3.3

Sustainability strategy

Introduction

The Council has committed to achieve Carbon Neutrality by 2030. The Council has the following priorities regarding sustainability:

- Undertake energy efficiency improvements to the majority of existing buildings;
- All new buildings to be zero carbon;
- Shift to dominance of mass transport, walking and cycling to reduce transport emissions;
- Rapidly increase local renewable energy generation.

To achieve these goals, a fundamental energy transformation of the Milsom Quarter estate needs to occur on a rapid trajectory. This section of the masterplan evaluates and plots the course for Milsom Quarter to achieve Net Zero Carbon by 2030, alongside other aims such as generating a sustainable income stream for the Council. Achieving this is particularly challenging given the heritage status of most buildings in the area, and constraints imposed by current heritage policy in the Sustainable Construction and Retrofitting SPD which prevents achieving Net Zero Carbon since heritage planning issues are given greater weight than implementing energy efficiency measures.

During the Stakeholder engagement sessions, it was made clear that the speed and scale of change required was significant and the impact of policy-compliant energy efficiency measures, alongside switching from gas to electric heating would make only a small impression on the overall annual carbon emission reductions required to achieve Net Zero.

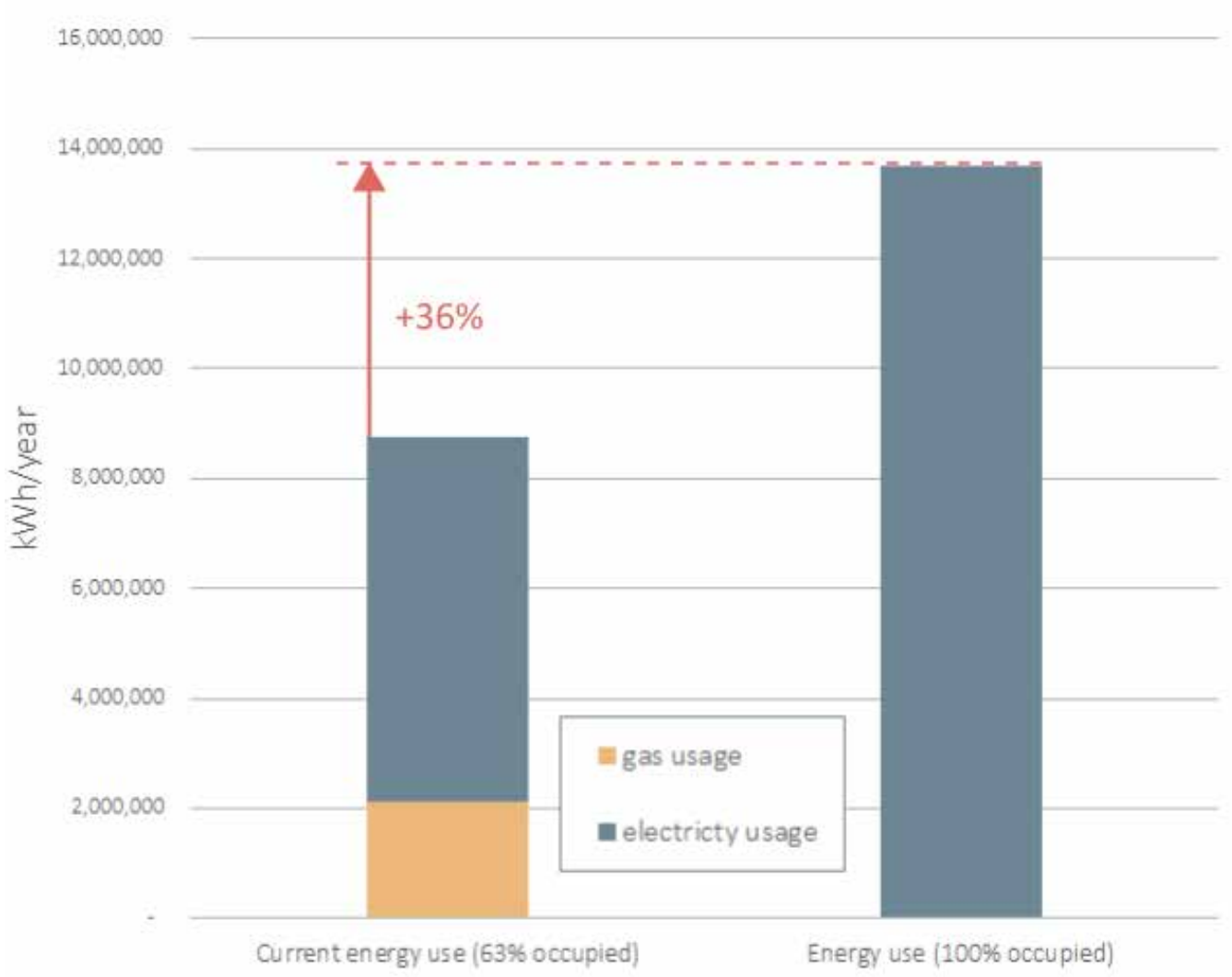
Therefore, significant change to retrofit policy for heritage and listed buildings is required in light of the climate emergency, in order to reduce the energy consumption and running costs of buildings within the quarter. Following retrofit, large-scale off-site renewables will still need to form a large part of Milsom Quarter and Bath's route to Net Zero, and achieving this in the most timely and economical way is of utmost importance to adapt to the changing role of the city and its role in reducing its environmental impact.

The Energy, Carbon & Sustainability strategy has been informed by; local and national policy, B&NES Council Core Strategy & Placemaking Plan, Sustainable Construction and Retrofitting SPD (current and emerging), best practice guidance from UKGBC, RIBA & LETI, future Part L Building regulations and UK energy transition.

Current Picture

The following key points arise from the baseline analysis:

- There are opportunities for growth in Milsom Quarter through new development on key sites such as Cattlemarket as well as opportunities to make better use of underused space in existing buildings. Some of this space could be used for uses such as energy storage.
- The local electricity network is heavily constrained and will likely require significant reinforcement works for any repopulating of vacant floor space or construction of new major buildings.
- Reusing the heritage building stock and repopulating each building to its maximum potential, alongside switching from gas to electricity, could lead to an almost doubling of annual energy usage and thus exacerbate the level of intervention needed to achieve Net Zero.
- Currently, there is significant revenue generated from the car parks on the site, which is a significant factor in evaluating the viability of alternative schemes - but the projected down-turn of car-use through car-share, micro-mobility and bringing more residential development into the Quarter should be considered for the long-term sustainability of the area.

