Three Rivers District Council:

Carbon policy support

Evidence base and policy recommendations

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Bioregional

Rev 2
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Glossary of terms and acronyms

BRE	Buildings Research Establishment. The UK's building science research institution which develops and/or tests various building products, techniques, standards, and qualifications and data. Originally a UK civil service body, but now independent.
BREDEM	Buildings Research Establishment Domestic Energy Model. A methodology for estimate calculations of the energy use and fuel requirements of a home based on its characteristics. BREDEM is the basis for SAP (see elsewhere in this glossary) but BREDEM retains more flexibility by allowing the user to tailor some assumptions made in the calculations to better reflect the project.
B&NES	Bath & North East Somerset [local plan]. Cited as a recent successful precedent example of innovative and highly effective net zero carbon planning policy.
Carbon, or carbon emissions	Short for 'carbon dioxide emissions' but can also include several other gases with a climate-changing effect, that are emitted to the atmosphere from human activities (see 'GHG', below).
Carbon budget	Amount of greenhouse gas that can be emitted by an individual, organisation or geographic area. Usually set to reflect a 'fair share' of the global amount that can be emitted before reaching a level of atmospheric carbon that causes severely harmful climate change.
Carbon intensity/ carbon factors	A measure of how much carbon was emitted to produce and distribute each kWh of grid energy at a certain point in time. For electricity, this has been falling as coal-fired power stations have been phased out over years. It also varies on an hourly basis: at times of high renewable energy generation, the carbon intensity is lower than at points where gas-fired electricity dominates the generation mix.
TRDC	Three Rivers District Council
CIBSE	Chartered Institution of Building Services Engineers.
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. Expressed in kilowatt-hours per square metre of floor space per year.
GHG	Greenhouse gas (CO_2 and several other gases: methane, nitrogen dioxide, and fluorinated refrigerant gases). Often collectively referred to as 'carbon'; see above.
GLA	Greater London Authority. Cited as a well-established example of a planning authority that has developed one type of net zero carbon buildings policy and produced implementation guidance for this.
IAS	International aviation and shipping. One of the sectors into which carbon emissions are often categorised.
kW	Kilowatt. A unit of energy generation capacity.
kWh	A unit of energy, which can be either generation or usage.
kWp	Kilowatt-peak. A measure of energy generation capacity typically used to describe the size of a solar PV array in terms of the maximum amount of energy it can generate under optimum conditions.
LETI	Low Energy Transformation Initiative. A coalition of built environment professionals working to establish and achieve the energy performance needed for net zero.
MVHR	Mechanical Ventilation with Heat Recovery
MW	Megawatt. A unit of energy generation capacity.
NPPF	National Planning Policy Framework. A central government document laying out how the planning system should function, including plan-making and decisions.
Part L	Building regulations section that sets basic legal requirements regarding buildings' energy and CO_2.
Performance gap	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 predict a building's energy use. It is used to design buildings that seek Passivhaus certification but can be used without pursuing certification.

Regulated energy or carbon	Carbon emissions associated with energy uses that are 'regulated' by Building Regulations Part L. This covers permanent energy uses in the building, (space heating, space cooling hot water, fixed lighting, ventilation, fans, and pumps).
RIBA	Royal Institute of British Architects.
RICS	Royal Institute of Chartered Surveyors.
SAP	Standard Assessment Procedure – the national calculation method for residential buildings' energy and carbon, used to satisfy building regulations Part L. SAP is based on BREDEM model, but with fixed assumptions and thus less flexibility.
SBEM	Simplified Buildings Energy Model – the national calculation method for non-residential buildings' energy and carbon, used to satisfy building regulations Part L.
SEA	Strategic Environmental Assessment.
Sequestration	Removal and storage of carbon dioxide (or other GHGs) so that it cannot perform its harmful climate-changing role in the atmosphere. Currently only achieved by trees/plants and soil. May be achieved by technologies in future.
Space heat demand	Amount of energy needed to heat a building to a comfortable temperature. Expressed in in kilowatt-hours per square metre of floor space per year.
TER	Target Emission Rate – a limit set by Part L of building regulations on CO_2 emissions per square metre of floor, from regulated energy use in the building.
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 inefficiencies during power generation and distribution.
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	A method to accurately calculate buildings' energy use. Devised by CIBSE (as above).
UKGBC	UK Green Building Council.
Unregulated energy or carbon	Carbon associated with energy use in a building or development but which is not covered by Building Regulations Part L. Includes plug-in appliances, lifts, escalators, external lighting, and any other use not covered by Part L.
U-value	A measure of how much heat is transmitted through a building element, such as the walls, floor, roof, windows or doors. Lower U-values mean a greater retention of heat within the building.
WMS	Written Ministerial Statement. A formal statement made by a Government minister that can form a relevant statement of national policy that needs to be a material consideration in the creation and examination of local plan policies. In this report, where appended by a year (e.g. 'WMS15', 'WMS2015', 'WMS2023') this denotes a specific written ministerial statement made in that year that has been referred to and explained in a prior paragraph of this report.

Introduction

Bioregional and Edgars are appointed to provide Three Rivers District Council (TRDC) with an assessment of options available within the local planning system to address climate change in TRDC to inform Local Plan policy.

Local planning authorities (LPA) have a legal duty to mitigate climate change (deliver carbon reductions) through the planning process, and government planning policy confirms that these reductions should be in line with the Climate Change Act. The Climate Change Act includes both the 2050 goal for a net zero carbon UK, and sharply declining five-yearly carbon budgets between today and 2050.

Our appointment to support Three Rivers District Council in this effort has comprised the following workstreams:

- **Output 1: Literature review of powers, precedents, existing local carbon and climate strategies – completed**
- **Output 2: Policy Risk Matrix outlining potential policy options and their associated risks, for example to climate change, planning powers, national technical standards and cost – completed**

A meeting was held with TRDC officers on the 25th July 2024 to review the policy options and was presented to members on 14th August 2024. Following these meetings, TRDC officers outlined the policy option they wanted progress. This report represents the recommended policy wording and the evidence base to support the recommended policy to support the formation of policy in TRDC's Local Plan

- **Final report bringing together the above, including policy approach recommendation based on Outputs 1 and 2, with draft recommended wording – this report.**

Further engagement with TRDC officers took place in March 2025, where comments on the recommended policies was made and matters around future implementation of the policies was discussed. This report is a result of these discussions and includes updates to the policies and supporting text according to this feedback. In addition, this report captures updates to national planning policy and any pertinent events occurring between October 2024 when first issued and April 2025. For the avoidance of doubt, Output 1 and Output 2 have not been updated retrospectively.

Executive Summary of Literature Review

Why must the local plan act on climate change?

Legal duty to mitigate climate change through the plan

The local plan is legally obligated to design its policies "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" (Planning & Compulsory Purchase Act, Section 19[ii]). This duty is further underscored by similar wording in the more recent Levelling Up & Regeneration Act 2023[iii] in which the obligation is to design the plan, not just the individual policies, to achieve that goal.

The National Planning Policy Framework (NPPF) defines climate change mitigation as:

> "Action to reduce the impact of human activity on the climate system, primarily through reducing greenhouse gas emissions".

Therefore, the local plan's duty is not simply to minimise the amount of new emissions that new development adds to the district, but rather to ensure that its local plan reduces the overall amount of carbon emissions of the district. This means that the more carbon new development is permitted to emit, the greater the reductions that will be needed in existing buildings, business, industry, transport, energy production, and land use within the council in order to fulfil that duty to deliver an overall mitigation.

Given that the local plan can only ensure change via the granting or refusal of planning permissions (and raising of funds as a condition of permission), it cannot force changes to existing buildings, transport, industrial/business operations, or land use. Its only certain route to climate mitigation, therefore, is in ensuring that proposed developments are designed and located to actively reduce the amount of emissions associated with the District.

Standalone renewable energy can actively mitigate the District's carbon emissions, as can provision for public transport, walking and cycling. New buildings, however, will only help to actively mitigate the District's carbon emissions if the new building exports more renewable energy than they consume in grid energy, or if it replaces an existing building that had greater carbon emissions. This is therefore a strong argument that new buildings are only logically compatible with the duty to mitigate climate change if they are, at least, net zero carbon in their own right or are delivered in step with sufficient renewable energy to match or exceed that building's energy demands.

What degree of mitigation is justifiable?

The NPPF provides detail illustrating the extent to which this mitigation should go. In particular:

- "The planning system should support the transition to net zero by 2050 and take full account of all climate impacts including overheating, water scarcity, storm and flood risks and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure" (Paragraph 161).
- "Plans should take a proactive approach to [mitigation] … In line with the objectives and provisions of the Climate Change Act 2008" (Paragraph 162 and footnote 61).
- "The need to mitigate and adapt to climate change should be considered when preparing and assessing planning applications, taking into account the full range of potential climate change impacts" (Paragraph 163).

Logically, therefore, a local plan should aim to proactively ensure the changes necessary to hit the carbon targets set by the Climate Change Act 2008. That Act sets the legally binding net zero target for 2050, and requires fixed carbon budgets for each 5-year period between 2008 and 2050. The Climate Change Act 2008 commits the UK to limit climate change to no more than 2°C above pre-industrial global average temperatures, and to pursue a lower limit of 1.5°C.

The Committee on Climate Change (CCC) identifies a wide range of more fine-grained actions and performance changes that will be needed in order to reach net zero. We here summarise a few of the most relevant to the sphere of influence of the local plan (note that all of these are taken from the Sixth Carbon Budget[iv] unless signified by a different endnote reference):

- New homes built from 2025 onwards to achieve[v]:
  - No more than 15-20kWh space heat demand
    - *[Note: Recent energy modelling[vi] shows that this would equate to a 69 to 82% reduction on the space heat demand of a building that meets today's Part L 2021, or a 59 to 78% reduction on that of a home that meets the Future Homes Standard, assuming the fabric standard expressed in the indicative FHS specification released by government in 2021 as opposed to the much weaker fabric standard proposed in the two options from the most recent FHS consultation[vii]]*
  - Not be connected to the gas grid
  - Have low-carbon heating such as a heat pump, not gas
  - Ideally be net zero carbon in operation[viii]
  - Reduced whole-life carbon impact including embodied and sequestered carbon.
- Increased material efficiency, energy efficiency and material substitution, to achieve low carbon manufacturing and construction – reducing new buildings' embodied carbon. The manufacturing & construction sector as a whole will need to hit an interim milestone of 70% emissions reduction by 2035 from a 2018 baseline. [ix]
- Dramatically increase the rollout of electrical heat/heat pumps to existing buildings, so that low carbon heating systems reach 100% of heat system sales from 2033.
- Transport[x]: Decreasing car travel (6% reduction in car kilometres by 2030 and 17% by 2050) alongside increased acceleration of electric vehicle uptake, further rollout of rail electrification and linear increase in rail passengers and rail freight.

- Increase in renewable energy generation capacity to reach 60% of total grid electricity generation by 2030 and 80% by 2050, at the same time as meeting a doubling in the amount of electricity demand (occurring due to the aforementioned necessary switch from fossil fuel to electricity in existing buildings, transport, and many industrial processes), and phasing out unabated gas power stations by 2035.
- Forest cover to reach 18% by 2050xi, whereas the 2020 baseline was 13%

Legislation that defines powers that the local plan may use for carbon reduction

Planning & Energy Act 2008

The Planning & Energy Act is the source of the local plan's most important power to influence the energy and carbon performance of development.

It grants the local planning authority the power to set 'reasonable requirements' for:

1. Energy efficiency standards higher than those set by building regulations
2. Renewable or low carbon sources 'in the locality of the development' to supply a proportion of energy used at the development.

The Act notes that policies made using these powers "must not be inconsistent with relevant national policies for England". This means the NPPF, according to NPPF (2024) Paragraph 1[xii].

The Act defines 'energy efficiency standards' as ones that are set out or endorsed by the Secretary of State. This may imply only the methods used to demonstrate compliance with Part L of Building Regulations (SAP or SBEM despite their aforementioned shortcomings, or TM54). As TM54 is one of the methods endorsed by Part L as of 2021, it appears the Act would therefore permit local energy efficiency to account for *total* energy use, not just regulated (see glossary).

The Act does not define 'energy used at the development'. It therefore appears to empower the local plan to set requirements for renewable energy to meet a proportion of the new building's *total* energy, not just 'regulated' energy (see glossary). In that case a method would need to be chosen to account for that unregulated energy, ideally in a way that works alongside the calculation for regulated energy. Several methods could be used: TM54 (as above), BREDEM, and SAP Appendix L. PHPP could also be used but may not directly plug into SAP/SBEM.

The Act stipulates that policies set using these powers "must not be inconsistent with the relevant national policies" for energy efficiency or for renewable/low carbon energy as applicable to the type of local plan policy proposed.

The Act does not define 'renewable energy', 'low carbon', or 'in the locality of development'. Presumably therefore the local planning authority is free to define these.

The Act furthermore does not specify whether these powers can be used in *new* or *existing* development. The implication therefore is that these powers could be used to set local plan policy that applies to proposals regarding existing buildings, not only new development. However, this would still be subject to the requirement to be 'reasonable'.

The Act does *not* define 'reasonable requirement'. A logical interpretation could be that the policies should be feasible, effective in fulfilling the climate mitigation duty (and/or other stated objectives set by the plan to fulfil local needs), and specific enough to be viability-tested to ensure they do not prevent the achievement of the Council's stated housing and development targets.

We interpret this to mean that a policy could require renewable energy to supply a 'reasonable proportion' of the *total* energy use of the development, not just the share that is 'regulated' by Part L of building regulations. This could arguably be a 100% proportion, if it can be shown why this requirement is 'reasonable' – for example in its necessity or effectiveness to meet the duty for climate mitigation, with evidence of its technical feasibility and its cost for viability testing.

National Planning Policy Framework

The NPPF (December 2024 edition) reaffirms various ways in which it is appropriate to pursue carbon reduction policies or other undefined sustainability improvements through the local plan. In addition to paragraphs 161, 162 and 163 noted above:

- Paragraph 164b: "New development should be planned for in ways that … help to reduce greenhouse gas emissions, [via] location, orientation and design… local requirements for [buildings] should reflect the Government's policy for national technical standards
- Paragraph 165a-b: "Plans should … provide a positive strategy for energy from [renewable and low carbon] sources … consider identifying suitable areas for [these] and supporting infrastructure … [and] identify opportunities for development to draw its energy supply from [these sources]".
- Paragraph 167: "to give significant weight… to energy efficiency and low carbon heating improvements to existing buildings [domestic and non-domestic]…Where proposals would affect [designated heritage assets] LPA's should apply the policies within Chapter 16 of the NPPF.

Written Ministerial Statement 23rd December 2023 (WMS2023)

On 13th December 2023, Government released a Written Ministerial Statement (WMS).

The new WMS purports to place quite stringent new limitations on the exercise of existing powers held by local planning authorities to require improvements in the energy and carbon performance of proposed new buildings in their area. The WMS does not remove the ability to set improved local standards, but it purports to limit them by stating:

1. **Energy efficiency policy must be expressed as percentage reductions on the Building Regulations Part L TER (Target Emissions Rate)**, using a "specified version of SAP".
2. Policies that exceed building regulations should be "**applied flexibly … where the applicant can demonstrate that meeting the higher standards is not technically feasible**, in relation to … local energy infrastructure … and access to … supply chains."

The WMS also emphasises that **any such policies must have a "well-reasoned and robustly costed rationale that ensures that development remains viable, and the impact on housing supply and affordability is considered** in accordance with the National Planning Policy Framework".

National Planning Policy Guidance (NPPG)

The NPPG is a resource of further guidance to help interpret various sources of government policy regarding planning, including written ministerial statements and the NPPF.

The NPPG section on climate change[xiii] still echoes the now superseded WMS2015 supposed limit on energy/carbon reduction policies (i.e. no more stringent than Code for Sustainable Homes Level 4).

However, that limit is now obsolete and should be considered irrelevant. We note that section of the NPPG has not been updated since 2019 and is thus outdated. This is further evidenced in that it refers to the "national target to reduce the UK's greenhouse gas emissions by at least 80% … by 2050" – this is now incorrect as the target is now a 100% reduction, as established by the 2019 update to the Climate Change Act.

In contrast to its obsolete advice on housing energy standards, the NPPG section on climate change confirms that local plans "are not restricted or limited in setting energy performance standards above the building regulations for *non-housing* developments" (emphasis added).

It also emphasises that where local plan standards for buildings' sustainability or carbon are set, they must be "based on robust and credible evidence and pay careful attention to viability."

Regarding energy improvements to *existing* buildings, the NPPG does not clarify how local policy should approach these, but notes that the planning authority "should ensure any advice to developers is co-ordinated to ensure consistency between energy, design and heritage matters", and notes that many energy improvements may not need planning permission.

Balance of power between legislation, NPPF and Ministerial Statements

Legislation, and the powers granted or duties imposed by it, cannot legally be undone by national policy.

The NPPF forms the overarching set of principles by which the Inspector will conduct the Examination in Public of the submitted local plan, to see if the plan can be considered 'sound', before it can be adopted.

The role of the WMS2023 in Local Plan formation is as a 'material consideration', i.e. one of the relevant considerations that the plan must take to account in order to be found sound and adopted, despite the fact that a WMS can be (and was in this case) made unilaterally without consultation.

However, a WMS is not an inviolable requirement. Open legal advice on this topic notes that it has been established in case law that a WMS "cannot lawfully countermand or frustrate the effective operation of any … relevant statutory power" (such as the duty to mitigate climate change and the power to require higher local standards) and that "any WMS must lawfully be applied subject to relevant statutory powers, and … justifiable local exceptions, rather than in a blanket fashion".

To what extent is the necessary mitigation being delivered by national regulation or the wider industry, thus negating the need for local plan policies?

Operational energy and carbon: Building Regulations Part L (and the Future Homes Standard)

Building Regulations Part L sets the minimum national standard of operational energy and carbon performance of new buildings. It only covers "regulated energy uses": space heating, hot water, fixed lighting, fans, pumps and ventilation. It does not regulate other energy uses in the building, for example appliances or plug-in lighting. These *unregulated* energy uses can be 50% of a building's total energy use[xiv], or between 23%-54% of a building's operational carbon[xv].

The current version of Part L in place is Part L 2021, which came into force in June 2022. Prior to this, Part L 2013 was in place from 2013-2022. The next update due to Part L is the Future Homes Standard (FHS) (or Future Buildings Standard, FBS, for non-residential) which Government has indicated will be introduced in 2025.

Part L works by modelling an imaginary ('notional') building of the same shape and size as the proposed building, with a certain minimum set of building elements applied (such as the amount of insulation, airtightness, the type of heating system, and the amount of solar panels). This sets the target limits for energy use and carbon emissions that the proposed building must meet. This means the targets vary by the shape and size of the building, as shape and size strongly affect how much heat is lost through external walls, roofs and joins. The FHS will update the standards in that 'notional' building – for example a heat pump instead of gas. However, the latest consultation[xvi] shows it might not improve the insulation or airtightness.

Compliance with these targets is established through a calculation method titled 'SAP', in homes, or 'SBEM' in non-residential buildings (see glossary). Part L sets the following targets:

- TER, Target Emission Rate: A carbon emissions metric. All building types (residential and non-residential) are subject to a TER.
- TPER, Target Primary Energy Rate: A measure of energy consumption of the building, taking into account the 'raw' energy that was used up in order to generate and transmit the energy used by the building (including the losses in converting one type of energy to another – for example burning gas in power stations to produce electricity – and the losses that occur in transmission of gas or electricity through the grid before it reaches the home). TPER also applies to all building types.
- TFEE, Target Fabric Energy Efficiency: A measure of energy demand for *heating and cooling*, based only on the building's fabric, irrespective of the heating system efficiency.

