



# Towards a net zero carbon London: Energy Monitoring Report 2023

OCTOBER 2024

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# This report

This report summarises the expected energy performance of all referable developments<sup>1</sup> that gained **planning approval** from the Mayor in the **calendar year 2023**, against the London Plan energy policies.

In 2023, 93 referable planning applications were granted provisional approval by their local planning authority and were subsequently approved by the Mayor. Of these applications, **all of these applications had an energy element** to the proposal that could be assessed against London Plan Policy SI 2. This is an overall decrease compared to 2022, when there were 134 applications with an energy element.

**Table 1 presents the type and quantity of developments which gained approval**, including the number of dwellings and non-residential floor area.

## Developments approved by the Mayor in 2023

| Type                     | Number    | Dwellings     | Non-residential floor area (thousand m <sup>2</sup> ) | Estimated residential floor area (thousand m <sup>2</sup> ) |
|--------------------------|-----------|---------------|-------------------------------------------------------|-------------------------------------------------------------|
| Mixed-use                | 51        | 28,356        | 553                                                   | 1,985*                                                      |
| Residential              | 8         | 2,296         | N/A                                                   | 161*                                                        |
| Non-residential          | 34        | N/A           | 624                                                   | N/A                                                         |
| <b>Total<sup>2</sup></b> | <b>93</b> | <b>30,652</b> | <b>1,177</b>                                          | <b>2,146*</b>                                               |

\*Floor areas are not collected for residential developments, so an area of **70 m<sup>2</sup> per dwelling** has been assumed to provide the estimated values for scale and comparison.

**Table 1:** Total number and type of referable developments approved by the Mayor in 2023

<sup>1</sup> A planning application is referable to the Mayor if it meets the criteria set out in the Mayor of London Order (2008). The criteria include: Residential development of 150 units or more; Non-residential development of more than 100,000 m<sup>2</sup> (in the City of London), more than 20,000 m<sup>2</sup> (in Central London excluding City of London), more than 15,000 m<sup>2</sup> (outside Central London); any development over 30 metres in height (outside the City of London) or on Green Belt or on Metropolitan Open Land. See the Order for the full criteria.

<sup>2</sup> In 2023, the total floor area for referable development decreased for both non-residential (2,414 thousand m<sup>2</sup> in 2022) and residential (3,350 thousand m<sup>2</sup> in 2022).





# Key findings

# London still leading the way

London is committed to achieving net zero carbon emissions by 2030. Through the London Plan, the Mayor is ensuring that new buildings are playing their part in reaching this target, exceeding national buildings standards and showing what can be achieved through higher levels of ambition and innovation.



**57 per cent CO<sub>2</sub> savings** compared to meeting minimum standards of national Building Regulations (Part L 2013 and Part L 2021)



**32,107 total tCO<sub>2</sub> saved**, equivalent to **27,000 return flight seats from London to New York\***

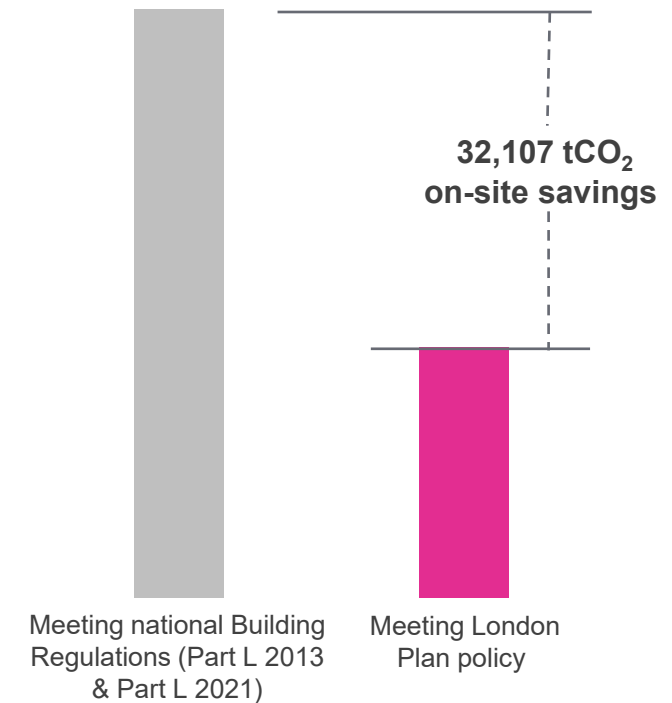


**Energy efficiency measures saved 8,552 tCO<sub>2</sub>**, equivalent to adding loft insulation to over 13,000 homes\*\*



**Solar PV proposed could cover 14 Wembley football pitches\*\*\***

## On-site CO<sub>2</sub> emissions savings achieved through the London Plan



**London Plan policy is pushing London forward in pursuit of its net zero carbon 2030 target**

\*[TravelNav.com](https://www.travelnav.com)

\*\*[Energy Saving Trust](https://www.energysavingtrust.org.uk)

\*\*\*[Football Pitch Dimensions](#), based on a typical array being applied across an equivalent roof area.

# 2023 key findings

## London continues to exceed national standards

The 93 developments approved in 2023 achieved **an overall on-site carbon reduction of over 57.4 per cent** beyond Building Regulations, up from 52.9 per cent in 2022. This shows London's construction sector continues exceed the Mayor's 35 per cent improvement target beyond Building Regulations, delivering carbon savings far above national standards.

**Residential:** Developments achieved an average of **63.4 per cent CO<sub>2</sub> reduction on Building Regulations**, up from **57.0 per cent** in 2022, driven mostly by an increase in 'be green' savings.

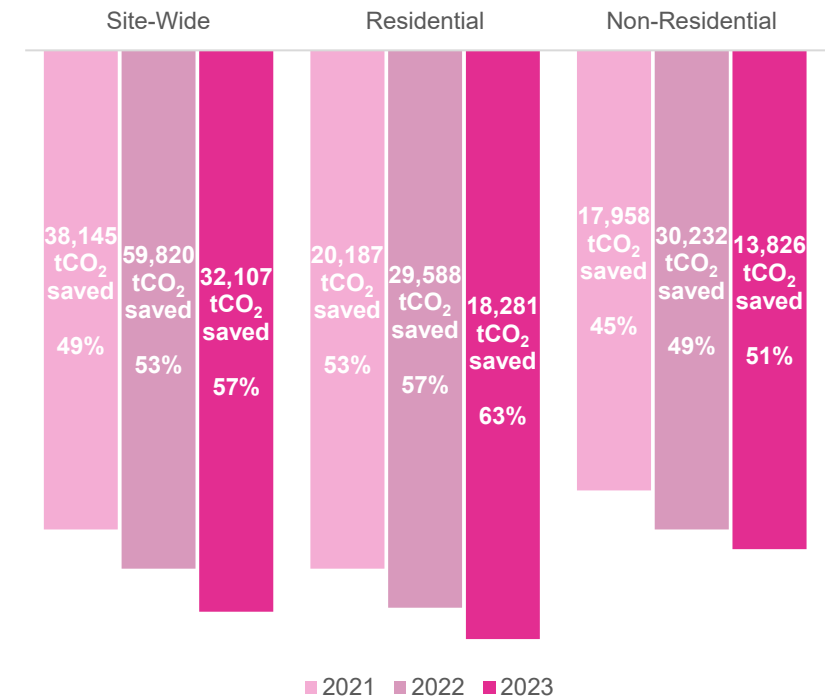
**Non-residential:** Developments reached an **average carbon saving of 51.0 per cent**, up from 48.9 per cent in 2022.

**On-site net zero carbon:** **Five developments achieved net zero carbon through on-site measures alone.** The majority were non-residential industrial sites that maximised renewable energy due to large available roof space and low heat demand.

**Energy efficiency** measures resulted in a **15.3 per cent carbon saving**. This is down from 17.7 per cent last year, due largely to improvements to the notional building under Part L 2021.

**Residential developments** achieved an average per development saving of **15.1 per cent** and **non-residential developments** achieved an average of **16.0 per cent**, exceeding their London Plan targets of 10 and 15 per cent respectively.

## CO<sub>2</sub> reduction over Building Regulations baseline



**Energy efficiency measures help to keep London's homes warmer in winter, cooler in summer, and residents' bills down. This is why local authorities must retain powers to set standards above national regulations.**



## 2023 key findings (2)

### London is at the forefront of low carbon heat and renewables

**Supporting heat networks and reducing gas-based heating solutions:** Over 28,000 dwellings (91 per cent of all new dwellings) are expected to connect to either communal heat networks or area-wide district heat networks (DHN). Of these, over 6,372 dwellings are expected to connect to existing DHNs. A further 20,423 dwellings connecting to communal networks will allow future connection to local DHNs once available. This supports London's progress towards the estimated 460,000 new heat network connections needed for the Mayor's 'Accelerated Green' Pathway to net zero by 2030. London Plan policy prioritises DHNs connection to promote an affordable, flexible low carbon energy system that's needed to reach net zero.

**Driving more heat pump installations:** 83.9 per cent of developments in 2023 proposed the installation of heat pumps, a total of 78 developments. In total, over 20,234 dwellings were proposing to connect to a heat pump-led heating system, and up to 1,035,994 m<sup>2</sup> of the non-residential floor area was proposed to be served by a heat pump-led heating system. 87 per cent of these proposed installations are large centralised heat pumps supplying communal and site-wide heat networks.

**New solar PV capacity:** The average installation size grew compared to 2022 (22 m<sup>2</sup> PV/1000 m<sup>2</sup> floor area in 2023 versus 20.7 m<sup>2</sup> PV/1000 m<sup>2</sup> in 2022). 92 per cent of developments included solar PV, down from 96 per cent in 2022, likely due to the types of developments proposed in 2023. This is equivalent to an installation of 13.8 MWp, down from 20.2 MWp in 2022, and an area of around 70,008 m<sup>2</sup> of solar PV (equivalent 2022 figure was around 116,399 m<sup>2</sup>) leading to approximately £21 million in new investment.

28,000 dwellings to connect to communal heat networks or DHNs

£60m investment in heat network infrastructure

78 developments with heat pumps

13.8 MWp of solar PV proposed

# 2023 key findings (3)

## Managing London's heat risk and cooling demand

**Overheating:** 71 out of 93 developments (76 per cent) submitted a dynamic overheating assessment, up from 101 out of 134 (75 per cent) in 2022 maintaining an ongoing increase. This assessment helps in designing better adapted buildings.