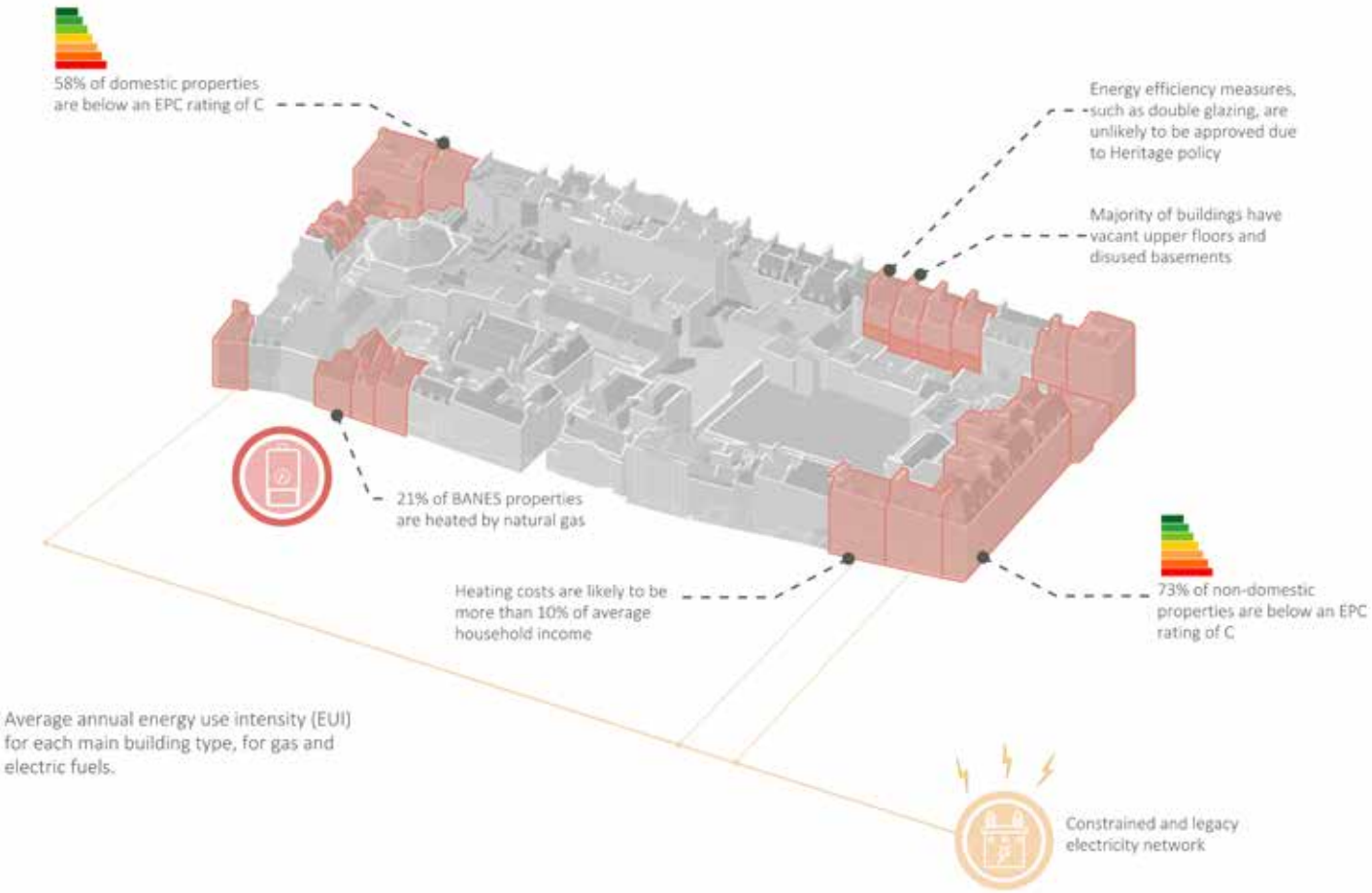


Current estimated energy usage and fuel mix (vacant floor space) compared with 100% of floor space occupied and all gas heating systems converted to electricty

Current Picture

2030 Operational Net Zero on site?	✕		
Ground Mounted PV amount		10 MWp	18 Hectares
Carbon Offsetting		20 MtCO2	via Transition Fund

Offsetting requirements to achieve Net Zero by 2030.
Either through off-site renewables or a carbon offsetting fund,



Current Picture - visual of current opportunities and constraints

Delivery strategies

The speed and scale of intervention in the Quarter will have a significant impact on whether the 2030 Net Zero target is achieved, and the total expenditure required by the Council and other stakeholders. In order to demonstrate this, three different pathways are outlined in the following sections which range from reactive to more proactive approaches that the Council could pursue in regard to carbon reduction. A summary of each pathway is as follows:

Market Baseline

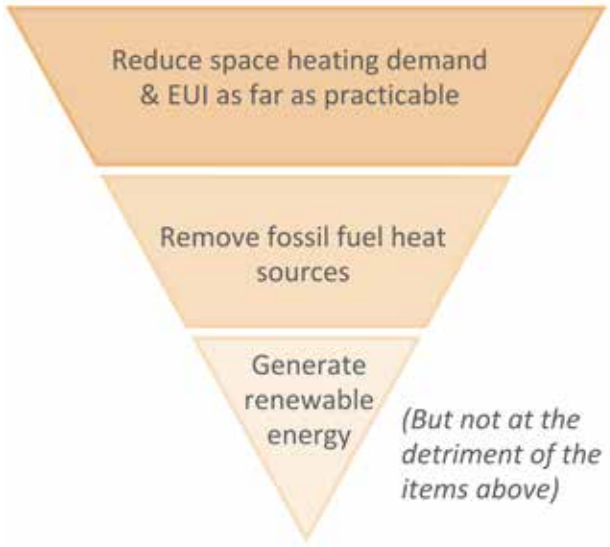
Applying a reuse rather than retrofit approach in line with current policy and legislation when renovating buildings, which will result in increasing carbon emissions from increased levels of occupancy as surplus space in Milsom Quarter is repurposed. Net Zero carbon by 2030 is achieved by relying solely on off-site renewables to offset emissions.

Committed Delivery

Driving policy changes to allow deeper levels of retrofit when renovating buildings, reducing the carbon impact of increasing the population density within the quarter. Net Zero carbon by 2030 is still achieved by using off-site renewables, but to a lesser extent than under the Market Baseline approach to building energy efficiency measures.

Aspirational Performance

As per the Committed Delivery pathway, plus leveraging retrofit measures on a terrace/street approach to maximise energy savings and maintain a consistent approach from a Heritage perspective whilst benefitting from economies of scale. Encouraging local, community-led renewable generation schemes on buildings to reduce both running costs and carbon emissions. Net Zero Carbon by 2030 is achieved through a combination of on-site and off-site renewable generation.



The Energy Hierarchy

Market Baseline

The Market Baseline pathway evaluates a minimum compliance approach, following projected changes to government policy such as; Part L revisions, Future Home & Building Standards, Minimum Energy Efficiency Standards, and intended Air Source Heat Pump adoption across the UK.

In accordance with the energy hierarchy, the following measures would be implemented for this pathway:

Use less energy

Undertake constrained retrofit to vacant buildings before re-use, in line with current Sustainable Construction and Retrofitting SPD guidance (internal roof insulation, secondary glazing);

Replace end-of-life systems with Part L compliant efficiency ratings;

Supply energy efficiently

Install all-electric heating or Air Source Heat Pumps (ASHPs) to reduce energy consumption.

Generate renewable energy

Fund large renewable projects within the area to allocate offset carbon emissions to achieve Net Zero by 2030.

Or pay for carbon offsetting at the HM treasury market rate annually for all MQ properties

The Market Baseline has a number of risks associated with it in regard to following an offset approach instead of a reduction approach.

