the potential disruption or even damage to their home.

We therefore note several emerging precedents that have expressed an intention to deliver offsetting schemes that only fund renewable energy or existing building retrofit.

Emerging Precedent: Warwick Emerging Net Zero Carbon Development Plan Document[xxii]

At the time of writing, this emerging precedent is undergoing Regulation 19 Consultation with a timeline for adoption in late 2022/early 2023.

It requires developments (of 1 or more dwellings and/or 1000m2 nonresidential space) to achieve reductions in energy use and carbon in line with the Future Homes Standard 2025, calculated using SAP/SBEM, followed by offsetting.

This is supported by an evidence base which draws on the national Future Homes Standard documentation and the evidence bases of other plans:

- Feasibility - using technical building modelling by other local plans' evidence bases, and the national Future Homes Standard Consultation
- Cost evidence for the capital cost uplift associated with delivering the fabric and low carbon heat of the Future Homes Standard – drawing on the FHS Impact Assessment by national government, and cost modelling from other local plans' evidence bases (specifically Cornwall).

Policy NZC2(C) (Offsetting) requires that where a development cannot demonstrate that it is net zero carbon, it must offset any residual emissions by a Section 106 contribution. This can be a cash contribution to the council's offsetting fund, or a verified local off-site offsetting scheme.

> "The amount of carbon to be offset will be calculated according to the SAP or SBEM carbon emissions submitted in the energy statement … multiplied to reflect emissions over a period of 30 years from completion. Where "zero-carbon ready" technology is proposed, associated carbon emissions should be calculated in accordance with the stated national trajectory for carbon reduction of the energy source (i.e. annual Treasury Green Book BEIS projections of grid carbon intensity or future national equivalent)."

Supporting text notes that electric heating is a 'zero carbon ready' technology for which there is a national trajectory for the decarbonisation of that energy source. For other energy sources without such projections, emissions are steady for 30yrs.

> "The carbon offset price is the central figure from the nationally recognised non-traded valuation of carbon, updated annually as part of the Treasury Green Book data by BEIS." Supporting text notes that in 2021, this was £245/tonne.
>
> "Funds raised through this policy will be ringfenced and transparently administered by the Council to deliver a range of projects that achieve measurable carbon savings as locally as possible, at the same average cost per tonne. The fund's performance will be reported in the Authority Monitoring report on: amount of funds spent; types of projects funded; amount of CO_2 saved."

Emerging precedent: Greater Cambridge Local Plan (First Proposals 2021[xxiii])

Policy CC/NZ aims to ensure new buildings achieve net zero carbon. This includes scope for offsetting, for those developments unable to meet the requirements on site.

The proposed policy includes that "Offsetting [is] to only be used in certain circumstances (e.g. insufficient roof space to generate renewable energy) – money would only be used to invest in additional renewable energy generation to ensure net zero carbon buildings are delivered. Where a proposal cannot meet the requirements in full, in addition to offsetting, the development must be futureproofed to enable future occupiers to easily retrofit or upgrade buildings and/or infrastructure in the future to enable achievement of net zero carbon development"

Emerging Precedent: Merton New Local Plan (draft 2022)

This plan is with the inspector over Summer 2022. Its proposed draft with main modifications after inspector's first comments[xxiv,xxv] Policy CC2 still includes the following, which begins similarly to existing precedents in London:

"All new build development resulting in the creation of 1 or more dwellings or 500sqm or more non-residential GIA:

e. To demonstrate compliance with the Mayor's net-zero carbon target ….
f. Where it is clearly demonstrated that the net-zero carbon target cannot be fully achieved on site … any carbon shortfall to be provided, either:
   i. through a cash in lieu contribution to Merton's carbon offset fund, or
   ii. off-site provided that an alternative proposal is identified, delivery is certain and subject to agreement with the council."

This emerging plan's innovation arises in the supporting text on pricing:

> "2.2.15 … the London Plan carbon offset price (£95/t in the London Plan 2021) is too low to actually deliver equivalent carbon savings and therefore does not incentivise sufficient on-site savings. Indeed, the cost of installing additional PV … is currently at around £190/t … expected to increase to £325/t using the SAP 10.1 carbon factors [reflecting] decarbonisation of grid electricity. …
>
> 2.2.16 … It would cost a local authority at least £300/t to save carbon in a sustainable way, taking into account administration and management costs …
>
> 2.2.17 In order to incentivise developers to implement lower carbon strategies on site where possible, and to ensure that any remaining carbon shortfall can adequately be addressed off site, the carbon shortfall for the assumed life of a development (e.g. 30 years) will therefore be offset at a rate of £300/t as at 2021. The price for offsetting carbon is regularly reviewed; this will be monitored and, if necessary, updated."

Emerging Precedent: Bristol New Local Plan (draft 2019)

This plan[xxvi] underwent Regulation 18 consultation in March to May 2019 but has not progressed since then. The intent was[xxvii] that responses to this consultation would inform the next iteration of the draft plan ('Regulation 19) which would undergo further consultation before being submitted to the Planning Inspectorate.

