October 2012

Energy Planning

Monitoring the implementation of London Plan energy policies in 2011

Greater London Authority
September 2012

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Executive Summary

An energy assessment setting out how a development will meet the London Plan energy policies is required for each strategic scale planning application[a] referable to the Mayor. Applicants are required to set out how the carbon dioxide (CO_2) emissions reductions of the proposed development have been maximised to meet the targets in the London Plan through the application of the energy hierarchy:

1) Be lean: use less energy
2) Be clean: supply energy efficiently
3) Be green: use renewable energy

To ensure that the London Plan policy is implemented and that the maximum CO_2 emissions reductions are achieved each of the energy assessments are evaluated by a specialist team. In 2011, 118 applications were assessed at stage II (see Appendix 1 for an explanation of stages I and II) compared to 112 in 2010.

An analysis of the energy assessments relating to all stage II planning applications determined from 1 January to 31 December 2011 has been undertaken to establish the projected CO_2 savings and infrastructure commitments that have been secured. The commitments set out in these final energy assessments are secured through a process of negotiations between the developer, architects, the Greater London Authority (GLA) and the local planning authority.

The Building Regulations governing the conservation of fuel and power (Part L) have been progressively tightened since their introduction. The Government has indicated its intention to continue these updates as part of the pathway to zero carbon buildings. The next update will occur in 2013.

In the previous report on the implementation of the London Plan policies in 2010[b], the CO_2 savings were assessed against a baseline of 2006 Building Regulations. New building regulations were introduced in the autumn of 2010 which require new developments to reduce their regulated CO_2 emissions[c] 25 per cent below those of a 2006 Building Regulations compliant development. Due to the introduction of the new regulations, this report assesses the CO_2 savings against a baseline of 2010 Building Regulations.

Despite the tighter regulatory requirements, the analysis demonstrated that substantial projected CO_2 savings continued to be secured through implementation of London Plan energy policies in 2011. Specifically, the following were achieved:

- Regulated[d] CO_2 emissions reductions of 33 per cent more than 2010 Building Regulations requirements for developments (see Figure A below). This exceeds the 2010 to 2013 target for new developments in Policy 5.2 of the London Plan, which requires a 25 per cent regulated CO_2 emissions reduction compared to a 2010 Building Regulations compliant development.

- Projected annual regulated CO_2 emissions reductions of 41,136 tonnes more than 2010 Building Regulations requirements for developments. By way of comparison approximately 24,000 tonnes

[a] Definitions of strategic applications are set out in the Mayor of London Order 2008
[b] Monitoring the impact of London Plan energy policies in 2010, GLA October 2011
[c] CO_2 emissions from energy used by fixed building services, as defined in Building Regulations Approved Document Part L
[d] In line with the London Plan, these figures exclude the impact of unregulated emissions e.g. catering, small power, etc.

of CO_2 per annum[e] were saved in London through the retrofitting of loft insulation[f] to 58,771 existing homes in 2011 under the Carbon Emissions Reduction Target (CERT) programme.

If the savings in 2011 and 2010 are both compared using the same baseline (2010 Building Regulations) the proportion of savings are virtually identical. See Table A below for a comparison of the figures for 2011 and 2010.

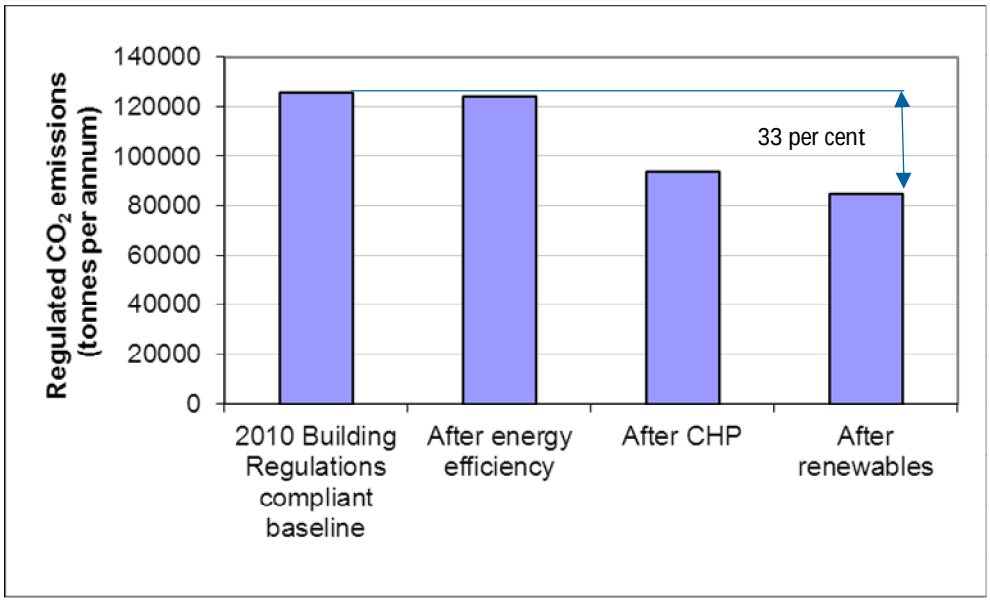

Figure A: Regulated CO_2 emissions reductions due to implementation of London Plan Policies in 2011

In terms of the specific contribution from the first element of the energy hierarchy, the CO_2 savings from energy efficiency alone were largely used to comply with the 2010 Building Regulations. However, if the savings from energy efficiency in 2011 are compared against a 2006 Building Regulations baseline (as used in the 2010 report), the savings in 2011 are a third greater than in 2010.