Increasing fuel prices trend for occupiers, fuel poverty not addressed;

Lack of capacity in electricity network to heat via electricity;

Significant upgrade contribution payments to utility network provider;

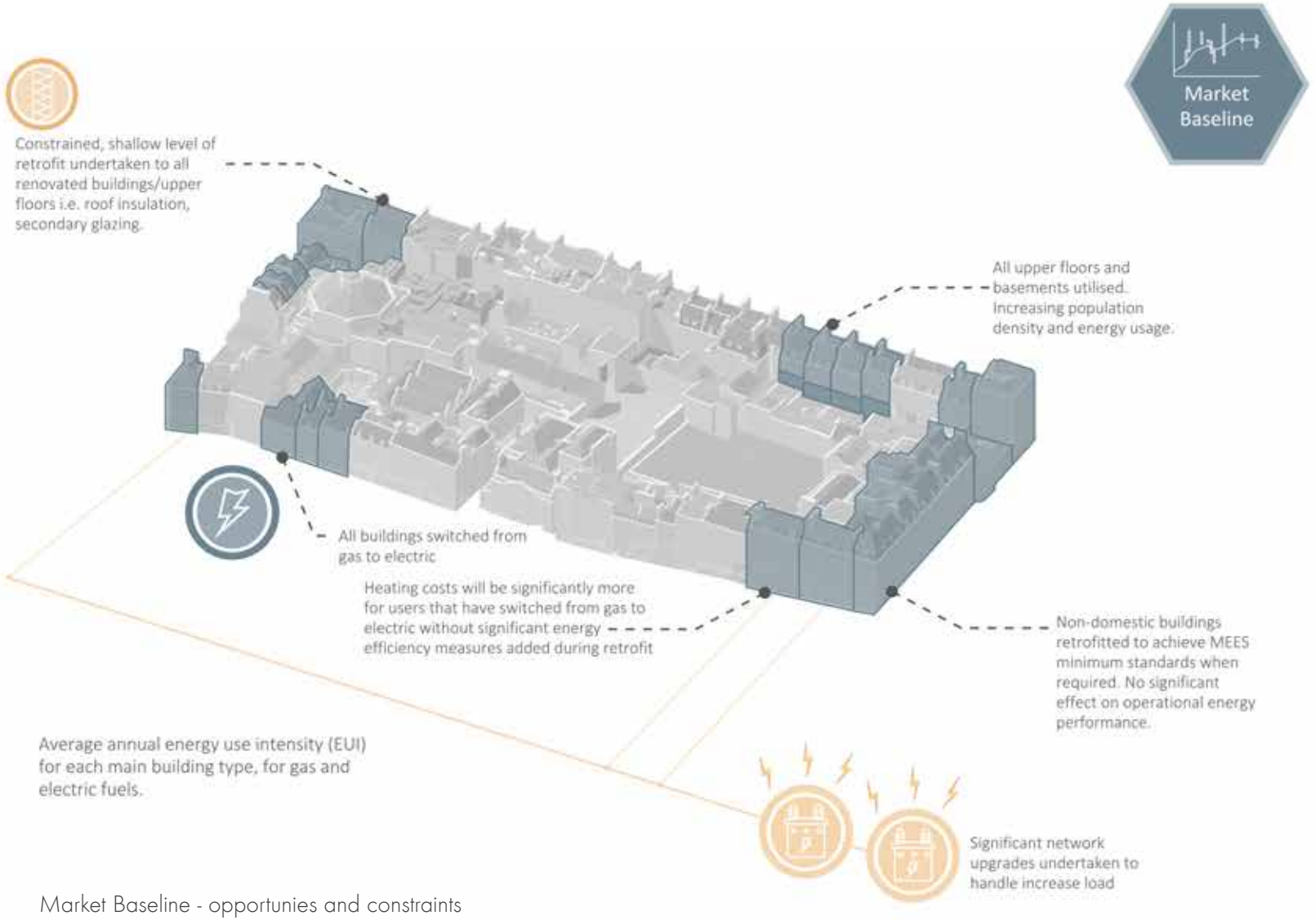
Quantity of carbon offsetting required increases spread of potential annual payment;

Operation of assets becomes increasingly expensive, lower margins.

Market Baseline

2030 Operational Net Zero on site?	✕		
Ground Mounted PV		15 MWp	28 Hectares
Wind Turbines		6 MWp	141 Hectares
Carbon Offsetting		10.4 MtCO2	via Transition Fund

Offsetting requirements to achieve Net Zero by 2030. Either through off-site renewables or a carbon offsetting fund,



Market Baseline - opportunies and constraints

Committed Delivery

Committed Delivery achieves Net Zero Carbon by 2030 through following a fabric first approach and doing what is possible with the significantly constrained existing building stock. This pathway results in significant energy demand and cumulative carbon emissions reductions, before offsetting with necessary off-site measures. This pathway has the following themes across the energy hierarchy:

Use less energy

Undertake constrained retrofit of buildings on a phased approach across entire Quarter, challenge Retrofitting SPD in light of Climate Emergency to achieve useful reductions in energy consumption, space heating demand whilst improving occupant wellbeing and affordability of energy;

Supply energy efficiently

- During retrofit process, install heat pumps to buildings that have reduced space heating demand through retrofit to avoid higher electrical energy costs for occupiers.
- Consult with utility network operator to plan upgrades as per phased retrofit approach to minimise repeat work

Generate renewable energy

Fund off-site renewable generation outside of Quarter, at a smaller scale than Market Baseline due to energy efficiency retrofit measures -or- remaining offset via offsetting fund

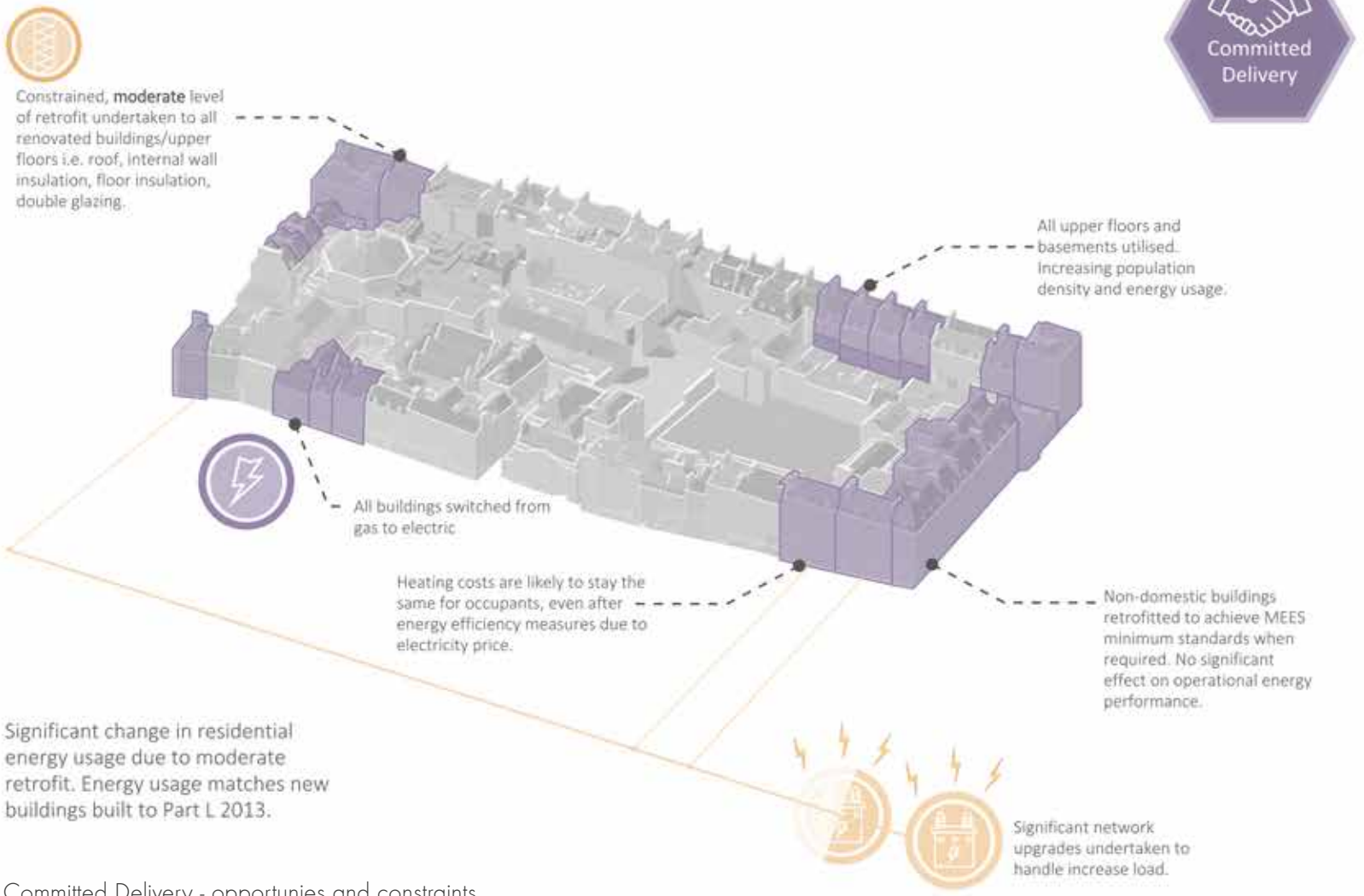
The risks associated with following the Committed Delivery pathway are as follows:

- Ability to retrofit properties based on existing heritage features and revised Retrofitting SPD guidance;
- Lack of capacity in electricity network to heat via electricity.

Committed Delivery

2030 Operational Net Zero on site?	✗		
Ground Mounted PV		7 MWp	13 Hectares
Wind Turbines		3 MWp	94 Hectares
Carbon Offsetting		7.3 MtCO2	via Transition Fund

Offsetting requirements to achieve Net Zero by 2030. Either through off-site renewables or a carbon offsetting fund,



Committed Delivery - opportunies and constraints

Aspirational Performance

The aspirational performance pathway builds upon the Committed Delivery pathway and seeks to decarbonise ahead of 2030 to achieve the largest carbon and cost savings by leveraging the B&NES-majority ownership in the Quarter, and using initial savings to fund further net zero revenue generating projects. This pathway has the following themes across the energy hierarchy:

Use less energy

- Undertake deep constrained retrofit of buildings on a street/terrace approach across entire Quarter, maximising benefits from a collective approach. Consult with Retrofitting SPD regarding double glazing, external rear wall insulation, internal wall insulation and floor insulation.

Supply energy efficiently

- During retrofit process, install heat pumps to buildings that have significantly reduced space heating demand, saving occupants energy costs and using less energy from the utility network than a gas alternative.
- Start community-led energy projects in order to amalgamate utility connections, install energy storage technology and reduce infrastructure upgrades through load shifting and diversity.

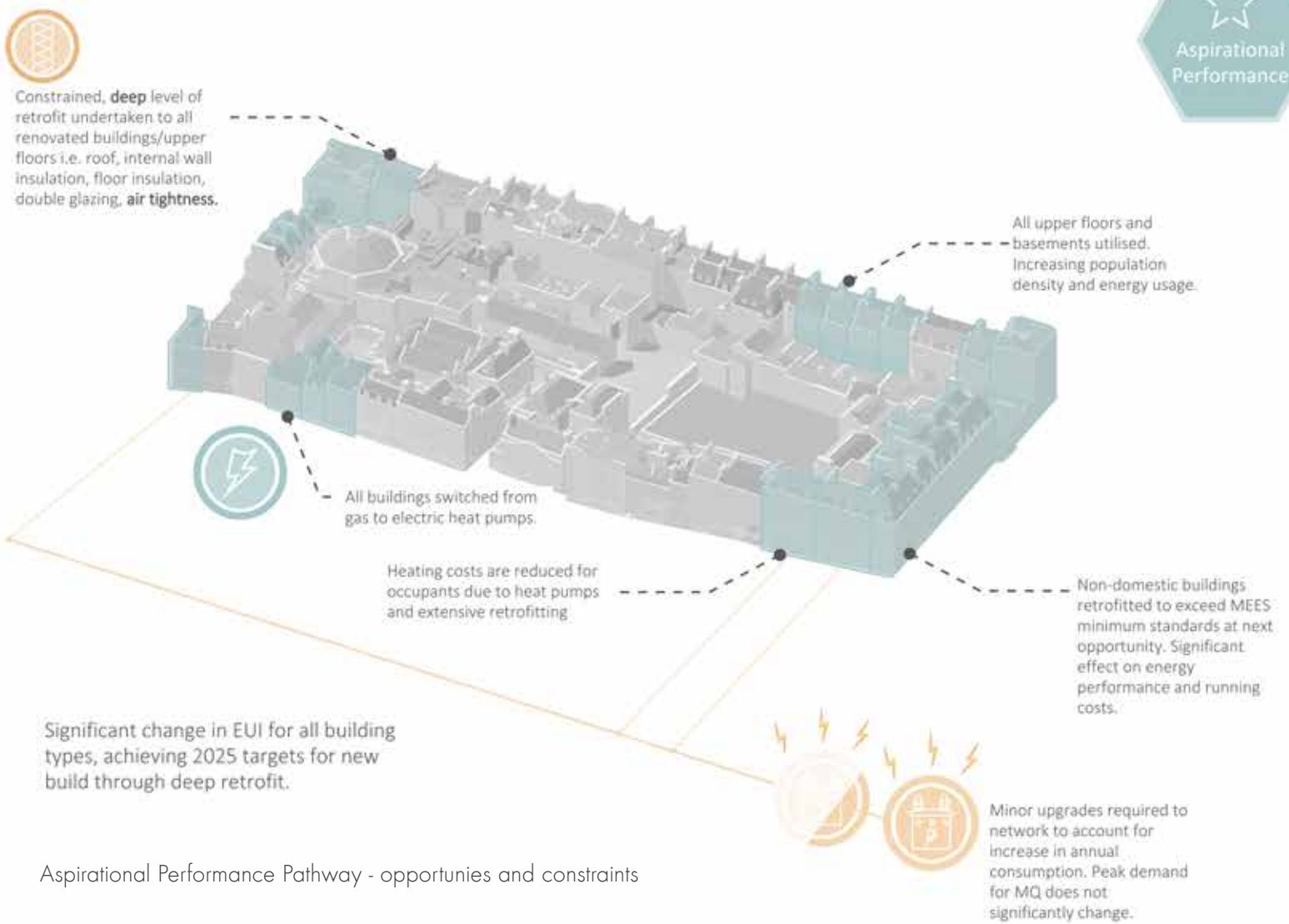
Generate renewable energy

- Use retrofit process and community-led schemes to install local renewable generation technology on buildings such as solar PV integrated-tiles to generate green electricity.
- Offset remaining carbon emissions through off-site renewable generation or through an offsetting fund.
- The risks associated with following the Committed Delivery pathway are as follows:
- Scale of properties with heritage features which reduce ability to retrofit significantly;
- Capital cost required to achieve savings, and ability to access properties quickly for Net Zero interventions.
- The Aspirational performance pathway reduces the reliance on offsetting measures, which frees up allocation for harder to decarbonise assets whilst not increasing renewable generation requirements.