As there has not been any further progress on this plan since the Spring 2019 consultation, Bristol City Council says it intends to publish a revised timetable in July 2022 which will enable the new local plan to be in place in early 2024[xxviii].

The 2019 Regulation 18 consultation version of the plan includes a proposed draft policy: Policy CCS2: Towards zero carbon development.

Policy CCS2 requires that new development will be expected to (paraphrased):

- Achieve the following on-site reductions in regulated CO_2:
    - ≥10% reduction through energy efficiency measures
    - ≥35% reduction through a combination of energy efficiency measures and on-site renewable energy generation
- Offset remaining regulated and unregulated carbon emissions to reach net zero carbon (a 100% reduction)
    - This can be delivered through "measures such as":
        - A financial contribution to renewable energy, low-carbon energy and energy efficiency schemes elsewhere in the Bristol area (at £95/tonne for 30 years)
        - Agreeing acceptable directly linked or near-site provision.
- The above requirements are waived if the building is certified Passivhaus.
- The policy also specifies a hierarchy of choices by which heating systems should be selected, and overheating avoided.

Neither the policy nor supporting text explains how unregulated energy is to be calculated.

They also do not specify which version of building regulations is the baseline against which the 10% and 35% regulated emissions reductions should be achieved, other than to say "current building regulations Part L". At the time of writing would have been Part L 2013 but it is not clarified whether the policy expects that the same percentages would apply when Part L 2021 or 2025 come into force.

In the policy, no distinction is made between residential or non-residential development. However, there is flexibility in the targets for buildings being converted to a new use, which only have to and show how the above measures have been implemented as far as possible and aim for a total 20% reduction in carbon emissions as a guideline.

Existing buildings

Emerging Precedent: Cornwall Climate Emergency Development Plan Document

This emerging plan has been through Regulation 19 consultation, and is about to undergo independent examination in Summer 2022[xxix].

Policy SEC1 (Sustainable Energy and Construction) includes that:

> Significant weight will be given to the benefits of development resulting in considerable improvements to the energy efficiency and reduction in carbon emissions in existing buildings.
> Proposals that help to increase resilience to climate change and secure a sustainable future for historic buildings and other designated and non-designated heritage assets will be supported and encouraged where they:
> c. conserve (and where appropriate enhance/better reveal) the design, character, appearance and historical significance of the building; or
> d. facilitate their sensitive re-use where they have fallen into a state of disrepair or dereliction (subject to such a re-use being appropriate to the specific heritage asset).

Emerging precedent: Greater Cambridge Local Plan (First Proposals 2021[xxx])

Policy GP/CC is titled 'Adapting heritage assets to climate change'.

The proposed policy direction includes

- "Require retrofit works to be carried out in accordance with the BSI PAS 2035 framework and Historic England guidance for energy improvements to heritage assets
- Require proposals to take a 'whole building' approach to undertaking works to heritage assets to enhance environmental performance"
- Support proposals which seek to undo the damage caused by previous inappropriate interventions (e.g. removal of cement render and replacement with breathable options).
- Give consideration to measures that will reduce carbon emissions and assist with adaptation to our changing climate (for example external shading or property level flood protection).
- The plan will also direct residents to further guidance on how to approach works to older homes."

The supporting text notes that need for this policy is evidenced by the local plan's Net Zero Carbon Study which showed that existing buildings cause one-third of the area's greenhouse gas emissions and therefore "we cannot meet our climate targets without reducing emissions and energy usage in all our homes", given that "the Committee on Climate Change have concluded that at least 90% of existing buildings in the UK should have energy efficient retrofits for the UK to meet its zero carbon targets".

The supporting text emphasises that this is particularly relevant because 20% of homes were built before 1919, and Listed Building Status applies to 1% of homes in Cambridge and 3% of homes in South Cambridgeshire. It also notes that such improvements to existing buildings reduces running costs and also increases the lifespan of the building.

It explains that "Policy is therefore needed to support owners of heritage assets to undertake sensitive works to address the performance of their buildings, in line with best practice guidance for heritage assets".

The plan is still in its relatively early stages as of May 2022. It completed its First Proposals/Preferred Options consultation in December 2021, and the first draft of the local plan itself is expected be released in Autumn 2022.

Embodied carbon

Emerging precedent: Salt Cross Area Action Plan

Policy 2 includes that – among other target metrics for energy demands and renewables – requires that proposals should "demonstrate attempts to reduce embodied carbon to meet the following KPI: < 500 kg CO2/m2 Upfront embodied carbon emissions (Building Life Cycle Stages A1-A5)". A report containing these calculations should be submitted with the application.

The Inspectors' requested Main Modifications (26th May 2022) seeks to "remove references to absolute requirements and KPIs that must be met and instead to reframe as standards for consideration as part of an energy statement". It is not clear whether this request applies to the *embodied carbon* target as well as the energy metrics. It may be separate, given that embodied carbon is a separate issue from energy and therefore would not typically be part of an energy statement.