The London Plan energy policies also aim to promote the use of district heating and combined heat and power (CHP) in support of the Mayor's target to supply 25 per cent of London's energy from decentralised sources by 2025. Decentralised energy systems serving large new developments can be designed to expand and serve the existing building stock or act as anchor loads[g] for area wide networks. Implementation of the policies in 2011 secured the following key commitments in relation to decentralised energy:

- circa 31,000 new apartments (27,000 in 2010) being heated by heat networks which are capable of future connection to area-wide decentralised energy schemes - this represents an increase of 16 per cent compared to the number of dwellings included in the Department of Energy and Climate Change (DECC) database of heat networks in the UK[h];

[e] Assumes average saving per dwelling of 0.4 tonnes of CO_2 per annum from OFGEM CERT spreadsheet
[f] Figures relate to Year 4 of CERT which ran from 1st April 2011 to 31st March 2012
[g] Anchor loads are the buildings, with significant heat loads, that provide the justification for forming a district heating networks
[h] DECC database figures quoted in District Heating: Heat Metering Cost Benefit Analysis http://www.decc.gov.uk/assets/decc/11/meeting-energy-demand/district-heating/5462-district-heating--heat-metering-cost-benefit-anal.pdf

- This represents investment of circa £78M in heat distribution network infrastructure[i].

- 7 very large[j] mixed-use developments establishing site wide heat networks of a scale that are capable of expanding to serve the wider area; and

- the installation of circa 17MW of CHP electrical capacity (28MW in 2010), broadly equivalent to the energy capacity required to supply 34,000 homes. This represents an increase of 9 per cent compared to the total 185MW of CHP electrical capacity already installed in London in 2010[k].

Where developments met the target in Policy 5.2 of the London Plan through the first two elements of the energy hierarchy, a number did not propose on-site renewable energy systems. However, renewable energy was proposed in the vast majority of developments and, in these cases, photovoltaic panels remained the most popular technology accounting for over half of installations.

Table A: Comparison of 2011 and 2010 figures

Measure	2010	2011
Stage II applications	112	118
Largest number of applications (not just stage II)	Tower Hamlets (33)	Newham (30)
Number of dwellings in developments	28,181	32,051
Non-domestic floor area (million m^2)	2.165	1.455
Regulated CO_2 emission reductions compared to 2010 Building Regulations (per cent)	33	33
Regulated CO_2 emissions reductions compared to 2010 Building Regulations (tonnes per annum)	35,598	41,136
Regulated CO_2 emissions reductions compared to building regulations in force at time (tonnes per annum)	50	33
Regulated CO_2 emissions reductions compared to building regulations in force at time (tonnes per annum)	71,813	41,136
Dwellings connected to heat networks	27,000	31,000
Proposed CHP electrical capacity (MW)	28	17
Percentage of developments including renewable energy	95	88

[i] Assumes a DH heat distribution cost of £2500 per flat, taken from Table 51 of Code for Sustainable Homes: A cost review (CLG March 2010)

[j] Including more than 1000 dwellings

[k] Combined Heat and Power in Scotland, Wales, Northern Ireland and the regions of England in 2010, Energy Trends article September 2011

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1. Introduction

The Mayor has set a target of reducing London's carbon dioxide (CO_2) emissions by 60 per cent below 1990 levels by 2025. In support of this, the policies in the London Plan seek to reduce the emissions of CO_2 primarily by ensuring developments are designed to enable the more efficient use of energy in new developments and supporting development of sustainable energy infrastructure to produce energy more efficiently.

The London Plan sets out a comprehensive range of policies (5.1, 5.2, 5.3, 5.4, 5.5, 5.6 and 5.7) that underpin London's spatial response to reducing CO_2 emissions. Major development proposals are required to be accompanied by a detailed energy assessment, based on Greater London Authority (GLA) guidance[l], demonstrating how CO_2 emissions reductions over and above 2010 Buildings Regulations will be achieved within the framework of the energy hierarchy:

- Be lean: use less energy
- Be clean: supply energy efficiently
- Be green: use renewable energy

Energy assessments are evaluated at the planning application stage to ensure that each development is designed to make the fullest contribution to mitigating climate change.

An analysis of the energy assessments submitted as part of the stage II planning applications determined from 1 January to 31 December 2011 has been undertaken to establish the projected CO_2 savings and infrastructure commitments that have been secured. This report summarises the results of the analysis.

In order to demonstrate the efficacy of the Mayor's London Plan energy policies, the Mayor initiated an annual review of CO_2 savings, starting in 2010[m]. This was preceded by earlier studies undertaken by London South Bank University.

2. The Mayor's role in strategic planning applications

A total of 300 planning applications were referred to the Mayor during 2011[n]. The largest number of applications (33) was received from Tower Hamlets. In 2010 258 applications were referred. Each year a significant number of applications proceed through the first phase '**stage I'** (see Appendix 1 for further details of the Mayor's role in strategic planning applications) but are withdrawn to be revised prior to being determined by the local planning authority (LPA) or are refused by the LPA. 118 applications were considered at 'stage II' in 2011, although 5 of these related to temporary structures e.g. seating areas for the Olympic Games. In 2010 112 were received.

Table 1 provides a breakdown by development type of the number of stage II applications considered by the Mayor in 2011 (see Appendix 2 for a comparison with 2010 figures). Planning permission for approximately 32,000 dwellings was approved in 2011. Of the 72 developments with a residential element, the average number of dwellings was 445. The average dwelling density across the developments is circa 140 dwellings per hectare.

[l] Energy planning: GLA Guidance on preparing energy assessments September 2011
http://www.london.gov.uk/sites/default/files/guidance-energy-assessments-2011.pdf
[m] Energy planning: Monitoring the impact of London Plan energy policies in 2010 (GLA)
[n] Table 4.2 of the London Plan Annual Monitoring Report 8, 2010-11 (March 2012)

Type of development	Number of Developments	Number of dwellings	Non-domestic floor area (Millions m^2)
Mixed use[o]	58	29,516	0.637
Domestic	14	2,535	-
Non-domestic	46	-	0.818
Total	**118**	**32,051**	**1.455**

Table 1: Breakdown by category of applications at stage II in 2011

This report is based solely on applications proceeding through stage II during 2011, as these represent the applications actually proceeding through the planning system.

