Policy SI 2 Minimising greenhouse gas emissions

A Major development should be net zero-carbon.[151] This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

1) be lean: use less energy and manage demand during operation
2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly
3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
4) be seen: monitor, verify and report on energy performance.

B Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

C A minimum on-site reduction of at least 35 per cent beyond Building Regulations[152] is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

1) through a cash in lieu contribution to the borough's carbon offset fund, or
2) off-site provided that an alternative proposal is identified and delivery is certain.

D Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

---

151 Where zero-carbon is used in the Plan it refers to net zero-carbon – see Glossary for definition.

152 Building Regulations 2013. If these are updated, the policy threshold will be reviewed. https://www.gov.uk/government/publications/conservation-of-fuel-and-power-approved-document-l

E Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

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

9.2.1 The Mayor is committed to London **becoming a zero-carbon city**. This will require reduction of all greenhouse gases, of which carbon dioxide is the most prominent.[153] London's homes and workplaces are responsible for producing approximately 78 per cent of its greenhouse gas emissions. If London is to achieve its objective of becoming a zero-carbon city by 2050, new development needs to meet the requirements of this policy. Development involving major refurbishment should also aim to meet this policy.

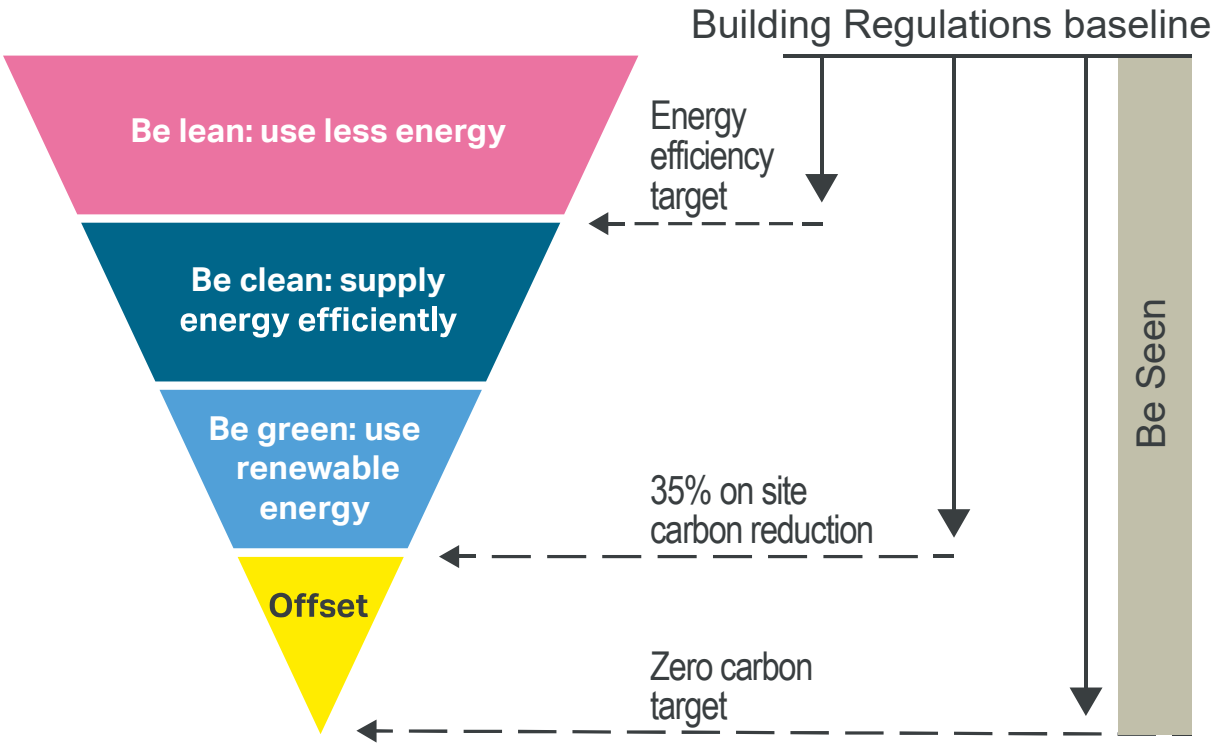
9.2.2 **The energy hierarchy** (Figure 9.2) should inform the design, construction and operation of new buildings. The priority is to minimise energy demand, and then address how energy will be supplied and renewable technologies incorporated. An important aspect of managing demand will be to reduce peak energy loadings.