The Inspectors' full report is not yet available to explain why they seek this change.

Beyond the building: Reducing carbon via the spatial strategy and standalone renewable s

Allowing growth only where the transport carbon emissions can be minimised

Transport is now the UK's largest emitter of CO_2 – representing 34% of total CO_2 emissions across the UK[1], [xxxi] (compared to homes 26%, commercial/public buildings 8%, industry 15%, and land use 3%). In West Berkshire transport is responsible for an even greater proportion of emissions. Moreover, transport carbon emissions have not been reducing much in the past decade before 2020 (unlike the homes and other buildings sectors which have benefitted from reductions in electricity grid carbon). This is because the small increases in vehicle efficiency (and electric vehicles) have been outweighed by an overall increase in miles driven. A switch to electric vehicles is underway but has been slow and it will be many years before EVs make up the majority of new vehicles, let alone the majority of vehicles on the road (as the ban on sales of new fossil fuelled cars and vans is not till 2035, and the last fossil fuelled cars can be expected to be still in use for at least 14 years[xxxii] after that).

There is therefore a strong climate justification to devise the spatial strategy to focus the bulk of development in locations where there is a realistic likelihood of low car use, in particular on public transport corridors and walkable urban locations, and to refrain from allocating any sites where driving will be the only realistic attractive option for most daily trips. Walkable sites also enable more efficient land use due to reduced parking area, while growth in urban locations can share existing infrastructure and thus avoid embodied carbon associated with new infrastructure. Where other considerations constrain this approach (such as green belt designations preventing growth around well-served railway stations or bus routes) there may be grounds to review the relative merit of those designations compared to the climate imperative. This should not be done lightly and should be supported by analysis to explore the differences in carbon emissions that would result in growth in different locations.

Transport carbon emissions are largely determined by *where* the development takes place as opposed to what policies are imposed to regulate the quality of each development itself. Once the location is set, it is difficult or impossible for the developer or the local plan to effectively influence the transport habits of the occupants and their associated carbon emissions. Recognising this, emerging local plans are taking steps at a very early stage of plan development to ensure that transport carbon emissions are considered from the outset of spatial strategy design and not as an afterthought.

To avoid locking-in long-term avoidable carbon emissions that come with development in car-dependent locations, spatial strategies can be informed with evidence to show how much carbon could be saved by choosing to direct growth to locations that are inherently conducive to public transport and active travel. This gives a quantifiable value to the carbon savings, thus allowing them to be more fairly weighed alongside other considerations for growth sites such as ecology, landscape or impact on existing residents.

[1] As percentage of UK emissions, before taking into account sequestration by forests and grassland.

Emerging Precedent: Greater Cambridge Local Plan

In 2020-21, the emerging Greater Cambridge Local Plan was in the early stages of identifying the possible options for its spatial strategy. There were several broad spatial categories reflecting the potential areas where new growth could occur. There was also a range of housing growth numbers (low, medium, high).

Greater Cambridge Shared Planning service commissioned comparative modelling of the carbon emissions of buildings and transport in different types of location: urban, suburban, public transport corridors, new towns, villages.

This modelling used publicly available data on the local area's energy use and emissions of buildings and transport, combined with a locally-specific transport model. It also took into account the different locations' typical densities, home sizes and amount of new infrastructure that would be needed along with housing.

The potential sites being considered for growth were categorised into these different types of location. A range of options were tested, with homes spread in varying proportions across different types of location.

This revealed*xxxiii* a very large difference in carbon emissions in the plan period depending on where homes were built. Importantly, it showed that the carbon emissions difference (between growth in the most versus least car-dependent locations) was just as large as the difference that would be made by applying zero-carbon buildings policies.

Village-led growth had far higher carbon emissions than any other option. Growth on public transport corridors was nearly as low-carbon as urban growth, and both were better than new settlements. Applying a range of carbon reduction policies (for buildings and transport) would halve the total emissions, except in villages because more of their carbon due to transport, which is influenced more by location than policy.

This informed the further refinement of the growth options. The modelling was repeated*xxxiv* for the refined options. Both were taken into account in the sustainability appraisal*xxxv*. As a result, the proposed preferred option is led mainly by growth on public transport corridors and urban areas, and does not include significant development in villages (only where they are well connected to existing transport and employment.)

Emerging Precedent: Central Lincolnshire Local Plan Review

Central Lincolnshire Local Plan Review used the same approach as Greater Cambridge, with same consultant team conducting analysis[xxxvi] to compare the carbon impacts of its various spatial growth options.

Here, the difference between locations was less pronounced. This was partly because the spatial options in Central Lincolnshire were less starkly 'urban' or 'rural' but more blended, and partly because the Lincolnshire growth locations did not include areas with such an unusually high level of cycling and low car use as urban Cambridge has.

