

MAYOR OF LONDON

ENERGY PLANNING

Monitoring the implementation of London Plan energy policies in 2014

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EXECUTIVE SUMMARY

The Mayor's energy policies for new development are helping to transform the city into a low carbon, resource efficient city, setting the targets for a path towards zero carbon development. This document sets out the outcomes secured in 2014 as a result of implementing the London Plan energy policies, in particular Policy 5.2 and considers the role of new development in contributing to the delivery of decentralised energy systems in London. The information contained may be of interest to developers and their consultants, planning case officers, policy officers and others with an interest in how London Plan policies are implemented.

Highlights:

Key outcomes secured in 2014 as a result of implementation of the London Plan energy policies include:

- Regulated CO₂ emission reductions of 39 percent more than required by Part L of the Building Regulations across applications considered by the Mayor.
- Cumulative regulated CO₂ emission reductions of over 53,000 tonnes CO₂ per annum against the relevant Part L baseline.
- Commitment to the provision of low carbon and renewable energy infrastructure including: Combined Heat and Power (CHP) plant able to produce more than 20MW of electricity (broadly equivalent to the amount required to supply 40,000 homes) and a similar amount of heat, 82,000m² of solar photovoltaic (PV) panels (equivalent to the electricity demand requirements of around 16,000 homes) and a substantial increase in the number of heat pump installations.
- Significant investment (and with it associated employment opportunities) at each stage of the energy hierarchy including:
 - Be Lean - Investment in energy demand reduction measures resulting in a 14 percent reduction in CO₂ emissions compared with relevant Building Regulations in force through energy efficiency measures alone
 - Be Clean - £114 million in heat network infrastructure and associated CHP
 - Be Green - £16 million in PV panels and additional investment in other renewable

An energy assessment is required for each planning application referable to the Mayor, setting out how the London Plan energy policies will be met within the development. Specifically, applicants are required to set out how the proposals apply the following energy hierarchy:

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

The hierarchy provides the mechanism through which the carbon dioxide (CO₂) emission reduction targets in Policy 5.2 of the London Plan are achieved. It also contributes to the implementation of strategic energy policies relating to decentralised heat networks and ensures opportunities for building occupants to receive efficient, secure and affordable energy.

A specialist team evaluates each energy assessment to ensure that the London Plan energy policies are met and, where necessary, negotiate improvements to strategies. 142 applications which were

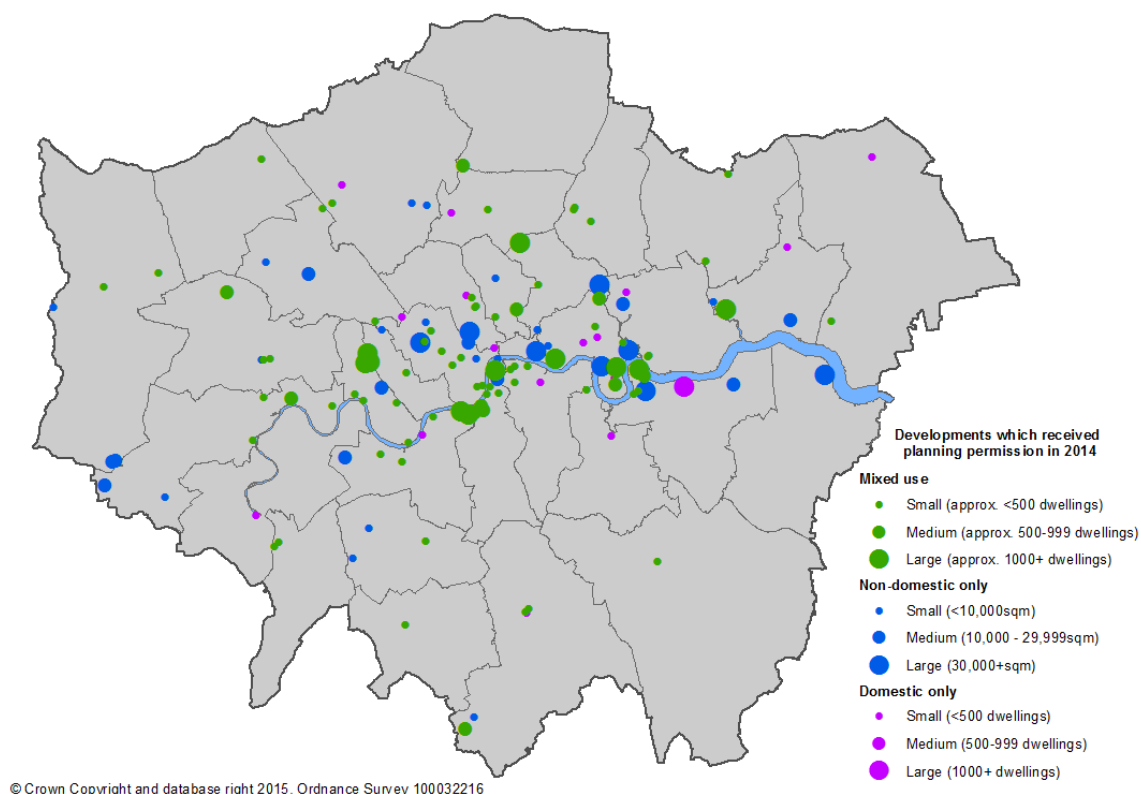
granted provisional permission by the local planning authority were considered by the Mayor at Stage II and approved. Two of the applications were for refurbishment schemes; there is a bespoke method for calculating the CO₂ emissions for these so that they are consequently not included in the overall CO₂ emissions assessments.

Of the remaining 140 applications, all but seven were assessed against Part L 2010 Building Regulations. Forty-four of the applications were assessed against the 25 percent target for new developments that was in place for the period 2010 to 2013, while the majority (89) of the applications were assessed against the new and more stringent target of 40 percent.

The overall saving for 2014 was 39 percent.¹ This is a bigger reduction than in previous years showing progression. Developments approved by the Mayor in 2014 were assessed against one of three energy targets (summarised in Table 4), due to the move to a higher target in the London Plan in 2013 and the implementation of Part L 2013 of the Building Regulations. The London Plan targets were set to ensure a progression towards zero carbon standards, and developers have responded through a progressive increase in the level of CO₂ reductions achieved over the past five years.

Figure 1 shows the distribution, size and type of developments approved by the Mayor at Stage II in 2014 and hence considered in this report.

Figure 1: Distribution of Stage II applications approved in 2014



¹ A detailed breakdown of combined savings for applications assessed against each of the targets is included on p27.

The way that applications strive to meet their target includes a range of solutions. Specifically, the approaches range from achieving the bulk of the savings from heat networks with CHP, either on-site or by connection to an existing network in the vicinity, to those which reach the target just through energy efficiency and renewable energy technologies. It is noticeable that more renewable energy is featuring in applications, indeed 82 percent of the developments meeting the 40 percent target incorporated renewable energy technologies. Other applications make use of all three parts of the energy hierarchy, including energy efficiency, CHP and renewable energy. The various approaches are illustrated in the case studies in Appendix 3.

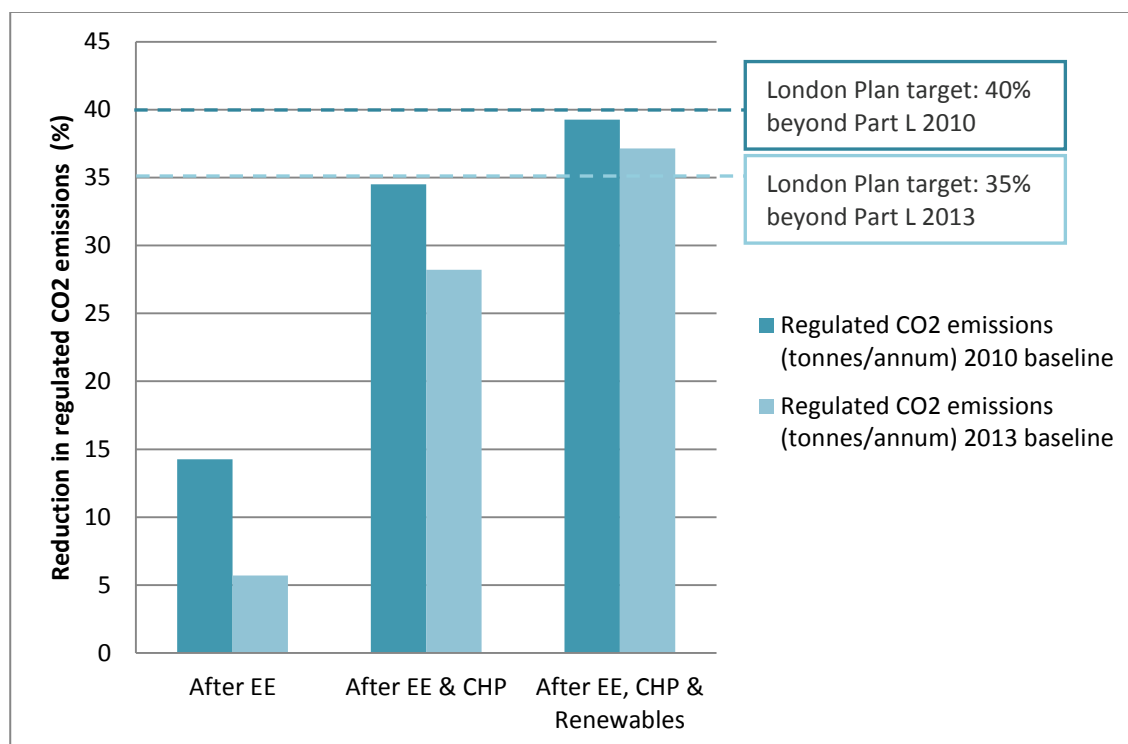
Collectively the applications that have been assessed in 2014 through implementation of London plan energy policies in 2014 have continued to secure substantial energy related outcomes. Specifically, these include commitments to:

- Investment in demand reduction measures to exceed the requirements of Building Regulations through energy efficiency alone and reduce residential energy bills by circa £900,000 per annum.
- New heat network infrastructure and associated generation equipment including:
 - Circa £14 million of investment in combined heat and power (CHP) plant to produce 20 MW of electricity and a similar amount of heat, broadly equivalent to the amount required to supply 40,000 homes.
 - Approximately £100 million of investment in heat network infrastructure for circa 40,000 communally heated dwellings.
 - Approximately 58 new permanent jobs created in order to operate and maintain the heat network infrastructure and associated energy generation equipment.
- Investment in renewable energy equipment, including circa £16 million to fit approximately 82,000m² of photovoltaic (PV) panels, accruing to about 8MW of new electrical capacity and equivalent to the demand of circa 16,000 homes.

The commitments secured during 2014 will reduce fossil fuel use leading to a total of over 53,000 tonnes per annum of regulated CO₂ emission reductions, over and above those reductions required to comply with the appropriate Part L (2010 or 2013) of the Building Regulations. This is broadly equivalent to retrofitting loft insulation in over 89,000 existing homes.

The regulated CO₂ emissions after each stage of the energy hierarchy are shown in Figure 2 below. These are shown separately for those applications that were assessed against the 2010 Building Regulations, and those that were assessed against the 2013 Building Regulations. The emissions are reduced well below Part L 2010 of the Building Regulations requirements through energy efficiency measures. The largest reduction is then achieved through CHP, before a further reduction through use of renewable energy technologies.

Figure 2: Cumulative reductions secured in CO₂ emissions at each stage of the London Plan hierarchy for developments assessed against Part L 2010 and Part L 2013



Applications considered at Stage II in 2014 were assessed against one of three targets, depending on the date they were received by the GLA at Stage I. The London Plan target of 40 percent beyond Part L 2010 was applied to applications received at Stage I from October 2013, but only 1 of these schemes advanced to Stage II that year. By contrast, 89 of the 140 applications assessed in 2014 were assessed against this target and a further 7 applications were assessed against the equivalent (but recalibrated) target of 35 percent beyond Part L 2013, once this was introduced in 2014. Table 1 summarises the 2013 and 2014 applications and the targets they were assessed against.

Table 1: Applications and targets in 2013 and 2014

Target applicable to developments	Number of applications 2013	Number of applications 2014 ²
25 percent beyond Part L 2010	173	44
40 percent beyond Part L 2010	1	89
35 percent beyond Part L 2013 ³	N/A	7

² Excludes refurbishment schemes

³ Equivalent to 40 percent beyond Part L 2010 – see further detail on page 14

Table 2 compares the statistics for applications received each year from 2010 to 2014. There was an overall increase in the regulated CO₂ emissions reductions in 2014 to 39 percent beyond Building Regulations requirements, up from 36 percent in 2012 and 2013. This continues the positive upward trend in CO₂ emission reductions and likely reflects the response of applicants to the introduction of the higher carbon reduction target which came into effect from October 2013. The figures in Table 2 refer purely to the on-site commitments. When developments are unable to reach the target on-site, the London Plan requires the developer to agree a cash-in-lieu contribution with the local borough to account for the shortfall in CO₂ emission reductions (see Policy 5.2E).

Although there were fewer applications than in 2013, the total number of dwellings across all applications was very similar and this was also reflected in a similar number of dwellings committed to a heat network. The lower number of applications than in 2013, may explain the slight drop in the total proposed CHP capacity, although there was also a significant increase in the amount of solar PV proposed, reflecting an increased role for renewable energy.

Table 2: Comparison of 2010, 2011, 2012, 2013 and 2014 figures

	2010	2011	2012	2013	2014
Stage II applications	112	118	171	174	142
Number of dwellings in development	28,181	32,051	55,879	43,178	43,814
Estimated domestic floor area ⁴ (million m ²)	2.0	2.2	3.9	3.0	3.1
Non-domestic floor area (million m ²)	2.2	1.5	2.3	2.3	2.0
Regulated CO ₂ emissions reductions compared to appropriate Part L (2010 or 2013) Building Regulations (percent)	33%	33%	36%	36%	39%*
Regulated CO ₂ emissions reductions compared to appropriate Part L (2010 or 2013) Building Regulations (tonnes per annum)	35,598	41,136	59,817	49,474	53,423*
Dwellings connected to heat networks	27,000	31,000	53,000	41,097	40,160
Proposed CHP electrical capacity (MW)	28	17	29	25	20
PV Panels (m ²)	22,500	49,000	87,000	71,354	82,405

*CO₂ emissions reductions associated with the two pure refurbishment applications are not included in these figures.

⁴ Assumes that the average dwelling receiving planning approval has an internal area of 70m²

INTRODUCTION

As befits the world's greatest city, a great deal of new development is taking place across London. Working with the GLA, developers are helping to transform the city into a low carbon, resource efficient city that provides Londoners with a high quality environment within which to live and work, at a price that is affordable.

The London Plan⁵ spearheads the approach to future buildings and development that at once challenges and allows communities and the city as a whole to demonstrate its commitment to progressively improving its sustainability credentials not only for its own and its citizens' sake, but also as a global exemplar. As such, the targets that reflect London's energy policies have continued to exceed those required by the Building Regulations.

The construction of new buildings and homes, accompanied by increased investment in energy efficiency measures, infrastructure and low and zero carbon technologies, stimulated through London's policies, also has a positive effect on employment and job creation.

Policy 5.2 of the London Plan sets CO₂ emission reduction targets for new buildings, aligned to previous governments' plans for zero carbon homes from 2016 and zero carbon non-domestic buildings from 2019. The targets support the development of energy efficient new buildings and investment in infrastructure to supply the remaining energy efficiently. These policies may also enable additional benefits for building occupants through provision of affordable energy and increased security of energy supply also minimising the impact on the existing energy network.

Policy 5.5 of the London Plan outlines how the Mayor expects 25 percent of the heat and power used in London to be generated through the use of localised decentralised energy systems by 2025, and prioritises the development of heat networks at the development and area wide levels accordingly. The delivery of decentralised energy in London is supported through the planning process by requiring the implementation of site wide heat networks where appropriate in new developments which are the subject of strategic planning applications.

An energy assessment is required for each planning application referable to the Mayor. In preparing the energy assessment, applicants are required to follow the Greater London Authority (GLA) guidance on preparing energy assessments.⁶ Each energy assessment is then evaluated on a case by case basis by a dedicated energy planning team to ensure compliance with London Plan policies and ensure each development (where appropriate) contributes to the long term plans for decentralised energy in London. The evaluation recognises the particular circumstances of individual developments and the constraints that apply in each case. The costs to the GLA of providing this support are provided in Appendix 4.

The regulated CO₂ emission reductions and infrastructure commitments secured through the planning process from applications determined in 2014 have been evaluated. This report presents the results of

⁵ The London Plan is available here <https://www.london.gov.uk/priorities/planning/london-plan>

⁶ <http://www.london.gov.uk/priorities/planning/strategic-planning-applications/preplanning-application-meeting-service/energy-planning-gla-guidance-on-preparing-energy-assessments>

the evaluation; it also provides details of the uptake of measures that have led to those savings, including energy efficiency, implementation of CHP and renewable energy sources.

Strategic scale applications determined in 2014

The Mayor is responsible for London's planning at a strategic level.⁷ The 32 London boroughs and the City of London are the local planning authorities for their areas.⁸

The Mayor is required to provide a statement of compliance with the London Plan within six weeks of receiving an application from the local planning authority (this statement is commonly referred to as a Stage I report). Once the planning authority has resolved to determine the application, the application is referred back to the Mayor to decide whether to direct refusal, take over the application for his own determination or allow the planning authority's decision to stand. The Mayor's decision (commonly known as Stage II) takes the form of an officer's report to the Mayor and a letter from the Mayor.

A total of 161 applications which had been granted provisional permission by the local planning authority were considered by the Mayor at Stage II in 2014 and approved. Of these, there were 19 schemes for which no CO₂ data was provided (these include, for example, temporary structures, a bridge, a barn); these are excluded from the analysis in this report leaving a total of 142 schemes. There were also 16 additional applications that were refused by the local planning authority but not taken over by the Mayor in 2014.