Development Plan Documents

The energy planning team also provide comments on energy planning policies in London Borough development plan documents (DPD's) received by the Mayor at the pre-submission or submission stages. In total 26 documents were reviewed including, for example, core strategies, development management plans, waste development plan documents, etc. to ensure that London borough policies are in line with the London Plan energy policies.

Opportunity Area Planning Frameworks

Support was also provided in considering the energy implications within Opportunity Area Planning Frameworks (OAPF). For example, an outline energy strategy was prepared for the London Riverside Opportunity Area. This considered both the size and location of the existing and anticipated energy demands in the area and available sources of waste heat. Taking these into account, a high level strategy for the establishment of area wide decentralised energy was established.

During the year to March 2012, the LDA and more latterly GLA also provided support for the development and completion of an energy master plan (EMP) for the Upper Lee Valley (ULV). Coordinated by the North London Strategic Alliance, it involved the London Boroughs of Enfield, Haringey and Waltham Forest. ULV is one of London's most exciting areas of change. This EMP report addresses how planning the future of energy provision in the sub-region could help catalyse positive outcomes in terms of economic rejuvenation and environmental improvements. The EMP demonstrates that there is a unique opportunity to deliver a commercially sustainable decentralised energy network (DEN) which would put the Upper Lee Valley at the forefront of energy production in London and give it a clear competitive advantage. The area combines strategic energy assets, including Edmonton incinerator, major waste resources, significant regeneration activities, and a vibrant industrial corridor that hosts several significant users of energy. The EMP report demonstrates that these assets can be developed to become a source of low-cost, low carbon heat where local waste streams represent a significant renewable fuel resource. The vision is to deliver cost-competitive, low to zero carbon energy supplies (heating, cooling and power). This will assist with job creation, reduce overall carbon emissions, facilitate the transition to a low carbon economy, and support development in a coherent, unified fashion. The project has now proceeded to the feasibility study stage.

The Mayor's Decentralised Energy for London programme also provides London boroughs and other project sponsors with technical, financial and commercial assistance to develop and bring decentralised energy projects to market. The programme predominately supports district heating schemes supplied by combined heat and power and sources of waste heat. The engineering team

[o] All these developments have a residential and commercial component

which provides support under the programme were appointed in November 2011 and the project aims to facilitate £95million of investment before the summer of 2014.

3. The new baseline: 2010 Building Regulations

Building regulations set minimum compliance criteria that all new developments in the UK have to meet in order for development.

As part of the compliance criteria, Part L of the Building Regulations sets a target CO_2 emissions rate (TER). A new development's building/dwelling emissions rate (BER/DER) must be reduced below the TER in order to achieve compliance. This process is implemented through the Standard Assessment Procedure (SAP) methodology in dwellings and the Simplified Building Energy Model[p] (SBEM) methodology for non-domestic buildings.

The latest Part L Building Regulations came into effect on 1st of October 2010 and introduced tougher compliance criteria. As shown in Figure 1 below, the target CO_2 emissions rate for buildings to comply with the 2010 Building Regulations is approximately 25 per cent lower than the target CO_2 emissions under the 2006 Building Regulations.

Developments obtaining stage I approval after the 1 October 2010 were asked to state their regulated CO_2 emissions reductions relative to the CO_2 emissions of a development of the same size and type which complies with the 2010 Building Regulations. The vast majority of developments going through stage II during 2011 passed through stage I after the 1 October 2010.

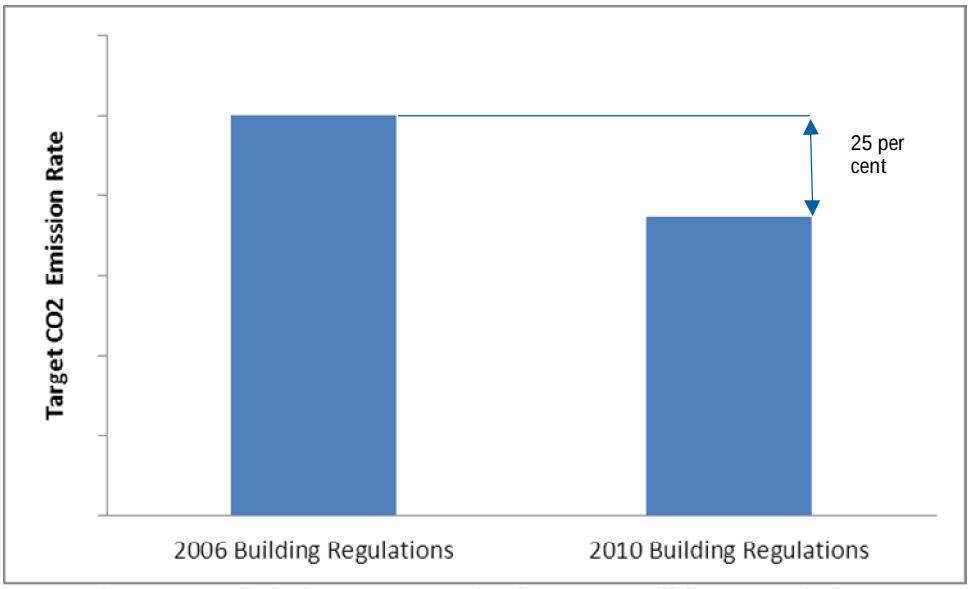

Figure 1: Built in improvement in the 2010 Building Regulations

In line with Government's stated pathway to achieving zero carbon new buildings, a further tightening of building regulations will occur in 2013. At this point, it will be necessary to assess the CO_2 savings from developments passing through planning against a 2013 Building Regulations compliant development.