Actively allocating sites for growth of renewable energy generation and distribution

Development of large-scale renewable energy can be controversial topic with communities, especially regarding wind turbines. However, Committee on Climate Chance carbon budgets & recommendations show that it is necessary for all local areas to accept a reasonable amount of new renewable generation in order to bring about the electricity grid decarbonisation that is essential for the entire country's legally binding transition to net zero carbon.

The shared challenge becomes even larger given that especially as we must not only switch existing electricity generation to zero-carbon sources, but also dramatically upscale electricity production and distribution to meet the rising electricity demand imposed by the equally necessary switch of heating and transport away from gas and oil and onto electrical power (the role of hydrogen is expected to be limited in geography, scale and application for the foreseeable future).

Energy distribution and storage infrastructure is a vital part of this renewable-heavy energy system, to match generation with demand (as renewable energy generation fluctuates with the wind or sun, and can be generated at a different time to when it is needed for use).

The Royal Town Planning Institute notes[xxxvii,xxxviii] that planning for renewable energy (generation, storage and other smart energy infrastructure) is most likely to be successful when specific suitable sites are allocated in concert with communities, grid operator/district network operator, and other stakeholders with relevant concerns e.g. ecological and landscape conservation bodies.

Perhaps the key success factor is to define reasonable requirements to mitigate the impacts and community acceptability, while not creating a planning environment that is so hostile as to entirely deter or block potential projects for renewable energy and energy storage.

Recognising this challenge, several emerging local plans are attempting to make provision for such developments.

Emerging precedent: Greater Cambridge Local Plan (First Proposals 2021[xxxix])

Policy CC/RE aims to bring forward standalone renewable energy development, in an acceptable way. This will include:

- A positive policy framework for development of renewable energy generation capacity, and associated infrastructure such as battery storage and grid capacity
- Identify broad areas of suitability for different types of renewable energy generation equipment, informed by Cambridgeshire Renewables Infrastructure Framework and a Landscape Sensitivity Assessment
- Indicate support for community-led projects
- Identify a set of criteria which will apply to all renewable energy projects with regards to their impact on amenity, landscape appearance, biodiversity, geodiversity, water, history/heritage, highway safety, aviation and telecoms
- Require special community engagement in the case of wind turbines
- Consideration of green belt impact and the potential for renewable energy development to be justified by 'very special circumstances'.

The need for this policy is evidenced by reference to national planning policy expectations that local plans should recognise the responsibility of all communities to contribute to energy generation from renewable sources, and a Net Zero Carbon study which had identified how much a 'fair share' of that contribution would be for the area. It is also noted that the alternative – having no policy to identify such areas – could fail to bring forward the amount of renewable energy required for the net zero carbon transition.

The plan is still in its relatively early stages as of May 2022. It completed its First Proposals/Preferred Options consultation in December 2021, and the first draft of the local plan itself is expected be released in Autumn 2022.

Emerging Precedent: Cornwall Climate Emergency Development Plan Document

This emerging plan has been through Regulation 19 consultation, and is about to undergo independent examination in Summer 2022[xl].

Background text notes that Cornwall is already ahead of the national average in the percentage of its electricity that is derived from renewables, with potential for more. Also:

> "The Policy map identifies broad areas that may be suitable for wind energy. [This] does not mean that proposals will automatically be granted … They are essentially an 'area of search' within which the Council will consider whether turbines should be granted permission in line with local and national policy which sets out a series of technical tests (including distances from homes and heritage assets …) and demonstrate the acceptability of their visual impact. An interactive map … sets out constraints against which proposals will be considered".

Proposed Policy RE1 proceeds to affirm that proposals for renewable generation and distribution projects will be supported where they:

- Contribute to Cornwall's target of 100% renewable electricity supply by 2030,
- Balance the wider environmental benefits and not result in significant adverse impacts on the local environment that cannot be satisfactorily mitigated (in AONBs they must be small scale and only in exceptional circumstances),
- Allow for the continuation of some form of agricultural activity on the site
- Provide for 10% net biodiversity gain
- Provide for community benefit (including offering an option for communities to own at least 5% of the scheme if it is 5MW or more)
- Have appropriate plans in place for removal of the technology 'on cessation of generation' and restoration of site to original or acceptable alternative use.

Wind energy development proposals will be permitted where they:

- Are located in a 'broadly suitable area' identified on the Policies Map or are for the repowering of an existing wind turbine/farm
- Demonstrate that various impacts have been consulted on and mitigated (community, shadow, flicker, noise, air traffic, radar, overshadowing / overbearing effect on habitations, integrity of European Sites, foraging zones for waders in 3km buffer zone of specific coastal habitat areas).

Solar energy development proposals for building mounted installations will be supported and encouraged wherever possible. Standalone ground-mounted solar will be supported on previously developed land and away from 'best and most versatile' agricultural land 'unless exceptionally justified'.

Hydroelectricity energy development (including tidal) will be supported subject to acceptable impacts on the water regime and nature conservation.