Table 3 gives a breakdown of the remaining 142 applications by development type. 140 of these were new-build developments and two (one mixed use and one non-domestic) were refurbishment schemes.

Table 3: Breakdown by category of applications at Stage II in 2014

Type of development	Number of developments	Number of dwellings	Non-domestic floor area (millions m ²)
Mixed use ⁹	90	40,471	1.2
Domestic	15	3,343	N/A
Non-domestic	37	N/A	0.8
Total	142	43,814	2.0

⁷ Criteria for referable planning applications can be found here -

https://www.london.gov.uk/sites/default/files/archives/uploads-summary-of-order-2008_0.pdf

⁸ The London Legacy Development Corporation is the local planning authority for parts of east London. The Old Oak and Park Royal Development Corporation is the local planning authority for the area around and including Old Oak and Park Royal. The Greater London Authority Acts 1999 and 2007 require the boroughs to consult the Mayor of London on planning applications that are of potential strategic importance to London, as defined by the government and set out in The Town and Country Planning (Mayor of London) Order 2008.

⁹ All these developments have a residential and commercial component

Energy policies in the London Plan

In Policy 5.1 the Mayor states his intention to seek to achieve an overall reduction in CO₂ emissions of 60 percent (below 1990 levels) by 2025. It is expected that the GLA Group, London boroughs and other organisations will contribute to meeting this strategic reduction target, and the GLA will monitor progress towards its achievement.

The modelling which informed the 60 percent CO₂ reduction by 2025 target assumed all new homes will need to be zero carbon from 2016, and non-domestic buildings from 2019. The contribution of new-build developments to CO₂ reduction targets may be modest compared to the existing building stock; however, it has an important role to play in demonstrating best practice in building design, ensuring resilience to future climate and energy supply changes and catalysing new, area wide decentralised energy schemes.

Policy 5.2A requires that developments should make the fullest contribution to CO₂ emissions in accordance with the following hierarchy:

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

Policy 5.2B sets targets for CO₂ reductions in buildings. These targets are expressed as minimum improvements over the Target Emissions Rate (TER) outlined in Part L 2010 of the Building Regulations. When Part L 2013 of the Building Regulations came into effect on 6 April 2014 the London Plan target was recalibrated to take account of the overall six percent reduction in CO₂ emissions from new residential buildings and an overall nine percent reduction in CO₂ emissions from new non-residential buildings compared to 2010. To retain the existing simple approach to assessing CO₂ reductions across a development, a flat percentage target of 35 percent beyond Part L 2013 across both residential and non-domestic buildings is now applied by the Mayor. This is deemed to be broadly equivalent to the 40 percent target beyond Part L 2010 of the Building Regulations.

Table 4 sets out the time periods over which each London Plan target has been applied and the number of developments under each target considered by the Mayor at Stage II in 2014. This includes new build applications only (excludes the two refurbishment schemes).

Table 4: Targets and their periods of applicability (for applications received by the GLA at Stage I)

Target	Applicable from	Applicable until	Number of developments in 2014
25 percent beyond Part L 2010	2010	30/09/2013	44
40 percent beyond Part L 2010	1/10/2013	5/07/2014	89
35 percent beyond Part L 2013 ¹⁰	6/04/2014	ongoing	7

Major development proposals are required to provide a detailed energy assessment to demonstrate how the targets for CO₂ emissions reduction outlined above are to be met within the framework of the energy hierarchy. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash-in-lieu contribution to the relevant borough to be ring fenced to secure delivery of CO₂ savings elsewhere.

¹⁰ The 35 percent beyond Part L 2013 was devised to be equivalent to the existing 40 percent beyond Part L 2010 target. A transition period applied between 6/04/2014 and 5/07/2014 when applicants were able to present their CO₂ reductions relative to either a 2010 or 2013 baseline.

APPLICATION OF THE ENERGY HIERARCHY

Meeting the targets through the energy hierarchy

The energy hierarchy, which is an embedded part of the London Plan and underpins the energy policies it contains, follows the sequence:

- Step 1: use less energy (be lean)
- Step 2: supply energy efficiently, supporting plans for district heating in London (be clean)
- Step 3: use renewable energy (be green)

Developments are able to reach their targets by applying different combinations of these steps. The case studies in Appendix 3 demonstrate how four of the applications determined in 2014 applied the energy hierarchy to achieve the Mayor's target. Two of the case studies achieve the target by applying all of the steps, such that they have chosen to implement energy efficiency measures, deploy CHP and district heating, and also integrate renewable energy. The remaining two case studies, however, achieve their targets with energy efficiency and renewables only. Likewise, there are other schemes that use energy efficiency and CHP without adding any renewable technologies.

The schemes that follow these steps can be purely domestic or non-domestic, or have a mix of both domestic and non-domestic building uses. Schemes achieving the targets are spread across the capital; the case studies reflect this geographic and inner/outer borough spread, from Redbridge in the east to Hammersmith & Fulham in the west.

Major refurbishment schemes are expected to apply the energy hierarchy. However the potential for CO₂ emission reductions is assessed on a case-by-case basis given the variability between schemes. Among the 142 schemes included in this report are two pure refurbishment schemes. The CO₂ reductions from these developments are not included in the total savings; however they highlight the very large potential for CO₂ emission reductions that can be achieved through improving the existing building stock (see page 32 for further detail).

Step 1: Energy efficiency in new developments

Policy 5.3 of the London Plan states that the highest standards of sustainable design and construction should be achieved to improve environmental performance and in order to adapt to the effects of climate change over their lifetime. Development proposals should demonstrate that sustainable design standards are integral to the proposal and ensure that they are considered at the beginning of the design process.

New developments are required to incorporate passive and active energy efficiency measures in order to minimise the demand for energy. In addition to enhancing the design of the building, developments are required to include active measures such as energy efficient lighting, heat recovery systems and advanced controls.

As energy efficiency is the first element of the energy hierarchy, developers are required to commit to improving energy efficiency before deciding on CHP and renewable energy systems. This approach is reinforced by requiring developments to reduce regulated CO₂ emissions below those of a Building Regulations compliant development through energy efficiency alone.

The case studies (Appendix 3) provide examples of this, with effective measures taking the contribution from energy efficiency in three of the cases beyond the average through a combination of increased insulation and air tightness to reduce heating demand and design features that minimise associated cooling demand.

Improving fabric energy efficiency can be a cost effective way of achieving CO₂ reductions, as well as having a positive benefit for building occupants through reduced energy bills. This is particularly relevant for low-income households in helping tackle fuel poverty.

Be Lean reductions (2010 Building Regulations)

For applications assessed against Part L 2010 of the Building Regulations, the overall reduction in regulated CO₂ emissions from energy efficiency alone equated to an average 14 percent beyond Part L 2010. This is a significant improvement on 2013 when there was an overall reduction of 9 percent beyond Part L 2010 of the Building Regulations. This suggests that increased attention is being devoted to energy efficiency measures. This may be due to the tightening of fabric standards as part of the Part L 2013 Building Regulations, or to a greater awareness of the benefits of energy efficiency and how to achieve them.

Be Lean reductions (2013 Building Regulations)

The seven applications which were assessed against Part L 2013 of the Building Regulations achieved an average 6 percent reduction in regulated CO₂ emissions from energy efficiency alone. This goes well beyond the Target Fabric Energy Efficiency (TFEE) standard introduced in Part L 2013 and is particularly impressive given the tightening of energy standards between Part L 2010 and Part L 2013 of the Building Regulations.

Overheating and cooling demand

Energy efficiency measures tend to focus mainly on reducing heating demand. However, it is increasingly important that attention is paid to minimising energy consumption and attendant CO₂ emissions resulting from cooling demand, particularly when considering the climate buildings may be operating in in decades to come.

Major development proposals are required to demonstrate the approach they have taken to reducing potential overheating and reliance on air conditioning systems, following the cooling hierarchy in policy 5.9. The cooling hierarchy prioritises passive measures, built into the design of buildings to reduce the overheating risk. These measures may include shading, orientation and fenestration to reduce solar gains, together with green roofs and walls. The presence of excess heat within the building can also be managed through coupling with thermal mass. A ventilation hierarchy is also set out that encourages passive ventilation, where possible to address any cooling demands.

This approach is evident in the case studies (Appendix 3), where examples of demand reduction include LED lighting and window solar controls, together with passive features including balconies and overhangs for shading, and design layout to promote natural cross and stack ventilation.

Step 2: New developments supporting the plans for district heating in London

Opportunities for developing district heating

The Mayor has a target for 25 percent of the heat and power used in London to be generated through the use of localised decentralised energy systems by 2025.¹¹ In order to achieve this target the Mayor prioritises decentralised heating and cooling networks at the development and area wide levels, including larger scale heat transmission networks.

The implementation of the 'Be Clean' element of the energy hierarchy in Policy 5.2 plays an important role both in providing an opportunity, through large new developments, for new heat networks to be established and in ensuring new developments are ready to connect to decentralised networks as and when they become available.

Such networks are fuel flexible and very well suited to supply from energy efficient technologies. The aggregation of the heat demands from many buildings produces a smoother overall heat demand which enables plant to run for a high proportion of the time, in turn assisting its efficiency and cost-effectiveness, notably important for CHP plant.