The London Plan requires developers to go beyond building regulation targets. In 2011, developers were expected to achieve a 25 per cent regulated CO_2 emissions reduction compared to a 2010 Building Regulations compliant development.

[p] Other certified software packages also implement the methodology for non-domestic buildings.

4. Regulated CO_2 Savings

The main objective of the energy polices in the London Plan are to ensure development proposals make the fullest contribution to mitigating climate change. Policy 5.2 of the London Plan sets targets for regulated CO_2 emissions reductions over and above those required by 2010 Building Regulations.

Observations

The implementation of the London Plan energy policies in new developments referred to the GLA in 2011 resulted in substantial CO_2 emissions reductions relative to 2010 Building Regulations TER. Considering the whole data set, as shown in Table 2 below, the percentage savings in regulated CO_2 emissions are approximately 33 per cent beyond the requirements of Part L of the Building Regulations 2010. The target in the London Plan for development between 2010 and 2013 for both domestic and non-domestic is a 25 per cent improvement on 2010 Building Regulations.

Appendix 2 contains a table comparing the detailed results for 2011 with 2010.

	Regulated CO_2 emissions	**Cumulative regulated CO_2 emissions reductions relative to 2010 Building Regulations i.e. excluding unregulated**	
	(tCO_2/year)	**(tCO_2/year)**	**(per cent)**
Baseline	125,981		
After energy efficiency	124,345	1,636	1[q]
After energy efficiency & CHP	93,583	32,398	26
After energy efficiency, CHP & Renewables	84,845	41,136	33

Table 2: CO_2 savings from application of the energy hierarchy

If the regulated savings in 2010 are calculated relative to 2010 Building Regulations, the percentage savings are very similar to that achieved in 2011 i.e. 33 per cent. Similarly if the regulated CO_2 emissions reductions in 2011 are calculated relative to 2006 Building Regulations, the savings are approximately 50 per cent, as was the case in 2010.

As shown in Figure 2 below over half of developments met or exceeded the targets in Policy 5.2 of the London Plan. There was a large spread in the percentage savings from the individual developments. The greater individual percentage savings were found in the larger schemes; for example, the very large mixed use schemes (see Table 3 below) achieved 39 per cent CO_2 emissions reductions over 2010 Building Regulations. This highlights how it is easier to successfully integrate low carbon supply technologies into larger scale developments.

[q] **if a 2006 Building Regulations baseline was used for comparison, the regulated CO_2 emission reductions from energy efficiency alone in 2011 were higher at 26% than the circa 19% achieved in 2010**

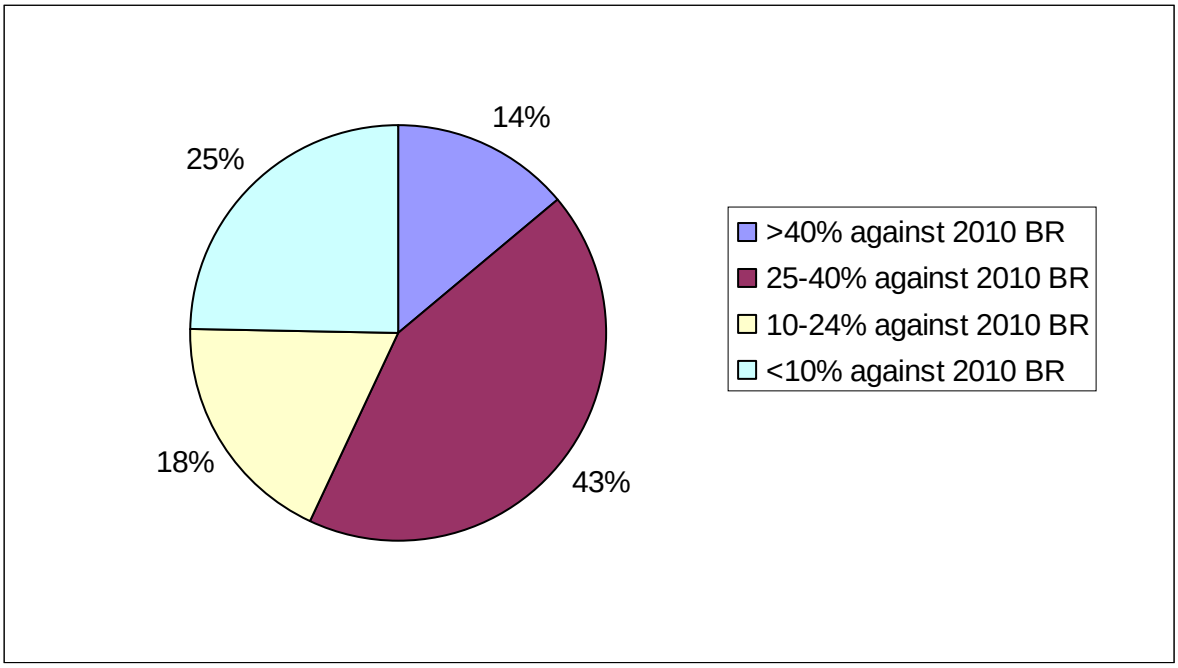

Figure 2: Proportion of developments meet and exceeding targets in 2011

Attributing CO_2 emissions reductions to individual elements of the energy hierarchy is less relevant than in previous years as the savings achieved from energy efficiency are now primarily used in achieving 2010 Building Regulations compliance. The smaller contribution from energy efficiency is the result of its logical position as the first element in the energy hierarchy, rather than any less relevance or importance for this element. This issue is discussed in more detail in the 'Be lean' section of the report.