Aspirational Performance

2030 Operational Net Zero on site?	✗		
Ground Mounted PV		4 MWp	8 Hectares
Wind Turbines		2 MWp	47 Hectares
Carbon Offsetting		6.4 MtCO2	via Transition Fund

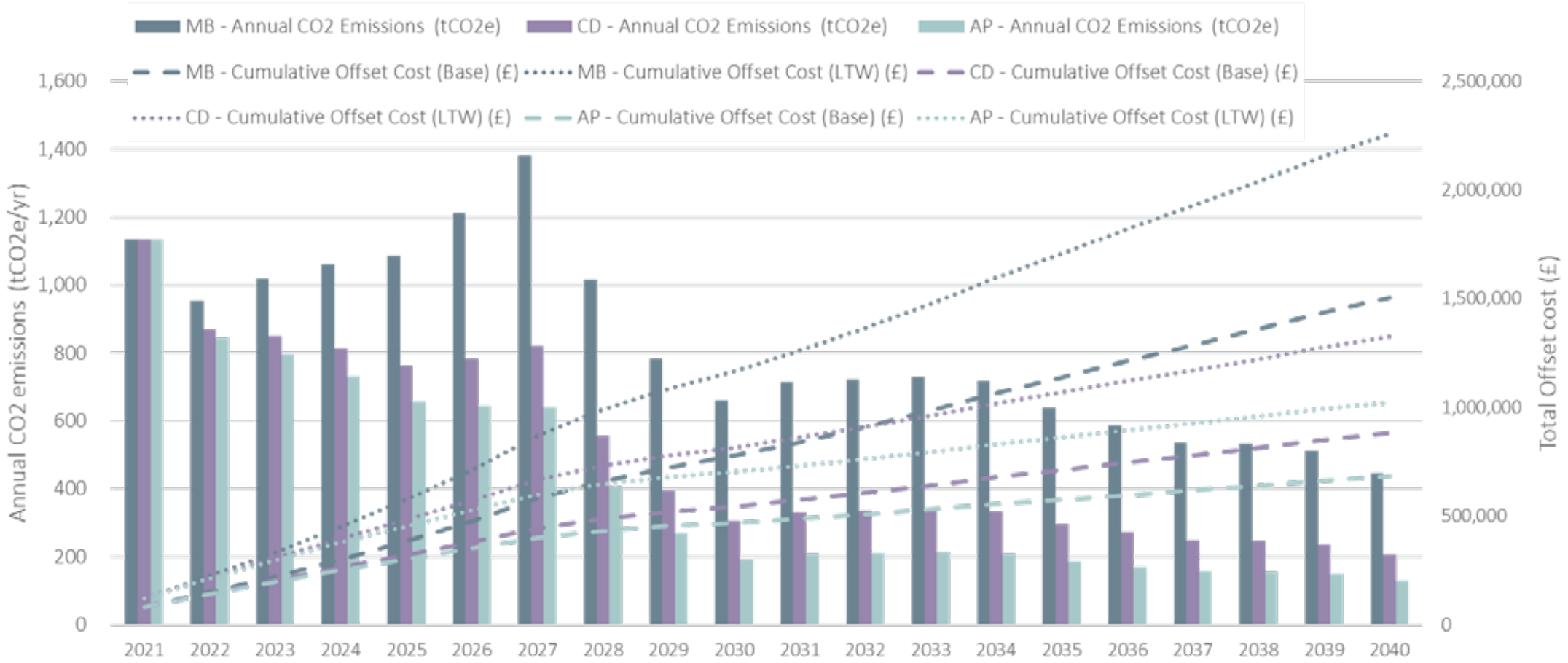
Offsetting requirements to achieve Net Zero by 2030. Either through off-site renewables or a carbon offsetting fund,



Aspirational Performance Pathway - opportunies and constraints

Pathway Comparison

Base = Business As Usual. Projected market-driven carbon offsetting prices [£70/tCO2 (2021) -> £155/tCO2](2040)]
LTW = Leading the Way. Projected proactive Gov policy trend in carbon offsetting prices [£105/tCO2 (2021) -> £224/tCO2] (2040)]



Comparison of Market Baseline (MB), Committed Delivery (CD) & Aspirational Performance (AP) over 20 year period showing predicted annual carbon emissions and projected cumulative carbon offset costs required

Recommended Pathway
Committed Delivery

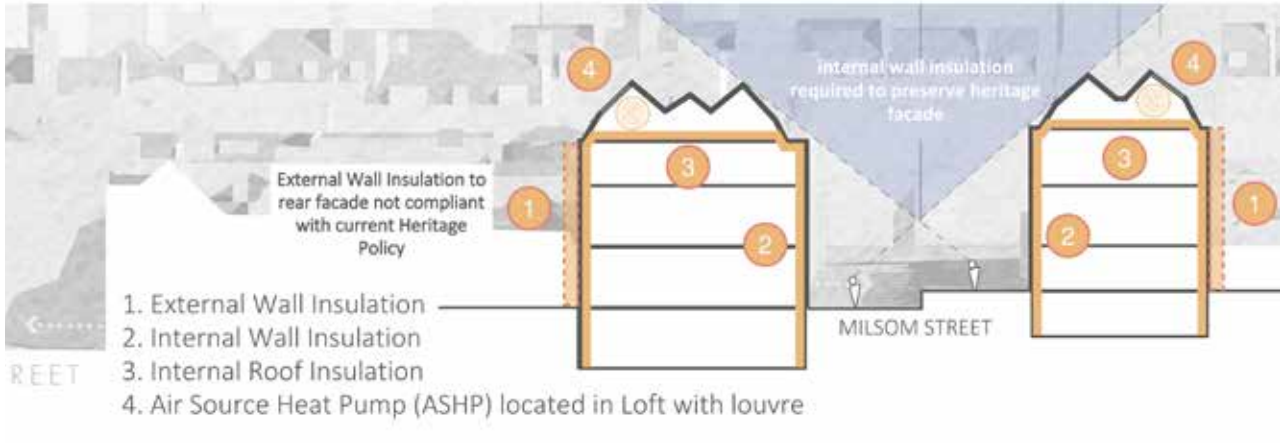
In order to achieve Net Zero by 2030 across the Bath & North East Somerset area, initiatives must be implemented that are ahead of government policy, as demonstrated by the Market Baseline pathway shown in comparison graph.

The Committed Delivery pathway is recommended as it allows for a balance between the Aspirational Performance and Market Baseline routes. Set out below are strategies for retrofitting, energy delivery, energy generation, new development and offsetting that could form a Committed Delivery pathway for Milsom Quarter.

Retrofitting Strategy

Retrofit is a key objective of B&NES and a fundamental part of achieving Net Zero by 2030 in an affordable and considered way. Currently, the Sustainable Construction and Retrofitting SPD alongside the planning process is significantly reducing the ability to retrofit heritage buildings within the area.