New developments have an important role to play in catalysing the emergence of area wide networks. If they are large they may form the focal point of an area wide initiative, but even if they are smaller, they will often be important heat loads to support wider connections of multiple existing and new buildings that can also grow to area wide size. This growth extends benefits and economies of scale.

The Tidal Basin case study (Appendix 3) provides a good example of how heat network solutions can evolve. It proposes its own site heat network with supply from the nearby CHP at the ExCeL Centre, already envisaged to be able to supply energy to the wider area. There is in turn a longer-term plan to connect with the existing district energy network at Queen Elizabeth Olympic Park and Stratford.¹²

Secondary heat sources

The report, *London's Zero Carbon Energy Resource* (July 2013)¹³ examined London's potential for harnessing secondary heat sources, including industrial and commercial waste heat, and sources of heat that exist naturally in the environment. It concludes that substantial potential exists for using these sources across London. Heat networks often present a suitable local demand for integrating such sources, particularly if the network is able to assimilate the heat at a low temperature.

Secondary heat sources are already being explored in London. Plans are in place for Islington's Bunhill scheme to integrate surplus heat from a ventilation shaft from the London Underground, and heat recovery from the Regent's Canal, utilising a water source heat pump technology. The Kingston Heights system in South London supplies 150 local homes and a conference centre using a river source heat pump, and the large area wide networks currently being developed present a particularly good opportunity for diverse heat sources.

¹¹ Mayor of London, *London Plan 2015. Consolidated with Alteratins since 2011*, Policy 5.5A

¹² <http://www.cofely-gdfsuez.co.uk/media/news/cofely-delivers-on-mayor-of-londons-district-energy-vision/>

¹³ <https://www.london.gov.uk/sites/default/files/031250%20GLA%20Secondary%20Heat%20-%20Summary%20Report.pdf>

Low temperature systems

When the specifications for a new heat network are being defined, it is well worth investigating the potential for applying new techniques highlighted, for instance, in the IEA District Heating & Cooling programme.¹⁴ For example, heat networks should not be configured to run at higher temperatures than is necessary.

The potential for developing a low temperature network is of particular relevance to new build developments where the heat demands are relatively small, and where the high level of energy efficiency means that a lower temperature supply may be adequate.

The overall potential for integrating locally available heat from renewable or secondary sources will be enhanced, because these can become useful even at relatively low temperatures. Additionally, it may be possible to make use of plastic pipes which are significantly cheaper (but which should not be used for high temperature systems).

New district heating systems can in many cases operate at 70°C flow temperature, and although relevant engineering details are always case-specific this makes a good starting point from which to investigate further. Whilst London Plan policy does not require the use of low temperature systems, consideration of these is encouraged in the latest version of the Energy Planning Guidance for developers.¹⁵

Energy Masterplans

The development of area wide heat networks depends on the identification of areas with the right mix of heat demands, connecting buildings and a motivated project owner. Area wide heat networks identified with the energy masterplans provide the flexibility to switch fuel and heat generation technologies, thereby allowing heat supplies to be decarbonised by moving away from fossil fuels.

The Energy Masterplanning (EMP) process has been developed by the GLA's Decentralised Energy Project Delivery Unit (DEPDU) to identify opportunities for new networks in London, and to set out a long-term vision for heat network development. Energy Masterplans are commissioned by the local boroughs and supported by the GLA with up to £10,000 of direct funding plus assistance with procurement. In 2014 these included RB Greenwich, LB Havering, and LB Islington, with others ongoing. Energy masterplans are often followed by feasibility studies which consider in detail the technical and economic opportunities and constraints to establishing heat networks serving part or all of the area covered by a masterplan. Should a network be considered feasible, a business plan for implementation is required and, ultimately, an authority (or other organisation) must proceed with a procurement exercise to deliver the network.

New developments supporting plans for heat networks

Large New Developments

¹⁴ www.iea-dhc.org

¹⁵ Greater London Authority, *Energy Planning: Greater London Authority guidance on preparing energy assessments* (April 2015)

A substantial number of large new developments obtained planning approval in 2014. Among these were a number of large mixed use developments (Table 5), each incorporating at least 1,000 dwellings. The energy infrastructure (e.g. site heat network) planned for these developments can be a key element in realising the plans for area wide district heating networks. Due to the scale of these developments they are inevitably multi-phase and often envisaged to take over a decade to complete.

Additionally, as part of the planning process the Choats Road Waste to Energy gasification plant in the LB Barking and Dagenham was approved; it includes a 19MW_e steam turbine with a heat offtake facility. This provides a major heat source for future heating infrastructure that may be developed in the vicinity.

Table 5: New developments with > 1000 dwellings obtaining planning permission in 2014

Development Name	Borough	Number of dwellings	Non-domestic floor area (m ²)
London Dock	Tower Hamlets	1,800	21,470
Former Dairy Crest	Hammersmith & Fulham	1,150	25,000
BBC Television Centre	Hammersmith & Fulham	1,000	75,000
Woodberry Down	Hackney	3,242	10,921
Land North of Westfield	Hammersmith & Fulham	1,347	75,000
One Woolwich	Greenwich	1,600	-
Battersea Power Station	Wandsworth	1,305	54,303
Wood Wharf	Tower Hamlets	4,500	350,000
Gascoigne Estate	Barking and Dagenham	1,575	27,500
New Covent Garden	Wandsworth	3,000	84,544
Greenwich Peninsula Central East	Greenwich	1,007	2,100

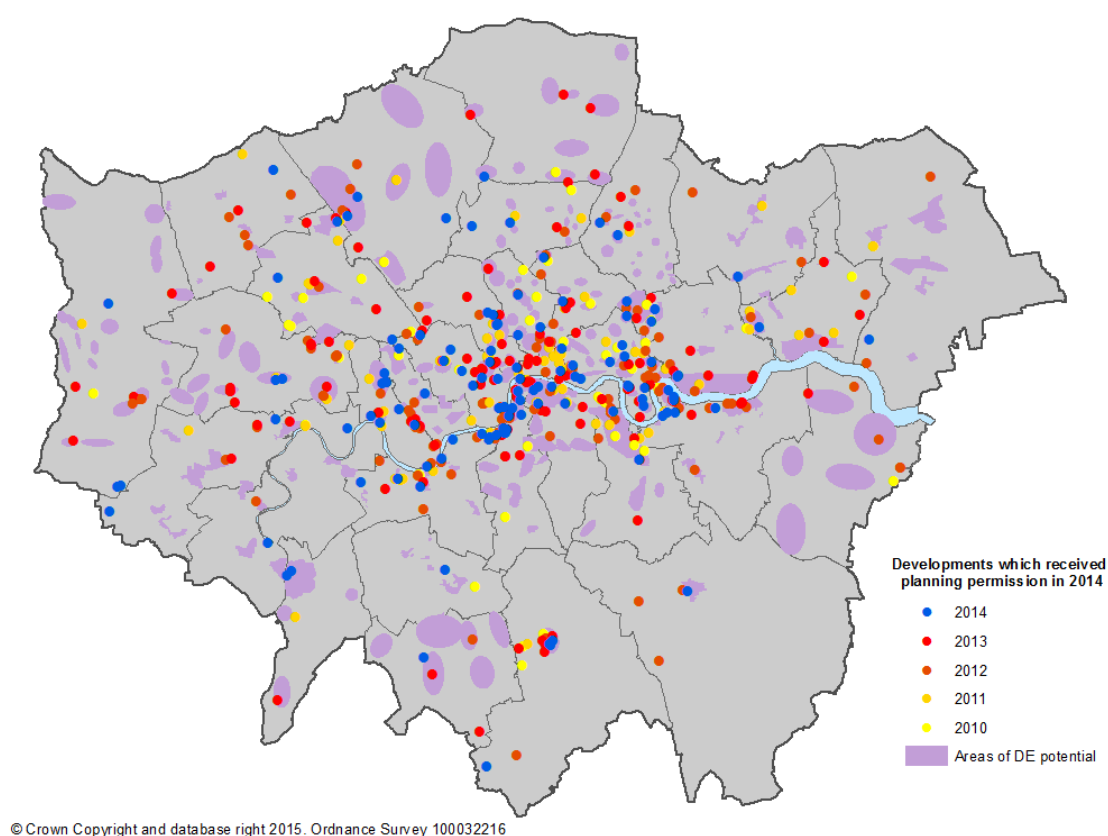
Ensuring smaller developments in dense areas are future proofed

The majority of residential units receiving planning approval from the Mayor in 2014 were located in developments of less than 1,000 homes. In those developments the average number of units was 231. While these developments were generally not of a scale where they would be the catalyst for an area wide network, it was important to secure commitment to them being future proofed to enable them to play their part in London's district heating plans.

This approach resulted in commitments to 20,597¹⁶ residential units being supplied by a site heat network. Including the 19,563 dwellings connecting to heat networks in the very large developments, overall this resulted in commitments to **40,160 dwellings** (91.7 percent of the total dwellings receiving approval) connecting to heat networks. Individual houses in developments were not usually communally heated due to the higher heat distribution losses typically occurring in the distribution system for these types of dwelling which are located a greater distance apart.

