ENERGY PLANNING

Greater London Authority guidance on preparing energy assessments (April 2014)

MAYOR OF LONDON

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SUMMARY OF GUIDANCE UPDATE

This update to the Energy Planning Guidance published in September 2013 relates to the changes to Part L of the Building Regulations which come into force from the 6 April 2014. The changes in this latest guidance document, summarised below, will come into force from this date.

Implementation of 2013 Building Regulations

Policy 5.2 of the London Plan states that from 2013 to 2016 energy assessments should be produced to meet a target of 40 per cent carbon reduction beyond Part L 2010 of the Building Regulations. The draft SPG on Sustainable Design and Construction confirmed that this requirement would apply for Stage 1 applications received by the Mayor on or after 1 October 2013.

From 6 April 2014 the 2013 changes to Part L of the Building Regulations come into effect. Part L 2013 delivers an overall reduction in CO_2 emissions for new residential and new non-domestic buildings, with the targets for individual buildings being differentiated according to building type. This reduction in CO_2 emissions affects the percentage reduction necessary above the new Part L 2013 regulations to meet the Mayor's targets in the London Plan.

As outlined in the Sustainable, Design and Construction SPG (to be published in April 2014), from 6 April 2014 the Mayor will apply a 35 per cent carbon reduction target beyond Part L 2013 of the Building Regulations - this is deemed to be broadly equivalent to the 40 per cent target beyond Part L 2010 of the Building Regulations, as specified in Policy 5.2 of the London Plan for 2013-2016.

The 35 per cent target is a flat percentage reduction across **both** residential and non-domestic buildings. This has the advantage of using the same approach as is currently employed, which is clear and simple for developers to follow. The Mayor recognises that some building types will find it harder than others to achieve this target without the use of carbon offsetting payments. Should particular building types struggle to meet the target on site, developers will need to provide the Mayor sufficient evidence to demonstrate that this is the case. The 35 per cent target will apply to Stage 1 applications received by the Mayor on or after 6 April 2014.

To allow developers time to transfer to the new SAP / SBEM modelling software, Stage 1 applications received by the Mayor between 6 April and the 5 July 2014 (inclusive) can demonstrate compliance with **either** the new 35 per cent target beyond the 2013 Building Regulations **or** the 40 per cent target beyond 2010 Building Regulations. All applications received from the 6 July 2014 will be assessed against the 35 per cent reduction target beyond Part L 2013 of the Building Regulations.

Housing Standards Review

In 2013 the Government consulted on proposals to reduce the range of local authority standards that apply to housing developments across the country through its Housing Standards Review. The Mayor's submission made a strong case for him to be able to keep the standards set out in his Housing SPG. The outcome of the consultation was announced on the 13 March 2014. However, details of transitional arrangements are still to be announced. The Government has indicated that it wishes to work with the Mayor to resolve any tensions between its national approach on housing standards and that which the Mayor has had in place for some time. A further update will be issued to

this guidance should the current situation change as a result of changes to legislation. The Housing Standards Review does not apply to non-residential development.

It should be noted that the Government is not proposing to limit the ability of local planning authorities to set strategic policies in relation to the connection of new housing developments to low carbon and renewable energy infrastructure, such as district heating networks.

Next steps to zero carbon homes: allowable solutions

The Government has consulted on its approach to Allowable Solutions[1] in relation to 'zero carbon homes'. However, there is still uncertainty over the requirements to meet the 'zero carbon' definition. In the interim boroughs are encouraged to set up their own funds in accordance with the guidance outlined in the Sustainable, Design and Construction SPG, which would apply to both residential and non-residential development. Appendix 4 contains further information on offsetting to address Policy 5.2E in the London Plan.

[1] Next steps to zero carbon homes: allowable solutions

PURPOSE OF ENERGY ASSESSMENTS

1 Introduction

1.1 This guidance note provides further detail on how to prepare an energy assessment to accompany strategic planning applications[2] as set out in London Plan Policy 5.2. The purpose of an energy assessment is to demonstrate that climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy. It also ensures energy remains an integral part of the development's design and evolution.

1.2 For non-referable applications London boroughs are encouraged to apply the structure for energy assessments set out in this guidance when applying development plan policy (which includes London Plan policy) and adapt it for relevant scales of development.

1.3 The energy assessment must fully address requirements in Policies 5.2 to 5.9 inclusive and, recognising the integrated nature of London Plan policies, take account of relevant design, spatial, air quality, transport and climate change adaptation policies in the Plan. Further guidance on implementing these policies is set out in the Mayor's Sustainable Design and Construction Supplementary Planning Guidance (SPG)[3]. The SPG provides detailed guidance on site layout and design, and energy and CO_2 emissions. All applicants must refer to and comply with the SPG when preparing the final energy assessment.

The energy assessment must clearly outline the applicant's commitments in terms of CO_2 savings and measures proposed. It is also important to consider and mitigate any potential air quality impacts. A guide to details required within an energy assessment follows in the main sections of this document.

1.4 This document only provides indicative guidance. Each application is considered on its merits, taking into account the individual characteristics of the development. Case specific final energy comments for each development are provided at Stage 1 and 2 of the GLA planning process. However, for the avoidance of doubt, energy assessments must:

- be submitted at the planning application stage, not submitted post planning in response to a condition
- commit to reducing regulated CO_2 emissions below those of a Part L 2013 of the Building Regulations compliant development through energy efficiency measures alone
- demonstrate that connection to existing or planned district heating networks has been prioritised and provide correspondence to support this
- commit to a site wide heat network[4] to allow connection to existing or planned district heating networks identified in the area
- commit to a single energy centre to supply the site wide heat network
- where CHP is proposed, select renewable technologies that are complementary.

[2] Planning applications referred to the Mayor of London under the GLA Act 2007
[3] Due for publication in April 2014
[4] Linking all apartments and non-domestic buildings

2 Planning Applications

Outline

2.1 The applicant must clearly identify whether the proposal relates to an outline or full planning application. All outline planning applications will be expected to set out an energy strategy with commitments, to guide the design and development of a planning application at the detailed stages. Depending on the matters to be considered, applicants should still undertake initial feasibility work on each part of the energy hierarchy set out in this guidance to illustrate how they will minimise carbon emissions from the development. The local planning authority should secure the key energy commitments in the strategy through appropriate clauses in the section 106 agreement or through an appropriate planning condition, and require reserved matters applications to demonstrate consistency with the outline strategy.