Additionally, the SAP or SBEM calculation methods can be used to extract other pieces of estimated data for a building, such as space heat demand or total energy use (for example, both of those were estimated using SAP10.2 in the 2023 modelling by the Future Homes Hub). However, these other data points are not part of the compliance metrics that Part L requires.

Unfortunately, even for the regulated energy uses, SAP and SBEM are not accurate predictors of a building's actual performance. In operation, buildings have been repeatedly documented to use far more energy than the SAP or SBEM methods predicted[xvii,xviii,xix]. This difference between SAP/SBEM-predicted energy performance and *actual* performance in use is termed in industry the 'Energy Performance Gap'. This is not common knowledge for home renters or purchasers, who may rely on the EPC certificate (which reflects the building's SAP calculation). In particular, space heat demand is dramatically underestimated by SAP[xx,xxi]. This is a real problem for climate mitigation given the aforementioned importance of the 15-20kWh/m^2/year space heat demand within the UK's route to hit its legislated carbon budgets.

Although SAP also contains an 'Appendix L' that tries to calculate unregulated energy use too, this overestimates the unregulated energy use[xxii] because it is based on outdated data about the efficiency of appliances. That data was collected many years ago and does not reflect the much more efficient typical appliances of today. Still, the *over*estimation of unregulated energy use does not fully balance out SAP's *under*estimation of space heat demand and total energy use.

Government has stated that when the Future Homes Standard is introduced, SAP will be replaced with a new model named HEM. As only an early-stage consultation version of HEM has been released to date, it remains to be seen whether HEM will avoid the inaccuracies of SAP.

The current Part L 2021 and FHS do not deliver the 15-20kWh/m^2/year space heat demand limit found to be necessary by the Committee on Climate Change as previously noted. To achieve that limit, improved fabric would be needed. This is true whether calculated with SAP (for example see the Future Homes Hub Ready for Zero report and appendix[xxiii]) or a more accurate energy prediction method[xxiv,xxv]. The 'Ready for Zero' work shows that a building fabric similar to that of the recent FHS consultation would result in a space heat demand of up to 54kWh depending on home type, even before taking into account SAP's underestimation of this.

Despite the Committee on Climate Change recommendation for "rapid and forceful pursuit of zero-carbon new-build"[xxvi], the current Part L 2021 and the FHS do not make buildings net zero carbon. Government has described the FHS as "zero carbon ready", but this only means the building will be all-electric (no gas) and thus will eventually get to net zero only when the national electricity grid is entirely zero carbon. Also, the latest FHS consultation[xxvii] shows that one of the options under consideration would have heating bills twice as high as a current new build home, due to switching from gas to electric heating without improving fabric at all.

Beyond Part L compliance, there are other more accurate methods that are used in the more forward-thinking parts of the buildings industry to better predict the energy performance of a given building design (and to improve it):

- PHPP: Passivhaus Planning Package. Can be used for any building. Does not require the pursuit of Passivhaus certification; can be used as a standalone tool.
- CIBSE TM54 (Technical Memorandum 54 by the Chartered Institute of Building Services Engineers). Intended for use primarily with non-residential buildings.

The use of PHPP outside the cutting-edge of the sector is in the minority, but growing. However, TM54 is recognised in Part L 2021 as a suitable method for the 'energy forecasting' that is now legally mandatory for non-residential buildings of 1,000m^2 or greater size[xxviii]. This means TM54 can be said to comply with the Planning & Energy Act definition of 'energy efficiency standards' as ones that are 'endorsed or laid out by the Secretary of State' (paraphrased). However, Part L 2021's requirement for energy forecasting is not linked to the achievement of the actual *targets* set by Part L (TER, TPER, and TFEE, as previously noted).

Regarding embodied or whole-life carbon of buildings: National Government has continued to neglect this despite opportunities to implement it. For example, a forward-thinking industry coalition in the development sector drafted and proposed a "Part Z" to building regulations. This was then put forward by a House of Lords member as an amendment to the Levelling Up & Regeneration Act but was never debated and thus never implemented.

In the absence of any action by national government to introduce mandatory standards for whole-life carbon, the industry has acted to develop these. There is a single formal established standard for the accounting of whole-life carbon (BS/EN15978) and this has been translated into a methodology or 'Whole Life Carbon Assessment' by RICS. In turn, forward-thinking bodies and coalitions within the industry have developed benchmarks and targets using that RICS methodology, differentiated by building type. The prominent examples are the RIBA and LETI aligned carbon targets[xxix]. Given that target-setting policy is necessary on embodied carbon in order to fulfil the UK's carbon budgets, and given the absence of any national government standard with which local policy needs to be consistent, there is a clear role for the local plan to play and no reason why the LETI/RIBA targets could not be adopted if feasible and viable.

Two main types of approach to net zero carbon buildings policy – and their variations, strengths and weaknesses

There are two broad categories of policy that extant and emerging local plans in other local authorities fit into with regards to requiring enhanced energy and carbon performance in new buildings:

- Policy type 1, Using building regulations metrics: Policies that require a % improvement on the Target Emissions Rate that is set by Part L of building regulations (in some cases is a 100% reduction) and/or improvements to be demonstrated in other Part L metrics.
    - Adopted examples: London Plan 2021 policy SI 2; Milton Keynes 2019 policy SC1; Reading 2019 Policy H5, Warwick Net Zero Carbon DPD 2024; many others.
- Policy type 2, 'True net zero operational carbon' using energy-based metrics: Policies set fixed energy efficiency targets in terms of 'space heat demand' and 'total energy use intensity' (EUI), and renewable energy provision to match 100% of the development's total annual energy use. This follows the recommendations of expert green building coalitions LETI and UKGBC.
    - Adopted examples: Cornwall, Bath & North East Somerset; Central Lincolnshire.

In addition to the operational carbon policy types described above, there is one adopted and several emerging local plans that require reporting and/or specific targets in embodied carbon. That is the carbon emitted in order to construct the building (including material extraction, product manufacturing, transport of materials to site, use of energy during construction). In some cases, the 'embodied carbon' can also include the maintenance and eventual demolition/disposal of the building at end of life – in which case the scope is termed 'whole life embodied carbon'. If the 'embodied carbon' scope is only considered up to building completion, that is termed 'up-front embodied carbon'.

There is no current national building regulation that regulates embodied carbon, nor any nationally described standard for reporting it. However, the industry has developed its own standards for reporting on embodied carbon (the RICS Whole Life Carbon Assessment methodology). The London Plan is the most well-known adopted example that requires whole-life carbon reporting, yet it does not set any targets that must be met. The only precedent plan that we are aware of that sets such a target is Bath & North East Somerset (B&NES) Local Plan Partial Update (adopted 2023).

Existing Buildings

It is not yet known when the Government will phase out the installation of gas boilers in existing buildings, which is currently muted for 2035. The Committee on Climate Change has shown (and Government has recognised) 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.

In respect of existing buildings, 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. 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, Local Plan policies can be used to support retrofitting by providing positive weight to proposals that improve fabric efficiency, energy efficiency and lower carbon emissions in existing buildings, including seeking alternatives to fossil fuel heating.

Local Plan's in combination with embodied carbon themes can also place greater weight to the retention, reuse and refurbishment of existing buildings in recognition of the embodied carbon they have inbuilt in the structures, and the cause of new emissions in replacing existing buildings.

April 2025 Update: Tendring Colchester Border Garden Community: Development Plan Document

GC Policy 8 Sustainable infrastructure

Further to those adopted policies cites above (Bath & Northeast Somerset etc), Tendring's approach follows absolute energy metrics (policy type 2) and is performance-based and measurable, with numeric targets embedded in policy.

The policy is holistic in scope, emphasising fabric-first design, renewable technologies like solar PV and heat pumps, and long-term smart energy systems such as district heating or local smart grids. If it can be robustly demonstrated that full on-site renewables are technically or economically unfeasible, the policy allows for partial delivery or contribution to an offset fund—but this is framed as a fallback, not the norm. It also encourages high sustainability certification standards: BREEAM 'Excellent' or 'Outstanding' for non-residential buildings, and Passivhaus or equivalent for housing.

Crucially, the DPD also incorporates a requirement to assess embodied carbon using the RICS Whole Life Carbon Assessment methodology, demonstrating that the Councils have taken a lifecycle approach to emissions.

The DPD sets the following clear requirements for all buildings within the Tendring Garden Community:

1. All buildings must achieve net zero carbon performance at **occupation** or within **five years** of occupation, in exceptional circumstances. The operational energy balance must be achieved on-site across the development.
2. **Energy Performance Standards**:
    - **Space Heating Demand (SHD)**: Less than 30 kWh/m² per annum.
    - **Energy Use Intensity (EUI)**: Less than 40 kWh/m² per annum.
    - **On-site Renewable Generation**: Must match or exceed total energy consumption. If on-site renewable generation is not technically or economically feasible, the policy allows for a **contribution to an offset fund**, but this is considered a secondary option.
3. A fabric-first approach to reducing energy demand, including high insulation levels, airtightness, and optimising solar gain while avoiding overheating and integration of smart energy technologies to control energy use across the development.
4. **Renewable Energy Integration**:
    - All buildings must integrate renewable energy systems such as **solar photovoltaic (PV)** and **heat pumps** (air or ground source) where feasible.
    - Encouragement of **district heating networks** and **smart local energy systems** to ensure long-term viability and management.
5. Proposals must consider **embodied carbon** in the design and construction phases, using the **RICS Whole Life Carbon Assessment** methodology, although no specific targets are set for embodied carbon reductions.
6. The policy encourages the use of high-level sustainability certifications, including **BREEAM 'Excellent' or 'Outstanding'** for non-residential buildings and **Passivhaus** or equivalent for residential buildings.

The Tendring Garden Community DPD underwent examination, and the Inspector's Report was published in April 2025. This confirmed the policy's robustness despite the introduction of the 2023 Written Ministerial Statement (WMS). The Inspector acknowledged the WMS but determined that the planning duty to mitigate climate change under the Planning and Compulsory Purchase Act 2004 and the Planning and Energy Act 2008 provided a strong legal basis for the policy.

The following key outcomes were noted:

- The **policy targets were deemed justifiable** based on the Councils' evidence that they would not compromise the viability or deliverability of the development.
- The **policy's alignment with national and regional climate goals** was affirmed, and the Inspector determined that the development would contribute positively to the UK's carbon reduction targets.
- The **only modification** made to the policy was the introduction of an **extended five-year period** to achieve net zero carbon status, where demonstrably necessary in exceptional cases.

The adoption of this policy sets an important precedent for other local authorities looking to integrate **net zero carbon** requirements into their development plans. It demonstrates that it is feasible to set **specific energy performance targets** and ensure **on-site renewable energy generation** while addressing potential challenges related to technical or economic viability.

TRDC's current carbon emissions and trajectory

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 that produces municipal-level carbon budgets towards a 2˚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 show the UK's total CO2 budget to 2100 if the UK is to pull its weight towards fulfilling the Paris Agreement (to limit global warming to 2˚C, with carbon cuts equitably distributed to each country in proportion to its technological and financial capability, its needs, and its responsibility for historic emissions). This starts with the middle-range global carbon budget likely to limit global climate change to "well below" 2˚C, determined by the IPCC. The Tyndall Centre derives the CO2 budget for the UK 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. The Paris-compliant carbon budgets for TRDC are shown here (Figure 2) and would be used up by the end of 2026 if emissions continue at the 2017 level.

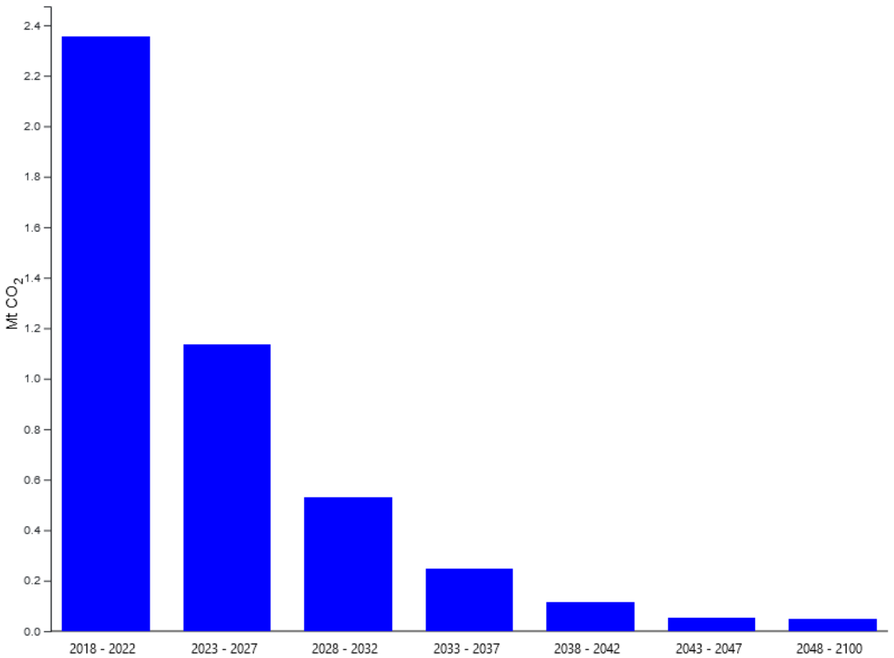

Figure 2: Three Rivers District Council's carbon budgets to 2100 (energy-only, CO2 only) compliant with the UK's commitment to the Paris Agreement. Calculated by the Tyndall Centre.[viii]

The Tyndall Centre's recommended pathways to net zero within TRDC's carbon budgets are represented in *Figure 3, respectively*. To avoid exceeding the Tyndall carbon budget, TRDC emissions would need to fall sharply starting from the 2018 baseline. This pathway amounts to a required annual 14.1% reduction to energy-related CO_2.

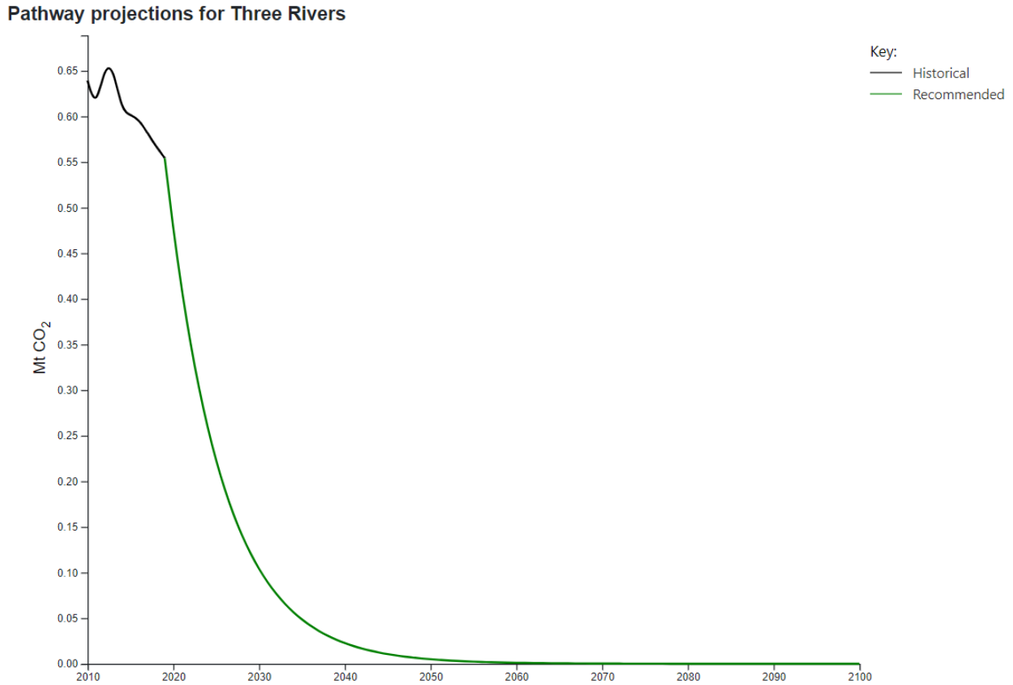

Figure 1: Emissions reduction pathway for energy-only CO2 emissions to fulfil carbon budgets for Three Rivers District Council from 2018 to 2100 compatible with the Paris Agreement. Tyndall Centre (2023).

The challenge of bringing forward net zero carbon new buildings, scaling up retrofit of existing buildings, and decarbonising transport and the wider energy system, will not be possible without the support of the local plan. By shaping what kind of development happens and where, the local plan can help to realise TRDC's ambitions.

A local plan that achieves dramatic carbon reductions will help to avoid contributing to the risk of TRDC's residents being impacted by financial and health-related harms that would come with climate change.

Three Rivers District Council's Climate Emergency

In recognition of the urgency to tackle climate change, Three Rivers District Council declared a Climate Emergency in 2019. TRDC have committed to:

- be a carbon-neutral Council by 2030
- be a carbon-neutral District by 2045

The Climate Emergency and Sustainability Strategy 2023-2027 outlines interventions relating to sources of emissions, in respect of housing and buildings, the strategy identifies:

- Encourage developers to adopt net zero design standards including the integration of renewable energy and low-carbon heat technologies.
- Require all major developments to submit an adaptation strategy and sustainability statement to demonstrate how the development will mitigate and adapt to climate change over its lifetime.
- For major non-residential developments, proposals should achieve BREEAM 'Excellent' as a minimum with the ambition to achieve "Outstanding."
- Require new development to install flood mitigation measures and facilitate optimum water and wastewater efficiency aiming for water neutrality.
- Refuse development if it is subject to unacceptable flood risk or if it would exacerbate flood risk on site or elsewhere.
- Develop and implement a decarbonisation action plan to reduce emissions from residential properties.
- Encourage a community-led approach to retrofit and sustainability.
- Support residents and businesses to reduce their energy use and improve the efficiency of their homes and buildings.
- Work in partnership to support the development of the local retrofit supply chain to increase skills and capacity for retrofit in the district and wider county.

Consequential to the Council's strategy commitments, TRDC are undertaking the following actions under the Climate Emergency and Sustainability Action Plan 2024 -2027 to achieve this:

- With an initial overall target of reducing emissions by an annual rate of 14% until 2027, actions are in progress to encourage installation, or retrofit, of renewable energy on buildings within the District. Through the uptake of the Solar Together bulk-buying scheme, TRDC are encouraging installation of solar photovoltaics on residential dwellings. By distributing grants from the UK Shared Prosperity Fund (UKSPF) for renewable energy technologies, energy efficiency improvements, and electric vehicles, TRDC aims to reduce emissions from commercial buildings.
- TRDC is supporting the 'able to pay' sector, through projects such as 'One Stop Shop', and is further investigating innovative sources of funding and financing to support the uptake of domestic retrofit.
- TRDC will continue to manage and deliver grant-funded domestic retrofit schemes, taking relevant grant-funded retrofit opportunities as they arise, and regularly promote funding opportunities for retrofit to residents and businesses through the Climate Change Team Communication Plan and Transitions Street programme.
- Outcomes from the District Council's ongoing annual reporting on the enforcement of the Minimum Energy Efficiency Standards (MEES) regulations will shape targeted interventions throughout the District.
- TRDC is actively engaging with local trades and small-medium enterprises (SMEs) about the market opportunity for retrofit in Three Rivers, and upskilling these to engage with retrofit-related roles.
- TDRC is also in the process of installing community-funded renewable energy technology on a building within the Three Rivers District.
- Dictated by OFGEM guidelines, TRDC endeavours to engage with regional energy strategic planning on the development and implementation of an LAEP (Local Area Energy Plan).