Figure 3 illustrates the distribution of the developments which committed to the provision of site wide heat networks between 2010 and 2014, mapped against identified areas of decentralised energy potential.¹⁷ This illustrates the concentrations of site wide heat networks in these areas, predominantly in the inner London boroughs, but also in specific identified areas further out (e.g. Croydon town centre).

Figure 3: Distribution of developments committed to providing site heat networks



Combined heat and power (CHP) capacity serving new developments

110 of the strategic developments for which CO₂ data was provided proposed to meet a proportion of their energy requirements through CHP. Of these, 94 plan on-site CHP installations, with the

¹⁶ This includes 340 dwellings on a refurbishment scheme

¹⁷ Data on areas of decentralised energy potential sourced from the London Heat Map - www.londonheatmap.org.uk/

remainder of the schemes committing to connect to an existing district heating network in the vicinity. This resulted in commitments to provision of circa 20MW of CHP electrical capacity. This compares to commitments to 25MW, 29MW and 17MW of CHP electrical capacity in 2013, 2012 and 2011 respectively.

As shown in Table 6 below, the vast majority of the capacity was found in the middle and larger installation tranches. The largest single CHP installation proposed was for 2.93MW_e.

The most recent guidance for developers provides clarity on use of CHP systems in small developments.¹⁸ It is recognised that such installations for residential only developments can lead to the complex issue of managing CHP electricity sales, however, developers often propose these to meet other requirements, for example compliance with conditions relating to the Code for Sustainable Homes.

Table 6: Size distribution of CHP installations secured through planning in 2014

	Total electrical capacity (MW_e)¹⁹	Average size of installation (MW_e)
Less than 100kW _e	1.796	0.04
100kW _e to 999kW _e	9.49	0.28
1MW _e and above	9.03	1.81
Total	20.31	-

¹⁸ Greater London Authority, *Energy Planning: Greater London Authority guidance on preparing energy assessments* (April 2015)

¹⁹ 12 developments incorporating CHP did not provide an estimate of the electrical capacity. These developments are estimated to incorporate an additional 1.5MW of electrical capacity. One further scheme was an S73 application, hence capacity not included.

Step 3: Renewable energy in new developments

Policy 5.7 of the London Plan requires that, after considering the first two elements of the energy hierarchy, major development proposals should provide CO₂ emissions reductions through the use of on-site renewable energy generation, where feasible. Overall it was revealed that 78% of developments incorporated renewable energy. This indicates a strong role for renewables in enabling developments to achieve the higher London Plan target, which is supported by the data in Table 7.

Table 7: Proportion of developments incorporating renewable energy

	Number of developments for which data was available	Number of developments incorporating renewable energy
25% beyond 2010	44	37 (84%)
40% beyond 2010	89	72 (81%)
35% beyond 2013	7	5 (71%)

Table 8 (below) gives an overview of renewable technologies proposed by applicants over the past four years. PV remains the most popular renewable energy technology in 2014, however, the number of schemes proposing PV is smaller than for 2012 or 2013, so that its popularity may have peaked, following the earlier years (2010 – 2012) of rapid growth. Despite this, the total area (Table 2) of PV envisaged for these developments actually exceeds that for 2013.

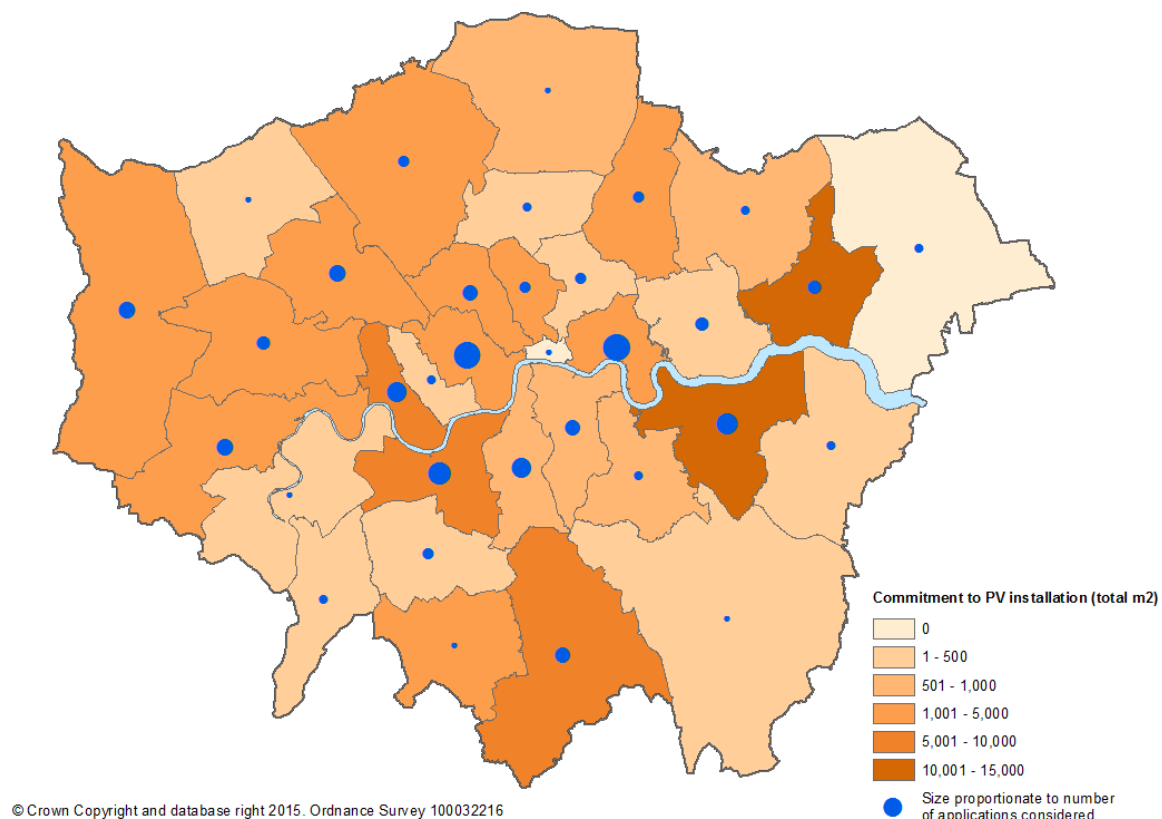
Table 8: Number of installations of different types of renewable energy systems

	2011	2012	2013	2014
PV	60	107	123	98
Biomass boilers	14	7	8	2
Heat pumps	19	21	27	43
Solar thermal	10	6	12	9

Figure 4 shows by borough the total area of PV commitments in the 2014 approved developments. Although in many cases the sum of PV installations per borough is broadly in line with the number of applications per borough, the map indicates a general higher quantum of PV per application in certain boroughs, notably LBs Barking and Dagenham and Croydon and RB Greenwich. This is likely to be due to the potential to incorporate significant PV installations on lower-rise development more typical in outer London boroughs; building types such as warehouses present a particularly good opportunity

for integrating large areas of PV. For example, just two developments in LB Barking and Dagenham proposed between them installation of more than 10,000m² of PV. By contrast there are more likely to be challenges on PV in high density development in inner London boroughs, where available roof space is typically smaller and overshadowing may be more of an issue.

Figure 4: Commitments to PV by borough



The most noticeable growth among the renewable energy technologies is that of heat pumps. The number of schemes featuring heat pumps has grown for each of the last three years, and the trend appears to be accelerating. For 2014, approximately 80 percent of the 43 applications specifying use of heat pumps proposed air source heat pumps; ground source heat pumps account for the remainder with the exception of two schemes which proposed both. Approximately 60 percent of the schemes proposing a heat pump solution also feature a heat network, and a similar proportion propose to include CHP as well as heat pump(s).

Biomass applications continue to fall, and are discouraged in many parts of London due to the air quality implications. The number of schemes featuring solar thermal remains steady though low, which is likely to be partly due to the popularity and optimisation of CHP systems in the energy hierarchy.

REDUCTIONS IN REGULATED CO₂ EMISSIONS ACHIEVED IN 2014

Energy targets applied to developments in 2014

Of the developments approved at stage 2 in 2014, CO₂ reduction information was only provided for 142 developments, two of which were pure refurbishment projects. The CO₂ reductions from these refurbishment projects have been considered separately later in this section. Those schemes that were approved but which did not provide CO₂ data were typically very small developments, temporary structures or bridges with low energy demand.

Depending on when the applications considered in this report were submitted, one of three targets applied (as in Table 4). The majority of applications were assessed against the target of 40 percent beyond Part L 2010 of the Building Regulations. This applied to all applications received by the Mayor at Stage I on or after 1 October 2013, and before 6 April 2014. A few applications were also considered against the new requirement of a 35 percent improvement beyond Part L 2013 of the Building Regulations.

Overall regulated CO₂ reductions

Tables 9, 10, 11, and 12 (below) show the emissions after each stage of the energy hierarchy for new developments that were referred to the GLA and obtaining planning approval in 2014. The tables differentiate between the targets and Building Regulations in place at the time.