9.2.3 Boroughs should ensure that all developments maximise opportunities for **on-site electricity and heat production** from solar technologies (photovoltaic and thermal) and use innovative building materials and smart technologies. This approach will reduce carbon emissions, reduce energy costs to occupants, improve London's energy resilience and support the growth of green jobs.

9.2.4 A zero-carbon target for major residential developments has been in place for London since October 2016 and applies to **major non-residential developments** on final publication of this Plan.

153 'Carbon' is used in the London Plan as a shorthand term for all greenhouse gases. London's carbon accounting is measured in carbon dioxide equivalent, which includes the conversion of other greenhouse gases into their equivalent carbon dioxide emissions.

Figure 9.2 - The energy hierarchy and associated targets



Source: Greater London Authority

9.2.5 To meet the zero-carbon target, an on-site reduction of at least 35 per cent beyond the baseline of Part L of the current Building Regulations is required.[154] The minimum **improvement over the Target Emission Rate** (TER) will increase over a period of time in order to achieve the zero-carbon London ambition and reflect the costs of more efficient construction methods. This will be reflected in future updates to the London Plan.

9.2.6 The Mayor recognises that **Building Regulations** use outdated carbon emission factors and that this will continue to cause uncertainty until they are updated by Government. Interim guidance has been published in the Mayor's Energy Planning Guidance on the use of appropriate emissions factors. This guidance will be updated again once Building Regulations are updated to help provide certainty to developers on how these policies are implemented.

154 Building Regulations 2013. If these are updated, the policy threshold will be reviewed. https://www.gov.uk/government/publications/conservation-of-fuel-and-power-approved-document-l

9.2.7 Developments are expected to achieve carbon reductions beyond Part L from **energy efficiency measures** alone to reduce energy demand as far as possible. Residential development should achieve 10 per cent and non-residential development should achieve 15 per cent over Part L. Achieving energy credits as part of a Building Research Establishment Environmental Assessment Method (BREEAM) rating can help demonstrate that energy efficiency targets have been met. Boroughs are encouraged to include BREEAM targets in their Local Plans where appropriate.

9.2.8 The price for offsetting carbon[155] is regularly reviewed. Changes to the GLA's suggested **carbon offset price** will be updated in future guidance. New development is expected to get as close as possible to zero-carbon on-site, rather than relying on offset fund payments to make up any shortfall in emissions. However, **offset funds** have the potential to unlock carbon savings from the existing building stock through energy efficiency programmes and by installing renewable technologies – typically more expensive to deliver in London due to the building age, type and tenure.

9.2.9 The Mayor provides **support to boroughs** by advising those which are at the early stages of setting up their carbon offsetting funds, and by setting out guidance on how to select projects. To ensure that offset funds are used effectively to reduce carbon whilst encouraging a holistic approach to retrofitting, Mayoral programmes offer additional support.[156]

9.2.10 The move towards zero-carbon development requires comprehensive **monitoring of energy demand and carbon emissions** to ensure that planning commitments are being delivered. Major developments are required to monitor and report on energy performance, such as by displaying a Display Energy Certificate (DEC), and reporting to the Mayor for at least five years via an online portal to enable the GLA to identify good practice and report on the operational performance of new development in London.

9.2.11 Operational carbon emissions will make up a declining proportion of a development's whole life-cycle carbon emissions as operational carbon targets become more stringent. To fully capture a development's carbon impact, a **whole life-cycle approach** is needed to capture its unregulated emissions (i.e. those associated with cooking and small appliances), its embodied emissions

155 Boroughs should develop a price for offsetting carbon using either a nationally recognised carbon pricing mechanism or a price based on the cost of offsetting carbon across the borough. A nationally recognised non-traded price of £95/tonne has been tested as part of the viability assessment for the London Plan which boroughs may use to collect offset payments.