Work undertaken by the Energy Savings Trust in 2021 acknowledged the opportunity for retrofitting TRDC's existing housing stock, based on the typology of buildings within the district.

At a regional level, strategies within TRDC are supported by regional ambitions to lower carbon and to become a net zero county, including Hertfordshire County Council (HCC's) 2022 (Revised 2023) Sustainable Hertfordshire Strategy, Hertfordshire Growth Board (HGB's) Vision and Missions and Hertfordshire Climate Change and Sustainability Partnership (HCCSP's) 2023 Strategic Action Plan: Net Zero Across Hertfordshire (draft review).

Summary of policy objectives

To summarise the key ingredients for a policy that would ensure it thoroughly fulfils the local plan's legal duty to mitigate climate change:

- **New development's energy demand must be minimised** so as to minimise the needed amount of new renewable energy generation and grid reinforcement, given that all other sectors' net zero transition (e.g. transport and industry) will also place high demands on the UK's finite capacity for renewable energy, and other land uses (e.g. afforestation and farming) – considering the limited land supply and the embodied carbon of new energy equipment. This energy efficiency is also vital to protect people from excessive energy bills in the ongoing cost of living crisis.
- **New development should not use fossil fuel on site** given that the UK needs to transition its building stock away from gas, not add new gas users to the grid – and also given that heat pump technology exists that is three times as efficient as gas
- **New development should ideally come with enough new renewable energy generation to 'wash its own face'**, so that it does not worsen the existing huge challenge of weaning existing buildings, transport and industry off fossil fuel to electricity – when this condition is met, the building is 'net zero carbon in operation'. Evidence found in other existing and emerging local plan precedents elsewhere (Uttlesford/Essex, Greater Cambridge, South Oxfordshire &Vale of White Horse, Central Lincolnshire, Cornwall, Bath & North East Somerset) showed this is feasible in an array of typical types of building, so long as the building is energy efficient as above.
- **The energy/carbon metrics used in Building Regulations are unsuited to deliver the performance described above** therefore other more accurate methods are needed. As the national carbon budgets are absolute, the performance standards for new buildings should also be absolute limits, not percentage improvements on standard practice.
- **Therefore, the ideal policy for climate purposes would adopt absolute targets** for space heat demand, total energy use intensity per square metre, and 100% renewable energy on site (or payment towards off-site installation), and that all of the above should be demonstrated using an energy modelling approach known to be typically accurate in predicting the building's total energy performance. This approach has been taken in several successfully examined and adopted local plan precedents (Central Lincolnshire, Cornwall, Bath & North East Somerset) albeit these were examined and adopted prior to the Written Ministerial Statement 2023 and most recently in a post WMS2023 environment: Tendering & Colchester Border Community DPD.
- **In light of the Written Ministerial Statement of December 2023, the robustness and thoroughness of evidence on feasibility and viability will be even more vital** in order for any energy efficiency policies to successfully pass examination.

A truly comprehensive plan for buildings' climate mitigation would also include mandatory reporting and targets for embodied carbon. Embodied carbon policies are not affected by the Written Ministerial Statement 2023. However, the local planning authority will need to exercise its own judgement on what size threshold would be reasonable to require either reporting or targets, using the local authority's insight into the typical size and type of development in the area and the viability headroom to cover the cost of an embodied carbon assessment

Policy recommendations

Three Rivers District Council has been informed on a range of potential broad policy options in light of the 2023 WMS in addition to the range of other material considerations and evidence. The options that have been presented to TRDC are displayed in the diagram overleaf. Upon review of the issued outputs and further liaison between Bioregional/Edgars and TRDC, **Option 2 has been selected by TRDC as the preferred policy approach.**

The following policy recommendations are therefore a more detailed iteration of Option 2. Recommendations expand upon what was presented to TRDC as part of Output 1.

The previous exploration of three different policy approaches addresses the requirement of local plans to explore reasonable alternatives prior to selecting a preferred policy suite. The approaches were assessed by considering risk levels on the following topics:

- **Planning powers**
- **Climate impacts**
- **Cost and future disruption to occupants**
- **Impact on grid capacity/infrastructure**
- **Ability of Development Management to assess policies**
- **Sector readiness**
- **Viability/capital cost**
- **Compatibility with national approach [e.g. policy goals, legislated goals, and technical standards]**

Option 2 was selected by TRDC as a result of balancing risk levels among topics, of which 'planning powers' and 'compatibility with national approach' were given significant weight in the decision-making process, particularly relating to the 2023 WMS. The significant weight given to the 2023 WMS in selecting a preferred policy approach reveals the negative impact the WMS is having on the appetite of local authorities to pursue best practice policies. The perceived constraints of the 2023 WMS have led TRDC to select a reasonable policy approach – Option 2. Industry consensus is that policies as per Option 3 should still be pursued and are defensible at examination. However, the current planning risks associated with Option 3, as determined by TRDC, deemed Option 3 unsuitable.

Potential Policy Approach Considered by TRDC

Least effective for climate → Most effective for climate

1. WMS compliant	2. Test the boundaries of the WMS	3. Industry best practice (beyond WMS)
63% TER improvement from energy efficiency measures	63% TER improvement from 'energy efficiency features' (And *guideline-only* targets and reporting for energy use intensity & space heat demand)	Energy Use Intensity and space heating demand limits
Use of a quality assurance methodology to reduce the energy performance gap in practice		
On-site renewable energy generation to get to 100% TER reduction (equivalent to matching total ***regulated*** energy use)	On-site renewable energy generation to match total energy use (***regulated and unregulated***, calculated using Building Regs methods)	On-site renewable energy generation to match total energy use (***regulated and unregulated***, calculated with more accurate methods)
Offset any remaining regulated carbon emissions (£/tCO_2)	Offset any shortfall in on-site renewable energy generation (£/MWh)	Offset any shortfall in on-site renewable energy generation (£/MWh)
Report on embodied carbon for major development LETI embodied carbon targets set as limit for large-scale development	Report on embodied carbon for major development LETI embodied carbon targets set as limit for large-scale development	Report on embodied carbon for major development LETI embodied carbon targets set as limit for large-scale development

Relevant policy themes

Operational carbon

Operational carbon is an area of policy development where the local plan can push boundaries and ensure the provision of buildings that are fit for the future, both in terms of reduced energy consumption and holistic integration of design decisions that address climate adaptation.

As already explored in this report, recent examples have detached from the previously typical CO_2 % reduction approach that had been driven by metrics used for Building Regulations compliance. However, due to newborn constraints posed by the 2023 WMS, TRDC has decided to select a policy approach based on Building Regulations and its metrics.

The key metric utilised for operational carbon is the Target Emissions Rate (TER) used for Building Regulations, which represents the annual carbon emissions from a building. Since the 2023 WMS only applies to local energy efficiency standards, not renewable energy, the policy recommendations below focus on a TER within an energy efficiency focus. The subsequent stage to assessing energy efficiency improvements through the TER is then to require that on-site renewable energy matches total regulated energy use – this effectively achieves a 100% TER reduction. Option 2 goes one step further to require that unregulated energy use is also met by on-site renewable energy generation.

As with any well-designed building, the lower the total energy use, the less on-site renewable generation is needed to reach an on-site net zero energy balance. Generation is most easily achieved via rooftop PV. A key step to maximise energy consumption mitigation is to reduce the space heating demand – closest aligned to the Dwelling Fabric Energy Efficiency (DFEE) rate in SAP – to ensure that the building is demanding as little energy as possible to comfortably heat the building. Space heating demand is agnostic to any technology that requires powering within a building; rather the space heat demand metric is a measure of how many units of heat are required to provide sufficient comfort levels for occupants of the building. Whatever technology is used, whether this is a heat pump or gas boiler, will not change the space heating demand value as it is solely based on the fabric efficiency of the building.

Due to the 2023 WMS constraints, it is not possible to confidently set a space heating demand or a DFEE requirement in policy. However, it remains essential that developers prioritise these metrics and subsequent total energy consumption to best ensure that on-site renewable energy can feasibly match total regulated energy use. If the energy use of the building is not mitigated in the first instance, on-site renewable energy generation will likely not be sufficient to deliver a net zero building.

Embodied carbon

Operational energy policy requirements are gradually becoming more consistently set at levels necessary to align with UK carbon budgets and its eventual 2050 net zero target. However, as operational energy and carbon are reduced, the proportion of embodied carbon becomes larger than ever as a share of the building's lifetime carbon emissions. This means that reductions to embodied carbon will require increased attention going forward.

The definition of net zero is key when considering operational and embodied carbon, since a truly net zero carbon building (over its entire lifetime) would require zero embodied and operational carbon emissions. The NPPF updated in December 2024 strengthened the duty of plan making and outlined that the planning systems should take full account of all climate change impacts… and contribute to radical reductions in greenhouse gas emissions. The vast majority of nominally 'net zero' buildings today only consider operational emissions. In working towards a wholly net zero carbon building, local plan policy would need to address embodied carbon with equal weight, if not more, than operational energy/carbon policy.

A number of local authorities have now implemented embodied carbon policies that require reporting for development above a certain threshold, typically only larger development. However, where viability allows, requirements for embodied carbon targets to be hit should be promoted and integrated into local plans.

Overheating and Sustainable Design

Similarly to embodied carbon, the link between overheating and operational energy is becoming ever important and must now be put at the forefront of local plan policy, simultaneously with operational energy and embodied carbon policies.

As climate change impacts worsen, particularly more extreme and more variable temperatures, the need for overheating assessments to be undertaken for new buildings is crucial for current and future occupant comfort. In particular, new buildings that meet ambitious space heating demand requirements (previously described) will be at increased risk of overheating due to the ability of the building to retain heat well. Clearly, throughout winter this is a key comfort benefit, yet during summer this can result in the opposite effect if not otherwise mitigated with measures to enhance ventilation and avoid excess solar gain, in warmer months. It is therefore paramount that overheating risk is sufficiently assessed and integrated into decisions throughout design stages to ensure high fabric efficiency standards are not achieved at the detriment of internal comfort and temperature levels.

In addition to addressing overheating with building-related measures, overheating mitigation measures can also be integrated alongside blue and green infrastructure policies. Benefits here are further intertwined, whereby overheating risks can be mitigated whilst also improving the biodiversity of a site. For example, green roofs, walls and trees are effective at reducing surface temperatures through natural shading and evapotranspiration.

Retrofitting Existing Buildings

The decarbonisation of existing buildings is of immanent importance to TRDC, simply due to the proportion of emissions from existing buildings; a third of the districts' emissions are from existing buildings.

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, and 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.

A number of measures to improve the efficiency of buildings or the generation of renewable energy can be achieved under permitted development, and local planning policy should support willing owners' actions and investment in existing buildings to reduce the barriers to implementation of measures which would lower carbon emissions. This is supported by the latest version of the NPPF which saw amendments under paragraph 167 which states: *'Local planning authorities should also give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic (including through installation of heat pumps and solar panels where these do not already benefit from permitted development rights)".*

The role of local planning policy in supporting retrofit of existing buildings can be pursued through providing a permissive and supportive policy approach to energy efficiency, carbon improvements through non-fossil fuel heat and power. It is important to note that fabric measures should continue to be prioritised before low carbon heat systems (namely heat pumps) are installed to avoid excessive energy use. Lowering the energy demand first in existing buildings remains vital for net zero carbon and will deliver economic and wellbeing-related benefits in the long term if implemented correctly, alongside the deployment of low carbon heat and power.

Outline of recommended policies

The following policy recommendations have been split up according to development type or policy theme. This mix seeks to best ensure the utmost ease of policy implementation, considering the roles of developers/applicants and the Development Management team to respectively demonstrate and assess policy compliance.

This section sets out policy recommendations for:

A. **Net zero (regulated and unregulated operational carbon) new build residential development**

B. **Net zero (regulated and unregulated operational carbon) new build non-residential development**

C. **Overheating in new buildings**

D. **Embodied carbon**

E. **Retrofitting existing buildings**

The recommended policies are organised in 'modules' which reflect requirements across the sub-sections of the title policy's objective. TRDC may choose to redraft or relabel how the modules appear in the Local Plan, for example 1.1 could be expressed as 1a, and we leave this at the Council's discretion according to how other local plan policies are presented. However, it is noted that the order of the modules are fixed, as to ensure that measures are undertaken sequentially, for example policies A, B and E align with the energy hierarchy.

Beneath each of the above policy recommendations, we provide commentary assessing the following:

- **Scope for future improvements in next local plan review**
- **Alignment with national policy (including 2023 WMS)**
- **Implementation considerations**
- **Development industry capability to deliver policies**
- **Development Management capability to assess policies**
- **Costs and feasibility**
- **Co-benefits**

A. Net zero operational carbon in new build residential development

All new build dwellings (use class C3 and C4) are required to meet the following requirements:

A1.1 Part L % improvement	At least a 63% improvement (reduction) on Part L 2021 TER (Target Emissions Rate), from energy efficiency measures. Heat pumps are to be calculated as an energy efficiency measure, rather than a renewable energy measure. As a measure in aid of this TER target, achieve an improvement (reduction) on Part L 2021 TFEE (Target Fabric Energy Efficiency) as follows: 1. End terrace: at least a 12% improvement 2. Mid terrace: at least a 16% improvement 3. Semi-detached: at least a 15% improvement 4. Detached: at least a 17% improvement 5. Bungalow: at least a 9% improvement 6. Flats / apartments: at least a 24% (weighted average, whole block) improvement All of the above should be calculated using SAP10.2 or later version (or the Home Energy Model, HEM, once it has been implemented). In the event national building regulations exceed the requirements of this policy, the national standards (i.e. the higher standards) would apply.
A1.2 Energy metrics guidelines	Or – Positive weight will be given to development proposals which can demonstrate the following absolute energy metrics are met: • Total Energy Use: 35 kWh/m^2/year • Space heating demand: 15 kWh/m^2/year Performance in these targets must be evidenced using a methodology that accurately predicts buildings' operational energy use. Suitable methodologies include the Passivhaus Planning Package (PHPP). Where a building achieves Passivhaus certification, it will be deemed to have complied with these targets.
A2 No fossil fuels	The use of fossil fuels and connection to the gas grid will not be considered acceptable.
A3 On-site renewable energy	On-site annual renewable energy generation capacity (in kWh) at least equal to the predicted annual total **regulated and unregulated** energy use (residual energy use in kWh *after* A1.1 has been achieved, *plus* unregulated energy use). Where an on-site net zero regulated and unregulated energy balance is not possible[1], it should be demonstrated that the amount of on-site renewable energy generation equates to **at least 120 kWh/m^{2}projected building footprint/year**. Where a building in a multi-building development cannot individually achieve the requirements of A3, this shortfall is to be made up across other units on-site. Innovative solutions, for example utilising PV canopies on car parks or solar PV on communal buildings should demonstrated before carbon offsetting A4 is considered. Regulated and unregulated energy use can both be calculated with Part L SAP or BREDEM, but a more accurate method such as PHPP is advised. Any other proposed methods are subject to Council confirmation of acceptability. The annual renewable energy generation and the annual energy use are whole-building figures, not per-m^2 figures. Renewable energy output should be calculated in line with MCS guidance for the relevant technology (expected to be PV in most cases).
A4 Energy offsetting	Only in exceptional circumstances and as a last resort where it is demonstrably unfeasible to achieve an on-site net zero regulated and unregulated energy balance, any shortfall in on-site renewable energy generation that does not match energy use is to be offset via **S106 financial contribution,** reflecting the cost of the solar PV that will need to be delivered off-site. The energy offset price is set as £2.31/kWh, based on cost of solar PV data from the Department for Energy Security and Net Zero, and includes inflation and a 10% margin to enable administration of the offset fund to deliver off-site solar PV by the Council or its appointed partners. The price should be revised annually. This is set as a one-off payment, where the annual shortfall

[1] Exceptional circumstances where an on-site net zero energy balance is not achieved may only be found acceptable in some cases, for example with taller flatted buildings (4 storeys or above) or where overshadowing significantly impacts solar PV output.

	in on-site renewable energy generation is multiplied by the energy offset price. This amount does not need to be multiplied by any number of years.
A5 Reduced performance gap	An assured performance method must be implemented throughout all phases of construction to ensure operational energy in practice performs to predicted levels at the design stage.
A6 Smart energy systems	Proposals should demonstrate how they have considered the difference (in scale and time) of renewable energy generation and the on-site energy demand, with a view to maximising on-site consumption of energy generated on site and minimising the need for wider grid infrastructure reinforcement. Where the on-site renewable energy generation peak is not expected to coincide with sufficient regulated energy demand, resulting in a need to export or waste significant amounts of energy, proposals should demonstrate how they have explored scope for energy storage and/or smart distribution systems. The purpose being to optimise on-site or local consumption of the renewable energy (or waste energy) that is generated by the site. Where appropriate, proposals should demonstrate that they have integrated these to optimise these carbon- and energy-saving benefits and minimise the need for grid reinforcements. This may include smart local grids, energy sharing, energy storage and demand-side response, and/or solutions that combine elements of the above.
A7 Post-occupancy evaluation	Large-scale development (100 units or more) is to monitor and report total energy use and renewable energy generation values on an annual basis. An outline plan for the implementation of this should be submitted with the planning application. The monitored in-use data are to be reported to the local planning authority for 5 years upon occupation.

Supporting text and notes

Policy elements A1, A2 and A3 are to be addressed at the design and post-completion stages, to ensure that the development has been built to intended standards. Post-completion resubmission of the original energy statement including energy performance calculations, informed by the relevant tests to systems and fabric, should be required as a condition as part of the planning application process. A5 and A7 compliance should also be demonstrated post-completion through planning condition.

A1 – A7 are to be demonstrated at the planning application stage through submission of an energy statement, which should include associated output reports from energy modelling software (e.g. SAP, BREDEM, PHPP, or HEM when available for general use).

About the non-mandatory energy targets in Policy A1.2

Achievement of these energy efficiency performance levels will reduce the amount of solar PV required under A3 for an on-site net zero balance. This can save the applicant costs in renewable energy provision and/or energy offsetting.

Performance against these non-mandatory targets would need to be calculated using a method that accurately predicts energy use. SAP is not suitable for this due to its poor predictive accuracy in the context of high-performance buildings. PHPP (Passivhaus Planning Package) is a suitable methodology, as it is widely recognized for its precision in predicting energy performance, particularly for low-energy buildings. Unlike SAP, PHPP has a proven track record of providing accurate energy use and heating demand predictions, ensuring that the development can meet its energy efficiency targets and reduce operational energy consumption effectively.

The Council may subsequently take a view on whether the incoming Home Energy Model (HEM) may be suitable, when HEM's final form is known

A2 No fossil fuels

This policy module prohibits the use of fossil fuels within the operational phase of the development, specifically for energy purposes within the buildings, including heating, hot water, and electricity. The intent is to ensure that the development aligns with sustainability goals, reducing reliance on fossil fuels and supporting the transition to low-carbon energy sources.

The restriction on fossil fuels does not apply to their use in construction activities or transport. These areas may be addressed separately, in line with broader sustainability and carbon reduction strategies.