It is also worth noting that in 2011, a number of applications relating to temporary structures for the Olympics went through planning. Due to the nature of the developments (e.g. seating), many of them have very little regulated energy requirements. This has the effect of reducing the average tonnes of CO_2 savings per development.

Where individual developments have not met the targets in Policy 5.2 of the London Plan, developers are starting to engage with London boroughs regarding the payment of cash in lieu contributions to account for the shortfall in CO_2 savings. The GLA is working with a range of stakeholders to establish an appropriate methodology for calculating the payment, ensuring there are portfolios of quantified projects to spend the payments on and that boroughs have mechanisms in place for collecting and distributing these funds. The GLA expects to provide guidance to the boroughs early in 2013.

The total shortfall from developments not meeting the target in 2011 equated to approximately 4,000 tonnes of regulated CO_2 emissions per annum. Assuming an indicative CO_2 price of £46 per tonne and a 30 year lifetime[r], if enforced in 2011, the value of this shortfall would have equated to approximately £5.5M (when/if all the developments were eventually built out) to be spent on borough projects for CO_2 emissions reduction. This level of investment is enough to fund the heat network infrastructure for 1 medium scale district heating scheme.

Over 70 per cent of the shortfall occurred in developments in three boroughs. A third of the total shortfall occurred in developments in the City of London where, due to the type of development occurring e.g. prestige office blocks, it may be more difficult to achieve the target on site.

[r] See 'Zero Carbon Homes Impact Assessment', Communities and Local Government, May 2011.

Outcomes

Implementation of policy in 2011 has secured the following outcomes in relation to CO_2 savings:

- **Regulated**[s] CO_2 emissions reductions of 33 per cent compared to a baseline of 2010 Building Regulations compliant developments; this is a saving of 8 per cent over the requirements of the London Plan.

- Overall projected annual savings of 41,136 tonnes of regulated CO_2 (see table 2) more than 2010 Building Regulations requirements for developments. By way of comparison approximately 24,000 tonnes of CO_2 per annum[t] were saved in London through the retrofitting of loft insulation[u] to 58,771 existing homes in 2011 under the Carbon Emissions Reduction Target (CERT) programme.

- Average projected savings per development of 364 tonnes of regulated CO_2 per year compared to 2010 Building Regulations.

Note: Appendix 4 contains an analysis of the cost to the GLA of achieving the CO_2 emissions reductions highlighted above.

[s] These figures exclude the impact of unregulated emissions e.g. catering, small power, etc.
[t] Assumes average saving per dwelling of 0.4 tonnes of CO_2 per annum from OFGEM CERT spreadsheet
[u] Figures relate to Year 4 of CERT which ran from 1st April 2011 to 31st March 2012

5. Application of the hierarchy in referable applications

The application of policy at each stage of the energy hierarchy and the commitments secured are described in the subsections below. Additionally, observations are made that are relevant to the future implementation of policy.

5.1 Be lean: use less energy

Policy 5.3 of the London Plan states that development proposals should demonstrate that sustainable standards are integral to the proposal and ensure that they are considered at the beginning of the design process. Standards include measures to maximise CO_2 emissions reductions across the site, including the building and services.

Day to day application of policy

To minimise the demand for energy, new build developments have been routinely encouraged to make full use of passive and active energy efficiency measures. As well as optimising the design of the buildings through passive design, developers are asked to demonstrate that the potential for improvements through measures such as improved insulation, reduced air permeability, energy efficient lighting and enhanced controls are fully exploited.

The energy hierarchy requires that opportunities for CO_2 emissions reductions through energy efficiency are maximised before consideration of CHP and renewables. In line with this approach and to demonstrate that a high level of energy efficiency will be achieved, the GLA has pushed developers to commit to regulated CO_2 emissions reductions through energy efficiency measures alone that are greater than those required to comply with 2010 Building Regulations TER.

In developments not suited to CHP and/or renewable energy, optimising energy efficiency is the only technique for achieving the CO_2 emission reductions required by Policy 5.2 of the London Plan. In these circumstances, maximising the contribution of each measure, whether it be achieving very high air tightness or low specific fan power, becomes of paramount importance.

Observations

While the CO_2 emissions reductions secured from energy efficiency alone were significantly greater than those required to comply with 2006 Building Regulations TER[v], achieving significant reductions over 2010 Building Regulations TER through energy efficiency alone is much more difficult, although it varies depending on the building type. However, after undertaking modelling with building regulations compliance software to understand the opportunities and constraints, in general, developers have committed to emissions reductions through energy efficiency alone that are greater that those required to comply with 2010 Building Regulations TER. It is worth noting that if a 2006 Building Regulations baseline was used for comparison the savings from energy efficiency alone in 2011 were higher at 26% than the circa 19% achieved in 2010. However, achieving the 25 per cent tighter 2010 Building Regulations baseline absorbs these savings.

Outcome

In 2011 the key outcome secured in relation to energy efficiency was obtaining commitments for the vast majority of developments to achieve regulated CO_2 emissions reductions through energy efficiency alone greater than those required to comply with 2010 Building Regulations TER.

[v] Circa 19 per cent regulated CO_2 emissions reduction from energy efficiency alone is stated in Monitoring the impact of London Plan energy policies in 2010, GLA October 2011

5.2 Be clean: supply energy efficiently

Policy 5.6 of the London Plan requires that development proposals should evaluate the feasibility of combined heat and power (CHP). Major development proposals[w] should select energy systems in accordance with the following hierarchy:

1. Connection to existing heating and cooling networks;
2. Site wide CHP network;
3. Communal heating and cooling.

There is potential for significant CO_2 savings in high-density areas where heat networks, often utilising CHP, are highly applicable. London offers particular opportunities for the establishment of networks, as the vast majority of new and existing developments across London are high density.

