Camden Planning Guidance

Energy efficiency and adaptation

January 2021

Camden

CPG Energy efficiency and adaptation

1. Introduction

What is Camden Planning Guidance?

1.1 The Council has prepared this Camden Planning Guidance (CPG) on Energy and resources to support the policies in the Camden Local Plan 2017. This guidance is therefore consistent with the Local Plan and forms a Supplementary Planning Document (SPD) which is an additional “material consideration” in planning decisions.

1.2 This document should be read in conjunction with and within the context of the relevant policies in Camden's Local Plan, other Local Plan documents and other Camden Planning Guidance documents

What does this guidance cover?

1.3 This guidance provides information on key energy and resource issues within the borough and supports Local Plan Policies CC1 Climate change mitigation and CC2 Adapting to climate change.

1.4 Other relevant policies in the Local Plan include:

- C1 Health and wellbeing
- A1 Open space
- A2 Biodiversity
- D1 Design
- D2 Heritage
- CC3 Water and flooding
- CC4 Air quality
- CC5 Waste

1.5 This document was adopted on 15 January 2021 following statutory consultation and replaces the Energy efficiency and adaptations CPG (March 2019), which replaced the CPG3 Sustainability (July 2015).

2. Energy Hierarchy

KEY MESSAGES

- All development in Camden is expected to reduce carbon dioxide emissions by following the energy hierarchy in accordance with Local Plan policy CC1.
- Energy strategies are to be designed following the steps set out in the energy hierarchy.

2.1 The energy hierarchy is a sequence of steps (see diagram below) that minimise the energy consumption of a building. Local Plan Policy CC1 requires all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy.

2.2 Buildings designed in line with the energy hierarchy prioritise lower cost passive design measures, such as improved fabric performance over higher cost active systems such as renewable energy technologies.

2.3 Paragraph 8.8 of the Local Plan requires developments involving 5 or more dwellings and/or more than 500sq m (gross internal) floorspace are to submit an energy statement which demonstrates how carbon dioxide emissions will be reduced in line with the energy hierarchy. See chapter 6 of this CPG for more details on what to include in an energy statement.

Gross internal floorspace

The area within the perimeter of the outside walls of a building as measured from the inside surface of the exterior walls, with no deduction for hallways, stairs, closets, thickness of walls, columns, or other interior features.

2.4 Targets for energy reduction, as per those outlined in Local Plan policy CC1, are outlined in chapter 7 of this CPG.

3. Making buildings more energy efficient

KEY MESSAGES

- Natural ‘passive’ measures should be prioritised over active measures to reduce energy.
- Major residential development to achieve 10%, and non-residential development to achieve 15% reduction (beyond part L Building regulations), in accordance with the new London Plan, through on-site energy efficient measures (Be lean stage).

3.1 This chapter relates to stage 1 of the energy hierarchy. It is technically possible to reduce carbon dioxide emissions below Building Regulations through energy efficient design measures. All developments should seek to do this.

3.2 Energy efficient design requires an integrated approach to solar gain, access to daylight, insulation, thermal materials, ventilation, heating and control systems. It is important that these aspects are considered in relation to each other when designing a scheme. These measures are likely to have higher health and wellbeing benefits over active (mechanical) measures. A building which is naturally more efficient in retaining heat in cooler months and dissipating heat in warmer months are more likely to help reduce health risks, of older and vulnerable groups, particularly those who suffer from fuel poverty.

3.3 Energy efficient (passive) design measures should be considered prior to the inclusion of any active measures to ensure that the energy demand for developments is reduced as far as possible. This helps to reduce the size of building services and energy consuming technologies needed in developments.

Energy efficient (passive) design measures

3.4 Applicants should demonstrate (either in their Design and Access Statement, or Energy Statement) how the following passive design measures have been considered and incorporated in the development. Please refer to Table 1 which specifies when an Energy Statement is required.

Making the most of sunlight

3.5 Natural light makes buildings more attractive, pleasant, and energy efficient. Building layouts should be designed to maximise sunlight and daylight (below) while taking into account other factors such as overheating and privacy.

- Seek to locate principal rooms that require warmth and daylight on the south side of buildings to benefit from the sun's heat. Within 30 degrees of south is ideal.
- Consider any overshadowing from adjoining or of adjoining buildings and spaces that will reduce the amount of daylighting or solar gain to areas that require it.
- Investigate the potential to include renewable energy technologies, for example by including a flat or south facing roof for solar panels.

Making the most of daylight

- Maximise the amount daylight entering the building, minimising the need for artificial lighting.
- Carefully design windows to maximise the amount of daylight entering rooms to meet the needs of the intended use.
- Daylight is dependent on the amount of open, un-obscured sky available outside a window, the amount of sunshine and the amount of light reflected from surrounding surfaces.
- The size, angle and shape of openings together with room height depth and decoration determine the distribution of daylight.

Preventing overheating

3.6 Some developments may experience too much sunlight in the summer, therefore applicants should achieve a balance between benefitting from solar gain and preventing overheating. Measures that contribute to preventing overheating include:

- use of low energy lighting;
- electrical services equipment and sourcing IT provision should be located in separate sealed areas;
- locate any spaces that need to be kept cool or that generate heat on the north side of developments;
- use smaller windows on the south elevation and larger windows on the north (a balance is needed between solar gain/daylighting);
- use shading measures, including balconies, louvers, internal or external blinds, shutters, trees and vegetation. Any shading needs to be carefully designed to take into account the angle of the sun and the optimum daylight and solar gain;
- include high performance glazing e.g. triple glazed windows, specially treated or tinted glass; and

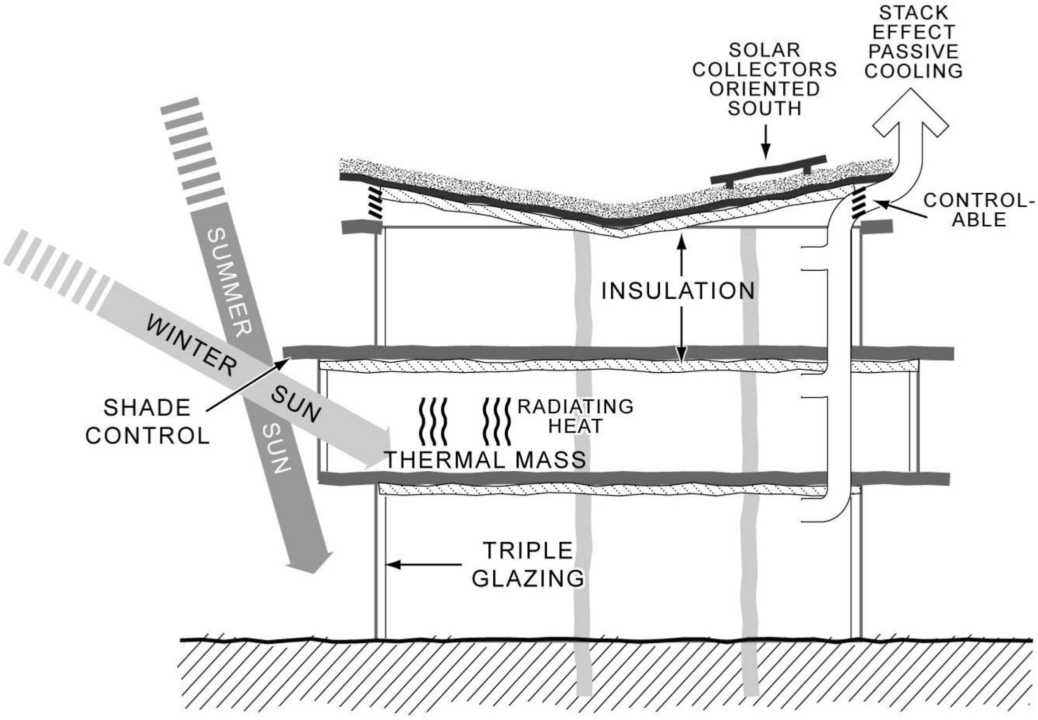
- incorporating green and brown roofs and green walls which help to regulate temperature as well as providing surface water run-off, biodiversity and air quality benefits.

Natural cooling

3.7 Natural cooling is a non-mechanical way of cooling a building. It uses an approach to design that controls the heat entering a building and encouraging dissipation.

- Openable windows, the ‘stack effect’ system where pressure differences are used to draw air through a building and, double layers of glazing, where one layer has openable windows where air can flow freely. These systems allow air to be drawn through a building and can operate in tall buildings. Careful design of internal space is required as air flows are impeded by walls and partitioning.
- Room layouts aiding circulation, shallow floor plans and high floor to ceiling heights all help the natural ventilation of buildings.
- Cooling can be created by shading and the evaporation effect from trees and other vegetation (including on green roofs and walls).
- The evaporation of water helps to passively cool buildings, reducing the energy needed for air conditioning. Night cooling is the operation of natural ventilation at night to loose excess heat and cool building fabric.

Figure 1. Natural system principles



Thermal performance

3.8 The thermal performance of a building relates to the amount of heat that is retained inside and the amount that is lost to the outside air. Ensuring a high thermal performance is one of the most effective ways to ensure a development is energy efficient.

- Energy efficiency requirements, such as insulation, should exceed Building Regulations where possible (paragraph 8.9 Local Plan), and installed without any gaps to reduce heat loss. Developers should consider how the insulation is attached to the building structure or walls to prevent the development of cold spots and potential points of condensation (cold or thermal bridging). The Council expects Energy Statements to include details of enhanced U-value numbers (W/m2K) for building fabric elements as well as the development’s approach to thermal bridging.

- Buildings should be designed to eliminate unwanted draughts and reduce heat loss.

- Materials with a high thermal mass (e.g. concrete) absorb and retain heat produced by the sun. These materials can be used to regulate indoor temperatures, especially to keep inside spaces cool during the day. Where heat is generated from within a building, exposed areas of thermal mass within the building can be used to transmit heat out of a building as the outdoor temperature drops.

- Porches, atriums, conservatories, lobbies and sheltered courtyards can be thermal buffers. They provide a transition between the cold outside and the warmth inside a building (or similarly the reverse in warmer months).

Energy efficient services (active/mechanical measures)

3.9 Natural measures should be prioritised over active measures; however mechanical systems are generally required by Building Regulations to enable buildings to be occupied. Where active measures are unavoidable the following should be considered.

Efficient heating

3.10 The installation of heating systems that run using gas are generally more carbon efficient than direct electric heating systems. Gas systems can also be designed so that they can be connected to a decentralised heating network (see Chapter 4 Decentralised energy).

3.11 Look to locate plant, e.g. pipes, flues, machinery, close to where the heat is required. This ensures a lower level of energy for pumping.

3.12 Include a community heating scheme, where appropriate e.g. Combined Heat and Power (see Chapter 4 Decentralised energy). This system provides heat to more than one dwelling or building and enables the whole development or site to be converted to a low carbon fuel source in the future. For large schemes this also enables heating demands of a site to be throughout the day.

3.13 Developments should avoid direct electric heating systems unless there is no access to a gas connection, or where heating is required for very short periods in isolated locations.

Efficient ventilation and cooling

3.14 Local Plan Policy CC2 discourages active cooling (air conditioning). Air conditioning will only be permitted where thermal modelling demonstrates a clear need for it after all preferred measures are incorporated in line with the London Plan cooling hierarchy (please see Chapter 10 for further information on overheating and the cooling hierarchy). The following passive measures should be considered first. If active cooling is unavoidable, applicants need to identify the cooling requirement and provide details of the efficiency of the system.

- Water based cooling systems reduce the need for air conditioning by running cold water through pipes in the floor and/or ceiling to cool the air.
- Evaporation cooling could also be investigated, this cools air through the simple evaporation of water.
- Ground source cooling. Ground source cooling is provided by a ‘ground source heat pump’ in the summer the ground stays cooler than the air and the difference in temperature can be harnessed for cooling.
- Exposed concrete slabs can provide natural cooling. This leaves internal thermal mass (concrete slabs, stone or masonry which form part of the construction) inside a building exposed so that it can absorb excess heat in the day and slowly release it at night.
- Developments could adopt a natural ‘stack effect’ which draws cool air from lower levels whilst releasing hot air.

Other energy efficient technology

- High efficiency lighting with controlled sensors, e.g. timers, movement sensors and photo sensors, which adjust the brightness of the light depending on the natural light level.
- Zoned lighting, heating and cooling with individual control.
- Specifying appliances which are A+ rated.
- Efficient mechanical services system or a building management system – computer systems which control and monitor a building’s mechanical and electrical equipment. Their main aim is to control the internal environment, but in doing so can also reduce the energy consumption of a building.
- Using heat recovery systems. Mechanical Ventilation with Heat Recovery (MVHR) conserves energy by recovering heat from stale warm air leaving a building and transferring the heat to the cooler incoming air.
- Energy monitoring, metering and controls should be used to inform and facilitate changes in user behaviour.