Steps to calculating and narrating amount of renewable energy provision

Policy A3 should contain the following steps, to be expressed in an energy statement:

- First calculate the total predicted annual energy use in kWh for all proposed new buildings (whole buildings, regulated and unregulated, after all the measures proposed in the application towards compliance with Policy A1).
- This can be modelled using SAP, BREDEM (the methodology on which SAP is based), or PHPP. PHPP is the preferred model due to its accuracy, to avoid SAP's inaccuracies at predicting actual energy use in operation (SAP underestimates space heat demand, overestimates unregulated energy, and may overestimate hot water use). The Council may later take a view on whether the incoming Home Energy Model (HEM) is a suitable method for energy use prediction when the final form of HEM is available.
- Then calculate the annual renewable energy generation for whole site in accordance with the MCS guidance for the relevant renewable energy technology (anticipated to be solar PV in most cases as this is typically the most suitable technology in an urban setting). This does not have to be exclusively on the buildings themselves, and can include provision of new standalone renewable energy installations within the site. The figure does not include renewable heat delivered by heat pumps, as that would count instead towards Policy A1.

- Deduct the annual renewable generation from the annual energy use. The result should be zero or less.
- If the result is not zero or less, explore how to provide more on-site renewable energy (for example through an adjustment to roof orientation, and ensuring PV area provision has been explored up to at least equivalent of 70% of projected building footprint including roof overhangs and with reasonably efficient panels available on the market).
- If it proves unfeasible to increase renewable energy generation on-site to result in an annual balance of energy generation with energy use, then divide the total annual renewable energy generation by the building footprint. This result should be at least 120kWh. If this is impossible, provide evidence as to why this is not possible even with a PV area equivalent to 70% of projected building footprint and reasonably efficient panels available on the market.
- Calculate the residual energy demand (whole building, not per m2) for all proposed new buildings after all measures proposed towards policies A1 and A3, then proceed to use this figure to calculate the required amount of offsetting provision in policy A4.

The 120 kWh/m² figure serves as a fallback requirement for developments that cannot achieve a net-zero energy balance on-site through renewable energy generation. If a development cannot generate enough renewable energy on-site to balance the total regulated and unregulated energy use (as calculated after fabric efficiency improvements in Policy A1.1), the policy requires the renewable energy generation to meet a minimum of 120 kWh per square meter (m²) of projected building footprint per year. This ensures that, even if the ideal net-zero energy generation balance cannot be achieved, a significant portion of energy demand is still met by on-site renewable generation.

Applicants should demonstrate compliance with this fallback target by providing a clear calculation of the renewable energy generated per square meter of the projected building footprint. This can be demonstrated in the Energy Statement by

- Renewable energy system design, such as PV layouts, system capacities, and expected energy outputs.
- Calculation of the renewable energy generated based on these designs, ensuring it meets or exceeds the 120 kWh/m² threshold for the total projected building footprint.

If the 120 kWh/m² target cannot be met, the applicant must provide evidence explaining why, even with renewable energy provision up to the equivalent of 70% of the projected building footprint (including roof overhangs), it is unfeasible to meet this threshold. This should include details on the constraints (e.g., site limitations, technical or financial barriers).

This ensures that, even in cases where an on-site net zero energy balance isn't possible, a robust proportion of energy demand is met through renewable energy, aligning with the broader policy goals.

What Applicants Should Do if They Can't Meet A1.1 and A3:

If applicants are unable to meet the requirements of Policy A1.1 (fabric efficiency) and Policy A3 (on-site renewable energy), they must demonstrate compliance through the energy hierarchy:

1. Fabric efficiency (A1.1 – Be Lean): The first step is reducing energy demand through fabric efficiency measures (e.g., insulation, airtightness, efficient windows). If these measures can't be met due to technical or site-specific constraints, applicants should provide clear evidence (e.g., feasibility studies or cost analyses) to justify why.
2. Renewable energy (A3 – Be Green): After addressing fabric efficiency, applicants must meet energy needs through on-site renewable energy generation. If fabric efficiency measures cannot be fully met, applicants can look to increase renewable energy provision, but they must still comply with overarching policy objectives.
3. Submission requirements: Applicants should submit an energy statement that includes:
    - Predicted energy demand (kWh/year).
    - Proposed renewable energy contributions (e.g., PV output in kWh/year).
    - The percentage of energy demand met by on-site renewables.
    - Evidence of site-specific constraints preventing full compliance.

About the offsetting calculation

The offset is a one-off payment, calculated by multiplying the annual shortfall in on-site renewable energy generation (in kWh) by the energy offset price (£/kWh). This represents the upfront cost of installing the equivalent renewable energy capacity that the developer has not provided on-site. Since it's a one-time contribution to cover this capital cost, it only reflects one year's shortfall—there's no need to factor in the building's lifetime or ongoing energy use

The offset price (£2.31/kWh) is based on the national cost of solar PV deployment as published by the Department for Energy Security and Net Zero (DESNZ). This price reflects the average cost of delivering solar PV (including installation), adjusted to include inflation and a 10% uplift to support fund administration and delivery of offset projects. The Council may revise the offset price annually to reflect updated DESNZ cost data.

A supporting spreadsheet calculator can be created if helpful to support future updates.

Flexibility in applying the offsetting requirement may be considered where it is robustly demonstrated that full offsetting would make social or affordable housing unviable due to site-specific costs that exceed assumptions in the Whole Plan Viability Assessment. In these cases, the Council may consider:

- Reducing the scope of energy to be offset, or
- Applying a discounted offset price where the Council is confident it can still deliver the equivalent renewable generation via the offset fund.

This flexibility would apply only to affordable housing. Market housing in mixed-tenure schemes should be expected to meet the full offset cost. Any proposed flexibility must be justified with clear viability evidence and will be assessed on a case-by-case basis.

About assured performance methods

These are processes to follow throughout design, construction, commissioning and building handover that reduce the energy performance gap (the gap between predicted energy use and actual energy use). These not only help keep the building's actual carbon emissions to a minimum (as opposed to their predicted emissions using inaccurate methods like SAP), but they also help to ensure occupant satisfaction. Suitable methods include BSRIA Soft Landings, NEF/GHA Assured Performance Process, and Passivhaus certification. Other processes may be available or become

available during the course of the plan. Alternative processes proposed by the applicant will be subject to consideration by the Council about their evidence-based merits. There are also some additional tools in the industry which are not in themselves an assured performance process but can assist in improving the energy performance of a building in-use, such as BS40101.

Applicability to outline applications

Compliance with the policies will be conditioned at outline stage and must be confirmed in detailed reserved matters. However, the Council accepts that the degree of detail provided in the outline energy strategy will be less than for full and reserved matters applications. It is also recognised that this means the outline energy calculations may be largely based on assumptions. The aim should be to demonstrate that options have been identified by which the development could comply with the policy targets, taking into account the broad mix of anticipated floorspace, typologies and site conditions. Statements made about estimated carbon and energy performance based on a high degree of assumptions at outline stage should be reassessed at detailed reserved matters, albeit the reserved matters may diverge in *how* the required compliant performance will be achieved.

Where more detail is known, it should be reflected in the outline application; for example if expecting to connect to a site-specific low-carbon energy source. For a further example, if expecting a limited number of repeated home types, then the energy modelling would ideally reflect similar archetypes and identify a specification by which they could meet the policy targets for energy efficiency and renewable energy (taking into account site conditions). The modelled homes could reflect, for example, a sample of a relevant housebuilder's 'products' most likely to be built on site. This exercise benefits the developer in that it gives an early understanding of the degree of amendment needed to their existing regular specifications, allowing them to set up supply chains and economies of scale well in advance of commencing on site, as outline proposals typically are large-scale and take several years from outline application, to detailed design, to commencement.

Outline applications' estimated offsetting contribution should be stated in the outline Energy Assessment. These will be subject to a Section 106 agreement, but not paid at the time of the outline application. In that case the offset contribution must be recalculated within the subsequent reserved matters application, and paid on or prior to commencement of works on site for the reserved matters scheme. The reason for payment into the offset fund prior to commencement of works is so that the offset fund administrators are able to deliver the offset projects on a timescale not too dissimilar from the timescale for completion and occupation of the development. The aim is to enable, wherever possible, the offsetting project to be producing renewable energy no later than the development's occupants begin to place their demands on the grid.

Scope for future improvements

Policies A1 and A1.2 could be improved by introducing mandatory target values for Energy Use Intensity and space heating demand, by ensuring that A1.2 became a compulsory requirement of the policy, if found to be feasible and viable in subsequent local plan iterations.

Alignment with national policy

All of the policy modules are aligned with national policy since their implementation works towards achieving the legally-binding UK target of net zero by 2050, as set out in the Climate Change Act 2008, and carbon budgets subsequently legislated under the aegis of that Act. These associated carbon budgets are linked to the Climate Change Committee's Balanced Pathway to Net Zero report, which in turn is supported by analysis that sets out that all new buildings must be net zero by 2025. Furthermore, the 2050 net zero target is now specifically referenced in the NPPF under paragraph 161.

The Planning and Energy Act 2008 sets out that local standards for energy efficiency in new homes are able to exceed those set in Building Regulations. Detail on why objections in relation to this local planning authority power are invalid is set out in detail previously in this report.

In the context of the 2023 WMS, explored in detail in a previous section, the A-suite of policies are fully compliant with the perceived constraints it poses. The WMS only applies to energy efficiency standards, where it states that any standards that exceed Building Regulations must be done so using the TER metric. A1 is the only policy recommendation that relates to the energy efficiency perceived constraints of the 2023 WMS and remains within its bounds through the use of TER % reduction as the primary metric. The TFEE target is not additional to, but is a step towards, that TER target.

The 63% reduction target on Part L 2021 TER is set to align with national policy in that it is in line with the Future Homes Standard (as the Government has stated that the FHS TER will be a ~75% reduction on the Part L 2013 TER, and that the Part L 2021 TER is a 31% reduction on the 2013 TER. This ~75% figure has remained constant through both rounds of FHS consultation to date (2019-21 and 2023/24). Correspondingly, the TFEE target is set to align with the performance of a home that achieves that TER target via the indicative FHS specification set out by the Government in the 2019-21 FHS consultation. This is necessary in order to reduce the space heat demand (which is necessary for the achievement of the UK's carbon budgets). It is also necessary in order to protect the resident from excessive energy bills and potential fuel poverty, as the latest FHS consultation indicated that the FHS carbon target could be achieved just with a heat pump and no fabric improvements, resulting in heating bills approximately double those of a current new build home. See previous citations for FHS consultations throughout this report, and/or see separate summary appendix of evidence sources.

A2 is aligned to the Government's direction of travel indicated by both the options proposed in the Future Home Standard 2023 consultation, in that no fossil fuel heating systems are proposed. A3 and A4 are not impacted because they address renewable energy, which is out of scope of the 2023 WMS.

Implementation considerations

To support these policies, it is vital that supplementary guidance is provided for the benefit of Development Management officers and the development industry. This is particularly important for A1, A1.1, A2, A4 and A5 because specific information for policy compliance must be set such as:

- Examples of assured performance
- Acceptable scenarios where exceptional circumstances are valid for A3 and A4
- Methodologies and assumptions for energy performance calculations (this could explore in more detail the suitable methodologies outlined within the suggested policy text above).

Implementation may also be aided by setting validation criteria/checklist for applications to ensure they are including the right information with their planning application. Examples of SPD's and checklists which are comparable are: Warwick Net Zero Carbon Buildings SPD and Pro-Forma and Nottingham & Broxtowe Reduction of Carbon in New Buildings SPD (currently under consultation).

Information on the mechanisms of energy offsetting for A4 will need to be included in a planning document that addresses planning obligations.

For A3, renewable energy installations will need to be accompanied with calculations of expected outputs required under the policy by an MCS certifier, which should be set as a planning condition. This is to ensure renewable energy technology has been correctly installed and operates at the predicted output sufficient to deliver an on-site net zero energy balance.

Industry capability

Assuming TRDC undertakes appropriate engagement with developers operating in the area throughout the local plan process, the local development industry should be well prepared to deliver on these policies. The policies require additional levels of skill to be applied through design and construction phases but do not introduce any new skills not currently known and utilised by developers.

The standard of insulation and glazing typically required to achieve A1 are aligned to those set out in the indicative specification for the Future Homes Standard (FHS). Therefore, the development industry should be well prepared to deliver on these policies, particularly as the FHS is understood to be planned for implementation in 2025, and the TRDC Local Plan planned for adoption in 2026.

The target of 120kWh/m^2 building footprint/year was selected having regard to several other local plans' energy modelling evidence (Central Lincolnshire, Essex[Error! Bookmark not defined.], South Oxfordshire & Vale of White Horse[Error! Bookmark not defined.]) which has evidenced that a target of 120kWh/m^2/year in those locations with a PV area approximately equivalent to 60-70% of the building footprint area using current typical PV panels (and the area required will reduce as PV technology improves in future).

Development Management capability

The capability of Development Management officers to accurately assess these policies is reliant on the degree of training and guidance documents available. It is essential that officers have guidance on hand to assess policies against to ensure that compliance is achieved in accordance with methodologies set out in a subsequent guidance document. Specific upskilling of at least one officer on climate change policies to gain a technical understanding will greatly assist the overall ability of the team to assess policy compliance.

Training for Development Management officers on technical processes involved with net zero carbon development can strengthen internal capabilities to assess whether applications may have submitted over-optimistic building performance values for the sake of policy compliance. These may include:

- Understanding of modelling techniques and tools (e.g. SAP/SBEM)
- Building elements energy performance values (e.g. U-values)
- Low- and zero-carbon heating and ventilation systems/technologies
- Orientation, form factor and design features for solar PV generation

[2] This is what the Future Homes Hub termed "contender specification 1" or 'CS1'. This is very similar to the "FHS Option 2" specification that Government recently consulted upon in their Future Homes Consultation 2023-2024.

Costs and feasibility

Policies A1 and A2 are aligned with the Future Homes Standard 2023 consultation Option 2, and with the Future Homes Hub Contender Specification "CS1" and "CS2" detailed in their Ready for Net Zero report (and associated Appendix F). The TFEE improvements are aligned with the Government's previously indicated FHS specification (released in 2021) as evidenced through the Future Homes Hub report cited above (see scenario 'Ref25' within that report). The 63% TER reduction on Part L 2021 is equivalent to a 75% reduction on Part L 2013 and is proven to be feasible through fabric and energy efficiency standards, and installation of a heat pump – i.e. no solar PV is required to achieve the % TER reduction.

In practice, these requirements have been demonstrably feasible, an example from Warwick see the case study on Gallows Hill council housing scheme (77-80% reduction on Part L 2013). This development by Vistry Partnership did include some contribution from solar PV, but the Future Homes Hub evidence cited above shows that the same reduction could still be achieved without solar PV given further fabric and energy efficiency improvements.

In the Future Homes Hub Ready for Net Zero report cited above, the following TER reductions on Part L were shown to be feasible with the least ambitious of the specifications tested in that report:

Type of home	% reduction on Part L 2013 TER (Future Homes Hub *Fig. 115; p154*)	% reduction on Part L 2021 TER (derived from Future Homes Hub appendix F)
End terrace	**78%**	67%
Mid terrace	**77%**	66%
Semi-detached	**76%**	67%
Large detached	**75%**	66%
Bungalow	**76%**	58%
Low-rise flat	**76%**	66%
High-rise flat	**76%**	69%

All of the above except 'Bungalow' exceed the requirement set by the draft TRDC policy. These reductions were modelled to be achieved by a building with equal or slightly worse fabric than today's Part L 2021, but have an air-source heat pump instead of a gas boiler[2].

The feasibility of Policies A1 and A2 is further evident through the tested archetype scenarios in the Future Homes Hub Report and the promotion of very similar standards in the 2023 FHS consultation.

However, the draft TRDC policy includes an element of fabric improvements, to ensure that residents are not subject to a doubling of energy costs that the Future Homes Standard consultation has conceded would occur if this %TER reduction is achieved solely through the addition of a heat pump. This is still feasible (as demonstrated through the Future Homes Hub report cited above) but costs will

be different if the %TER reduction were achieved solely through electric heat. Therefore, it is proposed to test cost uplift estimates that include an element of fabric improvement as a step towards the %TER reduction. Using averages of costs estimated in various different sources, the cost uplift over a Part L 2021 baseline for **Policies A1 and A2** for **houses** is estimated to be 0.78% for fabric measures and 1.59% for the heat pump installation, combining together to result in a **2.37% cost uplift** – this aligns with the 2% stated for CS1 in the Ready for Net Zero report. For **flats**, the estimated cost uplift for **Policies A1 and A2** is estimated to be **3.7%.**

Policy A3 is estimated to bring an **additional 2.5% cost uplift** over Part L 2021, for **houses**. This is a minimal cost uplift because the Part L 2021 baseline specification already includes 40% of roof space covered by solar PV (which has been estimated in the evidence base of South Oxfordshire & Vale of White Horse[xxx] to match approximately 60% of the total energy use of a house that meets the Future Homes Standard version released by Government in 2021, as previously cited). Therefore, only a small additional amount of PV is required in order to fulfil the policy.

For **flats**, the equivalent % uplift for on-site PV will vary by height of the block (more floor space for more storeys equals more energy use, but without increasing the roof space available for PV). This means that the taller the building, the higher the amount of energy use not met by the onsite PV. However: For a 4-storey block of 16 flats of TRDC's average new build flat size, plus circulation space, the PV cost (assuming 70% of footprint area) is estimated to be between 0.9-1.2%, plus a pessimistic[3] estimated further 2.5-3.6% for offset payments (the range of figures stated here depends on how the floor space is calculated). Combined cost for **policy A3** in flats is estimated at circa **4.2%**.

The **overall cost uplift** for A-suite policies for houses is therefore reasonably estimated to be **4.87% in houses** or **7.9% in flats.** This could be rounded up to 5% (houses) or 8% (flats) to give headroom to any site-specific constraints that hinder a development's ability to meet the policy requirements. For flats, this figure will vary more as it depends strongly on the height of the building.

Feasibility of Policy A3 is demonstrated by evidence bases cited elsewhere in this report including South Oxfordshire and Vale of White Horse (2023[xxxi]), Central Lincolnshire (2021[xxxii]) and Essex[xxxiii]. These show that it is possible to match total energy use, including unregulated, on a variety of residential building types up to about 3-4 storeys that meet best practice energy efficiency standards. They also show it is possible to do this in buildings taller than this if optimal energy efficiency is achieved and/or the roof is optimised for PV generation (for example, a monopitch roof facing south). Buildings above this height may struggle to match their own energy use on site and therefore a height over 4 storeys may be considered an acceptable reason for at least partially following the offset route rather than complying entirely on-site.

The feasibility of meeting policy A3 on site will vary by the height of the building. Lower-rise buildings will find it more feasible because they have more roof space (for PV) compared to floor space. Where this becomes a problem, the policy suite offers an alternative route to compliance through Policy A4 (energy offsetting).

Finally, it is feasible to calculate total energy use. Developers are familiar with providing SAP calculations to legally comply with Part L of building regulations. Part L SAP is mainly focussed on the *regulated* part of energy use, but can also give a figure for *unregulated* energy, albeit SAP overestimates this as it is based on outdated appliance efficiency rates (see 2021 evidence of Cornwall local plan). Therefore, if SAP is used to calculate the unregulated energy, it will overstate the amount of PV needed to meet it. This may be solved in HEM, the incoming replacement for SAP. Meanwhile, other more accurate tools for modelling total energy are available including PHPP.

The full range of total energy consumption calculated using SAP10.2 in the Future Homes Hub Ready for Zero report, for a home that meets the Policy A1 requirements[4], is 42 to 60kWh/m^2/year depending on the type of home. This is not dissimilar to the 69kWh/m2/year EUI estimated for a home meeting the same specification modelled using PHPP in the South Oxfordshire and Vale of White Horse evidence base referenced above. That South Oxfordshire evidence also showed that the home with that 69kWh EUI could meet about 60% of its own energy use with onsite PV of an area equivalent to about 40% of the home's footprint. Translating this up to 100% of energy use would therefore be feasible using an area of PV equivalent to about 69% of the house's footprint. The home can therefore more than meet its own energy demand on-site if the PV provision is equivalent to 70% of building footprint. This equates to an output of only 108 kWh/m^2 building footprint/year. Houses are therefore not expected to need to match the Policy A3 alternative target of 120kWh/m^2/year, as they can already feasibly match their own energy use (becoming net zero operational energy) with a lower proportion of PV.