Day to day application of policy

Where development is in close proximity to an existing heat network with spare capacity, developers must provide evidence that they have engaged with the heat network operator over utilising the space capacity as part of the initial energy proposals (stage I). Prior to consideration of the application at stage II, this provides assurance that the opportunities for connection have been fully investigated. For example, new developments close to the Olympic Park, such as those in Stratford High Street, are asked to liaise with the operators of the Olympic Park Heat Network to explore the opportunities for connection. The linking of new developments to the network is expected to be one of the main routes for growing the heat network in the post games period and the heat network operator has already succeeded in extending the network beyond the boundaries of the Olympic Park.

Where heat density is sufficient, developments are designed to allow future connection to an external heat network. Future connection is also often further facilitated through the installation of a site heat network in multi building developments.

Developments containing sufficient scale and a suitable mix of building types/uses, but not in the vicinity of an existing or planned network, are encouraged to install on site CHP as the lead heat source for the site heat network, as well as to investigate the opportunities for extending the system to supply adjacent buildings.

The Mayor's Climate Change Mitigation and Energy Strategy sets out the measures that the Mayor is taking to deliver his target of supplying 25 per cent of London's energy from decentralised sources by 2025. The Decentralised Energy capacity study sets out the opportunity and the pathway to delivering the target.

Observations

Developers usually commit to establishing site heat networks which facilitate later connection to larger area wide networks, despite the potential difficulties arising from the phasing of large mixed use developments. These developments will also be able to act as anchor loads in the establishment of new larger networks in the future. An estimated 31,000 dwellings obtaining planning permission in 2011 will be supplied by heat networks. Should these be built out, a conservative estimate is that this represents an investment of circa £78million in heat distribution network infrastructure[x]. Circa 35 jobs[y] are also estimated to result from maintaining the operation of the site networks.

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[w] See London Plan 2011 for a definition of Major Development proposals

[x] Assumes a heat distribution cost of £2500 per flat for district heating, taken from Table 51 of Code for Sustainable Homes: A cost review (CLG March 2010)

[y] Assumes 0.5 jobs per mixed use/residential development for maintaining a site network

Even when considered on their own, very large mixed use developments have the potential to be the nucleus of area wide networks supplied by CHP. As seen in Table 3 below, seven of these very large mixed use developments proceeded through to obtaining planning permission in 2011. Most of these developments form key elements of the wider plans for decentralised energy in the areas in which they are located. For example, the Northwest District Wembley development energy centre will be an important node in the establishment of a district heating network serving the wider Wembley area. The developer is also engaged in the planning of the wider heating network and supporting the feasibility study work. Similarly, Surrey Canal Road will be served by a site wide heat network which will be a key anchor load in the establishment of an area wide district heating network supplied with heat from SELCHP energy from waste plant.

Name of development (and date of decision by the Mayor)	Borough	Number of dwellings	Non-domestic floor area (m^2)
Clarendon Square, Haringey Heartlands (14/12/2011)	Haringey	1,080	1,800
Northwest District Wembley (21/9/2011)	Brent	1,300	108,000
RAF Uxbridge (14/12/2011)	Hillingdon	1,373	16,710+
Leamouth Peninsula North (20/4/2011)	Tower Hamlets and Newham	1,706	19,464
Inglis Barracks (1/6/2011)	Barnet	2,174	4,570+
Surrey Canal Road (1/12/2011)	Lewisham	2,400	57,640
Silvertown Quays (19/1/2011)	Newham	4,930	25,290

Table 3: Large site heat networks capable of expanding to serve a wider area

To further enable the straight forward future connection of new build developments to large off-site heat networks or, in the case of the larger mixed use developments, utilise large, efficient on-site CHP plant, developers usually minimise the number of energy centres.

The establishment of the site heat network infrastructure referred to above will enable whole communities to connect into area wide district heating networks and be supplied from renewable heat sources in the years ahead. This supports the vision for low and zero carbon decentralised energy in London.

Sometimes, usually in parts of the outer boroughs, densities are lower and there is less potential for heat networks and individual technologies are sometimes proposed. The heat mapping work conducted by individual boroughs with funding support from GLA has proved a useful tool in identifying where developments are located outside of areas where district heating is planned. This enables an informed judgement to be made regarding the suitability of the proposals.

CHP

As shown in Table 4 below, 77 installations (two thirds of developments) will meet part of the energy requirements from CHP and of the schemes reaching the target in Policy 5.2 of the London Plan, 80 per cent of them met part of their energy requirements from CHP. Of the total installed electrical capacity, approximately 40 per cent of it is due to the CHP that will be installed in the large mixed use schemes listed in the table above. The largest proposed CHP installation was 1.8MW of electrical

capacity. While the total electrical capacity is less than that occurring in 2010[z], that year included a small number of large CHP installations sized to supply existing properties in the surrounding areas as well as the new build developments. The 17MW of CHP electrical capacity proposed in 2011 represents an increase of 9 per cent compared to the total 185MW already installed in London in 2010[aa]. The proposed CHP capacity represents investment of circa £12million[bb].

Number of installations obtaining energy from CHP	Total new electrical capacity (MW)	Average installation electrical capacity (kW)
77	17	223

Table 4: CHP installations secured through planning in 2011

Additionally, several waste-to-electricity plants obtained planning permission in 2011 (see Appendix 3). The CO_2 savings arising from the electricity they generate are not included in this report. These systems will be configured to allow the export of heat to local consumers via district heating network infrastructure should heat customers be identified and signed up in the future.