4. Decentralised energy

KEY MESSAGES

- All new major developments in Camden are expected to assess the feasibility of decentralised energy network growth (paragraph 8.25 Local Plan).

4.1 The ‘Be Clean’ stage of the energy hierarchy aims to ensure that developments have an efficient supply of heat and power. It is the local supply of heat and energy which optimises supply to demand so is much more efficient. Until now, this step has typically been achieved through the installation of combined heat and power units (CHP) or connection to a Decentralised Energy Network (DEN) often powered by CHP and gas boilers. These are defined below.

4.2 **Combined Heat and Power** is a technology for generating usable heat and power efficiently, and is supplied to buildings or a network. In practice it is often combined with a DEN, as it works best with a constant, large demand for heat.

4.3 A **Decentralised Energy Network** is a way of distributing the heat (and more rarely, power) generated from a given energy source(s) across multiple buildings or, as Camden prefers, multiple sites. A DEN is heat-technology-neutral, meaning the heat may come from boilers, heat pumps, CHP or waste heat sources.

REQUIREMENTS

Local Plan Policy CC1 requires all major developments to assess the feasibility of connecting to an existing decentralised energy network, and where this is not possible establishing a new network (see paragraph 8.25 Local Plan).

Combined Heat and Power

4.4 The carbon benefit of CHP derives from the lower carbon intensity of the generated electricity when compared to that supplied through the national electricity grid. Government projections for grid decarbonisation suggest that the carbon benefit of gas fired CHP will cease by 2032. Given this trajectory and a typical CHP design life of 15-20 years, the latest Government analysis concludes that only CHP deployed before 2023 will deliver carbon savings during its lifetime.

4.5 Development proposing gas CHP for installation prior to 2023, where there is neither the potential nor the intention for that development to form part of a wider decentralised energy network, will not be considered feasible (as per Local Plan Policy CC1) unless the developer provides an Energy Transition plan. The Energy Transition plan must set out how the proposed CHP will be decommissioned and replaced with an alternative carbon saving technology at the end of its design life. The Energy Transition Plan will also need to quantify the projected carbon savings of the future arrangement. The Energy Transition plan will be secured through legal agreement.

4.6 The whole borough of Camden is an Air Quality Management Area and Nitrogen Dioxide (NOx) emissions and particulates associated with CHP have an adverse impact on local air quality. The health impacts associated with air pollution are outlined in the Councils Air quality CPG and Clean Air Action Plan. Any permitted CHP installations will need to meet NOx emissions standards set out in the Mayor's SPG on Sustainable Design and Construction and any applicable or updated standards in the London Plan. CHP units with a capacity of less than 50 kW_{th} are unlikely to be supported, but where these are permitted, they will be expected to meet the Mayor’s SPG or London Plan standards. A quantitative air quality assessment will need to be undertaken and the applicant will need to ensure that the details are consistent with those provided in the energy statement. Appropriate mitigation measures should be designed in and implemented (e.g. higher stack to disperse pollutants and treatment of exhaust gas). Applicants will also need to consider noise and vibration, particularly if there are any dwellings located above plant rooms. Where CHP has a significant impact on existing air pollution levels, as identified within an Air Quality Assessment, the Council will expect developers to consider an alternative energy strategy. Please see CPG on Air Quality, for further information on Air Quality Assessments for developments incorporating CHP.

4.7 Notwithstanding the policy framework, CHP emissions standards may in certain rare circumstances be relaxed, providing sufficient evidence and justification is supplied, and that these specific conditions apply:

- CHP is the key enabling energy technology for a decentralised energy network (DEN) of major strategic importance to the borough;
- it has been adequately demonstrated to the Council’s satisfaction and sufficiently detailed evidence, that the DEN to be served would be uneconomic to implement in the absence of CHP;
- the DEN will be future-proofed to accept alternative low or zero emission energy sources in place of the initial CHP (covered in the Energy Transition Plan); and
- the overall scheme including the proposed CHP is Air Quality Neutral

Decentralised Energy Networks

4.8 Camden considers that there are benefits in establishing and supporting existing decentralised energy networks in defined parts of the borough, which connect multiple buildings to one or more energy sources and have the potential to transition to lower carbon and renewable energy sources over time. Camden's Borough Wide Heat Demand and Heat Source Mapping study defines decentralised energy growth areas. There are a number of existing decentralised energy networks in the borough, including:

- Bloomsbury Heat and Power
- Gower Street Heat and Power
- King's Cross Central
- Gospel Oak
- Somers Town Energy

4.9 As noted in paragraph 8.25 of the Local Plan, major developments in close proximity (typically 500m or less) to existing decentralised energy networks should prioritise immediate connection to them and fully test the feasibility of doing so. Applicants should include consideration of the points in the feasibility study checklists contained in **Appendix 3** of this CPG when undertaking a feasibility assessment.

4.10 Developers must also provide evidence of correspondence with the operator of the existing network as an appendix to their energy statement. This must include confirmation or otherwise from the network operator that the network has the capacity to serve the new development, together with supporting estimates of installation cost and timescales for connection.

4.11 In some situations, it may be preferable for the Council to undertake a wider feasibility study. In these situations the developer should make a contribution towards this wider study, and not undertake their own.

4.12 Applicants can include CO2 reductions attributed to connecting to a decentralised energy network within their energy statements as long as connection is made within an agreed timescale or by an agreed trigger point. If connection is not made by this agreed point, the developer must either:

- install another low carbon heating system if suitable;
- pay a cash-in-lieu contribution (valued at CO2 shortfall from missed connection); or a
- combination of the above two options.

4.13 Where a development could be supplied by a district heating network but the applicant considers that allowing for future connection will result in uneconomic costs to end users, they must provide a whole life cost (WLC) analysis comparing the communal and proposed systems. Please refer to Appendix 1 of "Energy planning - Greater London Authority guidance on preparing energy assessments (March 2016)" for details of how this should be approached.

4.14 If no existing network is present, applicants must investigate whether a network is planned in the area. Reference must be made to Camden's Borough Wide Heat Demand and Heat Source Mapping study. Please also consult the following maps and development frameworks as relevant:

- London Heat Map
- Map showing up-to-date information on Council Housing Stock
- Map showing up-to-date information on current planning applications
- Euston Road Area Plan
- Camden Goods Yard Planning Framework

4.15 Where a network is planned, all major developments must be designed to connect to the proposed network in the future. The London Heat Network Manual (www.londonheatmap.org.uk) provides further information on designing developments to allow connection.

4.16 The Council will only accept CHP as an enabling technology in decentralised energy growth areas where the technology brings forward a clearly defined decentralised energy network. In these circumstances, CHP installed prior to 2023 has the potential to provide carbon savings and the revenue benefit needed to finance network development.

4.17 Where decentralised energy networks and CHP are proposed and accepted by Camden, the CIBSE Heat Networks Code of Practice should be followed. Applicants should submit a statement confirming adherence to the Code of Practice and should clearly define and document within the Energy Statement where any of the standards in the Code are not to be included. The feasibility checklist in **Appendix 3** of this CPG should be completed and submitted as part of the Energy Statement. Networks should actively be future-proofed and demonstrated ready to accept low or zero carbon energy generation sources at a later point.

4.18 Where a developer does not connect to a heat network, in a situation where it is technically feasible to do so, the Council may request a financial contribution to enable expansion of the network and possible future connection. This will be secured through a S106 agreement and will be based on the following pricing structure:

Size of development (storeys)	**Residential (per dwelling) or Per 300sqm of non-residential floorspace**
Over 20	£2,800
8-20	£2,500
5-7	£2,800
3-4	£4,100
2-3	£5,300
Single dwelling houses or single storey commercial developments	£8,600

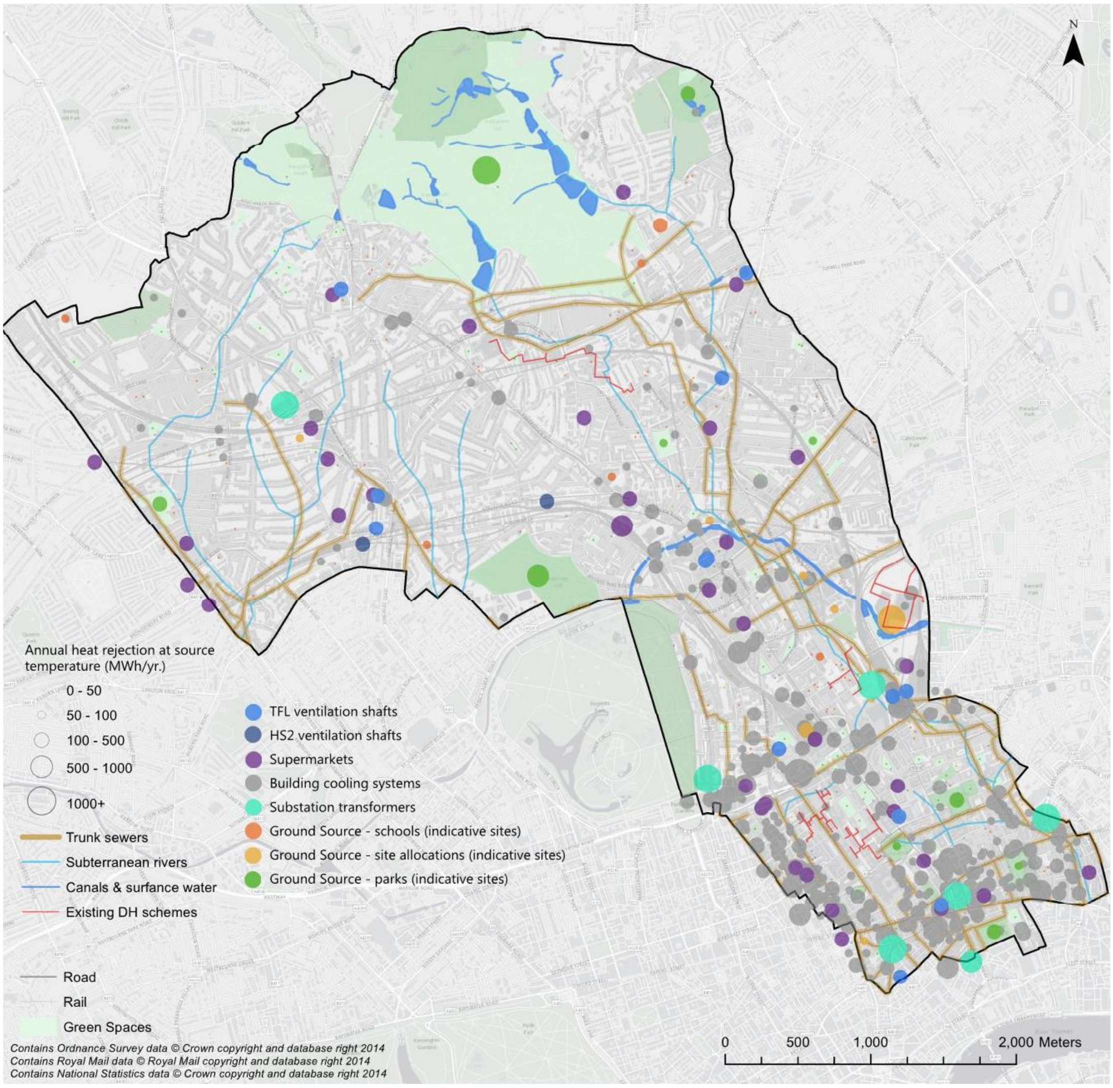
4.19 This pricing structure, published 2008 by the Town and Country Planning Association, by Urbed ‘Community energy’, “The density and layout of properties has a significant impact on the cost of district heating. Higher density, compact urban development has the potential to reduce pipe lengths, including the primary distribution network in streets, and the secondary ‘branch’ connections to each property”.

Alternative and secondary energy sources

4.20 Where developments are not located in decentralised energy growth areas and/or CHP is not proposed because there is no clear Transition Plan, developers will still be expected to demonstrate compliance with the Be Clean stage of the Energy Hierarchy and overall carbon improvements over Part L of the Building Regulations.

4.21 Developments must therefore make use of alternative and often secondary energy sources, such as building or process heat rejection (for example from supermarket refrigeration, data centres and electricity sub-stations, and London Underground vent shafts), and heat sources that occur naturally in the environment (for example ground and water source). The heat available from secondary heat sources is generally low grade (usually 5°C - 35°C, depending on the source of heat) and once upgraded by heat pump is particularly well suited to low temperature new build development.

4.22 Camden’s 2015 Borough Wide Heat Demand and Heat Source Mapping provided an overview of the key secondary heat sources. The map below is taken from the study.