2.2 The strategy must include the following:

- Estimated site wide regulated CO_2 emissions and reductions, expressed in tonnes per annum, after each stage of the energy hierarchy.
- A clear commitment to regulated CO_2 emissions savings compared to a Part L 2013 of the Building Regulations compliant development through energy demand reduction measures alone.
- Evidence of investigation into existing or planned district heating networks that the development could be connected to.
- Commitment to a site heat network infrastructure linking all apartments and non-domestic building uses, if appropriate for the development.
- Investigations of the feasibility and, where viable, commitment to the installation of CHP in the proposed development (if connection can't be made to an area wide network).
- Large-scale developments (e.g. mixed use developments containing more than 1000 homes) must provide a feasibility assessment to ensure that CHP is optimised to meet the domestic hot water and part of the space heating demand, thereby minimising CO_2 emissions.
- An initial feasibility test for renewable energy technologies and, where appropriate, commitment to further reduce CO_2 emissions through the use of onsite renewable energy generation.
- Where the London Plan required CO_2 improvement on a development's Part L 2013 of the Building Regulations compliant baseline is not met, the developer must provide a commitment to ensure the shortfall is met off-site using the provision established by the borough.

Full

2.3 Full planning applications must provide the information set out in the sections below. Planning conditions and/or section 106 agreements should be used to secure the implementation of proposed measures. They must not be used to secure feasibility work that normally underpins a planning application. The technical and economic feasibility of such measures can be influenced by the stage at which they are considered in the design process. With the

supplementary planning guidance available, and the London Plan policies, energy must be integral in the design of any new development.

2.4 The energy assessment should also justify how the site layout, building design and active and passive measures have been chosen to minimise the CO_2 emissions. The measures that should be discussed are set out in the Sustainable Design and Construction SPG.

2.5 The design of all applications should consider the CO_2 targets that will be in place at the time of submission of reserved matters applications to ensure that the scheme can meet any higher planning or regulatory targets in place at the time.

3 Non Standard Applications

Waste

3.1 In relation to those planning applications containing proposals to generate energy from waste, the primary consideration for the energy assessment is that the electricity generation plant is designed with a heat off take facility to provide heat to an existing or future district heating network and space for district heating heat exchangers and pumps – see section 8.4 for further details – and has a costed strategy for how this will be done.

For those developments which process waste for onward product delivery, the energy assessment should only cover those buildings (or parts thereof) which are not exempt from the energy efficiency requirements of building regulations[5]. For non-exempt buildings the guidance set out in this document must be followed in line with the energy hierarchy. For the purposes of the energy assessment, process loads are classified as unregulated energy uses (see section 6.3 for more information on unregulated emissions).

Developments generating industrial waste heat

3.2 For those planning applications relating to developments which generate surplus waste heat, for example industrial applications such as the Tate and Lyle Sugar Refinery, the primary consideration for the energy assessment is again that the development is designed to allow the supply of heat to existing or future district heating networks. In a similar manner to the guidance set out in section 8.4, the development should identify a route for district heating pipework to run to the perimeter of the site and space should also be provided to accommodate district heating pumps and heat exchangers.

4 Guidance on integration with supporting documents for Planning Applications

4.1 An energy assessment will always be required, however, where other documents are being submitted as part of a planning application, it may be appropriate to cross-reference these documents, provided cross-referencing is clear and the documents contain sufficient information to allow an assessment of the application. Cross referenced documents may include the following:

[5] Exempt buildings include industrial buildings where the space is not generally heated other than by process heat: See Appendix C of Approved Document L2A Conservation of Fuel and Power 2013 Edition

- Design and Access Statement
- Sustainability statement
- BREEAM pre-assessment report
- Environmental Impact Assessment
- Air Quality Assessment (including an emissions/concentrations assessment)
- Energy master plan for the area (where this exists).

It will also be beneficial to reference generic guidance documents where appropriate, e.g. District Heating Manual for London.

4.2 All energy assessments must contain a brief description of the proposed development. This must clearly state the number of each different type of residential unit (e.g. 450 flats and 70 houses), as well as the associated floor area. It should also summarise the floor area (m^2) allocated for different non-domestic uses.