The extent of retrofit on constrained properties is the most significant factor in reducing energy consumption, renewable generation requirements and offsetting fund requirements. Currently a large portion of existing buildings do not meet minimum EPC requirements and require special exemptions for their listed status, this is a major risk for landowner and leaseholder arrangements which must be addressed in revised policy through the Retrofitting SPD policy review. Reducing energy must be done first through fabric retrofit before heat pumps and renewable generation are sought in order to not increase energy costs for occupiers and make renewable energy projects unaffordable



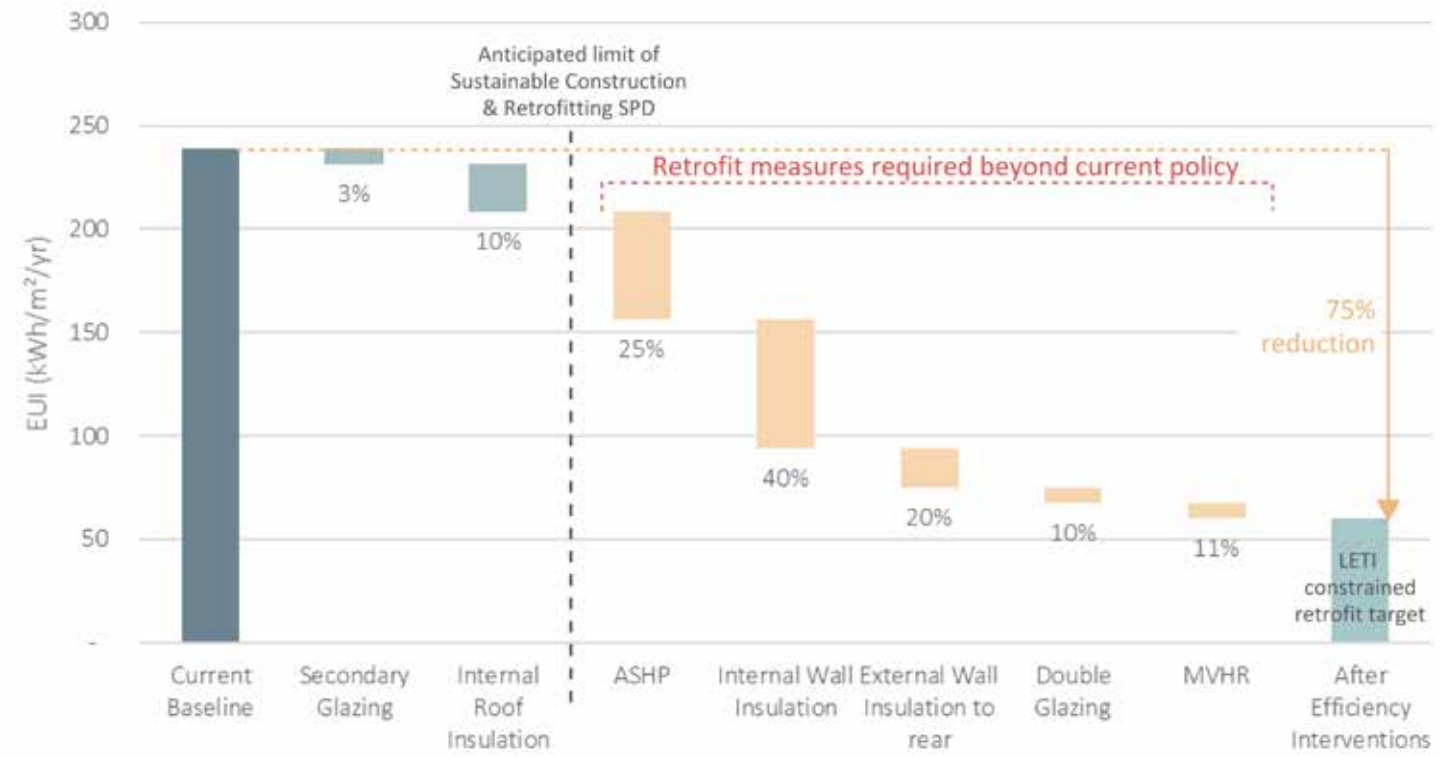
Indicative insulation strategy for heritage buildings in Milsom Quarter (adapted from LETI retrofit design guide)

Retrofitting Strategy

Retrofit is a key objective of B&NES and a fundamental part of achieving Net Zero by 2030 in an affordable and considered way. In order to help facilitate appropriate retrofit the Council has recently reviewed its guidance and prepared and adopted an Energy Efficiency, Retrofitting and Sustainable Construction SPD.

This SPD sets out positive and detailed guidance on the types of energy efficiency measures that can be appropriately and successfully retrofitted to heritage buildings. In finding successful solutions to retrofit on heritage properties in the Milsom Quarter it will be essential to take an appropriate fabric first approach to retrofit, supplemented by renewable energy generation and offsetting initiatives

Currently a large portion of existing buildings in the Milsom Quarter do not meet minimum EPC requirements and the SPD provides guidance on the measures that require Listed Building consent and those measures that can be introduced without.



Example impact of energy efficiency interventions for a heritage building on Energy Use Intensity (EUI)

Energy Delivery Strategy

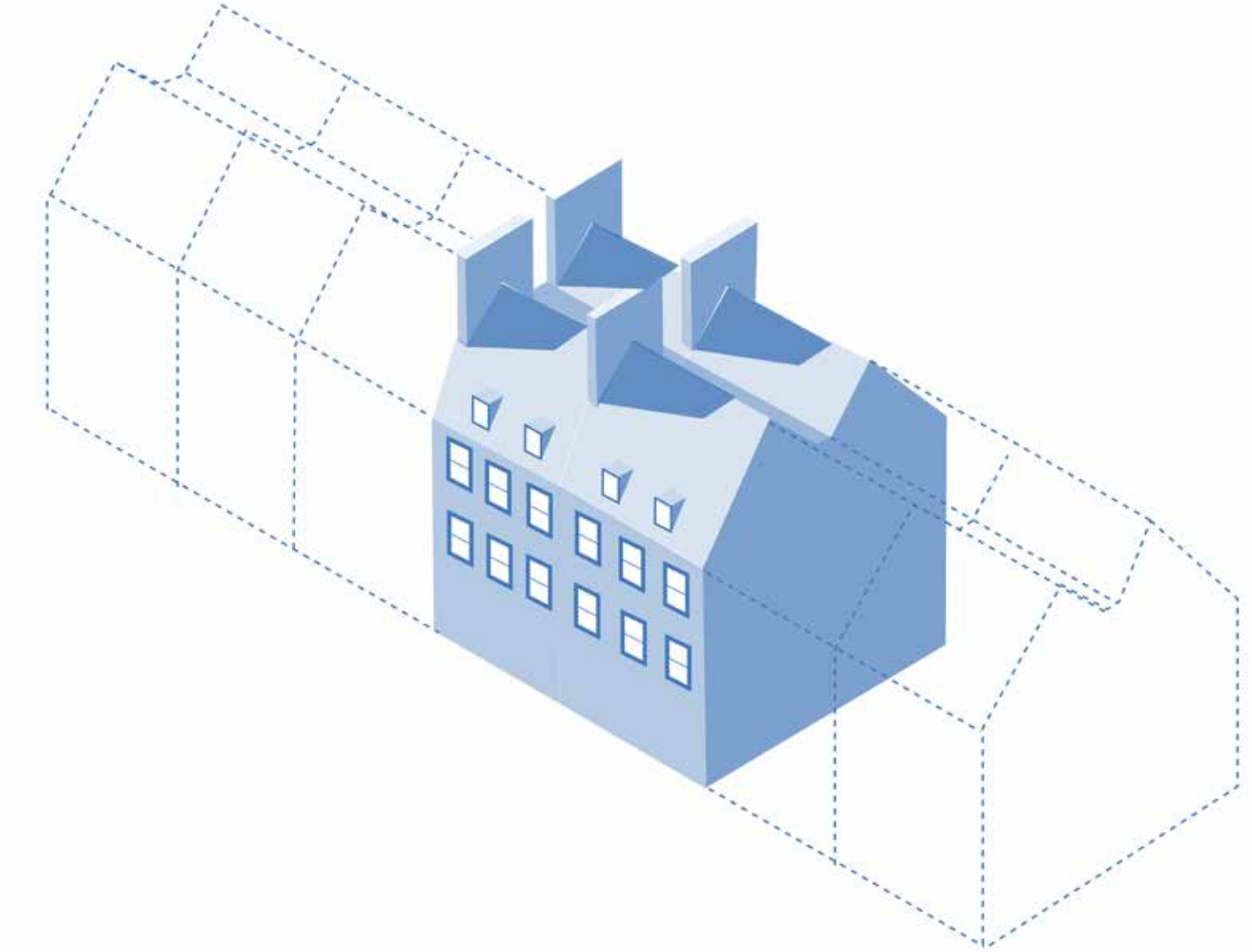
This section looks at the Committed Delivery Pathway at a building level in order to demonstrate the opportunities and risks with taking a building-by-building approach.