**Cooling:** The cooling hierarchy encourages the use of passive and low-energy strategies to minimise the risk of internal overheating and reduce dependence on active cooling systems, such as air conditioning. Active cooling should only be proposed when deemed necessary and/or where there are site constraints (e.g. air quality and noise). **Total cooling consumption (7.1 GWh/yr) is around one fifth of that in 2022. 70 developments (75 per cent) included some element of active cooling, similar to 2022. No active cooling was proposed in 88 per cent of all residential development.**

## Offsetting and Whole Life-Cycle Carbon

**Carbon offset payments:** An estimated £71.9 million was potentially available for collection by LPAs from referable development proposals in 2023, down from £162.2 million in 2022. Further details on the sums being collected and how they are being spent can be found in the annual [Carbon Offset Funds Monitoring Report](#).

**Whole Life-Cycle Carbon (WLC):** London is the first UK city to require WLC assessments (WLCA) for all referable developments. In 2023, **72 applications conducted WLCA**. In general, the **development performance improved compared to the benchmarks**; performance against aspirational benchmarks also improved but are still proving more challenging to meet.

**Increase in dynamic  
overheating assessments  
secured**

**88 per cent of residential  
development avoids use of  
active cooling**

**Greater on-site savings  
has reduced reliance on  
offsetting in 2023**

**72 developments reported  
WLC emissions**





# Overview

# The role of the planning system in the climate emergency

## The London Plan

The **London Plan 2021** is the Spatial Development Strategy for Greater London. It **sets out a framework for how London will develop over the next 20-25 years** and the Mayor's vision for Good Growth.

The Plan is part of the **statutory development plan for London**, meaning that the policies in the Plan should **inform decisions on planning** applications across the capital.

The London Plan is **legally part of each of London's Local Planning Authorities' Development Plans** and must be taken into account when planning decisions are taken in any part of Greater London. **All Development Plan Documents** and Neighbourhood Plans have to be 'in **general conformity**' with the London Plan.



## Planning and Net Zero Carbon

The Mayor has declared a climate emergency and is aiming for London to be net zero carbon by 2030. The **planning system plays an important role** in our response to the climate and ecological emergencies by reducing carbon emissions, **integrating adaptation measures** and resilience to the impacts of climate change; **improving air quality** and ensuring all new developments aspire to the **highest sustainability standards**. Without this action, we will only add to the number of buildings that need to be retrofitted and at a greater cost and disruption.

The London Plan's net zero carbon target applies to **all major planning applications** and year on year is incentivising on-site carbon reductions **far beyond national building regulations**. This progress is reported on an annual basis through our publicly available energy monitoring reports.

**The London Plan ensures new development is responding to the climate emergency by minimising emissions and implementing adaptation measures, ensuring resilience to climate change and reaching net zero by 2030**

# Meeting the net zero carbon target

The London Plan requires all major developments\* to achieve net zero carbon. There is a **minimum requirement for a 35 per cent on-site carbon improvement** on national Building Regulations.

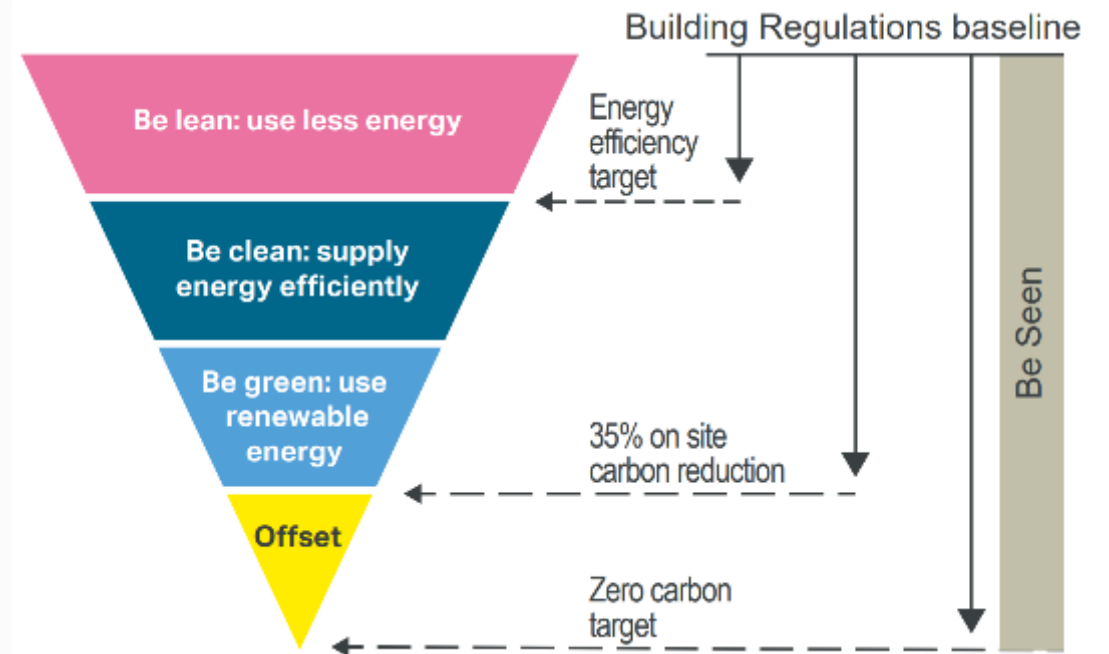
Beyond this, and once on-site carbon reductions have been maximised, the shortfall to zero carbon is offset by making a cash-in-lieu contribution into the relevant Local Planning Authorities (LPA) carbon offset fund.

To meet the target, planning applicants are expected to follow the energy hierarchy:

- **'Be Lean'** – use less energy
- **'Be Clean'** – supply energy efficiently and cleanly
- **'Be Green'** – maximise renewable energy
- **'Be Seen'** – monitor, verify and report energy performance

**Planning applicants are expected to maximise savings on-site before paying to offset their residual carbon emissions**

## The Energy Hierarchy



\*Those with 10 or more units and those with >1,000 m<sup>2</sup> of floorspace, not just those referred to the Mayor

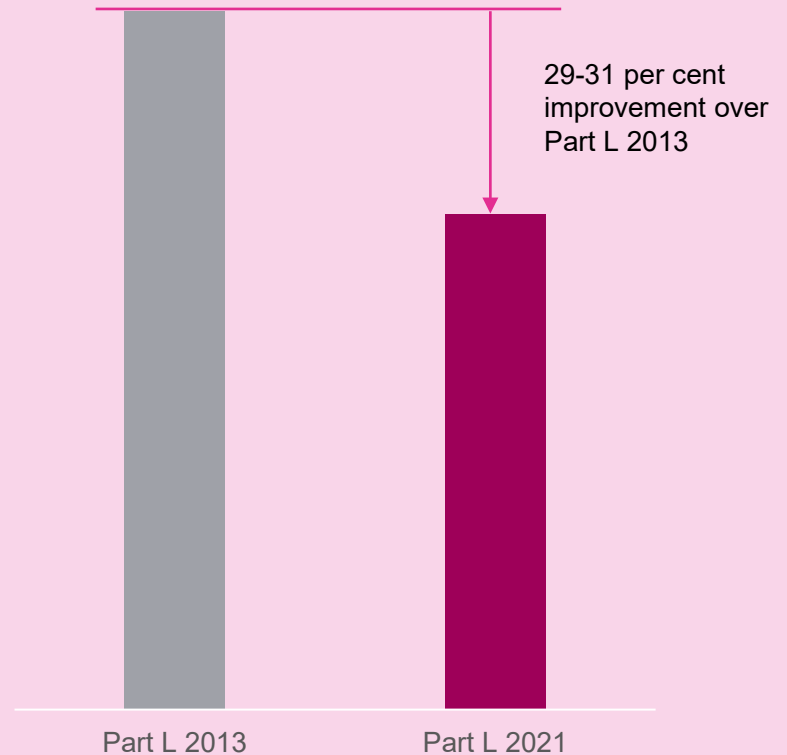
# London's approach to Part L 2021

Applications approved in 2023 included a mixture of developments assessed under **Part L 2013** and **Part L 2021**, depending on whether applications were submitted before or after the 2022 guidance update. This monitoring reporting presents combined Part L 2013 and Part L 2021 results to represent performance across Greater London.

Government consultations on Part L 2021 reported that the **introduction of the new standard will see improvements on the Part L 2013 standard of 31 per cent and 29 per cent for non-residential and residential development respectively.**

On **15 June 2022**, national building regulations were updated to enhance energy performance standards for new buildings through **Part L 2021**. The GLA [Energy Assessment Guidance 2022](#) was subsequently updated to explain how London Plan policy should be applied in this context. **Major developments** should now achieve a **minimum 35 per cent on-site carbon reduction over Part L 2021**. Due to the higher performance standard introduced for Part L 2021, it has been more challenging for some types of development to achieve the same **percentage improvement over national building regulations** as has been reported with respect to Part L 2013 in previous years.

GLA's policies continue to push beyond national Building Regulations and demonstrate that these ambitious targets can be met by applicants.



**Figure 1:** Relative comparison of baseline CO<sub>2</sub> emissions performance set by the Part L 2013 and Part L 2021 standard



# London's approach to carbon emission factors

Applications approved in 2023 included a mixture of developments assessed under Part L 2013 and Part L 2021.

Those assessed under Part L 2013 used the 2020 Energy Assessment Guidance, which encouraged applicants submitting referable planning applications to use the **SAP 10.0** carbon emission factors. This approach more accurately reflected the decarbonisation of the electricity grid, which encouraged electrically-based low carbon heating, such as **heat pumps**. Under this guidance, some referable developments with potential to connect to a **district heat network were able to use SAP 2012 emission factors**, provided the heat network operator had submitted an acceptable decarbonisation strategy to the Mayor. **This approach enabled London Plan policy** to encourage, where appropriate, the **expansion and decarbonisation of district heat networks**.

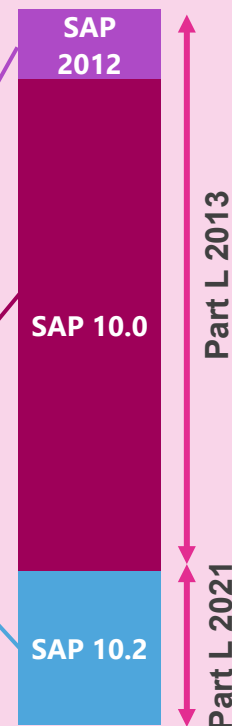
With the adoption of Part L 2021 (and SAP 10.2) all new planning applications are now required to follow the Energy Assessment Guidance 2022 – see 'London's approach to Part L 2021' section for more details.