STRUCTURE AND CONTENT OF ENERGY ASSESSMENTS

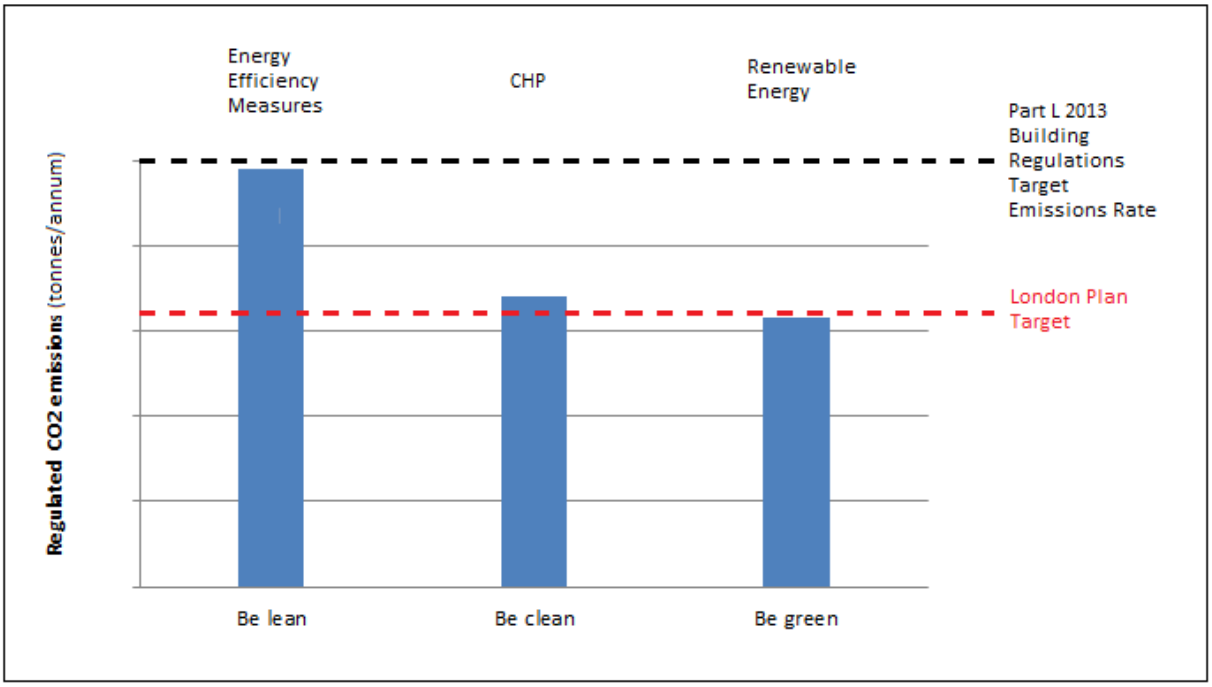
5 Executive Summary

5.1 This must be a non-technical summary setting out and committing to the key measures and CO_2 reductions identified as part of the application for each stage of the energy hierarchy. It must clearly indicate the performance of the development in relation to the London Plan carbon reduction targets for new buildings. The target for 2013-2016 is 35 per cent beyond Part L 2013 of the Building Regulations.

Where the 35 per cent target cannot be met on-site a commitment to ensure the shortfall is met off-site using the provision established by the borough must be provided (see Table 3 for calculations to determine the shortfall). Further information on carbon dioxide offsetting is contained in the SPG[6], as well as later in this guidance.

5.2 The concept of applying the energy hierarchy in relation to Part L 2013 of the Building Regulations is illustrated in Figure 1 below. Where the blue bars drop below the black dotted line, this demonstrates savings in regulated CO_2 emissions compared to a development that complies with Part L 2013 of the Building Regulations. In the example, it can be seen that the development exceeds Building Regulations compliance through energy efficiency alone, with further reductions achieved through CHP and renewable energy to comply with the London Plan target.

Figure 1: The Energy Hierarchy



5.3 Completion of the following tables must be undertaken to demonstrate compliance with the energy hierarchy. Note: unregulated emissions are likely to be the same after the first stage of the energy hierarchy.

[6] This is available from www.london.gov (from April 2014)

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2013 of the Building Regulations Compliant Development	A	
After energy demand reduction	B	
After CHP	C	
After renewable energy	D	

Please note that savings are to be expressed in **tonnes of CO_2 per annum**, not $kgCO_2/m^2$ per annum.

Table 2: Regulated carbon dioxide savings from each stage of the Energy Hierarchy

	Regulated Carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Savings from energy demand reduction	A - B	(A – B)/A * 100
Savings from CHP	B- C	(B – C)/B * 100
Savings from renewable energy	C - D	(C – D)/C*100
Total Cumulative Savings	**A - D = E**	**(A – D)/A*100**
Total Target Savings	**[A * 0.35] = F**	**35%**
Annual Surplus	**E - F**	

Table 3 must also be completed if the development fails to meet the 35 per cent target. In this case the annual shortfall is determined by subtracting the overall regulated carbon dioxide savings from the target savings. The result is then multiplied by the assumed lifetime of the development's services (e.g. 30 years) to give the cumulative shortfall. The cumulative

shortfall is multiplied by the carbon dioxide offset price[7] to determine the required cash-in-lieu contribution.

Table 3: Shortfall in regulated carbon dioxide savings

	Annual Shortfall (Tonnes CO_2)	Cumulative Shortfall (Tonnes CO_2)
Shortfall	F - E = G	G * 30

6 Establishing CO_2 emissions

6.1 The energy assessment must clearly identify the carbon footprint of the development after each stage of the energy hierarchy. Regulated emissions must be provided and, separately, those emissions associated with uses not covered by Building Regulations i.e. unregulated energy uses.

6.2 Calculating regulated CO_2 emissions for a Part L 2013 of the Building Regulations compliant development

The energy assessment must first establish the regulated CO_2 emissions assuming the development complied with Part L 2013 of the Building Regulations using Building Regulations approved compliance software (see references to SAP and SBEM below). When determining this baseline, it should be assumed that the heating would be provided by gas boilers and that any active cooling would be provided by electrically powered equipment. See Appendix 1 if further guidance is required on the procedure to be followed to determine this baseline.

As shown in Table 2, the total **regulated** emissions must be multiplied by the percentage target (divided by 100) to give the aggregate target reduction in the development's tonnes of regulated CO_2 emissions.

6.3 Calculating regulated CO_2 emissions at each stage of the energy hierarchy

Regulated emissions, which include the energy consumed in the operation of the space heating/cooling and hot-water systems, ventilation, internal lighting, must be calculated. Separately, unregulated emissions i.e. those relating to cooking and all electrical appliances and other small power, should be calculated.

Emissions for **dwellings** must establish:

- a Dwelling CO_2 Emissions Rate (DER) calculated through the Part L 2013 of the Building Regulations methodology SAP 2012[8] . This is multiplied by the cumulative floor area for the particular dwelling type in question to give the related CO_2 emissions

[7] Set by the local authority

- separately, emissions associated with non Building Regulation elements (i.e. cooking and appliances) established by using BREDEM (BRE Domestic Energy Model) or similar methodology.

In terms of the extent of modelling work required, the applicant must provide information for a representative sample of domestic properties.

Emissions for **non-domestic** development must establish:

- a Building CO_2 Emissions Rate (BER) calculated through the Part L 2013 of the Building Regulations methodology based on the National Calculation Methodology (NCM) and implemented through SBEM[9] v5.2b or later or equivalent software[10]. For each building, the related BER is multiplied by its floor area to give the related carbon dioxide emissions
- additional emissions associated with non Building Regulation elements established by using individual end use figures (for example catering and computing) from CIBSE guide baselines (e.g. CIBSE Guide F) or evidence established through previous development work.

A short summary of the modelling work output (i.e. BRUKL reports) must be provided in an appendix of the energy assessment for each stage of the energy hierarchy.