156 For examples see London Environment Strategy 2018.

(i.e. those associated with raw material extraction, manufacture and transport of building materials and construction) and emissions associated with maintenance, repair and replacement as well as dismantling, demolition and eventual material disposal). Whole life-cycle carbon emission assessments are therefore required for development proposals referable to the Mayor. Major non-referable development should calculate unregulated emissions and are encouraged to undertake whole life-cycle carbon assessments. The approach to whole life-cycle carbon emissions assessments, including when they should take place, what they should contain and how information should be reported, will be set out in guidance.

9.2.12 The Mayor may publish further planning guidance on sustainable design and construction[157] and will continue to regularly update the guidance on preparing **energy strategies** for major development. Boroughs are encouraged to request energy strategies for other development proposals where appropriate. As a minimum, energy strategies should contain the following information:

a. a calculation of the energy demand and carbon emissions covered by Building Regulations and, separately, the energy demand and carbon emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations (i.e. the unregulated emissions), at each stage of the energy hierarchy

b. proposals to reduce carbon emissions beyond Building Regulations through the energy efficient design of the site, buildings and services, whether it is categorised as a new build, a major refurbishment or a consequential improvement

c. proposals to further reduce carbon emissions through the use of zero or low-emission decentralised energy where feasible, prioritising connection to district heating and cooling networks and utilising local secondary heat sources. (Development in Heat Network Priority Areas should follow the heating hierarchy in Policy SI 3 Energy infrastructure)

d. proposals to further reduce carbon emissions by maximising opportunities to produce and use renewable energy on-site, utilising storage technologies where appropriate

e. proposals to address air quality risks (see Policy SI 1 Improving air quality). Where an air quality assessment has been undertaken, this could be referenced instead

157 This will build on the 2014 Sustainable Design and Construction SPG.

f. the results of dynamic overheating modelling which should be undertaken in line with relevant Chartered Institution of Building Services Engineers (CIBSE) guidance, along with any mitigating actions (see Policy SI 4 Managing heat risk)

g. proposals for demand-side response, specifically through installation of smart meters, minimising peak energy demand and promoting short-term energy storage, as well as consideration of smart grids and local micro grids where feasible

h. a plan for monitoring and annual reporting of energy demand and carbon emissions post-construction for at least five years

i. proposals explaining how the site has been future-proofed to achieve zero-carbon on-site emissions by 2050

j. confirmation of offsetting arrangements, if required

k. a whole life-cycle carbon emissions assessment, and actions to reduce life-cycle carbon emissions (for development proposals referable to the Mayor)

l. analysis of the expected cost to occupants associated with the proposed energy strategy

m. proposals that connect to or create new heat networks should include details of the design and specification criteria and standards for their systems as set out in Policy SI 3 Energy infrastructure.

Policy SI 3 Energy infrastructure

A Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.

B Energy masterplans should be developed for large-scale development locations (such as those outlined in Part A and other opportunities) which establish the most effective energy supply options. Energy masterplans should identify:

1) major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)
2) heat loads from existing buildings that can be connected to future phases of a heat network
3) major heat supply plant including opportunities to utilise heat from energy from waste plants
4) secondary heat sources, including both environmental and waste heat
5) opportunities for low and ambient temperature heat networks
6) possible land for energy centres and/or energy storage
7) possible heating and cooling network routes
8) opportunities for futureproofing utility infrastructure networks to minimise the impact from road works
9) infrastructure and land requirements for electricity and gas supplies
10) implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector
11) opportunities to maximise renewable electricity generation and incorporate demand-side response measures.

C Development Plans should:

1) identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure

2) identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.

D Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:

1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

a) connect to local existing or planned heat networks

b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)

c) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)

d) use ultra-low NOx gas boilers

2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality

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

E Heat networks should achieve good practice design and specification standards for primary, secondary and tertiary systems comparable to those set out in the CIBSE/ADE Code of Practice CP1 or equivalent.

9.3.1 The Mayor will work with boroughs, energy companies and major developers to promote the **timely and effective development of London's energy system** (energy production, distribution, storage, supply and consumption).