## What does this mean for the developments approved in 2023?

**73 developments approved in 2023 reported against Part L 2013. 9 of these developments were approved using the SAP 2012 emission factors with the majority of these proposing connection to an existing heat networks.**

**The remaining 64 developments approved in 2023 reporting against Part L 2013 used the SAP 10.0 carbon emission factors, in line with Energy Monitoring Guidance 2021.**

**The remaining 20 developments approved in 2023 reported against Part L 2021 using SAP 10.2 emission factors. These factors represent the ongoing decarbonisation of the electricity grid and benefit of low carbon technologies such as heat pumps in reducing total carbon emissions.**



**Figure 2:** Proportion of applicants using SAP 10.0 and SAP 2012 (Part L 2013) vs SAP 10.2 (Part L 2021)

# Whole life-cycle carbon emissions reporting

Since September 2020, the Mayor has encouraged applicants submitting referable planning applications to calculate and then work to reduce the whole life-cycle carbon (WLC) emissions of their proposals. This requirement was **formally brought into effect in March 2021** through Policy SI 2 when London Plan 2021 was published.

A WLC approach takes account of a development's total carbon impact i.e. its **embodied carbon emissions** as well as its operational emissions. **London is the first city in the UK to require WLC assessments from all new development proposals referred to the Mayor.**

The 2021 Energy Monitoring Report was the first monitoring report to include the WLC emissions reported by referable developments in London. In 2023, **77 per cent of developments approved by the Mayor reported WLC emissions**, across a total of 72 developments. This is an increase from 65 per cent of developments approved by the Mayor reporting WLC emissions in 2022.

**As the first UK city to require WLC assessments for all new development proposals referred to the Mayor, London is again leading the way in tackling the climate emergency**

WLC assessments calculate and reduce emissions across a development's life-time using the following life-cycle modules:

-  **Module A (Product sourcing and construction stage)**
  - Including materials extraction and transportation
-  **Module B (Use stage)**
  - Including maintenance/repair and replacement, and in-use energy usage
-  **Module C (End of life stage)**
  - Including demolition and disposal
-  **Module D (Benefits and loads beyond system boundary)**
  - Including reuse and recycling potential

# ‘Be Seen’

The London Plan 2021 introduced updates to Policy SI 2 upon its publication in March 2021. This included the introduction of a fourth stage to the energy hierarchy. **‘Be Seen’ requires monitoring, verification and reporting of the actual energy performance of major developments for at least five years.**

Through the introduction of the ‘Be Seen’ energy monitoring requirement, the **GLA seeks to gather data to better understand actual operational energy performance** and work towards **bridging the ‘performance gap’** between design theory and actual energy use to work towards the delivery of truly net zero-carbon buildings. The ‘Be Seen’ element of the energy hierarchy **takes account of both regulated and unregulated energy uses**, i.e. energy uses which both are and are not currently covered by national Building Regulations.

Up to the end of the 2023 calendar year, a total of **119 planning stage submissions have been received**. Six as-built submissions have been received via the webform, with annual in-use reporting to follow.

**‘Be Seen’ supports London’s targets to achieve truly net-zero carbon buildings and work towards closing the performance gap**

The ‘Be Seen’ energy monitoring guidance was published in September 2021. There is a supporting reporting template and webform which should be completed by applicants at three key stages throughout the development programme:



Planning Stage (RIBA Stage 2/3) – *planning stage estimates to be provided and confirmation of metering plans.*



As-built (RIBA Stage 6) – *update energy performance predictions and confirm metering installation.*



In-use (RIBA Stage 7) – *submit measured annual energy performance data, for at least five years.*



Overall results



# Total on-site carbon savings

An overall carbon reduction of **57.4 per cent** (up from 52.9 per cent in 2022) more than required by Building Regulations was secured for the 93 developments approved in 2023.

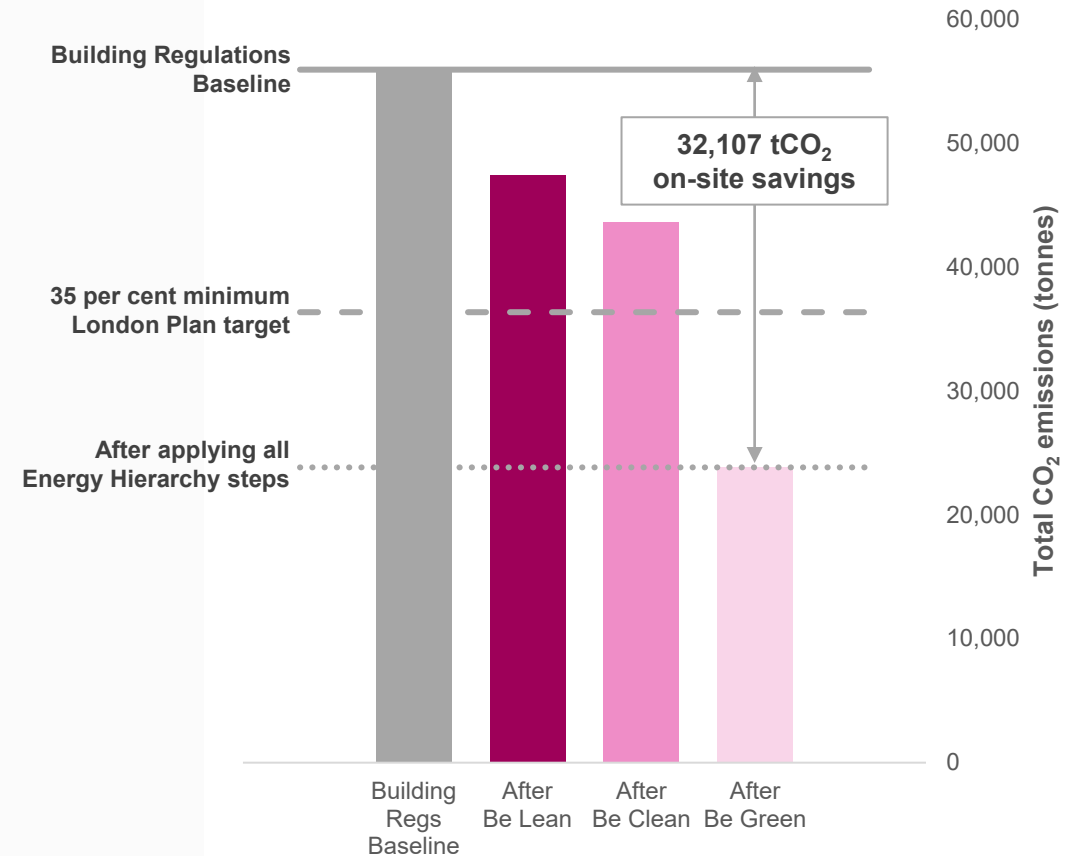
☁️ **32,107 tonnes of CO<sub>2</sub> saved in total** (equating to a 57.4 per cent saving, up from 52.9 per cent in 2022)

🏠 **18,281 tonnes of CO<sub>2</sub> from residential developments** (equating to a 63.4 per cent saving, up from 57.0 per cent in 2022)

🏢 **13,826 tonnes of CO<sub>2</sub> from non-residential developments** (equating to 51.0 per cent, up from 48.9 per cent in 2022)

The increase in savings is due predominantly to a rise in ‘be green’ savings. **London’s pioneering use of SAP 10.0 emission factors** as the basis for energy assessments is **generating higher carbon savings** from this part of the energy hierarchy. Changes to the notional building used to determine the Part L 2021 baseline is expected to impact the savings throughout the Energy Hierarchy going forward.

**The Mayor’s policies demonstrate the important role that raising national building standards can play in tackling the climate emergency**



**Figure 3:** Site-wide carbon emissions after each stage of the Energy Hierarchy

# Carbon savings breakdown

## Be Lean

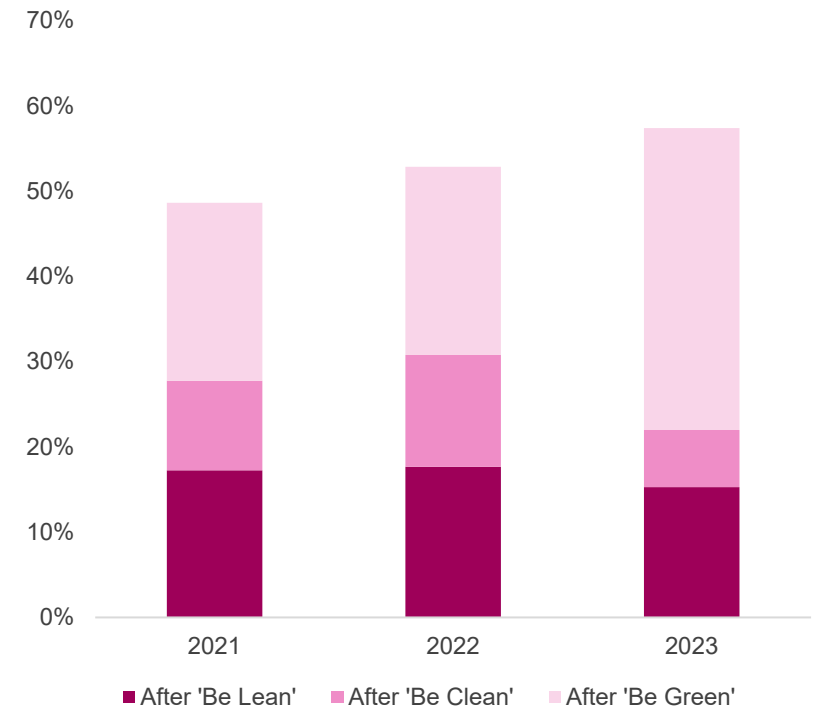
**15.3 per cent CO<sub>2</sub> reduction** (17.7 per cent in 2022), a **decrease from last year**. Average 'Be Lean' savings illustrate that development was able to meet or exceed London Plan energy efficiency targets for their respective development types by reducing energy demand and improving fabric performance. See the 'Be Lean' section for further analysis.

## Be Clean

**6.7 per cent CO<sub>2</sub> reduction** (13.1 per cent in 2022) resulting from an estimated **£60m investment in heat network infrastructure**. For the past five years this hierarchy stage has shrunk significantly, largely due to gas-engine CHP being discouraged except where it can stimulate area wide DHNs. As in 2022, once again no new CHP capacity was proposed in 2023. See the 'Be Clean' section for further analysis.