The CO_2 emissions for each building and dwelling type must then be summed to give the total regulated emissions and expressed in tonnes per annum.

After calculating the regulated emissions at each stage of the energy hierarchy, the percentage savings in regulated emissions over a Part L 2013 of the Building Regulations compliant development must be provided (as shown in Table 2 above).

7 Demand Reduction (Be Lean)

7.1 It is technically possible to exceed Building Regulations requirements (Part L 2013) through demand reduction measures alone (see figure 1). Energy assessments must therefore set out the demand reduction measures specific to the development and demonstrate the extent to which they meet and then exceed Building Regulations. Measures typically include both architectural and building fabric measures (passive design) and energy efficient services (active design), as described in the SPG. Introducing demand reduction features is encouraged at the earliest design stage of a development.

7.2 Demonstrating CO_2 savings from demand reduction measures

Passive design measures, including optimising orientation and site layout, natural ventilation and lighting, thermal mass and solar shading, should be set out in the Design and Access statement and cross-referenced in this document. Active design measures, including high

[8] SAP is the Government's Standard Assessment Procedure for Energy Rating of Dwellings. SAP 2012 is adopted by government as part of the UK national methodology for calculation of the energy performance of buildings. It is used to demonstrate compliance with building regulations for dwellings - Part L (England and Wales)
[9] Simplified Building Energy Model
[10] other building regulation compliance software such as IES or TAS is also acceptable

efficacy lighting and efficient mechanical ventilation with heat recovery, must be set out in the energy assessment.

Applicants should apply the cooling hierarchy in Policy 5.9 of the London Plan to the development. Measures that are proposed to reduce the demand for cooling should be set out, i.e. minimisation of internal gains, night cooling, etc.

The applicant must provide details in the energy assessment of the demand reduction measures specific to the development, for example enhanced U-value numbers (W/m^2K), air tightness improvement, efficient services and lighting. Where a particular energy efficiency standard is to be met, this must be clearly stated. The glazing percentage of the buildings, expressed as the glazed area[11] divided by the façade area (multiplied by 100), should be clearly stated within the energy assessment.

The applicant must clearly identify the extent to which Part L 2013 of the Building Regulations is exceeded through the use of these demand reduction measures **alone**, i.e. the percentage improvement on the BER/DER over the Target CO_2 Emissions Rate (TER)[12].

So the improvements from energy efficiency alone can be understood, the appendix of the energy assessment must include a summary output sheet from the modelling work (i.e. a print out such as a BRUKL report) only taking into account energy efficiency measures, i.e. excluding CHP and renewable energy. For applications including residential units, a clear explanation of the different dwelling types modelled should be provided.

8 Heating Infrastructure including CHP (Be Clean)

Once demand for energy has been minimised, all planning applications must demonstrate how their energy systems have been selected in accordance with the order of preference in Policy 5.6. Energy assessments will need to explicitly work through the order of preference and where an approach is not appropriate for the development the assessment must provide reasoned justification, as set out in the SPG.

8.1 Connection to area wide low carbon heat distribution networks

Existing networks

The applicant must investigate, making reference to the London Heat Map[13] and contacting the local borough or the local decentralised energy operator, the potential for connecting the development to an existing district energy system. Examples of existing CHP-led district energy networks in London include the Olympic Park and Stratford City, Citigen, the Pimlico District Heating Undertaking (PDHU), Barkantine Heat and Power, Whitehall District Heating network, the Bunhill energy centre and heat network and the University College London and Bloomsbury networks.

[11] From the inside looking out
[12] The Target CO_2 Emissions Rate is the minimum energy performance requirement for a new dwelling/building. It is expressed in terms of $kgCO_2$ per m^2 of floor area per year
[13] www.londonheatmap.org.uk

Where a heat network exists in the vicinity of the proposed development, the applicant must prioritise connection and provide evidence of correspondence with the operator as an appendix to the energy assessment. 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.

The carbon factor associated with the heat supplied by a network should be obtained from the network operator and be provided.

Planned networks

If no existing network is present, the applicant must investigate whether such a network is planned in the area. Reference must be made to the relevant borough's heat mapping report (available to download at www.londonheatmap.org.uk) as well as energy master plans or similar studies carried out involving the borough (e.g. Royal Docks). Enquiries should also be made to appropriate contacts within the relevant borough. Examples of planned networks include Vauxhall Nine Elms Battersea and the Royal Docks. Where a network is planned, developments must demonstrate that they are designed to connect to future district energy networks. The District Heating Manual for London (available at www.londonheatmap.org.uk) provides further information on designing developments to allow connection to district heating networks.

Section 8.2.2 of the District Heating Manual contains guidance on an approach that can be adopted when a new development falls within an energy master plan area (EMP) that proposes a district heating network.

Where a development is within an area that could be supplied by a district heating network but the applicant is contending that providing a site heat network to allow future connection will result in uneconomic costs to end users, the applicant must provide a whole life cost (WLC) analysis comparing the communal and individual systems. See Appendix 2 for further details of how this must be approached. Although WLC results will vary on a case by case basis, modelling usually shows that WLC of well-designed heat networks and individual boilers are broadly similar for high density developments. Where the WLC of the site heat network are broadly similar to those of individual gas boilers the network will **not** be considered to result in uneconomic costs. Where it can be demonstrated and evidenced that the WLC of the site heat network are significantly higher than those of individual gas boilers and would undermine the development going ahead, the site heat network will be deemed uneconomic. However, the WLC analysis and assumptions will be subject to intense scrutiny before such a conclusion is drawn.

Whilst there may appear to be no prospect of a district heating network in the vicinity, in certain developments, for example large, mixed use developments, it may still be necessary to provide a site heat network (see below) to enable the buildings to be supplied from on-site low and zero carbon energy sources. This approach enables the whole development to convert

to new low and zero carbon heating technologies at the same time, making it easier and more economically viable to upgrade plant.

If it can be clearly and unequivocally demonstrated that the development is not within an area that will be supplied by a district heating network in future, for example where only individual existing houses surround the development, it will not be necessary to make provision for future connection. However, each case will be considered on its own merits.