Table 9: On-site CO₂ emission reductions from applications assessed against Part L 2010 Building Regulations where the **25%** target applied

	Regulated CO ₂ emissions	Cumulative regulated ²⁰ CO ₂ emissions reductions relative to Part L 2010 Building Regulations	
	(tCO ₂ /year)	(tCO ₂ /year)	(percent)
Baseline	37,790	-	-
After energy efficiency	32,635	5,154	13.6
After energy efficiency & heat networks / CHP	25,234	12,556	33.2
After energy efficiency, heat networks / CHP & renewables	23,083	14,707	38.9

²⁰ Excluding unregulated energy

Table 10: On-site CO₂ emission reductions from applications assessed against Part L 2010 Building Regulations where the **40%** target applied

	Regulated CO ₂ emissions	Cumulative regulated ²¹ CO ₂ emissions reductions relative to Part L 2010 Building Regulations	
	(tCO ₂ /year)	(tCO ₂ /year)	(percent)
Baseline	95,549	-	-
After energy efficiency	81,695	13,881	14.5
After energy efficiency & heat networks / CHP	62,123	33,413	35.0
After energy efficiency, heat networks / CHP & renewables	57,905	37,629	39.4

Table 11: On-site CO₂ emission reductions from applications assessed against Part L 2013 Building Regulations where a **35%** target applied

	Regulated CO ₂ emissions	Cumulative regulated CO ₂ emissions reductions relative to Part L 2013 Building Regulations	
	(tCO ₂ /year)	(tCO ₂ /year)	(percent)
Baseline	2,926	-	-
After energy efficiency	2,760	166	5.7
After energy efficiency & heat networks / CHP	2,100	826	28.2
After energy efficiency, heat networks / CHP & renewables	1,839	1087	37.2

The figures show significant progression since 2013, with average CO₂ emission reductions of more than 39 percent beyond Part L 2010 of the Building Regulations, compared with an average of 36 percent in both 2012 and 2013. There were only a small number of applications assessed against the recalibrated target of 35 percent beyond Part L 2013, but overall these exceeded this challenging target and achieved a 37 percent reduction in regulated CO₂ emissions beyond Part L 2013 of the Building Regulations.

²¹ Excluding unregulated energy

Table 12 summarises the total CO₂ emission reductions in tonnes per annum for all applications in 2014, beyond the relevant Building Regulations requirements.

Table 12: Total CO₂ emission reductions for each step from all applications assessed against the appropriate Part L (2010 or 2013) Building Regulations

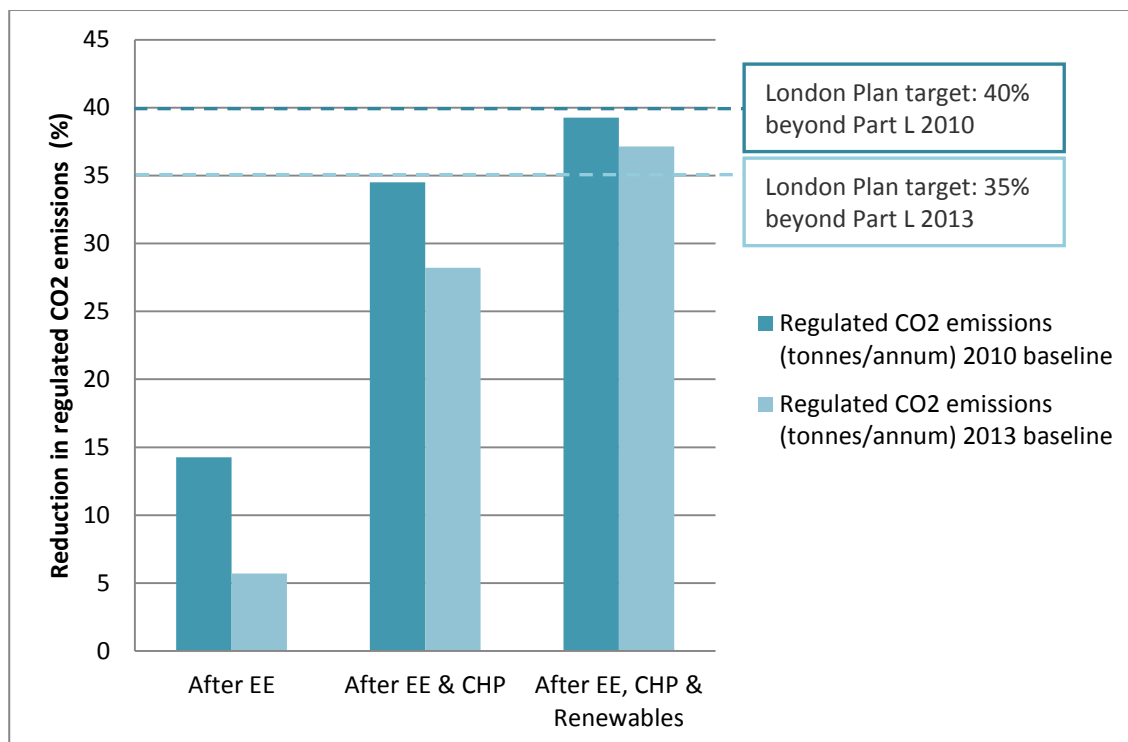
	Regulated CO₂ emissions reductions
	(tCO₂/year)
Energy efficiency	19,200
Heat networks / CHP	27,594
Renewables	6,629
TOTAL	53,423

The application of the London Plan energy policies in these new developments resulted in cumulative regulated CO₂ emission reductions of 53,423 tonnes per annum. This is broadly equivalent to the savings achieved from retrofitting loft insulation in over 89,000 existing houses.²²

As in previous years, the largest contribution was due to connection to heat networks and on-site CHP, which amounted to 27,594 tonnes of CO₂ per annum – over half of the overall reduction. The first element of the energy hierarchy, energy efficiency, achieved an average reduction of 14 percent. Renewable energy, the final element of the hierarchy, was responsible for the smallest reduction of the three elements – this is likely to be due to the challenge associated with installing on-site renewable energy in a high density, urban environment and the appropriateness of renewable technology use in tandem with CHP. Figure 5 illustrates the cumulative percentage savings at each stage of the hierarchy for applications assessed against both Part L 2010 and Part L 2013.

²² Assumes average saving per dwelling of 0.6 tonnes of CO₂ per annum for virgin loft insulation, based on EST calculations

Figure 5: Cumulative reductions secured in CO₂ emissions at each stage of the London Plan hierarchy for developments assessed against Part L 2010 and Part L 2013



Proportion of developments meeting the target through on-site measures

In 2014, 93 percent of the developments subject to the 25 percent target met or exceeded the target through on-site measures alone – an increase on 2013. The three developments which did not fully achieve the target on-site were very small, with low emissions and limited scope for CO₂ emission reductions.

The introduction of the more challenging 40 percent target was accompanied by an overall rise in the total CO₂ emission reductions compared with 2013. In total, 52 of the 89 of the developments subject to the revised 40 percent reduction target met or achieved this on site. This lower proportion likely reflects a transition period as the developments initially planned to meet the 25 percent target were delayed and ended up being referred after the changeover date for the new, more stringent target.

In addition, many developments which did not meet the target fully on-site were those when CHP were deemed inappropriate (e.g. due to the development having a small or inconsistent heat load). This emphasises the significance of the 'Be Clean' element of the hierarchy, and the importance of retaining challenging CO₂ reduction targets to support investment in decentralised energy technologies.

Notwithstanding the challenges of transitioning to a more challenging target, overall developments assessed against this 40 percent target achieved an overall 39 percent reduction beyond Part L 2010. This demonstrates the 40 percent target beyond Part L 2010 is likely to be regularly achieved once the more challenging target is applied from the earliest stages of a project.

Although the number of applications considered against the equivalent Part L 2013 target was too small to draw any strong conclusions, initial indications are positive with 5 out of the 7 applications assessed in this way meeting or exceeding the target through on-site measures.

This indicates both the stretching nature of the current target, and the need for ambitious targets to support innovation.

The cumulative shortfall in CO₂ reductions

Where developments may not be able to meet the target in Policy 5.2 solely through on-site measures, a cash-in-lieu contribution may be made by the developer to the local borough to account for the shortfall in CO₂ emission reductions. The GLA supplementary planning guidance (SPG) for Sustainable Design and Construction contains guidance to promote a consistent approach to CO₂ off-setting and collection of cash in lieu contributions across boroughs.

The total shortfall from developments not meeting the target in 2014 accrued to approximately 4772 tonnes of regulated CO₂ emissions per annum. This shortfall equates to circa £8.59 million assuming an indicative CO₂ price of £60 per tonne²³ and a 30 year lifetime. Over 99 percent of this shortfall was due to developments where the higher 40 percent and 35 percent targets applied, reflecting the flexibility of this policy approach where it may not be achievable to fully meet the required level of CO₂ reductions on-site.