The typical building archetype in Milsom Quarter consists of a retail unit at ground floor, retail storage on the upper floors, and a basement level. This often results in around 60-80% of the building being unoccupied and underutilised.

When looking to reuse this archetype, it is assumed access will be created at ground floor to allow all upper floors to be converted into self-contained apartments, and also provide separate access to the basement level for ancillary spaces, alongside the potential for energy storage.

There is opportunity with this building level approach to combine all existing utility connections into one and install a microgrid network, which provides opportunity for communal renewables and storage.

In regard to solar PV potential on roofs, the figures opposite show the theoretical maximums that can be achieved using solar tiles, which are commonly used on heritage buildings.



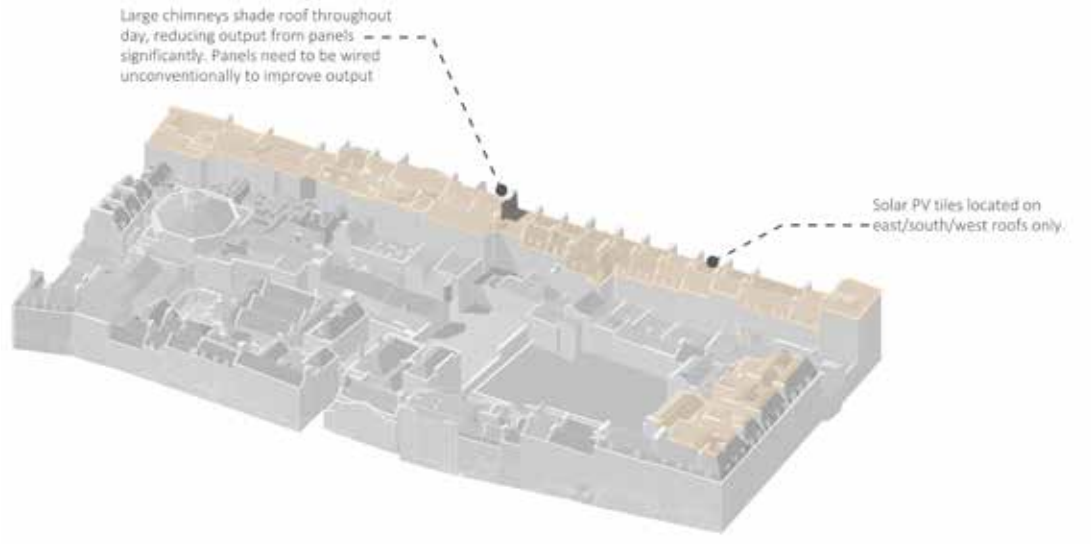
Energy delivery and efficiency measures can be delivered more economically using a co-ordinated approach for all connected buildings

Energy generation strategy

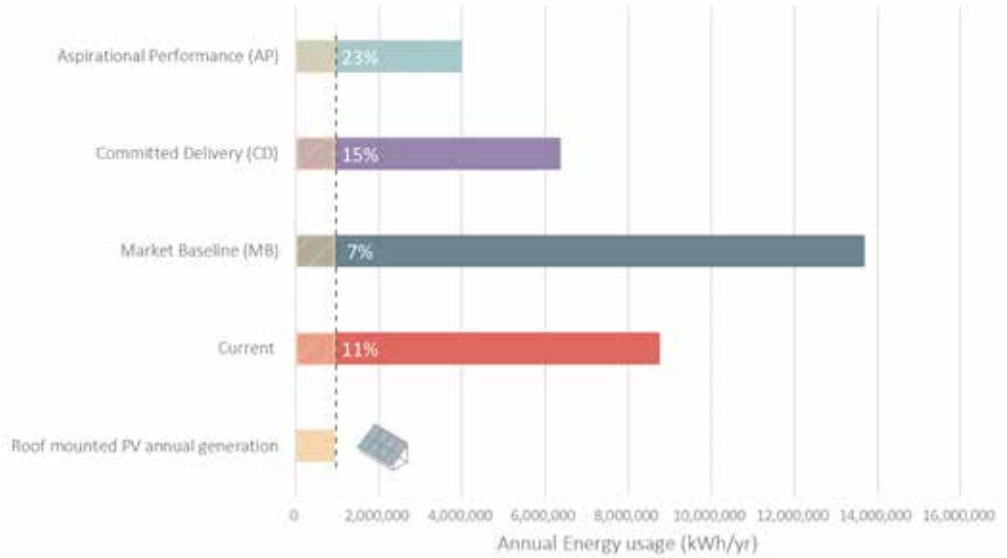
With the Committed Delivery Pathway, there is even greater opportunity for economies of scale in regard to efficiency interventions when zooming out to terrace or even street-level. This would require co-ordination with a number of adjacent properties, but should be pursued for the reduction in cost and infrastructure benefits.

On a terrace level will be defined as: multiple buildings sharing a single point-of-connection with the electricity provider. This approach requires a private electricity network to be installed (microgrid) in the grouped buildings, and relies on the ability to install energy storage systems at scale in each basement to provide a significant proportion of the building energy demand during the day.

This approach has the advantage of being able to reduce the number and size of utility connections required to individual dwellings/units and uses diversification of energy use to reduce strains on the already constrained electricity grid. This approach will also allow buildings to utilise low-carbon, low-cost electricity generated at off-peak times, reducing the amount of energy needed to be offset for Net Zero.