Outcomes

Implementation of London Plan policy in 2011 has secured the following outcomes in relation to heat networks:

- Commitments to circa 31,000 new apartments being supplied by heat networks. This equates to 16 per cent of the dwellings estimated in the Department of Energy and Climate Change (DECC) district heating database to be currently served by heat networks in the UK[cc].

- Commitments to seven very large[dd] mixed-use developments (see Table 3 above) establishing site wide heat networks supplied by CHP.

- Commitment to the installation of circa 17MW of CHP electrical capacity. An increase of 4 per cent relative to the 394MW of CHP electrical capacity currently installed in buildings in the UK[ee].

5.3 Be green: use renewable energy

Within the framework of the energy hierarchy, Policy 5.7 of the London Plan states that major development proposals should provide CO_2 emissions reductions through the use of onsite renewable energy generation, where feasible.

Day to day application of policy

Following the order of the energy hierarchy, renewables are investigated after energy efficiency and CHP (where applicable) have been considered. The potential for on-site renewable energy is often constrained where developments are being supplied with heat from CHP. For example, renewable heat

[z] 28MW of CHP electrical capacity was proposed through planning in 2010.
[aa] Combined Heat and Power in Scotland, Wales, Northern Ireland and the regions of England in 2010, Energy Trends article September 2011
[bb] Assuming an average installed cost of £700/kW_e
[cc] DECC database figures quoted in District Heating: Heat Metering Cost Benefit Analysis http://www.decc.gov.uk/assets/decc/11/meeting-energy-demand/district-heating/5462-district-heating--heat-metering-cost-benefit-anal.pdf
[dd] Including more than 1000 dwellings
[ee] Table 7C of the Digest of UK Energy Statistics 2012

technologies would compete with CHP for the base heat load. In terms of renewable electricity technologies, photovoltaic (PV) panels are a compatible technology with CHP.

A wider range of renewable technologies are employed when CHP is not applicable. These include solar thermal panels, ground source heat pumps, biomass boilers and air source heat pumps. The characteristics of the developments influence which technologies are adopted.

Observations

Nine developments exceeded the targets in Policy 5.2 of the London Plan through the first two elements of the energy hierarchy and did not propose on-site renewable energy systems.

However, the vast majority of developments proposed the use of some renewable energy and over half of all new developments planned to install PV panel arrays (see Table 5 below for the number of installations for each technology). This reflects the complementary nature of PV and CHP (which many developments are also adopting), as they do not compete for the same energy loads. However, the use of roofs for other purposes, for example accommodating ventilation and cooling plant, often constrained the space available for installing PV panels; this impacts on the CO_2 savings secured from the technology in those cases. The proportion of developments planning to include photovoltaic panels dropped by 5 per cent when compared to 2010[ff]; this may in part be to uncertainties surrounding the feed-in-tariff (FiT).

14 developments (see Table 5 below) planned to include biomass boilers. At 12 per cent the proportion of developments proposing biomass is similar to that in 2010. As shown in Figure 3 below, the figures for both these years are substantially below that occurring in the preceding years when 50 per cent of all applications analysed included biomass boilers[gg].

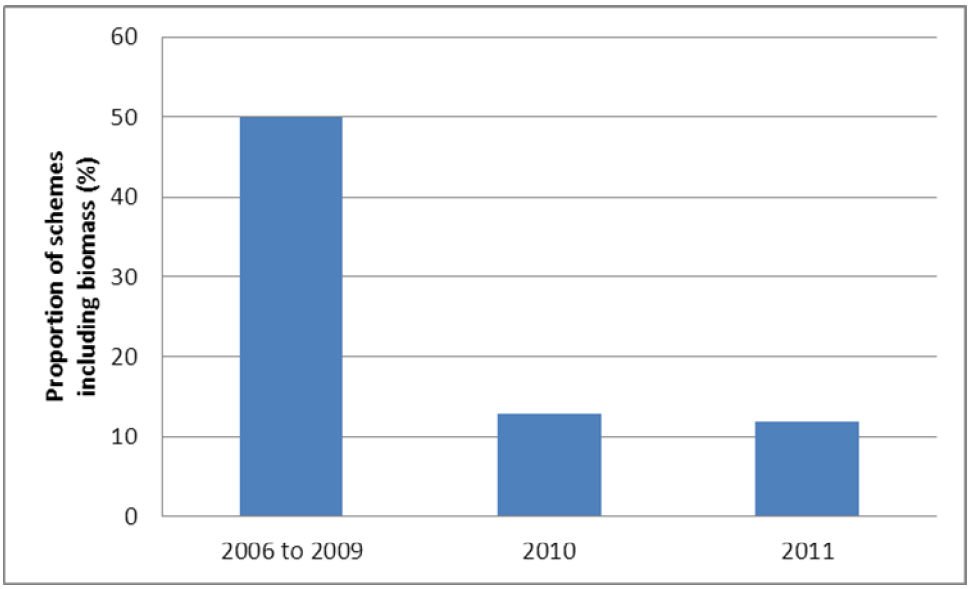

Figure 3: Proportion of all schemes including biomass

Individual air source heat pumps (ASHP) have sometimes been proposed for groups of dwellings that are either not in the vicinity of any existing district heating networks or not in an area which could accommodate a district heating network in the future. These dwellings are predominantly individual houses.

[ff] 59 per cent of developments proposed to include PV in 2010

[gg] Monitoring the London Plan Energy Policies – Phase 3: London South Bank University, December 2009 at http://static.london.gov.uk/mayor/priorities/docs/lon-plan-energy-policies-monitoring-1.pdf

	PV	Biomass boilers	Heat pumps	Solar thermal	Wind
Number of installations in 2011	60	14	19	10	1
Number of installations in 2010	66	15	20	11	0

Table 5: Number of installations of different types of renewable energy systems

Outcomes

The main outcome secured in relation to renewable energy from implementation of policy in 2011 has been commitments to the installation of approximately 49,000m^2 of photovoltaic panels, equivalent to circa 5MW electrical capacity.