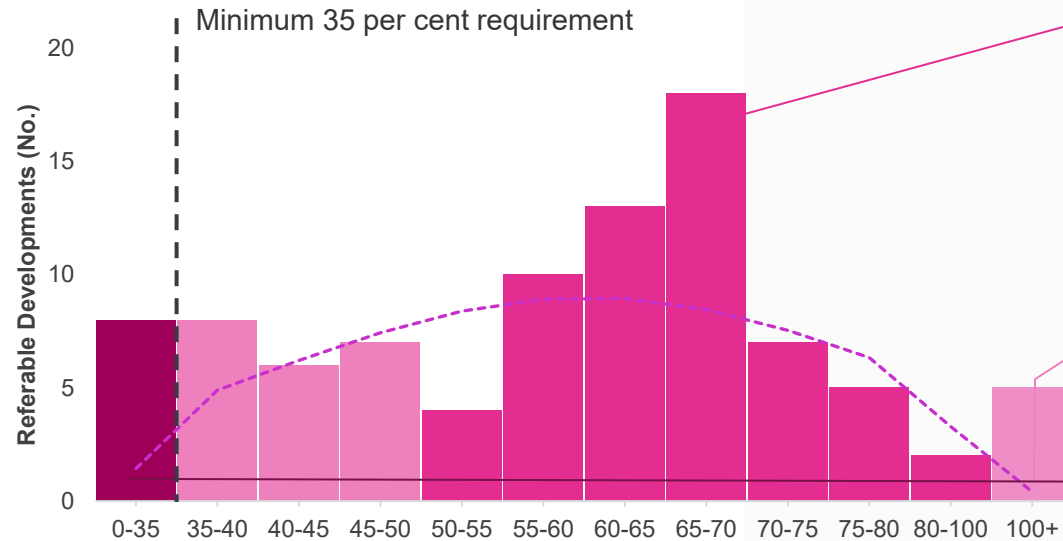
## Be Green

**35.4 per cent CO<sub>2</sub> reduction** (22.1 per cent in 2022), largely from 78 developments with heat pumps, (compared to 118 in 2022). As in 2022, **'Be Green' now makes up the largest proportion of CO<sub>2</sub> savings**. There are also 86 developments installing 13.8 MWp of solar PV (down from 20.2 MWp in 2022) with an estimated area of 70,008 m<sup>2</sup> and new investment of around £21m. See the 'Be Green' section for further analysis.



**Figure 4:** Breakdown of total tCO<sub>2</sub> savings by each stage of the Energy Hierarchy for all referable developments

# Distribution of carbon savings



**Figure 5:** Range, frequency and distribution of CO<sub>2</sub> savings (per cent) achieved in 2023

**91 per cent of developments met or exceeded the minimum on-site target, a five per cent decrease from 2022.**

**Over two-thirds of all development reported a saving of 50 per cent or more over the relevant Building Regulations baseline.**

The Energy Assessment Guidance 2022 defined a **benchmark improvement of over Part L 2021 of 50 per cent** which residential developments should be aiming to achieve. **80 per cent of residential development elements were able to achieve an on-site saving of 50 per cent or more** over the relevant Building Regulations baseline.

**Five developments achieved more than 100 per cent savings.** This means that the developments' CO<sub>2</sub> emissions are calculated to be below zero according to the Part L methodology. This is mainly possible through the adoption of 'Be Green' measures, such as when a building generates more energy than it consumes.

**Eight developments missed the 35 per cent target, an increase on those in 2022.** These were non-domestic elements only. This reflects the increased stringency of building regulations under Part L 2021, making it more challenging for some non-residential developments to achieve London Plan policy targets. The majority of these either reported using SAP 2012 factors or under Part L 2021 (using SAP 10.2 factors).

# Carbon offsetting

**Carbon offsetting is a last resort measure** in meeting the London Plan's net zero target, but it does provide flexibility where on-site savings have been maximised. **Carbon offset funds are funding carbon reduction projects across London in support of London's net zero carbon target.** Examples include retrofit and renewable energy projects.

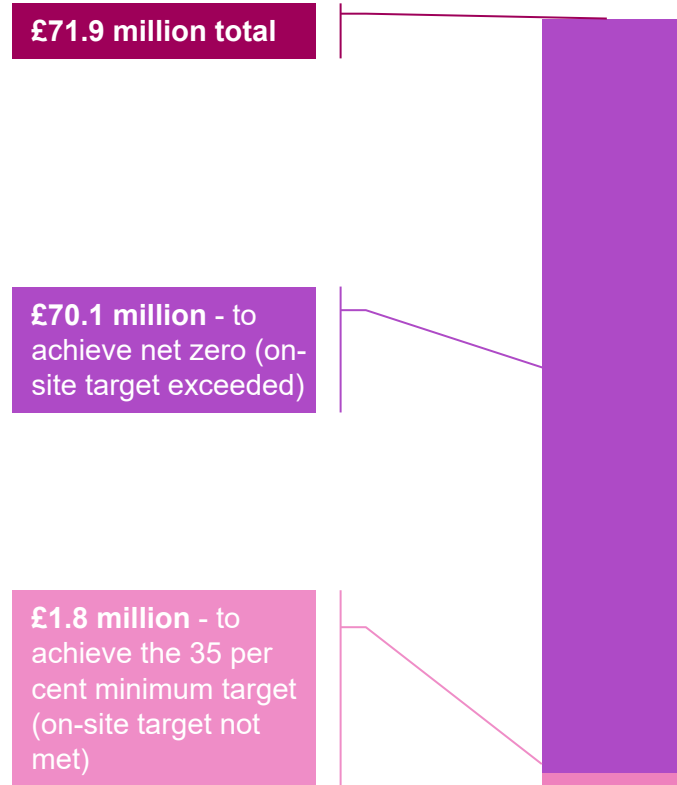
The Mayor's **recommended carbon offset price is £95/tonne**. Alternatively, Local Planning Authorities can apply their own locally-set price.



**It is estimated that up to £71.9 million could ultimately be collected by Local Planning Authorities from referable developments that have gone through planning between January and December 2023.**

The figures above and in the chart are estimates only. **Local Planning Authorities are responsible for calculating and collecting offset payments.** The Mayor monitors implementation of the carbon offset policy. These reports are published separately and are available on the [GLA website](#).

**Due to the increase in carbon savings achieved by developments in 2023, the estimated offset payment per development has decreased to £760,000, from £1.2m in 2022.**



**Figure 6:** Estimated carbon offset amounts for 2023



# Whole life-cycle carbon emissions

The average WLC CO<sub>2</sub> emissions reported per development in 2023 was **934 kg CO<sub>2</sub>/m<sup>2</sup> Gross Internal Area (GIA)** (908 kg CO<sub>2</sub>/m<sup>2</sup> GIA in 2022) **which demonstrates an improvement over the WLC benchmarks**. Whilst this is a three per cent increase compared to 2022, this maintains a significant improvement over the average 1,021 kg CO<sub>2</sub>/m<sup>2</sup> GIA illustrated when WLC emissions were reported for the first time in 2021. This area continues to develop within the industry, including through reporting processes which more robustly account for embodied carbon emissions.

Applicants are required to outline the key actions to achieve the WLC emissions reported and estimate the emission reductions expected. **Following the implementation of these key actions, the average CO<sub>2</sub> emissions reduction reported within the WLC assessments was 48 kg CO<sub>2</sub>/m<sup>2</sup> GIA.** Applicants must also estimate potential savings from the reuse or recycling of components at the end of a building's useful life. In 2023, applicants on average reported further potential savings of **97 kg CO<sub>2</sub>/m<sup>2</sup> GIA**. These savings are based on planning stage estimates. Applicants are expected to provide a post-completion stage update prior to occupation to report on the actual WLC emissions of the development as built.

A: Product sourcing and construction stage  
B: Use stage  
C: End of life stage

|                                                | Module A<br>(kg CO <sub>2</sub> /m <sup>2</sup> GIA) | Module B1-B5 & C<br>(kg CO <sub>2</sub> /m <sup>2</sup> GIA) | Total<br>(kg CO <sub>2</sub> /m <sup>2</sup> GIA) |
|------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------|
| <b>Reported CO<sub>2</sub> emissions</b>       | <b>598</b>                                           | <b>337</b>                                                   | <b>934</b>                                        |
| <b>WLC residential benchmarks</b>              | <850                                                 | <350                                                         | <b>&lt;1,200</b>                                  |
| <b>Aspirational WLC residential benchmarks</b> | <500                                                 | <300                                                         | <b>&lt;800</b>                                    |

**Table 2:** WLC emissions reported against benchmarks

*NB: the figures above do not include the impact of grid decarbonisation. Also, while most applications were mixed-use schemes, applicants are required to report performance against the benchmarks for the dominant use which is why the table above shows comparison against the residential benchmarks only. Actual comparison may therefore be slightly different in practice.*

**The Mayor's industry-leading WLC policy is driving change in the sector. The benchmarks are pushing applicants to make design choices that are much more sustainable across the lifecycle of a building.**

# Local highlights

Opportunities for carbon savings vary between Local Planning Authority areas, depending on their density, availability of DHN connections and waste heat sources as well as how the Local Planning Authority is using the planning system to respond to the climate emergency.



**City of London** achieved a **53 per cent CO<sub>2</sub> reduction** across three referable developments from **fabric first measures** through '**Be Lean**'. This saving was led by a proposed large-scale refurbishment.

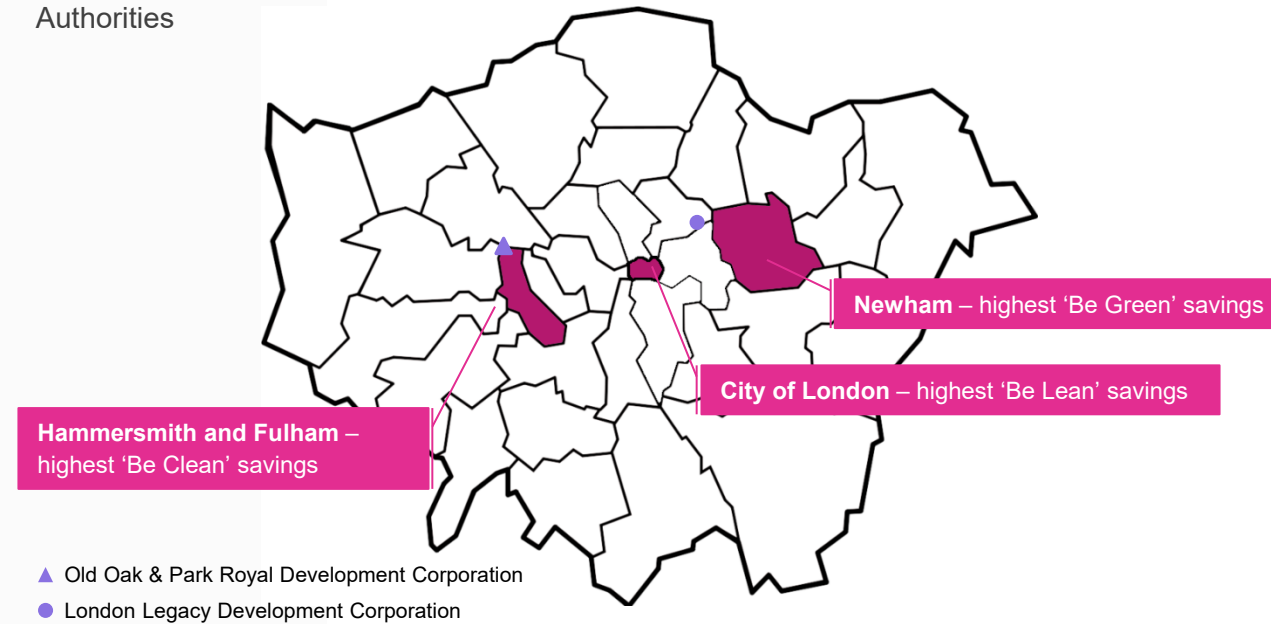


**Hammersmith and Fulham** achieved a **40 per cent CO<sub>2</sub> reduction** across two referable developments from '**Be Clean**' measures, with a key development proposing to **connect 1,700 homes to the Westfield heat network**.