Example constraints in Milsom Quarter for placing solar panels on building roofs



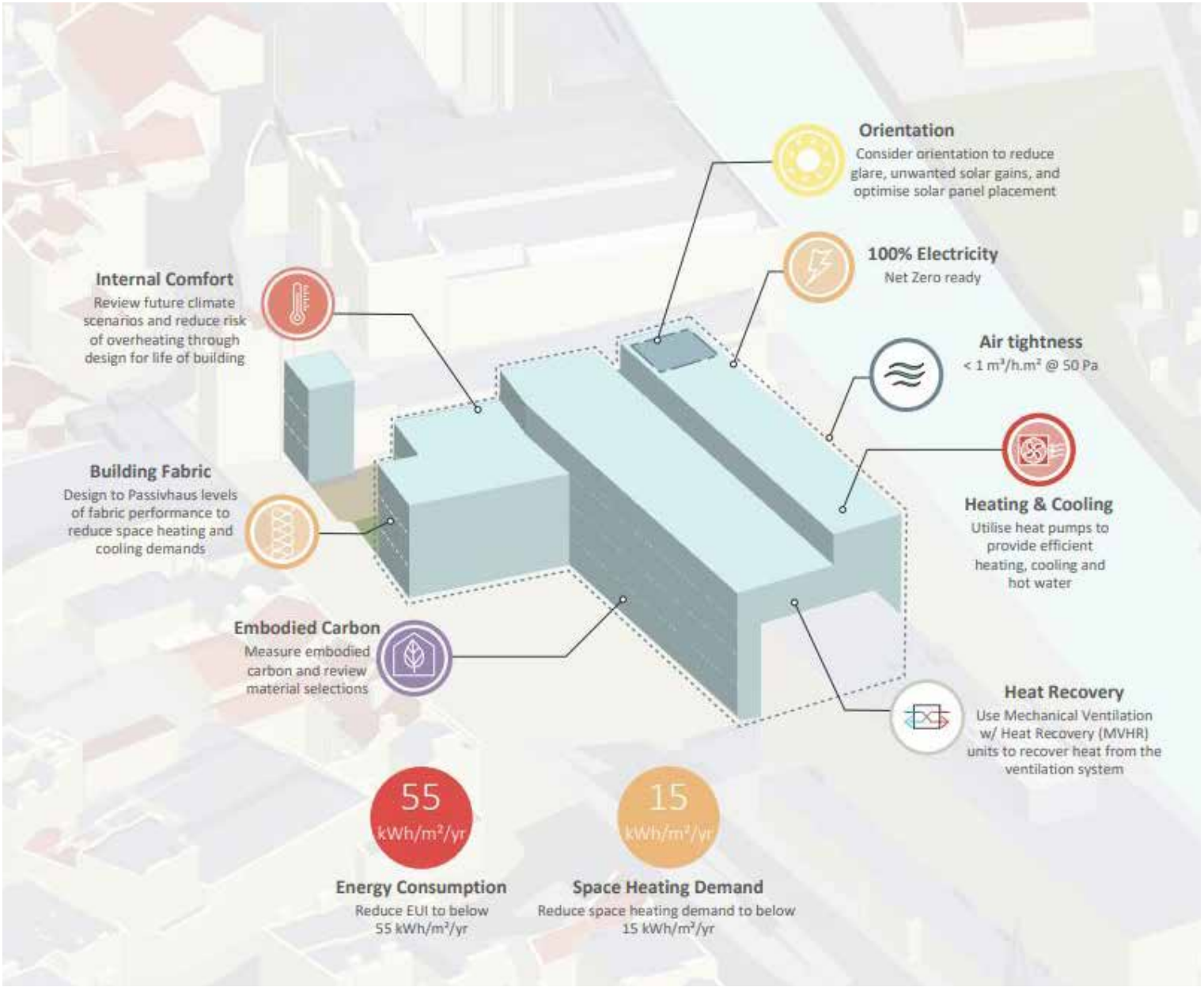
Contribution that local roof-mounted solar panels in MQ could make for each pathway (theorectical maximum shown)

New development strategy

Net Zero Carbon Design Principles

New development should be designed to meet the Best Practice guidance for new buildings using the RIBA 2030 Climate Challenge and LETI Climate Emergency Design Guide principles. These documents set high-performance design standards intended to significantly reduce space heating demand, energy usage and embodied carbon. The targets set by these are based on top-down methodologies and aim to achieve Net Zero Buildings using on-site renewables.

The buildings at Cattle & Cornmarket and Broad St. Yards should be powered from 100% electricity, in order to be Net-Zero ready when the grid decarbonises post-2030. Each building should incorporate renewables such as Solar PV where possible in order to reduce reliance on the electricity grid and reduce operational costs



Offsetting strategy

Achieving net zero

The nature of Milsom Quarter and the existing heritage buildings means that achieving a Net Zero energy balance on site is not possible even following the Committed Delivery Pathway, as energy usage is too high compared with the amount of renewable energy generation required to balance the annual consumption.

This typically means that to be Net Zero, the building owner would have to pay a carbon offsetting entity to offset their residual emissions through accredited offsetting schemes or by generating renewable energy and assigning it to the building. This offsetting method does not provide any lasting benefit for the owner and is much like a carbon tax.

However, large entities such as the Council have the ability to setup a Transition Fund to fund large renewables projects and provide a long-term asset and potential revenue generator. This approach means that the Council pays into the fund for each building to offset residual annual carbon emissions at an agreed rate. The proposal being that when renewables projects are completed, residual emissions can be offset via these projects instead of paying for offsetting.

Next Steps

Milsom Quarter has the potential to achieve Net Zero Carbon by 2030 through the Committed Delivery Pathway and establish long-term sustainable revenue streams through establishing a Transition Fund to finance large scale renewables projects within the region. The scale of the challenge is large and required fundamental change in order to achieve this in regards to:

- retrofitting heritage buildings;
- establishing private energy networks;
- creating a Transition fund;
- all new buildings to be NZC.

Approximate costs for delivering the Committed Delivery Pathway are as follows:

Infrastructure item (these all fall to BANES as landlord if NZC is the objective to be achieved)	Cost £m
Microgrid energy storage	£3.2-£8m The low end of this range is based on one domestic sized battery (4kW) per unit (assumed 1 commercial unit & 3 residential units per property). The high end of the range is based on a 40kW battery per property. These costs assume: Batteries will be connected together over a private network to do energy trading / reduce peak electricity demand for the quarter. That a large single-site battery project (2 MW+) is not currently achievable due to heritage constraints 101 BANES properties
Retrofit of existing BANES properties	£20.2m (assumed £200k average cost per property x 101 BANES properties)
Offsite PV provision	£2.4-£8.3m (depending on level of offset required - more zero carbon interventions mean less PV required
Total	£25.8-£36.5m

Next Steps

By reducing the energy consumption of the Quarter, before offsetting via off-site measures, it can benefit from reduced reinforcement works for electricity networks, increased capacity for future connections, ability to provide resilience to the local network and ensure assets are not stranded from being un-lettable in the future.

Undertaking a policy review of the Sustainable Construction and Retrofitting SPD is vital to reduce risks from un-lettable buildings with failing EPCs, alongside the larger picture of mass retrofit projects to reduce energy consumption and space heating demands. Retrofit will also reduce excessive energy costs and increase comfort for building occupants.

In order to evaluate progress and align with other net zero initiatives and best practice, the following targets should be used:

Energy Use Intensity = 60 kWh/m^2/yr

Space Heating Demand = 60 kWh/m^2/yr

Maximise local renewable energy such as solar PV on suitable roofs.

Buildings with gas heating to be converted to electric heating via heat pumps only after retrofitting has been undertaken