Due to the 2023 WMS constraints, particularly the discouragement of the use of absolute energy metrics – Energy Use Intensity and space heating demand – the policy recommendations above do not directly limit energy use, which would have assisted developers in designing towards an on-site net zero regulated balance because the amount of solar PV would be matched to the clearly stated energy use limit. However, even in the absence of these effective best-practice metrics, reducing energy use should be the main priority of the developer to best enable feasibility of sufficient solar PV to match regulated energy use. Reducing energy use directly benefits the subsequent building occupant but also the developer, as shown by a comparison of costs below.

To compare the cost differential between prioritising energy use reduction or relying on solar PV to achieve a net zero balance, we look at two scenarios for a semi-detached house:

- On-site net zero building with energy use of **69 kWh/m^2/year** (as modelled[xxxiv] in a semi-detached home that meets the FHS indicative specification released by Government in 2021**)**
- On-site net zero building with energy use of **32 kWh/m^2/year** (as modelled[xxxiv] to be feasible in a semi-detached home using best-practice fabric and heat pump).

For scenario 1 to achieve on-site net-zero status, it would have to install over double the amount of rooftop solar PV than scenario 2. Scenario 2 achieves its lower energy use through better specification of U-values and improved air tightness of scenario 1. There are higher costs associated with specifying

[3] The pessimistic assumptions were that shared/circulation area has the same energy demand per m^2 as the dwellings (resulting in a higher-than-realistic energy demand) and a further pessimistic assumption that none of the panels face directly south (resulting in a lower-than-optimal solar PV output, resulting in a need for more offsetting). This resulted in a larger-than-likely offset payment required – which is more expensive per kWh than on-site PV provision, because the offset price includes a 10% margin to allow administration of the fund and implementation of the offsite PV provision. Additionally, it used total energy use estimations published by the Future Homes Hub that were modelled in SAP, which overestimates unregulated energy demand because it is based on outdated appliance efficiencies.

[4] Several different "contender specifications" were modelled in the cited Future Homes Hub 'Ready for Zero' report. The one we assume to meet the Policy A1+A2 specifications is "Ref25", which represents the FHS indicative specification published by Government in 2021, as previously cited.

higher performance fabric values for scenario 2 compared to the inefficient energy use of scenario 1. However, the same argument applies to higher solar PV costs to achieve net zero on-site for scenario 1. Interestingly, the cost uplifts over Part L 2021 for both scenarios are extremely close at 4.8% (scenario 1) or 4.6% (scenario 2). The capital costs of scenarios 1 and 2 are respectively **£161,248 and £160,987**, in the Oxfordshire context, inferred from the South Oxfordshire and Vale of White Horse 2023 costs evidence base[xxxv].

It is evident that both scenarios are feasible and effectively equal in cost, although the best practice scenario 2 is in fact less costly. Therefore, developers have a clear incentive to design new buildings to best practice energy standards that maximise all opportunities for energy use reduction. It is the responsibility of the developer to reduce energy use to levels that are known to be feasible to enable a regulated net zero building. This shows that although the TRDC policy is expressed as % TER reduction (so as to appease the WMS2023), developers can instead make smarter choices to achieve the policy's overarching 'net zero' standard by making smarter choices to design according to EUI targets, rather than purely by designing for % TER reductions.

Local authorities, including TRDC, feel constrained to the perceived boundaries of the 2023 WMS and have therefore not decided to select a policy approach that prioritises the use of fixed metrics that would specifically limit energy use to absolute targets (such as EUI and space heat demand). However, above we have demonstrated that reducing energy use to best practice levels can in fact result in a lower cost uplift in achieving a net zero building than if energy use reduction was neglected.

No additional cost uplift is assumed for A5 because the offset price is set as to the exact cost of solar PV that was assumed for the A3 cost uplift. Therefore, no change in cost is evident between installing a sufficient amount of solar PV on-site or off-site.

Value uplift

There is evidence that increased energy efficiency in homes, as sought by policies A1-A2, delivers a value uplift which could be offset against the cost uplift to aid the viability of the scheme. This was evidenced in a 2021 study by Lloyds/Halifax[xxxvi], which looked at actual home sale value across all regions of England and Wales, not just surveys of willingness to pay. It expressed the sale value uplift in terms of the % difference between EPC bands. The increase is greater between EPC bands at the lower end (for example a 3.8% value increase from EPC G to EPC F) but there is still an uplift between higher bands (an uplift of 2% from EPC C to EPC B, and an uplift of 1.8% from EPC B to EPC A). All of these values are the average across England and Wales; however, the study confirms that the uplift was evident in all regions and therefore should be reasonably applicable to TRDC.

Please note that increased sale value does not necessarily translate proportionally into increased cost of owning and running a home, thanks to the running cost savings on energy bills that can be achieved via the improved energy efficiency (draft policy A1.1 and A1.2) and the on-site solar generation (draft policy A3).

Co-Benefits

As previously outlined, there are benefits to occupants from setting the policy requirement A1 and A2, as to ensure that occupant bills are not excessive from the costs of running a low carbon heat system (e.g. electrified system) by reducing the overall heating demand through an improved fabric efficiency. Combined with recommended policy C, this suite of policies aims to support new buildings which can support occupant health and well-being by creating more comfortable buildings and greater comfort with less fluctuation in temperatures and reducing financial stress (occupant bills costs). Additionally, improved energy efficiency in homes translates into fewer retrofit needs over time, reducing the future financial burden on homeowners to upgrade their properties to meet evolving energy standards.

The drive for improved fabric efficiency has dual benefits both from a cost perspective, but also from an embodied carbon perspective as materials do not need to be replaced in a relatively short timescale. By ensuring buildings are future-proofed during the construction stage, policies A1 and A3 actively support the objectives of policy D, which aims to minimize the whole-life carbon footprint of new buildings. The policies work in tandem to reduce the environmental impact over the building's lifespan, aligning with broader net zero ambitions. By reducing energy demand these policies can directly address fuel poverty. Lower-income households stand to benefit from reduced energy bills, which can free up income for other essential needs. Tackling fuel poverty is a key social benefit that aligns with TRDC objectives and wider government goals to improve living standards, particularly in vulnerable communities.

Additionally, policy A3 would ease local grid stress by promoting on-site renewable energy generation, thereby matching energy demand more efficiently. In cases where full on-site generation isn't feasible, policy A4 ensures any remaining energy demand is met through district-wide offsetting initiatives. This helps local authorities meet net zero goals while minimising reliance on external energy sources.

The benefits extend further when combined with policy A6, which promotes the use of smart energy systems. These systems enable buildings to store and use energy during optimal periods, reducing grid demand during peak times. For example, smart systems could manage the timing of electric vehicle (EV) charging or coordinate the use of high-energy appliances (e.g., washing machines or dishwashers) to coincide with periods of lower energy demand or higher renewable energy generation.

While upgrades to local electricity infrastructure may be required to accommodate the increased demand from electric vehicles and electrified heating systems, such upgrades are already anticipated as part of broader infrastructure planning. These improvements would largely replace the need for investments in outdated gas infrastructure. As a result, costs associated with these upgrades are not considered additional burdens but rather necessary steps in the transition away from fossil fuels. By promoting on-site renewable energy generation and energy storage systems, homes reduce dependence on external energy sources, which can be subject to price volatility and supply disruptions. This enhances the resilience of households to energy price hikes or shortages, offering greater energy security.

Furthermore, the policy suite reduces reliance and use of fossil fuels, especially natural gas for heating and cooking, leading to fewer emissions of pollutants like nitrogen oxides (NOx) and particulate matter (PM). This improvement in local air quality can have significant public health benefits, reducing respiratory issues such as asthma and cardiovascular diseases among residents. In key AQMA areas this can also help TRDC meet air quality targets.

Lastly, the requirement for homes to comply with this suite of policies helps stimulate the development of local skills and supply chains, contributing to growth in the green economy. By fostering demand for expertise in low-carbon construction techniques, renewable energy installation, and smart home technologies, the policies create new job opportunities and support local economic

resilience. This approach aligns with the UK's wider economic goals for a just transition to a net zero economy, ensuring that the move towards sustainability also delivers social and economic benefits to communities.

B. Net zero (regulated operational carbon) in new build non-domestic development

All new build non-domestic development is required to be net zero carbon in operation (regulated energy) through the following requirements:

B1.1. Part L % improvement	% improvement on Part L 2021TER (or equivalent reduction on future Part L updates), through on-site measures as follows: • Offices: at least 25% improvement • Schools: at least 35% improvement • Industrial buildings: at least 45% improvement • Hotels (C2, C5) and residential institutions (C2, C2a): at least 10% improvement • Other non-residential buildings: at least 35% improvement In the event national building regulations exceed the requirements of this policy, the national standards (i.e. the higher standards) would apply.
B1.2 Energy metrics guidelines	Positive weight will be given to applicants who can demonstrate the following absolute energy metrics: • Total Energy Use: 65 kWh/m^2/year • Space heating demand: 15 kWh/m^2/year Employing absolute energy metrics reduces the amount of solar PV required under B3 for an on-site net zero balance of regulated energy. Applicable methodologies to calculate this include CIBSETM54 and the Passivhaus Planning Package (PHPP). At present, the Part L calculation method (SBEM) is not considered suitable as it is does not provide accurate predictions of a building's actual energy use.
B2. No fossil fuels	The use of fossil fuels and connection to the gas grid will not be considered acceptable.
B3. On-site renewable energy	On-site annual renewable energy generation capacity to at least equal predicted annual total **regulated** energy use (residual energy use after B1.1 has been achieved). In buildings subject to Part L's requirement for energy forecasting, that forecasting should be the source of the 'annual total regulated energy' figure. Where an on-site net zero regulated energy balance is not possible[5], it should be demonstrated that the amount of on-site renewable energy generation equates to **>120 kWh/m^{2}projected building footprint/year**. Where a building in a multi-building development cannot individually achieve the requirements of B3, this shortfall is to be made up across other units on-site before carbon offsetting (B4) is considered. Development should demonstrate that opportunities for on-site renewable energy infrastructure (on-site but not on or attached to individual buildings), such as solar PV canopies on car parks, have been explored.
B4. Energy offsetting	Only in exceptional circumstances and as a last resort where it is demonstrably unfeasible to achieve an on-site net zero regulated energy balance, any shortfall in on-site renewable energy generation that does not match regulated energy use is to be offset via **S106 financial contribution,** reflecting the cost of the solar PV delivered off-site. The energy offset price is set as £2.31/kWh. This price is based on cost of solar PV data from the Department for Energy Security and Net Zero, and includes inflation and a 10% margin to enable administration of the offset fund to deliver off-site solar PV by the Council or its appointed partners. The price should be revised annually. This is set as a one-off payment, where the shortfall in annual on-site renewable energy generation is multiplied by the energy offset price. This amount does not need to be multiplied by any number of years.
B5. Reduced performance gap	An assured performance method must be implemented throughout all phases of construction to ensure operational energy in practice performs to predicted levels at the design stage.
B6. Smart energy systems	Proposals should demonstrate how they have considered the difference (in scale and time) of renewable energy generation and the on-site energy demand, with a view to maximising on-site consumption of energy generated on site and minimising the need for wider grid infrastructure reinforcement. Where the on-site renewable energy generation peak is not expected to coincide with peak onsite energy demand, resulting in a need to export or waste significant amounts of energy, proposals should demonstrate how they have explored scope for energy storage and/or smart distribution systems. The goal is to optimise on-site or local

[5] Exceptional circumstances where an on-site net zero energy balance is not achieved may only be found acceptable in some cases, for example with taller flatted buildings (4 storeys or above) or where overshadowing significantly impacts solar PV output.

	consumption of the renewable energy (or waste energy) that is generated by the site. Where appropriate, proposals should demonstrate that they have integrated these to optimise carbon- and energy-saving benefits and minimise the need for grid reinforcements. This may include smart local grids, energy sharing, energy storage, demand-side response, or solutions combining elements of the above.
B7. Post-occupancy evaluation	Large-scale development (over 5,000 m^2 floorspace) is to monitor and report total energy use and renewable energy generation values on an annual basis. An outline plan for the implementation of this should be submitted with the planning application. The monitored in-use data are to be reported to the local planning authority for 5 years upon occupation.

Supporting text and notes

Policy elements B1, B2 and B3 are to be addressed at the design and post-completion stages, to ensure that the development has been built to intended standards. Post-completion resubmission of the original energy statement including energy performance calculations, informed by the relevant tests to systems and fabric, should be required as a condition as part of the planning application process. B5 and B7 compliance should also be demonstrated post-completion through planning conditions.

B1 – B7 are to be demonstrated at the planning application stage through the submission of an energy statement, alongside associated output reports from energy modelling software (e.g. SBEM).

About compliance with Policy B1.1 TER reductions

Please note that these %TER reduction targets are not limited to be solely delivered through energy efficiency measures. Therefore, there could be an element of clean energy supply or renewable energy measures included in these. However, please note that further renewable energy will be needed to subsequently meet the requirement of Policy B3, therefore applicants are advised to pursue energy efficiency measures as far as feasible in the first instance in pursuit of Policy B1.1, so that the subsequent Policy B3 renewable energy requirements (to match 100% of regulated energy use) are not rendered excessively expensive or unfeasible. Designing to use less energy in the first place reduces the amount of renewable energy needed to match this, and/or the amount of carbon offset payment needed.

Applicants and Council development management officers should be aware that in the current Part L for non-domestic buildings, the type of heating system in the 'notional' building (from which the TER is derived) is the same as the type of heating system in the actual proposed building. Therefore, no TER gains will be made by switching from a gas or oil boiler to a heat pump or other all-electric or otherwise low-carbon heat system. However, TER improvements *can* be made by selecting a heating system that is *more efficient than Part L 2021's notional efficiency for that heating type*.

About Assured Performance Processes for energy performance

Regarding assured performance processes, in addition to those mentioned in relation to the equivalent residential policy (A5) in residential, there is also one additional method for non-residential: NABERS UK (administered by CIBSE). NABERS is currently only available for offices but intended to extend to other building types in future.

About offsetting

The requirement for offsetting may be applied flexibly where it is demonstrated that this makes development unviable due to the unique energy use profile of the proposed building and site characteristics, where this results in an offsetting cost uplift significantly higher than assessed in the Whole Plan Viability Assessment. The flexibility could include a reduction in the scope of energy that has to be offset, or a discounted price per kWh if the Local Authority is confident it can still deliver the required offset projects within this price (when pooled into the offsetting fund which will primarily consist of full-price offset contributions). The degree of flexibility will depend on the unique scheme characteristics and evidence submitted the local authority about what could be viably accommodated. It may also depend on the degree to which the proposed development represents a socially desirable facility that meets unmet community needs (such as for healthcare, education, or similar).

Please see also the supporting text for the equivalent residential policies (A1-A7) regarding:

1. **calculating renewable energy provision and offset payments,**
2. **applicability to outline applications, and**
3. **assured performance processes.**

Scope for future improvements

Policies B1 and B2 could be improved by introducing the mandatory target values for Energy Use Intensity and space heating demand, by ensuring B1.2 become a compulsory requirement of the policy if found to be feasible and viable in subsequent local plan iterations.

Alignment with national policy

All of these policies are aligned with national policy goals since their implementation works towards achieving the legally-binding UK target of net zero by 2050, as set out in the Climate Change Act 2008, and carbon budgets subsequently legislated under the aegis of that Act. Furthermore, the 2050 net zero target is now specifically referenced in the NPPF under paragraph 161.

These carbon budgets legislated by the Climate Change Act are linked to the Climate Change Committee's Balanced Pathway to Net Zero in the Sixth Carbon Budget report, which sets out that all new buildings should be zero carbon from 2025, with high levels of energy efficiency and low-carbon heat. It also found that non-residential buildings should phase out high-carbon fossil fuel boilers no later than 2026, and phase out gas boilers in 2030-33, less than 10 years from today (2024), while boilers have a typical lifetime of 15 years.

Therefore, new buildings today should not have these, to avoid the need for expensive disruptive retrofit less than 10 years after completion which would also waste embodied carbon (even if the need for 'net zero carbon new builds from 2025' did not already effectively rule out fossil fuel boilers). The policy supports these targets by prohibiting fossil fuel connection and improving energy efficiency, which mandate a heating technology similarly efficient to a heat pump (which a fossil boiler cannot meet).

It is not yet completely clear whether the missives of the 2023 WMS are relevant to non-residential development. The WMS uses the term 'local energy efficiency standards for buildings', which could be taken to mean all buildings. But on the other hand the WMS asks for the standards to be expressed in terms of SAP, which is a methodology that only applies to residential. Also, the concern that the WMS purports to address is that "multiple local standards [may] add further costs to building new *homes* ... [and therefore] the impact on *housing supply* and *affordability* [must be] considered in accordance with the National Planning Policy Framework". The NPPF only discusses affordability in relation only to homes, not any other buildings. Nevertheless, even if the WMS2023 is interpreted to apply to non-residential development too, the B-suite policies remain consistent with the 2023 WMS' stipulations, given that the metric for B1 is a % reduction on TER (to be calculated with SBEM, which is the non-residential equivalent of SAP).

B2 is aligned to the Government's direction of travel indicated by both the options proposed in the Future Home Standard 2023 consultation, in that no fossil fuel heating systems are proposed. B3 and B4 are not impacted because they address renewable energy, which is out of scope of the 2023 WMS.

Implementation considerations

To support these policies, it is vital that supplementary guidance is provided for the benefit of Development Management officers and the development industry. This is particularly important for B1, B2, B4 and B5 because specific information for policy compliance must be set such as:

- Examples of assured performance
- Acceptable scenarios where exceptional circumstances are valid for B3 and B4
- Methodologies and assumptions for energy performance calculations

Implementation may also be aided by setting validation criteria / checklists for applications to ensure they are including the right information with their planning application. Examples of SPD's and checklists which are comparable are: Warwick Net Zero Carbon Buildings SPD and Pro-Forma and Nottingham & Broxtowe Reduction of Carbon in New Buildings SPD (currently under consultation).

Information on the mechanisms of energy offsetting for B4 will need to be included in a planning document that addresses planning obligations.

For B3, renewable energy installations will need to be accompanied with calculations of expected outputs required under the policy by an MCS certifier, which should be set as a planning condition. This is to ensure renewable energy technology has been correctly installed and operates at the predicted output sufficient to deliver an on-site net zero energy balance.

Industry capability

With appropriate engagement with developers operating in the area throughout the local plan process, the local development industry should be well prepared to deliver on these policies. The policies require additional levels of skill to be applied through design and construction phases but do not introduce any new skills not currently known and utilised by developers.

Development Management capability

The capability of Development Management officers to accurately assess these policies is reliant on the degree of training and guidance documents available. It is essential that officers have guidance on hand to assess policies against to ensure that compliance is achieved in accordance with methodologies set out in a subsequent guidance document. Specific upskilling of at least one officer on climate change policies to gain a technical understanding will greatly assist the overall ability of the team to assess policy compliance.