9.3.2 London is part of a national energy system and currently sources approximately 95 per cent of its energy from outside the GLA boundary. Meeting the **Mayor's zero-carbon target by 2050** requires changes to the way we use and supply energy so that power and heat for our buildings and transport is generated from local clean, low-carbon and renewable sources. London will need to shift from its

reliance on using natural gas as its main energy source to a more diverse range of low and zero-carbon sources, including renewable energy and secondary heat sources. Decentralised energy and local secondary heat sources will become an increasingly important element of London's energy supply and will help London become more self-sufficient and resilient in relation to its energy needs.

9.3.3 Many of London's existing **heat networks** have grown around combined heat and power (CHP) systems. However, the carbon savings from gas engine CHP are now declining as a result of national grid electricity decarbonising, and there is increasing evidence of adverse air quality impacts. Heat networks are still considered to be an effective and low-carbon means of supplying heat in London, and offer opportunities to transition to zero-carbon heat sources faster than individual building approaches. Where there remains a strategic case for low-emission CHP systems to support area-wide heat networks, these will continue to be considered on a case-by-case basis. Existing networks will need to establish decarbonisation plans. These should include the identification of low- and zero-carbon heat sources that may be utilised in the future, in order to be zero-carbon by 2050. The Mayor will consider how boroughs and network operators can be supported to achieve this.

9.3.4 Developments should connect to existing heat networks wherever feasible. New and existing networks should incorporate good practice design and specification standards comparable to those set out in the CIBSE/ADE Code of Practice CP1 for the UK or equivalent. They should also register with the Heat Trust or an equivalent scheme. This will support the development of good quality networks whilst helping network operators prepare for regulation and ensuring that customers are offered a reliable, cost-competitive service. Stimulating the delivery of new district heating infrastructure enables the opportunities that district heating can provide for London's energy system to be maximised. The Mayor has identified **Heat Network Priority Areas**, which can be found on the London Heat Map website.[158] These identify where in London the heat density is sufficient for heat networks to provide a competitive solution for supplying heat to buildings and consumers. Data relating to new and expanded networks will be regularly captured and made publicly available. Major development proposals outside Heat Network Priority Areas should select a low-carbon heating system that is appropriate to the heat demand of the development, provides a solution for managing peak demand, as with heat networks, and avoids high energy bills for occupants.

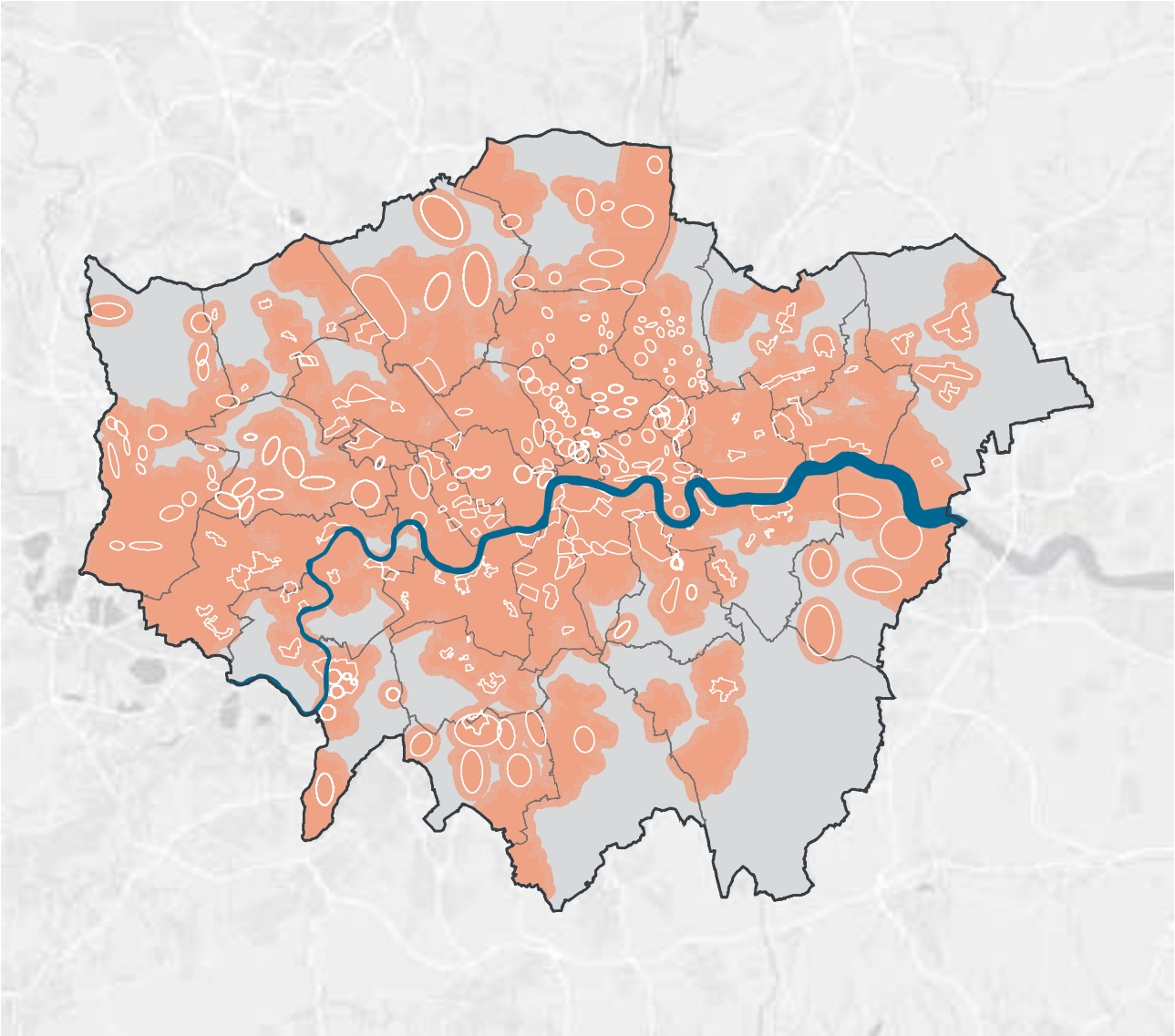
158 London Heat Map, https://www.london.gov.uk/what-we-do/environment/energy/london-heat-map