**Newham** achieved a **62 per cent 'Be Green' CO<sub>2</sub> reduction** from air source heat pumps and solar PV from two developments. The 'Be Green' saving achieved by this development led to Newham seeing the greatest savings **across the whole energy hierarchy**.

**Figure 7:** Map of London Planning Authorities



**Table 3:** Number of referable applications by LPA area

| Number of referable developments that gained planning approval from the Mayor in the calendar year 2023 (per Local Planning Authority) |   |                               |   |                        |   |               |   |                      |   |
|----------------------------------------------------------------------------------------------------------------------------------------|---|-------------------------------|---|------------------------|---|---------------|---|----------------------|---|
| Barking and Dagenham                                                                                                                   | 5 | Croydon                       | 2 | Harrow                 | 0 | Lambeth       | 5 | Richmond upon Thames | 1 |
| Barnet                                                                                                                                 | 1 | Ealing                        | 8 | Havering               | 1 | Lewisham      | 3 | Southwark            | 9 |
| Bexley                                                                                                                                 | 2 | Enfield                       | 2 | Hillingdon             | 3 | LLDC          | 3 | Sutton               | 1 |
| Brent                                                                                                                                  | 3 | Greenwich                     | 4 | Hounslow               | 3 | Merton        | 0 | Tower Hamlets        | 5 |
| Bromley                                                                                                                                | 2 | Hackney                       | 2 | Islington              | 2 | <b>Newham</b> | 2 | Waltham Forest       | 2 |
| Camden                                                                                                                                 | 4 | <b>Hammersmith and Fulham</b> | 2 | Kensington and Chelsea | 0 | OPDC          | 1 | Wandsworth           | 0 |
| <b>City of London</b>                                                                                                                  | 3 | Haringey                      | 4 | Kingston upon Thames   | 2 | Redbridge     | 2 | City of Westminster  | 4 |



**‘Be Lean’**

# ‘Be Lean’: Residential

Planning applications for residential developments in 2023:

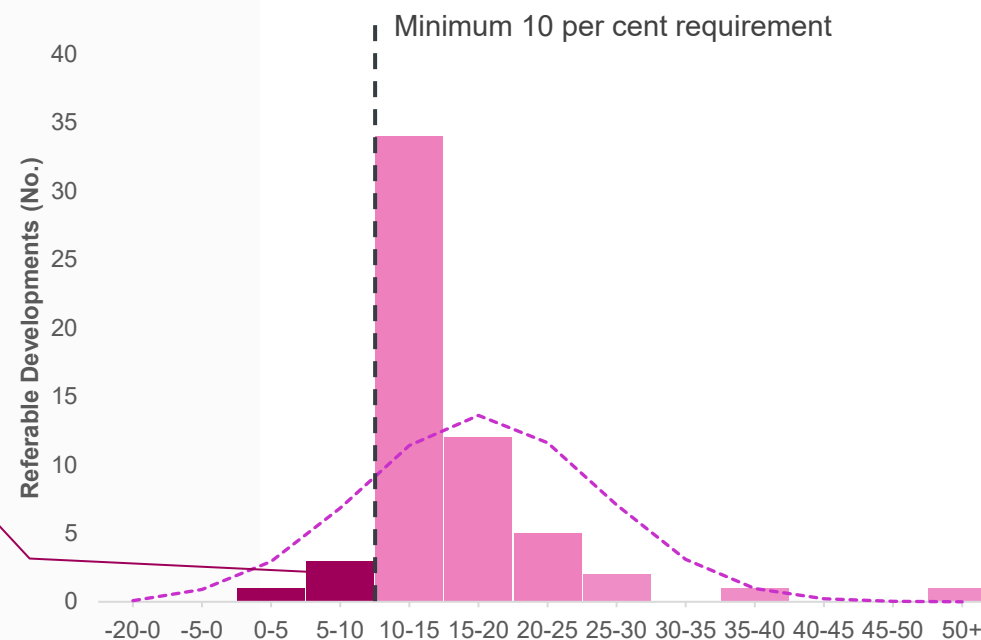
 achieved on average a **15.1 per cent** reduction in CO<sub>2</sub> emissions from energy efficiency measures alone, exceeding the 10 per cent energy efficiency target.

 have maintained an **increase in energy efficiency savings over the last five years.**

**93 per cent of residential development was able to meet or exceed the 10 per cent minimum energy efficiency target.**

All developments missing the ‘Be Lean’ target exceeded the minimum 35 per cent requirement after applying the rest of the energy hierarchy.

**The Mayor’s ambitious energy efficiency target influences applicants’ design decisions, reducing energy demand, CO<sub>2</sub> emissions and energy bills**



**Figure 8:** CO<sub>2</sub> savings (per cent) achieved from ‘Be Lean’ measures for residential developments



# ‘Be Lean’: Non-residential

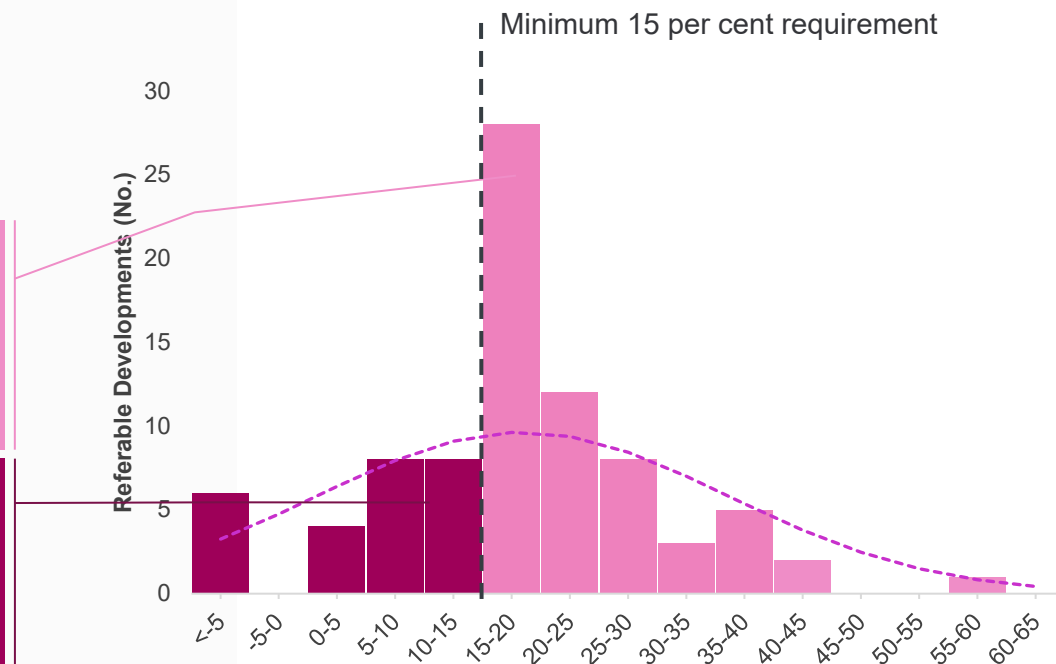
Planning applications for non-residential developments in 2023:

 secured on average a **16.0 per cent carbon reduction from energy efficiency measures** alone, a decrease from the 17.3 per cent in 2022.

Energy efficiency savings achieved have been impacted by the adoption of Part L 2021. The cover note to the GLA Energy Assessment Guidance 2022 acknowledged that developments would find it harder to meet this target due to the considerable improvement of the notional baseline building with ASHP and better lighting performance.

Around 40 per cent of developments missed the non-residential energy efficiency target when reporting against the new, more stringent standard of Part L 2021. More than half of developments which missed the energy efficiency target were able to achieve the 35 per cent onsite saving after applying the rest of the energy hierarchy.

There were six cases where the non-residential element did not reach the Building Regulations baseline through ‘Be Lean’ measures alone. Four of these were able to achieve the 35 per cent on-site saving after ‘Be Clean’ and ‘Be Green’ savings were applied. Those which did not subsequently meet this target were a refurbishment and a hospital.



**Figure 9:** CO<sub>2</sub> savings (per cent) from ‘Be Lean’ measures for non-residential developments

**69.4 per cent of non-residential developments met or surpassed the energy efficiency target, down from 73 per cent in 2022**

# Overheating

The Mayor's cooling hierarchy ([London Plan](#) Policy SI 4) requires applicants to mitigate overheating risks using passive measures. **External shading, such as shutters or blinds, is strongly encouraged**, as is solar control glazing, and these can significantly reduce solar heat gains while maintaining natural light. See Case Study 4 for an example of how developments are mitigating overheating risk.

**Active cooling, such as air conditioning, is discouraged in residential developments. Applicants must follow the cooling hierarchy and prioritise passive design solutions, such as external shading.**

## G-values

A g-value is a measure of solar heat gain through a window. For residential developments approved in 2023, **an average g-value of 0.42 was proposed**, a third lower than the Part L notional value of 0.63, demonstrating a good improvement on national regulations when specifically considering overheating risk.

**G-values often vary with orientation.** For non-residential developments, cooling demands should be reduced below the figure calculated for the Part L notional building. Where reported, **68 of the 71 applications with a non-residential element managed to reduce their actual active cooling demand** below that of the notional building.

## Tools for assessing overheating risk

To demonstrate the mitigation of overheating risk, **applicants are required to undertake a CIBSE Technical Memorandum TM59 compliant dynamic overheating assessment**. Non-residential developments with natural ventilation must use TM52.



**71 (51 residential, 20 non-residential) submitted a TM59 or TM52 dynamic overheating assessment.** This represents 76 per cent of applications in 2023 undertaking overheating assessments, up from 75 per cent in 2022.



**65 showed compliance** (down from 95 last year) with the TM49 Design Summer Year (DSY) 1 weather file - representing summer conditions occurring every other year.