Training sessions for Development Management officers on technical processes involved with net zero carbon development can strengthen internal capabilities to assess and scrutinise applications. These may include:

- Understanding of modelling techniques and tools (e.g. SBEM)
- Building elements energy performance values (e.g. U-values)
- Low-and zero-carbon heating and ventilation systems/technologies
- Orientation, form factor and design features for solar PV generation

Feasibility

Policy module B3 (on-site renewable energy generation) requires that non-residential buildings meet an on-site energy balance for **regulated** energy in operation, this differs from A3 which applies to residential dwellings due to the variability in the operational energy demand from commercial users. In homes, the unregulated energy demand is easier to model, whereas for non-residential buildings the unregulated energy demand of the occupier can vary based on the type of commercial activity, e.g. energy demand and use for light engineering will differ greatly from those for heavy manufacturing.

Part L 2021 operates differently between residential and non-residential buildings, primarily due to the different Part L energy modelling calculation methodologies: SAP for domestic buildings and NCM/SBEM for non-domestic buildings. It is therefore recommended that different levels of on-site carbon performance for individual non-residential typologies are required as per B1. It is important to note that achieving a 100% reduction – a net zero building under the Building Regulations framework including only regulated energy – in SBEM and SAP is more difficult than in more sophisticated modelling tools such as PHPP. Therefore, offsetting is more likely to play a significant role in Building Regulations framed policies.

The % TER reductions selected for Policy B1.1 are reflective of the recommended targets for 18 London Councils based on very recent modelling[xxxix] of what is feasible using various different solutions in various different types of non-domestic buildings. There is no technical reason why these should be any less feasible in TRDC than they are in London (in fact they may be more feasible, given that TRDC's development is likely to be lower-rise and less complex). There will however be a need to assess whether the TRDC market can carry the cost uplifts associated with these (discussed below). The difference in target % values for on-site TER reduction for B1 is due to differences in building shape and use. For example, offices tend to have higher energy demand than schools, whilst typically having less roof space relative to the internal floor area. Therefore, due to the typically higher energy demand but typically less available relative roof space to achieve an on-site net zero balance, a higher on-site % reduction value for the office is typically less feasible than for a school. Similarly, hotels

tend to have very high and sudden hot water loads which result in an unavoidably high energy use intensity and peaks in demand that may not be easy to meet with the lowest-carbon, lowest-cost, highest-efficiency technologies. These differences are reflected in the typology-specific target % reductions given in B1.

Feasibility of the overall approach of B1 – B4 is also supported by the evidence base of West of England authorities[xxxvii], in which the policy approach titled 'Approach 1' achieves net zero *regulated* emissions, which assumed fabric and energy efficiency levels based on the indicative Future Buildings Standard specification. The policy scenario in the West of England report achieves net zero regulated emissions by following the fabric first hierarchy, maximising rooftop solar PV and offsetting as a last resort, aligning with the overall approach of the policy recommendations above. However, it is clear that the net zero regulated emissions can feasibly be achieved without excessive offsetting. The costs associated with Approach 1 stated in the West of England report were as follows:

- 0.9 – 1.2% uplift on Part L 2021 baseline
- 1.6 – 2.4% uplift on Part L 2013 baseline

For the office archetype tested in the West of England, only 0.1% of the cost uplift was associated with offsetting, whilst the school archetype did not use offsetting to achieve net zero regulated emissions, as per B1 – B4 policy recommendations.

Precedents for policies structured similarly to B1 and B3 include London Plan and Milton Keynes Local Plan policies, both implemented from 2019. The London Plan requires a 35% on-site reduction on Part L 2013, as demonstrated to be feasible since 2013 in an analysis of planning applications throughout London councils – this on-site % reduction is also adopted by Reading Council. The Milton Keynes policy requires that a 19% reduction on Part L 2013 is achieved on-site *before* a further 20% from renewable energy, therefore presumably the first 19% is through energy efficiency measures. This Milton Keynes target was also supported by a local analysis of Building Regulations compliance data. The authority stated that it does "not anticipate that the requirement to exceed the TER by 19% will be unduly onerous for developers, as our analysis of BRUKL 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". We note that while these precedents are originally from a baseline of Part L 2013 (rather than TRDC's Part L 2021 baseline), London has since updated its guidance[xxxviii] to clarify that the 35% reduction should now be achieved from the new Part L 2021 baseline. Additionally, the success of these policies evidence that developers are able to understand and work with policy requirements that are structured in this way.

The feasibility of the annual PV generation target figure for 120kWh/m^2 floorspace is as described for the identical residential figure.

Estimating costs to test for viability

The requirement for a percentage of the TER reduction to be met through on-site measures acts as a backstop target to ensure that offsetting is not excessively and avoidably used. The % value is supported by Part L modelling undertaken for the Delivering Net Zero report[xxxix]. The cost uplifts stated in that report range from as little as 0.4 – 1.1% for offices and schools, but rise to 5.5% for the industrial buildings % target.

A certain amount of PV is already included in the cost uplifts stated in the 'Delivering Net Zero' report (cited above) to reach the TER % reduction targets echoed in TRDC draft policy B1.1. That amount of PV provision already accounted for varies by archetype. To find the cost of installing further PV (or offsetting) to match the remaining *regulated* energy use, we here calculate this based on the regulated-only portion of the energy use modelled in that report, and convert this to a kWp size, then multiply this by a nationally endorsed cost per kWp (as used for the 'residential – flats' costs discussed previously), minus the cost of PV that would already be int the Part L 2021 baseline. Converted to a % uplift on the Part L 2021 baseline stated in the 'Delivering Net Zero' report cited above, the PV/offsetting cost for TRDC draft Policy B3 is estimated as follows:

- Offices: 1.5% uplift
- Schools: 0.3% uplift
- Industrial buildings: 2.5% uplift
- Hotels (C2, C5) and residential institutions (C2, C2a): 6.3% uplift
- Other non-residential buildings (average of the above, excluding hotel as an outlier): 1.4%.

Adding this PV/offsetting cost to the median costs of achieving the fabric/services improvements for the required onsite TER reductions in the respective building types, **a total reasonable cost uplift for policies B1 – B4 is estimated as follows:**

- **Offices: 1.9%**
- **Schools: 1.4%**
- **Industrial buildings: 8%**
- **Hotels (C2, C5) and residential institutions (C2, C2a): 6.8%**
- **Other non-residential buildings: 3.3%.**

Notes on feasibility and cost of excelling beyond TRDC draft non-domestic policies

It is clear that the standards of B1 – B4 can be feasibly achieved. Further to this, it is therefore also enlightening to explore what level of performance can be demonstrated feasible in non-residential buildings according to industry best practice approaches (going further than the draft TRDC policies to instead use fixed energy efficiency targets measured by non-Building Regulations methods which some local authorities do not feel confident pursuing due to the disruptive perceived constraints of the 2023 WMS). The previously referenced South Oxfordshire & Vale of White Horse evidence base presents information on level of performance feasible in non-residential buildings, where energy use reduction is directly assessed and subsequently limited before determining solar PV output to achieve net zero status.

To achieve on-site net zero status (**including unregulated energy, which is in fact out of scope** for the draft TRDC B-suite policies), the following cost uplifts over Part L 2021 are found in the South Oxfordshire & Vale of White Horse reports cited above:

a. Office: 6.1%
b. School: 4.3%
c. Warehouse: 0%
d. Retail: 1.2%

The cost uplift in the Oxfordshire study, which is sometimes higher and sometimes lower than those of TRDC draft policies B1-B4, can be attributed to higher costs for better performance fabric and energy efficiency, alongside installing more solar PV to match *unregulated* energy use as well as *regulated*. Additionally, the modelled buildings in the Oxfordshire study are not identical to those in the 'Delivering net zero' London study that was previously cited to derive the estimated costs for B1-B4. However, it shows that even exceeding the policy requirements of B1–B4 does not result in an excessive cost uplift. In the context of the % uplifts assumed for B1–B4, there is therefore a clear incentive for developers to deliver industry best practice development that exceeds B1 – B4 at a capital cost that is not dissimilar to those of the draft policies – at least for some types of non-domestic building. Near equivalency in cost is associated with more favourable modelling tools (e.g. PHPP or TM54) to demonstrate a net zero balance, higher fabric costs but significantly lower solar PV costs.

Value uplift

We also note that there is **evidence that improved energy performance increases the sale value** in non-residential. For example, research by Knight Frank[xl] found a sale value uplift of 8%-18% for buildings with a 'green' rating. This uplift was 10.1%-10.5% for BREEAM (a holistic sustainability rating covering many topics) or 8.3%-17.9% for NABERS depending on how high the NABERS score is (NABERS is an energy-only rating that originated in Australia but is now available for offices in the UK). Noting that this study's UK evidence was of prime offices in the London market[xli], these uplifts should not be assumed to directly apply to all non-residential buildings in TRDC. However, they do provide a strong rationale for the viability assessment to assume some degree of sale value uplift for the draft policies described here (which would be likely to translate to a high NABERS rating).

Co-Benefits

The suite of policies outlined under **Policy B1** aims to drive significant improvements in energy efficiency and the reduction of regulated operational carbon in new non-domestic buildings. By setting ambitious improvement targets over **Part L 2021** standards, the policies deliver a range of economic, environmental, and social co-benefits.

Policy B1 requires improvements on Part L 2021 standards and directly reduces operational energy costs for building owners and occupants. By improving energy efficiency, these measures mitigate financial stress on businesses, particularly small and medium enterprises (SMEs), which can reinvest savings into growth, productivity, or workforce development. The positive weight and guidelines for the use of **absolute energy metrics** further strengthen this by encouraging buildings to meet ambitious targets for total energy use, directly reducing energy bills and promoting operational resilience. These metrics would also limit reliance on large solar PV installations under B3, reducing capital investment requirements. Additionally, improved energy efficiency standards reduce the need for future **costly retrofits** to meet tightening regulations, protecting building owners from future carbon compliance costs as the UK moves toward more stringent climate targets. For TRDC, this means fewer buildings requiring energy performance upgrades in the future, aligning with national and local net zero goals.

The policy suite, particularly through **B1** contributes to healthier and more comfortable indoor environments. By reducing energy demand and improving thermal efficiency, buildings will experience more stable temperatures, reducing overheating in summer and improving comfort in winter. This benefits **occupant well-being** by creating a healthier work environment, enhancing productivity and reducing absenteeism due to health issues. Moreover, the shift to **all-electric systems** (B2) eliminates reliance on gas, improving **air quality** inside and outside the building, and reducing the incidence of respiratory illnesses associated with fossil fuel combustion.

The reduction of regulated energy demand under B1 and the focus on on-site renewable energy generation under **B3** significantly contribute to the **reduction of carbon emissions**. These measures help decrease a building's operational carbon footprint and support the local authority's climate targets by ensuring non-domestic buildings align with the UK's pathway to net zero by 2050.

The integration of **on-site renewable energy generation** under B3 helps to alleviate stress on the national grid by increasing local energy resilience and self-sufficiency. This reduces reliance on external energy sources, contributing to **energy security** and lowering the risk of grid overload, particularly during peak demand periods.

Additionally, the removal of **fossil fuels** and connection to the gas grid under B2 further accelerates the transition to a clean energy system, helping to eliminate carbon emissions from heating systems and future-proofing non-domestic buildings against rising energy costs and carbon taxes.

The drive for energy efficiency and on-site renewable generation under **B1** and **B3** also reduces the need for costly and **carbon-intensive retrofits**. By meeting higher performance standards from the outset, buildings are less likely to require significant upgrades to meet future regulations, thus avoiding the **embodied carbon** associated with frequent material replacements or renovations.

Moreover, the focus on energy-efficient design under B1, including reducing energy use and space heating demand, ensures that non-domestic buildings are **future-proofed** for changes in energy demand, climate conditions, and regulatory environments.

By prioritising on-site renewable energy generation through **B3** and encouraging the adoption of **smart energy systems** under B6, the policy suite enhances **energy resilience**. Smart systems help to optimise energy consumption, ensuring that energy generated on-site is stored and used during periods of peak demand. This reduces the need for costly grid reinforcements and supports more efficient use of renewable energy. Additionally, the ability to integrate **energy storage** and **smart local grids** helps to reduce energy waste and enhances **self-sufficiency**, making businesses and buildings less vulnerable to external energy price fluctuations and supply interruptions.

The requirement for **post-occupancy evaluation** under B7 ensures that buildings perform as predicted, closing the **performance gap** between design and operation. This promotes energy accountability and transparency, helping TRDC monitor progress toward their climate targets while allowing building owners to adjust operations to optimise energy use over time.

The emphasis on high energy performance standards, on-site renewables, and smart energy systems creates demand for a wide range of skills, driving growth in **local green supply chains**. Policy suite B encourages investment in **green technologies**, supporting the development of local expertise in renewable energy, energy-efficient building design, and smart energy management. This can stimulate **job creation** and economic growth in the local area, while also supporting the transition to a **green economy**.

By setting higher energy efficiency and renewable energy generation targets, the policies align with the UK government's broader **net zero by 2050** commitments and compliance with future **Part L** updates. This alignment reduces the risk of non-compliance with future regulatory changes and supports the local authority's broader climate mitigation strategies.

In summary, the co-benefits of Policy Suite B extend beyond just carbon reduction. The policies look to drive **economic savings** for building occupants, improve **health and well-being**, foster **energy resilience**, and promote **local economic growth** through the creation of **green jobs**.

C. Climate-adapted Design and Construction

All new build residential and non-residential buildings should mitigate against climate change and adapt to climate change by employing sustainable design and construction principles.

Applicants are expected to submit an Energy Statement demonstrating these elements have been considered, and evidenced where appropriate by the corresponding assessment methodology. The following measures should be demonstrated:

C1 BREEAM	For new non-residential developments (including C1, C2, C2a and C5) over 1,000sqm or more should achieve BREEAM 'Excellent' certification, including full water credits for category Wat 01 (water efficiency).
C2 Sustainable Construction	All new developments must minimise their carbon footprint and energy impact through sustainable design and construction practices. Proposals should demonstrate efforts to reduce greenhouse gas emissions by considering factors such as site location, building orientation, design, landscaping, and planting strategies, while prioritising a "fabric-first" approach. Additionally, all new developments should be designed to enhance resilience to the anticipated effects of climate change. Proposals must incorporate measures to adapt to changing climate conditions, including resilience to extreme weather events, rising temperatures, stronger winds, droughts, heavy rainfall, and snow. Water conservation and storage measures should also be integrated into designs, taking into account best practices and future climate projections. All development should demonstrate consideration to reducing carbon emissions and waste through construction. Where development impacts existing buildings proposals should also comply with policy on 'Reducing carbon emissions in existing buildings'.

C3 Cooling hierarchy	All development proposals should show how designs have optimised the internal and solar heat gains to balance the need to minimise space heating demand with the need to passively maintain comfortable temperatures during hot summers.
	
	This should be shown by demonstrating that overheating risk measures have been incorporated in accordance with the cooling hierarchy which prioritises measures, as follows:
	
	• Minimise internal heat generation through energy-efficient design and equipment selection.
	• Reduce and manage the amount of heat entering the building in summer using:
	  • Building orientation
	  • Shading
	  • Albedo
	  • Fenestration
	  • Insulation.
	• Manage heat within the building through exposed internal thermal mass and high ceilings.
	• Passive ventilation, including cross ventilation through a building wherever possible. Passive stack and wind-driven ventilation, night purging and designing windows to allow effective and secure ventilation. Single aspect developments are discouraged.
	• Natural cooling measures including green and blue infrastructure.
	• Use of mixed-mode cooling such as low-energy mechanical cooling (fan-powered ventilation).
	• Mechanical ventilation (which, if it has a heat recovery function, should also have a summer bypass mode).

C4 Overheating assessment	All major residential developments should complete **CIBSE TM59** overheating assessment as their route to compliance with Building Regulations Part O (or future equivalent assessment methodology). The simplified Part O route will not be considered acceptable. All major non-residential developments should complete **CIBSE TM52** overheating assessment (or future equivalent assessment methodology)
C5 Resilience to climate change	All development should incorporate measures that increase resilience to extreme weather events and a changing climate, including increasing temperatures and frequency and intensity of rainfall. All developments should: ▪ Reduce the risk of flooding and conserve water ▪ Employ sustainable urban drainage

	Development proposals sould reduce the 'heat island' effect through the use of cool materials and green and blue infrastructure within the development.

Supporting text and notes

To ensure that buildings are not at risk of overheating, applicants are required to demonstrate compliance with additional assessments beyond the standard requirements set by Building Regulations. C4 of the policy mandates that all major residential developments complete a CIBSE TM59 overheating assessment to assess and mitigate overheating risk, in addition to the basic compliance with Building Regulations Part O (or its future equivalent). For major non-residential developments, a CIBSE TM52 overheating assessment must be completed, or the future equivalent.

These additional assessments go beyond the standard regulatory checks to ensure that the building design considers factors such as internal heat generation, ventilation, and shading to avoid uncomfortable indoor temperatures during hot summer months.

The Energy Statement should include the relevant overheating assessment reports, demonstrating that the design of the building effectively addresses overheating risk and includes measures to minimise it

For BREEAM, applicants are expected to submit a BREEAM pre-assessment to demonstrate that the relevant BREEAM level has been designed into the scheme, and that more than the minimum WAT 01 credits (for the respective certification level targeted) will be achieved. A condition upon any grant of planning permission is expected to ensure that the development is completed in accordance with the BREEAM pre-assessment and that the BREEAM certification is provided once the building is completed.

Scope for future improvements

This policy focuses on the general principles of sustainable design and construction, and so there is not as many numerical targets as you would find in the energy and carbon policies above. However, BREEAM certification is included in this policy as BREEAM considers a multitude of sustainable design and construction modules under its certification scheme. There is scope to increase the level of BREEAM certification to require BREEAM outstanding in future iterations of the Local Plan. Or alternatively, like with targeting the water (Wat 01) credits, there could be scope to stipulate achieving a certain level of credits within a particular module.

TRDC is in an area of serious water stress and water conservation is a vital aspect of how we can mitigate against climate change and use natural resources more efficiently. Included within the policy is the requirement for BREEAM Wat 01 credits which reduce the use of water within non-residential buildings. The policy may also seek to set a requirement for residential dwellings, to limit the water use to 105litres/per person/per day (note that this above current Building Regulations. Additional requirements for residential developments could include:

- Every new home with a garden must be fitted with at least one water butt (unless an alternative rainwater harvesting scheme is implemented that would make this redundant),
- Compliance with exemplar water efficiency standards (such as the Royal Institute of British Architects '2030 Climate Challenge' water use targets) to be encouraged.
- Development at site allocations and major development should maximise water efficiency through large-scale rainwater harvesting and grey water recycling schemes where it is feasible and viable to do so..

Alignment with national policy

The NPPF requires that the planning system takes full account of the long-term implications of climate change including the risk of overheating.

Part O of Building Regulations requires overheating assessments to be undertaken in residential development, with CIBSE TM59 provided as one route to compliance for residential buildings. Therefore, C4 is aligned with national policy approaches.

However, Part O does not require that TM59 is completed, as the Simplified Method can be alternatively used. Additionally, CIBSE TM52 is not referenced because Part O does not relate to non-residential buildings.

The Housing Update Written Ministerial Statement (15 December 2021) states that there is no need for local policy to duplicate Part O policy. The cooling hierarchy (C3) is not referenced in Part O and CIBSE assessment are not *required*, therefore C3 is not a duplicate of national requirements.

The extensively referenced 2023 WMS does not impact C1 – C5 as the scope of the WMS only impacts energy efficiency standards.

Implementation considerations

Specific information on overheating assessments should be set out in supplementary policy guidance. Implementation may also be aided by setting validation criteria / checklist for applications to ensure they are including the right information with their planning application and within the Energy Statement. Examples of SPD's and checklists which are comparable are: Warwick Net Zero Carbon Buildings SPD and Pro-Forma and Nottingham & Broxtowe Reduction of Carbon in New Buildings SPD (currently under consultation). See also RBWM Sustainability SPD on adaptive climate measures.