Generally, it is not expected that individual houses will be connected to heat networks. This is due to the higher network heat losses occurring when supplying individual houses compared to apartments. They also have a higher cost of connection.

8.2 Site wide heat networks

See the glossary for definitions of site heat network and communal heating.

By ensuring the necessary infrastructure is in place and providing a single point of connection, a site wide heat network served by a single energy centre helps to facilitate later connection of a development to an area wide district heating network. It ensures that the connecting heat network infrastructure investment occurs at the construction stage, rather than retrofitting, with its higher costs, at a later date. The higher costs of retrofitting can have a detrimental impact on the business case for making a connection and, hence, make it less likely.

Applicants must work on the assumption that a site heat network will be required unless it can be clearly demonstrated that is not applicable due to local circumstances. Therefore, where multiple high density buildings are proposed and the development is located in an area that could be served by a district heating network in the future, a communal heating system must ordinarily be adopted with all apartments and non-domestic buildings/uses within the development connected into a single site wide heat network.

The site heat network should be supplied from a central energy centre where all energy generating equipment, such as CHP and boilers, is located. As well as facilitating later connection to an area wide district heating network, this will help to ensure that, **where appropriate**, a single larger CHP is adopted rather than multiple smaller CHP installations of equivalent capacity. This typically provides a higher electrical efficiency helping to reduce CO_2 emissions, as well as reducing maintenance and operating costs. Accordingly, the energy assessment must demonstrate that enough space has been allocated for a sufficiently large energy centre. This must be clearly shown on the plan drawings of the development and the floor area in m^2 confirmed in writing. A floor plan showing the layout of the energy centre should also be provided.

Networks that will be implemented in a number of phases, and where a number of energy centres are proposed, must seek to minimise the number of energy centres and explain how the energy strategy will be implemented across the development's phasing programme.

A simple schematic of the site heat network showing all apartments and non-domestic buildings/uses connected into it, as well as the location of the single energy centre, must be provided as part of the energy assessment. Where the development is phased, a number of schematics should be provided showing how the network will evolve, including indicative timescales if available.

8.3 Combined Heat and Power (CHP)

Where connection to an area wide heat network will not be available in the foreseeable future (for example the 5 years following completion of the development), or the development is of such a scale that it could be the catalyst for an area wide heat network, applicants should evaluate the feasibility of on-site CHP and, where applicable, commit to its use.

Where CHP is considered feasible, a full feasibility analysis based on CHP modelling should be provided including details of the size of the engine proposed (kWe/kWth), the provision of any thermal store and suitable monthly demand profiles for heating, cooling and electrical loads, cost benefit analysis, carbon reduction benefits, etc.

By way of general guidance, it is not expected that small purely residential developments (for example, less than 300 dwellings) include on-site CHP. Due to the small landlord electricity supplies, CHP installed to meet the base heat load would require the export of electricity to the grid. It is recognised that the administrative burden of managing CHP electricity sales at this small scale, where energy service companies (ESCOs) are generally not active, is too great for operators of residential developments to bear. If CHP is installed but does not operate because arrangements for CHP electricity sales are not concluded, the projected CO_2 savings will not materialise.

In line with the London Plan energy hierarchy, where CHP is applicable, the size of the CHP must be optimised based on the thermal load profile before renewable energy systems are considered for the site.

CO_2 savings from the CHP must be expressed as a percentage reduction on regulated emissions after demand reduction measures have been applied to the baseline regulated emissions.

Cross referencing the Air Quality Assessment, an energy assessment should confirm that the NO_x emission standards set out in the SPG on Sustainable Design and Construction will be met.

An energy assessment should include a commitment that the CHP operator will be required to monitor and provide evidence on a yearly basis, in the form of an annual maintenance report, to demonstrate continued compliance with the emission limits.

Details of the commercial operation of the CHP, such as information on how any sales of power will be managed should also be provided (this is particularly important where power is

being exported to the local distribution network). Details of communication with ESCOs must also be supplied where appropriate.

8.4 Ensuring waste to energy plants are CHP ready

Some developments whose purpose is to process waste will also produce fuel (e.g. bio gas) and combust the fuel to produce electricity, e.g. gasification plants. This will usually be via an engine or, in larger scale installations, a boiler to produce steam for a steam turbine. To achieve energy efficient operation in the future, it is essential that these facilities are designed with a heat off take facility, i.e. a design which allows useful heat produced during the electricity generation process to be recovered. In such circumstances, the primary purpose of the energy assessment is to provide details of the heat off take facility, e.g. plant description, heat output capacity, technical drawings, etc. This will vary depending on whether an engine or steam turbine is to be used:

- **Engine** - the facility will need to incorporate an exhaust gas heat exchanger and heat exchangers to recover heat from the engine cooling systems.
- **Steam turbine** - the turbine will need to allow the extraction of steam at a temperature/pressure suitable for raising the flow temperature in a district heating network to 110°C. The ratio of lost electricity output to useful heat output must be provided for the turbine.

It will also be necessary to identify a route for district heating pipework to run to the perimeter of the site and to install adequately sized flow and return pipework to the perimeter. The route needs to be sufficiently wide for flow and return pre-insulated steel pipes, of sufficient internal diameter to allow the export of the full heat output of the plant, to be accommodated and be designed in accordance with the District Heating Manual for London. Space should also be provided to accommodate district heating pumps and heat exchangers.

Carbon intensity floor

In line with Policy 5.17B, facilities generating energy from waste need to perform better in CO_2 equivalent terms than the energy they are replacing to achieve a positive carbon outcome. The Mayor has developed a minimum CO_2 equivalent emissions performance for such facilities to achieve, known as a carbon intensity floor, set at 400g of CO_2 equivalent per kWh of electricity generated from waste. Generally, waste facilities operating in combined heat and power or using a high amount of biomass fuel will meet the carbon intensity floor.

Performance against the carbon intensity floor will be used to determine whether waste to energy facilities are in general conformity with Policy 5.17B. The GLA has developed a free tool that applicants can use to test a limited number of scenarios against the carbon intensity floor. The tool, along with more information on the carbon intensity floor and ways to meet it, can be found at http://www.london.gov.uk/priorities/environment/putting-waste-good-use/making-the-most-of-waste.