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4.23 Major developments in Camden that are in close proximity to secondary heat sources, or which, by their nature, will generate waste heat (for example, because of proposed refrigeration plant) will be required to test the feasibility of using the secondary heat to meet on-site energy demands.

4.24 Where applicable the Council will expect developers to provide evidence within energy statements, that they have fully investigated the potential of secondary heat sources, as per paragraph 8.25 of the Local Plan. Evidence should include correspondence with the owner of the secondary heat source confirming commercial interest in the secondary heat and requesting permission to carry out an assessment of the heat sources potential. The assessment of the heat sources potential to supplement heating demands should include a technical and financial appraisal to determine a proposed heat purchase price that must then be offered to the heat owner.

4.25 The Canal and River Trust, which owns and operates the canal network in Camden, has a team dedicated to working with developers to harness opportunities. The Council therefore expects any development within 200 metres of the Regent’s or Grand Union Canal to prioritise water source heat pumps.

5. Renewable energy technologies

KEY MESSAGES

- There are a variety of renewable energy technologies that can be installed to supplement a development’s energy needs.
- Developments are to target a 20% reduction in carbon dioxide emissions from on-site renewable energy technologies.

5.1 All developments should consider the feasibility of on-site renewable energy generation. Renewable energy generation should only be considered once the earlier stages of the energy hierarchy have been followed and energy demand has been reduced as far as possible.

5.2 In areas of poor air quality, there is an expectation of zero emission buildings. Developers should look to prioritise the installation of renewable energy technologies with no polluting emissions. These can be air, ground, or water heat pumps and potentially efficient direct electric ‘point of use’ heaters to supply a hot water load, unless found to be unfeasible. “

5.3 As per paragraph 8.11 of the Local Plan, developments (including refurbishments) of 5 or more dwellings and/or more than 500 sqm of any gross internal floorspace must demonstrate a 20% ‘Be Green’ stage carbon dioxide reduction from renewables. Where feasible the renewables target should be fully met or exceeded, regardless of whether overall carbon dioxide reduction targets have already been met (those for minor new build residential and major applications specified in Table 1) through earlier stages of the energy hierarchy.

5.4 Note: the installation of renewable energy technologies or improvements to the fabric of Listed Buildings and buildings in Conservation Areas are not automatically prohibited. There are many examples in the borough where such improvements have been undertaken to these buildings. The applicant will be expected to work with Heritage and Conservation Officers to determine what would be an acceptable strategy. Where carbon dioxide reduction targets cannot be met due to the designated status of the building, then the applicant will need to provide evidence that this is the case.

Renewable technologies: supporting information

5.5 The council will expect developers to assess the feasibility of low and zero carbon technologies. The following information (in the blue text boxes below) should be provided to support the inclusion of low and zero carbon technologies where they are proposed. For schemes which require BREEAM assessment (see Local Plan policy CC2 and Chapter 11 of this CPG), we expect the full 'BREEAM Low and Zero Carbon Feasibility Report' to be submitted alongside the Energy and Sustainability Statements. The BREEAM Low and Zero Carbon Feasibility Report can also be submitted for any scheme as a way to demonstrate feasibility.

5.6 Developers of schemes which appear to show potential for renewable energy technologies, where the reasons for rejection initially identified do not prove to have sufficient detail or merit, are expected to revisit these opportunities with a view to inclusion. Applicants will be asked to conduct a detailed feasibility assessment by a qualified professional including proper examination of technical and economic considerations.

5.7 Where appropriate and feasible renewable energy technologies are proposed in a planning application the details and continued maintenance will either be secured by a planning condition or S106 agreement, depending on the nature of the development.

Solar thermal hot water panels

What is it?

5.8 A system made of flat plate collectors or evacuated tubes which allow water to flow through and be heated by the sun's rays.

How does it work?

5.9 Uses the sun's heat to warm water - up to 85 degrees Celsius.

Solar hot water tubes

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Where might this technology be appropriate?

- Suitable for developments with all year hot water demands.
- South facing at 30-40 degrees is ideal, but as the panels do not rely on direct sunlight they can still be efficient at other angles.
- Can be fitted to existing buildings, but need to consider additional weight of the panels and compatibility of heating/hot water system

What issues should I consider?

- Flat plate systems are cheaper. Evacuated tube systems are more efficient so need less space.
- Generally used for hot water where approximately 4sq m of solar panel per household is sufficient with 80 litres of hot water storage.
- Aim to minimise pipe lengths as this reduces heat losses.
- Not ideal with combined heat and power as it can reduce the efficiency of the CHP system.

WHAT DOES THE COUNCIL EXPECT FOR THIS TECHNOLOGY?

- Where space allows, panels are to meet 100% of the site's summer hot water needs, which equates to 50-60% of the annual demand.
- Applicants are to confirm the number and size of panels or the overall square meters to be installed and shown on plan. Please refer to GLA Energy Assessment Guidance October 2018 (Appendix 3 page 50) which outlines what information is required for this technology
- The accompanying heating system such as the top up boiler must be compatible. For example, it must include a storage tank and be able to use pre-heated water.
- Larger schemes should use a central system
- A meter is to be installed on the system for monitoring.

Photovoltaics (PVs)

What is it?

5.10 Photovoltaic cells are panels you can attach to your roof or walls. Each cell is made from one or two layers of semiconducting material, usually silicon. There are a number of different types available e.g. panels, tiles cladding and other bespoke finishes.

How does it work?

5.11 When light shines on the PV cell it creates an electric field across the layers. The stronger the sunshine, the more electricity is produced.


Solar PV roof tiles


Solar PV panels

Where might this technology be appropriate?

- On a roof or wall that faces within 90 degrees of south, and isn't overshadowed by trees or buildings. If the surface is in shadow for parts of the day, your system will generate less energy.
- On top of a green or brown roof is ideal because the cooler temperature created locally by the vegetation improves the efficiency of the solar panel.
- Can be fitted to existing buildings, but need to consider additional weight of the panels.

What issues should I consider?

- PV works best in full sunlight.
- Consider movement of shadows during the day and over the year. Overshadowing can impact the overall performance of the PV array.
- The best commercial efficiency is 22%.
- In general 1sqm of conducting material such as crystalline array will provide an output of 90-110 kWh per year.

WHAT DOES THE COUNCIL EXPECT FOR THIS TECHNOLOGY?

- Preference is for PVs to be flush to the roof or wall, but considerations will include the efficiency of the panel/s and whether they are visible.
- Applicants are to confirm the number and size of panels or the overall square meters to be installed shown on plan as well as any tilt
- A meter is to be installed on the system for monitoring.
- Confirmation that the installation and maintenance of panels will not impact on the potential presence of bats and birds nesting/roosting in historic buildings.

- Safe access arrangements for inspection and maintenance

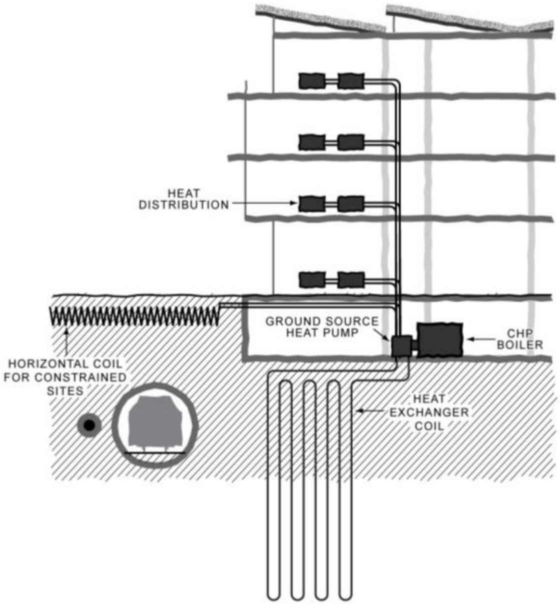
Ground Source Heat Pumps (GSHP) or geothermal

What is it?

5.12 A network of underground pipes, which circulate a mixture of water and chemicals (to prevent freezing) through a loop and a heat exchanger.

How does it work?

5.13 The heat from the ground is absorbed by the liquid that is pumped through the buried pipes. A heat exchanger in the heat pump extracts the heat from the liquid and transfers it in the building's heating system which can be used for central heating and hot water. In the summer, when the ground is cooler than the air, the system can be reversed to provide cooling.



Where might this technology be appropriate?

- The lower temperatures mean that GSHPs are well suited for underfloor heating
- Ideal for buildings which need heating in winter and cooling in summer

What issues should I consider?

- There are horizontal and vertical systems.
- Horizontal systems, also known as loop systems use trenches

- Vertical systems use boreholes which require a ground survey and a drilling license from the Environment Agency
- There are a range of permits and consents that might be required
- Generally provides heat at lower temperatures (30-50 degrees Celsius) than normal gas boilers.
- Buildings need to be well insulated for a GSHP to be effective
- The pump requires electricity to run so this technology will not be renewable or energy efficient in all developments.

WHAT DOES THE COUNCIL EXPECT FOR THIS TECHNOLOGY?

- Evidence is to be provided to demonstrate that the local geology can accommodate the necessary excavation
- Consider how much electricity is required to work the pump versus the energy savings of providing heat or cooling. The carbon content of the electricity required to run the pump could be higher than the gas needed to run a traditional gas boiler. The ratio of heat or cooling produced to the energy used to produce the heat is called the coefficient of performance (COP). For example, a heat pump which uses 1kW of electricity to produce 4kW of usable energy has a COP of 4 and is therefore 400% efficient. GSHPs need to have a COP of 4 or more to be considered renewable.
- Clarification of any above ground impacts on open space.
- Confirmation that no hydrofluorocarbons (HFCs) will be used in the system.
- Confirmation that the central heating system is compatible with low temperature heating system.
- Confirmation that the building is well insulated and therefore GSHP will be effective.
- When considering the carbon efficiency of a heat pump system the Council will take into account research and evidence of past performance of heat pumps and the seasonable performance. Evidence that the proposals meet the relevant industry technical standards for design and installation (http://www.gshp.org.uk/GSHP_Standards.html)
- A meter on the system for monitoring

Air source heat pumps (ASHP)

What is it?

5.14 A heat pump that extracts heat from the outside air to heat the interior of a building or to heat hot water. It can also extract the heat from inside a building to provide cooling.

How does it work?

5.15 Air to water heat pumps operate on a similar principle to an ordinary refrigerator. Heat from the atmosphere is extracted by an outdoor unit and is absorbed by a refrigerant solution which is then compressed to a high temperature. The heat generated is used by the indoor unit to create hot water for a traditional heating and hot water system.

5.16 Air to air heat pumps work in a similar way, but instead of generating hot water, the heat from the compressed refrigerant solution is turned into hot air by an indoor unit which is used to heat the building.

Where might this technology be appropriate?

- Where there is no gas connection.
- Where the heating demand is isolated and for a short period of time.
- Can produce cool air as well as heat, so could be suitable in buildings which may otherwise require air conditioning.

What issues should I consider?

- ASHPs need electricity to run
- Can be less efficient than GSHPs as air temperature is more variable, i.e. colder in the winter when more heat needs to be extracted from the air.
- Consider the noise and vibration impact.
- Consider the visual impact.

WHAT DOES THE COUNCIL EXPECT FOR THIS TECHNOLOGY?

- Consider how much electricity is required to work the pump versus the energy savings of providing heat or cooling. We will expect carbon calculations to show that that their use for heating is more efficient than gas. Otherwise they will not be acceptable. The calculations will be based on the co-efficient of performance (COP) and the carbon content of electricity and gas. ASHPs need to have a COP of more than 4 to be more efficient than a conventional heating system.

- When considering the carbon efficiency of a heat pump system the Council will take into account research and evidence of past performance of heat pumps and the seasonable performance.
- Noise assessment and mitigation report to be submitted
- A meter on the system for monitoring

Wind turbines

What is it?

5.17 Blades or turbines which are rotated by the power of the wind.

Vertical axis turbine

Horizontal axis turbines

How does it work?

5.18 The wind turns the blades of the turbine to produce electricity. Horizontal or vertical axis turbines are available.

Where might this technology be appropriate?

- Could be suitable for low density developments or those with large amounts of open space e.g. schools and playing fields.

What issues should I consider?

- Require a certain level of wind to make them feasible which is often difficult in London where there large obstacles such as buildings and trees which distort the flow of wind.
- If poorly located could use more energy than they generate.
- Need to be orientated towards the prevailing wind.
- Noise, vibration and flicker.

WHAT DOES THE COUNCIL EXPECT FOR THIS TECHNOLOGY?

- An assessment of the impact on neighbouring properties, particularly flicker, noise and vibrations.
- A wind study and feasibility report.

- A meter on the system for monitoring.

Monitoring

5.19 To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment. All renewable or low carbon technologies should be fitted with a meter to measure and monitor energy generation. This helps building owners/ occupiers understand how effectively the technology is operating and helps to identify any performance issues.