9.3.5 Where developments are proposed within Heat Network Priority Areas but are beyond existing heat networks, the heating system should be designed to **facilitate cost-effective future connection**. This may include, for example, allocating space in plant rooms for heat exchangers and thermal stores, safeguarding suitable routes for pipework from the site boundary and making provision for connections to the future network at the site boundary. The Mayor is taking a more direct role in the delivery of district-level heat networks so that more new and existing communally-heated developments will be able to connect into them, and has developed a comprehensive decentralised energy support package. Further details are available in the London Environment Strategy.

9.3.6 The Mayor also supports the development of **low-temperature networks** for both new and existing systems as this allows cost-effective use of low-grade waste heat. It is expected that network supply temperatures will drop from the traditional 90°C-95°C to 70°C and less depending on system design and the temperature of available heat sources. Further guidance on designing and operating heat networks will be set out in the updated London Heat Network Manual.

9.3.7 **Low-emission CHP** in this policy refers to those technologies which inherently emit very low levels of NOx. It is not expected that gas engine CHP will fit this category with the technology that is currently available. Further details on circumstances in which it will be appropriate to use low-emission CHP and what additional emissions monitoring will be required will be provided in further guidance. This guidance will be regularly updated to ensure that it reflects changes in technology.

Figure 9.3 - Heat Network Priority Areas



Heat Network Priority Areas

- Heat Network Priority Areas
- Local Authority Heat Network Studies

Source: GLA Environment

Contains OS data © Crown copyright and database right (2017)

9.3.8 Increasing the amount of **renewable and secondary energy** is supported and development proposals should identify opportunities to maximise both secondary heat sources and renewable energy production on-site. This includes the use of solar photovoltaics, heat pumps and solar thermal, both on buildings and at a larger scale on appropriate sites. There is also potential for wind and hydropower-based renewable energy in some locations within London. Innovative low- and zero-carbon technologies will also be supported.

9.3.9 **Electricity** is essential for the functioning of any modern city. Demand is expected to rise in London in response to a growing population and economy, the increased take up of electric vehicles, and the switch to electric heating systems (such as through heat pumps). It is of concern that the electricity network and substations are at or near to capacity in a number of areas, especially in central London. The Mayor will work with the electricity and heat industry, boroughs and developers to ensure that appropriate infrastructure is in place and integrated within a wider smart energy system designed to meet London's needs.