## Preparing for higher temperatures in the future

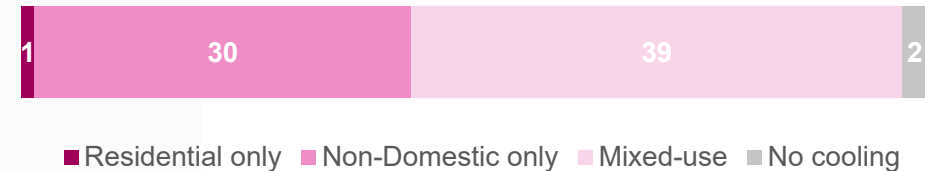
It is becoming **increasingly important to mitigate overheating risk** as climate change leads to rising temperatures. In response to this, the GLA **Energy Assessment Guidance 2022 requires a more rigorous analysis**, to include modelling under DSY 1, DSY 2 and DSY 3. Part O of Building Regulations, adopted at the same time as Part L 2021, now also sets overheating standards for new residential buildings in England.

# Cooling proposals

**Residential – One residential only and six mixed-use developments** proposed residential active cooling. This represents 11.9 per cent of developments with a residential component, a decrease from 17.0 per cent in 2022. **While active cooling is discouraged, it may be needed where site constraints prevent passive measures** from reducing overheating risk sufficiently. There are an increasing number of developments which are proposing use of peak lopping, MVHR tempering, trim boost to mitigate overheating, in lieu of separate active cooling systems.

**Non-residential – 30 non-residential only and 38 mixed-use developments** proposed active cooling (80.0 per cent of developments with a non-residential element, up from 78.7 per cent in 2022).

The **total proposed cooling** reported was **7.1 GWh/yr** - this has **more than halved since 2022**. In previous years, this was driven by just a handful of developments including data centres and hospitals. Once again those with the largest cooling loads include a hospital, data centre and large-scale mixed-use masterplans.



**Figure 10:** Number of developments proposing cooling by development type

**The cooling hierarchy prioritises passive design measures to minimise any reliance on energy intensive active cooling measures.** As such, the proportion of overheating assessments undertaken increased in 2023. For developments that propose active cooling, the demand calculated using the National Calculation Methodology (NCM) should be lower than the notional estimate.

**The total proposed cooling reported in 2023 (5.4 kWh/m<sup>2</sup>/yr) decreased compared to 2022 (14.1 kWh/m<sup>2</sup>/yr), demonstrating how following the cooling hierarchy keeps cooling demand to a minimum**

# Case study 1: 114-116 Queensway, Westminster

A new development in the **City of Westminster** comprising a commercial-led mixed-use development that includes 32 residential units alongside 8,320 m<sup>2</sup> of office space and 2,025 m<sup>2</sup> of retail across two buildings of up to seven storeys.



**Communal Heat Network:** The development will be served by a **communal heat network** powered by a **centralised energy centre**, saving **embodied carbon** and enabling simple **future connection to a DHN**.



**Overheating strategy:** The overheating strategy has ensured that the actual building cooling demand is **50 per cent below the notional cooling load**.



**23.4 per cent carbon savings from energy efficiency:** U-Values achieving up to a **40 per cent improvement** over the notional building targets **and an MVHR with 90 per cent heat recovery efficiency**.

## Be Lean

U-value of **0.15 W/m<sup>2</sup>.K** is proposed to the main roof, with a targeted air tightness as low as **3 m<sup>3</sup>/h/m<sup>2</sup> @ 50Pa**, and a **glazing u-value of 1.2 W/m<sup>2</sup>.K**.

LED lighting with an efficacy of up to **120 lm/W**.

**G-Value has been optimised** to balance solar gains and balance overheating risk.

## Be Clean

Applicant has committed to providing sleeving for both heating and cooling to allow **future DHN connection**.

## Be Green

**Through consultation with the GLA**, the applicant is exploring the use of **PV panels** on **green/brown roofs** to maximise savings further on the limited roof space available.

Photo credits: Foster + Partners



| Hierarchy Stage | Emissions (tCO <sub>2</sub> )* | Saving |
|-----------------|--------------------------------|--------|
| Baseline        | 265                            | -      |
| 'Be Lean'       | 203                            | 23.4%  |
| 'Be Clean'      | 203                            | 0%     |
| 'Be Green'      | 171                            | 12.1%  |

\*Reported against Part L 2013 using SAP 10.0 emissions factors



# Case study 2: Block C – Land North of Westfield, Hammersmith and Fulham

A new development in the **London Borough of Hammersmith and Fulham**, comprising a new mixed-use development for up to 1,760 units and 2,510 m<sup>2</sup> of commercial floorspace across nine distinct blocks, with associated private and communal garden and amenity space.



**47.1 per cent carbon savings from ‘be clean’:** SAP 2012 factors were used where the development proposes to **connect to the Westfield London district heating network (operated by E.ON)**, a network that is currently undergoing decarbonisation plans with the GLA.



**PV Maximisation:** A PV array of **461 kWp** generating **398,456 kWh** of renewable energy annually.

## Be Lean

A U-value of **0.15 W/m<sup>2</sup>.K** is proposed to the external walls and **0.12 W/m<sup>2</sup>.K** to the roofs used in combination with **bespoke thermal bridging values** to achieve ‘be lean’ targets.

## Be Clean

The dwellings will connect to the **Westfield DHN**, whilst the commercial uses will be served by Air Source Heat Pumps.

## Be Seen

A ‘be seen’ commitment is in place to enable post construction monitoring of operational performance for at least five years after construction. **There will be an energy meter within the development’s on-site energy centre**, to enable the ‘be seen’ monitoring to take place. This seeks to address the ‘performance gap’ between designed energy use and operational performance.

Photo credits: Glenn Howells Architects



| Hierarchy Stage | Emissions (tCO <sub>2</sub> )* | Saving |
|-----------------|--------------------------------|--------|
| Baseline        | 2078.5                         | -      |
| ‘Be Lean’       | 1797.9                         | 13.5%  |
| ‘Be Clean’      | 818.7                          | 47.1%  |
| ‘Be Green’      | 767.6                          | 2.5%   |

\*Reported against Part L 2013 using SAP 2012 emissions factors



**‘Be Clean’**



# ‘Be Clean’

The ‘Be Clean’ element of the energy hierarchy requires that applicants exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly as part of a system level solution to energy supply.

**The proportion of developments connecting to existing DHNs increased in 2023 to 10.6 per cent (10 developments), up from 8.2 per cent in 2022 (11 developments).** Several developments identified area-wide **heat networks for potential connection** which were identified in the submitted energy strategies with corresponding ‘Be Clean’ savings. There was at least one development which identified **a future planned network for which the development’s connection is confirmed.**

Once again there was **no new on-site CHP capacity proposed in 2023**, as in 2022, continuing the trend which has seen the installation of on-site CHP installations decrease rapidly over recent years as low carbon heat sources have been proposed usually with accompanying heat pumps.

**‘Be Clean’ represents 6.7 per cent of carbon emissions savings from development approved in 2023, with 10.6 per cent of developments proposing connections to existing District Heat Networks (DHNs)**

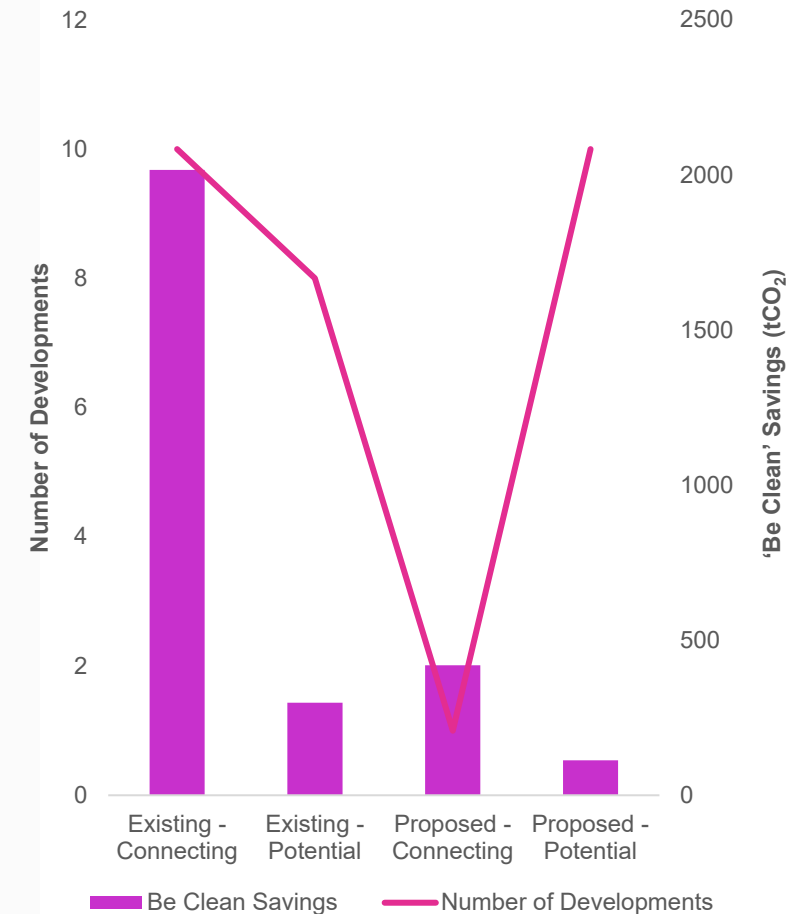


Figure 11: ‘Be Clean’ savings by proposed connection type

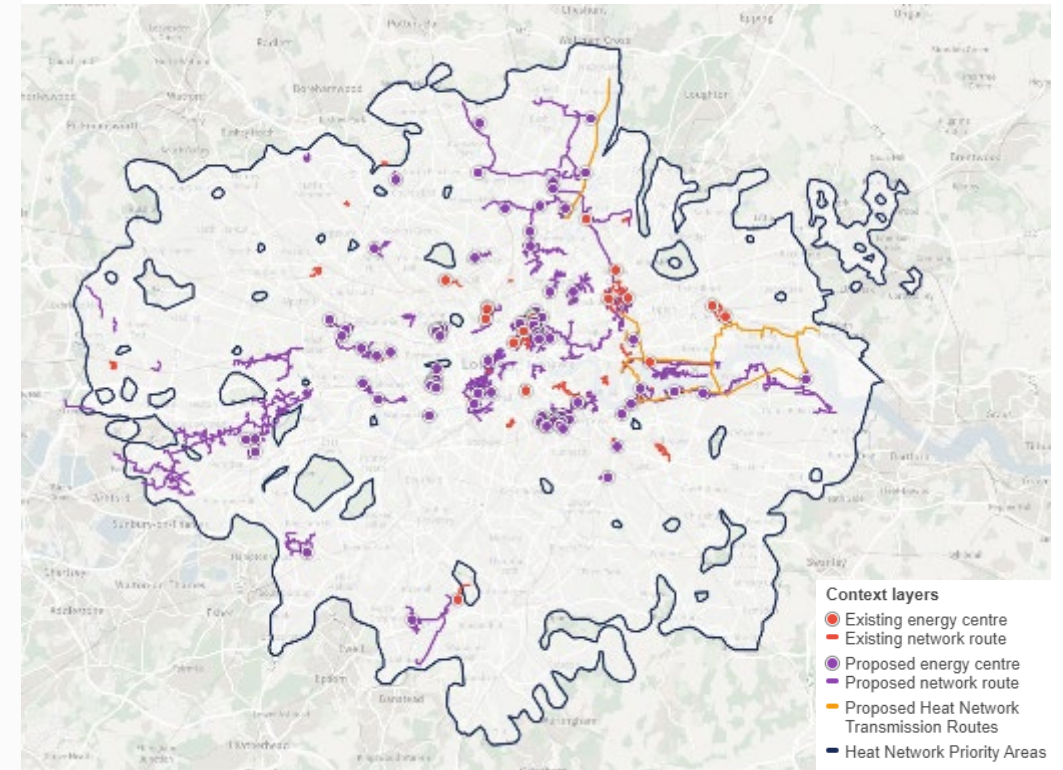
# Communal heat networks

A communal heat network connects individual dwellings in a building and buildings on a site to a centralised site-wide heating system, which is more efficient for managing heat demand. Developments in Heat Network Priority Areas are expected to have communal networks to enable their connection to a DHN in the future.