5.20 Furthermore, developments should include building energy monitoring at a level of detail that is proportionate to the scale of development. This may be through smart metering technology or a Building Management System (BMS or BEMS). Again, this helps the building owners/ occupiers to understand the energy performance of the development and to spot any abnormal patterns of energy consumption, which may signify a fault or improper operation.

5.21 Energy monitoring also helps to confirm the real-life energy performance of a building, comparing it to the expected energy performance as modelled during the planning application process. This helps to understand the effectiveness of carbon reduction measures over time and will confirm if carbon reduction policies are met in practice. Energy performance software, used to inform energy statements, is evolving but does have limitations. Therefore all major developments should monitor actual energy performance and provide this information back to the Council.

Applicants can install their own monitoring equipment and regularly feed this information back to the Council on an annual basis. Alternatively, the Council can seek a contribution towards monitoring and arrange for a system to be installed which provides direct feedback to the Council. Details of monitoring equipment and reporting regularity and format can be agreed between the applicant and the Council and will be secured through S106 agreement.

6. Energy statements

KEY MESSAGES

- Energy statements are required for all developments involving 5 or more dwellings and/or more than 500sqm of any (gross internal) floorspace.
- Energy statements should demonstrate how a development has been designed following the steps in the energy hierarchy.
- The energy reductions should accord with those set out in the Chapter below 'Energy reduction'.

What are Energy Statements?

6.1 Energy statements set out how a development has been designed to follow the steps in the energy hierarchy. It should demonstrate how the proposed measures are appropriate and viable to the context of the development.

What should an Energy Statement include?

6.2 The Energy Statement should include details of the baseline energy demand and carbon dioxide emissions following each stage of the energy hierarchy ('Be Lean', 'Be Clean', 'Be Green'). Applicants should also refer to Table 1a and 1b below summarising the information that energy statements should contain by development type.

6.3 Developers should present the results for new and refurbished areas and residential and non-residential areas separately due to the differing carbon dioxide reduction targets, in line with 'Energy Planning: GLA Guidance on Preparing Energy Assessments' March paragraphs 9.3 and 9.4). See Appendix 1.0 for a suggested format to include within the Energy Statement.

6.4 A concluding section should be provided outlining the contribution of each set of measures/ technologies make towards meeting the relevant targets and provide recommendations as to which approach is most suitable for the site. Where it has not been possible to reach the targets, a clear explanation should be provided.

6.5 An energy statement should present technical data while remaining easy to read and understand. Clearly laid out tables should be used to present data for ease of reading and comparison. Plans should be used where possible, e.g. to indicate suitable roof areas for installing solar technologies or the location of a plant room. References should be used to explain where data has been obtained from.

6.6 Where a development consists of blocks of multiple dwellings, a representative sample may sometimes be used within the energy modelling (e.g. modelling one of each type and set of relevant characteristics) if shown to be reasonable and necessary. The numbers and locations of the remaining (un-modelled) units should be listed out, stating which sample unit they correspond to, when calculating the declared whole building energy performance. Energy Statements for non-domestic developments and smaller residential developments should always cover the whole building.

6.7 Applicants should submit Building Regulation Part L output reports alongside their Energy Statements, to support the savings claimed. For non-residential schemes, this means the full Building Regulation UK Part L (BRUKL) documents; for residential schemes it means the full Dwelling Emission Rate (DER) and Target Emission Rate (TER) calculation worksheets from the Standard Assessment Procedure (SAP).

Energy statements for refurbishments

6.8 Refurbishments and changes of use should be presented separately to new build elements within the energy statement, to establish the baselines, measures and approaches taken for the different parts of the developments, and how they meet and exceed the respective Part L Building Regulations (including consequential improvements).

6.9 However, the overall energy reduction target will depend on the building control approach and therefore whether any new build parts within the development are large enough (according to the definitions outlined within the Building Regulations) to be considered a “new building” and should therefore be assessed separately, or whether it should be considered as part of the refurbishment. **Appendix 2.0** provides some examples of mixed new build and refurbishment schemes, and the suggested approach to take.

6.10 The energy assessment should state both the existing building baseline and Part L compliant baseline. Improvements against these baselines at each stage of the energy hierarchy should be outlined in the energy assessment.

Within the Energy Statement, the applicant should fully outline the scope of works and if any parts of an existing scheme will not be required to undergo improvements under planning or building regulations. The Council will encourage all schemes to go as far as possible to deliver the greatest carbon savings, taking account of the scope of works.

Table 1a: Energy statement information, residential

Key: ✓ **Development should comply with these standards/provide this information**	**Residential New Build (assessed under L1A)**			**Residential Refurbishment (assessed under L1B)**		
	Major **(10+ units or >1,000 sqm new floor space)**	**Medium** **(5-9 units, 500sqm**	**Minor** **All new dwellings (up to 4 units and <500 sqm new floor space)**	**Major** **(10+ units or >1,000 sqm)**	**Medium** **(5-9 units, 500sq.m**	**Minor** **(up to 4 units and <500 sqm)**
Energy and carbon reduction targets						
Energy Statement required *(Local Plan CC1, London Plan 5.2, 5.3)* follow GLA Guidance on Preparing Energy Assessments.	✓	✓	Not required – however, performance against carbon reduction targets should be included in a Sustainability Statement following the methodology below	✓	✓	Not required – however, performance against carbon reduction targets should be included in a Sustainability Statement following the methodology below

Energy assessment methodology	Calculated through the Part L 2013 of the Building Regulations methodology Standard Assessment Procedure (SAP) 2012 Non regulated emissions (i.e. cooking, appliances) should also be included in the report but included in the overall carbon reduction figures. The total non-regulated emissions can be established by using BREDEM (BRE Domestic Energy Model) or similar methodology	
Baseline calculation	Notional Building Target Emissions Rate (TER) set by Building Regulations.	Dwelling Emissions Rate (DER) for the existing dwelling, as well as a Building Regulations Compliant baseline (i.e. inputting the minimum building specification according to Part L1B following application of the usual Part L1B “payback test” methodology)

Table 1b: Energy statement information, non-domestic

✓ Development should comply with these standards/provide this information	**Non-domestic New Build (assessed under L2A)**			**Non-domestic Refurbishment (assessed under L2B)**		
	Major (>1,000 sqm)	**Medium (500sq.m and <1,000 sqm)**	**Minor (<500sq.m)**	**Major (>1,000 sqm)**	**Medium (500sq.m and <1,000 sqm)**	**Minor (<500sq.m)**
Energy and carbon reduction targets						
Energy Statement required *(Local Plan CC1, London Plan 5.2, 5.3)* follow GLA Guidance on Preparing Energy Assessments.	✓	✓	Not required	✓	✓	Not required
Energy assessment methodology	National Calculation Methodology (NCM) and implemented through Simplified Building Energy Model (SBEM) v5.2d or later or equivalent software – presented in the BRUKL Non regulated emissions (i.e. catering and computing) should also be included in the report but included in the overall carbon reduction figures. The total non-regulated emissions can be established from individual end use figures from CIBSE guide baselines (e.g. CIBSE Guide F) or through evidence established through previous development work					
Baseline calculation	Notional Building Target Emissions Rate (TER)			Building Emissions Rate (BER) for the existing building, as well as a Building Regulations		

	set by Building Regulations	Compliant baseline (i.e. inputting the minimum building specification according to Part L2B following application of the usual Part L1B "payback test" methodology)

7. Energy reduction

KEY MESSAGES

- All development in Camden is expected to reduce carbon dioxide emissions through the application of the energy hierarchy.
- All new build major development to demonstrate compliance with London Plan targets for carbon dioxide emissions.
- Deep refurbishments (i.e. refurbishments assessed under Building Regulations Part L1A/L2A) should also meet the London Plan carbon reduction targets for new buildings.
- All new build residential development (of 1 – 9 dwellings) must meet 19% carbon dioxide reduction; and
- Developments of five or more dwellings and/or more than 500sqm of any gross internal floorspace to achieve 20% reduction in carbon dioxide emissions from on-site renewable energy generation

7.1 The carbon reduction targets for developments in Camden are outlined in **Table 2a and 2b below**. This will be updated in line with any subsequent updates to the Local Plan, national and London planning policy.

7.2 Part L of the Building Regulations sets out the minimum requirements that buildings must meet relating to the conservation of fuel and power. Developments in Camden are expected to exceed Part L of Building Regulations through the application of the energy hierarchy. Camden's planning policies use Part L calculations as a baseline that should be exceeded. Deep refurbishments (i.e. refurbishments assessed under Building Regulations Part L1A/L2A) should also meet the London Plan carbon reduction targets for new buildings. All other refurbishments should demonstrate quantifiable improvements against the relevant new build baseline, L1A or L2A.

Carbon offsetting

7.3 Where the London Plan carbon dioxide reduction targets cannot be met on-site (Local Plan paragraph 8.12), we may accept the provision of carbon reduction measures elsewhere in the borough, or secure a S106 financial contribution to Camden's Carbon Offset Fund. The Carbon Offset Fund is used to secure the delivery of carbon reduction projects in Camden. Projects will be connected to those identified in the Council's environmental sustainability plan 'Green Action for Change'.

7.4 Camden Council aligns the price per tonne of carbon with the GLA’s pricing strategy. Please note: this is subject to change as further viability studies are undertaken. Details of the current pricing strategy are outlined on our website. Any offsetting project managed by the developer will need to demonstrate like-for-like savings and will need to be additional to any planned projects. Funds cannot be used to support other, existing development proposals to meet carbon reduction targets.

Table 2a Energy reduction targets, domestic

Development should comply with these standards/provide this information	**Residential New Build (assessed under L1A)**			**Residential Refurbishment (assessed under L1B)**		
	Major **(10+ units or >1,000 sqm new floor space)**	**Medium** **(5-9 units, >500sq.m and <1,000 sqm new floor space)**	**Minor** **All new dwellings (up to 4 units and <500 sqm new floor space)**	**Major** **(10+ units or >1,000 sqm)**	**Medium** **(5-9 units, >500sq.m and <1,000 sqm)**	**Minor** **(up to 4 units and <500 sqm)**
Energy and carbon reduction targets						
Overall carbon reduction targets:	*Zero Carbon, minimum 35% reduction beyond Part L Building Regulations on site, with 10% reduction through on-site energy efficiency measures).*	*19% below Part L of 2013 Building Regulations* *(Local Plan*	*19% below Part L of 2013 Building Regulations* *(Local Plan*	*Greatest possible reduction - meeting Part L1B for retained thermal*	*Greatest possible reduction - meeting Part L1B for retained thermal*	*Greatest possible reduction - meeting Part L1B for retained thermal*

	(London Plan, Local Plan CC1)	*CC1)*	*CC1)*	*elements (London Plan 5.4, Local Plan CC1)*	*elements (London Plan 5.4, Local Plan CC1)*	*elements (London Plan 5.4, Local Plan CC1)*
Reduction in CO2 from onsite renewables (after all other energy efficiency measures have been incorporated)	*20% (London Plan, Local Plan CC1)*	*20% (London Plan, Local Plan CC1)*	Incorporate renewables where feasible	*20% (London Plan 5.4, 5.7, Local Plan CC1)*	*20% (London Plan 5.4, 5.7, Local Plan CC1)*	Incorporate renewables where feasible

Table 2b Energy reduction targets, non-domestic

Development should comply with these standards/provide this information	**Non-domestic New Build (assessed under L2A)**			**Non-domestic Refurbishment (assessed under L2B)**		
	Major (>1,000 sqm)	**Medium (500sq.m and <1,000 sqm)**	**Minor (<500sq.m)**	**Major (>1,000 sqm)**	**Medium (500sq.m and <1,000 sqm)**	**Minor (<500sq.m)**
Energy and carbon reduction targets						
Overall carbon reduction targets	*Zero carbon, minimum 35% reduction below Part L Building Regulations on-site, with 15% reduction through on-site energy efficiency measures) (London Plan Local Plan CC1)*	*Greatest possible reduction below Part L of 2013 Building Regulations (Local Plan CC1)*	*Greatest possible reduction below Part L of 2013 Building Regulations (Local Plan CC1)*	*Greatest possible reduction, meeting Part L2B for retained thermal elements. (London Plan 5.4, Local Plan CC1)*	*Greatest possible reduction below Part L of 2013 Building Regulations (Local Plan CC1)*	*Greatest possible reduction below Part L of 2013 Building Regulations (Local Plan CC1)*
Reduction in CO2 from onsite renewables (after all other energy efficiency measures have been incorporated)	*20% (London Plan, Local Plan CC1)*	*20% (London Plan, Local Plan CC1)*	*Incorporate renewables where feasible*	*20% (London Plan, Local Plan CC1*	*20% (London Plan, Local Plan CC1*	*Incorporate renewables where feasible*

8. Energy efficiency in existing buildings

KEY MESSAGES

- All developments should demonstrate how sustainable design principles have been considered and incorporated.
- Sensitive improvements can be made to historic buildings to reduce carbon dioxide emissions.
- Warm homes and buildings are key to good health and wellbeing. As a guide, at least 10% of the project cost should be spent on environmental improvements.
- The 20% carbon reduction target (using on-site renewable energy technologies) applies for developments of five or more dwellings and/or more than 500 sqm of any gross internal floorspace (see Chapters 2 and 4).