There is a presumption in favour of grid energy storage development where it is collocated with renewables, alleviates grid constraints, or enables further renewables to be deployed.

Quantifying and protecting the carbon sequestration value of green landscapes

Emerging precedent: Greater Cambridge Local Plan (First Proposals 2021[xli])

Policy CC/CS will:

- "Support the creation of land and habitats that play a role as carbon sinks and protect existing carbon sinks from development in particular undisturbed or undrained peat"
- "Promote approaches that minimise soil disturbance, compaction and disposal during construction projects".

The details of how this policy will be structured are not yet available.

However, the First Proposals document explains that it is supported by (and will draw on) an evidence base including:

- Net Zero Carbon Study
- Green Infrastructure Opportunity Mapping Report – this took an 'ecosystem services' approach to identify existing and potential green infrastructure, of which one of the ecosystem services is carbon sequestration. This included approximate mapping of soil carbon and above-ground carbon in vegetation.
- Natural England (2021) report on Carbon Sequestration and Storage by Habitat (report NERR094).

It is argued that although many carbon-rich land areas will already be protected by nature conservation policies or designations, this is not true for all existing or potential carbon sinks. The policy is therefore needed because the Net Zero Carbon Study had shown that additional land-based carbon sequestration will still be necessary in the UK's net zero carbon future, even after all possible actions have been taken to reduce carbon emissions at source.

Emerging precedent: Central Lincolnshire Local Plan Review

This proposed plan underwent Regulation 19 consultation in Spring 2022[xlii].

Aware of the region's widely distributed peatland as well as other green infrastructure, the Central Lincolnshire planning team commissioned specialists[xliii] to map the area's peatland and estimate the potential amount of carbon that is stored, removed, or emitted by those areas.

It found that while the area of peatland is small, its degraded condition means that it has a noticeable impact on overall emissions (potentially amounting to more climate impact per year than the operational carbon emissions of all the proposed new housing for which the plan must make room). As a result, the emerging plan is proposing Policy S16[xliv] [note: now Policy S17] which will require assessment and mitigation or compensation of the carbon impacts of development on any carbon sinks including peat.

However, carbon sinks do not appear to have been a criterion in the sustainability appraisal for site allocations as only 2% of the land was identified peatland and thus not expected to be a common issue confronting many sites.

While not yet adopted and therefore not yet a full legal precedent, this approach could be relevant to other local plans with substantial amounts of high-carbon soils, woodland, grassland or other natural carbon sinks.

Proposed Policy S17 (carbon sinks) includes that:

> "Existing carbon sinks, such as peat soils, must be protected, and where opportunities exist they should be enhanced in order to continue to act as a carbon sink.
>
> Where development is proposed on land containing peat soils or other identified carbon sinks, including woodland, trees and scrub; open habitats and farmland; blanket bogs, raised bogs and fens; and rivers, lakes and wetland habitats*, the applicant must submit a proportionate evaluation of the impact of the proposal on either the peat soil's carbon content or any other form of identified carbon sink as relevant and in all cases an appropriate management plan must be submitted."

It goes on to state that: "The demonstration of meaningful carbon sequestration through nature based solutions … will be a material consideration in the decision-making process. Material weight in favour of a proposal will be given where the net situation is demonstrated to be a significant gain in nature based carbon sequestration … Where a proposal will cause harm to an existing nature based carbon sequestration process, weight against such a proposal will be given … with the degree of weight dependent on the scale of net loss." The text refers the reader to the carbon soil mapping, and Natural England report NERR094 to assist in identifying the significance of carbon sinks.

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Appendix G

Briefing_Note_PAG Carbon Offsetting and App A 221115

Briefing Note – LPR Policies SP5 and DM4 - Cost Viability and Carbon Offsetting Context

Produced for:	Please select: Planning Advisory Group (PAG)
Requested by:	Bryan Lyttle
Portfolio Member:	Councillor Steve Ardagh-Walter
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Date Prepared:	15.11.22
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1 Purpose of the Briefing

1.1 In the context of Policies SP5 and DM4 of the Local Plan Review (LPR), the purpose of this briefing paper is to provide context and further information relating to cost of measures to comply with increased building energy performance standards and the viability of offsetting any remaining carbon emissions, including a worked example.

2 Background

2.1 Following detailed research and analysis by Consultants from Bioregional and Edgars, in consultation with the Environment Delivery Team and Planning Policy Team, the Planning Advisory Group (PAG) endorsed the updated wording of the LPR Policies SP5 and DM4 in September 2022.

2.2 Policy DM4 includes a section on carbon offsetting which requires further explanation.

2.3 As part of the detailed research and analysis, Bioregional produced reports and evidence to support the policy approach taken. Within the 'West Berkshire Council Local Plan Review: Zero Carbon policy options – Appendix' dated 09 May 2022, Bioregional outlined a section on LPR Cost Viability and Carbon Offsetting which included a viability of offsetting any remaining carbon emissions worked example.