8.5 Supplying CHP heat beyond the site boundary

In line with Policy 5.6A, where CHP is proposed, particularly on large developments, the applicant should investigate opportunities for supplying heat outside the site boundaries. If CHP could be made feasible by connecting to energy consumers beyond the site boundary then applicants are encouraged to consider this option. Applicants could look in particular for opportunities to link to existing developments to help reduce their carbon dioxide emissions and this could help developments that can't meet their carbon reduction targets on-site to meet them off-site.

Very large mixed-use developments can often be the catalyst of heat networks serving the wider area. Therefore, it is important that these developments incorporate CHP and opportunities for the export of heat are fully explored. In these circumstances, sufficient allowance should be made in sizing the energy centre and site heat network infrastructure to allow for expansion of the network to serve a wider area in the future.

8.6 Active Cooling

Where design measures and the use of natural and/or mechanical ventilation are not enough to guarantee the occupant's comfort (in line with the cooling hierarchy set out in London Plan Policy 5.9), the development's cooling strategy must include details of the active cooling plant being proposed, including efficiencies, and the ability to take advantage of free cooling and/or renewable cooling sources.

Where appropriate, the cooling strategy should investigate the opportunities to improve cooling efficiencies through the use of locally available sources such as ground cooling, river/dock water cooling, etc.

9 Renewable energy (Be Green)

Energy assessments should set out consideration of renewable energy technologies in line with Policy 5.7 of the London Plan. Within the main body of the energy assessment, detailed site specific analysis should only be provided for those renewable energy technologies considered feasible. Site specific analysis for those technologies not considered feasible should be included in an appendix.

9.1 Information required on renewable energy generation:

- An assessment of what is achievable and compatible with the measures already implemented in steps one and two of the energy hierarchy should be provided.
- Applicants should provide calculations to demonstrate that their chosen system or systems will reduce CO_2 emissions from residual regulated emissions once CO_2 savings from demand reduction measures and energy efficient supply including CHP have been discounted from baseline regulated emissions.
- If a number of renewable energy technologies are proposed, it will be important to demonstrate how they will work in tandem and, where applicable, how they will be integrated into a heat network (for heat generating technologies) and, again where applicable, also how they will integrate with a cooling system/strategy. Where heat is

already to be supplied by CHP, it is important that any technologies proposed complement and not compete with CHP. For example, solar hot water is not considered compatible with CHP as they both supply base heat demands.

9.2 Detailed requirements for different types of renewable energy

Appendix 3 provides further guidance in relation to particular types of renewable energy systems. Where a particular type of renewable energy system is proposed, the relevant section should be consulted and required information provided as part of the energy assessment.

For the avoidance of doubt, heat pumps are categorised under this third and final element of the energy hierarchy (not the first element, "be lean").

10 Carbon offsetting

Once the GLA is satisfied that the CO_2 reduction target cannot feasibly or viably be met on-site, a commitment to ensure the shortfall is met off-site using the provision established by the borough must be provided. Table 3 and the related text above provides further information on how both the annual and cumulative shortfall in tonnes of CO_2 savings should be calculated.

Further information on CO_2 offsetting, both through off-site CO_2 reduction projects undertaken directly by the developer or payment in to an offsetting fund in liaison with the relevant borough, is contained in the SPG. Further summary information is also contained in Appendix 4.

Where boroughs do not have an established price, a figure of £60/tonne for a period of 30 years should be applied. The August 2013 consultation[14] on allowable solution suggests possible price caps ranging from £36 to £90 per tonne of CO2, with a central scenario of £60 per tonne of CO_2.

11 Monitoring

Developers are strongly encouraged to monitor the energy use during the occupation of their developments. Further information on monitoring energy use can be found in the SPG. Developers may also consider incorporating technology that would enable demand side response.

[14] Next steps to zero carbon homes: Allowable Solutions consultation. Department of Communities and Local Government. August 2013

GLOSSARY

Building Emissions Rate (BER) or Dwelling Emission Rate (DER) - the actual building/dwelling CO_2 emission rate. It is expressed in terms of the mass of CO_2 emitted per year per square metre of the total useful floor area of the building (kg/m^2/year). In order to comply with Part L of the Building Regulations, the BER/DER must be less than the TER (see below).

Combined Heat and Power (CHP) - defined as the simultaneous generation of heat and power in a single process.

Communal heating - a general term for a shared heating system where heat is supplied to multiple dwellings and/or non-domestic buildings using pipes containing hot water.

Energy assessment – an energy assessment is a document which explains how the London Plan targets for CO_2 reduction will be met for a particular development within the context of the energy hierarchy.

Individual gas boiler – a gas boiler is installed in a dwelling or a non-domestic building to provide the property with heat. In this case natural gas (rather than hot water) is piped to the property.

kilowatt (kW) – One thousand watts. A watt is a measure of power.

Megawatt (MW) – One million watts. A watt is a measure of power.

Part L of the Building Regulations – Approved documents L1A and L2A of the Building Regulations relate to the conservation of fuel and power in new dwellings and new buildings other than dwellings respectively.

Regulated CO_2 emissions – The CO_2 emissions arising from energy used by fixed building services, as defined in Approved Document Part L of the Building Regulations. These include fixed systems for lighting, heating, hot water, air conditioning and mechanical ventilation.

Simplified Building Energy Model (SBEM) - a computer program that provides an analysis of a building's energy consumption. The purpose of the software is to produce consistent and reliable evaluations of energy use in non-domestic buildings for Building Regulations compliance.

Site heat network – a set of flow and return pipes circulating hot water to the apartment blocks (and apartments contained therein) and non-domestic buildings on a development.

Standard Assessment Procedure (SAP) - a methodology for assessing and comparing the energy and environmental performance of dwellings. Its purpose is to provide accurate and reliable assessments of dwelling energy performances that are needed to underpin Building Regulations and other policy initiatives

Target CO_2 Emission Rate (TER) - the minimum energy performance requirement for a new dwelling/building. It is expressed in terms of the mass of CO_2 emitted per year per square metre of the total useful floor area of the building (kg/m^2/year).