8.1 Many of the sections in this guidance focus on reducing the environmental impact of new buildings, however Camden's existing buildings account for almost 90% of the borough's carbon dioxide emissions. Therefore it is essential that these buildings make a contribution towards the borough's reduction in carbon dioxide emissions.

8.2 This section provides more information on how existing buildings can be more energy efficient. It builds on Stage 1 of the energy hierarchy and improving energy efficiency in new buildings. These energy efficient measures will help to reduce carbon emissions and provide other benefits such as lower energy bills.

8.3 The Council supports sensitive development which improves the energy efficiency of existing buildings. The Council expects proportionate measures to be taken to improve the energy performance and sustainability of existing buildings. All buildings being refurbished are expected to reduce their carbon emissions by making improvements to the existing building. This includes work involving a change of use or an extension to an existing property.

How can I make an existing building more energy efficient?

8.4 There are many opportunities for reducing energy, the design, fixtures, and materials used can make a significant contribution. Installing condensing boilers, heating controls and energy saving light bulbs and appliances reduce energy use and carbon dioxide emissions significantly. Applicants should also refer to Chapter 3 of this CPG for more detail on design and layout changes to increase the energy efficiency of a building.

8.5 When dealing with historic buildings a sensitive approach needs to be taken. Guidance on this is provided later within this section.

Windows

8.6 Windows let light and heat into a building, but they can also let a lot of heat out when temperatures are colder outside than inside. If you are replacing windows or building an extension, thermally efficient glazed windows will provide more effective insulation than older windows. Double glazed panels can now be fitted into some original wooden frames, without the need to replace the whole frame. This helps preserve the historic character of the building.

8.7 Where there is scope, and it does not detract from the character and appearance of the building, applicants should consider whether there are opportunities to increase natural daylighting and sunlight, while taking into account overheating and privacy. Refer to Chapter 3 of this CPG.

Insulation

8.8 Applicants should look to optimise insulation, although this will vary to limit overheating (see Chapter 3 of this CPG).

8.9 Loft insulation – a building may already have some loft insulation, but if the material is thin it will not be saving as much energy and money as it could. Fitting proper loft insulation is the most cost-effective way of saving energy. As a guide, loft insulation should be around 250mm thick to be effective. The recommended depth of mineral wool insulation is 270mm, other materials need different depths.

8.10 Floor insulation - if there are any gaps between floorboards and skirting boards, these can reduce heat loss by sealing them with a regular tube sealant. It is also very useful to insulate underneath the floorboards at ground floor level.

8.11 Cavity wall insulation involves filling the gap between the bricks with insulating material. It can reduce heat loss by up to 60%. Most homes built after 1930 will have a cavity that could be insulated.

8.12 Solid wall insulation (internal or external) – buildings constructed before 1930 almost always have solid wall construction. The only way to insulate solid walls is to add insulation to the inside or outside of the wall. External insulation involves adding a decorative weather-proof insulating treatment to the outside of your wall while internal insulation involves attaching insulating plaster board laminates or wooden battens in-filled with insulation to the inside of the wall. Generally 100mm of insulation is required to be effective.

Solid wall insulation, whether internal or external, will require relocation of the services attached to the wall e.g. radiators, electrical sockets, drainpipes.

Heating and hot water

8.13 Replacing an old boiler (more than 10 years old) with a high efficiency condensing boiler and heating controls to provide heating and hot water could significantly cut energy consumption.

8.14 New/upgraded central heating – if a new boiler is installed the rest of the central heating system may need upgrading, for example large, old radiators could be replaced with smaller, more efficient radiators that are better suited to the new boiler.

8.15 Upgrading heating controls - install heating controls that allow control of the temperature in different parts of a building. These can be included as an electronic timer control.

8.16 Insulating hot water pipes and hot water tanks will retain hot water for longer, and save money on heating it.

8.17 See the Council's website for further information for householders on various retro-fitting measures and whether permission is required (www.camden.gov.uk/green-camden). The following guides may also be of interest, available on this webpage:

- Energy efficiency planning guidance for conservation areas,
- Retrofitting - making your home more sustainable,
- Energy efficiency planning guidance for Dartmouth Park Conservation Area.

Generating energy

8.18 Buildings can also reduce their energy consumption by generating their own energy in the form of heat or electricity using low carbon and renewable technologies which use little or no energy. See section 5 of this guidance on renewable energy for more advice on the technologies that are available and appropriate in Camden.

Table 3 below applies to all development and is a useful way to demonstrate which adaptation measures have been considered in a planning application. Please note that not all the measures below will be appropriate for all buildings.

Measure	**Specification**	**Evidence**
Draught proofing		
Reflective radiator panels		
Overhauling/upgrading windows		
New boiler		
LED lighting		
Meters, timers, sensors, controls on heating or lighting		
Mechanical Ventilation with Heat Recovery		
Insulation		
Hot water tank & pipes		
Roof		
Walls Internal		
Walls External		
Floor		
Renewable energy technology		
Solar PV panels		
Solar thermal (hot water) panels		
Ground source heat pumps		
Double glazed windows / Secondary glazing		
Combined heat and power unit		
Green or brown roof		
Rainwater harvesting		
Other measures		
Join the Camden Climate Change Alliance (commercial only)		

What if a building is historic, listed or in a conservation area?

8.19 Historic buildings have special features that need to be conserved and therefore need to be treated sensitively. This section explains how energy efficiency improvements can be achieved without causing harm to the historic environment.

8.20 Reflecting the special qualities of historic buildings, additional consents may be required for statutorily designated buildings (listed buildings, or those in conservation areas). The Council's website has more detailed guidance on what types of permission are required. The Council will aim to balance the conservation of fuel and power against the need to conserve the fabric of the building.

8.21 Historic buildings can perform well in terms of energy efficiency. When looking to install high energy efficiency measures, however, it is essential to ensure that works do not compromise the character and significance of the building or area.

8.22 In order to identify the most appropriate measures, the Council recommends taking the following approach, which takes into account measures best suited to individual buildings and households (i.e. taking human behaviour into consideration as well as the building envelope and services):

- Assess the heritage values of the building;
- Assess the condition of the building fabric and building services;
- Assess the effectiveness and value for money of measures to improve energy performance;
- Assess their impact on heritage values; and
- Assess the technical risks.

8.23 A range of thermal efficiency measures can then be implemented, which avoid harm to the historic environment. Ranked according to their impact on heritage and the technical risks, these include:

1. Ensure that the building is in a good state of repair
2. Minor interventions - upgrade the easier and non-contentious elements:
   - insulate roof spaces and suspended floors;
   - provide flue dampers - (close in winter, open in summer);
   - provide energy efficient lighting and appliances
   - draught-seal doors and windows;
   - provide hot water tank and pipe insulation.
3. Moderate interventions - upgrade vulnerable elements:
   - install secondary (or double) glazing (if practicable);
4. Upgrade building services and give advice to building users on managing them efficiently:
   - install high-efficiency boiler and heating controls;
   - install smart metering;

  - install solar panels, where not visible from the street or public spaces.

5. Major interventions - upgrade more difficult and contentious elements (where impact on heritage values and level of technical risk shown to be acceptable)
  - provide solid wall insulation.

8.24 When considering refurbishment, it is the owner's responsibility to ensure that any work does not cause unlawful or unnecessary damage to the building.

8.25 Before carrying out any work, find out if the property is listed, in a conservation area or subject to any other planning restrictions such as an Article 4 Direction. Then check if any of the proposed works require consent – such as listed building consent, planning permission or conservation area consent. See CPG on Design for more information on Camden's historic buildings. The Council's website also provides detailed information on these matters.

Useful links:

- Energy Saving Trust
- Sustainable Traditional Building Alliance
- Energy Efficiency and Historic Buildings - Historic England
- 'Retrofitting planning guidance'
- 'Energy Efficiency Planning Guidance for Conservation Areas'

9. Reuse and optimising resource efficiency

KEY MESSAGES

- We will expect creative and innovative solutions to repurposing existing buildings, and avoiding demolition where feasible;
- All development should seek to optimise resource efficiency and use circular economy principles.

Supporting information

- Condition and feasibility study, and options appraisal. See paragraphs 9.4 – 9.7. (applies to: major redevelopment applications, any development proposing substantial demolition)
- Whole Life Carbon assessment and pre-demolition audit. See paragraphs 9.6 – 9.7. (All applications where the option is substantial demolition)
- Resource efficiency plan. See paragraph 9.10. (All major applications, and new buildings)

Reusing existing buildings

9.1 "Retaining the resource value embedded in structures is one of the most significant actions you can take to reduce waste and material consumption. Include a stage in your asset management process to review the need for a brand new building/asset." (Green Construction Board, Top Tips for Embedding Circular Economy Principles in the Construction Industry)

9.2 Local Plan policy CC1 states we will e) require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and f) expect all developments to optimise resource efficiency.

9.3 Reusing buildings helps developers and the wider community to understand the environmental, social, and heritage value of a site. Benefits of retaining and refurbishing buildings:

- Reduces the requirement for virgin materials and therefore reduces its embodied carbon impact;
- keeps products and materials at their highest value for as long as possible;
- maintains heritage value;
- minimises demolition waste;

- reduces human disruption of extensive demolition and construction works, associated noise and transport impacts, and likely impact on air quality;
- cost and programme savings, depending on the scope of refurbishment; and
- achieve BREEAM credits.

Examples

The examples below have been taken from UK Green Building Council, Circular economy guidance for construction clients, How to practically apply circular economy principles at the project brief stage, April 2019

The Bartlett School of Architecture was refurbished to provide 3000m2 of additional floor area.

Derwent London's Angel Building in Islington London was overclad and fully let within 13 months.

The Senator building in London is being refurbished by Legal & General to high sustainability standards.

Argent's Kings Cross Development includes over 20 reused and refurbished buildings.

LWARBs office was fitted out in just four weeks, using circular principles. The result is a smart, medium spec, modern working environment delivered for the same price as a traditional cat B, low spec fit out.

UKGBC office refit reused or repurposed 98% of original fixtures and fittings.

The University of Cambridge's David Attenborough building had poor energy and comfort performance, but also a significant volume of embodied carbon locked into the compact 16,000m2 of valuable real estate. The University challenged the design team to retain the building and it is estimated that over 82% of the building's embodied carbon has been saved through the refurbishment works.

9.4 In assessing the opportunities for retention and refurbishment developers should assess the condition of the existing building and explore future potential of the site. The New London Plan highlights the importance of retaining the value of existing buildings with the least preferable development option of recycling through demolition, although Policy D3 of the New London Plan states the "best use of the land needs to be taken into consideration when deciding whether to retain existing buildings in a development." The following information in the table below should help to inform decision making prior to the pre-application of a scheme. This should provide a transparent and holistic approach to assessing options that delivers the best outcomes.

Condition and feasibility studies (to understand the reuse potential of the existing building/s)	
Existing building uses	• How well does the building function? Identify operational positives/negatives. • Existing user surveys (if occupied) to understand what works / or doesn't work • If the building is not occupied have other options for reuse been explored?
Servicing	• Summary of MEP (Mechanical, Electrical, Plumbing) servicing, thermal performance and efficiency for each building component. • Identify remaining lifespan of plant and discuss pros/cons of plant upgrade.
Technical: review, with evidence and photos, of existing building, based on intrusive survey.	• Upgrades required to comply with current legislation • A material inventory audit, including an estimate of embodied carbon • Scaled section drawings showing slab depths, floor to ceiling dimensions etc. • Loading capacity of structural frame, materials strength, pile testing • Energy performance of the façade • SBEM (Simplified Building Energy Model) energy modelling • Details of Air Tightness, thermal bridge modelling and condensation analysis in exploration of limits to fabric upgrade in existing building • Future projections for carbon content of electric load should incorporate latest BEIS carbon factors
Site capacity	• What is the best use of the site? And can optimal site capacity be achieved?

Development options

9.5 Taking into account the condition of the existing building and feasibility of re-use above, the following hierarchy should be used to explore all potential options of an existing site, with the aim of optimising resource efficiency (paragraphs 9.9 – 9.12).

9.6 All options should achieve maximum possible reductions for carbon dioxide emissions and include adaptation measures, in accordance with the Council's Development Plan and this CPG.