2.4 Full details of the LPR 'Cost Viability and Carbon Offsetting' sections are included within Appendix A. Additional annotations are included to show what would need to be done with these figures to make them reflect the draft policy with both regulated and unregulated carbon to be brought to zero.

3 Current Status

3.1 Policies SP5 and DM4 are due to go out for Regulation 19 consultation in January 2023. Appendix A will form part of the evidence base for these policies. A full evidence base for Policies SP5 and DM4 will accompany the Regulation 19 consultation.

4 Supporting Information (if required)

4.1 Detailed below are additional points of note from Bioregional.

- Bioregional would advise that West Berkshire's viability/cost consultant should be asked to sense-check the costs for fabric, heat pump and PV. Some concerns have been raised over the heat pump cost uplift in particular (Bioregional suspect the estimate might be a bit low). All of the costs quoted in the Bioregional report were the cost difference between a standard house built under Part L 2013, not the TOTAL cost (e.g Bioregional are not saying a heat pump system costs £1600 in total – they are saying that the report referenced estimates that a heat pump system might cost about £1,600 MORE than a gas boiler).
- The costs reports Bioregional have quoted do not make it fully clear whether the uplifts include labour or just products.
- All Bioregional quoted figures are for a three-bed semi detached home of around 92m2. We considered that a reasonable middle ground between flats, terraces and detached.
- All Bioregional quoted figures for fabric, heat pumps and renewables need to be adjusted for inflation since cost year 2019. The base costs and house price sale value should also be increased to reflect that. Therefore Bioregional would advise WBC viability/costs consultant translates these cost uplifts into a % uplift on the 2019 base build cost, then apply that as a % uplift on the current cost year if the current baseline were Part L 2013 not Part L 2021.
- The cost uplift applied should include fabric, heat pump, and EITHER renewables OR offsetting costs. The Bioregional renewables and offsetting costs are each estimated assuming that only one of them is used to get to net zero, after the developer has already built to the Future Homes Standard.
- Bioregional have made notes in appendix A about how to do the offset cost adjustment to include unregulated energy. Bioregional could support further work on how to do this calculation although this would be a further piece of work.

5 Conclusion

5.1 Further work will be undertaken during Regulation 19 consultation to finalise the operation of carbon offsetting payments.

6 Appendices

6.1 Appendix A – 'Appendix A_Costs and Offsetting pages WBC LPR DM4_221116'

Appendix A

Viability of required improvements to the building

The cost of measures to comply with increased building energy performance standards should be considered within a whole-plan viability assessment. Despite a range of aforementioned precedent plans that include carbon reduction requirements, there is not a consistent approach to transparently assessing the cost of policy compliance. Their viability studies have variously applied cost uplifts of:

- £5/m^2 for 'BCIS Energy + Carbon' although it is not explained how this reflects the policy requirements, and somehow reaching £25,000/dwelling for fully zero carbon homes.
- £15,000 per dwelling for a bundle of sustainability measures including carbon and renewable energy– without clarifying the breakdown, or how this cost of policy compliance was identified.
- 1% uplift to overall costs to allow for professional fees, and BCIS cost data reflecting the construction cost of the Code for Sustainable Homes Level 4.

These precedents were successfully adopted and so their viability assessments were deemed sound by the Planning Inspectorate for the purpose of those plans' policies. Nevertheless it will be more robust to use more transparently evidenced cost uplift data, directly linked to policy requirements, if West Berkshire chooses to put forward policies that push the boundaries of precedents.

To support viability assessment of requirements for energy efficiency and renewable energy, there is a variety of credible costs data available. Two key sources are identified:

- National Government Future Homes Standard Consultation Impact Assessment[lxxv]
- Other local plan evidence bases for similar requirements (as cited under 'feasibility'.)

The following table compares estimated cost uplifts in a three-bedroom home for various steps that an effective net zero carbon buildings policy might require (compared to a building regulations Part L compliant baseline), based on the national and local government cost sources.

Please note: All of these costs are from cost year ~2019 and would need to be increased to reflect inflation (the house sale value should also be increased to reflect house price rises in recent years).

Policy requirement	FHS Impact Assessment 2019	Currie & Brown 2021 for Cornwall DPD Evidence Base
Future Homes Fabric	+£2160 (£2560 minus £400 for waste-water heat recovery)	+£1977
Heat pump system (to reach Future Homes carbon emission rate that is 75% lower than Part L 2013, or 35kWh/m^2/year energy use)	Not specified as an individual element	+£1562
Solar panels to meet remaining regulated energy use (*Not part of Future Homes Standard requirements – but shown here to illustrate approximate cost to go from FHS to net zero regulated operational carbon).	£2700 - £3100 (Derived from £1,100 fixed cost + £800 per kWp; estimating that the regulated energy demands of a home with FHS fabric and heat pump could be covered by a ~2 – 2.5kWp system.)	£1328 to meet regulated energy use of 20kWh/m^2/year (Derived from cost of solar panels to meet total energy use in home with efficient fabric and heat pump, minus the share of unregulated energy, rounded up to 6 whole panels.)