Additional CO₂ reductions from refurbishment projects

An additional 3,500 tonnes CO₂ per annum savings are envisaged from two applications which dealt purely with the refurbishment of existing buildings. These include the former international broadcast centre, iCity on the Queen Elizabeth Olympic Park. This refurbishment is on a very large scale, comprising well over 100,000m² floor area. Substantial CO₂ emission reductions are proposed, notably by means of energy efficiency improvements, although the change in use is also a major factor.

²³ £60 per tonne of CO₂ was the central price assumption used in government's consultation on Allowable Solutions

INVESTMENT DUE TO LONDON PLAN ENERGY POLICIES

Finding new and innovative ways to deliver energy which is secure, sustainable and affordable is a challenging task which the London Plan energy policies are helping to achieve. For example, the London Plan policies around promotion of decentralised energy networks are driving investment in site wide heat networks which provide for ease of connections to future low-carbon decentralised energy networks, avoiding the need for costly retro-fitting in the future.

Delivering the commitments associated with implementation of London Plan energy policies in 2014 consequently involves substantial investment in infrastructure and technologies. Overall, this is expected to total more than £150 million.

Implementing these energy efficiency measures is estimated to result in annual energy cost savings for dwelling occupants of £900,000 per annum, with additional energy costs savings for non-domestic building occupants.

Assuming an installed capital cost of £700 per kilowatt of electrical capacity, the 20MW of CHP electrical capacity committed to in 2014 is estimated to require investment of circa £14million.²⁴ With the estimated reduction of 27,634 tonnes of CO₂ emissions associated with this investment, this accrues to approximately £33 per tonne of CO₂. When compared with a typical carbon offset scheme cost of £60 per tonne, this demonstrates the cost-effectiveness of CHP as a emissions reduction mechanism.

The site heat network infrastructure into which CHP will supply heat energy will also require significant investment. It is estimated that an outlay of circa £100 million²⁵ will be required to fund the heat network infrastructure for the just over 40,000 dwellings with communal heating. The non-domestic buildings will require additional further investment for the associated heat network infrastructure. A workforce will be required to operate and maintain the heat network infrastructure and associated energy generation equipment serving the new developments. It is estimated that the developer commitments obtained in 2014 will result in approximately 58 permanent jobs,²⁶ the majority of them being in energy services companies (ESCOs).

Investment in renewable energy systems was also proposed to help achieve the CO₂ reduction commitments. Using an installed capital cost estimate of £2,000 per kilowatt, providing circa 8MW of PV panel electrical capacity will require an investment of approximately £16 million. Further investment will happen in other renewable energy technologies, e.g. heat pumps, solar thermal panels and biomass boilers.

²⁴ i.e. $700 \times 20 \times 1000 = 14,000,000$

²⁵ Assumes a heat distribution cost of £2,500 per flat for district heating, taken from Table 51 of Code for Sustainable Homes: A cost review (CLG March 2010)

²⁶ Assumes 0.5 jobs per mixed use/residential development for maintaining a site network and 117 networks

CONCLUSION

The continued implementation of the London Plan energy policies in 2014 has resulted in the following commitments being secured:

- Regulated CO₂ emission reductions of 39 percent against a baseline in which developments complied with the Part L of the Building Regulations in place at the time of application.
 - Cumulative regulated CO₂ emission reductions of 53,423 tonnes CO₂ per annum against the relevant Part L baseline.
 - Significant investment at each stage of the energy hierarchy including:
 - Investment in energy demand reduction measures to reduce residential energy bills by circa £900,000 per annum
 - £114 million in heat network infrastructure and associated CHP capacity
 - £16 million in PV panels and additional investment in other renewable energy technologies.
 - Approximately 58 permanent jobs in operating and maintaining heat network infrastructure and associated energy supply plant.
-

APPENDIX 1

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London's Zero Carbon Energy Resource – secondary heat, Mayor of London, July 2013

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²⁷ Available at: www.londonheatmap.org.uk

APPENDIX 2

Glossary

Building Emissions Rate (BER) or Dwelling Emission Rate (DER) is the actual building/dwelling CO₂ 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.

Communal heating is 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.

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 CO₂ emissions – The CO₂ 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.

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) is a methodology for assessing and comparing the energy and environmental performance of dwellings. Its purpose is to provide accurate and reliable assessments of a dwelling's energy performance that are needed to underpin building regulations and other policy initiatives.

Target CO₂ Emission Rate (TER) is the minimum energy performance requirement for a new dwelling/building. It is expressed in terms of the mass of CO₂ emitted per year per square metre of the total useful floor area of the building (kg/m²/year).

APPENDIX 3

Case Study 1: FORMER KELVIN HUGHES SITE, REDBRIDGE

The 'former Kelvin Hughes' site is a 2.25 hectare site for redevelopment on the former manufacturing site of a marine equipment specialist. Specifically, the proposal is to demolish existing buildings at the site, and redevelop it to provide 183 residential units together with 1017m² of commercial floorspace.

Figure 6: Aerial view of proposed development showing green roofs



The site lies in the London Borough of Redbridge close to the edge of Epping Forest where there is local environmental sensitivity; however the site does not lie in a 'Heat Mapping Decentralised Energy Potential' zone, and with the exception of the apartment blocks, the site is in any case generally of a relatively low heat density. Consequently, the development's energy compliance is based on a combination of energy efficiency and renewables, and it is a good example of achieving the target in an area which is unlikely to develop or be close to a heat network.

Redbridge's sustainability requirements stipulate that the dwellings should achieve Code for Sustainable Homes Level 4, and requires the commercial building to achieve BREEAM Excellent standard. A combination of energy efficiency measures together with the installation of renewable technologies (primarily solar PV panels) are proposed to enable the development to reach the target for carbon emissions reduction of 40 percent beyond Part L 2010 of the Building Regulations.

Energy efficiency measures account for a combined saving of 18 percent of CO₂ emissions. The measures include a range of passive approaches to demand reduction, both for heating and for cooling.

To minimise heating demand, levels of insulation and air tightness are being specified, beyond those required by the Building Regulations. Attention has also been paid to minimising losses through cold bridging.

In order to regulate solar gains while exploiting the benefit of daylight, windows feature solar controls to limit summertime gains while maximising the potential for natural daylight.

Sympathetic design of the office building, with narrow open plan layout as well as openable windows and controllable louvres helps to stimulate cross ventilation, while dwellings have been designed to benefit from both passive stack and cross ventilation. Consequently, only for the apartment blocks and some of the houses is mechanical ventilation envisaged, and this will integrate heat recovery (MVHR).

A further innovative element of the design is the presence of green roofs (figure 5); these help to regulate both heating and cooling requirements, while also improving biodiversity and contributing to Sustainable Urban Drainage.

Both the dwellings and the commercial unit will be heated by means of high efficiency boilers with corresponding efficient controls. This will include weather compensation and zoning across the development; additionally, boilers in the dwellings will be equipped with flue heat recovery. Other features of this development are the likely to be the use of variable speed pumps and fans, high efficiency lighting, and the provision of smart meters to enable future demand side opportunities. Lighting in the commercial unit will be equipped with addressable daylight dimming.

Within the energy hierarchy a further 27 percent of CO₂ emissions will be saved by the installation of renewables, principally by means of a substantial amount of PV. This amounts to a total panel area of 866m² for the residential part of the development with a further 75m² installed on the commercial unit.

Both the overall site layout and the position of the roofs have been designed to optimise the yield from the PV panels, with south facing panels set at an angle of 30° from horizontal, and with panel sizing increased where this was not possible.

For visual reasons the PV panels are mainly located away from frontages; for only 6 of the houses did this prove impractical. The consequent site wide shortfall was offset with larger areas of PV on other buildings within the development. Additionally, in order for these dwellings to attain Code Level 4, enhanced levels of fabric and/or building services performance are envisaged, potentially also involving air source heat pumps.

Case Study 2: TIDAL BASIN, NEWHAM

The development at 28-34 Tidal Basin Road is situated in a strategically significant area (figure 7) in Silvertown, adjacent to the Royal Victoria Docks and within reach of the ExCeL exhibition and conference centre where there is already a CHP-led energy centre and a vision to extend heat provision to the surrounding area.

The site specifically comprises 0.47 hectares on Tidal Basin Road, which forms an access road to the ExCeL centre in the London Borough of Newham. It is currently a redundant island site containing a range of low rise buildings and a derelict pub next to the Silvertown Way flyover (A1020).

Figure 7: Aerial view of proposed development needs location specified



The proposal is for the comprehensive redevelopment of the site to provide a residential mixed use scheme comprising two towers of 23 and 25-stories (figure 8).

The site had already been granted planning permission in 2012 but this included a hotel subsequently thought to be not viable. While not changing markedly in appearance, the proposed development is now residential-led with 360 units (14.4 percent Newham's annual housing target of 2,500 homes), and 455m² of commercial floorspace at the ground floor level within the eastern tower building.

The site lies in the Lower Lea Valley Opportunity Area, the Planning Framework for which steers development towards a mix of uses including highlighting the potential for housing at high density. It is also designated within Newham Council's Core Strategy (2012) as being appropriate for such development as it is a 'gateway site' to the Royal Docks. As such, the scheme chimes with local and strategic policy.