I. Refit
II. Refurbish
III. Substantial refurbishment and extension
IV. Reclaim and recycle

Refit
This option retains the existing structure as is, includes minor works, and the replacement of building services such as heating and insulation, to continue occupation of the building.

Refurbish
Refurbishment should seek to significantly improve the service life of the existing building. This option provides an opportunity to retrofit the building to reduce carbon emissions and include sustainable adaptation measures.

Substantial refurbishment and extension
This option is similar to the above, but takes into consideration the need to optimise site capacity and alter the existing structure to meet future needs. This may involve significant changes to the façade (façade replacement) but should seek to retain as much of the existing building as possible reducing the need to use new materials and reduce the loss of embodied carbon in the existing structure. If this option includes partial reclaim and recycle the development proposal should include a pre-demolition audit, as specified below.

Reclaim and recycle
Where it is demonstrated to the Councils satisfaction, that the above options are not feasible the development proposal should include a pre-demolition audit identifying all materials within the building and documenting how they will be managed. The preference should be for re-use on site, then re-use off site, remanufacture or recycling. (Providing time in the project plan for selective deconstruction techniques and materials storage to maximise reuse). . New London Plan policy SI7 expects 95% of construction and demolition waste to be diverted from landfill

(reuse, recycle, recovery), and 95% of excavation waste to be put to beneficial use.

At this option a **Whole Life Carbon** assessment (including embodied carbon) should be submitted, following the GLA draft SPG and including long term carbon factors (as set out in the GLA Whole Life Carbon SPG).

- Specifically, the most recently available long-term Green Book projections from the Government should be used in preference to the National Grid source suggested in the current draft, as we view this is as the more established source. The fuel-specific carbon factors are given, to year 2100, in worksheet ‘Conversion factors from fuel to CO2e’ within the spreadsheet ‘IAG spreadsheet toolkit for valuing changes in greenhouse gas emissions’. WLC assessment to be undertaken prior to any public consultation and results explained and included in design options.

9.7 This approach is justified through Local Plan policy CC1 which requires all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building. Paragraph 8.17 of the Local Plan states this should be justified in terms of optimisation of resources and energy use. As such a Whole Life Carbon assessment will be expected for all applications proposing substantial demolition.

9.8 It is important to connect all development options to resource efficiency and circular economy principles, outlined in Local Plan policy CC1 and expanded in the section below.

Resource efficiency and circular economy principles

9.9 As noted above the construction process and new materials employed in developing buildings are major consumers of resources and can produce large quantities of waste and carbon emissions. Policy CC1 expects all development whether for refurbishment or redevelopment to optimise resource efficiency by:

- reducing waste;
- reducing energy and water use during construction;
- minimising materials required;
- using materials with low embodied carbon content; and
- enabling low energy and water demands once the building is in use.

9.10 Reducing embodied carbon impacts can result in other additional benefits including: less waste to landfill from efficient construction methods, or improved air quality benefits from reduced transportation and lower costs of development, operation, and maintenance.

9.11 Policy SI7 of the New London Plan and GLA draft guidance provides a clear framework for integrating circular economy principles within a development but this has the most value when considered at the earliest stages of project design.

9.12 There are various stages of the development process where resource efficiencies can be made and we will expect these to be demonstrated in your Sustainability or Energy statement where relevant..

Design stage

Energy efficient building design
Minimise the quantities of materials used
Where demolition is involved, submission of a pre-demolition audit, implementing careful demolition strategies, segregating materials and conducting analysis to maximise reuse and reclamation
Use of reclaimed / recycled content, and enabling reuse of building materials (local sourcing through material exchange portals)
High durability materials and low maintenance requirements
Design to allow for flexibility – reconfiguration/ remodelling
Design to allow for easy repair/ replacement of components
Design for deconstruction and reuse of materials

Construction stage:

Minimise the quantities of other resources used (energy, water, land)
More efficient use of resources and materials including minimising waste generation
Divert waste from landfill (via reuse, recycling or recovery)
Demolition and construction waste - 95% to reuse, recycling, recovery (excavation 95% ‘beneficial use’)
Use efficient demolition equipment
More efficient modes of transporting materials
Local sourcing of materials responsibly and sustainably
Post completion bill of materials (including as a minimum the building layer, element, material and quantity)
Efficient construction processes and machinery

Operation stage:

Use a soft landings approach to ensure the building is operating efficiently as designed
Implement a good maintenance/ repair strategy to maximise life of materials

Consider repair before replacement
When replacements required select high durability materials with low maintenance requirements

Deconstruction/ end-of-life, and managing waste:

Design for deconstruction and reuse of materials
Divert waste from landfill (via reuse, recycling or recovery)
Demolition and construction waste - 95% to reuse, recycling, recovery
Excavation 95% ‘beneficial use’
Use efficient demolition equipment.

10. Sustainable design and construction measures

KEY MESSAGES

- All developments involving 5 or more residential units or 500 sqm or more of any additional floorspace should address sustainable design and construction measures (proposed in design and implementation) in a Sustainability Statement (Local Plan policy CC2).
- Active cooling (air conditioning) will only be permitted where its need is demonstrated and the steps in the cooling hierarchy are followed (Local Plan policy CC2).
- Development is expected to reduce overheating risk through following the steps in the cooling hierarchy. All new development should submit a statement demonstrating how the cooling hierarchy has been followed (Local Plan policy CC2).
- All developments should seek opportunities to make a positive contribution to green space provision or greening.

10.1 In Camden the changing climate is likely to mean we will experience warmer, wetter winters with more intense rainfall and local flooding events. It will also bring hotter drier summers which will potentially increase the number of days we experience especially poor air quality. Hotter summers will also increase the demand for our open space and the use of electricity for mechanical cooling. Changes to our climate could also lead to subsidence and damage to building structures - increased shrinking and expanding of Camden’s clay base as they dry out in summer followed by wetter winters which contribute to risks of ‘heave’ where ground swells.

10.2 These changes will have an impact on the health and wellbeing of those who live, work and do business in Camden, as such it is important that all development includes sustainable design and construction measures.

10.3 The earlier sections of this guidance have focused on energy efficiency measures which are aimed at reducing the human impact on the climate i.e. by reducing energy use (carbon dioxide emissions). It is also important to plan for a changing environment through appropriate adaptation measures.

Overheating

10.4 Where developments are likely to be at risk of overheating applicants will be required to complete dynamic thermal modelling to demonstrate that any risk to overheating has been mitigated (see Local Plan Policy CC2, paragraph 8.41).

10.5 This assessment should be undertaken in addition to any assessment of overheating risk obtained from the Part L Building Regulation compliance tools SAP and SBEM. This is because these basic overheating compliance tests do not cover all factors which influence overheating. Dynamic thermal modelling should be carried out in accordance with guidance and data sets in CIBSE and GLA 'Design Summer Years for London (TM49: 2014) which provides guidance on future proofing for future impacts of overheating from climate change.

10.6 Active cooling (such as air conditioning) is discouraged, unless the applicant can demonstrate exceptional circumstances where opportunities for cooling are unable to be controlled through passive measures alone.

Cooling hierarchy

10.7 All developments should follow the cooling hierarchy outlined below, to reduce the risk of overheating and subsequent reliance on active cooling:

1. **Minimise internal heat generation through energy efficient design**, considering the following:
   - Layout and uses: locate any spaces that need to be kept cool or that generate heat on cooler sides of developments.
   - Reducing heat gains e.g. including low energy lighting.
   - Seal/ insulate heat generating processes.
   - Reduce the distance heat needs to travel and insulate pipework.
   - Design layouts to promote natural ventilation e.g. shallow floor plans and high floor to ceiling heights.
   - Consider evaporation cooling which cools air through the evaporation of water.
   - Consider 'free cooling' or 'night cooling', which uses the cooling capacity of ambient air to directly cool the space.

2. **Reduce the amount of heat entering a building in summer**:
   - Consider the angle of the sun and optimum daylight and solar gain balance.
   - Orientate and recess windows and openings to avoid excessive solar gain.
   - Consider low g-values and the proportion, size and location of windows.
   - Make use of shadowing from other buildings.
   - Include adequate insulation.

- Design in shading: e.g. include internal courtyards, large shade-providing trees and vegetation, balconies, louvers, internal or external blinds, and shutters.
- Make use of the albedo effect (use light coloured or reflective materials to reflect the sun's rays).
- Include green infrastructure e.g. green wall, green/blue roofs and landscaping, to regulate temperatures.
- Reduce the amount of heat entering a building in summer.

3. **Manage the heat within the building through exposed internal thermal mass and high ceilings,** (see 'Thermal performance' Chapter 3 of this CPG).

4. **Passive ventilation**:
    - Natural ventilation, openable windows, the 'stack effect' system (see Chapter 3 of this guidance).
    - Design layouts to promote natural ventilation e.g. shallow floor plans and high floor to ceiling heights.
    - Consider evaporation cooling which cools air through the evaporation of water.
    - Consider 'free cooling' or 'night cooling' which uses the cooling capacity of ambient air to directly cool the space

5. **Mechanical ventilation**:
    - Ensuring the most efficient system possible.
    - Consider mechanical ventilation with heat recovery

6. **Active cooling**:
    - Ensuring they are the lowest carbon options.
    - Ground Source Heat Pumps and Air Source Heat Pumps can be used in reverse to provide cooling to buildings.
    - Water based cooling systems also reduce the need for air conditioning by running cold water through pipes in the floor and/or ceiling to cool the air.

10.8 The Council will discourage the use of air conditioning and excessive mechanical plant because of the additional energy consumption from operating the equipment, impacts on microclimate from the warm air expelled from the equipment, and because of the competition for plant space, which could otherwise be used for other renewables or green roofs.

10.9 If active cooling is unavoidable, applicants need to identify the cooling requirement of the different elements of the development in the Energy Statement. Where cooling proposed, the efficiency of the system and details of controls should be provided, as well as the ability to take advantage of free cooling and/or renewable cooling sources (e.g. ASHP).

10.10 Where cooling is provided in residential development, this should be modelled and the monthly kWh/m2 consumption attributed to the cooling included in the energy assessment. Where cooling is required in non-residential development, the cooling demand of the actual and notional buildings should be compared, with the aim of reducing the cooling demand below that of the notional building. If this is not possible, the applicant should provide a clear explanation of why it is not possible, and outline the implications for building design.

10.11 Comfort cooling (air conditioning) should not be specified in developments where it has been demonstrated that passive or other measures proposed have successfully addressed the risk of overheating. The Council will resist applications proposing active cooling in residential developments to meet market expectations, where no risk of overheating is identified.

Flooding and drought

10.12 Developments should consider how changing climates will impact flood risk as well as access to water, including structural stability as a result of changing ground conditions.

10.13 Best practice should be followed for the structural integrity of retaining walls and the design of foundations so that they are not vulnerable to seasonal variations in moisture content. Developments should also include adequate on-site drainage and green infrastructure to mitigate against the impacts of increased rainfall and soil erosion. The use of Sustainable Drainage System (SuDS) techniques can also help to reduce subsidence caused by drying out of soils (see CPG Water and flooding for more information on SuDS).

Green spaces

10.14 Improving the borough’s network of green spaces, parks, trees, and green/blue roofs and walls will have a significant cooling effect as well as promoting biodiversity, reducing flood risk, improving air quality, maintaining ground conditions, providing amenity and health and wellbeing benefits.

10.15 All developments should seek opportunities to make a positive contribution to green space provision, through landscaping, wildlife friendly planting and green walls and roofs. Developments in areas considered to be deficient in green space should give special consideration to on-site provision of green space, including developments located within wildlife corridors. See CPG’s on Public open space and Biodiversity for more detail.

10.16 Wildlife features should be integrated throughout the site, rather than being isolated pockets of nature. Planting schemes should be selected according to their suitability for local growing conditions (soil, temperature ranges, rainfall, sunlight and shade), the ability to attract wildlife (e.g. nectar rich planting), and their ability to conserve water.

10.17 The planting of trees as part of new developments is encouraged but species selection and location will need to be carefully considered to avoid risks of subsidence, drying out the soil, or excessive maintenance. See CPG on Trees for more detail.

10.18 The Council will expect the following details from developers:

- location and extent of green space provision;
- planting details, including details of the planting technique, plant varieties, sizes, and densities;
- a management plan detailing how the green space will be maintained. This should include details of the irrigation requirements and sources of irrigation; and
- details of any bird or bat boxes or other wildlife features proposed, including a plan showing the location of features.

Greening roofs

10.19 As development densities increase, brown roofs, green/blue roofs and green walls can provide valuable amenity space, create wildlife habitats, and store or slow down the rate of rainwater run-off, helping to reduce the risk of surface water flooding. Where green roofs are to be accessible for amenity purposes potential overlooking and loss of privacy to adjoining properties will also be assessed. Developers should justify why the provision of a green or brown roof or green wall is not possible or suitable where they are not proposed.