Future Homes Fabric + Heat pump = Future Homes Standard (West Berks minimum construction standard for resi)

Must increase solar panel costs proportionally to reflect that West Berks draft policy seeks net zero TOTAL rather than just regulated. See suggested % increases in my comments (with link to data sources)

It is important to note that the above documents look at cost uplifts compared to a 'business as usual' baseline of a building that complies with Part L 2013. By the time the updated West Berkshire Local Plan is adopted, the new Part L uplift (2021/22) will be in force, which raises the 'business as usual' baseline energy performance and thus the cost difference for 'net zero carbon' will be smaller. The strongest justification would be to commission a similar study of the cost uplifts specific to West Berkshire for a range of building typologies expected to come forward during the local plan period. These cost uplifts could be locally-specific, more reflective of the current market, and could be compared to the baseline cost of complying with the new Part L 2021/22 rather than the 2013 Part L.

Finally, there is some evidence[lxxvi] showing that homes with better energy and carbon performance may command higher sale prices thus aiding viability, but these effects were regionally specific at the time. This effect may increase if the government incentivises carbon performance through the mortgage lending system as suggested in its recent Net Zero Strategy[lxxvii] and Heat and Buildings Strategy[lxxviii].

Viability of offsetting any remaining carbon emissions

The cost of offsetting can be easily assessed, as it is up to the local authority to decide on the cost per tonne of carbon, and the period of time for which the emissions must be offset.

Most precedents choose a period of 30 years and assume that the annual emissions do not change over that time, and nor does the price per tonne of carbon. Their total offset cost would be as follows:

(Annual carbon emissions) x (**£cost per tonne**) x (**30 years**) = £total offset payment.

Regulated carbon emissions can be estimated using the live public record of new dwelling energy performance certificates[lxxix]. This includes average annual regulated CO_2 emissions per dwelling, as calculated by Part L SAP. This can be filtered by local authority area and date. An average of all properties in the last two years gives a reliable typical new build performance under 'business as usual'. In West Berkshire as of May 2022, this average is 1.7 tonnes.

This average typical new build regulated carbon emission in West Berkshire must then be reduced to reflect any proposed policy requirements for on-site improvements – for example, a 75% improvement if the policy will bring forward the Future Homes Standard. Therefore:

(Annual 1.7 tonnes – 75% = 0.43 tonnes) x **30 years** = 12.79 tonnes to offset.

Next the cost of carbon must be decided. The precedents have sometimes conducted a local study to understand the cost to achieve carbon removals or reductions, but most use a £60-90/tonne figure that reflected a previous year's nationally recognised central value per tonne of non-traded carbon. That nationally recognised cost is now[lxxx] £248/tonne and rises by 2% year-on-year to reach £378 in 2050. West Berkshire could either use current value for the whole local plan period as follows:

(12.79 tonnes to offset) x £248 = £3170.90 total offset payment.

Alternatively, West Berkshire could apply an increase to reflect that the value of the home's carbon emissions will go up over time to reflect the changing nationally recognised value:

(0.43 tonnes x 2022 price) + (0.43 tonnes x 2023 price) + (0.43 tonnes x 2024 price) … etc **for all years over a 30-year period**. This would raise the total offset payment to £3,986.

However: If we are going to apply future years' carbon values, it seems reasonable to also recognise that the carbon emissions will also change in future years due to changes in grid electricity generation. Publicly available data for this is also found in the same data set as the national carbon values. Assuming the home is gas-free and all-electric, we can apply the future grid carbon reduction percentages to the home's total regulated carbon. This would work out as follows:

(0.43 tonnes x 2022 price) + (0.41 tonnes x 2023 price) + (0.45 tonnes x 2024 price) … etc **for all years over a 30-year period**. The resulting total is £1,062.

This final total of £1062 is suitable for viability testing alongside the cost of making any required on-site carbon reductions. In practice, only gas-free homes should be allowed to use this final step of the calculation. If the home has gas, the calculation should finish after applying the future £/tonne prices.

If the policy also requires unregulated carbon emissions to be offset too, this amount would be added to the annual amount *after* the 75% reduction is applied, but before multiplying by the years, the grid carbon reductions, and the price. An estimation of the typical amount of unregulated carbon may need analysis by an energy specialist using BREDEM calculations, but there may be some industry averages available elsewhere.

All the figures here are for REGULATED carbon only.

To get the TOTAL carbon figure (regulated+unregulated) we would need to do the following.

a. Existing new build regulated carbon emissions minus 75% to reflect Future Homes Standard PLUS:
b. Existing regulated carbon figure * 30-100% (as unregulated carbon typically is an amount equivalent to 30-100% of regulated - see previous page notes and comments)

- Sum the above figures a .and b. to get the first year's total emissions.
- Apply grid carbon reduction trajectory and carbon price increase trajectory to each of the remaining 29 years.
- Sum all of the total 30 years to get the total offset cost.