Although mechanical ventilation is listed down the cooling hierarchy as part of C3, the use of mechanical ventilation with heat recovery (MVHR) should not be viewed negatively as this may assist compliance with operational energy policies. However, MVHR should have the ability to bypass the heat recovery function in periods of warmer weather in order to support the overheating risk mitigation goal.

Industry capability

Overheating assessments are a requirement of Building Regulations Part O (for residential), and is a common measure performed in the design of good-quality non-residential new buildings especially where a BREEAM rating is sought. Therefore, it should not inflict any significant additional burden on the development industry to deliver on C1 and C3.

BREEAM is a very commonly used and sought-after certification within the major non-residential development industry. It is required in many other local plans with generally good compliance.

Development Management capability

The cooling hierarchy is simple to follow and assess to grant policy compliance, assuming some officers have had training carried out and have guidance to refer to. CIBSE overheating assessments (referred to in Policy C4) give results in terms of passing or failing certain criteria (or percentage of rooms in the building that pass or fail the criteria). Those criteria vary by type of building or room. Guidance on how to assess CIBSE overheating assessments will make policy compliance simple to grant or not.

Costs and feasibility

No evidence of costs available. Feasibility is evidenced in that Part O of Building Regulations essentially includes the TM59 process and will require some buildings to undertake that assessment even in the absence of the policy (TRDC is unlikely to be categorised as a 'high risk location', but TM59 is still triggered in Part O where a building exceeds certain glazing ratios). There does not seem to have been a national impact assessment covering costs for Part O in the same way there was for Part L. Therefore, presumably national government does not envision costs significant enough to inhibit viability.

Co-Benefits

While Policies A and B ensure that new dwellings and non-residential buildings are energy-efficient, Policy C addresses the critical need to mitigate the risks associated with overheating and climate vulnerability. This is essential in light of rising global temperatures and the increasing frequency of extreme weather events. Without effective design interventions, factors such as building orientation and glazing ratios could elevate the risk of overheating. To respond to this, Policy C includes modules C3 (the cooling hierarchy) and C4 (overheating assessments), which ensure that new developments do not contribute to unacceptable levels of overheating risk.

The cooling hierarchy prioritises passive design measures (e.g., shading, natural ventilation, thermal mass) over mechanical cooling systems, creating more comfortable indoor environments that promote occupant health and comfort. This approach reduces the need for air conditioning and other energy-intensive systems, contributing to lower operational energy demands and improved thermal comfort throughout the year. In the context of rising global temperatures, maintaining safe and comfortable indoor conditions helps prevent health risks associated with heat stress, particularly for vulnerable populations such as the elderly, children, and those with pre-existing health conditions.

By prioritising passive cooling measures over mechanical systems, Policy C helps occupants avoid the additional financial burden associated with running air conditioning or other cooling technologies. This aligns with the overarching goals of policies A and B by further reducing operational energy demand and occupant bills. Through cost savings on energy use, particularly in warmer months, Policy C supports both affordability and energy resilience. For non-residential buildings, the BREEAM Wat 01 credits also incentivises the use of water-saving measures, insulating building occupants from excessive water costs, a critical consideration in areas facing water stress.

Policy C acknowledges the increasing pressure on water resources, especially in water-stressed regions. For non-residential buildings, water use limits aligned with BREEAM Wat 01 credits promote efficient water consumption and reduce operational costs. Although some water-saving measures for residential buildings (such as reduced-flow taps or lower-capacity sanitary ware) can be retrofitted by occupants, setting water use limits ensures that homes are built with long-term water efficiency in mind, contributing to climate resilience. Even in cases where retrofitting occurs post-occupancy, the initial design measures set a baseline of sustainability that supports long-term environmental goals.

Policy module C5 emphasises adaptive measures such as sustainable drainage systems (SuDS) and the incorporation of green and blue infrastructure, linking closely with other local plan policies on flood risk management and biodiversity. These measures not only mitigate the impacts of extreme weather events, such as flooding and drought but also provide co-benefits like enhanced biodiversity and improved well-being for occupants. Access to green spaces and natural environments has been proven to improve mental health, promote physical activity, and foster community resilience.

Policy C works holistically with other local plan policies to create environments that are more resilient to climate change. Through strategies like flood management, green infrastructure, and passive cooling, Policy C looks to ensure that occupants are safeguarded from the risks posed by climate events, such as heat waves, flooding, and water shortages. This comprehensive approach not only reduces the likelihood of future retrofitting (which can be disruptive and costly) but also promotes future-proofing of new developments, ensuring long-term sustainability and occupant well-being.

The integration of green and blue infrastructure within the policy framework offers additional social and environmental co-benefits. Green spaces, tree canopies, and water features improve urban cooling by reducing the heat island effect, enhancing air quality, and provide recreational opportunities, which directly benefit both physical and mental health. This contributes to social well-being, promoting healthier, more connected communities. Moreover, these features enhance biodiversity, supporting local wildlife and contributing to ecosystem resilience in urban areas.

Policy C, in conjunction with Policies A and B, contributes to a comprehensive approach to sustainable building design that promotes healthier, more comfortable living environments, enhances climate resilience, and reduces financial stress by limiting energy and water costs. By addressing overheating risks, improving water efficiency, and integrating climate-adaptive infrastructure, Policy C supports the creation of future-proof buildings that align with long-term sustainability goals. This policy ensures that new developments are not only energy-efficient but also resilient to the impacts of climate change, creating environments that enhance occupant well-being and reduce future retrofitting needs.

D. Embodied carbon and waste

Residential and non-residential buildings (thresholds given below) must meet the following requirement:

D1. Embodied carbon reporting	All major new residential (10 dwellings or more) and non-residential (1000 m^2 floorspace or more) developments are required to complete a whole-life carbon assessment in accordance with **RICS Whole Life Carbon Assessment** guidance.
D2. Limiting embodied carbon	All large-scale major development (100 dwellings or more; 5,000 m^2 non-residential floor space or more) is required to limit embodied carbon (RICS/BS 15978 modules A1 – A5) to **600 $kgCO_2e/m^2$ GIA**.
D3. Building end-of-life	All new buildings are to be designed to enable easy material re-use and disassembly, subsequently reducing the need for end-of-life demolition.
D4. Demolition audits	All major development that contains existing buildings/structures to carry out a pre-redevelopment and/or pre-demolition audit, following a well-established industry best practice method (e.g. BRE) in accordance with the policy on 'Reducing carbon emissions in existing buildings'.
D5. Narrative on embodied carbon in minor development	Proposals for new development of 1 or more homes or ≥100m2 non-domestic floor space, but below the size thresholds for embodied carbon reporting and targets as noted above, should include proportionate narrative on options considered (and where possible, decisions made) to minimise embodied carbon of the proposed development.

Supporting text and notes

Compliance with D1, D2 and D3 are to be demonstrated within an energy statement. If applicable, output reports for D4 should be submitted alongside an energy statement.

For D3, designing for material re-use and disassembly is crucial for creating sustainable buildings and supporting a circular economy. To ensure buildings can be adapted or dismantled at the end of their life, developers should focus on modular design using dry construction methods (e.g., bolts, screws) to enable easy disassembly. Avoiding permanent adhesives and welds allows materials to be reused or recycled efficiently.

Furthermore, material selection is key. Low-embodied-carbon materials like timber or recycled steel are preferred for ease of reuse. Designs should prioritise durable, long-lasting materials and incorporate a reuse strategy for managing materials at the building's end of life, including deconstruction and sorting for recycling or reuse

For D5, it is recognised that the level of detail required will vary depending on the size and scale of the development. The aim is to encourage applicants to consider embodied carbon, while avoiding excessive or impractical requirements for smaller sites. Applicants should provide a proportionate narrative in their energy statement, exploring how embodied carbon has been minimised. While detailed assessments are not required for smaller developments, the following considerations are encouraged:

- Incorporating and repurposing on-site materials or features where possible.
- Designing with a focus on reducing material use, such as through space-efficient layouts or structural design.
- Opting for materials with lower embodied carbon, such as timber, instead of higher-carbon materials like steel, aluminium, or conventional cement.
- Reducing 'product miles' by sourcing materials closer to the site or from manufacturers with demonstrated low-carbon practices.
- Implementing processes that reduce material wastage during construction.

This approach ensures that applicants, even for smaller developments, are considering embodied carbon in a meaningful way, fostering sustainable practices without imposing excessive burdens on projects that do not meet the higher thresholds for formal reporting.

Scope for future improvements

There is significant scope for future improvements for embodied carbon and waste policies. In particular, standards set for D2 should be lowered in future local plan reviews as embodied carbon policy becomes integrated into local and national policy, for example in line with the 2030 target set by LETI/RIBA (subject to evidence of feasibility and cost at the time of adopting such targets).

As policy is implemented on embodied carbon, industry will become better placed to deliver on ambitious policy requirements and move towards net zero embodied carbon emissions.

Alignment with national policy

Whilst there is no explicit reference to embodied carbon in the NPPF, the NPPF references to 'low carbon development' and 'low carbon economy' could readily include embodied carbon as an implicit part of the equation.

A new paragraph, paragraph 163, in the revised NPPF in December 2024 however requires that the full range of potential climate change impacts is considered when preparing and assessing planning applications. It's considered that it would be wholly irrational for decision makers to refuse climate change as a consideration, and that consideration can include embodied carbon, or downstream emissions, as well as reductions in carbon emissions from buildings themselves.

Additionally, embodied carbon is a design issue and therefore should logically fall under the NPPF's instruction that "New development should be planned for in ways that … can help to reduce greenhouse gas emissions, such as through its … design". The case for addressing embodied carbon is justified by the increasing proportional importance of these emissions as a share of buildings' total carbon footprint as the power grid is decarbonised

In respect of Building Regulations, embodied carbon is not part of Building Regulations currently. Therefore on this topic, there is no particular national policy with which the local policy can be expected to align.

The industry proposal of Part Z, as an additional document to Building Regulations, has been going through the parliamentary process and could be integrated before the adoption of this local plan. This would require that whole-life carbon reporting is implemented in Building Regulations and that emissions limits are set from 2027. It is aligned with the RICS Whole Life Carbon method, the same as specified in the draft TRDC policies above. More recently in early 2024, a further coalition of respected industry standard-setting bodies has released a policy paper pressuring the next Government to introduce Part Z.

The Environmental Audit Committee states that embodied carbon assessments must be undertaken for new development and that if embodied carbon emissions are not actively reduced, the UK will not remain within its carbon budgets nor achieve its 2050 net zero target. Therefore, there is a clear justification for local authorities to require embodied carbon assessments and limit emissions arising from the construction of new development.

Policy D in combination with policies A and B, seeks to ensure that carbon emissions are limited across the whole life cycle of a building. Without this combination of policies, large amounts of carbon emissions would be missed (as much as 50% of a building's lifetime carbon emissions result from upfront embodied carbon). The Committee on Climate Change has also identified that decarbonisation of the manufacturing & construction sector (including through resource efficiency and production fuel switching) is an essential component in the future scenarios for the UK's 6th carbon budget (part of the Climate Change Act).

The previously referenced 2023 WMS is not relevant to policy D1 – D5, as the scope of that WMS only impacts energy efficiency standards.

Implementation considerations

Information and requirements on embodied carbon assessments will need to be set out in supplementary policy guidance to enable developers to sufficiently demonstrate policy compliance. Methodologies and the scope of embodied carbon assessment should be clarified, alongside other potential implications such as third-party verification.

Similarly, acceptable methodologies (i.e. RICS Whole-Life Carbon Assessments guidance) to comply with D1 and D2 should be set out in guidance. An example of an SPD's which includes guidance on WLCA is: Warwick Net Zero Carbon Buildings SPD.

Industry capability

The required embodied carbon limit set within point D2 represents an ambitious but achievable target for developers, acting as a backstop to prevent large-scale developments from excessive embodied carbon emissions.

The expectation set by point D3 (demonstrating ease of future building disassembly for future reuse) and D4 (pre-demolition or pre-redevelopment audit) are both within the industry's current capability in that they are part of the most common environmental certification system used across the industry (BREEAM), with widespread take-up (especially within the non-domestic sector):

- Pre-demolition or pre-redevelopment audits are not uncommon in the development sector, as they are one of the actions that developers often choose to take in order to gain certain credits within the very widespread BREEAM certification (relevant credit: BREEEAM 'Wst 01'[xlii]). The industry in London is familiar with these as part of that region's requirement for circular economy statements; as a result many of the major nation-wide built environment consultancies have had exposure to these. Alternatively, these audits are offered as a service by the BRE itself, and by some demolition contractors. Guidance on best practice is available from the BRE[xliii].
- BREEAM credit (Wst 06) requires the applicant to produce "a study to explore the ease of disassembly and the functional adaptation potential" of several different design options, and from that study to "develop recommendations or solutions … during or prior to concept design, that aim to enable and facilitate disassembly and functional adaptation". This would be relevant to the recommended policy point D4. Also, any industry body that is also active within London will also have gained exposure to this concept through the GLA's requirement for circular economy statements, whose guidance[xliv] notes that three of the six 'circular economy principles' are 'building in layers', 'designing for adaptability or flexibility', and 'designing for disassembly'. While such analysis may not be commonplace outside London, it is not unheard of, and this policy is designed to boost the practice by increasing the demand and thus encouraging the local development industry to grow its capacity to produce this analysis that will be a vital part of the local and national transition to net zero. Other than the GLA, guidance is available from several sources online including ISO[xlv] and UKGBC[xlvi,xlvii].

Development Management capability

The capability of Development Management officers to accurately assess these policies is reliant on the degree of training and guidance documents available. It is essential that officers have guidance on hand to assess policies against to ensure that compliance is achieved in accordance with methodologies set out in a subsequent guidance document. Specific upskilling of at least one officer on climate change policies to gain a technical understanding will greatly assist the overall ability of the team to assess policy compliance. Officers could familiarise themselves with the following to better understand and assess embodied carbon calculations:

- Different scopes of carbon (e.g. upfront embodied carbon vs. whole-life carbon)
- Knowledge of RICS whole-life carbon assessment guidance
- General understanding of low-carbon materials
- Good practice efficient structural design choices to reduce embodied carbon

Costs and feasibility

For Policy D1: No robust industry-wide evidence is available about the costs of the embodied carbon assessment, but anecdotal experience in recent years suggests this could be around £10,000-15,000 depending on the size and complexity of the project. If this figure is used in viability testing, it should only be applied where the policy applies.

Alongside testing the feasibility of operational energy policy requirements, the South Oxfordshire and Vale of White Horse evidence base also explored the feasibility and costs of embodied carbon emissions limits on the tested residential and non-residential archetypes. The limit set out under D2 has been shown to be feasible for all archetypes, as modelled under a Part L 2021 scenario.

Using typical materials required to comply with Part L 2021 (i.e. current industry standard), no archetype exceeded 559 $kgCO_2/m^2$ GIA. Therefore, this can be considered a cost neutral limit since the Part L 2021 scenario represents business-as-usual. The only costs therefore associated with D1 and D2 only arise from the cost of an embodied carbon assessment, which generally comes at a cost of no more than £15,000. Given that D1 only applies to large-scale development, the relative cost uplift of an embodied carbon assessment is negligible.

To achieve industry best practice targets aligning with LETI guidance[xlviii], cost uplifts increase but also assume that the archetype has achieved net zero status accounting for both regulated and unregulated energy. These can be summarised from the results of the evidence base as follows:

- Residential (excluding flats) (from 2025): **300 $kgCO_2e/m^2$ GIA**
- Non-residential and flats (from 2030): **350 $kgCO_2e/m^2$ GIA**

If these more ambitious embodied carbon targets were therefore adopted alongside the A- and B-suite policies, the following cost uplift values would be expected to be lower.

Please note the following cost uplifts do not apply to the draft TRDC target of 600kg/m² but are provided here to give a general idea of the scale of the cost that could be incurred if the policy were amended to more ambitious targets.

- Semi-detached: 10%
- Terraced: 9%
- Detached: 6%
- Flats: 12%
- Retail: 12%
- School: 10%
- Office: 7%
- Warehouse: 9%

Another evidence study produced by WSP[xlix] for West of England authorities in 2021 found that a cost neutral embodied carbon limit is 900 $kgCO_2e/m^2$ GIA, which was subsequently adopted by Bath & North East Somerset Council as a policy. The difference between the two business-as-usual limits 900 $kgCO_2e/m^2$ GIA in the 2021 study compared to 550 $kgCO_2e/m^2$ GIA in the 2024 South Oxfordshire and Vale of White Horse study suggests that industry and supply chains can now achieve embodied carbon limits more cost effectively. This pattern is expected to continue as embodied carbon is increasingly considered throughout industry and policy.

Co-Benefits

Policy D establishes a framework to reduce the environmental impact of both residential and non-residential buildings by targeting **embodied carbon**—the emissions associated with materials and construction processes throughout a building's lifecycle. By addressing embodied carbon and promoting sustainable construction practices, this policy could deliver a range of **co-benefits** that extend beyond carbon reduction, supporting wider economic, environmental, and social goals.

The requirement for **whole-life carbon assessments** under **D1** ensures that all major developments assess and mitigate the full carbon impact of building materials and construction. By limiting embodied carbon in large-scale developments (e.g., to 600 kgCO2e/m2 GIA under **D2**), Policy D plays a pivotal role in reducing the carbon impact of construction, which can represent up to 50% of a building's total emissions.

By promoting **circular economy principles**, particularly in **D3** and **D4**, which focus on material reuse and the ease of disassembly at the end of a building's life, the policy encourages more resource-efficient construction. This not only reduces waste generation but also **lowers costs** associated with future demolition, material procurement, and disposal. Designing buildings for disassembly and **material reuse** helps reduce dependency on raw materials and limits costs related to sourcing and transporting new materials. It also promotes **long-term economic savings** for developers and property owners by maximising the value of materials throughout their lifecycle.

The embodied carbon limits and reporting requirements stimulate the adoption of **innovative construction methods** and **low-carbon materials**. Developers and builders will explore new technologies, such as **modular construction**, **prefabrication**, and the use of **low-carbon materials** like timber, reclaimed steel, or recycled aggregates. This shift drives demand for **green building products**, creating opportunities for local businesses and manufacturers, particularly within the **green economy**, while fostering **local supply chains** that specialise in sustainable materials and techniques.

The requirement for **demolition audits** under **D4** ensures that before any building is demolished, the potential for reusing or recycling materials is thoroughly assessed. This reduces the amount of waste sent to landfill and encourages the **repurposing of valuable materials** within the construction industry, supporting circular economy principles. By maximising material reuse, the policy mitigates the environmental impacts associated with resource extraction, waste disposal, and material production, aligning with **national waste reduction targets**.

By designing for **disassembly and material re-use** (**D3**), new buildings will be more **adaptable** and **future-proofed**, capable of being modified, extended, or dismantled with lower environmental impact. This leads to greater **building longevity** and **flexibility**, enabling spaces to evolve without the need for significant new construction. This adaptability contributes to **reduced lifecycle costs** and makes buildings more resilient to changing demands, whether for residential or commercial purposes.

The policy's focus on **limiting embodied carbon** and promoting **sustainable construction** aligns with broader goals for **climate resilience**. Buildings that are designed to limit embodied carbon are often constructed with materials that perform well in diverse climate conditions, further supporting long-term sustainability. Additionally, the reduction of carbon emissions through material choices and construction processes ensures that new developments have a smaller climate impact, helping to mitigate global warming and the associated risks of **climate change**.