10.20 Green/blue and brown roofs can help to reduce temperatures in urban environments. This is particularly valuable in Camden which suffers from increased temperatures due to the urban heat island effect. All developments (including refurbishments and minor developments) should incorporate green/blue roofs, brown roof and/or green walls where appropriate.

10.21 Green roofs can range from basic sedum roofs to intensively landscaped roofs. The choice of roof may depend on the building structure, location and design. The Council's preference is for developments to incorporate biodiverse green roofs rather than sedum roofs, as sedum roofs provide limited biodiversity value.

General features of Green and Brown roofs

	Extensive	**Semi Intensive**	**Intensive**

	(e.g. sedum or brown roofs)		
Use	Ecological Landscape	Garden/Ecological Landscape	Garden/Park
Type of vegetation	Mosses, Herbs, Grasses	Grasses-Herbs-Shrubs	Lawn, Perennials, Shrubs & Trees
Depth of Substrate	60-200mm	120-250mm	140-400mm
Weight	60-150 kg/m2	120-200 kg/m2	180-500 kg/m2
Maintenance requirement	Low	Periodic	High

10.22 Green roof specifications should be tailored to realise the benefits most suitable for the site and should consider appropriate drought resistant planting to ensure that they can survive hot summers with minimal maintenance. Developers should also consider the microclimate when specifying planting mix: roof conditions are often hostile, with high winds, extreme temperatures, periodic rain and drought. Diverse dry meadow mixes that are naturally self-sustaining in exposed environments can be used. Green roofs require regular maintenance and inspection to ensure adequate growth and removal of invasive species.

10.23 The substrate should be made of varying depths and include dead wood and aggregates to create different microclimates and increase the potential for habitat diversity. Soils and growing media can be formed of recycled material, which support different potential for flora and fauna.

10.24 Brown roofs are similar to green roofs, but the substrate is generally left unplanted and allowed to grow naturally. Brown roofs should create habitats mimicking local brownfield sites. It is preferable to use materials of known quality and water holding capacity. The brown roof is then planted with an appropriate wild flower mix or left to colonise naturally with areas of dead wood or perches for birds.

10.25 Green roofs can be designed to include rainwater collection (e.g. through a ‘Blue Roof’ attenuation layer). However, consideration needs to be given to the materials and pipe work that will go underneath the roof structure and any extra filters required to ensure the water can be re-used (if incorporating rainwater harvesting).

10.26 Green/ brown roofs are compatible with solar PV. The vegetation provides thermal regulation for the PV panels. The planting specifications should be tailored to realise the benefits most suitable for the site.

Greening walls

10.27 Green walls can include vegetation which is planted directly into a substrate within the wall or can be planted in the ground or a pot and encouraged to climb up a structure so that the wall is covered with vegetation. There are three main types of green walls:

- self-clinging climbers such as Ivy, Russian Vine and Virginia Creeper;
- climbers which need support e.g. Honeysuckle and Jasmine; and
- vertical Systems (also known as Living Walls or Vertical Gardens) made up of modular panels designed to support plant growth and incorporating watering systems and a plant nutrient supply.

10.28 The Council will expect the following details from developers:

- a plan showing the location and extent of the green roof and proximity to any mechanical plant;
- a statement of the design objectives for the green/brown roof or green wall;
- details of its construction and the materials used, including a section at a scale of 1:20;
- planting details, including details of the planting technique, plant varieties and planting sizes and densities;

a management plan detailing how the structure and planting will be maintained (this should include details of the irrigation requirements and sources of irrigation), which may either be secured by planning condition or S106; and confirmation that the structure can accommodate the load.

Sustainable design and construction measures

10.29 All developments involving 5 or more residential units or 500 sqm or more of any additional floorspace should address sustainable design and construction measures (proposed in design and implementation) in a Sustainability Statement. Applicants should detail how sustainable design and construction principles have been incorporated into the development either in their Design and Access Statement or in a Sustainability Statement.

10.30 Applicants should demonstrate how sustainable design and construction principles and climate change adaptation measures, as outlined in the table below and the Mayor's Sustainable Design and Construction SPG, have been incorporated into the design. Applicants should address each of the following areas, describing in detail how the design will be informed by these principles:

Energy demand reduction: building fabric (passive measures)	Layout of uses
	Design of windows and openings
	Floorplate size and depths and floor to ceiling heights
	Reducing internal heat gains
	Reducing the need for artificial lighting
	Limiting excessive solar gain
	Optimising natural ventilation
	Passive cooling
	Green infrastructure
	Best practice levels of insulation
	Draught proofing and air tightness

	Thermal mass
	Thermal buffers
	Consideration of renewable energy technology
Energy demand reduction: Energy efficient services (active measures)	Efficient ventilation
	Efficient cooling
	Efficient heating
	Efficient lighting
	Zoning, controls and sensors
	Efficient appliances and equipment
	Energy monitoring and building management systems
	Metering
Energy generation	Inclusion of low and zero carbon technologies
Water conservation	Efficient water use Re-use of water
Adaptation to climate change	Sustainable urban drainage
	Impact on microclimate
	Measures to reduce overheating (cooling hierarchy)
Materials and resource conservation	Recycling provision
	Reuse and recycling of materials
	Responsible sourcing

Nature conservation and biodiversity	Green walls, roofs and landscaping
	Enhancement and creation of wildlife habitats
Sustainable and active travel	Bicycle storage
	Low carbon vehicles
Other	Education and awareness raising
	On-going management and review
	Future use of the building and flexibility to change

11. Sustainable Assessment tools

KEY MESSAGES

- BREEAM Excellent is required for all non-residential development of 500sqm or more floorspace
- Other assessment tools such as Home Quality Mark and Passivhaus are encouraged, they can serve to demonstrate the incorporation of sustainable design principles.

11.1 One way to ensure buildings are designed to be sustainable is to use a standardised environmental assessment tool, such as BREEAM to measure the overall performance of buildings against set criteria. Buildings that achieve high ratings use less energy, consume less water and have lower running costs than those designed to building regulations alone.

11.2 BREEAM assessments generally consist of nine categories covering: Energy; Health and Well-being; Land use and Ecology; Management; Materials; Pollution; Transport; Waste; Water. The development is then rated on a scale from PASS, to GOOD, VERY GOOD, EXCELLENT and ending with OUTSTANDING.

11.3 Local Plan Policy CC2 expects non-residential developments of 500sqm or more of floorspace to achieve an Excellent BREEAM rating, achieving 60% of all available Energy and Water credits and 40% of available Materials credits. These sub-targets are included as achieving this weighting of credits is considered to result in the greatest environmental benefits.

11.4 New build developments can undertake a BREEAM New Construction assessment (can be applied to fully fitted developments as well as shell only and shell and core building projects). Refurbishments/change of use schemes can undertake a BREEAM Refurbishment and Fit Out assessment, which has four parts. Schemes can be assessed using a combination of these parts, depending upon the scope of the works:

- Part 1 - Fabric and structure: external envelope including walls, roof, windows and floor
- Part 2 - Core services: centralised mechanical and electrical plant including heating, cooling and ventilation
- Part 3 - Local services: localised services including lighting, local heating, cooling and ventilation
- Part 4 - Interior design: interior finishes, furniture, fittings and equipment

11.5 There are also specific assessments for various building uses such as offices, retail, industrial, education and multi-residential. For developments that are not covered by one of the specific BREEAM assessment tools (this often applies to mixed-use schemes) a tailored assessment can be created using the BREEAM Bespoke method. Furthermore, specific criteria are available for heritage buildings that take into account constraints made by conservation officers.

11.6 For complex or mixed use schemes, developers should discuss the project with BRE to determine the most suitable assessment approach. Some schemes may require multiple assessments, for example where there is a mix of new build and refurbishment or multiple use classes. In some situations, small spaces (<500 sq.m) which do not fit into a chosen assessment methodology can be excluded from the scope of the assessment, but full justification for the exclusion will need to be provided and agreed with the Council. The Sustainability Statement will still need to demonstrate how the sustainable design and construction principles outlined above have been incorporated into the design and proposed implementation. **Appendix 2.0** provides three case studies on policy application for complex mixed developments, including BREEAM.

BREEAM is assessed in stages:

1. The *pre-assessment* stage involves an initial review of the development, undertaken by a licensed assessor. This review will provide an indicative score (which will form a basis of the condition/S106 planning obligation agreements) as well as recommendations to make the scheme as sustainable as possible. The pre-assessment also helps to identify if there are any experts, such as ecologists, that need to be involved in the development.
2. The Design Stage Assessment reviews the detailed design specifications of a development. It allows the assessor to make a more precise estimate of the BREEAM rating. Some

elements of the assessment will need to be refined once construction has begun, because some materials and appliances are not specified until after or during construction. The assessor will ensure that any design and/or specification changes are reflected in the final Design Stage Assessment. This Design Stage Assessment must be submitted to BRE, who will then review this assessment and issue a BREEAM Design Stage certificate, which must be submitted to the Council prior to construction to discharge the relevant condition or Section 106 planning obligation.

3. The Post-construction assessment reviews the design stage assessment and compares it with the completed development to ensure that all the specified credits have been achieved. A copy of the post-construction certificate must be submitted to the Council. There is often a delay between the completion of a development and the receipt of a post-construction certificate. Therefore the Council will allow occupation prior to the receipt of the final certificate. This approach will be monitored to ensure that the design stage certificate is consistent with the final post-construction report and certificate.

Alternative assessment tools

Home Quality Mark

11.7 The Home Quality Mark (HQM) is an assessment tool for new homes developed by BRE. It uses a simple 5-star rating to provide impartial information from independent experts on a new home's design, construction quality and running costs. It incorporates sustainability standards, including energy consumption, overheating and air quality.

11.8 The Council will be supportive of schemes that aim to achieve Home Quality Mark, subject to other policy and design considerations.

http://www.homequalitymark.com/

PassivHaus

11.9 PassivHaus is a design and construction standard from Germany that can result in a 90% reduction in energy demand and usage. It can be applied to both commercial and residential buildings.

11.10 PassivHaus buildings must meet the following criteria:

- The total energy demand for space heating and cooling is less than 15 kWh/m2/yr of the treated floor area.
- The total primary energy use for all appliances, domestic and hot water and space heating and cooling is less than 120 kWh/m2/yr.

- Specific cooling demand is less than or equal to 15kWh/m2/yr.
- Primary energy demand is less than or equal to 120kWh/m2/yr.
- Air permeability limiting value is less than or equal to 0.6 air changes per hour at n50.
- Summer comfort is less than 25°C for <10% hours. Minimum internal surface temperature is >17°C (to lower convection driven drafts).
- Ventilation is 30m3 per person per hour.

www.passivhaus.org.uk

EnerPHit Standard

11.11 The EnerPHit standard applies to refurbished buildings and recognises the challenges that older buildings face in achieving Passivhaus standard. The EnerPHit criteria are as follows:

- Specific Heat Demand less than or equal to 25kWh/m2/yr.
- Primary Energy Demand is less than or equal to 120 kWh/m2/yr
- Air permeability limiting value is less than or equal to 1 air change per hour at n50.

11.12 PassivHaus and EnerPHit developments are designed using a special software package called the PassivHaus Planning Package (PHPP) and regional climate data. The Council will be supportive of schemes that aim to achieve PassivHaus or EnerPHit standards, subject to other policy and design considerations. More information can be found on the PassivHaus website - www.passivhaus.org.uk

11.13 The above schemes involve reducing unregulated as well as regulated energy consumption, and have a high success rate both in implementation of design measures and in operational performance. The Council reserves the right to waive part or all of any carbon offset payments that would otherwise be due, for schemes which are able to evidence full PassivHaus, EnerPHit or Home Quality Mark certification.

Appendix 1

Presentation of carbon reductions calculations for the Energy Assessment

Applicants are advised to present the carbon reduction in the following format. This table is based on that provided in the GLAs Guidance on Preparing Energy Assessments.

	New build commercial (includes major refurbishments assessed under Part L2A)		New build residential (includes major refurbishments assessed under Part L1A)		Commercial Refurbishment (assessed under Part L2B)		Residential Refurbishment (assessed under Part L1B)		Overall area weighted reductions	
	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage	Total tCO2	% reduction at each stage
Baseline	A	N/A	A	N/A	A	N/A	A	N/A	A	N/A
Be Lean	B	(A-B) /A *100	B	(A-B) /A *100	B	(A-B) /A *100	B	(A-B) /A *100	B	(A-B) /A *100
Be Clean	C	(B-C) /A *100	C	(B-C) /A *100	C	(B-C) /A *100	C	(B-C) /A *100	C	(B-C) /A *100
Be Green	D	(C-D) /A *100	D	(C-D) /A *100	D	(C-D) /A *100	D	(C-D) /A *100	D	(C-D) /A *100

TOTAL	A-D = E	(A-D) /A *100	A-D = E	(A-D) /A *100	A-D = E	(A-D) /A *100	A-D = E	(A-D) /A *100	A-D = E	(A-D) /A *100

Shortfall	(A * 0.35) – E	*30 years = £	A – E	*30 years = £	N/A	6 N/A	N/A	8 N/A	Domestic + non	*30 years = £

Appendix 2

Policy application for mixed use developments

The guidance below relates specifically to policy application in mixed developments that require planning permission. Where there is any doubt about policy application, applicants are encouraged to contact the Council prior to submission.