Please note: These offset costs are also based on the assumption that the developer has ONLY built to the future homes standard and has NOT ADDED ANY SOLAR PANELS THEREAFTER.

Be careful not to over-inflate the cost by double-counting renewables as well as offsetting. To get the total cost uplift for the draft West Berkshire policy (as of 10/11/22), you would need to sum all of the following:

1. Future Homes Fabric uplift cost - as per previous page
2. Heat pump uplift cost - as per previous page
3. Plus EITHER of the following:
    - EITHER PV cost (as per previous page plus a 30-100% allowance for unregulated energy)
    - OR offsetting cost (based on the calculation above).

Appendix H

Changes to Building Regulations Part L Target [carbon] Emissions Rate (current and incoming), plus carbon emissions

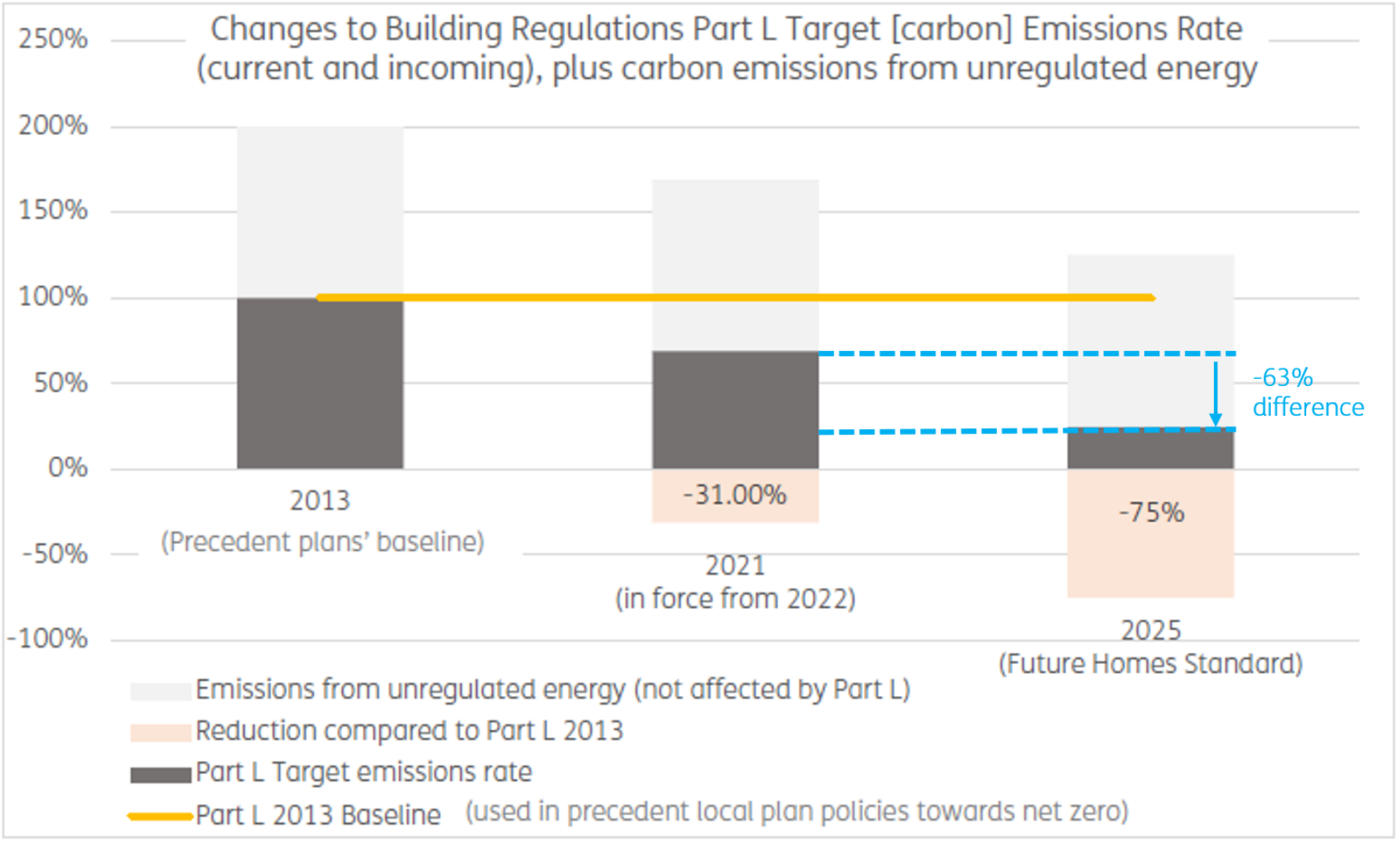

Figure 3: Illustration of the difference in Target Emissions Rate of building regulations in 2022 and 2025, compared to 2013. Half of the home's carbon emissions are from unregulated energy, thus remains unchanged.