In 2023, a total of **28,000 dwellings** are expected to connect to a communal heat network or an area-wide DHN (**91.3 per cent of all dwellings**, a decrease from 96.1 per cent in 2022). Figure 12 shows the development of communal heat networks in London since 2011.

2023 saw a continued shift to a low carbon heat supply for new development across London, with **68 communal and site-wide heat networks supplied by heat pumps**. There were no communal heat networks brought forward in 2023 proposing installation of new on-site gas-fired CHP capacity. See 'Be Green' for further details about the number of heat pumps proposed.

**The London Plan is driving the development of low carbon heat networks and the decarbonisation of existing networks, including those supplied by heat pumps utilising recoverable low carbon heat sources**



**Figure 12:** London Heat Map illustrating existing and proposed networks across London. The London Heat Map is a tool designed to help identify areas of high heat demand, opportunities for new and expanded district heat networks and to plot potential heat networks and assess their financial feasibility.



# District heating network connections

DHNs have an important role to play in London's path to net zero. They offer an **efficient and competitive low carbon solution for heating buildings** in high density areas, form an important part of a low carbon, flexible and resilient energy system and can make use of recoverable environmental and waste heat sources. Applicants must refer to the [London Heat Map](#) and consult with local heat network operators and/or Local Planning Authority energy officers to identify if their site is in the vicinity of an existing or planned heat network. If they are, **the applicant is expected to prioritise connection**, and connect either on completion or when the heat network arrives at the site boundary.

If the heat network is planned and not yet in existence, then **applicants must design a communal on-site heat network solution which is future-proofed for later connection**. In this way, heat networks can serve a growing number of buildings in an area with low or zero carbon heat and help manage demand and protect capacity on the local electricity network. The GLA also works with heat network operators to ensure that they are developing and implementing decarbonisation strategies for their existing DHNs.

**6,372 dwellings in 10 developments are expected to connect to existing DHNs, down from 8,632 dwellings in 11 developments in 2022. Connection numbers depend on the proximity of development to DHNs. 84 per cent of applications approved in 2023 will be supplied by communal networks, future-proofed for DHN connection once this is available.**

| Connection type                     | Developments | Dwellings | Name of District Heat Network                                                                                                             |
|-------------------------------------|--------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Existing DHN (immediate connection) | 10           | 6,372     | Queen Elizabeth Olympic Park, Citigen, THDEN, Westfield (E.ON), Barking Town Centre                                                       |
| Existing DHN (later connection)     | 8            | 4,091     | Bunhill, Citigen, Barkantine DHN, GreenScies, Shoreditch, Greenwich Peninsula, SELCHP, Beam Park Masterplan                               |
| Future connection to proposed DHN   | 11           | 3,617     | Lee Valley (Meridian Water), SBEG, Mill Hill East, Kingston, Woodberry Down, Sutton Town Centre Heat Network, Edmonton EfW, Colindale CHP |

**Table 4:** Number of developments and dwellings connecting to existing and proposed DHNs



**‘Be Green’**

# Solar energy

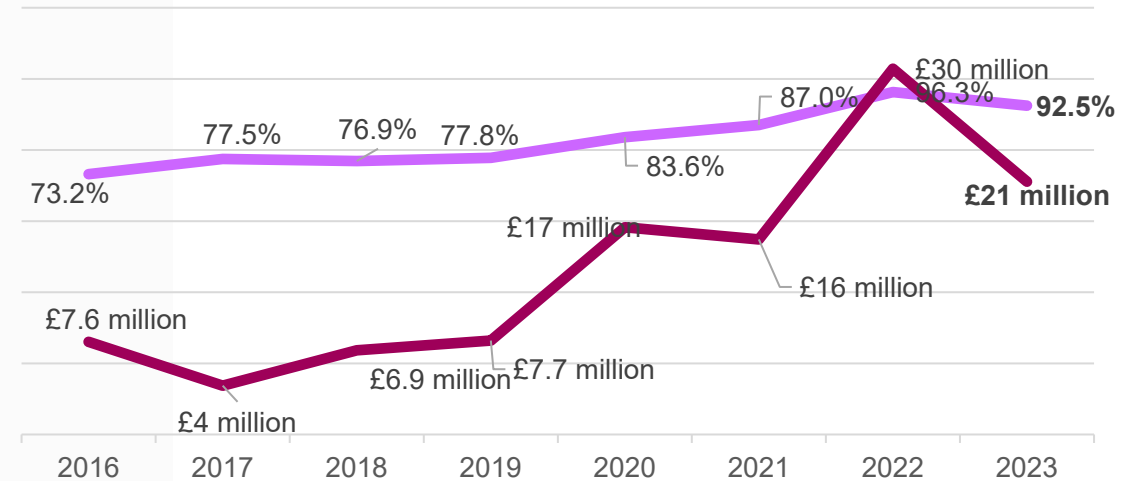
In 2023, **92 per cent of developments (86 developments) proposed new solar PV capacity**, down from 96 per cent of developments in 2022. There was a corresponding drop in PV capacity proposed in 2023 **amounting to 13.8 MWp** (down from 20.2 MWp in 2022). This is estimated to **equate to an investment of £21 million**.

New installations represent an area of **70,008 m<sup>2</sup>** (down from 116,399 m<sup>2</sup> in 2022), with an **average area of 814 m<sup>2</sup>**. Due to the decreased number of applications approved in 2023, the new solar capacity proposed has also decreased. The average PV array area has also decreased, which could be impacted by a number of factors, for example, massing and density.

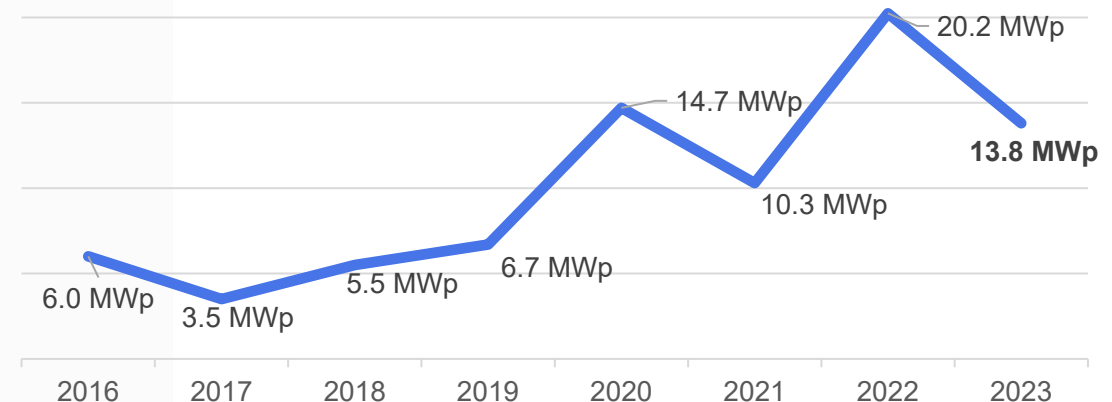
The **total area of solar PV relative to development area has increased** from 2022, in line with policy which requires applicants to maximise PV provision. The total area of solar PV per 1,000 m<sup>2</sup> of floor area in 2023 increased from that observed in 2022 (22.0 m<sup>2</sup> PV/1,000 m<sup>2</sup> compared with 20.7 m<sup>2</sup> PV/1,000 m<sup>2</sup>).

**Outer London planning authorities** continue to lead by total PV area proposed. **Hounslow proposed the highest area of solar PV** in 2023. **Haringey** proposed the second highest area, with new arrays totaling more than 5,000 m<sup>2</sup> expected to be installed in each borough.

**The area of solar PV panel proposed in 2023 would cover 9 Wembley football pitches**



**Figure 13:** Proposed solar PV by percentage of developments and estimated investment



**Figure 14:** Proposed solar PV by capacity

# Heat pumps

In 2023, 78 developments (84 per cent of all developments) committed to installing a heat pump, compared with 118 (88 per cent) in 2022. The decrease in the proportion of developments proposing installation of heat pumps can be attributed to the increase in the proportion of developments proposing to connect to existing heat networks.

For 63 developments, applicants proposed to install only heat pumps or ambient loops. One case proposed a hybrid air source (ASHP) and ground source (GSHP) solution. The majority of remaining developments proposed a hybrid system with ASHPs and gas boilers. Around a quarter of the hybrid solutions are proposed to be electric only. The remainder of systems are ASHP led with boiler back-ups.

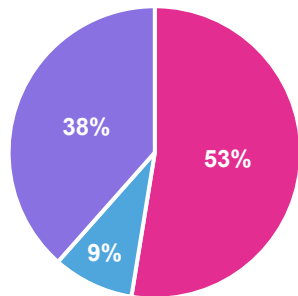


Figure 15: Proportion of heat pump installations by development type

68 of the 78 installations proposed are large centralised heat pumps supplying communal and site-wide heat networks. Large scale heat pumps are well suited to serve mixed-use developments through a communal heat network from a centralised energy centre.

In total, 20,234 dwellings are proposed to be served by heat pumps (compared to over 31,000 in 2022). Up to 1,035,994 m<sup>2</sup> of non-residential floor area is proposed to be served by heat pumps (compared to approximately 3,700,000 m<sup>2</sup> in 2022).