Mixed Residential/Non-residential: Mixed schemes with both residential and non-residential uses should follow the policy guidelines noted in this guidance for the respective areas. Where individually residential and non-residential spaces fall under the 'Minor' classification but together the total floor space is considered a 'Major' application, then the applicant should follow guidance relating to Majors.

Mixed refurbishment and new build: Developments involving a mix of refurbished existing spaces and new build development (including new build extensions) should follow the guidance in the GLAs Guide to Preparing Energy Assessments and present the spaces separately within the energy assessment. Inclusion of the existing building in the calculation depends on the extent to which the existing building is being refurbished or the use changed and to what extent the thermal envelope of the new extension area is separated from the existing building. In terms of BREEAM requirements, BRE should be consulted on the best assessment approach. This will help decide: which parts should be included within the Refurbishment and Fit Out schedule (and whether they should be assessed separately) depending on the extent of refurbishment; whether a separate BREEAM New Construction assessment is required for new build areas; or whether a 'Bespoke' assessment tool would be more suitable. In some situations small spaces (i.e. <500 sq.m) may be excluded from the scope (full justification will need to be provided). However, the Sustainability Statement will need to demonstrate how the sustainable design and construction principles, and climate change adaptation measures, have been incorporated into the design.

Extensions: For non-residential schemes, if an extension is 'large', as defined by the building regulations (i.e. with a useful floor area that is both greater than 100sqm, and greater than 25 per cent of the total useful floor area of the existing building) then it should be regarded as a 'new building' and the guidance in Approved Document L2A should be followed. If it is 'small' and subsequently forms part of the refurbishment, then the whole building would be assessed as a refurbishment, however the new elements should at least meet the limiting values of Part L.

For residential schemes, if the new build part would constitute as a 'Major' development (i.e. > 1,000 sq.m) then this part should be presented separately.

Consequential improvements also apply to major developments with an extension.

The Council will expect developers to improve upon minimum Building Regulations in both the new build and refurbished parts, where possible.

Mixed use non-residential: Where there are multiple individual spaces of different use class, the applicant should consult BRE about the most suitable assessment methodology and scope for the scheme. In some situations small spaces may be excluded from the scope (full justification will need to be provided). However, the Sustainability Statement will need to demonstrate how the sustainable design and construction principles, and climate change adaptation measures, have been incorporated into the design.

Case Studies

Case Study 1: New build mixed use development.

	Proposed	
	Use class	**Floor area (sq.m)**
Ground Floor	A3: Cafe	150
Ground Floor	A1: Retail	300
Ground Floor	B1: Offices	400
First Floor	C3: Residential	800
Second Floor	C3: Residential	800

Total residential floor space = 1,600 sq.m therefore the development will need to meet policies for new build ‘Major’ residential development. These details should be presented separately in the energy statement.

Total commercial floor space = 850 sq.m therefore the development will need to meet the carbon reduction and technical standards for new build ‘Medium’ commercial developments, and make the greatest contribution to carbon reduction, striving for 35% reduction.

11.91 As the combined floor space is >1,000 sq.m, the development would be expected to follow guidance for Major developments. The applicant would need to consult with BRE about the scope of the BREEAM assessment and provide justification for excluding any uses from scope.

Case Study 2: Existing 3-storey building, Grade Two Listed. Proposed change of use to some parts of the building, light refurbishment, and vertical extension.

	Existing		**Proposed**		**Change of use**	**New floor space**
	Use class	**Floor area (sq.m)**	**Use class**	**Floor area (sq.m)**		
Basement	B1: Office	556	B1: Office	156		
			D2: events hire space	400	400	
Ground Floor	B1: Office	56	A3: Cafe	86	86	
Ground Floor	D1: Clinic	200	D1: Library	470	170	
Ground Floor	D1: Library	300				
First Floor	D1: Library	300	B1: Office	300	300	
First Floor	B1: Office	256	B1: Office	256		
Second Floor			B1: Office	556		556
		1,668		**2,224**	**956**	**556**

Extension is >100sqm and > 25% of existing floor area, therefore is considered to be ‘large’. Therefore this part of the development needs to be presented separately within the energy statement. Guidance for ‘Medium’ ‘non-domestic new build’ will apply.

There is 956sqm of change in use therefore these spaces combined will meet triggers for non-domestic refurbishment 'Medium' development. Where there are only minor works being undertaken and there is no change of use, then the applicant can just detail how the individual elements of the energy hierarchy have been implemented and CO2 reductions achieved rather than model those areas. However, it will likely be more practical to include the entire refurbished building in the assessment rather than just those areas undergoing change of use. Either way the applicant should make the extent of works clear within the energy and sustainability statement.

Due to the multiple use classes spread throughout the building, the applicant should consult with BRE over the choice of BREEAM assessment and justify any exclusion.

As the building is listed, reasonable consideration will be given to constraints.

Case Study 3: Refurbished commercial/office space with rear extension over all floors, no external works to existing building.

	Existing		**Proposed**		**Change of use**	**New floor space**
	Use class	**Floor area (sq.m)**	**Use class**	**Floor area (sq.m)**		
Ground Floor	A1: Retail	456	A1: Retail	456		
Ground Floor	B1: Office	300	B1: Office	500		200
First Floor	B1: Office	650	B1: Office	750		100
Second Floor	B1: Office	650	B1: Office	750		100
Third Floor	B1: Office	600	B1: Office	700		100
		2,656		**3156**	**0**	**500**

Extension is >100 sq.m but < 25% of existing floor area, therefore is not classified as a 'large' extension. This means the new build and existing parts of the building can be assessed together as a refurbishment. Where possible, the carbon reductions for the new build parts and refurbished parts should be presented separately within the energy statement. However, it is acknowledged that in some situations separating the new build and the existing part of the building may be impractical where these spaces are integrated into the existing building fabric and share the same services. Details of how the development meets/exceeds building regulations for each of the new and existing building elements should still be provided.

The total new floor space is 500sqm therefore it just triggers the requirement for BREEAM. If the existing part of the building is not undergoing any external works then BREEAM will only be triggered by policy in the extension parts, however, it would make sense to include the entire building within the assessment where possible (particularly if there are extensive refurbishment works in the existing building). The applicant can decide whether to also assess the retail unit – this is not required under policy as it is smaller than 500sqm, but would be encouraged.

If the existing building is undergoing external works, we would expect the applicant to include these areas within the scope of the BREEAM assessment and also detail how these parts have been improved beyond Part L building regulations.

If the refurbishment works are extensive and include alterations to the building fabric to the extent that it can be regarded as a ‘new build’ (i.e. is assessed under Part L2A), this will be counted towards the ‘new floor space’ area and new build policies would apply to those areas.

Appendix 3

CHP and District Heating Feasibility Assessment Checklists

Applicants should ensure the following information is included within the Energy Assessments where decentralized energy networks or CHP is proposed, or when preparing the development for future connection to a network.

District Heating Connection – Assessment Checklist:	
Please confirm if the development is located within 500m of an existing network. Please refer to the following maps: **Borough Wide Heat Demand and Heat Source Mapping** **London Heat Map**	☐
Please provide details on any physical or technical barriers to connection, if applicable	☐
Please confirm if connection to the network will not conflict with energy strategy.	☐
Please provide details of correspondence with the network operator confirming: Network capacity and business/expansion plans Connection costs Timescale for connection Phasing requirements (if applicable) Type of heat source installed in the energy centre (e.g. boilers, heat pumps, CHP) Type of fuel used The heat efficiency Power efficiency (where CHP is used as a heat source) Carbon factor for the heat supplied, and assumptions used to derive this Estimated heat losses and power efficiency Estimated CO2 reductions if the development is to connect to the network (over the lifetime of the technology, taking into account projected decarbonisation of the grid).	☐
Please provide details of any plant room space and pipe routes	☐

and connection points from plant room to property boundary.	
Please provide a schematic of the network showing all buildings connected to the network and energy centre. Phased schematics with timescales should be provided where relevant.	☐
Please provide any further details demonstrating technical compatibility for connection and conformity with CIBSE Code of Practice	☐
CHP – Assessment Checklist:	
Please provide estimated annual and peak energy demands (kWh/year and kW) for the development for: Heat demand (for hot water and space heating separately) Electricity demand (including unregulated energy) Cooling demand where district cooling is proposed	☐
Please provide details on expected daily, weekly and annual occupancy patterns of each building.	☐
Please provide details of the number of energy centres proposed on the network and details of phasing, if applicable.	☐
Please provide details of the fuel to be used, including type of fuel and amount (kWh/yr). *The applicant should review available heat sources and technologies, including renewables and local waste heat sources where possible, with a comparison of whole life costs and contributions to CO2 reductions. The applicant should take account of future trends in energy prices and electricity decarbonisation, and level of technology risk.*	☐
Please provide details of the CHP, including: CHP size (kWth/kWe) CHP efficiency (thermal and electrical - gross and not net) Heat generated (kWh/yr) as a total, and as a % proportion of the total heat demand Electricity generated (kWh/yr) as a total, and as a % proportion of the total heat demand used on site. Operating hours (per yr) Thermal store details (litres and m3)	☐

Details of standby and top up boilers	
Please provide details of the proportion heat and electricity demand provided by CHP, thermal stores, boilers, and other technologies, illustrated as a heat profile showing: Monthly demand profiles Typical monthly design day profiles *Please note: this should show the total heat and electricity demand for the development*	☐
Please provide details of the carbon benefits (gross values rather than net values) for the lifetime of the technology, taking into account the projected decarbonisation of the grid.	☐
Please provide details of the NOx emissions associated with the plant and confirmation that a detailed Air Quality Assessment (including dispersion modelling) has been completed. Guidance regarding Air Quality Assessments can be found in **Chapter 6 of this SPD.** *Appropriate mitigation should be in place. Cross referencing the Air Quality Assessment, the energy assessment should confirm that the NOx emission standards set out in the SPG on Sustainable Design and Construction will be met*	☐
Please submit a floor plan of energy centre and layout of plant, and confirm that there is sufficient access for maintenance.	☐
Please confirm that the proposed system meets all relevant regulatory requirements	☐
Please confirm that the CIBSE Code of Practice has been followed in designing the system and network.	☐
Please provide details on how heat gains from pipework have been minimised. Risk of overheating in summer should be assessed**.**	☐
Please provide details of other potential developments which could connect to the network and whether they have been included in the assessment. The developer should consider the potential for scheme extensions and new connections and provide details of other buildings that are willing to take heat. Please consult the following documents/ maps: Borough Wide Heat Demand and Heat Source Mapping – this will be updated following any changes	☐

London Heat Map

Map showing up-to-date information on Council Housing Stock

Map showing up-to-date information on current planning applications

Euston Road Area Plan

Camden Goods Yard Planning Framework

Please provide details of how the scheme will be able to connect to a wider network, should one become available. Please also provide the triggers for connecting to a wider network.	☐
Please provide details of the estimated electricity exported to grid (kWh/yr).	☐
If electricity will be exported, please provide confirmation of who will be responsible for the CHP electricity sales and that the costs associated with this have been considered. Include any details of communications with ESCOs.	☐
If electricity will be exported, please provide details of any plans for G59 connection – further details are available here https://www.ukpowernetworks.co.uk/internet/en/our-services/list-of-services/electricity-generation/distributed-generation-connection/	☐
Please provide details of operation, maintenance and monitoring arrangements and please confirm that the CHP will be economical to operate and maintain	☐
Future Proofing Connection – Assessment Checklist:	
Please provide confirmation that the development is within 1km of a potential network	☐
Please provide a floor plan of energy centre and layout of plant.	☐
Please provide details of pipe routes and connection points from plant room to property boundary	☐
Please provide details of the triggers for connecting to a wider network (i.e. when a network becomes available or a particular date)	☐

Appendix 4

Low and Zero Carbon technology comparison

The following table can be used to present comparison of different energy strategies and impact of decarbonisation of the grid. Add/ amend years as necessary.

LZC Technology Option	Annual CO2 savings					Renewables Targets (20%)% met	Offsetting cost
	Year 1	Year 2	Year 3	Year 4	Year 5…..		
Option 1 [provide detail here]							
Option 2 [provide detail here]							
Option 3 [provide detail here]							