6 Conclusions

The following conclusions can be drawn from the analysis:

- For developments obtaining planning permission in 2011, continued implementation of the energy policies in the London Plan has been successful in achieving significant regulated CO_2 emissions reductions over and above the minimum regulatory requirements. Cumulative regulated CO_2 emissions reductions of 33 per cent against a baseline in which developments complied with 2010 Building Regulations were achieved. This is above the requirements of developers for 2010 to 2013 set out in the London Plan.

- While optimising energy efficiency remains the first step for any development, these CO_2 saving benefits towards the London Plan targets are now largely used up in complying with the 2010 Building Regulations.

- The Mayor's decentralised energy target continues to be supported by:

    - ensuring developments located in areas where there is potential for area wide decentralised energy schemes are future proofed to allow later connection; and

    - requiring the establishment of site wide heat networks utilising CHP in large, high density, mixed use developments (these developments often have the potential to be the nucleus of area wide schemes).

- A number of developments are complying with the targets in Policy 5.2 of the London Plan through the first two elements of the energy hierarchy and not proposing on-site renewable energy systems. Where renewable energy is proposed PV remains the most common technology.

Glossary

Building Emissions Rate (BER) or **Dwelling Emission Rate (DER)** is the actual building/dwelling CO_2 emission rate. 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) is defined as the simultaneous generation of heat and power in a single process. The power output is usually electricity, but may include mechanical power. Heat outputs include hot water for space heating or domestic hot water production.

CHP Electrical Capacity – is the maximum power generation capacity of CHP.

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) is 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.

Standard Assessment Procedure (SAP) is 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) is 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).

Appendix 1: Mayor's role in strategic planning applications

London planning authorities must consult the Mayor on all planning applications that are of strategic importance to London[hh]. The Mayor is required to provide a statement setting out whether he considers that the referred application complies with the London Plan. The Mayor must give this statement, commonly known as **stage I**, within six weeks of receiving the application.

Once the Local Planning Authority (LPA) has resolved to grant or refuse permission for a referable application it must send the application back to the Mayor with a copy of the draft decisions notice and other documentation. Following receipt the Mayor has 14 days to decide to either direct the LPA to refuse the application; direct that he is to act as the LPA and determine the application himself or take no further action. The Mayor's decisions, commonly known as **stage II**, take the form of an officer's report to the Mayor and a letter from the Mayor to the LPA.

[hh] Definitions of strategic applications are set out in the Mayor of London Order 2008

Appendix 2: Comparison of 2010 and 2011 outcomes

Measure	2010	2011
Stage II applications	112	118
Largest number of applications (not just stage II)	Tower Hamlets (33)	Newham (30)
Number of dwellings in developments	28,181	32,051
Non-domestic floor area (million m^2)	2.165	1.455
Regulated CO_2 emissions reductions compared to 2010 Building Regulations (per cent)	33	33
Regulated CO_2 emissions reductions compared to 2010 Building Regulations (tonnes per annum)	35,598	41,136
Regulated CO_2 emissions reductions compared to building regulations in force at time (tonnes per annum)	50	33
Regulated CO_2 emissions reductions compared to building regulations in force at time (tonnes per annum)	71,813	41,136
Dwellings connected to heat networks	27,000	31,000
Proposed CHP electrical capacity (MW)	28	17
Percentage of developments including renewable energy	95	88

Appendix 3: Waste to electricity plants

Case	Case name (date going through planning)	Borough	Process
0512b	Frog Island Depot (1/12/2011)	Havering	Anaerobic digestion of food waste to produce biogas for use in gas engines to produce electricity.
2771	Former Maskel Site (5/10/2011)	Barking & Dagenham	Anaerobic digestion in SIP to produce biogas for use in 1MW electrical capacity gas engine to generate electricity. The heat off take thermal capacity will be 1.15MW.
2531	Cookham Road	Bromley	Anaerobic digestion of food waste to produce biogas for use in gas engines of 2MW electrical capacity for electricity generation.
1335c	Land west of Fairview industrial park (11/8/2011)	Havering	Gasification to produce gas for burning in boilers to produce steam for use in a steam turbine of 13.5MW electrical capacity. A heat off take facility was secured by conditioned.
0953b	Beckton sewage treatment works (9/1/2011)	Newham	Sludge digestion plant to produce fuel for gas engines with an electrical capacity of 4.2MW. The electricity generated by the gas engines will displace imported electricity responsible for emitting 16,340 tonnes of CO_2 per annum.

Appendix 4: The cost effectiveness of CO_2 savings

The CO_2 savings described in the 2011 monitoring report are secured as a result of a team evaluating the energy assessments produced by developers to ensure they meet the energy policies in the London Plan and, where they do not, requesting changes to the proposals to bring them into compliance. In effect, the team act as a gate keeper ensuring that only those proposals meeting the policy requirements pass through the planning system.

The team involves an authority energy officer and external specialist consultants (as well as the planning case officers assigned to individual applications). The annual combined costs of the core team are approximately £200,000.

Assuming the annual CO_2 savings secured through planning continue for a period of 30 years reflecting the lifetime of the building services, cumulative CO_2 savings of 1,234,080 tonnes will be achieved as a result of the implementation of the London Plan energy policies in 2011.

Considering purely the officer and consultancy costs to the GLA, this represent a cost per tonne of CO_2 saved of £0.16. In practice, the cost per tonne of CO_2 saved will be higher as some of the savings will not materialise, for example, where the development does not get built out or is superseded by a new planning application in a later year. Nevertheless, even if half of the developments did not proceed, the cost to the GLA is still significantly less than £1 per tonne of CO_2 saved.