The requirement to provide a **narrative on embodied carbon** for smaller developments under **D5** encourages developers of all scales to consider sustainable construction methods and communicate their choices. This fosters greater **awareness** and **engagement** with sustainable practices, promoting social responsibility within the construction industry. It also encourages **community involvement** by ensuring that developers actively consider the long-term environmental impacts of their projects,

which can contribute to **positive relationships** with local communities concerned about the **environmental footprint** of new developments.

E. Reducing carbon emissions in existing buildings

Development which would result in considerable improvements to the energy efficiency, carbon emissions and the general suitability and longevity of an existing building will be supported, with significant weight attributed to those benefits.

All development proposals involving existing buildings must submit a feasibility assessment within an Energy Statement which demonstrates:

E1 Prioritise retrofit-first principles	Development should adopt a retrofit-first approach, where options for retrofitting and retention of existing buildings are considered before demolition. The appraisal should demonstrate that a whole building approach, and the following hierarchy has been considered: a. Refurbishment and upgrading of existing building fabric including wall, roof and floor insulation, windows, doors and thermal bridging. b. Installation of low or zero-carbon heating and hot water systems, and the installation of renewable energy generation on-site c. Connection to an existing or planned low carbon heat network Applicants are recommended to utilise a nationally recognised quality assurance scheme such as BSI PAS 2035 Where substantial or total demolition is proposed, the feasibility assessment should demonstrate: d. The whole life carbon of a new building(s) would be less or similar to a suitably comparable retrofit option (as detailed in a-c above). e. The proposed development would deliver public benefits which would not be delivered by a suitably comparable retrofit option. f. The feasible reasons retrofit cannot be considered, including operation or structural requirements. It is recommended that applicants engage with the District Council early in the development of proposals around feasibility assessments and alternative options. Demolition of existing buildings will only be permitted where developers can demonstrate that alternative development options have been comprehensively explored and on balance, the proposed demolition of existing buildings secures benefits over and above retention, refurbishing and retrofitting an existing building(s).
E2 Embodied carbon	For major developments involving substantial or total demolition of an existing buildings, applicants should submit a Whole Life Carbon Assessment in accordance with Policy D1.
E3 Adapting heritage assets to climate change	Development which would result in considerable improvements to the energy efficiency, carbon emissions, resilience and longevity of designated or non-designated heritage assets will be supported, providing that significance of the asset is conserved. A whole-house approach should guide interventions to upgrade historic buildings, and direct interventions to where they limit the impact to the significance of the historic buildings, or their setting. Development which would result in considerable improvements to the energy efficiency, carbon emissions, resilience and longevity of buildings with a Conservation Area should conserve and enhance the character and appearance of the area. The sensitive retrofitting of energy efficiency measures and the appropriate use of micro-renewables in designated and non-designated assets and within Conservation Areas will be encouraged, providing that the significance, character and appearance are conserved.

Supporting text and notes

Compliance with E1 should be demonstrated within the energy statement. If applicable, output reports for E2 should be submitted alongside an energy statement.

For E1, it is accepted that the level of detail will be lower for householder and minor applications. The aim for these applications is to ensure applicants explore the topic of retrofitting under criteria E1 a-c. However, where substantial or total demolition is proposed applications would still be expected to assess the embodied carbon of alternatives to demonstrate why this level of demolition would be acceptable.

E3 aligns with Local Plan policy 'Heritage and the Historic Environment'.

Scope for future improvements

As discussed in the literature view, it would be difficult to create any universal requirements for energy or carbon performance as the existing housing stock in TRDC varies in the typology of housing, age and use.

TRDC could explore how the policy could stipulate that all existing buildings undergoing retrofitting must achieve a minimum EPC rating, with progressively higher targets established over time. This could be outlined as follows:

- Initial Target: Set a baseline EPC rating that all retrofit projects must achieve upon completion.
- Progressive Improvement: Require that, within a specified time frame (e.g., every 5 years), buildings must improve their EPC rating by a set increment. For example, a building currently rated EPC D might be required to achieve EPC C within 5 years, followed by EPC B in the subsequent 5 years.

The policy could require that all major retrofitting projects undergo a post-occupancy evaluation to assess the actual energy performance of the building against pre-retrofit predictions. This could include:

- Require property owners to track energy consumption for a specified period (e.g., 1-3 years) after completion of the retrofit. This data should be compared against the building's predicted energy performance to identify any discrepancies.
- Establish a structured process for collecting feedback from occupants regarding their comfort levels, energy usage patterns, and overall satisfaction with the building's performance.

The policy could be expanded in the future to include targets for waste recycling where demolition is permitted. For example, the GLA Circular Economy Guidance contains targets for recycling rates in demolition (95%), excavation (95%), construction(95%) and municipal waste (65%).

As noted under Policy D, there would be scope to tighten the embodied carbon limit to LETI/RIBA targets also. Additional, under Policy A and B there is scope to tighten carbon reduction from any resulting new build development.

Alignment with national policy

The Committee on Climate Change[I] has shown (and Government has recognised[Ii]) 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. Locally this is also recognised as a priory, owing that approximately 1/3 of the districts' emissions are sourced from existing buildings. Therefore, local plan policy that supports applicants in improving the efficiency of buildings, reducing energy demand, carbon emissions and limiting embodied carbon aligns with local and national carbon targets (including the UK's legally mandated Carbon Budget).

This policy also provides positive impetus for the removal of gas boilers in existing buildings ahead of the Government's phasing out of gas boilers, planned for new homes from 2025 in new builds and existing buildings from 2035.

National Planning policy supports the transition to a low carbon future, paragraph 161 of the NPPF states that '*the planning system should support the transition to net zero by 2050 ...[by] shaping places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.* Furthermore, a recent insertion into the NPPF, paragraph 167 states '*LPA's should also give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings [domestic and non-domestic]... where the proposals would affect conservation areas, listed buildings or other relevant designated heritage assets, local planning authorities should also apply the policies set out in chapter 16 of this Framework*".

The 2023 WMS is not relevant to policy E1-E2, as the scope of that WMS only impacts energy efficiency standards, and the policy does not stipulate any requirements for existing buildings.

Implementation considerations

To support applicants in retrofitting existing buildings, guidance around interventions would be helpful. There is a plethora of guidance available which could be signposted including: LETI Climate Emergency Retrofit Guide (LETI, 2021), Net Zero Carbon Toolkit (Etude, Elementa, Passivhaus, Levitt Bernstein, 2021), and Passivhaus Trust's Retrofit Primer (2022)

In respect of historic buildings, guidance directed to conserve and enhance heritage assets should be signposted including Historic England's Energy Efficiency and Retrofit Guidance.

As noted previously, information and requirements on embodied carbon assessments will need to be set out in supplementary policy guidance to enable developers to sufficiently demonstrate policy compliance to Policy D and E.

Industry capability

As previously noted under policy D, the expectation set by point D3 (demonstrating ease of future building disassembly for future reuse) and D4 (pre-demolition or pre-redevelopment audit) are both within the industry's current capability in that they are part of the most common environmental certification system used across the industry (BREEAM), with widespread take-up (especially within the non-domestic sector).

Furthermore, whole life carbon assessments are required under Policy D1 at a major development scale, and such the inclusion of E1 is not thought to increase the burden to developers in comparing embodied carbon in alternative options.

For E1, it is accepted that the level of detail will be lower for householder and minor applications. The aim for these applications is to ensure applicants explore the topic of retrofitting under criteria E1 a-c, although where substantial or total demolition is proposed applications would still be expected to assess the embodied carbon of alternatives to demonstrate why this level of demolition would be acceptable. This may be challenging for individual developers but considered necessary against the scale of carbon reductions required to meet local and national targets. Applicants are encouraged to engage with the district council early, so that reporting and alternative options can be considered before an application is made.

The products and the skills to install these measures outlined in E1 a-b are found within the current workforce and such are deemed feasible for the industry. In respect of E1c, this is only where current or planned heat or power networks are in the locality and may not be applicable.

Development Management capability

The capability of Development Management officers to accurately assess these policies is reliant on the degree of training and guidance documents available. It is essential that officers have guidance on hand to assess policies against to ensure that compliance is achieved in accordance with methodologies set out in a subsequent guidance document. Specific upskilling of at least one officer on climate change policies to gain a technical understanding will greatly assist the overall ability of the team to assess policy compliance. Officers could familiarise themselves with the following to better understand the application of this policy:

- Retrofitting guidance; LETI, Net Zero Toolkit or Passivhaus Retrofit Primer
- Different scopes of carbon (e.g. upfront embodied carbon vs. whole-life carbon)
- Knowledge of RICS whole-life carbon assessment guidance
- General understanding of low-carbon materials
- Good practice efficient structural design choices to reduce embodied carbon

Costs and feasibility

The policy has been intentionally drafted to require more detailed assessment where substantial or total demolition is proposed. By following a hierarchical approach, applicants are expected to demonstrate first how a retrofit first approach has been taken, in refurbishing and retrofitting the existing building for that use, before significant demolition is sought.

As noted previously, the skills and products are readily available within the supply chain to satisfy E1 a-b. Some individual or small developers may find E1 d-f but these measures are considered necessary against the scale of carbon reductions required to meet local and national targets. Applicants are encouraged to engage with the district council early, so that reporting and alternative options can be considered before an application is made, this would include discussion on the proportionate level of reporting based on the proposals at hand.

From Policy D1: No robust industry-wide evidence is available about the costs of the embodied carbon assessment, but anecdotal experience in recent years suggests this could be around £10,000-15,000 depending on the size and complexity of the project. If this figure is used in viability testing, it should only be applied where the policy applies (major development).

Co-Benefits

The hierarchical approach to retrofitting prioritises fabric upgrades and energy efficiency improvements before incorporating low- or zero-carbon heating, hot water systems, and renewable energy generation. This strategy aligns with Policy A and ensures that existing buildings become more comfortable, temperate, and cost-effective to operate. The immediate benefits to occupants include enhanced comfort and reduced energy bills, while the long-term advantages contribute to the durability and longevity of the buildings. Thus, Policy E1 not only mitigates the risk of costly retrofits in the future but also minimizes the embodied carbon loss associated with demolition.

Furthermore, Policy E supports the expansion of embodied carbon reporting and targets, fostering transformative changes across various sectors, including:

- By emphasising the reuse of existing buildings and materials, this policy reduces the extraction of raw materials, contributing to more sustainable resource management.
- The policy encourages manufacturers to lower carbon emissions during processing by adopting less carbon-intensive production methods, such as operating at lower temperatures or eliminating processes that generate significant carbon dioxide emissions.
- By promoting local sourcing of materials and reducing the need for transportation, the policy supports efforts to decrease travel distances, utilise less carbon-intensive transportation methods, and incorporate sustainable fuels.
- The focus on increasing recycled content in products and ensuring that materials can be repurposed supports circular economy principles, reducing waste and promoting sustainability.

The integration of Policies D and E not only fosters the development of innovative products and services that actively contribute to carbon reductions but also stimulates growth within the green economy. Moreover, these policies align with broader sustainability goals, helping to drive market demand for eco-friendly materials and services, which can create new job opportunities and bolster local economies.

Additionally, Policy E provides support for owners and users of heritage assets, facilitating sensitive interventions that enhance building performance while respecting best practice guidelines for historic preservation. This approach ensures that retrofitting efforts are both environmentally responsible and culturally sensitive, ultimately leading to a more sustainable and resilient built environment.

In summary, the emphasis on retrofitting not only addresses immediate carbon reduction goals but also contributes to a comprehensive strategy for a low-carbon future. By reducing embodied carbon and enhancing the efficiency of existing structures, these policies help create healthier living environments, minimise financial burdens on occupants, and support the transition to a more sustainable, circular economy.

Policy implementation and monitoring

Policy adoption is key, yet policy implementation is essential to ensure effective delivery of required standards. It is recommended that the Council put together a group that includes policy officers, development management officers (and conservation/heritage) and building control officers to design an effective monitoring system.

Policy compliance

Adoption of ambitious local plan policies is crucial to work towards a net zero future. However, without reliable implementation and monitoring mechanisms, intended benefits of these policies will not be experienced and their reputation hindered.

Implementation is key to the success of policy delivery in practice and should be treated equally as important to policy development. Therefore, Development Management officers will need to gain an understanding of how the policies are intended to operate in practice and initially be guided through how to assess policy compliance.

To ensure that policies on net zero operational carbon, embodied carbon and overheating are delivered as intended, two key stages of assessing compliance are necessary: planning application/design stage and post-completion stage. Submission of data throughout design stages is what will determine policy compliance for the full planning application, yet this must be verified with as-built data to confirm true policy compliance; this only applies for recommended policy components A1 – A4, B1 – B4, C1, C4, and D1 – D2. Pre-commencement and pre-occupation conditions must therefore be set at the planning application stage, which could include:

- Photographic evidence of building fabric, heating systems and ventilation technologies
- Air tightness tests whilst the air barrier remains accessible (to allow improvements to be made if required standards are missed)
- As-built reports for building energy performance, embodied carbon assessments and overheating measures

In cases where standards fall below required levels at the post-completion stage, it is important to have enforcement mechanisms in place to penalise non-compliant applications. This is a difficult issue to deal with as buildings cannot be deconstructed but the council should explore options with the Enforcement team on how to mitigate as-built risks.

Monitoring standards

Understanding how policies work in operation assist the future development of improved policies and informs other local authorities on what is deliverable. TRDC should develop a reliable monitoring system that enables the collation of policy performance data both for compliance at application stages and once the building is in use. This should be made available in a standardised format for ease of data input for developers and subsequent sharing of data. TRDC could look to distribute this standardised reporting form to neighbouring authorities to form a regional understanding of policy implementation. Examples of suggested monitoring indicators for new buildings and also renewable energy include:

Indicator	Source	Policy link
Average in-use Energy Use Intensity of new buildings	Development data	A1.2 and B1.2
Average on-site renewable energy generation per m^2 building footprint (kWh)	Development data	A3 and B3
MW capacity of solar PV installed on buildings (kWp)	Planning portal or MCS data	A3 and B3
MW capacity of solar PV installed as standalone scheme (above 1MW)	DESNZ Renewable Energy Planning Database (REPD) data	Other renewable energy policies (out of scope)
MW capacity of wind turbine installed as standalone scheme (above 1MW)	DESNZ REPD data	Other renewable energy policies (out of scope)
MW capacity of battery storage installed	DESNZ REPD data	Other renewable energy policies (out of scope)
Annual CO_2 emissions of new build development (split into regulated and unregulated) and %TER reduction for the regulated portion	Development data	A1, A3, B1 and B3
Average TER % reduction delivered through energy efficiency measures	Development data	A1, B1
£ contribution to renewable energy offsetting fund, £spent, and kWh generation delivered via the fund	Local Authority's own S106 records	A4 and B4
Number of heat pumps installed	Planning portal or MCS data	A1 and B1
Average embodied carbon of new development	Development data	D1 and D2

As required by policies A7 and B7, Post-Occupancy Evaluation (POE) is key to understanding in practice success of net zero operational energy policy. The primary purpose of undertaking POE is not for policy compliance but to better understand the performance gap between design stage energy performance predictions and the as-built performance of the building. Once the building is in use by occupants, developers cannot be penalised if reported values on energy consumption exceed the policy requirements because operational energy consumption is largely dependent on occupant behaviour.

Due to the influence of occupant behaviour on values reported through POE, there are privacy concerns with residents associated with these exercises. Therefore, developers cannot force residents to participate in POE but should show to the best of their ability that the building performs as intended with a minimal performance gap with the amount of data available. Implications of this potential risk are that data collection of energy performance may not be possible and future policy iterations are less informed.

Mitigating the performance gap

UK buildings are consistently victim to a performance gap between the energy performance of the building at the design stage and operational performance. The delivery of truly net zero buildings therefore requires rigorous systems to be in place to mitigate such a gap in energy performance, which are explored below.

Often the first point of failure of below-par operational energy performance is at the modelling stage, which in the UK is led by use of inaccurate compliance tools for Building Regulations, SAP and SBEM. However, in order to appease the 2023 WMS thus reducing risks to policy adoption at examination, TRDC has selected a policy option that uses SAP (rather than PHPP).

If local policy is to more effectively deliver net zero buildings, alternative methodologies should be used to gain an understanding of building energy performance at the design stage. Proven alternatives are available for both residential and non-residential buildings:

- Residential: Passivhaus Planning Package
- Non-residential: CIBSE TM54 with Passivhaus Planning Package or IES-VE

It is also worth noting that the use of accurate energy modelling tools, like PHPP or TM54, is often a first step within process-based assured performance methods (see later subheading in this section).

TRDC's policy implementation will be more effective where applicants are enticed or encouraged to use these (rather than SAP or SBEM) for compliance, especially with policies A1.2, A3, A4, A5, B1.2, B3, B4 and B5. A new residential energy modelling tool for building regulations Part L is current in development nationally: the Home Energy Model, HEM. Although efforts are being made to remedy the inaccuracies of SAP within HEM, the final form and in-practice effectiveness of HEM is not yet known. The Council is encouraged to return to this topic once HEM is well-established and its accuracy evidenced, to consider whether this would be a suitable step within efforts to reduce the performance gap and/or comply with the optional energy performance targets of A1.2 and B1.2.

Accurate assessments are equally important for policies on overheating and embodied carbon. For overheating, the simplified method on offer for Part O of Building Regulations is an inaccurate tool, hence why CIBSE overheating assessments should be completed so that more specific and accurate overheating measures specific to the at-risk building can be implemented.

Embodied carbon assessments require reliable and up-to-date data on the carbon content of various materials and products. Accurate data is the key to robust embodied carbon assessments. Since embodied carbon is not a national policy requirement, there is no approved methodology, but the RICS Whole Life Carbon Assessment guidance is generally accepted as the industry standard.

Third party verification

The use of accurate assessment and modelling tools is essential to the eventual performance of building, but human inaccuracies and errors throughout stages remain a risk to exacerbating a performance gap. Therefore, requiring third-party verification mechanisms to assess the accuracy of the approach, inputs and assumptions to modelling and/or assessments can further mitigate performance gap risks. There is currently no recognised collection of third-party verification systems and should therefore be a council-led decision on what would constitute an acceptable third-party verification process demonstrated by a developer. An acceptable third-party verification approach would be the submission of an audit undertaken by a third-party consultancy who are able to undertake the calculations themselves but are independent to the development. Additionally, if the assured performance schemes (as below) are used, this would constitute an effective third-party verification process.

Assured performance

Once accurate modelling and assessments have been completed to the best of abilities, following the processes above, assured performance schemes should be employed as the final element of performance gap mitigation. These are procedural toolkits that are designed to deliver a reduction in the performance gap through following optimal steps during design and construction to make assumptions and modelling more accurate and then to deliver correctly on what was designed. Building Control at local authorities firstly do not have control over all development sites and even at those where the authority does, regular on-site checks are not always carried out. Management systems to ensure high levels of construction quality are necessary to deliver energy performance standards as predicted.

For example, air tightness and thermal bridging are key components of the net zero operational energy policies recommended in this document. These need to be checked throughout construction phases, meaning that a simple confirmation of insulation thickness is insufficient to assess construction quality.

Acceptable schemes to demonstrate compliance with policies A5 and B5 should be set out in supplementary policy guidance. Several schemes are available and proven to be reputable, as listed below:

- **Passivhaus Certification** (residential and non-residential)
- **AECB Building Standard** (residential and non-residential)
- **NABERS UK** (non-residential)
- **Assured Performance Process** (residential)
- **National Energy Foundation** (residential).

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