Figure 8: Development at 28 - 34 Tidal Basin Road



The residential element complies with Code for Sustainable Homes Level 4 and the commercial floorspace will achieve BREEAM 'Excellent' leading to an aggregate reduction of 218 tonnes of CO₂ emissions per year in regulated emissions compared to a 2010 Building Regulations compliant development, equivalent to an overall saving of 57 percent. The CO₂ savings therefore exceed the target for this development of 40 percent above 2010 Building Regulations.

The development's energy compliance is achieved through a mix of energy efficiency measures, receiving heat from CHP through connection to the ExCeL district heating network, and a renewable contribution from PV.

A range of passive design features and demand reduction measures are included, with both air permeability and heat loss improved beyond the building regulation requirements. Energy efficient lighting and heat recovery systems also feature, while the demand for cooling is minimised through

design features such as overhangs and balconies. These measures combine to achieve a reduction of 14 tonnes per annum (4 percent) in regulated CO₂ emissions compared to a 2010 Building Regulations compliant development.

The Tidal Basin development lies within 400m of the ExCeL centre. The energy centre for ExCeL has current capacity for 18MW of heating with plans in place to serve the wider area. Gas fired CHP is the lead heat source and provides the majority of its heat supply; by connecting to this network the Tidal Basin development achieves a reduction in regulated CO₂ emissions of 200 tonnes per annum (54 percent). Operated by Cofely District Energy, the longer term plan for the ExCeL network is to join up with the existing network at the Queen Elizabeth Olympic Park and Stratford.

The Tidal Basin development also features a 9kWp roof mounted PV array; this renewable element will lead to a further reduction in regulated CO₂ emissions of 4 tonnes per annum (2 percent) for the third element of the energy hierarchy.

Case Study 3: HURLINGHAM RETAIL PARK, HAMMERSMITH AND FULHAM

The proposed development (figure 9) at the Hurlingham Retail Park in the London Borough of Hammersmith and Fulham (LBHF) is 1.18 hectares in size and is currently occupied by a 4800m² retail unit and two small residential blocks. It falls within the South Fulham Riverside Regeneration Area where the London Plan and LBHF local policies promote major new developments and is located within a semi industrial and underutilised strip of land on the River Thames in an area which is a mix of residential and retail.

Specifically, the site is bordered by Wandsworth Bridge Road to the east, an industrial estate to the west and Carnworth Road to the north, with the river lying to the south. The surrounding area is a mix of residential and retail.

Figure 9: Bay study view of east elevation



The plan is for demolition of the existing buildings and replacement with new residential led mixed use development with 242 dwellings and a reduced retail area of 3045m². The new dwellings will achieve Code for Sustainable Homes level 4 and the retail space will achieve BREEAM Very Good.

Overall savings accrue to 42 percent beyond 2010 Part L Building Regs.

Energy efficiency measures combine to achieve 19 percent savings in CO₂ emissions. Measures include the use of high standards of insulation and air tightness, together with ventilation heat recovery and overall zoning with occupant control for provision of heat and light. A shading and glazing strategy will be used to minimise solar gains, which together with low energy lighting will mitigate overheating. The development also features grey water heat recovery, and integration of 11,354m² of green or brown roofs.

The location of the proposed Hammersmith and Fulham district heating network is more than a mile away so that no early connection is envisaged. However, the development will be designed to be ready for connection in the event of further network development in the vicinity.

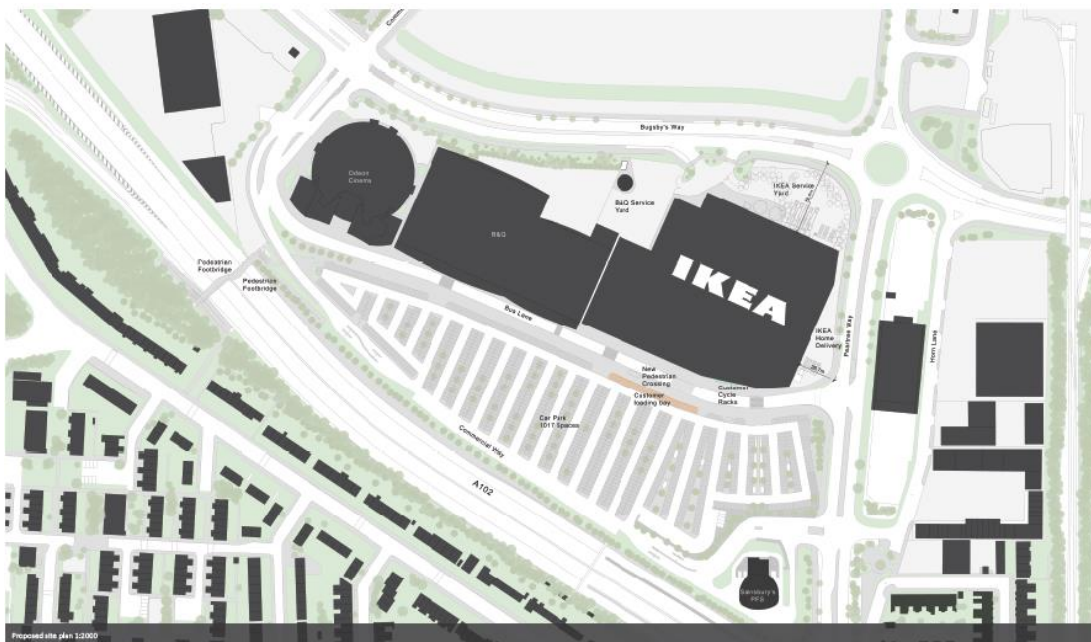
The development will have its own site wide heat network with a CHP that will deliver a further 27 percent savings in carbon emissions.

The development will also include 70m² of PV securing a further 1 percent saving in CO₂ emissions.

Case Study 4: NEW IKEA STORE, BUGSBY WAY, GREENWICH

The Greenwich Millennium Retail park already has a reputation for ground breaking energy solutions, with the existing Sainsbury's store in Bugsby Way an exemplar, visibly so with its inclusion of twin wind generators at the front of the store. Although this store and the adjacent former Comet store are being demolished, with Sainsbury relocating a short distance away, the replacement retail development for an IKEA store (figure 10) can be similarly proclaimed a pacesetter for future retail developments to follow.

Figure 10: Plan of proposed change to development



The new store will take its place alongside the existing B&Q store, the floorspace increasing by nearly fourfold compared with the buildings that will be demolished. The new store will be constructed using high energy efficiency specifications and with the correspondingly larger roofspace area, it will be able to accommodate an extensive array of PV cells.

The new store needs to comply with an overall target for CO₂ emissions reduction of 40 percent above that set by Part L 2010 of the Building Regulations. This has been achieved by means of a combination of energy efficiency measures and renewables, and is a good example of how non-domestic developments are able to meet the requirements of the London Plan.

The building design incorporates both passive design features and demand reduction measures. The latter includes high specification construction and materials to achieve high insulation levels for walls and windows, and air-tight construction with low air permeability, each well in advance of those currently set by the Building Regulations. It also integrates green roofs. Direct solar gains are attenuated by means of shading to the south and east, and the installation of LED lighting reduces internal gains.

Together these measures lead to a 21 percent reduction in CO₂ emissions. The strategy for proceeding from this saving to reach the target of an overall 40 percent reduction in CO₂ emissions has been to

integrate in the roof an area of 2662m² of PV. With its peak output extending to 395kWp this leads to a follow-on 25 percent reduction in CO₂ emissions.

The Greenwich Peninsula, in which this development is situated, has in place a district heating network which was, at the time of submission, operated by EON. This network does not currently extend close enough for it to be practical for the new store to connect, however, discussions have taken place with EON to clarify the potential future possibility for scheme expansion and consequent connection. As a result of this data was sent to EON and their interest in future connection has proved sufficient to drive the store design to cater for easy future connection, with its energy centre situated at the periphery of the store.

APPENDIX 4

Cost to the GLA

A team evaluate the energy assessments produced by developers to ensure they meet the energy policies in the London Plan and this process results in the CO₂ saving commitments described in this 2014 monitoring report. Where the proposed energy assessments do not meet the policies, changes to the proposals are requested to bring them into compliance. The role is primarily that of a gate keeper ensuring that only those proposals meeting the policy requirements obtain approval through the planning system.

The team is led by a GLA energy officer with support provided by external specialist consultants. The team regularly interacts with the planning case officers assigned to individual applications. The combined costs of the core team in 2014 were approximately £100,000.

Cumulative CO₂ savings of 1,602,690 tonnes will be achieved as a result of the implementation of the London Plan energy policies in 2014. This assumes the annual CO₂ savings secured through planning continue for a period of 30 years reflecting the lifetime of the building services.

This represents a cost per tonne of CO₂ saved of £0.06 when considering purely the officer and consultancy costs to the GLA. The cost per tonne of CO₂ saved will be higher in practice 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. However, even if the majority of the developments did not proceed, the cost to the GLA is still less than £0.25 per tonne of CO₂ saved.

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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 নিচের ফোন 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 اس دستاویز کی نقل اپنی زبان میں
چاہتے ہیں، 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.