REFERENCES

District Heating Manual for London (2013) - available from http://www.londonheatmap.org.uk/Content/uploaded/documents/DH_Manual_for_London_February_2013_v1.0.pdf

London Heat Map - http://www.londonheatmap.org.uk/

Mayor's Air Quality Strategy (2010) - available from https://www.london.gov.uk/priorities/environment/publications/mayors-air-quality-strategy

Sustainable, Design and Construction SPG (to be published in April 2014)

APPENDIX 1

Calculating regulated CO_2 emissions for a Part L 2013 of the Building Regulations compliant development

The energy assessment must first establish the regulated emissions assuming the development complies with Part L of the Building Regulations.

- For each non-domestic building the building's Target Emissions Rate (TER) is multiplied by its floor area to provide the related regulated CO_2 emissions.
- For each representative dwelling type, the related TER is multiplied by the cumulative floor area for that dwelling type to establish the related CO_2 emissions.
- The CO_2 emissions for each non-domestic building and dwelling type are then summed to give the total regulated emissions for the development.

APPENDIX 2

Required approach to whole life costing

This section provides information on how whole life costing (WLC) must be approached where the developer is claiming that adopting communal heating will result in uneconomic costs to end users. It provides broad guidance on how the WLC must be approached - individual assumptions will be subject to scrutiny.

The WLC analysis should be conducted over a 30 year period, with the heat network assumed to have a lifespan of at least this duration. The residual value of the heat network and, where applicable, the alternative individual boilers at the end of the analysis period should be taken into account.

The discount rate should reflect the sources of finance that will be used to implement the system, e.g. for social housing funded by government grant a 3.5 per cent discount rate should be assumed in line with HM Treasury Green Book guidance.

The analysis must take into account:

- Initial installed capital cost - for the heat network this would typically be expected to be around £5,500 per apartment. This excludes the costs of internals downstream of the hydraulic interface unit (HIU) which should be assumed to be the same as those for an individual boiler. Cost estimates should be obtained from established district heating installation companies.
- Replacement costs – an individual boiler will typically be replaced twice during the lifetime of a heat network.
- Annual fuel costs – due to bulk purchasing communal boilers will have a lower unit gas cost than individual gas boilers.
- Annual operation and maintenance costs.
- Annual meter reading and billing administration costs – for heat networks this would not be expected to be greater than £80 per dwelling per annum.

In determining the annual fuel costs for the heat network option reasonable assumptions must be made regarding the heat loss and efficiency of the communal boilers. It is considered that by adopting best practice design, for example low temperatures, twin pipes, etc., heat losses can be kept to in the order of 10 per cent.

APPENDIX 3

Guidance on different types of renewable energy

Details required in relation to biomass application and biomass emissions standards

Please refer to the Mayor's Air Quality Strategy, section 7.14 of the London Plan and relevant sections of the Sustainable Design and Construction supplementary planning guidance for more detailed air quality requirements.

Development proposals should be at least 'air quality neutral', not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs), and create opportunities to improve local air quality. They should minimise exposure to existing poor air quality and make provision to address local problems of air quality (particularly within AQMAs and where development is likely to be used by large numbers of those particularly vulnerable to poor air quality)[15].

Where the use of biomass is proposed, the biomass boiler must meet the Mayor's biomass standards as set out in the SPG on Sustainable Design and Construction.

Details required in relation to liquid biofuel applications

Where the use of biofuel is considered appropriate the following information will also be required:

- Details of the manufacturer's warranty for the use of the proposed liquid bio-fuel in the CHP unit chosen.
- Confirmation of the blend and standard of biofuel to be used (typically B100 BS EN 14214).
- Details of potential supplier(s) of the bio-fuel to be used and written confirmation that they can supply the required quantities.
- Information relating to the maintenance regime of the CHP as a consequence of biofuel use.
- Review air quality implications of bio-fuel with borough air quality officers.
- Information relating to the sustainability and carbon intensity of the bio-fuel in line with the Government's Renewable Transport Fuel Obligation (RTFO) carbon and sustainability methodology for bio-fuels.
- Details of how the fuel will be stored on site.
- The running costs of a CHP utilising biofuel will typically be higher than a conventional CHP engine using natural gas. Confirmation that this increased running cost has been acknowledged and that it will not affect the proposed operation of the CHP is required.

Details required in relation to photovoltaic applications

Where the use of photovoltaic panels is considered appropriate the following information will also be required:

[15] Clearing the air. The Mayor's Air Quality Strategy, December 2010, http://www.london.gov.uk

- Drawings showing the amount of roof that is available within the development and that could be used to install photovoltaic modules with suitable orientation and free of shading. The shading analysis should include an assessment of the height of existing buildings and any permissions granted for buildings near the application site.
- Quantification of the amount of roof area that could be used to install photovoltaic modules.
- An estimate of the electricity that the photovoltaic modules will generate including the assumptions for the calculations.
- A calculation of the CO_2 and air pollutant savings that may be realised through the use of this technology.

Details required in relation to solar thermal

Where the use of solar thermal collectors is considered appropriate the following information will also be required:

- Clarification to how the solar thermal collectors will operate alongside the heating system being proposed by the applicant
- Drawings showing the amount of roof that is available within the development and that could be used to install solar thermal collectors with suitable orientation and free of shading
- Quantification of the amount of roof area that could be used to install solar collectors
- An estimate of the heating requirements that the solar thermal collectors may provide including the assumptions for the calculations
- A calculation of the CO_2 and air pollutant savings that may be realised through the use of this technology.

Details required in relation to ground/water source heat pumps

Where the use of ground source heat pumps (GSHPs) is considered appropriate the following information will also be required:

- Clarification to how the GSHP will operate alongside any other heating/cooling technologies being specified for the development and alongside communal heating systems being proposed by the applicant
- An estimate of the heating and/or cooling energy the GSHP may provide to the development and the electricity the heat pump would require for this purpose.
- The estimation of the amount of heating/cooling that the GSHP may supply should be supported with the following information:
    - For closed loop systems an indication of the land area available that would be required to install the required number of boreholes. Where possible, the ground conditions of the specific site should be taken into account for the calculations.
    - For open loop systems (including aquifer thermal storage systems) the flow rate of water that is available on-site. It should be used to estimate the amount of heating/cooling the system could provide.
- Details of the Coefficient of Performance (COP) and Energy Efficiency ratio (EER)
- An indication of the seasonal COP and EER of the heat pumps

- A calculation of the CO_2 and air pollutant savings that may be realised through the use of this technology.
- Confirmation that the site geology is suitable for ground source heat pumps.
- Also evidence of the likelihood of a permit being granted by the Environment Agency, where required.