The London Plan is accelerating the transition from gas to heat pump-led heating solutions

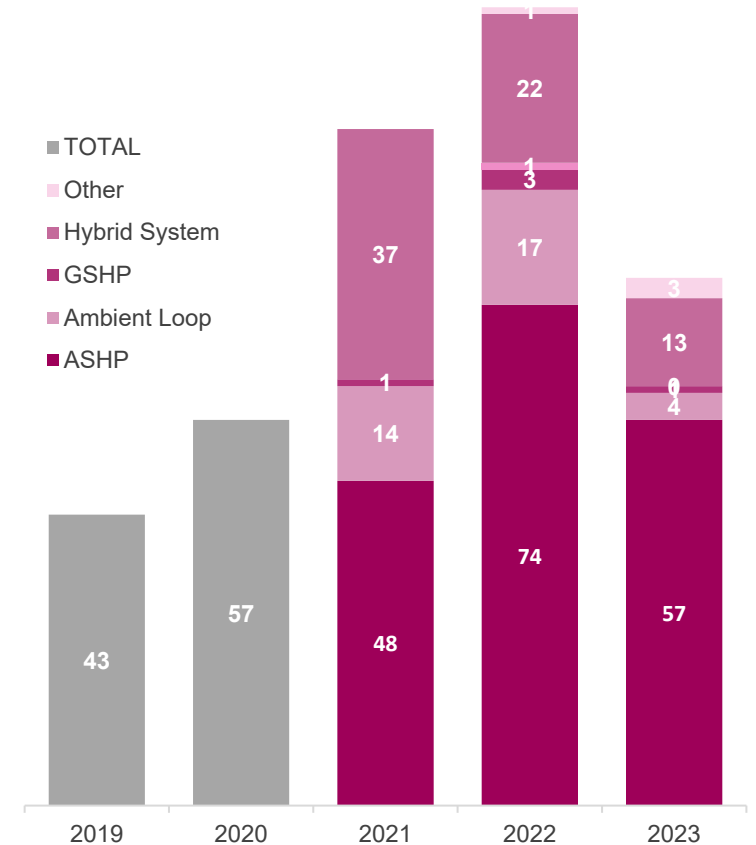


Figure 16: Number of developments proposing heat pumps by type



# Case study 3: Oxlow Bridge School, Barking & Dagenham

Oxlow Bridge School is a development in the London Borough of **Barking and Dagenham**, proposing a new **Special Education Needs and Disability School (SEND)** in a part two-storey building of approximately **2,500 m<sup>2</sup>**. Highlights include:



**All-electric development:** The development proposes an **all-electric approach** heated and cooled by a Variable Refrigerant Flow (VRF) heat pump system.



**Incorporating natural ventilation:** A **hybrid ventilation approach** is taken using natural ventilation and cooling with **g-value as low as 0.28**.



**Beyond net-zero carbon regulated emissions:** The development **achieves beyond net zero carbon** using a fossil fuel-free electric-only energy strategy in line with priorities for the decarbonisation of buildings, **achieving a total 109 per cent saving**.

## Be Lean

A specification is applied which allows for a 'Be Lean' reduction of 23.9 per cent to be achieved, **greatly exceeding the residential energy efficiency target of 15 per cent**.

## Be Clean

The Site lies outside of a Heat Network Priority Area or Heat Map Study Area. There are no existing or proposed heat networks or transmission routes within the vicinity.

## Be Green

The development uses **VRFs served by split ASHPs to provide heating** (and cooling where required) to the key occupied teaching and office spaces.

The development proposes a **PV array** equal to approximately **18.4 per cent of the total floor area** is to be delivered. An array of 96 kWp is proposed, expected to generate 78,600 kWh of renewable energy annually.

Photo credits: 3BM Studio



| Hierarchy Stage | Emissions (tCO <sub>2</sub> ) | Saving |
|-----------------|-------------------------------|--------|
| Baseline        | 14.2                          | -      |
| 'Be Lean'       | 10.9                          | 23%    |
| 'Be Clean'      | 10.9                          | 0%     |
| 'Be Green'      | -1.3                          | 86%    |

# Case study 4: Harriot, Apsley & Pattison Houses, Tower Hamlets

The redevelopment of the site in **Tower Hamlets** to deliver **412 residential units** and 1,192 m<sup>2</sup> GIA of community use, across buildings ranging from 4-8 storeys. Highlights include:



**All-electric development:** The development proposes an **all-electric site-wide heating system served by air source heat pumps**. This technology takes advantage of the decarbonising grid and saves embodied carbon by minimising the number of energy centres required across the site. The strategy also allows the development to connect to a district heat network in future.



**Overheating mitigation strategy:** **Early design analysis** and **targeted strategy for noise sensitive areas** was undertaken to help identify rooms where overheating mitigation strategies would be required.

## Be Lean

A specification is applied which allows for a 'be lean' reduction of **19.2 per cent** to be achieved across the site, with an air tightness of **1 m<sup>3</sup>/h/m<sup>2</sup> @ 50Pa** being targeted.

## Be Green

The site will use **ASHP compatible with a DHN connection**, and **308 kWp of PV** will be installed across 1,536m<sup>2</sup> of available roof space.

## Overheating strategy

The overheating strategy includes:

- A targeted **g-value of 0.45**.
- **Natural ventilation** where possible and **internal blinds** as a mitigation strategy
- **Full height louvres to help** minimise solar gain and external noise.
- **MVHR cooling module** to maintain suitable temperatures when windows are closed.

Photo credits: PRP



| Hierarchy Stage | Emissions (tCO <sub>2</sub> ) | Saving |
|-----------------|-------------------------------|--------|
| Baseline        | 470.7                         | -      |
| 'Be Lean'       | 380.1                         | 19.2%  |
| 'Be Clean'      | 380.1                         | 0%     |
| 'Be Green'      | 139.8                         | 51.1%  |





# Conclusions

# 2023 Conclusions

**New developments in London are continuing to achieve far higher carbon savings than required by national policy.** In 2023, approved developments achieved an overall 57.4 per cent carbon reduction improvement on respective National Building Regulations.

**The Mayor's net zero carbon target is driving greater on-site reductions** with 69 per cent of all developments reporting a saving of 50 per cent or more over the relevant Building Regulations baseline.

**Carbon offsetting continues to play a role in achieving the London Plan net zero target,** with an estimated £71.9 million potentially available for collection in 2023 by LPAs.

**Energy efficiency improvements achieved an overall 15.3 per cent reduction** saving 8,552 tCO<sub>2</sub>, equivalent to adding loft insulation to over 13,000 homes. The average reduction from both residential and non-residential development exceeded their respective targets by at least one per cent.

**London's pioneering approach to emission factors is driving the necessary shift away from gas-based heating solutions** in support of the Mayor's net zero and air quality ambition, with no new on-site CHP capacity proposed in 2023, the second year in a row.

**The London Plan is driving district heat network development and decarbonisation.** 6,372 dwellings are expected to connect to existing networks with decarbonisation plans, a greater proportion of development compared to 2022. 84 per cent of developments will be future-proofed to enable future connection to a DHN.

**Solar PV continues to be prioritised in London, with capacity in 2023 totalling 13.8 MWp from 70,008 m<sup>2</sup>** - equivalent to over 14 Wembley football pitches. 92 per cent of developments proposed PV, down from 96 per cent in 2022 however total area of solar PV per 1,000 m<sup>2</sup> GIA increased in 2023 from 20.7 vs 22.0 m<sup>2</sup> PV/1,000 m<sup>2</sup>.

**London Plan policies are promoting the uptake of heat pumps.** 78 developments with up to 20,234 dwellings and 1,035,994 m<sup>2</sup> of non-residential floor area committed to being served by heat pumps, down from over 31,053 dwellings and 3,691,224 m<sup>2</sup> in 2022.

**To demonstrate the mitigation of overheating risk, 76 per cent of developments submitted a dynamic overheating assessment** up from 75 per cent in 2022. The majority of developments were able to meet requirements without full active cooling.

**On average, developments were able to improve their performance beyond the WLC benchmarks;** 72 developments reported WLC emissions.





# Appendices

# Appendix – Carbon savings secured

| Cumulative carbon emissions and savings     |                             |                               |                                                                                      |                          |
|---------------------------------------------|-----------------------------|-------------------------------|--------------------------------------------------------------------------------------|--------------------------|
| Stages of the energy hierarchy              | Regulated emissions         | Regulated emissions reduction | Cumulative regulated emissions reductions relative to Part L of Building Regulations |                          |
|                                             | (tCO <sub>2</sub> per year) | (tCO <sub>2</sub> per year)   | (tCO <sub>2</sub> per year)                                                          | (percentage improvement) |
| Building Regulations Baseline               | 55,935                      | -                             | -                                                                                    | -                        |
| After 'Be Lean' (energy efficiency)         | 47,383                      | 8,552                         | 8,552                                                                                | 15.3%                    |
| After 'Be Clean' (heat network connections) | 43,632                      | 3,750                         | 12,302                                                                               | 22.0%                    |
| After 'Be Green' (renewable energy)         | 23,828                      | 19,805                        | 32,107                                                                               | 57.4%                    |

**Table 5:** Total cumulative carbon emissions and savings after each stage of the energy hierarchy

# Appendix – Results since 2016

## Progress in the outcomes from London Plan energy policies since 2016

| Key outcome                                                | 2016                  | 2017                  | 2018                  | 2019                  | 2020                  | 2021                  | 2022                   | 2023                  |
|------------------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|
| Number of applications with an energy element              | 142                   | 129                   | 130                   | 108                   | 140                   | 138                   | 134                    | 93                    |
| Percentage improvement over Part L                         | 35.7%                 | 40.5%                 | 36.9%                 | 40.6%                 | 46.2%                 | 48.6%                 | 52.9%                  | 57.4%                 |
| Savings from energy efficiency measures compared to Part L | 7.4%                  | 15.8%                 | 13.5%                 | 16.7%                 | 19.8%                 | 17.3%                 | 17.7%                  | 15.3%                 |
| Number of developments proposing heat pumps                | 42                    | 41                    | 57                    | 43                    | 57                    | 100                   | 118                    | 78                    |
| Proportion of developments proposing solar PV              | 73.2%                 | 77.5%                 | 76.9%                 | 77.8%                 | 83.6%                 | 87.0%                 | 96.3%                  | 92%                   |
| Estimated investment in solar PV                           | £7.6 million          | £4 million            | £6.9 million          | £7.7 million          | £17 million           | £16 million           | £30 million            | £21 million           |
| Proposed PV capacity                                       | 6.0 MWp               | 3.5 MWp               | 5.5 MWp               | 6.7 MWp               | 14.7 MWp              | 10.3 MWp              | 20.2 MWp               | 13.8 MWp              |
| Proposed PV area                                           | 62,736 m <sup>2</sup> | 34,691 m <sup>2</sup> | 55,027 m <sup>2</sup> | 39,599 m <sup>2</sup> | 87,099 m <sup>2</sup> | 59,834 m <sup>2</sup> | 116,399 m <sup>2</sup> | 70,008 m <sup>2</sup> |

**Table 6:** Key outcomes from London Plan energy policies since 2016