9.3.10 Demand for **natural gas** in London has been decreasing over the last few years, with a 25 per cent reduction since 2000.[159] This trend is expected to continue due to improved efficiency and a move away from individual gas boilers. Alongside the continuing programme of replacing old metal gas mains (predominantly with plastic piping), local infrastructure improvements may be required to supply energy centres, associated with heat networks, that will support growth in Opportunity Areas and there may also be a requirement for the provision of new pressure reduction stations. These requirements should be identified in energy masterplans.

9.3.11 Cadent Gas and SGN operate London's gas distribution network. Both companies are implementing significant **gasholder de-commissioning programmes**, replacing them with smaller gas pressure reduction stations. The Mayor will work with key stakeholders including the Health and Safety Executive to achieve the release of the resulting brownfield sites for redevelopment including energy infrastructure where appropriate.

9.3.12 Land will be required for energy supply infrastructure including **energy centres**. These centres can capture and store energy as well as generate it. The ability to efficiently store energy as well as to generate it can reduce overall energy consumption, reduce peak demand and integrate greater levels of renewable energy into the energy system.

159 Based on data from London Energy and Greenhouse Gas Inventory (LEGGI) https://data.london.gov.uk/dataset/leggi

Policy SI 4 Managing heat risk

A Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

B Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
2) minimise internal heat generation through energy efficient design
3) manage the heat within the building through exposed internal thermal mass and high ceilings
4) provide passive ventilation
5) provide mechanical ventilation
6) provide active cooling systems.

9.4.1 Climate change means London is already experiencing higher than historic average temperatures and more severe hot weather events. This, combined with a growing population, urbanisation and the urban heat island effect, means that **London must manage heat risk** in new developments, using the cooling hierarchy set out above. Whilst the cooling hierarchy applies to major developments, the principles can also be applied to minor development.

9.4.2 In managing heat risk, new developments in London face two challenges – the need to ensure London does not overheat (the urban heat island effect) and the need to ensure that individual buildings do not overheat. **The urban heat island effect** is caused by the extensive built up area absorbing and retaining heat during the day and night leading to parts of London being several degrees warmer than the surrounding area. This can become problematic on the hottest days of the year as daytime temperatures can reach well over 30°C and not drop below 18°C at night. These circumstances can lead many people to feel too hot or not be able to sleep, but for those with certain health conditions, and 'at risk' groups such as some young or elderly Londoners, the effects can be serious

and worsen health conditions. Green infrastructure can provide some mitigation of this effect by shading roof surfaces and through evapotranspiration. Development proposals should incorporate green infrastructure in line with Policy G1 Green infrastructure and Policy G5 Urban greening.

9.4.3 Many aspects of building design can lead to increases in overheating risk, including high proportions of glazing and an increase in the air tightness of buildings. Single-aspect dwellings are more difficult to ventilate naturally and are more likely to overheat, and should normally be avoided in line with Policy D6 Housing quality and standards. There are a number of low-energy measures that can **mitigate overheating risk**. These include solar shading, building orientation and solar-controlled glazing. Occupant behaviour will also have an impact on overheating risk. The Mayor's London Environment Strategy sets out further detail on actions being taken to address this.

9.4.4 Passive ventilation should be prioritised, taking into account external noise and air quality in determining the most appropriate solution. The increased use of **air conditioning systems** is not desirable as these have significant energy requirements and, under conventional operation, expel hot air, thereby adding to the urban heat island effect. If active cooling systems, such as air conditioning systems, are unavoidable, these should be designed to reuse the waste heat they produce. Future district heating networks are expected to be supplied with heat from waste heat sources such as building cooling systems.

9.4.5 The Chartered Institution of Building Services Engineers (CIBSE) has produced **guidance on assessing and mitigating overheating risk in new developments**, which can also be applied to refurbishment projects. TM 59 should be used for domestic developments and TM 52 should be used for non-domestic developments. In addition, TM 49 guidance and datasets should also be used to ensure that all new development is designed for the climate it will experience over its design life. Further information will be provided in guidance on how these documents and datasets should be used.