Details required in relation to air source heat pumps

Where the use of air source heat pumps (ASHPs) is considered appropriate the following information will also be required:

- Clarification as to how the ASHP will operate alongside any other heating/cooling technologies being specified for the development (i.e. how will the ASHP operate alongside communal heating systems, and/or combined heat and power plant, solar thermal, etc. if they are also being proposed by the applicant)
- An estimate of the heating and/or cooling energy the ASHP would provide to the development and the electricity the heat pump would require for this purpose
- Details of the Coefficient of Performance (COP) and Energy Efficiency ratio (EER) of the proposed heat pump under test conditions.
- Evidence that the heat pump complies with the minimum performance standards as set out in the Enhanced Capital Allowances (ECA) product criteria for the relevant ASHP technology (http://etl.decc.gov.uk)
- Evidence that the heat pump complies with other relevant issues as outlined in the Microgeneration Certification Scheme Heat Pump Product Certification Requirements document at: http://www.microgenerationcertification.org
- An indication of the seasonal COP and EER of the heat pumps
- A calculation of the CO_2 and air pollutant savings that may be realised through the use of this technology.

Details required in relation to wind energy applications

Where the use of wind energy is considered appropriate the following information will be required:

- Estimation of the wind resource on-site at turbine height. The use of the UK Wind Speed (NOABL) Database on its own is unlikely to be appropriate to estimate the wind resource for the majority of wind energy applications in London. Instead, methodologies that modify the wind resource considering the type of terrain (flat terrain, farm land, suburban, urban etc) and surrounding obstacles should be used.
- Drawings showing the wind turbine location and height in relation to the surrounding structures and including the predominant wind directions
- An estimate of the electricity that the wind turbine/s modules may generate calculated using the estimated wind resource and the wind turbine characteristics i.e. power curve if available or a specific turbine swept area.
- A calculation of the CO_2 and air pollutant savings that may be realised through the use of this technology.

APPENDIX 4

Offsetting

The SPG on Sustainable Design and Construction SPG contains high level guidance for boroughs on how to establish a carbon offsetting fund and identify suitable projects to be funded.

London Plan Policy 5.2 sets out that where the required percentage improvements beyond Part L of the Building Regulations are not met on-site, any short fall should be provided off-site or through a cash-in-lieu contribution to the relevant borough.

Boroughs may agree with a developer for the developer to directly off-set any shortfall in carbon dioxide reductions from a development by installing a carbon dioxide saving project off-site e.g. photovoltaic panels on a local school.

To maximise the reduction in carbon dioxide emissions in London, boroughs should establish a planning related carbon dioxide reduction fund and set a price at which the carbon dioxide short fall will be calculated.

The SPG provides further guidance on:

1. calculating the price of carbon
2. establishing an offsetting fund and identifying projects.

Note: There are important requirements relating to, for example, interactions with the Community Infrastructure Levy (CIL) and the SPG provides further information on this.

The guidance in the SPG also contains further information in relation to:

- monitoring emission reductions, and
- carbon accounting (where off-set measures are funded from multiple sources).

Other formats and languages

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Chinese
如果需要您母語版本的此文件，
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Hindi
यदि आप इस दस्तावेज की प्रति अपनी
भाषा में चाहते हैं, तो कृपया निम्नलिखित
नंबर पर फोन करें अथवा नीचे दिये गये
पते पर संपर्क करें

Vietnamese
Nếu bạn muốn có văn bản tài liệu
này bằng ngôn ngữ của mình, hãy
liên hệ theo số điện thoại hoặc địa
chỉ dưới đây.

Bengali
আপনি যদি আপনার ভাষায় এই দলিলের প্রতিলিপি
(কপি) চান, তা হলে নীচের ফোন্ নম্বরে
বা ঠিকানায় অনুগ্রহ করে যোগাযোগ করুন।

Greek
Αν θέλετε να αποκτήσετε αντίγραφο του παρόντος
εγγράφου στη δική σας γλώσσα, παρακαλείστε να
επικοινωνήσετε τηλεφωνικά στον αριθμό αυτό ή ταχυ-
δρομικά στην παρακάτω διεύθυνση.

Urdu
اگر آپ اِس دستاویز کی نقل اپنی زبان میں
چاھتے ھیں، تو براہ کرم نیچے دئے گئے نمبر
پر فون کریں یا دیئے گئے پتے پر رابطہ کریں

Turkish
Bu belgenin kendi dilinizde
hazırlanmış bir nüshasını
edinmek için, lütfen aşağıdaki
telefon numarasını arayınız
veya adrese başvurunuz.

Arabic
إذا أردت نسخة من هذه الوثيقة بلغتك، يرجى
الاتصال برقم الهاتف أو مراسلة العنوان
أدناه

Punjabi
ਜੇ ਤੁਹਾਨੂੰ ਇਸ ਦਸਤਾਵੇਜ਼ ਦੀ ਕਾਪੀ ਤੁਹਾਡੀ ਆਪਣੀ ਭਾਸ਼ਾ
ਵਿਚ ਚਾਹੀਦੀ ਹੈ, ਤਾਂ ਹੇਠ ਲਿਖੇ ਨੰਬਰ 'ਤੇ ਫ਼ੋਨ ਕਰੋ ਜਾਂ ਹੇਠ
ਲਿਖੇ ਪਤੇ 'ਤੇ ਰਾਬਤਾ ਕਰੋ:

Gujarati
જો તમને આ દસ્તાવેજની નકલ તમારી ભાષામાં
જોઈતી હોય તો, કૃપા કરી આપેલ નંબર ઉપર
ફોન કરો અથવા નીચેના સરનામે સંપર્ક સાધો.

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